Watershed Nature-Based and Green Infrastructure Activities Avoiding Emissions from Water Management Gray Infrastructure Construction and Operations Methodology v1.0

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Version: 1.0
Last updated: June 1, 2023
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1. Methodology Overview

This *Methodology* can be used by *Project Proponents* to reduce nonpoint source pollution of watersheds, thereby avoiding greenhouse gas emissions from electricity use, consumables, and infrastructure construction through reduced energy demand associated with downstream drinking water, wastewater, and stormwater management and treatment. This methodology creates a standardized approach to quantify and verify the emission reduction benefits of green infrastructure projects that improve water quality. The methodology will quantify the reduction in GHG emissions associated with avoided energy and material use from the upgrading or new construction of water quality treatment facilities. An outline of the methodology structure is shown in the following figure.

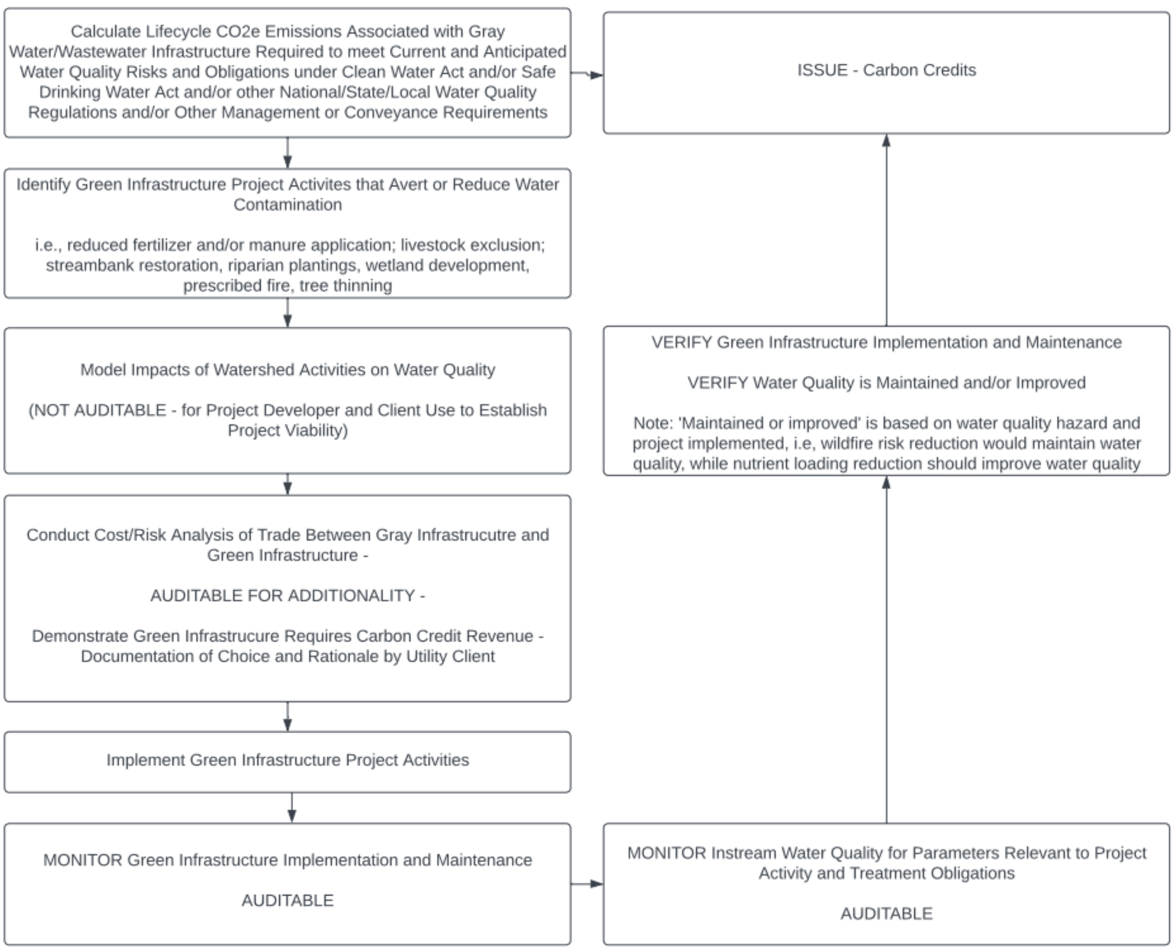

Figure 1: Methodology Overview

1.1. Scope

The methodology directs Project Proponents through the calculation of the GHG emissions avoided through the implementation of a green infrastructure program in a watershed, including the estimation of avoided energy and material use from the upgrading of water quality treatment facilities. The methodology also provides guidance on green infrastructure projects implemented in a watershed that improve water quality. The methodology includes a detailed description of the project activities, including the selection criteria for project sites, the design and implementation of projects, and the maintenance and monitoring of projects over time.

1.2. Applicability

This methodology is applicable to green infrastructure projects implemented in any watershed, provided that the project meets the eligibility criteria outlined in the methodology. The methodology is applicable to new or existing programs, provided additionality is demonstrated, and can be used by project proponents seeking to develop carbon offset projects or to claim emission reduction benefits for their green infrastructure projects. The methodology is designed to align with international standards for carbon accounting and verification.

This methodology is applicable under the following conditions:

1. A water utility or other entity is required or otherwise motivated to improve water quality and is considering infrastructural upgrades that increase the energy and material use and associated emissions of the facility. Facility construction or upgrades are referred to as 'gray infrastructure' in this methodology.
2. Watershed projects that improve regional water quality or resiliency are a viable alternative for compliance, pre-treatment or risk avoidance. Watershed projects are referred to as 'green infrastructure' in this methodology.
3. The water entity attests in writing that the anticipated carbon revenue enables green infrastructure water quality solutions that:
    a. enable pre-permit action, and/or
    b. provides a necessary performance risk-reduction incentive, and/or
    c. generate additional demonstrated benefits for existing programs.

1.3. Normative References

The methodology refers to the latest approved versions of the following tools:

A. Nutrient Tracking Tool: The Nutrient Tracking Tool (NTT) is a free, online, user-friendly decision-making tool that quantitatively estimates the nitrogen, phosphorus and sediment losses from crop, pasture, forest lands. NTT has been developed by the modeling team at Texas Institute for Applied Environmental Research (TIAER) at Tarleton State University in cooperation with USDA's Office of Environmental Markets, NRCS, and ARS for the last nine years.
B. APEX: APEX has components for routing water, sediment, nutrients, and pesticides across complex landscapes and channel systems to the watershed outlet as well as groundwater and reservoir components. A watershed can be subdivided as much as necessary to assure that each subarea is relatively homogeneous in terms of soil, land use, management, and weather. APEX was constructed to evaluate various land management strategies

considering sustainability, erosion (wind, sheet, and channel), economics, water supply and quality, soil quality, plant competition, weather, and pests. The routing of water, sediment, nutrient, and pesticide capabilities are some of the most comprehensive available in current landscape-scale models and can be simulated between subareas and channel systems within the model.

