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Winter, 1988

15 B. C. Envtl. Aff. L. Rev. 349

LENGTH: 21382 words

SUMMARY:

... As the water table declines in the landfill beneath your century-old house, its wooden support piles rot and structural settlement accelerates, rendering the premises unsafe for occupation. ... This Comment first assesses the possible application of support law to the wooden-pile support problem to determine whether a landowner, whose building has settled as a result of a loss of ground water needed to maintain subsurface wooden piles, may recover under common law principles of subjacent or lateral support and the Restatement (Second) of Torts. In many cases, these common law principles do permit recovery for settlement damage due to withdrawal of ground water that provides lateral or subjacent support. ... In lateral support cases involving improvements, courts have limited the strict liability standard by first deciding whether the improvements contributed to or caused the subsidence and then applying strict liability only if the land would have subsided without the improvement. ... Before concluding whether ground water law or support law should govern the relationships among the parties when subsurface wooden piles require ground water to prevent their decay, this Comment describes an example of the failure of such a support system as the water table has fallen in a neighborhood in Boston, Massachusetts. ...

COMMENT: CITIES SUPPORTED BY STICKS IN THE MUD: A
VARIATION ON THE SETTLEMENT OF LAND AND
STRUCTURES CAUSED BY GROUND WATER
REMOVAL

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I. INTRODUCTION

It starts slowly. First you see cracks across the ceilings and down the walls. Windows and doors no longer close smoothly. As the water table declines in the landfill beneath your century-old house, its wooden support piles rot and structural settlement accelerates, rendering the premises unsafe for occupation. Finally, the local building inspector condemns your house.¹

Ground water removal may cause subsidence or settlement² of the land surface in two common ways. One prevalent cause of subsidence or settlement is a change in lateral pressure in shallow subsurface layers.³ For example, if construction or repair of a sewer, tunnel, or building foundation is underway in an area where shallow subsoil

* Managing Editor, 1987-1988, BOSTON COLLEGE ENVIRONMENTAL AFFAIRS LAW REVIEW.

¹ Wells, Shaky Foundations: Beacon Hill Buildings Called 'Unsafe' from Water Table Damage, Boston Tab, June 4, 1985, at 1, col. 2.

² Depending on the depth and amount of water removed and the area affected, writers have distinguished between land subsidence and settlement. E.g., Comment, Controlling Land Subsidence: A Proposal for a Market-Based Regulatory Scheme, 31 UCLA L. REV. 1208, 1208 n.1 (1984). Subsidence may refer only to the compaction of several deep layers of soil as a result of the removal of underground fluids or solids. Id. Settlement may refer to the land surface's sinking as a result of the compaction of shallow subsurface layers. Id. Either the removal of fluids, semi-fluids, or solids, or the weight of the load on the surface may cause settlement. Id. at 1210. This Comment will not distinguish between subsidence and settlement in this manner, because case law has used both terms to describe either phenomenon.

³ T. DUNNE & L. LEOPOLD, WATER IN ENVIRONMENTAL PLANNING 165, 173-75 (1984). For reasons that vary with the porosity of the subsoil in the area, adjoining land may subside as supporting lateral strata either compact as they lose water content or flow away with the water. See id.

layers hold an amount of water, water or a mixture of water and soil will flow into the trench. As excavators pump water and mud out of the trench, they may actually be removing water or material that provides lateral or subjacent support for adjoining land. A second form of subsidence or settlement occurs when water-users pump ground water from water-bearing formations, called aquifers, located far below the surface⁴ In this situation, a large tract of land subsides when the removal of water creates a decline in pressure in the aquifer. When the pressure declines, the clay and other materials in the aquifer compact.⁵

The combination of the loss of buoyant support in the aquifer and the weight of overlying rock or soil causes the land surface to sink.⁶

The first type of subsidence occurs often, and has long been the subject of lawsuits. The outcomes of these suits depend upon jurisdictional variations in the common law. The second type is a major but localized problem in the Southwest and west coast of the United States, as well as in Japan, Thailand, and Mexico.⁷ Cities such as Brooklyn and Philadelphia have also faced subsidence problems involving shifts in shallow subsurface strata and changes in water table levels.⁸

One variation on settlement caused by shallow subsurface withdrawals of water is the settlement of buildings that rest on wooden piles preserved by water in the subsoil. Instead of providing buoyant support by filling voids as it does for soil in the settlement situations described above, ground water “supports” wooden piles by preventing their decay.⁹ This settlement problem occurred at one building in Boston, Massachusetts as early as 1929.¹⁰ Property owners have

4 F. TRELEASE, WATER LAW: CASES AND MATERIALS 439 (3d. ed. 1979).

5 *Id.*; Comment, *supra* note 2, at 1210.

6 See Comment, *supra* note 2, at 1210 & n. 23.

7 *Id.* at 1208-09; see also Teutsch, Controls and Remedies for Ground Water-Caused Land Subsidence, 16 HOUS. L. REV. 283, 283 (1979) (discussing subsidence in the Houston-Galveston area); Note, Subsidence: An Emerging Area of the Law, 22 ARIZ. L. REV. 891, 894 (1980) (discussing subsidence in California, Arizona, and other locales).

8 See Rohter, Puzzle in Brooklyn: The Bizarre Sinking of a 20-Block Area, N.Y. Times, Jan. 3, 1986, at 51, col. 1; Stevens, Sinking Homes Shock Neighborhood, N.Y. Times, Nov. 2, 1986, at 52, col. 4 (discussing settlement of buildings in Philadelphia).

9 HALEY & ALDRICH, INC., REPORT ON GROUNDWATER IN BACK BAY BOSTON 44-46 (1985) [hereinafter B.R.A. REPORT] (report for the Boston Redevelopment Authority).

10 Pokorny, Boston Down Under: Stabilizing Water Table is Key to ‘Mooring’ Imperiled Townhouses, Boston Globe, Aug. 19, 1985, at 38, col. 2. When cracks appeared in the walls of the Boston Public Library in 1929, an investigation showed that its wooden support piles had rotted as a result of ground water loss. Leaks in a nearby sewer had drained off the ground water. *Id.*

only recently recognized that this particular type of settlement is more extensive and serious than previously thought. Long term lowering of ground water levels and the decay of wooden piles supporting older structures would be a disaster that can be prevented.¹¹ Costs of replacing piles under one building in Boston, Massachusetts have exceeded \$ 200,000, and more than ²⁰⁰ buildings could be affected.¹² The settlement of buildings supported by water-preserved wooden piles is prevalent in certain areas of Boston¹³ and other older, coastal cities where buildings rest on wooden piles in wet subsoil that is often landfill. This Comment analyzes support law and ground water law as they apply to this variation of the settlement problem.

This Comment first assesses the possible application of support law to the wooden-pile support problem to determine whether a landowner, whose building has settled as a result of a loss of ground water needed to maintain subsurface wooden piles, may recover under common law principles of subjacent or lateral support and the Restatement (Second) of Torts. In many cases, these common law principles do permit recovery for settlement damage due to withdrawal of ground water that provides lateral or subjacent support.¹⁴ Neither these cases nor the Restatement (Second) explicitly discusses ground water that prevents the decay of subterranean piles. Nevertheless, as applied in other cases in which subsidence of land and structures occurred as a result of ground water removal, support law may protect landowners' interests in the ground water needed to sustain piles that support surface structures.

On the other hand, landowners' rights to supporting ground water are also usufructory. Requiring the presence of ground water to maintain subsurface wooden piles is an appropriation of ground water for a landowner's use and enjoyment. If courts characterize this subsurface piles-water support system as a use of ground water, then building owners' recovery for the repair of the piles and any ensuing settlement damage depends upon the principles of ground water law in that jurisdiction.¹⁵ This Comment assesses the ability of both support law and ground water law to address this particular settlement issue. This Comment concludes that modern ground water law principles are best able to allocate the costs of preventing

11 B.R.A. REPORT, *supra* note 9, at 53.

12 See *infra* notes 191-97 and accompanying text.

13 Pokorny, *supra*, note 10, at 37, col. 1.

14 See *infra* notes 62-80 and accompanying text.

15 See *infra* notes 96-104, 112-31 and accompanying text.

subsidence due to a loss of ground water and to assign responsibility for withdrawals among many users of a water table.

II. RECOVERY BASED ON SUPPORT LAW

Some jurisdictions have held that subsidence caused by the removal of ground water involves the law of support as opposed to the law of ground water.¹⁶ The right to support of land in its natural state is the basic right of landowners to enjoy the support of adjoining land so that their land does not sink or subside when adjoining landowners excavate or otherwise alter their land.¹⁷ Lateral support describes the right of land to the support of the land lying next to it.¹⁸ Subjacent support refers to the right of land to the support of the material lying beneath it.¹⁹

The rules of both subjacent and lateral support are closely related and similar.²⁰ The source of the difference between the two is the physical relationship of the respective owners' interests.²¹ The duties and liabilities following from the right to subjacent support generally describe situations in which ownership of the surface and ownership of the subsurface layers have been severed.²² Although withdrawal of ground water that supports land is the removal of a subjacent supporting substance, the distinction between these two related and similar sets of rules blurs when an adjoining landowner removes only

¹⁶ Massachusetts, Missouri, and Washington have applied support law when the settlement resulted from the removal of only ground water. *Gamer v. Town of Milton*, 346 Mass. 617, 620, 195 N. E. 2d 65, 67 (1964); *St. Joseph Light & Power Co. v. Kaw Valley Tunneling, Inc.*, 589 S.W.2d 260, 268 (Sup. Ct. Mo. 1979) (en banc); *Bjorvatn v. Pacific Mechanical Constr., Inc.*, 77 Wash. 2d 563, 567, 464 P.2d 432, 434 (1970) (en banc). Alaska, Illinois, Ohio, Pennsylvania, and Rhode Island have applied support law when settlement resulted from the removal of ground water and sand or soil. *Williams v. Anderson Constr. Co.*, 105 F.

Supp. 497, 498 (D. Alaska 1952); *Chicago City Ry. v. Rothschild & Co.*, 213 Ill. App. 178, 186 (1919); *City of Columbus v. Williard*, 7 Ohio C.C. 113, 116, 7

Ohio Cir. Dec. 33, 34 (1893); *Witherow v. Tannehill*, 194 Pa. 21, 23, 44 A. 1088, 1088 (1899); *Prete v. Cray*, 100 R.I. 209, 216, 141 A. 609, 613 (1928).

¹⁷ 1 AM. JUR. 2D *Adjoining Landowners* § 37 (1962) [hereinafter 1 AM. JUR. 2D].

¹⁸ BLACK'S LAW DICTIONARY 1291 (5th ed. 1979).

¹⁹ *Id.* Jurisdictions vary in their treatment of this lateral versus subjacent distinction. Some states and the Restatement (Second) of Torts recognize the difference between the two. See RESTATEMENT (SECOND) OF TORTS §§ 817-821 (1977) [hereinafter RESTATEMENT (SECOND)].

²⁰ 1 AM. JUR. 2D, *supra* note 17, § 77 (1962).

²¹ RESTATEMENT (SECOND), *supra* note 19, §§ 817-821 scope and introductory note.

²² See 1 AM. JUR. 2D, *supra* note 17, § 79. Courts typically refer to subjacent support rules between subjacent owners and not between adjacent owners. Annotation, *Liability of Landowner Withdrawing Ground Water from Own Land for Subsidence of Adjoining Owner's Land*, 5 A.L.R. 4TH 614, 616 (1981).

ground water and not any other supporting materials.²³ The Restatement (Second) of Torts states a rule specifically for withdrawing subterranean substances²⁴ and categorizes this section as applying to both lateral and subjacent support.²⁵ A comment to § 818 indicates that the privilege to withdraw a subterranean substance is not a defense to liability arising from the right of the surface owner to “lateral and subjacent support.”²⁶ In other words, the Restatement (Second) section on the withdrawal of subterranean substances is not limited to subjacent support. Since there is no severance of ownership of subjacent layers in the wooden-piles settlement problem,²⁷ this Comment concentrates on rules of lateral support, but also considers subjacent support concepts.

