

LSU Journal of Energy Law and Resources

Volume 12
Issue 2 *Summer 2024*

6-26-2024

The Potential for Conflicts Between CCS Projects and Mineral Extraction

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Repository Citation

Joseph A. Schremmer, *The Potential for Conflicts Between CCS Projects and Mineral Extraction*, 12 LSU J. of Energy L. & Resources (2024)

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*Joseph A. Schremmer**

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I. INTRODUCTION

This Article classifies the types of conflicts likely to occur between carbon dioxide sequestration¹ and mineral extraction operations occurring simultaneously on the same tract of land. It then sets up a framework for thinking through the legal disputes that may result. These are modest goals, and the central problem—concurrent carbon dioxide sequestration and mineral development—is more complex than can be fully analyzed here. Three further questions worthy of attention are (i) how these principles guide resolution of specific kinds of disputes,² (ii) how best to arrange the contractual relations among property owners to harmonize simultaneous sequestration and extraction,³ and (iii) how, if at all, states should regulate these relations.⁴ Work on these important questions cannot

1. This Article will also refer to “carbon dioxide sequestration” variously as “carbon storage” or “carbon capture and storage” (CCS).

2. I address the first question of how the basic principles guide resolution of the kinds of disputes identified in the present Article in recent work. *See generally* Joseph A. Schremmer, *The Concurrent Use of Land for Carbon Sequestration and Mineral Development*, 75 BAYLOR L. REV. 630 (2023); Joseph A. Schremmer, *Conflicts and Confluences Between Surface and Mineral Estates with CCS*, 24 WYO. L. REV. (forthcoming 2024) (on file with author).

3. Readers interested in the second question regarding contracts for coordinating carbon sequestration and mineral development should consult Keith B. Hall, *Drafting and Negotiating Instruments to Acquire Pore Space Rights for CCS*, 69 FDN. FOR NATURAL RES. & ENERGY L. INST. 5-1 (2023).

4. Another related issue that is not analyzed in this Article is the problem generally referred to as “subsurface trespass,” which arises when carbon dioxide

proceed, however, except from a firm analytical foundation built on background principles. That, and nothing more, is what this Article hopes to provide.

To begin, Part II explains some basics of carbon sequestration and identifies the ways in which sequestration may conflict with concurrent mineral development. The three primary sources of dispute involve (i) use of the surface of the land, (ii) use of the subsurface of the land, and (iii) exploration of the subsurface using geological and geophysical techniques. Within the broad second category, disputes over the use of the subsurface, there are three subtypes of possible disputes: (a) the drilling and location of wellbores in the subsurface of the land, (b) access to deeper geologic strata by drilling through shallower strata, and (c) occupation of geologic porosity, or “pore space,” into which carbon may be injected for sequestration.

The challenge in analyzing the legal disputes that might arise from these (or any) kinds of conflicts lies in properly classifying the legal relationships that exist among the relevant parties. Those parties may include a sequestration operator, a mineral developer, and a surface owner. Which kind of legal relationships are presented depends on how title to the subsurface of the earth is held among the interested parties. Accordingly, one cannot begin to analyze the legal relations governing concurrent extraction and sequestration without first identifying how title is held to the surface, minerals, and pore space in the land. As Part III explains, there are fundamentally three different types of relationships that are likely to exist based on how title to the subsurface is carved up. Each relationship is in essence correlative, though each is governed by its own set of legal principles. Part IV outlines the background legal principles underpinning each of the three fundamental types of relationships.

The first of the fundamental legal relationships is the split-estate relationship, in which the surface estate owner or its lessee (the “surface tenant”) pursues carbon sequestration, and a separate mineral estate owner or its lessee (the “mineral tenant”) extracts minerals. The second is the relationship between holders of separate easements in the same land. This relationship would occur where the carbon sequestration developer owns only an easement for sequestration purposes, and mineral extraction is conducted either by the owner of fee simple title to the land or a severed

injected underneath one tract of land migrates beneath the land of other owners without those owners’ authority. For discussion of the principles governing that topic, see generally Joseph A. Schremmer, *A Unifying Doctrine of Subsurface Property Rights*, 46 HARV. ENVTL. L. REV. 525 (2022) [hereinafter Schremmer, *Unifying Doctrine*]; Joseph A. Schremmer, *Subsurface Trespass: Private Remedies and Public Regulation*, 101 NEB. L. REV. 1005 (2023).

mineral tenant. The third distinct type of relationship is that of severed, coequal estates. This type of relationship would arise if the owner of fee simple title in land were to sever an estate in minerals and, separately, sever an estate in the pore space in all or a stratum of the subsurface for purposes of carbon sequestration.

II. CARBON SEQUESTRATION BACKGROUND

A. The Carbon Sequestration Process

While only a brief overview of carbon sequestration is possible here, there are many other resources explaining the details of the process.⁵ This section focuses on only those aspects of the process that bear directly on the relationship between sequestration and mineral development within the same tract of land.

As used here, carbon sequestration refers to the injection of carbon dioxide, in a supercritical state, into the porosity of subsurface geologic rock formations for permanent retention—and not for any other purpose, such as enhanced recovery of oil or gas.⁶ Ultimately, the reason to geologically sequester carbon dioxide in this fashion is to mitigate the greenhouse gas effect that the carbon dioxide would have in the atmosphere, and thus slow the rate of climate change. Sequestration is the final process in carbon capture and sequestration (CCS), in which carbon dioxide is captured from an anthropogenic source, such as a fossil-fuel-fired power plant or an ethanol plant,⁷ or directly from the ambient air,⁸ and is then transported by pipeline to an injection well where it is sequestered.

5. See generally Gabriel Pacyniak, *State Sequestration: Federal Policy Accelerates Carbon Storage, but Leaves Full Climate, Equity Protections to States*, 14 SAN DIEGO J. CLIMATE & ENERGY L. 95 (2023); NAT'L ACADS. OF SCIS., *NEGATIVE EMISSIONS TECHNOLOGIES & RELIABLE SEQUESTRATION: A RESEARCH AGENDA* 9 (2018), <https://nap.nationalacademies.org/catalog/25259/negative-emissions-technologies-and-reliable-sequestration-a-research-agenda> [<https://perma.cc/A34Y-79R6>]; NAT'L ENERGY TECH. LAB'Y & U.S. DEP'T OF ENERGY, *CARBON STORAGE ATLAS* (5th ed. 2015), <https://www.netl.doe.gov/sites/default/files/2018-10/ATLAS-V-2015.pdf> [<https://perma.cc/8QP8-K9W5>].

6. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *CLIMATE CHANGE 2022 MITIGATION OF CLIMATE CHANGE* 11–35 (2022), https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SPM.pdf [<https://perma.cc/3GZE-9EC8>].

7. *Id.*

8. Pacyniak, *supra* note 5, at 8.

A favorable geologic formation for carbon sequestration has a few characteristics. It is porous, meaning that it contains a relatively high volume of “pore space” within the rock.⁹ Porosity makes the rock capable of receiving and holding fluids. Those pore spaces also need to be interconnected to a sufficient degree to permit injected carbon dioxide to flow through the rock’s pore spaces, a quality known as permeability.¹⁰ The formation must also rest below a relatively impermeable caprock or seal to prevent the vertical migration of injected carbon into shallower geologic strata. As it happens, the geologic formations that have these qualities tend to occur near areas with existing mineral development: depleted oil and gas reservoirs and deep saltwater aquifers.¹¹

Although the property and tort issues that are likely to arise among carbon sequestration and mineral development operations are primarily matters of state law,¹² two sources of federal law governing carbon sequestration are of note. First is the federal Safe Drinking Water Act. The law requires an underground injection control (UIC) permit to inject carbon dioxide for permanent sequestration or storage. The particular class of permit required for a carbon sequestration well, a Class VI permit, is administered by the federal Environmental Protection Agency (EPA) everywhere but Wyoming and North Dakota, where the states have taken primacy over the program.¹³ The requirements for a Class VI injection

9. See MICHAEL G. FAURE & ROY A. PARTAIN, CARBON CAPTURE AND STORAGE: EFFICIENT LEGAL POLICIES AND COMPENSATION § 2.1.1.1 (2017).

10. *Id.*

11. *Id.* §§ 2.1.1.1 & 2.1.1.3; see also ENERGY TECHNOLOGY PERSPECTIVES 2020: SPECIAL REPORT ON CARBON CAPTURE UTILISATION AND STORAGE 112, 114 (Int’l Energy Agency 2020), https://www.oecd-ilibrary.org/energy/energy-technology-perspectives-2020-special-report-on-carbon-capture-utilisation-and-storage_208b66f4-en [<https://perma.cc/J3QY-DQUH>].

12. To date, the principal focus of state legislation has been on assembling property rights in pore space throughout a geologic formation to enable the injection and migration of carbon for sequestration. States have adopted statutes empowering private parties to apply to the state to unitize pore space for this purpose. *E.g.*, WYO. STAT. ANN. §§ 35-11-313–35-11-317 (West 1977); MODEL STATUTE FOR CARBON STORAGE (Interstate Oil & Gas Compact Comm’n 2010). Other states have delegated condemnation authority to private carbon sequestration operators to take pore space for this purpose. LA. REV. STAT. § 19:2(12) (2020). This legislation does not directly concern the interaction between sequestration and extraction insofar as they occur on the same land.

13. Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO₂) Geologic Sequestration (GS) Wells, 75 Fed. Reg. 77,230 (Dec. 10, 2010) (“Final Class VI Rule”) (codified at 40 CFR 124 and 40 CFR 144–47).

permit are extensive. Consistent with the purposes of the Safe Drinking Water Act, the requirements largely focus on containing the injected carbon within the sequestration complex and preventing it from contaminating underground sources of drinking water. The Class VI regulations require the permit applicant to monitor the carbon storage facility to ensure that none of the injected carbon dioxide escapes from the storage complex, either during the injection phase or during a post-injection period.¹⁴ Additionally, the applicant must identify each “penetration” of the storage complex, including all active and abandoned wells, and perform “corrective action” on such wells to ensure that they do not serve as a conduit for leakage of injected carbon dioxide.¹⁵ Corrective action may consist of plugging or replugging the wells or conducting other remedial operations.¹⁶

Wyoming’s regulations impose additional requirements.¹⁷ In particular, they require the permit applicant to demonstrate that the “discharge of water will not degrade or decrease the availability of mineral resources, including oil and gas.”¹⁸ Further, the applicant must produce a cost estimate for the project and demonstrate sufficient financial resources to cover the costs.¹⁹ This “financial assurance” requirement expressly covers the costs of infringement of mineral and storage rights and surface property rights.²⁰ EPA’s Class VI regulations make no similar requirement.²¹

The second relevant source of federal law is tax law. Section 45Q of the Internal Revenue Code provides for a tax credit payable to taxpayers based on the volume of qualifying carbon oxides they inject for permanent geologic storage.²² Together with the statutory requirements to qualify for the credit, U.S. Treasury regulations make the taxpayer liable for dollar-

14. *Primary Enforcement Authority for the Underground Injection Control Program*, EPA, https://www.epa.gov/uic/primary-enforcement-authority-underground-injection-control-program-0#what_states [<https://perma.cc/7B58-TL79>] (last updated Feb. 2, 2024).

15. 40 C.F.R. § 146.84(c)(2) & (d).

16. UIC PROGRAM CLASS VI WELL AREA OF REVIEW EVALUATION AND CORRECTIVE ACTION GUIDANCE 4.4.1–4.4.2 (Env’t Prot. Agency 2013).

17. My thanks to Professor Tara Righetti for bringing these to my attention.

18. tit. 20 ch. 8 WYO. CODE R. § 1–7 (2018) (formerly cited as WYO. ADC ENV WQ Ch. 8 § 6).

19. tit. 20 ch. 24 WYO. CODE R. § 1–26 (2021) (formerly cited as WYO. ADC ENV WQ Ch. 24 s 19; 020.0011.24 § 19).

