

WATER RIGHTS FOR OIL SHALE

Oil shale production and its associated requirements would represent a major new demand for water in Colorado. While some of this water would probably come from retirement of existing uses, most would come from new projects that would capture flows of water in the two primary rivers of the regions, the Colorado River and the White River, and move them to the places of use. This section summarizes the water rights that have been established in anticipation of serving oil shale production and the existing rights that have been purchased.³⁷

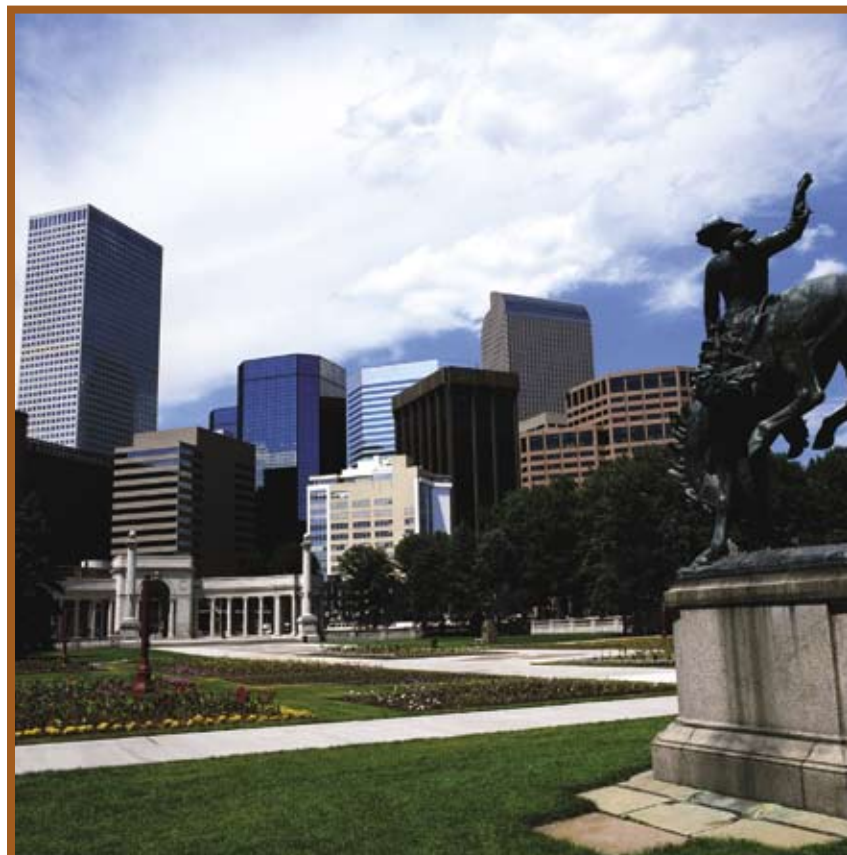
As described below, oil companies have acquired agricultural rights and taken initial steps to secure other water rights (conditional rights). In order to reach large-scale commercial production of oil shale, companies would need to use both rights.

A. CONDITIONAL WATER RIGHTS

Companies interested in oil shale development have established conditional water rights (see sidebar) associated with more than 200 proposed structures, such as a diversion or storage dam in the Colorado River and White River Basins, dating back more than 50 years.³⁸ *Figures 3 and 4* provide an overview of the general location of these conditional rights. A chronological description of their development is provided in *Appendix A*. Tables listing these rights for each basin according to their priority can be found in *Appendix B*.

Companies first established conditional claims in the Colorado River Basin, as early attention focused on oil shale deposits in the Parachute Creek area. Several of the largest early conditional rights envision pumping water through pipelines from the Colorado River for use in the Parachute Creek and Roan Creek watersheds. Subsequent conditional rights added proposed storage reservoirs.

As more information about the quality of deposits in the Piceance Basin to the north became available in the 1950s and 1960s, individuals and companies began to establish conditional appropriations in the White River Basin. The richest oil shale deposits in the Piceance are located on the high plateau that separates the mainstem Colorado River and White River Basins. Unlike



in the Colorado River, there are multiple reservoirs proposed for construction on the North and South Forks as well as on the mainstem White River. Pipelines and pumps are proposed to lift the water from the White River into the Piceance watershed. *Figures 5 and 6* display the location of conditional water rights in this basin.

There are approximately 105 separate proposed structures with associated conditional water rights that could be used for oil shale development in the Colorado River Basin. These rights are for a mixture of both direct diversion and storage rights. In addition, there are 114 proposed structures with conditional rights in the White River Basin. These conditional structures include proposed reservoirs, pipelines (most with pumps), ditches, wells, and springs. These rights would enable a total direct diversion of approximately 5,000 cfs in the Colorado River Basin and nearly 5,700 cfs in the White River Basin. They would provide for total storage of approximately 735,000 af of water in the Colorado River Basin and over 1 million af in the White River Basin.