The right to lateral support is absolute with regard to land in its natural condition.²⁸ Hence, courts invoke a strict liability standard when an adjoining landowner interferes with this right.²⁹ When improvements on the land have suffered a loss of support, however, courts differ in how they modify the standard. The first judicial approach is to apply a strict liability standard for land and improvements. The second approach is to apply strict liability for both land and improvements only if the improvements did not contribute to or materially cause the subsidence. The third is to apply a negligence standard whenever improvements are present on the land.

A. Strict Liability for Land and Improvements

The most expansive standard within the law of support is strict liability for both land and structures. The Supreme Court of Washington applied this rule in *Bjoivatn v. Pacific Mechanical Construction, Inc.*³⁰ In *Bjorvatn*, the court held the defendant strictly liable for lowering the water table in the process of excavating for a city sewer and, as a result, removing support from under the plaintiff’s

²³ See RESTATEMENT (SECOND), supra note 19, § 818.

²⁴ Id.

²⁵ Id.

²⁶ Id. comment b. Massachusetts does not distinguish between a duty to provide lateral support and a duty to provide subjacent support. Note, *A General Survey of the Rights and Duties of Adjoining Landowner in New England* 39 B. U. L. REV. 228, 242 (1959).

²⁷ In a situation where subsurface wooden piles support a structure, it is unlikely that there is a severance of ownership of subjacent layers. Even an easement for public sewer pipes probably does not run directly beneath the settling property. In most instances the pipes lie under an adjoining street or sidewalk.

²⁸ RESTATEMENT (SECOND), supra note 19, § 817 comment b.

²⁹ See, e.g., *Gilmore v. Driscoll*, 122 Mass. 199, 207-08 (1877).

³⁰ 77 Wash. 2d 563, 464 P.2d 432 (1970) (en banc).

house.³¹ Because the digging of a deep trench deprived the compressible soil of its natural water content, the plaintiff's land sank, causing cracks in the foundation and walls of his house.³² The court held that the state constitution mandated compensation for private property damaged in the course of public construction.³³ The plaintiff's right to recovery rested on the strict liability standard that the court used because the harm occurred in the exercise of the power of eminent domain.³⁴

The Bjorvatn court relied on a standard that the Supreme Court of Washington had set in *Muskatell v. City of Seattle*.³⁵ In *Muskatell*, the court found the defendant city strictly liable for subsidence damages when its construction of a sewer resulted in the subsidence of the plaintiff's land and the sinking of his building.³⁶ The Supreme court of Washington concluded that the issue of whether the city was negligent was immaterial in an action brought under the constitution to recover damages for the removal of lateral support.³⁷ Once the court established that the removal of the wet sand from the excavation trench, and nothing else, directly caused the subsidence of the land, strict liability attached.³⁸ In addition, the court did not allow distinctions among loss of support caused by removing either soil, silt, quicksand, or water from under the adjoining land.³⁹ Although strict liability has survived in Washington support law cases for over forty years, each case stressed that the state constitution's eminent domain provision required the strict liability standard.⁴⁰

In an Illinois case where inverse condemnation was not a question, however, the court's language indicated that the strict liability standard would also apply.⁴¹ In *Chicago City Railway v. Rothschild & Co.*, a company was excavating and in the process removed the

31 Id. at 567-68, 464 P.2d at 435.

32 Id. at 564-65, 464 P.2d at 433.

33 Id. at 567, 464 P.2d at 434-35.

34 Id. at 567, 464 P.2d at 434.

35 10 Wash. 2d 221, 116 P.2d 363 (1941). In *Muskatell*, the plaintiff brought an action under the state constitution to recover for building damages that resulted from the city's removal of wet sand from a trench during the construction of a sewer in front of the plaintiff's property. Id. at 223, 116 P.2d at 365.

36 Id. at 235-36, 116 P.2d at 370.

37 Id. at 233, 116 P.2d at 369.

38 See id. at 233-36, 116 P.2d at 370.

39 Id. at 238, 116 P.2d at 371.

40 See *Bjorvatn*, 77 Wash. 2d at 567, 464 P.2d at 434; *Muskatell*, 10 Wash. 2d at 223, 116 P.2d at 365.

41 *Chicago City Ry. v. Rothschild & Co.*, 213 Ill. App. 178, 186 (1919).

lateral support of neighboring land on which the plaintiff owned trolley tracks.⁴² The Illinois court found the excavating company liable for subsidence damages.⁴³ The court applied a strict liability standard in this case to the subsidence of land containing trolley tracks but did not explicitly extend the standard to all improvements.⁴⁴ In addition, the court noted that the defendants had removed both soil and water during the excavation,⁴⁵ but indicated without deciding the question that the excavating company would still be liable for subsidence even if it had removed only ground water.⁴⁶

Although ensuring plaintiffs recovery, the strict liability standard does not attach in most subsidence cases where improvements are present on the land. The court that has used the strict liability standard broadly and without qualification has emphasized that its state constitution's takings clause required it.⁴⁷ In addition, the only authority for an unqualified strict liability standard for both land and improvements in a non-takings case was a case in which the improvement on the land was a line of trolley tracks.⁴⁸ Even in *Muskatell*, the court did not apply strict liability for improvements until after it had addressed the jury's determination that the weight of the improvements had not contributed to the subsidence.⁴⁹

B. Strict Liability for Land and Improvements After Determining Causation-in-Fact

In lateral support cases involving improvements, courts have limited the strict liability standard by first deciding whether the improvements contributed to or caused the subsidence and then apply-

42 *Id.* at 180-82.

43 *Id.* at 186.

44 See *id.* at 182.

45 *Id.* at 183-84.

46 *Id.* at 186 (*dicta*). After finding the defendant liable, the court stated, "it is unnecessary for us to decide whether in such case the abutting property owner would be liable if the depression were caused solely by the withdrawal of subsurface percolating waters, and we leave the question where it is." *Id.*

47 *Bjorvatn*, 77 Wash. 2d at 567, 464 P.2d at 434.

48 *Chicago City Ry.*, 213 Ill. App. at 186.

49 *Muskatell*, 10 Wash. 2d at 236, 116 P.2d at 370. A later case that relies on *Bjorvatn* and *Muskatell* makes it clear that, although the right to lateral support in Washington is based on the constitutional takings prohibition and also exists between private parties, the plaintiff has the burden of proving that the taking indeed took place. *Bay v. Hein*, 9 Wash. App. 774, 777, 779, 515 P.2d 536, 538, 539 (1973). In the case of land with improvements on it, this means that the plaintiff must prove that the improvements to the land did not increase the neighbor's duty to provide lateral support. *Id.* at 777, 575 P.2d at 538.

ing strict liability only if the land would have subsided without the improvement.⁵⁰ In some cases, to recover damages for land and structures, the plaintiffs have the burden of proving that the weight of the building did not materially increase the lateral pressure and as such did not directly cause the subsidence.⁵¹ In others, defendants must raise the issue of an improvement's causing subsidence as an affirmative defense.⁵² For example, in *Williams v. Anderson Construction Co.*, during the course of the defendant's digging the foundation of an apartment building, a mixture of "fluid soil" and wet sand "oozed from plaintiff's property into the hole in which the defendant was digging."⁵³ The dispositive issue was whether the soil on the plaintiff's side of the boundary fell away of its own weight, and in doing so caused the settlement of the plaintiff's house.⁵⁴ Upon finding that the flow of wet sand caused settling of the land and consequently the damage to the apartment building, the court held the defendant strictly liable for withdrawing the necessary lateral support for the plaintiff's land.⁵⁵

The District Court of Alaska refused to consider whether the defendant was negligent in his efforts to shore up the house because in this case liability was not predicated on negligence.⁵⁶ Thus, having first determined that the removal of the wet soil, and not the weight of the building, caused the settlement, the court held the defendant strictly liable.

Rhode Island also requires a threshold determination of causation-in-fact before strict liability can attach when improvements are present.⁵⁷ In *Prete v. Cray*, the city of Providence, Rhode Island excavated a ditch for the repair of a sewer in the street in front of plaintiff's property and drove down plank sheathing to support the walls of the trench.⁵⁸ At a depth of thirty-eight or forty feet, the

⁵⁰ E.g., *Williams v. Anderson Constr. Co.*, 105 F. Supp. 497, 498 (D. Alaska 1952); *Prete v. Cray*, 100 R.I. 109, 216, 141 A. 609, 612 (1928).

⁵¹ See, e.g., *Miller v. State*, 199 Misc. 237, 242, 98 N.Y.S.2d 643, 648 (1950); *Gladin v. VonEngeln*, 195 Colo. 88, 92, 575 P.2d 418, 421 (1978). In

VonEngeln, the court stated that here is a presumption that the weight of the buildings contributed to the subsidence. To overcome this presumption and recover for damage to structures, the plaintiff must prove that the building's weight did not materially increase pressure on the land causing it to subside. *VonEngeln*, 195 Colo. at 91-92, 575 P.2d at 420-21.

⁵² E.g., *Farnandis v. Great N. Ry.*, 41 Wash. 487, 495, 84 P. 18-20 (1906).

⁵³ 105 F. Supp. 497, 497-98 (D. Alaska, 1952).

⁵⁴ *Id.* at 498. The court did not hold expressly that the plaintiff had the burden of establishing that the weight of the structure did not cause the subsidence. *Id.*

However, it appears that the court treated the issue as one for the plaintiff to address at the outset because it is one the court's initial findings. *Id.* at 497-98.

⁵⁵ *Id.* at 498.

⁵⁶ *Id.*

⁵⁷ *Prete v. Cray*, 49 R.I. 209, 214-15, 141 A. 609, 612 (1928).

⁵⁸ *Id.* at 215-16, 141 A. at 612-13.

excavators reached a bed of quicksand that “flowed somewhat like water.”⁵⁹ The defendants, in removing the quicksand as fast as it flowed in from the plaintiff’s land, destroyed the support of the plaintiff’s land.⁶⁰ Because the land sank from the curb line of the street all the way back to the front of the foundation of the house, while the rear of the foundation was not disturbed, the court said it was clear that the weight of the plaintiff’s buildings did not cause the subsidence of the soil.⁶¹ The court agreed with the line of authority that placed full responsibility upon the person who interfered with the support of a neighbor’s land and held for the plaintiff.⁶² The court’s rationale was that by erecting buildings, landowners should not lose their rights to the lateral support of land.⁶³ When their land settles because an adjoining owner has invaded this right, landowners are entitled to recover for all damage directly resulting from that invasion, as long as the weight of the building on the land did not cause the subsidence damage.⁶⁴

C. Negligence Standard for Improvements

Like Alaska and Rhode Island, Massachusetts has also recognized that the strict liability standard should apply to an injury to land in

⁵⁹ Id. at 216, 141 A. at 613.

⁶⁰ Id.

⁶¹ Id. at 216-17, 141 A. at 613.

⁶² Id. at 215, 141 A. at 612.

⁶³ See id. at 213, 141 A. at 612.

⁶⁴ Id. The court in *Prete* referred to a general rule of liability for improvements to land. Id. at 213, 141 A. at 611. Under this rule, when the removal of support caused the subsidence damage to land and buildings, the neighbor who removed the support was not liable for damage to the building unless he had been negligent.

