Underground Injection Control Carbon Sequestration
Class VI Permit Application

FINANCIAL ASSURANCE DEMONSTRATION
40 CFR 146.85
Section 4.0

Four Corners Carbon Storage, LLC
San Juan Basin, New Mexico Carbon Sequestration Project

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FINANCIAL ASSURANCE DEMONSTRATION
40 CFR 146.85

Four Corners Carbon Storage, LLC – Injector 1

Facility Information

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Injector 1

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Well location: San Juan County, New Mexico
[redacted]

[1] North American Datum 1983

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ACRONYMS AND ABBREVIATIONS

2D	two dimensional
A	
AoR	area of review
C	
CCSvt	carbon capture and storage stochastic Monte Carlo
CO_2	carbon dioxide
CFR	Code of Federal Regulations
E	
ERRP	emergency and remedial response plan
M	
MM	million
O	
O&M	operation and maintenance
P	
PPM	parts per million
PISC	post-injection site care
U	
USDW	underground sources of drinking water

4.0 FINANCIAL ASSURANCE DEMONSTRATION [40 CFR 146.85]

4.1 Financial Responsibility Summary and Cost Estimates

Four Corners Carbon Storage, LLC (Four Corners Carbon) proposes drilling and completing a carbon sequestration injection well and a monitoring well for the safe sequestration of carbon dioxide (the "Project") into [redacted]. Four Corners Carbon is providing financial responsibility pursuant to 40 CFR 146.85. Four Corners Carbon is purchasing a combination of financial instruments (**Attachments 1** and **2**). The instruments being purchased include a surety bond in the amount of $11,387,500 to cover the costs of corrective action, injection well plugging, post-injection site care, and site closure. A Pollution Legal Liability insurance policy will cover emergency and remedial response costs.

The estimated costs of each of these activities, as provided by Four Corners Carbon (see Statement of Qualifications in **Appendix A**), are presented in **Table 4.1**.

Table 4.1—Cost estimates for activities to be covered by financial responsibility.

Activity	Estimated Total Cost ($)
Corrective Action	[redacted]
Plugging Injection Well	[redacted]
Post-Injection Site Care and Site Closure	[redacted]
Emergency and Remedial Response	[redacted]
Total	[redacted]

A financial assurance cost estimate, based on 2023 dollars, is provided for:

- Corrective actions for all wells in the area of review (AoR) that require corrective action (as identified in the Area of Review and Corrective Action Plan, Section 3.0 to meet the requirements of 40 CFR 146.84);
- Plugging and abandoning the injection well (as identified in the Injection Well Plugging Plan, Section 9 to meet the requirements of 40 CFR 146.92);
- Post-injection site care and site closure (as described in the Testing and Monitoring Plan in Section 8 includes monitoring, measurement, verification, and other actions needed to ensure that underground sources of drinking waters (USDW) are not endangered from the well-plugging until the site is closed to meet the requirements of 40 CFR 146.93); and
- Emergency and Remedial Response (as described in the Emergency and Remedial Response Plan (ERRP), Section 11.0 to meet the requirements of 40 CFR 146.94)

These costs will be updated annually to account for inflation and Project-related cost changes.

4.1.1 Corrective Action

No wells in the AoR, as defined in Section 3, were determined to need corrective action. Therefore, no corrective action costs were included in the estimate.

While the study concludes that corrective action is not required pursuant to 40 CFR 146.84 within the delineated area of review, if it were necessary, the cost to remediate the injection well is estimated to be [redacted] for study, testing, and review.

4.1.2 Plugging Injection Well

The plugging costs for the injection and monitoring wells are estimated to be [redacted] per well; a breakdown of costs is provided in **Table 4.2**. A detailed discussion of the plugging procedures is included in Section 9.

Table 4.2—Plugging costs.

Activity	Cost
Workover Rig	[redacted]
Rental Tools	[redacted]
Mud/Brine	[redacted]
Frac Tanks	[redacted]
Wireline	[redacted]
Final Mechanical Integrity Test and Casing Logs	[redacted]
Cement	[redacted]
Bridge Plugs/Packers	[redacted]
Misc.	[redacted]
Total	[redacted]

4.1.3 Post-Injection Site Care and Site Closure

The post injection site care and site closure cost estimates (**Table 4.3**) include costs for the post-injection period related to [redacted] monitoring program, groundwater monitoring, soil monitoring, and the operation and maintenance activities for the monitoring well, as described in Section 8. The site closure costs include plugging the monitoring well and surface facility closure costs.