This information is summarized in the following tables and detailed in *Appendix B*.

Table 3.
Summary of Conditionally Decreed Structures – Colorado River Basin

Proposed Structures by Type	Total Conditionally Decreed Quantities of Water
Reservoirs: 27	736,770.6 af
Pumps and pipelines: 23	1,515.6 cfs
Ditches: 6	3,472.3 cfs
Wells: 5	1.36 cfs
Springs: 44	6.76 cfs
Total structures: 105	Total quantities: 4,996.02 cfs 736,770.6 af

Table 4.
Summary of Conditionally Decreed Structures – White River Basin

Proposed Structures by Type	Total Conditionally Decreed Quantities of Water
Reservoirs: 34	1,186,625.8 af
Pumps and pipelines: 33	4,274 cfs
Ditches: 24	1,363 cfs
Wells: 12	54.02 cfs
Springs: 11	2.45 cfs
Total structures: 114	Total quantities: 5693.47 cfs 1,186,625.8 af

B. AGRICULTURAL WATER RIGHTS

In addition to establishing conditional water rights, energy companies have been actively purchasing existing agricultural ditch rights in both basins. *Figure 7* shows the location of these ditches in the Colorado River Basin, and *Figure 8* shows their location in the White River Basin. *Appendix C* contains tables listing these rights. Acquisition of ditches provides control of water with senior priorities, especially important on the flow-limited tributaries in which they are located. In many cases, ownership of the ditches is shared by two or more energy companies. For the most part, the water associated with these ditches remains in irrigation use. Shifting the use to energy production or other purposes requires petitioning the Colorado water court

to change the use of the water. Among other requirements, the water right holder must demonstrate that a different use will not injure other existing rights.

As shown in *Table 5*, 57 irrigation ditches in the Colorado River Basin are now owned in whole or in part by energy companies, with decreed absolute rights to divert approximately 470 cfs of water. According to state records, average diversions under these rights are approximately 50,000 af of water per year.

Another 57 ditches in the White River Basin are now owned by energy companies. In many cases, companies have acquired only partial ownership of a ditch (less than 100% of total ditch shares). Sometimes several energy companies share in the ownership of the same ditch. The decreed absolute diversion rates associated with these ditches total approximately 200 cfs. The total annual volume of water diverted under these rights, on average, is approximately 19,000 af.

Table 5.
Summary of Irrigation Ditches Owned by Energy Companies

No. of Ditches	Decreed Diversion Rate	Average Volume Diverted Annually
Colorado: 57	468.55 cfs	50,293 af
White: 57	207.94 cfs	19,193 af

In sum, conditional water rights that could potentially be developed to provide water for oil shale development include storage rights to nearly 2,000,000 af of water and rights to divert more than 10,000 cfs of water in the two basins.³⁹ In addition, more than 100 irrigation ditches in the area of potential oil shale development now are owned by energy companies. Collectively, these ditches hold absolute rights to divert approximately 675 cfs of water.

