



Submittal Guidance for BCarbon Methane Capture and Reclamation Protocol

Version 1.1

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Acronyms and Abbreviations

ADR	Annual Decline Rate	MRV	Monitoring, Reporting, Verification
AOI	Area of Interest	NAIP	National Agriculture Imagery Program
API	American Petroleum Institute	NHD	National Hydrography Dataset
BE	Baseline Emissions	NOAA	National Oceanic and Atmospheric Administration
CO _{2e}	Carbon Dioxide Equivalent	NRCS	Natural Resources Conservation Service
CWA	Clean Water Act	NWI	National Wetlands Inventory
d-MRV	digital Monitoring, Reporting, Verification	NWIS	National Water Information System
DOE	Department of Energy	OCD	New Mexico Oil Conservation Division
EJ	Environmental Justice	P&A	Plugged & Abandoned
ES	Executive Summary	PD	Project Developer
ESA	Endangered Species Act	RP	Recommended Practice
GHG	Greenhouse Gas	RRC	Railroad Commission of Texas
GIS	Geographic Information System	tCO _{2e}	Total Project Emissions
GWPC	Ground Water Protection Council	TWDB	Texas Water Development Board
IPaC	Information for Planning and Consultation	USFWS	U.S. Fish and Wildlife Service
LPE	Last Production Estimate	USGS	United States Geological Survey
MCR	Methane Capture and Reclamation	WOUS	Waters of the U.S.

Overview

BCarbon's Methane Capture and Reclamation MCR Protocol (Version 1.1) provides the framework and technical methodology to quantify carbon offset credits that are generated from the prevention of methane emissions due to the plugging of abandoned and orphaned oil and gas wells, and the subsequent reclamation of associated land surfaces. This document introduces guidance and technical considerations that can be used by individual Project Developers (PDs) to help ensure project submissions satisfy the necessary BCarbon application and MCR protocol requirements to generate carbon credits. The guidance is organized by primary topics, as detailed in the Methane Capture and Reclamation (MCR) Materials Checklist (refer to **Attachment A**) and includes discussions relevant to the Provisional and Final Project Plans to aid in the collection of required information, level of detail, and sources or approaches that can be utilized to gather relevant material or data. In addition, this document focuses on technical considerations for calculating baseline and project emissions based on assessment of decline curve and leak rate models.

This guidance document has been developed to assist PDs who have familiarity with plugging methods and requirements that will satisfy presiding regulators, as well as sufficient technical experience to calculate and interpret greenhouse gas emissions by utilizing decline curve and leak rate models. Therefore, it is recommended that project related documentation and emission calculations, at a minimum, be reviewed by appropriate personnel (e.g., petroleum engineer, air quality specialist, etc.) for accuracy and applicability prior to submission to BCarbon (and third-party verifiers) for approval. Applicable documentation that should be reviewed or considered in conjunction with this guidance document include:

- All materials delineated in the MCR Materials Checklist (**Attachment A**), including the Methane Capture and Reclamation Application

Definitions

The following section provides details or clarification for key terminology presented in the MCR protocol to facilitate the consistent interpretation of the protocol's eligibility, methods, and requirements. Questions or concerns, or in situations where clarification is needed, should be communicated directly to BCarbon prior to the submission of any application material.

Abandoned Wells: For nomenclature clarity across the protocol and support documents, BCarbon considers Abandoned Wells as any unplugged wells that are not currently in production, and which have a known, solvent operator. In oil and gas industry practice there are several terms fitting this definition and may include idle, shut-in, temporarily abandoned, or non-producing wells. For a well to be applicable for BCarbon environmental attributes, it must have been non-productive for at least 3 months.

Additionality: An evaluation used in carbon markets to demonstrate that the results of a crediting initiative would not have occurred in absence of the incentive of carbon credits. A project is considered "additional" if it would not have happened in a business-as-usual scenario without the crediting project; it is "non-additional" if it would have still occurred. Abandoned Wells that are within regulatory compliance and do not have an active regulatory plugging order will be reviewed for Additionality on a case-by-case basis by BCarbon and third-party verifiers.

American Petroleum Institute (API): A national trade association that represents the interests of the United States oil and natural gas industry and sets standards for the industry.

Baseline Emissions: Emissions likely to occur if the Project is not implemented.

Carbon Dioxide Equivalent (CO₂e): A standard unit of measure to express the impact of each different greenhouse gas in terms of the amount of CO₂ that would create the same amount of global warming.

Digital MRV (d-MRV): An advanced methodology for Monitoring, Reporting, Verification (MRV) that applies digital technologies to streamline data collection, processing, and quality control in the issuance of GHG emission credits.

Environmental Attribute: Greenhouse gas emission reduction recognition in any form, including verified emission reductions, voluntary emission reductions, offsets, allowances, credits, avoided compliance costs, emission rights and authorizations under any law or regulation, or under any emission reduction registry, trading system, or pursuant to any reporting or reduction program for greenhouse gas emissions that is established, certified, maintained, or recognized by any international, governmental, or nongovernmental agency.

Local or Presiding Regulator: The government entity charged with the oversight and regulation of oil and gas production, or who will oversee the P&A process. Depending on the location of the well, this may include multiple regulatory agencies. For instance, federal or state agencies may be involved, or in some areas, City or County governmental agencies.

Landowner: A general term that may refer to the owner of the surface or mineral estate. In some rare cases, landowner may refer to an adjacent surface owner who can provide access to a location.

Operator: The entity with authority to conduct oil and gas operations for an oil and gas well. The current or past Operator, or Operator's affiliates, of a well is not eligible to act as Project Developer for such well under this Protocol, with the exception of Project Developers who have legally become Operators for the sole and express purpose of plugging a well.