Id. In the absence of negligence, the defendant was liable only for damage to the land. Id. at 213-14, 141 A. at 612. The court in *Prete* modified this general rule and held the strict liability standard applicable whenever the land subsided of its own weight. Id. When a plaintiff complained of the settlement of a building, the court in *Prete* favored the approach that calls for an initial finding of whether the weight of the building or the removal of support proximately caused the subsidence damages to both the improvement and the land. Id. Accord, *Gladin v. VonEngeln*, 195 Colo. 88, 91-92, 575 P.2d 418, 420-21 (1978). The court in *Gladin* overruled *Colorado Fuel and Iron Corp. v. Salardino*, 125 Colo. 516, 245 P.2d 461 (1952), to the extent that *Salardino* had held that strict liability could not be imposed if there were improvements to the land. *Gladin*, 195 Colo. at 92, 575 P.2d at 421.

The reasoning of cases like *Williams* and *Prete* leads to the application of the strict liability standard in an equitable manner, because this reasoning permits a finding of fact to establish the cause of the damage to a structure. If the possibility of recovery were limited only to damage to land, then potential plaintiffs would be discouraged from bringing suits for the loss of support because the damage award for land alone may not justify the cost of a suit. As a result, in a dense urban area where open land is scarce, or wherever it would be difficult to determine the actual cause of the settlement of a building, excavators would have less incentive to undertake the expense of a careful study of the dangers of the lateral support loss that could result from their activities.

its natural state.⁶⁵ A long line of Massachusetts cases, however, has limited recovery to injury to land only, unless the defendant was negligent.⁶⁶ For example, in a 1964 case, *Gamer v. Town of Milton*, a defendant contractor removed water from the subsoil in an area surrounding a pond and thus caused the subsidence of the plaintiffs' adjoining land.⁶⁷ As the contractor drained the pond, he also drained water from the subsoil in the area.⁶⁸ As he should have foreseen, the soil in the area became compacted from its loss of water, and the plaintiffs' houses settled.⁶⁹ The court predicated recovery for the settlement of the plaintiffs' land and buildings on the negligent manner in which the defendant contractor excavated in the area.⁷⁰

In allowing recovery for settlement of structures when the defendant negligently removed only water, *Gamer* extended earlier Massachusetts decisions in which defendants, in negligently removing a mixture of water and sand or soil, were liable for damage to both land and structures. The court in *Cabot v. Kingman* had applied the rule requiring negligence for recovery for structures before the turn of the century.⁷¹ The plaintiff in *Cabot* complained of subsidence caused by the defendants' removal of wet sand, silt, or quicksand that had flowed into the defendants' trench for sewer construction.⁷² Despite the disagreement of three state justices, including Oliver Wendell Holmes, who urged the application of water law doctrine,⁷³ the Supreme Judicial Court of Massachusetts stressed that the water removed from the trench carried the plaintiff's supporting soil away with it.⁷⁴ Since this appeal was taken on exceptions to the trial court's dismissal for a failure to state a cause of action and its directed verdict for the defendants, the court did not dwell on the damage issue and whether recovery extended to land, or structures, or

65 E.g., *New York Cent. R.R. v. Marinucci Bros. & Co.*, 337 Mass. 469, 472, 149 N.E.2d 680, 682, (1958); *Gilmore v. Driscoll*, 122 Mass. 199, 201 (1877);

see also, *City of Columbus v. Williard*, 7 Ohio C.C. 113, 116, 7 Ohio Cir. Dec. 33, 34 (1893) (approving *Gilmore v. Driscoll*, 122 Mass. 199 (1877)).

66 *Gamer v. Town of Milton*, 346 Mass. 617, 620-21, 195 N.E.2d 65, 67 (1964); *New York Central*, 337 Mass. at 472-73, 149 N.E.2d at 682; *Gilmore*, 122 Mass. at 205.

67 346 Mass. at 618-19, 195 N. E.2d at 66.

68 *Id.*

69 *Id.* at 618-19, 195 N.E.2d at 66 (quoting findings of court-appointed auditor).

70 *Id.* at 621, 195 N.E.2d at 67.

71 See *Cabot v. Kingman*, 166 Mass. 403, 406, 44 N.E. 344, 345 (1896). The rule was announced in *Gilmore*, 122 Mass. at 205.

72 *Cabot*, 166 Mass. at 404, 44 N.E. at 344.

73 *Id.* at 407, 44 N.E. at 345.

74 *Id.* at 405, 44 N.E. at 345.

both.⁷⁵ The plaintiff, however, complained of the cracking and settlement of brick buildings,⁷⁶ and the court found the defendants negligent in failing to require its contractor to take precautions to prevent the quicksand from running into the trench.⁷⁷ This finding indicates that the court was applying a negligence standard for injury to buildings. The later case, *Gamer*, cites *Cabot* as direct authority for the general rule of strict liability for removing the support of land in its natural state.⁷⁸

Gamer, which limited recovery to land unless the defendant was negligent in causing the loss of support, remains the law in Massachusetts.⁷⁹ If improvements are present on the land and a neighbor's activities cause the land to subside and injure the improvements, the neighbor is strictly liable for the land itself but liable for the improvements only if he or she was negligent.⁸⁰ The rationale for having different standards of liability for improved and unimproved land is that by erecting improvements landowners should not increase their neighbors' responsibility to provide support.⁸¹ As long as neighbors take reasonable care against foreseeable injury, they will be liable only for subsidence to land and escape any liability for damage to buildings or other improvements.

⁷⁵ *Id.* at 407, 44 N.E. at 345.

⁷⁶ See *id.* at 404-05, 44 N.E. at 344-45.

⁷⁷ See *id.* at 406, 44 N.E. at 345.

⁷⁸ *Gamer*, 346 Mass. at 620, 195 N.E.2d at 67.

⁷⁹ See *id.* at 621, 195 N.E.2d at 67.

⁸⁰ *New York Cent. R.R. v. Marinucci Bros. & Co.*, 337 Mass. 469, 472, 149 N.E.2d 680, 682 (1958). At first, this analysis seems like a logical way to limit the expansiveness of strict liability. The problem with using the negligence standard in this way is that it cuts off liability at injury to the land solely because the land has an improvement on it. This standard fails to consider that the improvement may not have contributed in any way to the subsidence. When improvements are present on the land, using the negligence standard in this way will fail to provide recovery if such land subsides irrespective of the weight of any improvement.

A more realistic approach to the liability issue assigns responsibility for a defendant's activity according to the activity's effect on a landowner's natural right to support. The cases that take this approach focus on a factual finding of whether the land would have subsided without the improvements. E.g., *Williams v. Anderson Constr. Co.* 105 F. Supp. 497, 498 (D. Alaska); *Prete v. Cray*, 49 R.I. 209, 216, 141 A. 609, 613 (1928); see also *Gladin v. VonEngeln*, 195 Colo. 88, 91-92,

575 P.2d 418, 420-21 (1978) (ruling on a question of jury instructions, the court found that the choice of liability standard hinged on whether the subsidence would have occurred had the land remained in its natural state). In many cases, the results may not differ very much from those of the Massachusetts approach. The reason is that excavators who recognize the possibility of the subsidence of neighboring land will also account for any improvements on it when they take due care to prevent subsidence. Nevertheless, treating the effect of the improvements on the land as a threshold issue allocates the risk among parties based on the real effect of any improvements on the land.

⁸¹ *Gilmore v. Driscoll*, 122 Mass. 199, 201 (1877).

D. Choice of Liability Standard and the Restatement (Second) of Torts

The Restatement (Second)'s comment to § 818 on the withdrawal of subterranean substances emphasizes that the "right of the surface owner to lateral and subjacent support of his land in its natural state is paramount,"⁸² and the privilege of withdrawal does not in itself serve as a defense to strict liability.⁸³ It follows from the paramount importance of the strict liability standard that, where improvements are concerned, before a court lowers the standard to one of negligence, it should first determine whether the improvements were a material factor in the loss of support caused by the withdrawal of a subterranean substance. If an improvement did not contribute to or materially increase the settlement, strict liability remains the appropriate standard and should extend to all settlement damage following directly from the loss of support for land.⁸⁴ If the land would not have settled without the presence of the improvement, then strict liability is not an appropriate standard. Only after an initial finding that the presence of the improvement contributed to or materially increased the subsidence should a court apply a negligence standard.

82 RESTATEMENT (SECOND), *supra* note 19, § 818 comment b.

83 *Id.* § 818. The introduction to the Restatement (Second) chapter on support of land describes two different approaches that may have given rise to the two conflicting judicial approaches toward the limitation on strict liability when improved land has subsided. *Id.* §§ 817-821 scope and introductory note. The earlier of the two theories regards the right to support as an easement. Under this theory, the right to support is "a natural easement subjecting the supporting land to a natural servitude." *Id.* As such, the right to support is in the supporting land. One result of adopting this theory is that the right extends only to the supported land itself and not to support needed by any improvements on it. Invaders of this right would then be strictly liable for the mere removal of support. *Id.* The introduction to this Restatement (Second) chapter does not state explicitly whether this liability standard extends to improvements on the land when the land in its natural state would have subsided regardless of the presence of improvements. See *id.*

The second theory regarding the limit of strict liability when there are improvements on the land views the right to support as a right to the integrity of the supported land and as such is a right "in respect to the supported land." *Id.* One result of adopting this view is that the right to support would exist both for land in its natural state and improvements on it. In addition, the mere withdrawal of support would not be a violation of this right. Liability would require negligence or intention to cause harm. *Id.*

While neither view has unqualified acceptance, the earlier, easement-servitude theory has more heavily influenced the development of the law of support with respect to land in its natural state. *Id.* The Restatement (Second) mentions that the second theory has determined the law of support in cases where improvements are present. *Id.* This emphasis on the right to support of land in its natural state indicates that for a loss of support caused by the withdrawal of subterranean substances, the authors of the Restatement (Second) § 818 had the easement-servitude theory in mind.

84 See *Prete v. Cray*, 49 R.I. 209, 217, 141 A. 609, 613 (1928).

If the improvement did materially contribute to or cause the subsidence, then negligence is the appropriate standard by which to judge the defendant's actions. The reasoning is that by erecting improvements landowners should not be able to increase their neighbors' duty to provide support for adjacent land.⁸⁵ The initial finding of causation-in-fact prevents neighboring landowners from escaping their duty to maintain the natural support of land that has been improved.⁸⁶ When neighbors must meet an objective standard of due care with respect to improvements, landowners who have made improvements have neither increased nor decreased their neighbors' burden to provide support for land in its natural state.

When the improvements to land are subsurface wooden piles and the removal of ground water causes their decay and a subsequent loss of support, the negligence standard is almost always appropriate because the land itself would not have settled when the water table dropped. The scope of duty with respect to the wooden-pile support system then is to take reasonable care in any removal of supporting ground water so that the water table remains high enough to prevent decay of wooden piles. If the water table remains high enough, improvements to the land will remain intact. In the same way that an excavator must provide shoring for neighboring land with a building on it, a neighboring landowner would not be able to remove supporting ground water without taking a reasonable degree of care to prevent the decay of a wooden-pile support system.

The basis of the foregoing analysis regarding this artificial support system is to characterize the system's water dependence as a form of support from ground water. The water, however, does not support the piles by providing buoyancy. Rather, the chemical properties of water provide support by preventing decay of the piles.⁸⁷ Because a court may characterize this maintenance of the piles as nothing more than a use of ground water, it is necessary to consider the rules governing the use of ground water.

