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Managing Hydrologically Connected Surface and Ground Water: Practices from Other Western States

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> This hypothetical withdrawal of water from a shallow aquifer that discharges into a nearby surface-water body is a simplified but compelling illustration of the concept that ground water and surface water are one resource. *In the long term, the quantity of ground water withdrawn is approximately equal to the reduction in streamflow that is potentially available to downstream users.*
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> Thomas C. Winter, Judson W. Harvey, O. Lehn Franke & William M. Alley
> "Ground Water and Surface Water: A Single Resource"
> U.S. Geological Survey Circular 1139 at 11 (emphasis added) (1998)

The 2004 Nebraska Legislature addressed this blunt hydrologic fact in adopting LB962. In doing so, Nebraska becomes the first western state to explicitly and meaningfully consider the effects of ground water pumping on streamflows in making water allocation decisions.

Beginning January 1, 2006 the DNR must make annual evaluations of "the expected long-term availability of hydrologically connected water supplies for both existing and new surface water uses and existing and new ground water uses in each of the state's river basins." NRS 46-713(1)(a). For each river basin, subbasin, or reach evaluated, the report shall describe (I) the nature and extent of use of both surface water and ground water in each river basin, subbasin, or reach, (ii) the geographic area within which the DNR preliminarily considers surface water and ground water to be hydrologically connected and the criteria used for that determination, and (iii) the *extent to which the then-current uses affect available near-term and long-term water supplies*. Id (emphasis added).

Based on the information reviewed in the evaluation process, the DNR shall arrive at a preliminary conclusion for each river basin, subbasin, and reach evaluated as to whether such river basin, subbasin, or reach presently is ***fully appropriated*** without the initiation of additional uses. NRS 46-713(1)(b) (emphasis added).

A river basin, subbasin, or reach shall be deemed fully appropriated if the department determines that then-current uses of hydrologically connected surface water and ground water in the river basin, subbasin, or reach cause or will in the reasonably foreseeable future cause

> (a) the surface water supply to be insufficient to sustain over the long term the beneficial or useful purposes for which existing natural flow or storage appropriations

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were granted and the beneficial or useful purposes for which, at the time of approval, any existing instream appropriation was granted,

(b) the streamflow to be insufficient to sustain over the long term the beneficial uses from wells constructed in aquifers dependent on recharge from the river or stream involved, or

(c) reduction in the flow of a river or stream sufficient to cause noncompliance by Nebraska with an interstate compact or decree, other formal state contract or agreement, or applicable state or federal laws. NRS 46-713(3).

Finally, a river basin, subbasin, or reach shall be deemed ***overappropriated*** if, on July 16, 2004, the river basin, subbasin, or reach is subject to an interstate cooperative agreement among three or more states and if, prior to such date, the DNR has declared a moratorium on the issuance of new surface water appropriations in such river basin, subbasin, or reach and has requested each NRD with jurisdiction in the affected area in such river basin, subbasin, or reach either (I) to close or to continue in effect a previously adopted closure of all or part of such river basin, subbasin, or reach to the issuance of additional water well permits in accordance with NRS 46-656.25(1)(k) as such section existed prior to July 16, 2004, or (ii) to temporarily suspend or to continue in effect a temporary suspension, previously adopted pursuant to NRS 46-656.28 as such section existed prior to July 16, 2004, on the drilling of new water wells in all or part of such river basin, subbasin, or reach. NRS 46-713(4)(a).

By September 15, 2004, the DNR shall designate which river basins, subbasins, or reaches are overappropriated. The designation shall include a description of the geographic area within which the department has determined that surface water and ground water are hydrologically connected and the criteria used to make such determination. NRS 46-713(4)(b).