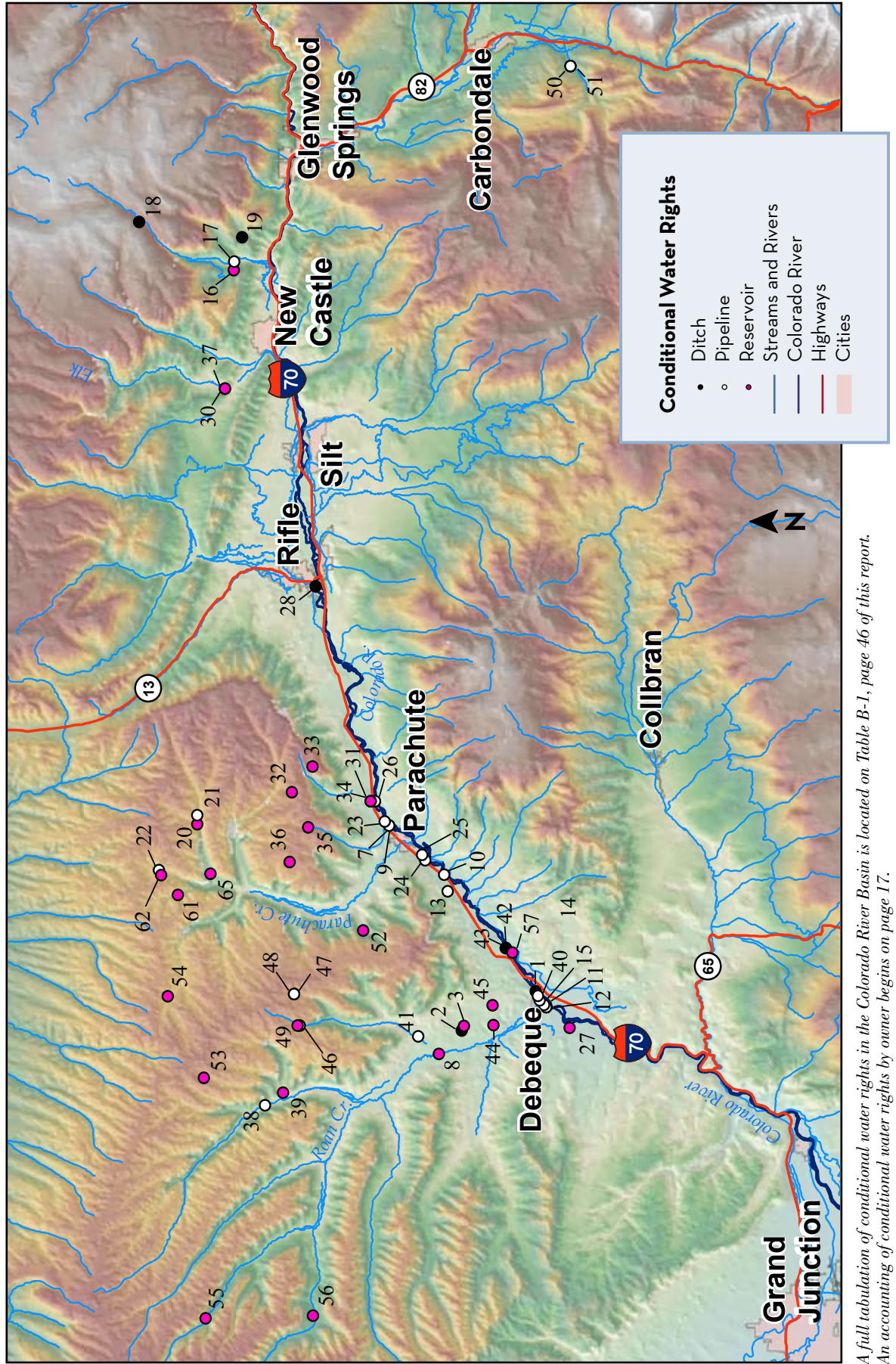
A NOTE ON OIL SHALE PRODUCTION TECHNOLOGIES

Oil shale can be mined using one of two methods: underground mining, using the room-and-pillar method, or surface mining. After mining, the oil shale is transported to a facility for retorting, a heating process that separates the oil fractions of oil shale from the mineral fraction. (The vessel in which retorting takes place is known as a retort.) After retorting, the oil must be upgraded by further processing before it can be sent to a refinery, and the spent shale must be disposed of.

Shell Oil is currently developing an in-situ conversion process (ICP). The process involves heating underground oil shale, using electric heaters placed in deep vertical holes drilled through a section of oil shale. The volume of oil shale is heated over a period of two to three years, until it reaches 650-700°F, at which point oil is released from the shale. The released product is gathered in collection wells positioned within the heated zone.

