



**Verified Carbon
Standard**

REDUCING CARBON EMISSIONS ON I-64
CAPACITY IMPROVEMENT PROJECT WITH
THE USE OF FSB AND EMULSION ASPHALT
MIXTURES VALIDATION AND
VERIFICATION REPORT



RUBY CANYON ENVIRONMENTAL

Document Prepared by Ruby Canyon Environmental, Inc.

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Summary:

The foam stabilized base (FSB) and asphalt emulsion mixtures project aims to enlist road construction contractors in the United States of America with the purpose of reducing greenhouse gas (GHG) emissions during the asphalt installation process by using FSB and asphalt emulsions in place of Hot Mix Asphalt (HMA). The baseline scenario road construction projects would have utilized typical HMA or Warm Mix Asphalt (WMA) installation which has a significant GHG emission footprint associated with the mining of virgin aggregates, trucking the virgin aggregate to the mix plant, heating the mix to 310° F, and then trucking the mixed product at high temperatures to the job site

Global Emissionary, LLC (GE) contracted Ruby Canyon Environmental, Inc. (RCE) to complete the validation and verification of the initial project instance of repairing Interstate Highway 64 near Williamsburg, Virginia. The crediting period is from 17 April 2018 to 16 April 2028. The first monitoring period verified is from 17 April 2018 to 13 September 2021.

The purpose of the validation is to ensure that the baseline scenario is valid, that the Project complies with the VCS Standard, version 4 and VM0039 Methodology for Use of Foam Stabilized Base and Emulsion Asphalt Mixtures in Pavement Application, that the project plan and GHG calculation methods are materially correct, and that the planned project could reasonably be expected to achieve the claimed emission reductions.

The Purpose of the verification is to ensure that the GHG statement is materially correct, that the statement conforms with the specified requirements and adheres to the VCS program rules, and that the data provided to RCE can be documented and if errors or omissions are detected, they be corrected by GE.

The Project was assessed against the requirements of VM0039, the VCS Standard and the Project Description dated 27 July 2023. As part of the validation and verification activities, RCE reviewed the completeness, conservativeness, and accuracy of the underlying evidence for the Project's assumptions and data sources used.

The scope of the validation and verification includes an assessment of the combined Project Description and Monitoring report, dated 27 July 2023, and supporting data and documentation against the defined criteria listed below in Section 1.2.

The validation and verification team's method for assessing the project against the above criteria (including the policy, procedures or requirements used to validate the project description and verify the monitoring report) included creating a validation and verification risk assessment and sampling plan. RCE determined which areas of the project contained the highest risk and focused on reviewing evidence to mitigate these risks. The validation and verification team included a desk review of project information, a site visit to the project location and interviews with key personnel involved in developing the project and carrying out the monitoring and metering.

During the validation and verification process, RCE issued a total of 22 findings which include:

- 4 Corrective Action Requests
- 2 Non-material Findings
- 11 Additional Document Requests
- 5 Clarification Requests
- 0 Forward Action Request

Based on documentation and explanations provided by the Project Proponent, RCE closed out all findings in a clear and transparent manner. RCE is reasonably assured that the Project meets all relevant VCS requirements and correctly applies the Methodology. All uncertainties associated with inherent data collection and analysis are properly managed through data controls and quality assurance checks.

RCE states, to a reasonable level of assurance that the Project as described in the combined Project Description and monitoring report dated 27 July 2023 meets all relevant VCS requirements and correctly applies VM0039 with noted deviations.

RCE concludes that that all relevant VCS validation criteria have been satisfied and the Project Activity properly applies the criteria of VM0039. RCE concludes that the baseline is valid and that the emission reductions attributable to the Project Activity are additional to any emission reductions that would occur in the absence of the Project. RCE also confirms that the estimated emission reductions to be claimed during the crediting period is a reasonable estimate.

RCE confirms, to a reasonable level of assurance, that the Project's GHG statement of 17,790 metric tons of CO₂ equivalent emissions for the period of 17 April 2018 – 13 September 2021 is fairly stated.

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1 INTRODUCTION

1.1 Objective

The purpose of the validation is to ensure that the baseline scenario is valid, that the Project complies with VM0039 Methodology for Use of Foam Stabilized Base and Emulsion Asphalt Mixtures in Pavement Application version 1.0, that the project plan and GHG calculation methods are materially correct and meet the requirements of the VCS program, and that the planned project could reasonably be expected to achieve the claimed emission reductions.

The purpose of the verification is to ensure that the GHG statement is materially correct, that the data provided to RCE can be documented and if errors or omissions are detected, they be corrected by GE.

1.2 Scope and Criteria

This is the validation of the Project's crediting period from 17 April 2018 to 16 April 2028. The validation scope is defined as an independent and objective review of the project activities using foam stabilized base (FSB) and asphalt emulsions, including the review of the Project Description (PD) v6.0, dated 27 July 2023. The PD was reviewed against the following criteria:

- Verified Carbon Standard (VCS), v4.4 (Issued 19 September 2019; updated 17 January 2023)
- VCS Validation and Verification Manual version 3.2 (October 19, 2016)
- VCS Methodology VM0039 Methodology for Use of Foam Stabilized Base and Emulsion Asphalt Mixtures in Pavement Application Version 1.0 (24 June 2019)
- Validated Project Description (PD), dated 27 July 2023
- ISO 14064-3:2006 "Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions"

This is the verification of the Project's first reporting period from 17 April 2018 to 13 September 2021 during the first and only crediting period. The verification scope includes the organizational boundaries of an HMA plant where FSB was produced and the I-64 roadway. The GHG emission sources included are associated with CO₂ from raw material acquisition, raw material transport, in-plant production, to site transport, installation, FSB/asphalt emulsions production, and FSB/asphalt emulsions production and placement.

RCE conducted the verification based upon the following criteria:

- Verified Carbon Standard (VCS), v4.4 (Issued 19 September 2019; updated 17 January 2023)
- VCS Validation and Verification Manual version 3.2 (October 19, 2016)
- VCS Methodology VM0039 Methodology for Use of Foam Stabilized Base and Emulsion Asphalt Mixtures in Pavement Application Version 1.0 (24 June 2019)
- Combined Validated Project Description (PD) and Monitoring Report (MR), dated 27 July 2023
- ISO 14064-3:2006 "Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions"

1.3 Reasonableness of Assumptions and Level of Assurance

RCE conducted the validation and verification activities to a reasonable level of assurance. During the validation, RCE confirmed the reasonableness of assumptions, limitations, and methods that support the statement about the outcome of future activities (see list of findings in the Appendix).

The VCS Standard defines materiality as errors, omissions, or discrepancies resulting in misstatement of greater than five percent of the Project's GHG assertion. Additionally, RCE considered qualitative non-conformances with criteria requirements as material during the verification process.

1.4 Summary Description of the Project

The validation assesses the eligibility of the project for the crediting period and the verification covers the first monitoring period of the grouped project. VM0039 uses performance benchmarks to determine additionality and the crediting baseline. All instances of the project activity performed better than the performance benchmark and are therefore considered additional. Emission reductions are calculated as the difference between actual project emissions and the crediting performance benchmark. The project is located within the City of Newport News, James City County, and York County in Virginia on Interstate Highway 64.

RCE reviewed the two initial project activity instances (PAIs) and confirmed that each occurred in the U.S., complies with the eligibility criteria for inclusion of a new PAI, is included in the monitoring report with sufficient technical, financial, geographic and other relevant information to demonstrate compliance with the applicable set of eligibility criteria, was validated at the time of verification against such criteria, has evidence of project ownership, has a start date that is later than the grouped project start date, is eligible for crediting from the start date of each instance through to the end of the project crediting period and that neither of the two instances have left a VCS project to subsequently enroll in another VCS project.

RCE also reviewed section 1.4 of the combined Project Design and Monitoring Report document to confirm that the project proponent included additional and relevant information for the addition of new instances in the grouped project including baseline scenario, location, validation and verification criteria, start date and crediting period length.

The project activity includes roadway paving projects that utilize FSB and/or asphalt emulsion instead of HMA in the production and installation of asphalt pavement construction. GHG emission reductions are generated from producing and installing FSB and asphalt emulsions instead of HMA. The total energy intensity is calculated for the project installation and compared to the additionality benchmark for the year in which project activities took place. The final emission reduction value is the difference between the baseline performance standard and the project emission intensity.

2 VALIDATION AND VERIFICATION PROCESS

2.1 Method and Criteria

RCE used a risk-based assessment approach for the validation and verification process to develop the validation and verification sampling plan as part of the validation and verification activities.

The validation process and sampling plan involved the following independent and objective activities:

- Select a validation team;
- Perform a Conflict of Interest assessment;
- Conduct a kick-off meeting with GE;
- Review the combined Project Description (PD) and Monitoring Report (MR);
- Develop a validation plan and risk-based sampling plan;
- Review the validity of the baseline scenario;
- Conduct a site visit;
- Review the accuracy of the emission reduction projections for the crediting period;
- Review whether project activities are subject to regulatory compliance;
- Confirm project ownership is accurately described in the PD;
- Confirm the application of VCS Methodology VM0039 Methodology for Use of Foam Stabilized Base and Emulsion Asphalt Mixtures in Pavement (24 June 2019);

- Review the monitoring plan;
- Issue corrective action requests (CARs), non-material findings (NMFs), additional documentation requests (ADRs), and clarification requests (CRs).
- Conduct a senior internal review;
- Issue a joint validation/verification report and representation; and
- Conduct an exit meeting with GE.

The validation/verification team was selected according to RCE's GHG Verification Policies & Procedures to ensure team members are qualified to perform validation/verification activities pertaining to the Project. The validation/verification team consisted of the following individuals:

Lead Validator: Phillip Cunningham

Senior Internal Reviewer: Bonny Crews

Team Member: Garret Heidrick

Prior to validation/verification project activities, RCE performed a Conflict of Interest assessment to determine whether any potential conflicts exist with the project developer. No issues were discovered that would affect the impartiality or independence of the validation/verification team. RCE also submitted a Notice of Validation and Verification services form to Verra on 10 October 2022.

A validation/verification kick-off conference call was held with GE on 5 October 2022. The purpose of the kick-off conference calls was to introduce the GE personnel and the RCE validation/verification team, review the validation/verification objectives, process, and VCS requirements, and to confirm the schedule.

RCE reviewed the joint PD/MR and developed a validation/verification plan and sampling plan that was used throughout the validation/verification of the Project. A risk-assessment was performed based upon the criteria listed above and evidence provided to RCE by GE that pertained to the current

crediting/monitoring period. The validation/verification team confirmed that each instance in this grouped project met the additionality requirements listed in VM0039.

Information in the joint PD/MR was the primary focus of the validation, verification and sampling plan. RCE reviewed the joint PD/MR for completeness and accuracy and used the joint PD/MR to determine other relevant documents to review and personnel to interview. To assist in the project review, RCE developed a sampling plan checklist based on the requirements of the VCS standard and VM0039.

After a preliminary risk assessment of the Project, RCE performed a site visit on 9 November 2022. Both the project cold central recycling plant and I-64 segment where project activities were carried out were inspected. The Lead Verifier interviewed key personnel, reviewed GHG sources, sinks and reservoirs (SSRs) and viewed relevant monitoring equipment. Following its initial review of all Project documents and the site visit, RCE submitted an Issues Log to GE with findings that included CARs, NMFs, ADRs, and CRs. GE provided responses to all identified issues.

The verification process and sampling plan involved the following independent and objective activities:

- Select a Verification Team;
- Perform a Conflict of Interest assessment;
- Conduct a kick-off meeting with GE;
- Review the joint validated Project Description and Monitoring Report;
- Review the current Monitoring Report;
- Develop a verification plan and risk-based sampling plan;
- Conduct a site visit;
- Review the project information control systems and quality control procedures;
- Review the Project's emission reduction calculations;
- Issue corrective action requests (CARs), non-material findings (NMFs), additional documentation requests (ADRs), and clarification requests (CRs).
- Conduct a senior internal review;
- Issue a joint validation/verification report and representation; and
- Conduct an exit meeting with GE.

RCE developed a verification plan and sampling plan that were used throughout the verification of the Project. A sampling plan was created after reviewing the combined PD/MR and the VCS Standard. A risk-assessment was performed based upon the criteria listed above and evidence provided to RCE by GE that pertained to the current reporting period.

Rather than selective sampling, RCE re-calculated all emission reductions based on raw data collected from engineering documents for the road design and other information collected from the road construction contractor and confirmed that all default emission factors were correct. RCE performed a census of the roadway dimensions and pavement mix designs as these inputs were considered to have the highest risk when assessing the accuracy of the emission reduction calculations.

The only project equipment that used a measuring device that needed regular calibration and maintenance were the truck loadout scales used to measure weight of materials at the cold central recycling plant where the FSB was manufactured. The roadway dimensions themselves were certified under the Virginia department of transportation and considered to be accurate. The other main inputs to the equations (not including default emission factors listed in the methodology) were transport distances

estimated using electronic mapping on the internet and hours of operation estimated by the road construction contractor, neither of which used measuring devices that required calibration.

The verification plan was used throughout the reporting period as a basis for assessing the completeness, consistency, accuracy, and transparency of the Project's GHG emission reductions.

Following the close-out of all open items, RCE completed a joint validation/verification report, and submitted the validation/verification for senior internal review.

2.2 Document Review

The validation/verification activities relied heavily on document review. RCE reviewed several versions of the joint PD/MR and audited underlying evidence, data, records, and supporting documents in order to confirm that the emission reductions calculations were accurate, that the methodology requirements had been followed and that the Project met the VCS requirements. RCE cross-checked and compared these documents to the VCS program requirements and communicated any deficiencies to GE (communicated via an issues log). These documents are listed in Appendix A.

2.3 Interviews

RCE held numerous discussions with the following personnel throughout the verification process:

- Ben Devine, P.E. – Lead Engineer, Global Emissionary
- Harold Green – CEO, Global Emissionary
- David Choy – Partner, Global Emissionary
- Chandra Anakisetty – Pavement Engineering Specialist, Global Emissionary

Topics discussed included:

- GE's process for compiling the joint PD/MR to meet the VCS standard and VM0039 requirements;
- Process for determining that the project was not legally mandated;
- Methods for including relevant SSRs in the Project boundary;
- Ownership structure of the Project;
- Review of documents provided in support of the joint PD/MR

RCE interviewed the following personnel during the site visit:

- Ben Devine, P.E. – Lead Engineer, Global Emissionary
- Harold Green – CEO, Global Emissionary
- David Choy – Partner, Global Emissionary
- Chandra Anakisetty – Pavement Engineering Specialist, Global Emissionary
- Tim Peffer – Director, Quality Control, Allan Myers
- Aleksandra Wojcik – Quality Control Manager, Allan Myers
- Stephen Morse – Plant Mechanic, Allan Myers
- Gage Browning – KMA Mix Plant Operator, Allan Myers

Topics discussed during the site visit included:

- Construction of the project
- Start date
- Methods for data collection
- Ownership structure of Project
- Relevant Project permits
- How material production is tracked
- Installation and construction of the I-64 segment
- QA/QC procedures for equipment (truck scale)

2.4 Site Visits

RCE conducted a site visit on 9 November 2022 to the project cold central recycling plant and I-64 segment where project activities were carried out. The goal of the visit was to gain an understanding of the project activity and to confirm appropriateness of selected sources, sinks and reservoirs (SSRs).

The objective of the site inspection was to confirm the location of relevant Project monitoring equipment (as applicable), confirm that all relevant GHG SSRs were included in the joint PD/MR and GHG calculations, and confirm that Project personnel were qualified to carry out their respective roles and responsibilities. The site visit activities included a physical inspection of the project operations and a review of the Project's information control systems, data handling, and QA/QC activities.

RCE physically viewed the Wirtgen cold-mix plant located at the cold central recycling plant used to produce the FSB material for the I-64 road segment. There is a diesel tank on-site that fuels the Wirtgen cold-mix plant; no electricity was used during the monitoring period for any equipment. RCE interviewed key personnel (see section 2.3) responsible for the day-to-day operation of equipment, data aggregation and compilation, and overall maintenance of the Project.

2.5 Resolution of Findings

RCE used an Issues Log to request CARs, NMFs, ADRs, and CRs during the validation/verification process. GE responded to all requests, which were subsequently closed out.

During the verification/validation process, RCE issued a total of 22 findings which include:

- 4 Corrective Action Requests
- 2 Non-material Findings
- 11 Additional Document Requests
- 5 Clarification Requests
- 0 Forward Action Requests

The resolution of findings is summarized in the table found in Appendix B

2.5.1 Forward Action Requests

RCE issued no forward action requests.

3 VALIDATION FINDINGS

3.1 Project Details

The project is a grouped project under Sectoral Scope 6 (Construction) that includes the project activities of applying FSB/Asphalt emulsions through the CCPR/FDR/CIR process for road construction. The CCPR process includes transportation of milled reclaimed asphalt pavement (RAP) from a job site to a central plant where these materials are blended with foamed asphalt and a small amount of Portland cement. The asphalt mixture is then transported to the jobsite and applied as new roadway. The FDR or CIR process involves the current road section being uniformly pulverized at the job site and blended to provide an upgraded, homogenous base material that is applied on-site without transporting any material. The FDR process takes place at the project location thus there are no emissions from a central plant or from transporting RAP/asphalt to and from a central plant.

The technologies and measures implemented include the construction of highway using FSB/Asphalt emulsions which is less energy intensive than traditional hot mix asphalt/warm mix asphalt. The initial project instances are on the same highway. Namely the I-64 segment starting at 1.05 miles west of Humelsine Parkway/Marquis Centre Parkway (MM 241.30) and ending 0.54 miles east of Yorktown Road (MM 248.35). The PD identifies the geographic area as the United States where new project instances

may be added. RCE's assessment of the baseline scenario and additionality was based upon the initial instances included within the United States.

