

**Conflicts and Confluences between Surface and Mineral Estates
in CCUS**

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Conflicts and Confluences between Surface and Mineral Estates with CCUS

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I. INTRODUCTION.....	296
A. <i>Asking the Right Questions</i>	297
B. <i>Distinguishing CCU and CCS</i>	299
C. <i>Introducing Split Estates</i>	301
II. LOCATING THE RIGHT TO CONDUCT CCUS AMONG SPLIT ESTATES ..	
.....	303
A. <i>Private Lands</i>	304
1. <i>Pore Space Ownership under Common Law</i>	304
i. Principles of Construction	304
ii. Pore Space: Surface or Mineral?.....	308
2. <i>Statutory Declarations of Pore Space Ownership</i>	310
3. <i>Pore Space Rights of the Mineral Estate</i>	311
i. The Rights Typical of a Mineral Estate.....	311
ii. The Rights Granted in a Typical Oil and Gas Lease.....	313
B. <i>Public Lands</i>	315
1. <i>Federal Lands</i>	316
i. Land Grants under the Stock-Raising and Homestead Act	
316	
ii. Land Exchanges under Other Statutes	321
2. <i>State Lands</i>	322
III. ANCILLARY RIGHTS TO USE OTHER SPLIT ESTATES FOR CCUS.....	326
A. <i>Surface-Use Rights of Mineral Estate</i>	327
1. <i>The Implied Surface-Use Easement</i>	327
2. <i>Reasonable Accommodation</i>	329
3. <i>Express Surface-Use Easements</i>	332
4. <i>Surface Damage Legislation</i>	337
B. <i>Use Rights of Surface Estate</i>	338
IV. CONFLICTS WITH OTHER SUBSURFACE ACTIVITIES	342

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A. <i>Oil and Gas Production</i>	342
1. <i>Well Drilling and Accessing Deeper Strata</i>	343
i. Well Drilling	343
ii. Accessing Deeper Strata	346
2. <i>Occupying Pore Space</i>	350
3. <i>Exploration</i>	352
B. <i>Coalbed Methane Production</i>	353
1. <i>Coal, CBM, and Pores</i>	353
2. <i>Ownership of CBM and Coal Pores</i>	355
i. Federal Lands	355
ii. Private Lands.....	357
iii. Statutory Declarations of Pore Space Ownership	362
3. <i>Co-Locating CCUS and CBM Development</i>	363
C. <i>Geologic CO₂ Production</i>	365
D. <i>Co-Location and Conflicts on Public Lands</i>	369
V. CONCLUSION	372

ABSTRACT

Carbon capture, utilization, and storage (CCUS) presents a new way of using an old resource: the subterranean rock structures and their interstitial “pore” space that make up the subsurface of the earth. Injecting carbon into these structures also raises a number of new legal questions about their ownership and the relations between the owners of the structures and the owners of other subsurface resources contained within them, like oil and gas, coal, coalbed methane, and geologically native carbon dioxide. This Article explores these new legal questions and the conceptual difficulties they present with the aim of guiding participants in CCUS projects about the state of the law and its many open questions. Drawing on previous scholarship and analogies from oil and gas law, the Article suggests answers to, or at least ways of thinking about, several of the open questions. Specifically, this Article addresses the following: (1) ownership of subsurface rock structures and pore space under private, federal, and state-owned lands in the United States; (2) the respective rights and duties of the owners of pore space and mineral interests in the same tract of land; and (3) conflicts that may arise between pore space and mineral owners when CCUS projects are conducted alongside (a) oil and gas development, (b) coal mining and coalbed methane extraction, and (c) geologic carbon dioxide production.

I. INTRODUCTION

A major factor complicating investment in carbon capture, utilization, and storage (CCUS) is the diversity of property interests that already exist

in geological strata needed for sequestering carbon dioxide. On occasion, a CCUS developer might find a clean slate in the form of a tract of land owned in unified fee simple absolute title, including surface and minerals, that is free of other rights or burdens affecting title to subsurface strata. But tracts like these are rarely found in the mineral producing regions of the United States, where CCUS activity is most prominent. In places with significant mineral production, land titles are commonly held in “split estates,” in which rights to some or all of the subterranean minerals are owned separately from the land itself. To complicate matters further, a large portion of these split estate lands, especially in the American West, are owned in part by the United States and various state governments. Any significant CCUS project will need to acquire subsurface property rights in numerous tracts of land in the country’s mineral producing areas and will invariably encounter problems of comprehending and coordinating preexisting property rights in these split estate lands. This Article is intended as a guide to the lawyer or landman facing such issues.

A. Asking the Right Questions

A proper legal analysis of the property rights implicated in a CCUS project begins with identifying the pertinent issues accurately and precisely. This Article advances three distinct questions relating to property rights that nearly any CCUS project will face at some juncture in its planning and operation.¹ These questions bear on the work of lawyers and landmen in the planning stage and when the needed property interests are acquired, as well as on the work of the litigators and trial counsel who help CCUS projects navigate, resolve, and litigate disputes with other interest holders. While these questions cover a lot of ground, they do not exhaust the possible property-related problems a CCUS project may encounter during its planning and operation. One essential issue that is beyond the scope of this Article is the problem of CCUS operations spilling into and possibly trespassing on tracts of land owned by persons who have not consented to participating in the project. Recent scholarly literature has dealt with these spillover problems.² Many of the questions taken up here have received comparatively less scholarly attention.

¹ See *infra* Parts II–IV.

² See, e.g., Tara K. Righetti, *Correlative Rights and Limited Common Property in the Pore Space: A Response to the Challenge of Subsurface Trespass in Carbon Capture and Sequestration*, 47 ENV’T L. REP. NEWS & ANALYSIS 10420 (2017); Keith B. Hall, *Reconciling Property Rights with Carbon Capture and Storage*, 10 BELMONT L. REV. 382 (2023); Joseph A. Schremmer, *A Unifying Doctrine of Subsurface Property Rights*, 46 HARV. ENV’T L. REV. 525 (2022); Joseph A. Schremmer, *Subsurface Trespass: Private Remedies and Public Regulation*, 101 NEB. L. REV. 1005 (2022).

The first question, addressed in Part II, is which split estate owns the right to conduct CCUS and enjoy the economic benefits that follow.³ The answer will determine which estate is entitled to grant to a CCUS operator the right to conduct its enterprise. To address this question, it is often necessary to determine the extent of the property rights conferred on a severed mineral interest and, conversely, the extent of the rights retained in the balance of the land, called a “surface estate.” This determination ultimately focuses on one key component of subsurface geological systems: the porosity and permeability of rock formations, constituting the formation’s capacity to store fluids like injected carbon dioxide. Often called “pore space” by those in the industry, this is the critical physical feature of the earth for conducting CCUS projects of all kinds and thus is the element whose ownership must be determined as a threshold matter.

The second question, addressed in Part III, is what auxiliary or incidental rights and duties each estate possesses to access, occupy, consume, damage, and otherwise use the elements of the earth that are owned by other estates.⁴ Fugitive (or “fugacious”) minerals like oil and gas and pore space coexist within the same subsurface rock formations. These rock formations are layered like a cake beneath the surface of the earth. There is no way to profitably use property rights in any of these elements of the subsurface without accessing, occupying, consuming, and damaging elements of the earth that are the separate property of other estates. For instance, a CCUS well cannot be drilled into targeted pore space without penetrating shallower, possibly mineral-bearing formations. The second essential question therefore seeks to understand each estate’s interlocking rights to use the property of other estates.

The third and final question, addressed in Part IV, closely relates to the second: how would the law resolve disputes that may arise between CCUS projects and other subsurface activities commonly found in locations targeted for CCUS⁵ These concurrent activities may include primary oil and gas production, coalbed methane production, and extraction of carbon dioxide that is indigenous to the formation. It might be said that this level of the analysis deals with disputes over “co-location” of subsurface operations or the “multiple development” of different resources. A significant portion of the work in addressing co-location disputes consists of applying the principles studied in Parts II and III concerning the correlative ownership and use rights of various split estates.

³ See *infra* Part II.

⁴ See *infra* Part III.

⁵ See *infra* Part IV.

In addressing each of the three guiding questions, attention must be paid to the differences between privately owned split estates, in which all surface and mineral interests are held in private hands, and publicly owned split estates, in which an interest in either the surface or minerals is held by the United States or a state government. Attention must also be given to the different types of CCUS operations. While the discussion to this point has been content to refer to CCUS as a single type of activity, the term encompasses two distinct, and quite different, kinds of operations. As context for the rest of the Article's discussion, the following subparts briefly introduce CCUS and the legal fundamentals of split surface and mineral estates.⁶

B. *Distinguishing CCU and CCS*

CCUS involves the injection into depleted or producing oil and gas reservoirs, unmineable coal seams, or deep saline aquifers of carbon dioxide captured from an industrial source, like a coal-fired powerplant, or directly from the atmosphere. The ultimate reason for injecting carbon dioxide for CCUS is to sequester it underground to prevent it from entering the atmosphere where it may contribute to climate change.⁷ The more immediate reason that people want to inject carbon dioxide for CCUS is usually to do one of two things. The person may wish to utilize captured carbon to flood a depleted oil and gas reservoir in a process known as enhanced oil or gas recovery (EOR or CO₂ EOR).⁸ Injection of captured carbon for this purpose constitutes carbon capture and *utilization*, or CCU. Alternatively, a person may inject carbon simply to store or sequester it underground, where it cannot be emitted into the atmosphere. This is the process of carbon capture and *storage*, or CCS.⁹

Both CCU and CCS result in the permanent sequestration of carbon dioxide underground and away from the atmosphere,¹⁰ and both qualify for a federal tax credit intended to incentivize private carbon sequestration. Section 45Q of the Internal Revenue Code provides a federal income tax

⁶ See *infra* Parts I.B–I.C.

⁷ See 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, 97 (2023).

⁸ “Enhanced oil recovery is the extraction of crude oil from an oil field that cannot be extracted otherwise. The process involves injecting liquified CO₂ into the pore space of reservoir rock to help displace oil and drive it to a production wellbore.” 8 PATRICK H. MARTIN & BRUCE M. KRAMER, WILLIAMS & MEYERS, OIL AND GAS LAW, MANUAL OF TERMS *Enhanced Oil Recovery* (quoting OXY USA, Inc. v. U.S. Dep’t of Interior, 32 F.4th 1032, 1039 n.9 (10th Cir. 2022)).

⁹ *Id.* at C (defining carbon sequestration).

¹⁰ See Tara K. Righetti, et al., *The Carbon Storage Future of Public Lands*, 38 PACE ENV’T L. REV. 181, 183–84 (2021).

credit for carbon captured and placed into secure geologic storage (CCS) as well as for carbon captured and used as an injectant in an EOR project (CCU).¹¹ These economic incentives were significantly increased in the Inflation Reduction Act of 2022,¹² signaling Congress's continuing commitment to CCUS. The state of California also incentivizes CCS projects through its Low Carbon Fuel Standards (LCFS) tax credit,¹³ which operates similarly to the 45Q tax credit.

Despite their shared ultimate goals, CCU and CCS differ in ways that matter for property law. CCU for CO₂ EOR injects carbon dioxide into depleted oil and gas reservoirs as a means of repressuring the formation and producing the residual hydrocarbons left behind by primary and secondary production techniques.¹⁴ In this process, most of the carbon is sequestered in the formation via secure geologic storage.¹⁵ CO₂ EOR, therefore, is typically conducted as the final phase, before plugging and abandonment, of fieldwide development of an oil and gas reservoir. This practice has a long history in oil and gas extraction. Decades before the invention of carbon capture technologies, the carbon used in EOR was extracted from naturally occurring geologic sources and transported by pipeline to the field for reinjection.¹⁶ Now that the means exist to capture carbon from the atmosphere or nearby industrial sources and the additional value of a federal tax credit makes it more economical to do so,¹⁷ the use of CO₂ EOR might well expand to oil and gas fields that once were too distant from geologic sources of carbon to feasibly deploy it.

CCS, in contrast, is unrelated to oil and gas extraction. Yet many, if not most, CCS projects target areas with significant historical or ongoing oil and gas production.¹⁸ Most of these projects utilize either depleted oil or gas reservoirs or saline aquifers, both of which provide a porous and

¹¹ 26 U.S.C. § 45Q; Inflation Reduction Act of 2022, Pub. L. No. 117–169, § 13104, 136 Stat. 1924, 1924–29.

¹² 26 U.S.C. § 45Q; Inflation Reduction Act of 2022, Pub. L. No. 117–169, § 13104, 136 Stat. 1818, 1924–29.

¹³ CAL. CODE REGS. tit. 17, § 95490(b)(1) (2024); CAL. AIR RES. BD., CARBON CAPTURE AND SEQUESTRATION PROTOCOL UNDER THE LOW CARBON FUEL STANDARD 119 (2018).

¹⁴ Righetti, et al., *supra* note 10, at 196.

¹⁵ *Id.*

¹⁶ *See infra* Part IV.C.

¹⁷ *See supra* notes 10–12 and accompanying text.

¹⁸ *See* Deepika Nagabhushan, *Interactive Map of CCUS Projects in Development in the U.S.*, CLEAN AIR TASK FORCE (July 27, 2020), <https://www.catf.us/2020/07/ccus-interactive-map/> [https://perma.cc/3866-TUAN].

permeable medium in which fluids may be injected and stored.¹⁹ For this reason, saline aquifers are frequently used for waste disposal of other kinds as well, especially the disposal of wastewater from oil and gas extraction (called “produced water”).²⁰ In addition to the conditions contained in federal tax law, CCS projects in most states are directly regulated by the federal Environmental Protection Agency (EPA). EPA administers the permitting program for CCS wells through the Class VI permit program everywhere except North Dakota, Wyoming, and Louisiana which have obtained authority to administer the Class VI permit program under state law.²¹ In comparison with the injection permit required for a CCU EOR well (a Class II permit), the Class VI permit incorporates much more extensive requirements pertaining to siting and demonstrating geologic containment, well construction, operation, monitoring, plugging, post-injection site care, post-closure monitoring, and increased financial assurances.²² The Class VI permitting process is seen as onerous and time consuming compared with the more routine process of obtaining Class II permits for injection for EOR.²³

C. *Introducing Split Estates*

Many CCUS projects involve lands held in “split estates.” In the parlance of mineral law, land is owned in “split estates” when ownership of one or more mineral substances is divided or “severed” from ownership of the land. Mineral severance is treated as creating a wholly independent right of ownership, or “estate,” from the right of ownership in the land itself.²⁴ Mineral severances are usually effectuated in the first instance by a

¹⁹ INT’L ENERGY AGENCY, ENERGY TECHNOLOGY PERSPECTIVES 2020: SPECIAL REPORT ON CARBON CAPTURE UTILISATION AND STORAGE: CCUS IN CLEAN ENERGY TRANSITIONS 112 (2020).

²⁰ *See id.*

²¹ *Primary Enforcement Authority for the Underground Injection Control Program*, ENV’T PROT. AGENCY (Oct. 10, 2023), <https://www.epa.gov/uic/primary-enforcement-authority-underground-injection-control-program-0> [<https://perma.cc/862Z-S5XT>].

²² Elizabeth L. McGinley, et al., *Critical Issues for Carbon Capture Projects: Tax, Environmental, and Rights, and Commercial Issues*, 68 NAT. RES. & ENERGY L. INST. 7-1, 7-12 to 7-13 (2022).

²³ *See id.*

²⁴ Joseph A. Schremmer, *The Concurrent Use of Land for Carbon Sequestration and Mineral Development*, 75 BAYLOR L. REV. 630, 653 (2023). Louisiana law does not recognize the power of a landowner to sever full ownership of oil and gas from ownership of the land itself. Instead, Louisiana’s mineral code permits only the creation of a servitude in underlying minerals. Like all servitudes under Louisiana’s civil law, the mineral servitude is inherently limited in duration to a period of ten years, unless the servitude is developed, in which case it may continue for as long as development continues. *Id.* at 653 n.101 (citing LA. STAT. ANN. §§ 31:21, :27 (1975)). Despite its differences from the common law, Louisiana law treats the owner of the land and the holder of the servitude as owning

deed in which the grantor conveys ownership of all or some portion of the minerals or reserves some mineral ownership from a conveyance of the land.²⁵ Split estates are common in privately owned land all over the United States. Particularly in regions with historical and ongoing mineral production, split estates make sense for landowners who wish to utilize the surface of their land while also empowering others to take a chance on developing the underlying oil, gas, or other minerals.

Split estate lands are also found in the public domain. The U.S. federal government owns approximately 57 million acres of split estate minerals, in which the corresponding surface estate is held by private owners or state governments.²⁶ This arrangement is the result of a series of federal land-disposal laws enacted by Congress in the 19th and 20th centuries by which the federal government reserved certain minerals from patents of land granted to individuals from the public domain.²⁷ The federal government also owns split surface estates, under which the minerals are privately owned, as the result of land acquisitions and exchanges that did not include the minerals.²⁸ Many of these lands, which are far fewer than federally owned mineral split estates, are located in national forests and national parks.

States also own split estates in many acres of land, though not nearly in the same quantity as the federal government. As states were created and admitted into the Union following independence, the federal government ceded lands to them to support the operation of common schools and for other purposes. The extent of these grants differed across time, with certain significant oil and gas producing states like Oklahoma, Utah, and New Mexico receiving significant grants—four sections in every township.²⁹ In 1927, Congress confirmed by statute that the grants of specific lands to states carried with them title to the minerals.³⁰ As states disposed of these lands in various ways, they frequently reserved the

independent rights in much the same way that the common law treats owners of split estates as owning distinct things.

²⁵ *Id.* at 653.

²⁶ Righetti, et al., *supra* note 10, at 192.

²⁷ *Id.* These enactments included the Coal Land Acts, the Agricultural Entry Act, and the Stock-Raising Homestead Act, among others. *Id.*

²⁸ *Id.*

²⁹ James M. Piccone, *History, The Government Survey, and Basic Oil and Gas Leasing Legislation*, in 1 FOUND. FOR NAT. RES. & ENERGY L., LAW OF FEDERAL OIL AND GAS LEASES § 2.03[3][a] (2023). Alaska also received the right to select lands from the federal public domain upon statehood. For various reasons that exceed the scope of this Article, title to most minerals under those lands remained with the federal government. James D. Linxwiler & Bree Mucha, *Federal Oil and Gas Leasing in Alaska*, in 2 FOUND. FOR NAT. RES. & ENERGY L., LAW OF FEDERAL OIL AND GAS LEASES § 27.02[3] (2023).

³⁰ 43 U.S.C. § 870.

minerals. This led to many acres of private ownership of the surface and state ownership of underlying minerals.³¹

The law's recognition of a severed estate in subsurface minerals raises several follow-on issues relevant to the present discussion. One issue is determining which things in the land are owned by the mineral estate and which are owned by the surface estate. This is key to the first question this Article addresses in Part II—which estate has the right to conduct CCUS.³² Another such issue is defining what, if any, rights each estate enjoys in the property of the other estate. This is the critical issue for the second guiding question, taken up in Part III.³³

II. LOCATING THE RIGHT TO CONDUCT CCUS AMONG SPLIT ESTATES

The first property-related question in any CCUS project is from whom to obtain the rights to conduct the CCUS operation in each necessary tract of land. Where title to the minerals remains unified with the title to the rest of the land, there is no question the landowner alone may conduct CCUS, of any stripe, within that land. The owner of land, as a matter of law, owns the entire column of subsurface rock underlying the land, stretching to the center of the earth, including every ownable substance and thing contained within or attached to that column of rock. This is the meaning of the common law principle of *ad coelum*.³⁴ The landowner thereby owns all rock structures, pore spaces, and mineral substances lying under her tract, and she has exclusive rights to do with them as she pleases within the boundaries of her own tract.³⁵ Thus, in land owned in unified fee title, the landowner has exclusive authority to conduct or authorize CCUS on her tract, either to obtain the minerals in EOR or to utilize the pore space for carbon storage through CCS.

Where ownership is instead split between a surface and one or more mineral estates, which estate may conduct CCUS depends on the type of CCUS to be pursued. Only the estate that owns title to the oil and gas in place has the right to take those minerals through CO₂ EOR, exclusive of other estates in the same land. Similarly, only the estate that holds title to the porosity of an underlying rock formation would ordinarily possess the

³¹ See, e.g., *Prather v. Lyons*, 2011-NMCA-108, 267 P.3d 78 (N.M. Ct. App. 2011) (involving the interpretation of a patent of state trust land that reserved “all minerals of whatsoever kind”).

³² See *infra* Part II.

³³ See *infra* Part III.

³⁴ See Joseph A. Schremmer, *Ad Coelum and the Design of Property Rights*, 9 TEX. A&M J. PROP. L. 707, 709 (2023).

³⁵ For discussion of the owner's relations with neighboring owners with rights in common formations, see the literature cited *supra* in note 2.

right to permanently store foreign substances like carbon dioxide.³⁶ Therefore, in determining which severed estate or estates in a tract of land may conduct CCU or CCS, the lawyer's task is one of examining and interpreting title to each severed estate to ascertain ownership of the minerals and pore space within the relevant geologic formations. The principles to be applied in conducting the examination differ depending on whether the split estates are privately or publicly owned.

A. Private Lands

1. Pore Space Ownership under Common Law

State common law primarily governs the scope of ownership rights in split estates in private lands. In private lands, the surface estate generally holds title to subsurface rock formations and pore space and thereby has exclusive rights to inject carbon dioxide for storage through CCS. Conversely, a severed mineral estate in oil and gas generally has the exclusive right to inject carbon dioxide to enhance the recovery of oil or gas through CCU because the mineral estate holds title to those substances.

These generalizations are handy for the lawyer to know, but they must not be mistaken for rules of law. The common law does not define the scope of a severed estate in the same way it defines the scope of land ownership under the *ad coelum* maxim. On the contrary, when a landowner severs a new estate in a distinct natural resource like oil or gas, the law allocates title to subsurface substances between the newly split estates at the direction of the grantor creating the severed estate. Title to pore space and minerals is divided based on the grantor's objectively expressed intent. Thus, while it would be unusual, it is possible for a severed mineral estate to own the right to store carbon dioxide for CCS. For this reason, title to pore space and minerals and the accompanying entitlement to conduct CCS and CCU, respectively, must be determined deed by deed.

i. Principles of Construction

To recapitulate, the right to inject carbon dioxide for CCS or CCU depends on how title to the minerals in place, such as oil and gas, and the storage space of rock formations are held, and how title to these things is held depends on the intent of the landowner who first severed the estate in the minerals. All true but not very helpful in practice because hardly any instruments severing an estate in minerals specify title to pore space or subsurface rock formations. Grantors have never had the perfect foresight

³⁶ See 1 ERNEST E. SMITH, JACQUELINE WEAVER & OWEN L. ANDERSON, THE TEXAS LAW OF OIL AND GAS § 2.1.B.3 (2d ed. 2023).

to name and allocate rights to every object and substance that constitutes or is found within the land. Even less than a generation ago, it would have been difficult to imagine that the pore space under land could itself be a valuable natural resource that a landowner should take care to deal with expressly in a grant or reservation of the land.

How, then, is one to determine title to pore space and thus the right to conduct CCS when the grantor was silent or not specific? Courts in these situations resort to rules of construction to ascertain the grantor's intent. One of the most basic of these rules is the common law maxim (codified in many jurisdictions) that whatever rights are not expressly retained are conveyed.³⁷ Likewise, where the grantor reserved rights from a conveyance, all rights that are not expressly reserved are presumed to have been conveyed.³⁸

In the context of conveyances and reservations of mineral interests, the presumption that everything is granted that is not expressly retained usually renders a narrow mineral estate, consisting of only what substances are named in the conveyance or reservation, and a broad surface estate consisting of everything not expressly conveyed or reserved with the identified minerals. Suppose, for example, that the owner of unified fee simple title in Blackacre, *O*, conveys to *A* “the oil and gas in and under Blackacre.” Because the grant is expressly limited to oil and gas in place under the land, the residue of the ownership rights in Blackacre is presumed to remain with *O*'s surface estate. So long as nothing in *O*'s deed to *A* would express a contrary intent to rebut the presumption, *O*'s surface estate would hold title to the rock formations and their porosity and enjoy the right to inject them full of carbon dioxide for CCS. Suppose instead that *O* conveyed Blackacre to *A* “excepting and reserving [to *O*] the oil and gas thereunder.” The reserved mineral estate is expressly limited to oil and gas and, presumptively, all other elements of Blackacre are meant to pass to *A*. Absent language elsewhere in the instrument to rebut this presumption, *A*'s surface estate would own all substances other than the oil and gas, including the rock formations and their pore space.