20. *Id.*

21. *See* 40 C.F.R. §§ 146.81–.95.

22. 26 U.S.C. § 45Q.

for-dollar repayment (recapture) of the tax credit for any carbon oxides that escape.²³ These provisions effectively require the taxpayer to maintain control over and monitor the lands in which it has sequestered carbon oxides during and after the period of injection.

Additionally, the state of California provides a tax credit for the production of low-carbon fuels, the Low Carbon Fuel Standards (LCFS) tax credit. Taxpayers may qualify for the LCFS tax credit by, among other things, injecting carbon dioxide in compliance with the state's CCS Protocol.²⁴ The CCS Protocol requires "proof that there is a binding agreement among relevant parties that drilling or extraction that penetrate the storage complex are prohibited to ensure public safety and the permanence of the stored CO₂."²⁵

B. Carbon Sequestration and Mineral Extraction

This section surveys the likely areas of conflict between carbon sequestration and mineral (especially oil and gas) operations that occur within the same tract of land. In general, carbon dioxide sequestration requires use of the surface of the earth for many of the same purposes that oil and gas development does: ingress and egress, surface locations for drilling wells and setting equipment, ongoing monitoring over the course of decades, etc.. Drilling wells for injecting carbon dioxide and monitoring wells also entails a certain degree of subsurface destruction, as the wellbores consume subsurface rock, fluids, and minerals in the drilling process. Sequestration additionally demands the occupation of subsurface porosity for storage of the carbon dioxide that is directly injected or that indirectly migrates under the land from elsewhere. Additionally, before a geologic formation is identified as a candidate for carbon sequestration, some amount of scientific exploration of its geology and geophysics is necessary, which may require use of the surface and reveal information about subsurface minerals.²⁶

More specifically, we can organize the likely sources of conflict into three basic types: (i) conflicting uses of the actual surface of the earth by the interest owners for things, such as farming and constructing oil and gas

23. *Id.* § 45Q(f)(4); 26 C.F.R. § 1.45Q-1(h)(2)(iii).

24. 17 CAL. CODE REG. §95490(a).

25. *Id.* §95490(b)(1); CARBON CAPTURE AND SEQUESTRATION PROTOCOL UNDER THE LOW CARBON FUEL STANDARD 9(c) 119 (Cal. Air Res. Bd. 2018).

26. *Cf.* Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO₂) Geologic Sequestration (GS) Wells, 75 Fed. Reg. 77,230 (Dec. 10, 2010) ("Final Class VI Rule") (codified at 40 CFR 124 and 40 CFR 144-47).

or injection well facilities; (ii) simultaneous occupation of subsurface portions of the land, including pore space, such as when a mineral tenant seeks to drill through depths in which a pore space or surface owner has injected carbon dioxide, or when a pore space or surface owner seeks to inject carbon dioxide into a formation that a mineral tenant is using for fluid disposal or ongoing production; and (iii) conflicts over which parties may explore subsurface geology by various means and who is entitled to use information obtained by other parties.

1. Use of the Surface

The surface activities that accompany carbon sequestration are like those customarily required in oil and gas development.²⁷ Injecting carbon for sequestration requires injection wells, which are typically vertical wells constructed on wellpads at the surface. The size of these pads will vary, but they are likely to resemble pads for conventionally drilled injection wells for other types of fluid disposal, such as saltwater disposal wells. Pads will likely range between one and ten acres in size.²⁸ In addition to injection wells, monitoring wells are also likely to be drilled. The total number of wells and wellsites needed for a carbon sequestration project will also vary depending on the amount of carbon to be injected.

To accomplish the drilling and completion of injection and monitoring wells, the driller may construct earthen pits to hold and circulate drilling fluid. Large and heavy equipment, including drilling and completion rigs, will need to access the drilling location by suitable roads across the surface of the land.²⁹ It is also likely that pipelines and related facilities will need to cross the surface of the land to deliver carbon dioxide to injection sites.

Oil and gas development likewise requires the use of access roads, wellpads, temporary pits, and pipelines of various sizes and for various purposes.³⁰ Unconventional or “horizontal” drilling typically involves much larger wellpads than are used for conventional vertical drilling.³¹ Oil production involves burying lines to move oil and produced water to a tank battery for separation and storage, which is also located on the surface of the land. Production of natural gas entails burying gathering lines to collect gas from wells on the premises. Ancillary surface facilities commonly

27. Wyatt D. Swinford, *Range War: Conflicts Between Oil and Gas Operations and Wind Farms*, 70 INST. ON OIL & GAS L. § 1.03[1][a] (Ctr. for Am. & Int’l L. 2019).

28. *Cf. id.* § 1.03[1][a].

29. *Cf. id.* § 1.03[1][c].

30. *Id.* § 1.03[1].

31. *Id.* § 1.03[1][a].

accompany gas gathering lines, such as gas separators, dehydrators, and compressors.

The potential for conflict between concurrent carbon sequestration and oil and gas development on the surface of land is clear. On any given tract, both developers may wish to drill in the same locations, build their pipelines in the same places, or compete over available surfaces to site their ancillary surface facilities. These problems will be aggravated in areas where topography and surface conditions limit the usable space.

Moreover, the needs of both carbon sequestration and oil and gas developers may conflict with the surface tenant's existing and planned activities on the land. Use of the surface for drilling wells, building roads, setting equipment, etc., diminishes the land available for farming, grazing, building improvements, and many other valuable activities often pursued by landowners. The noise, lights, dust, and traffic that accompany drilling and completion activities also tend to interfere with the landowner's use and enjoyment of the surface. In sum, the potential for conflicts over the use of the surface of land is great but well understood from long experience in oil and gas drilling.

2. Use of the Subsurface

a. Drilling and Locating Wellbores

Just as carbon sequestration and mineral developers will clash over the location of facilities at the surface, they are likely to encounter difficulties in locating their respective wellbores beneath it. Particularly where oil and gas development is pursued through the drilling of multiple horizontal or "lateral" wellbores,³² the locations of subsurface laterals could limit where a developer may drill its vertical injection or monitoring wells, and vice versa.³³

Drilling a wellbore also destroys the rock and fluid substances in its path—including valuable minerals.³⁴ The drilling of a carbon injection or monitoring well may thus harm a mineral owner by destroying oil and gas (albeit in small quantities) or damaging productive reservoirs. On the flip side, oil and gas drilling conceivably could damage a zone or formation targeted for carbon sequestration. Anywhere multiple wells are drilled in proximity to each other, the possibility exists that completing one wellbore through hydraulic fracturing could cause pressure to communicate to and

32. *See id.* § 1.03[1][b].

33. *See, e.g.,* *Lightning Oil Co. v. Anadarko E&P Onshore, LLC*, 520 S.W.3d 39 (Tex. 2017).

34. *Id.*

damage another wellbore. The problem of so-called “frac hits” has been well documented in reservoirs where horizontal drilling and hydraulic fracturing completions are interspersed with conventionally drilled vertical wells.³⁵

b. Accessing Deeper Zones

Subsurface geologic formations are mostly stacked on top of one another. To access a deeper formation, one must drill through many shallower zones. Oil-and-gas-bearing formations occur at many different intervals of depth—some relatively shallow, others quite deep, and many in between. Rock formations suitable for carbon sequestration likewise occur at various depths. This physical situation raises a potential problem for concurrent carbon sequestration and oil and gas development: What should happen when one of the two parties wants access to a deeper formation by drilling through a shallower formation that the other party is using?

This problem is likely to occur when an oil and gas developer wishes to drill through a formation in which carbon dioxide is sequestered. For a variety of reasons, carbon sequestration developers may hesitate to consent to drilling through. One reason is the need to maintain control over possible vertical and lateral migration of the carbon plume, both to comply with permitting requirements and to avoid any legal liability for subsurface trespass or nuisance, or harm to public health and safety from escaping carbon. Additionally, wellbore penetrations of a carbon plume require potentially costly “corrective action.”³⁶

Another reason relates to the financing of carbon sequestration projects through federal and state tax credits. As noted, the federal 45Q tax credit requires the taxpayer to pay back to the United States Treasury every dollar of tax credit received for any carbon dioxide that escapes from sequestration.³⁷ Allowing penetrations into the sequestration formation could be costly if they lead to leakages. Additionally, California’s LCFS tax credit is conditioned on compliance with the state’s CCS Protocol,

35. Mark D. Christiansen & David E. Pierce, *When the Horizontal and Vertical Collide: Frac Hits and Operators Quest for Détente in the Common Reservoir*, 61 ROCKY MTN. MIN. L. INST. 12-1 (2015).

36. See *supra* Part II.A.

37. 26 U.S.C. § 45Q.

which requires that the operator obtain “a binding agreement among relevant parties” to *prohibit any* penetrations of the storage complex.³⁸

c. Occupying Pore Space

Pore space presents yet another common ground for dispute between sequestration and extraction. Carbon sequestration is the permanent occupation of carbon dioxide in pore space. Mineral extraction occupies and uses pore space, too. Oil and natural gas are themselves located in pore space, and extracting them means changing the formation pressure to draw them out of pore space.³⁹ Pore space is also the dumping ground for saltwater produced along with oil and gas (known as “produced water”).⁴⁰ Oil and gas operations also use pore space to conduct secondary and enhanced recovery of oil and natural gas.⁴¹ Secondary recovery proceeds by injecting water into pore space to repressurize the formation and push the residual hydrocarbons toward a producing wellbore.⁴² Enhanced recovery injects other substances, sometimes including carbon dioxide, into pore space to like effect.⁴³

Disputes may result when a sequestration and an extraction operation each seek to use the same pore space for incompatible purposes. Pore space in saline aquifers is probably the likeliest location for this kind of conflict. Saline aquifers are both the primary target formations for saltwater disposal wells and one of the likeliest places for sequestering carbon. Conducting carbon sequestration in a formation that is used concurrently for wastewater disposal may well increase formation pressure and make both competing injection operations more difficult and expensive. To complicate matters further, operators of Class VI carbon dioxide injection wells must monitor all penetrations of the zones where carbon is sequestered, including all active and abandoned wells, and perform “corrective action” on any of those wells to prevent them from allowing fluids from the injection zone to contaminate underground sources of drinking water.⁴⁴

38. CAL. CODE REGS. tit. 17, § 95490(b)(1) (2019); CARBON CAPTURE AND SEQUESTRATION PROTOCOL UNDER THE LOW CARBON FUEL STANDARD 9(c) 119 (Cal. Air Res. Bd. 2018).

39. JOHN S. LOWE ET AL., CASES AND MATERIALS ON OIL AND GAS LAW 16–17 (7th ed. 2018).

40. *Id.* at 961.

41. *Id.* at 47–51, 311–12.

42. *Id.*

43. *Id.* at 886–87.

44. 40 C.F.R. § 146.84(c)(2), (d).

Carbon sequestration might also occur in depleted oil or gas-bearing zones. The potential for interference with efforts to produce the remaining hydrocarbons from those zones, perhaps through secondary or enhanced recovery, would seem obvious. Sequestration of carbon into such a zone would certainly preclude any further development of remaining hydrocarbons since producing any fluids from the zone would be antithetical to the goal of permanently storing the carbon dioxide in place.

Finally, use of pore space in oil and gas extraction, such as for produced water disposal, could preclude later use of the pore space for carbon sequestration. Surface owner complaints about the lost use value of pore space occupied for produced water disposal have already made their way onto courts' dockets.⁴⁵ These claims might become more common as carbon sequestration projects expand throughout oil and gas countries and pore space owners become increasingly jealous of uncompensated use of their property.

