NRDC

March 23, 2016

BY HAND DELIVERY

The Honorable Gina McCarthy
Administrator
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

Re: Citizen Petition to Repeal or Amend the EPA's Aquifer Exemption Regulations to Protect Underground Sources of Drinking Water

Dear Administrator McCarthy,

The undersigned organizations hereby petition the U.S. Environmental Protection Agency ("EPA"), pursuant to the Administrative Procedure Act, 5 U.S.C. § 553(e), to repeal or amend the aquifer exemption provisions of EPA regulations in order to adequately protect underground sources of drinking water.

This petition provides evidence that existing EPA rules related to aquifer exemptions have allowed for the contamination of current sources of drinking water. In addition, it sets forth information showing that the existing process for evaluating aquifer exemption requests has allowed for the approval of applications without scientifically-defensible evidence which demonstrates that the water cannot reasonably be expected to serve as a public source of drinking water in the future. The existing rules therefore violate the Safe Drinking Water Act and EPA must revise them. Furthermore, given the inadequacies of the existing rules identified in this petition, the agency can and must impose a moratorium on any new or expanded exemptions until such revisions are finalized.

In devising new rules, EPA must take account of developments since the existing rules were written in the early 1980s, including increasing demand for groundwater, the rapid depletion of aquifers in many states, the extent to which climate change is likely to exacerbate these problems, improved technologies for water treatment and corresponding increases in the use of desalination of brackish groundwater as a drinking water source, and advances in our scientific and technical understanding of groundwater, especially in the areas of computer modeling and contaminant fate and transport.

The EPA must also update its rules to ensure that the public is provided with adequate notice and opportunity for input on aquifer exemption applications and to ensure that full information is publicly available so that exempted aquifers that have been contaminated are not inadvertently tapped as a source of drinking water in the future. Petitioners request that EPA treat this petition as a comment on all pending and future exemption applications and give it full consideration as part of the record.[1] Petitioners reserve the right to raise the evidence and arguments presented here as a challenge to any action (or inaction) by the EPA that would grant or expand any aquifer exemption.

The EPA should also conduct a full review of all previously granted exemptions to ensure that they met the standards required by the Safe Drinking Water Act and to protect any aquifers which may still have the potential to be used as a drinking water source.

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[1] As discussed further in Section VIII.A (at pages 53-54), existing rules are inadequate to ensure that the public is given effective notice of, and opportunity to comment on, pending aquifer exemption applications. Petitioners' request that this petition be treated as a comment on all pending and future aquifer exemption applications is therefore crucial to ensure that the issues raised herein are included in the record that the EPA considers when evaluating such applications.

I. Background

The Safe Drinking Water Act ("the Act" or "SDWA") sets forth a regulatory structure for the protection of underground sources of drinking water.[2] The Act was intended to provide broad protections for current and future sources of potential drinking water from contamination. However, extensive evidence set forth in this petition indicates that the goals of the Act and its statutory requirements are being undermined by the aquifer exemption provisions as they are currently administered by EPA.

Since 1982, when the underlying framework for the exemption of aquifers was last amended by EPA, there have been dramatic changes in the need for groundwater as a source of drinking water, the threats to existing and potential underground drinking water supplies, the expense that communities bear in order to develop new sources, the capabilities and costs of treatment technologies, the alternatives available to industries who seek to inject contaminants underground, and our scientific understanding concerning the effects of such injection. Aquifer exemptions, as currently administered under existing law, are not an appropriate regulatory tool

[2] *See* Safe Drinking Water Act, Pub. L. No. 93-523, 88 Stat. 1660 (1974) (codified as amended at 42 U.S.C. §§ 300f - 300j-26 (2012)).

for accomplishing the goals of the SDWA and the evidence set forth in this petition demonstrates that they are in conflict with the Act's intent and requirements.

This petition requests the repeal or amendment of the EPA's regulations allowing for the designation of aquifers as exempt from the protections of the Safe Drinking Water Act, the criteria for such exemptions, and associated provisions.[3] The petition also asks the EPA to fully review previously granted exemptions and protect any aquifers which are still of good enough quality that they have any potential to serve as a drinking water source, now or in the future. Further, the petition requests that the EPA impose a moratorium on granting any new exemptions or expansions of existing exemptions until new rules are in place, in order to ensure that protected aquifers are not contaminated as a result of decisions made under existing policies while the EPA considers this petition. Petitioners also request that EPA treat this petition as a comment on all pending and future exemption applications and give the information contained within this petition full consideration when evaluating any such applications.

The petition is submitted pursuant to the Administrative Procedure Act.[4] It is well-established that petitioner membership organizations may petition on behalf of their interested members.[5]

II. Petitioners

The **Natural Resources Defense Council** (NRDC) is a nonprofit advocacy organization whose purpose is to safeguard the Earth: its people, its plants and animals, and the natural systems on which all life depends. NRDC uses law, science, and the support of more than two million members and online activists to protect public health and the environment and to solve the most pressing environmental issues we face today. NRDC has worked for many years to protect safe drinking water and clean water more generally, and to ensure that safe and sufficient water sources are available to meet the needs of communities and ecosystems, now and in the future.

Clean Water Action is a national citizens' organization, founded in 1972, of over 1 million members and is active in over a dozen states. Clean Water Action works for strong public health and environmental protections with an emphasis on those that impact water resources.

The **Powder River Basin Resource Council** is a grassroots citizen organization in Wyoming. With approximately 1,000 members across the state, the organization advocates for responsible energy development in Wyoming to protect precious air, land, and water resources. The group has opposed several recent aquifer exemption requests, including a very controversial one that was recently denied by the Wyoming Oil and Gas Conservation Commission.

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[3] *See, e.g.*, 40 C.F.R. §144.3 (defining underground source of drinking water as not including those aquifers which have been exempted); *Id.* §144.7 (setting forth a process for the designation of exempt aquifers); *Id.* § 146.4 (providing the criteria by which aquifers may be exempted).
[4] *See* Administrative Procedure Act § 4(e), 5 U.S.C. § 553(e) (2012) (requiring that "[e]ach agency shall give an interested person the right to petition for the issuance, amendment, or repeal of a rule").
[5] *See, e.g.*, *Defenders of Wildlife v. Gutierrez*, 532 F.3d 913 (D.C. Cir. 2008).

The **New Mexico Environmental Law Center** is a nonprofit, public interest law firm that provides free and low-cost legal services on environmental matters throughout New Mexico. Founded in 1987, the Law Center works with clients – often individuals, neighborhood associations, environmental organizations, Tribes and Pueblos – seeking to protect the environment. The New Mexico Environmental Law Center's mission is to protect New Mexico's natural environment and achieve environmental justice for New Mexico's communities through legal representation, policy advocacy and public education.

III. EPA has the legal authority and duty to update the aquifer exemption rules

The Safe Drinking Water Act was enacted by Congress in 1974 in order to "to assure that water supply systems serving the public meet minimum national standards for protection of public health."[6] Among other things, the Act was intended to address the "substantial hazards and dangers associated with deep well injection of contaminants," which Congress noted was "clearly an increasing problem."[7]

In order to accomplish this objective, the SDWA requires an underground injection control (UIC) program to be established in any state listed by EPA as requiring one.[8] All states have been listed by EPA.[9] Under the SDWA, EPA must promulgate rules that contain minimum requirements for UIC programs to ensure the programs are effective to prevent any underground injection that endangers drinking water sources.[10] States and eligible Indian tribes may develop a UIC program to prevent the endangerment of underground sources of drinking water (USDWs), subject to EPA approval.[11] Where a state or tribe does not have an approved UIC program, EPA is charged with implementing a program that will prevent such endangerment.[12] In some cases, a state or tribe may be approved to administer a UIC program for certain classes of underground injection wells while EPA administers the program for the remaining classes of wells.[13]

The Act provides that "[u]nderground injection endangers drinking water sources if such injection may result in the presence in underground water which supplies or can reasonably be expected to supply any public water system of any contaminant, and if the presence of such contaminant may result in such system's not complying with any national primary drinking water regulation or may otherwise adversely affect the health of persons."[14]

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[6] H.R. Rep. No. 93-1185 (1974), *reprinted in* 1974 U.S.C.C.A.N. 6,454, attached as Exhibit B1.
[7] *Id.* at 6,481.
[8] 42 U.S.C. § 300h-1 (2012).
[9] *See* 40 C.F.R. § 144.1(e).
[10] 42 U.S.C. § 300h(b)(1) (2012).
[11] *Id.* § 300h-1(b), (e); 40 C.F.R. § 145.1(h).
[12] 42 U.S.C. § 300h-1(c) (2012); *see also* 40 C.F.R. § 145.21(d).
[13] *See* 40 C.F.R. § 147.1(b). *See also Id.* § 145.21(f) ("States which have partially approved programs have authority to enforce any violation of the approved portion of their program. EPA retains authority to enforce violations of State underground injection control programs, except that, when a State has a fully approved program, EPA will not take enforcement actions without providing prior notice to the State and otherwise complying with section 1423 of SDWA.").
[14] 42 U.S.C. § 300h(d)(2) (2012).

The U.S. House of Representatives Report that accompanied H.R. 13002, the bill that became the Safe Drinking Water Act, provides the clearest picture of Congress' intent when passing the Act.[15] EPA acknowledged this by relying on the House Report when developing the regulations that implement the Act.[16] Courts have also looked to the House Report to elucidate the intent of Congress when it passed the SDWA.[17]

The House Report makes clear that the scope of water sources protected should be "liberally construed so as to effectuate the preventative and public health purposes of the bill."[18] The Report noted that Congress intended contamination of underground sources of water to be prevented "if there is *any reasonable likelihood* that these sources will be needed in the future to meet the public demand for water and if these sources may be used for such purpose in the future."[19]

Congress was also concerned that the "definition of 'endangering drinking water sources' be construed liberally," stating its intent that any injection into water sources be considered to endanger them "if injected material were not completely contained within the well, if it may enter either a present or potential drinking water source, and if it (or some form into which it might be converted) may pose a threat to human health or render the water source unfit for human consumption."[20] Finally, the House Report notes that "the Committee expects the Administrator's regulations at least to require States to provide protection for subsurface waters having less than 10,000 p.p.m. dissolved solids, as is currently done in Illinois and Texas, even though water containing as much as 9,000 p.p.m. would probably require treatment prior to human consumption."[21]

The Safe Drinking Water Act makes no mention of allowing aquifers to be exempted from the law's protections. However, in 1980, the EPA promulgated rules which allowed for the

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[15] *See* H.R. Rep. No. 93-1185 (July 10, 1974), *supra* note 6. *See also* H.R. 13002, 93rd Cong. (1974), enacted as Pub. L. No. 93-523 (Dec. 16, 1974). There was no conference report on the bill and the U.S. Senate Report, which was produced more than a year earlier, related to a previous version of proposed legislation that did not contain regulatory requirements related to underground sources of drinking water. See S. Rep. No. 93-231 (June 18, 1973) (accompanying S. 433, which contained a provision requiring a study of the causes of contamination of groundwater resources, but did not contain the provisions requiring UIC programs), attached as Exhibit A1.

[16] *See* Consolidated Permit Regulations: RCRA Hazardous Waste; SDWA Underground Injection Control; CWA National Pollutant Discharge Elimination System; CWA Section 404 Dredge or Fill Programs; and CAA Prevention of Significant Deterioration, 45 Fed. Reg. 33,290, 33,332 (May 19, 1980) [hereinafter *Consolidated Permit Regulations 1980*] (noting that the EPA was adopting an approach to designation of USDWs "based upon that suggested in the House Committee Report on SDWA") attached as Exhibit A2; Water Programs; Consolidated Permit Regulations and Technical Criteria and Standards; State Underground Injection Control Programs, 45 Fed. Reg. 42,472, 42,476 (June 24, 1980) [hereinafter *UIC Regulations 1980*] (quoting the discussion in the House Report stating the intent that the definition of "endangering drinking water sources" be liberally construed), attached as Exhibit A3.

[17] *See, e.g., Legal Envtl. Assistance Found., Inc. v. U.S. E.P.A.*, 118 F.3d 1467, 1475 (11th Cir. 1997).

[18] H.R. Rep. No. 93-1185, *supra* note 6 at 32, *reprinted in* 1974 U.S.C.C.A.N. 6454, 6484.

[19] *Id.* (emphasis added).

[20] *Id.*

[21] *Id.*

identification of aquifers to which the SDWA's protections would not apply.[22] The EPA justified this action on the basis that such exemptions would only apply to those aquifers "which would otherwise qualify as 'underground sources of drinking water' to be protected, but which have no real potential to be used as drinking water sources."[23] EPA promulgated the rules and procedures for exempting aquifers in 1980.[24] Aside from rules specific to geologic sequestration of carbon dioxide, which were added in 2010,[25] no significant changes have been made to the rules that set forth the criteria and processes for evaluating and approving aquifer exemptions since 1982.[26] In more than three decades since the rules were written, there have been dramatic changes that necessitate reexamination of the existing regulatory program, including significant technological improvements, advances in scientific knowledge, and new information about the demand for fresh water and the detrimental effects of past exemptions.

In addition to having the legal authority to update the aquifer exemption rules, EPA also has a duty to do so at this time. Evidence set forth in this petition demonstrates that EPA-approved aquifer exemptions have allowed for the contamination of current drinking water sources, via the extraction of natural resources and the disposal of wastewater.[27] And EPA's existing, inadequate regulatory program has also allowed for contamination of aquifers that could reasonably have been expected to supply a public water system in the future.[28] Likewise, EPA has the authority and duty to refrain from approving any new exemptions, or expansions of existing exemptions, until the rules are updated. In light of past contamination and the continued likely contamination of scarce sources of groundwater under the existing program, EPA can no longer justify the aquifer exemption provisions on the basis that the aquifers being contaminated have no real potential to be used as drinking water sources, and must update its regulations to comply with the Safe Drinking Water Act.

EPA has a duty to update its rules to ensure that no exemptions are granted for sources that have any reasonable potential to be used now or in the future. The new rules must reflect current

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[22] Consolidated Permit Regulations 1980, *supra* note 16, at 33,437-38; UIC Regulations 1980, *supra* note 16, at 42,502.

[23] Consolidated Permit Regulations 1980, *supra* note 16, at 33,328; Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO2) Geologic Sequestration (GS) Wells, 75 Fed. Reg. 77,230, 77,286-87 (Dec. 10, 2010) (stating the same) attached as Exhibit A4.

[24] *See* Consolidated Permit Regulations 1980, *supra* note 16; UIC Regulations 1980, *supra* note 16.

[25] *See* Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO2) Geologic Sequestration (GS) Wells, *supra* note 23 (adding provisions related to aquifer exemptions for Class VI injection wells).

[26] *See* Underground Injection Control Program Criteria and Standards, 47 Fed. Reg. 4,992 (Feb. 3, 1982) (amending the definition of USDW and adding additional criteria by which exemptions can be granted), attached as Exhibit B2; Environmental Permit Regulations: RCRA Hazardous Waste; SDWA Underground Injection Control; CWA National Pollutant Discharge Elimination System; CWA Section 404 Dredge or Fill Programs; and CAA Prevention of Significant Deterioration, 48 Fed. Reg. 14,146 (April 1, 1983) (making only technical changes to relevant sections and renumbering parts of the regulations), attached as Exhibit A5; Safe Drinking Water Act—National Drinking Water Regulations, Underground Injection Control Regulations; Indian Lands, 53 Fed. Reg. 37,396 (Sept. 26, 1988) (promulgating rules providing for the treatment of Indian Tribes as states such that they can apply for primacy under SDWA and manage their own UIC program, but making no other relevant alterations), attached as Exhibit B3.

[27] *See infra* Section VII.A (at pages 33-41).

[28] *See id.*; *see also infra* Section VII.E (at pages 50-51).

scientific knowledge about modern water treatment technologies and their costs, geologic transport of contaminants, increasing demand for drinking water, the likelihood that such demand will continue to increase because of climate change and its predicted effects on future water availability, and the significant body of other information set forth in this petition. Further, the process used to evaluate exemptions must be grounded in current science, including proper sampling techniques and quality controls, statistically valid numbers of samples to establish current groundwater quality, modeling of contaminant transport and flow, and long-term monitoring at the proposed exemption boundaries in order to prevent approval of exemptions based on incomplete or inaccurate information and to ensure that that contamination of non-exempt sources does not occur.

Until new rules and procedures are in place that comply with the SDWA, EPA must cease to approve any further exemptions.[29] And because of information showing that previous exemptions have endangered current and potential sources of drinking water, the updated rules must also require the re-examination of previously-granted exemptions to prevent further contamination of water sources which might be used in the future and which have not yet been so contaminated that any future use as a drinking water source has been precluded.

IV. Current information on the number and extent of aquifer exemptions

To understand the current state of aquifer exemptions and how they affect groundwater across the country, NRDC conducted an analysis of aquifer exemptions based on available information. We examined the number of exemptions granted; the extent of those exemptions; the original state of the exempted aquifers; and the current status of each of those exemptions – both from a regulatory and technical perspective.

In order to evaluate the most current and complete information, NRDC submitted a Freedom of Information Act (FOIA) request to EPA for the "[t]he most comprehensive nationwide database or spreadsheet of existing aquifer exemptions."[30] In response, EPA provided NRDC with a database containing 4,937 entries representing aquifer exemptions. However, a letter from EPA accompanying the database noted that the data have significant limitations and are also incomplete.[31] Specifically, the letter from EPA noted that:

- "The current [aquifer exemption] database is a work in progress. Although it contains data through September 2013, the data is still undergoing internal [quality assurance] as [the EPA's Office of Ground Water and Drinking Water]

[29] As noted in the introductory letter and in Section I, this is because the evidence set forth in this petition demonstrates that approvals of aquifer exemptions under the existing regulatory regime have resulted in violations of SDWA by causing the contamination of protected aquifers.

[30] *See* Letter from Matthew McFeeley, Attorney, Natural Resources Defense Council, to National Freedom of Information Officer, Envtl. Protection Agency, re: *Freedom of Information Act Request for Records Related to Aquifer Exemptions* 1 (Jan. 5, 2015) (designated FOIA #HQ-2015-002834 by EPA), attached as Exhibit A6.

[31] *See* Letter from Stephanie Flaharty, FOIA Public Liaison, Envtl. Protection Agency, to Matthew McFeeley, Attorney, Natural Resources Defense Council (Jan. 20, 2015), attached as Exhibit A7.

continues to gather additional information from EPA regions on approved [aquifer exemptions].