³⁷ Owen L. Anderson, *Geologic CO2 Sequestration: Who Owns the Pore Space*, 9 WYO. L. REV. 97, 99 (2009). However, not all courts apply this rule. As Professor McGinley observed, some, like Oklahoma courts, have applied the opposite rule in some cases, i.e., “that contracts in realty should be strictly interpreted in favor of the grantor, with no conveyance or rights passed absent express language.” Patrick C. McGinley, *Legal Problems Relating to Ownership of Gas Found in Coal Deposits*, 80 W. VA. L. REV. 369, 383 (1980) (citing *Hammett Oil Co. v. Gypsy Oil Co.*, 218 P. 501, 502 (Okla. 1921)).

³⁸ Anderson, *supra* note 37, at 99 (citing *Duhig v. Peavy-Moore Lumber Co.*, 144 S.W.2d 878, 880 (Tex. 1940)).

Courts employ another, different set of construction rules to determine the scope of a mineral conveyance or reservation when the express language does not specifically describe all the substances intended to be severed. This is a frequent problem because, as mentioned, landowners do not know all the kinds of valuable substances that might currently exist under the land or, as in the case of pore space, what elements underlying the land might be discovered to have value at some future time. For this reason, deeds commonly use generic words or phrases to describe the extent of a mineral estate, like “minerals,” “all minerals,” and “oil, gas, and *other minerals*.”

To construe the scope of generic mineral descriptions, courts employ a range of legal tests to infer what the grantor’s specific intent would have been with regard to an unnamed substance from evidence of the grantor’s general goals in severing the mineral estate.³⁹ This basic approach was proposed by Professor Eugene Kuntz

who introduced it with his “manner of enjoyment” theory. In Kuntz’s view, the general intent of a landowner who severs ownership of “minerals” is to create two separate estates that may be separately enjoyed in different manners: The surface estate, which is enjoyed primarily by use of the surface of the land, and a mineral estate, which is enjoyed by extracting and carrying away substances that are valuable apart from the land and are not necessary to enjoyment of the surface.⁴⁰ “Minerals” therefore are those things that can be extracted from the earth without precluding use of the surface and that are valuable independently of the surface. The value of “minerals” is not connected with use of the land itself.⁴¹

Perhaps the test to ascertain the grantor’s general intent that is in widest use is the surface-destruction test, wherein the court considers whether the substance in dispute requires destruction of the surface to exploit. If the substance can only be extracted by destroying the surface, it is presumed the grantor would not have intended to separate it from ownership of the surface. On the other hand, if surface destruction is not necessary to extract the substance, it is presumed the substance was

³⁹ See *Vulcan Lands, Inc. v. Currie*, 316 Cal. Rptr. 3d 494, 497 (Cal. Ct. App. 2023) (finding a mineral deed to be ambiguous as to the grantor’s specific intent and looking to extrinsic evidence of the grantor’s general intent); see also David E. Pierce, *Evaluating the Jurisprudential Bases for Ascertaining or Defining Coalbed Methane Ownership*, 4 WYO. L. REV. 607, 607–09 (2004).

⁴⁰ Eugene O. Kuntz, *The Law Relating to Oil and Gas in Wyoming*, 3 WYO. L.J. 107, 112 (1949).

⁴¹ See *id.*

intended to pass as a “mineral,” since it can be removed and enjoyed without precluding separate use of the surface.⁴²

Texas overruled the surface-destruction test for all conveyances after 1983 in *Moser v. U.S. Steel Corporation* and adopted the “ordinary and plain meaning test” instead.⁴³ Under this test, the court presumes the mineral estate includes all substances, and only those substances, that would be understood to be “minerals” within the ordinary and plain meaning of that term.⁴⁴ The test disregards the scientific definition or the particular chemical composition of the substance.⁴⁵ Under this test, as under the surface-destruction test, near-surface materials like sand, gravel, and near-surface lignite are generally considered not to be a “mineral” because they require so much of the surface to exploit.⁴⁶

Other states apply the general canon of construction *ejusdem generis* to define the meaning of “other minerals” when the phrase is used at the conclusion of a list of specifically enumerated substances like oil and gas.⁴⁷ Canons of construction are not dispositive but only suggestive of the grantor’s intent.⁴⁸ Whereas presumptions determine the grantor’s intent unless affirmatively rebutted by evidence of contrary intent contained in the instrument,⁴⁹ canons (like *ejusdem generis*) do not bind a court. Thus, a court may consider but ultimately decline to apply a canon without identifying affirmative evidence of contrary intent. Nevertheless, courts that employ *ejusdem generis* to determine the meaning of “other minerals” often treat the canon as though it binds them like a presumption.⁵⁰

Some courts do not reliably follow any presumption or canon of construction, but instead consider several factors. California courts, for example, consider whether the substance in question was produced or

⁴² *Acker v. Guinn*, 464 S.W.2d 348, 352 (Tex. 1971).

⁴³ 676 S.W.2d 99, 102 (Tex. 1984). The Texas Supreme Court had adopted and refined the surface destruction test in a series of cases before *Moser*. See *Reed v. Wylie*, 597 S.W.2d 743 (Tex. 1980); *Reed v. Wylie*, 554 S.W.2d 169 (Tex. 1977); *Acker*, 464 S.W.2d 348.

⁴⁴ *Moser*, 676 S.W.2d at 101–03.

⁴⁵ *Id.* at 101.

⁴⁶ *Id.* at 102.

⁴⁷ *E.g.*, *State ex rel. Comm’rs of Land Off. v. Butler*, 753 P.2d 1334, 1336 (Okla. 1987). “According to the usual statement of this rule, the scope of general words following an enumeration of particulars is restricted to things, within the description, of the same kind or nature as the particular enumerated.” *Acker*, 464 S.W.2d at 349–50.

⁴⁸ See generally Bruce M. Kramer, *The Sisyphian Task of Interpreting Mineral Deeds and Leases: An Encyclopedia of Canons of Construction*, 24 TEX. TECH. L. REV. 1 (1993).

⁴⁹ *Van Dyke v. Navigator Grp.*, 668 S.W.3d 353, 364 (Tex. 2023).

⁵⁰ See *Butler*, 753 P.2d at 1338–39 (finding that the application of *ejusdem generis* by Oklahoma courts is well established and that under that rule, the phrase “oil, gas, and other minerals” has a definite and certain legal meaning).

mined in the area at the time of severance, whether the substance has some distinct chemical composition or commercial value, and whether its production would harm the surface estate.⁵¹ Other courts have even concluded that reference to “minerals” or “other minerals” without more is ambiguous. As a consequence, these courts require extrinsic evidence of the grantor’s intent to ascertain the scope of “minerals” or “other minerals.”⁵² It may be just as impossible to locate the grantor’s specific intent from extrinsic evidence as it is from the language in the instrument. The original parties to the instrument have often passed on. Even if they or other first-hand witnesses could be found to testify, it is unlikely they would have anything useful to say about the grantor’s intent about a particular substance because the grantor likely did not consider the substance when drawing the deed.

ii. Pore Space: Surface or Mineral?

Under these principles, a conveyance or reservation of “oil and gas” does not carry with it the geologic structures and pore space where the oil and gas are located in place.⁵³ However, conveyances and reservations of oil and gas are frequently coupled with the phrase “other minerals,” and there is no case law considering whether geologic structures and porosity may be included in such a catch-all phrase. Regardless, it is improbable that the rock structures and porosity of geologic formations would be considered “minerals” or “other minerals” under any of the foregoing legal tests.

While the rock formations where pore space is found could be extracted from the earth, there is generally no reason to do so since their storage capacity would be lost. Use of pore space requires that it be fixed in place underground. For this reason, the surface-destruction-test would be wholly inapposite, since there is no extraction in the use of pore space which could destroy the surface. Under the ordinary and plain meaning test, moreover, pore space would never meet the ordinary definition of mineral for the simple reason that it is common, even ubiquitous, within land. It exists in vast volumes in every sedimentary rock found in the subsurface of the earth. There is nothing unusual or rare about it. Nor would pore space be considered an “other mineral” under the *ejusdem generis* canon because it has nothing in common with oil or gas in terms of its

⁵¹ *Vulcan Lands, Inc. v. Currie*, 316 Cal. Rptr. 3d 494, 501–02 (Cal. Ct. App. 2023).

⁵² *E.g., Bumpus v. United States*, 325 F.2d 264, 266–67 (10th Cir. 1963).

⁵³ Several Texas cases have said so explicitly. *See, e.g., Coastal Oil & Gas Corp. v. Garza Energy Tr.*, 268 S.W.3d 1, 15 (Tex. 2008); *Lightning Oil Co. v. Anadarko E&P Onshore, LLC*, 520 S.W.3d 39, 46–47 (Tex. 2017); *Humble Oil & Refin. Co. v. West*, 508 S.W.2d 812, 815 (Tex. 1974); *Springer Ranch, Ltd. v. Jones*, 421 S.W.3d 273, 283 (Tex. App. 2013).

physical nature, the methods of its enjoyment, or its economic value. Pore space and the common, ordinary sedimentary rocks in which it exists, simply are not part of what a landowner generally intends to sever in a conveyance or reservation of “minerals.”⁵⁴

Arguments have been made to the contrary in the context of federal mineral reservations.⁵⁵ Commentators have argued that the rock structures within which pore space is found are themselves minerals because they are inorganic, and thus that the pore space must be mineral in character.⁵⁶ However, courts generally do not take the term “minerals” to mean simply anything that is inorganic. They do not, in other words, divide the world into categories of animal, vegetable, and mineral and define the mineral estate as comprising those things that do not fit either of the first two categories. That method would produce absurd results. Such a broad definition of “minerals” would encompass the soil and substructure of the earth, which “would be a negation of the substance of the transaction.”⁵⁷ Indeed, use of the word “minerals” appears intended to distinguish the covered substances from the earth itself, consisting precisely of rock and its porosity, wherein the covered substances would be found. Thus, a grant or reservation of “all minerals” or “other minerals” should not, without more, encompass the pore space necessary for CCS.

Thus far, the discussion has focused on naturally occurring pore space. Some tracts of land also contain subsurface cavities that are artificially created. The case law on ownership of artificially created caverns is mixed. A panel of the Texas Court of Appeals held in *Mapco, Inc. v. Carter* that the owner of a severed estate in salt deposits owned title to the empty cavern left behind by its mining process and that the salt owner was entitled to use the cavern to store hydrocarbons produced from other lands.⁵⁸ The

⁵⁴ *But cf. Currie*, 316 Cal. Rptr. 3d at 510 (holding that sand and gravel were retained in a reservation of “all oil, gas, and other hydrocarbons and minerals”). Although *Currie* held that ordinary rock materials like sand and gravel are “minerals,” it is important to note that the court did not consider the surface destruction that is usually involved in mining sand and gravel. The court was persuaded that the open-pit extraction of these substances would not harm the surface estate because, in this case, the surface estate had retained an undivided one-half interest in the minerals. This meant that the surface estate would directly benefit from sand and gravel mining. *Id.* at 509. Absent this fact, it is not clear the court would have considered sand and gravel to be “minerals” in light of the destructive manner in which they are extracted.

⁵⁵ See Kevin L. Doran & Angela M. Cifor, *Does the Federal Government Own the Pore Space under Private Lands in the West—Implications for the Stock-Raising Homestead Act of 1916 for Geologic Storage of Carbon Dioxide*, 42 ENV'T L. 527, 535–36 (2012).

⁵⁶ *Id.* at 542–43.

⁵⁷ *Holland v. Dolese Co.*, 540 P.2d 549, 551 (Okla. 1975) (citing *Waring v. Foden*, [1932] 1 Ch. 276, 86 A.L.R. 969, 979 (Eng.)).

⁵⁸ 808 S.W.2d 262, 277–78 (Tex. App. 1991), *rev'd in part*, 817 S.W.2d 686 (Tex. 1991).

Mapco court relied on older opinions from Kentucky which adopted the “English rule” granting title to mined-out caverns to the mineral estate.⁵⁹ The English rule, to the extent it was ever really a rule,⁶⁰ has been roundly rejected by American jurisdictions, including Kentucky.⁶¹ Even *Mapco*, which has not been explicitly overruled on this point,⁶² is of uncertain force. In 2022, a different Texas Court of Appeals rejected *Mapco* and held that title to a subsurface cavern created by the mineral owner’s brine-mining process belonged not to the mineral estate but to the surface estate.⁶³ In Texas, doubt surrounds ownership of artificially created caverns.

2. *Statutory Declarations of Pore Space Ownership*

Several state legislatures have taken the step of declaring pore space to be a part of the surface estate unless expressly severed.⁶⁴ At least one state, North Dakota, prohibits the severance of pore space from ownership of the surface of land.⁶⁵ Because most of these statutes permit express conveyance of pore space from the surface estate and because they are generally prospective in their effect, these statutes do not totally eliminate the need to examine title to the surface and mineral estates to determine which holds title to pore space. Even in North Dakota, where severance of pore space is prohibited, deeds that predate the statute might include a grant of pore space to a mineral estate.⁶⁶ For this reason, it is doubtful that these statutes meaningfully change the analysis required under common law principles, except perhaps to clarify pore space ownership under deeds that do not specifically address it.

⁵⁹ *Id.* at 277 (citing *Cent. Ky. Nat. Gas Co. v. Smallwood*, 252 S.W.2d 866, 869 (Ky. Ct. App. 1952), *overruled in part by* *Tex. Am. Energy Corp. v. Citizens Fidelity Bank & Tr. Co.*, 736 S.W.2d 25 (Ky. 1987)).

⁶⁰ Barry Barton, *The Common Law of Subsurface Activity: General Principle and Current Problems*, in *THE LAW OF ENERGY UNDERGROUND: UNDERSTANDING NEW DEVELOPMENTS IN SUBSURFACE PRODUCTION, TRANSMISSION, AND STORAGE* 30–34 (Donald N. Zillman et al. eds., 2014).

⁶¹ *See* *Tex. Am. Energy Corp. v. Citizens Fidelity Bank & Tr. Co.*, 736 S.W.2d 25, 28 (Ky. 1987).

⁶² *Mapco* was reversed by the Texas Supreme Court on other grounds. 817 S.W.2d 686 (Tex. 1991).

⁶³ *Myers-Woodward, LLC v. Underground Servs. Markham, LLC*, No. 13-20-00172-CV, 2022 WL 2163857, 2022 Tex. App. LEXIS 4082, at *28 (Tex. App. June 16, 2022).

⁶⁴ *E.g.*, N.D. CENT. CODE § 47-31-05 (2024); OKLA. STAT. tit. 60 § 6(B)(2) (2024); WYO. STAT. ANN. § 34-1-152(a) (2024); MONT. CODE ANN. § 82-11-180(3) (2024).

⁶⁵ N.D. CENT. CODE § 47-31-05.

⁶⁶ North Dakota’s statutes on pore space ownership and severance do not affect transactions before April 9, 2009. *Id.* § 47-3-07.

3. *Pore Space Rights of the Mineral Estate*

i. The Rights Typical of a Mineral Estate

Even though landowners are empowered to create an estate in minerals encompassing any substances and possessing nearly whatever legal rights the grantor desires, in practice most estates created in oil and gas possess a fairly standard complement of rights and powers. The standard mineral estate encompassing oil and gas enjoys the exclusive right to develop the oil and gas in place and the power to alienate the development right, generally by granting an oil and gas lease. In exercising this power, the lessor effectively transfers the right to develop to the lessee, typically for a determinable duration with the development right returning to the lessor if production is not established or when production ceases.⁶⁷ As consideration for the lease, the lessor generally retains a royalty on oil and gas produced from the land, as well as a bonus payment in consideration for granting the lease and rental payments paid for the privilege of delaying drilling obligations during the primary term of the lease.⁶⁸

The canonical description of the rights of a mineral estate is that it possesses five attributes. These attributes are: “(1) the right to develop (the right of ingress and egress), (2) the right to lease (the executive right), (3) the right to receive bonus payments, (4) the right to receive delay rentals, (5) the right to receive royalty payments.”⁶⁹ The first two encompass the rights inherent in a mineral interest and the latter three represent the typical forms of consideration retained by the owner in the grant of an oil and gas lease.⁷⁰

In substance, the right to develop entitles the holder (whether a mineral estate owner or lessee) to the fair chance or opportunity to take oil and gas in place under the land. It does not entail ownership or title to any particular molecules of oil or gas. Nor does it include title to the geologic structures or their porosity, which are typically retained in the surface estate under the principles discussed above.⁷¹ Thus, while a mineral owner may

⁶⁷ JOHN S. LOWE, ET AL., *CASES AND MATERIALS ON OIL AND GAS LAW* 162–68 (Am. Casebook Series 8th ed. 2022).

⁶⁸ *Id.*

⁶⁹ *Altman v. Blake*, 712 S.W.2d 117, 118 (Tex. 1986) (citing RICHARD W. HEMMINGWAY, *LAW OF OIL AND GAS* §§ 2.1–2.5 (1971)).

⁷⁰ A more precise representation of these incidents would be as follows: (1) the right to develop (including the right of ingress and egress), and (2) the right to lease (the executive right) which entitles the owner to negotiate for consideration consisting usually of lease (a) bonus payments, (b) delay rentals, and (c) royalty payments.

⁷¹ *See supra* Part II.A.1.ii.

own title to oil and gas, this title does not give possessory rights to any particular oil and gas in place, but only a fair chance to take them. Although the mineral estate's rights in the oil and gas in place are not absolute, they are exclusive of the surface estate. The surface estate may not interfere with the mineral estate's fair chance at extraction, let alone attempt to extract the mineral for its own account.⁷²

Exercising the mineral estate's fair chance to take oil and gas in place may require enhanced recovery techniques, like CO₂ EOR. For this reason, it is within the rights of a mineral estate encompassing oil and gas to inject carbon dioxide into a depleted formation to enhance the recovery of remaining oil and gas.⁷³ In the course of developing the oil and gas in this manner, however, a mineral owner or lessee must leave behind, in the porosity of the target formation, which is the surface estate's property, some amount of CO₂ injected over the life of the EOR project. The mineral owner is permitted to do this in exercise of its ancillary rights to use, occupy, and consume the land in pursuit of its fair chance to take the oil and gas. These ancillary rights are discussed fully below.⁷⁴

The standard mineral estate does not have the right to inject substances into pore space for the purpose of storing them there. For example, most jurisdictions faced with the question have held that the right to inject produced natural gas into pore space for temporary storage usually rests with the surface estate.⁷⁵ It is also well settled that a mineral owner may not inject wastewater from oil and gas production on other, unrelated lands into a surface owner's geologic formations for disposal.⁷⁶ The lesson from the gas storage and saltwater disposal cases is that the mineral estate's right to store or dispose of substances in geologic formations is merely ancillary or incidental to its development of its own property, i.e., the chance to extract oil and gas. Although a mineral estate owner or lessee may incidentally store or dispose of substances in subsurface geology in pursuit of reasonable methods to extract oil and gas, it may not treat the subsurface as its own property, to do with as it pleases.

⁷² *Lightning Oil Co. v. Anadarko E&P Onshore, LLC*, 520 S.W.3d 39, 49–50 (Tex. 2017).

⁷³ 1 EUGENE KUNTZ, A TREATISE ON THE LAW OF OIL AND GAS § 4.8 (2023).

⁷⁴ *See infra* Part III.

⁷⁵ *See Anderson, supra* note 37, at 118.

⁷⁶ 1 PATRICK H. MARTIN & BRUCE M. KRAMER, WILLIAMS & MEYERS, OIL AND GAS LAW § 222 n.22 (2023); *e.g.*, *Dick Props., LLC v. Paul H. Bowman Tr.*, 221 P.3d 618, 621 (Kan. Ct. App. 2010) (explaining that the oil and gas lessee's right to inject saltwater that is a waste product from the production of oil and gas "is limited to saltwater produced on the lease and does not extend to saltwater produced on other leases.").

ii. The Rights Granted in a Typical Oil and Gas Lease

The rights to the oil and gas in place under a tract of land are commonly held under an oil and gas lease. The grant of an oil and gas lease creates a defeasible estate in the oil and gas when executed by one owning unified title to the land. Unlike a deed severing oil and gas ownership, an oil and gas lease provides for a royalty on oil and gas produced and sold from the premises, as well as numerous and often detailed provisions for the development, operation, and continuation of the lease.⁷⁷

Among these provisions is a granting clause, which conveys the present right to develop, produce, and market the oil and gas in place and the ancillary rights to use the surface and subsurface as necessary to accomplish those purposes.⁷⁸ The granting clause of a lease governs the scope of the lessee's rights in the land and thus whether the lessee enjoys the right to conduct CCUS. Just as a landowner may convey an estate in minerals that enjoys the right to use pore space for CCS, the lessor of an oil and gas lease might draft the granting clause broadly enough to entitle the lessee to inject CO₂ for storage, unrelated to oil and gas development. This would be highly unusual.

Most leases grant rights to develop only the oil and gas and other hydrocarbons. Any rights granted in the rock formations or porosity underlying the premises are merely rights to support enjoyment of the oil and gas.⁷⁹ This would generally encompass the right to inject CO₂ for EOR or CCU, but not for pure storage. Regardless of the language of a granting clause, it follows from the principles outlined in the preceding subparts that the grant of an oil and gas lease by one owning a severed mineral estate ordinarily may convey the right to conduct CCU but not the right to conduct CCS. A lessor, like any grantor, may not convey greater rights than she owns.⁸⁰

It will usually be easy to distinguish between an oil and gas lessee's injecting CO₂ for an EOR project (which it usually has the right to do) and its injecting CO₂ for pure storage (which it lacks the right to do), but

⁷⁷ See 1 KUNTZ, *supra* note 73, §§ 15.8–15.9 (distinguishing leases from fee interests).

⁷⁸ 3 PATRICK H. MARTIN & BRUCE M. KRAMER, WILLIAMS & MEYERS, OIL AND GAS LAW § 665 (2023).

⁷⁹ *Id.*

⁸⁰ See *Texaco, Inc. v. R.R. Comm'n of Tex.*, 716 S.W.2d 138, 141 (Tex. App. 1986) (“a grantor cannot create by conveyance greater rights than the grantor himself possessed.”).

difficult cases are possible.⁸¹ For example, suppose an oil and gas lessee were to flood a depleted oil and gas reservoir using carbon captured from a nearby coal-fired powerplant. This EOR project produces residual oil or gas from the reservoir, but the project would likely never payout but for the fact that the lessee earns federal and state tax credits because it utilized captured CO₂. As a condition of earning the applicable credits, the lessee must demonstrate that nearly all the CO₂ injected over the life of the project will remain underground in stable permanent geologic storage. But may such a project proceed without the authority of the overlying surface estate?

On the one hand, carbon sequestration results from sweeping oil and gas out of the formation and into a producing wellbore and, in this sense, is incidental to the mineral lessee's enjoyment of the fair chance to produce. On the other hand, the lessee may have never exercised its fair chance to take the residual mineral through enhanced recovery but for the opportunity to collect a tax credit for doing so with captured CO₂. Perhaps it was the lessee's primary purpose to sequester the CO₂ in place to earn the tax credits, and the production of residual oil and gas was merely incidental to this goal. It might be difficult to determine whether carbon sequestration is truly incidental to oil and gas development.