3. Geological and Geophysical Exploration

The final category of potential conflict involves concurrent scientific exploration of the subsurface for different purposes. Exploration of the subsurface has always been part of the development of oil and gas.⁴⁶ The drilling of each new well produces new information about the geology of the subsurface rock formations it penetrates. Rock cuttings, well logs, core samples, and drill stem tests conducted during and after the drilling and completion processes reveal a bevy of information about what formations exist, their stratigraphy, lithology, porosity, permeability, and even the presence or absence of hydrocarbons within them.⁴⁷ The geophysical characteristics of the subsurface may be learned from work done at the surface of the earth as well. Seismic surveying records the reflection off of subsurface rocks of seismic vibrations to determine the rocks' locations, structures, and even fluid saturation.⁴⁸ Geophysical surveying requires use

45. *E.g.*, Burlington Res. Oil & Gas Co., LP v. Lang & Sons Inc., 259 P.3d 766 (Mont. 2011); Mosser v. Denbury Res., Inc., 898 N.W.2d 406 (N.D. 2017); Cont'l Res., Inc. v. Fisher, No. 1:18-cv-181, 2021 U.S. Dist. LEXIS 227504, at *12–13 (D.N.D. Nov. 29, 2021).

46. LOWE, ET AL., *supra* note 39, at 28–34, 38.

47. *Id.*

48. *Id.* at 28–34. Other methods of geophysical surveying exist, such as the use of gravimeters and magnetometers. Seismic surveying is the most utilized of these.

of the surface of the land and often results in surface damage to crops and even springs of water.⁴⁹

Carbon sequestration also requires a detailed understanding of the geology of the subsurface, and thus also relies heavily on information obtained through geological and geophysical exploration. A suitable formation for sequestering carbon dioxide has many of the same characteristics of a good reservoir for oil and gas: It is relatively thick, porous, and permeable so as to receive large volumes of carbon dioxide.⁵⁰ There must also be sufficient confining zones, relatively free of faults and fractures, of sufficient extent and integrity to contain the injected carbon dioxide.⁵¹

Thus, although mineral owners were historically the only parties interested in exploring the subsurface,⁵² surface and pore space owners may well become more interested in exploring suitable sequestration sites in the future. The potential for conflict between mineral developers and sequestration operators revolves around access to and use of the information obtained from exploration. Exploration of the subsurface for sequestration purposes will likely reveal information bearing on the potential for hydrocarbon production, and vice versa. The publication of such information could affect the value of the mineral estate, and mineral owners may be keen to limit exploration by surface owners, accordingly.⁵³

In addition to conflicts between parties around the right to obtain and use subsurface information, disputes may occur with surface tenants who suffer the resulting damage to the surface of the land itself. These kinds of conflicts have brewed between surface tenants and oil and gas explorers for decades. In the future, these conflicts may involve subsurface explorers interested in carbon sequestration.

49. See *Hunt Oil Co. v. Kerbaugh*, 283 N.W.2d 131, 133 (N.D. 1979) (involving a claim for damages to the surface, including disruption of a natural spring, caused by the defendant's seismic operations).

50. See 40 C.F.R. § 146.83(a) (defining the minimum geologic criteria for siting a Class VI carbon injection well).

51. *Id.*

52. Owen L. Anderson, *Geophysical "Trespass" Revisited*, 5 TEX. WESLEYAN L. REV. 137, 146–50 (1999).

53. See, e.g., *Grynberg v. City of Northglenn*, 739 P.2d 230, 234–35 (Colo. 1987) (involving a claim for depreciation of a mineral estate caused by publication of geological information).

III. PATTERNS OF PORE SPACE OWNERSHIP

Just as the discovery of petroleum led to new forms of leasing and deeding title to oil in gas in place,⁵⁴ carbon sequestration may lead to new forms of holding property rights in subsurface pore space. While the technology for carbon sequestration has evolved to relative maturity, the commercial market for acquiring the land rights to accomplish a sequestration project remains in a nascent stage of development. In the context of oil and gas and mineral development, in which markets are mature, common patterns of commercial development have clearly emerged. For example, most oil and gas resources are developed pursuant to the grant of an oil and gas lease—a defeasible fee or profit in the mineral estate—by the owner of title to the oil and gas in place.⁵⁵ Title to much oil and gas in place is owned in fee, much of it in determinable fee, and some of it in term interests.⁵⁶

In the carbon sequestration context, in contrast, it is too early to know what, if any, common patterns of commercial development will emerge.⁵⁷ This makes analysis of the relations between carbon sequestration and mineral development in the same tract of land particularly challenging. Because different patterns of ownership of rights in land raise potentially different problems between sequestration and mineral development, it is necessary to hypothesize the typical land transactions that will be used to facilitate carbon sequestration and the patterns of subsurface ownership each would create.

The beginning point for analysis is ownership of title to subsurface pore space. The owner of fee title to land, including all subsurface minerals, owns the underlying rock structures and the porosity contained within them.⁵⁸ Nearly every jurisdiction recognizes the creation of two separate estates when such a landowner severs ownership of the oil, gas, and other minerals in the land by a conveyance or a reservation from a

54. See *Brown v. Vandergrift*, 80 Pa. 142, 147 (1875).

55. LOWE, ET AL., *supra* note 39, at 112–16 (summarizing frequently encountered business relationships that result in common patterns of oil and gas ownership).

56. *Id.*

57. For an early discussion, see generally Owen Anderson & R. Lee Gresham, *Legal and Commercial Models for Pore-Space Access and Use for Geologic CO₂ Sequestration*, 72 U. PITT. L. REV. 701 (2011).

58. This is the meaning of the maxim, *cujus est solum, ejus est usque ad coelum et ad inferos* (he who owns the soil owns also to the sky and to the depths). Henry E. Smith, *Exclusion versus Governance: Two Strategies for Delineating Property Rights*, 31 J. LEGAL STUD. S453, S455 n.4 (2002).

conveyance.⁵⁹ Absent contrary language in the instrument of conveyance, the surface estate is deemed to own all the elements of the land except the fair chance to capture and enjoy the minerals.⁶⁰ The pore space thus remains part of the surface estate. The mineral estate also enjoys, by implication if not by express grant, an easement to use the surface estate from which it was carved for enjoyment of the underlying minerals.⁶¹ Logically, this easement burdens every element of the surface estate, including the pore space.

As the owner of the surface of the land and all underlying pore space (subject to an easement for mineral development), the surface tenant may itself use these elements to sequester carbon dioxide beneath its tract. Ordinarily, however, a landowner would wish to transfer these rights to a third person with the expertise and resources to assemble a carbon sequestration project. The following sections outline the transactions likeliest to occur in order to identify the kinds of legal relationships each would create. Only then can we begin to analyze the relations between carbon sequestration and oil and gas development on the same tract.

By way of an overview, the three general kinds of relationships that arise among interest owners in a shared tract of land are (i) split estates, (ii) conflicting easements, and (iii) coequal severed estates. Split estate problems arise when title to subsurface minerals is held separately from title to the remainder of the land, creating the classic “split estate” relationship between the mineral and surface estates. Split estate relationships involve the concurrent use of the surface estate by the surface tenant and the mineral tenant, the latter of which holds an easement in the surface estate to enable the use and enjoyment of its subsurface estate. Thus, the defining features of the split estate relationship are the parties’ correlative rights in the surface and the dominance of the mineral estate over the surface estate with respect to the former’s easement.

Conflicting easements occur when multiple persons hold easements burdening the same property. Often, this relationship arises when a severed mineral estate holds an easement in the surface estate to develop subsurface minerals, and another person holds an easement in the surface estate for other purposes, such as the laying of a pipeline. Conflicting

59. 1 PATRICK H. MARTIN & BRUCE M. KRAMER, *WILLIAMS & MEYERS OIL & GAS LAW* § 202.2 (2023). Louisiana recognizes the creation only of a “mineral servitude” by such a transaction. LA. REV. STAT. ANN. § 31:21 (1975).

60. *Lightning Oil Co. v. Anadarko E&P Onshore, LLC*, 520 S.W.3d 39, 50–51 (Tex. 2017).

61. *Callahan v. Martin*, 3 Cal. 2d 110, 127 (1935); *Ramey v. Stephney*, 173 P. 72, 73 (Okla. 1918).

easements entitle their holders to correlative rights to use the surface estate, generally with priority favoring the first in time of creation.

Thirdly, coequal severed estates arise when title to different subsurface resources is held by separate persons—for example, when title to the oil and gas in place is held separately from title to the coal, lignite, or uranium deposits within the same tract of land. Here, neither estate is necessarily dominant over the other, since both resources may themselves enjoy dominance over the surface estate. Both estates enjoy easements in the surface estate, lending to this relationship the quality of correlativity, as well.

A. Pore Space Leases

In the simplest scenario, the surface owner itself would conduct the carbon sequestration activities directly. Alternatively, the surface owner might lease the surface estate to a surface tenant, in which case the surface tenant takes present possession of the surface estate, subject to the lessor's reversion, as when a surface owner grants a lease for agricultural purposes or wind or solar energy development.⁶² The lessee or tenant of a surface estate simply steps into the shoes of the lessor surface owner for the duration of the lease. Therefore, in either case, the surface owner or tenant in possession is entitled to use and enjoy the land for carbon sequestration purposes but is duty-bound not to interfere with the surface-use easement of a prior severed estate in the minerals. In this regard, the transaction raises similar issues to the grant of a surface lease for wind or solar development.⁶³

For example, suppose *A* owns fee simple title to Blackacre, subject to *B*'s severed mineral estate. As the surface estate owner, *A* would be entitled to use the pore space underlying Blackacre to inject and store carbon dioxide to the extent permitted by *A*'s duty to respect *B*'s easement rights. Alternatively, *A* may lease the surface estate to *C*, who would take the present possessory rights to the surface estate and thus use the pore space for carbon sequestration, also within the bounds of the surface estate's duties to *B*'s mineral estate. In either case, the relationship of *A* or

62. Ernest E. Smith & Becky H. Diffen, *Winds of Change: The Creation of Wind Law*, 5 TEX. J. OIL GAS & ENERGY L. 165, 181–82 (2009).

63. See *id.* at 181–86; Swinford, *supra* note 27, § 4.02; K.K. DuVivier & Roderick E. Wetsel, *Jousting at Windmills: When Wind Power Development Collides with Oil, Gas, and Mineral Development*, 55 ROCKY MTN. MIN. L. INST. 9-1 (2009).

C, on the one hand, and B's mineral estate, on the other, is governed by the law of surface uses between split estates.⁶⁴

One potential caveat is worth noting. It is an open question in most jurisdictions whether the law will recognize the power of a landowner to separate ownership of pore space from the land itself into an independent estate, as the law recognizes the power to create separate ownership of minerals. In jurisdictions that do recognize a "pore space estate," a lease of the pore space by the surface owner may be construed to sever a separate estate in the pore space.⁶⁵ Where this is the case, the transaction is not to be treated as a mere lease of the surface estate for carbon sequestration purposes, but rather, is to be understood as a severance of pore space as discussed below in subsection C.⁶⁶

B. Pore Space Easements

A likely type of transaction in pore space would involve the grant by the owner of the surface estate of an easement, *i.e.*, nonpossessory rights to use, in all or a defined portion of the subsurface for storage of carbon dioxide. It is likely that an easement model would work well for non-injection-site tracts—tracts into which the carbon plume is likely to migrate, but which are not themselves needed for surface activities or injection or monitoring wells. Depending on the express terms of the grant, it could create an easement in the surface estate for storage of carbon dioxide and all ancillary actions reasonably necessary to the use of the surface for that purpose. This could include use of the surface for accessing or monitoring the subsurface easement. Again, depending on the language of the grant, it may create a specific easement or a blanket easement.⁶⁷ A specific easement is granted when the location and dimensions of the

64. See *infra* Part IV.A.

65. Cf. 1 KUNTZ, LAW OF OIL & GAS §§ 3.1, 15.9 (discussing oil and gas leases as effecting a severance of the covered minerals).