The DNR is required to identify river basins or portions thereof that are either fully-appropriated or overappropriated, taking into account the stream depletion effect of existing wells withdrawing hydrologically connected ground water. In general terms, the DNR must determine whether the stream depletion resulting from pumping hydrologically connected wells will now or in the future interfere with existing surface water appropriations. If so, the basin, subbasin or stream reach is overappropriated. If not, but if stream depletion from new hydrologically connected wells would interfere with existing surface water appropriations, the basin, subbasin or stream reach is fully appropriated. Conceptually, this process involves three major steps: (1) determining what ground water is hydrologically connected, (2) determining the long-term effect of withdrawals from current wells on the ground water supply, including possible stream depletion effects, and (3) the long-term availability of streamflow to meet current surface water rights and uses.

No western states currently makes such "fully appropriated" or "overappropriated" determinations for streams and hydrologically-connected ground water. However, some western states do make similar but more limited determinations, e.g. (1) in defining ground water as being tributary or hydrologically connected, (2) in determining whether "critical" ground water areas should be closed to new uses, or whether unappropriated ground water is available for appropriation; and (3) whether unappropriated surface water is available for appropriation. A brief description of these procedures may assist the DNR in making its fully-appropriated and overappropriated determinations.

Because there are so few useful precedents we will simply describe the relevant authorities and administrative practices of each western state. By way of background, all

western states follow the doctrine of prior appropriation for surface water allocation, and most (but not all) western states follow appropriation for ground water allocation. However the appropriation procedures vary widely among states. Further, appropriation is only a partial basis for surface water allocation in California and Texas, and is not a significant basis for ground water allocation in California, Texas, Arizona or Nebraska. There is also wide variation regarding authority for state appropriation officials to determine that there is no surface or ground water available for appropriation.

Another important issue is the extent to which hydrologically connected surface and ground water are treated as a single source. Some states apply appropriation to both surface and ground water. Some states apply appropriation to surface water but only to some categories of ground water. Two broad categories of ground water relevant to this discussion are (1) water in an underground stream and (2) tributary ground water. Although precise definitions vary from state to state, in very broad terms wells that induce ground water recharge from a surface stream would usually be considered to be pumping water from an underground stream, or from the underflow of a surface stream (for our purposes the two terms are synonymous). Tributary ground water is ground water that would ultimately reach a stream if not first intercepted by a well. Arizona and Texas follow the underground stream/underflow doctrine; California and Colorado follow the tributary stream doctrine. Some states (such as California) recognize the relationship between hydrologically connected and surface water principally through court decisions.

Arizona

Surface water law. Prior appropriation is the rule for surface water allocation. ARS 45-101, -101(A). Prior to 1919, surface water appropriations could be acquired by meeting notice and actual water use requirements. After adoption of the 1919 irrigation code, appropriations were obtained upon application to the state water commissioner. 6 Waters & Water Rights at 214-15 (1994). However, pre-1919 priorities were not adjudicated, and Arizona is currently adjudicating priorities on most of its streams. Id. at 209. Unappropriated water is available for appropriation. NRS 45-151(A). No statutory criteria to aid in determining whether a stream is unappropriated.

Prior appropriation also applies to water "in definite underground channels". 6 Waters & Water Rights at 205-06. Arizona courts have interpreted the "definite underground channel" language to include only the "underflow, subflow, or undercurrent" of a surface stream; this is the only ground water in Arizona that is also subject to appropriation. This subflow/underflow doctrine has recently been affirmed by the Arizona courts. Id. The Arizona Department of Water Resources (DWR) had proposed a test that a well could be considered to be withdrawing surface water if the well's stream depletion was at least 50% of total pumping within 90 days of continuous pumping. Id. at 206. This test was rejected by the Arizona supreme court as not being the subflow of a surface stream. Id. at 207. A narrower test limiting subflow to the "saturated floodplain Holocene alluvium" was subsequently approved by the court. In re Gila River General Adjudication, 9 P.3d 1069, 1080-81 (2000).