Table 4.3—Post-injection site care and site closure costs.

Activity	Estimated Total Cost
Post-Injection Site-Care	
[redacted] Monitoring Surveys	[redacted]
Groundwater and Soil Monitoring	[redacted]
Operations and Maintenance of Monitoring well	[redacted]
Subtotal	[redacted]
Site Closure	
Monitor Well Plugging	[redacted]
Surface Facilities Closure	[redacted]
Subtotal	[redacted]
TOTAL:	[redacted]

4.1.4 Emergency and Remedial Response

This section summarizes estimates of emergency and remedial responses costs for Four Corners Carbon Storage, LLC's ("Four Corners Carbon") proposed San Juan Basin, New Mexico, Carbon Sequestration Project (the "Project"). These estimates are consistent with the U.S. EPA's Underground Injection Control (UIC) Program's Class VI statutory and regulatory requirements and are intended to inform the face amount of financial assurance(s) necessary to satisfy emergency and remedial response actions.[2] Estimating possible emergency and remedial cost estimates for Carbon Capture and Underground Storage (CCUS) necessitates understanding of the interactions between the CCUS technology, the geophysical environment in which it will be stored, and nearby aquifers and populations. The long-term nature of such projects, the low (but not zero) probability of a release event occurring that may require emergency and remedial response, variability in potential incident conditions at the site, the size of the potentially impacted population, and likely exposure pathways (among other factors) inform the following emergency and remedial response cost estimates.

Four Corners Carbon combines readily available information with the results of Monte Carlo analysis tailored to Four Corners Carbon project-specific risks and uncertainties to generate reasonable upper bound estimates of emergency and remedial response costs. In our view, the following cost estimates provide a reasonable, and objective basis for determining the face amount of financial assurance instrument(s) necessary to support a Class VI permit. Importantly, model results vary with factors that would be expected to impact project risk, such as: the purity of the CO_2 sequestration stream and degree to which any co-contaminants might result in additional emergency response challenges; the duration of injection and post-injection site care activities; the number of wells present in the area of review (AoR) that extend below USDWs and the proportion of wells that penetrate the upper confining zone; population

[2] Per 40 CFR 146.85(6)(c), during the active life of the Project, the cost estimate for ERR should be updated no less than annually to reflect changes in inflation. In addition, within 60 days of any amendments to the ERR plan, the owner or operator must also provide to the Director written updates of adjustments to the cost estimate, including without limitation, any amendments that may arise as a result of any event that necessitates emergency and remedial response during the life of the Project through site closure.

density and the type/extent of private water well use; the presence and size of community/municipal water systems; and the use and length of pipelines to transport captured CO_2 to injection well locations.

The cost estimation method applied to Four Corners Carbon is based on the peer-reviewed approach pioneered by Industrial Economics, Incorporated ("IEc"); this approach has been used to inform estimation of emergency and remedial response costs in previously approved Class VI permits.[3] Four Corners Carbon estimates the cost of emergency and remedial response by tailoring the valuation parameters underpinning the Carbon Capture and Storage stochastic Monte Carlo model ("CCSvt model") to reflect site-specific factors associated with the Project. Specifically, the model's input parameters reflect the geologic location and specific chemical composition of the Project's CCUS stream, as well as site-specific conditions that exist within the established area of review. The analysis adopts several conservative input assumptions and incorporates probabilistic calculations that allow for multiple release incidents throughout operations and post-injection site care. Cost estimates are based upon generally accepted response actions and Four Corners Carbon's Emergency & Remedial Response Plan (ERRP, Section 11), both of which include commonly used steps to respond to contamination incidents that could impair the public's ability to safely access underground source(s) of drinking water (USDWs).