The hypothetical presents two distinct scenarios with potentially different outcomes. In one scenario, the lessee's motive for injecting the CO₂ is mixed. The motivation is partly to obtain residual oil and partly to obtain tax credits for sequestering CO₂. In the second scenario, the lessee's purpose in conducting the CO₂ flood is to sequester the carbon to earn the tax credit and thus the enhanced recovery component of the project is illusory, mere window dressing.

Just how courts would resolve either case is unclear. One approach would be to disregard the lessee's motive altogether and permit the lessee's sequestration because it did, in fact, aid mineral production.⁸² Another approach would be to weigh the motives to determine the lessee's predominate purpose in conducting the CO₂ EOR project. If the lessee primarily intended to pursue oil and gas production, then the sequestration

⁸¹ The following hypothetical is inspired by an unreported case in which lessor landowners alleged that the lessee was injecting carbon primarily for sequestration rather than for enhanced oil recovery. The case was dismissed on ripeness grounds and therefore the court did not reach the merits of the lessors' claims. *See* *Giacometto Ranch Inc. v. Denbury Onshore, LLC*, CV-16-145-BLG-SPW-KLD, 2020 WL 6205725 (D. Mont. July 15, 2020).

⁸² *Cf. Oblensky v. Trombley*, 115 A.3d 1016, 1023–25 (Vt. 2015) (discussing the “sole purpose” and “predominate purpose” approaches to determining when spite fences constitute actionable abuses of right).

is permissible as incidental, but if the lessee primarily intended to secure the tax credit, then the sequestration would be an impermissible exercise of ownership over the surface estate's geology. The predominate purpose approach poses a difficult fact question, which an objective approach that disregards the lessee's motive or purpose would avoid.

The lessee's conduct under the first scenario would be permissible under either kind of test because its primary purpose is to produce residual hydrocarbons and using captured carbon is the best means of doing so. In the second scenario, however, the lessee's purpose is to use the pore space as its own. While this might be permissible under an objective test that ignores the lessee's purpose, it would likely violate a test that measures the lessee's conduct by its primary or predominate purpose.

* * *

In summary, under common law principles, the terms of a severance deed determine which estate owns the right to inject CO₂ for CCS and for CCU based on which estate receives ownership of the oil and gas and ownership of geologic structures and pore space. Where there is no express provision for ownership of the latter, the rock structures and pore space will ordinarily remain with the surface estate. The rights of the mineral estate entitle it only to a fair chance to recover the oil and gas in place, which includes the right to inject CO₂ for CCU but not the right to store foreign substances in pore space unrelated to oil and gas development. The rights of a surface estate that retains title to pore space include the right to store foreign substances within the pore space such as CO₂ for CCS.

B. *Public Lands*

A substantial portion of lands suitable for CCUS in the western United States are held in split estates with a government owning one or the other estate.⁸³ Most of these public split-estate lands involve a federally owned mineral estate underlying a surface estate owned in private hands or held by a state government in trust for citizens of the state.⁸⁴ Relatively few lands are held in split estates where the federal government owns the surface estate overlying a privately owned mineral estate.⁸⁵ Many lands in the west consist of a surface or mineral estate owned or held in trust by a state government with the corresponding estate owned by either the federal government or in private hands.⁸⁶ Much of this variety is the result

⁸³ See generally Piccone, *supra* note 29 §§ 2.02–2.03.

⁸⁴ *Id.*

⁸⁵ *Id.*

⁸⁶ *Id.*

of the federal government's history of acquiring and disposing of lands in the West across generations.⁸⁷

In lands owned by the federal government and those owned or held in trust by state governments, the right to inject carbon dioxide for EOR or CCU rests with the mineral estate and is ordinarily conferred to private parties by the issuance of an oil and gas lease.⁸⁸ However, ownership of pore space and the right to inject CO₂ for storage or sequestration in public split-estate lands differs significantly from private lands. The following subsections explore these differences.

1. *Federal Lands*

i. Land Grants under the Stock-Raising and Homestead Act

Most federal split-estate lands in existence are the result of grants of land from the United States to homesteaders and other claimants through land patents in which the United States reserved all or certain specified minerals. These land dispositions occurred under a variety of congressional acts, several of which required the minerals be reserved to the United States, including the Coal Lands Acts of 1909 and 1910⁸⁹ and the Agricultural Entry Act of 1914.⁹⁰ The most important, by far, of these land-disposition acts is the Stock-Raising and Homestead Act of 1916 (SRHA).⁹¹ Lands patented under the SRHA consist of a privately owned surface estate overlying a federally owned mineral estate. Over 70 million acres of land, located entirely in the arid western United States, were disposed of under the SRHA in this fashion.⁹² As with grants and reservations of minerals in private conveyances, the scope of the mineral estate reserved by the federal government under the SRHA has been contested in many cases. The question of whether the SRHA's mineral

⁸⁷ *Id.*

⁸⁸ See 1 BRUCE M. KRAMER & PATRICK H. MARTIN, THE LAW OF POOLING AND UNITIZATION § 16.01 (3rd ed. 1989). The U.S. Congress authorized the Bureau of Land Management (BLM) to issue oil and gas leases to private developers on federally owned minerals through the Mineral Leasing Act of 1920. 30 U.S.C. § 226. Leases of publicly owned minerals generally confer rights to conduct enhanced recovery, which would include EOR using captured CO₂.

⁸⁹ 30 U.S.C. §§ 81, 83–85.

⁹⁰ *Id.* § 121; see generally Piccone, *supra* note 29, § 2.03.

⁹¹ 43 U.S.C. §§ 291–302.

⁹² Doran & Cifor, *supra* note 55, at 535.

reservation encompasses title to pore space has divided commentators⁹³ and has only recently become the subject of litigation.⁹⁴

Congress's purpose in enacting the SRHA was to open up federally owned lands in the west that were suitable for ranching and planting of forage crops.⁹⁵ Congress acted with the understanding that the private recipients of these lands would be "farmer-stockm[e]n" who would not wish to develop the underlying mineral resources.⁹⁶ Therefore, Section 9 of the SRHA reserved to the United States title to "all the coal and other minerals" in lands patented under the act.⁹⁷

The U.S. Supreme Court defined the type of minerals that Congress intended to reserve in *Watt v. Western Nuclear, Inc.*, where the issue presented was whether the federal government retained gravel deposits in lands patented under the act.⁹⁸ The scope of the reservation of "other minerals" is to be understood in light of congressional purpose, which sought to facilitate concurrent development of both surface and subsurface resources given the expectation that patentee homesteaders would use the surface of SRHA lands for stock raising and raising crops but not to develop valuable subsurface resources.⁹⁹ The SRHA's mineral reservation therefore includes substances that (i) are "mineral in character," i.e., that are inorganic and considered a mineral within a familiar definition of that term; (ii) can be removed from the soil, (iii) can be used for commercial purposes, and (iv) for which there is no reason to suppose Congress intended it to be included in the surface estate.¹⁰⁰

In holding that gravel deposits were reserved by the federal government, the *Watt* Court found support not only in these four factors, but also in the fact that gravel had long been treated by federal statutes and judicial opinions as a locatable mineral under general mining laws.¹⁰¹ Moreover, to bolster its conclusion, the Court cited a common law principle for interpreting government land grants.¹⁰² Land grants, the

⁹³ Compare Anderson, *supra* note 37, at 137–38 (arguing that the SRHA reservation does not include pore space), with Doran & Cifor, *supra* note 55, at 535–46 (arguing that the reservation includes pore space).

⁹⁴ See, e.g., True Oil LLC v. Bureau of Land Mgmt., No. 2:22-CV-188-KHR, 2023 U.S. Dist. LEXIS 221156 (D. Wyo. Oct. 30, 2023).

⁹⁵ *Watt v. W. Nuclear, Inc.*, 462 U.S. 36, 37 (1983) (citing 43 U.S.C. § 292).

⁹⁶ *Rosette Inc. v. United States*, 277 F.3d 1222, 1229 (10th Cir. 2002) (citing *Watt*, 462 U.S. at 53–56).

⁹⁷ 43 U.S.C. § 299(a).

⁹⁸ 462 U.S. at 37–38.

⁹⁹ *Id.* at 47.

¹⁰⁰ *Watt v. W. Nuclear, Inc.*, 462 U.S. 36, 44, 53 (1983).

¹⁰¹ See *id.* at 56–59.

¹⁰² *Id.* at 59.

Court wrote, “are construed favorably to the Government . . . nothing passes except what is conveyed in clear language, and . . . if there are doubts they are resolved for the Government, not against it.”¹⁰³ However, land grants “are not to be so construed as to defeat the intent of the legislature.”¹⁰⁴

Subsequently, in *BedRock Ltd., LLC v. United States*,¹⁰⁵ the Court clarified the meaning of the third element of the *Watt* test, the “commercial purposes” element. A substance may satisfy this prong of the *Watt* test even if it was not known to be valuable when the SRHA was enacted. Instead, the test requires only a “minimal inquiry into whether a substance might at some point have separate value from the soil and might, in the abstract, be susceptible of commercial use.”¹⁰⁶

The Ninth and Tenth Circuit Courts of Appeal have concluded that the SRHA’s reservation encompasses geothermal resources.¹⁰⁷ The Tenth Circuit reasoned that “[i]t is highly unlikely that Congress intended that homesteaders taking patent to the surface area develop geothermal resources. Certainly, it would be difficult for such homesteaders to utilize geothermal steam or even hot water for use in the production of forage crops and the raising of livestock.”¹⁰⁸ According to the Ninth Circuit, within the meaning of the SRHA, “[a]ll of the elements of a geothermal system—magma, porous rock strata, even water itself—may be classified as ‘minerals.’”¹⁰⁹

Currently on appeal to the Tenth Circuit is an opinion from the Federal District Court for the District of Wyoming holding that subsurface structures and pore space were not reserved to the federal government under SRHA patents. In *True Oil LLC v. BLM*, the court reasoned that the significance of the *Watt* test is “two-fold.”¹¹⁰ “First, is that a mineral must be a substance ‘that can be removed from the soil.’”¹¹¹ “Second, the test focuses on extraction and commercial value.”¹¹² Under the *Watt* test, in the court’s view, “[m]inerals must be some resource that is pulled from the

¹⁰³ *Id.*

¹⁰⁴ *Leo Sheep Co. v. United States*, 440 U.S. 668, 682–83 (1979).

¹⁰⁵ 541 U.S. 176 (2004).

¹⁰⁶ *Id.* at 183 n.5.

¹⁰⁷ *United States v. Union Oil Co. of Cal.*, 549 F.2d 1271, 1279 (9th Cir. 1977); *Rosette Inc. v. United States*, 277 F.3d 1222, 1229 (10th Cir. 2002).

¹⁰⁸ *Rosette Inc. v. United States*, 277 F.3d 1222, 1229 (10th Cir. 2002).

¹⁰⁹ *Union Oil*, 549 F.2d at 1273–74.

¹¹⁰ *True Oil LLC v. Bureau of Land Mgmt.*, No. 2:22-CV-188-KHR, 2023 U.S. Dist. LEXIS 221156 (D. Wyo. Oct. 30, 2023).

¹¹¹ *Id.* at *14 (quoting *Watt v. W. Nuclear, Inc.*, 462 U.S. 36, 53 (1983)).

¹¹² *Id.* at *14–15.

ground, not everything within the ground itself.”¹¹³ Thus, according to *True Oil*, the SRHA did not reserve the entire subsurface, including its rock structures and interstitial spaces, but only those extractable minerals that have commercial value apart from the land itself.¹¹⁴

True Oil is well reasoned and it accords with the writings of one prominent scholar, Professor Owen Anderson. Anderson believes that “the SRHA provision requiring the reservation of ‘coal and other minerals’ in patents, no matter how broadly defined by the federal courts, should not be construed as reserving pore spaces” because the *Watt* Court’s reasoning emphasized the ability to *extract* substances that are mineral in character.¹¹⁵ Indeed, pore spaces are not extractable substances, and even if they were quarried out of the subsurface as part of the rocks in which they exist, the spaces would lose all their commercial value as containers and transmitters of fluids. Unlike oil and gas, coal, and other quintessential “minerals,” porosity is valuable only in place. Despite this, Anderson also admits that “some language in [*Watt*] might leave open the possibility for the federal government to claim pore spaces.”¹¹⁶

Professors Kevin Doran and Angela Cifor disagree, arguing that “[g]iven the capacious nature of the SRHA mineral reservation, the underlying legislative history, and the federal jurisprudence interpreting the reservation . . . the SRHA’s mineral reservation likely includes the subsurface pore space.”¹¹⁷ Doran and Cifor contend that pore space is “mineral” in character because it exists within rock formations that are themselves mineral in character.¹¹⁸ Further, they argue pore space satisfies the commercial value prong of the *Watt* test because not only is it useful today for things like wastewater disposal and carbon sequestration, but the limestone, dolomite, and other rock formations that pore space is encased within were known to be valuable minerals at the time of SRHA’s enactment.¹¹⁹ Finally, they argue there is no reason to suppose that Congress intended pore space to transfer with the surface estate.¹²⁰ This is because “Congress was not explicitly aware of pore space in 1916 and could not have conceived of it as an aspect of surface ownership,” and it “does nothing to further the agricultural and ranching purposes of SRHA land patents and it follows that Congress could not have intended it to be

¹¹³ *Id.* at *15.

¹¹⁴ *Id.* at *16.

¹¹⁵ Anderson, *supra* note 37, at 137.

¹¹⁶ *Id.*

¹¹⁷ Doran & Cifor, *supra* note 55, at 535–36.

¹¹⁸ *Id.* at 542–43.

¹¹⁹ *Id.* at 543–44.

¹²⁰ *Id.*

part of the surface estate.”¹²¹ Doran and Cifor admit that pore space cannot be “removed” from the subsurface without rendering it useless, but they insist the removability element of the *Watt* test is trivial, since *Watt* “devoted only a single line in its opinion to the removability issue.”¹²²

One court found Doran and Cifor’s interpretation persuasive. In *City of Kenai v. Cook Inlet Natural Gas Storage Alaska, LLC*, the Supreme Court of Alaska interpreted a state land patent to the City of Kenai reserving “minerals” to retain title to pore space.¹²³ The court reasoned as follows: “Because porous rock formations are mineral, the parts that make them up are also mineral, including the microscopic pore space that constitutes much of these formations. And because AS 38.05.125(a) broadly reserves ‘all . . . minerals,’ it reserves the constituent parts of those minerals.”¹²⁴

The argument that subsurface pore spaces are minerals under the SRHA has two premises: first, it presupposes that all rock formations are mineral in character, and second, it presumes that because pore space exists within rock formations it must also share in their mineral character. As to the first premise, there is disagreement. Texas courts since 1984 determine the meaning of “minerals” as used in private conveyances based on the ordinary and natural meaning of the word.¹²⁵ According to these courts, rocks like sand, gravel, and limestone “when they are useful only for building and road-making purposes, are not regarded as minerals in the ordinary and generally accepted meaning of the word.”¹²⁶ It might be argued that “minerals” encompass all inorganic materials—everything that is not either animal or vegetable—but courts have recognized that such a definition is overbroad, “since all land belongs to the mineral kingdom, and the exception could not be given effect without destroying the grant.”¹²⁷

Most of the rock formations containing pore spaces *are* the crust of the earth. If removed from the land, they possess value mostly for ordinary construction purposes. Yet, when they are located thousands of feet below ground, far below where they could be excavated or quarried, their only known use is to hold fluids, native and non-native alike. These rocks have no separate identity from the structure of the land itself that would lend to

¹²¹ *Id.* at 544.

¹²² *Id.* at 543 (quoting *Sunrise Valley, LLC v. Kempthorne*, 528 F.3d 1251, 1255 (10th Cir. 2008)).

¹²³ 373 P.3d 473 (Alaska 2016).

¹²⁴ *Id.* at 481 (alteration in original) (footnote omitted) (quoting ALASKA STAT. § 38.05.125 (2016)).

¹²⁵ *Moser v. U.S. Steel Corp.*, 676 S.W.2d 99, 102 (Tex. 1984).

¹²⁶ *Heinatz v. Allen*, 217 S.W.2d 994, 997 (Tex. 1949).

¹²⁷ *Pscencik v. Wessels*, 205 S.W.2d 658, 659 (Tex. App. 1947).

them significance as a valuable mineral, within any familiar meaning of the word.

The second premise of the “pore space as minerals” argument is also flawed. While it is true that pore space is removable in the sense that the rock can be quarried from the land, pore space would lose all of its commercial value by being removed. Pore space cannot satisfy both the third element (commercial value) and the second element (removal) of the *Watt* test simultaneously. Either the pore space is commercially valuable, or it has been removed; unlike true minerals, pore space does not *become* commercially valuable by being removed from the land. This is not necessarily the case with the rock formations in which pore space exists, which may be used for aggregate or construction materials if removed from the land. In fact, they are *only* useful if removed, apart from providing subjacent support for the surface of the land. It thus appears that rock and its pore space are not one-and-the-same, possessing perfectly coextensive characteristics. A rock may be removed and given commercial value and thus, under *Watt*, satisfy these two prongs of the test, while the rock’s own porosity cannot.

In sum, SRHA mineral reservations are construed broadly in favor of the United States and in line with the broad reading courts have given to the purpose of the SRHA. Considering these factors, the act may be interpreted either to retain or transfer pore space. Until a final, definitive judicial decision on this difficult question, only one answer can be given with certainty: prudence dictates acquiring the authority of both surface and federal mineral estates in lands patented under the SRHA, if it is not possible to exclude such lands from the project altogether.

ii. Land Exchanges under Other Statutes

The *Watt* test does not apply to all federal mineral reservations. In addition to mineral estates reserved from patents issued under land-grant laws like the SRHA, the United States has also retained severed mineral estates from patents issued in land exchanges authorized by other federal statutes, such as the Indian Reorganization Act¹²⁸ and the Taylor Grazing Act.¹²⁹ Each of these statutes authorizes the Secretary of the Interior to exchange federally owned lands for lands owned by private parties and states. Each statute permits the Secretary to reserve minerals from such exchanges, but neither statute prescribes any form of mineral reservation. Thus, the Secretary is free to reserve all, part, or none of the minerals in a

¹²⁸ 25 U.S.C. § 5104.

¹²⁹ 43 U.S.C. §§ 1715–17. The Taylor Grazing Act provided authority for BLM to exchange lands with state governments prior to 1976. *See* 43 U.S.C. § 315g (repealed).

land exchange under either act, so long as the lands exchanged are equivalent in value and, under the Taylor Grazing Act, the Secretary has duly considered the minerals' value.¹³⁰

The *Watt* test generally does not apply to construe the scope of discretionary mineral reservations in land-exchange patents.¹³¹ Courts do not apply the *Watt* test.¹³² Since neither the Indian Reorganization Act nor the Taylor Grazing Act mandate mineral reservations, there is no overarching congressional intent or expectation about the scope of such reservations to guide the interpretation.¹³³ Without explicit congressional purpose to guide them, courts generally apply state law principles for construing land patents to determine the scope of mineral reservations in land-exchange patents.¹³⁴ State law principles of patent construction are discussed next.

2. *State Lands*

States, particularly in the western United States, also own substantial lands in split estates. They hold title to surface estates overlying federal mineral estates and also have reserved mineral estates underlying privately held surface estates. States may also hold title to surface estates overlying privately owned mineral estates, usually resulting from condemnation of the overlying surface for public use. Most of the land owned or held in trust by plains states and western states (except for Texas) was granted to them by the federal government upon admission to statehood or thereafter for various purposes.¹³⁵ Over time, states have sold, exchanged, and otherwise disposed of the lands entrusted to them, often retaining the mineral estate to create split estates. This subpart outlines the methods courts employ to ascertain the scope of mineral reservations from patents of state lands. It then discusses two states in particular, Texas and New Mexico, that have especially significant mineral holdings.

The criterion for determining whether the pore space underlying lands in which a state holds a mineral reservation is the scope of the reservation itself. Often, the mineral reservation is required under the terms of an

¹³⁰ See *United States v. Hess*, 194 F.3d 1164, 1171 (10th Cir. 1999).

¹³¹ *Watt* concerns the interpretation of reservations made under a particular statute, the SRHA, in light of that particular statute's purpose. See 462 U.S. 36, 37–60 (1983).

¹³² *Hess*, 194 F.3d 1164 (respecting the Indian Reorganization Act); *Poverty Flats Land & Cattle Co. v. United States*, 788 F.2d 676 (10th Cir. 1986) (respecting the Taylor Grazing Act).

¹³³ *Hess*, 194 F.3d at 1172; *Poverty Flats*, 788 F.2d at 681.

¹³⁴ See *Hess*, 194 F.3d at 1173.

¹³⁵ Piccone, *supra* note 29, § 2.03[3]. These various purposes included the draining of "swamplands" and establishing agricultural colleges. See *id.*

applicable constitutional, statutory, or regulatory provision, much like the federal SRHA requires minerals be reserved from federal patents.¹³⁶ Where this is so, the terms of the public law provision govern the scope of any reservation in a patent issued pursuant to the law for the reason that “[a] patent cannot convey what has been reserved by law.”¹³⁷ Thus, because patents are “given effect according to the laws and regulations under which they were issued,” courts apply rules of statutory interpretation to ascertain the scope of required mineral reservations, rather than rules of deed construction.¹³⁸ It is the intent of the legislature that matters,¹³⁹ not the intent of the parties to the patent.

Statutes and regulations that provide for the disposition of lands held in the public trust “are to be strictly construed; the intent to abandon must be clearly expressed or necessarily implied.”¹⁴⁰ While ambiguities in private deeds are construed against the grantor, who ordinarily drafted the deed, ambiguities in public grants are construed broadly in favor of the government and “no rights pass by implication.”¹⁴¹

Applying these statutory interpretation principles, in *City of Kenai* the Alaska Supreme Court construed a patent of state lands in which the state reserved, pursuant to a statutory mandate, “all oils, gasses, coal, ores, minerals, fissionable materials, geothermal resources, and fossils of every name, kind or description, and which may be in or upon said land.”¹⁴² The court construed the term “minerals” to encompass pore space.¹⁴³ This interpretation, the court explained, “is supported by the statute’s apparent purpose,” which was “to maximize revenue for the state” and to “manag[e] surface and subsurface uses for the maximum development of each use with minimal interference from the others.”¹⁴⁴ Because “[p]ore space itself is a valuable State resource, its ownership is unnecessary to full enjoyment of the surface estate, and treating pore space differently from the rest of the mineral estate would be problematic for purposes of planning, leasing,

¹³⁶ *E.g.*, *Bogle Farms, Inc. v. Baca*, 925 P.2d 1184, 1187 (N.M. 1996) (discussing New Mexico regulations requiring the state to reserve rights to “all minerals of whatsoever kind, including oil, gas, commercial sand, gravel and caliche”).

¹³⁷ *Leo Sheep Co. v. United States*, 570 F.2d 881, 888 (10th Cir. 1977), *rev’d in part*, 440 U.S. 668 (1979).

¹³⁸ *City of Kenai v. Cook Inlet Nat. Gas Storage Alaska, LLC*, 373 P.3d 473, 479 (Alaska 2016) (quoting *Swendig v. Wash. Water Power Co.*, 265 U.S. 322, 332 (1924)).

¹³⁹ *Schwarz v. State*, 703 S.W.2d 187, 189 (Tex. 1986).

¹⁴⁰ *City of Berkely v. Superior Court*, 606 P.2d 362, 369 (Cal. 1980).

¹⁴¹ *City of Kenai*, 373 P.3d at 480 (quoting Loren L. Mall, *Federal Mineral Reservations*, 20 ROCKY MTN. MIN. L. INST. 399, 410 (1975)).

¹⁴² *Id.* at 480 (quoting ALASKA STAT. § 38.05.125(a)).