Ground water law. Traditionally Arizona has followed the rule of reasonable use, similar to Nebraska. Thus no state permits were required to drill irrigation wells. In 1980 Arizona adopted the Arizona ground water code to control ground water depletion. ARS 45-401 et seq. The 1980 statute designated four active management areas (AMAs) and two irrigation non-expansion areas (INAs). ARS 45-411. A fifth AMA was designated by statute in 1994. A third INA was designated by the Director of the Arizona Department of Water Resources. ARS 45-432(a); 6 Waters & Water Rights at 209-10. Ground water pumping is being gradually reduced

in AMAs and new high-capacity well drilling is severely limited. No new irrigation are allowed in INAs, but existing uses are not regulated. Id. at 210. ARS 45-512. The ground water management goal is to reach safe yield by 2025, taking into account water availability from the Central Arizona Project. ARS 45-562. .

California

Surface water law. California law recognizes both riparian and appropriative surface water rights. 6 Waters & Water Rights 243ff. Since December 19, 1914, new surface water appropriations (including appropriations of ground water in a known and definite channel) are subject to state approval, currently from the State Water Resources Control Board. Id. at 245-46; Cal. Water Code §1225. However, the widespread existence of active riparian rights complicates surface water administration in California. The SWRCB has conditioned new appropriations on maintaining instream flows for environmental purposes. 6 Waters & Water Rights 248. The SWRCB uses a formal "water availability analysis" to help it determine whether unappropriated water is available (for more detailed information, go to www.waterrights.ca.gov/WaterAvailability/default.html#watercode). See Appendix B [Jess] at 3-4.

Ground water law. Ground water is not subject to state permitting, unless the ground water is being pumped from a known and definite underground channel. Only in Texas do ground water pumpers have fewer pumping restrictions than in California. California courts have ruled that tributary ground water is legally considered to be part of the stream and is subject to surface water law (riparian and appropriative). Sax, "We Don't Do Groundwater: A Morsel of California Legal History," 6 U. Denver Water L. Rev. 269 (2003).

Colorado

Surface water law. In Colorado, "the right to divert the unappropriated waters of any natural stream to beneficial uses shall never be denied." Colo. Const. art XVI §6; cf. CRS 37-82-101 (waters of natural streams, including tributary ground water, are subject to appropriation). The primary limit on appropriations is that they not harm senior appropriators. CRS 37-82-104. The Colorado state engineer does not grant permits for new appropriations, as is common in other western states. Instead, acquiring new water rights is a judicial process. Applications for conditional water rights are filed with the clerk of the local water court. Once the conditional right is decreed by the court (after notice and hearing), the appropriation must be perfected by application to beneficial use. Then the appropriator may apply to the court for a decree for the perfected appropriation. 2 Waters & Water Rights 15-48 to -52; CRS 37-92-101ff. Clearly there is no administrative process for determining whether unappropriated water is available for surface water or tributary ground water.

Ground water law. Appropriation applies to tributary ground water. 6 Waters & Water Rights 256. The process for obtaining an appropriation of tributary ground water is similar to acquiring a surface water appropriation through the water courts.

Colorado statutes do establish when ground water is not tributary ground water. Nontributary ground water is water (outside a designated ground water basin–discussed below) that, when withdrawn, does not deplete the flow of a natural stream within 100 years greater than one-tenth of one percent of the annual rate of withdrawal." CRS 37-90-103(10.5). For example, a well pumping 200 acre-feet per year for 100 years (20,000 acre-feet total) would be tributary if it depleted streamflow at a rate exceeding 0.20 acre-feet per year within the 100 years. This is one method (very inclusive) for defining what constitutes tributary (or

hydrologically connected) ground water.

