

July 15, 2022

Andrea Wright
 Agency of Transportation
 219 N. Main Street
 Barre, VT 05641

Re: Vermont Transportation Carbon Reduction Strategy

Dear Ms. Wright:

This letter serves as a proposed scope of work for a project to develop a Carbon Reduction Strategy for the Vermont Agency of Transportation (VTrans). Cambridge Systematics, Inc. (CS) is pleased to respond to this request and looks forward to supporting VTrans with the development of this strategy. The remainder of this letter describes the objectives of the work, proposed tasks, budget, and time schedule.

Capacity of Key Personnel

The capacity of the CS team's proposed key personnel to support this work order is shown in Table 1. All of the proposed key staff have sufficient capacity to support successful execution of this assignment.

Table 1. Capacity of Key Personnel

Firm	Staff	Role	% Available	Other Commitments
CS	Chris Porter*	Project Manager	30%	NCHRP 25-64, Considering GHG and Climate Effects in Environmental Reviews; Colorado DOT GHG Rule Implementation Support; Massachusetts DOT NEVI Plan Implementation; Chicago Delivering Zero Emissions Communities program support
CS	Ben Eskin*	Deputy Project Manager	40%	Colorado DOT GHG Rule Implementation Support; Regional Transportation Commission of Southern Nevada Project Prioritization Tool; Northern New England Passenger Rail Authority rail plan
CS	Joe Zissman	Senior Advisor	25%	MassDOT Capital Investment Program, MassDOT Long-Range Transportation Plan, New Hampshire Asset Management On-Call
FHI Studio	Marcy Miller*	Project Manager	15%	I-84 Danbury Project, I-95 Stamford PEL, Quechee Gorge, CT Road Safety Audits
FHI Studio	Laura Parete*	Engagement Specialist	25%	Greater Hartford Mobility Study, Highgate Springs, Lyndon-Barton Project, Stowe VT Route 100

Firm	Staff	Role	% Available	Other Commitments
FHI Studio	Hannah Brockhaus*	Engagement Specialist	20%	Newfane, VT, VT Route 100
FHI Studio	Sara Grossman	Visual Communicator	15%	I-84 Danbury Project, Greater Hartford Mobility Study

*Denotes Key Personnel

Creative and Technical Solution

Project Understanding

VTrans is undertaking this work assignment with two primary objectives: 1) to support meeting the State's aggressive goals for greenhouse gas (GHG) emissions reduction, including a goal for the transportation sector to contribute 40 percent of the state's emission reduction targets of 40 percent below 1990 levels by 2030, and 80 percent below 1990 levels by 2050; and 2) to support Federal requirements for each State to develop a Carbon Reduction Strategy pursuant to the new U.S. Department of Transportation Carbon Reduction Program, which provides dedicated funding for GHG-reducing transportation projects.

VTrans' Carbon Reduction Strategy will build on previous work by the State and its partners to inventory GHG emissions and identify emission reduction strategies, including for the transportation sector, including regulations and incentives to move the State's motor vehicle fleet towards zero emissions, as well as emissions-reducing transportation investments and land use policies. The strategy will help VTrans take the next step towards carbon reduction by tying GHG mitigation analysis to the Agency's capital programming process and identifying programming strategies to close gaps between projected GHG emissions and needed emission reductions.

CS' proposed Project Manager for this effort, Chris Porter, recently led the development of a National Cooperative Highway Research Program (NCHRP) guide for State Departments of Transportation (DOTs) to estimate and reduce GHG emissions. In addition, supported by key staff Ben Eskin, he led work for Virginia DOT to develop a statewide GHG inventory and build/no-build forecast considering State and Metropolitan Planning Organization (MPO) long-range plans and capital programs, and is supporting the Colorado DOT in implementing a GHG reduction rule for transportation planning, including developing simplified methods to evaluate mitigation projects proposed by the State, its MPOs, and local agencies. Joe Zissman, Senior Advisor for the project, is an expert in capital programming methods, having provided ongoing support to MassDOT's Capital Investment Plan as well as to other states' performance-based planning activities. This and other project experience on GHG mitigation and transportation planning and programming provide the CS team with a strong understanding of the opportunities and challenges that VTrans faces in developing an effective Carbon Reduction Strategy. Some of the lessons learned from other States' efforts include:

- The majority of GHG emission reductions will come from technological advances including clean vehicles and fuels. VTrans can play an important supporting role in these advances, for example, by assisting with deployment of electric vehicle (EV) charging infrastructure. However, it may be hard to quantify the specific contribution of VTrans' activities to overall benefits achieved through State electrification policies and programs.



