Climate Pollution Reduction Grants Program: Texas Quality Assurance Project Plan, Revision 0

United States Environmental Protection Agency

Office of Air and Radiation

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1. Project Management (Group A)

1.1. Title and Approval Page

Quality Assurance Project Plan for
Environmental Information Submitted to Texas Policymakers in the Greenhouse Gas (GHG) Inventory and Options Identification Phase of the Climate Pollution Reduction Grants (CPRG) Program

Grant Number 02F35501

Prepared by:
Texas Commission on Environmental Quality

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Date: 10/10/2023

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QAPP Revision History

Revision No.	Description	Author	Date
0	Original Version	Kasey Savanich	10/10/2024

1.2. Table of Contents

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Abbreviations

Bbtu	Billion British Thermal Units
CAA	Clean Air Act
CAP	Comprehensive Action Plan
CFR	Code of Federal Regulations
CH_4	Methane
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
CPRG	Climate Pollution Reduction Grant
DMV	Department of Motor Vehicles
EIA	U.S. Energy Information Administration
EPA	U.S. Environmental Protection Agency
F-gasses	Fluorinated Gasses
GHG	Greenhouse Gas
GHGRP	Greenhouse Gas Reporting Program (40 CFR Part 98)
HCF	Hydrofluorocarbon
ICR	Information Collection Request
MD	Monitoring Division
MMT	Million Metric Tons
MPG	Miles per Gallon
NAICS	North American Industry Classification System
NF_3	Nitrogen Trifluoride

N_2O	Nitrous Oxide
OA	Office of Air
OAR	EPA Office of Air and Radiation
PAP	Priority Action Plan
PFC	Perfluorocarbon
PM	Project Manager
PO	EPA Project Officer for Grant
POP	Period of Performance
POR	EPA Project Officer's Representative
PWP	Project Work Plan
QA	Quality Assurance
QAM	Quality Assurance Manager
QAMD	Quality Assurance Manager Delegate
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QC	Quality Control
QMP	Quality Management Plan
SF_6	Sulfur Hexafluoride
SIT	State Inventory Tool (provided by the EPA)
TCEQ	Texas Commission on Environmental Quality
TL	Task Leader
U.S.	United States
USDA	U.S. Department of Agriculture
VMT	Vehicle Miles Traveled

1.3. Distribution List

This section presents the primary staff who will be working on the project. This section presents specific staff members who will be identifying existing data[1] resources for evaluation and potential use under the project. This section also includes all other staff who will be serving in project-specific roles for implementing the Quality Assurance Project Plan (QAPP). The listing in **Table 1.1** includes United States (U.S.) Environmental Protection Agency (EPA) and Texas Commission on Environmental Quality (TCEQ) staff responsible for implementing independent internal quality management steps and staff serving in external oversight roles.

This QAPP and, as applicable, all major deliverables relying on existing data will be distributed to the staff presented in **Table 1.1.** Additionally, this QAPP will be provided to any unlisted staff who are assigned to perform work under this project. A secured copy of this QAPP will be maintained in the project files under the *//tceq4afesvr1/PAFS/OA/Permits/OA Admin/Quality_Management/QAPP* directory.

Table 1.1 QAPP Distribution List

Name	Organization	Role
Mariama Mitchell Mitchell.Mariama@epa.gov 214-665-6778	U.S. EPA, Region 6	EPA Project Officer (PO) or PO Representative (POR)
Michael Gildner Gildner.Michael@epa.gov 214-665-7376	U.S. EPA, Region 6	EPA Quality Assurance Manager or Designee
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Kasey Savanich Kasey.Savanich@tceq.texas.gov 512-239-1145	TCEQ	Project Manager and Task 1 - 5 Leader
D. Jody Koehler Jody.Koehler@tceq.texas.gov 512-239-1990	TCEQ	Quality Assurance Manager
Chris Owen Chris.Owen@tceq.texas.gov 512-239-4235	TCEQ	Lead Quality Assurance Specialist
James Nolan James.Nolan@tceq.texas.gov 512-239-6634	TCEQ	Technical Specialist

[1] The term "existing data" is defined by the EPA's *Environmental Information Quality Policy* (CIO 2105.3) as "… data that have been collected, derived, stored, or reported in the past or by other parties (for a different purpose and/or using different methods and quality criteria). Sometimes referred to as data from other sources." The term "secondary data" may also be used to describe "existing data" in historical EPA quality-related documents.

1.4. Project/Task Organization

The primary personnel responsible for implementation of this project are the TCEQ Project Manager (PM) and Task Leader (TL), Quality Assurance Manager (QAM), Lead Quality Assurance Specialist (QA Specialist or QAS), and Technical Specialist. Their duties are outlined briefly in this section. The TCEQ QAM is independent of the unit generating the data.

Kasey Savanich is the TCEQ PM and Task Leader and will provide senior-level oversight as needed. The PM is responsible for TCEQ's technical and financial performance as well as maintaining communications with the EPA to ensure mutual understanding of grant requirements, EPA expectations, and conformity with EPA quality procedures; managing oversight and conduct of project activities including allocation of resources to specific tasks; ensuring that quality procedures are incorporated into all aspects of the project; developing, conducting, and/or overseeing QA plans as necessary; ensuring that any corrective actions are implemented; operating project activities within the documented and approved Quality Assurance Project Plan; and ensuring that all products delivered to the EPA are of specified type, quantity, and quality.

As TL, the TCEQ PM, with assistance from the Technical Specialist, will develop a baseline emissions inventory for the sector(s) under the task and develop sector-specific options for potential emissions reduction projects including estimates of the potential reductions under each option and estimates of uncertainties for each reduction option. The TL, presented in **Table 1.1,** will be responsible for day-to-day task-level activities, including planning, reporting, and controlling of technical and financial resources allocated to the task. Accordingly, the TL is primarily responsible for implementing the Quality Program and this Quality Assurance Project Plan on task-level assignments.

Task-level management system. For each of the major deliverables under each task, the TL will review all QA-related plans and reports and is responsible for transmitting them to the Lead QA Specialist for review and approval. The TL is responsible for ensuring that quality procedures are implemented at the task level and for maintaining the official, approved, task-level QAPP content. The TL will discuss any concerns about quality or any proposed revisions to task-level QAPP content with the Lead QA Specialist to identify, resolve, or preclude problems or to amend task-level plans, if necessary. In addition, the TL will work with the TCEQ QA Manager or designated QA staff to identify and implement quality improvements. The TCEQ PM is responsible for ensuring the consistency of similar or related QA measures across tasks. The TL is responsible for overseeing task-level work performed by technical staff and providing assurance that all required QA/QC procedures are being implemented.

Project-level management system. Tasks are expected to proceed concurrently, in parallel. The PM will ensure any difficulties encountered or proposed changes at the task level are reviewed for implications on other similar or related tasks. The PM is also responsible for communicating progress or difficulties encountered (across all tasks) to the EPA PO or POR, who provides EPA's primary oversight function for this project at EPA OAR/ Region 6 and is responsible for review and approval of this QAPP and any future revisions. The PM (with support from assigned TCEQ technical staff) will be responsible for consulting with the EPA PO or POR, on planning, scheduling, and implementing the QA/QC for all project deliverables and obtaining required EPA approvals.

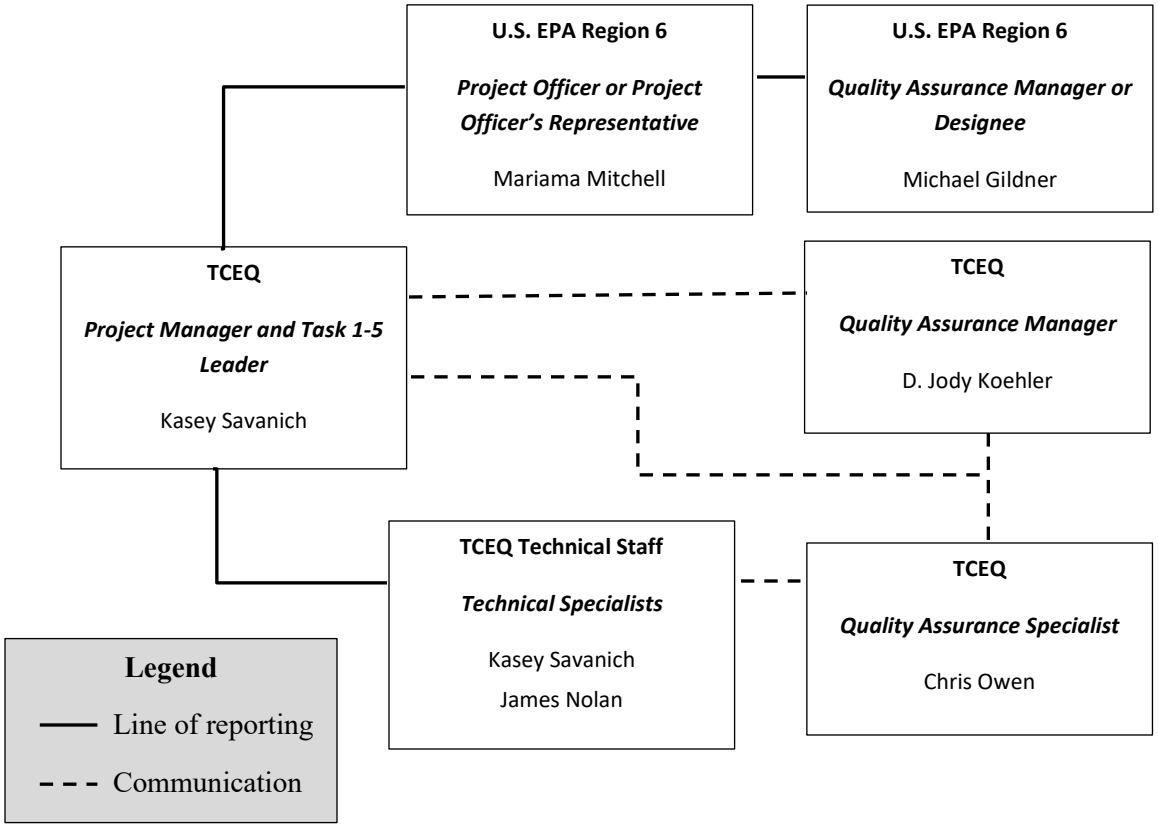
The TCEQ QA Manager, D. Jody Koehler, is responsible for coordinating development and implementation of the TCEQ QA program. The TCEQ QA Manager provides oversight and guidance for the TCEQ QA program and is responsible for the development and maintenance of the TCEQ Quality Management Plan (QMP), as well as review and approval of program/project QAPPs with federal funding to ensure the QAPPs conform to TCEQ and EPA requirements as detailed in the TCEQ QMP. The TCEQ QAM is employed by TCEQ's Laboratory and Quality Assurance Section within the Monitoring Division

of the Office of Compliance and Enforcement, which is in a separate office from TCEQ's Office of Air. For each task under this project, TCEQ QAM is supported by the Lead QAS, who will assist in the implementation of the quality system. The TCEQ QAM, or designated quality assurance staff in the Quality Assurance Work Group within the Laboratory and Quality Assurance Section, may conduct periodic independent audits of this program's QA system. An audit report documenting audit results and recommendations will be provided to the TCEQ PM. The TCEQ QAM, or designated quality assurance staff in the Quality Assurance Work Group, will evaluate and concur with proposed corrective actions to negative findings noted in the audit report.