- "The database may include some duplicate records; therefore the total number of records in the database may not necessarily represent the total number of approved aquifer exemptions.
- "The database may not have records for some approved [aquifer exemptions] due to gaps in historical data. In particular, a majority of existing aquifer exemptions were approved at the date of original program primacy (early to mid-1980s). We have made efforts to retrieve all records, but depending on how these [aquifer exemptions] were documented at the time of primacy, [aquifer exemption] data may be limited."[32]

While the agency states that it is currently trying to locate additional data and improve the quality of the database, the version analyzed by NRDC represents the most up-to-date data available as of the submission of this petition. Prior to NRDC's FOIA request, no nationwide data on aquifer exemptions had ever been made available to the public, to the best of our knowledge. It is also noteworthy that the agency itself does not have a full picture of existing aquifer exemptions.

NRDC analyzed the data provided by EPA to gain the best picture of aquifer exemptions possible given the data's constraints. The EPA Aquifer Exemption Database contained 4,937 entries representing separate aquifer exemption requests nationwide.[33] Of those exemptions requested, EPA approved 4,679 – or greater than 95%. Only 37 were listed as denied. The approval status of 219 – the vast majority of the 221 remaining applications – is blank or listed as "other."[34] It is unclear what a blank or "other" signifies, but in many cases, accompanying comments make clear that EPA does not know whether the exemption was eventually granted.[35]

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[32] *Id.*

[33] *See* Envtl. Protection Agency, Aquifer Exemption Database provided in response to FOIA #HQ-2015-002834 (Jan. 20, 2015) [hereinafter *EPA Aquifer Exemption Database*], attached as Exhibit A8.

[34] Entries for 27 aquifer exemptions are blank, while 192 entries are listed as "other." Of the remaining two entries, one is listed as "permit withdrawn" and one as "conditional concurrence."

[35] Many of the comments associated with such entries include notes such as "Unclear if AE ultimately approved/denied" or "No record of approval/denial found within state permit file." EPA Aquifer Exemption Database, *supra* note 33, at Exemption ID #s 8_985, 8_813.

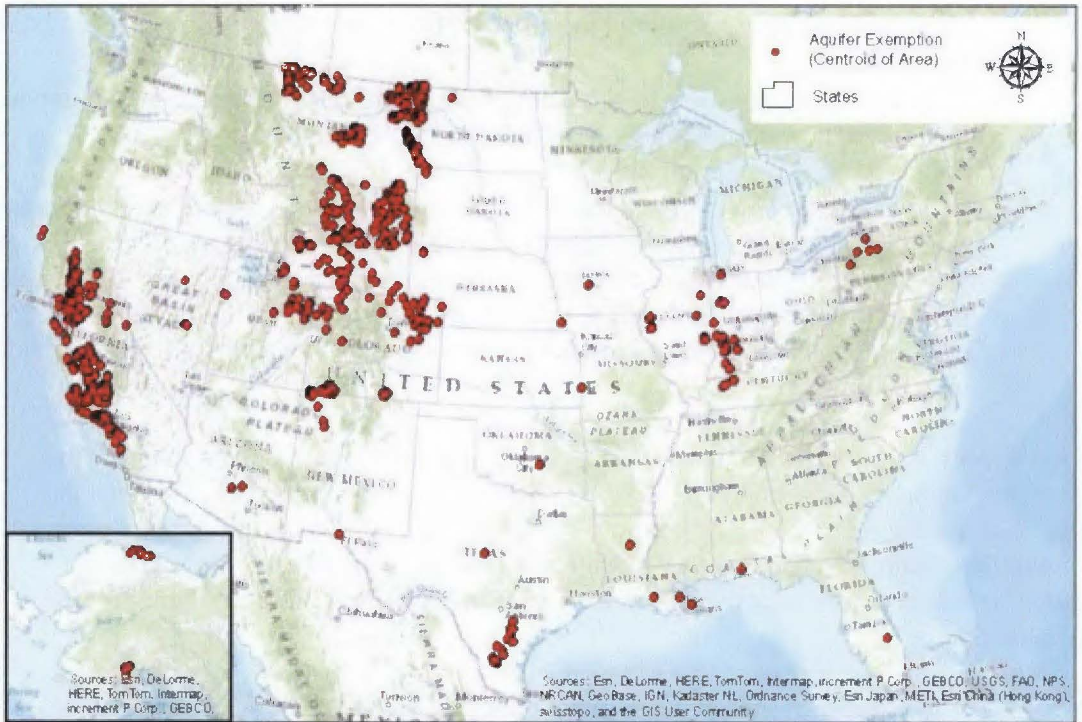

Figure 1: EPA Map of Aquifer Exemptions[36]

In the vast majority of cases, aquifer exemptions are associated with a particular underground injection well or wells. EPA divides injection wells into six categories or "classes."[37] The following table sets out information about each class of well and provides the number of approved aquifer exemptions associated with each class, based on the data EPA provided to NRDC.

CLASS	INJECTION ACTIVITY	NUMBER OF ASSOCIATED AQUIFER EXEMPTIONS (% OF TOTAL)
Class I	Inject hazardous wastes, industrial non-hazardous liquids, or municipal wastewater beneath the lowermost USDW	70 (1.5%)

[36] This map provides a rough view of the nationwide prevalence of aquifer exemptions, depicting centroid points for aquifer exemptions for which EPA had data by May 29, 2014. The map was taken from slides that accompanied a presentation given by Joe Tiago, EPA Office of Ground Water & Drinking Water. Joe. Tiago, Background on Aquifer Exemptions and Aquifer Storage and Recovery: Webinar for Association of Public Health Laboratories, at slide 25 (May 29, 2014), attached as Exhibit A9.

[37] *See* Envtl. Protection Agency, *Classes of Wells*, http://water.epa.gov/type/groundwater/uic/wells.cfm (last visited Dec. 7, 2015), attached as Exhibit A10.

Class II	Inject fluids or gasses associated with oil and gas production, and hydrocarbons for storage, specifically:	Total Class II: 4456 (96.0%)
	• **Class IID** (Disposal): Inject fluids associated with the production of oil and gas or the storage of natural gas, for disposal	IID: 1,142 (24.6%)
	• **Class IIR** (Enhanced Recovery): Inject fluids, steam, carbon dioxide, or other substances for the purpose of enhancing the recovery of oil and gas from underground formations	IIR: 3,176 (68.4%)
	• **Class IIH** (Hydrocarbon Storage): Inject liquid hydrocarbons into underground formations for storage	IIH: 13 (0.3%)
Class III	Inject fluids associated with solution mining of minerals, including uranium mining via the process of in-situ leaching (ISL)	115 (2.5%)
Class IV	Banned except in extremely limited circumstances, these wells inject hazardous or radioactive wastes into or above a USDW	0
Class V	Includes any injection well which does not fall into classes I-IV or VI	2 (0.0%)
Class VI	Inject carbon dioxide for geologic sequestration	0

Of the 4,937 entries in the EPA database, 4,643 provide information on the class of injection well associated with the aquifer exemption. More than two-thirds of these aquifer exemptions are associated with Class IIR enhanced recovery wells. Aquifer exemptions associated with Class IID oil and gas waste disposal wells make up roughly another quarter of the total. (An additional 125 wells were listed in the database as being Class II but did not provide enough information to determine a sub-class.) The next largest group of exemptions is associated with Class III solution mining wells. Of the 115 exemptions associated with Class III wells, at least 97 are associated with in-situ leaching (ISL) mining of uranium. Seventy (1.5%) of the exemptions in the data are associated with Class I wells. Very few exemptions are associated with other classes of wells.

NRDC conducted a detailed analysis of the data provided for the 4,679 exemptions which are listed as approved. Among NRDC's key findings:

- 66% of exemptions lack any data documenting the water quality of the aquifer that was exempted. Of the 34% that do have such data, much of the water quality information appears to be based on estimations, without any identified sampling methods or quality control.
  - Comments in the database frequently highlight the lack of reliable data, even though exemptions have been approved. The following is a sampling of statements related to water quality data:
    - "Assumed, most likely < 3000 mg/L. Documentation is spotty."[38]
    - "[R]ange from [Statement of Basis] - notes that the samples not taken from area near proposed well."[39]
    - "Two zones are exempted in one letter, but the depths and [Total Dissolved Solids] values were not differentiated between the two."[40]
    - "A second well was included in this area permit in 1999. Water quality data showed that [one of three formations exempted] was sampled and was 1020 mg/L TDS?? No data provided for [the other two formations exempted]."[41]
  - Among the 34% of approved exemptions (1,616 exemptions in total) that include a figure for water quality:[42]
    - 9% have water quality of 1,000 mg/L TDS or less
    - 28% have water quality of 3,000 mg/L TDS or less
    - 57% have water quality of 5,000 mg/L TDS or less
- 18% have no data in any of the fields related to location, other than the state and county where the exemption is located. This fundamental information is essential to an accurate picture of aquifer exemptions, to carrying out the EPA's approval and regulatory functions, and to ensuring that the exempted water sources are not used by the public.
- 22% had no data identifying the depth of the aquifer to be exempted—meaning the precise vertical extent of the exempted aquifer is unknown or unclear, and meaning there are significant limitations on the ability to identify possible connections or preferential pathways for contaminants that could potentially impact adjacent USDWs.
- The aerial extent of many aquifer exemptions appears arbitrary. For instance, the data indicates that 2,479 exemptions (53%) are .196 square miles in area, which corresponds to a ¼ mile radius around the point of the injection well. Another

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[38] EPA Aquifer Exemption Database. *supra* note 33, at Exemption ID #: 8_137.
[39] *Id.* at Exemption ID #: 8_653.
[40] *Id.* at Exemption ID #: 8_453.
[41] *Id.* at Exemption ID #: 8_198.
[42] The data regarding water quality in the bullets below appears in a column in the EPA Aquifer Exemption Database labeled "Water Quality" which contains numbers but no units. The data appear to indicate the mg/L total dissolved solids of each source – it is assumed that this is the measurement unit used.

1,075 (23%) of the exemptions are precisely 1 square mile and correspond to a section designated by the Public Lands Survey System (PLSS).
- The aerial extent of some aquifer exemptions is extremely large. For instance, in California, 63 of the state's exemptions add up to more than 1,000 square miles of exempted aquifers. It also appears from the data that EPA has exempted the entire Dakota/Lakota aquifer in western North Dakota – an area of roughly 35,000 square miles.[43]
- Of the 4,679 entries for approved aquifer exemptions in the EPA nationwide aquifer exemption spreadsheet, 1,936 (44%) do not list any criteria by which the aquifer exemption was granted. One criterion that must be met for all aquifer exemptions is that the aquifer cannot currently serve as a source of drinking water, 40 C.F.R. § 146.4(a), yet among those approved exemptions that do list information on the criteria under which they were approved, 485 do not state whether 146.4(a) was met.
- While EPA included a column for the expiration date of exemptions, no data appears in that column for any exemption and we are not aware of any exemptions that have ever been granted for a time-limited period, or anything in EPA or state rules which would indicate that any of the thousands of existing exemptions will ever expire.

V. Existing criteria and procedures for granting aquifer exemptions

The criteria used for evaluation of aquifer exemption requests and the processes for approval of exemptions are set forth in EPA regulations governing UIC programs. Those rules define an "underground source of drinking water" as "an aquifer or its portion:

(a)

(1) Which supplies any public water system; or

(2) Which contains a sufficient quantity of ground water to supply a public water system; and

(i) Currently supplies drinking water for human consumption; or

(ii) Contains fewer than 10,000 mg/l total dissolved solids; and

(b) Which is not an exempted aquifer."[44]

The Director of a UIC program, which may be the EPA Regional Administrator or the Director of an approved state or tribal program, is encouraged to identify USDWs.[45] However, all USDWs that meet the definition must be protected, regardless of whether they have been identified.[46]

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[43] *See* EPA Aquifer Exemption Database, *supra* note 33 at Exemption ID #: 8_3349. Note that the EPA Database indicates that the aerial extent of this exemption is 78.837 square miles. However, this appears to be a mistake, as this figure is greater than the total area of North Dakota.

[44] 40 C.F.R. § 144.3.

[45] *Id.* § 144.7(a). *See also Id.* § 144.3 (defining "Director").

[46] *Id.* § 144.7(a).

Because protections are applied only to USDWs, an aquifer is no longer entitled to protections if it is exempted. An aquifer or part thereof that is designated by a UIC program Director for exemption must be described "in geographic and/or geometric terms (such as vertical and lateral limits and gradient) which are clear and definite."[47] State and tribal programs may impose more stringent requirements than those required by EPA rules.[48]

A. Criteria for exemption of aquifers

EPA regulations allow the exemption of aquifers on a number of distinct grounds. For injection wells falling in classes I through V, an aquifer meets the criteria for exemption if:

> "(a) It does not currently serve as a source of drinking water; and
> (b) It cannot now and will not in the future serve as a source of drinking water because:
> > (1) It is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible.
> > (2) It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical;
> > (3) It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption; or
> > (4) It is located over a Class III well mining area subject to subsidence or catastrophic collapse; or
>
> (c) The total dissolved solids content of the ground water is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system."[49]

New aquifer exemptions are not permitted for Class VI wells, but existing Class II aquifer exemptions can be expanded for Class VI use. Specifically, EPA rules provide that previously-granted aquifer exemptions which were granted for the purpose of enhanced oil or gas recovery may be expanded for Class VI injection of carbon dioxide for geologic sequestration if the aquifer or portion to be designated does not currently serve as a USDW, and the total dissolved solids content of the groundwater is more than 3,000 mg/l and less than 10,000 mg/l, and it is not reasonably expected to supply a public water system.[50]

B. Exemption of aquifers as part of the approval of the initial UIC program

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[47] *Id.* § 144.7(b)(1). It is not clear whether clear and definite lateral and vertical limits were ever specified in many cases. As noted in section IV, the EPA's nationwide database of aquifer exemptions is missing definite data on the aerial extent of at least 18% of aquifer exemptions and on the vertical extent of at least 22% of exemptions. In any case, the fact that the EPA does not appear to possess this data raises serious questions about the agency's oversight of the aquifer exemption program and its ability to fulfill its statutory duty to protect current and potential sources of drinking water.

[48] *Id.* § 145.11.

[49] *Id.* § 146.4.

[50] *Id.* § 146.4 (d).

Aquifers may either be exempted during the initial process for approval of a state or tribal UIC program or later, on an individual basis.[51] In the former case, exemptions will be part of the program developed by the state or tribe for approval by EPA. The proposed UIC program must undergo a public comment period of not less than 30 days, including a public hearing.[52] A submission for UIC program approval may then be forwarded to EPA, along with comments received and responses to those comments.[53] Upon receipt of a complete submission for state or tribal approval, the EPA issues a notice in the Federal Register providing for a 30-day comment period on the program submission and a public hearing (which may be cancelled if sufficient public interest is not expressed).[54] The EPA Administrator is required to approve the state or tribe's UIC program within 90 days if it "conform[s] to the applicable requirements."[55] Where EPA administers a UIC program, the agency may designate exempted aquifers at the time a program is established.[56]

C. Addition of aquifer exemptions subsequent to initial UIC program approval

Procedures for exempting aquifers subsequent to the promulgation of the original UIC program vary depending on the type of exemption sought and whether the program is administered by EPA or a state or tribe. Certain types of aquifer exemptions are deemed "substantial" revisions of a UIC program and are subject to a different process from those deemed "non-substantial."

i) *Aquifer Exemption Proposals Deemed "Substantial" UIC Program Revisions*

EPA guidance lists the types of UIC program revisions considered substantial.[57] The guidance document (Groundwater Protection Branch Guidance #34 – hereinafter "Guidance 34") identifies as substantial only proposed exemptions where an aquifer contains water with a content of less than 3,000 milligrams per liter (mg/L) total dissolved solids (TDS) and which are either "(a) related to any Class I well; or (b) not related to action on a [UIC] permit, except in the case of enhanced recovery operations authorized by rule."[58] Requests for the expansion of the areal extent of an exemption granted for enhanced oil or enhanced gas recovery for the purpose of geologic sequestration of carbon dioxide are also deemed substantial revisions.[59] By addressing only the above-covered items, the guidance implies that all other revisions are considered non-substantial. This would include, for instance, requests to exempt aquifers containing water of high quality, below 3000 mg/L TDS, that are associated with a non-Class I UIC permit.

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[51] *Id.* § 144.7(b).
[52] *Id.* § 145.31(a).
[53] *Id.* § 145.31(b).
[54] *Id.* § 145.31(c).
[55] *Id.* § 145.31(d).
[56] *Id.* § 144.7(b)(2).
[57] Envtl. Protection Agency, Guidance for Review and Approval of State Underground Injection Control (UIC) Programs and Revisions to Approved State Programs: GWPB Guidance #34 at 5 (1984) [hereinafter *Guidance #34*] attached as Exhibit A11.
[58] *Id.*
[59] 40 C.F.R. § 145.32(b)(2).

Guidance 34 makes clear that the categories apply "as a general rule," and that a "firm definition" of what constitutes a substantial revision is impossible to establish.[60] However, it is clear from the document that the vast majority of aquifer exemptions are considered non-substantial. Even if exemptions outside the enumerated categories are occasionally considered to be substantial based on individual circumstances, very few aquifer exemptions would likely meet the criteria. In fact, in the nationwide spreadsheet EPA provided NRDC in response to a Freedom of Information Act request, only six approved aquifer exemptions are listed as "substantial" revisions.[61] In contrast, there are at least 776 entries for approved aquifer exemptions that have been classified as "non-substantial."[62]

The approval process for substantial exemptions differs depending on whether the UIC program is administered directly by EPA or, instead, by a state or tribe. Where a state or tribe administers the UIC program, the state or tribe first reviews an aquifer exemption application. The state or tribe must then publish a public notice of the application and an opportunity for a hearing.[63] The state or tribe may then submit the request for exemption of an aquifer to EPA for approval. If EPA deems the requested exemption to be substantial, EPA will then notify "interested persons" and publish notice of the proposed exemption in local newspapers and the Federal Register, providing for a public comment period of at least 30 days.[64] EPA will hold a public hearing on the proposed substantial exemption if requests are received demonstrating "significant public interest."[65] The EPA Administrator will then make a determination to either approve or deny the exemption request. If an exemption is granted, the EPA will publish a notice of the approval in the Federal Register.[66]

Where EPA administers the program, the application for an exemption is submitted directly by the applicant to the EPA Regional Office. Public notice and comment procedures are more vague than what is required of states or tribes. EPA rules simply require that EPA "may, after notice and opportunity for a public hearing, identify additional exempted aquifers."[67] The decision on whether to have a public hearing is a discretionary one based on EPA's judgment of whether

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[60] Guidance #34, *supra* note 57, at 5.