¹⁴³ *Id.* at 479.

¹⁴⁴ *City of Kenai v. Cook Inlet Nat. Gas Storage Alaska, LLC*, 373 P.3d 473, 481–82 (Alaska 2016).

and management,” the court held that the purposes of the statute would be better served by interpreting mineral to include pore space.¹⁴⁵

These same principles apply in Texas, where lands patented under statutes dating back to the early 20th century reserve a mineral estate to the state. When Texas secured its independence from Mexico, it recognized land claims that had been made under Mexican and Spanish law.¹⁴⁶ These grants were of surface only and ownership of mines and minerals rested with the sovereign, which was first the Republic of Texas and then in 1846, the State of Texas.¹⁴⁷ In its Constitution of 1876 (as well as under prior state constitutions), Texas released its claim to the minerals underlying private lands to the landowners of those lands but set aside several million acres of lands as “public free school land” to be sold to fund schools.¹⁴⁸ Thereafter, Texas sold public free school lands pursuant to various statutes that required the state to retain the minerals to generate revenue for public schools. The Lands Sales Act of 1883, for example, provided “[t]he minerals on all lands sold or leased under this Act are reserved by the State for the use of the fund to which the land now belongs.”¹⁴⁹

In *Schwarz v. Texas*, the Texas Supreme Court found a reservation of “the minerals” patented under one of these land-disposition acts to be ambiguous.¹⁵⁰ Because it was ambiguous, “the term ‘the minerals’ must be interpreted in favor of the State” to include all coal and lignite “whether or not recovery of such would destroy or deplete the surface estate.”¹⁵¹ The finding that “the minerals” is ambiguous may open the door for arguments in Texas that generic mineral reservations in patented school lands encompass pore space. Notably, the purpose of Texas’s land-disposition statutes—to maximize the value of the land to support state schools—is

¹⁴⁵ *Id.* at 482.

¹⁴⁶ A.W. Walker, Jr., *The Texas Relinquishment Act*, 1 PROC. ANN. INST. ON OIL & GAS L. & TAX’N 245, 245–46 (1949); *Schwarz v. State*, 703 S.W.2d 187, 190 (Tex. 1986).

¹⁴⁷ Walker, *supra* note 146 at 245–46; *Schwarz*, 703 S.W.2d at 190.

¹⁴⁸ See *Schwarz*, 703 S.W.2d at 190; see also *Magnolia Petroleum Co. v. Walker*, 83 S.W.2d 929, 934 (Tex. 1935).

¹⁴⁹ *Schwarz*, 703 S.W.2d at 190 (quoting 1883 Tex. Gen. Laws 88, 9 H. Gammel 391). Oil and gas lawyers may be familiar with the Texas Relinquishment Act, which reserved to the state a portion of the oil and gas from patents of land between September 1, 1895, and August 21, 1931. This act applied only to oil and gas. Walker, *supra* note 146, at 247.

¹⁵⁰ 703 S.W.2d at 189.

¹⁵¹ *Id.*

similar to the statutory purpose behind Alaska's statute, which *City of Kenai* found to justify including pore space in the mineral reservation.¹⁵²

In 2009, a definition for the term “minerals” was promulgated into the Texas Administrative Code pertaining to development of state minerals other than oil and gas.¹⁵³ Although of dubious relevance for construing the legislative intent behind 19th and early 20th century land-disposition acts, the definition is helpful. Without expressly mentioning pore space, the regulatory definition appears to clearly exclude pore space from “minerals”:

Any naturally occurring inorganic or organic substance formed through geological processes having a definite chemical composition or a range of characteristic chemical compositions, *and distinctive physical properties or molecular structure*, or an aggregate thereof, *that may be extracted from the earth with an expectation of profit*. This includes, but is not limited to, base and precious metals; industrial minerals, such as gypsum, sulfur, talc, etc.; coal and lignite; construction materials such as granite, limestone, rhyolite and other rock that may be quarried for dimension stone or crushed for aggregate; or sand, gravel, caliche, clay and borrow material.¹⁵⁴

The requirement that a mineral has “distinctive physical properties or molecular structure” seems to exclude subsurface space from the definition. More importantly, pore space may not “be extracted from the earth with an expectation of profit,” and thus is not eligible to qualify as a mineral under this definition.

Not all courts look to the intent behind the public law provision requiring mineral reservations to determine the scope of these reservations from state land patents. New Mexico courts, for instance, construe the provisions of the patent itself rather than the language of the statute or regulation requiring the reservation.¹⁵⁵ Thus, New Mexico courts apply ordinary rules of deed construction to the terms of the patent.¹⁵⁶ Under New Mexico law, this entails consideration of all the surrounding circumstances of a transaction, and not just the express language of the

¹⁵² *City of Kenai v. Cook Inlet Nat. Gas Storage Alaska, LLC*, 373 P.3d 473, 482 (Alaska 2016).

¹⁵³ 31 TEX. ADMIN. CODE § 10.1(a)(5) (2024).

¹⁵⁴ *Id.* (emphasis added).

¹⁵⁵ *See Bogle Farms, Inc. v. Baca*, 925 P.2d 1184, 1194 (N.M. 1996).

¹⁵⁶ *See id.*

instrument, to ascertain the intent of the parties.¹⁵⁷ In *Prather v. Lyons*, the New Mexico Court of Appeals rejected the surface-destruction test on the grounds that it presumed or implied the parties' intent, in contradiction of the New Mexico Supreme Court's requirement that the parties' actual intent be determined on a case-by-case basis.¹⁵⁸ Like courts in most jurisdictions, New Mexico courts do not permit state lands to be conveyed by implication.¹⁵⁹

* * *

Summarizing, the scope of mineral reservations in patents of state lands depends, in most states, on the proper interpretation of the constitutional, statutory, or regulatory provision requiring the reservation. Unlike in the interpretation of deeds of private lands, use of the term "minerals" will usually be given a broad meaning in favor of the government—perhaps even to include the pore space within rock formations themselves, as in Alaska. This creates uncertainty surrounding ownership of pore space in split-estate lands in which a state owns or holds in trust a mineral estate. Short of seeking a definitive declaration of rights from the courts, prudence again dictates that planners acquire at least a quitclaim of ownership rights in the pore space from both estates in such lands.

III. ANCILLARY RIGHTS TO USE OTHER SPLIT ESTATES FOR CCUS

Locating title to oil and gas and pore space as between split estates is only the first property-related inquiry facing a CCUS project. The next important question concerns the ancillary rights and duties that govern the conduct of the owners of the split estates toward one another in the use and enjoyment of their separate property. This second question is required by the nature of the subsurface and of CCUS operations. In a nutshell, the owner of title to oil and gas or pore space cannot enjoy the property without in some way using the property of the other. There is no way to access and produce oil and gas without involving the surface and subsurface of the land, including the pore space, through drilling, hydraulic fracturing, disposing of produced water, etc. There is likewise no manner in which the owner of pore space can store carbon dioxide without drilling through mineral-bearing rock formations and occupying space that might contain oil and gas or that might otherwise be available for produced water disposal. The law recognizes these fundamental problems and accordingly

¹⁵⁷ *Id.*

¹⁵⁸ *Prather v. Lyons*, 267 P.3d 78, 93 (N.M. Ct. App. 2011).

¹⁵⁹ *Bogle Farms*, 925 P.2d at 1194.

grants each estate ancillary rights to use the property of the other. This Part outlines those rights and their limits.¹⁶⁰

A. Surface-Use Rights of Mineral Estate

1. The Implied Surface-Use Easement

Despite multiplying the objects of ownership encompassed in a tract of land, mineral severance does nothing to change the physical fact that the now-separate estates exist within a single mass of earth. Each can enjoy the fruits of his or her separate estate only by accessing, occupying, using, and consuming that same mass of earth. This is less of an impediment for the owner of the surface estate, since it owns every element of the earth capable of ownership that is not separated into a mineral estate. For the owner of the mineral estate, enjoyment of the minerals depends on accessing, occupying, using, and consuming a chunk of earth that belongs to the owner of the surface estate.

The law acknowledges the futility of recognizing property that the owner has no means to use or enjoy, and accordingly implies a grant to every mineral estate of what is necessary to its practical enjoyment: an easement in the surface estate.¹⁶¹ This implied easement operates, as any other species of easement does, by imposing a burden on the surface estate. In this sense, and only in this sense, the estate that is benefitted by the easement—the mineral estate—is dominant over the estate burdened by it—the surface estate.¹⁶² The terms “dominant” and “servient” do nothing more than indicate in which direction the burden of an easement runs (to the servient estate) and which way the benefit runs (to the dominant estate).¹⁶³ The principles operate in the same way in both private and public lands.¹⁶⁴

Moreover, the dominant and servient labels have no meaning except with respect to the scope of the easement. The servient estate is burdened by, and thus must yield to, the dominant estate’s use of the servient estate insofar, and *only insofar*, as the scope of the easement allows.¹⁶⁵ Because the easement is implied, the limits of its scope must also be implied. And so they are, based on the time-honored common law standard of

¹⁶⁰ Much of the following is more fully examined in Schremmer, *supra* note 24, at 653–74.

¹⁶¹ *Id.* at 653–54.

¹⁶² *Id.* at 654–55.

¹⁶³ *Id.*

¹⁶⁴ See Doran & Cifor, *supra* note 55, 535 n.59 (collecting authorities discussing the dominant–servient doctrine in the context of federal mineral estates).

¹⁶⁵ Schremmer, *supra* note 24, at 654–55.

reasonableness. The scope of the mineral estate's implied easement allows it to access, occupy, use, and consume the servient surface estate for all purposes that are reasonably necessary for the use and enjoyment of the underlying mineral estate, and only that estate.¹⁶⁶ Courts permit the easement holder to design its permissible uses of the surface estate with its own convenience in mind. If, but only if, a use of the surface estate would be reasonably necessary for enjoyment of the minerals, the mineral owner may pursue that use in a convenient manner even if other means might reduce the impact on the surface estate.¹⁶⁷

As with other easements, the implied mineral easement grants the holder a legal right to use the surface within the easement's scope. Like all legal rights, the easement right implies a correlative legal duty on the surface estate owner and all third parties to forbear from blocking or interfering with the mineral owner's reasonable use. For that reason, the mineral owner's reasonable use creates no liability to the surface owner for compensation.¹⁶⁸ Damage that results from a rightful use of the implied easement is thus *damnum absque injuria*—damage that does not injure (violate) another's legal right.¹⁶⁹

Even though it is subject to the burden of an implied mineral easement, the surface estate also owns the right to access, occupy, use, consume, and possess the land. These rights imply duties on the mineral estate and all third parties to forbear from interfering with the surface owner's use rights or trespassing on its right of possession. Obviously, this could only occur if the mineral estate were to use the surface estate beyond what its easement right permits. Thus, any action taken by the owner of a mineral estate that exceeds its easement, i.e., that is not reasonably necessary or not conducted in a reasonable manner, violates the rights of the surface estate. The surface estate in this situation has an action in tort—trespass or nuisance—for a remedy.¹⁷⁰

The shorthand for describing this interlocking system of correlative rights and duties concerning use of the shared land is to say that the mineral estate owes “due regard” for the rights of the surface estate.¹⁷¹ This “due regard” principle is a truism, if we accept that every property right implies a duty on the rest of the world not to violate it. What “due regard” really means is that the mineral estate must respect the limits of its implied easement. The easement's scope is limited in two essential ways that the

¹⁶⁶ *Id.*

¹⁶⁷ *Id.* at 656.

¹⁶⁸ *Id.*

¹⁶⁹ *Id.*

¹⁷⁰ *Id.* at 656–57.

¹⁷¹ *Id.* at 655.

mineral tenant must duly regard. First, the easement must only be used for the purpose of enjoying the underlying mineral estate and none other. Hence, any surface activities intended to benefit other mineral estates or leases would exceed the mineral easement's scope and would breach the mineral owner's duty to exercise its rights with due regard to the rights of the surface estate. Second, uses must be reasonably necessary for this purpose, which of course imports the myriad of questions about what is reasonable. Reasonable "necessity," wrote one court, is "a word of relative import, which may mean, on the one hand, less than imperative need, and, on the other hand, more than mere suitable convenience."¹⁷² Ultimately, reasonable necessity is a matter for a jury to decide based on the relevant circumstances, facts about the locality, and the customs and practices of the local industry.¹⁷³

2. Reasonable Accommodation

Tricky issues arise when both estates wish to use the land simultaneously in ways that cannot coexist. The classic case is *Getty Oil Co. v. Jones*, where the surface owner farmed the land using a walking irrigator that physically could not walk around the oil and gas lessee's pumping units.¹⁷⁴ The same kind of problem arises when both estates want to consume the same resource on land, as happened in *Sun Oil Co. v. Whitaker*, when the parties fought over use of the groundwater aquifer underlying the common tract.¹⁷⁵ Conflicts over clashing uses of the surface are more complex than questions about whether a mineral owner used the surface excessively. Unlike those "unidimensional conflicts," in which only one estate's actions need be examined, clashes of uses have two dimensions because both estates have actively used the surface in ways that, except for the irreconcilable conflict between the two, would be reasonable and lawful.

Accordingly, the law responds to "multidimensional conflicts" with a more sophisticated doctrine—the accommodation doctrine. The accommodation doctrine applies only where both surface and mineral estates seek to develop their property.¹⁷⁶ The doctrine grows out of the due

¹⁷² *Williams v. Gibson*, 4 So. 350, 354 (Ala. 1888).

¹⁷³ *See id.* at 354–55.

¹⁷⁴ 470 S.W.2d 618 (Tex. 1971).

¹⁷⁵ 483 S.W.2d 808 (Tex. 1972).

¹⁷⁶ *Lyle v. Midway Solar, LLC*, 618 S.W.3d 857, 874 (Tex. App. 2020) (explaining the doctrine only applies where the mineral estate actually seeks to develop its minerals). Professor Kuntz was clear that the accommodation doctrine "has no application where there are no conflicting uses of the surface." 1 KUNTZ, *supra* note 73, § 3.2 (citing *Ottis v. Haas*, 569 S.W.2d 508, 512–14 (Tex. Ct. App. 1978)). Many others, led by Professor

regard principle, which, in turn, rests on the “reasonably necessary” standard for measuring the scope of the mineral estate’s easement.¹⁷⁷ Due regard for the easement rights of the mineral estate means that the surface estate must yield to the reasonably necessary and convenient uses engaged by the mineral owner. However, a mineral owner’s use could hardly be considered “reasonably necessary” if it would needlessly clash with an established use of the surface owner. Thus, due regard and reasonable necessity may demand that a mineral owner pursue its desired end by a different means if different means exist and would permit the surface estate to continue its established use. Of course, if the only alternatives would impose an unreasonable cost or would otherwise be found unreasonable in some respect, the mineral estate could not, without being divested of its easement, be required to pursue it.

Consider an outlandish example. Suppose an oil and gas lessee wanted to build a lease road across a tract of land for ingress and egress to its well, and that the shortest distance from the township road to the wellhead would be straight through the living room of the surface owner’s house. It would be unreasonable for the oil and gas lessee to destroy the surface owner’s house for this purpose, even though a road is reasonably necessary and the straight line through the location where the surface owner has placed his sofa would be convenient. The oil and gas lessee can surely reroute the proposed road to go around the surface owner’s house, allowing both parties to enjoy their surface uses in harmony. In practice, no oil and gas lessee would balk at taking a slightly longer path to the well to avoid the surface owner’s house—this accommodation would be entirely reasonable.

Now suppose that the topography is such that there was no other means to reach the well other than a new road, and that the only other route for a lease road would have to use a neighboring tract of land. Under these circumstances, it would appear more likely that routing the road through the surface owner’s existing abode would be necessary. In this case, where no alternative exists on the lease premises themselves for the

Kramer, argue that the accommodation doctrine is an alternative to the reasonable necessity doctrine, representing a “multidimensional approach” to resolving surface-use disputes as contrasted with the traditional “unidimensional approach.” Bruce M. Kramer, *The Legal Framework for Analyzing Multiple Surface Uses*, 44 ROCKY MTN. MIN. L. FOUND. J. 273, 298–99 (2007). I have contended elsewhere that these doctrines do not represent two alternative tests but instead are each part of the same integrated doctrinal system that makes up the law in every jurisdiction. The system operates on two different kinds of problems, some that might be called “unidimensional” and others that are “multidimensional,” and as Professor Kuntz understood, the accommodation doctrine only applies to multidimensional problems. Schremmer, *supra* note 24, at 657.

¹⁷⁷ See *Tarant Cnty. Water Control & Improv. Dist. No. 1 v. Haupt, Inc.*, 854 S.W.2d 909, 911 (Tex. 1993).

oil and gas lessee's reasonably necessary surface activity, to prohibit the lessee from building its road through the surface owner's house would be equivalent to divesting the mineral owner of its estate.

The net result is extremely harsh: the surface owner must suffer a road to be built through the heart of his house. While we cringe at this prospect, it is well to remember that the hypothetical facts are themselves quite harsh—and unrealistic. There also remains an opportunity for the surface owner to bargain for an alternative, perhaps by agreeing to pay for some or all of the mineral owner's costs in pursuing an extraordinary alternative. In the end, however, the justification for the harsh result must lie with the fact that the surface estate (though quite possibly not the present owner of the surface estate themselves) created the mineral estate and, at that moment, had all the legal power necessary to expressly limit the surface-use rights of the mineral estate.¹⁷⁸ All successors to the surface estate took their interest subject to the rights conferred on the mineral estate by their predecessor and must suffer the consequences, foreseeable or not. Cold comfort, to be sure, but preferable to divesting the mineral estate of a lawfully obtained easement merely to alleviate the consequences of the surface owner's own bad bargain.

Without the accommodation doctrine, the mineral estate might truly dominate the surface estate, demanding that it abandon its established uses even where it would otherwise be possible for both surface and mineral uses to coexist. Yet, the accommodation doctrine also has the potential, if applied too broadly, to undermine the basic principles that justify it. If misapplied, the doctrine could nullify the dominance of the mineral estate by allowing courts to choose which conflicting use may proceed based on ad hoc criteria like which it finds most beneficial or least offensive.¹⁷⁹

Fortunately, courts have cabined the accommodation doctrine and structured its application through a burden-shifting framework.¹⁸⁰ First, the surface owner bears the initial burden to show that a use by the mineral estate has materially interfered with an existing use of the surface by the surface owner. Material interference requires a showing that the surface owner's use has been substantially impaired or totally precluded and that no reasonable alternative exists on the premises.¹⁸¹ If this is shown, the burden then shifts to the mineral owner to demonstrate that its surface use

¹⁷⁸ See *infra* Part III.A.3.

¹⁷⁹ See Kramer, *supra* note 176, at 298–301.

¹⁸⁰ Schremmer, *supra* note 24, at 660–62 (citing *Bay v. Anadarko E&P Onshore, LLC*, 912 F.3d 1249, 1257 (10th Cir. 2018)); *Gerrity Oil & Gas Corp. v. Magness*, 946 P.2d 913, 933–34 (Colo. 1997)).

¹⁸¹ Schremmer, *supra* note 24, at 663 (citing *Merriman v. XTO Energy, Inc.*, 407 S.W.3d 244, 249 (Tex. 2013)).

is within the scope of its easement, i.e., is reasonably necessary for enjoyment of the mineral estate. At this point, the burden shifts again to the surface owner to prove that reasonable alternatives to the mineral estate's use exist that would allow the mineral estate to achieve its end while also accommodating the surface owner's established use. To qualify as reasonable, an alternative must be available on the surface estate and it must be one that is customarily employed by the industry in the locale under like circumstances. It is for a jury to decide whether the parties have met their burden of production on any given point and whether the surface owner ultimately satisfies its burden of persuasion that it is entitled to accommodation.¹⁸²

Some courts engage in a balancing test to determine which of the two competing surface uses should be allowed to proceed but only if the surface owner has satisfied its burden to show that reasonable alternatives exist for the mineral owner to pursue on the premises.¹⁸³ In so doing, these courts seem to confuse the legal question of whether the mineral estate has a duty to accommodate the surface use of the surface estate with the equitable question of whether the remedy of injunction would be appropriate under the circumstances. Balancing is appropriate at the remedy stage where one of the parties has sought equitable relief or raised an equitable defense. It is not appropriate at the liability stage, when the court determines the parties' respective rights and duties under due regard, reasonable necessity, and the accommodation doctrine.

3. *Express Surface-Use Easements*

Although deeds severing a mineral estate usually do not expressly provide for easement rights in the surface estate, they sometimes do. Oil and gas leases nearly always include in the grant an express easement that spells out, often in detail, the lessee's surface-use rights.¹⁸⁴ Where easement rights are expressly granted or reserved along with a mineral estate, it is important to understand whether the express easement fully abrogates any implied easement and, if not, how the express terms interact with the terms of the standard implied easement.

¹⁸² *Id.* at 661 (citing *Gerrity Oil & Gas Corp.*, 946 P.2d at 933–34).

¹⁸³ *E.g.*, *Hunt Oil Co. v. Kerbaugh*, 283 N.W.2d 131, 137 (N.D. 1929).

¹⁸⁴ Oil and gas leases virtually always provide for rights to use the surface and subsurface. These enumerated rights need not mirror the scope of the implied easement but may take whatever form the parties desire, with one proviso. A lease may not convey to the lessee greater surface use rights than the lessor owns, and so if the lessor's surface-use rights were implied by law, the express easements in the lessor's lease cannot exceed the scope of the implied easement. Anderson, *supra* note 37, at 100 n.13.

As Professor Bruce Kramer observed, surprisingly few cases exist that address these questions.¹⁸⁵ One such case is *Texaco Inc. v. Faris*.¹⁸⁶ Plaintiffs owned the surface estate subject to defendant's oil and gas lease, which expressly granted to the lessee the typical laundry list of surface-use rights, namely rights

to conduct operations for testing by any method for formations or structures and prospecting and drilling for, mining, and producing oil, gas, distillate, sulphur and other minerals, injecting salt water, other fluids, and gas, into subsurface strata, storing minerals and fluids, laying pipe lines, dredging canals, building roads, bridges, docks, tanks, powers, stations, telephone and electric transmission lines, and other structures and facilities including houses for employees, *necessary* for producing, saving, caring for, treating, processing, and transporting minerals and conducting said operations, the following described land.¹⁸⁷

Plaintiffs sued alleging the defendant used the surface unnecessarily and excessively.¹⁸⁸ The jury found in favor of the plaintiff.¹⁸⁹ The defendant appealed a jury instruction on the grounds that it instructed the jury to find the defendant liable if it “made an unnecessary use of the surface estate.”¹⁹⁰ The defendant argued the proper standard was whether its conduct was *reasonably* necessary, not merely “necessary.”¹⁹¹

The court upheld the jury instruction, explaining that the law does not define the scope of an easement or furnish the measure of its acceptable use where the parties have done so themselves.¹⁹² Where an express easement provides for rights to use the surface (e.g., rights to “lay pipe lines, provide storage, build roads, construct telephone and telegraph lines, etc.)” but makes no provision for the extent or scope of the easement's use (e.g., how many pipelines or how wide of roads¹⁹³) the common law may supplement or “gap fill” by implying necessary rights and standards. Such implied rights are often called “secondary easements” because they are inferred from the intent of an express easement or implied as a

¹⁸⁵ Kramer, *supra* note 176, at 276.

¹⁸⁶ 413 S.W.2d 147 (Tex. Civ. App. 1947).

¹⁸⁷ *Id.* at 149.

¹⁸⁸ *Id.* at 148.

¹⁸⁹ *Id.*

¹⁹⁰ *Id.* at 148.

¹⁹¹ *Texaco Inc. v. Faris*, 413 S.W.2d 147, 149 (Tex. Civ. App. 1947).

¹⁹² *Id.* at 149–51.