The Lead QA Specialist, Chris Owen, is responsible for assisting the PM in planning, documenting, and implementing the QA requirements for this project. Working with the PM, and in consultation with the QA Manager (or designated quality assurance staff in the Quality Assurance Work Group within the Laboratory and Quality Assurance Section), the Lead QAS will ensure that process- and project-specific QA documents are developed; that required or recommended protocols are followed; that data are reduced, validated, and reported according to specific criteria; and that QC assessments are performed. The Lead QAS will report to the PM and the QAM, or designated quality assurance staff in the Quality Assurance Work Group within the Laboratory and Quality Assurance Section, as needed, on quality issues.

Additionally, QC functions will be carried out by other technical staff and monitored by the PM, who will work with the Lead QAS and consult with the TCEQ QAM (or designated quality assurance staff in the Quality Assurance Work Group) to oversee this plan and implement quality improvements. Other technical staff will include persons with expertise in industrial processes and air pollution engineering, technical reviewers, database specialists, quality auditors, and technical editors. The PM will ensure that technical staff do not review work in a QA capacity for which they were a primary or contributing author. **Exhibit 1.1** presents the organizational chart.

Exhibit 1.1 Project Organization[2]



[2] Under CIO 2105-S-02.0, section 3, the organization chart must also identify any contractor relationships relevant to environmental information operations. Contractors will be selected at a later date and added to the QAPP by amendment at that time.

1.5. Problem Definition / Background

Under this project, the TCEQ will identify, evaluate, and utilize existing data resources[3] to develop a statewide inventory of the major sources of greenhouse gas (GHG) emissions within Texas and use that inventory data to develop an action plan. This QAPP focuses on the handling of environmental information under sector-specific tasks by technical staff charged with completing the following subtasks in a future planning project implemented in accordance with this QAPP:

1. Develop a comprehensive GHG inventory for the largest sources within each sector,
2. Develop options for reducing emissions within each sector,
3. Develop estimates or ranges of estimates for the reductions achievable under each option,
4. Develop uncertainty analyses for the emissions reduction estimate(s) or ranges under each option, and
5. Present the inventory, options listing, and associated analyses in a technical report for consideration by state policymakers with the authority to approve the deliverables under the CPRG planning grants.

The GHG inventory may utilize the EPA's State Inventory Tool (SIT),[4] state-level GHG inventories prepared by the EPA,[5] and data reported to the EPA's Greenhouse Gas Reporting Program (GHGRP)[6] together with any independent, sector-specific estimates prepared by the state. Any state estimates will be compared to corresponding federal estimates for validation. Significant differences will be evaluated and discussed in the inventory report with the underlying data and methodology used for the independent state estimates. The statewide inventory will include the following sectors and gases:

Sectors	***Greenhouse Gases (across all sectors)***
1. Transportation 2. Electricity generation and/or use 3. Natural and working lands 4. Industry 5. Agriculture 6. Commercial and residential buildings 7. Waste and materials management 8. Wastewater	carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), fluorinated gases (F-gases) including hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3)

1.5.1. Rationale for Selection of Sectors

For each sector included in the statewide inventory **Table 1.2** briefly describes why the sector was included in the inventory and the relative significance of the sector in terms of the magnitude of air emissions from existing inventories, the associated geographic distribution of the sources, and recent trends in readily available activity data for the source category.

[3] EPA, *Environmental Information Quality Policy*, CIO 2105.3, 03/07/2023 (p. 8) provides common examples of environmental information used to support the EPA's mission at https://www.epa.gov/system/files/documents/2023-04/environmental_information_quality_policy.pdf.
[4] https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool
[5] https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals
[6] https://www.epa.gov/ghgreporting/data-sets

Table 1.2 Rationale for Sector Selection

Sectors Included in Inventory	**Rationale for Including in GHG Inventory**
Transportation	Transportation activities were the largest source (29 percent) of total U.S. greenhouse gas emissions in 2021. From 1990 to 2021, transportation CO_2 emissions from fossil fuel combustion increased by 19 percent. Transportation activities occur across all states.
Electric power generation	The electric power sector accounted for 25 percent of total U.S. greenhouse gas emissions in 2021. Power generation and/or consumption occurs across all states.
Industry	The industrial sector accounted for 24 percent of U.S. greenhouse gas emissions in 2021. Since 1990, industrial sector emissions have declined by 11 percent. In 2021, total energy use in the industrial sector increased by 2 percent due to an increase in total industrial production and manufacturing output. EPA's GHGRP data provide additional insights into underlying trends in the industrial sector.
Natural and working lands[7]	Natural and working lands include fluxes of carbon from activities such as converting forests to agricultural use and practices that remove CO_2 from the atmosphere and store it in long-term carbon sinks like forests. In 2021, the net CO_2 removed from the atmosphere by natural and working lands was 12% of total U.S. greenhouse gas emissions. Between 1990 and 2021, total carbon sequestration in this sector decreased by 14%, primarily due to a decrease in the rate of net carbon accumulation in forests, as well as an increase in CO_2 emissions from urbanization.
Agriculture	Agriculture accounted for about 10 percent of U.S. greenhouse gas emissions in 2021, and agricultural soil management was the largest source of N_2O emissions. Enteric fermentation was the largest source of CH_4 emissions.
Commercial and residential buildings	In 2021, the commercial and residential sectors accounted for 7 and 6 percent of total U.S. greenhouse gas emissions, respectively. Emissions from the commercial and residential sectors have increased since 1990. Total residential and commercial greenhouse gas emissions, including direct and indirect emissions, in 2021 have increased by 2% since 1990. In 2021, an increase in heating degree days (0.5 percent) increased energy demand for heating in the residential and commercial sectors, however, a 1.8 percent decrease in cooling degree days compared to 2020 reduced demand for air conditioning in the residential and commercial sectors.
Waste and materials management	This sector includes landfills, composting, and anaerobic digestion. Landfills were the third largest source of anthropogenic methane emissions in 2021, and landfills accounted for 1.9 percent of total U.S. greenhouse gas emissions.
Wastewater	Wastewater treatment, both domestic and industrial, was the third largest anthropogenic source of N_2O emissions in 2021, accounting for 5.2 percent of national N_2O emissions and 0.3 percent of total U.S. greenhouse gas emissions.

[7] Under international GHG inventory protocols this category is called "Land use, land-use change, and forestry."

Table 1.2 Rationale for Sector Selection

Sectors Included in Inventory	Rationale for Including in GHG Inventory
	Emissions from wastewater treatment increased by 6.1 MMT CO_2e (41.6 percent) since 1990 as a result of growing U.S. population and protein consumption.

1.5.2. Decisions to be Made

Existing EPA datasets and the SIT cover categories of GHG emissions by sector and by activity or segment (e.g., electric utility combustion of natural gas). The SIT provides many default values to facilitate developing statewide estimates that are consistent with the National Inventory of GHG Emissions.[8] The Task Leader will be charged with three primary decisions under each task of this project:

1. Determine (for each major activity estimate) if existing EPA data or the SIT default estimate for the sector/activity should be used for the statewide, baseline estimate, or should the state's estimate be derived from existing information available to the state (including other EPA datasets, state inventories, or GHGRP publications).
2. Determine the best options for reducing emissions of air pollution and achieving the following objectives[9] under the Inflation Reduction Act:
   a. Deliver cleaner air by reducing harmful air pollution in places where people live, work, play, and go to school.
   b. Reduce climate pollution, create good jobs, and lower energy costs for families.
   c. Accelerate work addressing environmental injustice and empowering community driven solutions in overburdened neighborhoods.
3. Develop an estimate (or range) of reductions that could be achieved under each option.
4. Estimate the uncertainty of the emissions reduction estimate under each option.

1.5.3. Actions to be Taken, Action Limits, and Expected Outcomes

Existing state-level estimates prepared by the EPA or the SIT tool will be utilized with federal default values for each sector/activity relevant to GHG-emitting activities within the state. Actions will be limited to the GHG-emitting activities defined in the SIT or in the existing EPA estimates used by the state. Subsequently, the state may elect to prepare separate, independent estimates for the state's major sector/activities based on the state's existing data resources. If the state elects to incorporate these independent estimates in the inventory, the independent estimate will be compared to the SIT estimate or the EPA's state-level estimate by subject matter experts with the requisite knowledge of the source category, and the rationale for utilizing the state's independent estimate will be documented in the state's GHG inventory report along with the underlying data and calculation methodology. TCEQ expects that sectors that include major stationary sources under CAA Title V with longstanding requirements for submission of activity data and emissions estimates may be better represented in the GHG inventory based on existing data. For minor sources of GHGs, TCEQ expects that the SIT default estimates for the state will provide the better estimates.

When identifying the best options for reducing air pollution, the Task Leader will consider the activities affecting the largest numbers of families, business establishments, recreation areas, and

[8] https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2021
[9] CPRG Program Guidance, page 4. Available at https://www.epa.gov/inflation-reduction-act/climate-pollution-reduction-grants#CPRGProgramGuidance.

schools.[10] Options may include measures for achieving potential reductions in nonattainment areas and impacting residential, commercial, and school districts near the largest sources of air pollution. TCEQ expects that each task will produce up to three options for sector-specific emissions reduction projects for further consideration by management and policymakers.

[10] Ibid.