Project Developer (PD): The entity responsible for submitting the project application, quantifying emission reductions, documenting pre and post plugging work and following the terms of the protocol. A PD may work as a "third-party" representative on behalf of an operator and must demonstrate a contractual right to receive environmental attributes related to the decommissioning of the project wells. A well's current or past Operator, or Operator's affiliates, are not eligible to be a Project Developer, with the exception of Project Developers who have legally become Operators for the sole and express purpose of plugging a well.

Orphaned Wells: Wells without a solvent operator, and that are not plugged or have been poorly plugged and require additional plugging measures to fully decommission the well.

Plug & Abandon Activity (P&A): Any activity related to the plugging of an oil and gas well. P&A requirements vary by jurisdiction. For all P&A Activity related to a Project, Project Developers must demonstrate Regulatory Compliance.

Contractual Right to Environmental Attributes: Legally binding agreement demonstrating (i) the right to perform the Project and (ii) the right to receive the Environmental Attributes of the Project.

Regulatory Compliance: The adherence to laws, regulations, and statutes enforced by the governmental or regulatory bodies pertinent to a Project based on the jurisdiction in which it operates.

Required vs. Requested: “Required” refers to information that is necessary to complete the BCarbon MCR application in a manner that satisfies the protocol. “Requested” refers to information that is desired by BCarbon to complement the application material but is not required to satisfy the protocol.

Roles-Based Access: The assignment of access rights to property for entities based on their role within a program. Such access allows transparency in the carbon credit buying and selling process.

Total Project Emissions (tCO₂e): The carbon emissions accounted for during the production activities of a Project, measured in tons of Carbon Dioxide Equivalent, to be offset against the prevented emissions resulting from Project execution.

Project Activities

Exhibit 1 below illustrates the steps Project Developers and BCarbon will follow when completing Projects, including the issuance and registration of carbon credits.

Project Logistics

Eligibility

Projects or wells eligible to receive offset credits must be located in the United States or Canada and be considered onshore wells. In addition, confirmation that the applicant wells have a status of non-producing or have had no net production for three months is also required. Lastly, pre-plugging test must confirm the presence of methane at the wellhead in excess of 1,925 parts per billion, which represents the globally averaged mean atmospheric methane concentration for December 2022, as reported by the National Oceanic and Atmospheric Administration (NOAA).¹

For reasons of additionality, wells plugged before submission of an application to BCarbon (and/or before the Protocol was officially published), will not be eligible for carbon credit application.

Project Boundaries

Per BCarbon’s protocol, the geographic boundary of the project will consist of the surface wellhead, associated ancillary equipment, and well pad. Furthermore, any surface area considered by the presiding regulator to be within district boundaries will be considered within the geographic boundaries of the project.

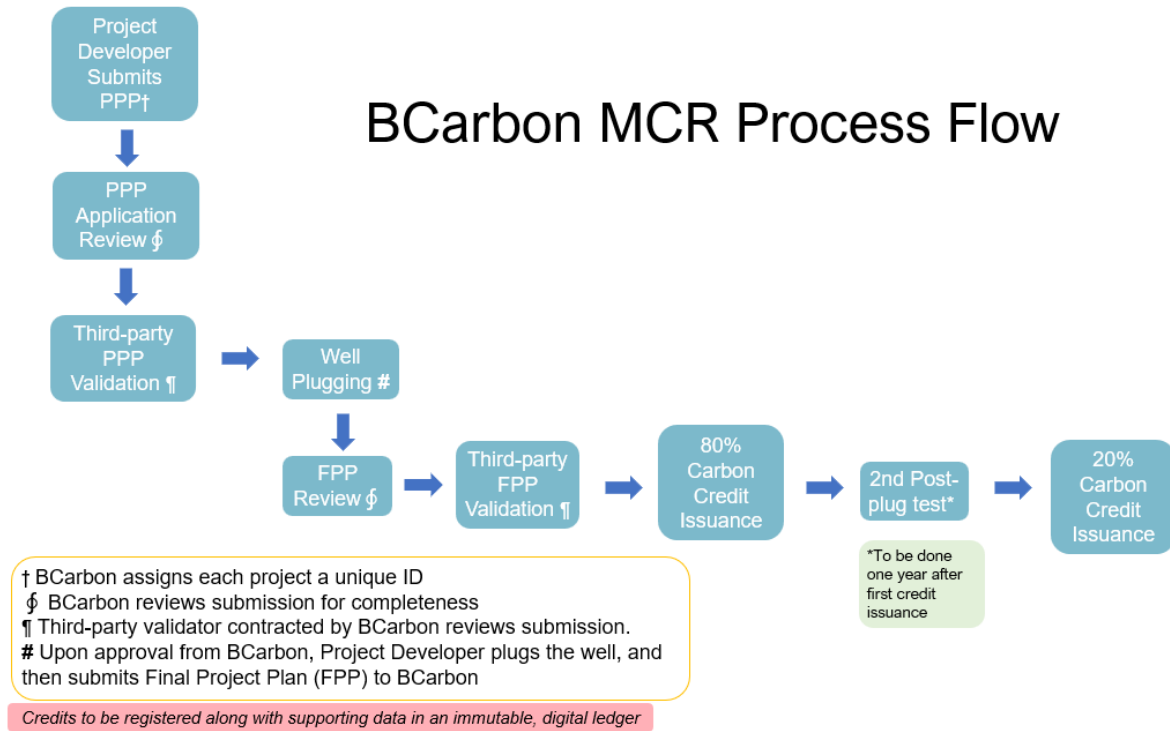
GHG assessment boundaries (or qualified offsets) arise in situations where methane emissions would occur from project wells if a methane emission capture project was not implemented. In addition, in cases where methane is being released from any surface equipment associated with the project well, those emissions could also be measured and reported for net emission reductions.