66. See *infra* Parts III.C. & IV.C.

67. See *Brown v. ConocoPhillips Pipeline Co.*, 271 P.3d 1269, 1271 (Kan. Ct. App. 2011):

The language of the grant forming the easement determines whether it is a specific easement or a blanket easement. A specific easement is formed when the width, length, and location of the easement for ingress and egress have been expressly described in the instrument creating the easement. In a blanket easement, on the other hand, the instrument creating the easement does not delineate specific dimensions of the easement for ingress and egress as it crosses the servient tenant's property.

easement are specifically expressed in the grant. A blanket easement, in contrast, does not delineate specific dimensions or locations.⁶⁸ A blanket easement might cover the pore space throughout the entire subsurface, while a specific easement might specify a particular interval or intervals in which the pore space may be used.

Returning to the earlier example, suppose again that *A* owns fee simple in the surface estate in Blackacre, subject to the severed mineral interest owned by *B*. Rather than incur the heavy capital and labor costs to inject carbon dioxide for sequestration into Blackacre herself, *A*, in this scenario, would sell an easement to *C* entitling *C* to permanently store carbon dioxide in a geologic formation under Blackacre, either by injecting it directly into the formation from the surface of Blackacre or by allowing carbon dioxide injected elsewhere in the formation to migrate underneath Blackacre.

A transaction of this kind would create an easement in the surface that competes with the surface-use easement enjoyed by a severed mineral interest. The relationship between *C* and *B* would be governed by the law ordering the priority of competing easements.⁶⁹

C. Severed Estates in Pore Space

By far the least studied and most uncertain type of potential transaction would be the severance of a separate subsurface estate for use in carbon sequestration. There would seem to be two mechanisms by which landowners might do this. In the first, the landowner might either grant by conveyance or retain by reservation the fee interest in a specified depth or interval of the subsurface, or in an identified geologic zone or formation. This might be done either through the grant of fee title or a leasehold interest.⁷⁰ In a lease transaction, the lessor would retain a reversion or possibility of reverter, but the lessee/tenant would take present possession of the severed interest.⁷¹ Such “depth severances” of the mineral interest are common.⁷² A depth severance of a full fee estate would encompass the rock structures and their porosity, as well as their contents, within the defined interval, absent a prior conveyance or limiting language in the instrument creating the estate. Such a conveyance or reservation

68. *Id.*; accord *Evans v. Bd. of Cty. Comm’rs*, 97 P.3d 697, 702–03 (Utah Ct. App. 2004).

69. *See supra* Part IV.B.

70. *See* 1 KUNTZ, *supra* note 65, §§ 3.1, 15.9.

71. *Id.*

72. *See generally* Tim George et al., *A Survey of Depth Severance Issues and Related Drafting Considerations*, 63 ROCKY MTN. MIN. L. INST. 30-1 (2017).

would create a separate, severed estate in the land every bit as much as would a conveyance of a divided portion of the surface of the land, like the west 100 feet of the tract.

For a concrete example of what a depth severance of this kind would look like, suppose again that *A* owns the surface estate and *B* the severed mineral estate in Blackacre. *A*, as the owner of the rock, porosity, and fluid contents (other than oil and gas) within the subsurface, conveys by deed to *C* “the subsurface depths in the interval from 5,000 feet to 10,000 feet below the surface of the ground” or language to similar effect.⁷³ Following the conveyance, *A* retains title to the surface estate reaching down to 5,000 feet below the ground and also all horizons below 10,000 feet beneath the ground. *B* retains title to the severed mineral estate at all intervals. *C* takes title to the surface estate in the defined interval, which constitutes a separate “tract” of land from *A*’s estate for title purposes. *C*’s estate and *B*’s estate are likely to be treated as coequal estates, each with easement rights burdening *A*’s surface estate.⁷⁴

The second alternative approach to creating a severed estate for carbon sequestration might be to convey, or reserve from a conveyance of the fee, an estate in subsurface pore space itself. Following such a conveyance or reservation, there would be a surface estate and a severed pore space estate, just as a conveyance or reservation of oil, gas, and other minerals results in a surface estate and a severed mineral estate. Returning to our example, in this scenario *A* would convey to *C* by deed “all subsurface porosity, voids, and pore spaces in and under Blackacre” or language to like effect. Following the conveyance, *A* would retain its surface estate, *B* its severed mineral estate, and *C* would take a severed estate in the pore space in place under Blackacre. Here again, *C*’s and *B*’s estates are likely to be treated as coequal estates, each enjoying use rights burdening *A*’s surface estate.⁷⁵

A “pore space estate” might seem far-fetched, but landowners have proven ingenious in creating severed estates in natural resources previously thought to be an inherent part of the surface estate. In West Texas, for example, many landowners began giving deeds to the severed “wind estate” above their land after the advent of wind turbines made the airflows economically valuable.⁷⁶ The question that has plagued conveyances of the “wind estate,” and which would likewise haunt attempts to create a “pore space estate,” is whether and to what extent the

73. This is a highly simplified example of language granting rights in a subsurface interval. *See id.*

74. *See infra* Part IV.C.

75. *See infra* Part IV.C.

76. Smith & Diffen, *supra* note 62, at 181–82.

common law of property would recognize the interest. That important question is too intricate and too far afield to be dealt with here.

IV. LEGAL FRAMEWORKS

Complex as it may be, classifying the type of legal relationship that exists between a carbon sequestration operator and a mineral developer is only the threshold step in analyzing potential conflicts between the two. Once the relationship is properly classified, the task turns to understanding the legal principles underpinning the relationship. The remainder of the Article sketches out the basic legal concepts that govern each basic type of relationship.

A. *Split Estates*

This section introduces the law governing the legal relationship between split mineral and surface estates. This is the legal relationship that would govern conflicts between sequestration and mineral development where the surface tenant (either the fee owner of the surface estate or that person's lessee) develops the land for carbon sequestration, subject to the rights of a separately owned severed mineral estate.⁷⁷ In this part, the analysis assumes that the surface tenant's rights are subordinate to the mineral estate's surface-use easement. It should be noted, however, that where a tenant (even an agricultural tenant) takes leasehold title to the surface estate prior to severance of a mineral interest, the rights of the mineral estate are generally subordinate to the surface tenant's rights, for the duration of the surface lease.⁷⁸

"Split estates" result when a landowner, exercising a power recognized in every American jurisdiction, creates a separate (severed) estate in identified mineral substances, like oil and gas, under the land.⁷⁹

77. See *supra* Part II.A.

78. Smith & Duffen, *supra* note 62, at 181–82; Guy L. Nevill, *Multiple Uses and Conflicting Rights*, 13 ST. MARY'S L.J. 783, 790–91 (1981); Republic Natural Gas Co. v. Melson, 274 P.2d 543 (Okla. 1954). *Contra* Ball v. Dillard, 602 S.W.2d 521 (Tex. 1980); Mobile Pipe Line Co. v. Smith, 860 S.W.2d 157 (Tex. App. 1993). However, while the mineral estate's surface-easement is subordinate to the prior rights of the surface tenant, courts have held that the surface tenant cannot exclude the mineral tenant from the premises altogether. Nevill, *supra* note 78, at 791 (citing Ball v. Dillard, 602 S.W.2d 521, 523 (Tex. 1980); Stanolind Oil & Gas Co. v. Wimberly, 181 S.W.2d 942, 944 (Tex. App. 1944)).

79. Tara K. Righetti, *Liberating Split Estates*, 14 INT'L J. COMMONS 638 (2020).

This may be done either by conveying the estate in the minerals to a grantee or by reserving the mineral estate from a conveyance of the rest of the land to a grantee. In either case, the law recognizes a separate fee estate in the minerals, consisting of several incidents of ownership, which may be limited or expanded by the language of the grant. Broadly, these incidents encompass (i) the exclusive opportunity to produce the severed minerals, which includes the right to lease the minerals and retain all lease benefits, including royalty, and (ii) an easement in the elements of the surface estate, including the pore space and other subsurface structures and substances.⁸⁰

The surface estate from which a mineral estate is carved enjoys all rights, privileges, duties, and liabilities of a general fee simple title in land *less* the rights of the severed mineral estate. The surface estate is thus the residual estate; it owns everything in the land that is not the property of another.⁸¹ Typically, a split surface estate enjoys the following rights: (i) possession and use of the earth's surface; (ii) title to all of the subsurface element not specifically severed, including the pore space, which entitles the owner to a fair opportunity to use and enjoy the pore space for non-mineral purposes.⁸²

The severed mineral estate's surface-use easement is implied in law absent an express grant or reservation of rights to use the surface.⁸³ The courts that developed the implied surface-use easement were often unclear about the source of these rights.⁸⁴ Important scholars have identified the source as the doctrine of easement by necessity. They have also observed that the traditional requirements for an implied easement under the doctrine are not met in the typical case of a mineral severance.⁸⁵ It is also possible (and probably more likely) that the implied easement derives from the common law maxim that "when the law doth give any thing to one, it giveth impliedly whatsoever is necessary for enjoying the same."⁸⁶

80. See 1 KUNTZ, *supra* note 65, § 3.2[a].

81. See *Lightning Oil Co. v. Anadarko Onshore E&P, LLC*, 520 S.W.3d 39, 44 (Tex. 2017).

82. Schremmer, *Unifying Doctrine*, *supra* note 4, at 560–63.

83. See *Callahan v. Martin*, 3 Cal. 2d 110, 127, 43 P.2d 788, 796 (1935); *Ramey v. Stephney*, 173 P. 72, 73 (Okla. 1918).

84. David E. Pierce, *Toward a Functional Mineral Jurisprudence for Kansas*, 27 WASHBURN L.J. 223, 238–39 (1988).

85. Bruce M. Kramer, *The Legal Framework for Analyzing Multiple Surface Use Issues*, 44 ROCKY MTN. MIN. L. FDN. J. 273, 274–79 (2007) [hereinafter Kramer, *Multiple Surface Use Issues*]; accord Pierce, *supra* note 84, at 238–39.

86. 2 WILLIAM BLACKSTONE, COMMENTARIES ON THE LAWS OF ENGLAND 36 (Oxford, Clarendon Press 1765). It could be said that the reason for the principle

It was by reasoning from this maxim that courts developed the doctrine that a severed mineral interest includes an implied easement to access, use, and enjoy it.⁸⁷ As one court explained in 1862: “It is a well established doctrine from the earliest days of the common law, that the right to the minerals thus reserved carries with it the right to enter, dig and carry them away, and all other such incidents thereto as are necessary to be used for getting and enjoying them.”⁸⁸

An easement gives its holder the right to use another’s tenement in land free from unreasonable interference.⁸⁹ The landowner whose estate is burdened by the easement may not unreasonably interfere with it.⁹⁰ Accordingly, the right holder’s tenancy, which is benefitted by the easement, is known as the “dominant” estate, whereas the estate burdened by it is “servient” because it owes a duty of forbearance as to the easement’s holder’s estate.⁹¹ As it pertains to the use of the land burdened by the easement, the dominant and servient tenants’ relationship is correlative because each has a concurrent right to use of the same land and each owes to each other concurrent duties. The servient tenant owes the duty not to unreasonably interfere with the dominant tenant’s use, and the dominant tenant owes the duty not to use the land unreasonably or

derives from the likely intent of the parties to the severance of the mineral interest. Surely no grantor would intend to grant, nor any grantee intend to acquire, an interest in property that the grantee could not enjoy because it is trapped deep beneath the surface of the earth. *Callahan v. Martin*, 3 Cal. 2d 110, 127 (1935) (“One who grants a thing is presumed to grant also whatever is essential to its use.”).

87. *See, e.g.*, *Marvin v. Brewster Iron Mining Co.*, 55 N.Y. 538, 549–50 (1874); *Callahan*, 3 Cal. 2d at 127; *Ramey v. Stephney*, 173 P. 72, 73 (Okla. 1918); *Jilek v. Chi.*, *Wilmington & Franklin Coal Co.*, 47 N.E.2d 96, 100 (Ill. 1943).