GE established a set of criteria (conditions listed in VM0039) and sufficiently demonstrated the baseline scenario and additionality for these initial project activity instances in the PD. GE provided evidence to RCE that demonstrated the baseline scenario and additionality for each instance. The Project Proponent has monitoring in place to collect data from all project activity instances. This data is stored in GE's company database that is backed up on a regular basis. RCE reviewed this data management system and confirmed that it was complete, rigorous, and contained all necessary information to assess the accuracy of the emission reduction claims.

The project is eligible under VM0039 because the project is a road construction project in the United States and applies FSB/Asphalt emulsions using CCPR and FDR processes for said road construction. The project site has at least one FSB or asphalt emulsions base layer as specified by the engineering design documents approved by Virginia Department of Transportation (VDOT). The baseline scenario for this project type is the use of only hot mix asphalt (HMA), warm mix asphalt (WMA) or other non-FSB/asphalt emulsions paving layers.

According to the methodology the baseline is the use of only hot mix asphalt (HMA), warm mix asphalt (WMA) or other non-FSB/asphalt emulsions paving layers. Section 3.4.2 Applicability describes in detail how each project activity instance meets the methodology eligibility criteria. RCE confirmed the Project adheres to all the eligibility criteria as required by Sections 3.6.9, 3.6.16 and 3.6.17 of the VCS Standard, v4.4. Section 3.6.9 does not apply to this Project since VM0039 imposes no capacity limits to the project activity. RCE confirmed that all project activity instances met the eligibility criteria of Sections 3.6.16. RCE confirmed that Section 3.6.17 does not apply to the Project during this validation and verification because all new project activity instances are included in the initial validation of the Project.

The additionality for all project instances is the same throughout the United States as specified in section 6 of VM0039; specifically, the project activity is not required by law and any additional instances must meet the applicability conditions in the methodology. According to VM0039 there are no capacity limits for the project activity. The PD includes a set of eligibility criteria for the inclusion of new project activity instances.

The Project Proponent is Global GE, LLC represented by Ben Devine, Lead Engineer. Allen Myers is the construction contractor that carried out the project activities. RCE confirmed both of these parties' competencies throughout the validation and verification and confirmed that they hold sufficient knowledge and experience for completing required documentation.

GE retains ownership through a contract with Allen Myers whereby the construction contractor has transferred to the Project Proponent any and all legal rights of ownership to verified carbon units. RCE reviewed this contract and confirmed that it contains sufficient wording clearly stating that the Project Proponent has the legal right to control and operate the project.

RCE confirmed the project start date is 17 April 2018 when the first load of FSB/asphalt emulsion material was transported to the job site for I-64 segment 2 layer 1. RCE reviewed evidence of start date via timestamped truck scale logs. RCE also reviewed the Virginia DOT construction plans to confirm the start date. This is also the start of the first monitoring period. RCE confirmed that no emission reductions occurred before this date because each road segment activity is, a project. VM0039 defines a project via section 3 of the methodology. Emission reductions could not have occurred prior to the project start date because the project itself did not exist (the section of road had not been constructed using FSB).

This is the first and only crediting period for the project from 17 April 2018 to 16 April 2028 for a total of ten years. The project's size category is "Project" and will generate less than 300,000 tonnes of CO₂e per year. The estimated emission reductions are 73,790 tonnes of CO₂e over the life of the project. The project is located in the U.S. and the first cohort includes two segments on the I-64 section identified above in paragraph two of this section. A full list of each project instance with geodetic coordinates is listed in the joint PD/MR. The baseline assumption is that these road segments would have used traditional HMA/WMA mixes to complete construction resulting in higher GHG emissions.

The project complies with applicable laws, statutes and other regulatory frameworks. CO₂ is not a regulated pollutant, and all permits required to carry out the project activity were reviewed and approved by VDOT. RCE reviewed Project documentation to confirm that construction specifications for asphalt materials and mix designs, and cold recycling installation equipment followed applicable requirements. There are no requirements at the local, state, or national level that requires this technology. RCE reviewed laws applicable to road construction and found no evidence that FSB is a required component of road construction. Further, RCE found no evidence that there were any environmental violations caused by the project activity. RCE concludes that the project follows all applicable laws, statutes and other regulatory framework since nothing was found during the audit that would imply that the project activity was required by law or caused any harm to the environment.

The project has not been registered nor is seeking registration under any other GHG program. The project also has not been rejected by another GHG program. The project is not located in a jurisdiction under an emissions trading program (applicable to the project activity) nor are there any binding limits. The Project is not seeking any other form of environmental credits.

The project contributes to sustainable development goals (SDG) 9 target 9.4, 12 target 12.5 and 13 Climate Action. The project activity aims to upgrade infrastructure and retrofit industries to make them sustainable using increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes. The project also reduces waste generation through prevention, reduction, recycling and reuse. Finally, the project reduces GHG emissions by using a less energy intensive method for constructing roads.

There is commercially sensitive information provided to Ruby Canyon and Verra as an Appendix involving detailed data (project plans, mix designs, etc.). The information provided as proof of ownership clearly demonstrates that GE has the legal right to control and operate the project activity. According to VM0039, no sources of leakage have been identified for this project activity. There is no additional information.

RCE concludes that the Project description included in the PD is accurate, complete, and provides an understanding of the nature of the Project. There is no commercially sensitive information withheld from the project record. The Project has been implemented as described in the PD except for one noted methodology deviation described in section 3.4.7.

3.2 Participation under Other GHG Programs

RCE confirmed the Project does not participate under other GHG programs. RCE also confirmed the Project is not double counted by the partner constructors through a review of contractual agreements between Global Emissionary, LLC and their current partner contractors.

3.3 Safeguards

3.3.1 No Net Harm

There are no potential negative environmental or socio-economic impacts because of the Project. A final environmental impact statement and record of decision was completed for the entire Interstate 64 peninsula section in 2013. VDOT also approved all work carried out by the contractor before, during and after the completion of Project activities. The project activity decreases the need for virgin materials, energy needed to produce asphalt and greatly reduces truck traffic for FDR instances. The project reduces the amount of CO₂ that would have been emitted as compared to the baseline scenario as well as other criteria pollutants. CO₂ is not a regulated pollutant. RCE confirmed the Project results in no net harm via the Interstate 64 Peninsula Study Final Environmental Impact Statement ([FEIS](#)) and Record of Decision. The Project contributes to SDGs 9, 12 and 13.

3.3.2 Local Stakeholder Consultation

Multiple stakeholder engagement activities took place as part of the I-64 Environmental Impact assessment with Allen Myers, the Virginia Transportation Research Council, Virginia Department of Transportation and the general public. The public was informed about the road construction projects, including aspects of the use of recycled asphalt pavement (RAP) and FSB, via public meetings, project mailings, and a project website that included videos. that displayed the asphalt installation process. No updates were made to the project design related to the use of CCPR or FDR since no related comments were received or recorded in the I-64 Peninsula Study Environmental Impact Statement or during the Verra open public comment period for the project. To date, the Project Proponent has not received any comments regarding the project. RCE search the internet and could not locate any evidence that there has been public outreach to the Project Proponent regarding the project.

3.3.3 Environmental Impact

The interstate 64 peninsula project completed an environmental impact statement that was finalized in December 2013. The plan was approved, and the road construction project moved forward including the project activity beginning in April 2018. RCE confirmed the environmental impacts of the Project based on the Interstate 64 Peninsula Study Interstate 64 Peninsula Study (FEIS) and Record of Decision and Record of Decision.

3.3.4 Public Comments

The project did not receive any public comments during its public comment period.

3.3.5 AFOLU-Specific Safeguards

This is a non-AFOLU project and this section is not required.

3.4 Application of Methodology

3.4.1 Title and Reference

The project follows the VCS Standard version 4.4 and uses the following methodology: VM0039 Methodology for Use of Foam Stabilized Based and Emulsion Asphalt Mixtures in Pavement Application.

3.4.2 Applicability

This is the initial validation of the project's first and only crediting period. The Project Proponent justified meeting each applicability condition of VM0039 by providing documentation for each project activity instance (PAI) which are located on the same roadway as described above in Section 3.1. RCE confirmed that VM0039 is applicable to this project and reviewed applicability conditions listed in the methodology. Namely:

1. Project activities include the construction of any type of road and/or parking lot (including parking lot patching projects) in the United States. The project activity took place in Virginia, USA (see Section 3.1 for exact location).
2. Project activities must apply one or more of the following processes for road construction: FSB/Asphalt emulsions using the CCPR/FDR process. The VDOT engineering documents for the project roadway specifically state that "Cold Central Plant Recycling Material" and "Full Depth Reclamation Existing Aggregate and Stabilizer Subgrade (FSB)" were used as part of the pavement design. RCE reviewed the project equipment during the site visit and the engineering documents to confirm this eligibility item.
3. Production plants where the project activity occurs may serve multiple pavement types, including, but not limited to, roadways and parking lots. The Lead Verifier visited the production plant where the FSB/Asphalt emulsions were produced using the Wirtgen KMA 200 cold central plant production machine.
4. Project activities may have an HMA or WMA surface layer but must have at least one FSB or asphalt emulsions base layer. RCE reviewed the VDOT engineering documentation and confirmed that in each project instance, there is at least one FSB or asphalt emulsions base layer.

There are no additional tools included in VM0039 that projects must adhere to.

3.4.3 Project Boundary

RCE travelled to Allen Myers – New Kent Asphalt plant near the project location and to the actual road constructed on I-64 that contained the FSB/Asphalt emulsion layers to validate the physical boundaries and inclusion of SSRs. Based on the information and knowledge gained during the site visit and by reviewing the project information, RCE confirms that the diagram of the equipment, systems, flows of mass and energy, and GHG emission sources identified in the project boundary diagram included in Section 3.3 Project Boundary of the JPD-MR is accurate. Allen Myers data tracking system shows the first outbound asphalt truck delivering material to the project location on 17 April 2018. This evidence corresponds with the project start date and the start date of the other instance added to the grouped project during the initial monitoring period.

The geographic boundary is the United States and encompasses the roadway construction process from raw material acquisition to product installation. The physical boundaries include the Wirtgen KMA 200 cold central plant production machine, vehicles used to transport material to and from the asphalt plant, raw material production and transport (default values listed in the methodology), and machinery used to install the FSB/asphalt emulsion layer. Allen Myers, the contractor, tracks number of trips to the jobsite, the number of hours per shift, and the number of shifts carried out to complete the job. However, the

only piece of monitoring equipment that requires regular calibration and maintenance is the truck scale located at the Allen Myers – New Kent Asphalt plant. There was no electricity consumption for either project activity instance.

RCE reviewed the methodology and GE provided a list of SSRs included in the GHG project boundary. The GHG sources, sinks and reservoirs, are described in Section 3.3 of the JPD/MR in Figure 1. The GHG impact from producing asphalt mixtures is calculated by summing the following emission sources:

Sources:

GHGs associated with manufacturing each of the constituent and ancillary materials: Raw material acquisition

GHGs from transporting materials from factory to mixing plant

GHGs from all forms of energy involved in producing the asphalt at the mixing plant; and

GHGs from all forms of energy involved in milling the existing pavement and placing new pavement including relevant transport activities.

Sinks: Not applicable according to the methodology.

Reservoirs: Not applicable according to the methodology.

The GHG SSRs are described in Table 5 of Section 3.3 Project Boundary. RCE confirmed that each SSR had been appropriately chosen or not chosen according to the methodology and based on the real world project activities. Maintenance and Excavation were appropriately excluded as per VM0039. All other SSRs were included and appropriately accounted for. RCE confirmed this by visiting the project site location and through document review of the construction report. RCE agrees that the project boundary is appropriately specified and that all SSRs are justified and correctly included.

The Lead Verifier viewed database systems, interviewed site personnel, and confirmed that the PD lists all relevant SSRs and the process diagram to be accurate. The selected SSRs correspond with those identified in the applied methodology. RCE confirmed that all relevant SSRs were selected and included in the Project boundary which are described in the PD.

3.4.4 Baseline Scenario

VM0039 specifies the baseline scenario as the application of HMA, or the subcategory WMA, to both the surface and base layers. The emissions associated with the quarry, transportation, and production of HMA or WMA serve as performance benchmarks, which are identified in the methodology itself. CCPR, CIR, and FDR projects replace HMA or WMA base layers with FSB or asphalt emulsions. RCE confirmed that without GE's application of FSB/Asphalt emissions, the baseline scenario would have been the application of traditional HMA/WMA applications to construct the roadway.

RCE interviewed plant personnel who confirmed that prior to GE's technology being used, traditional HMA/WMA was used for roadway projects. RCE researched FSB/Asphalt emulsion base layers and could not find any relevant national and/or sectoral policies that would mandate the project activity. CO₂ is not a regulated pollutant in the initial project instance geographic area for this industrial sector (road construction). The facility is located in a state that participates in the Regional Greenhouse Gas Initiative program, but this serves only as a cap-and-trade market for the power sector.

GE correctly identified the baseline scenario, and the scenario reasonably represents what would have occurred in the absence of the project. The identified baseline scenario is justified and is an accurate and reasonable assessment of pre-project conditions. The PD describes how the baseline scenario is relevant through documentary evidence provided as attachments and considers relevant sectoral policies and circumstances when proving that the project activity is additional. RCE confirmed that the identification of the baseline scenario is justified appropriately, supported by evidence, and can be deemed reasonable.

3.4.5 Additionality

VM0039 is a standardized methodology that uses a performance benchmark. The methodology stipulates that if the project energy intensity is lower than the performance benchmark listed, the Project is additional. In both project activity instances, the project performed better (was much less energy intensive) than the performance standard and is therefore additional. The project selected the correct performance benchmark listed in the Protocol and achieved the level of the benchmark.

The table below shows the project performance (energy intensity) compared to the performance benchmark for Roadway Projects listed in Table 3 of VM0039:

| Project Instance | Performance Benchmark (kgCO _{2e} /t material) | Project actuals (kgCO _{2e} /t material) |
|-----------------------|--|--|
| CCPR Segment 2 | 94.7 | 60.14 |
| FDR Segment 2 | 94.7 | 52.92 |
| CCPR Segment 3 - 2019 | 94.6 | 51.03 |
| CCPR Segment 3 - 2020 | 94.5 | 50.92 |
| CCPR Segment 3 - 2021 | 94.4 | 54.62 |
| FDR Segment 3 - 2019 | 94.6 | 52.29 |
| FDR Segment 3 - 2020 | 94.5 | 52.22 |
| FDR Segment 3 - 2021 | 94.4 | 52.29 |

RCE re-calculated the project's actual emissions regarding CCPR Segment 2, FDR Segment 2, CCPR Segment 3 and FDR Segment 3. RCE reviewed source documentation and independently calculated emissions from each segment using source data for the total project length, road width, road area, layer thickness, density of each mix, weight of materials used, fraction of material used in the mix design, number of trips to and from the central plant (as applicable), distances and the default baseline intensity from the Protocol.

RCE confirmed the project adheres to regulatory surplus requirements. Through a literature search of regulatory agencies, RCE found no laws, statutes or other binding mandates that stipulate the use of FSB/Asphalt emulsions in the construction of roadways in Virginia or the United States. RCE found no

evidence that the project activity was legally required in Virginia or the United States. On the contrary, RCE’s review of information provided by the Project Proponent implied that this technology is considered ‘experimental’.

RCE confirmed the calculations of emissions intensities to be materially correct and compared the values to the performance benchmarks to ensure the project activity intensities are lower than the associated performance benchmarks. The Project adhered to all other criteria and procedures set out in VM0039 as described above in Section 3.4.2. Based on the evidence provided, RCE agrees that the additionality of the project is justified according to the selected methodology.