The Colorado ground water commission regulates ground water use within designated ground water basins. 6 Waters & Water Rights 256. The commission uses a "three mile test" to determine whether unappropriated ground water is available for new wells. The basic process is that a circle with a three-mile radius is drawn around the proposed well. If the total authorized ground water withdrawals within the circle plus the ground water sought to be appropriated would deplete the ground water within the circle more than 40% in 100 years (formerly in 25 years), the permit for the new well is denied. The formulas implementing this regulation are included in the commission's designated ground water rules, which were emailed to the DNR on August 4, 2004. This is one method for determining whether unappropriated ground water is available for appropriation. It is also a method for allowing new wells in areas that have otherwise been closed to new well drilling where supplies will allow new well develop without violating depletion criteria.

Idaho

Surface water has been subject to appropriation in Idaho since before statehood. 6 Waters & Water Rights 321. State permits have been required for surface water appropriations since 1971. Ground water has been subject to appropriation since statehood, and state permits have been required for ground water appropriations since 1963. Id. 324. Appropriation permits cannot be issued if they would interfere with senior appropriations. ICA 42-203A(a); 6 Waters & Water Rights at 326. See generally ICA 42-103 (unappropriated surface and ground water subject to appropriation). There are no statutory criteria to determine whether surface or ground water is unappropriated.

Because the state permitting process is relatively recent, many appropriations are unadjudicated, Idaho is currently adjudicating appropriations throughout the state. 6 Waters & Water Rights 327.

Kansas

Kansas applied the appropriation doctrine to surface and ground water in 1945. Id. 369. Appropriation permits are obtained from the chief engineer of the Kansas Board of Agriculture. Id. 370; KSA 82a-703 (all surface and ground water are available for appropriation, subject to vested rights). Kansas has a two-mile test similar to the Colorado 3-mile test for determining whether ground water is available for appropriation by a specific well. See Appendix A [McMahon] 23-24.

Montana

Montana applies the appropriation doctrine to both ground and surface water. MCA 85-2-101(1). However, a state appropriation permitting process was not established for ground water until 1961, and was not established for surface water until 1973. 6 Waters & Water Rights 473. Montana is also in the process of adjudicating appropriations throughout the state, including adjudicating of Indian tribal water rights. Id. 478-80.

Nebraska

The issue of whether unappropriated water was available for appropriation was litigated in Central Platte NRD v. Wyoming, 235 Neb. 439 (1994). In that case the Nebraska supreme court ruled that the Nebraska Department of Water Resources (DWR) [now the Department of

Natural Resources or DNR] could use historic streamflows to indicate whether unappropriated streamflow was available for instream appropriation. 245 Neb. at 444-447. Wyoming had argued that historical streamflows should have been adjusted downward to reflect unexercised but authorized appropriations. This "full rights" method was required by the Texas supreme court in Lower Colorado River Authority v. Texas Department of Water Resources, 683 S.W.2d 357 (1984). In the Texas case, the TDWR modeled historic flows and then adjusted the results by assuming that all water rights were exercised to the maximum quantity. This approach, although rejected by the Texas Water Commission, was ratified by the Texas supreme court as being the proper method for determining whether unappropriated surface water was available for appropriation. This method was explicitly rejected by the Nebraska supreme court, at least with regards to instream appropriations. The court noted that irrigation appropriations had two quantities, one explicit and one implicit. The explicit quantity is the maximum amount authorized by statute to be diverted for irrigation purposes, up to three acre feet of water per irrigated acre per year. The second implicit limit is the beneficial use limit; i.e. the often lower amount of water that the appropriator is actually applying to a beneficial use. The beneficial use amount fluctuates with the appropriator's needs, principally the availability of precipitation. The Nebraska supreme court concluded that the historic streamflows method was a permissible method to determine the quantity of unappropriated water that was available for appropriation. 245 Neb. 446-47.

Nevada

Both surface and ground water are subject to appropriation in Nevada. 6 Waters & Water Rights 499-501. NRS 533.030(1) (all waters subject to appropriation); 534.020 (ground water subject to appropriation). Surface appropriations were subject to a state engineer permit requirement beginning in 1905; mandatory ground water permitting was established in 1939. The state engineer must reject applications when there is no unappropriated water available. NRS 533.370(4). Some basins apparently have been closed to appropriation due to court determinations that they are over appropriated. Appendix B [Jess] at 8.