The CCSvt model, published in the peer-reviewed technical literature, leverages Monte Carlo (i.e., risk-based, probabilistic) modeling and site-specific scenario analysis (Trabucchi et al. 2014). In Four Corner Carbon's view, Monte Carlo analysis is particularly well suited to the evaluation of potential costs arising from low-probability events over long periods of time. As described in Trabucchi et al. (2014), key parameters which inform the CCSvt model inputs include the identification of release event types and probabilities, the duration of injection and post-injection/site closure (PISC) activities, and cost distributions for anticipated response actions if a release occurs. Based on a Monte Carlo model run of 50,000 iterations, Four Corners Carbon estimates an upper-bound cost estimate to satisfy emergency and remedial response of $3.0 million in current 2023 dollars (**Table 4.4**). This estimate specifically accounts for an array of possible risk events of potential concern at CCUS sites, including undocumented deep well leaks, CO_2 injection well leaks, CO_2 monitoring well leaks, rapid leakage through the upper confining zone, slow leakage through the upper confining zone, releases through an existing fault, releases through an induced fault/fracture, leakage through the upper confining zone/faults then a shallow well, and pipeline releases. The upper-bound cost estimate reflects the single Monte Carlo iteration with the greatest emergency and remedial costs out of the 50,000 trials run. We believe this estimate to be reasonable and appropriately conservative.

[3] This approach informed the ERR coverage estimates for Class VI permits in North Dakota, including for example, Dakota Gasification Company (Case No. 29450), Red Trail Energy, LLC (Case No. 28848) and Blue Flint Sequester Company, LLC (Case No.: 29888). See Trabucchi, C., Donlan, M., Sprit, V., Friedman, S. and Esposito, R., 2014, 'Application of a Risk-Based Probabilistic Model (CCSvt Model) to Value Potential Risks Arising from Carbon Capture and Storage', Energy Procedia 63 (2014) 7608-7618, https://www.sciencedirect.com/science/article/pii/S1876610214026101. See also Trabucchi, C., Donlan, M. and Wade, S., 2010 'A Multi-Disciplinary Framework to Monetize Financial Consequences Arising from CCS Projects and Motivate Effective Financial Responsibility', International Journal of Greenhouse Gas Control 4 (2010) 388-395, https://www.sciencedirect.com/science/article/abs/pii/S1750583609001108. See also Trabucchi, C., Donlan, M., Huguenin, M, Konopka, M., Bolthrunis, S., 2012, Valuation of Potential Risks Arising from a Model, Commercial-Scale CCS Project Site: Prepared for GCCSI and the CCS Valuation Sponsor Group, June 1, 2012, https://www.globalccsinstitute.com/archive/hub/publications/40831/iec2012valuationofpotentialrisks.pdf.

Table 4.4—Emergency and remedial response plan costs.

Summary Statistic	Cost	# of Events Occurring
Average	[redacted]	[redacted]
Median	[redacted]	[redacted]
Standard Deviation	[redacted]	[redacted]
5th Percentile	[redacted]	[redacted]
95th Percentile	[redacted]	[redacted]
99th Percentile	[redacted]	[redacted]
Minimum	[redacted]	[redacted]
Maximum	[redacted]	[redacted]