3.4.6 Quantification of GHG Emission Reductions and Removals

RCE recalculated the ex-anted and ex-post emission reductions by inputting data from source documentation into equations from VM0039 and compared these results to the Project Proponent’s emission reductions. RCE confirmed that estimated ex-ante estimates were accurate based on the emission reductions achieved during the first reporting period.

| | | | | Year | BASELINE EMISSIONS | PROJECT EMISSIONS | NET REDUCTION | LEGEND | | | |
|--|--|--|--|------|--------------------|-------------------|---------------|---------------------------------|--|--|--|
| | | | | 2018 | 22,905 | 13,724 | 9,181 | = Ex-Ante (Projections) | | | |
| | | | | 2019 | 5,378 | 2,988 | 2,390 | 20% = Assumed Annual % Increase | | | |
| | | | | 2020 | 8,054 | 4,473 | 3,581 | | | | |
| | | | | 2021 | 6,298 | 3,660 | 2,638 | | | | |

| Count (years) | Vintage Start | | Vintage End | Year | Crediting Baseline | Average Correction Factor | Average CIR EI | Project Amount | Baseline Emissions (rounded) | Project Emissions | Net GHG Reduction | Cumulative Net GHG Reduction | Notes |
|---------------|---------------|----|-------------|------|--------------------|---------------------------|----------------|-------------------------|------------------------------|-------------------|---------------------------|------------------------------|---------------------------------|
| | | | | | | | tCO2e/tonne | Tonnes of CIR installed | Tonnes Co2 | Tonnes Co2 | Tonnes Co2 | Tonnes Co2 | |
| 0.71 | 4/17/2018 | to | 12/31/2018 | 2018 | 94.7 | 1.02 | 56.53 | 246,719 | 22,905 | 13,724 | 9,181 | 9,181 | I-64 Segment 2 |
| 1 | 1/1/2019 | to | 12/31/2019 | 2019 | 94.6 | 1.02 | 51.66 | 57,994 | 5,378 | 2,988 | 2,390 | 11,571 | I-64 Segment 3 |
| 1 | 1/1/2020 | to | 12/31/2020 | 2020 | 94.5 | 1.02 | 54.10 | 86,941 | 8,054 | 4,473 | 3,581 | 15,152 | No projects |
| 0.7 | 1/1/2021 | to | 9/13/2021 | 2021 | 94.4 | 1.02 | 54.10 | 68,055 | 6,298 | 3,660 | 2,638 | 17,790 | No projects |
| 0.3 | 9/14/2021 | to | 12/31/2021 | 2021 | 94.4 | 1.02 | 54.10 | - | - | - | - | 17,790 | No projects |
| 1 | 1/1/2022 | to | 12/31/2022 | 2022 | 94.3 | 1.02 | 54.10 | - | - | - | - | 17,790 | No projects |
| 1 | 1/1/2023 | to | 12/31/2023 | 2023 | 94.2 | 1.02 | 54.10 | - | - | - | - | 17,790 | No projects |
| 1 | 1/1/2024 | to | 12/31/2024 | 2024 | 94.1 | 1.02 | 54.10 | 275,826 | 25,500 | 15,000 | 10,500 | 28,290 | I-64 Gap Segment A |
| 1 | 1/1/2025 | to | 12/31/2025 | 2025 | 94.0 | 1.02 | 54.10 | 330,991 | 30,500 | 18,000 | 12,500 | 40,790 | I-64 Gap Segment B |
| 1 | 1/1/2026 | to | 12/31/2026 | 2026 | 93.9 | 1.02 | 54.10 | 397,189 | 36,500 | 21,500 | 15,000 | 55,790 | I-64 Gap Segment C |
| 1 | 1/1/2027 | to | 12/31/2027 | 2027 | 93.8 | 1.02 | 54.10 | 476,627 | 43,750 | 25,750 | 18,000 | 73,790 | Unknown project name |
| 0.29 | 1/1/2028 | to | 4/16/2028 | 2028 | 93.7 | 1.02 | 54.10 | - | - | - | - | 73,790 | No projects due to cold weather |
| 10 | | | | | | | | Totals | 178,885 | 105,095 | 73,790 | | |
| | | | | | | | | | | | Average Annual Reductions | 7,379 | |

RCE re-calculated the project’s actual emissions regarding CCPR Segment 2, FDR Segment 2, CCPR Segment 3 and FDR Segment 3. The below table summarizes the assessment of ex-ante GHG ERRs and the equations verified in order to confirm the accuracy of the ex-ante and ex-post emission reduction calculations. The screenshots below are from RCE’s workbooks used to re-calculate parameters verified with corresponding equations.

CCPR Segment 2

| Variable | Value | RCE Value | Difference | Unit | Data Source |
|--|-------------|-------------|-------------|-------------------------|---|
| Total Project Length, L | 16.748 | 16.828 | 0.080 | Miles | Physical Assessment Section PlanSheet 2A to 2A(1) |
| Road Width | 4202.424 | 4203.714 | 1.290 | ft | Physical Assessment Section PlanSheet 2A to 2A(1) |
| Road Area | 487.378 | 493.938 | 6.560 | ft ² | Calculated |
| CCRP Layer Thickness | 0.4 | 0.4 | 0.000 | ft | Physical Assessment Section PlanSheet 2A(1) |
| Volume of CCRP Installed | 2,493,209 | 2,279,610 | -213,599 | ft ³ | Calculated |
| Density of CCRP Mts. 02 | 130.00 | 130.00 | 0.00 | lb/ft ³ | Standard P&E Density from Methodology page 23 |
| Weight of CCRP Mts Installed, Project Amount | 323,945,780 | 295,441,760 | -28,504,020 | lb of CCRP | CCRP Production Report |
| Material Emission Factor, E _{FA} RAP | 0.00 | 0.00 | 0.00 | kg CO ₂ /kg | Methodology Section 2.1 |
| Material Emission Factor, E _{FA} CEMENT | 0.83 | 0.83 | 0.00 | kg CO ₂ /kg | Methodology Section 2.1 |
| Material Emission Factor, E _{FA} BITUMEN | 0.48 | 0.48 | 0.00 | kg CO ₂ /kg | Methodology Section 2.1 |
| Material Emission Factor, E _{FA} WATER | 0.00 | 0.00 | 0.00 | kg CO ₂ /kg | Methodology Section 2.1 |
| Material Emission Factor, E _{FA} CRUSHED ROCK | 0.094 | 0.094 | 0.00 | kg CO ₂ /kg | Methodology Section 2.1 |
| Material Emission Factor, E _{FA} SAND | 0.000 | 0.000 | 0.000 | kg CO ₂ /kg | Methodology Section 2.1 |
| Material Emission Factor, E _{FA} MANUFACTURED AGGREGATE | 0.000 | 0.000 | 0.000 | kg CO ₂ /kg | Methodology Section 2.1 |
| % RAP Composition | 77.90% | 77.90% | 0.00% | Actual | From "Allen Myers & Co CCRP Mix Design 07-20-2017_2018 Update.pdf" |
| % Cement | 1.00% | 1.00% | 0.00% | Actual | From "Allen Myers & Co CCRP Mix Design 07-20-2017_2018 Update.pdf" |
| % Bitumen | 2.00% | 2.00% | 0.00% | Actual | From "Allen Myers & Co CCRP Mix Design 07-20-2017_2018 Update.pdf" |
| % Water | 4.80% | 4.80% | 0.00% | Actual | From "Allen Myers & Co CCRP Mix Design 07-20-2017_2018 Update.pdf" |
| % Crushed Rock | 0.00% | 0.00% | 0.00% | Actual | From "Allen Myers & Co CCRP Mix Design 07-20-2017_2018 Update.pdf" |
| % Sand | 0.00% | 0.00% | 0.00% | Actual | From "Allen Myers & Co CCRP Mix Design 07-20-2017_2018 Update.pdf" |
| % Manufactured Aggregates | 13.70% | 13.70% | 0.00% | Actual | From "Allen Myers & Co CCRP Mix Design 07-20-2017_2018 Update.pdf" |
| Weight of Material, W _{FA} RAP | 79,321.97 | 79,321.98 | 0.00 | Tons | Calculated |
| Weight of Material, W _{FA} CEMENT | 1,269.72 | 1,269.72 | 0.00 | Tons | Calculated |
| Weight of Material, W _{FA} BITUMEN | 71,888.77 | 71,888.80 | 0.03 | Tons | Calculated |
| Weight of Material, W _{FA} WATER | 1,071.73 | 1,071.73 | 0.00 | Tons | Calculated |
| Weight of Material, W _{FA} CRUSHED ROCK | 923,268 | 923,263 | -5 | Tons | Calculated |
| Weight of Material, W _{FA} SAND | 2,544.53 | 2,544.53 | 0.00 | Tons | Calculated |
| Weight of Material, W _{FA} BITUMEN | 2,000.12 | 2,000.12 | 0.00 | Tons | Calculated |
| Weight of Material, W _{FA} WATER | 4,800.30 | 4,800.30 | 0.00 | Tons | Calculated |
| Weight of Material, W _{FA} CRUSHED ROCK | 4,431.69 | 4,431.63 | -0.06 | Tons | Calculated |
| Weight of Material, W _{FA} SAND | 13,802.37 | 13,802.38 | 0.00 | Tons | Calculated |
| Weight of Material, W _{FA} MANUFACTURED AGGREGATE | 12,654.96 | 12,654.93 | -0.03 | Tons | Calculated |
| Number of Trips, Trips, RAP | 12,804.94 | 12,809.54 | 4.60 | Trips | Calculated assuming 20-ton truck loads |
| Number of Trips, Trips, Cement | 51 | 51 | 0 | Trips | Calculated assuming 20-ton truck loads |
| Number of Trips, Trips, Bitumen | 127 | 127 | 0 | Trips | Calculated assuming 20-ton truck loads |
| Number of Trips, Trips, Water | - | - | - | Trips | Calculated assuming 20-ton truck loads |
| Number of Trips, Trips, Crushed Rock | - | - | - | Trips | Calculated assuming 20-ton truck loads |
| Number of Trips, Trips, Sand | - | - | - | Trips | Calculated assuming 20-ton truck loads |
| Number of Trips, Trips, Manufactured Aggregates | 700 | 700 | 0 | Trips | Calculated assuming 20-ton truck loads |
| Distance to plant, Distance RAP | 0 | 0 | 0 | Miles per Ton | Reported from Allen Myers |
| Distance to plant, Distance Cement | 140 | 140 | 0 | Miles per Ton | Reported in data intake sheet / RCE reviewed and confirmed with info. |
| Distance to plant, Distance Bitumen | 100 | 87.1 | -12.9 | Miles per Ton | Reported in data intake sheet / RCE reviewed and confirmed with info. |
| Distance to plant, Distance Water | 0 | 0 | 0 | Miles per Ton | Reported in data intake sheet |
| Distance to plant, Distance Crushed Rock | 0 | 0 | 0 | Miles per Ton | Reported in data intake sheet |
| Distance to plant, Distance Sand | 0 | 0 | 0 | Miles per Ton | Reported in data intake sheet |
| Distance to plant, Distance, Manufactured Aggregates | 45 | 45 | 0 | Miles per Ton | Reported in data intake sheet / RCE reviewed and confirmed with info. |
| Number of Trips, Trips, CCRP Mts | 1,613 | 1,613 | 0 | Trips | CCRP Production Report |
| Distance to Site, Distance CCRP Mts | 32 | 32.20 | 0.20 | Miles per Ton | Reported in data intake sheet / RCE reviewed and confirmed with info. |
| Shrinkage Factor, SF | 1.1 | 1.1 | 0.000 | unitless | Methodology Section 2.1 |
| Heat Emission Factor, H _{FA} | 38.2 | 38.2 | 0.0 | kg CO ₂ /MWh | Methodology Section 2.1 |
| Griding Baseline, GB | 94 | 94 | 0 | 0 | Methodology Section 2.4. Project was built in 2018 and is a primary project. |
| Correction Factor for P _{FA} | 1.00 | 1.00 | 0.000 | unitless | Methodology Section 2.4. "Allen Myers & Co CCRP Mix Design 07-20-2017_2018 Update.pdf" page 236 |

Differences

| Equation | Variable | Value | Unit | Impact |
|------------|--|-----------|------|--------|
| Equation 1 | W _{FA} RAP | 79,321.98 | 0.00 | 0.16 |
| | W _{FA} CEMENT | 1,269.72 | 0.00 | 0.00 |
| | W _{FA} BITUMEN | 71,888.80 | 0.27 | 0.19 |
| | W _{FA} WATER | 1,071.73 | 0.00 | 0.00 |
| | W _{FA} CRUSHED ROCK | 4,431.63 | -5 | -0.00 |
| Equation 2 | E _{FA} CEMENT | 0.83 | 0.00 | 0.00 |
| | E _{FA} BITUMEN | 0.48 | 0.00 | 0.00 |
| | E _{FA} WATER | 0.00 | 0.00 | 0.00 |
| | E _{FA} MANUFACTURED AGGREGATE | 0.00 | 0.00 | 0.00 |
| Equation 3 | W _{FA} RAP | 79,321.98 | 0.00 | 0.00 |
| | W _{FA} CEMENT | 1,269.72 | 0.00 | 0.00 |
| | W _{FA} BITUMEN | 71,888.80 | 0.00 | 0.00 |
| | W _{FA} MANUFACTURED AGGREGATE | 12,654.93 | 0.00 | 0.00 |
| Equation 4 | W _{FA} RAP | 79,321.98 | 0.00 | 0.00 |
| | W _{FA} BITUMEN | 71,888.80 | 0.00 | 0.00 |
| | W _{FA} MANUFACTURED AGGREGATE | 12,654.93 | 0.00 | 0.00 |
| Equation 5 | E _{FA} CEMENT | 0.83 | 0.00 | 0.00 |
| | E _{FA} BITUMEN | 0.48 | 0.00 | 0.00 |
| | E _{FA} WATER | 0.00 | 0.00 | 0.00 |
| Equation 6 | E _{FA} CEMENT | 0.83 | 0.00 | 0.00 |
| | E _{FA} BITUMEN | 0.48 | 0.00 | 0.00 |
| | E _{FA} WATER | 0.00 | 0.00 | 0.00 |
| Equation 7 | E _{FA} CEMENT | 0.83 | 0.00 | 0.00 |
| | E _{FA} BITUMEN | 0.48 | 0.00 | 0.00 |
| | E _{FA} WATER | 0.00 | 0.00 | 0.00 |
| Equation 8 | E _{FA} CEMENT | 0.83 | 0.00 | 0.00 |
| | E _{FA} BITUMEN | 0.48 | 0.00 | 0.00 |

CCPR Segment 3

Project Proponent Values

RCE Values

| Variable | Value | RCE Values | Difference | Unit | Data Source |
|---|-------------|-------------|------------|---------------------------|---|
| Total Project Length, L | 43,579 | 43,579 | - | FT | Physical Placement Sections |
| Road Width | 6.25 | 6.25 | - | Miles | Revised 24 to 2419 |
| Road Area | 130.00 | 130.00 | 0.00 | FT | Physical Placement Sections |
| CCPR Layer Thickness | 5,275,951 | 5,275,951 | - | FT | Physical Placement Sections |
| Volume of CCPR Installed | 881,055 | 881,055 | - | FT | Physical Placement Sections |
| Density of CCPR Mix, DE | 0.42 | 0.42 | 0.00 | FT | Physical Placement Sections |
| Weight of CCPR Mix installed, Project Amount | 2,178,955 | 2,178,955 | - | FT | Physical Placement Sections |
| Material Emission Factor, EF _{BAP} | 130.00 | 130.00 | 0.00 | kg/CO ₂ e/kg | Methodology Section 8.1.1 |
| Material Emission Factor, EF _{CEMENT} | 293,217,798 | 293,217,798 | - | kg/CO ₂ e/kg | Methodology Section 8.1.1 |
| Material Emission Factor, EF _{BITUMEN} | 146,809,021 | 146,809,021 | - | kg/CO ₂ e/kg | Methodology Section 8.1.1 |
| Material Emission Factor, EF _{WATER} | 133,228,111 | 133,228,111 | - | kg/CO ₂ e/kg | Methodology Section 8.1.1 |
| Material Emission Factor, EF _{CRUSHED ROCK} | 0.00 | 0.00 | 0.00 | kg/CO ₂ e/kg | Methodology Section 8.1.1 |
| Material Emission Factor, EF _{SAND} | 0.00 | 0.00 | 0.00 | kg/CO ₂ e/kg | Methodology Section 8.1.1 |
| Material Emission Factor, EF _{MANUFACTURED AGGREGATES} | 0.00 | 0.00 | 0.00 | kg/CO ₂ e/kg | Methodology Section 8.1.1 |
| % BAP Composition | 77.95% | 77.95% | 0.00% | Calculated | From "Alan Myers I-64 CCPR Mix Design 07-20-2017_2019 Update.pdf" |
| % Cement Composition | 1.00% | 1.00% | 0.00% | Calculated | From "Alan Myers I-64 CCPR Mix Design 07-20-2017_2019 Update.pdf" |
| % Bitumen Composition | 2.50% | 2.50% | 0.00% | Calculated | From "Alan Myers I-64 CCPR Mix Design 07-20-2017_2019 Update.pdf" |
| % Water Composition | 4.80% | 4.80% | 0.00% | Calculated | From "Alan Myers I-64 CCPR Mix Design 07-20-2017_2019 Update.pdf" |
| % Crushed Rock Composition | 0.00% | 0.00% | 0.00% | Calculated | From "Alan Myers I-64 CCPR Mix Design 07-20-2017_2019 Update.pdf" |
| % Sand Composition | 0.00% | 0.00% | 0.00% | Calculated | From "Alan Myers I-64 CCPR Mix Design 07-20-2017_2019 Update.pdf" |
| % Manufactured Aggregates Composition | 13.76% | 13.76% | 0.00% | Calculated | From "Alan Myers I-64 CCPR Mix Design 07-20-2017_2019 Update.pdf" |
| Weight of Material, W _{BAP} | 130,844.26 | 130,844.26 | - | Tons | Calculated |
| Weight of Material, W _{Cement} | 1,468.59 | 1,468.59 | - | Tons | Calculated |
| Weight of Material, W _{Bitumen} | 3,532,202 | 3,532,202 | - | Tons | Calculated |
| Weight of Material, W _{Water} | 3,671.48 | 3,671.48 | - | Tons | Calculated |
| Weight of Material, W _{Crushed Rock} | 3,330.70 | 3,330.70 | - | Tons | Calculated |
| Weight of Material, W _{Sand} | 7,062.23 | 7,062.23 | - | Tons | Calculated |
| Weight of Material, W _{Manufactured Aggregates} | 6,394.95 | 6,394.95 | - | Tons | Calculated |
| Number of to-plant Trips, Trips, BAP | 73 | 73 | - | Trips | Calculated assuming 20-ton truck loads |
| Number of to-plant Trips, Trips, Cement | 184 | 184 | - | Trips | Calculated assuming 20-ton truck loads |
| Number of to-plant Trips, Trips, Bitumen | 184 | 184 | - | Trips | Calculated assuming 20-ton truck loads |
| Number of to-plant Trips, Trips, Water | 184 | 184 | - | Trips | Calculated assuming 20-ton truck loads |
| Number of to-plant Trips, Trips, Crushed Rock | 184 | 184 | - | Trips | Calculated assuming 20-ton truck loads |
| Number of to-plant Trips, Trips, Sand | 184 | 184 | - | Trips | Calculated assuming 20-ton truck loads |
| Number of to-plant Trips, Trips, Manufactured Aggregates | 184 | 184 | - | Trips | Calculated assuming 20-ton truck loads |
| Distance to-plant, Distance, BAP | 0 | 0 | 0 | Miles per Trip | Reported in data intake form |
| Distance to-plant, Distance, Cement | 145 | 145 | 0 | Miles per Trip | Reported in data intake form/ RCE reviewed email provided with info. |
| Distance to-plant, Distance, Bitumen | 87.5 | 100 | 12.5 | Miles per Trip | Reported in data intake form/ RCE reviewed email provided with info. |
| Distance to-plant, Distance, Water | 0 | 0 | 0 | Miles per Trip | Reported in data intake form |
| Distance to-plant, Distance, Crushed Rock | 0 | 0 | 0 | Miles per Trip | Reported in data intake form |
| Distance to-plant, Distance, Sand | 0 | 0 | 0 | Miles per Trip | Reported in data intake form |
| Distance to-plant, Distance, Manufactured Aggregates | 45 | 45 | 0 | Miles per Trip | Reported in data intake form/ RCE reviewed email provided with info. |
| Number of to-site Trips, Trips, CCPR Mix | 7,561 | 7,561 | - | Trips | CCPR Production Reports |
| Distance to Site, Distance, CCPR Mix | 22.7 | 22.7 | 0 | Miles per Trip | From Google Maps - New Kent signed Point to Center of Segment 3/ RCE reviewed in email |
| Discount Factor, DF | 1.1 | 1.1 | 0 | Unitless | Methodology Section 7.2.1 |
| Truck Emission Factor, EF _T | 36.2 | 36.2 | 0 | kg CO ₂ e/mile | Methodology Section 8.1.2 |
| Crediting Baseline, CB | 94.6 | 94.6 | 0 | Tons/tonne | Methodology Section 2, Project started in 2019 |
| Correction Factor for FSB, CF _{FSB} | 1.02 | 1.02 | 0 | Unitless | Methodology Section 7.4, "Alan Myers I-64 CCPR Mix Design 07-20-2017_2019 Update.pdf" reports FSB |