- It is also hard to “move the needle” much just through the types of investment choices normally included in a transportation agency’s capital program. This is especially true in a state like Vermont where there is already a minimal focus on capacity expansion and primary emphasis on system preservation and multi-modal investments. Transit services, bicycle and pedestrian infrastructure, and travel demand management can play dividends for mobility, equity, public health, and local economies, but will have only incremental effects on GHG emissions.
- Because of the relative importance of “co-benefits” of transportation investments, it is essential that consideration of GHG benefits be integrated into the overall consideration of transportation benefits supporting the State’s goals, and that the full range of benefits of these various types of investments be communicated when discussing and making investment decisions.
- The short-term (2030) benefits of land use strategies in a state like Vermont, with low population growth rates, will be modest; but they will multiply over the long-term (2050). Land use decisions are made mainly at a local (municipal) level, but VTrans can support and reward transportation-efficient land use through project selection criteria and investment decisions.
- Pricing strategies such as carbon pricing, cap-and-invest, and vehicle feebates can have larger emissions benefits but can also elicit substantial public concern. If there is any hope for these strategies to be implemented they must be designed carefully, and in close collaboration with stakeholder groups representing various segments of the public and Vermont’s business community, to address potential concerns regarding equity and economic impacts. Again, most of these strategies go beyond VTrans’ purview to implement; VTrans can be an important partner but not the lead agency.
- With these considerations in mind, it is essential to clearly communicate robust information on the effectiveness, cost- effectiveness, and co-benefits of the various transportation GHG reduction opportunities so that stakeholders and the public can understand what can realistically be achieved, and what some of the more difficult choices may be when working to meet GHG reduction targets.

In addition to these practical challenges to meeting GHG targets, CS recognizes the technical challenges of evaluating capital program projects and scenarios for GHG reduction. Capital programs generally include numerous projects with only very limited information available to support GHG reduction estimates. Staff resources are typically inadequate to perform detailed estimates for every project considering key drivers of emissions such as traffic flow changes, mode and route shifts, etc. CS’ approach to this challenge has been to make use of information sources from the literature, models, etc. to develop simple factors relating emission reduction potential to basic project characteristics that are most likely to be available at the planning and programming stage. For example, for Colorado DOT CS developed a “point” system (1 point = 1 metric ton GHG) to provide GHG emission reduction estimates per unit of investment (e.g., mile of new bicycle or pedestrian facility by urban/suburban/rural area type, revenue-mile of new transit service by vehicle/service type, improved intersection by traffic volume). An example of this point system is shown below for bike lanes.



Table 1. GHG Mitigation Measures and their points/metric in each compliance year.

Project Type	Metric	Project Lifetime (Years) ¹	Points/Metric ² Now-2025 ³	Points/Metric 2026-2030	Points/Metric 2031-2040	Points/Metric 2041-2050	Additional Multipliers
Pedestrian/Bicycle							
Bike lane/facility - core urban ⁴	Miles of two-way facility built between plan year 1 and evaluation year ³	30	23	19	9	3	2.0 – separated / protected lane or bike boulevard
Bike lane/facility - urban			12	10	5	2	
Bike lane/facility – suburban			4	3	1	1	1.5 – within mixed-use district or ½ mi of transit station or school
Bike lane/facility – rural			1	1	1	1	

Phase I: Capital Program GHG Accounting Methodology and Baseline

Task I: Project Initiation

The objective of this task is to ensure a successful start to the project. CS will conduct a (virtual) pre-project meeting with the VTrans Project Manager, followed by an in-person or hybrid kick-off meeting with the Technical Committee to review the scope, discuss roles and to gather members’ comments on available information. A kick-off meeting will also be held with the Advisory Committee to discuss the process for identifying strategies. A proposed schedule for the Technical and Advisory Committee meetings, including the kick-off meetings, is included in the “Schedule” section below. CS will provide agendas for each meeting and notes including key discussion points and action items. CS will also update and expand, as needed, the initial project schedule and workplan as proposed in this response, to reference key deliverables and other schedule milestones needed to complete the Strategy within the required timeframe and make any revisions to the approach based on Technical Committee input.