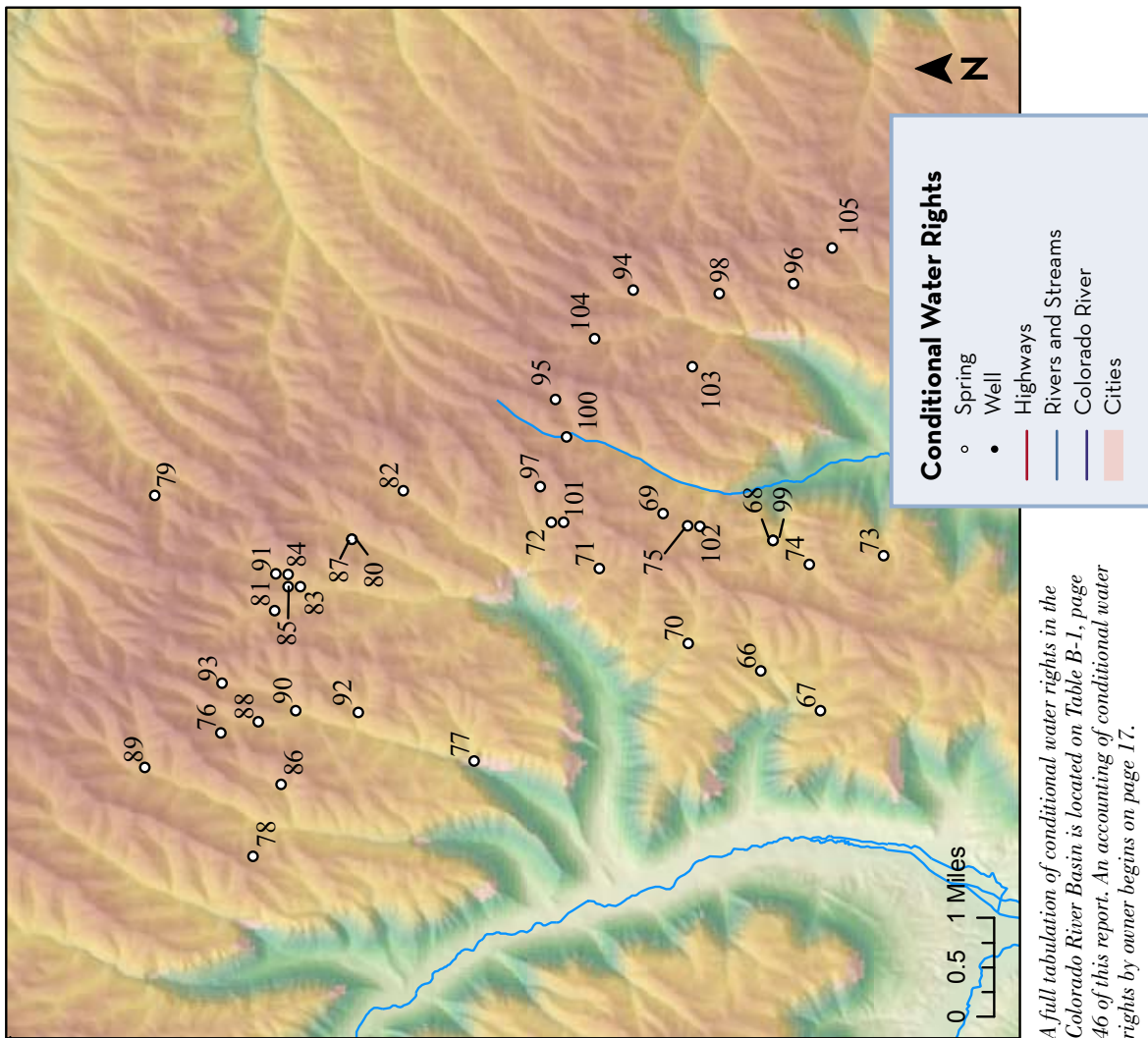
Source: *Oil Shale & Tar Sands Programmatic EIS Information Center Web site, available at <http://ostseis.anl.gov/guide/oilshale/index.cfm>.*

Figure 3. Conditional Water Rights (Ditches, Pipelines, Reservoirs) for Oil Shale Development in the Colorado River Basin



A full tabulation of conditional water rights in the Colorado River Basin is located on Table B-1, page 46 of this report. An accounting of conditional water rights by owner begins on page 17.

Figure 4. Conditional Water Rights (Springs and Wells) for Oil Shale Development in the Colorado River Basin



A full tabulation of conditional water rights in the Colorado River Basin is located on Table B-1, page 46 of this report. An accounting of conditional water rights by owner begins on page 17.