New Mexico

Both surface and ground water are subject to appropriation in New Mexico. 6 Waters & Water Rights 529. NMSA 72-1-1 (surface water subject to appropriation); 72-12-1 (ground wter subject to appropriation). State permitting began in 1907. 6 Waters & Water Rights 529. Courts adjudicate appropriations in New Mexico. Id. 531. In Mathers v. Texaco, 77 N.M. 239, 421 P.2d 771 (1966), the New Mexico supreme court affirmed the decision of the New Mexico state engineer to establish ground water depletion rates of 66% depletion in 40 years. The ground water basin was a closed basin that received little recharge. The state engineer concluded that the remaining 1/3 of the ground water supply would be sufficient to continue economically supplying domestic uses and perhaps some other uses, but irrigation withdrawals would no longer be economically feasible (presumably because of higher pumping costs).

North Dakota

North Dakota applies appropriation to both surface water and ground water. 6 Waters & Water Rights 557. NDCC 61-01-01 (surface and ground water are subject to appropriation). Permits for surface water appropriations were required beginning in 1905. 6 Waters & Water Rights 557; NDCC 61-04-02 (appropriation permit requirements for surface and ground water). The North Dakota water commission requires surface water to be available 80% of the time in order to be considered available for appropriation. Appendix B [Jess] at 11.

Oklahoma

Surface water law. Oklahoma water law has recognized both riparian rights and appropriative rights. 6 Waters & Water Rights. 688-90. Attempts to statutorily limit riparian rights to domestic uses have been invalidated in court. Id. 689. The existence of riparian rights makes the determination of the quantity of water available for appropriation difficult, as new riparian uses can be initiated at any time. OSA 82 §105.9 (appropriation requirements).

Ground water law. Ground water withdrawn from inside the cut bank of a stream is legally considered to be surface water. 6 Waters & Water Rights 694. Otherwise, ground water is allocated on a proportional basis to overlying owners. Id. 694-96. The Oklahoma Water Resources Board uses a 20 year useful life period in making ground water allocations to overlying landowners. Appendix B [Jess] at 11-12.

Oregon

Historically Oregon's 1909 water code applies to both surface and ground water, and state permits are required for all appropriations. 6 Waters & Water Rights 699; ORS 537.120 (surface and ground water subject to appropriation). Surface water permits have been required since 1909. Ground water permits have been required east of the Cascades since 1927, and statewide since 1955. Id. 6 Waters & Water Rights 700. Pre-1909 appropriations are being adjudicated; most surface appropriations have been adjudicated but few ground water appropriations have been. Id. 708. The Oregon Water Resources Department requires that surface water be available 80% of the time in order to be considered available for appropriation. ORS 690-400-010(11)(a)(A); Appendix B [Jess] at 13. Specific computation procedures are contained in the 170 page report, Determining Surface Water Availability in Oregon, Aug. 2002. Appendix B at 13, which was emailed to the DNR on August 4, 2004.

Professor Glennon, in the leading law review article dealing with management of tributary ground water in the West, describes Oregon regulations for determining whether wells pumping hydrologically connected ground water may be a significant source of surface water interference. Glennon & Maddock, The Concept of Capture: The Hydrology and Law of Stream/Aquifer Interactions, 43 Rocky Mountain Mineral Law Institute 22-1, 22-25 to 22-28. If the ground water is hydrologically connected (HC) ground water, the well is presumed to be a significant cause of substantial interference if one of the following conditions exists:

(1) the well is within 1/4 mile of the stream; or
(2) the rate of withdrawal is greater than 5 cfs and the well is less than one mile from the stream; or
(3) the rate of withdrawal is greater than either (a) 1% of minimum perennial streamflow or senior instream appropriation or (b) greater than 1% of stream discharge equaled or exceeded 80% of the time, and (in either case) the well is less than one mile from the stream; or
(4) the ground water pumping would deplete streamflow by more than 25% after 30 days of continuous pumping, and the well is less than one mile from the stream.