1.5.4. Reason for Project

The baseline GHG inventory and options analyses developed under this project will be utilized by TCEQ for planning purposes to support Texas's development of the following three deliverables under the CPRG Program:

- Texas's **Priority Action Plan** (PAP), which is due on March 1, 2024. This plan will include near-term, implementation-ready, priority GHG reduction measures and is a prerequisite for any implementation grant.
- Texas's **Comprehensive Action Plan** (CAP), which is due in 2025 (later for tribes and territories). This plan will review all sectors that are significant GHG sources or sinks, and include both near- and long-term GHG emission reduction goals and strategies.
- Texas's **Status Report** on progress towards goal, which is due in 2027 (not applicable to tribes or territories). This progress report will include updated analyses, plans, and next steps for key metrics.

This QAPP describes in detail the necessary QA and QC requirements and technical activities that will be implemented to ensure the baseline GHG inventory and the sector-specific emissions reduction options are reliable for the PAP and CAP.

As necessary, amendments and revisions to the QA and QC requirements defined in this QAPP will be updated in the 2027 Status Report.

1.5.5. Relevant Clean Air Act Mandates and Authorizations

The inventory and options analyses produced under this project will support a grant application authorized under 42 U.S.C.A. § 7437 for *Greenhouse Gas Air Pollution Plans and Implementation Grants*. The inventory and options analyses will be used to evaluate opportunities for reducing GHG emissions from all major-emitting sources including both mobile source categories and stationary source categories. This project will include the fundamental research necessary to evaluate and plan new programs (and amendments to existing Clean Air Act [CAA] programs) for reducing emissions from fossil fuel combustion activities. Many sectors and activities that will be included in the GHG inventory (and subsequent emissions reductions options analyses) include major sources of criteria and toxic pollutants. Accordingly, the purpose of this project (to evaluate and plan for reductions in GHG emissions, including reductions from usage or production of fossil fuels) is also consistent with the following statutory mandates and authorizations under Clean Air Act Title I:

- ***§ 7403. Research, investigation, training, and other activities***
  (a) Research and development program for prevention and control of air pollution
  The Administrator shall establish a national research and development program for the prevention and control of air pollution ….
    (1) conduct, and promote the coordination and acceleration of, research, investigations … and studies related to the causes … extent, prevention, and control of air pollution;
    (2) encourage, cooperate with, and render technical services and provide financial assistance to air pollution control agencies and other appropriate public or private agencies, institutions, and organizations, and individuals in the conduct of such activities ….
  (b) Authorized activities of Administrator in establishing research and development program
  In carrying out the provisions of [paragraph (a)] the Administrator is authorized to–
    (1) collect and make available, through publications and other appropriate means, the results of and other information, including appropriate recommendations by him in connection therewith, pertaining to such research and other activities;….

(2) make grants to air pollution control agencies … for purposes … in subsection (a)(1) ….

- ***§ 7404. Research related to fuels and vehicles***
  (a) Research programs; grants; ….
  The Administrator shall give special emphasis to research and development into new and improved methods, having industry-wide application, for the prevention and control of air pollution and control of air pollution resulting from the combustion of fuels… he shall–
  (1) conduct and accelerate research programs directed toward development of improved , cost-effective techniques for–
  (A) control of combustion byproducts of fuels, ….
  (B) improving efficiency of fuels combustion so as to decrease atmospheric emissions ….

- ***§ 7405. Grants for support of air pollution planning and control programs***
  (a) Amounts; limitations; assurances of plan development capability.
  (1)(A) The Administrator may make grants to air pollution control agencies … in an amount up to three-fifths of the cost of implementing programs for the prevention and control of air pollution …. For the purpose of this section, "implementing" means any activity related to the planning, developing, establishing, carrying-out, improving, or maintaining of such programs….
  (C) With respect to any air quality control region or portion thereof for which there is an applicable implementation plan under section 7410 … grants under subparagraph (A) may be made only to air pollution control agencies which have substantial responsibilities for carrying out such applicable implementation plan.

1.5.6. Information Provided by the EPA under § 7403(b)(1)

Under authority of CAA § 7403(b)(1) the EPA has provided the following resources to states to ensure reliable air emissions inventories are produced to support plans for reducing emissions:

- Agency-wide Quality Program Documents
- Quality Assurance-specific Directives
  - CIO 2105.3 – *Environmental Information Quality Policy*, April 10, 2023
  - CIO 2105-P-01.3 – *Environmental Information Quality Procedure*, March 7, 2023
  - CIO 2105-S-02.0 – EPA's Environmental Information QA Project Plan (QAPP) Standard
  - EPA Regional Sites for Quality Management Plans and Guidance:
    - Region 1
    - Region 2
    - Region 3
    - Region 4
    - Region 5
    - Region 6
    - Region 7
    - Region 8
    - Region 9
    - Region 10
- QA Guidance
  - Latest QA guidance published on the following website: https://www.epa.gov/quality/agency-wide-quality-program-documents

TCEQ will utilize these resources, as applicable, to ensure evaluation of existing data and utilization of those data are consistent with the EPA's relevant directives and guidance.

1.6. Project / Task Description

A schedule of deliverables for the technical tasks (Tasks 1-5) for the GHG inventory QAPP is presented in **Tables 2.1** through **2.5.** The work to be performed under this project by TCEQ involves preparing a statewide GHG emissions inventory for Texas. The organization of the work is based on the use of the EPA's SIT[11] under the following sector-specific tasks:

Task 1: State inventory of transportation-related GHG emissions.

Task 2: State inventory of electric power generation-related GHG emissions.

Task 3: State inventory of GHG emissions and sinks from natural working lands and forestry

Task 4: State inventory of GHG emissions from other major sectors.

Task 5: State inventory of GHG emissions from minor sectors.

For each sector-specific task and for each plan (the PAP and the CAP), the TCEQ will either utilize the existing EPA state-level GHG inventory or prepare an independent state-level GHG inventory. If TCEQ utilizes EPA's existing state-level GHG inventory, a profile of GHG emissions for Texas will be produced from the EPA state-level GHG data from https://www.epa.gov/system/files/other-files/2023-02/State-Level-GHG-data.zip, EPA's State Inventory and Projection Tool (SIT) from https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool, or from data published by the EPA's Greenhouse Gas Reporting Program (GHGRP). The user manual for EPA's SIT will be reviewed for any module used. If TCEQ elects to prepare its own GHG inventory, it will utilize EPA tools, resources, and the steps described **Tables 2.1–2.5**. The resulting estimates from a Texas-developed inventory will be compared to EPA's existing state-level GHG inventory.

After a GHG inventory has been produced, utilizing either existing EPA state-level data, or independently produced state-level data, TCEQ will prepare a listing of options for emissions reductions for each sector-specific task. The emission reductions will include the following components:

- The specific source categories and activities affected by the proposed option.
- The quantity of GHG emissions reduced by the options with an associated uncertainty estimate.
- The quantity of criteria emissions reduced by the options with an associated uncertainty estimate.
- The quantity of toxic air pollutant emissions (as defined under applicable local, state, or federal rules for air toxics) reduced by the option with an associated uncertainty estimate.
- The number of people living in any nonattainment areas where the option would reduce emissions (regardless of the specific pollutant triggering nonattainment).
- A description of any benefits that the option will impart to communities with known environmental injustice issues such as close proximity of the community to an affected source under the option that emits toxic air pollutants.
- Evaluation of the option's impacts on soil, water, or other natural resources.

The TCEQ may use contractors to support inventory development. Prior to the development of any emissions data by a contractor, each contractor must agree to the terms of each specific project and this

[11] https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool.

QAPP. The PM and TL will review all inventory data submitted by each contractor prior to TCEQ's acceptance of the data.

Table 2.1 Technical Task Descriptions for Task 1.

Tasks and Deliverables	Schedule
Task 1. Transportation Sector (Mobile Sources)	
1. If TCEQ elects to produce an independent state-level GHG inventory, a profile of mobile source emissions will be generated by utilizing the following tools and resources: a. The EPA's State Inventory and Projection Tool (SIT) from https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool. The [co2ffc-module.xlsm] module would be used for CO_2 and the [Mobile Combustion module.xlsm] module would be used for CH_4 and N_2O from the transportation sector. b. The most recent listing of registered motor vehicles from the Texas Department of Motor Vehicles (DMV) including year-manufactured, make, model, body style, fuel, county, description. c. The national average vehicle miles traveled (VMT) and miles per gallon (MPG) by vehicle class from https://www.fhwa.dot.gov/policyinformation/statistics/2021/vm1.cfm. 2. For the selected inventory year, TCEQ will review SIT default entries for the statewide usage of "transportation motor gasoline" and for the statewide usage of "transportation distillate fuel" (reported in billion British thermal units per year, or Bbtu/year) on the [Default State Energy Data Table] sheet. a. Estimates of statewide usage of gasoline and distillate fuel (diesel) for light-duty and heavy-duty vehicles will be produced using the national average values for VMT and MPG for light-duty vehicles (and separately for heavy-duty vehicles), based on the statewide population of vehicles from the Texas Department of Motor Vehicles (DMV). TCEQ will use the use the heating values and CO_2 emission factors for gasoline and distillate oil under 40 CFR Part 98 Subpart C, Table C-1 and the CH_4 and N_2O emission factors from Table C-2. CH_4 and N_2O will be converted to CO_2e using the global warming potentials (GWP) from Part 98 subpart A, Table A-1. b. The statewide heat inputs by fuel (calculated with the Texas DMV population of registered vehicles) will be compared to the heat input by fuel in the SIT's [Default State Energy Data Table] sheet. c. The statewide CO_2e mass by fuel (based on Texas DMV vehicle population) will be compared to the CO_2e mass reported in the SIT for the corresponding year on the [Transportation] sheet. d. Calculations and comparison of the SIT's Bbtu/yr and CO_2e values versus the state's calculation from DMV vehicle records and national averages for VMT and MPG will be documented. e. GHG emissions estimates from the existing EPA state-level data and the comparison to values calculated from the DMV population and national averages will be reported in the GHG inventory.	Within 120 days of QAPP approval by EPA or by federally authorized delegate for the PAP and 420 days for the CAP.

Table 2.2 Technical Task Descriptions for Task 2.