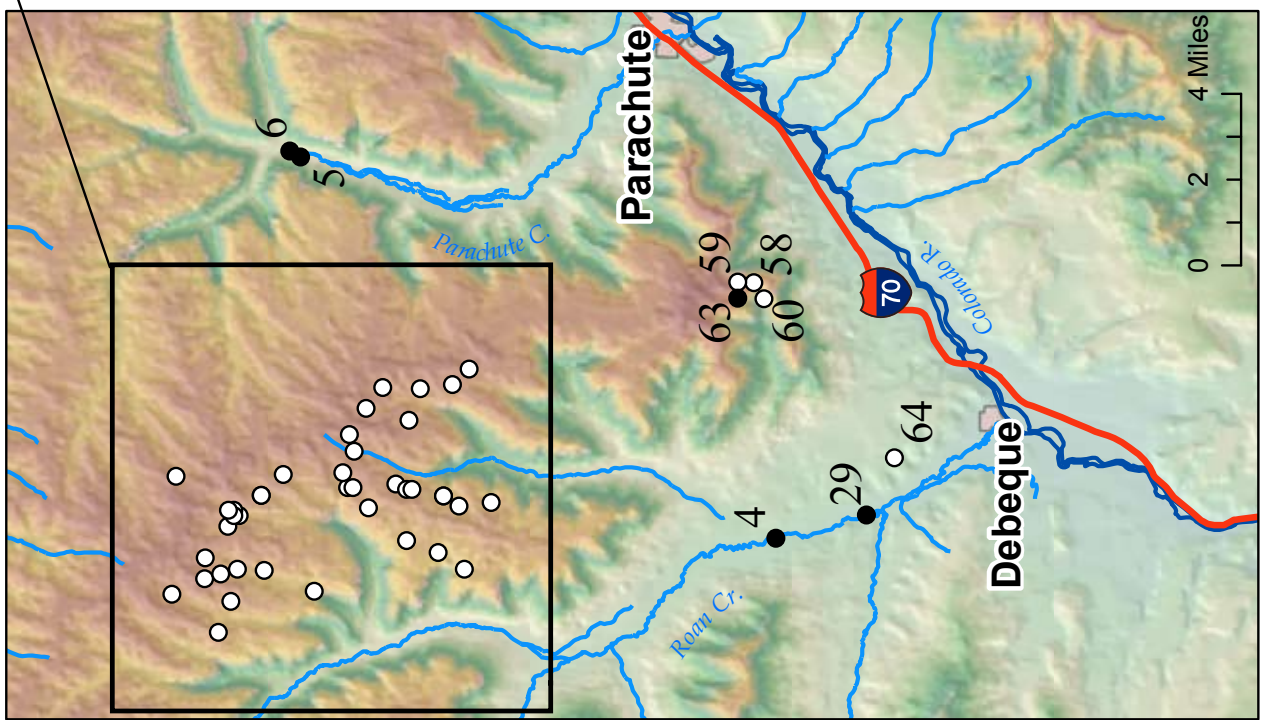
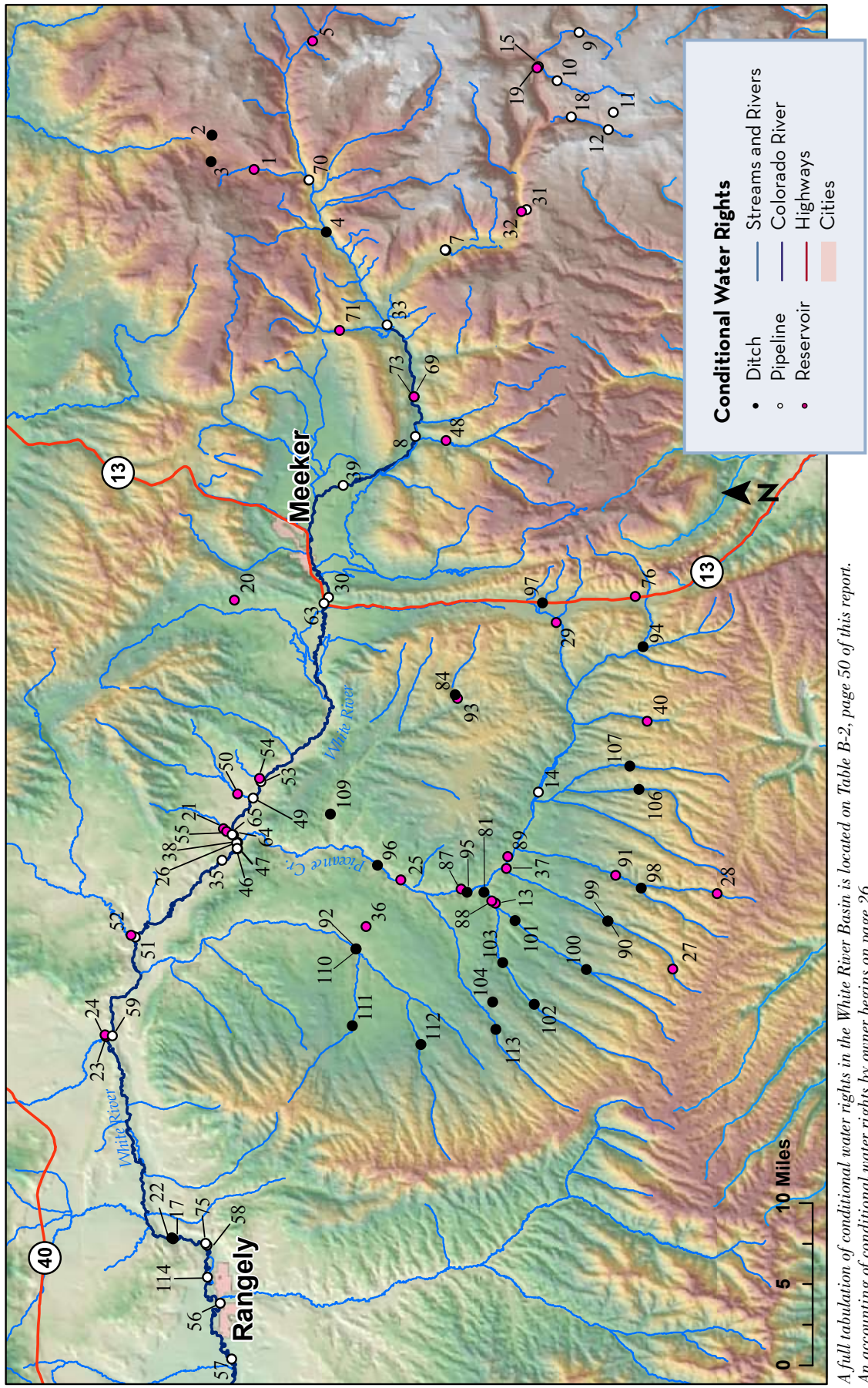