¹⁹³ *Id.* at 149.

necessary incident to one.¹⁹⁴ Secondary easements may fill in any number of gaps in express easements, including by providing the scope or measure of express easement rights, as the *Faris* court noted, or by granting use rights that are not expressly given in the language of the grant.¹⁹⁵

However, *Faris* goes on to explain that where the language of the instrument sets forth both the uses that may be made and the extent of such uses, the implied “reasonably necessary” standard does not apply.¹⁹⁶ In this case, the parties’ lease provided the measure or standard of use: necessity.¹⁹⁷ Thus, the defendant had the right to do those things that were “necessary” and to the extent “necessary” and not “reasonably necessary.”¹⁹⁸

Courts have also decided that the common law accommodation doctrine has no application where the mineral estate acts under an express easement,¹⁹⁹ unless the express easement is unclear or “there is substantial disagreement regarding the parties’ intent in the terms used in a deed.”²⁰⁰ In *Landreth v. Melendez*, the surface owner sought accommodation from the lessee of a severed mineral estate for the surface owner’s center-pivot irrigators, which could not maneuver around the mineral lessee’s pumping units.²⁰¹ The deed originally severing the mineral estate expressly provided a surface easement entitling the mineral owner “to take all usual, necessary and convenient means” to explore for, produce, and remove the oil, gas, and other minerals under the surface.²⁰²

In reversing the trial court, which had ordered the mineral lessee to accommodate the surface owner’s irrigation system, the Texas Court of Appeals abruptly concluded, that unlike the surface-use easement implied in law, the lessee’s express easement rights are not subject to the due regard principle or the accommodation doctrine.²⁰³ Observe the entirety of the court’s reasoning:

Given the rights reserved to the mineral owners by the reservation, it follows that this is not a situation where the

¹⁹⁴ RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.10 cmt. c (AM. L. INST. 2000).

¹⁹⁵ David E. Pierce, *Oil & Gas Easements*, 33 ENERGY & MIN. L. INST. 318, 323 § 9.04[1] (2012).

¹⁹⁶ See *Texaco Inc. v. Faris*, 413 S.W.2d 147, 149–50 (Tex. Civ. App. 1947).

¹⁹⁷ *Id.*

¹⁹⁸ *Id.*

¹⁹⁹ See *Coyote Lake Ranch, LLC v. City of Lubbock*, 498 S.W.3d 53, 56 (Tex. 2016).

²⁰⁰ *Lyle v. Midway Solar, LLC* 618 S.W.3d 857, 870 (Tex. 2020).

²⁰¹ 948 S.W.2d 76, 79 (Tex. App. 1997).

²⁰² *Id.* at 81.

²⁰³ *Id.*

usual rights implied from a standard lease in favor of the mineral estate are to be exercised with due regard to the rights of the surface owners to be accommodated in the existing use being made of the surface. Instead, it is a situation where the mineral owners are under no obligation to accommodate the surface owners in the existing use made of the surface so long as the mineral owners use all usual, necessary and convenient means in conducting their operations.²⁰⁴

Landreth is not alone among courts that have found the accommodation doctrine to be displaced by express easement language. The U.S. District Court for the District of Colorado also held, in an unpublished opinion, that an express easement entitling an oil and gas lessee to “construct, maintain, and use . . . all oil wells . . . *necessary or convenient* in prospecting and developing . . . oil” released the lessee of liability for accommodating the clashing surface uses of the surface owner.²⁰⁵ “[I]t would be contrary to Colorado Law,” the opinion says, “to apply the ‘reasonable and necessary’ standard . . . in lieu of the ‘necessary or convenient’ standard the parties bargained for.”²⁰⁶

Not every court agrees the accommodation doctrine is displaced by an express easement. The argument was made to the U.S. District Court for the District of North Dakota in *Mosser v. Denbury Resources*.²⁰⁷ The defendant, Denbury, claimed that its use of subsurface pore space for saltwater disposal should not be balanced with the surface owners’ interest in the pore space under North Dakota’s version of the accommodation doctrine because its oil and gas lease granted it “any and all other rights and privileges *necessary, incident to, or convenient for*, the economical operation . . . for the production . . . of oil [and] gas . . . and the injection of water, brine and other fluids into subsurface strata.”²⁰⁸ The court declined to rule on the issue, deciding the case on other grounds, but did express doubt about whether the North Dakota Supreme Court would accept Denbury’s argument.²⁰⁹ The court was not sure whether the language “necessary,

²⁰⁴ *Id.* (internal citation omitted) (citing *Getty Oil Co. v. Jones*, 470 S.W.2d 618, 621–22 (Tex. 1971)).

²⁰⁵ No. 07-cv-01985-WYD-MJW, 2009 WL 890716, 2009 U.S. Dist. LEXIS 26886, at *13–14 (D. Colo. Mar. 31, 2009) (alteration in original).

²⁰⁶ *Id.* at *14.

²⁰⁷ See 112 F. Supp. 3d 906 (D.N.D. 2015).

²⁰⁸ *Id.* at 912, 915 (emphasis added).

²⁰⁹ *Id.* at 916–17.

incident to, or convenient for” would “trump” the reasonably necessary standard imposed in law.²¹⁰

In *Lyle v. Midway Solar, LLC*, the Texas Supreme Court held that the language in a deed reserving the minerals and “the right to such use of the surface estate in the lands above described as may be *usual, necessary* or *convenient* in the use and enjoyment of the oil, gas, and general mineral estate hereinabove reserved” did not supplant the accommodation doctrine.²¹¹ This language was too imprecise to clearly indicate an intent to provide standards instead of the accommodation doctrine.²¹² Moreover, a clause expressly immunizing the mineral owner from liability for damage to the surface estate also provided no basis for negating the accommodation doctrine since “the clause states little more than what the common law would already require.”²¹³

The rule that express language can trump the common law accommodation doctrine also has scholarly critics. Professor Kramer has written that the language “all usual, necessary and convenient means” should not be interpreted to foreclose application of the doctrine.²¹⁴ In my view, the common law principles of due regard, reasonable necessity, and reasonable accommodation should continue to apply notwithstanding the grant of an express easement, unless the instrument creating the severed estate clearly expresses an intent that they should not apply. This is easier said than applied because parties usually will not specify that they wish to abrogate the common law standards and doctrines in so many words. Instead, their intent to do so must be ascertained from the express language in the instrument. If the language provides for standards and rules that effectively supplant the common law standards and rules, it likely would frustrate the parties’ intent to impose the common law doctrines.

The foregoing cases are consistent with this view. Consider again the *Faris* case, where the court held that an express easement was specifically for purposes that were “necessary” for operation of the lease.²¹⁵ The effect of the word “necessary” was to specify the scope of the lessee’s easement, which is the same role that reasonable necessity performs in the common law system. Despite performing the same function as the implied standard of reasonable necessity, the “necessary” language conspicuously excludes the element of reasonableness from the standard. It can only be assumed that the grantor of the easement did not wish for the easement’s scope to

²¹⁰ *Id.* at 916.

²¹¹ 618 S.W.3d 857, 870 (Tex. 2020).

²¹² *Id.* at 870–71.

²¹³ *Id.* at 871.

²¹⁴ Kramer, *supra* note 176, at 277.

²¹⁵ *Texaco Inc. v. Faris*, 413 S.W.2d 147, 150 (Tex. Civ. App. 1947).

be modified by the descriptor “reasonably.” The consequence must be that necessity governs the scope of the easement rather than reasonable necessity.²¹⁶

The same logic underpins the *Landreth* decision that the language “all usual, necessary and convenient means” precluded operation of the accommodation doctrine.²¹⁷ This is the appropriate conclusion because “all usual, necessary and convenient means,” like the language in *Faris*, furnishes a standard or scope by which to measure the mineral lessee’s use of the express easement. It thus supplants the common law’s scope provision of reasonable necessity, essentially by contracting out of the “reasonableness” element. By removing the element of reasonableness in the scope of the easement, the express language also supplants the accommodation doctrine. This is because the very basis of the accommodation doctrine, as demonstrated previously, is the requirement that the lessee exercise its easement rights reasonably.²¹⁸ If reasonableness is not the criterion for compliance with the easement because the parties have chosen different criteria, then there remains no justification for requiring the easement holder to reasonably accommodate the surface owner.

4. *Surface Damage Legislation*

Many states have modified the common law surface-use rights of mineral owners. Generally, these “surface damage acts” do not curtail the power to use the surface granted to a mineral estate, but merely condition exercise of that power upon payment of damages to the surface owner and compliance with certain other requirements, such as the giving of advanced notice and the negotiation of a surface-use agreement.²¹⁹ Elsewhere, I have

²¹⁶ It is not immediately clear whether “reasonably” serves to expand or constrain the actions an easement holder may pursue out of necessity. On the one hand, it may be that something “reasonably necessary” need not be strictly necessary, so that by removing the modifier “reasonably,” express language narrows the easement’s scope. This seems to be the understanding implicit in *Faris*. On the other hand, it might be argued that necessity standing alone does not mean “strict necessity,” but instead refers broadly to what the pertinent actor believes to be necessary. In this view, the modifier “reasonably” would seem to limit the field of actions that can be necessary by shifting the criterion from what the pertinent actor subjectively views as necessary to what could be objectively (reasonably) necessary. Thus, by dispensing with “reasonably” one may broaden the scope of the easement, allowing a potentially wider field of activities to occur that might not be necessary under an objective standard.

²¹⁷ *Landreth v. Melendez*, 948 S.W.2d 76, 81 (Tex. App. 1997).

²¹⁸ See *Tarrant Cnty. Water Control & Improv. Dist. No. 1 v. Haupt, Inc.*, 854 S.W.2d 909, 911 (Tex. 1993).

²¹⁹ See Joseph A. Schremmer, *The Potential for Conflicts between CCS Projects and Mineral Extraction*, 12 LA. ST. U. J. OF ENERGY L. & RES. 23–25 (forthcoming 2024), available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4713662.

discussed the application of these acts to the use and damage of subsurface elements of the earth for mineral development.²²⁰ In general, these acts have been interpreted to apply to mineral developers' subsurface activities as well as their actions taken on the surface.²²¹ Moreover, some states' surface damage acts have been interpreted to require compensation to the surface estate owner for the mere occupation of pore space in the course of mineral development, such as for fluid disposal or EOR.²²² The specific language of the statute controls and that language may vary from state to state.²²³

B. *Use Rights of Surface Estate*

Although the surface estate is burdened by the superior use rights of a severed mineral estate, the surface estate nonetheless enjoys the rights to possess, use, and consume the land. These rights are much broader than those of the mineral estate because they encompass any type of lawful activity pursued for any purpose. However, the surface estate's right to occupy, consume, and use the land also entails the duty not to unreasonably interfere with the easement rights of a mineral estate.²²⁴ To do so may result in liability to the mineral owner or lessee for interference or trespass of the easement.²²⁵

In unidimensional situations, where the surface owner alone occupies or uses the land and the mineral owner remains passive, the criterion for liability to the mineral owner is whether the surface owner's activity unreasonably interfered with the mineral estate's right to use the land. Since implied, as well as most express, mineral easements create a blanket easement covering the entire surface estate,²²⁶ a surface owner may be liable for interference for occupying or using any part of the surface estate. However, the mere fact that a surface owner's activity might potentially interfere with the mineral estate's future use of land for accessing or developing the minerals is not enough to establish substantial

²²⁰ *Id.*

²²¹ *Mosser v. Denbury Res., Inc.*, 898 N.W.2d 406 (N.D. 2017).

²²² *Burlington Res. Oil & Gas Co., L.P. v. Lang & Sons Inc.*, 259 P.3d 766, 771 (Mont. 2011).

²²³ *See Brown v. Cont'l Res., Inc.*, 58 F.4th 1023, 1026–27 (8th Cir. 2023).

²²⁴ Schremmer, *supra* note 24, at 654–55.

²²⁵ Where the lessor of an oil and gas lease is also the surface owner, the lessor may be precluded from suing for breach or termination of the lease if the lessor's own actions prevented the lessee from taking a necessary action to preserve or comply with the lease's terms. This is referred to as the "obstruction doctrine." Cindy Keely, *Oil and Gas: Burger v. Wood—A Misguided Application of the Doctrine of Obstruction to Third Parties*, 34 OKLA. L. REV. 162, *passim* (1981).

²²⁶ *See Schremmer, supra* note 24, at 675–81 (discussing blanket easements).

interference.²²⁷ How great the disruption of future mineral development must be to substantially interfere with a mineral easement is not clear, but it is usually quite high. In *Lyle v. Midway Solar*, the Texas Supreme Court rejected a mineral owner's claim that the surface owner's solar energy facility trespassed on the mineral easement because it covered 70% of the available surface area for drilling wells and left only two potential areas for locating wells.²²⁸ The mineral owner even claimed that these locations could not comply with applicable spacing and setback regulations.²²⁹

In multidimensional scenarios, where the mineral estate is also being developed, or the mineral owner or lessee actively seeks to develop, the accommodation doctrine applies to balance the uses of surface and mineral estates.²³⁰ The doctrine ordinarily requires the surface estate's activities to yield to those of the dominant mineral estate where the two would irreconcilably clash.²³¹ Where, however, the surface estate's activity is already established when the mineral estate seeks to use the land, the accommodation doctrine may require the mineral estate to modify its use to accommodate the surface estate's use, but only if two conditions are satisfied: (i) the surface estate's prior use is completely irreconcilable with the mineral estate's use and no reasonable alternative exists within the surface estate, and (ii) there are reasonable, customary, and usual alternatives available to the mineral estate within the same tract of land.²³²

These same principles, including the accommodation doctrine, apply to subsurface as well as surface activities conducted by the owner of a surface estate.²³³ For example, in *Lightning Oil Co. v. Anadarko E&P Onshore, LLC*, the Texas Supreme Court held in favor of a surface lessee in a unidimensional dispute with an oil and gas lessee in the same tract.²³⁴ The surface lessee obtained the right to drill horizontal wellbores across the Briscoe Ranch to access the minerals under its lease on an adjoining tract from the owner of the surface estate in the Ranch. The mineral lessee sought an injunction against the surface lessee to restrain the drilling,

²²⁷ *Lyle v. Midway Solar, LLC*, 618 S.W.3d 857, 874 (Tex. 2020) (citing *Lightning Oil Co. v. Anadarko E&P Onshore, LLC*, 520 S.W.3d 39, 39 (Tex. 2017)).

²²⁸ *Id.* at 867, 874; accord *Lightning Oil Co. v. Anadarko E&P Onshore, LLC*, 520 S.W.3d 39, 39 (Tex. 2017) (holding that the presence of subsurface wellbores drilled with the permission of the surface owner would not be sufficient to preclude development by the plaintiff mineral lessee).

²²⁹ *Lyle*, 618 S.W.3d at 867, 874.

²³⁰ *See id.* at 874.

²³¹ *See id.* at 868–70.

²³² *Id.* at 869.

²³³ *See Lightning Oil Co.*, 520 S.W.3d 39, 50 (Tex. 2017) (noting that the accommodation doctrine applied to this subsurface-use dispute).

²³⁴ *Lightning Oil Co. v. Anadarko E&P Onshore, LLC*, 520 S.W.3d 39, 50 (Tex. 2017).

alleging that it would unreasonably interfere with or trespass on its mineral estate. The court held in favor of the surface lessee on the ground that the mineral lessee had failed to show that the proposed eight-inch diameter wellbores running through the subsurface of the ranch would actually interfere with its development of the minerals. The court characterized the mineral lessee's argument as "essentially that it should have the right to prevent any surface or subsurface use that might later interfere with its plans" and rejected it accordingly.²³⁵ The fact that a small amount of oil and gas would be destroyed in the drilling process also did not justify a finding of interference, since it would be a trivial amount in comparison with the good to the surface lessee and society as a whole in being able to drill to access its mineral lease on other lands.²³⁶ The court did not apply the accommodation doctrine, and appropriately so, given that the mineral lessee was not actively developing or seeking to develop its lease. The opinion noted nevertheless that the doctrine would apply in such a case even though it occurred in the subsurface.²³⁷

Not all courts take *Lightning Oil's* view that merely drilling through a mineral-bearing formation does not trespass a mineral interest with rights in the formation. In contrast to the reasoning of *Lightning Oil*, for example, a federal court applying Ohio law found in *Tera II LLC v. Rice Drilling D, LLC*, that merely penetrating the top of a rock formation by drilling may trespass on a mineral owner's rights in the formation.²³⁸ As in Texas, under Ohio law a subsurface trespass occurs when an unauthorized substantial physical invasion interferes with the owner's reasonable or foreseeable uses of the subsurface.²³⁹ Based on this, the court rejected the defendant's argument that drilling a well but not extracting hydrocarbons does not constitute a trespass, as held by *Lightning Oil*:

The wide array of discovery submitted to this Court indicates that drilling these wells and causing hydraulic fractures has a substantial impact on the stability and use of subsurface minerals, leading to the logical conclusion that Plaintiffs' reasonable and foreseeable use of the hydrocarbons in the [formation] would be impacted.²⁴⁰

²³⁵ *Id.* at 39.

²³⁶ *Id.* at 50–51.

²³⁷ *Id.* at 50.

²³⁸ 679 F. Supp. 3d 620, 642–43 (S.D. Ohio 2023).

²³⁹ *Id.* at 653 (citing *Baatz v. Columbia Gas Transmission, LLC*, 929 F.3d 767, 773 (6th Cir. 2019); *Chance v. B.P. Chem. Co.*, 670 N.E.2d 985, 991–92 (Ohio 1996)).

²⁴⁰ *Tera II LLC*, 679 F. Supp. 3d at 643.

Other courts have likewise suggested that the mere fact of drilling may cause substantial damage to a plaintiff's rights in a formation.²⁴¹

Surface owners whose land overlies a federally owned mineral estate may require a permit from the Bureau of Land Management (BLM) to drill through the federal mineral estate, even if the wellbore is not intended to produce minerals. In *True Oil LLC v. BLM*, the Federal District Court for the District of Wyoming held that Congress has the constitutional authority to protect the federal mineral estate by regulating private activities on overlying surface estates and that Congress delegated this authority to BLM through the Mineral Leasing Act.²⁴² BLM may thus require a surface owner to apply for a permit to drill a wellbore through federally owned minerals if the traversing wellbore would be likely to interfere with BLM's ability to protect the federal mineral estate from harm.²⁴³ The court stopped short of saying BLM would have the authority to prohibit a surface owner from traversing federal minerals with a wellbore.²⁴⁴

While merely drilling wells into the subsurface may or may not constitute substantial interference by the surface estate, contaminating oil or gas reserves usually will. Consider the unusual facts of *Cassinis v. Union Oil*.²⁴⁵ The case involved a plaintiff oil and gas lessee suing a wastewater injector that lacked the plaintiff's authority to dispose of off-lease wastewater into the tract. Instead, the wastewater injector had obtained the authority of the surface estate owner in the tract.²⁴⁶ The plaintiff mineral lessee claimed the defendant's wastewater communicated through fractures in the subsurface formation where it injected the water and interfered with its oil and gas wells on the premises.²⁴⁷ The court held for the plaintiff, finding the wastewater injection interfered with and damaged the plaintiff's wells, causing a sudden drop in oil production and an

²⁴¹ See *Chevron Oil Co. v. Howell*, 407 S.W.2d 525, 526–28 (Tex. App. 1966) (enjoining a party from drilling a directional wellbore through another's subsurface tract to access minerals on the other side based on expert testimony that “any time you drill into something there is bound to be some damage.”); *Briggs v. Sw. Energy Prod. Co.*, 224 A.3d 334, 347–48 (Pa. 2020) (noting that “the mere act of drilling interferes with nature”); *True Oil LLC v. Bureau of Land Mgmt.*, No. 2:22-CV-188-KHR, 2023 U.S. Dist. LEXIS 221156, at *22 (D. Wyo. Oct. 30, 2023) (finding that “[a] traversing well could not only potentially go through federal minerals, but also injure the United States’ ability to protect its minerals.”).

²⁴² *True Oil LLC*, 2023 U.S. Dist. LEXIS 221156, at *17–22.

²⁴³ *Id.* at *22.

²⁴⁴ See *id.* at *23.

²⁴⁵ 18 Cal. Rptr. 2d 574 (Cal. Ct. App. 1993).

²⁴⁶ *Id.* at 576–77.

²⁴⁷ *Id.* at 577.

increase in the “water to oil ratio.”²⁴⁸ *Cassinios* demonstrates that it is possible for the surface estate owner or lessee to be liable for unreasonably interfering with a severed mineral estate by injecting foreign fluids into the subsurface—an important lesson for CCS projects.

* * *

In summary, both the surface and mineral estates enjoy rights to use and occupy the land’s surface and subsurface. These rights correlate with duties not to use the land unreasonably to the injury of the other estate. Where the reasonable, permissible activities of the two estates clash irreconcilably, the law works out their relative priorities through the accommodation doctrine, unless the parties have provided for a different standard in an express easement. These basic precepts furnish the “rules of the road” for mineral or surface owners pursuing CCUS. The next and final substantive Part of the Article explores how these rules might apply to guide the concurrent use of land for CCUS and other subsurface activities.

IV. CONFLICTS WITH OTHER SUBSURFACE ACTIVITIES

Rounding out the guidance for navigating split estates in conducting CCUS projects, this Part considers some of the specific issues involved in co-locating CCUS projects with other subsurface activities common to the places where CCUS projects are most likely to happen. Specifically, the subsurface activities discussed here involve oil and gas development, coalbed methane production, and production of geologic CO₂.

A. Oil and Gas Production

The most likely source of conflicts with co-located subsurface activities and CCUS is concurrent oil and gas production. Other work has delved into the details of these potential conflicts, particularly regarding CCS.²⁴⁹ Highly summarized, the potential conflicts might include use of the actual surface for locating wells, wellpads, roads, and ancillary surface facilities, as well as use of the subsurface for various purposes.²⁵⁰ The conflicts likely to pose the greatest legal difficulty are those that occur in the subsurface. Subsurface clashes might involve three types of conduct: (i) drilling wells, including drilling through shallower geologic formations or strata to access

²⁴⁸ *Id.* at 580.

²⁴⁹ Schremmer, *supra* note 24, at 644–52; *see generally* Schremmer, *supra* note 219.

²⁵⁰ Schremmer, *supra* note 24, at 644–45.

deeper strata, (ii) occupying reservoir pore space under the land, and (iii) conducting geological and geophysical exploration of the subsurface.²⁵¹

1. *Well Drilling and Accessing Deeper Strata*

i. Well Drilling

There are relatively few reasons for a surface estate owner to drill wells deep enough to reach common sources of oil and gas. Historically, these are probably limited to saltwater disposal wells for outside water and, occasionally, hazardous waste injection wells. With the advent of CCS, there is a new reason for surface owners to drill deep injection wells. Interest in drilling entails potential conflicts over the location of drilling and interference between wells drilled by different parties for different purposes. The owner or lessee of oil and gas estate in a tract of land might complain that injection wells planned or drilled by authority of the surface estate deprive it of an opportunity to develop the minerals.²⁵² The surface owner might allege that the oil and gas owner or lessee's drilling of wells is excessive and limits potential locations for the surface owner's own CCS wells.²⁵³ Conflict is foreseeable where an operator hydraulically fractures an oil and gas well and materials or pressure from the fracturing treatment communicate with and damage a CCS well drilled by authority of the surface owner in the same tract. The interwellbore-communication problem is known variously as a "frac hit," "frac bash," or "well interference."²⁵⁴

The analysis of each of these disputes under the common law framework set forth in Part III, above, begins with whether the person drilling the well in question acted with the requisite authority. If the driller owns a mineral interest or lease, this demands that the drilling be reasonably necessary and convenient for enjoyment of the underlying oil and gas. If the driller is the surface owner, her authority stretches to any lawful use of the subsurface other than taking the oil and gas, including the authority to drill a well for CCS.

The next question is whether the surface or mineral owner, as the case may be, acted with due regard for the rights of the other estate. Here, it is helpful to classify the case as unidimensional or multidimensional. When

²⁵¹ *Id.* at 645–49.