Tasks and Deliverables	Schedule
Task 2. Electric Power Generation and Consumption	
1. If TCEQ elects to produce an independent state-level GHG inventory, a profile of emissions from the electric power generation and consumption sector will be generated by utilizing the following tools and resources: a. The [co2ffc-module.xlsm] module for the electric power sector from EPA's State Inventory and Projection Tool (SIT) at https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool. b. The most recent electric power data published under U.S. Energy Information Administration (EIA) Form 923 at https://www.eia.gov/electricity/data/eia923/. 2. Total fuel consumption by power plants in Texas will be estimated using the [Page 1 Generation and Fuel Data] sheet, the [Page 7 File Layout] sheet (for fuel type code definitions), and the following columns on the [Page 1 Generation and Fuel Data] sheet in EIA Form 923: a. Column G – "Plant State" b. Column O – "Reported Fuel Type Code" c. Column CP – "Total Fuel Consumption MMBtu" 3. For the selected inventory year, TCEQ will review SIT default entries for fuels labeled "electric power …" (reported in Bbtu/yr) on the [Default State Energy Data Table] sheet. a. Total power sector emissions from the use of fossil fuels will be based on the total heat input for each type of fuel reported under EIA 923 and calculated using the heating values for the corresponding fuels under 40 CFR Part 98 Subpart C, Table C-1 and the global warming potentials under Part 98 Subpart A Table A-1. b. The statewide values calculated with the EIA 923 fuel usage data will be compared to the fuel usage in the SIT's [Default State Energy Data Table] sheet. c. Calculations and comparison of the SIT's Bbtu/yr values versus the state's calculation from EIA 923 data will be documented. d. The GHG emissions estimate from the [Electric Power] sheet and the comparison of the values calculated from the EIA 923 data will be reported in the GHG inventory.	Within 120 days of QAPP approval by EPA or by federally authorized delegate for the PAP and 420 days for the CAP.

Table 2.3 Technical Task Descriptions for Task 3.

Tasks and Deliverables	Schedule
Task 3. Natural Working Lands and Forestry	
1. If TCEQ elects to produce an independent state-level GHG inventory, a profile of emissions from the natural working lands an forestry sector will be estimated by utilizing the module entitled [land-use-land-use-change-and-forestry-module.xlsm] in the EPA's State Inventory and Projection Tool (SIT) at https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool.	Within 120 days of QAPP approval by EPA or

Tasks and Deliverables	Schedule
Task 3. Natural Working Lands and Forestry	
2. The default estimates for Texas will be obtained using the following sheets: a. [Forest Land Remaining Forest] b. [Land Converted to Forest Land] c. [Forest Land Converted to Land] d. [Urban Trees] e. [Settlement Soils] f. [Burning CH4] – No default data on area burned are provided in the SIT. The acreage of fires will be obtained from Monitoring Trends in Burn Severity at https://www.mtbs.gov/direct-download. g. [Burning N2O] h. [Yard Trimmings] i. [Ag Soil C Flux Default] j. [Summary] 3. Staff knowledgeable of existing methods and studies of carbon fluxes from forest lands in Texas will complete the following QA steps for the most recent year of data: a. Review the U.S. Department of Agriculture (USDA) Forest Service publication that is the basis for the federal default estimates at https://www.fs.usda.gov/research/treesearch/62418. b. Complete an independent assessment of the federal default estimates for Texas including comparison to any contemporaneous estimates developed by state foresters. c. Include a discussion of this review with any side-by-side comparison of federal default estimates versus independent estimates prepared under this subtask or versus independent estimates previously completed by the state in the inventory.	by federally authorized delegate for the PAP and 420 days for the CAP.

Table 2.4 Technical Task Descriptions for Task 4.

Tasks and Deliverables	Schedule
Task 4. State Inventory of GHG Emissions for Other Major Sectors	
1. If TCEQ elects to produce an independent state-level GHG inventory, a profile of emissions from major sources will be generated by utilizing the following tools and resources: a. EPA's State Inventory and Projection Tool (SIT) at https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool. The table below lists the modules that will be used to develop comparison estimates for the listed sectors: **GHGRP Values** / **SIT Modules** Non-biogenic CO_2 from combustion (excluding electric power) / [co2ffc-module.xlsm] [solid-waste-module.xlsm, step 9] [natural-gas-and-oil-module.xlsm, flaring] CH_4 and N_2O emissions / [stationary-combustion-module.xlsm]	Within 120 days of QAPP approval by EPA or by federally authorized delegate for the PAP and 420 days

Tasks and Deliverables	Schedule
Task 4. State Inventory of GHG Emissions for Other Major Sectors	

	[coal-module.xlsm] [natural-gas-and-oil-module.xlsm] [solid-waste-module.xlsm] [wastewater-module.xlsm](industrial only)
Non-biogenic CO_2, N_2O and F-gases	[ip-module.xlsm]

for the CAP.

b. Data summary spreadsheets for each reporting year published by the EPA's Greenhouse Gas Reporting Program (GHGRP) as a zip file at https://www.epa.gov/ghgreporting/data-sets.

2. GHGRP data will be used to develop an inventory for each GHG-emitting sector in Texas for the most recent reporting year:
   a. *GHGRP non-biogenic CO_2 from combustion*. A summary table with the below columns will be developed for the latest reporting year using the data on the [Direct Emitters] sheet from the [2021] file published by the GHGRP:
      i. State (from column E of GHGRP file)
      ii. Primary North American Industry Classification System (NAICS) Code (from column K)
      iii. Primary NAICS Code Description (from https://www.census.gov/naics/?48967)
      iv. Statewide Total CO_2 by NAICS (sum ***column O*** by NAICS).
      v. Fraction of direct CO_2 emissions reported to GHGRP from Texas.
      vi. Category among SIT CO_2 combustion categories.
         1. Electric Power Generation
         2. Industrial
         3. Solid Waste (Step 9 - combustion)
   b. *GHGRP methane emissions.* Another table will be developed, but will instead utilize the columns and categories for CH_4:
      i. Statewide Total CH_4 by NAICS (sum ***column P*** by NAICS Code).
      ii. Fraction of direct CH_4 emissions reported to GHGRP from Texas.
      iii. Category among SIT CH_4 categories.
         1. Electric Power Generation
         2. Industrial
         3. Solid Waste
   c. *GHGRP N_2O emissions*. A table will be developed utilizing the following columns and categories for N_2O:
      i. Statewide Total N_2O for NAICS (sum of ***column Q*** for each NAICS).
      ii. Fraction of direct N_2O emissions reported to GHGRP from Texas.
      iii. Category among SIT N_2O combustion categories.
         1. Electric Power Generation
         2. Industrial
         3. Solid Waste
      iv. The sectors in the table will be sorted in descending order by metric tons N_2O emitted in the most recent reporting year.

Tasks and Deliverables	Schedule
Task 4. State Inventory of GHG Emissions for Other Major Sectors	
d. *Other GHGs*. For other GHGs reported to GHGRP, a table will be developed utilizing ***columns R through Z***, as appropriate, on [Direct Emitters] sheet for mass of emissions reported to the GHGRP from Texas. 3. A comparison of values calculated from the GHGRP data versus values calculated using the SIT will be included in the inventory. The differences will be evaluated and the types of industrial sources in the state that operate below the GHGRP applicability thresholds under 40 CFR Part 98 subpart A will be discussed. GHG sources in the state that are operating below GHGRP thresholds will be discussed and estimates of the number of minor permits issued in the sectors where the SIT inventory has higher emissions than the GHGRP inventory will be provided.	

Table 2.5 Technical Task Descriptions for Task 5.

Tasks and Deliverables	Schedule
Task 5. Compile Statewide Inventory for Minor GHG Sources	
1. If TCEQ elects to produce an independent state-level GHG inventory, a profile of emissions from minor GHG sources will be generated by utilizing the federal default values from the associated modules in the EPA's State Inventory and Projection Tool (SIT): a. Agriculture [ag-module.xlsm] b. Commercial [co2ffc-module.xlsm] for CO_2 [stationary-combustion-module.xlsm] for CH_4 and N_2O c. Residential [co2ffc-module.xlsm] for CO_2 [stationary-combustion-module.xlsm] for CH_4 and N_2O d. Wastewater [wastewater-module.xlsm](municipal) 2. Independent estimates for each minor sector will be developed using data available to the state. A subject matter expert for each sector will compare the state's independent estimate to the federal default estimate for the sector and determine which value to use in the state's inventory. 3. For each minor sector, the ratio of the minor sector's CO_2e value determined under this task over the corresponding values for each major sector determined under Tasks 2-5 will be calculated. The ratios calculated with the state's values will be compared to the ratios calculated using the SIT with federal defaults. Two matrices will be developed (one for the state's ratios and one for the federal default ratios for the state) similar to the matrix below:	Within 120 days of QAPP approval by EPA or by federally authorized delegate for the PAP and 420 days for the CAP.

Minor Source Ratios Using Federal Defaults for State

Minor Sectors ➔ ***Major Sectors***	Agriculture	Commercial	Residential	Wastewater
Transportation	Minor CO_2e/ Major CO_2e	Minor CO_2e/ Major CO_2e	Minor CO_2e/ Major CO_2e	Minor CO_2e/ Major CO_2e
Electricity Gen.	"	"	"	"
Natural…Lands…	"	"	"	"
Industrial Sector 1	"	"	"	"
Industrial Sector 2	"	"	"	"

Tasks and Deliverables	Schedule
Task 5. Compile Statewide Inventory for Minor GHG Sources	

….	"	"	"	"

4. The matrix of state ratios will be compared to the matrix of federal default ratios for the state. A subject matter expert familiar with the associated sectors will evaluate the state ratios that depart from the federal ratios by more than 10%. A discussion of the state ratios that are significantly different from the federal default ratios will be provided in the inventory.[12] Independent analyses from other states or independent datasets to explain potential drivers for the deviations will be identified.

[12] The data and methodologies available at Greenhouse Gas Inventory Data Explorer and GHGRP and the US Inventory of GHG Emissions and Sinks may be useful for understanding differences.

1.7. Quality Objectives / Criteria

The primary objectives for this project are to develop reliable inventories for each of the primary GHG-emitting sectors in Texas and to identify options for reducing emissions from those sectors. Accordingly, all quality objectives and criteria are aligned with these primary objectives. The quality system used for this project is the joint responsibility of the TCEQ PM, Task Leaders, and Lead QAS. As discussed in Section 1.4, an organizationally independent QA Manager will maintain oversight of all required measures in this QAPP. QC functions will be carried out by technical staff and will be carefully monitored by the responsible Task Leader, who will work with the Lead QAS and consult with the TCEQ QAM (or designee) to identify and implement quality improvements. All activities performed under this project will conform to this QAPP.