Project Scope

Each well will be reviewed and validated based on the rules of their particular local regulator. A single application/project may consist of multiple or even many wells – however, all wells within

¹ NOAA. 2023. Global Monitoring Laboratory. Earth System Research Laboratories.
https://gml.noaa.gov/ccgg/trends_ch4.

one application/project must fall within the same state (or local regulatory jurisdiction). Further division of projects is highly preferred for larger volume portfolios; in these cases, BCarbon strongly recommends submitting single applications no larger than on a per-field basis. PDs may submit more than one application to cover a portfolio spanning multiple fields and/or multiple states.



Offset Ownership

Since oil and gas well ownership can be difficult to obtain and complex to interpret, the operator is requested, but not required, to give ownership details for each well. This can include a title opinion, a joint interest billing deck or any other list of well ownership at the time of well plugging. Similarly, the PD must provide authorization to work on behalf of a third party (the operator) and demonstrate their right to receive the environmental attributes (carbon credits) of a project.

Review Structure

The BCarbon internal review of project submissions will assess all elements of the project, including GHG calculations, well Additionality, and Regulatory Compliance. This review also includes contracting with third- party validators.

After submission of the Provisional Project Plan to BCarbon, BCarbon will inform the PD if all the required materials have been properly submitted. Additional material will be requested as necessary. After acknowledging they have a complete Provisional Project Plan, BCarbon will conduct a thorough review of the PPP’s content (along with third party validators) and after doing so, will notify the PD that they either have an approved project or deficiencies that need to be addressed in the Provisional Project Plan. Submissions, review, and notifications regarding the Final Project Plan will follow the same order and structure used for the Provisional Project Plan.

Note: BCarbon agrees to process the Provisional and Final Project Plans as timely as reasonably practicable. PDs should be aware that large projects with multiple wells will require more time to review both by the BCarbon team and the third-party validators.

Provisional Project Plan (Pre-Plugging)

Executive Summary

An executive summary (ES) describing the project should be included as part of the Provisional Project Plan package to introduce the general scope of the project and outline the well or group of wells that are proposed for GHG capture certification. Summary information relevant to the plugging plan, reclamation plan and GHG emission test results should also be included in this section.

Project Information

The Project Information section presents general details about the project and includes the project name and developer information, well name and location, and a short summary of pre-plugging tests completed on the wells in the Project. This information should be summarized for each well included in the project. In addition, a project summary table that details project information (**Table 1**, below) is required for submission with the application package. The MCR checklist provided in **Attachment A** list project information required for this section of the application.

In addition to the required information discussed above, PDs are encouraged to provide photographic or video documentation throughout the plugging process to assist BCarbon and third-party verifiers in the validation of methods, equipment, and well status.

Table 1: Project Summary Table (*example*)

Project Name:		Well Name:	
Project Developer:		Location (lat/long):	
Point of Contact:		Pre-Plugging Date:	
API Number:		Pre-Plugging Test Results:	

Well Details

Information related to well details can be used to assess the risks associated with plugging and abandoning the well and to develop a safe and effective plan for abandonment. This data also allows BCarbon and third-party verifiers to have access to well details to confirm eligibility and prepare the required Validation Certificates for the wells.

Information collected for the “well details” section will typically rely on the review of state or federally administered historical well records (e.g., RRC, Bureau of Land Management, Pennsylvania Department of Environmental Protection, etc.) that are publicly available online. These records can include well logs, production and completion reports, sundry notices, safety records, and compliance reports. In some cases, if historical records have not been digitized by the state, then review and collection of the data will need to be conducted at the local presiding field office. Information collected during an onsite field visit will also provide pertinent information,

to include required field photographs that show the well or group of wells that are planned for plugging, the project's location, and any relevant details that can assist in demographic descriptions (see *below*). Furthermore, historical records can also be found from a variety of other sources, including internal records from oil and gas companies, landowners, libraries, or other archives. Refer to the MCR Materials Checklist (**Attachment A**) for a listing of all Well Details required for this section of the application.

Well Plugging Plan

The plugging and abandonment process involves permanently sealing a well by placing cement and mechanical plugs into the wellbore to function as barriers for migration of oil, gas, and other fluids from the wellbore into the surrounding environment. Per BCarbon MCR protocol, PDs are responsible for determining state specific plugging plan requirements and to confirm the applicant well or group of wells scheduled for plugging is in compliance with the appropriate presiding regulator by submission of all applicable regulatory documents (i.e., sundry notice, W3a in Texas, etc.). Furthermore, the accompanying well plugging plan that is submitted must also satisfy local regulatory requirements. In situations where there are no local or state plugging regulations or requirements, then applicants are required to adhere to guidelines established by the API per Recommended Practice (RP) 65-3: Wellbore Plugging and Abandonment Standard for US projects, and the Alberta Energy Regulator (AER) Directive 020: Well Abandonment for Canadian projects. Following an approved plan is critical as improper methods and equipment can result in the escape and contaminate groundwater, surface water, and soil.²

Technical Considerations and Best Practices

Technical considerations or industry best practices for well plugging and abandonment should be summarized in the well plugging plan to provide BCarbon and third-party verifiers confirmation that appropriate plugging practices are being properly implemented per state regulations for a given project and location. Provided below is a bulleted summary of some key plugging best practices/general state requirements that should be considered for submission with the application package.

- **Records Review:** A review of permit applications or completion reports can be used to determine the current mechanical condition of a well. Important well construction details such as the size, grade, weight, setting depth, top of cement and perforation depth of each casing string are important.
- **Site Characterization:** In specific cases where there has been a known release or suspected release of well fluids, the site should be characterized to define the extent of the contamination. The results of the site characterization can then be used to determine if remediation is necessary per regulation.
- **Written Procedures:** Methods to remove remaining downhole equipment should be developed before plugging commences. This is important as unrecovered tubing, rods, pumps, or packers may prevent access to portions of the well that need to be plugged.
- **Remedial Operations:** A number of remedial operations may be necessary to appropriately

² Raimi, Daniel, Krupnick Alan, Shah Jih-Shyang, and Alexandra Thompson. "Decommissioning Orphaned and Abandoned Oil and Gas Wells: New Estimates ..." *Decommissioning Orphaned and Abandoned Oil and Gas Wells: New Estimates and Cost Drivers*. Environmental Science and Technology, July 14, 2021. <https://pubs.acs.org/doi/10.1021/acs.est.1c02234>.

prepare the wellbore and casing walls to successfully place mechanical and cement plugs during an abandonment operation. Before abandonment operations commence, mud-cake and scale deposits should be removed from casing walls to maximize bonding at depths where plugs and retainers are to be placed.