C. Shade-A-Lator: The Shade-a-lator model contained in HeatSource Version 8.0.8 (Shade-a-lator) is an approved metric for calculating Water Quality Temperature Credits in the Willamette Partnership's Ecosystem Credit Accounting System. Shade-a-lator was developed by Oregon's Department of Environmental Quality (DEQ) to calculate thermal load reductions (or shade potential), in kcal/day, from riparian shade restoration projects. The assessment's spatial unit is a stream reach whose upstream-downstream boundaries are defined by the user, and whose lateral boundaries extend outward and perpendicular to the stream to a distance also defined by the user, but typically not more than 150 feet (the usual size of recommended buffers).
D. COMET-Farm: COMET-Farm is a whole farm and ranch carbon and greenhouse gas accounting system. The tool guides users through farm and ranch management practice descriptions, including alternative future management scenarios. Once complete, a report is generated comparing the carbon changes and greenhouse gas emissions between current management practices and future scenarios.
E. Soil and Water Assessment Tool (SWAT): The Soil & Water Assessment Tool is a small watershed to river basin-scale model used to simulate the quality and quantity of surface and ground water and predict the environmental impact of land use, land management practices, and climate change. SWAT is widely used in assessing soil erosion prevention and control, non-point source pollution control and regional management in watersheds.
F. eGRID: The Emissions & Generation Resource Integrated Database (eGRID) is a comprehensive source of data from EPA's Clean Air Markets Division on the environmental characteristics of almost all electric power generated in the United States.The data includes emissions, emission rates, generation, heat input, resource mix, and many other attributes. eGRID is typically used for greenhouse gas registries and inventories, carbon footprints, consumer information disclosure, emission inventories and standards, power market changes, and avoided emission estimates.
G. TRACI 2.1: TRACI is an environmental impact assessment tool. It provides characterization factors for Life Cycle Impact Assessment (LCIA), industrial ecology, and sustainability metrics. Characterization factors quantify the potential impacts that inputs and releases have on specific impact categories in common equivalence units. Impact categories include ozone depletion, climate change, acidification, eutrophication, smog formation, human health impacts, and ecotoxicity.Resource uses of fossil fuels are also characterized.
H. Capdetworks: CapdetWorks is a tool for fast and accurate preliminary design and cost estimation of wastewater treatment plant construction projects. Eliminate cumbersome and time-consuming spreadsheet-based design algorithms. Simply drag-and-drop unit processes to build a plant schematic with CapdetWorks and it will design the plant and estimate the costs to build, operate and maintain the facility. By quickly and easily building multiple treatment alternatives to compare relative costs, planning-level design and

costing productivity improves dramatically, leading to better engineering decisions. CapdetWorks utilizes industry-accepted design algorithms to derive the required unit process designs. Sophisticated unit cost estimation techniques are used to size and cost all treatment processes.

l. ISO 14040: ISO 14040:2006 describes the principles and framework for life cycle assessment (LCA) including: definition of the goal and scope of the LCA, the life cycle inventory analysis (LCI) phase, the life cycle impact assessment (LCIA) phase, the life cycle interpretation phase, reporting and critical review of the LCA, limitations of the LCA, the relationship between the LCA phases, and conditions for use of value choices and optional elements.

1.4. Definitions

For the purpose of this methodology, the following definitions apply:

1. Additionality: In an environmental market, the benefit secured through the payment is deemed additional if it would not have been generated absent the payment provided by the market system. In the case of this methodology, additionality is demonstrated the water entity attests in writing that the anticipated carbon revenue enables green infrastructure water quality solutions that
    a. enable pre-permit action, and/or
    b. provides a necessary performance risk-reduction incentive, and/or
    c. generate additional demonstrated benefits to existing programs.
2. Best Management Practice (BMP): BMPs include, but are not limited to, nonstructural and structural controls, operation, and maintenance procedures that can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into waterways.
3. Baseline: The pollutant-specific discharge limits, BMP installation requirements, or both that must be met prior to generating credits for sale in a trading program.
4. Clean Water Act (CWA): The primary federal law in the United States governing water pollution, codified at 33 U.S.C. §§ 1251–1387.
5. Credit: A measured or estimated unit of pollutant reduction per unit of time at a specified location, as adjusted by discount factors, trading ratios, reserve requirements and baseline requirements. For this methodology, the word ‘credits’ will be used to describe the units of avoided GHG emissions. The units of environmental improvements in watershed programs will be labeled ‘benefits’, though for many programs there is likely to be terms like ‘water quality credit’ used when describing watershed program transactions.
6. Exceedance: The difference between a regulated facility’s actual discharge and its effluent limit.
7. Load Allocation (LA): The portion of a receiving water's assimilative capacity that is attributed to existing or future nonpoint sources of pollution or to natural background sources by a TMDL.
8. Nonpoint Source: Diffuse sources of water pollution, such as stormwater runoff, that do not originate from a single, discernible source and is largely unregulated by the CWA.

9. Point of Maximum Impact (POMI)/Point of Concern (PoC): The point at which the greatest deviations from a particular water quality standard occurs, as identified by watershed-wide modeling (usually in a TMDL).
10. Point Source: Any discernible, confined and discrete conveyance that discharges pollutants, as defined in 33 U.S.C. § 1362(14). Point sources are subject to federal or state regulation under the CWA.
11. Project Proponent - the project developer or land steward that is applying to register a project on the registry.
12. Project Developer - the individual or organization that is in charge of managing the project and is the main point of contact with Regen Registry. The Project Developer can be the land steward or a third party.
13. Total Maximum Daily Load (TMDL): The maximum amount of a pollutant a waterbody can receive and still meet applicable water quality standards (accounting for seasonal variations and a margin of safety), including an apportionment of the allowable pollutant loadings to point and nonpoint sources.
14. Trading Ratio: A numeric value used to adjust credit values in order to address various forms of risk and uncertainty and to ensure net environmental benefits from credit transactions.
15. Wasteload Allocation (WLA): The portion of a receiving water's loading capacity allocated to existing or future point sources of pollution.
16. Water Quality Standard (WQS): Provisions of state or federal law which comprise a designated use(s) of a waterbody and water quality criteria necessary to achieve and maintain those uses.
17. Life Cycle Assessment (LCA): Methodology used to evaluate the environmental impact of a process or product. The methodology can utilize standard published Life Cycle Inventory (LCI) data. This data quantifies the environmental impact of standard products or processes.

1.5. Co-Benefits

The main indicator assessed in the methodology is:

Carbon Emissions Avoided: Avoided future CO_2e emissions calculated by quantifying the multi-year energy and material use from:

1. reducing the use of existing infrastructure,
2. eliminating the need for new infrastructure, and/or
3. eliminating the need for upgrades or retrofits.

For energy this would be the corresponding energy savings multiplied by the average grams or tons CO_2e that exists and is projected to exist in the regional electricity grid for the life of the projected upgrade. For materials this would be the material-specific life cycle inventory data for CO_2e emissions.