[61] See EPA Aquifer Exemption Database, *supra* note 33. We also searched the federal register. One substantial exemption that is not listed among the substantial exemptions in the EPA spreadsheet was found but the search did not provide reason to believe that substantial exemptions make up more than a tiny fraction of all exemptions granted. *See* Underground Injection Control Program Revision: Aquifer Exemption Determination for Portions of the Lance Formation Aquifer in Wyoming, 67 Fed. Reg. 47,721 (Jul. 22, 2002) (approving an aquifer exemption in the Lance formation in Wyoming that we did not locate among the substantial exemptions listed in the EPA Aquifer exemption database) attached as Exhibit A12.

[62] *See* EPA Aquifer Exemption Database, *supra* note 33 (listing only six approved aquifer exemptions as "Substantial" or "S" under the column heading "*RevisionType*," while 776 approved exemptions are listed as "Non-Substantial" or "NS"). Note that 145 approved aquifer exemption entries contain no data in the *RevisionType* column, so the total number of exemptions deemed "substantial" or "non-substantial" may be larger. (The majority of the remaining entries that indicate they have been approved – 3,289 indicate that they were granted at primacy or on the effective date of the UIC program while some 463 are listed as "Not Applicable.").

[63] 40 C.F.R. § 144.7(b)(3).

[64] *Id.* § 145.32(b)(2).

[65] *Id.*

[66] *Id.* § 145.32(b)(4).

[67] *Id.* § 144.7(b)(3).

there is significant public interest.[68] After the public comment process, the Regional Administrator may approve or deny the exemption.[69]

ii) *Aquifer Exemption Proposals Deemed "Non-Substantial" UIC Program Revisions*

For all aquifer exemption applications which are not considered substantial, the UIC program Director (either the EPA Regional Administrator or the state or tribal program director, as applicable) may identify aquifers proposed for exemption after public notice and opportunity for a public hearing.[70] Where a state or tribe administers the program, the state forwards approved applications to EPA, and the EPA Regional Administrator may approve the request for exemption via letter to the relevant state or tribal official.[71] However, in the case of exemptions proposed by a state or tribe under 40 C.F.R. § 146.4(c), EPA approval is not required.[72] In this case, where the state or tribe proposes to exempt an aquifer on the basis that "the total dissolved solids content of the ground water is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system," the proposed exemption becomes final 45 days after the request is submitted in writing to the EPA Administrator if the Administrator has not disapproved the request.[73] Where EPA administers the program, the Regional Administrator will approve or deny the exemption.

VI. Significant new information has arisen since the existing aquifer exemption rules were written

A. Understanding of the importance of groundwater has evolved dramatically in the decades since EPA wrote the existing rules

Existing EPA rules do not reflect the current scientific understanding about increasing demand for water and reliance on groundwater, decreasing groundwater supplies, current groundwater treatment and pumping technologies, or the effects of climate change on these variables.

Groundwater is a significant source of drinking water supply for public water systems, as well as serving needs for agricultural irrigation and other purposes. According to the United States Geological Survey (USGS), groundwater is used to supply drinking water for almost half of the population of the United States, as well as serving other needs, including providing one of the

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[68] *Id.* § 25.4.

[69] *See, e.g., Id.* § 147.1952 (setting out aquifer exemptions in Pennsylvania, where EPA administers the UIC program, and noting that "EPA may in the future exempt other aquifers or portions, according to applicable procedures, without codifying such exemptions in this section. An updated list of exemptions will be maintained in the Regional office.")

[70] 40 C.F.R. § 144.7(b)(3).

[71] Guidance #34, *supra* note 57 at 6.

[72] *See* 40 C.F.R. § 144.7(b)(3) (referencing 40 C.F.R. § 146.04(c), which has been renumbered as 40 C.F.R. § 146.4(c)).

[73] 40 C.F.R. § 144.7(b)(3).

largest sources of water for agricultural irrigation.[74] Groundwater is attractive to meet water needs because it is accessible in areas without substantial surface water availability, generally requires less treatment than surface water, and is less susceptible to drought conditions.

Groundwater resources are not only a crucial current source of water, but they are expected to be increasingly tapped as a necessary source of fresh water in the future. According to the Ground Water Protection Council (GWPC), a nonprofit organization whose members consist of state groundwater regulatory agencies, "Water resource planners are facing unprecedented challenges to both maintain current resources and find new ones to meet increasing demands. Groundwater is being tapped more and more for a host of different uses . . . all vying for what is essentially a static or decreasing resource."[75]

The gap between water supply and demand is expected to be particularly acute in certain regions, especially in arid western states. As one example, a U.S. Bureau of Reclamation study of the Colorado River basin developed a range of scenarios for future supply and demand and found that the median long-term projections showed a supply shortfall of 3.2 million acre feet each year by 2060.[76] All of the portfolios of options that the Bureau developed for responding to these projected shortfalls include treatment of saline groundwater,[77] water with a total dissolved solids concentration of 1,000 mg/L or more.

Public water systems can be expected to utilize the lowest-cost source of water available to them. In general, this will mean that they prefer to use water sources that are of higher quality in order to reduce treatment costs. When relatively high quality source water is unavailable, the next economically available source of water is used. In coastal areas, sea water, which typically contains approximately 35,000 mg/l TDS, is used as a last resort, due to relatively higher water treatment costs and the expense of disposing of the waste products, including high-salinity "concentrate."[78] Public water systems also generally prefer sources that are closer in distance, requiring lesser transport costs, and those with lower access costs, which may include the cost of purchasing water rights.

As water sources become more scarce, increasing costs will be expended to develop additional sources. Therefore, many water resource and environmental engineers regard preventing water contamination in the first instance as the best option. Unfortunately, aquifer exemptions take this preferred option off the table and allow the contamination of sources that could otherwise provide the lowest-cost source for a public water supplier.

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[74] Molly A. Maupin et al., Estimated use of water in the United States in 2010, U.S. Geological Survey Circular 1405, at 12, 14, 22 (2014), attached as Exhibit A13 and available at http://pubs.usgs.gov/circ/1405/pdf/circ1405.pdf.

[75] Ground Water Protection Council, Ground Water Report to the Nation, Chapter 11, *Alternative Water Supplies*, at 11-2 (May 2014), attached as Exhibit A14 and available at http://www.gwpc.org/ground-water-report-nation.

[76] U.S. Bureau of Reclamation, Colorado River Basin Supply & Demand Study: Executive Summary 9 (Dec. 2012) attached as Exhibit A15 and available at http://www.usbr.gov/lc/region/programs/crbstudy/finalreport/Executive%20Summary/CRBS_Executive_Summary_FINAL.pdf.

[77] *Id.* at 13, tbl 2.

[78] *See* Geoffrey Thyne, Ground Water Treatment Technology 10, 13 (July 2014) [hereinafter *Thyne Report*] attached as Exhibit A16.

i) *Groundwater demand has sharply risen since the existing rules were issued and is projected to continue to increase*

Water demand in the United States is predicted to increase significantly over the coming decades.[79] As the availability of surface water in many areas dwindles,[80] groundwater will increasingly be relied on to serve the public's needs.[81] With many parts of the U.S. already struggling with severe drought, water shortages, and water conservation measures, the impacts of climate change will further stress water availability.[82]

Indeed, the changes discussed above are already occurring. Due to increasing water needs and decreasing supplies from more traditional sources, many communities are being forced to seek water from sources that would not previously have been considered, including saline groundwater.

These increases in groundwater demand and use represent a significant change from the conditions that existed when EPA promulgated the aquifer exemption rules in the early 1980s. For instance, almost half of the increase in groundwater withdrawals in the U.S. from 1985 to 2010 was due to increased use of saline groundwater – water with a dissolved solids

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[79] *See, e.g.*, Thomas C. Brown et al., *Projected freshwater withdrawals in the United States*, 49 Water Res. Research 1259, 1273 Fig. 9 (2013) attached as Exhibit A17 and available at http://onlinelibrary.wiley.com/doi/10.1002/wrcr.20076/pdf; Elodie Blanc et al., *Modeling U.S. Water Resources Under Climate Change*, 2 Earth's Future: 197-224, 224 (2014) ("Results suggest that population and economic growth alone would increase water stress in the United States through mid-century. Climate change generally increases water stress with the largest increases in the Southwest."), attached as Exhibit A18 and available at http://onlinelibrary.wiley.com/doi/10.1002/2013EF000214/epdf.

[80] Kristen Averyt et al., *Sectoral contributions to surface water stress in the coterminous United States*, 2013 Environ. Res. Lett. 8 035046, at 2 (2013) ("Average surface water supplies are decreasing, and are expected to continue declining, particularly in the southwestern US."), attached as Exhibit A19 and available at http://iopscience.iop.org/article/10.1088/1748-9326/8/3/035046/pdf.

[81] Timothy R. Green et al., *Beneath the surface of global change: Impacts of climate change on groundwater*, 405 Journal of Hydrology 532-560, 554 (2011) ("The demand for groundwater is likely to increase in the future because of the need to offset the substantial declines in surface water availability from increasing precipitation variability and reduced summer low flows in snow-dominated basins. The current demands for surface water in many parts of the world will not be met under plausible future climate conditions, much less the demand under future population growth."), attached as Exhibit A20 and available at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.465.3292&rep=rep1&type=pdf; Vincent C.Tidwell et al., *Mapping water availability, projected use and cost in the western United States*, Environmental Research Letters 9:064009 (2014), attached as Exhibit A21 and available at http://iopscience.iop.org/article/10.1088/1748-9326/9/6/064009/pdf; Josué Medellín-Azuara et al., *Hydro-economic analysis of groundwater pumping for irrigated agriculture in California's Central Valley, USA*, 23 Hydrogeology Journal 1205-1216, 1216 (2015), attached as Exhibit A22 and available at http://link.springer.com/article/10.1007%2Fs10040-015-1283-9.

[82] *See* U.S. Global Change Research Program, Global Climate Change Impacts in the United States, Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson, (eds.), 47 (2009), attached as Exhibit A23 and available at https://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf. For a more complete discussion of the impacts of climate change on water demand and availability, see *infra*, Section VI.A.iv (pages 25-28).

concentration of 1,000 mg/L or more.[83] While saline groundwater use in the U.S. was only about 650 million gallons per day in 1985, it rose to almost 3.3 billion gallons per day in 2010, an increase of over 400%.[84]

Reliance on saline groundwater has increased dramatically in many parts of the country. Figure 2 shows the percentage point change in groundwater reliance, by county, from 1985 – 2010.[85] Many more counties increased their saline groundwater reliance than decreased it during this period. Around the country, 166 U.S. counties increased their reliance by five percentage points or more, while only 30 counties decreased their reliance by this amount. Some 40 U.S. counties increased their saline groundwater reliance by more than forty percentage points, while only one decreased its reliance by this amount. By 2010, more than 100 U.S. counties used saline groundwater to provide at least 20% of their total water supply.[86] This number has likely grown in the intervening years.

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[83] *See* Wayne B. Solley et al., Estimated Use of Water in the United States in 1985, U.S. Geological Survey Circular 1004 (1988), attached as Exhibit A24 and available at http://pubs.usgs.gov/circ/1988/1004/report.pdf; Molly A. Maupin, *supra* note 74.

[84] *See* Wayne B. Solley, *supra* note 83; Molly A. Maupin, *supra* note 74.

[85] The figure uses USGS data on estimated water use from 1985 and 2010, which accompany the reports cited *supra* note 83. The change in reliance was taken by measuring the difference between the percentage of total county water use that came from saline groundwater in each year. For example, if 10% of a county's water supply came from saline groundwater in 1985 and 17% came from saline groundwater in 2010, the county experienced a seven percentage point increase in saline groundwater reliance and would be displayed in light orange.

[86] U.S. Geological Survey, Estimated Use of Water in the United States, County-Level Data for 2010, attached as Exhibit A25 and available at http://water.usgs.gov/watuse/data/2010/. The figure was calculated by dividing total saline groundwater withdrawals (column DF) by total county withdrawals (column DM). The data indicate that in 2010, 104 counties used saline groundwater for at least 20% of their total supply.

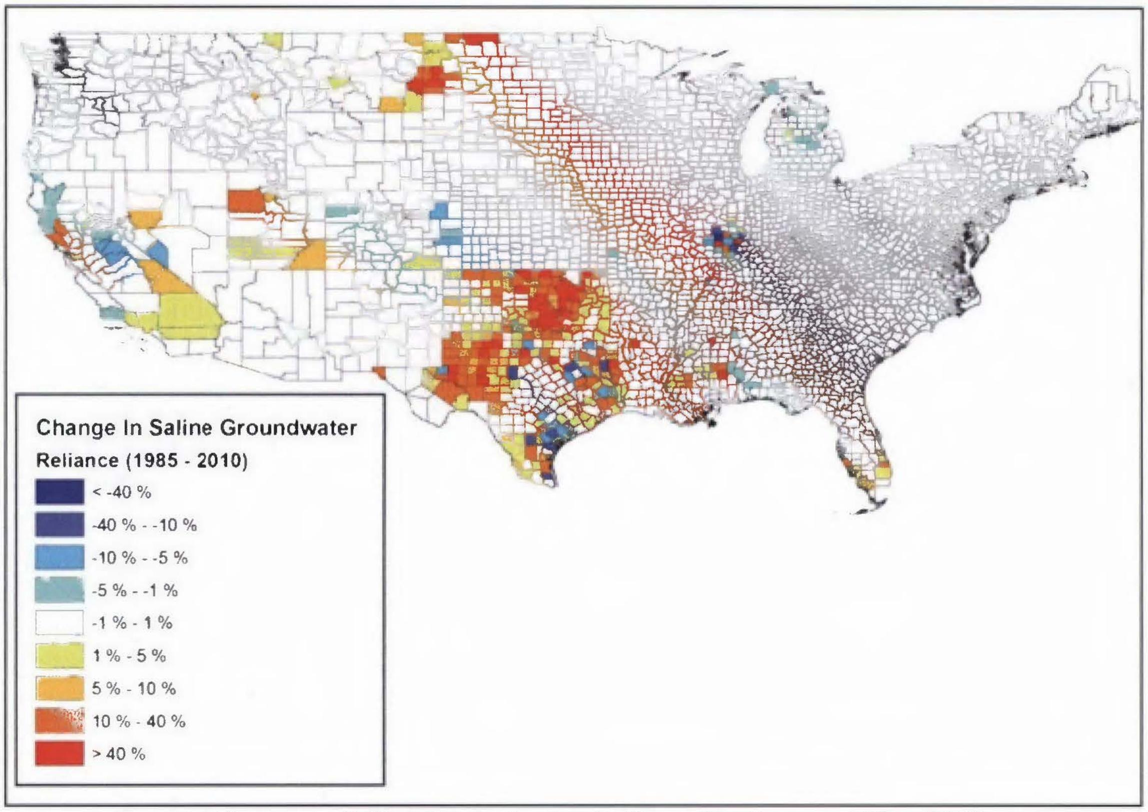

Figure 2: Change in Saline Groundwater Reliance by County, 1985 - 2010

The USGS states that brackish water "is considered by many investigators to have dissolved-solids concentration between 1,000 and 10,000 milligrams per liter (mg/L)."[87] Brackish water is a subset of saline water; above 10,000 mg/L many investigators would no longer consider the water to be brackish.[88]

In its National Brackish Groundwater Assessment, the USGS documented projections of rising groundwater demand that have led to an increased need to protect brackish groundwater sources – many of which would have been deemed unsuitable for drinking water in the past:

> "In many parts of the country, groundwater withdrawals exceed recharge rates and have caused groundwater-level declines, reductions to the volume of groundwater in storage, lower streamflow and lake levels, or land subsidence. It is expected that the demand for groundwater will continue to increase because of population growth, especially in the arid West. Further, surface-

[87] U.S. Geological Survey, *What is "Brackish"?*, http://water.usgs.gov/ogw/gwrp/brackishgw/brackish.html (last visited February 19, 2016), attached as Exhibit A26.

[88] We adopt the USGS convention that brackish water contains TDS of between 1,000 and 10,000 mg/L TDS in this discussion. However, it is important to note that the term is susceptible to other definitions and some sources consider any water with salinity less than that of seawater (which contains roughly 35,000 mg/L TDS) to be brackish.

> water resources are fully appropriated in many parts of the country, creating additional groundwater demand. Development of brackish groundwater as an alternative water source can help address concerns about the future availability of water and contribute to the water security of the Nation."[89]

Brackish water is already being treated for use as drinking water around the country. For example, many large municipalities in Texas have become reliant on brackish groundwater as the state has suffered historic droughts over the last decade.[90] Texas has at least 34 municipal desalination plants that treat brackish groundwater.[91] The combined design capacity of these plants is approximately 73 million gallons per day (Mgd).[92] One brackish groundwater treatment facility in El Paso has the capacity to treat nearly 27.5 Mgd to drinking water quality.[93] San Antonio recently completed construction of the first phase of a desalination facility that will treat more than 30 Mgd once the full project is completed.[94] According to the director of the Texas Desalination Association, "Until recently, brackish water was not considered usable. But with chronic drought conditions, it is suddenly becoming more and more useful."[95] It is projected that roughly 14% of the total water supply for the Lower Rio Grande Valley of Texas will be met with brackish groundwater by 2060.[96] The state water plan also calls for significant increases in the use of brackish groundwater, projecting that nearly an additional 165 Mgd could be generated from desalination of brackish groundwater.[97]

In California, the most recent update to the state's Water Plan notes that "desalination is being considered more frequently as water supplies become constrained, more local supplies are sought to augment imported water, and desalination technologies improve and become more cost-effective."[98] In just seven years, from 2006 to 2013, groundwater desalination capacity in

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[89] U.S. Geological Survey, *Why Study Brackish Groundwater?*, http://water.usgs.gov/ogw/gwrp/brackishgw/study.html (last visited February 19, 2016), attached as Exhibit A27.

[90] David Sneed, *Cambria Water reclamation plant to start operating soon*, The Cambrian, November 8, 2014, attached as Exhibit A28 and available at http://www.sanluisobispo.com/2014/11/08/3339786/cambria-csd-water-treatment-plant.html (discussing the rise of the use of brackish water in Texas and other states); Tex. Water Dev. Bd., *Desalination: Brackish Groundwater* (Sept. 2015) (providing statistics on brackish groundwater treatment in Texas), attached as Exhibit A29 and available at http://www.twdb.texas.gov/publications/shells/Desal_Brackish.pdf.

[91] Texas Water Dev. Bd., *supra* note 90.

[92] *Id.*

[93] *Id.*

[94] *See* Scott Huddleston, *'Desal' Plant a Year from Completion*, San Antonio Express-News, Sept. 10, 2015, attached as Exhibit A30 and available at http://www.expressnews.com/news/local/article/Desal-plant-a-year-from-completion-6497254.php.

[95] David Sneed, *supra* note 90.