Deliverables:

- Kick-off meeting agendas and notes.
- Revised, detailed project schedule.

Task II: Methodology Options Evaluation and Recommendation

The objectives of this task are to identify and document GHG emission analysis methodologies being applied by other state DOTs, MPOs and other transportation agencies, and to recommend methodologies for use by VTrans.

CS recently completed a review of GHG emissions tools and methods for NCHRP Project 25-56 (the review of tools was published as [WebResource 1](#), Appendix B) and updated this review in 2022 for Project 25-64 (considering GHG and climate effects in environmental reviews). These reviews have comprehensively covered tools suitable for project-level evaluation as well as plan/program level evaluation. We have also developed our own, typically spreadsheet-based tools, finding that other existing tools are typically either too complex and data-intensive for quick-response use, or do not have the functionality needed to cover the full range of project types that might be evaluated. For example, for years we have supported the Transportation and Climate Initiative (TCI) states (including Vermont) with a custom spreadsheet tool for evaluating clean transportation investments



(including not only GHG but also cost-effectiveness, air pollution, health, and economic benefits). We have adapted elements from this tool for other uses, such as supporting Rhode Island's Clean Mobility Investment Strategy, and an evaluation of the GHG effects of Virginia's "SmartScale" capital investment program.

We will present and discuss the most appropriate and practical tools and methods with VTrans, but we expect the primary options to include the following:

- CS would develop emission rates by year and vehicle type for all future analysis years. CS has developed emission rates using both the MOVES model and the U.S. Department of Energy's Annual Energy Outlook. The project team will coordinate with the Technical Committee to identify the most appropriate emission rate assumptions considering consistency with previous analyses (e.g., the Vermont Pathways Analysis Report) and the latest preferred assumptions on vehicle technology regulations.
 - "Off-model" adjustments to emission rates may be needed to account for projected baseline levels (or scenarios) of electrification in Vermont. CS will confirm how information on emissions produced by generating electricity for transportation uses will be reported and used. These emissions are inventoried in other sectors but it is still important to consider the effects of transportation decisions on these emissions.
- CS would develop a simple system of lookup factors relating the type, value and/or quantity, and context of a project to GHG emissions benefits, similar to the point system we developed for Colorado. This could be operationalized with only modest effort in a spreadsheet or another technical platform (such as R Shiny) suitable for interface with VTrans' capital program database. We will discuss the most appropriate inputs to the factors, but we expect that something as simple as dollar value by project type may be needed based on limited information available for most Capital Program projects. Other information related the quantity/scale of project (e.g., transit revenue-miles, miles of bike lane or sidewalk, traffic volume served) would provide a refinement if available. CS has developed tools for other clients to translate these simple metrics into GHG reductions, such as the TCI Investment Strategy Tool that uses inputs of expenditures by program category, and would adapt these tools and data for Vermont.
- Other tools that might be considered include:
 - Vermont's statewide travel demand model, used in conjunction with emission rates, can potentially support analysis of major capacity projects (if any) as well as updates to on-road transportation sector baseline projections If needed.
 - For any project for which project-specific traffic or ridership analysis has been conducted, such as major highway expansion, operational improvements, or transit service expansion, project-specific traffic or ridership forecasts may be used in conjunction with mode and/or speed-specific emission rates. These types of projects are expected to be infrequent.
 - The FHWA Congestion Mitigation and Air Quality Improvement Program (CMAQ) emissions calculator tools could potentially be used for other projects of more significant scale where sponsors have developed basic input estimates such as transit ridership, trail usage, traffic speed improvements, or clean fleet replacements.



- To support the strategy analysis in Task II.III, the methods will need to be able to consider strategies within other agencies' jurisdiction (such as land use, pricing, and clean vehicle technology) in addition to types of projects included in VTrans Capital Program. CS has included this full range of strategies in other tools we have developed, such as a spreadsheet-based sketch analysis tool for the City of Boston's Carbon Free Boston study, which we subsequently adapted to support San Francisco's Climate Action Plan.