These regulations seem to be focused on wells likely to induce recharge from the stream, and would not deal with the long-term depletion effects of tributary ground water pumping.

South Dakota

Surface and ground water have been subject to appropriation in South Dakota since

1955. 6 Waters & Water Rights 744; SDCL 46-1-3 (both surface and ground water are subject to appropriation). Appropriations may be granted only if there is a reasonable probability that there is unappropriated water available. SDCL 46-2A-9. Water rights are currently being adjudicated in South Dakota. 6 Waters & Water Rights 745. Apparently the South Dakota Department of Environmental & Natural Resources requires surface water to be available 50% of the time in order to be considered available for appropriation. Appendix B [Jess] at 15. Ground water permits are denied if the new pumping would cause total pumping to exceed the county's average annual recharge rate. Id.

Texas

Surface water law. Texas surface water recognizes both riparian and appropriative rights. VCTA Water Code 11.022 (surface water subject to appropriation); 11.121ff (permit procedures); 11.131 (application denied if no unappropriated water available). Water right claims are being adjudicated under a 1967 statute, and most river basins have been adjudicated. 6 Waters & Water Rights 771-74. Regarding determination of whether unappropriated water is available for appropriation, see discussion at Nebraska, above. The Texas Natural Resources Conservation Commission requires at least 75% of the surface water sought to be appropriated to be available at least 75% of the time in order to be considered available for appropriation for irrigation. For municipalities, 100% of the water must be available 100% of the time unless the municipalities has a backup source of supply. Appendix B [Jess] at 16-17.

Ground water law. Texas follows the rule of absolute ownership for ground water allocation. 6 Waters & Water Rights 784-85. The state is regulating withdrawals from the Edwards Aquifer near San Antonio to protect municipal water uses and endangered species. Id. 787-92. Texas faces issues similar to those that Nebraska faces on the Platte River.

Utah

Surface water has always been subject to appropriation in Utah, and surface appropriations have been subject to state permitting requirements since 1903. Id. 799-800. Percolating ground water (i.e. ground water not flowing in "underground streams") was not subject to appropriation and state permitting until 1935. Id. 809. UCA 73-3-1 (surface and ground water subject to appropriation). Applications shall be approved if among other things there is unappropriated water in the source of supply. Id. 73-3-8(1)(a).

Washington

Washington water law recognizes both riparian and appropriative surface water rights. 6 Waters & Water Rights 831-35. RCWA 90.03.010 (surface water subject to appropriation); State permits were required for surface water appropriations beginning in 1917. 6 Waters & Water Rights 835-36. The Department of Ecology must find that unappropriated water is available for appropriation before granting an application. RCWA 90.03.290(1).

A state ground water appropriation permitting statute was adopted in 1945. 6 Waters & Water Rights 831-32, 839; RCWA 90.44.040 (ground water subject to appropriation). Ground water appropriations may not be granted beyond the capacity of the supply to yield such water within a reasonable or feasible pumping lift or artesian pressure reduction. RCWA 90.44.070.

Claims for all water uses not evidenced by a state permit were required to be filed by 1985. 6 Waters & Water Rights 838. Basin water right adjudication proceedings have been initiated, and only one major basin adjudication is still in process. Id.

Wyoming

Wyoming applies prior appropriation to both surface water and ground water. Surface water appropriation permits have been required since 1890. Id. 865. State permits have been required for ground water since 1969. Id. 868; Appendix B [Jess] at 20. See WSA 41-4-501 (appropriation permit requirement). Applications must be rejected if there is no unappropriated water available. Id. 41-4-503.