[96] John E. Meyer et al., Brackish Groundwater in the Gulf Coast Aquifer, Lower Rio Grande Valley, Texas, Texas Water Development Board Report 383, at 1 (Sept. 2014) attached as Exhibit A31 and available at http://www.twdb.texas.gov/innovativewater/bracs/doc/TWDB_Report_383_LRGV_GulfCoast.pdf.

[97] Tex. Water Dev. Bd., *supra* note 90 (noting projections that 184,704 acre feet per year of new water supplies could be created via brackish groundwater – the figure was converted into Mgd for ease of comparison).

[98] State of Cal., California Water Plan: Update 2013, Bulletin 160-13, at 10-23, attached as Exhibit A32 and available at http://www.waterplan.water.ca.gov/cwpu2013/final/.

California more than tripled.[99] In 2006, the state had 14 groundwater desalination plants with a total capacity of 41 Mgd.[100] By 2013, there were 23 groundwater desalination plants operating in the state, with a capacity of nearly 125 Mgd.[101] Another 20 plants were in progress or proposed as of 2013, and were projected to add roughly 75 Mgd of additional capacity.[102] The current drought is likely to accelerate these trends. For instance, in September, 2015, a water supplier in San Diego County announced the start of a $42 million project to double the capacity of its groundwater desalination plant from 5 to 10 million gallons of drinking water per day.[103]

ii) *Water managers are planning on pumping water hundreds of miles for water supply due to scarcity of groundwater*

As communities facing water shortages struggle to develop new sources to serve their citizens, they have been forced to find water sources from farther and farther afield. These projects demonstrate the increasing costs communities are willing to bear to obtain useable water in areas where water availability is insufficient. A 2012 NRDC report lists more than a dozen large-scale water pipeline projects in the western United States that were either already underway or in the planning or permitting stages.[104] The water supply projects catalogued in the report run up to 500 miles in length and several are projected to cost upwards of a billion dollars.[105]

These substantial pipeline projects also demonstrate that even water sources located hundreds of miles away from users may be needed in today's current state of water shortages. For example, a pipeline to pump groundwater from eastern Nevada to Las Vegas would extend 300 miles and is projected to cost $3.5 billion.[106] The Lake Powell Pipeline Project has been proposed to transport water for approximately 140 miles from Arizona to Utah at a cost of more than $1 billion.[107] The Lewis and Clark Regional Water System, authorized by Congress in 2000 to transport 45 million gallons of water per day more than 330 miles from South Dakota to Iowa and Minnesota, had already involved outlays of more than $360 million by 2013, despite being only 65% completed.[108] And the Gillette Madison Pipeline Project in Wyoming, projected to cost more than $215 million, will route water approximately 45 miles from the Madison aquifer to the city

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[99] *Id.* at 10-25, tbl. 10-4, 10-27, tbl. 10-6.
[100] *Id.* at 10-25, tbl. 10-4 (converted into Mgd for ease of comparison).
[101] *Id.* at 10-27, tbl. 10-6 (converted into Mgd for ease of comparison).
[102] *Id.* (converted into Mgd for ease of comparison).
[103] Regina Ruiz, *South Bay Desalination Plant to Double Production*, 7 San Diego, Sept. 29, 2015, attached as Exhibit A33 and available at http://www.nbcsandiego.com/news/local/desalination-facility-expands-330026121.html.
[104] Denise Fort & Barry Nelson, Pipe Dreams: Water Supply Pipeline Projects in the West 8-9 (2012), attached as Exhibit A34 and available at http://www.nrdc.org/water/management/files/Water-Pipelines-report.pdf.
[105] *Id.* at 9.
[106] *Id.*
[107] *Id.*
[108] *See* Lewis & Clark Reg'l Water Sys., Lewis & Clark Regional Water System Talking Points, at slide 4 (July 2013) attached as Exhibit A35 and available at http://www.lcrws.org/images/stories/pdf/Talking_Points_2013.pdf.

of Gillette and is expected to meet water demand only until about 2037.[109] These pipeline projects demonstrate increased water demands and the limited and costly options that many water suppliers are faced with to meet those demands.

iii) *Existing rules do not account for the latest groundwater depletion data, which indicate significant reductions in groundwater availability nationwide*

Groundwater extraction has increased significantly throughout the United States since World War II, primarily due to technological advancements in pumping and increased demands for agricultural irrigation.[110] When more groundwater is removed than recharged, a deficiency occurs, a phenomenon termed groundwater depletion. Many areas of the United States are losing groundwater volumes at an unsustainably rapid rate – one that, if maintained, may threaten the very existence of certain communities as water becomes too difficult or expensive to obtain in some areas. In California, 28 small communities appeared on a list of "critical water systems" at some point between January and September of 2014, meaning that they were designated as having the potential to lose all water within 60 days.[111] At least 120 California communities have applied for state drought-related drinking water funding.[112]

The total groundwater volume depleted in the United States from 1900 to 2000 is estimated at 800 cubic kilometers (km^3). However, the depletion volume from just 2000 to 2008 is estimated at 200 km^3, a rate that is approximately triple the average annual rate of depletion during the previous century.[113] To put this in perspective, the total volume of depleted groundwater nationwide from 1900 to 2008 would cover the entire state of Pennsylvania in approximately 25 feet of water.[114]

The depletion rate in certain regional aquifers is substantially higher than the nationwide average. For instance, the Central Valley aquifer in California, and the High Plains aquifer (also known as the Ogallala aquifer), which underlies eight states, experienced dramatic groundwater volume losses from 1960 to 2008.[115]

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109 Wyo. Water Dev. Office, Water News 1 (Fall 2015) (providing cost and distance information) attached as Exhibit A36 and available at http://wwdc.state.wy.us/newsletter/2015-2.pdf. City of Gillette, Gillette Long-Term Water Supply Study, Executive Summary 1 (2007) (noting that the project would meet demand projections only until about 2037) attached as Exhibit A37 and available at http://www.gillettewy.gov/home/showdocument?id=5428.

110 Leonard F. Konikow, *Long-Term Groundwater Depletion in the United States*, 53 Groundwater 1, 7 (2015) attached as Exhibit A38 and available at https://assets.documentcloud.org/documents/1674356/konikow-2015-groundwater.pdf.

111 Becerra, Hector, *Drought has 14 communities on the brink of waterlessness*, Los Angeles Times, Sept. 25, 2014, attached as Exhibit A39 and available at http://www.latimes.com/local/la-me-critical-water-20140926-story.html.

112 State of Cal. Water Res. Control Bd., Drinking Water Drought Funding (Oct. 21, 2015) attached as Exhibit A40 and available at http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/drought/funding_map.pdf.

113 Leonard F. Konikow, Groundwater depletion in the United States (1900–2008): U.S. Geological Survey Scientific Investigations Report 2013–5079, at 50 (2013), attached as Exhibit A41 and available at http://pubs.usgs.gov/sir/2013/5079.

114 Based on an area of Pennsylvania of approximately 119,300 km^2.

115 *Id.* at 22-25 (Central Valley aquifer), 22-24 (High Plains aquifer).

As of 2013, groundwater pumping in the High Plains aquifer has resulted in a decline of 266.7 million acre-feet – or enough water to cover California in approximately 2.5 feet of water.[116] Parts of the High Plains aquifer have experienced groundwater level declines over 150 feet.[117] In fact, a study published in the Proceedings of the National Academy of Sciences (PNAS) concluded that "[e]xtrapolation of the current depletion rate suggests that 35% of the southern High Plains will be unable to support irrigation within the next 30 y[ears]."[118]

Significant groundwater depletion has also occurred over the last 60 years in the southern Central Valley aquifer, also known as the Tulare Basin. An estimated 97 km^3 of groundwater has been depleted in the Tulare Basin since 1961.[119] In certain areas of the Tulare Basin, the groundwater level has declined by as much as 120 meters and land has subsided by approximately nine meters.[120] The California Water Plan concludes that, "As it now stands and as groundwater desalination expands in the future, groundwater overdraft issues will be an integral consideration."[121]

iv) *The existing aquifer exemption rules do not account for the impact of climate change on water supplies*

Climate change will have substantial consequences for water supplies in the United States. One recent study examined water demand under a number of climate scenarios and found that climate change substantially increases projected water demands above what current water use trends would otherwise suggest.[122] Some scenarios predict that U.S. water withdrawals will more than double from 2005 levels by 2090.[123]

According to the GWPC, "One unmistakable conclusion that can be drawn from various discussions on historical climate variability and current efforts to predict local climate change is that the hydrologic cycle that has been observed over the past century is no longer a reasonable benchmark on which to base future water management decisions."[124]

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[116] *See* Virginia L. McGuire. Water-Level Changes and Change in Water in Storage in the High Plains Aquifer. Predevelopment to 2013 and 2011–13. U.S. Geological Survey Scientific Investigations Report 2014-5218. at 1 (2014). attached as Exhibit A42 and available at http://pubs.usgs.gov/sir/2014/5218/pdf/sir2014_5218.pdf. The 2.5 foot figure is based on an area of California of approximately 163.700 square miles.
[117] *Id.* at 2. Fig.1.
[118] Bridget R. Scanlon et al., *Groundwater depletion and sustainability of irrigation in the US High Plains and Central Valley*. 109 Proc. of the Nat'l Acad. of Sci. 9.320. 9.320-21 (2012) attached as Exhibit A43 and available at http://www.pnas.org/content/109/24/9320.full.pdf.
[119] *Id.* at 9.321.
[120] *Id at* 9.323.
[121] *California Water Plan. Update 2013*, *supra* note 98. at 10-27.
[122] Thomas C. Brown et al., *Projected freshwater withdrawals in the United States under a changing climate*. 49 Water Resources Res. 1259. 1259 (2013) attached as Exhibit A44 and available at http://onlinelibrary.wiley.com/doi/10.1002/wrcr.20076/epdf.
[123] *Id.* at 1274.
[124] Ground Water Protection Council. *supra* note 75. at 11-4.

Minority and low-income communities are also more likely to be disproportionately impacted by water stress associated with climate change.[125] Because of their unique cultural connection to landscapes and specific water sources, indigenous peoples are particularly vulnerable to climate change impacts.[126] Indeed, the Intergovernmental Panel on Climate Change (IPCC) has indicated that poor communities in both rural and urban areas that lack fundamental infrastructure and services are at increased risk from climate change impacts, including water shortages.[127]

On a regional scale, the forecasts from climate prediction models for precipitation and temperature changes suggest the "wet-get-wetter" and the "dry-get-drier." That is, most models predict that arid regions, such as the southwestern United States, will observe less precipitation, less surface water runoff, and increased temperatures.[128] These predictions indicate further stress to surface and groundwater supply in these regions. A 2010 study conducted for NRDC concluded that more than two thirds of all counties in the United States are expected to suffer moderate to extreme water stress due in part to climate change.[129] More than 400 U.S. counties are expected to face "extremely high" risks of water shortages by mid-century.[130] In particular, the report noted the risk that "water supplies will not be able to keep pace with withdrawals in many areas of the United States."[131]

As can be seen in Figure 3, a large percentage of approved aquifer exemptions are in regions experiencing moderate to high levels of water stress. The figure displays ecoregions and their corresponding levels of water stress throughout the United States using data from Hoekstra *et al.* and overlays the number of EPA approved aquifer exemptions in each state.[132]

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[125] Maxine Burkett, *Just Solutions to Climate Change: A Climate Justice Proposal for a Domestic Clean Development Mechanism*, 56 Buffalo L. Rev. 169, 179-180 (April, 2008), attached as Exhibit A45 and available at http://www.buffalolawreview.org/past_issues/56_1/Burkett%20Web%2056_1.pdf.

[126] *Id.* at 181-183.

[127] Intergovernmental Panel on Climate Change, Climate Change 2014: Synthesis Report, Contributions of Working Groups I, II, and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change at 69 (2015) attached as Exhibit A46.

[128] Patricia Romero-Lankao & Joel B. Smith, Climate Change 2014: Impacts, Adaptation, and Vulnerability, Part B: Regional Aspects, North America. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, 1439, 1448, 54, 56 (2014) attached as Exhibit A47; *see also* Elodie Blanc et al., *supra* note 79.

[129] Natural Res. Defense Council, Climate Change, Water, and Risk: Current Water Demands Are Not Sustainable 3 (July 2010) attached as Exhibit A48 and available at http://www.nrdc.org/globalwarming/watersustainability/files/WaterRisk.pdf.

[130] *Id.* at 1.

[131] *Id.*

[132] The data on water stress by ecoregion accompanies the Atlas of Global Conservation, published by the Nature Conservancy, and is available at http://databasin.org/galleries/2d2d35ae3bc34399976b598ed7893254. *See* Jonathan M. Hoekstra et al., The Atlas of Global Conservation: Changes, Challenges, and Opportunities to Make a Difference (Molnar, J.L., Ed.) (2010). The number of aquifer exemptions in each state is taken from the EPA Aquifer Exemption Database, *supra* note 33.

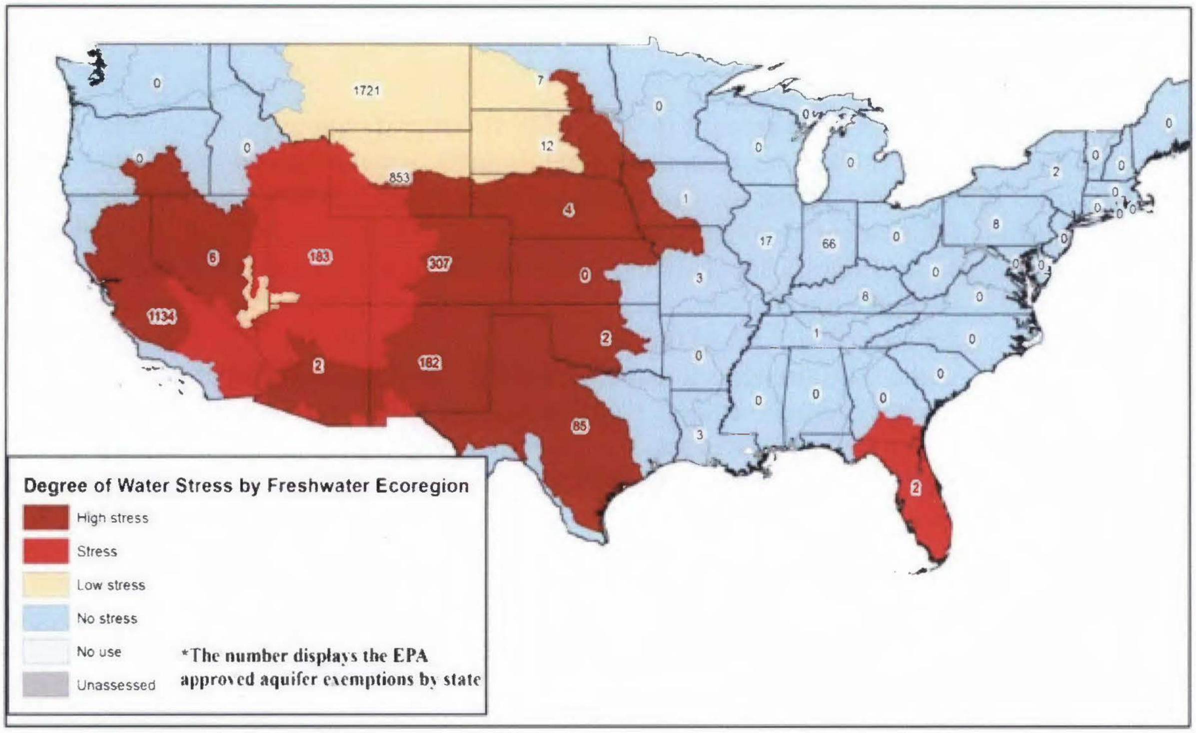

Figure 3: Aquifer Exemptions are Concentrated in Areas Experiencing Water Stress

A 2012 NRDC report found that only three of seventeen western states had undertaken comprehensive planning to address the likely impacts of climate change on water resources, while thirteen had done nothing or very little to prepare.[133] Unfortunately, existing aquifer exemption policies are likely to further exacerbate water stress, which is already projected to increase because of climate change.

Other factors are also likely to further exacerbate the water stress from increasing water demand and the effects of climate change. A 2014 report by the investor group CERES found that "nearly half of oil and gas wells hydraulically fractured since 2011 were in regions with high or extremely high water stress, and over 55% were in areas experiencing drought."[134] While the water used for such development is often a small portion of a state's available water resources, the report notes that at the local level, areas which are highly dependent on groundwater are often disproportionately impacted.[135] For example, in 2008, consumption of water for shale gas

[133] Natural Res. Defense Council, Ready or Not: An Evaluation of State Climate and Water Preparedness Planning, 3, 7-8 (April 2012), attached as Exhibit A49 and available at http://www.nrdc.org/water/readiness/files/Water-Readiness-full-report.pdf. We use 'western states' to denote those seventeen that are part of the contiguous 48 United States including Texas, Oklahoma, Kansas, Nebraska, South and North Dakota and all those states to their west.

[134] Monika Freyman, CERES, Hydraulic Fracturing and Water Stress: Water Demand by the Numbers 6 (Feb. 2014) attached as Exhibit A50 and available at http://www.ceres.org/resources/reports/hydraulic-fracturing-water-stress-water-demand-by-the-numbers.

[135] *Id.* at 7 ("Shale development in many regions is highly reliant on groundwater resources, which are generally less regulated than surface waters, thus increasing risks of water resource depletion and water competition.")

extraction, including for fracking, represented as much as 29% of the total net water use in certain counties in Texas.[136]

States with increasing populations are also in some of the most arid regions of the country and many are currently experiencing long term and severe drought. The most recent projections from the U.S. Census Bureau indicate that the five states with the fastest population growth during the first three decades of this century will be Nevada, Arizona, Florida, Texas and Utah.[137] Each of these states is likely to face significant challenges in terms of securing future water supplies. While California is not in the top five states in percentage terms, population increases there are expected to account for more than 15% of the net population change in the United States during this time period.[138] As the state struggles to cope with a historic drought and rapid population growth continues, reliance on groundwater is likely to increase substantially. In these states and others, it is likely that water planners will need to expand the use of brackish groundwater, as well as saline groundwater from aquifers with TDS levels above 10,000 mg/L. This shift in practice is not accounted for by the existing aquifer exemption rules.