1.7.1. Data Quality, Management, and Analyses

For this project, TCEQ will use a variety of QC techniques and criteria to ensure the quality of data and analyses. Data of known and documented quality are essential components for the success of the project, as these data will be used to inform the decision-making process for Texas's PAP and CAP as discussed in Section 1.5.4 of this QAPP. The table in **Appendix A** lists by task the specific QC techniques and criteria that are part of this QAPP.

The data quality objectives and criteria for this project are accuracy, precision, bias, completeness, representativeness, and comparability. *Accuracy* is a measure of the overall agreement of a measurement to a known value. It includes a combination of random error (precision) and systematic error (bias). *Precision* is a measure of how reproducible a measurement is or how close a calculated estimate is to the actual value. *Bias* is a systematic error in the method of measurement or calculation. If the calculated value is consistently high or consistently low, the value is said to be biased. Our goal is to ensure that information and data generated and collected are as accurate, precise, and unbiased as possible within project constraints. It is not anticipated that this project will include primary data collection. Generally, existing data and tools provided by the EPA and other qualified sources will be used for project tasks. A subject matter specialist familiar with technical reporting standards (such as a permit writer or compliance engineer with knowledge of the state's facilities operating in the sector) will be used to QA all data utilized for developing the statewide GHG inventory. TCEQ will verify the accuracy of all data by checking for logical consistency among datasets. All existing environmental data shall meet the applicable criteria defined in CFR and associated guidance, such as the validation templates provided in the *EPA QA Handbook Volume II*.

Uncertainty can be evaluated using a few different approaches. The most useful uncertainty analysis is quantitative and is based on statistical characteristics of the data such as the variance and bias of estimates. In a sensitivity analysis, the effect of a single variable on the resulting emissions estimate generated by a model (or calculation) is evaluated by varying its value while holding all other variables constant. Sensitivity analyses will help focus on the data that have the greatest impact on the output data. Additional statistical tests may be utilized depending on the need for more or less rigorous tools and on the specific project activity being evaluated.

When available, data originally gathered using published methods whose applicability, sensitivity, accuracy, and precision have been fully assessed, such as EPA reference methods, will be preferred and considered to be of acceptable quality. Project decisions may be adversely impacted if, for example, existing data were used in a manner inconsistent with the originator's purpose. Metadata can be described as the amount and quality of information known about one or more facets of the data or a dataset. It can be used to summarize basic information about the data (e.g., how, why, and when the existing data were collected), which can make working with specific data or datasets easier and provides

the user with more confidence. Metadata are valuable when evaluating existing data, as well as when planning for collection primary data that may be required in the future. However, the effort needed to locate and obtain original source materials can be costly. Accordingly, a graded approach to planning will be applied and ongoing discussions with the EPA will be held to determine what magnitude and rigor of QA effort are appropriate and affordable for the project.

For the data analysis completed under this project, analytical methods will be reviewed to ensure the approach is appropriate and calculations are accurate. Spreadsheets will be used to store data and complete necessary analyses. Design of spreadsheets will be configured for the intended use. All data and methodologies specific to each analysis will be defined and documented. Tables and fields will be clearly and unambiguously named. Spreadsheets will be checked to ensure algorithms call data correctly and units of measure are internally consistent. Hand-entered or electronically transferred data will be checked to ensure the data are accurately transcribed and transferred.

The draft inventory will be evaluated for GHG-emitting-sector and geographic completeness. TCEQ will utilize the framework of sectors in the EPA's SIT tool or the EPA's state-level GHG inventories to ensure that the inventory prepared under this project includes all major GHG-emitting sectors. To ensure the inventory is geographically complete, the draft inventory will also be submitted for review by TCEQ staff within the state's regional offices or by stakeholders from the various regions of the state to ensure that all major-emitting activities in all regions of the state are included in the inventory.

Representativeness is a qualitative term that expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. TCEQ will use the most complete and accurate information available to compile representative data for this project.

Data c*omparability* is a qualitative term that expresses the measure of confidence that one dataset can be compared to another and can be combined for the decision(s) to be made. TCEQ will compare datasets when available from different sources to check for the quality of the data. This QA step will also ensure that any highly correlated datasets or indicators are identified. Supporting data, such as information on test methods used and complete test reports, are important to ensure the comparability of emissions data.

1.7.2. Document Preparation

All documents produced under this project will undergo internal QC review, as well as technical review and an editorial review, prior to submission to the EPA PO. QC will be performed by an engineer, scientist, or economist, as appropriate, with sufficient knowledge. The technical reviewer will review the document for accuracy and integrity of the technical methodologies, analyses, and conclusions.

An editorial review of all final documents will be performed. Editors will verify clarity, spelling, and grammatical correctness, and ensure documents are free of typographical errors. Editors will verify that references are cited correctly. This will include a comparison against the original documents.

The *QC Documentation Form* (**Appendix B**) will be used to track the approval process. The form must be completed and signed for all document deliverables. The signatures required include those of the Task Leader and technical and editorial reviewers. Completion of this form certifies that technical review, editorial review, and all required QC procedures have been completed to the satisfaction of the TL and Lead QAS. Copies of these signed forms will be maintained in the project files.

1.8. Special Training / Certifications

All TCEQ staff assigned to work on this project shall have appropriate technical and QA training to properly perform their assignments. The TCEQ has a base of skilled, professional personnel that enable successful completion of project tasks and activities. All TCEQ project personnel meet the specific training requirements for their positions and a review of required and completed training is included in performance assessments. A centralized TCEQ database documents formal training in an agency training record. The project personnel are deemed qualified to perform work through educational credentials, specific job/task training, required competency evaluations, and internal and external assessments of their respective programs. Records of educational credentials, training, competency demonstrations, and assessments are retained by management, saved according to the TCEQ Office of Air (OA) Records Retention Schedule, and are available for review.

Competency requirements for TCEQ and contractor personnel are documented in the QMP, QAPPs, contracts, statements of work (SOWs), and/or quality manuals as appropriate. Records of educational credentials, training, competency demonstrations, and assessments are retained by management and are available for review. Training requirements for contractors and staff performing work for these projects are stated in contract specifications. If training is required for new staff or for particular segments of the GHG inventory, the PM in coordination with the associated TL will identify available training resources for the inventory segment and incorporate the required training into the project schedule.

1.9. Documents and Records

TCEQ will document in electronic form (and/or hard copy) QC activities for this project. The TL is responsible for ensuring that copies of all completed QC forms, along with other QA records (including this QAPP), will be maintained in the project files. Project files will be retained by TCEQ for 5 years after QAPP approval by the EPA or federally recognized delegate. The types of documentation that will be prepared for this project include:

- Planning documentation (e.g., QAPP)
- Implementation documentation (i.e., Review/Approval Forms and QA records)
- Assessment documentation (i.e., QA audit reports).

Detailed documentation of QC activities for a specific task or subtask will be maintained using the *QC Documentation Form* shown in **Appendix B**. This form will document the completion of the QC techniques planned for use on this project as listed in the table in **Appendix A**. One or more completed versions of these forms, as necessary, will be maintained in the project files. The types of documents for which QC will be conducted and documented may include raw data, data from other sources such as data bases or literature, field logs, sample preparation and analysis logs, instrument printouts, model input and output files, and results of calibration and QC checks.

Technical reviews will be used along with other technical assessments (i.e., QC checks) and QA audits to corroborate the scientific defensibility of any data analyses. A technical review (i.e., internal senior review) is a documented critical review of a specific technical work product. It is conducted by subject matter experts who are collectively equivalent (or senior) in technical expertise to those who performed the work. Given the nature of the deliverables under this project, a technical review is an in-depth assessment of the assumptions, calculations, extrapolations, alternative interpretations, and conclusions in technical work products. Technical review of proposed methods and associated data will be documented in the *QC Documentation Form* shown in **Appendix B**. The form will include the reviewer's charge, comments, and corrective actions taken.

Additionally, TCEQ has developed and instituted document control mechanisms for the review, revision, and distribution of QAPPs. Each QAPP has a signed approval form, title page, table of contents, and a document control format that conforms to EPA's Environmental Information QAPP Standard; see header at top of the page. The distribution list for this QAPP was presented in **Table 1.1**.

Amendments to the QAPP are developed and approved to reflect changes in project organization, tasks, schedules, objectives, and methods; address deficiencies and nonconformances; and accommodate unique or unanticipated circumstances. When changes are needed, the TCEQ PM will present the changes and reasons for the changes to the EPA Region 6 PO as outlined in the TCEQ Quality Management Plan (TCEQ QMP). If the EPA deems the changes to be substantive, the TCEQ PM develops a formal amendment detailing the change and sends the amendment to the EPA for review and approval, prior to change implementation if possible, or within 90 days of change implementation with the concurrence of the TCEQ QAM (or designee). For a change that is determined to be nonsubstantive, the EPA determines what documentation is necessary for the amendment and EPA's approval of the amendment. The original amendment request to EPA and approvals may be considered the official amendment for the nonsubstantive change. Amendments are effective immediately upon approval by the TCEQ PM, the Lead QAS, the TCEQ QAM (or designee), and the EPA Region 6 PO. Amendments to QAPPs and the reasons for the changes shall be documented by the TCEQ PM and distributed immediately to all individuals detailed in **Table 1.1**. Once approved, all changes will remain in effect until the next QAPP revision.

Depending on the approval term provided by the EPA, the QAPP is reviewed annually during the approval period and certified to be correct and accurate. The annual reviews must be documented in memorandum form and their accuracy certified; the certification must include any program or project changes which were approved via amendment during the prior year. Any necessary amendments shall be approved by the EPA prior to completion of the annual certification. Minor administrative changes not impacting data or operations (e.g., organizational changes, schedule changes not affecting the project design or quality or quantity of work to be performed, etc.) that arise during the certification process can also be conveyed as part of the annual certification. The TCEQ PM coordinates the review, documentation, and certification of the QAPP, and provides the certification to the TCEQ QA Manager and EPA PO 30 days before the annual anniversary date of the QAPP, as specified in the TCEQ QMP. If the project will extend beyond the QAPP's approval term, a full QAPP revision is required. If the QAPP expires, work described within this document must be halted.

At this time, TCEQ will not collect or handle personally identifiable information (PII) subject to the Privacy Act of 1974. However, if during the course of this project technical staff determine that PII is required to support project objectives, TCEQ will meet all requirements of the Privacy Act of 1974.