- **Annular Barriers:** Evaluation of annular barriers is critical for ensuring the integrity of the wellbore; there are numerous evaluation methods that can be used to include logging, pressure testing, and visual inspection.

Construction and Excavation

In addition to the above technical considerations, states will often have specific requirements for conducting excavation and construction activities near abandoned wells since they may still contain residual hydrocarbons, chemicals, or other hazardous materials present in and around the wellbore. Although specific requirements will vary by jurisdiction, regulatory agencies typically require certain precautions or restrictions on activities near abandoned wells to protect public health and the environment by minimizing the risks associated with residual hazardous materials. As such, the well plugging plan submitted to BCarbon should address the following general requirements, as necessary per state rules, for construction and excavation activities.

- **Notification Requirements:** Individuals or companies planning to conduct activities near abandoned wells may be required to notify the presiding regulatory agency or landowner of their plans in advance. This allows the agency an opportunity to assess potential risks and provide precautionary feedback.
- **Safety Precautions:** Depending on the nature of the activity and the proximity to the abandoned well, safety precautions such as fencing, signage, and personal protective equipment may be required to prevent accidental contact with hazardous materials.
- **Permitting Requirements:** In some cases, activities near abandoned wells may require a permit or approval from the presiding regulatory agency. This helps to ensure that the activity is conducted in a safe and responsible manner.
- **Monitoring Requirements:** Regulatory agencies may require ongoing monitoring of abandoned wells to detect any leaks or other signs of environmental contamination. This can help to identify and address any risks before they become a more severe problem.³
- **Financial assurance requirements:** Operators or landowners may be required to provide financial assurance to cover the costs of any potential environmental cleanup or other liabilities associated with proposed activities near abandoned wells.⁴

Site Surface Reclamation Plan

Development of a site surface reclamation plan is required as part of the BCarbon MCR protocol to ensure all regulatory requirements are fulfilled, and that proper reclamation procedures will be conducted. Specific site closure, timelines, and surface reclamation requirements will often vary by

³ United States Environmental Protection Agency. Region 5 Guidance #4 Plugging And Abandoning Injection Well, 1994. <https://www.epa.gov/sites/default/files/2015-09/documents/r5-deepwell-guidance4-plugging-abandoning-injection-wells-19941222.pdf>.

⁴ Castle, Megan. "Colorado Oil & Gas Conservation Commission Votes Unanimously to Adopt SB 19-181 New Financial Assurance Rules." Colorado Oil & Gas Conservation Commission, March 1, 2022. https://ecmc.state.co.us/documents/media/Press_Release_FA_Rulemaking_Adoption_20220301.pdf.

state, and in some cases, must meet contractual requirements within existing mineral leases. The goal of the plan is to restore site stability and ecosystem functions by returning the disturbed lands to native conditions prior to surface disturbances, such as crop production or wildlife habitat.⁵ In general, the plan should discuss reclamation approaches or methods that will be used to re-contour the site, how topsoil will be spread to fill in disturbed areas, and the re-seeding of native vegetation per state regulations or per landowner surface use agreement. Applicants are encouraged to review applicable state or local regulations and develop a plan that will satisfy promulgated rules. A recent document sponsored by the Groundwater Protection Council (GWPC)⁶ provides key reclamation requirements by state and is recommended for review by PDs if further detail or instruction for land reclamation requirements is necessary.

Pre-Plugging Test Results

Pre-plugging emissions testing is critical in identifying active methane emissions across the surface production equipment. Project Developers are encouraged to use any of the different measurement or sensor devices to identify the location of surface leaks. As methane measurement technology improves, the goal is to be able to both identify *and measure* all surface emissions.

Binary or Qualitative Devices (Required)

At least one pre-plugging test with a device capable of testing for methane emissions is required. These devices have been used in the oil and gas industry for decades to test for the *increased* presence of methane and include items like gas sniffers, methane sensors, FLIR cameras, OCR cameras, and other laser or thermal based solutions.

Quantitative Measurement Devices (Requested)

Measuring the (mass or volume) flow rate for active leaks for each location is requested. While this type of measurement technology is newer to the oil and gas industry, these devices are critical in understanding the relative size and scope of each leak.

Note: Documentation of the device, date, results, and calibration are required. Additional documentation of leaks with photos, location, videos, screen captures, or data files is highly encouraged.

Greenhouse Gas Emissions

The following discussion provides guidance for calculating Baseline Emissions, and the use of the decline curve and leak rate models to determine carbon credit offsets. A process flow chart (**Exhibit 3**, pg. 13) has been developed to assist PD's or technical personnel with the calculation process.

Historic Production Data Sourcing

Historical production data singularly sourced from the presiding regulatory agency (e.g., Oklahoma Corporation Commission or RRC) or a reputable third-party production software company (e.g., Enervus, IHS) is acceptable. In the event historic production is not available in either of these methods, additional methods may be considered on a case-by-case basis. The project developer must demonstrate historic gas production. Some examples include, but are not limited

⁵ Western Exploration. 2023. Land Maintenance & Site Reclamations. <https://www.western-exploration.com/#:~:text=The%20primary%20goal%20of%20reclamation,it%20proves%20to%20be%20dry>.