4.2 Financial Instruments

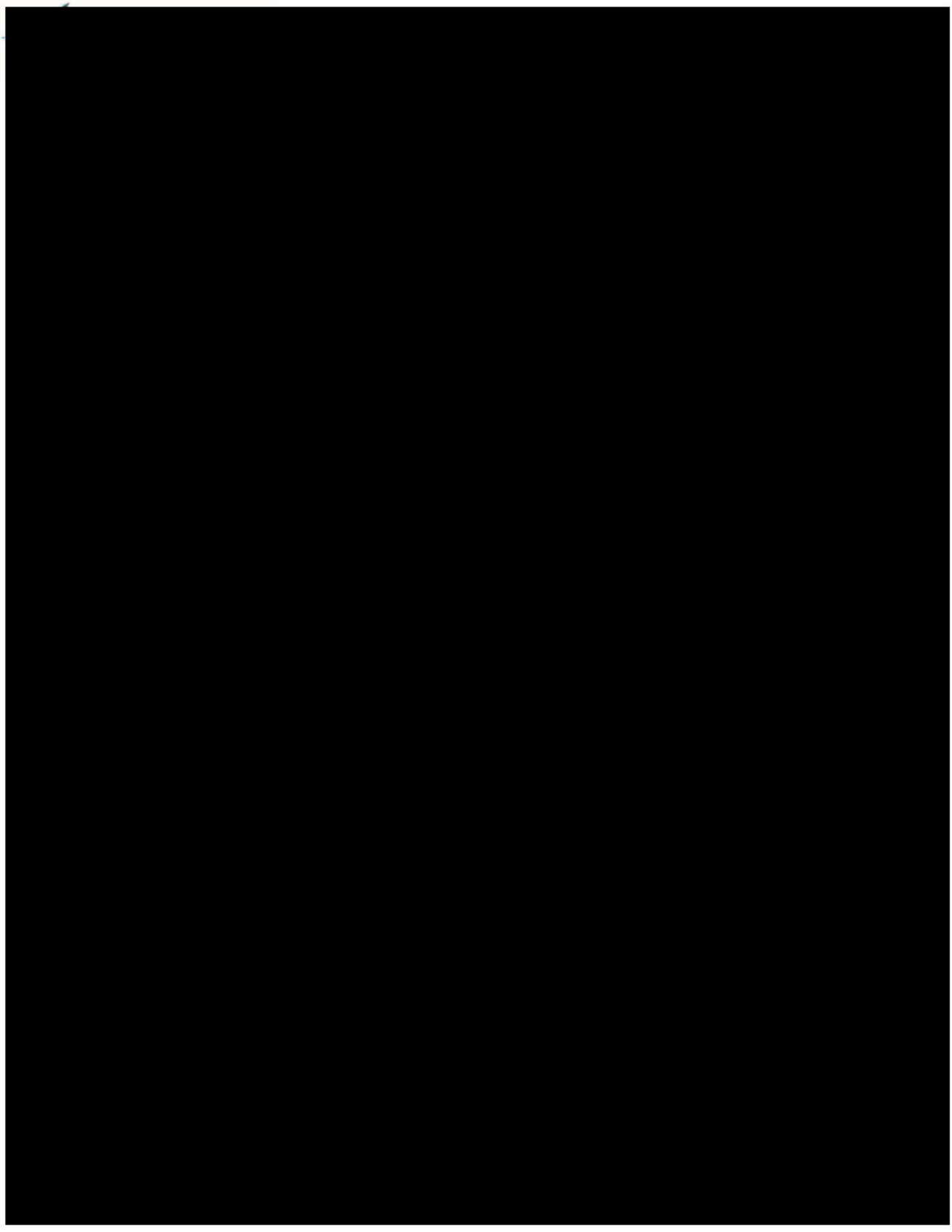
Pursuant to 40 CFR 146.85(a), Argonaut Insurance Company will provide a surety bond in the amount of [redacted] of plugging injection well costs and up to [redacted] of post-injection site care and site closure costs. See **Attachment 1**.

Pursuant to 40 CFR 146.85(a), Marsh USA Inc will provide Pollution Legal Liability insurance with all EPA required endorsements to cover emergency and remedial response costs. See **Attachment 2**.

4.3 References

Trabucchi, C., Donlan, M., Spirt, V., Friedman, S., & Esposito, R. (2014). Application of a Risk-Based Probabilistic Model (CCSvt Model) to Value Potential Risks Arising from Carbon Capture and Storage. Energy Procedia, 63, 7608-7618. https://www.sciencedirect.com/science/article/pii/S1876610214026101.

Attachment 1—[redacted] Insurance Company: Surety Bond Letter



Attachment 2—[redacted].: Pollution Liability Insurance Letter

[redacted]

Appendix A—Statement of Qualifications

Chiara Trabucchi, Chiara Trabucchi's areas of expertise are corporate finance and economics. As a Principal with Industrial Economics, Incorporated (IEc), Chiara is a nationally recognized expert in financial assurance and the design of financial settlement frameworks tailored for the protection of the public trust. An expert in evaluating the financial integrity of business, non-profit, and governmental organizations, Chiara has 30 years of consulting experience in assessing financial damages arising from mass torts and class action matters, lost profits, disgorgement, property diminution, economic benefit of noncompliance, fraudulent conveyance, and natural resource injuries. As a consultant to public- and private-sector clients, including litigators and in-house counsel, she regularly applies her expertise in the context of rigorous verification and auditing standards. Her recent work involves the monetization of financial consequences associated with Carbon Capture and Underground Storage (CCUS). Chiara has been qualified as an expert in financial management design and implementation of trusts to fund organizations in perpetuity by the Superior Court of the District of Columbia. She has testified in numerous forums on issues related to financial settlements for large-scale environmental damages. Chiara served as an invited expert on design considerations for financial risk management before the U.S. Federal Interagency Task Force on Carbon Capture and Storage, as well as an invited expert before the U.S. Senate Commerce, Science and Transportation Committee. She has testified before the U.S. Senate Committee on Energy and Natural Resources, as well as before the U.S. Senate Permanent Subcommittee on Investigations, Committee on Homeland Security & Governmental Affairs. She serves on several multi-stakeholder panels addressing the implications of financial assurance requirements on new and emerging technologies for climate change. She has authored articles in peer-reviewed journals on issues related to financial assurance, environmental disclosure requirements, environmental risk management, and the valuation of financial consequences arising from natural disasters and catastrophic events. Chiara has served as IEc's Chief Financial Officer, and as a member of the U.S. EPA's Environmental Financial Advisory Board, and the U.S. DOE's National Risk Assessment Partnership Stakeholder Group. She is a member of the American Institute of Certified Public Accounts, Forensic and Valuation Services. Chiara is an Adjunct Professor at the Roger Williams University, School of Law, and also serves as a Director on the Foundation Board of the Massachusetts College of Art and Design.