| Conversions | | | |
|-------------|----|----------|----------------|
| From | To | Factor | Source |
| tons | By | 0.907185 | to get Tonsnes |
| kg | By | 0.453592 | to get kg |
| kg | By | 2.20462 | to get lb |
| tons | By | 0.2025 | to get Tonsnes |
| tons | By | 907.185 | to get kg |

| | | | |
|------------------------|-----------------------------------|------------------------------------|--|
| 2019 Vintage | 2379.17355 tons CCPR r calculated | | |
| 35,971.60 2019 Vintage | 0.27 | CCPRM Tickets (controlling factor) | |
| 2020 Vintage | 3608.39184 tons CCPR r calculated | | |
| 54,623.54 2020 Vintage | 0.41 | CCPRM Tickets (controlling factor) | |
| 2021 Vintage | 2815.18656 tons CCPR r calculated | | |
| 42,633.01 2021 Vintage | 0.32 | CCPRM Tickets (controlling factor) | |

| Equation | Variable | 2018 | | 2019 | | 2020 | |
|------------|---------------------------------------|------------|--------|--------|-------|-------|---------|
| | | Value | RCE | Value | RCE | Value | RCE |
| Equation 1 | CCPR M | 52.14 | 52.14 | 52.14 | 52.14 | 52.14 | 52.14 |
| | D.M | 21.11 | 21.11 | 21.11 | 21.11 | 21.11 | 21.11 |
| | T.P.D | 6.27 | 6.27 | 6.27 | 6.27 | 6.27 | 6.27 |
| | T.W | 14.45 | 14.45 | 14.45 | 14.45 | 14.45 | 14.45 |
| | T.P | 7.36 | 8.13 | 7.32 | 8.13 | 10.09 | 8.13 |
| Equation 2 | EF | 1.05 | 2.16 | 1.89 | 7.16 | 7.67 | 2.16 |
| | EF _{CEMENT} | 2113 | | | | | |
| | EF _{BITUMEN} | 8.26 | | | | | |
| | EF _{MANUFACTURED AGGREGATES} | 12.00 | | | | | |
| Equation 3 | T.P.D | 6.27 | | | | | |
| | Trips, Cement | 0.90 | | | | | |
| | Trips, Bitumen | 1.83 | | | | | |
| Equation 4 | T.P.D | 14.45 | | | | | |
| | Trips, CCPR Mix | 14.45 | | | | | |
| Equation 5 | T.P | 7.36 | | | | | |
| | T.D | 7.36 | | | | | |
| | EF | | | | | | |
| Equation 6 | EF | 7.36 | 7.12 | | | | 10.09 |
| | CCPR M | 52.14 | 52.14 | | | | 278.988 |
| | Rubber Tired Loaders, D | 46,624 | 46,624 | 68,479 | | | 75,764 |
| | Rubber Tired Loaders, D | 46,624 | 46,624 | 68,479 | | | 75,764 |
| Equation 7 | EF | | | | | | |
| | EF _{EL} | 291.73 | | | | | |
| | CF | 133,228.11 | | | | | |
| | Project Amount | 133,228.11 | | | | | |
| Equation 8 | EF | 1.05 | 1.89 | | | | 2.67 |
| | EF | | | | | | |

FDR Segment 2

Project Proponent Values

RCE Values

| Variable | Value | RCE Values | Difference | Unit | Data Source |
|--|-------------|-------------|------------|------------------------------------|---|
| Total Project Length, L | 2,905 | 2,905 | - | FT | Typical Pavement Sections - Plansheet 2A to 2A(3) |
| | 0.55 | 0.55 | - | Miles | |
| Road Width | Variable | Variable | #VALUE! | FT | Typical Pavement Sections - Plansheet 2A to 2A(3) |
| Road Area | 2,618,275 | 2,621,336 | (3,062) | SF | Calculated |
| | 290,919 | 291,260 | (340) | SY | |
| FDR Layer Thickness | 1.00 | 1.00 | - | FT | Typical Pavement Sections - Plansheet 2A(7) |
| Volume of FDR Installed | 2,618,275 | 2,621,336 | (3,062) | CF | Calculated |
| Density of FDR Mix, DE | 130 | 130 | - | LB/CF | Methodology |
| Weight of FDR Mix Installed, | 340,375,701 | 340,773,722 | (398,021) | LB of FDR Installed | Calculated |
| | 170,188 | 170,387 | (199) | Tonnes of FDR Installed | Calculated |
| | 154,391.86 | 154,572.23 | (180) | Tonnes of FDR Installed | Calculated |
| Material Emission Factor, EFM RAP | 0.00 | 0.00 | - | kgCO2e/kg | Methodology Section 8.1.2 |
| Material Emission Factor, EFM CEMENT | 0.83 | 0.83 | - | kgCO2e/kg | Methodology Section 8.1.3 |
| Material Emission Factor, EFM BITUMEN | 0.48 | 0.48 | - | kgCO2e/kg | Methodology Section 8.1.4 |
| Material Emission Factor, EFM WATER | 0.00 | 0.00 | - | kgCO2e/kg | Methodology Section 8.1.5 |
| % RAP Composition | 94.00% | 94.00% | - | - | See % Composition Tab |
| % Cement Composition | 5.00% | 5.00% | - | - | See % Composition Tab |
| % Bitumen Composition | 0.00% | 0.00% | - | - | See % Composition Tab |
| % Water Composition | 1.00% | 1.00% | - | - | See % Composition Tab |
| Weight of Material, Wm RAP | 159,976.58 | 160,163.65 | (187) | Tons | Calculated |
| | 145,128.353 | 145,297.900 | (169,547) | Kg | Calculated |
| | 145,128.35 | 145,297.90 | (170) | Tonnes | Calculated |
| Weight of Material, Wm Cement | 8,509.39 | 8,519.34 | (10) | Tons | Calculated |
| | 7,719.593 | 7,728.612 | (9,018) | Kg | Calculated |
| | 7,719.59 | 7,728.61 | (9) | Tonnes | Calculated |
| Weight of Material, Wm Bitumen | - | - | - | Tons | Calculated |
| | - | - | - | Kg | Calculated |
| | - | - | - | Tonnes | Calculated |
| Weight of Material, Wm Water | 1,701.88 | 1,703.87 | (2) | Tons | Calculated |
| | 1,543,919 | 1,545,722 | (1,804) | Kg | Calculated |
| | 1,543.92 | 1,545.72 | (2) | Tonnes | Calculated |
| Number of to-site Trips, Trips RAP | - | - | - | Trips | Calculated assuming 20-ton truck loads |
| Number of to-site Trips, Trips Cement | 425 | 426 | (0) | Trips | Calculated assuming 20-ton truck loads |
| Number of to-site Trips, Trips Bitumen | - | - | - | Trips | Calculated assuming 20-ton truck loads |
| Number of to-site Trips, Trips Water | - | - | - | Trips | Calculated assuming 20-ton truck loads |
| Discount Factor, DF | 1.1 | 1.1 | - | unitless | Methodology Section 7.2.1 |
| Distance to Site, Distance\$ RAP | 0 | - | - | Miles per Trip | Reported by Allan Myers |
| Distance to Site, Distance\$ Cement | 177.7 | 177.7 | - | Miles per Trip | Reported by Allan Myers |
| Distance to Site, Distance\$ Bitumen | 132.7 | - | 133 | Miles per Trip | Reported by Allan Myers |
| Distance to Site, Distance\$ Water | 0 | - | - | Miles per Trip | Reported by Allan Myers |
| Truck Emission Factor, EFT | 10.2 | 10.2 | - | Kg CO2e/mile | Methodology Section 8.1.2 |
| | 22.49 | 22.49 | (0) | LB CO2e/mile | Calculated |
| Crediting Baseline, CB | 94.7 | 94.7 | - | Tonnes CO2e/tonne of FDR installed | Methodology Section 7 |
| | 1.02 | 1.02 | - | Unitless | Methodology Section 7.4; |

Differences

| | | | | |
|-------------------|-----------------------------------|---------|-------|--------|
| (0.01) Equation 1 | CCPR EI | 52.91 | 52.92 | 0.01 |
| - | EI M | 41.50 | 41.50 | - |
| 0.00 | EI PD | 5.49 | 5.49 | (0.00) |
| - | EI SD | - | - | - |
| (0.01) | EI P | 5.92 | 5.92 | 0.01 |
| - | EI I | - | - | - |
| Equation 2 | EI M | 41.50 | - | - |
| | EF _{ix} CEMENT | 41.50 | - | - |
| | EF _{ix} BITUMEN | - | - | - |
| | EF _{ix} MANUFACTURED | - | - | - |
| Equation 3 | EI PD | 5.49 | - | - |
| | Trips _p Cement | 5.49 | - | - |
| | Trips _p Bitumen | - | - | - |
| | Trips _p Manufactured A | - | - | - |
| Equation 4 | EI SD | - | - | - |
| | Trips _p FDR | - | - | - |
| Equation 5 | EI P | 5.92 | - | - |
| | EI D | 5.92 | - | - |
| | EI E | - | - | - |
| Equation 6 | EI D | 5.92 | - | - |
| | Cold recycler, Wirtgen 1 | 829,251 | - | - |
| | Rollers, Others | 42,649 | - | - |
| | Rollers, Others | 42,649 | - | - |
| Equation 7 | EI E | - | - | - |
| | EF EL | 291.23 | - | - |
| | C EL | - | - | - |
| | Project Amount | - | - | - |
| Equation 8 | EI I | - | - | - |

FDR Segment 3

Project Proponent Values RCE Values

| Variable | Value | RCE Values | difference | Unit | Data Source |
|---|-------------|-------------|------------|---------------------------|---|
| Total Project Length, L | 43,691 | 43,691 | 0 | FT | Typical Pavement Sections - Plansheet 2A to 2A(3) |
| Road Width | 8.27 | 8.27 | 0 | Miles | See Project Length Tab |
| Road Area | 1,352,659 | 1,352,576 | (83) | SF | Calculated from typical sections |
| FDR Layer Thickness | 150,295 | 150,286 | (9) | SY | Calculated |
| Volume of FDR Installed | 1.00 | 1.00 | - | FT | Typical Pavement Sections - Plansheet 2A(7) |
| Density of FDR Mix, DE | 1,352,659 | 1,352,576 | (83) | CF | Calculated |
| Weight of FDR Mix Installed, Project Amount | 130 | 130 | - | LB/CF | Calculated |
| | 175,845,729 | 175,834,907 | (10,822) | LB of FDR Installed | Calculated |
| | 87,923 | 87,917 | (6) | Tons of FDR Installed | Calculated |
| | 79,762.30 | 79,757 | (5) | Tonnes of FDR Installed | Calculated |
| Material Emission Factor, EF _u RAP | 0.00 | 0.00 | - | kgCO ₂ e/kg | Methodology Section 8.1.2 |
| Material Emission Factor, EF _u CEMENT | 0.83 | 0.83 | - | kgCO ₂ e/kg | Methodology Section 8.1.3 |
| Material Emission Factor, EF _u BITUMEN | 0.48 | 0.48 | - | kgCO ₂ e/kg | Methodology Section 8.1.4 |
| Material Emission Factor, EF _u WATER | 0.00 | 0.00 | - | kgCO ₂ e/kg | Methodology Section 8.1.5 |
| % RAP Composition | 94.00% | 94% | - | - | FDR Mix Design |
| % Cement Composition | 5.00% | 5% | - | - | FDR Mix Design |
| % Bitumen Composition | 0.00% | 0% | - | - | FDR Mix Design |
| % Water Composition | 1.00% | 1% | - | - | FDR Mix Design |
| Weight of Material, W _m RAP | 82,647.89 | 82,642.41 | (5) | Tons | Calculated |
| | 74,976.52 | 74,971.869 | (4.65) | Tonnes | Calculated |
| Weight of Material, W _m Cement | 4,396.14 | 4,395.87 | (0) | Tons | Calculated |
| | 3,988.115 | 3,987.865 | (0.25) | kg | Calculated |
| Weight of Material, W _m Bitumen | 3,988.12 | 3,987.87 | (0) | Tonnes | Calculated |
| | - | - | - | Tons | Calculated |
| | - | - | - | kg | Calculated |
| | - | - | - | Tonnes | Calculated |
| Weight of Material, W _m Water | 879.23 | 879.17 | (0) | Tons | Calculated |
| | 797.623 | 797.573 | (0) | kg | Calculated |
| | 797.62 | 797.57 | (0) | Tonnes | Calculated |
| Number of to-site Trips, Trips RAP | - | - | - | Trips | Calculated assuming 20-ton truck loads |
| Number of to-site Trips, Trips Cement | 220 | 220 | (0) | Trips | Calculated assuming 20-ton truck loads |
| Number of to-site Trips, Trips Bitumen | - | - | - | Trips | Calculated assuming 20-ton truck loads |
| Number of to-site Trips, Trips Water | - | - | - | Trips | Calculated assuming 20-ton truck loads |
| Discount Factor, DF | 1.1 | 1.1 | - | unitless | Methodology Section 7.2.1 |
| Distance to Site, Distance _s RAP | 0 | - | - | Miles per Trip | Reported in data intake form |
| Distance to Site, Distance _s Cement | 167.7 | 167.70 | - | Miles per Trip | Reported in data intake form |
| Distance to Site, Distance _s Bitumen | 122.7 | 123 | - | Miles per Trip | Reported in data intake form |
| Distance to Site, Distance _s Water | 0 | - | - | Miles per Trip | Reported in data intake form |
| Truck Emission Factor, EF _t | 10.2 | 10.20 | - | kg CO ₂ e/mile | Methodology Section 8.1.2 |
| | 22.49 | 22 | 0.00005 | LB CO ₂ e/mile | Calculated |
| Crediting Baseline, CB | 94.6 | 94.60 | - | Tonnes | Methodology Section 7 |
| Correction Factor for FSB, C _{FSB} | 1.02 | 1.02 | - | Unitless | Methodology Section 7.4 |

| Conversions | | | | | |
|-------------|----|----------|--------|--------|--|
| Multiply | | | | | |
| tons | by | 0.907185 | to get | Tonnes | |
| lb | by | 0.453592 | to get | kg | |
| kg | by | 2.20462 | to get | lb | |
| kg | by | 0.001 | to get | Tonnes | |
| tons | by | 907.185 | to get | kg | |

| | | | | |
|-----------|---------------|-------------|------------------------------|------------|
| 21,534.47 | 2019 Vintage! | 23739.17335 | tons CCPR r | calculated |
| | 2019 Vintage! | 0.27 | CCPRM Tickets (controlling f | |
| 32,700.50 | 2020 Vintage! | 36048.37434 | tons CCPR r | calculated |
| | 2020 Vintage! | 0.41 | CCPRM Tickets (controlling f | |
| 25,522.34 | 2021 Vintage! | 28135.31656 | tons CCPR r | calculated |
| | 2021 Vintage! | 0.32 | CCPRM Tickets (controlling f | |

| | 2018 | 2019 | 2020 |
|-------------------|---------|-------|-------|
| (0.03) Equation 1 | CCPR EI | 52.29 | 52.29 |
| - | EI M | 41.50 | 41.50 |
| (0.03) | EI PD | 5.19 | 5.19 |
| - | EI SD | - | - |
| - | EI P | - | - |
| 0.00 | EI I | 5.61 | 5.61 |

| Equation 2 | 2018 | 2019 | 2020 |
|----------------------------|-------|------|------|
| EI M | 41.50 | | |
| EF _u CEMENT | 41.50 | | |
| EF _u BITUMEN | - | | |
| EF _u MANUFACTUR | - | | |

| Equation 3 | 2018 | 2019 | 2020 |
|-------------------|------|------|------|
| EI PD | 5.16 | 5.19 | 5.19 |
| Trips Cement | 5.16 | | |
| Trips Bitumen | - | | |
| Trips Manufacture | - | | |

| Equation 4 | 2018 | 2019 | 2020 |
|------------|------|------|------|
| EI SD | - | | |
| Trips FDR | - | | |

| Equation 5 | 2018 | 2019 | 2020 |
|------------|------|------|------|
| EI P | - | | |
| EI D | - | | |
| EI E | - | | |

| Equation 6 | 2018 | 2019 | 2020 |
|----------------------------|------|------|------|
| EI D | - | | |
| Cold recycler, Wirtgen 32' | | | |
| Rollers, Others | | | |
| Rollers, Others | | | |

| Equation 7 | 2018 | 2019 | 2020 |
|----------------|--------|------|------|
| EI E | - | | |
| EF EL | 291.23 | | |
| C EL | - | | |
| Project Amount | - | | |

| Equation 8 | 2018 | 2019 | 2020 |
|------------|------|------|------|
| EI I | 5.61 | 5.61 | 5.61 |
| | | | |
| | | | |