III. RECOVERY BASED ON GROUND WATER LAW

The Restatement (Second) of Torts illustrates a clear turning point in the law of support and that of ground water withdrawal, because it completely reverses the position of the first Restatement on the question of the withdrawal of water and loss of support.⁸⁸ Prior to

⁸⁵ *Gilmore v. Driscoll*, 122 Mass. 199, 201 (1877).

⁸⁶ See *Prete*, 49 R.I. at 213, 141 A. at 611-12.

⁸⁷ See *infra* notes 175-178 and accompanying text.

⁸⁸ RESTATEMENT (SECOND), *supra* note 19, § 818 app. reporter's note.

this reversal, the first Restatement refused to recognize liability for the loss of support when a defendant removed water from under another's land.⁸⁹ This idea, which had taken hold in England in 1869,⁹⁰ gave rise to a rule that denied recovery whenever water was the withdrawn supporting substance.⁹¹ Courts have been seeking ways to limit this rule ever since.⁹²

One of the earliest cases addressing the problem of liability for the removal of supporting ground water, *New York Continental Jewell Filtration Co. v. Jones*, characterized the problem as an injury without legal remedy.⁹³ The plaintiff in *Jones* contended that her land had settled and that the foundation and walls of her house had cracked as a result of the defendant's excavation for a subway tunnel in the street next to her property.⁹⁴ The District of Columbia Court of Appeals noted that the soil in the vicinity was "composed of sand and gravel heavily charged with water" and that the tunnel had to be drained to facilitate construction.⁹⁵ Reversing a lower court that had granted recovery to the plaintiff, the court held that, if the defendant's withdrawal of ground water from beneath the plaintiff's land caused the damage, the injury was without a legal remedy.⁹⁶ The court based its holding on the common law right of landowners to drain ground water from beneath their own land and cited *Popplewell v. Hodkinson*⁹⁷ as controlling.⁹⁸

In *Popplewell*, the Court of the Exchequer denied the owner of cottages built on "wet and spongy"⁹⁹ land any recovery for subsid-

89 RESTATEMENT OF TORTS § 818 (1939).

90 See *Popplewell v. Hodkinson*, 49 L.R.-Ex. 248, 251-52 (1869).

91 See *New York Continental Jewell Filtration Co. v. Jones*, 37 App. D.C. 511, 515 (1911).

92 See e.g., *Finley v. Teeter Stone, Inc.* 251 Md. 428, 248 A.2d 106 (1968); *Friendswood Dev. Co. v. Smith-Southwest Indus.*, 576 S.W.2d 21 (Tex. 1978).

93 *Jones*, 37 App. D.C. at 514.

94 *Id.* at 512.

95 *Id.* at 513.

96 *Id.* at 514-15.

97 4 L.R.-Ex. 248 (1869).

98 *Jones*, 37 App. D.C. at 514-15. The court in *Jones* distinguished *United States v. Alexander*, 148 U.S. 186 (1893), in which the government, pursuant to a federal statute authorizing tunnel construction and condemning a right-of-way for the tunnel, drained the plaintiff's well. *Jones*, 37 App. D.C. at 517. The court in *Jones* said that, because the relief in *Alexander* turned on the language of the statute authorizing the activity that caused the loss of water, *Alexander* was not on point. *Id.* at 517-18. Since there was no similar statutory authorization for the defendant's activity in the District of Columbia, the court refused recovery for settlement damage to the plaintiff's property. *Id.* at 518. But cf. *Gamer v. Town of Milton*, 346 Mass. 617, 620, 196 N.E.2d 65, 67 (1964). In the absence of any statutory authorization the court in *Gamer* found an actionable offense for a municipal contractor's removal of pure water and refused to distinguish earlier Massachusetts cases that held that the loss of support caused by the removal of a mixture of water and soil was actionable. *Id.*

99 *Popplewell*, 4 L.R.-Ex. at 249.

ence damages caused by the draining of water in an adjacent excavation for the construction of a church.¹⁰⁰ The plaintiff argued that the right to support from ground water should be equated with the right to support from adjacent soil.¹⁰¹ The plaintiff argued further that the right to underground water and the right to support from water are distinct.¹⁰² Nevertheless, the court declared the issue one of water law and not support law when it found that “although there is no doubt that a man has no right to withdraw from his neighbor the support of adjacent soil, there is nothing at common law to prevent his draining that soil, if, for any reason it becomes necessary or convenient for him to do so.”¹⁰³

Hence, from an early dispute between the owner of cottages and the builder of a church, a rule emerged in England denying liability for subsidence caused by ground water removal.¹⁰⁴ This rule was based on the naive belief in the mysterious nature of ground water,¹⁰⁵ and has since been applied to deny recovery in cases in which subsidence occurs as a result of the loss of supporting ground water.¹⁰⁶ The Jones court reiterated that the reason for this rule stems from the uncertainty about ground water:

100 *Id.* at 251. The court added that even if the plaintiff had a right to the support of underground water, he could not recover under these circumstances because “he had no right to suppose that the adjacent land would be used for the erection of such cottages as he himself erected, or of other buildings requiring equally little support.” *Id.* at 252 (*dicta*).

101 *Id.* at 250.

102 *Id.*

103 *Id.* at 251-52. The court added that because the land was close to an “important and populous town” the plaintiff should have known the land would be developed and consequently drained for construction. *Id.* at 252 (*dicta*).

104 See *id.* at 251-52. When the analysis of the problem of subsidence caused by the removal of ground water begins with the premise that if the supporting material is water, then the rules of the ownership of ground water apply, and there can be no recovery in any jurisdiction that has adopted the English Rule of absolute ownership set forth in *Acton v. Blundell*, 152 Eng. Rep. 1223, 1235, 12 Meeson & Welsby, 324, 354 (1843). The court in *Acton* formulated this rule

based on the principle that the owner of the land surface, since his claim of ownership includes all that is beneath the surface, may dig in his land and appropriate for any purpose any water he finds there. *Id.* If, in exercising this right, he drains water from underground springs that extend to a neighbor’s property, any inconvenience to the neighbor is an injury without remedy. *Id.* The court believed that this rule for ground water ownership must necessarily differ from that of surface water because of a perceived difference in the nature of surface and ground water. *Id.* at 351, 152 Eng. Rep. at 1234. The basis of the distinction between the two was the court’s declaration that, while surface water flows openly in sight of all neighbors, ground water does not move in the sight of others and no one knows who has taken what portion of the water. *Id.* at 349-50, 152 Eng. Rep. at 1233. See also *Garland, Subsidence Resulting From the Removal of Ground Waters*, 12 S. TEX. L.J. 201, 205-06 (1970); *Comment, supra* note 2, at 1215-16.

105 *Acton*, 152 Eng. Rep. at 1233, 12 Meeson & Welsby at 350.

106 *New York Continental Jewell Filtration Co. v. Jones*, 37 App. D.C. 511, 518 (1911); *Langbrook Properties Ltd. v. Surrey County Council*, 3 All E.R. 1424, 1440 (Ch. 1969).

[P]ercolating subterranean water is a wandering thing, which, like the air, is not subject to any fixed rules of law. The existence, origin, course, and movement of such waters, and the causes which govern and direct their movements, are so involved in mystery, secrecy, and uncertainty as to render any attempt to establish or administer any set of legal rules with respect to them practically impossible.¹⁰⁷

Commentators have criticized these results because the rule's basis in the mysterious nature of ground water is erroneous.¹⁰⁸ Modern ground water management techniques are sophisticated enough to measure accurately the impact on a water table of one party's tapping a ground water source.¹⁰⁹ Recognition of the potential for harsh results and the rule's basis in outmoded scientific assumptions have led courts to attempt to depart from the rule.¹¹⁰ One court that recognized a more modern ground water rule permitting certain withdrawals defined as reasonable applied the reasonable use rule to a ground-water-loss subsidence case.¹¹¹

Other jurisdictions have gone a step further to hold that any negligent withdrawal of water that causes subsidence is actionable.¹¹²

Texas is an example of a jurisdiction that has expanded the scope of liability to include negligence.¹¹³ In 1973, the Supreme Court of Texas, in *Friendswood Development Co. v. Smith-Southwest Industries*, departed from the rule of nonliability for subsidence caused by

107 Jones, 37 App. D.C. at 516. The movement of ground water also mystified the court in *Frazier v. Brown*, 12 Ohio St. 294, 311 (1861). The *Frazier* court said that there was no right to ground water

[b]ecause the existence, origin, movement and course of such waters, and the causes which govern and direct their movements, are so secret, occult and concealed, that an attempt to administer any set of legal rules in respect to them would be involved in hopeless uncertainty, and would be, therefore, practically impossible.

108 Comment, *When the Well Runs Dry: A Proposal for Change in the Common Law of Ground Water Rights in Massachusetts*, 10 B.C. ENVTL. AFF. L. REV. 445, 478-79 (1982); Teutsch, *supra* note 7, at 290.

109 Comment, *supra* note 108, at 462.

110 See *State v. Michels Pipeline Constr. Inc.*, 63 Wis. 2d 278, 291-93, 217 N.W.2d 339, 345-46, modified 63 Wis. 2d 278, 303a, 219 N.W. 308, 309-10

(1974); see also *Friendswood Dev. Co. v. Smith-Southwest Indus.*, 576 S.W.2d 21, 28-29 (Tex. 1978) (court applied the English absolute ownership rule, which denied recovery for subsidence damages caused by ground water loss, to the instant case but held prospectively that plaintiffs can recover if defendants remove water negligently, willfully, or wastefully).

111 See *Finley v. Teeter Stone, Inc.*, 251 Md. 428, 439, 248 A.2d 106, 113 (1968) (finding that under this rule the defendant's pumping large quantities of ground water for on-site mining operation was reasonable).

112 *Friendswood*, 576 S.W.2d at 30.

113 *Id.*

the removal of underground water.¹¹⁴ The court held prospectively that a showing of negligence would provide an exception to the old rule of nonliability that allowed almost unlimited withdrawals of ground water regardless of the effects on surrounding land.¹¹⁵ Landowners brought Friendswood as a class action seeking recovery for subsidence damages caused by the defendants' Withdrawals of large quantities of water from wells on the defendants' lands.¹¹⁶ The trial court applied the old common law rule that, absent any maliciousness or waste, landowners are not liable for damage to their neighbors' lands when the damage results from the landowners' exercise of their rights to withdraw ground water from beneath their own land.¹¹⁷ In reversing summary judgment for the defendants, the Court of Civil Appeals held that the plaintiff had a cause of action in negligence and that the record showed a genuine issue of material fact.¹¹⁸

The Supreme Court of Texas reversed the Court of Civil Appeals and affirmed the trial court because it declared itself bound by common law as it existed during the time of the defendants' actions.¹¹⁹ In a dramatic shift, however, the court held prospectively that in addition to willful waste and maliciousness, a showing of negligence will further limit the application of the common law rule that allowed unlimited ground water withdrawals.¹²⁰

In carving out this exception to the rule that permitted almost unlimited withdrawals of water, the Friendswood court faced a difficult choice: either discard an established rule of water law and allow damage suits worth millions of dollars or affirm an archaic doctrine that was not only based on a lack of knowledge about ground water but also the subject of prior cases in which the court itself had strongly urged legislative reform.¹²¹ The Texas legislature had heard this call for reform. Three years before Friendswood the legislature had created the Harris-Galveston Coastal Subsidence District in an effort to remedy the area's subsidence problem.¹²² In

114 Id. at 30-31.

115 Id.

116 Id. at 21-22.

117 Id. at 22.

118 Id.

119 Id. at 29.

120 Id. at 30. The court refused to rule retroactively because the case involved a long-established rule governing a property right. Id. at 29.