Additional co-benefits that a project proponent may calculate and credit are:

1. Water Quality: This methodology is designed to use green infrastructure to improve water quality in watersheds. Project Proponents may directly measure these water quality benefits and quantify them separately when appropriate.
2. Soil Health and Carbon Sequestration: Green infrastructure practices, such as riparian revegetation and wetland creation, can help to improve soil health by increasing organic matter content, reducing soil erosion, and enhancing nutrient cycling. Healthier soils can lead to increased productivity and resilience of agricultural lands, which can provide additional economic benefits to the local communities.
3. Additional Benefits: Green infrastructure programs can provide a range of additional benefits to the local communities. These may include enhanced biodiversity and increased recreational opportunities. The program can also contribute to the creation of green jobs and the development of local economies.

By recognizing and promoting the co-benefits of the green infrastructure program, project proponents can increase the program's impact and promote a more holistic approach to sustainable development. The co-benefits can be monitored and reported alongside the avoided emissions of not upgrading water treatment infrastructure to provide a comprehensive picture of the program's impact.

2. Project Boundary

2.1. Spatial Boundaries

To ensure that the green infrastructure program is effective and can be accurately monitored and verified, project proponents must establish a clear project boundary. This boundary defines the area where the green infrastructure projects will be implemented and where environmental benefits will be claimed and monitored.

1. Geographic Scope: The project boundary should be defined based on the geographic scope of the green infrastructure program. This may include the entire watershed or specific sub-watersheds, depending on the program's objectives and resources. The project boundary will also include the water entity which may or may not be within a continuous boundary of the green infrastructure program.
2. Land Use: The project boundary should also consider the land use within the defined area. The program should prioritize green infrastructure projects in areas where they will have the most impact, such as areas with high erosion rates, degraded riparian areas, or areas with high nutrient loads.
3. Ownership: The program should also consider land ownership within the project boundary. Green infrastructure projects may be implemented on private or public land, and the program must establish clear guidelines for engaging with landowners and securing their participation in the program.
4. Exclusions: The program may also establish exclusions within the project boundary where green infrastructure projects will not be implemented, such as areas that are unsuitable for certain practices, areas with critical infrastructure or areas where other land use practices are prioritized.

By establishing a clear project boundary, project proponents can ensure that the program's impact is accurately monitored and verified.

2.2. Temporal Boundaries

The temporal boundaries of a green infrastructure program refer to the crediting term, which is the length of time for which a project plan is valid and can generate credits. Under this methodology, the crediting term is defined as the expected life of the avoided water treatment upgrade, which is the length of time that the green infrastructure program is expected to provide benefits that would otherwise require an upgrade to water treatment infrastructure.

1. Avoided System Life: The crediting term is established based on the expected life of the avoided water treatment system. This means that the program will generate credits based on the expected duration of the environmental benefits generated by the green infrastructure projects that would have otherwise required an upgrade to water treatment infrastructure.
2. The Project Initial Monitoring Date is the date when the project implementation is complete and acts as the starting date of the Crediting Term.
3. The minimum number of monitoring rounds is established in the Credit Verification and Release Schedule in the associated Credit Class document.
4. The end date of the Crediting term will correspond to the last milestone in the Credit Verification and Release Schedule in the associated Credit Class document.

3. Additionality

Green infrastructure programs designed to meet water quality obligations or goals, and thereby offsetting emissions associated with gray infrastructure, have variable and evolving effectiveness, costs, risks, and uncertainties. Further, the carbon credit revenue anticipated under this methodology is in most or all cases anticipated to be only a fractional contribution toward the project cost.

While green infrastructure is often more affordable than gray infrastructure, it is not in fact the preferred solution by most utilities because regulators are risk-adverse - the distributed, nature-based solutions cannot guarantee performance the same way established hardware technologies can. Given this risk adversity by regulators, utilities typically do not incur costs passed on to community rate-payers for programs that may not ultimately pass regulatory muster.

Under this methodology, the anticipated carbon revenues therefore provide the additional required facilitation to motivate installation of nature-based solutions, taking both performance and regulatory permit risk, and being rewarded only upon demonstration of implementation success and subsequent avoidance of gray infrastructure needs.

Therefore, under this methodology additionality is sufficiently established when the water entity attests in writing that the anticipated carbon revenue enables green infrastructure water quality solutions that:

A. enable pre-permit action, and/or

B. provides a necessary performance risk-reduction incentive, and/or
C. generate additional demonstrated benefits to existing programs.

4. Calculating Net GHG Reduction

4.1. Baseline Scenario Identification

4.1.1. Gray Infrastructure New Build Upgrade or Green Infrastructure Analysis

Completing a gray infrastructure new build or upgrade options analysis is an important step for project proponents to determine the feasibility of implementing traditional gray infrastructure new build or upgrades as compared to green infrastructure. Here are the steps that a project proponent should follow to complete an analysis of all options and determine the net environmental impact for each technology as well as the delta between options:

1. Identify the objectives of the project, including the specific parameters to be addressed, such as water quality, capacity, reliability, or regulatory compliance.
2. Conduct a site analysis to identify the existing conditions of the infrastructure, including age, condition, and capacity.
3. Explore potential alternatives to traditional gray infrastructure new build or upgrades, such as green infrastructure, demand management, water reuse, or other innovative solutions.
4. Generate an engineering process model that is representative of the systems that are identified as effective solutions. This includes a detailed energy and mass balance of the system during operation. This work needs to additionally include the upfront materials and energy required for the development of the treatment solution.
5. Conduct a life cycle assessment of each alternative to evaluate the environmental impacts associated with construction, operation, and disposal or decommissioning quantified through greenhouse gas accounting. The LCA uses the engineering process model as foundational inputs which is combined with life cycle inventory data.
6. Evaluate the feasibility of implementing each alternative, considering factors such as land availability, regulatory requirements, and community support.
7. Determine whether traditional gray infrastructure new build or upgrades would provide the greatest overall benefit in terms of cost, environmental impact (GHGs), and feasibility, or whether one or more alternative approaches would be a more effective solution.

4.1.2. Calculating Environmental Impact and Life Cycle Cost of Water Treatment

Calculating the environmental impact of gray infrastructure is an important step in determining the potential benefits of alternative approaches to traditional gray infrastructure new build or upgrades. Here are the steps that a project proponent should follow to calculate the environmental impact of gray infrastructure and green infrastructure:

1. Develop an Engineering process model: Determine the expected energy and material consumption associated with the proposed treatment technology, including the energy

and materials required for construction, operation, and maintenance. Apply the same accounting to all other proposed options including the green infrastructure.

2. Perform the Life Cycle assessment accounting: Calculate the expected greenhouse gas emissions associated with the energy and material consumption, using appropriate emission factors for the specific energy and materials used based on established life cycle inventory.
3. Compare the LCA GHG emissions of the proposed gray infrastructure new build or upgrades to alternative approaches, such as green infrastructure, demand management, water reuse, or other innovative solutions.
4. Consider the potential co-benefits of each approach, such as improved water quality, reduced water loss, or enhanced resilience to climate change.

By conducting a gray infrastructure new build or upgrade analysis and calculating the life cycle emissions of gray infrastructure, project proponents can make more informed decisions about the most effective and sustainable approach to addressing the identified objectives.