B. Significant advancements in water treatment and pumping technologies have been made since the aquifer exemption rules were written

Groundwater treatment and pumping technologies have improved dramatically, becoming more effective, efficient, and economical since the early 1980s. These improvements significantly alter previous expectations about what can reasonably be expected to supply a public water system. Many aquifers previously considered to be an unlikely public drinking water source because of depth or quality (or both) can now be reasonably expected to supply public drinking water systems. The text of the Safe Drinking Water Act anticipates such developments and the clear intent of the Act is to adopt a precautionary principle with respect to groundwater sources so that any aquifer which "supplies or could reasonably be expected to supply any public water system" is protected.[139]

The House Report specifically noted that Congress intended the scope of protected sources to be liberally construed so that it "may include water sources which presently exceed maximum intake water quality requirements or maximum contaminant levels or which are not presently accessible for use as a community drinking water supply source."[140] Improvements in water treatment and pumping technologies have dramatically altered reasonable expectations about what can be expected to supply a public water system. The EPA must revisit its rules to ensure

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[136] Jean-Philippe Nicot & Bridget R. Scanlon, *Water use for Shale-gas production in Texas, U.S.*, 46 Envtl. Sci. & Tech. 3580, 3583, Tbl. 2 (2012) attached as Exhibit B4.
[137] U.S. Census Bureau, 2005 Interim State Population Projections, Table 1: Ranking of census 2000 and projected 2030 state population and change, attached as Exhibit A51 and available at http://www.census.gov/population/projections/data/state/projectionsagesex.html.
[138] *Id.*(projecting a population increase in California of more than 12.5 million during this period, compared to a total of just over 82 million for the U.S. as a whole).
[139] 42 U.S.C. § 300h(d)(2) (2012).
[140] H.R. Rep. No. 93-1185, *supra* note 6, at 32, *reprinted in* 1974 U.S.C.C.A.N. 6454, 6484.

the agency does not sacrifice useable water sources because of the current failure to take account of these developments.

The EPA's UIC regulations, promulgated in the early 1980s, provide an additional criterion for exempting aquifers which contain greater than 3,000 mg/l total dissolved solids (TDS) and exclude aquifers containing 10,000 mg/l TDS or greater from the definition of a USDW altogether, unless the formation currently serves as a public source of drinking water.[141] Thus, unless an aquifer currently supplies drinking water, groundwater above the 3,000 mg/l threshold is subject to weakened protections and groundwater above the 10,000 mg/l threshold is not subject to any protections at all under existing rules.

In the more than three decades since these thresholds were established by the EPA, there have been dramatic changes in the availability and cost of water treatment technologies. A white paper commissioned by NRDC demonstrates that, based on current cost and capacity, desalination of brackish groundwater is a viable and economically competitive source of drinking water.[142] Current desalination technology makes groundwater up to 40,000 mg/L TDS treatable to drinking water standards and can be technically performed for almost any type of input water chemistry, provided that the groundwater is not contaminated with organic chemicals or petroleum products.[143]

Among the white paper's other findings: in 2005, total U.S. desalination capacity was 1.3 billion gallons per day, with 177 Mgd going to municipal users.[144] By 2010, there were 314 active desalination plants in the U.S. that produced approximately 269 Mgd for municipal purposes, representing a 52% increase in just five years.[145]

Much of the recent growth in desalination capacity is due to large scale plants for municipal use.[146] Ninety-five percent of U.S. plants are inland, and most are designed to treat brackish or saline groundwater.[147] For example, the Kay Bailey Hutchison Desalination Plant in El Paso, Texas, is among the world's largest inland desalination plants and uses brackish groundwater to increase El Paso Water Utilities' fresh water production by approximately 25%.[148] In California, there were few facilities for desalination of groundwater before the 1990s, when drought, combined with "[r]apid advances in [reverse osmosis] membrane efficiency, energy recovery technology, and innovative process designs" led to over a dozen groundwater desalination facilities being constructed and beginning operation by the end of the decade.[149]

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141 40 C.F.R. §§ 146.3, 146.4(c).
142 *See* Thyne Report, *supra* note 78, at 14. It is important to note that desalination comes with negative environmental impacts that are not discussed in this petition but which must be addressed and minimized.
143 *Id.* at 1.
144 *Id.* at 3.
145 *Id.*
146 *Id.*
147 *Id.*
148 *Id.*
149 *California Water Plan: Update 2013*, *supra* note 98, at 10-25.

Membrane technology is now used in almost all brackish water desalination plants in the U.S.[150] The white paper notes that inflation-corrected costs for membrane filtration dropped by a factor of four between 1975 and 1990 and by another 75% between 1990 and 2002 – a combined decrease of over 90%.[151]

Current membrane exclusion technology allows removal of more than 90% of salt from saline source water. Reverse osmosis, a type of membrane technology that has been around for decades but in recent years has significantly improved, can effectively remove ionic and non-ionic solutes, including perchlorate and methyl tertiary-butyl ether, and common surface water contaminants via the membrane exclusion process.[152] The maturation of reverse osmosis has greatly reduced the cost of treating water with high TDS content. Because of these decreased costs and the increasing need to tap additional water sources, desalination by reverse osmosis has grown significantly in the last two decades. Several emerging desalination technologies also offer further improvements, and together with more efficient energy, are projected to continue to lower per unit costs for large scale plants.[153]

Desalination of brackish water is already a viable and economically competitive source of drinking water in many U.S. regions, as demonstrated by its increasing use.[154] And as the costs continue to decline and the technological ability to treat high TDS content water continues to improve, it will become ever more competitive. The EPA should revise its rules to take account of current technologies and to reflect the true likelihood that higher-TDS water sources will be needed in the future to meet the public demand for water.

C. Our understanding of contaminant fate and transport, geology, hydrology, and geochemistry and the tools used to assess them have dramatically evolved since the existing rules were drafted

There has been remarkable progress in the development of scientific tools, analysis, and research related to groundwater – especially with respect to how we understand the movement of contaminants through groundwater – since the early 1980s. Significant advances have occurred in the scientific community's understanding of groundwater contaminant fate and transport through the varying disciplines of geology, geochemistry, microbiology, and hydrology, and the

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[150] Thyne Report, *supra* note 78, at 3. (citing a 2008 study by Zander *et al.*, who composed the National Research Council's Committee on Advancing Desalination Technology, which found that 96% of U.S. desalination plants use membrane technology): Committee on Advancing Desalination Technology, National Research Council, Desalination: A National Perspective, 22, fig. 2-3 (2008) attached as Exhibit A52.
[151] Thyne Report, *supra* note 78 at 14.
[152] *Id.* at 8.
[153] *Id.* at 23.
[154] *Id.* at 14. *See also* Am. Water Works Ass'n, Comments to U.S. EPA, *RE: Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide Geosequestration Wells, Proposed Rule*, at 5, Tbl. 1-1 (Dec. 24, 2008) (setting forth a list of utilities which use "more challenging water sources," including groundwater with TDS concentrations as high as 13,200 mg/L) attached as Exhibit A53 and available at http://www.regulations.gov/contentStreamer?documentId=EPA-HQ-OW-2008-0390-0181&attachmentNumber=1&disposition=attachment&contentType=pdf.

interplay and interdependencies between these fields. Additionally, scientific tools such as computer modeling and instrumentation are more widely available and much more economical than they were in the early 1980s. These advances have significant implications for the aquifer exemption program, regarding factors such as the likelihood that contaminants will move significant distances over time, the extent to which contaminants are likely to disperse or degrade, and the ease with which additional sampling and groundwater modeling can be conducted.

New technologies provide a better understanding of how groundwater movement occurs and allow modeling of site-specific factors much more cost-effectively than was possible in the early 1980s. For instance, the advent of personal computers has allowed groundwater modelers to perform massive numbers of iterations using finite element numerical models in seconds (or fractions of seconds) on standard desktop computers. Modeling software is increasingly inexpensive or even free, while offering the ability to specify relevant conditions, as well as incorporating various redox process, rates and kinetics, updated thermodynamic equilibria of complex minerals, and species/surface interactions.[155]

Another area where modern understanding has advanced significantly since the early 1980s is related to groundwater remediation. Significant experience in the intervening decades has demonstrated the enormous technical difficulties in groundwater remediation and shown that the costs of remediation can be enormously high.[156] The EPA acknowledges in guidance documents that groundwater remediation may be costly, difficult or impracticable.[157] The EPA must take account of the tremendous potential costs posed by the risk of groundwater contamination migrating out of an exempted formation. A paper published in the journal *Environmental Science and Technology* noted that in cases of groundwater remediation "the goal of reaching stringent health-based cleanup standards is very remote and the ultimate cost of cleanup very high."[158] Likewise, a U.S. General Accounting Office ("GAO") – now the U.S. Government Accountability Office – study of groundwater contamination due to oil and gas waste injection

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[155] As just one example for what can be accomplished using a personal computer today, we suggest viewing the USGS publically available freeware: PHAST – "A Computer Program for Simulating Groundwater Flow, Solute Transport, and Multicomponent Geochemical Reactions" available at http://wwwbrr.cr.usgs.gov/projects/GWC_coupled/phast/index.html.

[156] As just one pertinent example, after tailings from a uranium mill polluted groundwater at one site in Cibola County, NM, costs of groundwater restoration were estimated as $38,479,370. *See* Homestake Mining Company, 2012 Closure Cost Estimate Documents, 15 (Mar. 29, 2012) attached as Exhibit A54 and available at http://pbadupws.nrc.gov/docs/ML1209/ML12096A074.pdf.

[157] *See* Envtl. Protection Agency, Office of Solid Waste & Emergency Response, Groundwater Remedy Completion Strategy, OSWER Directive 9200.2-144 at 3 (May 2014) (noting that "achieving remedial action objectives (RAOs) can take years or even decades"), attached as Exhibit A55; *Id.* at 14-15 ("In some circumstances . . . the current RAOs and associated applicable or relevant and appropriate requirements (ARAR)-based cleanup levels selected in the [record of decision] are not likely to be achieved, even after optimization and consideration of other cleanup approaches."); Envtl. Protection Agency, Office of Solid Waste & Emergency Response, Groundwater Road Map: Recommended Process for Restoring Contaminated Groundwater at Superfund Sites, OSWER Directive 9283.1-34, at 20 (2011) ("EPA's goal of restoring contaminated groundwater within a reasonable timeframe at Superfund sites will be modified where complete restoration is found to be technically impracticable."), attached as Exhibit A56.

[158] Douglas M. Mackay & John A. Cherry, *Groundwater contamination: Pump-and-treat remediation*, 23 Envtl. Sci. & Tech. 630, 630 (1989) attached as Exhibit B5.

found that in 18 of 23 cases of contamination they identified, "EPA or the state decided that cleanup was either technically not feasible, too expensive, or not practical."[159]

New technology also allows for detection of subsurface hydrocarbon plumes that have been found to change aquifer geochemistry and groundwater quality. For example, recent research has shown hydrocarbon-induced mobilization of soluble arsenic—a known carcinogen—into groundwater.[160]

In short, our basic understanding of contaminant fate and transport, geology, hydrology, and geochemistry is vastly improved from where it stood more than three decades ago and our policies protecting scarce water resources from the risks from underground injection should reflect the evolution of that understanding. Additionally, more accurate and affordable tools such as sampling instrumentation and computer modeling that may have imposed significant costs in the early 1980s – and offered lesser precision – are now widely available and should be required where they can help to ensure that aquifer exemptions are not granted based on faulty assumptions or insufficient data.

VII. Existing EPA rules are inadequate in light of the new information raised in this petition

The existing EPA rules do not account for new information about groundwater demand, supply, climate change, contaminant fate and transport, geology, hydrology, geochemistry, or modern water treatment technologies. The American Water Works Association (AWWA)—the "largest organization of water supply professionals in the world," with approximately 50,000 members—has determined that water utilities are increasingly looking to deeper groundwater sources as well as those with higher salt contents, indicating that the cost of pumping from deeper aquifers is no longer a major impediment.[161] AWWA has demonstrated that there are many utilities already treating sources containing greater than 10,000 mg/L TDS and concluded that, "The use of very deep and/or high salinity groundwater becoming more commonplace is only a matter of time. Therefore, we believe the 10,000 mg/L TDS USDW definition is no longer appropriate."[162] More of these higher salinity aquifers are likely to be used as technology and water availability

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[159] U.S. Gen. Accounting Office, GAO/RCED-89-97, Drinking Water: Safeguards Are Not Preventing Contamination from Injected Oil and Gas Wastes, at 25 (July 1989), attached as Exhibit A57 and available at http://www.gao.gov/assets/150/147952.pdf.

[160] Press Release, U.S. Geological Survey, Natural Breakdown of Petroleum Underground Can Lace Arsenic into Groundwater (Jan. 26, 2015), attached as Exhibit A58 and available at http://www.usgs.gov/newsroom/article.asp?ID=4110#.VseP6_mLTIV.

[161] Am. Water Works Ass'n, *supra* note 154 at 4 ("[M]any utilities are turning to more challenging groundwater sources such as those that are very deep or have high salinity concentrations. Additionally, the pumping costs for these deep wells are no longer prohibitive given the lack of sufficient water sources. Some of these new sources could fall outside of the current definition of a USDW, in that the aquifer has a TDS concentration higher than 10,000 ppm. . . . The definition of a USDW was written at a time when many advanced water treatment technologies were generally cost prohibitive, and the general thinking [was] that the high-salinity aquifers would never be utilized as drinking water sources.").

[162] *Id.* at 5.

issues continue to evolve. Based on the wide range of new information set forth in this petition, EPA must revise the existing aquifer exemption rules to comply with the SDWA.

A. Existing aquifer exemption rules do not protect USDWs from contamination

Contamination of USDWs – including non-exempt aquifers adjacent to exemptions and aquifers that are entitled to protection under the SDWA but have been wrongfully exempted – continues to occur under the existing aquifer exemption rules. These rules do not ensure the protection of USDWs, nor do they provide a scientifically-defensible method of determining the likely extent of contamination, or impose conditions and monitoring requirements to ensure that contamination does not reach USDWs.

i) *Contamination of USDWs due to aquifer exemptions is a recurring problem*

Existing rules have allowed horizontal and vertical migration of contaminants from exempted aquifers into non-exempt USDWs. For example, under the existing rules, the EPA makes arbitrary assumptions about the possible 'depth' of excursions when the latest science would provide a much better assessment of the potential for contamination of nearby or adjacent non-exempt aquifers. More detailed information about confining units, geological units thinning and aquitard inconsistencies, historical well locations, and improved mechanical integrity testing must be required as part of the aquifer exemption application process to improve the potential to prevent vertical fluid migration and contamination of non-exempt aquifers.

Horizontal migration of contaminants beyond aquifer exemption boundaries has also occurred. For example, the Kingsville Dome in-situ leaching (ISL) site in Texas, which was granted an aquifer exemption, is surrounded by a ring of monitoring wells that are approximately 400 feet from uranium mining production wells. Water sampling data from the monitoring wells has shown a significant increase in uranium concentrations over time, demonstrating that uranium has migrated from the production area and beyond the monitoring well ring in a relatively short time frame (approximately a decade).[163] While the data at the monitoring wells does not, by itself, indicate that contaminants have traveled beyond the exemption boundary, there is data from two private water wells (known as the Garcia wells) located approximately 300 meters downgradient of the Kingsville Dome uranium mine that demonstrates that ISL operations have impacted a USDW.[164] A groundwater sample taken from one of those private water wells in 2007 had a uranium concentration of 0.979 mg/L— orders of magnitude higher than values measured prior to mining activities, and approximately 33 times higher than EPA's drinking water standard.[165] After researching the geochemical trends, geology, and hydrology, an

[163] George Rice, *Excursions of Mining Solution at the Kingsville Dome In-situ Leach Uranium Mine*, 9 Austin Geological Society Bulletin 18, 26, Fig. 7 (2012-2013) attached as Exhibit A59 and available at http://www.austingeosoc.org/AGS%20Bulletin%202012-13_Final.pdf.

[164] *See* Garcia Well Data Documents (NRC ADAMS Accession Number ML14237A649) at 6 attached as Exhibit A60 and available at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML14237A649.

[165] *Id.* (2007 data); *id.* at 2 (showing a measured uranium concentration of only 0.011 mg/L in April 1988); Rice *supra* note 163, at 30-31.

independent hydrologist concluded that "[t]he available data indicate that the likely source of the increased uranium concentrations in the Garcia well is [Production Area 3 of the ISL site]."[166]

In Nebraska, the Nuclear Regulatory Commission (NRC) determined that a groundwater uranium plume from Crow Butte ISL mine unit 1 extended beyond the exempted aquifer boundary into a USDW.[167] The NRC also stated that "[p]ost-operational ISL mining caused [uranium concentrations] to be orders of magnitude larger in monitoring groundwater wells."[168] Nevertheless, despite documentation of uranium increases in monitoring wells and a uranium plume beyond the boundary of the exemption, we are not aware of any regulatory action taken by either EPA or the NRC. Further, and clearly contradicted by the existence of the uranium plume, the NRC webpage providing water quality data for the Crow Butte ISL facility states that "no excursions" – i.e., movements of contaminants beyond the mining zone – have occurred at mine unit 1.[169] This situation clearly demonstrates that the existing aquifer exemption rules are inadequate to prevent lateral migration into USDWs.

The existing EPA rules do not consider scientific uncertainties with respect to vertical migration of contamination into a USDW when considering an aquifer exemption, which has allowed contamination of overlying aquifers. At the Smith Ranch Highland ISL site in Wyoming, which has been granted an aquifer exemption, samples from dozens of water wells in shallow aquifers (less than 200 feet deep) have exceeded the safe drinking water limits for uranium and selenium, sometimes by an order of magnitude or more.[170] Investigations of other ISL sites suggest that the contamination is likely associated with vertical migration via failed or malfunctioning ISL uranium production wells, abandoned boreholes, thin or discontinuous confining units, or seepage from surface ISL operations.[171] These pathways are not considered when granting aquifer exemptions.

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[166] George Rice, *supra* note 163, at 31.

[167] Nuclear Regulatory Comm'n, Office of Nuclear Regulatory Research, Historical Case Analysis of Uranium Plume Attenuation, Publication # NUREG/CR-6705, at 24 (Feb. 2001), attached as Exhibit A61 and available at http://pbadupws.nrc.gov/docs/ML0104/ML010460162.pdf.

[168] *Id.* at 20, Tbl. 5.

[169] Nuclear Regulatory Comm'n, *Crow Butte Resources ISR Wellfield Excursion Ground Water Quality Data*, http://www.nrc.gov/info-finder/materials/uranium/licensed-facilities/crow-butte/isr-wellfield-excursion-ground-water-quality-data.html (last visited Feb. 19, 2016) attached as Exhibit A62.

[170] *See* Wright Environmental Services, 2012 Status Update, Casing Leak Investigation C, E, and F Wellfields, Smith Ranch-Highland Operations (NRC ADAMS Accession Number: ML13109A315) at 51-55 (Feb. 20, 2013) (showing well depths) attached as Exhibit A63; *Id.* at 57-85 (providing water quality data). NRDC used this data to develop a dynamic map and visualization to more easily understand the impacts on groundwater that have been caused by ISL mining at the Smith Ranch Highland site. It is available online at: http://isl-uranium-recovery-impacts-nrdc.org/Smith_Highland/.