⁶ GWPC. 2023. Best Practice Considerations for Idle and Orphan Well Plugging and Abandonment. Prepared by ALL Consulting. September 2023.

to, daily flaring volumes, historical unintegrated paper (Barton) charts, or extended flow tests with modern measuring technology.

Baseline Emissions (BE) Calculations

The Baseline Emissions Calculations are the total projected emissions from a well for a 20-year time period. To calculate the emissions, the historical monthly production, the “Decline_Curve_Model” and the “Leak_Rate_Model” Spreadsheets are required. For detailed instructions about using these two Excel files, please see Section 5 of the MCR protocol.

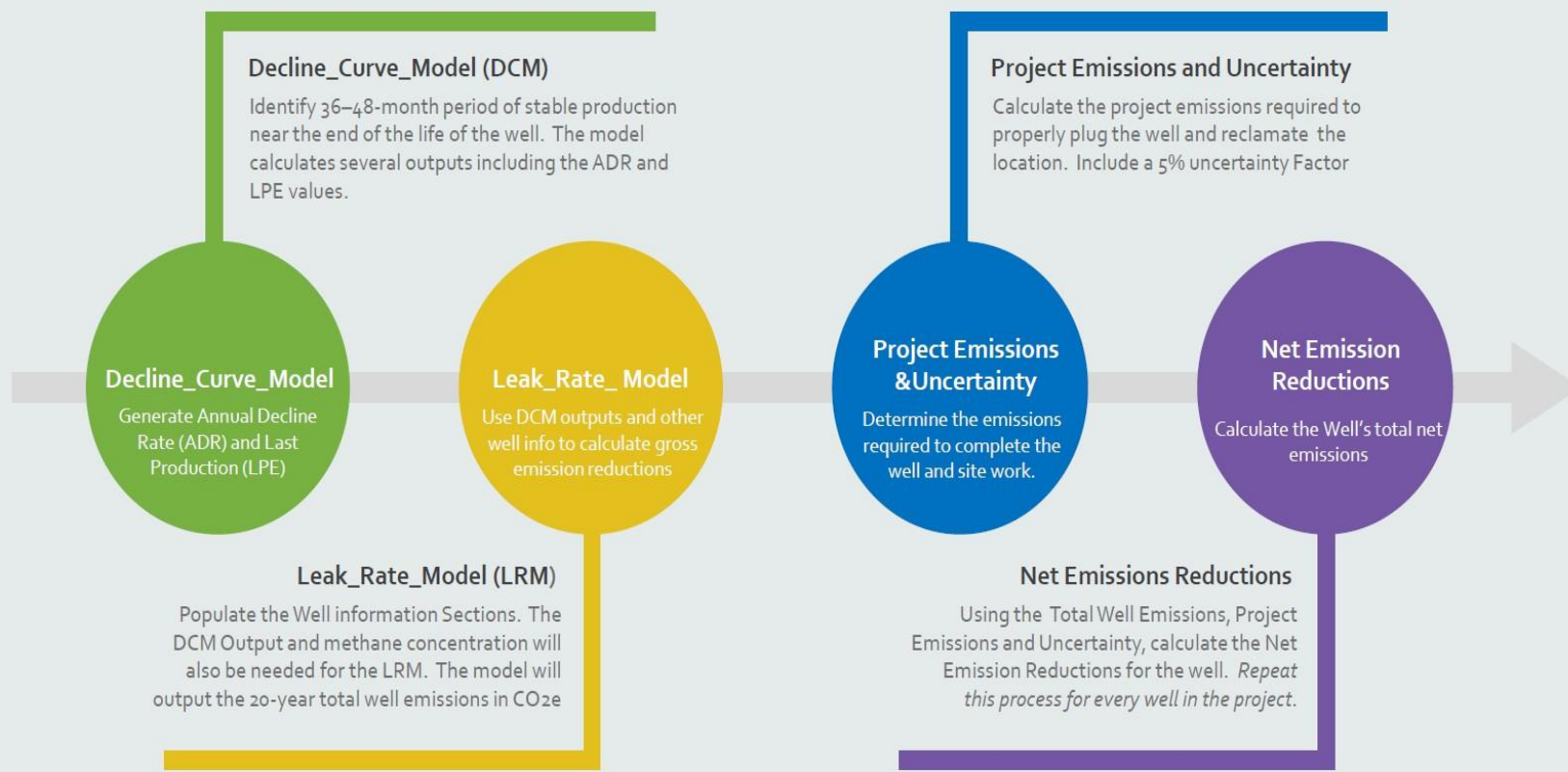
Decline Curve Model

The “Decline_Curve_Model” is used to calculate two main output parameters that will be used in the leak rate model. The first parameter, the annual decline rate (ADR), is used to estimate the decline in the gas production rate over time. By MCR protocol definition, the ADR cannot be less than 3% or greater than 30%. The other important parameter, the last production estimate (LPE), is the estimated gas rate which the future gas reserves and emissions will be based.

Exhibit 3: Methane Emissions Calculations Process Flow



Methane Emissions Calculations Process Flow



Leak Rate Model

The “Leak_Rate_Model” is a proprietary model used to calculate the projected methane emissions of a well over a given period. This rigorous model accounts for many factors to calculate the final estimated methane emissions. Yellow highlighted cells in the spreadsheet are required inputs. Following are short descriptions of the different sections of the “Leak_Rate_Model” spreadsheet.

- The **Well Detail Section** is straightforward. The year the well was drilled and whether the well is actively leaking are important components in the calculations.
- The **Volume Projections** section is where the two outputs (ADR and LPE) from the “Decline_Curve_Model” are input into the model.
- **Leak Rate Projections** are the most complex part of the model. The notes in the model should provide clarity on how to calculate this part of the model. A search in Excel Help or on Google can be useful in providing a tutorial with the “Goal Seek” part of the calculation.
- **GHG Emissions** contain the output for the “Leak_Rate Model”. These are the final emissions calculations that convert from an mcf of methane into a metric ton of CO_{2e}.