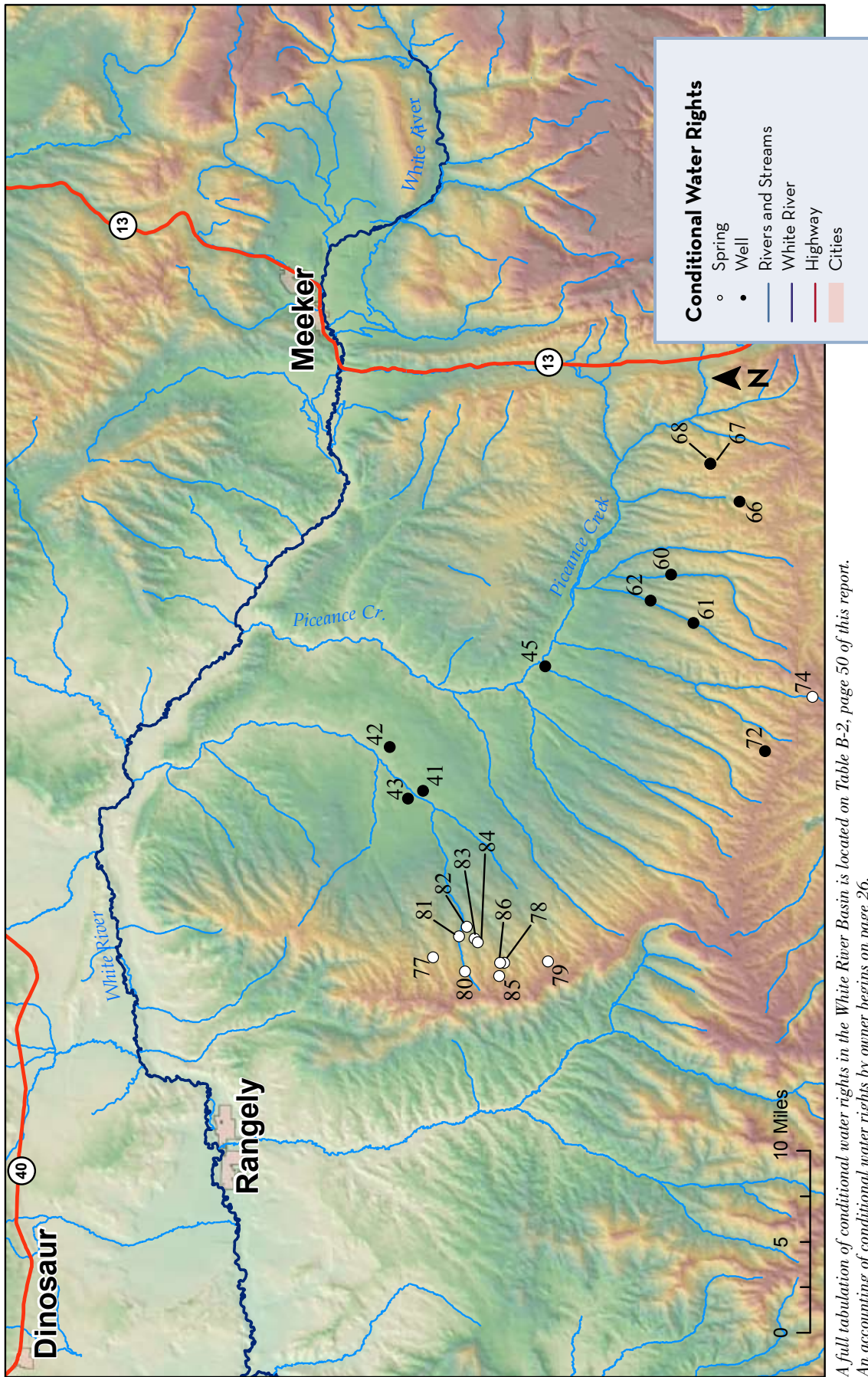