2. Existing Data Acquisition and Management Protocols (Group B)

2.1. Sampling Process Design

2.1.1. Need and Intended Use of Data Used

As indicated in **Tables 2.1–2.5**, a wide range of data for a diverse set of GHG-emitting activities is necessary to prepare a statewide inventory. Existing data resource may include sector-specific or facility-specific GHG emissions estimates, emissions factors, or activity data for use with emissions factors. The experimental design for this inventory project relies on the EPA's State Inventory Tool (SIT) together with independent estimates prepared by TCEQ. The SIT allows for expedited estimates for many sectors with default entries included in the tool. Existing data resources from previously completed inventories will be utilized to develop GHG emissions estimates that are comparable to the SIT estimates. Subsequently, the SIT estimates for each sector will be compared to any independent state estimate utilized for the statewide inventory.

2.1.2. Identification of Data Sources and Acquisition

In addition to the data integrated into the EPA's SIT tool, the following data sources will be utilized under each task to develop estimates for the major-emitting sectors in Texas.

- Task 1: Vehicle registration data from the Texas Department of Motor Vehicles.
  State or federal averages on vehicle miles traveled and miles per gallon.
- Task 2: Activity data for electricity generators published by the U.S. Department of Energy (DOE) under EIA Form 923.
- Task 3: Forest resource data published by state or federal forestry officials.
- Task 4: Data published by the EPA under the Greenhouse Gas Reporting Program.
- Task 5: The EPA's SIT tool is expected to be the primary source for this task.

2.2. Quality Control

All environmental information operations conducted for this project will involve existing, non-direct measurement data. All data received will be reviewed by a senior technical staff member to assess data quality and completeness before their use. In addition to reviewing and assessing the data collected, all data entered into spreadsheets and all calculations completed for analyses will be reviewed by a senior technical reviewer. The reviewer will evaluate the approach to ensure the methods are appropriate and have been applied correctly to the analysis. The technical reviewer will also confirm all data were entered correctly and that calculations are complete and accurate. Calculations will be checked by repeating each calculation, independently, and comparing the results of the two calculations. Any data entry and calculation errors will be identified and corrected. Data tables prepared for the draft and final reports will be checked against the spreadsheets used to store the data and complete the analysis.

Where calculations are required to assess the data/datasets, calculations will be performed using computer spreadsheets and calculators to reduce typographical or translation errors–mathematical/ statistical calculations are performed using spreadsheets or software programs with predefined formulas and functions. TCEQ will ensure that any manipulations performed on the data/dataset were done correctly. To ensure that calculations are correct statistical checks such as mean, median, maximum, and minimum will be utilized to look for data outliers. These checks include sorting the datasheet for one or more data variables and using the high and low values to check for outliers. TCEQ may also use spreadsheets or other statistical software such as Microsoft Excel, SAS, R, or Python to create boxplots, histograms, and scatterplots to identify gaps in the data (missing data), outliers, or unusual data points. As appropriate, TCEQ will also use hypothesis tests to find outliers, or an interquartile range (IQR) to calculate boundaries for what constitutes minor and major outliers. The methods used will be driven by the scale and type of data. TCEQ will determine outlier detection methods to be used based on the initial review of the data. Identified outliers will be highlighted to the EPA PO or delegate with options for treatment.

2.3. Non-direct Measurements

All environmental information operations conducted on this project will involve existing, non-direct measurement data. All existing data received will be reviewed by a senior technical staff member to assess data quality and completeness before their use.

Consistent with the EPA's QA requirements, this QAPP describes the procedures that will be used to ensure the selection of appropriate data and information to support the goals and objectives of this project. Specific elements addressed by this QAPP include:

- Identifying the sources of existing data,
- Presenting the hierarchy for data selection,
- Describing the review process and data quality criteria,
- Discussing quality checks and procedures should errors be identified, and
- Explaining how data will be managed, analyzed, and interpreted.

Data presented in the GHG inventory will be traced to its source (e.g., database input and output). Key resources include data collected by the EPA (e.g., GHGRP data), and data from EPA-approved data sources (e.g., EIA Form 923 data). These sources may include primary literature (i.e., peer-reviewed journal articles and reports) or databases. TCEQ may also use approved existing sources (e.g., handbooks, databases). Original sources for all information and data contained in the document will be included in a list of references with appropriate citations. When peer-reviewed literature or EPA-approved data sources cannot be used, TCEQ will document any significant limitations to the data sources used.

We will document information regarding each dataset and our rationale/selection criteria for selecting the data sources used in the inventory. The TL will be responsible for overseeing and confirming the selection of the data for the project tasks.

Table 3.1 presents an example hierarchy for data quality when identifying and reviewing available sources of data and information. When evaluating data resources, efforts will be made to identify and select data sources that most closely conform to the highest ranked criteria. Data quality metrics and documentation may not be provided by each source, and as necessary, TCEQ may consult with subject matter experts from permitted facilities or trade associations operating in Texas to qualify data for use to meet project objectives.

Any available data quality information will be reviewed by TCEQ and project advisors to ensure that the data represent full-scale designs and commercial processes, and that they are applicable to economic and regulatory conditions in the United States. TCEQ will document data sources used and any significant limitations of utilized data or information to ensure that the data are appropriate for their intended use. An internal technical reviewer will review the approach for selecting and compiling data; the review will include examination of the data sources and the intended use of the data. The specific QC techniques used will depend on the technical activity or analysis to which they are applied. The TCEQ TL is responsible for verifying the usability of data and related information.

Table 3.1 Existing Data Quality Ranking Hierarchy

Quality Rank	**Source Type**
Highest	Federal, state, and local government agencies
Second	Consultant reports for state and local government agencies
Third	NGO studies; peer-reviewed journal articles; trade journal articles; conference proceedings
Fourth	Conference proceedings and other trade literature: non-peer-reviewed
Fifth	Individual estimates (e.g., via personal communication with vendors)

TCEQ will work with EPA to ensure that all data used for the project are appropriate for their intended use. The main criteria that will be used in the selection of the data are the quality of the data (based on peer review, credible source, and/or QA documentation), availability, suitability for the intended purpose, and agreement with SIT estimates.

TCEQ will use the Secondary Data Quality Ranking Hierarchy when identifying and reviewing available sources of information. The source types in **Table 3.1** appear in the order in which they are likely to meet data quality criteria. For example, federal government data are more likely to be from a credible source, thoroughly reviewed, suitable, available, and representative, and any exceptions to these data criteria are likely to be noted in the government data, providing transparency. Data from individuals are expected to be less reliable, not peer reviewed, and may not be suitable or representative.

If it is determined that data meeting the fourth (i.e., conference proceedings and other trade literature: non peer-reviewed) or fifth (i.e., individual estimates such as personal communications with vendors) level are from the best or only available data source, the TL will include in the inventory a description of these data with associated limitations for review by the EPA PO or delegate.

These measures of data quality will be used to judge whether the data are acceptable for their intended use. In cases where available data do not or may not meet data quality acceptance criteria, the TL will include in the inventory a discussion for review by the EPA PO or delegate explaining how emissions estimates that relied on such data compare to SIT estimates.

We will also consider, for example, the age (i.e., date of dataset) and the representativeness of the data and will include in the inventory report for review by the EPA of any quality concerns regarding data that are outdated or that have other quality issues, like data gaps or inconsistency with other sources. Any data source utilized that is older than 10 years will specifically be flagged in the inventory report.

Representativeness will be evaluated by determining that the emissions or activity data are descriptive of conditions in the United States, data are current, and data are descriptive of similar processes within Texas. Any incomplete datasets will be identified, and deficiencies will be evaluated to determine whether data are missing or confusing and if they meet the secondary-use quality objectives.

Key screening criteria will be used to screen the sources identified. The TCEQ TL will provide oversight to the screening process to ensure sources collected are the most relevant and meet quality

requirements. Available data and information from the selected sources will be compiled and relevant summary information will be extracted out of the information sources to develop the required output for each of the project tasks.

2.3.1. Criteria for Accepting Existing Data for Intended Use

The criteria for determining whether the data are acceptable for use in developing the statewide inventory will be based on a comparison of the associated emissions estimate to the emissions estimate produced using the EPA's SIT. While some differences between the state's calculations and SIT calculations are expected, differences of more than 10 percent must be accompanied by an explanation subject to approval by the EPA prior to using the state's estimate in lieu of the SIT estimate.

2.3.2. Criteria for Options Identification in Planning Phase

The criteria for reviewing all activities under each task and identifying the best options for emissions reductions will be based on the following criteria[13] in the EPA's CPRG program guidance:

1. Quantity of reductions in emissions of climate pollution under the option.
2. Number of jobs likely to be created by the option.
3. Environmental justice benefits of the project including the number of people living in overburdened neighborhoods that will benefit from the option.
4. Quantity of reductions in criteria and toxic air pollutants that can be achieved by option.
5. Number of people living, working, recreating, and going to school in the area(s) benefiting from the option.

[13] CPRG Program Guidance, page 4. Available at https://www.epa.gov/inflation-reduction-act/climate-pollution-reduction-grants#CPRGProgramGuidance.

2.4. Data Management

Data management procedures include file storage and file transfer. All project and data files will be stored on TCEQ project servers. Files will be organized and maintained by the TL in folders by project, task, and function, including a system of file labeling to ensure version control. Any files containing confidential business information will be stored on secure computers. The TL will make sure that staff are trained and adhere to the project file organization and version control labeling to ensure that files are placed in consistent locations. All files will be backed up each night to avoid loss of data. Data are stored in various formats that correspond to the software being used. As necessary, data will be transferred using various techniques, including email, File Transfer Protocol, or shared drives. Typically, records will be archived once the project is completed. Record retention times will be based on contractual and statutory requirements or will follow TCEQ practices for storing materials of up to 10 years after the end of the period of performance (POP). Multiple project staff are granted access rights to the archived file system for each project. Records may be retrieved from archived file system by the TL, PM, or other project staff with access during the records retention period. As soon as allowed by applicable regulations or the grant agreement, records will be destroyed according to TCEQ policies and procedures. For any sensitive information that is gathered under the project, TCEQ's policy is consistent with EPA–recommended methods of destruction, which include degaussing, reformatting, or secure deletion of electronic records; physical destruction of electronic media; recycling; shredding; incineration; and pulping. Should the grant specify some other manner of disposition (e.g., transfer to the client), TCEQ will comply with that directive. As noted above, TCEQ has developed a file naming convention/ nomenclature for electronic file tracking and record keeping. Foremost, all files must be given a short but descriptive name. For those records and files gathered or provided to TCEQ, the filename may include the identification of "original" in its filename.