88. *Cowan v. Hardeman*, 26 Tex. 217, 222 (1862).

89. RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 1.2 (AM. L. INST. 2000).

90. *Cassinis v. Union Oil Co.*, 18 Cal. Rptr. 2d 574, 579 (Cal. App. 1993) (citing *Tidewater Oil Co. v. Jackson*, 320 F.2d 157, 163 (10th Cir. 1963)); *Eternal Cemetery Corp. v. Tammen*, 324 S.W.2d 562, 564–65 (Tex. App. 1969) (finding that surface tenant’s converting the surface of the land to a cemetery unreasonably interfered with the mineral estate’s surface easement because it practically precluded use of the surface for mineral development).

91. RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 1.1 (AM. L. INST. 2000).

excessively.⁹² This is what is meant by the principle that each tenant must exercise its rights in the land with *due regard* for the rights of the other.⁹³

The scope of the dominant estate's easement is the crux of the parties' correlative relationship. Often, the instrument creating the severed mineral estate expressly defines the scope by defining the purpose of the easement and its permissible uses. This is usually true where the instrument creating the mineral interest is an oil and gas lease.⁹⁴ When the easement is created expressly, the parties' objectified intent, as reflected in the unambiguous language of the grant, controls the easement's scope.⁹⁵

Just as often, though, the parties' instrument is silent as to the surface-use rights of the mineral estate. This is typically the case in deeds severing an interest in the minerals.⁹⁶ These situations call on the law to imply not only the easement itself but also its scope, including the purpose of the easement and the standard governing its proper use. Uniformly across jurisdictions, the common law defines the scope of the mineral estate's implied easement in accordance with the general principle that supports its creation. The easement permits the dominant tenant to do whatever is *reasonably necessary* for the convenient enjoyment of the mineral estate.⁹⁷ It must be understood that the aspect of convenience follows the requirement of necessity. As one court explained in 1874, the easement holder is not privileged to use the land in any manner that is convenient. Rather, the easement holder may claim "only that which is necessary but may have that in a convenient way."⁹⁸ "One may have a way by necessity . . . and having it thus, he may have it at a place and route that is convenient."⁹⁹

92. Cases describing the relationship between dominant and servient estates as concurrent or correlative include *Sanders v. Davis*, 192 P. 694 (Okla. 1920); *Westmoreland Natural Gas v. DeWitt*, 18 A. 724 (Pa. 1889); *Rennie v. Red Star Oil Co.*, 190 P. 391 (Okla. 1920); *Diamond Shamrock Corp. v. Phillips*, 511 S.W.2d 160 (Ark. 1974); *Mingo Oil Producer v. Kamp Cattle Co.*, 776 P.2d 736 (Wyo. 1989); *Gerrity Oil & Gas Corp. v. Magness*, 946 P.2d 913 (Colo. 1997).

93. *Coyote Lake Ranch, LLC v. City of Lubbock*, 498 S.W.3d 53, 60 (Tex. 2016).

94. Kramer, *Multiple Surface Uses*, *supra* note 85, at 275.

95. *Texaco, Inc. Faris*, 413 S.W.2d 147, 149–50 (Tex. App. 1967).

96. Kramer, *Multiple Surface Uses*, *supra* note 85, at 275.

97. 1 KRAMER & MARTIN, *supra* note 59, § 218; *e.g.*, *Harris v. Currie*, 176 S.W.2d 302, 305 (Tex. 1943); *Frankfort Oil Co. v. Abrams*, 413 P.2d 190, 195 (Colo. 1966); David E. Pierce, *Oil & Gas Easements*, 33 ENERGY & MIN. L. INST. 9, § 9.05[3] (2012) (citing RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.10) (AM. L. INST. 2000)).

98. *Marvin v. Brewster Iron Mining Co.*, 55 N.Y. 538, 552–53 (1874).

99. *Id.*

The “reasonably necessary and convenient” standard prohibits uses of the surface estate for the enjoyment of minerals other than those immediately underlying the servient estate, unless (perhaps) the mineral estate is properly pooled or unitized with minerals underlying other lands.¹⁰⁰ This interpretation of the easement’s scope again accords with the general principle that “when the law doth give any thing to one, it giveth impliedly whatsoever is necessary for enjoying the same.”¹⁰¹

Not all damage to the surface estate occasioned by the dominant tenant’s use injures the servient tenant’s legal rights. On the contrary, where the dominant tenant’s use falls within the scope of its easement, it does not violate any correlative right of the servient tenant, nor any correlative duty owed to it by the dominant tenant. Such damage is *damnum absque injuria*—damage without legal injury.¹⁰² This is true regardless of the cause of action a servient tenant may wish to bring for the damage. The typical alternatives are an action for excessive user of the easement and the torts of trespass of the servient estate or negligence.¹⁰³ By definition, use of the dominant tenant’s easement that is within its correlative rights cannot constitute excessive user. Similarly, it cannot constitute a trespass of the servient estate to exercise rights to use the servient estate within their defined scope. Likewise, negligence requires a breach of duty, which itself necessitates a showing of the existence and extent of the duty owed by defendant to plaintiff.¹⁰⁴ Damage done that does not breach the dominant estate’s duty is *damnum absque injuria*, whether the servient estate sued in negligence or excessive user.

It has become popular to sort jurisdictions into two camps, those that apply the “reasonably necessary” standard and focus “unidimensionally” on the needs of the mineral estate, and those that instead apply the “due

100. Professor Pierce has discussed the effects of pooling on the scope of the mineral estate’s implied easement. Pierce, *supra* note 97, § 9.06[1][a]. That might be an important consideration where the owner of an easement or a severed estate in pore space pools or unitizes its interest with other lands. See also Joseph A. Schremmer, *Crystal Gazing: Foretelling the Next Decade in Oil and Gas Law*, 66 ROCKY MTN. MIN. L. INST. 5-29-5-33 (2020). Several states have enacted legislation to compel such unitization for carbon sequestration purposes. *E.g.*, WYO. STAT. ANN. §§ 35-11-313–35-11-317. This issue, though important, is too significant to treat in the limited space here.

101. 2 BLACKSTONE, *supra* note 59, at 36.

102. *Marland Oil Co. v. Hubbard*, 34 P.2d 278 (Okla. 1934), *overruled in part*, *Pure Oil Co. v. Chisholm*, 75 P.2d 464 (Okla. 1936).

103. 1 MARTIN & KRAMER, *supra* note 60, § 218.8.

104. See *Speedman Oil Co. v. Duval Cty. Ranch Co.*, 504 S.W.2d 923, 929 (Tex. App. 1973).

regard” standard and focus “multidimensionally” on the needs of both the mineral and the surface estate.¹⁰⁵ It should be noted, however, that the cases themselves do not seem to conceive of “due regard” as an alternative to “reasonably necessary.”¹⁰⁶ Instead, they view the split estate relationship as correlative and governed by the overarching principle that each estate owes “due regard” for the rights of the other. What “regard” is “due” to one estate from the other depends on the extent of the parties’ respective correlative rights. These in turn may be defined in an instrument or implied in law. Where implied, the dominant estate enjoys all rights to use as are “reasonably necessary and convenient” to the beneficial use of the dominant estate. Due regard for the dominant estate’s rights requires not unreasonably interfering with the reasonably necessary and convenient use of the surface. Due regard for the servient estate’s rights amounts to forbearing from uses that are tortious or not reasonably necessary for enjoyment of the minerals. In short, “reasonably necessary” is the standard by which the law measures what regard is due to the servient or dominant estate by the other.

These two legal concepts work together to define the legal relations of the mineral and surface estates. They do not provide two distinct *standards* for determining the dominant tenant’s compliance with the scope of its implied easement. Rather, they operate together to resolve two distinct kinds of *problems*—unidimensional problems and multidimensional problems. The different types of problems call for different approaches to applying the legal standards governing the dominant–servient relationship.

1. Unidimensional Problems

Unidimensional problems are those that involve unilateral action by the dominant tenant that damages the surface estate’s property but would not directly preclude the servient tenant’s ongoing or planned use of the surface. A unidimensional problem arises, for instance, when an oil and

105. See Kramer, *Multiple Surface Uses*, *supra* note 85, at 274–75, 298–99.

106. Courts routinely use the concepts together. *E.g.*, Warren v. Martin, 271 S.W. 2d 410 (Tex. 1954); Gulf Prod. Co. v. Continental Oil Co., 132 S.W.2d 553, 562 (Tex. 1939); Charles F. Hayes & Associates, Inc. v. Blue, 233 So.2d 127 (Miss. 1970); Getty Oil v. Royal, 422 S.W.2d 591 (Tex. App. 1967); Getty Oil v. Jones, 470 S.W.2d 618, 622–67 (Tex. 1971); Diamond Shamrock Corp. v. Phillips, 511 S.W.2d 160 (Ark. 1974); Flying Diamond Corp. v. Rust, 551 P.2d 509 (Utah 1976); Hunt Oil Co. v. Kerbaugh, 283 N.W.2d 131 (N.D. 1979); Mingo Oil Producer v. Kamp Cattle Co., 776 P.2d 736 (Wyo. 1989); Gerrity Oil & Gas Corp. v. Magness, 946 P.2d 913 (Colo. 1997); Brown v. Lundell, 344 S.W.2d 863, 866 (Tex. 1961).

gas lessee causes oil to spill onto and damage surface vegetation.¹⁰⁷ The damage, even if serious, does not necessarily preclude the surface tenant from pursuing any particular kind of activity, even if it would impose a loss on the surface tenant. In contrast, multidimensional problems involve a clash of the dominant tenant's use of the surface with an existing or planned use of the surface by the servient tenant, such as where an oil and gas lessee installs pumping units that interfere with the normal operation of the surface tenant's center-pivot irrigator.¹⁰⁸ In those cases, the surface tenant's and mineral tenant's surface activities cannot coexist without modifying or prohibiting one of them to accommodate the other.

Unidimensional problems thus turn on whether the dominant tenant's actions comply with the scope of its express or implied easement, and no consideration of the servient tenant's activities is necessary or relevant. This is ultimately a jury question, although legal principles such as the rule that use of the servient estate is limited only for the benefit of the dominant estate apply to limit the discretion of the fact finder in any given case.¹⁰⁹

2. Multidimensional Problems

a. In General

Frequently, however, conflicts arise when the split estates seek to use the surface for incompatible purposes or through incompatible means. This occurs when the dominant estate's preferred use of the surface estate would preclude or substantially impair the servient tenant's surface. The due regard principle continues to govern the parties' relationship in these "multidimensional" cases, but it operates somewhat differently. Now, the dominant estate may be required, by its correlative duty not to interfere with the servient estate's rights, to accommodate the servient tenant's surface, if and to the extent that the dominant estate's incompatible use is not necessary to exercise its rights in the minerals. Thus, a mineral estate owner may have no right to prevent the surface estate owner from fencing off roads through which the mineral owner accesses its estate, if the mineral owner cannot demonstrate that its unimpeded use of the roads is reasonably necessary to its accessing the estate.¹¹⁰ Nor could a mineral owner require a surface owner to cease using a center-pivot irrigation system so long as the mineral owner would have a reasonable alternative

107. *E.g.*, *Kerbaugh*, 283 N.W.2d at 131.

108. *Jones*, 470 S.W.2d at 622–67.