²⁵² *Lightning Oil Co. v. Anadarko E&P Onshore, LLC*, 520 S.W.3d 39, 43 (Tex. 2017).

²⁵³ *Bay v. Anadarko E&P Onshore, LLC*, 912 F.3d 1249 (10th Cir. 2018).

²⁵⁴ 8 PATRICK H. MARTIN & BRUCE M. KRAMER, WILLIAMS & MEYERS, OIL & GAS LAW, MANUAL OF Terms *Frack Hit*; see, e.g., *Yoho v. Sw. Energy Co.*, 688 F. Supp. 3d 345 (N.D. W. Va. Aug. 23, 2013).

the actor's drilling merely damages the other estate but does not interfere with or inconvenience the current development of the other estate, a unidimensional problem is presented. If the drilling party is the mineral owner or lessee, the question reduces to whether the drilling was reasonably necessary for enjoyment of the mineral estate and was conducted in a reasonable manner. If the drilling party is the surface owner, the question is whether the drilling unreasonably interfered with the mineral owner's opportunity to enjoy the underlying oil and gas.

Existing case law helps guide the question of what constitutes unreasonable interference. As was the case in *Lightning Oil Co.*²⁵⁵ and *Lyle*,²⁵⁶ the mere fact that one estate drills wells that would reduce the locations available for the other estate to drill in the future is insufficient to establish liability. *Lightning Oil* would also suggest that the damage to the formation caused by a traversing wellbore would likely not exceed what is reasonable, while other cases, like *True Oil LLC*²⁵⁷ and *Tera II LLC*²⁵⁸ weigh in the opposite direction.

Actions that interfere with or inconvenience the current activities of another estate, however, raise multidimensional problems and implicate the accommodation doctrine. Where, for instance, the surface owner has previously drilled a CCS well and a mineral lessee later wants to drill in the same or a nearby location, the clashing subsurface uses would need to be ordered in priority. Under the accommodation doctrine in this hypothetical, the surface owner's CCS well constitutes an established, preexisting use that would undoubtedly be precluded if the mineral lessee were to insist that the CCS well be plugged to permit the drilling of a mineral well. The case would come down to whether the surface owner could demonstrate that reasonable alternatives exist for locating the proposed mineral well. If the roles were reversed and the mineral lessee's well was preexisting, the surface owner's case for accommodation would be very weak because it would be difficult to satisfy the threshold element of a preexisting use.

The wellbore interference case poses another multidimensional problem. Particularly in basins where vertical and horizontal development coexist, frac hits are a common source of dispute between operators of oil and gas wells on neighboring units.²⁵⁹ The problem is not typically

²⁵⁵ 520 S.W.3d at 39; *see supra* text accompanying notes 234–237.

²⁵⁶ 618 S.W.3d at 857; *see supra* text accompanying notes 228–232.

²⁵⁷ No. 2:22-CV-188-KHR, 2023 U.S. Dist. LEXIS 221156; *see supra* text accompanying notes 110–114.

²⁵⁸ 679 F. Supp. 3d at 620; *see supra* text accompanying notes 238–241.

²⁵⁹ Although common, frac interference cases are not always litigated and rarely result in decisional law. *But see, e.g., Yobo*, 2023 U.S. Dist. LEXIS 155718.

associated with clashes between oil and gas wells and CCS wells on the same tract, but only because the CCS industry remains in its infancy. A frac hit is a form of multidimensional conflict because the surface owner's operation of a preexisting CCS well clashes with the mineral owner or lessee's hydraulic fracturing treatment of a well drilled for oil and gas production. When the fracturing treatment communicates with the CCS well in such a scenario, one view of the problem might consider the CCS well to be as much a cause of the clash as the mineral operator's fracturing treatment—after all, if the CCS well were not present, the fracturing treatment would have worked as designed. This leads to confusion as to which estate caused the clash and which estate was damaged by it.

The way out of this causal confusion is through the accommodation doctrine. The surface owner's CCS well, in this example, constitutes a preexisting subsurface-use activity. The mineral lessee's hydraulic fracturing treatment damaged and potentially precluded the continued operation of this preexisting activity. The mineral lessee is privileged to do so *only* if it lacked any reasonable alternative to its conduct on the premises. Having established the CCS well as preexisting, the surface owner has the opportunity to show that customary and reasonable alternatives existed on the premises to the mineral lessee's fracturing treatment.²⁶⁰ Perhaps the surface owner could demonstrate that the mineral lessee could have designed its fracturing treatment differently to avoid the communication or completed the well in a different interval or location in the tract or perhaps even arranged to reinforce the CCS well before conducting the treatment. Demonstrating the existence of a reasonable alternative would establish that the mineral lessee's failure to pursue such alternative injures the rights of the surface owner. If the surface owner cannot demonstrate that any reasonable alternatives existed, the accommodation doctrine is not satisfied and the damage to its CCS well would be considered *damnum absque injuria* (damage that does not injure another's legal right).²⁶¹

What emerges from application of the accommodation doctrine is a loose kind of first-in-time principle of priority.²⁶² Once the mineral estate establishes a lawful, authorized use of the surface or subsurface, it generally cannot be disturbed by the surface owner without compensation. It is likewise true that the mineral estate generally cannot interfere with the established uses of the surface estate. At the margins, however, the first-in-time principle yields to the dominance of the mineral estate, so that in cases where the surface estate's use is preexisting, the mineral estate may be privileged to interfere with it where necessary to do so. Despite this

²⁶⁰ See *Bay v. Anadarko E&P Onshore, LLC*, 912 F.3d 1249, 1257 (10th Cir. 2018).

²⁶¹ Schremmer, *supra* note 24, at 660–61.

²⁶² *Id.*

caveat, the accommodation doctrine will order the surface uses of the competing estates according to which came first in most cases, which also means that it will permit both uses to coexist most of the time.²⁶³ The accommodation doctrine also plays a role in dealing with the next likely source of conflicts: drilling through shallower formations to reach deeper ones.

ii. Accessing Deeper Strata

As one commentator observed, “The potential for conflict in multiple mineral development stems in the first instance from geologic processes which resulted in physical and chemical deposition of sediments.”²⁶⁴ The rock formations where oil and gas are found and porosity for CCS is located are layered, or deposited, on top of each other like a sandwich. Like spearing a club sandwich with a toothpick, drilling into deeper strata of the subsurface to produce oil and gas or to inject carbon dioxide means penetrating all the shallower zones layered above. Unlike in the sandwich example, drilling through shallower formations can cause real damage that infringes on the rights of other estate owners in those formations. The trouble comes in two varieties: the surface estate drilling through shallower mineral-bearing formations and the mineral estate drilling through shallower formations in use for CCS.

The first involves destruction of oil, gas, and other minerals by drilling wells for CCS. Drilling through shallower zones that contain valuable mineral deposits, including oil and gas, to bottom a CCS well in a deeper formation may destroy some amount of the mineral. Unless the drilling also interferes with current oil and gas development, such as by affecting the operation of an existing well, this scenario poses a unidimensional problem. Under the common law, the surface owner’s right to destroy the mineral is measured by the standard of unreasonable interference with the mineral estate’s fair chance to produce the mineral.²⁶⁵ Where the amount of oil, gas, or other minerals likely to be destroyed is slight, courts and juries, like the court in *Lightning Oil Co.* are not likely to find the interference to be unreasonable.²⁶⁶

The second variety of trouble involves the mineral estate drilling through a formation in current use by the surface estate for CCS. Such drilling would not only damage the sequestration formation, but, more importantly, it would likely trigger special requirements for reinforcing

²⁶³ See *id.*

²⁶⁴ Phillip William Lear, *Multiple Mineral Development Conflicts: An Armageddon in Simultaneous Mineral Operations*, 28 ROCKY MTN. MIN. L. INST. 2, 82 (1982).

²⁶⁵ 520 S.W.3d at 49 (Tex. 2017).

²⁶⁶ See *id.*

wellbores that penetrate a carbon storage facility under federal environmental law. As a condition to holding a Class VI injection well permit for CCS injection,²⁶⁷ the permittee must perform “corrective action” on all “penetrations” of the storage facility that could cause leakage.²⁶⁸ These penetrations include all wellbores (even plugged and abandoned wellbores).²⁶⁹ Corrective action may require reinforcing wellbores to ensure they can resist corrosion and will not allow carbon dioxide in the storage facility to leak out or communicate to underground sources of drinking water through the wellbore penetration.²⁷⁰ In a nutshell, if an oil and gas owner or lessee wishes to drill through a permitted carbon sequestration facility located in shallower strata, someone must pay for the federally required reinforcement of the wellbore.

This presents a multidimensional problem in the form of a clash between the surface owner’s current CCS project and the mineral owner’s current (or planned) oil and gas drilling.²⁷¹ If the surface owner (or its lessee or licensee) establishes a CCS facility in a formation before the mineral owner or lessee begins its plans to drill through the storage formation, the surface use would be preexisting under the first element of the accommodation doctrine. Whether this preexisting use is entitled to accommodation will depend on whether the oil and gas drilling will substantially impair or preclude the continuation of the CCS project. While this is a factual question, it is likely the two activities could coexist.²⁷² The Class VI permit requirements contemplate wellbore penetrations and require that they be remediated through corrective action.²⁷³ Since it is improbable that a wellbore penetration would preclude operation of the CCS project, the surface owner in our scenario is likely to fail in its claim for accommodation. Consequently, the costs of corrective action should rest with the permittee of the CCS facility, likely the surface owner or the person acting with the surface owner’s authority.

Furthermore, the mineral driller in this scenario would probably lack any reasonable alternative to drilling through the carbon storage formation to reach oil and gas reserves in a deeper formation. The natural alternative to vertical drilling is horizontal or directional drilling. However, there might be no way for a mineral developer to drill around a carbon-bearing

²⁶⁷ See *supra* Part I.B.

²⁶⁸ 40 C.F.R. § 146.84.

²⁶⁹ 40 C.F.R. § 146.90.

²⁷⁰ *Id.* § 146.84(c)(2), (d).

²⁷¹ Schremmer, *supra* note 24, at 668–69.

²⁷² See *Merriman v. XTO Energy, Inc.*, 407 S.W.2d 244, 249 (Tex. 2013) (interpreting the accommodation doctrine to require total preclusion of the surface estate’s existing use).

²⁷³ 40 C.F.R. §§ 146.84, 146.90.

formation from a location on the servient estate if the formation in which carbon is stored extends beneath the entire tract. Put another way, any alternatives to vertical drilling may require the use of other tracts of land to place the surface location of the wellbore, and this would not be considered reasonable under the accommodation doctrine.²⁷⁴ Unlike *Lyle* where some surface locations were left open for oil and gas drilling by the surface owner's solar facility,²⁷⁵ a typical CCS project would leave no windows in the formation for drilling. Thus, even if the surface owner could show that its CCS project would be precluded from continuing if penetrated by the mineral estate's wellbore, its claim for accommodation is likely to fail because alternatives to the penetration would be hard to find on the premises.

Additional complexities may be introduced where subsurface strata or their porosity have been severed by the surface estate and are owned separately by a third party.²⁷⁶ This would create a situation somewhat like having separate estates in oil and gas, coal, and the surface within a single tract of land, which is a familiar experience in coal-producing parts of the country.²⁷⁷ Despite the presence of an additional severed estate in pore space or in particular strata, the principles governing split estates would still apply. The famous case of *Chartiers Block Coal Co. v. Mellon* illustrates the basic framework.²⁷⁸ In a dispute between the owner of a coal estate and the holder of an oil and gas lease over whether the oil and gas lessee may drill through a seam of coal to access the oil and gas formation, the *Chartiers Block* court explained the basic principles as follows: each estate is entitled to the right to enjoy its property, free from the unreasonable interference of other estates.²⁷⁹ This includes the right of each estate to access its property by drilling through shallower formations, as well as the reciprocal duty to allow the other estates to do likewise.²⁸⁰ Each estate must exercise this right reasonably and with due regard for the rights of the other estates whose property is damaged in the process.²⁸¹ None of the parties may completely destroy the property of the others “nor even to seriously depreciate it, without ample compensation.”²⁸²

However, incidental taking or destruction of the property of other estates is privileged so long as it is truly incidental. For instance, in *Guffey*

²⁷⁴ See *Sun Oil Co. v. Whitaker*, 483 S.W.2d 808, 812 (Tex. 1972).

²⁷⁵ 618 S.W.3d at 863–64.

²⁷⁶ The possibilities are discussed in Schremmer, *supra* note 24, at 651–53, 687–88.

²⁷⁷ *Id.*

²⁷⁸ 25 A. 597 (Pa. 1893).

²⁷⁹ *Id.* at 599

²⁸⁰ *Id.*

²⁸¹ *Id.* at 598.

²⁸² *Id.*; accord *Rend v. Venture Oil Co.*, 48 F. 248, 248–49 (W.D. Pa. 1891).

v. Stroud the lessee of oil rights was permitted to drill through shallow gas-bearing formations owned by a separate gas lessee to produce oil from lower zones, even if this meant bringing “to the surface so much of the gas as was necessary in the proper drilling for oil.”²⁸³ The oil lessee was not entitled, however, to produce or consume the gas for its own sake but only as reasonably necessary to the drilling and production of oil.²⁸⁴ Thus, incidental use or destruction of the property of the other estate is one of the rights both estates enjoy reciprocally.

Under these principles, each estate holds an easement in the others to access its property contained within lower strata. Thus, when one estate seeks to drill through a formation containing the property of another estate, the drilling estate acts pursuant to its easement as the dominant estate and accordingly must conduct the drilling reasonably and within the scope of its easement. The servient estate, which is subject to the drilling, owes a duty not to unreasonably interfere with the dominant estate’s rightful activities.

As with split estates generally, the accommodation doctrine applies to multidimensional clashes of the estates’ correlative use rights. Thus, if a mineral owner or lessee seeks to drill through a shallower formation containing carbon dioxide injected in the pore space owner’s CCS project, the accommodation doctrine would guide which party must suffer the costs of the drilling. This hypothetical is explored in more detail elsewhere.²⁸⁵

Overarching all of these legal principles is the equitable power that courts may exercise in certain circumstances to coordinate the location, timing, and means of drilling through the property of other estates.²⁸⁶ For example, in *Monongahela River Consolidated Coke Co. v. Greensboro Gas Co.*, the court allowed an oil and gas lessee to drill through another owner’s seam of coal but exercised its equitable powers to prescribe certain safety precautions. The court specified the manner of construction of the well, required daily testing for escaping gasses, prescribed the methodology for plugging the well if abandoned, and required the oil and gas lessee to post a bond to indemnify the coal owner against damage.²⁸⁷ Notably, the coal had alleged “imminent danger to the lives of the men employed in the

²⁸³ 16 S.W.2d 527, 528 (Tex. 1929).

²⁸⁴ *Id.*

²⁸⁵ Schremmer, *supra* note 24, at 698–99.

²⁸⁶ *Lear*, *supra* note 209, at 201 (citing *T.W. Phillips Gas & Oil Co. v. Manor Coal Co.*, 68 Pa. Super. 372 (1917)).

²⁸⁷ 20 Pa. D. 320, 324–25 (Pa. Com. Pl. 1910).

mines by reason of the probability of gas escaping from the well into” the owner’s mines.²⁸⁸

2. *Occupying Pore Space*

The ultimate battle ground in CCUS is the pore space itself. Both surface and mineral estates have reasons to use and occupy the pore space in land, including carbon dioxide sequestration. As established in Part II, the surface estate is entitled to store carbon dioxide in pore space for CCS while the mineral estate is generally empowered to inject carbon for CCU even if that entails sequestering the carbon in place in the pore space.²⁸⁹ The mineral estate may also occupy pore space for other purposes that are incidental and reasonably necessary to enjoyment of the minerals, principally including disposal of produced water. The interactions between uses of the pore space for these purposes are discussed in greater depth in other work and will only be summarized here.²⁹⁰

The surface estate holds title to the pore space and thus may inject carbon dioxide into it for permanent storage. The surface estate may also grant the authority to another to allow carbon dioxide injected elsewhere to migrate into and permanently occupy the pore space under the surface owner’s tract.²⁹¹ In either case, the surface estate owes duties not to unreasonably interfere with the mineral estate’s easement in the pore space. This generally precludes the surface owner from injecting or permitting carbon dioxide to contaminate oil and gas reserves or interfere with the operation of existing oil and gas wells.²⁹² Notwithstanding this limit, minimal interference or contamination would probably not be actionable so long as it does not substantially interfere with the mineral estate’s fair chance at taking the oil and gas in place.²⁹³

The mineral estate enjoys the right to use and occupy pore space as reasonably necessary for enjoyment of the minerals as an incident of its ownership of the minerals. Under the common law, use of pore space for such purposes is not compensable. However, some states’ surface damage acts require payment to surface owners for use of pore space for such things as saltwater disposal. Under North Dakota’s act, for example,

²⁸⁸ *Id.* at 321.

²⁸⁹ *See supra* Part II.A.1.

²⁹⁰ Schremmer, *supra* note 24, at 669–72.

²⁹¹ *Id.* at 649–51.

²⁹² *Cf.* *Cassinis v. Union Oil Co.*, 18 Cal. Rptr. 2d 574 582 (Cal. Ct. App. 1993) (holding surface lessee liable for trespass to mineral lessee for injecting wastewater that contaminated mineral lessee’s wells).

²⁹³ *See* *Lightning Oil Co. v. Anadarko E&P Onshore, LLC*, 520 S.W.3d 39, 49 (Tex. 2017).

mineral developers must compensate surface owners for the value of lost access and use of pore space, even when the surface owner is not currently using and has no plans to use the pore space for other purposes.²⁹⁴ The same is true under Montana's act.²⁹⁵ South Dakota's act, on the other hand, does not include language requiring compensation for "lost access" or "use" and has been interpreted to require actual damage to the surface estate before compensation is owed.²⁹⁶

Multidimensional clashes over use of pore space are inevitable. To illustrate, suppose a surface owner or lessee seeks to inject carbon dioxide for storage into the same formation in which a mineral owner or lessee is conducting an enhanced recovery operation—perhaps even a CO₂ EOR operation for CCU. It is obvious the two projects cannot occupy the same pore space at the same time. Under the accommodation doctrine, priority often goes to the first to establish its use of the pore space. If that happens to be the mineral estate, the surface estate will be liable for interference if it allows its operation to disrupt the mineral estate's EOR activities. If the surface estate's project is established first, the mineral estate would be liable for interfering with it unless there are no reasonable alternatives to the mineral estate's proposed EOR project within the premises. This would probably be the case, since the residual hydrocarbons targeted by an EOR project are recoverable only by EOR and only in the formation where they exist. In this way, a mineral estate's EOR project is likely to take precedence over a surface estate's CCS project in the same formation, regardless of temporal seniority.

If the mineral estate's use of the pore space were for some other activity, such as saltwater disposal, the surface estate would have a better argument for accommodation because other methods of saltwater disposal exist. For example, the mineral estate might deepen or recomplete its disposal well to inject into a different zone. Whether such alternatives would be customary and reasonable would be a question for a trier of fact. The uncertainty inherent in such a question counsels in favor of resolving it by agreement between the parties rather than by a jury.

²⁹⁴ *Mosser v. Denbury Res., Inc.*, 898 N.W.2d 406, 415 (N.D. 2017) (interpreting N.D. CENT. CODE § 38-11.1-04); *Continental Res., Inc. v. Fisher*, No. 18-cv-181, 2021 U.S. Dist. LEXIS 227504, at *16–24 (D.N.D. Nov. 29, 2021); *see also* Schremmer, *supra* note 24, at 670–71.

²⁹⁵ *Burlington Res. Oil & Gas Co., LP v. Lang & Sons, Inc.*, 259 P.3d 766, 771 (Mont. 2001) (interpreting MONT. CODE ANN. § 82-10-504(1)(a)).

²⁹⁶ *Brown v. Continental Res., Inc.*, 58 F.4th 1023, 1026–27 (8th Cir. 2023) (interpreting S.D. CODIFIED LAWS § 45-5A-4).

3. *Exploration*

Historically, surface estate owners have had few if any reasons to explore the structures and contents of subsurface geology. This fact has led some courts to suggest a surface estate has no legal interest, that is, any right to conduct subsurface exploration and this right is exclusive to the mineral estate.²⁹⁷ This is surely incorrect. Since the surface estate retains title to subsurface structures and contents other than what minerals have been severed,²⁹⁸ it must also enjoy as an incident of that ownership the right to explore the structures and substances to which it holds title.²⁹⁹ This flows from simple logic and common sense, as reflected in the old common law maxim that when a property interest is recognized in law, the rights necessary to enjoyment of the interest are also impliedly recognized.³⁰⁰

Given that each estate enjoys rights to use the land to explore their respective property, subsurface exploration presents yet another example of the correlative relationship between split estates, and another opportunity for both unidimensional and multidimensional problems to arise. Some of the particulars of these conflicts are explored elsewhere.³⁰¹ Disputes over exploration differ from other concurrent-use disputes for the primary reason that one party's exploration of the subsurface of a tract does nothing to diminish the ability of another party to explore the same tract. The likely source of conflict, therefore, is not to be found in the ability to conduct exploration, but in the use and control of the information that exploration reveals to the explorer.³⁰²

If the surface estate conducts exploration operations to ascertain the land's potential for CCS, it is likely to learn information incidentally that bears on the value of the land for oil and gas production, and vice versa. There is nothing actionable about incidental "peeking" in itself, provided that it is truly incidental and the information obtained is not used to frustrate the other estate's fair chance at enjoying its property.³⁰³ Thus, if the surface estate learns information relative to the mineral estate while exploring the land's CCS potential (or for any purpose related to

²⁹⁷ See *Grynberg v. City of Northglenn*, 739 P.2d 230 (Colo. 1987); *Phillips Petroleum Co. v. Cowden*, 241 F.2d 586 (5th Cir. 1957).

²⁹⁸ See *supra* Part II.A.1.

²⁹⁹ This is also the position taken by Professor Owen Anderson. Owen L. Anderson, *Geophysical Trespass Revisited*, 5 TEX. WESLEYAN L. REV. 137, 146 (1999).

³⁰⁰ *Williams v. Gibson*, 4 So. 350, 352 (Ala. 1888).

³⁰¹ Schremmer, *supra* note 24, at 672–74.

³⁰² *Id.*

³⁰³ *Cf. Guffey v. Stroud*, 16 S.W.2d 527, 527 (Tex. 1929) (permitting an oil lessee to take or destroy natural gas incidentally in drilling for oil); *Grynberg v. City of Northglenn*, 739 P.2d 230, 237 (Colo. 1987).

enjoyment of the surface estate), it may not use that information to interfere with the mineral estate's fair chance at profiting from the minerals.³⁰⁴ This may preclude publishing the information or sharing it with third parties.³⁰⁵ It might arguably also preclude using the information, without disclosure, to gain an advantage in negotiations with the mineral estate.³⁰⁶ Likewise, the mineral estate may obtain information relative to the value or potential of the surface estate (such as its suitability for CCS) and would act unreasonably to use the information so as to interfere with the profitable use of the surface estate for purposes not directly intended to enjoy the mineral estate. "The touchstone for liability is the effect on the [other] estate's ability to enjoy its property."³⁰⁷

Considering these principles, the owner of either split estate might be wise to approach the other estate owner before engaging in any subsurface exploration. The potential for cooperation is great because the methods of exploration and the targeted formations are the same. Cooperation on the front end would avoid the information asymmetry that could lead to disputes over use and control of the data.

B. Coalbed Methane Production

1. Coal, CBM, and Pores

In addition to oil and natural gas production, there is a significant amount of coalbed methane (CBM) production in parts of the United States suitable for CCUS.³⁰⁸ The conflicts that might arise between CCUS and oil and gas production might also occur with CBM production, with the additional complication that coalbed methane is trapped within beds or seams of coal.³⁰⁹ In other words, coalbed methane is commingled with another exploitable resource, coal,³¹⁰ which may be owned and developed independently of the CBM by a third-party coal owner or lessee. To complicate matters further, coal seams are also potential targets for CCUS

³⁰⁴ *Grynberg*, 739 P.2d at 237.