121 Comment, *supra* note 2, at 1223 n. 136.

122 Act Creating the Harris-Galveston Coastal Subsidence District, ch. 284, §§ 1, 3 1975 Tex. Gen. Laws, 672, 672-73. The District's board of directors has the power to issue or deny permits for wells, regulate well locations, and adopt any rules to prevent further subsidence. Id. §§ 24, 28, at 679, 681.

rendering the Friendswood decision, the Supreme Court of Texas relied heavily on expressed legislative intent to regulate subsidence and withdrawals of water.¹²³ The court noted that the legislative action had followed thorough geological and hydrological studies that produced accurate knowledge and measurement of ground water.¹²⁴ The court reasoned that limiting the harshness of an archaic, judge-made rule was in harmony with expressed legislative intent.¹²⁵ The court also noted that the enjoyment of ground water ownership, long recognized as part of the ownership of the land surface, should not receive a special immunity from tort liability, because the use of other aspects of surface or subsurface ownership were not insulated from tort liability when their use proximately caused harm to adjoining landowners.¹²⁶

A Maryland appellate court used a less dramatic approach than that of the Texas court in applying water law doctrine to a subsidence claim in *Finley v. Teeter Stone, Inc.*¹²⁷ In *Finley*, the plaintiffs claimed that the defendant's pumping of water for its quarrying operations adjacent to the *Finley* farmland resulted in a lowering of the water table underlying their land.¹²⁸ Purportedly, the "draw-down" caused sink holes and subsequent subsidence of the *Finley* property.¹²⁹ The plaintiffs argued that ground water law should not apply because the eventual result of the defendant's actions was subsidence. Therefore, the court should look to rules governing the support of land.¹³⁰

On appeal from a directed verdict for the defendant, the *Finley* court declared first that, "[a]s the present case involves the use of subterranean water, we will now consider the law applicable to such waters."¹³¹ The court characterized the problem as one of water law because, since the *Finley* land did not move "sidewise" into the

¹²³ See *Friendswood*, 576 S.W2d at 29-30.

¹²⁴ *Id.* at 29.

¹²⁵ *Id.* at 30.

¹²⁶ *Id.*

¹²⁷ 251 Md. 428, 248 A.2d 106 (1968).

¹²⁸ *Id.* at 429, 248 A.2d at 108.

¹²⁹ *Id.* at 430-31, 248 A.2d at 108-09. Expert testimony indicated that the pumping of water rather than a removal of land near the property line caused the subsidence. See *id.* Furthermore, the plaintiffs, did not contend that the defendant was negligent in his quarry operations or in his pumping of water from it. *Id.* at 431, 248 A.2d at 109.

¹³⁰ *Id.* at 442, 248 A.2d at 115.

¹³¹ *Id.* at 432, 248 A.2d at 109.

Teeter quarry, cases on lateral support did not apply.¹³² Having distinguished the plaintiff's line of cases because the facts indicated that the defendants in each case had removed soil, silt, or quicksand, the court expressed what it called a "vital distinction" between those cases and cases that involved only the movement of water.¹³³ While it did not resort to the naivete of earlier decisions that discussed the mysterious nature of underground water, the court based its distinction the fact that water, unlike quicksand, has a "dynamic quality" and "flow[s], shift[s], or chang[es] position in response to the vagaries of weather and climatic conditions."¹³⁴ The court concluded that:

It is primarily because of this dynamic quality that we cannot hold that interference with the support provided by water is subject to the same rules of absolute liability that are imposed on a landowner who deprives his neighbor of the natural support provided by soils and other more solid materials.¹³⁵

The court thus based its choice of applicable doctrine on a somewhat arbitrary assumption that quicksand and other liquid or semi-liquid substances do not flow, shift, or change position in response to climatic change. The court reached this conclusion despite expert testimony that thoroughly described the process that led to the sink holes. This testimony indicated that the water functioned with clay and other materials to provide support to the surface land and that seasonal changes in rainfall had a marked effect on the ability of the underground system to withstand the pressure of the soil on the surface.¹³⁶

¹³² Id. at 442, 248 A.2d at 115.

¹³³ Id. at 443, 248 A.2d at 116.

¹³⁴ Id.

¹³⁵ Id.

¹³⁶ See id. at 430-31, 248 A.2d at 108-09. A geologist testified that the rock formation under the Finley land was characterized by faulting, fractures, and voids, through which ground water moved naturally at a slow speed. Id. at 430, 248 A.2d at 108. Teeter's pumping of water caused the velocity of the flow toward the quarry to increase substantially. Id. "This action resulted in the dislodging of soils forming the roofs of the solution channels as well as causing soils from the clay mantle to be removed by percolation and flow, thus leaving voids . . ." Id. The clay that formed plugs in these solution channels may have been directly washed away or desiccated when no longer in contact with the water. Id. at 431, 241 A.2d at 109. The overlying mantle of soils over the bed rock, unsupported by earth, then formed the roof of a vault that may have been three to ten feet high. Id. When heavy rains came in the late winter or early spring, "the sudden rush of water infiltrate[d] and saturated! this clay and precipitate[d] a series of collapses. These propagate[d] upwards until the surface of the land cave[d] in and caused! sink holes." Id. Despite expert testimony describing the interconnection of the movement of solid subsurface material, the amount of ground water in the soil, and seasonal changes in rainfall, id. at 430-31, 248 A.2d 108-09, the court distinguished the loss [continues on next page]

Having concluded that the applicable rule was within the body of water law, the Finley court noted a trend toward limiting the old rule of nonliability because it led to harsh results and possible abuses.¹³⁷ The court then stated, however, that under either the old rule of nonliability or one that permits reasonable withdrawals the plaintiffs could not recover.¹³⁸ Under the Finley court's interpretation of a rule that permits reasonable withdrawals, the defendant had the right to use the water beneath his land for any purpose connected with a legitimate and reasonable use of the land.¹³⁹ Because pumping water in the process of quarrying was such a use, the plaintiff could not recover.¹⁴⁰ The court concluded that "[a]s it is prima facie established that Teeter's use of the percolating waters on its land is a legitimate and reasonable one, it is incumbent upon

of lateral support caused by the movement of earth or quicksand from the loss of lateral support caused by the removal of ground water because it believed that the solids or semi-solids did not move in response to climatic changes. *Id.* at 443, 249 A.2d at 116. Modern hydrology indicates this distinction may have been incorrect. See DUNNE & LEOPOLD, *supra* note 3, at 3-6.

137 *Finley*, 251 Md. at 435-36, 248 A.2d at 111. This trend has developed into a rule called the American rule. *Id.* Under the American rule, ground water users escape liability for removing ground water to the injury of another if the removal is for some useful or beneficial purpose relating to the land from which the water is taken. *Id.* at 436, 248 A.2d at 111-12. The landowner's appropriation of ground water from beneath his land must be for a reasonable or beneficial use on that land. Comment, *supra* note 108, at 482.

The court in *Finley* noted that courts sometimes refer to the American rule as either the reasonable use rule or the correlative rights rule. *Finley*, 251 Md. at 436 n. 3, 248 A.2d at 112 n. 3. However, *Bristol v. Cheatham* recognized that the two terms refer to two distinct doctrines. *Id.* (citing *Bristol v. Cheatham*). California cases have distinguished the correlative rights rule as "a refinement or possibly an extension of the scope of the reasonableness of the use rather than a departure from the basic principle of reasonable use underlying the American Rule." *Id.* Commentary has also observed that an important difference between the reasonable use rule and the correlative rights rule is that, as between two local and reasonable users, the correlative rights rule provides for an allocation of water when supply becomes scarce by giving each user a fair and just portion. See Comment, *supra* note 108, at 491. On the other hand, the reasonable use rule categorizes uses as either reasonable or unreasonable based on the situs and purpose of use and fails to assess the reasonableness of a particular interference. See *id.* at 484. Commentary has also noted that the reasonable use rule embodies some of the same deficiencies of the absolute ownership rule, since both permit capturing unlimited amounts of ground water. *Id.* The reasonable use rule limits the absolute ownership rule only by recognizing a local user's rights against users who transport ground water for off-site use or users who appropriate ground water wastefully or maliciously. *Id.* Finally, the reasonable use rule fails to take into account modern hydrological knowledge and the ability to measure the impact of withdrawals on a water table. *Id.* The rigidity of both the absolute ownership rule and the reasonable use rule creates all-or-nothing resolutions to disputes that a scientific approach to ground water allocation would resolve more equitably. *Id.* at 486.

138 *Finley*, 251 Md. at 439, 248 A.2d at 113.

139 *Id.*

140 *Id.* at 439, 248 N.E.2d at 114.

the Finleys to show that such was unreasonable.”¹⁴¹ The court described unreasonable uses as selling water for commercial purposes, wasting water, and maliciously or negligently using water.¹⁴² The court then held that without proof by the Finleys that Teeter acted wastefully, maliciously, negligently, or in any other unreasonable way in using water in its quarrying operation, the injury to the plaintiff remained without a legal remedy.¹⁴³

Citing cases holding that sales or waste of water were unreasonable uses, the Finley court correctly found no liability under a rule prohibiting withdrawals for specific unreasonable purposes. Without examining the effect of pumping great quantities of water in the quarrying business, however, the Finley court found the use of water in quarrying a reasonable use because it was a legitimate business on the defendant’s own land.¹⁴⁴ The Finley court’s finding illustrates a problem of the rule permitting “reasonable” uses, namely that, the reasonable use rule offers no guidance for choosing between two reasonable and local users.¹⁴⁵ Although the Finley court found no liability because the plaintiffs failed to prove that the defendant was negligent or wasteful, the court’s language actually masks a decision that amounts to favoring the larger user.¹⁴⁶ Because

¹⁴¹ *Id.* at 441, 248 N.E.2d at 114.

¹⁴² *Id.* at 441, 248 N.E.2d at 114-15. The court then listed three cases cited by the plaintiffs in their favor as providing that negligent appropriation of ground water is unreasonable and hence grounds for liability. *Id.* at 441, 248 N.E.2d at 115. The court stated that it would assume that these three cases rested on the law of ground water despite evidence in each that defendants drained solid matter out from under the plaintiff,s’ properties. *Id.* at 441 n. 5, 248 N.E.2d at 115 n. 5. This assumption is incorrect because the court in each of the three cases explicitly stated that its decision rested upon principles of lateral support. *Gamer v. Town of Milton*, 346 Mass. 617, 621, 195 N.E.2d 65, 67 (1964) (“The liability, then, lies in the failure to take reasonable precautions to protect the plaintiffs’ adjacent land and does not involve questions of the rights of ownership and use of water.” (footnote omitted)); *New York Cent. R.R. v. Marinucci Bros. & Co.*, 337 Mass. 469, 472, 149 N.E.2d 680, 682 (1958) (“The same obligation [of using reasonable care not to remove lateral support] is imposed upon the excavator in withdrawing a mixture of silt and water as if he [were] removing only sand.”); *Cabot v. Kingman*, 166 Mass. 403, 405, 44 N.E.2d 344, 345 (1896) (“[T]he defendants had no right to take away the soil of the plaintiff . . . and . . . it is immaterial that the soil . . . had been carried away by percolating water.”). The Finley court failed to recognize that this Massachusetts line of cases requires the application of lateral support law and not water law to the water-loss subsidence damage of which the Finleys complained. Moreover, this line of cases requires strict liability where the damage is to land in its natural state like that in *Finley*. See *supra* notes 66-80 and accompanying text.

¹⁴³ *Finley*, 251 Md. at 442, 248 N.E.2d at 115.

¹⁴⁴ *Id.* at 439, 248 N.E.2d at 113.

¹⁴⁵ See Comment, *supra* note 108, at 484.