4.1.3. Goal and Scope Definition

In the context of calculating the environmental impact of gray infrastructure or green infrastructure, the Goal and Scope Definition phase would involve the following steps:

1. Defining the Goal: The first step is to clearly define the goal of the life cycle analysis (LCA). In this case, the goal is to compare the environmental impact of a gray infrastructure new build or upgrade to the environmental impact of a comparable green infrastructure project in order to make an informed decision on the most sustainable option for improving water quality in the watershed.
2. Establishing the Scope: The scope of the study should be established to ensure that all relevant processes and impacts are included in the analysis. This would involve identifying the system boundaries, which may include the entire gray infrastructure system, from the water treatment plant to the distribution network, and the associated energy and resource inputs and outputs. The system boundary must be consistent across all compared solutions and should only include the direct impacts and not indirect impacts.
3. Defining the Functional Unit: The functional unit is a quantifiable measure of the performance of the system being assessed. In this case, the functional unit would be defined as the amount of water treated and distributed through the gray infrastructure system or the equivalent amount of water treated and distributed through the green infrastructure system.
4. Identifying Impact Categories: The impact categories to be assessed should be identified to ensure that all relevant environmental impacts are considered. In this case, the impact category will be global warming potential on the metric of greenhouse gas emissions.
5. Specifying Data Requirements: The data requirements for the LCA should be specified to ensure that the study is based on accurate and relevant information. This may include data on energy and resource inputs and outputs, emissions, and waste for both the gray and green infrastructure options.

6. Establishing Assumptions: Finally, any assumptions made during the LCA study should be documented to ensure that they are transparent and can be verified. This may include assumptions about the expected life cycle of the gray infrastructure new build or upgrade, the maintenance requirements of the green infrastructure, and the expected energy and resource savings from the green infrastructure option.

By following these steps, the Goal and Scope Definition phase of the LCA study can ensure that the analysis is comprehensive, transparent, and scientifically rigorous, providing a solid foundation for the subsequent phases of the study.

4.1.4. Selection of the functional unit and system boundaries

The functional unit is the qualitative and quantitative aspect of the service performed by the system and is used to normalize data in the life cycle inventory (LCI) phase. The service performance of water and wastewater treatment plants is associated with the pollutant load removed, which is often legislated. While a volumetric-based functional unit is the most common, it ignores differences in water quality and potential dilution effects. Adopting a functional unit that reflects influent or effluent pollutant loads and operation targets in terms of water quality is recommended. This criterion includes contaminant treatment requirements or effluent/product water standards. System boundaries must be appropriately chosen to ensure comparable results. All unit process operations required for water treatment must be included, and all inputs and outputs relevant to the purpose of the study must be considered. For gray water and green infrastructure this includes all capital infrastructure, operational energy, and materials required for treatment. Inclusion of capital infrastructure emissions is encouraged.

4.1.5. Life cycle inventory analysis (LCI) phase

The inventory phase of the process-based LCA approach involves collecting data on inputs (e.g. materials, energy, resources) and outputs (e.g. emissions to air, water, and soil) of the system, including construction, operation, and end-of-life. The first step is creating a process flow diagram that accurately represents the modeled process, detailing all energy and mass inputs and outputs. The next step is collecting emissions intensity data, which can be sourced from various databases providing life cycle inventory data. It is essential to disclose energy and mass balances as well as life cycle inventory data for verification.

4.1.6. Life cycle assessment (LCA) phase

The focus of this methodology is the calculation of the GHG emissions associated with gray water or green infrastructure. Emissions data may come from eGRID, or other transparent and verifiable databases, some recommendations of which are given later. The TRACI 2.1 method for determining the GHG intensity of materials and processes is recommended.

Co-product credit methodology: Some systems will generate co-products in the form of products or energy. An example of this is the treatment of water with the production of energy and concentrated nutrients from the anaerobic digestion of sludge with methane generated and used onsite for the production of electricity through a combined heat and power system and concentrated nutrients land applied. In this example situation where there is a co-product, the displacement method should be used to determine the credit associated with the co-product. Specifically, the produced product is assumed to displace a current product. In the example of electricity production from a system, the produced electricity is assumed to displace the local average grid electricity. The land applied sludge is assumed to replace traditional fertilizer. In GHG accounting the system is given a GHG credit for the production of electricity and fertilizer that would not need to happen traditionally.

Geospatial considerations: Local life cycle inventory data should be used whenever possible. Electricity is a good example. EIA or EPA data for localized GHG emissions should be used. (It is important to note that the electrical grid is expected to continue to become cleaner over time. This methodology does not require the inclusion of grid evolution due to uncertainty in the future grid but rather the grid intensity is revised every 5 years with models updated.)

4.1.7. Life cycle interpretation phase

This includes the critical evaluation of results including a direct comparison to existing literature. The ISO standard includes three steps in support of this effort. First is considering the results in terms of the impact of relative contributions of the life cycle stages. Second, evaluation is performed, including completeness, sensitivity, and consistency checks. Lastly, conclusions and recommendations are documented. During this phase, results that are dramatically different than reported in the literature need to be evaluated.

4.1.8. Credit Calculations

The carbon credit is the difference in emissions between the two technologies. It is expected the gray infrastructure system will be a net GHG emitter. In some cases the green infrastructure system has the potential to be a net negative carbon system. The credit calculation will be done through taking the total emissions determined for the gray infrastructure minus the green infrastructure emissions. In the case when the green infrastructure is negative then the total GHG savings will be the gray GHGs plus the GHG savings for the deployment of green infrastructure.

4.1.9. Reporting and critical review of the LCA

Transparency in LCA is critical and is foundational in LCA reporting. The reporting of results needs to include all foundational assumptions including implemented methodology. The reporting should be sufficient to where the work can be regenerated by a seasoned LCA practitioner. The reporting must include functional units, system boundary, detailed process flow diagrams of the treatment process evaluated, and references to all data. The work developed will support the evaluation of the GHG emissions reductions from green infrastructure which will simply be the delta between gray infrastructure and green infrastructure. The reporting must include sufficient information to support reproducible science. Specifically, the LCA reporting section will include complete methods sufficient for the regeneration of results with the publishing of foundational models encouraged.

4.1.10. Data Sources

The following data sources are recommended for the LCA:

- Emissions: EPA's Emissions & Generation Resource Integrated Database (eGRID) provides pounds of CO2-eq per megawatt-hour of electricity generation depending on location. If this source is used for emissions data, the options for "non-baseload output emission rate," "CO2 equivalent," and "state" must be selected.
- CO2-eq factors: EPA's Tool for Reduction and Assessment of Chemicals and Other Environmental Impacts (TRACI).
- Energy data: The U.S. Energy Information Administration (EIA) provides various kinds of energy that may be useful for the LCA.
- Life cycle inventory: The Ecoinvent Database is a Life Cycle Inventory (LCI) database that supports various types of sustainability assessments. Another source is the U.S. Life Cycle Inventory (USLCI) Database, published through the National Renewable Energy Laboratory.

5. Green Infrastructure Project Activity Identification

Green infrastructure project activities creditable under this methodology will be highly variable in context, design, implementation, and monitoring. The design and implementation process will be iterative, contextual and require qualified expertise.

As such, it is outside of scope of a third party validator to be responsible for approving the design of the green infrastructure programs. Instead, the third party validator will verify that the program is additional, is implemented as planned, and that water quality is monitored, consistent with the Credit Verification and Release Schedule detailed in the associated Credit Class document for this methodology.