RCE re-calculated total emission reductions with the above results. Leakage emissions are not applicable for this project type according to the methodology. The below table summarizes RCE’s re-calculation (values in the table may not add up exactly due to rounding errors):

| v3 | RCE | | | | | | Straughan | | | Difference | | | | |
|-----------------|----------|---------|-------|-------|-------|-------|-----------|---------|-----|------------|---------|-------|--------|--------|
| | Baseline | Project | | Check | ERs | | Baseline | Project | ERs | Baseline | Project | ERs | % Diff | |
| 2018 CCPR Seg 2 | 94.70 | 8,572 | 59.98 | 5,538 | 3,034 | 3,034 | 94.70 | 60.14 | | 3,018 | 0.00 | -0.16 | 16 | 0.53% |
| 2018 FDR Seg 2 | 94.70 | 14,351 | 52.91 | 8,179 | 6,172 | 6,172 | 94.70 | 52.92 | | 6,163 | 0.00 | -0.01 | 9 | 0.15% |
| 2019 CCPR Seg 3 | 94.60 | 3,336 | 51.16 | 1,840 | 1,496 | 1,496 | 94.60 | 51.03 | | 1,521 | 0.00 | 0.13 | -25 | -1.66% |
| 2020 CCPR Seg 3 | 94.50 | 5,061 | 50.85 | 2,778 | 2,283 | 2,283 | 94.50 | 50.92 | | 2,263 | 0.00 | -0.06 | 20 | 0.85% |
| 2021 CCPR Seg 3 | 94.40 | 3,946 | 54.61 | 2,328 | 1,617 | 1,617 | 94.40 | 54.64 | | 1,612 | 0.00 | -0.03 | 5 | 0.32% |
| 2019 FDR Seg 3 | 94.60 | 1,997 | 52.26 | 1,125 | 872 | 872 | 94.60 | 52.29 | | 871 | 0.00 | -0.03 | 1 | 0.07% |
| 2020 FDR Seg 3 | 94.50 | 3,030 | 52.29 | 1,710 | 1,320 | 1,320 | 94.50 | 52.29 | | 1,320 | 0.00 | -0.01 | 0 | 0.01% |
| 2021 FDR Seg 3 | 94.40 | 7,381 | 52.27 | 1,334 | 6,047 | 1,028 | 94.40 | 52.29 | | 1,027 | 0.00 | -0.02 | 1 | 0.05% |

Baseline emissions were re-calculated by multiplying the performance benchmark by the total project material produced. The total project material was tracked via Allen Myers’ database that collected all weight tickets from outbound trucks hauling project asphalt to the job site for the CCPR segments. For the FDR segments, the total material is calculated using dimensions in the VDOT engineering documents by the Protocol specified density of FSB. There were extremely small, non-material differences between RCE’s and GE’s baseline emission calculations.

RCE recalculated project emissions using equations 1 – 13 from VM0039 (baseline emission calculations were not assigned an equation number) and compared these values to GE’s calculations. Diesel was the only fuel consumed for transporting project material. Project emissions from raw materials are calculated by multiplying the fraction of raw material according to the asphalt mix design by the total weight of project material used for road construction. The weight of raw material is then multiplied by default factors from VM0039.

There was no electricity usage for these initial project activity instances. Mobile emissions were calculated using mostly default values located in VM0039 multiplied by either estimated mileage to and from the job site or to and from the sites of raw material acquisition (including any required discount) and estimated hours of equipment operation. RCE agrees that in all cases, GE used conservative values where applicable.

RCE did not identify any uncertainties regarding the recorded data and parameters used that are not already covered in VM0039 using applicable discount factors for uncertainty. RCE used the below source data that GE provided including:

- Road dimensions according to VDOT engineering documents
- Asphalt mix designs including percent cement and bitumen composition
- Allen Myers’ data on total truckloads of asphalt sent to jobsite
- Allen Myers’ data on total weight of material trucked to jobsite
- Estimated mileage to and from jobsite
- Estimated mileage to and from raw material sites
- Default emission factors from VM0039
- Conversion factors from VM0039
- Performance benchmark from VM0039

GE had one methodology deviation regarding default emission factors for heavy equipment not listed in the Methodology appendix. See the deviation below in Section 3.4.7 for a detailed explanation of this process.

RCE concludes that GE has correctly applied the Methodology to calculate baseline and project emissions. GE included all relevant assumptions and data in the joint PD/MR including references and sources. RCE confirms that these data are reasonable in the context of the project and that it is possible to replicate the estimate of baseline emissions based on the information provided in the joint PD/MR.

RCE’s final re-calculation of net GHG emission reductions and removals during the project monitoring period are within the materiality threshold stipulated by the VCS rules. All relevant assumptions and data are listed in the joint PD/MR (including references and sources where necessary). These data are reasonable in the context of the project and RCE replicated the baseline and project emissions using these data and parameters. RCE also confirmed that all relevant equations were listed in section 5 in the joint PD/MR.

3.4.7 Methodology Deviations

3.4.8 The validated PD does not include any deviations to methodology VM0039. Monitoring Plan

RCE confirmed the suitability of the implemented monitoring system by reviewing data collected as inputs into all methodology equations. Due to the nature of this project type, there are very few pieces of equipment that directly measure inputs into the calculations. The only value measured by a piece of equipment that requires regular maintenance and calibration was the truck scale at the Allen Myers asphalt plant. RCE reviewed truck scale calibrations to confirm that the equipment is appropriately maintained and measures data accurately. Specifically, RCE sampled calibrations and confirmed that they were accurate according to industry standards that met NIST Handbook 44 and were calibrated every 6 months.

The below table summarizes the dates of truck scale calibrations and the results from the plant.

| Date of Calibration | Result |
|---------------------|--------|
| 27 February 2018 | Pass |
| 2 May 2018 | Pass |
| 24 May 2018 | Pass |
| 28 June 2018 | Pass |
| 2 October 2018 | Pass |
| 19 October 2018 | Pass |
| 13 March 2019 | Pass |
| 14 October 2019 | Pass |
| 29 April 2020 | Pass |

| | |
|-----------------|------|
| 28 July 2020 | Pass |
| 2 November 2020 | Pass |
| 3 February 2021 | Pass |
| 23 August 2021 | Pass |

Other inputs into the calculations were either approved by the VDOT (in the case of engineering measurements and dimensions for the road), measured by equipment that doesn't require maintenance and calibration (shift hours and subsequent equipment operation hours), or is estimated based on web-based mapping platforms (mileage to and from job site and raw material aggregation sites) with appropriate discount factors applied.

RCE reviewed this and other information and found the implemented monitoring system to be suitable and concluded that data monitored is robust and accurate for the purposes of calculating emission reductions.

RCE concludes the monitoring plan adheres to all requirements of the Methodology. The tables below contain the data and parameters that are monitored and/or measured during the project crediting period and reporting period. RCE reviewed section 6 of the joint PD/MR and confirmed that ex-ante values were included.

DATA AND PARAMETERS AVAILABLE AT VALIDATION

HMA and CCPR

| | |
|---|--|
| Data/Parameter | EF _M |
| Data Unit | kgCO _{2e} /kg |
| Description | Material emission factor |
| Source of Data | CMUGDI (2008) |
| Value applied: | RAP: 0 Cement: 0.83 Bitumen: 0.48 Water: 0 Crushed rock: 0.056 Sand: 0.005 Manufactured aggregates: 0.006 |
| Justification of choice of data or description of measurement methods and procedures applied | CMUGDI (2008) comprises national economic input-output models and publicly available resources use and emission data, which has been accessed over 1 million times by researchers or business users. |
| Purpose of Data | Calculation of project emissions |
| Comments | Data to be updated when the material emissions factor is updated. |

| | |
|---|---|
| Data/Parameter | EF _T |
| Data Unit | kgCO ₂ e/mile |
| Description | Truck's emission per mile travelled |
| Source of Data | The Climate Registry (2023) |
| Value applied: | 10.2 |
| Justification of choice of data or description of measurement methods and procedures applied | Emission factors from The Climate Registry are compiled from publicly available data sources and updated each year to ensure that project proponents have the most accurate and up-to-date greenhouse gas data. |
| Purpose of Data | Calculation of project emissions |
| Comments | Data to be updated when the diesel emissions factor is updated. |

| | |
|---|--|
| Data/Parameter | EF _{EQ} |
| Data Unit | kgCO ₂ e/hr |
| Description | Equipment emissions per hour |
| Source of Data | VM0039 Appendix B |
| Value applied: | Cold Recycler, Other: 535.9 Rubber Tired Loaders, Other: 145.7 Paver, Others: 126.5 Rollers, Other: 46.4 |
| Justification of choice of data or description of measurement methods and procedures applied | The engine emission information is obtained from the EPA off-road engine certification database and further stratified equipment types by engine maker and horsepower rating. The database created for equipment emission estimation is presented in Appendix B of the methodology |
| Purpose of Data | The calculation of project emissions |
| Comments | Data was collected one time and must be updated when more strict emission standard is implemented nationwide |

| | |
|-------------------------|-------------------------|
| Data / Parameter | EF _{EL} |
| Data unit | kgCO ₂ e/kWh |

| | |
|---|--|
| Description | Electricity emission factor |
| Source of data | EPA (2017) |
| Value applied: | Refer to EPA's eGRID summary tables for electricity emission factors for different regions. (Please note that no electric consumption is applicable to the first monitoring period as all equipment used diesel fuel) |
| Justification of choice of data or description of measurement methods and procedures applied | Emission factors from eGRID summary tables are compiled by the EPA and updated each year to ensure that project proponents have the most accurate and up-to-date greenhouse gas data. The calculation of electricity emission must use region-specific emission factors. |
| Purpose of Data | Calculation of project emissions |
| Comments | The project proponent must use the most recent eGRID summary tables available. Please note that no electric consumption is applicable to the first monitoring period as all equipment used diesel fuel. |

| | |
|-------------------------|--|
| Data / Parameter | CF |
| Data unit | Between 0 and 1 |
| Description | Conversion factor: the percentage of equipment operating time in the total labor time |
| Source of data | Liu et al. (2016) |
| Value applied: | Milling machine: 0.66 Backhoe: 0.33 Loader: 0.33 Sweeper: 0.55 Paver: 0.50 Roller: 0.59 Truck: 1 |

| | |
|---|---|
| Justification of choice of data or description of measurement methods and procedures applied | Three projects were observed on-site to count the effective operation time of each piece of equipment. The percentage utilization (PU) was calculated using the effective operation time divided by the total labor hours. The average PU values are 0.55 for the asphalt-milling machine; 0.10 for the backhoe; 0.10 for the bobcat/loader; 0.4 for the sweeper/broom; 0.10 for the excavator; 0.33 for the paver and 0.45 for the roller. Different PUs will produce different amounts of GHG emissions. According to a study by Lewis et al. (2009), the emission rate of idling equipment is about one quarter of the emission rate of the operating equipment. This difference is simplified and incorporated into the emission calculation as an average conversion factor (CF), which equals $PU+0.25(1-PU)$. |
| Purpose of Data | Calculation of project emissions |
| Comments | Please note that this variable was not used in the first monitoring period as the contractor provided equipment operating hours rather than labor hours. |

| | |
|---|--|
| Data/Parameter | DF |
| Data Unit | Between 0 and 1 |
| Description | For conservativeness, a discount factor (DF) must be applied when a map distance calculator is used to estimate hauling distance. DF is equal to 0 if using actual logged miles. |
| Source of Data | On-site observations |
| Value applied: | 0.1 |
| Justification of choice of data or description of measurement methods and procedures applied | Ten projects were observed on site to count the distance between the map and equipment odometer. Hauling distance = Map distance × (1+DF) |
| Purpose of Data | Calculation of project emissions |
| Comments | Data does not need to be updated |

FDR or CIR

| | |
|-----------------------|-------------------------------------|
| Data/Parameter | EF_T |
| Data Unit | kgCO _{2e} /mile |
| Description | Truck's emission per mile travelled |
| Source of Data | The Climate Registry (2023) |
| Value applied: | 10.2 |

| | |
|---|---|
| Justification of choice of data or description of measurement methods and procedures applied | Emission factors from The Climate Registry are compiled from publicly available data sources and updated each year to ensure that project proponents have the most accurate and up-to-date greenhouse gas data. |
| Purpose of Data | Calculation of project emissions |
| Comments | Data to be updated when the diesel emissions factor is updated |

| | |
|---|--|
| Data/Parameter | EF _M |
| Data Unit | kgCO _{2e} /kg |
| Description | Material emission factor |
| Source of Data | Carnegie Mellon University Green Design Institute (CMUGDI 2008) |
| Value applied: | RAP: 0 Cement: 0.83 Bitumen: 0.48 Water: 0 |
| Justification of choice of data or description of measurement methods and procedures applied | CMUGDI (2008) is comprised of national economic input-output models and publicly available resources use and emission data, which has been accessed over 1 million times by researchers or business users. |
| Purpose of Data | Calculation of project emissions |
| Comments | Data to be updated when the material emissions factor is updated |

| | |
|---|---|
| Data/Parameter | EF _{EQ} |
| Data Unit | kgCO _{2e} /hr |
| Description | Equipment emission per hour |
| Source of Data | VM0039 Appendix B |
| Value applied: | Cold Recycler, Wirtgen, 12': 901.4 Roller, Others: 46.4 |
| Justification of choice of data or description of measurement methods and procedures applied | The engine emission information is from the EPA off-road engine certification database and stratified by equipment type, engine make, and horsepower rating. The database created for equipment emission estimation is presented in Appendix B. |
| Purpose of Data | Calculation of project emissions |
| Comments | Data was collected one time and must be updated when more strict emissions standards are implemented nationwide |

DATA AND PARAMETERS MONITORED

HMA and CCPR

| | |
|--|--|
| Data/Parameter | W_M |
| Data Unit | Kg |
| Description | Quantity of each raw material used to produce HMA or FSB or asphalt emulsions |
| Source of Data | Plant production records |
| Description of measurement methods and procedures to be applied | The W_M variable is an indirect measurement. The CCPR asphalt mix design provides the percent composition of each raw material. The contractor reports the total amount of mix produced through production records and trucking reports. Using the overall tonnage installed and the % composition of each raw material, the quantity of each raw material component is calculated. The truck scale used for trucking reports on the project was a Class III L scale which meets or exceed NIST Handbook 44 standards. |
| Frequency of monitoring/recording | The quantity of each raw material is calculated once per project instance at final completion. However, the trucking reports are monitored for every truck leaving the mix plant through the entire duration of the project and summed together once upon project instance completion. |
| Value applied: | <p>The values applied will vary based on each individual project instance. With this being a grouped project there will be future CCPR instances added over the project crediting period however the values cannot be accurately estimated until those projects are completed and incorporated into future monitoring periods.</p> <p>Refer to Section 5.4.3 for assumptions made in the ex-ante calculations.</p> |
| Monitoring equipment | Truck scales at the CCPR plant measure the tonnage of mix leaving the plant. The truck scale is a Cardinal PRC, accuracy class III L, serial number B30089. The CCPR mix design was performed by a certified independent third-party laboratory following ASTM D6926, AASHTO T-283, AASHTO T-180 Method D, AASHTO T 248 (Method A), and AASHTO T 27 (Dry) testing procedures. |
| QA/QC procedures to be applied | Cross-checking of contractor reported CCPR quantity versus trucking manifests was performed for each project instance and will be performed for all future instances at the completion of each project. Truck scale calibrations were performed at a minimum every 6 months according to industry standards to meet NIST Handbook 44 standards. |
| Purpose of Data | Calculation of project emissions |
| Calculation method | Percent composition of each raw material multiplied by total weight of mix produced. |
| Comments | N/A |

| | |
|--|---|
| Data/Parameter | Distance _p |
| Data Unit | Miles |
| Description | The total miles that trucks travelled to supply raw materials to HMA plant or FSB plant |
| Source of Data | Data derived from monitoring, supplied by Allan Myers |
| Description of measurement methods and procedures to be applied | Distance can be measured by approximation through number of truck loads and map distance between project site and mix plant. |
| Frequency of monitoring/recording | Once per project |
| Value applied: | <p>The values applied will vary based on each individual project instance. With this being a grouped project there will be future CCPR instances added over the project crediting period however the values cannot be accurately estimated until those projects are completed and incorporated into future monitoring periods.</p> <p>Refer to Section 5.4.3 for assumptions made in the ex-ante calculations</p> |
| Monitoring equipment | Distance from raw material suppliers to CCPR mix plant measured using online mapping software |
| QA/QC procedures to be applied | Cross-checking of reported mileage versus trucking manifests to confirm quality measurement. |
| Purpose of Data | Calculation of project emissions |
| Calculation method | Summation of total miles traveled |
| Comments | N/A |