¹⁴⁶ Cf. *id.* (“[T]he [reasonable use] rule purports to safeguard proprietary rights in ground water, but actually it recognizes only a local user’s right not to be harmed by a transporter or by a wasteful ground water withdrawal.”).

the reasonable use rule permits unlimited withdrawals for an acceptable use, if a large user's use is reasonable, then this rule permits withdrawing huge quantities of water irrespective of effects on neighboring land, unless the plaintiff can surmount the hurdle of proving waste, malice, or sale for off-site use.

The Supreme Court of Wisconsin expressed a similar dissatisfaction with the rule permitting reasonable withdrawals of ground water for failing to protect small users from larger, but still non-malicious or nonwasteful, users.¹⁴⁷ In *State v. Michels Pipeline Construction, Inc.*, the plaintiff-landowners complained that construction of a sewer resulted in a lowering of the water table so that their wells dried up, and as a result of the subsidence of the overlying land, buildings were damaged.¹⁴⁸ The court adopted "the rule set forth in Tentative Draft No. 17 of the Restatement of the Law Second, Torts, as proposed on April 26, 1971, for adoption by the American Law Institute."¹⁴⁹ The court interpreted this proposed section as broadening the protection of the reasonable use rule.¹⁵⁰ Under this view, the reasonable use rule encompasses an evaluation of the reasonableness of favoring one user over another.¹⁵¹ Although the Michels court focused on the loss of well water, it did not exclude the subsidence claim from the application of the proposed section's rule.¹⁵² Therefore, there was no indication that the basis for liability

147 See *State v. Michels Pipeline Constr. Inc.*, 63 Wis. 2d 278, 301, 217 N.W.2d 339, 350, modified 63 Wis. 2d 303a, 219 N.W.2d 308 (1974). The court also rejected the correlative rights rule because it would be difficult to administer and there was no scarcity of water in Wisconsin. See *id.* at 300, 217 N.W.2d at 349.

148 *Id.* at 281-82, 217 N.W.2d at 339-40.

149 *Id.* at 301, 217 N.W.2d at 350. The proposed section read:

A possessor of land or his grantee who withdraws ground water from the land and uses it for a beneficial purpose is not subject to liability for interference with the use of water by another, unless

(a) The withdrawal of water causes unreasonable harm through lowering the water table or reducing artesian pressure,

(b) The ground water forms an underground stream, in which case the rules stated in sec. [sic] 850A to 857 are applicable, or

(c) The withdrawal of water has a direct and substantial effect upon the water of a watercourse or lake, in which case the rules states in secs. [sic] 850A to 857 are applicable.

Id. at 302-03, 217 N.W.2d at 350-51 (quoting RESTATEMENT (SECOND) OF TORTS § 858A(Tent. Draft No. 17, 1971)).

150 *Id.* at 302, 217 N.W.2d at 350.

151 *Id.* at 303, 217 N.W.2d at 352.

152 See *id.* at 303a, 217 N.W.2d at 351. The Supreme Court of Wisconsin overruled the order of the trial court, which denied a cause of action for subsidence caused by the loss of ground water. *Id.* at 303a, 217 N.W.2d at 351.

found in this Restatement (Second) section would not apply to subsidence damage.

The Michels court also noted that a comment to the proposed Restatement (Second) draft indicates that, as between reasonable users, the rule would place similar burdens on persons similarly situated.¹⁵³ As applied to a subsidence case, this language indicates that the court would consider balancing support as one use against other possible uses. In doing so, the court would evaluate the unreasonableness of the subsidence harm to plaintiffs' land and improvements.¹⁵⁴ However, this rule does not necessarily offer complete protection for landowners who are using a water table as support. A landowner using ground water as support would most likely be an earlier user. Because the earlier user should not be able to dictate the acceptable level of withdrawals, a court should attempt to distribute the burden of preventing or repairing subsidence damage among all users of a water table.

As it appears in the Restatement (Second), the first exception to the general rule of nonliability reads much the same as the proposed draft.¹⁵⁵ Comments to § 858 indicate that the exceptions to nonliability incorporate all grounds of liability that the common law recognizes.¹⁵⁶ For example, clause (1)(a) reflects the modern tendency to extend protection to harm created by large, but nevertheless beneficial, uses on overlying land.¹⁵⁷

As described above, § 858 of the Restatement (Second) carves out a more equitable exception to a general rule of nonliability than do earlier ground water law approaches.¹⁵⁸ Making harm from lowering the water table an exception to a general rule of nonliability reflects modern hydrological knowledge¹⁵⁹ and bases liability on the reasonableness of the harm to neighboring landowners.¹⁶⁰ In a subsidence situation, the Restatement (Second)'s objective standard makes each party's right to ground water more secure than it would be under the Finley interpretation, which bases reasonableness on the situs and purpose of use.¹⁶¹ Because the unreasonable harm standard spe-

153 Id. at 303-03a, 217 N.W.2d at 351.

154 See id. at 303-03a, 217 N.W.2d at 351.

155 RESTATEMENT (SECOND), supra note 19, § 858(1)(a).

156 Id. comment c.

157 See Michels, 63 Wis. 2d at 302, 217 N.W.2d at 350.

158 See Comment, supra note 108, at 499.

159 Id. at 497.

160 See id. at 499.

161 See Finley v. Teeter Stone, Inc., 251 Md. 428, 439, 248 A.2d 106, 113 (1968).

cifically applies to any lowering of the water table, contractors, excavators, or water-users, who need to withdraw ground water for their activities would conduct thorough preliminary studies to predict the effects of their activity on the water table.¹⁶² This rule is effective in preventing subsidence because it stresses the importance of maintaining the water table. Whether land settles as a result of the loss of water's buoyant support, or wooden piles decay as a result of the loss of water's chemical properties, this standard protects the landowner whose primary interest is in maintaining the water table at pre-withdrawal levels.

In addition, if a court characterizes the problem of decayed piles as one for water law and accepts Restatement (Second) § 858, then as long as the withdrawal is for a beneficial purpose, the standard by which a court should judge a defendant's withdrawal is the reasonableness of the harm to the plaintiff through the lowering of the water table.¹⁶³ In situations where water is not withdrawn for a beneficial use, the defendant has no protection. Therefore, were this rule the law in the jurisdiction where homeowners' subsurface wooden support piles had decayed, as long as homeowners could prove that a withdrawal was not beneficial and caused unreasonable harm, they could enjoin future removal and recover damages for injury due to past withdrawals.

If a withdrawal of ground water was for a beneficial use, a court following the Restatement (Second) § 858 rule would look at whether the resultant harm was reasonable.¹⁶⁴ A comment to Restatement (Second) § 858 states that the salient factors in evaluating the unreasonableness of the harm are whether the withdrawals are in quantities not common to the locality and the fairness of placing the cost of alternatives on the person or organization whose withdrawals render the local source inadequate.¹⁶⁵ A court could then allocate the burden of replacing piles according to factors such as the amount of ground water the defendant needs to withdraw, the amount of water the plaintiff-landowner needs to maintain piles, the character of the

¹⁶² Cf. *Gamer v. Town of Milton*, 346 Mass. 617, 619, 621, 195 N.E.2d 65, 66, 67 (1964) (in finding that defendant negligently removed supporting ground water, the court elaborated on the precautions that the defendant should have taken even though the court based its decision on support and not water law principles).

¹⁶³ See RESTATEMENT (SECOND), *supra* note 19, § 858(1)(a); see also *id.* § 858 comment f (comparing reasonableness standard applicable to riparian owners).

¹⁶⁴ See *State v. Michels Pipeline Constr., Inc.*, 63 Wis. 2d 278, 302-03a, 217 N.W.2d 339, 350-51 (1974); RESTATEMENT (SECOND), *supra* note 19, § 858 comment e.

¹⁶⁵ RESTATEMENT (SECOND), *supra* note 19, § 858 comment e.

land, levels of water usage and recharge rates characteristic to the area, and alternative sources of both water and support for each party. These factors seem to favor a use such as the subterranean piles support system, which does not actually withdraw water.

However, the comment to § 858 also recognizes that any beneficial withdrawal of ground water necessarily includes the right to affect the source to some degree.¹⁶⁶ If a large and beneficial withdrawal were necessary, courts would most likely favor the necessary and beneficial use over maintaining the water table at a level high enough to prevent decay of wooden piles. The cost of finding an alternative water supply would probably exceed the cost of replacing the wood with steel, concrete, or any material that does not need water to maintain its strength.

The ground water doctrine outlined in the Restatement (Second) provides an opportunity for thorough inquiry into users' needs and the availability of local sources to meet those needs. The most equitable water law test becomes one of balancing one user's interest in maintaining the water table against another user's interest in withdrawing a reasonable amount for a beneficial use.¹⁶⁷

Before concluding whether ground water law or support law should govern the relationships among the parties when subsurface wooden piles require ground water to prevent their decay, this Comment describes an example of the failure of such a support system as the water table has fallen in a neighborhood in Boston, Massachusetts. The Boston settlement problem provides a background against which this Comment will analyze how a court should characterize the problem in a way that achieves a solution that adequately balances building owners' and water users' interests.

IV. CASE STUDY OF A SUBSURFACE WOODEN-PILE SUPPORT SYSTEM: BOSTON'S BACK BAY

Boston's Back Bay neighborhood provides an example of one location where the removal of ground water that prevents the decay of subsurface wooden piles has caused structures to settle.¹⁶⁸ Until the middle of the nineteenth century, most of modern Boston was either submerged or part of a large tidal flat.¹⁶⁹ A thin neck of land over three miles long connected what is now the North End, Finan-

¹⁶⁶ Id.

¹⁶⁷ See id.

¹⁶⁸ Pokorny, *supra* note 10, at 37, col. 2.

¹⁶⁹ Id. at 38, cols. 1-2.

cial District, Waterfront, and Beacon Hill sections of the city to the mainland.¹⁷⁰ As Boston outgrew its natural boundaries, the city looked to the tidal swamp nearby.¹⁷¹ In 1857, the Massachusetts legislature authorized an extensive project to fill the tidal flat.¹⁷² Over thirty years and many tons of sand and gravel later, the Back Bay emerged as a planned residential neighborhood resting on a water-logged bed of soft peat and decayed organic matter covered with sand and gravel that had been hauled by train from hills west of the city.¹⁷³

Thousands of wooden piles support the stately townhouses for which Boston's Back Bay is famous.¹⁷⁴ Because Back Bay is a filled tidal flat, nineteenth century builders who lined the streets with Federal and Georgian facades had a valid reason to believe that the spruce pilings they used would support three and four story homes.¹⁷⁵ The builders knew that, because water almost completely surrounded Back Bay, the underground water level in the area would remain at the mean tidal level.¹⁷⁶ As a result, given the porous nature of the sand and gravel fill, these builders could safely use the wooden piles as sub-surface support up to almost sea level. The water table could even fluctuate somewhat because large stone foundation slabs cap the piles below what was then the water table level.¹⁷⁷ These Back Bay builders reasonably assumed that the wooden piles would not decay because the water saturating this layer of landfill would protect them.¹⁷⁸

What the builders did not know was that Boston would grow to become a dense urban area replete with an underground subway system, buried railroad embankments, tunnels for expressways, and a maze of sewer lines.¹⁷⁹ Back Bay alone now has an estimated

¹⁷⁰ See *id.* at col. 2 (map).

¹⁷¹ *Northeast Journal: A Problem Under Boston*, N.Y. Times, July 28, 1985, at 34, col. 5 [hereinafter N.Y. Sunday Times].

¹⁷² Resolve of May 26, 1857, ch. 70, 1857 Mass. Acts 688.

¹⁷³ Pokorny, *supra* note 10, at 38, col. 2.

¹⁷⁴ *Id.* at 37, col. 1.