Figure 5. Conditional Water Rights (Ditches, Pipelines, and Reservoirs) for Oil Shale Development in the White River Basin



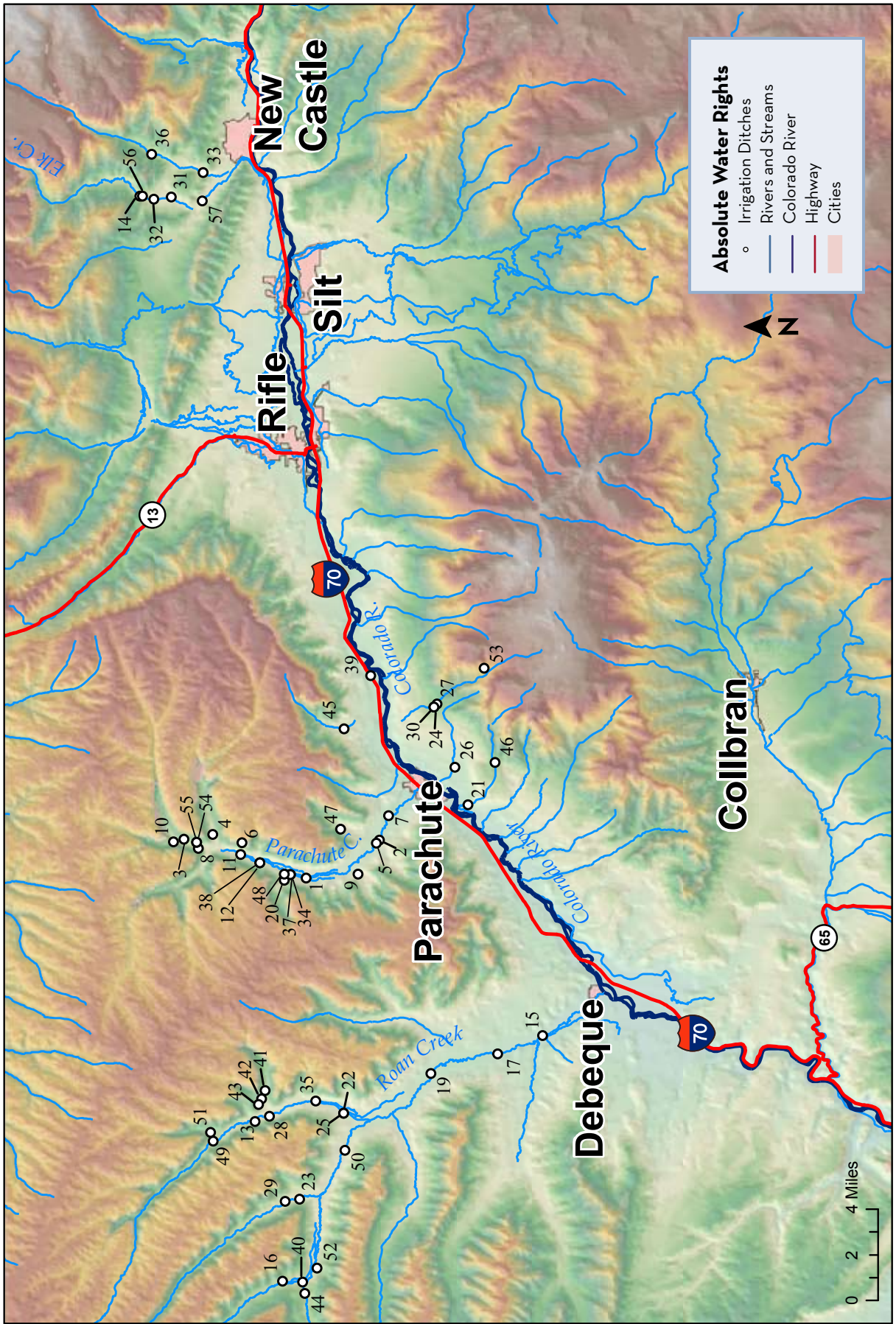
A full tabulation of conditional water rights in the White River Basin is located on Table B-2, page 50 of this report. An accounting of conditional water rights by owner begins on page 26.