109. Page Keeton & Lee Jones, Jr., *Tort Liability and the Oil and Gas Industry*, 35 TEX. L. REV. 1, 4 (1956).

110. *Royal*, 422 S.W.2d 591.

to ordinary pumping units that would not block the irrigator's operation.¹¹¹ However, the mineral owner may insist on its use of the surface to produce freshwater for its injection operations if no reasonable alternatives exist to enable it to pursue its extraction operations, even if its water use would impede the surface tenant's goals for the water.¹¹²

Multidimensional cases necessarily involve the actions or plans of both estates owning correlative rights in the land. The typical case involves the question: Which of the parties' respective incompatible uses of the surface should have priority? Ordinarily, priority goes to the dominant estate, except where the servient tenant can demonstrate that its preexisting or planned use is entitled to priority under the accommodation doctrine.¹¹³

b. The Accommodation Doctrine

Under the classic formulation of the accommodation doctrine, the dominant estate must pursue an alternative to accommodate the surface use of the servient estate only if (i) there is an existing use by the servient estate, (ii) that would be precluded or impaired by the dominant's estate's intended use, and (iii) there are alternative practices available to the dominant estate that are usual, customary, and reasonable.¹¹⁴ Properly understood, this is not a balancing test. It does not matter which competing use is more socially valuable or which party would suffer the greater hardship by being required to accommodate the other. These might be appropriate considerations for a court fashioning an equitable remedy, but they are not relevant in determining whether accommodation of the servient estate is required by law.¹¹⁵

111. *Jones*, 470 S.W.2d at 622–67.

112. *Sun Oil v. Whitaker*, 483 S.W.2d 808, 811 (Tex. 1972).

113. Courts only apply the Accommodation Doctrine when the servient tenant demonstrates that it was making or had concrete plans to make an actual conflicting use of the surface. *See Valence Operating Co. v. Tex. Genco, LP*, 255 S.W.3d 210, 218 (Tex. App. 2008) (holding that a surface owner's future plans must be accommodated if they are a part of the design of an overall project that is already in operation); *Diamond Shamrock Corp. v. Phillips*, 511 S.W.2d 160, 163 (Ark. 1974) (extending the accommodation doctrine to proposed uses of the land by a surface owner, if the mineral owner has knowledge of the proposal).

114. *Jones*, 470 S.W.2d at 622–67.

115. North Dakota courts do, however, balance the inconvenience that pursuing an alternative would impose on the dominant tenant against the inconvenience to the servient tenant, upon a showing that the servient estate is engaged in a preexisting use that would be precluded or impaired and that there are alternative uses available to the dominant tenant. *Hunt Oil v. Kerbaugh*, 283 N.W.2d 131 (N.D. 1979).

Courts have further developed the elements of the test. *Valence Operating Co. v. Texas Genco, LP* held that a surface use may count as “preexisting” even if it has not yet been commenced, so long as the planned use is part of an overall plan of design of a project that the surface tenant previously commenced.¹¹⁶ Similarly, *Diamond Shamrock Corp. v. Phillips* extended the accommodation doctrine to cover the surface tenant’s proposed use of the land that the mineral tenant knew about.¹¹⁷ *Merriman v. XTO Energy, Inc.* held that to be entitled to accommodation, the surface tenant must show that its preexisting use would be entirely precluded by the mineral tenant’s use and that it would lack any reasonable alternative.¹¹⁸ As to the third element, the existence of reasonable alternatives for the mineral tenant’s surface activity, *Sun Oil v. Whitaker* clarified that a mineral tenant’s alternative use may be considered “reasonable” only if it is available on the premises of the servient estate.¹¹⁹

These legal rules help structure the determination of when a dominant mineral tenant must accommodate the surface use of a servient surface tenant. At bottom, however, application of the accommodation doctrine requires a good deal of practical judgment at multiple levels. These judgments typically rest in the discretion of a jury.¹²⁰ First, as to whether the case indeed implicates the doctrine because the split estates are pursuing conflicting, incompatible uses. Second, on the question of whether the surface tenant has reasonable alternatives available to it on the premises. And third, regarding the availability to the mineral tenant of reasonable alternatives located on the premises. None of these are easy questions, and they may not be susceptible of a single right answer in any given case. Each is a matter of judgment. But the formal elements of the accommodation doctrine structure the decision-making of mineral and surface tenants, and that of courts and juries, even though it does not precisely determine how every case should come out.

In practice, the accommodation doctrine tends to favor the first party to establish a use of the surface.¹²¹ For the surface tenant to demonstrate an entitlement to accommodation, it must show that it established its use first. Otherwise, the surface tenant’s only hope of prevailing would be establishing that the mineral tenant’s competing surface use is not reasonably necessary and convenient, effectively making the dispute

116. 255 S.W.3d 210, 218 (Tex. App. 2008).

117. 511 S.W.2d 160 (Ark. 1974).

118. 407 S.W.3d 244 (Tex. 2013).

119. 483 S.W.2d 808, 811 (Tex. 1972).

120. Keeton & Jones, *supra* note 109, at 4.

121. Schremmer, *Crystal Gazing: Foretelling the Next Decade in Oil and Gas Law*, *supra* note 100, at 5-29.

unidimensional. If the surface tenant is the first mover in terms of establishing a surface use, its burden is mainly to show that reasonable alternatives exist to the mineral tenant's use—a tall task, but somewhat easier than proving that the use is not within the scope of the mineral easement.¹²² Especially where directional and horizontal drilling are commonplace practices, mineral tenants may face an uphill battle in arguing that a surface tenant's use leaves insufficient room for mineral development.¹²³

Consider as an example the 2017 Texas Supreme Court case, *Lightning Oil & Gas Co. v. Anadarko E&P Onshore, LLC*.¹²⁴ The surface tenant held a lease from the surface owner to drill horizontal wellbores from the surface and through the subsurface of the premises to produce minerals under other lands.¹²⁵ Before it could drill the wells, the mineral tenant sued for an injunction, asserting, *inter alia*, that the surface tenant's wellbores would preclude it from drilling its own wells to produce the minerals.¹²⁶ The court denied relief on the ground that the mineral tenant had not shown any concrete plans to drill in the locations where the surface tenant's wellbores would be located or that it would lack alternative drilling locations.¹²⁷ The court's holding favored the surface tenant as the first mover.

3. Legislative Reforms

Many states have adopted statutes modifying the common law principles governing split estates.¹²⁸ These statutes take a variety of forms, but commonly they impose a compensation requirement on the mineral estate for any damage caused to the surface of the land, reducing the

122. See *Getty Oil v. Jones*, 470 S.W.2d 618, 622–67 (Tex. 1971) (placing the burden of proof on the surface tenant).

123. See *Osage Nation ex rel. Osage Minerals Council v. Wind Capital Group, LLC*, No. 4:11-cv-00643, 2011 WL 6371384, at *1–8 (N.D. Okla. Dec. 20, 2011) (denying relief to a mineral tenant that failed to demonstrate that the surface tenant's use of the land for a wind farm conflicted with the mineral tenant's future drilling plans); *Bay v. Anadarko E&P Onshore, LLC*, 912 F.3d 1249, 1263 (10th Cir. 2018) (finding that the mineral tenant had a reasonable alternative in the form of unconventional directional drilling); *Texas Genco, LP v. Valence Operating Co.*, 187 S.W.3d 118, 124–25 (Tex. App. 2006) (same).

124. 520 S.W.3d 39 (Tex. 2017).

125. *Id.* at 39–43.

126. *Id.*

127. *Id.* at 50–51.

128. These are variously called “surface damage acts” or “surface owner protection acts.”

implied easement to a limited privilege, which can be exercised only upon payment of compensation.¹²⁹ These statutes also routinely require notice to the surface tenant before the mineral tenant enters or uses the land, and may also require the mineral tenant to pursue a surface-use agreement with the surface tenant.¹³⁰

Whether any particular surface damage act requires compensation for damage to the subsurface, such as through drilling or occupying pore space, is to be addressed in the particular language of each statute. Most surface damage acts were enacted at a time when the damage contemplated to the surface involved damage to agricultural productivity. The legislators who passed them likely did not have in mind subsurface damage, which might impair the surface tenant's ability to conduct carbon sequestration.¹³¹

Nevertheless, courts have had no trouble interpreting these acts to cover damage to subsurface property, including pore space. In 2011, the Montana Supreme Court acknowledged that Montana's statute may require payment to the surface owner of compensation for damage to subsurface pore space.¹³² Likewise, North Dakota courts have held that the word "land" in North Dakota's similarly worded statute referred generally to the surface estate's property and thus included pore space.¹³³ Following this decision, the North Dakota legislature amended the definition of "land" to expressly exclude pore space. Four years later, however, the amendment was held unconstitutional as a *per se* taking of landowners' property in pore space in *Northwestern Landowners Association v. North Dakota*.¹³⁴ Together, these opinions evidence a tendency among courts to give surface damage acts a broad construction to effect their remedial purpose of protecting the surface estate from economic harm from mineral development.

Although there has been little resistance to applying surface damage acts to subsurface damage, two states' statutes (Montana and South

129. Ronald W. Polston, *Redefining the Relationship between the Surface Owner and the Mineral Developer*, 12 ENERGY & MIN. L. FDN. § 22.04[4] (1991).

130. *E.g.*, N.M. STAT. § 70-12-5.

131. Schremmer, *Crystal Gazing: Foretelling the Next Decade in Oil and Gas Law*, *supra* note 100, at 5–11 (citing WYO. STAT. § 30-5-405 (2005); MONT. CODE § 82-10-502(2) (2013); N.D. CENT. CODE § 38-11.1-03 (2019)).

132. *Burlington Res. Oil & Gas Co., L.P. v. Lang & Sons Inc.*, 259 P.3d 766, 771 (Mont. 2011).

133. 112 F. Supp. 3d 906, 921–22 (D.N.D. 2015); *accord Mosser v. Denbury Res., Inc.*, 898 N.W.2d 406 (N.D. 2017).

134. 978 N.W.2d 679, 694–95 (N.D. 2022) (striking down N.D. CENT. CODE § 38-11.1-03 (2019)).

Dakota) have been interpreted not to require compensation merely for the *use or occupation* of a landowner's pore space. In *Brown v. Continental Resources, Inc.*, the 8th Circuit Court of Appeals held that South Dakota's compensation act entitles owners to payment for only three categories of loss: "[1] loss of agricultural production, [2] lost land value, and [3] lost value of improvements caused by mineral development."¹³⁵ The mere use or occupation of a landowner's pore space by fluid injected for disposal is not compensable under the act, unless it is accompanied by one of the enumerated categories of loss. The North Dakota Supreme Court, in contrast, held in *Mosser v. Denbury Resources* that North Dakota's Damage Compensation Act requires compensation not only for damage to, but also *use of* the surface owner's land, including pore space.¹³⁶ Thus, in contrast to the common law rule, mineral lessees in North Dakota are obligated to compensate surface owners for injecting wastewater into pore space, even if the water is produced from the land itself or a production unit that includes the land.

B. Conflicting Easements

This section outlines the relationship between mineral development and carbon sequestration when the latter is conducted by the holder of a mere subsurface easement for that purpose. It should be observed at the outset that the legal relationship that results between extraction and sequestration when the latter is conducted under an express easement depends on how title to the minerals is held. When title to the minerals is unified with title to the land and the mineral development is conducted by the landowner, the relationship between the landowner and the sequestration-easement holder is similar to the dominant-servient relationship of split estates. When, however, the minerals are owned by a severed mineral estate, the relations between the mineral owner and the sequestration easement holder revolve around a clash of the easements each owns in the surface estate. The following subsections briefly consider both scenarios.

The easements envisioned here enabling use of a tract for carbon sequestration are express easements. They may be specific or blanket easements, but in either case, they are expressly created rather than being implied as an incident of a severed estate. Because these easements are express, determining their proper scope is a matter of interpreting the

135. *Brown v. Cont'l Res., Inc.*, 58 F.4th 1023, 1027 (8th Cir. 2023); *accord Burlington Res.*, 259 P.3d at 771.