Project types in the following list are deemed within the scope of applicability for this methodology. Project developers may propose other green infrastructure alternatives for consideration by Regen Network as substantially compliant with the methodology intent.

Watershed Program Project Types

For temperature reduction:

- riparian forest buffer restoration
- flow augmentation
- island augmentation/creation
- water reuse

Nutrient and sediment runoff reductions, agricultural or non-forested lands:

- Structural:
    - riparian forest buffer restoration
    - tree planting
    - livestock exclusion fencing
    - off-stream livestock watering
    - streambank stabilization
    - dredging and aquatic habitat restoration
    - animal waste management system
    - barnyard runoff control
    - sediment basins
    - underground outlet
    - sprinkler irrigation upgrade
    - micro irrigation upgrade
    - surg irrigation
    - tailwater recovery
    - diversions
    - retirement of highly erodible land
    - wetland restoration and natural water courses restoration
    - water reuse
- Practice-based:
    - conservation easements
    - cover cropping
    - crop rotations
    - conservation tillage
    - filter strips
    - rotational grazing
    - straw in furrows
    - nutrient management
    - grass waterways
    - riparian grass buffer/restoration

Runoff reductions and water quality improvements, forested lands:

- riparian forest buffer restoration
- forest road management or decommissioning
- forest harvesting practice improvements
- prescribed fire following native practices
- forest thinning
- reforestation
- Erosion control

Upland non-forestry practices:

- wet meadow restoration
- beaver dam analog development
- beaver introduction
- increasing stream complexity
- opening historic side-channels

The balance of Section 5 of this methodology is provided as advisory guidance for project proponents and is not auditable by third party verifiers.

The first step in this phase is to assess the current water quality conditions in the watershed and identify areas that require improvement. This involves analyzing data on pollutant loads and sources, identifying impaired waterbodies, and assessing the potential impacts of climate change on water quality.

Once areas for improvement have been identified, the next step is to evaluate potential green infrastructure projects that could be implemented to address these issues.

Criteria for evaluating and selecting green infrastructure projects may include factors such as cost-effectiveness, environmental benefits, feasibility, and community support.

5.1 Modeling Impacts of Watershed Activities on Water Quality

In this section, the methodology focuses on modeling the impacts of watershed projects on water quality. The objective of this section is to demonstrate that the proposed project activity will maintain or improve water quality in the watershed. The project proponent would use the best available data, modeling tools, and scientific methods to estimate the potential water quality impacts of the proposed project activity.

The project proponent may collect baseline data on the current water quality conditions in the watershed before the project activity begins. This data will be used to establish a baseline against which the impacts of the proposed project activity can be compared. The proponent may then use watershed models to simulate the impacts of the proposed project activity on water quality.

The project proponent may use an appropriate watershed model that is widely accepted within the scientific community and that is relevant to the specific watershed. The model may be used to simulate the impacts of the proposed project activity on water quality for a range of possible scenarios, such as varying levels of precipitation or different land use patterns.

The project proponent may also conduct a sensitivity analysis to identify the key inputs and assumptions that are driving the model results. This will help to identify the areas of greatest uncertainty in the modeling results and inform any necessary adjustments to the project design or monitoring plan.

Finally, the project proponent may compare the modeled impacts of the proposed project activity to the baseline water quality conditions in the watershed. This comparison should conservatively demonstrate that the proposed project activity will maintain or improve water quality in the watershed. The methodology should provide clear and transparent documentation of the modeling methods, assumptions, and results, including any limitations or uncertainties associated with the modeling.

6. Implementing Watershed Program

The project proponent and project stakeholders must agree to the site selection and obtain appropriate approvals from landowners and any cognizant authorities.

Site preparation is an important step in implementing a green infrastructure project, and it involves preparing the land for the installation of the green infrastructure. This can involve activities such as removing vegetation, grading the land, and installing erosion control measures. The Project Proponent should ensure that all site preparation activities are conducted in accordance with best management practices to minimize any potential impacts on the environment.

After site preparation is complete, the Project Proponent can proceed with installing the green infrastructure based on design plans. The Project Proponent should ensure that all installations are conducted in accordance with best management practices and that all necessary permits and approvals are obtained.

The Project Proponent must develop a long-term maintenance plan that includes periodic maintenance activities, such as bi-annual or annual inspections, and identifies the party responsible for carrying out the maintenance activities. This plan should also include a budget for maintenance activities, as well as a plan for monitoring the performance of the green infrastructure over time and making adjustments as needed.

7.0 Water Quality Monitoring, Reporting, Verification

This section outlines the procedures and protocols for monitoring and reporting on water quality impacts resulting from the implementation of the program, consistent with the Credit Verification and Release Schedule in the associated Credit Class document for this methodology.

A variety of monitoring approaches can be used to monitor changes or maintenance of in-stream water quality. In-situ sensors can measure water quality parameters such as DOM, pH, temperature, and dissolved oxygen in real-time, providing detailed data on changes in water quality. Remote sensing technologies can be used to monitor changes in land use and vegetation cover, which impact water quality. Observational sample collection and laboratory analysis can provide a point-in-time estimate of water quality and validate other approaches. Mechanistic and statistical models can be used to simulate the effects of watershed protection activities on water quality. Together, these tools can quantify the impacts of watershed protection activities on water quality and the environment.

9.1 Parameters

Parameters for this methodology are often set by regional regulations, or in their absence, state regulations, or in their absence, national standards. The following references are provided as guidance only - project proponents must select water quality standards appropriate to the specific context of the project activity.

1. State-specific water quality standards effective under the CWA
    a. E.g. Colorado Regulation No. 31 (Tables I-III, p. 54); Oregon Water Quality Standards (Table 40, p. 107)
    b. E.g. Colorado Regulation No. 38:
2. Water quality criteria tables - dependent on designated uses (aquatic health, recreation, domestic water supply, and agricultural, industrial, navigational and other)
    a. E.g. Human Health Criteria Table includes 125 contaminants

9.2 Setting Water Quality Baseline

The setting of a water quality baseline is an important step in the project development process. It establishes a starting point for measuring water quality improvements resulting from the project activity. Instructions for setting a water quality baseline:

1. Identify the location and boundaries of the project site, including the watershed that it is located within.
2. Determine the parameters that will be used to measure water quality. Common parameters include dissolved oxygen, pH, temperature, total suspended solids, turbidity, and specific pollutants such as nitrogen and phosphorus compounds.
3. Identify the existing water quality conditions in the project area. This may involve collecting and analyzing water samples from streams, rivers, and other water bodies in the watershed.
4. Establish a baseline water quality for each parameter. This baseline should reflect the average water quality conditions over a sufficient period of time (e.g. several years) to capture seasonal and annual variations in water quality.
5. Consider any relevant regulatory requirements or water quality standards when establishing the baseline. For example, if there are established Total Maximum Daily Loads (TMDLs) for a particular pollutant in the watershed, the baseline should reflect compliance with those TMDLs.
6. Document the baseline conditions in a clear and transparent manner. This documentation should include a summary of the water quality parameters, the methodology used to collect and analyze data, and the resulting baseline values.