¹⁷⁵ *Id.* at cols. 1-2. Although wood will rot when it is buried, if water surrounds the wood, the water protects the cellulose within the wood's cells from the fungi and bacteria that cause decay. *Id.* at col. 1.

¹⁷⁶ *Id.* at col. 1.

¹⁷⁷ N.Y. Sunday Times, *supra* note 171, at 34, col. 5.

¹⁷⁸ Pokorny, *supra* note 10, at 37, cols. 1-2. The builders could safely use these wooden support piles up to sea level because the high content of water in the sand and gravel fill would suffice to protect the piles from decay. *Id.*

¹⁷⁹ *Id.* at col. 2.

population of 17,000 persons.¹⁸⁰ Located next to downtown Boston, Back Bay is a mixed-use residential and commercial neighborhood. Although necessary to maintain an urban neighborhood, this modern infrastructure may have contributed to lowering the water table and thus caused the decay of the wooden piles.¹⁸¹ As early as 1929, the walls of the Boston Public Library, in the heart of Back Bay, began to crack.¹⁸² Inspectors found that its wooden support piles had rotted because ground water had drained into a sewer line.¹⁸³ After this discovery, the city began to monitor ground water levels.¹⁸⁴ The federal Works Progress Administration (WPA) dug 700 observation wells throughout the Back Bay in the 1930s.¹⁸⁵ Experts also mapped the water table for the first time.¹⁸⁶ Unfortunately, most of these observation wells have been paved over and lost during the last fifty years.¹⁸⁷

Since the early 1900s, Back Bay's water table has dropped more than two feet.¹⁸⁸ As water drains from the soil around the piles, fungi and bacteria that could not live in water begin to feed on the piles.¹⁸⁹ Engineers have estimated that it takes three to ten years to destroy a pile completely.¹⁹⁰

Homeowners in the entire area face the possibility of having to replace the decayed wooden piles supporting their homes with concrete and steel foundation supports.¹⁹¹ Besides visible damage to walls and door or window frames, the condition of some of the piles may lead to pervasive damage making the buildings unsafe for occupation.¹⁹² In May, 1985, the City of Boston's Inspectional Services Department sent six homeowners notices that they must apply for permits to repair their foundations or raze their buildings.¹⁹³ Re-

¹⁸⁰ Bermar, Back Bay: Generational Elegance, Boston Globe, Nov. 15, 1986, at 37, col. 1.

¹⁸¹ Pokorny, supra note 10, at 37, col. 2.

¹⁸² Id. at 38, col. 2.

¹⁸³ Id.

¹⁸⁴ Id.

¹⁸⁵ Id. Massachusetts has recognized the importance of efforts to monitor ground water levels in deciding whether a defendant negligently drew off ground water.

See *Gamer v. Town of Milton*, 346 Mass. 617, 619, 621, 195 N.E.2d 65, 66, 67 (1964).

¹⁸⁶ Pokorny, supra note 10, at 38, col. 2. Mapping the water table is a way of recording ground water levels by the location of each observation well.

¹⁸⁷ See id.

¹⁸⁸ See id. at col. 1.

¹⁸⁹ Hudson, Sinking Feeling Hits Owners of Elegant Homes on Beacon Hill, Providence Sunday J., Oct. 13, 1985, at 20, col. 1.

¹⁹⁰ See id.

¹⁹¹ See Pokorny, supra note 10, at 37, col. 2.

¹⁹² Wells, supra note 1, at 1, col. 1.

¹⁹³ Id.

pairing townhouses on Brimmer Street, between Beacon Hill and Back Bay, has cost homeowners between \$ 150,000 and \$ 200,000, where in many cases only the upper two feet of piles had decayed.¹⁹⁴ The rotted piles are soft and crumble at the touch.¹⁹⁵ Repairs include cutting the columns below the current water level and shoring them up with concrete and steel.¹⁹⁶ Experts investigating the problem have agreed that many other buildings in the filled areas of the city would be affected.¹⁹⁷

Experts have found that one major cause of the drop in the water table is leaking sewer pipes that lie below the underground water level and drain off ground water.¹⁹⁸ Water from the ground above the pipes seeps into them through their cracks and then flows away.¹⁹⁹ Boston's Water and Sewer Commission has undertaken an extensive search for pipe leaks.²⁰⁰ This search has included dragging a special waterproof television camera through sewers on a cable.²⁰¹ Fixing the pipes may involve digging them up and replacing them, a costly project that would also require diverting traffic from the already over-crowded streets and highways overlying the pipes.²⁰² An alternative to replacing the pipes is relining them, but some

194 *Id.* at 38, col. 1. See also Kohn, Boston: That Sinking Feeling, Pilings Rot Away on Beacon Hill, USA Today, July 23, 1985, at B2, col. 2. A group of building and condominium unit owners have filed a complaint against the Metropolitan District Commission, Boston Water and Sewer Commission, Massachusetts Water Resources Authority, the City of Boston, and a design consultant. Complaint, *Brimmer Chambers Condominium Trust v. Metro. Dist. Comm'n*, No. 87-1123

(Mass. Super. Ct. filed Feb. 27, 1987). In Count One, the plaintiffs allege that the defendant government agencies were negligent in failing to maintain the sewer and stormwater collection systems in a way that did not lower ground water levels and cause deterioration of wooden piles under their buildings. *Id.* The second count alleges the design consultant's negligence in failing to include plans for observation wells in its plans for a pumping station. *Id.* The complaint also claims that the government agencies violated their statutory mandates and that their activities amounted to both a private nuisance and an unconstitutional taking of the plaintiffs' property. See *id.* The plaintiffs seek compensation for the loss of and damage to their buildings or units and an order to the defendant government agencies requiring them to develop a remedial plan to maintain ground water levels. See *id.* As of this writing, discovery on the case is underway, and the court has not set a trial date.

195 Pokorny, *supra* note 10, at 38, col. 1.

196 *Id.*

197 *Id.* See also In Boston, Real Downer: Beacon Hill Sinking as Pilings Rot, *Int'l Herald Tribune*, July 19, 1985, at 2, col. 6.

198 Pokorny, *supra* note 10, cols. 2-3. See also B.R.A. REPORT, *supra* note 9, at 20. The diagram in Appendix A shows the subsurface support system under a Back Bay townhouse, the change in ground water levels, and their relationship to sewers below basement level.

199 Pokorny, *supra* note 10, at 38, col. 1.

200 See *id.*

201 *Id.*

202 See *id.*

relining methods may succeed only if the cracks are small.²⁰³ Engineers have already found cracks in the major sewer conduit serving part of Back Bay.²⁰⁴ These engineers are working to discover which cracks are draining the most ground water.²⁰⁵ This process involves plugging and unplugging the pipes to find which cracks have the greatest effect on ground water levels.²⁰⁶ Engineers have also discovered that by increasing the water level in the main sewer conduit so that ground water does not flow into it from the outside, ground water levels in the affected area have risen.²⁰⁷ This fact indicates that the conduit is at least partially responsible for draining ground water from the layer of landfill in which the piles have decayed.²⁰⁸

Other possible causes for the lowering of the water table exist. Homeowners themselves could have leaks at their connections to the city's sewer lines.²⁰⁹ A powerful sump pump that removes 20,000 gallons of water per day from the underpass of a nearby expressway may also be draining local ground water.²¹⁰ Finally, construction of a subway tunnel in the late 1930s required extensive and prolonged dewatering to levels below any other construction known up to 1985.²¹¹

In 1985, Boston City Council's Planning and Development Committee responded to the problem initially with a public hearing to address solutions to and responsibility for building foundation damage caused by a lowered water table.²¹² Testimony at the hearing

203 Id.

204 Id. at col. 2.

205 Id. at col. 3.

206 Id.

207 Id.

208 Id.

209 Id.

210 Id. Even in dry weather, this pump removes 20,000 gallons of water per day from an underpass situated below the water table level. This removal may be a large drain on local ground water. Id. See also B.R.A. REPORT, *supra* note 9, at 22.

211 B.R.A. REPORT, *supra* note 9, at 20.

212 Information Memo [sic]: Water Table Levels (July 15, 1985) (available from office of City of Boston Councilor David Scondras) [hereinafter Scondras Memo]. At the hearing, officials recognized that the city had been aware of the problem since 1929. There was general agreement that the city assume a prominent role in future water table monitoring, assigning responsibility for the drawdown, devising a corrective program, and determining if owners are entitled to compensation. Id. Testimony at the hearing also indicated that what was originally perceived as a problem affecting only owners of stately townhouses in Boston's wealthier neighborhoods also threatened low-cost housing in the Fenway, a Boston neighborhood that is also built on landfill. See Low-Cost Housing and Aquifer Depletion: Testimony Before the Boston City Council (1985) (testimony of Galen Gilbert, Secretary, Fenway Community Development Corporation). This testimony indicated that many apartment building owners in this neighborhood could not afford necessary foundation repairs without large rent [continues on next page]

and reports from outside consultants hired by the city indicated four areas for remedial efforts: 1) recovering and using as many as possible of the 700 monitoring wells installed by the WPA; 2) exploring ways to raise the water table level; 3) seeking federal disaster relief aid for affected homeowners; and 4) creating a compensation pool funded by state or municipal agencies, public utilities, or private companies responsible for lowering the water table.²¹³

Almost a year later, the city established the Boston Ground Water Trust²¹⁴ to receive private sector donations to fund the drilling of water table observation wells.²¹⁵ Establishment of the Trust resulted from nine months of negotiations among city and state officials and business community leaders in search of both a long term ground water monitoring system and financial relief to property owners who have already suffered damages from a lowered water table.²¹⁶ Initially, the Trust will pay for ground water monitoring.²¹⁷ The Trust will then analyze the data, conduct studies and make recommendations on both short and long term solutions.²¹⁸ One city council member has also proposed an ordinance that would require anyone pumping more than 400 gallons of water per day to get a permit.²¹⁹ For Boston, the Ground Water Trust and a permitting program to monitor significant drawdowns are the beginnings of a solution to a complex and potentially disastrous problem.

hikes that would effectively displace low income tenants. See *id.* In the alternative, the owner would have to raze the building and sell the lot. If this happened, the pressure to replace the low cost housing with a luxury development would be enormous. Either way, foundation deterioration would become a problem for both high and low income city residents, See *id.*

213 See generally Scondras Memo, *supra* note 212, at 1-3. Boston City Councilor David Scondras also wrote to Massachusetts Governor Michael Dukakis asking the state to apply for funds from the Federal Emergency Management Agency (FEMA) to compensate area building owners. See also Wells, Scondras to Release Plan to Monitor Downtown Water Table, *Boston Tab*, May 13, 1986, at 1, col. 2.

214 BOSTON, MA., CODE eh. 11, § 400 (1986).

215 *Id.* See also Wells, *supra* note 213, at 1, col. 2; Frisby, Ground Water Level Concern: Hotel Pledges Donation to Trust That Would Examine the

Problem, *Boston Globe*, June 4, 1986, at 22, col. 4.

216 Wells, *supra* note 213, at 1, col. 2.

217 Boston City Council, Press Release (June 3, 1986) (available from office of Boston City Councilor David Scondras).

218 *Id.* At least one trustee, however, foresees funding the Trust with contributions from the governmental agencies or private companies responsible for water table drawdown and using the fund to compensate building owners for foundation repairs. Interview with Galen Gilbert, Trustee, Boston Ground Water Trust (Feb. 16, 1988).