The recommendation of tools will be informed by Technical Committee input on what is and is not practical, given available data and staff and project sponsor resources, balancing the need for sufficient information on GHG effects to inform decision-making.

Deliverables:

- Technical memorandum or PowerPoint listing and recommending GHG analysis tool(s) and method(s) for VTrans (draft and final).

Task III: Recommended Methodology Refinement and Application to the SFY 2024 Capital Program

The objective of this task is to prepare the recommended methodology for application in Vermont, test the methodology on previous Capital Programs, and apply it to the State Fiscal Year (SFY) 2024 Capital Program. CS' approach to this task would include:

- Obtain list(s) of past Capital Program projects for testing, in a database or spreadsheet format along with corresponding shapefiles or other georeferencing if available. Categorize projects into a set of pre-defined project types related to their expected relative GHG effectiveness.
- Associate any other information needed to apply the GHG estimation method. For example, the method would make use of area type data (e.g., metro urban, small town, rural) if available through a geographic information systems (GIS) analysis. If project studies have developed GHG estimates (e.g., for major projects) this information would also be associated.
- Using existing, readily-available project data, estimate GHG reductions using the methodology defined in Task I.II.
- Consider sensitivity to key uncertainties and what refinements to information (e.g., Vermont-specific cost or ridership factors) might produce better estimates.
- Based on consultation with the Technical Committee, refine the methodology as needed for application to the SFY 2024 future Capital Program.
- Apply the methodology to the 2024 program and review results.

Deliverables:

- Draft and revised memorandum or PowerPoint documenting test results.



Task IV: Documentation and Training

The objective of this task is to ensure that VTrans staff can apply the GHG analysis methodology to the analysis for future capital programs. CS will develop a technical guide to the methodology and will conduct an in-person training workshop. CS will also provide internal documentation (e.g., cell notes, script comments) to assist users.

Deliverables:

- Draft and final technical guide.
- Training workshop delivery and materials.

Phase II: Carbon Reduction Strategy

Task I: Stakeholder and Public Engagement

The objective of this task is to engage stakeholders and the public in the development of the Carbon Reduction Strategy, specifically, in helping to identify potential GHG mitigation strategies and projects, and providing input to the prioritization of projects and funding programs considering information on GHG effectiveness alongside other information project benefits, costs, and impacts.

Stakeholder and public engagement methods will include:

- An Advisory Committee, formed by VTrans and comprised of representatives from a broad cross-section of stakeholder groups (e.g., citizens groups, environmental groups, trucking and freight interests, business interests). The Advisory Committee will provide key input to the development of the strategy. For budgeting purposes we assume the Committee will meet four times, including once in-person and three times virtually.
- Two rounds of focus groups with up to six stakeholder groups (12 meetings total). It is assumed that these meetings will be held virtually, with up to two of the 12 meetings in-person (if requested in conjunction with a previously scheduled in-person meeting). Examples of stakeholder groups may include environmental groups, community-based organizations including equity and environmental justice interests, business community groups such as chambers of commerce, transportation industry associations (e.g., railroad, trucking), municipalities, and regional planning agencies.
- Two virtual public meetings will be held throughout the project in conjunction with key milestones. FHI Studio will collaborate with the project team and VTrans staff to advertise the meetings and help with materials, such as the presentation, potential polling, and virtual meeting assistance.
- FHI Studio will develop and maintain a project website/webpage and social media content for VTrans social media platforms (Facebook, Twitter, Instagram, and YouTube). Project announcements will be posted to these platforms up to six times per month to keep the public apprised of current activity, important outreach events, and other relevant news. These will be updated and maintained throughout the duration of the project.



For budgeting purposes, we assume that three project team staff (project manager, facilitator, recorder) will attend the Advisory Committee meetings, with two team staff (facilitator and recorder) attending each of the focus groups and public meetings. Virtual meetings will also require a technical support person.

Deliverables:

- Develop and manage a stakeholder database.
- Advisory Committee Meeting agendas, presentations, and summaries.
- Public Meeting agendas, presentations, press releases, and summaries.
- Focus group and public meeting materials and summaries
- Develop project webpage or website content.
- Social media content development and posting.