136. *Mosser v. Denbury Res., Inc.*, 898 N.W.2d 406, 415 (N.D. 2017).

language of the grant. In addition to the rights expressly granted, the grant may also include implied “secondary” easement rights. These rights are implied on the basis that they are necessary to the full use and enjoyment of the easement and thus are presumed to have been intended by the grantor.¹³⁷

1. Relations between Easement and Servient Estate

Where the owner of land grants an express easement for carbon sequestration, the grantee assumes a dominant position with relation to the grantor’s estate in the land, permitting it to use the grantor’s estate as set forth in the terms of the grant. If the grantor’s estate consists of oil, gas, or other minerals, as well as the surface, the grantee’s dominance logically extends to burden all those elements of the land. The legal relationship between the dominant sequestration tenant and the servient surface tenant would be the very same as the relationship between split mineral and surface estates, except that the special doctrines developed for mineral easements, like the accommodation doctrine, arguably do not apply, or do not apply in the same way.¹³⁸ Reference should be made, instead, to general principles of easement law.¹³⁹

Under general principles of easement law, the grantor surface tenant retains the right to “make any use of the servient estate that does not unreasonably interfere with the enjoyment of” the easement.¹⁴⁰ The grantor’s obligation of noninterference is measured in part by the physical dimensions of the easement. The grantor may not unreasonably interfere with the express dimensions or location of a specific easement. For blanket

137. Pierce, *Oil and Gas Easements*, *supra* note 97, § 9.04[1] (“The express easement also includes rights necessary to fully enjoy the expressly granted rights.” These rights are sometimes referred to as “secondary easements.” As the Restatement notes, “[c]onceptually, a secondary easement can be regarded either as an easement by necessity or as inherently included within the primary-use rights granted by the easement.”) (citing RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.10 cmt. c, at 594 (AM. L. INST. 2000)). “An example of a secondary easement is the primary grant of an easement for a pipeline. If the easement does not address use of the land to construct and maintain the pipeline, these rights will either be deemed to be encompassed by the express purpose of the grant, or implied as a necessary right to enjoy the rights expressly granted.” *Id.* (citing RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.10 cmt. c, at 594 (AM. L. INST. 2000)).

138. See *supra* Part IV.A.

139. See RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 1.1(2) (AM. L. INST. 2000); Pierce, *Oil and Gas Easements*, *supra* note 97, § 9.05[2].

140. RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.9 (AM. L. INST. 2000).

easements, the dimensions—and thus the grantor’s obligation of noninterference—are circumscribed instead by the easement holder’s reasonable necessity in pursuing the purpose of the easement.¹⁴¹ Thus, a grantor surface owner is considered to have unreasonably interfered with the scope of a blanket easement when it encroaches on the easement holder’s reasonable use and enjoyment, regardless of the physical location of the surface owner’s activity.¹⁴²

The Restatement calls on the servient and dominant parties both to exercise their rights in a spirit of “mutual accommodation” when the surface uses conflict.¹⁴³ But the dominant tenant must accommodate the servient only to the extent it can be accomplished “consistent with effectuating the purpose of the easement or profit.”¹⁴⁴ Professor Pierce sees in these provisions of the Restatement something akin to the accommodation doctrine that courts apply between split mineral and surface estates.¹⁴⁵ While it is uncertain whether courts would apply mineral law’s accommodation doctrine in disputes involving surface tenants and easement holders for carbon sequestration, the principles underpinning the accommodation doctrine would seem to justify it.¹⁴⁶

2. Relations between Easement and Mineral Estate

The grantee of an easement to sequester carbon dioxide takes an express, specific or blanket easement in subsurface pore space for the purpose of carbon sequestration. Where the mineral estate has been severed, the mineral tenant also holds an easement in the surface estate, which would ordinarily encompass the subsurface geological structures

141. *Id.* § 4.8.

142. *Brown v. ConocoPhillips Pipeline Co.*, 271 P.3d 1269, 1274–76 (Kan. Ct. App. 2012). This is true, at least, where the easement holder’s initial or prior use of the easement is held to define the entire extent of its dimensions and location. *See, e.g.*, *Jackson Elec. Membership Corp. v. Echols*, 66 S.E.2d 770, 772 (Ga. Ct. App. 1951); *Miller v. Long Oil & Gas Expl., Ltd.*, 542 So. 2d 75 (La. Ct. App. 1989).

143. RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.8. cmts. a & c (AM. L. INST. 2000).

144. *Id.*

145. Pierce, *Oil and Gas Easements*, *supra* note 97, at § 9.06[2][b].

146. Even if courts do not apply the accommodation doctrine in these situations, the Restatement also recognizes the servient tenant’s right to, upon payment to the easement holder, make reasonable changes to the easement to accommodate the servient estate’s uses. RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.8(3) (AM. L. INST. 2000). Thus, the servient tenant may obtain “accommodation” at its own expense.

and pore space. The mineral tenant's easement, in contrast, exists for the purpose of enjoying its mineral property.¹⁴⁷ These separately owned easements, created for differing purposes, share a kind of correlative relationship in the common servient property, the surface estate.

The generally accepted rule governing this correlative relationship is that both easement holders "must exercise their rights so that they do not unreasonably interfere with each other."¹⁴⁸ However, "[i]n the event of irreconcilable conflicts in use, priority of use rights is determined by priority in time"¹⁴⁹ The first-in-time, first-in-right rule follows logically from the principle that a party cannot "create in others a privilege which he did not have."¹⁵⁰ When a landowner grants an easement, the grantor may not use the land so as to unreasonably interfere with the grantee's easement rights. Consequently, if the grantor landowner were to grant a subsequent easement to another party, that grantee cannot unreasonably interfere with the easement rights of the first grantee (provided the second grantee took with notice of the first easement and is not given priority under an applicable recording act).¹⁵¹

Each holder of an easement in the same surface estate is entitled to use its easement within the scope of its express or implied grant. Each also owes correlative duties to other easement holders not to unreasonably interfere with their correlative use rights. A senior easement holder may not unreasonably interfere with a junior any more than the junior may

147. See generally Pierce, *Oil and Gas Easements*, *supra* note 97, § 9.01[1][b]. There is very little in the oil and gas literature discussing the clash of a mineral tenant's implied surface-use easement with another express easement. Most likely this is because large-scale development of lands burdened with a severed mineral estate, for things like multiple-mineral and renewable energy development, is typically pursued through leases of the surface estate or the creation of a separate, severed estate in the resource. Large-scale carbon dioxide sequestration, in contrast, logically could occur under the authority of a mere easement, at least where the land is only used to permit carbon to migrate into and remain in place within subsurface pore space.

148. *Id.* § 4.12.

149. *Id.*; *Panhandle Eastern Pipe Line Co. v. State Highway Comm'n of Kan.*, 294 U.S. 613 (1935).

150. David R. Green, *Earth and Wind Industries Playing with Fire: The Concurrent Rights of Wind Farm Operators, Oil and Gas Developers, and Landowners in Kansas*, 61 U. KAN. L. REV. 1089, 1101 (2013) (quoting *Brooks v. Mull*, 78 P.2d 879, 883 (Kan. 1938)).

151. See RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.12 (AM. L. INST. 2000).

interfere with the senior.¹⁵² Yet, in consequence of a senior easement holder's priority over a junior, the latter must accommodate the former's use where the two would irreconcilably clash. As applied, the priority rule may permit the junior to make reasonable changes to the senior's use, such as relocating or reinforcing the senior's pipeline, so long as the changes are made at the junior's sole cost and expense.¹⁵³ Like the junior, the senior may not unreasonably interfere with the junior's easement. Unlike the junior, however, the senior is not required to accommodate the junior's uses in the event of an irreconcilable conflict.¹⁵⁴ In that case, the junior must bear any costs of finding an alternative or modifying one of the uses to accommodate the senior.

C. Severed Coequal Estates

This section discusses the legal framework governing relations among separate, or "severed," coequal estates in the same subsurface tract. The scenarios envisioned in this section involve three separate legal estates in a single tract of land: (i) a surface estate, (ii) at least one mineral estate, and (iii) an estate either in all subsurface pore space, an estate in a specific interval of subsurface depth, or in a specific subsurface formation or formations. Conceptually, the conflicts that might arise over subsurface activities among coequal estates would be far more complex than those that arise between split surface and mineral estates. The ultimate cause of the difficulty is the fact that the property of one estate—the mineral estate—is contained within the property of a separate, coequal estate—the pore space estate—and neither estate enjoys priority in every respect. The possible coordination problems are legion and the correlative rights and duties of the parties "are exceedingly difficult of definition."¹⁵⁵

Broadly, the problems encountered between severed mineral and pore space estates mirror those presented in earlier eras between owners of separate estates in different minerals within the same tract—inviting an analogy to earlier "multiple-mineral development" cases. The touchstone for adjudicating these kinds of controversies is "to so apply the law as to give each owner the right of enjoyment of his property or strata without

152. *K. Petroleum, Inc. v. Lenape Gathering Corp.*, No. 22-CV-334-LJV, 2022 WL 4134237, at *6 n.5 (W.D.N.Y. Sept. 12, 2022).

153. See RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.12 illus. 2 (AM. L. INST. 2000); *Buckeye Pipe Line Co. v. Keating*, 229 F.2d 795 (7th Cir. 1956); *Magnolia Pipe Line Co. v. City of Tyler*, 348 S.W.2d 537 (Tex. App. 1961).

154. See *K. Petroleum, Inc.*, 2022 WL 4134237 at *6 n.5.

155. Cf. *Rend v. Venture Oil Co.*, 48 F. 248, 251 (W.D. Pa. 1891) (involving multiple-mineral development).

impinging upon the right of other owners.”¹⁵⁶ This proved a rather difficult task in the multiple-mineral development cases, and it promises to be a source of trouble for severed pore space and mineral estates, as well.

Part of the difficulty owes to the fact that parties’ respective rights and duties may differ substantially depending on the circumstances of the case. In some circumstances, the estates would hold competing easement rights over a common surface estate. At other times, the estates may share reciprocal easement rights in each other’s property such that one may be dominant to the other. And in other settings, the two estates may be perfectly coequal, sharing the same correlative rights and duties that all neighboring owners do in a common reservoir. It is therefore essential to ascertain the parties’ rights and duties within the context of the particular case.

1. Relations with the Surface Estate

Based on the common law maxim that “when the law doth give any thing to one, it giveth impliedly whatsoever is necessary for enjoying the same,” a severed pore space estate should enjoy implied rights to use the surface estate as reasonably necessary to enjoy the severed estate, if the grant or reservation creating the estate is silent as to surface-use rights.¹⁵⁷ The surface estate, out of which any severed estate is carved, should be the servient estate in the same kind of dominant–servient relationship that governs surface and mineral estates.¹⁵⁸ Within this relationship, the surface estate is entitled to use and occupy the surface in any way that does not unreasonably interfere with any severed estates’ beneficial use and enjoyment of their easements, and all severed estates are entitled to use, occupy, and consume the surface for purposes reasonably necessary and convenient for their use and enjoyment. Although the severed estates’ easement rights are dominant, in principle at least, a version of the accommodation doctrine ought to apply where the surface tenant’s use is preexisting, lacks a reasonable alternative, and the surface use of the dominant estate does have a reasonable alternative. In sum, the principles governing the relationship between split mineral and surface estates should apply to the relationship between the surface estate and *any* severed subsurface estate, whether encompassing minerals or pore space.¹⁵⁹

156. Cf. *Chartiers Block Coal Co. v. Mellon*, 25 A. 597, 598–99 (Pa. 1893) (involving a dispute between coal and oil and gas estates).

157. 2 BLACKSTONE, *supra* note 59, at 36; *Cowan v. Hardeman*, 26 Tex. 217, 222 (1862); *Marvin v. Brewster Iron Mining Co.*, 55 N.Y. 538, 549–50 (1874).