[171] W.P. Staub et al., An Analysis of Excursions at Selected In Situ Uranium Mines in Wyoming and Texas, Publication # NUREG/CR-3967 (NRC ADAMS Accession Number: ML14237A635), at 47-49 (1986), attached as Exhibit A64 and available at http://pbadupws.nrc.gov/docs/ML1423/ML14237A635.pdf.

Regardless of the fluid migration pathway, it is clear that contamination has moved both vertically and horizontally into non-exempt aquifers and new rules are required to fulfill the mandates of the SDWA.[172]

ii) *Aquifer exemption boundaries are often arbitrary*

As discussed in Section IV, 53% of approved aquifer exemptions appear to have been granted for an area representing a one-quarter mile circle around an injection well. This indicates that, for more than half of all approved exemptions, the EPA has concluded that no contamination will move beyond one-quarter mile from the point of injection. This is because any contaminant that moves beyond this radius would generally be travelling into a non-exempt portion of the formation that qualifies as a USDW.

However, there is strong scientific evidence that the assumption that contaminants will not move beyond one-quarter mile from injection wells is unfounded. The EPA's own National UIC Technical Workgroup concluded that a one-quarter mile area of review (AOR) for injection wells is inadequate, stating:

> "[M]uch existing evidence showed that the actual pressure influence of any authorized underground injection operation is not limited to any pre-determined fixed radius around any proposed or existing injection well, but is a function of specific physical parameters (including initial pore pressures in both the injection zone and in the lowermost USDW and actual injection rate). . . . Since injection rate (volume over time) is directly proportional in its effect on formation pressure in the injection zone, the duration of the injection also affects any calculated [zone of endangering influence of the injection well]."[173]

The Workgroup also noted that, "Historically, a fixed radius AOR is based on operational assumptions made in the early 1980s and does not technically consider the pressure buildup of long-term authorized injection activities."[174]

While this review related to the underground injection control regulations, its conclusions are scientifically relevant to aquifer exemptions. EPA's current aquifer exemption regulatory regime appears to allow the use of an arbitrary one-quarter mile radius aerial extent in more than half of

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[172] The EPA's draft uranium mining rule may improve regulation as it relates to some of the problems at ISL sites, but it is not adequate to address all of the problems with the aquifer exemption program identified in this petition. *See* Natural Res. Defense Council, Comments on 40 CFR 192, Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings Proposed Rule (May 27, 2015) attached as Exhibit A65 and available at http://docs.nrdc.org/water/files/wat_15060101a.pdf.

[173] Envtl. Protection Agency National UIC Technical Workgroup, Does a Fixed Radius Area of Review Meet the Statutory Mandate and Regulatory Requirements of Being Protective of USDWs under 40 C.F.R. § 144.12?, at work product page 1 [fourth page of document] (Nov. 5, 2004) attached as Exhibit A66 and available at http://www.epa.gov/sites/production/files/2015-08/documents/aor-zei.pdf.

[174] *Id.* at work product page 3 [sixth page of document].

all cases. It does not appear to require any kind of technical determination that contaminants will not move beyond the ¼ mile boundary based on relevant factors that the EPA's own technical workgroup highlighted, such as the injection rate and duration, among others. This is especially problematic in the case of aquifer exemptions because no further review is ever likely to be conducted and they have no expiration date.

Aquifers are intrinsically heterogeneous and generalized rules regarding 'boundaries' are arbitrary and not consistent with the protection of USDWs. Further, rapid vertical or horizontal contaminant movement can occur through discontinuous or fractured confining units or manmade pathways such as mine shafts and wells. The National UIC Technical Workgroup also noted that multiple confirmed cases of injection fluids travelling well beyond a quarter-mile radius had occurred, stating:

> "Numerous flowing wells outside the 1/4 mile area of review were noted by Jerry Thornhill's 1975 study. Additionally, a recent example was located on the Texas / Louisiana border. A commercial disposal well located in Texas within about 300 yards of the border caused two orphan wells located across the State boundary to begin to flow and affected a public water supply (surface water intakes). The orphan wells were more than a mile away."[175]

As noted in Section IV, EPA also frequently grants approval to aquifer exemptions whose aerial extent is based on land areas described by a "section" in the Public Land Survey System (PLSS).[176] A full 23% of approved exemptions correspond to a PLSS section. Setting the boundaries of an aquifer exemption as a particular square in a historical grid system created in 1785 (before the drafting of the United States Constitution) by an Act of the Continental Congress for the survey and settlement of lands is arbitrary and non-scientific.[177] First, there is no requirement that an injection well around which the exemption was granted is centered in the PLSS section, so the point of injection could be much closer to one part of the boundary. Further, PLSS boundaries have no ability to predict aquifer geology and subsurface processes and there is no scientific correlation between this arbitrary grid system and subsurface geology. In other words, contaminant transport underground is in no way predicted or constrained by a manmade public land surveying boundary.

Given the evidence that contamination frequently occurs beyond the short, arbitrary distances used by EPA to describe aquifer exemption boundaries, the EPA rules must require a calculation of the extent of contamination likely to occur based on a scientifically-defensible method. Any aquifer exemptions allowed should properly reflect the extent of the aquifer actually being contaminated, rather than an arbitrary boundary that bears no relation to the actual distance contamination is likely to travel. Further, such a boundary must account for the fact that exemptions are granted permanently. Additionally, injection wells which are permitted on the

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[175] *Id.* at work product page 2 [fifth page of document] (citations omitted) (emphasis added).
[176] *See supra* at page 12-13.
[177] *See* Land Ordinance of 1785, reprinted in 1 Laws of the United States 565 (1815) attached as Exhibit A67.

basis of an aquifer exemption should face limits on injection pressure, volume, and duration based on the extent of the exemption granted. EPA must make a determination that these limits will ensure that contaminants are confined to the exempted portion of an aquifer.

Under existing rules, there is also nothing to prevent a situation where an aquifer exemption boundary is drawn based on certain operational assumptions that exist at the time the exemption is granted, but which change at some point in the future, such as when a UIC permit is later renewed. No rules ensure that an aquifer exemption boundary will be reevaluated or an injection well's operations limited in order to ensure that the extent of contamination in an aquifer does not travel beyond the exempted portion. Such rules must be developed.

As noted in Section III, Congress intended the definition of "endangering drinking water sources" within the Safe Drinking Water Act to be construed liberally, noting that any injection should be considered to endanger drinking water sources "if injected material were not completely contained within the well, if it may enter either a present or potential drinking water source, and if it (or some form into which it might be converted) may pose a threat to human health or render the water source unfit for human consumption."[178] Clearly, contaminants which travel beyond the boundaries of exempted formations into USDWs are endangering drinking water sources within the meaning of the SDWA.

In developing the rules for Class I UIC wells, EPA concluded that it could only make a determination to a reasonable degree of certainty that injected fluids will not migrate out of the permitted injection zone if a showing could be made that (1) injected fluids will not migrate out of the zone within 10,000 years or (2) before they travelled out of the zone, there is evidence they would be attenuated to the point they are no longer hazardous.[179] In 1988, when the EPA developed those regulations, it noted that "[t]he Agency has reviewed these comments and after careful consideration believes the 10,000 year demonstration strikes an appropriate balance between the need to demonstrate 'no migration' with a reasonable degree of certainty and the limits of the technological means of making that demonstration."[180] As EPA also noted at that time:

> "Fluid flow modeling is a well-developed and mature science and has been used for many years in the petroleum industry. More recently, fluid flow models have been further developed for the Department of Energy nuclear waste isolation program. Specifically, a wide range of models exists that provide the capability to analyze pressure build up, lateral waste migration, vertical fluid permeation into overlying confining material, and leakage through defects in overlying aquitards. Models make it possible to predict tendencies or trends of events that have not yet

[178] H.R. Rep. No. 93-1185, *supra* note 6, at 32, *reprinted in* 1974 U.S.C.C.A.N. 6454, 6484.
[179] *See* 40 C.F.R. § 148.20(a)(1).
[180] Underground Injection Control Program: Hazardous Waste Disposal Injection Restrictions: Amendments to Technical Requirements for Class I Hazardous Waste Injection Wells: and Additional Monitoring Requirements Applicable to all Class I Wells, 53 Fed. Reg. 28,118, 28,126 (July 26, 1988) attached as Exhibit A68.

occurred or that may not be directly observable. Under the "no migration" standard, a demonstration need not show exactly what will occur, but rather what conditions will not occur. Conservative modeling can be used to "bound the problem" and can legitimately form the basis for the petition demonstrations."[181]

EPA must re-evaluate its current system for evaluating aquifer exemptions and require information, including modeling, which would allow the agency to conclude, to a reasonable degree of certainty, that contaminants will not enter a present or potential drinking water source, as required by the SDWA.[182]

iii) *Aquifer exemption boundaries have been arbitrarily redrawn to satisfy regulatory criteria*

EPA has also approved aquifer exemptions where applicants have modified spatial aquifer exemption boundaries by effectively redrawing lines on paper to avoid private wells, without regard to aquifer geology and without adequate changes to operational parameters to actually prevent contamination of the water supplies. This approach ignores basic hydrogeology and contaminant transport mechanisms, and EPA should revisit each instance where this has been done.

In Texas, Uranium Energy Corp (UEC) applied for an aquifer exemption for the Goliad ISL site, which was approved by the Texas Commission on Environmental Quality and forwarded to the EPA in 2011.[183] The original area proposed for the aquifer exemption was within a quarter-mile of a number of private water wells. The EPA expressed concern with this approach because it left little room for error if a contaminant plume migrated off-site and impacted a private well, and stated "based on EPA's experience with other in-situ mining projects, EPA believes there is a high likelihood that, following mining activities, residual waste from mining activities *will not remain in the exempted area.*"[184] The applicant later modified the boundary to avoid the water wells but did not provide the evidence that the EPA had requested showing that the contaminants

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[181] *Id.* at 28,126 – 27 (emphasis added) (citations omitted).
[182] *See* 42 U.S.C. § 300h(d)(2).
[183] *See* Letter from William K. Honker, Dir., Water Quality Prot. Div., Envtl. Protection Agency Region 6, to Zak Covar, Exec. Dir., Tex.Comm'n on Envtl. Quality, *Re: UIC Program Revision establishing an Aquifer Exemption for uranium mining in the A, B, C, and D sands of the Goliad Aquifer near Ander, Texas in Goliad County*, 1 (Dec. 4, 2012) [hereinafter *Goliad Aquifer Exemption Approval Letter*] attached as Exhibit A69 and available at https://assets.documentcloud.org/documents/613055/12-4-12-epa-to-tceq-approval-letter.pdf.
[184] Letter from William K. Honker, Dir., Water Quality Prot. Div., Envtl. Protection Agency Region 6, to Zak Covar, Exec. Dir., Tex. Comm'n on Envtl. Quality, *Re: Application for Exemption of Portions of the Goliad Aquifer Formation in Goliad County*, at 3 (May 16, 2012) (emphasis added) attached as Exhibit A70 and available at https://assets.documentcloud.org/documents/613023/5-16-12-epa-to-tceq.pdf.

would not move out of the exempted area.[185] Nevertheless, the EPA granted the aquifer exemption.[186]

In order to satisfy 40 C.F.R. § 146.4(a), EPA required a groundwater "capture zone analysis" to demonstrate nearby adjacent water users' wells were not currently drawing water from EPA's approved aquifer exemption.[187] EPA eventually rescinded a portion of the aquifer exemption. The remaining portions of the aquifer exemption, however, remained intact (based on meeting the criteria in 40 C.F.R. § 146.4(a) with a capture zone analysis),[188] despite the fact that the capture zone analysis looked only at *current* groundwater use and ignored future contamination of surrounding USDWs.[189] The aquifer exemption approval at Goliad is an example of the scientifically arbitrary nature of the existing process for granting aquifer exemptions and the existing rules' failure to protect adjacent USDWs.

In Wyoming, EPA approved an aquifer exemption for the Smith-Highland Ranch ISL site based on a similarly arbitrary process. A drinking water well existed within the boundary of the proposed exemption in the initial application, so the company revised the boundary to exclude the water well and the aquifer exemption was approved. According to EPA data on Wyoming aquifer exemptions:

> "Request was initially denied on 4/14/87 because [Permit Number] did not include [aquifer exemption/groundwater] reclass and denied again on 5/11/87 because [drinking water] wells existed in south part of requested AE area. The operator reduced the original mine area to not include the [drinking water] wells. The AE approval letter also restricts use of well #11. 6/5/1987 letter from [Wyoming Department of Environmental Quality] concurs that AE boundary should be moved such that the water well #11 is well outside of AE boundary. The exemption expands the originally exempted area when the State obtained primacy. It will be amended 2 more times."[190]

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[185] *See* Letter from Harry L. Anthony, Chief Operating Officer, Uranium Energy Corp., to Zak Covar, Exec. Dir., Texas Comm'n on Envtl. Quality, *Re: Request for Aquifer Exemption Area Reduction: UEC Permit No. URO3075* (Jun. 27, 2012) attached as Exhibit A71 and available at https://assets.documentcloud.org/documents/613044/6-27-12-uec-to-tceq-revision.pdf.

[186] *See* Goliad Aquifer Exemption Approval Letter, *supra* note 183, at 1.

[187] Letter from Harry L. Anthony, Chief Operating Officer, Uranium Energy Corp., to William K. Honker, Dir., Water Quality Prot. Div., Envtl. Protection Agency Region 6, *Re: Application to Exempt a Portion of the Goliad Formation in Goliad County* 1 (Feb. 13, 2012) attached as Exhibit A72.

[188] Letter from William K. Honker, Dir., Water Quality Prot. Div., Envtl. Protection Agency Region 6, to Richard A. Hyde, Exec. Dir., Tex. Comm'n on Envtl. Quality, *Re: Partial Withdrawal and Partial Reaffirmation of a UIC Program Revision establishing an Aquifer Exemption for uranium mining in a portion of the Goliad Aquifer near Ander, Texas in Goliad County*, 1-2 (June 17, 2014) attached as Exhibit A73.

[189] *See* Goliad Aquifer Exemption Approval Letter, *supra* note 183.

[190] *See* Envtl. Protection Agency Region 8, Wyoming Aquifer Exemption Spreadsheet, provided in response to FOIA R8-2015-001602 by Powder River Basin Resource Council (Dec. 15, 2014) attached as Exhibit A74 at cell AN300; *See also* EPA Aquifer Exemption Database, *supra* note 33, at Exemption ID # 8_894.

iv) *Existing rules allow exempted aquifers to be used as a drinking water source*

There is also some evidence that, under the existing aquifer exemption program, members of the public may be accessing water sources that are exempted. Unfortunately, the existing rules provide no assurance that members of the public will be notified or able to find information on what formations have been exempted when drilling new water wells, as discussed further in Section VIII.C (pages 55-57).

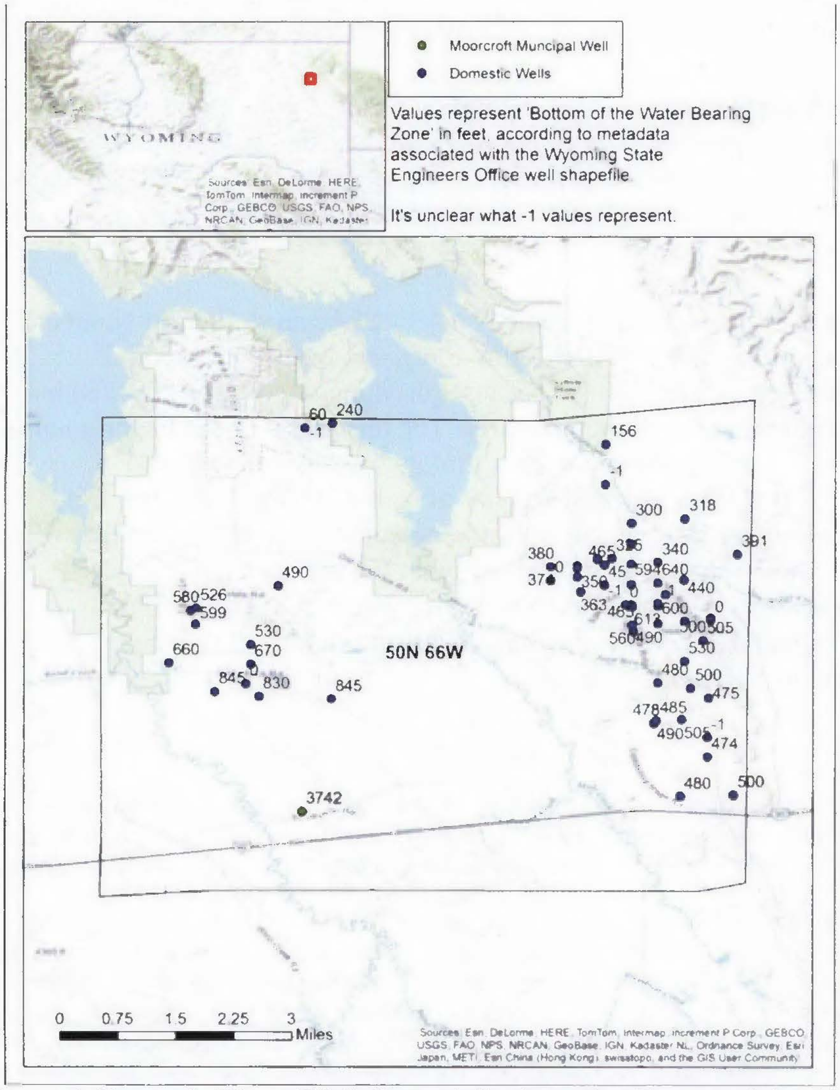

Figure 4: Domestic Water Wells Potentially Accessing Exempted Aquifer

For example, in Wyoming, the EPA approved an aquifer exemption for the Fall River formation at a reported depth of 577 feet for the purpose of enhanced oil recovery (EOR).[191] While the data sources do not provide clarity on the extent of the exemption due to incomplete and conflicting information,[192] according to data from the Wyoming State Engineer's office (WSEO), there are a number of domestic water wells in the area that draw from water bearing zones very near that reported depth.[193] Figure 4 shows the depths of completed water wells in the area and the potential aerial extent of the Fall River exemption. While the data from WSEO and EPA do not allow for a definitive finding, it is reasonable to be concerned – based on the range of depths of the water wells throughout the potentially-exempted area – that some of the wells may be drawing water from the exempted area of the Fall River formation. The uncertainty and poor data quality surrounding the extent of the exemption illustrates one of the serious flaws in the current regulations.