Task II: Gap Analysis

The objective of this task is to quantify the gap that needs to be closed in transportation GHG reduction considering current policies, programs, and projects. CS' approach to this task will include the following steps:

- Confirm/agree on key scoping parameters with the Technical Committee:
 - The year(s) for which the gap is to be evaluated (e.g., 2025, 2030, 2050).
 - The subsectors of emissions to be included in the analysis (e.g., on-road mobile sources, passenger and freight rail); and how overall transportation sector emissions targets will be scaled if only a subsector of transportation is included in the analysis (e.g., if air, water, and or other nonroad sources are excluded).
 - Accounting method for considering upstream/life-cycle emissions (including from electricity generation, life-cycle effects associated with other low-carbon fuels such as biodiesel, and embedded emissions associated with construction materials).
- Determine and confirm the baseline projection of included transportation sector emissions in each evaluation year (including confirming which policies are included in the baseline). We will use existing forecasts to the degree available, and make additional assumptions if needed to develop additional detail.
- Evaluate and incorporate the effects of any additional State policies that may be proposed but not included in the baseline (e.g., Advanced Clean Cars II, Advanced Clean Trucks).
- Incorporate the findings of Task I.III to bring in the projected effects of VTrans' SFY 2024 Capital Program.
- For planned investments by VTrans (or other state agencies or partners) that complement existing or proposed regulations (such as EV purchase or infrastructure incentives), the project team will determine in consultation with the Technical Committee whether the effects of these investments are expected to be additional to the effects of the policy, or covered within those effects.



- Compare the gap between projected emissions and transportation sector target emission reductions in each analysis year.

Deliverables:

- PowerPoint presentation documenting gap analysis and findings.

Task III: Develop and Evaluate Strategy Scenarios

The objective of this task is to identify strategies necessary to help achieve Vermont’s transportation GHG reduction requirements.

To accomplish this task CS will first develop up to four scenarios with different combinations of strategies, including:

- Exclusively transportation investments and services such as VTTrans would include in its Capital Plan.
 - We will discuss with the Technical Committee what financial constraints should be considered, but will assume that this scenario will need to work within the current envelope of projected Federal and matching State funding (including new programs such as the National Electric Vehicle Infrastructure program and the Carbon Reduction Program).
 - The scenario will not include specific projects, but will include illustrative quantities of projects consistent with available funding. However, the evaluation will consider the need to suballocate Carbon Reduction Program funds to different urbanized area sizes consistent with program requirements.
- Exclusively other policy and regulatory approaches, such as clean car and truck rules and incentives, low-carbon fuel standards, feebates, carbon pricing, and transportation network company regulations.
- A combined scenario. If this scenario includes new, revenue-positive pricing measures, some portion of these funds could be reinvested in clean transportation projects and services (the type of analysis CS conducted for TCI).
 - There might be two variations on this scenario, including (i) a “kitchen sink” scenario that includes every option needed to achieve GHG reduction targets, at relatively aggressive implementation levels, and (ii) a “more practical” scenario that includes only those strategies deemed most likely to be implemented.

We will work with the Technical and Advisory Committees to develop the scenarios. The committees will provide important input such as the specific policies and strategies to be included, the degree of policy implementation (e.g., level of carbon price and reinvestment of revenue), and the mix of investments. To support the scenario development, CS will provide qualitative information on cost-effectiveness of different types of strategies, as well as equity considerations and co-benefits such as health and economic effects, based on information we have



developed for other studies. For example, for the Rhode Island Clean Transportation and Mobility Innovation Report we presented summary information in a table as shown at right.

We will then evaluate the emission reduction scenarios using the GHG evaluation tool, and compare with the transportation sector gap vs. targets. We anticipate one round of iteration where initial results are presented, and then additional changes are made to key assumptions (such as the degree of a policy implementation or mix of spending) if needed to improve effectiveness.

Deliverables:

- Draft and revised scenario descriptions.
- Draft and revised PowerPoint presentation documenting strategy analysis and findings.