Estimated Project Emissions

Project Emissions are the emissions required to remove any surface equipment, plug and abandon (P&A) the well and reclaim surface disturbance within the project area. In practice, well plugging can be an unpredictable and resource-intensive enterprise that requires several different services, resources, and personnel. Tracking of the related services and equipment (and their emissions) can become overly tedious and complex for an operator or PD. Thus, the MCR protocol allows a PD some flexibility to account for project emissions in one of three ways:

1. Itemized Accounting of the on-site emissions sources. The MCR protocol (Section 5) and the MCR Materials Checklist include a list of the categories of emission sources (such as cement, trucking, etc.) to calculate each on-site project emitter.
2. A flat-rate emission total of XXMTCO_{2e}. This method allows the applicant to choose a pre-determined constant emission total for the project emissions of a typical project. The pre-determined constant emission total should be explained and justified in the FPP. As more data is gathered, this emission total may change.
3. For some projects, well plugging leads to an additional emissions reduction in that ongoing maintenance activities (i.e. water hauling and others) that produce GHG emissions are no longer needed. If the PD would like to “offset” their project emissions with these avoided future project emissions, they may provide supporting calculations and documentation for BCarbon to review.

Net Emissions Reductions

Carbon offsets will be granted from the net emission reductions. On a project basis, this is summation of the net emission reductions from all the associated wells and is derived from the equation below:

Net Emissions Reductions = (Baseline Emissions - Project Emissions) * 95% Uncertainty Factor

Additional Required Documentation

Project Developers are required to demonstrate to presiding regulators that wells included in the project are properly plugged and decommissioned, to include removal of surface equipment and reclamation, and provide documentation that clearly proves title to the Environmental attributes and evidence of the legal right to conduct plugging activities within the project area. This documentation includes the Contractual Right to the Environmental Attributes, Evidence of the legal Right to Conduct Plugging Activities, Proof of Approval from the Presiding Regulator (post-plugging only), and Plugging Record (post-plugging only). This information should be presented with the Provisional Project Plan package as part of the BCarbon application.

Post-Plugging Information

Key Post-Plugging (Final Project Plan) Documentation

Post Well Plugging documentation is critical in ensuring the wells are properly plugged, surface estate is properly reclaimed, and other associated risks are properly mitigated. In conjunction with the MCR Materials Checklist, the Post Well Plugging documentation should include any changes in well or project information, demographics, ownership, or any other background information that has changed since the original application. Additionally, an approved Plugging Record(s) and a post-plugging emissions test are required.

Post-Plugging Test Results

A post-plugging emissions test is required. Post-plugging methane emissions are expected to be negligible for a well that has been properly plugged. Each site must comply with all local and state requirements for regulatory recognition that the well has been properly plugged and abandoned. Documentation of the device, date, results, and calibration associated with this test are required for submission per BCarbon MCR protocol.

A second post-plugging verification test will also be required one year after first credit issuance, to ensure that no failure has occurred, following the same standards laid out for the initial pre- and post-plugging tests.

Note: Additional documentation of leaks with photographs, location, videos, screen captures, or data files is highly encouraged for post plugging activities.

Demographic Details

The BCarbon framework is integrated with a registry that tracks the complete lifecycle of certified projects from project approvals, and issuance, serialization, transferring, and retirement of credits. The BCarbon protocol requires assessment of certain environmental and socioeconomic demographic parameters within five miles of the project area for each well being considered for carbon credit certification. This demographic assessment provides more details on the wells and facilitates the development of baseline data that can be used to estimate, and document increases to applicable co-benefits (*see discussion below*) after surface reclamation in the project area has been completed. A combination of an on-site field visit and a desktop/Geographic Information System (GIS) analysis can be used to report the required information, as detailed below, within the associated BCarbon application. It is recommended that maps be used to depict demographic details presented in this section.

Aquifers and Water Wells

In general, an aquifer is a geologic formation or group of formations that are sufficiently saturated to produce water that is received by wells or springs.⁷ The United States Geological Survey (USGS) maintains GIS data that can be used to identify underlying aquifers and associated water wells within any project area and is available via the USGS National Water Information System (USGS NWIS) online map (<https://maps.waterdata.usgs.gov/mapper/index.html>). Data within this system can also be used to evaluate a specific project site's elevation contours, watershed boundaries and land cover.

In some cases, aquifer or water well data may be difficult to obtain from the USGS. When this situation arises, applicable aquifer and water well data and/or online maps may be available at the state level from a geological and/or water resources agency. For instance, shapefiles for minor and major aquifers, as well as groundwater wells in Texas, can be downloaded from the Texas Water Development Board (TWDB) <https://www.twdb.texas.gov/mapping/gisdata.asp>. In general, it is recommended mining for state level aquifer and water well data be conducted first as state managed data often contains more detailed information and aquifer/water well coverage. In New Mexico, the Office of the State Engineer provides publicly available GIS applications and online maps (<https://www.ose.state.nm.us/GIS/>) that can be used to collect well specific data to include year of completion, depth and water level.

Sensitive Receptors and Environmental Justice Data

To help the public and stakeholders better screen for Environmental Justice, BCarbon's Methane Capture and Reclamation MCR protocol requires the identification of primary sensitive receptors (e.g., hospitals, nursing homes, schools, playgrounds, places of worship, etc.) and socio-economic data that documents disadvantaged people and other key environmental justice (EJ) indicators within proximity of the project area. This information can be used as a baseline to evaluate and/or compare improvements to human health conditions upon completion of well plugging activities. Currently, the DOE is preparing to launch a "Responsible Carbon Management Initiative" and through this initiative is encouraging PDs to pursue environmental and societal benefits, to include EJ parameters.