| | |
|--|---|
| Data/Parameter | Distances _s |
| Data Unit | Miles |
| Description | The total miles that trucks travelled to transport CCPR mix from mix plant to jobsite. |
| Source of Data | Approximated by applying map distance between mix plant and jobsite and number of trips to transport all CCPR mix material. |
| Description of measurement methods and procedures to be applied | Distance can be obtained from the daily report of truck drivers or measured by approximation |
| Frequency of monitoring/recording | Once per project |

| | |
|---------------------------------------|---|
| Value applied: | The values applied will vary based on each individual project instance. With this being a grouped project there will be future CCPR instances added over the project crediting period however the values cannot be accurately estimated until those projects are completed and incorporated into future monitoring periods. |
| Monitoring equipment | Distance from the asphalt plant to the job site measured using online mapping software |
| QA/QC procedures to be applied | Cross-checking of reported mileage versus trucking manifests to confirm quality measurement. |
| Purpose of Data | Calculation of project emissions |
| Calculation method | Summation of total miles traveled |
| Comments | N/A |

| | |
|--|--|
| Data / Parameter | CEL |
| Data unit | kWh |
| Description | Electricity consumption of the mix plant |
| Source of data | Data derived through monitoring |
| Description of measurement methods and procedures to be applied | The use of electricity can be obtained from the mix plant's utility bills |
| Frequency of monitoring/recording | Utility bills must be collected monthly or quarterly |
| Value applied | <p>The values applied will vary based on each individual project instance. With this being a grouped project there will be future CCPR instances added over the project crediting period however the values cannot be accurately estimated until those projects are completed and incorporated into future monitoring periods.</p> <p>Refer to Section 5.4.3 for assumptions made in the ex-ante calculations.</p> |
| Monitoring equipment | Utility provider electricity meters |
| QA/QC procedures to be applied | Cross-checking reported consumption versus utility bills to confirm quality measurement. |

| | |
|---------------------------|---|
| Purpose of data | Calculation of project emissions |
| Calculation method | Not applicable – the consumption is reported directly on utility bills. |
| Comments | N/A |

| | |
|--|--|
| Data/Parameter | Project amount |
| Data Unit | tonnes |
| Description | Output quantity of FSB or asphalt emulsions |
| Source of Data | Plant production records |
| Description of measurement methods and procedures to be applied | The contractor reports the total amount of mix produced through production records and trucking reports. The truck scale used for trucking reports on the project was a Class III L scale which meets or exceed NIST Handbook 44 standards. |
| Frequency of monitoring/recording | The trucking reports are monitored for every truck leaving the mix plant through the entire duration of the project and summed together once upon project instance completion. |
| Value applied: | <p>The values applied will vary based on each individual project instance. With this being a grouped project there will be future CCPR instances added over the project crediting period however the values cannot be accurately estimated until those projects are completed and incorporated into future monitoring periods.</p> <p>For the purposes of ex-ante estimates the following values have been applied to calculations (see section 5.4.3 for assumptions):</p> <p>2018: 246,719 2019: 212,991 2020: 0 2021: 0 2022: 0 2023: 0 2024: 275,826 2025: 330,991 2026: 397,189 2027: 476,627 2028: 0</p> |

| | |
|---------------------------------------|---|
| Monitoring equipment | Truck scales at the CCPR plant measure the tonnage of mix leaving the plant. The truck scale is a Cardinal PRC, accuracy class III L, serial number B30089. |
| QA/QC procedures to be applied | Cross-checking of contractor reported CCPR quantity versus trucking manifests was performed for each project instance and will be performed for all future instances at the completion of each project. Truck scale calibrations were performed at a minimum every 6 months according to industry standards to meet NIST Handbook 44 standards. |
| Purpose of Data | Calculation of project emissions |
| Calculation method | Summation of all trucking reports upon project completion |
| Comments | N/A |

| | |
|--|--|
| Data/Parameter | HRE _{EQ} |
| Data Unit | Hour |
| Description | Total operating hours of on-site use of equipment |
| Source of Data | Data derived through monitoring |
| Description of measurement methods and procedures to be applied | Where equipment operation hours are not available, labor hours can be used to approximate equipment operation hours. Labor hours are documented in the project daily log for verification. |
| Frequency of monitoring/recording | Once per project instance |
| Value applied: | <p>The values applied will vary based on each individual project instance. With this being a grouped project there will be future CCPR instances added over the project crediting period however the values cannot be accurately estimated until those projects are completed and incorporated into future monitoring periods.</p> <p>Refer to Section 5.4.3 for assumptions made in the ex-ante calculations.</p> |
| Monitoring equipment | Print outs of internal time keeping data. |
| QA/QC procedures to be applied | Cross-checking of reported data versus labor hours to confirm quality measurement. |
| Purpose of Data | Calculation of project emissions |
| Calculation method | Summation of operating hours to complete CCPR installation. |
| Comments | N/A |

| | |
|--|--|
| Data / Parameter | HR _{LA} |
| Data unit | Hours |
| Description | The total labor hours of on-site installation equipment use |
| Source of data | Road contractor |
| Description of measurement methods and procedures to be applied | Can be obtained from daily timesheet logs. |
| Frequency of monitoring/recording | Once per project instance |
| Value applied | <p>The values applied will vary based on each individual project instance. With this being a grouped project there will be future CCPR instances added over the project crediting period however the values cannot be accurately estimated until those projects are completed and incorporated into future monitoring periods.</p> <p>Refer to Section 5.4.3 for assumptions made in the ex-ante calculations.</p> |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | Cross-checking reported values versus daily logs to confirm quality measurement |
| Purpose of data | Calculation of project emissions |
| Calculation method | Summing the daily logs across the duration of the project. |
| Comments | N/A |

| | |
|--|--|
| Data/Parameter | DE |
| Data Unit | Lb./cu ft |
| Description | Density of FSB or asphalt emulsions |
| Source of Data | Laboratory testing reports or VM0039 reported industry standards |
| Description of measurement methods and procedures to be applied | Density data can be obtained from project records or specifications. Commonly applied testing includes AASHTO T-180 Method D however the specific test method applied can depend on the locality of the project instances. |

| | |
|--|--|
| Frequency of monitoring/recording | Once per project instance |
| Value applied: | <p>The values applied will vary based on each individual project instance. With this being a grouped project there will be future CCPR instances added over the project crediting period however the values cannot be accurately estimated until those projects are completed and incorporated into future monitoring periods.</p> <p>Refer to Section 5.4.3 for assumptions made in the ex-ante calculations.</p> |
| Monitoring equipment | <p>The density testing is performed in a laboratory prior to project implementation to find the proper mix that achieves the optimum density based on the testing of the existing roadway aggregates. The CCPR mix designs are performed by a certified independent third-party laboratory following ASTM D6926, AASHTO T-283, AASHTO T-180 Method D, AASHTO T 248 (Method A), and AASHTO T 27 (Dry) testing procedures.</p> |
| QA/QC procedures to be applied | Cross-checking of reported data versus theoretical density to confirm quality measurement. |
| Purpose of Data | Calculation of project emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|--|---|
| Data/Parameter | LC |
| Data Unit | Unitless |
| Description | Layer coefficient of FSB or asphalt emulsions |
| Source of Data | Data derived from industry standards or VM0039 default values |
| Description of measurement methods and procedures to be applied | <p>Calculation of project specific layer coefficients is not feasible due to the need for post installation monitoring of the pavement performance. Therefore, layer coefficients must be pulled from industry technical research such as the American Association of State Highway Transportation Officials (AASHTO) Design Guide as was done for the development of VM0039.</p> |
| Frequency of monitoring/recording | Once per project instance |
| Value applied: | <p>FSB: 0.32</p> <p>Refer to Section 5.4.3 for assumptions made in the ex-ante calculations.</p> |

| | |
|---------------------------------------|--|
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | Cross-checking of contractor reported data versus DOT commonly used coefficients to confirm quality measurement. |
| Purpose of Data | Calculation of project emissions |
| Calculation method | N/A |
| Comments | N/A |

FDR

| | |
|--|--|
| Data/Parameter | W_M |
| Data Unit | Kg |
| Description | Derived through project records |
| Source of Data | The W_M variable is an indirect measurement. The FDR or CIR asphalt mix design provides the percent composition of each raw material. Using the overall tonnage installed (project amount) and the % composition of each raw material, the quantity of each raw material component is calculated. |
| Description of measurement methods and procedures to be applied | The quantity of each raw material is calculated once per project instance at final completion. |
| Frequency of monitoring/recording | <p>The values applied will vary based on each individual project instance. With this being a grouped project there will be future CIR or FDR instances added over the project crediting period however the values cannot be accurately estimated until those projects are completed and incorporated into future monitoring periods.</p> <p>Refer to Section 5.4.3 for assumptions made in the ex-ante calculations.</p> |
| Value applied: | The FDR or CIR mix design is performed by a certified independent third-party laboratory following ASTM D6926, AASHTO T-283, AASHTO T-180 Method D, AASHTO T 248 (Method A), and AASHTO T 27 (Dry) testing procedures. |
| Monitoring equipment | Ensuring that the project instance raw material tonnage reported by Allan Myers is cross-checked and aligns with the calculated values from the mix design % composition. |
| QA/QC procedures to be applied | Calculation of project emissions |
| Purpose of Data | Percent composition of each raw material multiplied by total weight of mix produced. |
| Calculation method | Derived through project records |
| Comments | N/A |

| | |
|--|---|
| Data/Parameter | Project amount |
| Data Unit | tonnes |
| Description | Output quantity of FSB and asphalt emulsions |
| Source of Data | Data derived through project records |
| Description of measurement methods and procedures to be applied | The measurement of project amount is theoretical based on project area, depth, and density. The construction equipment performing this work is not directly metered therefore project records must be used to perform the calculation. |
| Frequency of monitoring/recording | Once per project |
| Value applied: | The values applied will vary based on each individual project instance. With this being a grouped project there will be future CCPR instances added over the project crediting period however the values cannot be accurately estimated until those projects are completed and incorporated into future monitoring periods. |
| Monitoring equipment | For the purposes of ex-ante estimates the following values have been applied to calculations (see section 5.4.3 for assumptions): |
| QA/QC procedures to be applied | 2018: 246,719 |
| Purpose of Data | 2019: 212,991 |
| Calculation method | Product of project installation area, FDR layer depth, and FDR mix density. |
| Comments | N/A |

| | |
|--|--|
| Data/Parameter | L |
| Data Unit | Miles |
| Description | Length of damaged pavement |
| Source of Data | Data derived from monitoring |
| Description of measurement methods and procedures to be applied | Data obtained from project records - Design Plans, Typical Pavement Sections |
| Frequency of monitoring/recording | Once per project |
| Value applied: | The values applied will vary based on each individual project instance. With this being a grouped project there will be future instances added over the project crediting period however the values cannot be accurately estimated until |

| | |
|---------------------------------------|--|
| | <p>those projects are completed and incorporated into future monitoring periods.</p> <p>Refer to Section 5.4.3 for assumptions made in the ex-ante calculations.</p> |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | Cross-checking engineering plans to reported length. |
| Purpose of Data | Calculation of project emissions |
| Calculation method | Project lengths are reported in engineering plan documents. |
| Comments | N/A |

| | |
|--|---|
| Data/Parameter | Distances |
| Data Unit | Miles |
| Description | The total miles that trucks travelled to supply raw materials to the job site |
| Source of Data | Approximated by applying map distance between raw material suppliers to jobsite and number of trips to transport all raw materials. |
| Description of measurement methods and procedures to be applied | Distance can be obtained from the daily report of truck drivers or measured by approximation |
| Frequency of monitoring/recording | Once per project |
| Value applied: | <p>The values applied will vary based on each individual project instance. With this being a grouped project there will be future instances added over the project crediting period however the values cannot be accurately estimated until those projects are completed and incorporated into future monitoring periods.</p> <p>Refer to Section 5.4.3 for assumptions made in the ex-ante calculations.</p> |
| Monitoring equipment | Distance that trucks travelled to supply raw materials to the job site measured using online mapping software |
| QA/QC procedures to be applied | Cross-checking of reported mileage versus trucking manifests to confirm quality measurement. |
| Purpose of Data | Calculation of project emissions |
| Calculation method | Summation of total miles traveled |
| Comments | N/A |

| | |
|--|---|
| Data / Parameter | S |
| Data unit | Miles per hour |
| Description | Running speed of the cold recycler |
| Source of data | Road contractor |
| Description of measurement methods and procedures to be applied | The data can be obtained from project records. The contractor forman records the speed of the cold recycler throughout the project. |
| Frequency of monitoring/recording | Daily logs are kept to document running speed and averages over the project duration are used in the final calculations. |
| Value applied | <p>The values applied will vary based on each individual project instance. With this being a grouped project there will be future instances added over the project crediting period however the values cannot be accurately estimated until those projects are completed and incorporated into future monitoring periods.</p> <p>Refer to Section 5.4.3 for assumptions made in the ex-ante calculations.</p> |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | Cross-checking reported speed versus drivers log to confirm quality measurement. |
| Purpose of data | Calculation of project emissions |
| Calculation method | Averaging out reported cold recycler speeds. |
| Comments | All projects within the first monitoring period were able to track labor hours to estimate equipment operating hours therefore this variable was not used but may be used in future monitoring periods. |

| | |
|-----------------------------------|--|
| Data/Parameter | DE |
| Data Unit | Lb./cu ft |
| Description | Density of FSB or asphalt emulsions |
| Source of Data | Laboratory testing reports or VM0039 reported industry standards |
| Description of measurement | Density data can be obtained from project records or specifications. Commonly applied testing includes AASHTO T- |

| | |
|---|---|
| methods and procedures to be applied | 180 Method D however the specific test method applied can depend on the locality of the project instances. |
| Frequency of monitoring/recording | Once per project |
| Value applied: | <p>The values applied will vary based on each individual project instance. With this being a grouped project there will be future instances added over the project crediting period however the values cannot be accurately estimated until those projects are completed and incorporated into future monitoring periods.</p> <p>Refer to Section 5.4.3 for assumptions made in the ex-ante calculations.</p> |
| Monitoring equipment | The density testing is performed in a laboratory prior to project implementation to find the proper mix that achieves the optimum density based on the testing of the existing roadway aggregates. The CCPR mix designs are performed by a certified independent third-party laboratory following ASTM D6926, AASHTO T-283, AASHTO T-180 Method D, AASHTO T 248 (Method A), and AASHTO T 27 (Dry) testing procedures. |
| QA/QC procedures to be applied | Cross-checking of reported data versus theoretical density to confirm quality measurement. |
| Purpose of Data | Calculation of project emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|--|--|
| Data/Parameter | LC |
| Data Unit | Unitless |
| Description | Layer coefficient of FSB or asphalt emulsions |
| Source of Data | Data derived from industry standards or VM0039 default values |
| Description of measurement methods and procedures to be applied | Calculation of project specific layer coefficients is not feasible due to the need for post installation monitoring of the pavement performance. Therefore, layer coefficients must be pulled from industry technical research such as the American Association of State Highway Transportation Officials (AASHTO) Design Guide as was done for the development of VM0039. |
| Frequency of monitoring/recording | Once per project instance |
| Value applied: | FSB: 0.32 |

| | |
|---------------------------------------|---|
| | Refer to Section 5.4.3 for assumptions made in the ex-ante calculations. |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | Cross-checking of reported data versus DOT commonly used coefficients to confirm quality measurement. |
| Purpose of Data | Calculation of project emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|--|---|
| Data / Parameter | HRE _{EQ} |
| Data unit | Hours |
| Description | The total operating hours of on-site installation equipment |
| Source of data | Equipment operating hours are approximated by labor hours reported on equipment operator timesheets and conversion factors defined in the VM0039 Methodology |
| Description of measurement methods and procedures to be applied | Where equipment operation hours are not available, labor hours can be used to approximate equipment operation hours. Labor hours are documented in the project daily log for verification. |
| Frequency of monitoring/recording | Once per project instance |
| Value applied | <p>The values applied will vary based on each individual project instance. With this being a grouped project there will be future instances added over the project crediting period however the values cannot be accurately estimated until those projects are completed and incorporated into future monitoring periods.</p> <p>Refer to Section 5.4.3 for assumptions made in the ex-ante calculations.</p> |
| Monitoring equipment | Print outs of internal time keeping data. |
| QA/QC procedures to be applied | Cross-checking reported values versus operator timesheet documents |
| Purpose of data | Calculation of project emissions |
| Calculation method | Summing the labor hours reported for each piece of installation equipment and multiplying by the conversion factors (CF) defined in Section 5.1.1 |

Comments

N/A

3.5 Non-Permanence Risk Analysis

The section is not applicable for this Project type.

4 VERIFICATION FINDINGS

4.1 Accuracy of GHG Emission Reduction and Removal Calculations

The Project Proponent calculates the Project's emission reductions in accordance with the equations described in VM0039 and the joint PD/MR. RCE confirmed that all appropriate equations were used to quantify baseline and project emissions including formulas that could be used in case the operation hours of equipment are unavailable. RCE sampled the Project's raw data (engineering documents and contractor job site information) collected for the monitoring period to ensure the accuracy of reported data and to ensure that there were no material errors in the calculations. After the Project Proponent revised the emission reduction calculations based on a corrective action request made during the validation and verification, RCE found only minor discrepancies related to rounding and these discrepancies did not materially impact the final emission reduction totals.

RCE found the final GHG emission reduction calculations to be in conformance with VM0039, the Project Description, and free of material misstatement. In this context, during the first monitoring period, the completion of Segments 2 and 3 of I-64 constituted the entire extent of the road projects within this period. Segment 2 construction took place between the period of 17-April-2018 to 09-November-2018. Segment 3 construction took place between the period of 22-August-2019 to 13-September-2021 and is therefore split up according to the work completed in the respective 2019, 2020, and 2021 vintages. Please note that both of these projects are complete and will not result in any further emission reduction. As future roadway projects are procured additional instances will be added under future monitoring periods.