Michael C. Donlan, Mike Donlan is an expert in managing multidisciplinary natural resource and economic damage assessments. His work has involved all phases of the damage assessment and valuation process, including the identification, determination and quantification of natural resource injuries; the establishment of pollutant pathways linking pollutant sources with specific environmental receptors; the identification and evaluation of restoration options; calculation of the appropriate scale of restoration; costing of restoration alternatives; and, estimation of economic damages. Mike graduated magna cum laude from Dartmouth College with a B.A. in Geography modified by Economics. He also holds an M.B.A. from Stanford University.

John Harris, Numeric Solutions geoscientist, has 25 years of worldwide oil and gas exploration and development, uncertainty modeling and analysis as well as water resource management experience. John is a proven finder of hydrocarbon, specializing in basins with complex geology. John serves as a consultant to major and independent energy companies through Numeric Solutions, a company he founded after leaving Texaco in 1999. John's experience includes a number of successful projects ranging from hydrocarbon prospect generation to reserves estimation and valuation. While specializing in quantitative geology, John broadened his expertise into reservoir simulation and uncertainty analysis and risk assessment. With a leading role in uncertainty analysis and modeling at Statoil (now Equinor) in Houston, Texas, John developed tools to assess geologic uncertainty of Statoil's Gulf of Mexico assets and to

incorporate these uncertainties into the company's economic expectations for their development. John has degrees in Geology from both the University of Michigan and New Hampshire.

Mike Jones, Numeric Solutions energy finance professional, brings seasoned financial risk expertise with 18 years' experience in financial analysis, econometrics, financial planning and analysis, and energy finance. Mike holds a dual Bachelor of Arts degrees in Economics and U.S. Government from the University of Virginia in the Echols scholar program. Mike received his master's in international economics from American University's School of International Service. Mike's financial experience started at Accenture in the Strategy Consulting practice, continued to Friedman, Billing, and Ramsey in the Energy and Natural Resources group as a research analyst, and then to Stifel as an energy investment banker. From 2019 to 2021, Mike served as Chief Financial Officer of All American Drilling. Inc., a private water drilling, maintenance, and systems company based in Santa Barbara County, California. Beginning with Numeric Solutions 2016, Mike has worked in various water and natural resource financial roles, including technical writing/project management for SoCalGas for Aliso Canyon, and financial lead for Bridgemark Liquidation Trust, on behalf of Toll Brothers, for the environmental remediation and re-zoning of a brownfield oil site in Orange County, California.

Renata Billings, Numeric Solutions petroleum engineer, has 8 years of experience in upstream oil and gas. Her work history consists of field operations, environmental, health, safety, and regulatory work, and both financial and risk modeling. Renata holds a Bachelor of Science in Petroleum Engineering from Colorado School of Mines. Working with Noble Energy from 2015 to 2019, Renata gained experience as a project engineer in the Environmental, Health, Safety, and Regulatory group and a production engineer in the Denver-Julesburg Basin. She created safety documents and permitting outlines for the international new ventures group, performed analysis on event likelihood and adverse outcomes using Noble's internal event management system, and attended and participated in a variety of safety, hazard analysis, and process safety meetings. Her work included providing engineering support for a field team, designing plug and abandon procedures, and regularly reviewing pressure tests and mechanical integrity plans. In 2021, Renata began with Numeric Solutions, LLC where she has built financial models, worked on permitting for various redevelopment projects within California, and conducted conduit analysis projects for aquifer exemptions.