Even if there are not water wells drawing from within the boundaries of the exemption in this particular case, there may well be other instances in which exempted aquifers are being used as drinking water due to the lack of coordination between agencies and the lack of any notification requirements to ensure the public does not access exempted aquifers. Without creating a full and complete nationwide database of both exempted formations and of water wells, the agency cannot ensure that the public is not drawing from previously-exempted sources. This example highlights the dangers that the existing regulations pose to groundwater sources that are used as drinking water or can be reasonably expected to serve as drinking water in the future.

B. Existing rules do not require modeling or monitoring for purposes of ensuring that contamination does not travel beyond the aquifer exemption boundary

Neither the existing regulations for exemptions, nor associated guidance, require any monitoring or modeling. This leaves adjacent non-exempt underground sources of drinking water vulnerable to contamination. EPA guidance only indicates that the applicant must demonstrate "that the waste will remain in the exempted portion" of an aquifer when partial aquifer exemptions are granted.[194] The guidance sets out no standards for making this determination, simply noting

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[191] *See* EPA Aquifer Exemption Database, *supra* note 33 at Exemption ID # 8_2891.

[192] The EPA Aquifer Exemption Database, *supra* note 33, provides no location data for exemption # 8_2891 other than the county name, and states "area exempted is the entire areal extent described in TSR for area exemptions." The Wyoming Aquifer Exemption Spreadsheet provided to Powder River Basin Resource Council by EPA Region 8, *supra* note 190, at row 592, provides the location as Township 50N, Range 66 W. However, it is unclear if the exemption covers the full area of that township and range. The letter from EPA Region 8 that accompanied the final response to Powder River Basin Resource Council's FOIA stated that an additional PDF file also produced as part of the response "contains a list of aquifer exemptions that were provided when the program obtained primacy." Letter from Sadie Hoskie, Director, Water Program, Envtl. Protection Agency Region 8, to Megan Taylor, Powder River Basin Res. Council, *Re: Freedom of Information Act Request EPA-R8-2015-001602* at 1 (Dec. 15, 2014) attached as Exhibit A75. The PDF file included a list of injection wells, rather than any mention of aquifer exemptions or any information on their extent. *See* Water Resources Research Institute, Univ. of Wyo., Injection Well Inventory of Wyoming, Vol. II (1981) attached as Exhibit A76.

[193] *See* Figure 4, above; Wyo. State Engineer's Office, State Engineer's Office Wells Shapefile (2015), attached as Exhibit A77 and available at http://seo.wyo.gov/documents-data/maps-and-spatial-data.

[194] EPA Guidance #34, *supra* note 57, at Attachment 3, Guidelines for Reviewing Aquifer Exemption Requests, page 3.

certain factors that staff should "consider."[195] Without any substantive rules that ensure that the waste remains in the exempted portion, and without any monitoring to determine whether migration is occurring in most cases, this conclusory guidance is effectively meaningless and does not fulfill the mandate of the SDWA. While there are vertical and lateral monitoring requirements for some UIC well permits, these are not required in all cases. For instance, no monitoring requirements to measure lateral or vertical migration of injected or displaced fluids apply to Class II wells, which are associated with 96% of all aquifer exemptions.[196]

Monitoring requirements are feasible and should be implemented. For instance, for Class I wells, EPA rules already require that there be a monitoring program developed "[b]ased on a site-specific assessment of the potential for fluid movement from the well or injection zone and on the potential value of monitoring wells to detect such movement."[197] The Class I rules further allow the Director to impose requirements including:

- Monitoring within the area of review of any migration of fluids into and pressure in the underground sources of drinking water;
- Continuous monitoring for pressure changes in the first aquifer overlying the confining zone;
- The use of indirect, geophysical techniques to determine the position of the waste front, the water quality in a formation, or to provide other site specific data;
- Periodic monitoring of the groundwater quality in the first aquifer overlying the injection zone;
- Periodic monitoring of the groundwater quality in the lowermost USDW; and
- Any additional monitoring necessary to determine whether fluids are moving into or between USDWs.[198]

Mandatory monitoring requirements should be established to ensure that injection associated with aquifer exemptions does not contaminate USDWs.

Under existing rules applicable to ISL sites, the NRC, which licenses uranium mining operations, does not require operators to measure uranium concentrations at groundwater monitoring wells at ISL uranium mines, based on claims that uranium transport is slow and doesn't need to be monitored[199]—despite significant scientific and empirical evidence to the contrary.[200] Such a

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[195] *Id.*

[196] *See* table of aquifer exemptions associated with each class of well, *supra* page 10; *see also* Safe Drinking Water Act § 1425, 42 U.S.C. § 300h-4 (2012) (allowing an optional demonstration by states for Class II wells that, rather than adhering to EPA's specific requirements, states show that their program "represents an effective program (including adequate recordkeeping and reporting) to prevent underground injection which endangers drinking water sources"); 40 C.F.R. § 146.23(b) (imposing monitoring requirements for Class II wells that apply to EPA-administered programs and state programs approved under SDWA section 1422, but including no lateral or vertical monitoring requirements).

[197] 40 C.F.R. § 146.13(d).

[198] *Id.* at (b), (d).

[199] See Nuclear Regulatory Comm'n, Standard Review Plan for In Situ Leach Uranium Extraction License Applications, NUREG-1569, at 5-41 (2003) (stating that "[u]ranium is not considered a good excursion indicator because, although it is mobilized by *in situ* leaching, it may be retarded by reducing conditions in the aquifer" but

presumption that contaminant transport in this context is "slow" gravely underestimates the potential for hazardous constituents to migrate off-site, and into non-exempt aquifers.

According to an environmental engineer with the USGS, uranium transport in groundwater is highly complex and requires significant geochemical understanding to adequately predict:

> "Groundwater contamination from hexavalent uranium U(VI) is a problem at many federal sites because of its importance in the nuclear fuel cycle. The adsorption and therefore mobility of U(VI) in groundwater is controlled by the local geochemical conditions such as pH and especially the alkalinity which is usually composed primarily of bicarbonate and carbonate ions. Understanding the mobility of U(VI) in groundwater is a key prerequisite to estimating the discharge to receiving water bodies, quantifying risks from the use of contaminated groundwater and evaluating site management alternatives."[201]

When considering updated scientific information about uranium transport in aquifers in geochemical models, researchers from USGS have found that, under certain ISL mining relevant conditions, uranium can move through the aquifer substantially faster than previously understood.[202] Hydrogeology and the underground movement of contaminants is a fundamentally complex subject and many factors influence the speed of contaminant transport within an aquifer. The scientific assumptions used under the existing aquifer exemption rules, if any, are dated and based on little more than arbitrary agency guidance, with no scientific citation or documentation for the assumptions that underlie it.

In California, a recent case exposed numerous disposal wells operating in close proximity to the boundary of an associated aquifer exemption.[203] It is reasonable to suspect that the injected fluid may be migrating laterally out of the exemption zone.[204] However, without mandatory and publically available monitoring data, the public has no way to know if this has happened and high quality drinking water is put at risk.

In Texas, a recent case at the proposed Goliad ISL operation highlighted the problems that arise due to a lack of monitoring requirements in EPA regulations and the lack of any requirement to

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providing no scientific evidence or citation to support the claim) attached as Exhibit A78 and available at http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1569/sr1569.pdf.

[200] *See* e.g. Raymond H. Johnson & Hlanganani Tutu, *Reactive transport modeling at uranium in situ recovery sites: uncertainties in uranium sorption on iron hydroxides*, International Mine Water Association Conference Proceedings, 1 Reliable Mine Water Technology 377 (2013) attached as Exhibit A79 and available at https://www.imwa.info/docs/imwa_2013/IMWA2013_Johnson_417.pdf.

[201] U.S. Geological Survey, Professional Pages: Gary Curtis, https://profile.usgs.gov/gpcurtis (last visited Nov. 6, 2015) (describing research project aims at the Naturita site) attached as Exhibit A80.

[202] *See* Johnson & Tutu, *supra* note 200.

[203] Briana Mordick, Natural Res. Defense Council, Memorandum to William Samarin, *Subject: Deer Creek Oil Fields Class II Injection Wells* 3 (Oct. 6, 2014) attached as Exhibit A81.

[204] *See Id.* at 2-4.

accurately assess the risks that fluids will migrate outside the exempted zones. In this case, the EPA, which was rightly attempting to ensure waste would remain in the exempted portion of the aquifer, initially determined that modeling was necessary.[205] However, the Texas Commission on Environmental Quality (TCEQ) refused to comply with EPA's requests because modeling of the injected fluid is not explicitly required by EPA regulations for an exemption decision.[206]

Monitoring of aquifer exemptions is essential not only to identify fluid migration up the well or through confining layers, but also beyond the exemption boundaries. Monitoring requirements are needed to specifically track the fluid front in relation to the exempted zone and ensure that the fluid remains in the areas for which it is permitted. EPA must require monitoring and sufficient sampling to measure contaminants potentially moving beyond monitor wells and the aquifer exemption boundary. Without this level of oversight it is unclear whether nearby or conjoined USDWs are receiving the protection afforded by federal law.

Monitoring requirements for aquifer exemptions should mimic Class VI well testing and monitoring regulations, which verify that a geologic sequestration project is operating as intended and not endangering USDWs by requiring well operators to track the movement of the CO_2 plume and pressure front.[207] This style of monitoring and data collection should be used to periodically verify assumptions in the permit application that indicated fluids would remain in the exempted zone. Well operators should be required to report this information to EPA on a monthly basis.

Modeling contaminant transport through the aquifer is also a critical aspect of drinking water protection in this context and should not be optional. Since the EPA wrote the aquifer exemption rules in the early 1980s, the costs of computer modeling have decreased by many orders of magnitude while its precision has increased dramatically.[208] There is no reason why modeling should not be required for every aquifer exemption.

C. Existing rules allow for aquifer exemptions without scientifically-based water quality data

[205] *See* Letter from William K. Honker, Dir., Water Quality Prot. Div., Envtl. Protection Agency Region 6, *supra* note 184, at 3.

[206] *See* Letter from Zak Covar, Exec. Dir., Tex.Comm'n on Envtl. Quality, to William K. Honker, Acting Dir., Water Quality Prot. Div., Envtl. Protection Agency Region 6, *Re: Request for Approval of Non-Substantial Underground Control Program Revision to Establish an Aquifer Exemption in the Goliad Formation, Goliad County* (May 24, 2012) attached as Exhibit A82.

[207] *See* Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO2) Geologic Sequestration (GS) Wells, *supra* note 23, at 77,262-63, 77,298-99. *See also* U.S. Envtl. Protection Agency, Geologic Sequestration of Carbon Dioxide: Underground Injection Control (UIC) Program Class VI Well Testing and Monitoring Guidance, at 53-95 (Mar. 2013) attached as Exhibit A83.

[208] Commercial and open source 3D modeling software packages are powerful tools for understanding aquifer properties, groundwater hydrology, and chemical transport mechanisms. See, for example, available modeling software products distributed by the EPA and USGS at http://www2.epa.gov/exposure-assessment-models/groundwater and http://water.usgs.gov/ogw/modflow/.

Under existing rules, the EPA regularly approves aquifer exemptions despite the lack of any meaningful groundwater quality data, as discussed above in Section IV. The data indicate that the EPA often has no information about the quality of the groundwater in a formation it approves for exemption. In other cases, the information is clearly unreliable.

In an example from Colorado, EPA's database lists the water quality in one exempted aquifer as 372 mg/l, and then notes: "372-7170 mg/L: TDS range provided in [Statement of Basis] (also noted that samples not taken[] from near injection well). 14550 mg/L, TDS data from Rea Well (32-34N-8W), submitted with permit application."[209] Despite listing the water quality as 372 mg/L, the spreadsheet also notes that the aquifer was approved under 40 C.F.R. § 146.4(c) ("The total dissolved solids content of the ground water is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system.").[210] If the water quality was actually below 3,000 mg/L, as the recorded range indicates is possible, such an exemption was illegally granted.

In another Colorado example, EPA records indicate it may have approved an aquifer exemption despite the fact that there was no documentation of water quality. The EPA database indicates that the exemption was approved, but notes that the "[statement of basis] states that limited water quality data is available. 'After analysis are obtained, a decision will be made whether or not to issue aquifer exemption…'. Unclear if water sample was provided."[211]

In Montana, the entry for one approved exemption states that water quality was based on a "[s]ample from Wallace #12x-11, collected 7/17/2007 3 miles north of Inj[ection] well."[212] The information provides no reason to believe that a sample from a well three miles away represents water quality at the injection site. The absence of existing data on water quality is an unacceptable basis for the exemption of potential sources of drinking water from the protections afforded to them by the Safe Drinking Water Act.

EPA has also exempted large landscape-scale aquifers from protection without scientifically defensible data. In Wyoming, EPA granted a regional aquifer exemption for the Minnelusa aquifer near Gillette, an aquifer that spans an area covering approximately 1,387 square miles. This is roughly the size of the state of Rhode Island, and one of the largest approved aquifer exemptions in the country. In the acceptance letter, EPA cites high TDS concentrations from a 1979 USGS publication,[213] despite the fact that there were more recent USGS research papers

[209] EPA Aquifer Exemption Database, *supra* note 33, at Exemption ID # 8_642.
[210] *Id.*
[211] *Id.* at Exemption ID # 8_657.
[212] *Id.* at Exemption ID # 8_345.
[213] Letter from Kerrigan G. Clough, Asst. Regional Adm'r, Envtl. Protection Agency Region 8, to Dennis Hemmer, Dir., Wyo. Dept. of Envtl. Quality, *Re: Approval of the Non-significant Revision of the State of Wyoming, Underground Injection Control Program Comprised by the Aquifer Exemption of the Minnelusa Formation underlying Portions of Campbell County, WY* at 3 (Dec. 11, 1997), attached as Exhibit A84 and available at http://pbadupws.nrc.gov/docs/ML1302/ML13024A059.pdf. (*citing* Deborah K. Wells et al., U.S. Geological Survey, Chemical Analysis of Water from the Minnelusa Formation and Equivalents in the Powder River Basin and Adjacent Areas, Northeastern Wyoming, Wyoming Water Planning Program, Report No. 18 (1979), attached as Exhibit A85 and available at http://library.wrds.uwyo.edu/wwpp/No_18-Chemical_Analyses_of_Water_from_Minnelusa_Formation_in_Powder_River_Basin_NE_Wyoming.html).

documenting samples from the Minnelusa aquifer with TDS concentrations of less than 3,000 mg/L.[214] Some water quality from the Minnelusa formation, as deep as approximately 2,500 feet, was measured as having total dissolved solids of 346 mg/L, below EPA's secondary drinking water standard MCL of 500 mg/L.[215]

These reports were not included with EPA's decision granting an exemption for the entire Minnelusa aquifer. The state had two very different sampling results and was allowed to choose which one to use, based on little more than speculation, without providing any scientific basis for its conclusion. In EPA's 1997 approval letter for the Minnelusa aquifer exemption, it states:

> "There is some variability in the TDS analysis included in the USGS Report, showing TDS values below 3,000 mg/L in wells adjacent to wells completed within the same unit having TDS values an order of magnitude higher. In its response to that concern, the State interpreted those results to be due to dilution by fresh water drilling mud contamination during drill stem tests. The State noted that it is highly implausible that 2,840 mg/L and 58,500 mg/L TDS water would coexist in the same aquifer within the same 40 acre parcel, and concluded it was probable that actual TDS was higher and the water quality poorer than the sampling results indicated."[216]

The existing rules allow EPA to eliminate protections for an aquifer that spans an area roughly the size of the state of Rhode Island despite the fact that the geology, water quality, and geochemistry of the Minnelusa Formation in the exempted area is highly complex and heterogeneous, and readily available data showed excellent water quality in the area. EPA rules must be revised to ensure that water quality of formations proposed for exemptions is adequately understood and that no formations are exempted for which there *any reasonable likelihood* that these sources will be needed in the future to meet the public demand for water.[217]

i) *Existing rules allow estimates of total dissolved solids and methods known to overestimate TDS concentrations*

The existing EPA rules allow for estimates, rather than actual measurements, of TDS to be included in aquifer exemption applications. Allowed methods of estimating TDS using well logs (including the resistivity method and SP method) are inherently imprecise. In a 2002 PowerPoint

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[214] L.R. Larson, Ground-Water Quality in Wyoming, U.S. Geological Survey Water-Resources Investigations Report 84-4034 at 13, 26 (1984) attached as Exhibit A86 and available at http://pubs.usgs.gov/wri/1984/4034/report.pdf.

[215] Harold A. Whitcomb & Donald A. Morris, Ground-Water Resources and Geology of Northern and Western Crook County, Wyoming, U.S. Geological Survey Water-Supply Paper 1698 at 61 (1964), attached as Exhibit A87 and available at http://pubs.usgs.gov/wsp/1698/report.pdf.

[216] Letter from Kerrigan G. Clough, Asst. Regional Adm'r, Envtl. Protection Agency Region 8, *supra* note 213, at 3.

[217] *See supra* note 19 and accompanying text.

presentation, EPA notes: "What is the real salinity of the zone? Only a chemical analysis would tell for sure."[218] It then discusses "common errors" that are made using TDS estimation techniques and states: "What is the net result of these common errors? They can result in overstating USDW salinity by 100 percent! Know your method and know its drawbacks."[219] EPA rules currently allow TDS estimation methods that are known to be outdated and inaccurate, and must be revised.

There is currently no requirement that industry use a scientifically defensible method to determine the level of TDS present in the formation. This may result in a number of potential problems. First, overestimates could indicate that water in a formation is above the 10,000 mg/L TDS threshold and is not therefore a USDW. In this case, a company would wrongly be allowed to inject into a formation on the basis that it is not a USDW without ever even applying for an exemption. Second, overestimates could indicate that water in a formation is above the 3,000 mg/L TDS threshold, meaning that the formation may be exempted under criteria that would not apply if the water in the formation was below the threshold. In this case, an aquifer could be exempted on the grounds that "it is not reasonably expected to supply a public water system" even if it is, in fact, under 3,000 mg/L TDS.[220] Third, under the existing rules, an aquifer that does not currently serve as a drinking water source may be exempted either on the previously-mentioned basis or on the grounds that it is "so contaminated that it would be economically or technologically impractical to render that water fit for human consumption."[221] In either of these cases, overestimates of TDS may be used by the applicant to argue that the water source is unlikely to be used as a water supply because of the costs of treatment.