Exhibit 2: Example map from EJScreen depicting "disadvantaged" data within a five-mile radius of a project.

To better help the public and stakeholders screen for EJ factors, the EPA has developed an EJ information and mapping tool, referred to as EJScreen (<https://www.epa.gov/ejscreen>) that can be used to screen for potential public health, environmental, and socio-economic concerns. EJScreen utilizes nationally consistent data and an approach combining environmental and demographic indicators to produce reports and maps for any user-defined project area.

⁷ USGS. 2023. Principal Aquifers of the United States. Water Resources Mission Area. March 8, 2023.

EJScreen is updated annually with the newest and best data available and allows an easy to use one-stop solution for datasets from various sources.

Per BCarbon's MCR protocol, EJ factors in the pre-plugging application material should include, but not be limited to:

- Low income
- People of color
- Unemployment
- Breakdown of age by male/female
- Language use
- Schools
- Hospitals
- Places of Worship

Endangered Species

The U.S. Fish and Wildlife Service (USFWS) administers the Endangered Species Act (ESA) and has primary responsibility for terrestrial and freshwater organisms. Section 7 of the ESA requires Federal agencies to ensure that any action they authorize, fund, or carry out is not likely to adversely impact any federally listed threatened or endangered species or result in the destruction of critical habitat. The USFWS has developed the Information for Planning and Consultation (IPaC) planning tool (<https://ipac.ecosphere.fws.gov/>) that can be used to evaluate at a screening level the potential for ESA listed species to occur with any given area of the United States.

Project shapefiles, coordinates, or state/county information can be entered into the online tool to identify the search area, and specific project boundaries can be drawn via the tools polygon feature to provide specific project location details. Based on the entered location information, the system will generate a report for download that list potential federally listed species that can occur in the area. This list of species should be included into the related BCarbon application for further assessment of biodiversity increases that may result from implementation of the project.

Acreage of Agricultural Land and Soil Analysis

The Web Soil Survey (WSS) is operated by the USDA Natural Resources Conservation Service (NRCS) and provides interactive access to soil maps and data. The WSS tool allows the user to define an area of interest (AOI) by importing a shapefile or zipped shapefile of the 5-mile buffer around the well that is scheduled for plugging. Once the AOI has been created, the user can generate a map and report of the soil map units (soil types) along with the acreage and percentage of soil map units within the AOI. Additionally, the data can be downloaded into tabular and spatial data formats to be utilized in GIS software, such as ArcGIS.

For agricultural land use, the WSS also provides soil ratings to determine Farmland Classifications which identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. A map and report of the Farmland Classification can be generated in the same fashion as the soil map units, including the acreage and percentage of the units within the AOI. An estimate of available agricultural land per BCarbon MCR protocol should be calculated and reported in the associated application to help assess future soil regeneration and improvements to biodiversity that can result from land reclamation after well plugging activities have been completed.

Quantification of Land Reclamation

Land reclamation refers to land that is restored to its natural state once the well has been plugged, equipment has been removed, and surface disturbance to the site has been

minimized. Land reclamation is a critical feature of plugging actives as proper reclamation practices can improve biodiversity and soil regeneration.

Per BCarbon MCR protocol, the amount of land to be reclaimed must include all the wells being considered in a single application, and reported in the Demographic Details section. To approximate the amount of acreage to be reclaimed requires determination of the total surface disturbance that existed while a given well was in operation. The review of historical aerial imagery to identify disturbances at a well pad site is recommended as this can be easily accomplished by accessing historical imagery via Google Earth and digitizing a KMZ for the disturbed area of the well pad. Once a KMZ or shapefile has been created, the acreage can be calculated in Google Earth.

A similar method could be used by other GIS or CAD software by reviewing historical imagery, such as the National Agriculture Imagery Program (NAIP) or other available imagery sources, and digitizing a shapefile for the disturbed well site. For older historic well sites where review of historical imagery may not be possible, it is recommended the PD document and calculate the amount of disturbance during the plugging of the well.

Waters of the U.S. (Requested)

“Waters of the United States” (WOUS) is a threshold term in the Clean Water Act (CWA) and establishes the geographic scope of federal jurisdiction under the Act.⁸ Although the definition of WOUS is continually amended for varying reasons (e.g., political, litigation, etc.) by the EPA and U.S. Corps of Engineers, in general, WOUS can be considered traditional navigable waters, natural ponds, most streams and wetlands. Preliminary evaluation of potential WOUS within the project area can be determined by review of the USFWS’s digital Wetlands Mapper tool (<https://www.fws.gov/program/national-wetlands-inventory/wetlands-mapper>) that illustrates data contained in the National Wetlands Inventory (NWI) database. Another valid source to identify WOUS is available from the USGS National Hydrography Dataset (NHD) (<https://www.usgs.gov/national-hydrography/national-hydrography-dataset>). The NHD is available as a file geodatabase, that includes attribute tables and feature level metadata, or can be downloaded as a shapefile.

When comparing the available datasets, NHD is more useful when delineating watersheds, drainages and catchments; whereas NWI data typically provides more mapped features and details to include WOUS classifications. However, the use of either dataset can be used to ascertain potential WOUS features within proximity of the project area and subsequent evaluation of increases to biodiversity that may result from the project.

Co-Benefits Documentation (Optional)

BCarbon is focused on meaningful, well-designed projects that benefit the entire community. Co-Benefits are additional benefits that are associated with the capture of GHG emissions. Although co-benefits will vary by the project type (e.g., GHG emission, forest, etc.), project location, and the planned or required reclamation activities, co-benefits will typically consist of positive increases to environmental, social, or cultural factors. For instance, a GHG reduction project could result in improvements to local air quality parameters and the associated reclamation of land surfaces could benefit soil generation and biodiversity.

⁸ EPA. 2023. Definition of “Waters of the United States” under the Clean Water Act.