RCE reviewed GE's GHG assertion spreadsheets to ensure the accuracy of the formulas, emission factors applied, and functionality. GE applied the correct default values from the joint PD/MR and methodology to the equations in the assertion spreadsheet. RCE independently re-calculated each SSR. There were some transcription or transposition errors that were subsequently addressed through corrective action request (see Appendix B for details).

RCE reviewed truck scale calibrations to confirm that the equipment is appropriately maintained and measures data accurately. Specifically, RCE sampled calibrations and confirmed that they were accurate according to industry standards that met NIST Handbook 44 and were calibrated every 6 months.

After GE made corrections to the GHG statement, RCE compared its calculation to the total emission reductions stated in the final joint PD/MR. The final statement in the joint PD/MR is materially correct.

The table below lists a description for how each data and parameter used to calculate the GHG emission reductions was reviewed.

| Data and Parameter | Accuracy GHG emission reductions and removals, including accuracy of spreadsheet formulae, conversions and aggregations, and consistent use of the data and parameters | Methods and formulae set out in the project description for calculation baseline emissions, project emissions and leakage have been followed | The appropriateness of any default values used in the monitoring report |
|--------------------|---|--|--|
| EF _M | Confirmed appropriate default value for each material from VM0039 was used to quantify project FSB/Asphalt emission intensity and that spreadsheet formula to quantify this parameter was mathematically correct. | RCE confirmed the project proponent used the values listed in the joint PD/MR and followed equation 2 from VM0039. | Confirmed that the correct default values from VM0039 were appropriate for each material type used in the project. |
| EF _T | Confirmed appropriate default value for trucks from VM0039 was used to quantify emission intensity of to-plant or to-job site emissions and that spreadsheet formula to quantify this parameter was mathematically correct. | RCE confirmed the project proponent used the default value of 10.2 listed in the joint PD/MR and followed equation 3 from VM0039. | Confirmed that the correct default values from VM0039 were appropriate for equipment used. |
| EF _{EQ} | Confirmed appropriate default value for each equipment type listed in Appendix B of VM0039 was used to quantify emission intensity of in-plant production and pavement installation emissions and that spreadsheet formula to quantify this parameter was mathematically correct. | RCE confirmed the project proponent used the default values from Appendix B of VM0039 and followed equations 5 & 8 from VM0039. | Confirmed that the correct default values from Appendix B in VM0039 were appropriate for equipment used. |
| DF | Confirmed appropriate default value from VM0039 was used to quantify emission intensity of to-plant or to-job site emissions and that spreadsheet formula to quantify this parameter was mathematically correct. | RCE confirmed the project proponent used the default discount factor of 0.1 listed in the joint PD/MR and followed equation 3 from VM0039. | Confirmed that the correct discount factor from VM0039 was appropriate for equipment used. |
| W _M | Confirmed asphalt mix designs for each segment of the project and multiplied the fraction of materials by the total weight of total asphalt laid as part of the project activity to calculate emission intensity. | RCE confirmed the project proponent used the values listed in the joint PD/MR and followed equation 2 from VM0039. | Confirmed that the correct values of material were appropriate for relevant calculations. |

| | | | |
|---|--|---|--|
| Distance _P & Distance _s | Confirmed mapping distance from asphalt plants and raw material aggregators to job site were correct and the appropriate discount factor was applied for using web-based mapping programs. | RCE confirmed the project proponent used the values listed in the joint PD/MR and followed equation 2 from VM0039. | Confirmed that the correct distances were appropriate for relevant calculations. |
| Project amount | Confirmed asphalt mix designs for each segment of the project and multiplied the fraction of materials by the total weight of total asphalt laid as part of the project activity to calculate emission intensity. | RCE confirmed the project proponent used the values listed in the joint PD/MR and followed equation 2 from VM0039. | Confirmed that the correct values of material were appropriate for relevant calculations. |
| HR _{EQ} | Confirmed job hours based on contractor reports was used to quantify emission intensity of in-plant production and pavement installation emissions and that spreadsheet formula to quantify this parameter was mathematically correct. | RCE confirmed the project proponent used correct labor hours and followed equations 5 & 8 from VM0039. | Confirmed that the correct default values from Appendix B in VM0039 were appropriate for equipment used. |
| DE | Confirmed appropriate default value for density of FSB or asphalt emulsions were used to calculated total project material. | RCE confirmed the project proponent used the default value of 130 listed in the joint PD/MR and followed equation 2 from VM0039. | Confirmed that the correct default value from VM0039 was appropriate for the density of FSB/asphalt emulsions. |
| LC | Confirmed appropriate default value of layer coefficient of FSB or asphalt emulsions were used to calculated total project material. | RCE confirmed the project proponent used the default value of 0.32 listed in the joint PD/MR and followed equation 2 from VM0039. | Confirmed that the correct default value from the VDOT engineering documents was appropriate for the layer coefficient of FSB/asphalt emulsions. |
| L | Confirmed appropriate value of road dimensions used to calculated total project material. | RCE confirmed the project proponent used the VDOT engineering dimensions and followed equation 2 from VM0039. | Confirmed that the correct values from the VDOT engineering documents were appropriate for calculating road dimensions. |

RCE concludes the Project GHG emission reductions and removals have been quantified correctly in accordance with VM0039 and the joint PD/MR.

4.2 Quality of Evidence to Determine GHG Emission Reductions and Removals

RCE reviewed the records/documents listed in Appendix A in order to confirm the accuracy of monitored parameters. RCE included screenshots of calculation cross-checks in section 3.4.6. The Project Proponent provided adequate documentation for the emission reduction calculations as well as its information control systems and data management processes. RCE reviewed the Project's joint PD/MR, applicable measured data, and all emission reduction calculations. RCE confirmed that the joint PD/MR contained enough information for a reader to reproduce the emission reduction calculations.

Baseline emissions are calculated by multiplying the VM0039 performance standard values (Table 2 in the methodology) by the total amount of material used in each road construction segment (CCPR and FDR). The total material used in the road construction for the CCPR segments was based on truck scale tickets collected by the contractor. RCE reviewed the total asphalt output from the Allen Myers plant measured by truck scales during each CCPR segment construction. For FDR, the total asphalt material was calculated by multiplying the road dimensions by the default density for FSB/asphalt emulsions of 130 lbs./cu ft and default layer coefficient of 0.32. The total material output multiplied by the performance standard is the baseline emissions.

Project emissions are calculated by aggregating the actual emissions from carrying out the project activity including emission intensity of raw material production, to-site delivery, in-plant project and pavement installation.

RCE re-calculated the emissions intensity of raw material production by multiplying the total project material (as described above in the second paragraph of this section) by Allen Myers asphalt mix design percentages for cement, bitumen, and manufactured aggregates (other materials were either not included in these project instances or had an emissions intensity of 0 [i.e., water]).

RCE re-calculated emissions from to-site delivery by multiplying the truck emission factor default value (10.2 kg CO₂e/mile) by the total round-trip mileage from the asphalt plant to the jobsite and number of trips. The in-plant and pavement installation project emission intensity was re-calculated by multiplying the default equipment emission factors from Appendix B by the total number of work hours (estimated by the contractor) for each project segment.

GE implemented the monitoring plan described in the PD during the monitoring period. The Project Proponent obtained, recorded and compiled all required monitored data and parameters according to the schedule described in the monitoring plan. There were no data gaps or missing data during the monitoring period. There were no material discrepancies between the monitoring system and the monitoring plan described in the joint PD/MR or between VM0039.

RCE reviewed the Project's sustainable development goals (SDG) and confirmed contributions listed in section 1.17 of the joint PD/MR. RCE verified that the Project has been implemented as described in the Project Description and confirmed that the Project meets the requirements of the VCS Standard.

RCE interviewed GE staff members, and reviewed data collection processes and operational systems used to collect and report data. RCE found the systems employed result in adequate data collection and presentation with reliable controls. Quality assurance activities are present through data review techniques conducted by GE personnel. RCE confirmed the Project's management and staff to be

qualified and competent and determined that the GHG management system is sufficient to generate accurate and reliable data.

RCE concludes the Project data used to determine the GHG reductions to be of sufficient quantity and appropriateness of quality in all instances.

5 VALIDATION AND VERIFICATION CONCLUSION

The scope of the validation and verification included the Project activities to repair I-64 near Newport News, James City County, and York County in Virginia using FSB/Asphalt emulsions which are less GHG intensive than the baseline performance standard.

The goal of the project validation is to ensure that the project plan and GHG calculation methods are materially correct and meet the methodology requirements. The project meets the eligibility requirements of the VCS program and VM0039, and the planned project could reasonably be expected to achieve the claimed emission reductions.

RCE confirms that the validation was performed in accordance with the VCS Program Guide, Version 4.2, and VCS Standard, Version 4.4 in addition to VM0039 Methodology for Use of Foam Stabilized Base and Emulsion Asphalt Mixtures in Pavement Application. The Project Activity will result in a reduction of GHG emissions using a less-intensive GHG technology employed for road construction as compared to the baseline performance standard listed in VM0039. GE provided the verification team with data that is relevant, complete, consistent, accurate, transparent, and conservative.

Upon completion of the crediting period validation process RCE concludes that all relevant VCS validation criteria have been satisfied and the Project Activity properly applies the criteria of VM0039. RCE concludes that the baseline is valid and that the emission reductions attributable to the Project Activity are additional to any emission reductions that would occur in the absence of the Project.

Estimated Annual GHG Emission Reductions for Project Crediting Period

| Year | Estimated GHG emission reductions or removals (tCO _{2e}) |
|--|--|
| 2018 (17-April-2018 - 31-Decmeber-2018) | 9,181 |
| 2019 (01-January-2019 - 31-December-2019) | 2,390 |
| 2020 (01-January-2020 - 31-December-2020) | 3,581 |

| | |
|--|---------------|
| 2021 (01-January-2021 – 13-September-2021) | 2,638 |
| 2021 (14-September-2021 – 31-December-2021) | 0 |
| 2022 (01-January-2022 – 31-December-2022) | 0 |
| 2023 (01-January-2023 – 31-December-2023) | 0 |
| 2024 (01-January-2024 – 31-December-2024) | 10,500 |
| 2025 (01-January-2025 – 31-December-2025) | 12,500 |
| 2026 (01-January-2026 – 31-December-2026) | 15,000 |
| 2027 (01-January-2027 – 31-December-2027) | 18,000 |
| 2028 (01-January-2027 – 16-April-2028) | 0 |
| Total estimated ERs | 73,790 |
| Total number of crediting years | 10 |
| Average annual ERs | 7,379 |

All CARs, NMFs, ADRs, and CRs raised by RCE have been satisfactorily resolved by the Project Proponent. The ex-ante emission reductions from the Project Activity are estimated to be 73,790 tonnes of CO_{2e} over a 10-year crediting period from 17 April 2018 to 16 April 2028, resulting in an average of 7,379 tonnes of CO_{2e} annually throughout the crediting period. RCE considers it likely that the estimated quantity of

emission reductions may be achieved by the Project Activity should the assumptions and operational conditions remain the same including expansion of the project activity subsequent to project validation.

The goal of the verification is to ensure that the GHG assertion is materially correct, that the data provided to RCE can be documented and if errors or omissions are detected, they be corrected by the Project Proponent. The data and information supporting the GHG assertion were historical in nature.

RCE conducted a risk-based analysis of the Reducing Carbon Emissions on I-64 Capacity Improvement Project with the use of FSB and Emulsion Asphalt Mixtures including a strategic review of the Project data, documentation, and emission reduction calculations. RCE concludes to a reasonable level of assurance that the GHG assertion is free of material misstatement. The emission reductions resulting from the use of less GHG-intensive asphalt for the reporting period 17 April 2018 to 13 September 2021 can be considered in conformance with the following criteria:

- VCS Standard version 4.4 (23 January 2023);
- VM0039 Methodology for Use of Foam Stabilized Base and Emulsion Asphalt Mixtures in Pavement Application;
- Validated VCS Joint Project Description and Monitoring Report, 27 July 2023; and
- ISO 14064-3:2006 “Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions”

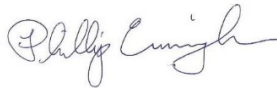
Verification period: From 17-April-2018 to 13-September-2021

Verified GHG emission reductions and removals in the above verification period (values in the table may not add up exactly due to rounding errors):

| Year | Baseline emissions or removals (tCO _{2e}) | Project emissions or removals (tCO _{2e}) | Leakage emissions (tCO _{2e}) | Net GHG emission reductions or removals (tCO _{2e}) |
|---|---|--|--|--|
| 2018 (17-April-2018 – 31-December-2018) | 22,905 | 13,724 | 0 | 9,181 |
| 2019 (1-January-2019 – 31-December-2019) | 5,378 | 2,988 | 0 | 2,390 |
| 2020 | 8,054 | 4,473 | 0 | 3,581 |

| | | | | |
|--|---------------|---------------|----------|---------------|
| (1-January-2020 – 31-December-2020) | | | | |
| 2021 (1-January-2021-13-September-2021) | 6,298 | 3,660 | 0 | 2,638 |
| Total | 42,635 | 24,845 | 0 | 17,790 |

Lead Validator/Verifier Signature



Phillip Cunningham

Senior Environmental Scientist

Independent Reviewer Signature



Bonny Crews

Senior Environmental Scientist

Estimated Ex-ante versus Achieved Emission Reduction Comparison

| Year | Ex-ante emissions reductions/removals | Achieved emissions reductions/removals | Percent difference | Justification for the difference |
|--|---------------------------------------|--|--------------------|----------------------------------|
| 2018 (17-April-2018 – 31-December-2018) | 9,181 | 9,181 | 0 | N/A |
| 2019 | 2,390 | 2,390 | 0 | N/A |

| | | | | |
|--|--------|--------|---|-----|
| (1-January-2019 - 31-December- 2019) | | | | |
| 2020 (1-January-2020 - 31-December- 2020) | 3,581 | 3,581 | 0 | N/A |
| 2021 (1-January-2021- 13-September- 2021) | 2,638 | 2,638 | 0 | N/A |
| Total | 17,790 | 17,790 | 0 | N/A |

APPENDIX A: DOCUMENTS REVIEWED

1. I-64 Segment II - Video and Photos from VDOT (002).pdf
2. eGRID SRVC.png
3. Equipment and delivery distance.pdf
4. 00_Appendix A_Compiled_11-2023.pdf
5. VCS_Roadway_ValidationVerificationReport_V2-0_PRR Response 101223 (1).pdf
6. VCS_RV1_PRR_3094_15NOV2023_GE Input_v1.docx
7. VCS_R1_PRR_3616_31 August 2023_101223.docx
8. 00_Appendix A_Compiled_12-2023.pdf
9. I-64-Segment 2 & 3-joint-PDMR-v4.2-final_v7-R&I-clean.docx
10. I-64-Segment 2 & 3-joint-PDMR-v4.2-final_v7-R&I-track.docx
11. I-64-Segment 2 & 3-joint-PDMR-v4.2-final_v7-R&I-clean.pdf
12. 2018 - 2028_Crediting Period Forecasting Estimate_GE.xlsx
13. 2023-07-27_I-64 Segment 2 & 3-joint-PDMR-v4.2-final_v6.pdf
14. 2023-07-14_I-64 Segment 2 & 3-joint-PDMR-v4.2-final_v6.pdf
15. 2023-07-14_I-64 Segment 2 3-joint-PDMR-v4.2-final_v6.docx
16. Truck Scale Calibration Records_New Kent Plant.pdf
17. Straughan Env - LoF 2.0_GE Responses.xlsx
18. Wirtgen KMA220-Mobile Cold Recycler_Tech Manual.pdf
19. Cat 1055 Paver_Tech Specs.pdf
20. CAT 973 Track Loader_Tech Specs.pdf
21. Cat 952 Loader_Tech Specs.pdf
22. I-64 - Final EIS December 2013.pdf
23. VA DOT- VTRC - CCPR and FDR Ongoing Research.pdf
24. I-64 - Final EIS Appendices December 2013.pdf
25. Emission Reduction Sales and Service Agreement - Fully Executed 7 12 21.pdf
26. I-64 Segment 3 - CCPR Emission Calculations_GE.xlsx
27. I-64 Segment 3 - FDR Emission Calculations_GE.xlsx
28. nonroad-compression-ignition-2011-present (EPA Dataset).xlsx
29. Emission Factor Deviation Summary_GE.xlsx
30. I-64 Segment 2 - CCPR Emission Calculations_GE.xlsx
31. I-64 Segment 2 - FDR Emission Calculations_GE.xlsx
32. I-64 Segment 2 & 3 - Emission Reductions Summary_GE.xlsx
33. 2023-06-11_Appendix A_Compiled_Highlights.pdf
34. 2023-06-11_I-64-Segment 2 & 3-joint-PDMR-v4.2-final_v6.pdf
35. _Appendix A Combined.pdf
36. v3_I-64-Section 2-Joint-Project-Description-Monitoring-Report-Sept 20 2022.pdf
37. V2_DRAFT_I-64-Section 2-Joint-Project-Description-Monitoring-Report-July 25 2022-clean.pdf
38. v4_I-64-Section 2-Joint-Project-Description-Monitoring-Report-Jan 13 2023.pdf
39. 00_Appendix A_Compiled.pdf
40. 00_Appendix A_Compiled_Highlights.pdf