219 Chapman, Legislation Aims to Aid Beacon Hill Water Table, *Boston Sunday Herald Downtown*, Oct. 25, 1987, at 2, col. 1. The permit would also require that water pumped from a construction site must be rerouted so that it recharges the water table. *Id.*

V. GROUND WATER WITHDRAWALS AND DECAYED SUBSURFACE WOODEN PILES: SUPPORT LAW OR GROUND WATER LAW?

Support law and ground water law approaches to ground-waterloss subsidence have developed simultaneously. Each approach began with an absolute-right based rule, either the absolute right of landowners to pump ground water from beneath their land²²⁰ or the absolute right of the land itself to the support of adjacent land.²²¹ In ground water law, courts have narrowed the old rule of nonliability by describing the kinds of uses permitted²²² or imposing objective standards on the acceptability of interference with others' ground water.²²³ In lateral support law, courts have limited the general rule of strict liability for land in its natural state by changing the standard when improvements are present on the supported land.²²⁴

Courts' efforts to limit support law's strict liability standard have led to the application of a negligence standard when improvements to land suffer settlement damage.²²⁵ Some jurisdictions require an initial finding of whether the improvement subsided due to its own weight or whether it contributed to the land's subsidence.²²⁶ If an improvement's weight has contributed to the settlement, the appropriate standard for actions causing injury to that improvement is negligence.²²⁷ One jurisdiction applies a negligence standard without this initial finding whenever improvements are present.²²⁸ Either one of these two support law approaches provides relief when negligent actions cause settlement of improvements.

When withdrawal of some mix of water and soil causes settlement damage to improvements, courts have continued to apply support law's negligence standard under either one of the two approaches to improvements described above.²²⁹ Alaska,²³⁰ Rhode Island,²³¹ and Massachusetts²³² have applied support law when the removal of quicksand or semi-liquids caused settlement. In 1964, Massachusetts

220 See supra notes 97-106 and accompanying text.

221 See supra notes 28-29 and accompanying text.

222 See supra notes 137-43 and accompanying text.

223 See supra notes 119-15 and accompanying text.

224 See supra notes 50-52, 65-66 and accompanying text.

225 See supra notes 66-81 and accompanying text.

226 See supra notes 50-64 and accompanying text.

227 See supra notes 51-61 and accompanying text.

228 See *Gamer v. Town of Milton*, 346 Mass. 617, 620-21, 195 N.E.2d 65, 67 (1964).

229 See generally supra notes 50-70 and accompanying text.

230 See *Williams v. Anderson Constr. Co.* 105 F. Supp. 497 (D. Alaska 1952).

231 See *Prete v. Cray*, 49 R.I. 209, 141 A. 609 (1928).

232 See *Cabot v. Kingman*, 166 Mass. 403, 44 N.E. 344 (1869).

went a step further in *Gamer v. Town of Milton*.²³³ The *Gamer* court concluded that, even though the defendant removed only water from the land adjacent to the plaintiffs' homes, support law governed.²³⁴

To apply support law to ground water loss and the wooden-pile support problem, a court should recognize the hydrological and chemical principles that allow water to function as a supporting substance. Where ground water withdrawals cause the decay of subsurface wooden piles, courts would have to extend the water-as-support concept to include water's functioning as a barrier to the decay of the wood. A court would have to recognize that both the physical and chemical properties of water can provide support.

When ground water loss causes wooden piles to decay, results under support law analysis may differ depending on whether a court makes the initial finding of causation-in-fact. If a court goes directly to the negligence analysis for improvements, its response would be that because wooden piles are improvements, negligence is the appropriate standard. However, if a court makes the initial finding of causation-in-fact, strict liability could conceivably attach for injury to wooden piles.²³⁵ The reason for imposing strict liability when causation-in-fact is a threshold determination is that the piles themselves would not have deteriorated had the water table remained at historical levels.²³⁶ Therefore, any party responsible for a ground water drawdown that resulted in a loss of the water's support for the piles could be held strictly liable for injury to the piles. This result, obtained when loss of support is equated with deterioration, would undermine the purpose of limiting the strict liability standard only to land in its natural state.²³⁷ Addressing damage to wooden piles in this manner would effectively permit the owner of a building supported by wooden piles to increase the burden on neighboring landowners to maintain ground water levels high enough to support

²³³ 346 Mass. 617, 195 N.E.2d 65 (1964).

²³⁴ *Id.*

²³⁵ At least two jurisdictions have applied strict liability when improvements were present on the land. See *supra* notes 30-49 and accompanying text.

²³⁶ The question could be whether the land surface itself would have settled from the drawdown in the water table, and if it would have, strict liability would attach.

See *Prete v. Cray*, 49 R.I. 209, 141 A. 609 (1928). See also note 64. Because the wooden piles are beneath and not on top of the land surface, however, this way of framing the issue should apply in a way that considers only damage to the piles. The loss of support for the piles is occurring below the surface of the land itself. Within this landfill layer, if ground water drawdown is great enough, materials composing this layer 'will compact. Effects of this compaction would transmit upwards as subsidence of the land. See *DUNNE & LEOPOLD*, *supra* note 3, at 227-29. Analyzing causation-in-fact by considering the land surface, however, would be appropriate when assigning responsibility for damage to structures supported by the wooden piles.

²³⁷ See *supra* notes 80-85 and accompanying text.

subsurface improvements. To avoid this result, a court should consider the piles themselves as contributing to their own decay when ground water levels decline. If a court does so, under either support law analysis involving improvements, negligence is the appropriate standard.

A better way to avoid such an all-or-nothing approach is to characterize the wooden piles' need for water as a use of ground water. The wooden piles' dependence on the presence of ground water is a use of water for the maintenance of a man-made support system. Rather than requiring a water table drawdown as do most other uses, maintaining this subsurface support system requires water table levels to remain the same over time.

Courts have grappled with a choice of law for the water-loss subsidence problem ever since *Popplewell v. Hodkinson*, an 1896 English case in which the plaintiff, whose cottages settled when a builder drained adjacent land, argued that the right to ground water and the right to support from ground water are distinct.²³⁸ Jurisdictions that have followed or modified *Popplewell's* ground water rule of nonliability have based their decisions on the presence of water as a supporting substance.²³⁹

One modern case, *Friendswood Development Co. v. Smith-Southwest Industries*, in which the court applied water law to ground-water-loss subsidence, changed Texas's ground water law prospectively to offer protection to future victims of a serious and widespread subsidence problem.²⁴⁰ After several calls for legislative reform of ground water law,²⁴¹ the court applied ground water law in the face of rapidly declining water supplies and in recognition of recent legislative action to monitor withdrawals to prevent further subsidence.²⁴² In another modern case, a court has chosen ground water law when the defendant's withdrawals were within the court's definition of acceptable uses.²⁴³ This court chose water law arbitrarily and failed to mention criteria other than possible harsh results and abuses under the general rule of nonliability.²⁴⁴ One later case, *State v. Michels Pipeline Construction, Inc.*,²⁴⁵ applied a draft of the new Restatement (Second) § 858 that incorporates a reasonableness stan-

238 *Popplewell v. Hodkinson*, 4 L.R. -Ex. 248, 250 (1869).

239 See supra notes 114-20, 132-37 and accompanying text.

240 576 S.W.2d 21, 30-31 (Tex. 1978).

241 Teutsch, supra note 7, at 315-16.

242 See *Friendswood*, 576 S.W.2d at 30.

243 *Finley v. Teeter Stone, Inc.*, 251 Md. 428, 432, 439, 428 A.2d 106, 109, 113 (1968).

244 See supra notes 131-32 and accompanying text.

245 63 Wis. 2d 278, 217 N.W.2d 339 (1974).

dard and a balancing approach to claims by various ground water users.²⁴⁶ Although these cases have gone beyond the earlier, absolute rule of nonliability for almost any withdrawal of ground water, only the courts in Michels and Friendswood made a choice based on an allocation of risks and responsibilities among the parties dictated by the conditions of the water supply in the region.²⁴⁷

Even though failure of the wooden-pile support system differs from the deep aquifer depletion problem that caused subsidence in Friendswood, both problems create situations in which a group of building owners depend upon ground water levels to prevent subsidence.²⁴⁸ Both the Friendswood and the Restatement (Second) approaches would protect building owners, dependent on ground water for support of wooden piles, from negligent ground water withdrawals.²⁴⁹

The Restatement (Second) goes beyond Friendswood, however, to establish a more equitable water law approach because it provides for a thorough inquiry into all users' needs and the availability of local sources to meet those needs.²⁵⁰ The Restatement (Second) approach also balances one user's interest in withdrawing a reasonable amount for a beneficial use against a user who requires the water table to remain at current levels.²⁵¹ Choosing a ground water approach that permits this balancing process allows water table maintenance at an historic level to the extent that it does not prevent necessary beneficial uses.

Under modern ground water law, however, courts may have to permit harm to wooden piles if ground water becomes a scarce resource. In this scenario, a court would consider the benefits of a local withdrawal for the needs of many and the costs of obtaining water from another source. The court would have to weigh these factors against the benefits of using this wooden-pile support system and the costs of replacing wooden piles with other structural supports not requiring ground water. Short of a natural disaster or an unusual climatic change, it is unlikely that this situation would arise in an area where ground water has been plentiful enough to permit the wooden-pile system in the first place. Nevertheless, this possibility should not prevent a jurisdiction from adopting the balancing

²⁴⁶ Id.

²⁴⁷ See supra notes 113-26, 150-54 and accompanying text.

²⁴⁸ See supra notes 113-16, 174-78 and accompanying text.

²⁴⁹ See supra notes 120, 163 and accompanying text.

²⁵⁰ See supra notes 158-67 and accompanying text.

²⁵¹ See supra notes 166-67 and accompanying text.

approach of modern ground water law over older ground water doctrine, or even support law, as a solution to this problem.

Although modern ground water law stresses maintaining water table levels, it also provides objective criteria for determining whether a particular ground water use causes unreasonable harm to other users.²⁵² Under modern ground water law, courts consider factors such as whether the withdrawals are in quantities not common to the locality and the fairness of placing the costs of alternatives on the person whose use renders local supplies inadequate for other reasonable uses. In addition to providing an objective standard by which courts can judge past actions, modern ground water law provides standards by which a legislatively created ground water authority can balance the needs of competing ground water users. Thus, if a wooden-pile support system fails because the water table has declined, modern ground water law as expressed in the Restatement (Second) not only provides an approach to the problem that balances competing users' interests, but also sets forth criteria by which courts and ground water authorities can evaluate future ground water needs and supplies.

VI. CONCLUSION

The settlement of structures resting on wooden piles that have decayed as a result of ground water loss provides an example of a settlement problem that Boston and other older, coastal cities will have to address in the next several years. A landowner's right to ground water that prevents the decay of an artificial support system involves the interplay of support and ground water law.

When artificial additions such as subsurface wooden piles are present, support law analysis culminates in holding defendant water-users either to a negligence standard of due care in making withdrawals or to a strict liability standard under the line of cases that first determine whether the improvement itself contributed to its own injury. Either way, support law analysis rests on characterizing decay of the piles as a failure of water to provide support.

The need for water to prevent decay of subsurface wooden piles is also usufructory in nature. Rather than depending on the natural presence of water pressure as part of a geological system beneath the land, subsurface wooden piles depend upon water's chemical

²⁵² See *supra* note 165 and accompanying text.

properties to prevent decay. Thus, the wooden piles' needs become a use of ground water that must compete with other possible uses.

Modern ground water law, as expressed in the Restatement (second), is best able to assign rights and responsibilities among competing users such as building owners dependent upon a subsurface wooden-pile support system. Like support law, modern ground water law provides a negligence standard that applies to all parties claiming a need for available ground water. In addition, modern ground water law provides criteria by which courts or a local water protection authority can balance maintaining current levels against other possible beneficial uses and plan for future use or protection of local ground water.