7. Once the baseline has been established, it can be used as a reference point to measure water quality improvements resulting from the project activity.

9.3 Estimating Water Quality Benefits

In order to determine the effect of an upstream or upland best management practice (BMP) on a downstream point of concern for each water quality parameter, it may be necessary to use multiple models.

These models often consist of combinations of other models representing different processes, such as water balance, crop growth, and soil erosion, and can be composed of both empirical and mechanistic models.

To quantify the water quality benefits of a green infrastructure project, the project proponent should take the following steps:

1. Identify Relevant Methods and Select a Model: Project proponents should select the most applicable existing water quality model from those developed by federal or state agencies to quantify the water quality benefits of their project. They should review the model's documentation to ensure that it is capable of simulating the necessary processes, and that it can be applied to their specific project site.
2. Adapt to Local Conditions (Set-Up and Refine): Once a model has been selected, it must be adapted to the local conditions of the project site. This may include the input of site-specific data, such as soil characteristics, land use, and climate data, and calibration of the model to local conditions through comparison of model predictions to measured data.
3. Technical Review: The model should be reviewed by technical experts in the field of water quality modeling to ensure that the model is applied correctly and that the results are valid.
4. Direct Monitoring: Direct monitoring of water quality should be conducted to validate the model's predictions and confirm the water quality benefits of the green infrastructure project.

9.5 Data Sources

Project proponents may directly measure water quality, or provide data collected through existing monitoring programs including public data sources.

Project proponents must provide water quality data with at least as much frequency as required by relevant regulatory authorities, for each parameter of interest, but in no case less frequently than three times per year.

9.6 Monitoring Locations

The project proponent must actively measure water quality within the project boundary to demonstrate either improvement or maintenance of relevant water quality parameters.

The monitoring locations are the specific points within the watershed where water quality samples will be collected and analyzed to evaluate the effectiveness of the green infrastructure projects and reduced treatment demand at the utility . The selection of monitoring locations is critical for the success of the monitoring program, as they must be representative of the impacts of the projects on water quality in the watershed.

At minimum:

- The project proponent must collect data from at least one control site, i.e., a location within the river that is upstream of the target contamination and green infrastructure remediation project boundary.
- The project proponent must collect data in proximity to the water utility supply intake.
- The project proponent must collect data in proximity to the green infrastructure activity.
- The project proponent may collect data in proximity to the POMI.
- All water quality collect locations must be well-mixed, i.e., not stagnant or contained water.

Further, when selecting monitoring locations, the following factors should be considered:

1. Proximity: Monitoring locations should be in close proximity to the green infrastructure project and to sites in the watershed that are strategic to the utility to capture the effects of the project on water quality.
2. Diversity of land use: Monitoring locations should be representative of the different land uses within the watershed, such as residential, agricultural, and industrial, to capture the variability in water quality within the watershed.
3. Hydrological connectivity: Monitoring locations should be located on the same stream or water body as the green infrastructure project to capture the effects of the project on downstream water quality.
4. Accessibility: Monitoring locations should be accessible to field crews for routine water quality sampling.
5. Historical data: Existing water quality data should be used to help guide the selection of monitoring locations to ensure continuity with previous monitoring efforts.

Overall, the selection of monitoring locations should be based on a combination of scientific principles and practical considerations to ensure the accuracy and relevance of the water quality data collected.

9.7 Data Accuracy

To ensure the accuracy of the calculations, all data collected must be reliable and consistent. The following guidelines should be followed:

1. Standardized methods and protocols should be used for sampling and analysis.
2. Quality control measures should be put in place to identify and address any errors or inconsistencies in the data.
3. Regular calibration of monitoring equipment is necessary to ensure accuracy and consistency of measurements.
4. All calculations must be reviewed and verified by qualified professionals to ensure accuracy and consistency.

9.8 Technology

Monitoring of water quality can be accomplished through a variety of techniques, ranging from traditional grab sampling to advanced sensor technologies. A inclusive but not exhaustive list of technology options is presented as guidance below:

Grab Sampling: Grab sampling is a method of collecting water samples that involves physically obtaining a water sample at a specific location and time. Grab samples are typically collected using a sample bottle or container that is designed for water sampling. To ensure that the sample collected is of high quality and suitable for analysis, several procedures and standards must be followed. The container used for sampling must be made of an appropriate material such as borosilicate glass or high-density polyethylene (HDPE) and must be thoroughly disinfected and rinsed with the sample water before use. The sample must be collected at the right depth, ensuring that the sampling location is representative of the water quality at that location. The sample should be stored in a cooler or icebox at the correct temperature and transported to the laboratory for analysis as soon as possible after collection.

Laboratories performing water quality analysis must adhere to a variety of standards and certifications to ensure the accuracy and precision of their results. In the United States, the Environmental Protection Agency (EPA) has established a series of standards and methods for water quality analysis. Laboratories performing water quality analysis should follow the EPA's guidelines for quality assurance and quality control. Additionally, laboratories should be certified by a recognized accrediting body such as the National Environmental Laboratory Accreditation Program (NELAP) or the American Association for Laboratory Accreditation (A2LA).

Sensors: Advanced sensor technologies can provide continuous and real-time water quality monitoring data. These sensors can be placed in a water body and remotely transmit data to a central database for analysis. Sensors can measure a wide range of parameters such as dissolved oxygen, pH, temperature, turbidity, and conductivity. The use of sensors can reduce the need for manual sampling and provide more accurate and frequent data. However, it is important to note that sensors may require regular maintenance and calibration to ensure accuracy.

Further, sensor data may be combined with other data sources and statistical and mechanistic models capable of yielding quantified or semi-quantified results. These technology combinations are acceptable if demonstrated to be at least 75% accurate and if the conservative bound of the 80% confidence interval is reported.

9.9 General References

These sources can be used as a guide for project proponents to deepen their understanding of specific aspects of the program, as well as to provide a basis for further research and exploration. The references cover a wide range of topics, from best management practices to technical standards, and are intended to be a comprehensive resource for anyone involved in the implementation of a watershed green infrastructure program.

EPA Water Quality Standards Handbook (2017)

EPA Water Quality Portal (WQP) - 380 million+ water samples from NWIS, STEWARDS, STORET, BIODATA, and others

USGS National Water Dashboard (NWD) - 13,500 observation stations.

EPA Surface Water Sampling - general and specific procedures, methods, and considerations to be used and observed when collecting surface water samples for field screening or laboratory analysis.

EPA CWA Methods for laboratory analytical methods.