41. I-64-Segment 2-Joint-Project-Description-Monitoring-Report v5.pdf
42. Straughan Env - LoF 1.0_GE Responses.xlsx
43. I-64 Segment 2 - CCPR Emission Calculations_SEI_KT Edits.xlsx
44. I-64 Segment 2 - FDR Emission Calculations_SEI_KT Edits.xlsx
45. I-64 Segment 3 - CCPR Emission Calculations_SEI_KT Edits.xlsx
46. I-64 Segment 2 _ 3 - Emission Reductions Summary_SEI_KT Edits.xlsx
47. I-64 Segment 2 & 3 - Emission Reductions Summary_SEI_KT Edits.xlsx
48. Declaration of Agency & Communications Agreement.pdf
49. Exemption Letter_3094_17Aug2022.pdf
50. VM0039-Methodology-for-Use-of-FSB-in-Pavement-Application-v1.0.pdf
51. DOC031722-03172022125535.pdf
52. CCPRM Tickets_Segment III.xlsx
53. I-64 Segment 3 - CCPR Emission Calculations_SEI.xlsx
54. I-64 Segment 3 - FDR Emission Calculations_SEI.xlsx
55. I-64 Segment 2 - FDR Emission Calculations_SEI.xlsx
56. CCPRM Tickets_Segment II.xlsx
57. I-64 Segment 2 - CCPR Emission Calculations_SEI.xlsx
58. Truck Calibration Reports

APPENDIX B: RESOLUTION OF VALIDATION & VERIFICATION FINDINGS

| Correction Action Request (CAR), Non-Resolving Finding (NRF), Additional Documentation Request (ADR), or Clarification Request (CR) | Ending and Date | Section of Project Methodology or Program Document | Project Developer Response and Date | RCR response and Date | Additional Project Developer Response and Date | Additional VCS Response and Date | Open or Closed |
|---|---|--|--|-----------------------|---|----------------------------------|----------------|
| CAR 1 | 01/10/2024 Please refer to the CAR1 (P1 & M1) Findings for these findings. | Project Description Introduction | V1/2024 The Project Description corrected all items. | V1/2024 Closed | | | Closed |
| CAR 2 | 01/10/2024 Please update calculations with updated material percentages. | W002B, Section 7, Equation 3 | The reviewer requested for ISB and CCR emission calculations are corrected based on updated data in section 7 of the Methodology. The specific issues were found related to Section 7 of the Methodology, or nothing has been changed. | V1/2024 Closed | V1/2024 The file is 04 September 2 - CCR Emission Calculations_02_07.xlsx and the Variables tab in the 04 September 2 - CCR Emission Calculations_02_07.xlsx and the Variables tab in the 04 September 2 - CCR Emission Calculations_02_07.xlsx. The reviewer requested for ISB and CCR emission calculations are corrected based on updated data in section 7 of the Methodology, or nothing has been changed. | V1/2024 Closed | Closed |
| CAR 3 | 01/10/2024 The spreadsheet '04 September 2 - CCR Emission Calculations_02_07.xlsx' will be on the Appendix A - ISB tab in the CCR Part 2 - CCR Emission Calculations_02_07.xlsx. The reviewer requested for ISB and CCR emission calculations are corrected based on updated data in section 7 of the Methodology, or nothing has been changed. | W002B, Appendix A | V1/2024 The spreadsheet '04 September 2 - CCR Emission Calculations_02_07.xlsx' will be on the Appendix A - ISB tab in the CCR Part 2 - CCR Emission Calculations_02_07.xlsx. The reviewer requested for ISB and CCR emission calculations are corrected based on updated data in section 7 of the Methodology, or nothing has been changed. | V1/2024 Closed | V1/2024 The spreadsheet '04 September 2 - CCR Emission Calculations_02_07.xlsx' will be on the Appendix A - ISB tab in the CCR Part 2 - CCR Emission Calculations_02_07.xlsx. The reviewer requested for ISB and CCR emission calculations are corrected based on updated data in section 7 of the Methodology, or nothing has been changed. | V1/2024 Closed | Closed |
| CAR 4 | 01/10/2024 The spreadsheet '04 September 2 - CCR Emission Calculations_02_07.xlsx' will be on the Appendix A - ISB tab in the CCR Part 2 - CCR Emission Calculations_02_07.xlsx. The reviewer requested for ISB and CCR emission calculations are corrected based on updated data in section 7 of the Methodology, or nothing has been changed. | W002B, Section 7, Equation 7 | V1/2024 The spreadsheet '04 September 2 - CCR Emission Calculations_02_07.xlsx' will be on the Appendix A - ISB tab in the CCR Part 2 - CCR Emission Calculations_02_07.xlsx. The reviewer requested for ISB and CCR emission calculations are corrected based on updated data in section 7 of the Methodology, or nothing has been changed. | V1/2024 Closed | V1/2024 The spreadsheet '04 September 2 - CCR Emission Calculations_02_07.xlsx' will be on the Appendix A - ISB tab in the CCR Part 2 - CCR Emission Calculations_02_07.xlsx. The reviewer requested for ISB and CCR emission calculations are corrected based on updated data in section 7 of the Methodology, or nothing has been changed. | V1/2024 Closed | Closed |
| IMF 1 | 01/10/2024 Please provide evidence of the project start and end date. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| IMF 2 | 01/10/2024 Please provide evidence of the project start and end date. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| ADR 1 | 01/10/2024 Please provide evidence of the project start and end date. | VCS Standard v4.1, Section 3 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| ADR 2 | 01/10/2024 Please provide evidence of the project start and end date. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| ADR 3 | 01/10/2024 Please provide evidence of the project start and end date. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| ADR 4 | 01/10/2024 Please provide evidence of the project start and end date. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| ADR 5 | 01/10/2024 Please provide evidence of the project start and end date. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| ADR 6 | 01/10/2024 Please provide evidence of the project start and end date. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| ADR 7 | 01/10/2024 Please provide evidence of the project start and end date. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| ADR 8 | 01/10/2024 Please provide evidence of the project start and end date. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| ADR 9 | 01/10/2024 Please provide evidence of the project start and end date. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| ADR 10 | 01/10/2024 Please provide evidence of the project start and end date. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| ADR 11 | 01/10/2024 Please provide evidence of the project start and end date. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| CR 1 | 01/10/2024 Why are the total height values for CCR different from DGP A even though they both being applied to the same roadway? They are different for both 3 and 2 mg/L. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| CR 2 | 01/10/2024 Why are the total height values for CCR different from DGP A even though they both being applied to the same roadway? They are different for both 3 and 2 mg/L. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| CR 3 | 01/10/2024 Why are the total height values for CCR different from DGP A even though they both being applied to the same roadway? They are different for both 3 and 2 mg/L. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| CR 4 | 01/10/2024 Why are the total height values for CCR different from DGP A even though they both being applied to the same roadway? They are different for both 3 and 2 mg/L. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |
| CR 5 | 01/10/2024 Why are the total height values for CCR different from DGP A even though they both being applied to the same roadway? They are different for both 3 and 2 mg/L. | W002B, Section 7 | The VCS project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. The project start and end date is 01/10/2024 to 31/12/2024. | V1/2024 Closed | | | Closed |

| # | Regarding the Project Description (findings are based on instructions in the template) | Project Developer Response | Open / Closed |
|-----|--|--|---------------|
| 1 | Section 1.1: Final paragraph, "10,0705". Check comma placement. | In Section 1.1, the estimated average annual emission reduction is stated as 19,0705 tonnes (MT) of CO2 was from the original POMR sent to Ruby Canyon on 10/10/22. A revised POMR including Segments 2 and 3 was sent to Ruby Canyon on 11/13/23. The correct number for the estimated average annual emission reduction for both Segments is 18,090.32. | Closed |
| 2 | Section 1.10 is missing the table for estimated GHG reductions per year. | The "Estimated GHG Emission Reductions or Removals" table has been added to Section 1.10. | Closed |
| 3 | Section 1.16.2: This section is for stating if the project has received or has tried to receive other environmental credits. | Section 1.16.2 has been revised to state that the project has not received or tried to receive other environmental credits. | Closed |
| 4 | Section 2.2: first paragraph "use of recycled asphalt reclaimed asphalt pavement". Is this supposed to read "use of recycled asphalt pavement" or "use of reclaimed asphalt pavement"? | Section 2.2 paragraph one has been revised to "use of recycled asphalt pavement." Please note we ensured that "Recycled Asphalt Pavement" or "RAP" is used consistently throughout the document. | Closed |
| 5 | Section 3.3 table 1: why doesn't FDR have installation emissions? | An "Installation" section has been added to the FDR section of "Table 1: GHG Sources Included in Baseline and Project Scenario" in Section 3.3. | Closed |
| 6 | Section 4.4.3: In the text, it states that layer 1 generated 6,040.36 MTCO2 and that layer 2 generated 11,004.93 MTCO2. However, in the equations, layer 1 generated 3,740.92 and layer 2 generated 10,890.70. Why are the ERs from Segment 3 not included? | The ERs for Layer 1 - CCRP and Layer 2 - FDR in the first paragraph of Section 4.4.3 have been updated. It appears these number were remnants from the Vera Pipeline Upload of the POMR. The equations below paragraph 1 remain the correct ERs, therefore no changes to the equations or the calculations for Segment 2 were made. Why the ERs from Segment 3 are not included: Clarifying language has been added at the beginning of Section 4.2 explaining that Segment 2 is used as an example calculation. Segment 3 is added to the totals in Section 6 to provide the final calculations for the first project instance (1-64 Segments 2 and 3). | Closed |
| 7 | The instructions from the template for Section 1.1 state, "A summary description of the technologies/measures to be implemented by the project." Please update this section to include asphalt emulsions, CCRP, FDR, CIR and describe these processes and acronyms. | 6/6/2023 - Section 1.1 has been revised to define and explain the processes and acronyms of the technologies implemented on the project. | Closed |
| 8 | Section 1.3 Eligibility does not include all VCS eligible items (the items listed are for VM0039 only). The instructions state, "Describe and justify how the project is eligible under the scope of the VCS Program." | 6/6/2023 - Section 1.3 has been revised to expand on the project eligibility as it relates to the VCS program requirement. | Closed |
| 9 | Section 1.4 does not list all items that the VCS Standard requires when describing grouped projects. The instructions state: "The grouped projects, provide additional information relevant to the design of the grouped project (e.g., the eligibility criteria for the inclusion of new project activity instances). Specifically: 1) Be subject to the baseline scenario determined in the project description for the specified project activity and geographic area. 2) Be validated at the time of verification against the applicable set of eligibility criteria. 3) Have a start date that is the same as or later than the grouped project start date. 4) Be eligible for crediting from the start date of the instance through to the end of the project crediting period (only). Note that where a new project activity instance starts in a previous verification period, no credit may be sought for GHG emission reductions or removals generated during a previous verification period (as set out in Section 3.4.4) and new instances are eligible for crediting from the start of the next verification period." | 6/6/2023 - Section 1.4 has been revised to include all eligibility criteria applicable to grouped projects. | Closed |
| 10 | Under section 1.5 Project Proponent, Harold Green is listed as the contact. However, on the cover page, Diana Gutierrez is listed as the contact. Consider updating on these sections for consistency. | 6/6/2023 - Diana has been removed from the cover page of the document and replaced by Ben Devine. Ben Devine, an employee of Global Emissionary, will serve as the primary contact with Vera. Harold, as CEO of Global Emissionary will remain as the project proponent. | Closed |
| 11 | Under section 1.6 Other Entities Involved in the Project, no phone number is listed for Jim Peacock. | 6/6/2023 - Jim Peacock's phone number has been added. | Closed |
| 12 | Under section 1.9 Project Start Date, the crediting period listed is not 10 years. Also, if you are choosing a fixed 10 year crediting period, the wording needs updated (currently you list this as the Project's 1st crediting period). | 6/6/2023 - The crediting period end date has been revised along with the terminology for 10 years fixed. | Closed |
| 13 | Under section 1.10 Project Scale and Estimated GHG Emission Reductions or Removals, the instructions state, "...when completing a draft project description, otherwise, delete this text...in all other cases, indicate the scale of the project..." Please update the PD to delete irrelevant text. | 6/6/2023 - The irrelevant text has been deleted. | Closed |
| 14 | Regarding the table estimating GHG emission reductions or removals, what are these values based on? | 6/6/2023 - These are estimated values assuming we are able to expand our operations and encourage the use of sustainable paving processes. | Closed |
| 15 | Under section 1.11 Description of the Project Activity, the following instructions / requirements have not been met specifically the instructions for non-ARCCU projects: 1. Include a list and the arrangement of the main manufacturing/production technologies, systems and equipment involved. 2. Include in the description information about the age and average lifetime of the equipment based on manufacturer's specifications and industry standards, and existing and forecast installed capacities, load factors and efficiencies. 3. Clearly explain how the same types and levels of services provided by the project would have been provided in the baseline scenario. 4. Where appropriate, provide a list of facilities, systems and equipment in operation under the existing scenario prior to the implementation of the project. | 6/6/2023 - Section 1.11 has been revised to meet the requirements of the POMR v4.2 template. | Closed |
| 16 | Under section 1.12 Project Location, the instructions state, "Indicate the project location and geographic boundaries (if applicable) including a set of geodetic coordinates." | 6/6/2023 - Geodetic coordinates have been added to section 1.12. | Closed |
| 17 | Under section 1.13 Conditions Prior to Project Initiation, the instructions state, "Describe the conditions existing prior to project initiation and demonstrate that the project has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal, or destruction." Information addressing this requirement is missing. | 6/6/2023 - Section 1.13 has been revised in it's entirety to justify that the project was not implemented for the purpose of subsequent reduction, removal, or destruction. | Closed |
| 18 | See the most recent Vera template, there is an entire section (1.17 Sustainable Development Contributions) missing from the Project Description. | 6/6/2023 - Section 1.17 has been added to the POMR per the template requirements. | Closed |
| 18a | The template instructions state, "Describe how the project contributes to achieving any nationally stated sustainable development priorities, including any provisions for monitoring and reporting same." | 7/19/2023 - The Project Proponent updated this section to meet the template requirements. | Closed |
| 18b | Refer to the template instructions in Section 1.17.2 Sustainable Development Contributions Activity Monitoring. Many of the instructions have not been addressed or completed. | 7/19/2023 - The Project Proponent updated this section to meet the template requirements. | Closed |
| 19 | Regarding section 2.2 Local Stakeholder Consultation, the instructions state (first bullet point in the most recent Vera template to "Include details on the following: (i.e., dates of announcements or meeting, periods during which input was sought)". Please update the PD to include dates of activities. | 6/6/2023 - The dates of the public hearings and open comment timeframes were added to section 2.2. | Closed |
| 20 | Regarding section 2.2 Local Stakeholder Consultation, the instructions state, "Include details on any updates to the project design or justify why updates are not appropriate". Please update the PD to include any necessary justification. | 6/6/2023 - Paragraph 4 of section 2.2 was revised to provide justification to not project design changes. | Closed |
| 21 | Regarding section 3.2 Applicability of Methodology, the PD lists the applicability conditions but does not describe how the project meets each of the applicability conditions listed in the methodology. | 6/6/2023 - Section 3.2 was revised to detail how each criterion was met. | Closed |
| 22 | Regarding section 3.3 Project Boundary, the instructions state to, "Define the project boundary and identify the relevant GHG sources, sinks and reservoirs for the project and baseline scenario...". Table 1 does not list all SRRs including a justification as to why they are excluded. Also, the second half of the table has a horizontal title that says "Project (HMA)" which is confusing (HMA is the baseline scenario and this implies that HMA was also used in the Project). | 6/6/2023 - The table in Section 3.3 has been renamed to Table 5 and was revised to include all SRRs defined under the VM0039 and to clarify that GHGs other than CO2 are excluded from reductions under the current methodology. | Closed |
| 23 | Regarding section 3.3 Project Boundary, the instructions under the table state, "For non-ARCCU projects, include in the diagram the equipment, systems and flows of mass and energy. Include the GHG emission sources identified in the project boundary". Please update this section to meet this requirement. | 6/6/2023 - A reference to the process diagrams in Section 1.11 was added to this section. | Closed |
| 24 | Regarding section 3.5 Additionality, the instructions state, "Where a performance method is applied to demonstrate additionality, demonstrate that performance can be achieved to a level at least equivalent to the performance benchmark metric." Also, "Provide sufficient information (including all relevant data and parameters, with sources) so that a reader can reproduce the additionality analysis and obtain the same results." Please update this section to meet the requirements of the template instructions. | 6/6/2023 - This section has been revised to provide a comparison of project emission intensity to the performance benchmark to prove that there are resulting emission reductions. All relevant data, parameters, and formulas are defined in the POMR Calculations/Appendix A. | Closed |
| 25 | See the most recent Vera template, there is an entire section (4 Implementation Status) missing from the Project Description. | 6/6/2023 - Section 4 was added to the POMR which now uses the latest template. | Closed |
| 26 | Regarding section 5.1 Baseline Emissions (4.1 in the PD), the instructions state, "Include all relevant equations, and explain and justify all relevant methodological choices (e.g., with respect to selection of emission factors and default values)". The equations for baseline emissions are not included in the PD. | 6/6/2023 - Section 5.1 has been revised to include equations for the baseline emission calculations. References to all emission factors and default values are provided. | Closed |
| 27 | Regarding section 4.4 Estimated Net GHG Emission Reductions and Removals, the instructions state, "Document how each equation is applied, in a manner that enables the reader to reproduce the calculation. Provide example calculations for all key equations, to allow the reader to reproduce the calculation of estimated net GHG emission reductions or removals." The baseline equations are missing. | 6/6/2023 - Section 5.4 (of the revised POMR) uses the emission reduction equations exactly as they are defined in the methodology. Please refer to VM0039 Section 7.4. The VM0039 uses a performance benchmark (Crediting Baseline) and subjects out the project emission intensity to calculate the net reduction. | Closed |