Similarly, files that have undergone a review by an independent, qualified person will include, at the end of the filename, the version number, the date reviewed, and the initials of the reviewer as a way to track which staff person(s) reviewed the file and when. Filenames of draft versions will follow an incremental, decimal numbering system. More specifically, each successive draft of a document is numbered sequentially from version 0.1, 0.2, 0.3… until a final version is complete. Final versions will be indicated by whole numbers (e.g., version 1.0). Final versions of documents that undergo revisions will be labeled version X.1 for the first set of revisions. While the document is under review, subsequent draft versions will increase incrementally (e.g., 1.2, 1.3, 1.4) until a revised final version is complete (e.g., version 2.0).

In the event data retrieval is requested and to prevent loss of data, all draft and final file versions will be retained electronically—that is, superseded versions will not be deleted.

Note that changes made to deliverables will be done using the software's *track changes* feature, which allows a user to track and view all changes that are made to the document version. All deliverable reviews will be documented in a QC Documentation Form (see **Appendix B**) for the project. This form will be maintained in the project files.

For this project, it is not anticipated that any special hardware or software will be used. General software available through the Microsoft Suite including Excel, PowerPoint, Access, and Word will be sufficient to perform the work (described in **Tables 2.1–2.5)** for this project.

3. Assessment and Oversight (Group C)

TCEQ is committed to preparing a comprehensive and reliable inventory of GHG emissions from Texas. Under this project our senior management team has dedicated the necessary resources to ensure TCEQ delivers an inventory that can be relied upon for future policy decisions. Accordingly, under this project, TCEQ will concurrently implement existing quality management systems that TCEQ has previously utilized for submissions to the EPA under Title I of the Act where task-level deliverables will be subjected to required, regular reviews (e.g., quarterly) to ensure that technical, financial, and schedule requirements of this project are consistent with the EPA PO's and QAM's (or their associated designees') expectations. This section discusses Elements C.1 (assessments and response actions) and C.2 (reporting) applicable to this project.

3.1. Assessments and Response Actions

The QA program includes periodic review of data files and draft deliverables. The essential steps in the QA program are as follows:

1. Identify and define the problem
2. Assign responsibility for investigating the problem
3. Investigate and determine the cause of the problem
4. Assign and accept responsibility for implementing appropriate corrective actions
5. Establish the effectiveness of and implement the corrective action
6. Verify that the corrective action has eliminated the problem.

The TL will provide day-to-day oversight of the quality system. Periodic project file reviews will be carried out by the Lead QAS, at least once per year to verify that required records, documentation, and technical review information are maintained in the files. The Lead QAS will ensure that problems found during the review are brought to the attention of the Task Leader and are corrected immediately. All nonconforming data will be noted, and corrective measures to bring nonconforming data into conformance will be recorded.

The TLs and Lead QAS in consultation with the TCEQ QAM (or designee) are responsible for determining whether the quality system established for the project is appropriate and functioning in a manner that ensures the integrity of all work products. All technical staff have roles and will participate in the corrective action process. Corrective actions for errors found during QC checks will be determined by the TL and, if necessary, with the Lead QAS in consultation with the TCEQ QA Manager QAM (or designee). The originator of the work will make the corrections and will note on the QC form that the errors were corrected. A technical specialist, not involved in the creation of the work, will review the corrections to ensure the errors were corrected. Any negative findings noted during audits require corrective action which will be reviewed and concurred with by the TCEQ QAM (or designee) prior to implementation. Depending on the severity of the deficiency, the TL or Lead QAS may consult the TCEQ QAM (or designee) and stop work until the cited deficiency is resolved. Deficiencies identified and their resolution will be documented in monthly project reports, as applicable. The Lead QAS and TL will comply and respond to all internal and EPA audits on the project, as needed. The TCEQ PM or Lead QAS will produce a report outlining any corrective actions taken.

3.2. Reports to Management

The periodic progress reports (to the EPA PO) required in the grant agreement will be reviewed by the TCEQ PM and the PM's manager (Director, Office of Air) to ensure the project is meeting milestones and that the resources committed to the project are sufficient to meet project objectives. These periodic progress reports will describe the status of the project, accomplishments during the reporting period, activities planned for the next period, and any special problems or events including any QA/QC issues. Reports to the EPA will be drafted by the TL or other project staff familiar with project activities during the reporting period.

Any QC issues impacting the quality of a deliverable, the project budget, or schedule will be identified and promptly discussed with the PM or Lead QAS as appropriate. All significant findings will be included in monthly reports with the methods used to resolve the specific QC issue or the recommendations for resolution for consideration by the EPA's PO or designee.

Based on the technical work completed during the reporting period, progress reports will be reviewed internally by an independent, qualified technical person (equivalent or senior to the TL), prior to submitting to the PM. The PM will conduct a final review of the report before transmitting the progress report to the EPA PO and the PM's manager will be cc'd on all progress reports.

4. Data Validation and Usability (Group D)

4.1. Data Review, Verification, Validation

All work conducted under this project will be subject to technical and editorial review. When existing data for the same GHG-emitting activity are available from multiple sources, the background information documents will be reviewed for all sources to determine the dataset that is the most representative of operations in the state. Additionally, the inventory report will include the vintage of the existing data resource and preference will be given to the most recent dataset that is representative of similar GHG-emitting activities in the state. Reviews will be conducted by a technical specialist, or the Lead QAS, or a qualified person not directly involved in the production of the deliverable. The term "validation" refers to whether the data meet the QAPP-defined user requirements while the term "verification" refers to whether conclusions can be correctly drawn from the data. The quality of data used and generated for the project will be reviewed and verified at multiple levels by the project team. This review will be conducted by the TCEQ TL or a senior technical reviewer with specific, applicable expertise. All original and modified data files will be reviewed for input, handling, and calculation errors. Additionally, all units of measure will be checked for consistency. Any potential issues identified through this review process will be evaluated and, if necessary, data will be corrected, and analysis will be revised as necessary, using corrected data. These corrections will be documented in project records. These measures of data quality will be used to judge whether the data are acceptable for their intended use. In cases where available data do not or may not meet data quality acceptance criteria, the TL will document these findings in the inventory along with corrective actions or use of alternative data sources.

4.2. Verification and Validation Methods

As a standard operating procedure, all data (retrieved and generated) will be verified and validated through a review of data files by an independent, qualified technical staff member (i.e., someone other than the document originator), and ultimately, the TCEQ TL. A checklist of QC activities for deliverables under this project is provided as **Appendix A**. Forms for documenting QC activities and review of deliverables are included in **Appendix B**. Documentation of calculations will be included in spreadsheet work products and in supporting memoranda, as appropriate.

The TL is responsible for day-to-day technical activities of tasks, including planning, data gathering, documentation, reporting, and controlling technical and financial resources. The TL is the primary person responsible for quality of work on tasks under this project and will approve all-related plans and reports. These reports will be transmitted by the TL to the Lead QAS for final review and approval.

Source data will be verified and validated through a review of data files by the technical staff, and ultimately the TL. Reviews of analyses will include a thorough evaluation of content and calculated values. All original and modified data files will be reviewed for input, handling, and calculation errors. Additionally, all measurement units will be checked for consistency. Any potential issues identified through this review process will be evaluated, errors corrected, and analysis repeated using the corrected data. All corrections will be documented in project records.

Source data will be verified and validated through a review of data files by the technical staff, and ultimately the TL. Typical data verification reviews can include checks of the following:

- Data sources are clearly documented,
- Calculations are appropriately documented,
- All relevant assumptions are clearly documented,
- Conclusions are relevant and supported by results, and
- Text is well-written and easy to understand.

The documented review process will be stored with deliverables for the project. For the narrative describing the methodologies used for the inventory, all comments on drafts will be clearly and concisely summarized including a description of how substantive issues raised by commenters were resolved.

As discussed in Section 1.7, QC objectives include verification that data in database tables are stored and transferred correctly, algorithms call data correctly, units are internally consistent, and reports pull the required data. These data management issues will be addressed as part of the QC checks of data acquisition and document preparation.

For this project, it is not anticipated that any special data validation software will be required. However, where calculations are required to assess the data/datasets, calculations will be performed using computer spreadsheets (like Excel spreadsheets with predefined functions, or formulas) and calculators to reduce typographical or translation errors. General software available through the Microsoft Suite including Excel, PowerPoint, Access, and Word will be sufficient to perform the work as described in Section 1.6 for this project.

4.3. Reconciliation with User Requirements

All data (retrieved and generated) and deliverables in this project will be analyzed and reconciled with project data quality requirements. To ensure deliverables meet user requirements, the TL or senior technical lead will review all data and deliverables throughout the project to ensure that the data, methodologies, and tools used meet data quality objectives, are clearly conveyed, and represent sound and established science.

TCEQ will review each project with the EPA at the planning stage to ensure the approach is fundamentally sound and will meet the project objectives. The TL or senior technical lead will evaluate data continuously during the life term of the project to ensure they are of sufficient quality and quantity to meet the project goals. Prior to submission of draft and final products, the TL or senior technical lead will make a final assessment to determine whether the objectives have been fulfilled in a technically sound manner. Assumptions made in preparing project analyses will be clearly specified in the inventory.

As discussed in Section 1.7.1, uncertainty can be evaluated using a few different approaches. The most useful uncertainty analysis is quantitative and is based on statistical characteristics of the data such as the variance and bias of estimates. In a sensitivity analysis, the effect of a single variable on the resulting emissions estimate generated by a model (or calculation) is evaluated by varying its value while holding all other variables constant. Sensitivity analyses will help focus on the data that have the greatest impact on the output data. Additional statistical tests may be utilized depending on the need for more or less rigorous tools and on the specific inventory activity being evaluated.

5. References

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USDA Forest Service, *Greenhouse gas emissions and removals from forest land, woodlands, and urban trees in the United States, 1990-2019* at https://www.fs.usda.gov/research/treesearch/62418. Accessed on 7/26/2023.

US DOT, *Highway Statistics Series* at https://www.fhwa.dot.gov/policyinformation/statistics/2021/vm1.cfm . Accessed on 7/26/2023.