Credit Class

[redacted]

GHG & Co-Benefits in Watershed Carbon Credit Class

[redacted]

Ecosystem focus: Watersheds

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Version: 1.0
Last updated: June 1, 2023
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Definitions

1. Approved Activities - the set of land management or conservation activities that are eligible activities for a given Credit Class.
2. Monitor - an individual or organization that is contracted to measure the benefits / indicators defined in a given Credit Class based on the requirements in the Approved Methodology.
3. Verifier - an individual or organization that is contracted to execute the verification requirements stipulated in a given Credit Class.
4. Project Proponent - the project developer or land steward that is applying to register a project on the registry.
5. Project Developer - the individual or organization that is in charge of managing the project and is the main point of contact with Regen Registry. The Project Developer can be the land steward or a third party.
6. Land Steward - the individual or organization that is performing the work on the ground. This can be a farmer, rancher, conservationist, forester, fisherman, etc.
7. Land Owner - the individual or organization that holds title to the land where the project is occurring. This can be the Land Steward or a third party that rents the land to the Land Steward.
8. Project Registration Date - the official date when a project commences.
9. Project Plan - the template that each project proponent fills out in order to register a project on the registry.
10. Co-Benefit - the Intergovernmental Panel on Climate Change (IPCC) defines co-benefits of climate change mitigation as the positive benefits related to the reduction of greenhouse gasses. We define it more broadly as a benefit that is achieved along with the main indicator tracked and promoted in a given credit - which need not be a reduction of GHG necessarily. For example a biodiversity credit might mainly promote the protection of a certain species and at the same time offer co-benefits, such as protection of water resources.
11. Verification - a systematic, independent, and documented assessment by a qualified and impartial third party of the benefits' assertions for a specific reporting period.
12. Crediting Term - is the finite length of time for which a Project Plan is valid, and during which a project can generate credits.
13. Project Activity - the applied management or conservation practice that a project proponent is undertaking in order to improve the benefits tracked in a given Credit Class.
14. Project Initial Monitoring Date - the date when the baseline measurement was performed.
15. Program Guide - the main document specifying the rules and procedures of Regen Registry.
16. Established Registries - other credible registries in the carbon market that Regen Registry recognizes and accepts for certain purposes such as onboarding verifiers. Example registries include:

a. VCS (Verra)[1]
b. Gold Standard[2]
c. American Carbon Registry[3]
d. Climate Action Reserve[4]
e. CDM[5]

Acronyms

- GHG - Greenhouse Gasses
- IPCC - Intergovernmental Panel on Climate Change is an intergovernmental body of the United Nations that is dedicated to providing the world with objective, scientific information relevant to understanding the scientific basis of the risk of human-induced climate change
- AFOLU - Agriculture, Forestry and Other Land Use; a category of carbon credit projects that related to agriculture, forestry and other land uses (e.g. conservation)
- RND - Regen Network Development, Inc., the entity developing and operating Regen Registry
- SDG - the United Nations' Sustainable Development Goals

[1] https://verra.org/
[2] https://registry.goldstandard.org/
[3] https://americancarbonregistry.org/
[4] http://www.climateactionreserve.org/
[5] https://cdm.unfccc.int/index.html

1. Introduction

This *Credit Class* can be used by *Project Proponents* to reduce nonpoint source contamination of watersheds, thereby avoiding greenhouse gas emissions from electricity use, consumables, and infrastructure construction through reduced energy demand associated with downstream drinking water, wastewater, and stormwater management and treatment.

2. Credit Class Overview

This credit class creates a standardized approach to quantify and verify the emission reduction benefits of green infrastructure projects that improve water quality. The credit class will consider the reduction in GHG emissions associated with avoided energy use from the upgrading of water quality treatment facilities.

2.1. Primary Indicator

The primary indicator defined in this credit class is GHG emissions quantified as 1 metric tons of CO_2e associated with avoided energy use from the upgrading of water quality treatment facilities.

2.2. Co-Benefits

The list below outlines the approved co-benefits for this credit class. Each of the co-benefits is monitored by a specific set of indicators which are defined within the methodology for each co-benefit. See Section 6 for more information on the co-benefit assessments.

1. Water Quality Benefits
2. Forestry Biomass
3. Soil Health
4. Ecosystem Health

2.3. Ecosystem Service Classification

This Credit Class applies to the ecosystem services of Water, Forests/woodlands, Grasslands, Pastureland, Cropland, Agroforestry, Shrubland and Wetland as defined in the RND Taxonomy[6] .

[6] RND Taxonomy Document

3. Project Eligibility

3.1. Ecosystem Type Classification

This Credit Class applies to watershed restoration efforts.

3.2. Project Activity

The project activity approved by this credit class is green infrastructure providing water quality benefits. There are many practices that fall under this definition, with examples provided in the methodology.

3.3. Land Ownership Type

This credit class accepts projects which can properly demonstrate land ownership or landowner approval with adequate documentation.

Project Proponent shall own, have control over, or document control over, or have a license to claim the credits from GHG sources/sinks from which removals originate.

Project Proponent shall provide documentation and/or attestation of land tenure. In the case of leased/rented land, the landowner shall agree to all contractual obligations taken by the Project Proponent, and the Project proponent shall provide documentation and/or attestation of title agreement to credits.

Regen Registry may require a legal review by an expert in local law.

3.4. Adoption Date

Adoption Date: Projects run under this credit class will accept an adoption date that goes back up to 10 years prior to Project Registration Date. In order to claim an Adoption Date before the Project Registration Date, the Project Proponent must have maintained clear historical records to that effect, as specified in the Approved Methodology.

3.5. Crediting Term

The crediting term is established based on the expected life of the avoided water treatment system.

4. Project Rules and Regulations

4.1. Approved Methodology

The approved methodologies for this Credit Class are:

a. Watershed Nature-Based and Green Infrastructure Activities Avoiding Emissions from Water Management Gray Infrastructure Construction and Operations Methodology v1.0

4.2. Aggregate Projects

Aggregate Projects are permitted in this credit class. Rules and regulations outlining the approach to approve aggregate projects should be defined in the approved methodology.

4.3. Project Plan

Any project run using this Credit Class must have an aligned project plan.

The Project Plan will define and evidence Project Area(s) Project Activity, Project Eligibility and Project Rules and Regulations. The Project Proponent shall fill out the Project Plan Template and submit for review by the Regen Registry.

5. GHG Removal and Emission Reduction Requirements

The credit class follows the GHG accounting requirements defined in the Program Guide.

5.1. Additionality

Proof of additionality is required for this credit class. See the corresponding methodology for this credit class for the Additionality definition and demonstration.

5.2. Leakage

Leakage is not required to be accounted for in this credit class.

5.3. Permanence Period

See Section 7.

5.4. Permanence Approach

See Section 7.

5.5. Buffer Pool

A buffer pool is not required for this credit class.

5.6. Verification

See Section 7.

5.7 Additional GHG Benefits

Project proponents may claim additional GHG benefits from green infrastructure project activities using existing methodologies such as the following, with additional methodologies considered for approval by Regen Network upon request for review by Project Proponents:

- Methodology for GHG and Co-Benefits in Grazing Systems
- VM0042 Methodology for Improved Agricultural Land Management, v2.0
- VM0035 Methodology for Improved Forest Management through Reduced Impact Logging v1.0
- VM0021 Soil Carbon Quantification Methodology
-

6. Co-Benefits

Three co-benefits are included in this credit class. The following are approved co-benefits, but alternative co-benefits can be accepted and appended. Each of these co-benefits is monitored by a specific set of indicators which are defined within the methodology for each co-benefit. The list of co-benefits will be continuously reviewed and updated, in order to account for the most relevant indicators assessing the changes in the ecological state in the project area.

6.1. Water Quality Health

Improve and/or maintain water quality as a result of good land management practices.