³⁰⁵ *Id.*

³⁰⁶ See Schremmer, *supra* note 24, at 673.

³⁰⁷ *Id.*

³⁰⁸ These include areas in Wyoming, New Mexico, Colorado, Alabama, West Virginia, and Pennsylvania, among others. See *Coalbed Methane Production*, U.S. ENERGY INFO. ADMIN. (Dec. 30, 2022), https://www.eia.gov/dnav/ng/NG_PROD_COALBED_S1_A.htm.

³⁰⁹ McGinley, *supra* note 37, at 377–78.

³¹⁰ See *id.* at 370; Phillip W. Lear & Matthew Snow, *Coal and Coalbed Methane Development Conflicts Revisited: The Oil and Gas Perspective*, PUBLIC LAND LAW, REGULATION, AND MANAGEMENT 10-1 (Fdn. Natural Resources & Energy L. 2003).

projects.³¹¹ Coal seams that are suitable for both CBM production and CCUS represent a perfect storm of multiple-resource-development problems.

Historically, CBM was a nuisance and a safety risk for coal mines that miners sought to control by various means of extracting or venting the gas from the subsurface and away from the underground mine.³¹² CBM gradually became seen as a potential source of energy, especially during the energy crisis of the 1970s. The gas is generally sweet because of its lack of hydrogen sulfide and is known for its high heating value. As of 2017, the United States produced around 980 billion cubic feet of CBM, mostly from coal deposits in Colorado, New Mexico, and Wyoming—all states where significant CCUS activity is likely.³¹³

When it is produced for commercial sale, CBM is often extracted in a similar manner to natural gas. Typically, vertical small-diameter boreholes are drilled into a coal deposit to produce the gas and hydraulically fractured, or “hydrofractured,” to stimulate production, much like a fracking treatment of an oil or gas well.³¹⁴ Hydrofracturing can be damaging to the structure of the coal seam³¹⁵ and may pose significant safety hazards to miners working in underground coal mines.³¹⁶ Other methods exist to extract CBM, including through horizontal wellbores drilled from within a coal mine or through “gob” wells constructed in piles of coal rubble resulting from longwall mining.³¹⁷

In addition to CBM, there is another important natural resource found in coal seams: pore spaces and fractures. These are the parts of a coal seam where CBM is located, and they are the parts that may be used for sequestering carbon dioxide through CCUS.³¹⁸ For this reason, undisturbed or “unmineable” coal seams, along with depleted oil and gas reservoirs and saline aquifers, have potential for CCUS.³¹⁹ Crucially, the pores of coal seams are integral parts of the corpus or “matrix” of the coal

³¹¹ INT’L ENERGY AGENCY GREENHOUSE GAS R&D PROGRAMME, SAFE STORAGE OF CO₂ (2006), (available at <https://ieaghg.org/publications/safe-storage-of-co2/> [<https://perma.cc/YF96-M4WN>]).

³¹² Conrad P. Armbrrecht, *Multimineral Development Conflicts—Coalbed Methane in the Balance*, COALBED GAS DEVELOPMENT 4B, 4B-12 to -17 (Fdn. Natural Resources & Energy L. 1992).

³¹³ Coalbed Methane Production, *supra* note 308.

³¹⁴ McGinley, *supra* note 37, at 373–74.

³¹⁵ *Id.*

³¹⁶ Armbrrecht, *supra* note 312, at 4B-19 to -20.

³¹⁷ *Id.* at 4B-20 to -25.

³¹⁸ Pengwei Mou, et al., *Coal Pores: Methods, Types, & Characteristics*, 35 ENERGY & FUELS 7467, *passim* (2021).

³¹⁹ INT’L ENERGY AGENCY GREENHOUSE GAS R&D PROGRAMME, *supra* note 311.

itself.³²⁰ Unlike the pore space of rock formations where oil and gas are found, coal pores are part of the very resource to which the coal estate owns title, rather than merely the container in which the resource exists before extraction.

When carbon dioxide is injected into a coal seam, it is adsorbed into the pores on the surface of the coal and in fractures within the coal seam, where the carbon is sequestered. The carbon should remain in place so long as the coal seam is not mined or disturbed.³²¹ When adsorbed, the carbon may displace any CBM located in the pores and fractures, which can then be recovered for commercial sale. This process is known as CO₂ enhanced coal bed methane recovery (ECBM), and it is a form of CCU.³²² Thus, just like depleted oil and gas reservoirs, coal seams furnish an opportunity for either CCS or CCU.

2. *Ownership of CBM and Coal Pores*

In thinking about the potential interactions between CCUS and CBM production, the familiar threshold task is ascertaining title to the relevant subsurface resources among multiple overlapping property interests. Generally, title to the coal will have been severed from the land, so that at least two separate estates—a surface estate and a coal estate—will exist in a tract of coal lands. Additionally, it is also possible, and even likely in some areas, that title to or a lease of oil and gas will have been severed from the surface estate. That would bring the count to three distinct estates: surface, coal, and oil and gas.

With the distinct estates identified, the task becomes ascertaining which estate holds title to the relevant resources. Here, those resources are the pore space and fractures within a coal seam and the CBM within a coal seam. There exists some law pertaining to ownership of CBM among split estates, but none specifically addressing ownership of the pores and fractures. Nevertheless, some analogies and extrapolations from the rules governing CBM ownership can inform analysis as to pore spaces and fractures.

i. Federal Lands

For federal public lands, ownership of CBM among split estates depends upon which congressional statute provided authority for the government patent of land at issue. As discussed earlier, regardless of the authorizing statute, reservations under government patents are construed

³²⁰ Mou, et al., *supra* note 318, at 7467.

³²¹ *See id.*

³²² *Id.* ECBM has been tested in pilot projects including one in the San Juan Basin.

broadly in favor of the government.³²³ The federal government reserved title to the coal in over 20 million acres of land under the Coal Lands Acts of 1909 and 1910.³²⁴ These reservations have been held *not to include* title to the coalbed methane, which passed to the patentee of the surface estate as a distinct mineral from coal.³²⁵ In *Amoco Production Company v. Southern Ute Indian Tribes*, the U.S. Supreme Court justified this interpretation on the basis that Congress, “intended to reserve only the solid rock fuel that was mined, shipped throughout the country, and then burned to power the Nation’s railroads, ships, and factories.”³²⁶ Because CBM was not considered as part of the coal itself in the years 1909 and 1910, but as a distinct substance that escaped from the coal, CBM was not reserved under Coal Lands Acts patents.³²⁷ Coal pores, on the other hand, are part of the solid mass of coal, and indeed are inseparable from it. If Congress intended to reserve the solid rock itself, it hardly could have avoided also reserving the pores residing on it and within it.

Lands patented under the SRHA of 1916 reserved to the United States all minerals, *including* coalbed methane.³²⁸ Given the breadth of courts’ interpretation of the mineral reservation under the SRHA, it is likely the reservation also encompasses coal pores, because coal is unquestionably a reserved mineral and the pores are part of the very matrix of a coal seam. Moreover, some courts have held that the government reserved subsurface rock structures under the SRHA in relatively ordinary rock layers like limestone and dolomite.³²⁹ It is therefore likely that subsequent courts would also find that SRHA reservations also encompass the pores within the matrix of a coal seam.

This Article argued above that the broad mineral reservation under the SRHA probably does not include title to pore space within sedimentary rock formations.³³⁰ Could it not be argued that coal pores are distinct from the coal itself in the same way that pore space is distinct from the sedimentary rocks where it resides? And could it not be said that coal pore space, like ordinary pore space in sedimentary rocks, would lose its only

³²³ See *supra* Part II.B.

³²⁴ Lear & Snow, *supra* note 310, at § 10.3 (citing *Amoco Prod. Co. v. S. Ute Indian Tribes*, 526 U.S. 865 (1999)).

³²⁵ *Id.*

³²⁶ 526 U.S. 865, 875 (1999).

³²⁷ *Id.* at 874.

³²⁸ *Id.* at § 10.03; see also *supra* Part II.B.1.

³²⁹ See *United States v. Union Oil Co. of Cal.*, 549 F.2d 1271, 1279 (9th Cir. 1977); *Rosette Inc. v. United States*, 277 F.3d 1222, 1229 (10th Cir. 2002). *But see* *True Oil LLC v. Bureau of Land Mgmt.*, No. 2:22-CV-188-KHR, 2023 U.S. Dist. LEXIS 221156, at *15 (D. Wyo. Oct. 30, 2023) (holding that subsurface rock structures and pore space were not reserved by SRHA mineral reservations).

³³⁰ See *supra* Part II.B.1.

value as a storage container if it were to be mined and carried away from the land?

These arguments are less persuasive with respect to coal pore space than to ordinary pore space because coal seams in which coal pores reside are undeniably mineral in character, unlike the sedimentary rocks where most pore space resides. Coal seams are highly valuable when removed from the land and sold, whereas ordinary sedimentary rocks generally are not.³³¹ Where ordinary sedimentary rock layers and the pore space within them are chiefly valuable for their capacity to store fluids in place, coal seams and their pores are chiefly valuable when removed and sold apart from the land as a valuable commodity. The porosity of ordinary rocks becomes less valuable when it is mined, while coal pores become more valuable. This strongly suggests that coal pores are truly “mineral” in character under the SRHA while ordinary pore space is not.

ii. Private Lands

Under state law governing private lands, title to the CBM in a given tract depends on the intent of the parties to the deed. Where the instrument of conveyance is not clear and specific about the parties’ intent, courts do not agree about which estate should hold title to CBM. Montana and Wyoming courts hold that title to CBM passes with ownership of the oil and gas because it is a gas, rather than part of the coal.³³² Pennsylvania courts take the opposite view and hold that title to CBM is inseverable from the coal.³³³ Alabama precedent holds that the owner of a coal seam is entitled to capture CBM gas within the seam but that “once that gas escapes unrecovered from the coal and migrates into other strata,” the holder of the gas estate is entitled to produce it.³³⁴ Courts are also somewhat split on whether typical language in an oil and gas lease conveys an interest in CBM. Most courts answer in the affirmative,³³⁵ but the West Virginia Supreme Court held that CBM is *not included* in the grant of an oil and gas lease absent specific language granting such rights.³³⁶

A jurisdiction’s approach to determining title to CBM may be helpful in understanding how its law would treat title to the pores and fractures

³³¹ *Cf. supra* Part II.B.1.

³³² *Lear & Snow, supra* note 310, at § 10.03.

³³³ *Id.* For a thorough discussion, see generally *Pierce, supra* note 39.

³³⁴ *NCNB Tex. Nat’l Bank, N.A. v. West*, 631 So.2d 212, 229 (Ala. 1993).

³³⁵ *See* 3 *MARTIN & KRAMER, supra* note 78, § 665.

³³⁶ *Energy Dev. Corp. v. Moss*, 591 S.E.2d 135, 146 (W. Va. 2003).

within a coal seam.³³⁷ The Pennsylvania Supreme Court, in *United States Steel Corp. v. Hoge*, adopted what is called the “container theory” of coal ownership.³³⁸ Under the container theory, a conveyance of ownership of a seam of coal conveys “a ‘container’ which includes anything within the confines of the coal container.”³³⁹ In *Hoge*, the court held that coal ownership includes title to CBM because “such gas is present in coal [and] must necessarily belong to the owner of the coal, so long as it remains within his property and subject to his exclusive dominion and control.”³⁴⁰ Applying the logic of the container theory to the pores on coal where CBM is trapped and where carbon dioxide might be injected for CCUS, the owner of a coal estate would own title to the pores because they are present in or on the coal.³⁴¹

Most courts, however, have not adopted the container theory and hold instead that CBM is not transferred with ownership of the coal. The Montana Supreme Court, for example, held that a conveyance of “all coal and coal rights” does not include CBM because “coal and gas are mutually exclusive terms” and “the express grant of one specific mineral does not imply the grant of all other minerals not referred to in the grant,” under the canon of construction *expressio unius est exclusio alterius* (the expression of one thing implies the exclusion of another).³⁴² Unlike CBM, coal pores are not a distinct mineral or substance from coal, and “coal” and “coal pores” are not “mutually exclusive terms.” The court’s reasoning for excluding CBM from the coal estate does not support separating title to the coal pores from title to the coal.³⁴³

Complicating matters in Montana, the supreme court concluded in *Burlington Resources Oil & Gas Co., LP v. Lang & Sons Inc.*, that a reservation of “coal, oil, gas, and other minerals in and under” land did not include title to pore space.³⁴⁴ The court reasoned that pore space is retained by the

³³⁷ I would note that courts have held that the coal estate retains title to the voids and caverns created in the course of extracting the coal and may use them as corridors “for the carriage of minerals.” *E.g.*, *Moore v. Indian Camp Coal Co.*, 80 N.E. 6, 8 (Ohio 1907). This fact is of little use to CCUS proponents, however, both because these caverns probably lack sufficient storage capacity for an economic carbon sequestration project and because the coal estate’s rights in the caverns are limited to supporting mining of the coal. *See Middleton v. Harlan-Wallins Coal Corp.*, 66 S.W.2d 30, 31–32 (Ky. 1933).

³³⁸ 468 A.2d 1380 (Pa. 1983); *accord* *Pierce*, *supra* note 39, at 610 (referring to the “container theory”).

³³⁹ *Pierce*, *supra* note 39, at 609–11.

³⁴⁰ *Hoge*, 468 A.2d at 1383.

³⁴¹ *See* *Anderson*, *supra* note 37, at 135–36.

³⁴² *Carbon Cnty. v. Union Reserve Oil Co., Inc.*, 898 P.2d 680, 684–86 (Mont. 1995).

³⁴³ *See id.*

³⁴⁴ 259 P.3d 766, 770 (Mont. 2011).

surface estate along with all “non-mineral material beneath the physical boundaries of property.”³⁴⁵ The “non-mineral material” phrase is potentially important, as it might distinguish pore space in ordinary sedimentary rock layers from coal pores residing within material that is usually considered “mineral” in character.

Wyoming courts consider the facts and circumstances surrounding the execution of the conveyance document as well as the objective meaning of the document’s language to determine, “case-by-case,” whether a deed or lease of coal also transferred rights to CBM.³⁴⁶ Special attention is paid to the circumstances and context surrounding the grant or reservation and the utility of the substance at issue as understood at that time. Such an approach is self-consciously subjective and, for all its potential merits in giving effect to the true intent of the parties,³⁴⁷ it is difficult to predict how a court applying the approach would determine title to coal pores under any tract of land. The historical context surrounding the grant or reservation of a coal estate is usually devoid of circumstances suggesting the utility of coal pores for CCUS, making it difficult to glean useful context from circumstantial evidence.

More broadly, Wyoming courts have employed Professor Eugene Kuntz’s manner of enjoyment theory to ascertain the general intent of the parties to an unspecific grant or reservation of minerals.³⁴⁸ As noted previously in Part II.A.1.a, Kuntz suggested that where the parties’ specific intent as to the scope of the grant or reservation is unascertainable, “the general intent should be arrived at . . . by considering the *purposes* of the grant or reservation in terms of manner of enjoyment intended in the ensuing interests.”³⁴⁹ Per Kuntz:

The manner of enjoyment of the mineral estate is through extraction of valuable substances, and the enjoyment of the surface is through retention of such substances as are necessary for the use of the surface, and these respective modes of enjoyment must be considered in arriving at the proper subject matter for each estate.³⁵⁰

³⁴⁵ *Id.*

³⁴⁶ *Newman v. RAG Wyo. Land Co.*, 53 P.3d 540, 549 (Wyo. 2002); *McGee v. Caballo Coal Co.*, 69 P.3d 908, 914 (Wyo. 2003); *see generally* *Pierce*, *supra* note 39, at 615–20.

³⁴⁷ *See generally* *Pierce*, *supra* note 39.

³⁴⁸ *Id.* at 615.

³⁴⁹ *Id.* (citing Eugene O. Kuntz, *The Law Relating to Oil and Gas in Wyoming*, 3 WYO. L.J. 107, 112 (1949)).

³⁵⁰ Kuntz, *supra* note 40, at 112.

The general intent or purpose of a mineral severance, in Kuntz's view, is to enable simultaneous enjoyment of the valuable substances below ground and of the surface of the land itself.³⁵¹ Substances that are chiefly valuable apart from the land and that may be extracted simultaneously with the separate enjoyment of the land are generally understood to be the kinds of things severed in a mineral estate.

Kuntz's general-intent analysis is helpful in deciding whether a severance of coal would generally be intended to include or exclude the coal pores. Coal is a classic mineral substance. The manner of enjoyment of coal is through extraction and marketing of the coal as a valuable commodity apart from the land. Coal is not strictly necessary for use of the surface (except for providing subjacent support) and can, at least to an extent, be extracted simultaneously with use of the surface. Coal pores, in contrast, are themselves chiefly valuable if left in place where they can provide storage capacity for injected fluids. Yet, while not enjoyed apart from the soil, coal pores also are not necessary for the use of the surface. It is feasible to inject fluids, like carbon dioxide, into coal pores while the surface of the land is simultaneously developed for other purposes. These considerations suggest differing conclusions as to whether coal pores are generally intended to be part of a mineral estate in coal or remain with the surface estate.

The decisive factor might be that the enjoyment of a coal estate would be constantly threatened if title to the coal pores remained separately owned by the surface estate. Implying title to coal pores in the surface estate would give to the surface estate the right to annihilate the value of the coal estate. Practically speaking, the only use of coal pores is the storage or sequestration of fluids. Yet, sequestering substances like carbon dioxide in the pores of a coal seam would render the seam unmineable. Thus, if title to the pore space were to remain in the surface estate, this title would hang over the head of the coal estate like the sword of Damocles. The coal estate would enjoy the economic benefits of mining and marketing the coal as a commodity, but its fortune would always be subject to the possibility of complete destruction at the hands of the surface estate.

If there is little or no possibility of using coal pores for fluid storage while also mining the coal seam, would there be any way for separate estates to enjoy title to the coal pores and coal simultaneously? If not, would there be any purpose in severing an estate in coal without also severing ownership of the coal pores? It would seem there would be no purpose in this if the reason for severing estates in minerals is to enable

³⁵¹ *See id.*

separate, simultaneous enjoyment of the minerals and the surface.³⁵² Thus, where separate enjoyment of coal would not be feasible apart from title to the coal pores, there is no reason to suppose the parties to the severance transaction intended to separate ownership of the coal from the pores. Therefore, it is likely that parties to a coal severance would ordinarily intend to sever the entire matrix of the coal seam, pores and all. There would be little sense in trying to separate the pores from the coal given that use of one would all but preclude use of the other.

It is also theoretically possible, though unlikely, that title to coal pores could rest with the owner of CBM. As with grants and reservations of ownership of oil and gas in place, it is unlikely that parties to a deed creating an interest in CBM generally intend for the interest to encompass both the CBM itself and the place where the CBM is found.³⁵³ This is especially improbable in light of the fact that the place where CBM is found (i.e., coal seams) is itself a valuable mineral that may be enjoyed independently of the CBM.

Although ownership of CBM usually would not entail ownership of the coal pores where it is found, title to CBM would include such incidental rights in the coal pores as are reasonably necessary for the enjoyment of the CBM.³⁵⁴ Just as the oil and gas estate enjoys incidental rights to use subsurface rock formations and pore space to conduct EOR using CO₂, the owner of CBM ought to enjoy the right to use coal pores for ECBM. This possibility entails significant coordination problems between coal mining and ECBM, which may preclude the CBM owner from pursuing ECBM in all or a portion of a coal seam.³⁵⁵

While there are good reasons to suppose, at least in container theory states, that coal pores are typically part of a coal estate, this position is not free from doubt. It would seem odd if ownership of a removable, depleting resource like a coal seam could entail ownership of the right to leave the resource in place in perpetuity while using it for storage purposes unrelated to development of the resource's value as a commodity. Professor Anderson made a similar observation that to entitle a coal owner to use a coal seam for permanent CCS appears to convert what at law is a determinable estate that reverts to the surface owner after removal of the coal into an absolute estate that can never be divested.³⁵⁶

³⁵² *See id.*

³⁵³ *See supra* Part II.A.1.

³⁵⁴ *See supra* Part III.A.1.

³⁵⁵ *See infra* Part IV.B.3.

³⁵⁶ Anderson, *supra* note 37, at 135–36.

Perhaps the answer to this puzzle is that, like all determinable estates, fee title to coal might be perpetual, so there is nothing unwarranted about allowing a coal estate to endure perpetually because its owner chose to utilize its capacity for carbon storage rather than mine it for its value as a fuel commodity. After all, since fee interests in real property like an estate in coal are not subject to abandonment,³⁵⁷ if the coal estate owner simply did nothing with its interest, the estate would endure forever without profiting the owner or society. If this could be permitted, surely it would no more offend the purpose of the coal estate to permit its owner to use the coal pores for sequestration rather than extraction.

iii. Statutory Declarations of Pore Space Ownership

At least two states with significant CBM reserves, Wyoming and Montana, have adopted statutory declarations of pore space ownership. Montana's statute provides, "[i]f the ownership of the geologic storage reservoir cannot be determined from the deeds or severance documents related to the property by reviewing statutory or common law, it is presumed that the surface owner owns the geologic storage reservoir."³⁵⁸ A "geologic storage reservoir" is further defined as "a subsurface sedimentary stratum, formation, aquifer, cavity, or void, whether natural or artificially created, including vacant or filled reservoirs, saline formations, and *coal seams suitable for or capable of being made suitable for injecting and storing carbon dioxide.*"³⁵⁹ Wyoming's statute provides, "[t]he ownership of all pore space in all strata below the surface lands and waters of this state is declared to be vested in the several owners of the surface above the strata."³⁶⁰ "Pore space" is further defined "to mean subsurface space which can be used as storage space for carbon dioxide or other substances" and thus would plainly encompass coal pores.³⁶¹

At first blush, these statutes appear to simplify the question of coal pore ownership among split surface, coal, and gas estates by placing title clearly in the surface estate unless express language in a prior deed conveyed it elsewhere. By their terms, these statutes apply both to pore space within ordinary rock formations and to pores in coal seams. While these statutes appear to be merely declaratory of the common law as applied to the former type of pore space, it is uncertain whether they merely clarify and codify the common law as to coal pores or if they instead modify it by taking title to coal pores from coal estates and giving it to surface estates. Which one it is depends on a proper interpretation of the

³⁵⁷ See *Gerhard v. Stephens*, 442 P.2d 692, 711 (Cal. 1968).

³⁵⁸ MONT. CODE ANN. § 82-11-180(3).

³⁵⁹ *Id.* § 82-11-101(12)(a) (emphasis added).

³⁶⁰ WYO. STAT. ANN. § 34-1-152(a).

³⁶¹ *Id.* § 34-1-152(d).

common law, which as the preceding Part demonstrates, is entirely unsettled on this point. Regardless of the validity of these statutes, the prudent planning lawyer is likely to seek the consent of all estates with an interest in coal pores before commencing a CCUS project in a coal seam.³⁶²

* * *

At bottom, the ownership of coal pores and the right to inject carbon dioxide into them for CCUS is unsettled except insofar as it has been validly clarified by statute in certain jurisdictions. For the lawyer tasked with arranging property rights for a CCUS project, the prudent approach may be to acquire the rights to inject carbon dioxide into coal seams from all possible holders of the rights.

3. *Co-Locating CCUS and CBM Development*

In theory, the same common law principles that guide the co-location of CCUS and oil and gas development would also govern parties conducting CCUS and CBM development within a common coal seam.³⁶³ For that matter, the same principles would guide the concurrent operation of a coal mine and a CCUS project, where title to the coal pores is separated from the coal itself.³⁶⁴ In practice, however, CCUS projects probably cannot coexist with mining operations in the same coal seam, for the reasons explained in the previous subpart. CCUS and CBM development within the same coal seam, in contrast, may be highly complementary if conducted as ECBM. But injection of carbon for CCS (pure storage) would likely preclude CBM development in the same coal seam, and vice versa.