As part of the BCarbon MCR protocol and application process, PDs may summarize co-benefits that are anticipated for improvement as a result from capturing GHG emissions. This information will be reviewed as part of a quality control program by BCarbon and third-party verifiers to ensure the project is adequately planned and that appropriate plugging methods are being utilized. Potential co-benefits for a GHG emission capturing project could include:

- Soil regeneration
- Improved air quality
- Increased biodiversity
- Job creation
- Improved water quality
- Improved human health conditions
- Removal of significant potential liabilities for state governments, local communities, and taxpayers

Appendix A: MCR Materials Checklist

The MCR Materials Checklist provides a detailed description of all files needed within the Provisional Project Plan (pre-plugging) submission and the Final Project Plan (post-plugging) submission for project developer reference.

Provisional Project Plan (PPP) (pre-plugging)

- Application Form**
- Project Summary Table with Project information and the following details for every well included in the Project:**
 - Project Name
 - Project Developer
 - Main Point of Contact
 - API Well Number
 - Name of well
 - Location Description/GPS Coordinates
 - Pre-Plugging Test Date
 - Pre-Plugging Test Results (in ppb)
- Well Details Summary** includes information for each well included in the Project
 - State and County
 - Presiding Regulator
 - Surface Landowner Name, Address, Phone Number, and Email. Needed for *all* landowners who hold titles within the project area.
 - Mineral Interest Owner(s) Contact Information (Optional)
 - Operator Name, Address, Phone Number, and Email. Needed for *all* operators who hold wells within the project area.
 - Well Plugger or Organization leading plugging activities
 - Well Type
 - Status (demonstration of eligibility re Regulatory Compliance)
 - Orphan Well?
 - Date Drilled
 - Date Shut-in
 - Last Production Date
 - Wellbore Diagram

- o Total Depth
- o Producing Zone(s), including perforation depths and geologic formations
- o Presence of casing or plug leaks?
- o Contaminants present? (e.g., H₂S, CO₂, etc.)
- o Directions to Well Site
- o Surface Estate Area Description
- o Description of Surrounding Land
- o Photos of:
 - Well and any surface equipment
 - Surroundings
 - Well Identifiers/Signage
- ❑ **Well Plugging Plan** for each well. At a minimum, the plan for each well must satisfy all requirements to maintain Regulatory Compliance through the P&A process
 - o Presiding Regulator Documents (e.g., W3a in TX)
 - o Summary Description of Plugging (including demonstration that the plan complies with the Protocol)
 - o Site Surface Reclamation Plan
 - o Estimated Project Emissions – result of calculations showing emissions associated with project activities
- ❑ **Test Results**
 - o Pre-Plugging Test Summary including:
 - Equipment selection and calibration details
 - Test results
 - Narrative explanation as needed
- ❑ **Greenhouse Gas Emissions Calculations**
 - o Emissions Report including:
 - all calculations for estimating Baseline Emissions and Project Emissions (including alternative PE accounting method if used, as specified in Guidance)
 - Project Emissions required to be assessed and reported:
 - Materials emissions from concrete used for plugging
 - Fuel for equipment and materials transport to project site
 - Fuel for rig operation during plugging activity
 - Methane vented during baseline measurement

- Project Developers shall use the current version of the U.S. Environmental Protection Agency’s Emission Factors Hub (GHG Emission Factors Hub | US EPA) to determine the correct factors to use for their equipment. For diesel fuel, use No. 2 Fuel Oil
 - o Greenhouse Gas Emissions Calculations Narrative
 - o Production Data for each well
 - Raw Data
 - Data Sources and Details
 - o Modeling
 - Modeling Narrative and Explanation of All Inputs
 - Decline Curve Model
 - Leak Rate Model
 - o Methane Concentration
 - Value from Index (per the Protocol) or
 - Gas Sample – Chromatograph Report
 - Narrative statement/description of which method used
 - o Final Calculations Summary Outlining Carbon Credits for each Well
- Evidence of the Legal Right to Conduct Plugging Activities**

Final Project Plan (FPP) (post-plugging)

- Updates to each section of the Provisional Project Plan, as needed**
- Executive Summary**
 - o Should note any updates to each section of the PPP
- Project Summary Table** (update if there are any changes from PPP in the summary details for the Project and every well included in the Project)

Additional information to include is listed below:

 - o **Plugging Date**
 - o **Post-Plugging Test Date**
 - o **Post-Plugging Test Result**
- Demographic details** (all that are known/applicable) including but not limited to demographic details listed below:
 - o # of aquifers within 5 miles of the well
 - o # of water wells within 5 miles of the well
 - o # of children, women of child-bearing age, and disadvantaged people within 5 miles of the well
 - o # of hospitals, nursing/retirement homes, schools, churches, playgrounds, etc.
 - o List of endangered species within 5 miles of the well
 - o Agricultural land acreage within 5 miles of the well

- o Total acreage of land reclamation across all wells

- Well Details Summary** (update if there are any changes from PPP for the information for each well included in the Project)
- Well Plugging Plan** (update if there are any changes from PPP for each well)
- Test Results**
 - o **Post-Plugging Test Summary Narrative and Results** (including equipment selection and calibration details)
- Greenhouse Gas Emissions Calculations** (update if there are any changes from PPP for each well)
- Co-Benefits Documentation (optional)**
- Proof of Approval from the Presiding Regulator** that the wells were appropriately plugged and decommissioned including removal of any equipment and suitable remediation
- Evidence of the Legal Right to Conduct Plugging Activities** (update if there are any changes from PPP)
- Submittal of Plugging Record from the Presiding Regulator** (i.e., W3 in Texas)

Second Post-Plugging Test

- Second Post-Plugging Test** (including date, equipment selection, and calibration details)
- Project Summary Table** updated with Second Post-Plugging Test results