Task IV: Carbon Reduction Strategy

The objective of this task is to develop a Carbon Reduction Strategy documenting the State’s approach to evaluating GHG and selecting reduction strategies and the final outcome. The Strategy will meet all Federal requirements including documentation of stakeholder and public involvement, as well as comparison against Carbon Reduction Program eligibility criteria. The Strategy may include more detailed technical analysis and public outreach findings from previous tasks as appendices.

Pending any further guidance from FHWA on the contents of a Carbon Reduction Strategy, a potential outline for the Strategy is shown in the sidebar.

Table 6. Cost-Effectiveness of Clean Transportation Strategies

Strategy	GHG	PM2.5	New non-SOV trips	Jobs	Health benefits
Light duty EVs	+++	+++	-	+	++
Electric transit buses	+++	+++	-	+	+++
Electric school buses	+++	+++	-	+	++
Electric trucks	+++	+++	-	++	++
Hydrogen trucks	+++	+++	-	++	++
Shared ride incentives	+	+	+++	+	+
Micromobility: Shared e-scooters & e-bikes	+	+	++	+	++
Micromobility: E-bike ownership	++	++	+++	+	++
Land use/smart growth	+++	++	-	++	++
Bicycle investment	++	++	+++	++	+++
Pedestrian investment	+	+	+++	++	+++
Travel demand & mobility management	++	++	+++	++	++
Bus rapid transit	+	+	+++	++	+
Commuter/intercity rail	+	+	++	++	+
Bus service: Expansion	+	-	++	+++	+
Bus service: Efficiency	++	+	++	+++	++
Electric microtransit	+	+	+++	++	+
Traffic flow improvements	+++	-	-	+++	-

Table 5. Benefits Key

Benefits Range	GHG tons/\$M	PM2.5 lbs/\$M	New non-SOV trips per \$M	New jobs per \$M	Value of health benefits per \$M
-	<10	<1	<1,000	<1	<\$0.1M
+	10 – 100	1 – 10	1,000 – 50,000	1 – 10	\$0.1 – \$0.25M
++	100 – 1,000	10 – 100	50,000 – 250,000	10 – 20	\$0.25M - \$2.5M
+++	>1,000	>100	>250,000	>20	>\$2.5M

Note: A typical car emits about 4 to 5 tons of GHG per year, so 100 tons is equivalent to taking 20 cars off the road, and 1,000 tons is equivalent to taking 200 cars off the road.



Carbon Reduction Strategy - Sample Outline

- Purpose of the Strategy
 - Reference to state goals/targets as well as Federal program requirements
- Approach to Developing the Strategy
 - Stakeholder and public engagement, including MPO consultation
 - Technical analysis
- Evaluation of Scenarios
- Proposed/Recommended Scenario
 - How the scenario will be incorporated into VTrans' Long-Range Plan and Capital Program
 - Policies and strategies outside of VTrans' authority
- Use of Carbon Reduction Program Funds
 - Project selection/prioritization criteria consistent with the proposed/recommended scenario
 - Consistency with program eligibility requirements
 - Suballocation of funds by urbanized area size

Deliverables:

- Draft and final Carbon Reduction Strategy.

Schedule

A proposed schedule for this work is shown in Figure 1, assuming a start date of August 1, 2022 and an end date of September 30, 2023. Figure 1 also identifies key milestones as noted in the Statement of Work. Table 2 identifies the proposed schedule for Technical and Advisory Committee meetings as well as public outreach and focus group meetings, and the purpose of each meeting. The schedule may be revised at or following the kickoff meeting depending upon the actual start date and further discussion with the Technical Committee.



Figure 1 Schedule

Phase/Task	2022					2023									
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
I.I: Project Initiation	■														
I.II: Methodology Options	■		1												
I.III: Methodology Refinement and Application			■		2	■		3							
I.IV: Documentation and Training							■								
II.I: Stakeholder and Public Engagement		■													
II.II: Gap Analysis							■								
II.III: Scenario Evaluation								■		4	■		5		
II.IV: Carbon Reduction Strategy											■			6	
Technical Committee	★		★		★	★			★		★		★		
Advisory Committee					★			★			★		★		
Focus Groups & Public Meetings							★				★				
	1 - Recommendation of methodology														
	2 - Testing of methodology														
	3 - Application of methodology/legislature presentation														
	4 - Scenario development														
	5 - Scenario analysis and recommendations														
	6 - Draft Carbon Reduction Strategy														