158. See *supra* Part IV.A.

159. See *supra* Part IV.A.

2. *Relations between Mineral and Pore Space Estates*

Matters are considerably more complex between the severed estates themselves. There are multiple aspects to the relationship between severed mineral and pore space estates in the same land. First, with respect to each estate's use of the surface estate for enjoyment of its property, the relationship between the pore space and mineral estates is that of conflicting easement holders. Second, because subsurface estates are by nature stacked vertically, one on top of the other, each separate estate enjoys correlative rights to access portions of its property located below other estates in the subsurface. By necessity, each estate owes correlative duties to permit access to deeper estates as well as to provide support to shallower estates. In this regard, the severed estates are bound together in a relationship of reciprocal easements. Third, when multiple separate estates own rights in a common subsurface formation, their relationship is that of neighbors in a common reservoir. Pursuant to this relationship, each owns correlative rights to a fair opportunity to use and enjoy their proportional share of the common reservoir. Each also owes correlative duties not to unreasonably interfere with the other's reciprocal opportunity.

a. Conflicting Easements in the Surface Estate

Where multiple subsurface estates have been created in a tract of land, each estate enjoys at least an implied easement to use the surface as reasonably necessary and convenient for the enjoyment of the estate.¹⁶⁰ The principles that apply to order the relationship between holders of separate easements in the same property should apply to order the surface activities of severed mineral and pore space estates.¹⁶¹ Under these principles, each easement holder is entitled to reasonably use its easement and is obligated not to unreasonably interfere with the other easement holder's use.¹⁶² Where the two easements would conflict irreconcilably, priority is given to the easement that was created first, on the principle of first in time is first in right.¹⁶³ Accordingly, irreconcilable conflicts between separate estates over occupying or using the surface estate are

160. See *Callahan v. Martin*, 43 P.2d 788, 796 (Cal. 1935); *Ramey v. Stephney*, 173 P. 72, 73 (Okla. 1918).

161. See *supra* Part IV.B.

162. RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.12 (AM. L. INST. 2000).

163. *Id.*

ordered in priority based on the time when each estate was first created or severed from the surface estate.

Commentators are split as to whether disputes between separate estates in land should be determined based on temporal priority,¹⁶⁴ or, instead, on the basis of reciprocal accommodation or “ad hoc balancing” of the parties’ interests.¹⁶⁵ The authors all make a common mistake. They all attempt to characterize the legal relations between severed estates entirely on the basis of one or the other principle, priority or balancing. Yet, it is not possible to paint with such a broad brush because the relations between severed estates depend upon the context of their interaction. The priority rule applies, but only where the conflict between the two involves the clash of their respective surface-use easements. Where the parties’ dispute arises in different contexts, different principles apply.

The other two kinds of contexts in which severed estates may clash are in their respective rights to access deeper zones and to concurrently use shared subsurface formations. The principles that apply in these other contexts are distinct from first in time, first in right. To a degree, they more closely resemble the reciprocal accommodation approach advocated by others, except they do not call for any interest or utility balancing.¹⁶⁶

b. Correlative Rights of Access and Support

Separate and apart from their surface-use easements, each severed estate in a shared tract of land enjoys a correlative right to reasonable access to its estate, even if it requires drilling through other estates.¹⁶⁷ Each also owes a correlative duty to provide support to estates resting above it.¹⁶⁸ Each estate enjoys these correlative rights, and owes these correlative duties, by implication. These rights are not prioritized on the basis of time.

164. Nevill, *supra* note 78, at 796; Fred A. Deering, Jr., *Multiple Use Problems of Operators Both On and Off the Public Domain*, 7 ROCKY MTN. MIN. L. INST. 541, 604 (1962); Phillip W. Lear, *Cooperative Multiple Mineral Development Agreements*, 43 ROCKY MTN. MIN. L. INST. 3, 11 (1997).

165. Kramer, *Multiple Surface Uses*, *supra* note 85, at 298–99; Bruce Kramer, *Conflicts Between the Exploitation of Lignite and Oil and Gas: The Case for Reciprocal Accommodation*, 21 HOUS. L. REV. 49, 62–63 (1984) [hereinafter Kramer, *Reciprocal Accommodation*]; K.K. DuVivier, *Sins of the Father*, 1 TEX. A&M J. REAL PROP. L. 391, 422 (2013).

166. See Kramer, *Multiple Surface Uses*, *supra* note 85, at 298–99; Kramer, *Reciprocal Accommodation*, *supra* note 165, at 62–63.

167. *Guffey v. Stroud*, 16 S.W.2d 527, 528 (Tex. App. 1929); *Chartiers Block Coal Co. v. Mellon*, 25 A. 597, 598–99 (Pa. 1893); *Rend v. Venture Oil Co.*, 48 F. 248, 250–51 (W.D. Pa. 1891).

168. *Burgner v. Humphrey*, 41 Ohio St. 340, 352 (1884) (citing cases).

Each estate enjoys them equally regardless of the sequence in which each estate was created.¹⁶⁹

These correlative rights are in the nature of reciprocal easements, or “servitudes,” that each estate owns in the others.¹⁷⁰ The severed mineral estate has an easement in the severed pore space estate to access deeper minerals and is subject to the pore space estate’s easement to access deeper pore space. As with any other correlative relationship, each estate is entitled to use its easement with due regard for the rights of the other estate. The easement holder (the dominant tenant) is permitted to use the servient estate as reasonably necessary to access its deeper property and without causing unreasonable injury to the servient estate.¹⁷¹ The servient estate must not unreasonably interfere with the dominant estate’s rightful use.¹⁷² The aim of the law is to give each owner the right of enjoyment of his property or strata without impinging upon the right of other owners.¹⁷³

To illustrate, suppose *A* owns a severed mineral estate in the oil and gas in and under Blackacre, and *B* owns a severed pore space estate in the same land. If *A* wishes to access pore space in the Viola formation to enjoy its estate, it has an implied easement in the shallower formations allowing it to drill through to the Viola. If *B* owns minerals in the shallower Morrison formation, *B*’s interest in the formation is subject to *A*’s easement for access, and *B* must forbear from unreasonably interfering with *A*’s right to drill through the Morrison in a reasonable manner. *A* may not needlessly damage the Morrison formation when drilling through it. As it pertains to *A*’s accessing its deeper rights, *A*’s estate is dominant, and *B*’s is servient. However, if *B* needs to access the Arbuckle formation, lying below the Viola where *A* is storing carbon dioxide, *B* may drill through the Viola without unreasonably damaging *A*’s operations. In this activity, *B*’s estate would be dominant and *A*’s servient. This is what is meant by “reciprocal easements.”

Difficulty is inevitable in determining what drilling is “reasonably necessary” and, correspondingly, what amount of damage the servient estate must suffer without compensation. These questions will be particularly troublesome when the servient tenant (the one whose estate is being drilled through) has established a preexisting use of the formation that would be harmed or endangered by the dominant tenant’s penetration. In such situations, general easement principles would require the parties

169. *Guffey*, 16 S.W.2d at 528 (holding that an oil estate severed later in time had access rights through an earlier created gas estate).

170. *Chartiers Block Coal*, 25 A. at 600 (Williams, J., concurring).

171. *Guffey*, 16 S.W.2d at 528.

172. RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 1.2 (AM. L. INST. 2000).

173. *Chartiers Block Coal*, 25 A. at 598–99 (majority opinion).

to exercise their rights with due regard to the other and in a spirit of “mutual accommodation.”¹⁷⁴ In theory, this might require the dominant estate to pursue a reasonable alternative to drilling through the stratum of the servient estate, where such an alternative exists.

c. Correlative Rights as Neighbors in a Common Reservoir

Severed pore space and mineral estates share yet a different relationship when they concurrently own property in the same geologic formation—for example, when the mineral tenant has rights to produce oil and gas from, or inject saltwater into, the same formation that the pore space tenant has the right to use for carbon sequestration. In this setting, the parties share correlative rights in a common geologic formation as do owners of separate tracts overlying a common reservoir of oil or gas. The essence of the parties’ relationship in these situations is not that of two easement holders fighting over the use of a third party’s property; each party itself owns an estate directly in the formation or its contents. Nor is the parties’ relationship characterized by the sharing of reciprocal easements in each other’s property.

The closest analogy that can be drawn is to the interaction between neighbors in the same “reservoir community,” to borrow David Pierce’s phrase.¹⁷⁵ The only difference is that the property boundaries of the two coequal estates coincide in the same subsurface area, as opposed to embracing adjacent areas. Just as among neighbors in a common reservoir, the coequal estates enjoy correlative rights in the formation, entitling each to a fair opportunity to use and enjoy a proportional share of the reservoir. Each in turn owes a concomitant duty not to interfere with others’ fair opportunity to do likewise, including a duty not to waste the formation’s contents or its porosity.¹⁷⁶

As I have argued elsewhere, the law of correlative rights in common reservoirs is disorganized and hard to apply.¹⁷⁷ Like the law of split estates, correlative rights have been reduced, by courts and commentators alike, to an ad hoc balancing test. Often, the interests of society and the parties are

174. RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.8. cmts. a & c (AM. L. INST. 2000); *see also supra* Part IV.B.1.

175. David E. Pierce, *Employing a Reservoir Community Analysis to Define and Marshal Correlative Rights in the Oil and Gas Reservoir*, 76 LA. L. REV. 787, 804 (2016).

176. Schremmer, *Unifying Doctrine*, *supra* note 4, at 560–63 (discussing the fair opportunity principle); 1 KUNTZ, *supra* note 65, §§ 4.3–4.8 (discussing correlative rights in common pools of oil and gas).

177. Schremmer, *Unifying Doctrine*, *supra* note 4, at 534–41.

considered in an all-of-the-circumstances analysis, with the apparent goal of prioritizing what the court considers to be the most important or beneficial use of the reservoir.¹⁷⁸

It is nevertheless possible to discern from the muddle certain recurring elements in the case law that seem to give rise to liability for violating a neighboring owner's correlative rights. A reservoir owner is liable when (1) the defendant's act (2) causes a physical invasion of the plaintiff's property boundaries and (3) damages the plaintiff either by (a) harming its ongoing subsurface activities or (b) depriving it of a fair opportunity to use the subsurface or produce its contents, unless the defendant has made a fair, reasonable, and nondiscriminatory offer to participate in the activity.¹⁷⁹ Additionally, uses of a common reservoir for wasteful, nonbeneficial purposes actionably deprive other common owners of their fair opportunity to use the wasted resource.¹⁸⁰

In applying this test in disputes between severed estates in the same tract of land, the parties should be treated as though they were neighbors in the reservoir. For more on how the test might apply to hypothetical facts, I would direct the reader to prior work applying the test to a hypothetical dispute between two reservoir neighbors, one using the pore space to inject produced water and the other using it for carbon sequestration.¹⁸¹

V. CONCLUSION

This Article attempted two things. First, it categorized the conflicts likely to arise between concurrent carbon dioxide sequestration and mineral development on the same tract of land. The typical disputes identified involve (i) uses of the surface of the land, (ii) uses of the subsurface of the land, including drilling through shallower zones to access deeper ones and occupying of pore space, and (iii) the geophysical and geological exploration of the subsurface.

The Article then suggested a framework for thinking through those conflicts. This framework proceeds by first characterizing the legal relationship of the party performing carbon dioxide sequestration with the party conducting mineral extraction. Which types of legal relationships exist depends on how title is held to subsurface pore space. The three fundamental types of relationships likely to arise are (i) the split estate relationship between severed surface and mineral estates, (ii) the

178. *Id.*

179. I call this test the "fair opportunity doctrine." *Id.* at 525.

180. *Id.* at 583.

181. See Joseph A. Schremmer, *Pore Space Property*, 2021 UTAH L. REV. 1, 70–72 (2021) (applying the fair opportunity doctrine to hypothetical facts).

“competing easements” relationship between an easement holder for carbon sequestration purposes and the owner of rights to use the surface for mineral development, and (iii) the coequal relationship between separate severed estates, such as that between a severed mineral estate and a severed estate in subsurface strata or pore space. Finally, the Article sketched out the legal principles traditionally governing each type of relationship. I leave the task of applying these principles to the likely conflicts between sequestration and extraction for a subsequent article.¹⁸²

182. See sources cited in note 6, *supra*.