Consider an illustrative hypothetical. An owner of CBM wishes to drill to extract the CBM from a coal seam in which another party holds title to the coal pores (either the owner of a coal estate or the surface estate) and wishes to inject carbon dioxide into the coal seam for CCUS. Because the coal pore owner lacks title to the CBM, the only type of CCUS the pore owner may pursue is pure storage or CCS. This scenario thus presents two parties that both enjoy the right to inject carbon dioxide into the same coal seam, but for purposes that are likely irreconcilable.

³⁶² See *infra* Part IV.B.3.

³⁶³ See *supra* Part IV.A.

³⁶⁴ This Article does not delve into the concurrent development of CBM and coal mining, but several good articles have explored the topic. See generally Lear & Snow, *supra* note 310; Lear, *supra* note 264; Armbrrecht, *supra* note 312, at 4B-19 to -20; Bruce M. Kramer, *Conflicts Between the Exploitation of Lignite and Oil and Gas: The Case for Reciprocal Accommodation*, 21 HOUS. L. REV. 49 (1984).

Now suppose the coal pore owner in this hypothetical were to start injecting carbon dioxide into the coal seam for CCS. The pore owner's CCS injection would likely cause any CBM entrained in the coal to release as free gas. What should become of this gas? Perhaps it would be possible for the CBM owner to produce the free gas from its existing or new wells in a kind of ECBM. But by penetrating the coal seam in which the pore owner is injecting for CCS, CBM wells would likely interfere with the pore owner's goal of permanently sequestering the carbon by triggering EPA Class VI permit regulations requiring corrective action.³⁶⁵ The CBM extraction might threaten the security of the pore owner's storage and possibly cause the pore owner to repay tax credits earned under the federal 45Q program.³⁶⁶ Even if it were somehow physically possible for the CCS injection and CBM production activities to coexist, the pore owner might balk at the idea of incurring much of the cost of enhancing the CBM production for the sole benefit of the CBM owner.

For these same reasons, it would complicate and possibly even preclude the pore owner from conducting CCS if the CBM owner were to first drill and produce CBM wells in the coal seam. Likewise, if the CBM owner were to move first by injecting carbon dioxide for ECBM, thereby occupying the coal pores with carbon dioxide, it may preclude the coal pore owner from conducting CCS in the coal seam for its own account. At a minimum, it would be folly for either party to proceed with CCS or CBM extraction without the cooperation of the other party.

As it concerns an owner of the coal estate that does not hold title to the coal pores, neither the coal pore owner nor the CBM owner should undertake any kind of CCUS without consent. Since either kind of CCUS is likely to render the coal seam unmineable, the coal estate may argue that its access to its property has been deprived in violation of its correlative rights to possess and mine the coal. The prudent course, once again, is for the proponent of CCUS to first acquire the consent or cooperation of the coal owner.

This sketch is only intended to suggest the remarkable complexity of the correlative rights of surface, CBM, and coal estates and to highlight the futility of pursuing a CCUS project in a coal seam without first acquiring the consent of the owners of all such estates. There are simply too many complexities and factual variables to concisely analyze how courts should resolve disputes over the use of commonly owned coal seams for CCUS,

³⁶⁵ See 40 C.F.R. § 146.84(c)(2), (d).

³⁶⁶ See 26 U.S.C. § 45Q.

and one hopes that CCUS developers will not tempt fate by proceeding with fewer than all the resource owners on board.

C. *Geologic CO₂ Production*

Until the advent of CCUS, most CO₂ EOR was conducted using carbon dioxide produced from naturally occurring geologic reservoirs of carbon dioxide, which is produced through vertical drilling in a similar manner as natural gas.³⁶⁷ There are over twenty carbon dioxide fields in the contiguous United States, most of which are scattered across the Rocky Mountain states of New Mexico, Colorado, Wyoming, and Utah.³⁶⁸ One significant field, the Jackson Dome, is located in the Gulf Coast region,³⁶⁹ which like the Rocky Mountain states is a major target for CCUS. Carbon dioxide produced from these fields is transported by pipeline to oil and gas fields where it is utilized in CO₂ EOR,³⁷⁰ but many of the carbon dioxide fields themselves are in regions where significant CCUS activity is expected. It is thus possible a CCUS project, mostly likely a CCS project, might utilize subsurface formations within land that also contains a naturally occurring carbon dioxide reservoir.

Production of geologic sources of carbon dioxide is highly similar to oil and gas production. Carbon reservoirs are found at similar depths and drilled and produced using similar techniques.³⁷¹ It follows that the types of conflicts involved between oil and gas production and CCUS provide good analogies to the interaction of CCUS and carbon dioxide production.³⁷² Thus, the legal principles discussed earlier in this Part should apply equally in this context.³⁷³

However, at least one special problem attends concurrent CCUS and carbon dioxide production: the potential for commingling of injected and

³⁶⁷ Jeffery Eppink et al., *Subsurface Sources of CO₂ in the Contiguous United States: Discovered Reservoirs 1* (U.S. Dep't of Energy, Nat'l Energy Tech. Lab., Working Paper No. 2014/1637 Mar. 5, 2014), https://www.netl.doe.gov/projects/files/FY14_SubsurfaceSourcesofCO2intheContiguousUnitedStatesVolume1DiscoveredReservoirs_030514.pdf [<https://perma.cc/Q3RP-QU2U>].

³⁶⁸ *Id.* at 1–2.

³⁶⁹ *Id.*

³⁷⁰ *Id.* at 1.

³⁷¹ See Cody Nelson, *Inside the Dirty, Dangerous World of Carbon Flooding*, SCIENCE: THE WIRE (Apr. 5, 2021), <https://science.thewire.in/environment/inside-the-dirty-dangerous-world-of-carbon-flooding/>. Carbon production wells are also subject to some of the same hazards as oil and gas wells, including blowouts. In 1982, a well in the Sheep Mountain field in Colorado experienced a blow out that released a column of carbon dioxide hundreds of feet into the air for approximately two weeks. Richard D. Lynch, et al., *Dynamic Kill of an Uncontrolled CO₂ Well*, 37 J. PETROLEUM TECH. 1267, *passim* (1985).

³⁷² See *supra* Part IV.A.

³⁷³ See *supra* Part IV.A.

geologic carbon dioxide that is native to the reservoir. If the injector of carbon dioxide for CCUS does not also hold title to the native carbon dioxide under the land, the injector runs the risk of a title dispute with the owner of native carbon over ownership of injected carbon.

The owner of native carbon might assert that its ownership attaches to injected carbon following sequestration, which would entitle that owner to produce and sell the sequestered carbon dioxide for its own account. The carbon injector would likely object, if release of the carbon would violate an applicable permit requirement or trigger recapture of some or all of its tax credits associated with the sequestration.³⁷⁴ Title to injected carbon might also be relevant to determining which person bears liability to third parties for trespasses and nuisances caused by the carbon and which is responsible for any requirements to monitor the injected carbon.³⁷⁵

The commingling problem is complicated by the fact that native carbon dioxide might be owned either by the surface estate or a mineral estate or lease covering oil and gas. The same concepts and legal principles that are raised anytime one must interpret the scope of a mineral grant or reservation apply here.³⁷⁶ There has been considerable controversy over whether carbon dioxide is included in deeds and leases of oil and gas rights.³⁷⁷ At least one state appellate court in Colorado interpreted a reservation of “oil and gas rights” to include carbon dioxide on the ground that it is a gas.³⁷⁸ As federal lands are concerned, the Tenth Circuit Court of Appeals interpreted the oil and gas reservation from government patents under the Agricultural Energy Act of 1914 to include carbon dioxide.³⁷⁹ Given the breadth of the SRHA, it seems quite likely the mineral reservations in SRHA patents would also include carbon dioxide.³⁸⁰ Moreover, the BLM has the authority to lease rights to develop carbon dioxide as “natural gas” under the Mineral Leasing Act of 1920.³⁸¹

The potential for title disputes over injected carbon is real, regardless of whether the native carbon in a tract of land is owned by the surface estate or by the owner or lessee of oil and gas. If, for instance, the carbon injector wishes to introduce carbon dioxide for pure storage, the injector

³⁷⁴ 26 U.S.C. § 45Q(f)(4); 26 C.F.R. § 1.45Q-1(h)(2)(iii).

³⁷⁵ Joseph A. Schremmer, *Crystal Gazing: Foretelling the Next Decade in Oil and Gas Law*, 66 ROCKY MTN. MIN. L. INST. 5-1, 5-16 (2020).

³⁷⁶ See *supra* Part II.A.1.

³⁷⁷ 1 MARTIN & KRAMER, *supra* note 76, § 219; see generally 8 *id.* MANUAL OF TERMS, *Carbon Dioxide* (noting the cases discussed in the text of this Article).

³⁷⁸ Hudgeons v. Tenneco Oil Co., 796 P.2d 21, 23 (Colo. Ct. App. 1990).

³⁷⁹ Aulston v. United States, 915 F.2d 584, 599 (10th Cir. 1990).

³⁸⁰ See *supra* Part II.B.1.

³⁸¹ Exxon Corp. v. Lujan, 970 F.2d 757, 763 (10th Cir. 1992).

will need to control title to the pore space for this purpose.³⁸² In this case, if the native carbon dioxide is owned not by the surface estate, which ordinarily owns title to the pore space, but by a mineral estate, the CCS injector may find itself contending with the mineral estate over ownership of the injected carbon dioxide. If, instead, the injector wishes to inject carbon for CO₂ EOR, it will need to control title to the oil and gas in place.³⁸³ Thus, if the surface estate, rather than the mineral estate, holds title to native carbon dioxide, the injector may need to defend its own title to the injected carbon dioxide against the claims of the surface estate.

Title disputes over sequestered carbon dioxide should be resolved by tracing title to the injected substances from the moment they enter the reservoir through the moment the dispute arises. At the time of injection, whether for CCS or CCU, the injector surely holds title to the carbon dioxide as its exclusive personal property. Following injection, when the carbon comes to reside in the storage formation, whether the injector's title persists is a matter of the injector's intent. It might be that the injector intends to retain title to the carbon dioxide after sequestration or that it intends to relinquish title through abandonment. If it can be shown at any point that the injector intended to abandon its title to the carbon, the owner of native carbon under the land may assert the right to extract it.

Measuring intent to abandon is an objective exercise; the injector's subjective intent is not determinative. To ascertain the injector's objective intent requires consideration of the surrounding circumstances, which may include the purpose of the injection, whether that purpose requires continual monitoring of or responsibility for the sequestered carbon under applicable regulations, whether the injector ever intends to retrieve the carbon or use it for any future purpose, and whether the injector has taken efforts to retain control over the carbon or keep it from escaping after injection.³⁸⁴

Based on these and other relevant factors, it is likely that an injector of carbon for CO₂ EOR does not ordinarily intend to abandon title to the owner of native carbon in the tract. This was the conclusion of a panel of the Texas Court of Appeals in *Occidental Permian Ltd. v. Helen Jones Foundation*.³⁸⁵ There, lessors under an oil and gas lease claimed entitlement to royalty on production of carbon dioxide injected and recycled in the defendant lease operator's CO₂ EOR project on the premises.³⁸⁶ The plaintiffs asserted that the carbon was the defendant's personal property

³⁸² See *supra* Part II.A.1.

³⁸³ See *supra* Part II.A.1.

³⁸⁴ Schremmer, *supra* note 375, at 5-16.

³⁸⁵ 333 S.W.3d 392, 410-11 (Tex. App. 2011).

³⁸⁶ *Id.* at 407-08.

before injection but that the defendant lost title to it when it injected or reinjected the carbon into the formation.³⁸⁷ They argued that the carbon then became subject to the rule of capture and that the plaintiffs were entitled to royalty on any carbon subsequently produced under the lease.³⁸⁸ Rejecting the plaintiff's position, the court relied on the holding in a natural gas storage case, *Lone Star Gas Co. v. Murchison*, that "title to natural gas once having been reduced to possession is not lost by the injection of such gas into a natural reservoir for storage purposes."³⁸⁹ The court in *Helen Jones Foundation* found no evidence indicating the operator's intent was to abandon the injected carbon. The injected carbon therefore remained the personal property of the injector after injection and was not subject to capture or the lease's royalty clause.³⁹⁰

Helen Jones Foundation is persuasive as to the likely intent of an injector of carbon for CCUS. The operator of a CO₂ EOR operation seeks to retain control over the injected carbon specifically so it can produce it and then reinject it in a cyclical fashion. Retaining title to injected carbon is even more important to a CCU operation than in an ordinary EOR project, because losing control of the injected carbon may cost the injector valuable tax credits.³⁹¹ Thus, the potential for dispute notwithstanding, the injector of carbon in a CCU project generally should not be held to have abandoned title to injected carbon.

The same logic should apply to carbon injected for CCS. Federal tax law requires an injector to ensure injected carbon does not leak or escape as a condition of receiving the 45Q tax credit.³⁹² But perhaps most importantly, it would defeat the purpose of CCS to permit carbon to escape sequestration and enter the atmosphere. In this way, CCS differs greatly from wastewater disposal, in which the injector wishes to part completely with its responsibility for the waste.³⁹³ CCS may be more like natural gas storage than waste disposal in terms of the intent to continue control over the injected substances. Contemporary courts seem to

³⁸⁷ *Id.*

³⁸⁸ *Id.*

³⁸⁹ *Id.* (quoting *Humble Oil & Refg Co. v. West*, 508 S.W.2d 812, 817 (Tex. 1974) (quoting *Lone Star Gas Co. v. Murchison*, 353 S.W.2d 870, 878 (Tex. App. 1962))).

³⁹⁰ *Id.* at 411.

³⁹¹ See 26 U.S.C. § 45Q(f)(4); 26 C.F.R. § 1.45Q-1(h)(2)(iii).

³⁹² 26 U.S.C. § 45Q(f)(4); 26 C.F.R. § 1.45Q-1(h)(2)(iii).

³⁹³ See Schremmer, *supra* note 375, at 5-16 (noting that courts have found that injectors of produced water for disposal abandon title to the injected water (citing *W. Edmond Salt Water Disposal Ass'n v. Rosecrans*, 226 P.2d 965, 970 (Okla. 1950)).

uniformly follow the *Murchison* court's reasoning that title to natural gas is not lost when injected.³⁹⁴

Finally, some states have enacted statutes vesting CCUS operators with title to injected carbon. The law in Wyoming, a state with both CCUS potential and native carbon reservoirs, provides that an injector of carbon for geologic sequestration shall “[h]ave title to any carbon dioxide the injector injects into and stores underground or within a unit area,” and “[h]old[s] title . . . until the department issues a certificate of project completion.”³⁹⁵ North Dakota,³⁹⁶ Utah,³⁹⁷ Montana,³⁹⁸ and Louisiana³⁹⁹ have similar statutes. In these states, the possibility for dispute over title to injected carbon is greatly reduced.

D. Co-Location and Conflicts on Public Lands

Co-location of mineral and natural resources development on federal lands is guided not by the common law of property, tort, and equity, as on private lands, but by federal statutes and regulations. While CO₂ EOR is authorized under oil and gas leases on federal minerals,⁴⁰⁰ specific statutory enactments and regulations addressing CCS largely do not exist. Consequently, while there are some general principles and provisions from existing federal statutes that can help guide the co-location of CCS with other uses of federal lands, there is no comprehensive web of background law to address every question. Fortunately, there is significant literature on the existing statutory regime coordinating multiple uses of federal mineral and surface estates,⁴⁰¹ and even some scholarship addressing the coordination of CCUS with other uses of federal lands.⁴⁰² Accordingly, the present section will not attempt to exhaust the topic, but merely introduce

³⁹⁴ The Kentucky Supreme Court held that title was lost to reinjected natural gas in an opinion, *Hammonds v. Cent. Ky. Natural Gas Co.*, 75 S.W.2d 204, 205 (Ky. 1934), but subsequently limited that case to its facts and appears to have adopted the *Murchison* line of reasoning instead. *Tex. Am. Energy Corp. v. Citizens Fidelity Bank & Tr. Co.*, 736 S.W.2d 25, 28 (Ky. 1987).

³⁹⁵ WYO. STAT. ANN. § 35-11-318(b).

³⁹⁶ N.D. CENT. CODE § 38-22-16.

³⁹⁷ UTAH CODE ANN. § 40-11-15(1).

³⁹⁸ MONT. CODE ANN. § 82-11-182(1).

³⁹⁹ LA. STAT. ANN. § 30:1104(E).

⁴⁰⁰ 30 U.S.C. § 226(m).

⁴⁰¹ See generally, e.g., Phillip Wm. Lear & J. Matthew Snow, *Conflicts with Development of Other Minerals*, in 2 FOUND FOR NAT. RES. & ENERGY L., LAW OF FEDERAL OIL AND GAS LEASES § 23.01 n.5 (2023) (collecting sources); Lear, *supra* note 264; Fred A. Deering, Jr., *Multiple Use Problems of Operators Both On and Off the Public Domain*, 7 ROCKY MT. MIN. L. INST. 541, 541 (1961); Norman Elliot, *The New Forty-Niners: Uranium vs. Oil and Gas on the Public Domain*, 28 S. CAL. L. REV. 147 (1955).

⁴⁰² Righetti, et al., *supra* note 10; Arnold W. Reitze Jr., *Federal Control of Carbon Capture & Storage*, 41 ENV'T L. REP. NEWS & ANALYSIS 10796, 10820–22 (2011).

it and point out some of the most practically significant gaps in existing federal law.

Exercising its authority under the Property Clause of the U.S. Constitution,⁴⁰³ Congress has enacted a vast array of statutes to govern disposal and use of federal lands. These enactments are administered by several federal agencies, most of which are housed within the U.S. Department of the Interior.⁴⁰⁴ The most important agency for the present discussion is BLM.⁴⁰⁵ These statutes authorize BLM to permit private developers on federal lands to locate and obtain a patent on valuable minerals under the General Mining Act of 1872,⁴⁰⁶ to lease other forms of minerals like oil, gas, and carbon dioxide under the Mineral Leasing Act of 1920,⁴⁰⁷ and to lease coal under the Coal Leasing Amendments Act of 1976.⁴⁰⁸

While no specific enactment authorizes private developers to undertake CCS on the federal public domain,⁴⁰⁹ the Federal Land and Policy Management Act of 1976 (FLPMA) empowers BLM to “regulate, through easements, permits, leases, licenses, published rules, or other instruments as the Secretary [of the Interior] deems appropriate [to] the use, occupancy, and development of the public lands.”⁴¹⁰ BLM takes the position that this provision empowers it “to undertake any use and development of public lands not specifically forbidden by law and not authorized by other laws or regulations.”⁴¹¹ Commentators believe that BLM’s authority under this provision would permit the agency to grant easements or other rights to private parties to conduct CCS.⁴¹²

Nearly as soon as Congress authorized private mining claims and oil and gas leases on federal lands, conflicts developed between the two. These conflicts mostly revolved around co-location issues, where mining claims overlapped with mineral leases. Initially, the Department of the Interior dealt with these conflicts on a more-or-less piecemeal basis.⁴¹³ Eventually,

⁴⁰³ U.S. CONST. art. IV § 3, cl. 2.

⁴⁰⁴ An important exception is the U.S. Forest Service, which administers the national forests and is housed in the U.S. Department of Agriculture.

⁴⁰⁵ Righetti, et al., *supra* note 10, at 199 (citing U.S. CONST. art. IV, § 3, cl. 2).

⁴⁰⁶ 30 U.S.C. § 22.

⁴⁰⁷ 30 U.S.C. § 226.

⁴⁰⁸ 30 U.S.C. § 201.

⁴⁰⁹ Righetti, et al., *supra* note 10, at 199–200.

⁴¹⁰ 43 U.S.C. § 1732(b).

⁴¹¹ Righetti, et al., *supra* note 10, at 202 (quoting OFF. OF FOSSIL ENERGY, REPORT OF THE INTERAGENCY TASK FORCE ON CARBON CAPTURE AND STORAGE 65 (2010), <https://perma.cc/v3YC-4N94>).

⁴¹² Righetti, et al., *supra* note 10, at 202.

⁴¹³ Lear & Snow, *supra* note 401 § 23.04[1][a].

in 1954, Congress passed the Multiple Mineral Development Act to provide for concurrent mineral development for minerals under both the General Mining Law and the Mineral Leasing Act.⁴¹⁴ The 1954 act provided that operations under both acts were to be conducted “so far as reasonably practicable, in a manner compatible with . . . multiple use.”⁴¹⁵ Eventually, after other intervening enactments, Congress adopted FLPMA in 1976 to govern multiple uses beyond mineral development, including rangelands,⁴¹⁶ and the National Forest Management Act (NFMA) to govern multiple uses of national forests.⁴¹⁷

These acts carry forward the policy of multiple use from the 1954 act, which aims for the

harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output.⁴¹⁸

Rather than attempt to accommodate multiple concurrent uses “so far as reasonably practicable,”⁴¹⁹ FLPMA and NFMA balance multiple uses largely through “land management planning” whereby the agency (BLM under FLPMA and the U.S. Forest Service under NFMA) promulgates resource management plans to identify areas where particular uses will be permitted.⁴²⁰ As one treatise notes, “Resource management plans have in fact created areas of limited, restrictive, and exclusive land use,” rather than accommodated multiple land uses occurring simultaneously in the same areas.⁴²¹

It is uncertain how the land-planning agencies would deal with CCS if they were to authorize the activity, but scholars have noted the potential tension between permanent carbon storage and the multiple use policy

⁴¹⁴ *Id.* § 23.04[1][b] (citing 30 U.S.C. §§ 521–31).

⁴¹⁵ 30 U.S.C. § 526(a).

⁴¹⁶ 43 U.S.C. §§ 1701–87.

⁴¹⁷ 16 U.S.C. § 16000–87.

⁴¹⁸ *See* 43 U.S.C. § 1702(c) (defining “multiple use” in FLPMA).

⁴¹⁹ *See* 30 U.S.C. § 526(a).

⁴²⁰ Lear & Snow, *supra* note 401 § 23.04[3] (citing William R. Marsh & Don H. Sherwood, *Metamorphosis in Mining Law: Federal Legislative and Regulatory Amendment and Supplementation of the General Mining Law Since 1955*, 26 ROCKY MT. MIN. L. INST. 209, 245 (1980)).

⁴²¹ *Id.*

under these laws.⁴²² Rather than attempt to accommodate CCS alongside other surface and subsurface uses through principles of reasonable use like the common law does, it is possible the federal government would attempt to avoid interactions between CCS and these other activities to the extent possible through land-use planning. Much remains to be legislated in this regard.⁴²³

V. CONCLUSION

For the lawyer or landman charged with a matter involving CCUS on split-estate lands, the practical difficulty and legal uncertainty is great but so is the opportunity for professional reward. Although specific, conclusive answers are hard to come by in this developing field of law, the lawyer's path is lighted by asking the right questions. This Article has suggested three guiding questions: (1) Who owns the relevant resources in the lands needed for the CCUS project? (2) What background rules and standards govern the correlative rights and duties of the various resource owners within a given tract of land? And (3) how do these background principles and analogous legal precedents inform the co-location or simultaneous development of pore space for CCUS and other, separately owned subsurface resources. Informed by the right questions, the basic principles, and analogous precedents, counsel's work is halfway done. The remaining work of reasoning or arguing one's way from this guidance to a planned course of action or a negotiated or litigated resolution is the stuff of pure lawyering.

⁴²² Reitze, *supra* note 402, at 10820–21; Righetti, et al., *supra* note 10, at 200.

⁴²³ For discussion of the needed legislative and regulatory provisions, see generally Righetti, et al., *supra* note 10, 209–19.