Table 2. Technical and Advisory Committee and Outreach Meetings

Meeting	Date	Purpose
Technical Committee #1*	Aug. 2022	Project kickoff
Technical Committee #2	Oct. 2022	Review methodology options and approve recommendation
Technical Committee #3	Dec. 2022	Review methodology application to SFY 2023 Program
Technical Committee #4	Jan. 2023	Review methodology application to SFY 2024 Program prior to legislative presentation
Technical Committee #5	Apr. 2023	Review gap analysis and initial scenario proposals
Technical Committee #6	Jun. 2023	Review scenario analysis results and recommendations
Technical Committee #7	Aug. 2023	Review draft Carbon Reduction Strategy
Advisory Committee #1	Dec. 2022	Project kickoff and review plan for public/stakeholder outreach
Advisory Committee #2*	Mar. 2023	Provide input into scenario development
Advisory Committee #3	Jun. 2023	Review scenario analysis results and recommendations
Advisory Committee #4	Aug. 2023	Review draft Carbon Reduction Strategy
Public Meetings and Focus Groups #1	Feb. 2023	Present plan goals and obtain general input to inform scenario development
Public Meetings and Focus Groups #2	Jun. 2023	Provide comments on scenario analysis results and recommendations

*In-person or hybrid meeting. Another meeting may be substituted for the indicated in-person/hybrid meetings. One additional Technical Committee meeting, to be determined, may be held in-person/hybrid. Other Technical and Advisory Committee meetings are proposed to be virtual, but additional in-person meetings may be accommodated with additional budget.

**Virtual public meetings. Two focus groups in each round may be in-person, others virtual.

Experience

Chris Porter, a Principal of CS based in Medford, MA, will serve as the Project Manager for this effort. Chris has supported state, regional, and local energy and GHG inventories and reduction planning efforts in Massachusetts, California, Colorado, Connecticut, Florida, Maryland, New Jersey, Oregon, Rhode Island, and Virginia as well as national assessments of transportation GHG reduction strategy impacts. He recently completed work for the Virginia DOT to develop a statewide GHG inventory and forecast for 2040 “build” and “no-build” plan alternatives and a pilot project-level GHG evaluation, and is currently supporting the Colorado DOT in developing quick-response methods to evaluate the GHG reduction benefits of GHG mitigation strategies at the state and MPO level. He recently completed National Cooperative Highway Research Program (NCHRP) *WebResource 1*, a guide for State DOTs to reduce GHG emissions, and is now leading another NCHRP project to develop a handbook for considering GHG emissions and climate change effects in environmental reviews. He led the



transportation strategy analysis for a project to support the City of Boston's Carbon-Free Boston study that set a plan for reaching carbon neutrality by 2050, and developed methods for evaluating the GHG impacts of the MassDOT's Capital Investment Plan. For the Georgetown Climate Center he is the CS project manager providing support to states to evaluate strategies to reduce transportation GHG emissions and measure the benefits of these strategies to the regional economy.

Ben Eskin, a Senior Professional of CS, will serve as will serve as Deputy Project Manager and GHG analysis lead for this effort. Ben's experience includes sustainable transportation policy, GHG analysis, vehicle electrification, public transit and active transportation planning, and smart growth. For the Virginia DOT, Ben led the technical analysis for the estimation of statewide GHG emissions as well as emissions along a portion of the I-95 corridor in Virginia under different transportation scenarios, using the EPA MOVES model and the FHWA infrastructure Carbon Estimator (ICE) tool. Ben provided analytical support for the Colorado DOT to quantify benefits and costs of strategies to achieve GHG reductions consistent with rule-based targets. As part of the support, Ben applied the Energy and Emissions Reduction Policy Analysis Tool (EERPAT). For the San Francisco County Transportation Authority he adapted an Excel-based "sketch tool" to estimate the VMT and GHG impacts of transportation emissions reduction strategies. Ben has prior consulting experience working on federal sustainability and climate change programs, including developing GHG inventories.