Figure 6. Conditional Water Rights (Springs and Wells) for Oil Shale Development in the White River Basin



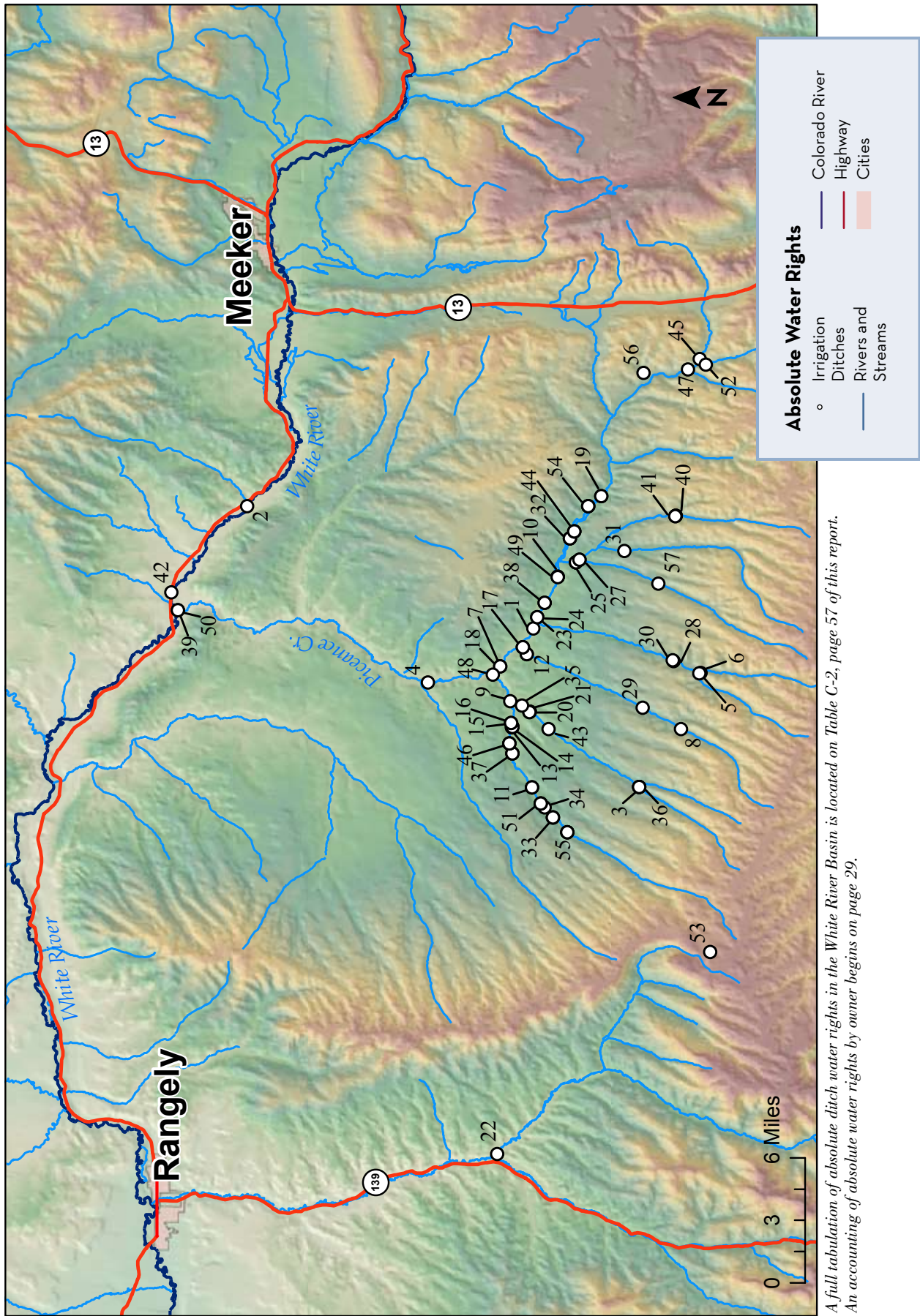
A full tabulation of conditional water rights in the White River Basin is located on Table B-2, page 50 of this report. An accounting of conditional water rights by owner begins on page 26.

Figure 7. Absolute Water Rights (Irrigation Ditches) for Oil Shale Development in the Colorado River Basin



A full tabulation of absolute ditch water rights in the Colorado River Basin is located on Table C-1, page 55 of this report. An accounting of absolute water rights by owner begins on page 18.

Figure 8. Absolute Water Rights (Irrigation Ditches) for Oil Shale Development in the White River Basin



A full tabulation of absolute ditch water rights in the White River Basin is located on Table C-2, page 57 of this report. An accounting of absolute water rights by owner begins on page 29.