6.2. Ecosystem Health

Improve and/or maintain water quality.

6.3. Soil Health

Improve and/or maintain the health of soil health as a result of good land management practices. Healthy, productive soils can positively support a variety of ecosystem services, some of which include improving water infiltration, improving soil structure, reducing potential for soil erosion, and increasing availability of nutrients for plant growth.

6.4. Community Health

Healthy river systems support a wide range of community health benefits. Disadvantaged communities globally rely more heavily on natural resources to survive, and thus improvements in instream water quality and the species found in riverine ecosystems disproportionately help these communities. Greater amounts of vegetation in riparian zones and in critical watershed areas lead to cleaner air and higher levels of biodiversity.

Less toxic algae blooms in rivers are beneficial for all who use the water or recreate nearby, and reductions in nitrate levels in groundwater sources are extremely valuable for the health of communities with shallow groundwater wells. Any reduction in the amount of catastrophic wildfires has huge benefits to air and water quality for communities well beyond the watershed that burns. More resilience agricultural productivity better supports jobs and keeps basic food prices lower. A thriving restoration economy creates many more local jobs than similar amounts of spending on gray infrastructure, and these jobs often don't require advanced degrees and thus are open to a wider range of applicants.

7. Credit Verification and Release Schedule

7.1. Credit Release Schedule

The green infrastructure practices that will be implemented under this methodology are similar to those incentivized by mitigation and conservation banking in the United States, an established markets-based approach. Credits generated in the banking context are released on a schedule determined by federal and state agency officials, generally in three phases - 'Initial,' 'Interim' and 'Final'.

The US Army Corps 2019 Regulatory Guidance Letter describes these phases as such: "three general phases in the credit release schedule for mitigation banks: an initial credit release, interim credit release(s) that are linked to achievement of performance-based milestones, and a final credit release, which should be comprised of a significant share of projected credits that are to be released once full achievement of the ecological performance standards for the mitigation bank has occurred."

The US Army Corps of Engineers December 2020 Mitigation Bank Enabling Instrument Template has a standardized credit release schedule for project developers to support clarity and scale. To be consistent with this mitigation banking precedent, this methodology adapts the same credit release schedule and ratios as follows:

Table 1: Credit Release Schedule

Milestone	Definition	Verification Requirement	Credit Release
1 - Initial	Project Selection	Additionality demonstrated through water entity attestation	15%
2A - Interim	Green Project Deployment	As-built report	25%
2B - Interim	Establishment of Avoided GHG from Gray Infrastructure using Grid Energy Mix from Project Baseline date.	LCA Report	

3 - Interim	12-Month Project Viability Demonstration	12-month monitoring report	15%
4 - Interim	24-Month Project Viability Demonstration	24-month monitoring report	15%
5 - Interim	36-Month Project Viability Demonstration	36-month monitoring report	15%
6 - Final	Post-implementation water quality improvement demonstration	Water quality monitoring report	15%
7A- Final	Permit Issued to Regulated Entities	Regulatory Permit	Ex-Ante convert to Ex-Post
7B- Final	48-Month Project Viability Demonstration for voluntary entities	48-month monitoring report	Ex-Ante convert to Ex-Post
8 - Final	Updated Avoided GHG from Gray Infrastructure using Grid Energy Mix as of Project Implementation + 5 years	Updated LCA Report	All credits issued after Project Implementation + 5 years based on adjusted GHG estimates

Grid Energy Mix GHG Updates

The project lifetime and credit issuance schedule will often be on the order of 10-30 years, based on the anticipated lifetime of the avoided gray infrastructure. As the carbon emission reductions are based on emissions associated with electricity use by the avoided infrastructure, and given that in many geographies the mix of renewable and non-renewable electricity sources is anticipated to improve over the coming decades, the Project Proponent is required to update estimates of GHG emissions and corresponding carbon credits every 5 years. For avoidance of doubt:

- Initial avoided GHG emissions estimates are based on the Project Initial Monitoring Date which is the start of the Crediting Term. The GHG avoided emissions are based on the Grid Energy Mix at that date, and applied throughout Avoided System Life, which corresponds to the end of the Crediting Term.
- All credits issued between the Project Initial Monitoring Date and Project Initial Monitoring Date plus five years (60 months) are based on the fraction of the initial avoided GHG emissions estimates identified in the Credit Release Schedule.
- The Project Proponent must update their avoided GHG emissions estimate and corresponding total anticipated credits every 5 years after the initial Project Initial Monitoring Date. Any increase or reduction in total anticipated credits will be adjusted on a forward basis, and not on a retroactive basis, following this formula:

- Initial Anticipated Credits: 100
- Credits issued during first 5-year period: 50
- Updated Anticipated Total Credits: 80
- Credits issued during subsequent periods: 80 - 50 = 30

If under the unexpected circumstance that the updated anticipated total credits are less than total credits already issued, all prior credits are deemed valid while no additional credits will be issued.

Ex-Ante Conversion to Ex-Post Credits

The primary credit-generating activity under this methodology is the selection of green infrastructure by a water utility which then avoids decades of GHG emissions related to the facility upgrade which has been rendered unnecessary by the implementation of a green infrastructure solution. The credits generated after this decision are arguably therefore 'ex post' at this stage, given that the credit-generating decision has been made and attested to. However a more conservative approach to credit issuance and type is reflected in the above credit release schedule and explained below.

For Regulated Entities: Once a green infrastructure solution has been formally accepted in a regulatory permit, credits already issued convert from 'ex ante' to 'ex post'. At this point the entity will have met their water quality obligation.

For Voluntary Entities: After the green infrastructure solution has been implemented and monitored for 48 months, the project is considered to have taken hold and is permanent, so credits generated convert from 'ex ante' to 'ex post'.

Demonstrated Water Quality Achievement: Milestone 6 above holds back 15% of credits for attainment of water quality improvements, whenever they are demonstrated during the life of the project. In some cases this may occur early in a project lifetime (such as nutrient reduction) or many decades later (such as shade provided by mature trees).

7.1 Verification

A third party reviewer will verify the milestones described in the above Credit Release Schedule, using Project To verify ongoing avoided GHG emissions at the water utility, the Verifier will review the Project Proponent's documentation, including monitoring and reporting data, to ensure that the methodology requirements are being met. The Verifier may also need to conduct site visits to the water utility and the site of the green infrastructure installations to verify that the planned upgrade has not taken place and that the green infrastructure project is still in place and functioning as intended.

Metadata Breakdown

Project Eligibility
Ecosystem Type: *Watersheds*
NBS: *Water Quality Protection*
Primary Indicator: *CO2e emissions avoided*
Number of Secondary Indicators: *3*
Credit Unit: *1 metric ton CO2e*
Land Ownership Type: *public, private, tribal*
Adoption Date:
Crediting Term:
Project Rules and Regulations:
Approved Methodologies:
Aggregate Projects: Permitted
Project Plan: Required [Insert link to project plan here]
Co-benefits:
Approved Co-benefits: soil health, ecosystem health, water quality
GHG Accounting:
Additionality: Accounted for
Leakage: Not accounted for
Permanence: Accounted for
Verification
Verification: Required