Appendix A: Check Lists of Quality Control Activities for Deliverables

<table>
<tr><th>Tasks and Deliverables</th><th>Quality Control Procedures</th></tr>
<tr><td colspan="2">Task 1. Transportation Sector GHG Inventory (Mobile Sources)</td></tr>
<tr><td>Statewide tabular inventory of GHG emissions from mobile sources with narrative report describing data sources, methodology, and documentation of QAPP implementation.</td><td>1. Comparison of (a) statewide inventory versus (b) statewide inventory developed using the EPA’s State Inventory Tool (SIT).
2. For any values used in state inventory inconsistent with values calculated using the SIT, the table below will be utilized to assess precision and bias of the statewide inventory versus SIT estimates:
<table><tr><th>Transportation Fuel</th><th>State Estimate</th><th>Federal Estimate</th><th>Statistics*</th></tr><tr><td>Aviation Gasoline</td><td></td><td></td><td rowspan="11"></td></tr><tr><td>Distillate Fuel</td><td></td><td></td></tr><tr><td>Ethanol</td><td></td><td></td></tr><tr><td>Jet Fuel, Kerosene</td><td></td><td></td></tr><tr><td>Jet Fuel, Naphtha</td><td></td><td></td></tr><tr><td>Hydrocarbon Gas Liquids</td><td></td><td></td></tr><tr><td>Lubricants</td><td></td><td></td></tr><tr><td>Motor Gasoline</td><td></td><td></td></tr><tr><td>Natural Gas</td><td></td><td></td></tr><tr><td>Residual Fuel</td><td></td><td></td></tr><tr><td>Other</td><td></td><td></td></tr></table>* Precision and bias calculations will be in accordance with the EPA’s Data Assessment Statistical Calculator (DASC) Tool available at https://www.epa.gov/sites/default/files/2020-10/dasc_11_3_17.xls with the state’s estimate taken as the measured value and the SIT value taken as the audit value.
3. Review by TL or senior technical reviewer—analytical methods and results are explained clearly, technical terms are defined, conclusions are reasonable based on information presented, and level of technical detail is appropriate.
4. Editor review—writing is clear, free of grammatical and typographical errors.</td></tr>
</table>

Tasks and Deliverables	Quality Control Procedures
Task 2. Electric Power Generation and Consumption	
Statewide tabular inventory of GHG emissions from electric power generation with narrative report describing data sources, methodology, and documentation of QAPP implementation.	1. Comparison of (a) statewide inventory *versus* (b) statewide federal estimate developed by the EPA. 2. For any values in the state inventory that are significantly different from federal estimates, the table below will be utilized to assess precision and bias of the state's estimate versus the federal estimate:

Electric Power Fuel	State Estimate	Federal Estimate	Statistics*
Coal			
Distillate Fuel			
Natural Gas			
Petroleum Coke			
Residual Fuel			
Wood			
Other			

* Precision and bias calculations will be in accordance with the EPA's Data Assessment Statistical Calculator (DASC) Tool available at https://www.epa.gov/sites/default/files/2020-10/dasc_11_3_17.xls with the state's estimate taken as the measured value and the SIT value taken as the audit value.

Ensure the GWPs used for the state estimate and the federal estimate are on the same basis. For example, the SIT tool uses AR5 GWP (e.g., methane GWP = 28).

3. Technical review of methods, calculations, and underlying datasets—data are appropriate for intended use, data are complete and representative and current, data sources documented, analytical methods are appropriate, and calculations are accurate.
4. Review by TL or senior technical reviewer—analytical methods and results are explained clearly, technical terms are defined, conclusions are reasonable based on information presented, and level of technical detail is appropriate)
5. Editor review—writing is clear, free of grammatical and typographical errors.

Tasks and Deliverables	Quality Control Procedures
Task 3. Natural and Working Lands and Forestry	
Statewide tabular inventory of GHG emissions and sinks from natural and working lands and forestry with narrative report describing data sources, methodology, and documentation of QAPP implementation.	1. Comparison of (a) statewide inventory *versus* (b) statewide inventory developed using the EPA's State Inventory Tool (SIT). 2. For any values used in state inventory inconsistent with values calculated using the SIT, the table below will be utilized to assess precision and bias of the statewide inventory versus SIT estimates:

Natural and Working Lands and Forestry Component	State Estimate	SIT Estimate	Statistics*
Net Forest Carbon Flux			
Urban Trees			
Landfilled Yard Trimmings Food Scraps			
Forest Fires			
N_2O from Settlement Soils			
Agricultural Soil Carbon Flux			
Other			

* Precision and bias calculations will be in accordance with the EPA's Data Assessment Statistical Calculator (DASC) Tool available at https://www.epa.gov/sites/default/files/2020-10/dasc_11_3_17.xls with the state's estimate taken as the measured value and the SIT value taken as the audit value.

3. Technical review of methods, calculations, and underlying datasets—data are appropriate for intended use, data are complete and representative and current, data sources documented, analytical methods are appropriate, and calculations are accurate.

4. Review by TL or senior technical reviewer—analytical methods and results are explained clearly, technical terms are defined, conclusions are reasonable based on information presented, and level of technical detail is appropriate)

5. Editor review—writing is clear, free of grammatical and typographical errors.

Tasks and Deliverables	Quality Control Procedures
Task 4. State Inventory of GHG Emissions from Other Major Sectors	
Statewide tabular inventory of GHG emissions from the state's major industrial, sources with narrative report describing data sources, methodology, and documentation of QAPP implementation.	1. Comparison of (a) statewide inventory *versus* (b) statewide inventory developed using the EPA's State Inventory Tool (SIT). 2. For any values used in state inventory inconsistent with values calculated using the SIT, the table below will be utilized to assess precision and bias of the statewide inventory versus SIT estimates:

Fuels and Feedstocks for Other Major Sectors	State Estimate	SIT Estimate	Statistics*
Asphalt and Road Oil			
Aviation Gasoline Blending Components			
Coal			
Coking Coal			
Crude Oil			
Distillate Fuel			
Feedstocks, Naphtha less than 401 F			
Feedstocks, Other Oils greater than 401 F			
Hydrocarbon Gas Liquids			
Kerosene			
Lubricants			
Misc. Petro Products			
Motor Gasoline			
Motor Gasoline Blending Components			
Natural Gas			
Pentanes Plus			
Petroleum Coke			
Residual Fuel			
Special Naphthas			
Still Gas			
Unfinished Oils			
Waxes			
Wood			
Other			

* Precision and bias calculations will be in accordance with the EPA's Data Assessment Statistical Calculator (DASC) Tool available at https://www.epa.gov/sites/default/files/2020-10/dasc_11_3_17.xls with the state's estimate taken as the measured value and the SIT value taken as the audit value.

3. Technical review of methods, calculations, and underlying datasets—data are appropriate for intended use, data are complete and representative and current, data sources documented, analytical methods are appropriate, and calculations are accurate.
4. Review by TL or senior technical reviewer—analytical methods and results are explained clearly, technical terms are defined, conclusions are reasonable based on information presented, and level of detail appropriate.
5. Editor review: writing is clear, free of grammatical and typographical errors.

Tasks and Deliverables	Quality Control Procedures
Task 5. State Inventory of GHG Emissions from Minor Sectors	
Statewide tabular inventory of GHG emissions from the state's minor sectors with narrative report describing data sources, methodology, and documentation of QAPP implementation.	1. Comparison of (a) statewide inventory *versus* (b) statewide inventory developed using the EPA's State Inventory Tool (SIT). 2. For any values used in state inventory inconsistent with values calculated using the SIT, the table below will be utilized to assess precision and bias of the statewide inventory for minor sectors versus SIT estimates:

Fuels and Feedstocks for Other Major Sectors	State Estimate	SIT Estimate	Statistics*
Asphalt and Road Oil			
Aviation Gasoline Blending Components			
Coal			
Coking Coal			
Crude Oil			
Distillate Fuel			
Feedstocks, Naphtha less than 401 F			
Feedstocks, Other Oils greater than 401 F			
Hydrocarbon Gas Liquids			
Kerosene			
Lubricants			
Misc. Petro Products			
Motor Gasoline			
Motor Gasoline Blending Components			
Natural Gas			
Pentanes Plus			
Petroleum Coke			
Residual Fuel			
Special Naphthas			
Still Gas			
Unfinished Oils			
Waxes			
Wood			
Other			

* Precision and bias calculations will be in accordance with the EPA's Data Assessment Statistical Calculator (DASC) Tool available at https://www.epa.gov/sites/default/files/2020-10/dasc_11_3_17.xls with the state's estimate taken as the measured value and the SIT value taken as the audit value.

3. Technical review of methods, calculations, and underlying datasets—data are appropriate for intended use, data are complete and representative and current, data sources documented, analytical methods are appropriate, and calculations are accurate.
4. Review by TL or senior technical reviewer—analytical methods and results are explained clearly, technical terms are defined, conclusions are reasonable based on information presented, and level of detail appropriate.
5. Editor review: writing is clear, free of grammatical and typographical errors.

Appendix B: Example QC Documentation Form

<Grantee Org.>

Documentation of QA Review and Approval of Electronic Deliverables

Approvals on this form verify that all technical and editorial reviews have been completed and the deliverable meets the criteria for scientific defensibility, technical, and editorial accuracy, and presentation clarity as outlined in the Quality Assurance (QA) Project Plan, QA Narrative, Quality Management Plan, and/or according to direction from the EPA PO.

Client:	EPA Region <X>
Grant Number:	<enter grant number>
EPA Project Officer:	<enter EPA PO>
Project Number:	<enter internal Project ID>
Project Name:	<enter internal project name>
Grantee Org. Project Manager	<enter grantee's project manager>

QA Form Details

Item Number	File Name (Copy the name of the File Reviewed)	Deliverable Description	Date Sent to Client	Deliverable (Draft)	Deliverable (Final)	Document Originator	QA Review Information (Review Type)	(Reviewer Name)	(Date Review was Performed)	(Brief Summary of Review Findings and Other Notes)	QA Review Information (Have all Findings Been Resolved)	(Originator Signature)	(Reviewer Signature)	(File Location) *Copy Long Folder Path Name*
01				☐	☐		*Technical*				☐ Yes			
							Technical				☐ Yes			
02				☐	☐		*Technical*				☐ Yes			
							Technical				☐ Yes			
03				☐	☐		*Technical*				☐ Yes			
							Technical				☐ Yes			
04				☐	☐		*Technical*				☐ Yes			
							Technical				☐ Yes			