Joe Zissman, proposed Senior Advisor, is Deputy Contract Manager for CS' retainer contract with VTrans. Joe is a Senior Associate of CS with expertise in performance-based planning, capital programming, and asset management. He will advise on the application of the GHG analysis methodology to VTrans' capital program. He is Contract Manager for CS' Planning On Call Services retainer contract with the Massachusetts DOT, and Project Manager for several tasks including annual Capital Investment Plan support. He is Deputy Project Manager for MassDOT's current long-range plan update, *Beyond Mobility*. Joe is also leading CS' support for New Hampshire DOT through our Asset Management and Planning On-Call Services contract.

Nimisha Deshwal joins CS' Medford office in August 2022 as a Professional. She will support research and analysis for this work assignment. Nimisha graduated with a Masters in City and Regional Planning from Rutgers University with concentrations in Transportation Management and Climate/Coastal Resilience. As a Student Research Assistant at the Voorhees Transportation Center, she performed mapping and analysis of transportation infrastructure and mobility characteristics; reviewed urban concepts for resilient, health, and equitable cities; and analyzed road datasets. Her previous work experience as a planner includes coordinating public opinion/interaction events, supervising interview campaigns, preparing bicycle and pedestrian circulation plans, and researching effects of air pollution. Her skills include ArcGIS, Python, R, Cube, Adobe Creative Suite, data mining, and graphic visualization.

Marcy Miller, Regional Community Engagement Manager with FHI Studio, specializes in the areas of community engagement, transportation planning, and environmental documentation and analysis. Specifically, she has experience in bringing diverse interest groups together to address issues in consensus building efforts. Her work has included identifying stakeholders as well as orchestrating and moderating public, stakeholder, interest group, and agency meetings and workshops. She is familiar with federal regulations related to public involvement in transportation planning. She holds a National Charrette Institute Certificate.

Laura Parete, Senior Planner with FHI Studio, is an experienced community engagement and strategic communications professional. Laura has a strong ability to connect with people, listen to community concerns,



and proactively communicate through verbal and written outreach. She understands the importance of gaining community support early on a project and that each one requires a unique approach to community engagement. Her skills include but are not limited to project management, client/community relations, environmental justice outreach, social media management, digital media, content creation, and crisis communications.

Hannah Brockhaus, Senior Planner with FHI Studio, is a transportation planner and community engagement specialist that effectively translates community concerns to implementable solutions. She has worked closely with civil and traffic engineers, guiding and translating project development on a variety of scales: corridor studies, bridge rehabilitation and replacement projects in design and construction, and neighborhood transportation plans. Hannah has worked on high profile, controversial projects and builds consensus through conversations between neighbors, advocates, and agencies.

Sara Grossman, Graphic Designer with FHI Studio, is a creative and detail-oriented designer with experience creating impactful visuals in a variety of areas, including print, digital, and branding. She strives to add value to projects by utilizing human centered design, putting intent behind every element, and embracing the client's principles and identity. She possesses the skills to undertake complex tasks and works diligently to provide work that aligns with the needs and requirements of clients in a timely manner.

Past Performance

Colorado DOT GHG Rule Cost-Benefit Analysis and Implementation Support. CS is supporting the Colorado DOT in developing guidance and analysis methods to support the state and its MPOs in implementing a GHG reduction rule, which was adopted in December 2021. CS initially led an economic impact assessment and a cost-benefit analysis of the proposed rule, which establishes GHG emissions reduction targets for transportation planning. CS has since developed sketch-level project evaluation methods for projects that cannot be modeled using the statewide model. The methods provide estimates of GHG emission reductions in future years (2025, 2030, 2040, and 2050) using basic inputs such as the miles of bikeway project by area type, revenue-miles of new transit service, and traffic volumes benefiting from traffic flow improvements. The outcome is a matrix of points (corresponding to tons of GHG reduced) associated with mitigation strategies and projects that can be programmed by CDOT and the state's MPOs. CS also applied the FHWA EERPAT GHG analysis tool to support evaluation of selected strategies including transit investment, land use, and travel demand management; and has supported CDOT in developing approaches to using the statewide and regional travel demand models to evaluate strategies such as telework, tele-travel, and pedestrian and bicycle investment. Finally, CS is supporting interagency consultation including presenting, explaining, and obtaining feedback on proposed evaluation methods.

Reference: Theresa Takushi, 303.757.9977, theresa.takushi@state.co.us.