EPA must implement strict standards for sample testing, documentation, and quality control, to support scientifically defensible TDS concentrations. Unfortunately, the existing rules include no requirements to ensure that EPA and the public have accurate information about the water quality of a formation proposed for exemption. And some methods EPA has allowed to determine groundwater quality are semi-quantitative at best and not subject to a scientific quality control process. EPA appears to generally allow permit proponents to provide imprecise estimates based on techniques of their choosing. Of course, under this regime and without any verification, TDS estimates offered by the permit proponents are likely to be biased towards higher values and likely to omit evidence that indicates water quality may be better. The existing system is akin to setting clear speed limits (e.g., 65 mph) but letting drivers estimate their own speed rather than allowing police to use radar guns. EPA rules should require the measurement of TDS of the formation using a scientifically-defensible methodology. Additionally, applicants should be required to submit all data that is relevant to the water quality of the area proposed for exemption, rather than providing only a selection of the data in the applicant's possession.

D. <u>Aquifers should not be exempted solely on the basis that they are mineral, hydrocarbon or geothermal energy producing</u>

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[218] U.S. Envtl. Protection Agency, Drinking Water Academy Presentation: Introduction to UIC Permitting, at 1-48 (April 2002) attached as Exhibit A88.
[219] *Id.* at 1-49.
[220] *See* 40 C.F.R. § 146.4(c).
[221] *Id.* § 146.4(b)(3).

The existing rules allow for exemption of aquifers solely on the basis that they are mineral, hydrocarbon, or geothermal energy producing or can be demonstrated to contain minerals and hydrocarbons that are expected to be commercially producible.[222] However, there is no statutory basis for the criteria in section 146.4(b)(1), which elevates the potential for production of minerals, hydrocarbons, or geothermal energy above EPA's duty to protect USDWs. To do so violates the Safe Drinking Water Act and unwisely prioritizes mineral and energy production above drinking water resources.

As discussed in Section III, Congress intended contamination of underground sources of water to be prevented "if there is *any reasonable likelihood* that these sources will be needed in the future to meet the public demand for water and if these sources may be used for such purpose in the future."[223] Congress did not make any exception to the rule that all potential sources of water must not be endangered.[224]

Congress did require that the EPA's rules not "interfere with or impede" underground injection of fluids brought to the surface in connection with oil or natural gas production or natural gas storage operations, or injection for the secondary or tertiary recovery of oil or natural gas, "unless such requirements are essential to assure that underground sources of drinking water will not be endangered by such injection."[225] However, the House Report notes that Congress merely "sought to assure that the constraints on energy production activities would be kept as limited in scope as possible *while still assuring the safety of present and potential drinking water sources*."[226] The Report further notes that "in using the words 'interfere with or impede' the Committee did not intend to include every regulatory requirement which would necessitate the expenditure of time, money or effort. Rather, the Committee intended to refer to those requirements which could stop or substantially delay production of oil or natural gas."[227] It is clear that these provisions did not alter the SDWA's requirement of protection for any underground water source for which there is any reasonable likelihood that it may be used as a public drinking water source in the future.

The presence of minerals and hydrocarbons in commercially producible quantities does not necessarily render an aquifer unusable to meet the public demand for water.[228] Yet the existing

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[222] *Id.* § 146.4(b)(1).
[223] *See* H.R. Rep. No. 93-1185, *supra* note 6, at 32 (emphasis added).
[224] 42 U.S.C. §§ 300h(b)(1), 300h (d), 300h-1(c) (2012).
[225] *Id.* §§ 300h(b)(2), 300h-1(c)(2).
[226] H.R. Rep. No. 93-1185, *supra* note 6, at 31 (emphasis added).
[227] *Id.*
[228] *See, e.g.*, ALL Consulting, Handbook on Coal Bed Methane Produced Water Management and Beneficial Use Alternatives at 1-9 (July 2003) (noting that the water produced from formations from which coalbed methane is being actively extracted can be of "very high quality [meeting state and federal drinking water standards]") attached as Exhibit A89 and available at http://www.all-llc.com/publicdownloads/CBM_BU_Screen.pdf. *See also, id.* at 5-147 to 5-149 (describing the use of water produced from coalbed methane wells and noting that in "North Dakota and some other western states, many rural homes rely exclusively on groundwater from underground coal seams as their sole water source, including water for drinking"); U.S. Envtl. Protection Agency, Draft Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources, Executive Summary, at ES-15 (June 2015) (noting that hydraulic fracturing to recover economic quantities of oil and gas may occur in

rules allow any aquifer that is not currently being used as a drinking water source to be exempted solely on this basis. For instance, the EPA exempted an aquifer in Wyoming that is near drinking-water quality in order to allow a coal gasification project.[229] The aquifer exemption was approved on the basis that syngas from a coal seam to be exempted could be produced in commercial quantities, even though there was no evidence that the water in the formation was not a suitable drinking water source that might otherwise be used to supply a public water system.[230] The example of the exemption in the Fall River formation in Wyoming (discussed on pages 40-41) demonstrates an instance in which water wells may be accessing a formation that was exempted solely on the basis that it was mineral or hydrocarbon-bearing.[231]

40 C.F.R. § 146.4(b)(1) directly conflicts with the SDWA and must be eliminated or changed. If, in fact, the presence of minerals contaminate an aquifer to the extent that there is no reasonable likelihood that it can be used as a drinking water source, the formation could be exempted under another criterion in the rule – i.e. on the basis that the water is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption or that it is not reasonably expected to supply a public water system.[232] Such determinations must be based on the best available science. Water sources which are rendered unusable by minerals or hydrocarbons will be able to satisfy at least one of these other criteria. However, if a water source cannot satisfy these other criteria, the SDWA's protections apply and no exemption can be legally issued.

Importantly, the existing rules do not even have adequate requirements for demonstrating that an aquifer satisfies section 146.4(b)(1). For instance, current rules allow the program Director to presume that an aquifer meets the criteria if the application is associated with a Class II well to be used for enhanced oil recovery and the applicant demonstrates that "historical production" has occurred "in the project area or field."[233] In the case of an aquifer exemption for the Minnelusa aquifer in Wyoming, EPA assumed or implied that the entire formation was capable of producing economic quantities of hydrocarbons, even though evidence indicates that economically-recoverable quantities of hydrocarbons are only located in certain regions.[234]

"formations that may currently serve, or in the future could serve, as a source of drinking water for public or private use" and thereby acknowledging that the presence of oil and gas in these formations does not rule out their use as drinking water sources), attached as Exhibit A90 and available at http://www.epa.gov/sites/production/files/2015-06/documents/hf_es_erd_jun2015.pdf.

[229] Letter from Callie A. Videtich, Assistant Reg'l Adm'r, U.S. Envtl. Protection Agency Region 8, to Mr. Kevin Frederick, Wyo. Dept. of Envtl. Quality, *Re: Linc Energy Ltd Class III Aquifer Exemption Request Underground Coal Gasification Demonstration Gasifier #6 Project Wyodak Coals*, with attached Aquifer Exemption Record of Decision, at ROD-3 (Sept. 8, 2014) (noting that the water quality in the formation "averaged 560 mg/L in the vicinity of the project," just over the EPA's secondary MCL for drinking water) attached as Exhibit A91.

[230] *Id.* at ROD-4 to -6.

[231] *See supra* pages 40-41 (describing Fall River exemption in Wyoming); EPA Aquifer Exemption Database, *supra* note 33 at Exemption ID # 8_2891 (indicating that the exemption was granted under 40 C.F.R. § 146.4(b)(1)).

[232] *See* 40 C.F.R. § 146.4(b)(3), (c). Of course, the formation would also have to satisfy the criteria that it does not currently serve as a source of drinking water. *Id.* § 146.4(a).

[233] *Id.* § 144.7(c)(2).

[234] *See* Donald L. Foster, Summary of the Stratigraphy of the Minnelusa Formation, Powder River Basin, Wyoming, Wyoming Geological Association Guidebook at 41 (2005) (noting a number of areas in which oil production in the formation has either been found to be "non-commercial" or has been abandoned altogether) attached as Exhibit A92.

E. Existing rules inadequately address 'future use' of groundwater supplies: the California example

The extreme drought in California foreshadows what may occur to other water stressed areas in many parts of the United States in the near future. By the spring of 2015, high to extreme drought conditions, ongoing for four years, covered the entire state. On April 1, 2015, with California snowpack at the lowest levels ever recorded, Governor Brown announced a 25% mandatory cut in water use.[235] The situation worsened by June, when the California Department of Water Resources determined the snowpack was completely gone.[236]

Previous droughts in California have led to increased use of groundwater to meet water demands when surface water is less available, a trend which promotes groundwater depletion.[237] Since the early 1960s, after decades of groundwater withdrawal, there have been cumulative groundwater losses that have resulted in progressively lower groundwater storage. Even excess precipitation during relatively "wet" years has failed to restore groundwater volumes.[238]

The drought conditions in California over the last four years have prompted groundwater drilling at historic rates and depths. For example, in Tulare County, the number of groundwater wells tripled from 2013 to 2014 and drilling companies are struggling to keep up with demand, further exacerbating groundwater depletion within the Central Valley aquifer.[239] Scientists believe that climate change has aggravated the dire drought situation in California.[240]

According to the Division of Oil, Gas, and Geothermal Resources (DOGGR) and the State Water Resources Control Board (SWRCB), many recently drilled private water wells are going to tremendous depths to access water, and targeting water of relatively low quality. For example, a guidance document published by the agencies states:

> "Based on current data, water supply wells are being drilled deeper and deeper because of the drought, [and] many water supply wells are being drilled below 4,000 feet. . . . The drought has forced

[235] Press Release, Office of Governor Edmund G. Brown Jr., Governor Brown Directs First Ever Statewide Mandatory Water Reductions (Apr. 1, 2015) attached as Exhibit A93 and available at https://www.gov.ca.gov/news.php?id=18910.

[236] Cal. Dept. of Water Res., *Snow Water Equivalents, Data for June 1, 2015*, attached as Exhibit A94 and available at http://cdec.water.ca.gov/cdecapp/snowapp/sweq.action.

[237] *See* Bridget R. Scanlon, *supra* note 118, at 9,322, Fig. 2.B.

[238] Univ. of Cal. Ctr. for Hydrologic Modeling, Cumulative groundwater losses in California's Central Valley since 1962 [Figure], attached as Exhibit A95 and available at http://www.ucchm.org/sites/default/files/pictures/wateradvisory.jpg.

[239] Alison Vekshin, *Dry Wells Plague California as Drought Has Water Tables Plunging*, Bloomberg Business, Apr. 17, 2015, attached as Exhibit A96 and available at http://www.bloomberg.com/news/articles/2015-04-17/california-plagued-by-dry-wells-as-drought-makes-water-elusive.

[240] Bettina Boxall, *Scientists explain how climate change helps fuel California drought*, Los Angeles Times, Mar. 2, 2015, attached as Exhibit A97 and available at http://www.latimes.com/science/sciencenow/la-sci-sn-california-drought-hot-and-dry-20150226-story.html.

> people of the State to use water of lesser quality to meet their needs."[241]

In California, significant regulatory confusion also persists, regarding what exemptions were even granted, their boundaries and depths, and changes to expanding production zones over time.[242] While California agencies acknowledge that lower quality, deeper groundwater will be increasingly relied upon, the state lacks adequate requirements for recordkeeping, evaluation, and approval to ensure that drinking water sources with a reasonable likelihood of being used in the future are protected. Many exemptions were granted with little, if any, scientific analysis regarding aquifer hydrogeology, confining layers, faults or zones of relative hydraulic conductivity, or potential future use.

Additionally, the fact that aquifers deeper than 4,000 feet are already being tapped illustrates the extent to which expectations about what water sources might reasonably be expected to supply a public water system change over time. To fulfill its duty under the Safe Drinking Water Act to actually protect any drinking water source for which there is any reasonable likelihood that it might one day be needed, the EPA must adopt a precautionary approach which considers a very long time horizon and takes into account factors including increasing future demand for groundwater and the role of climate change. Unfortunately, EPA's regulatory framework has not changed in more than three decades. As California struggles to cope with severe drought and taps ever-deeper groundwater for use, the EPA must revisit an aquifer exemption regime which approved the contamination of potential drinking water sources and did not anticipate the need that would exist now, or in an even more severely water-constrained future.

F. Existing rules do not account for the value of groundwater

Existing rules do not require that the EPA consider the economic value of the groundwater that is being exempted from protection. When the agency does evaluate the value of this scarce resource, it often underestimates its value. The EPA's recent draft economic analysis to accompany the proposed revisions to the "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings" makes clear that the EPA's most recent consideration of this value is an underestimate. This analysis omitted two important valuation frameworks for the economic value of groundwater: ecosystem service valuation and natural resource damage assessments. In addition, while the qualitative discussions on the monetary value of health benefits and bequest values for future generations in the document were a good starting point,

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[241] Cal. Div. of Oil, Gas, & Geothermal Res. & State Water Res. Control Bd.. Aquifer Exemption Process Guidance Document at 5 (Apr. 10, 2015), attached as Exhibit A98 and available at ftp://ftp.consrv.ca.gov/pub/oil/UIC%20Files/Aquifer%20Exemption%20Guidance%20Document%204-10-2015.pdf.

[242] See Memorandum from Matthew Rodriquez, Sec'y, Cal. Envtl. Protection Agency, to Cliff Rechtschaffen, Senior Advisor, Office of the Governor & John Laird, Sec'y, Cal. Natural Res. Agency, *Memo: CalEPA Review of UIC Program* at 1, 4-5 (Mar. 2, 2015) attached as Exhibit A99 and available at http://www.calepa.ca.gov/Publications/Reports/2015/UICFindings.pdf.

there are a number of additional benefit categories that the EPA should consider when evaluating the value of groundwater and the benefits of protecting groundwater.

An analysis conducted for NRDC provides details on the shortcomings of the EPA's existing approach to measuring the value of groundwater, including: the need to properly account for spillover effects; the failure of the EPA's analysis to incorporate non-market values that capture people's willingness to pay for groundwater protection; the need to include costs associated with groundwater contamination, including interim lost use, averting behavior, and additional health costs; and the need to conduct more robust sensitivity analysis regarding the benefits of groundwater protection.[243]

EPA should analyze not only the current value of groundwater, and the outlays *currently* being expended to develop water sources, but also the future costs of developing any groundwater that can be *reasonably expected* to be used.

G. <u>In no case must aquifer exemptions be allowed without EPA approval</u>

As noted in Section V.C, EPA approval is not required for all aquifer exemptions under the existing rules. Where the state or tribe proposes to exempt an aquifer on the basis that "the total dissolved solids content of the ground water is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system," an exemption may be approved without any action by the EPA.[244] In this case, the existing rules provide that the proposed exemption becomes final 45 days after the request is submitted in writing to the EPA Administrator, if the Administrator has not disapproved the request.[245] This procedure is not reasonable and must be eliminated.

Allowing the permanent contamination of an underground source of drinking water cannot be a default option that can occur without full consideration by the EPA. The existing rules must be revised to allow the agency time to adequately consider any application and determine whether the evidence provided supports an approval. These changes are necessary to ensure that the protections afforded by the SDWA are not removed from an aquifer without an affirmative finding that there is no reasonable expectation that the aquifer could supply a public water system.

H. <u>New rules are needed to adequately protect aquifers which qualify for protection under the SDWA because there is a reasonable likelihood that these sources will be needed in the future to meet the public demand for water</u>

Given the changes in groundwater demand, supply, science, technology, and economics over the past 30 years, the existing limit of 10,000 mg/l TDS for aquifer protection and the rules that

[243] Evan Hjerpe & Pete Morton, Economic Value of Protecting Groundwater: A Response to EPA at 8-11 (2015) attached as Exhibit A100.
[244] *See* 40 C.F.R. §§ 146.4(c), 144.7(b)(3).
[245] *Id.* § 144.7(b)(3).

allow aquifer exemptions below this threshold are severely out of date and require agency revision. The EPA must revise its rules to prevent the contamination of current and future water sources to comply with the Act. As detailed above in Section VI.B (pages 28-30), the 10,000 mg/L TDS threshold no longer reflects a level of water quality over which it can be reasonably assumed that a formation will not serve as a source of drinking water in the future. The EPA must address the documented increased demand for groundwater, depleting supply, the inadequacy of the existing rules to protect USDWs, the currently available technology for treating groundwater, and the value of groundwater. The protection of saline groundwater should become a greater priority for federal protection under the SDWA, and a review of existing EPA aquifer exemption regulations is necessary.[246]

VIII. EPA rules do not provide sufficient public notice and comment opportunities nor sufficient information for the public to understand the location and extent of aquifer exemptions

A. Existing public notification requirements for aquifer exemption requests are inadequate

The existing federal rules do not assure that citizens are afforded the opportunity for a public comment process and hearing dedicated to an aquifer exemption request in all cases. As discussed in Section V.C, either a state, EPA, or both, may conduct a public notice and comment process under existing regulations. Primacy states must conduct a public notice and comment process for any aquifer exemption request they forward to the EPA. However the rules do not specify the length of the public comment period, how notice must be given, or the criteria for when a hearing must be held.[247] Where the state does not have primacy, EPA regulations require at least a thirty-day public comment period.[248] The EPA has discretion regarding whether to hold a public hearing.[249] If the agency does opt to hold a hearing, it must provide at least thirty days' notice.[250]

Under current rules, states sometimes conduct a single notice and comment process that combines consideration of both a UIC well permit application and an aquifer exemption application.[251] In many of these cases, the state considers both applications using the less robust

[246] When promulgating any new rules, EPA must comply with President Clinton's Executive Order No. 12,898, *Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations*, 59 Fed. Reg. 7,629 (Feb. 11, 1994), attached as Exhibit A101, and EPA's *Guidance on Considering Environmental Justice During the Development of Regulatory Actions* (May 2015) attached as Exhibit A102 and available at http://www3.epa.gov/environmentaljustice/resources/policy/considering-ej-in-rulemaking-guide-final.pdf.

[247] 40 C.F.R. § 144.7 (b)(3).

[248] *Id.* § 25.4(c).

[249] *Id.* § 145.32(b)(2).

[250] *Id.* § 25.5(b) (requiring 45 days in many circumstances, but allowing the agency to provide only 30 days' notice in some situations).

[251] *See, e.g.*, 30 Tex. Admin. Code § 39.655(b) (2015). Other examples are provided in the following paragraphs of this section.

process for consideration of the UIC permit, which does not allow the opportunities for public comment that should accompany any aquifer exemption.

In Wyoming, this combined process has led to situations where the only opportunity for citizens to participate in the decision-making process regarding an aquifer exemption is via a contested case hearing.[252] This process erects barriers to involvement by requiring anyone with concerns about an exemption to engage in an adversarial, court-like process where legal representation may be required, participation is much more burdensome, and companies or state regulators may challenge the right of citizens to even engage in the process (such as by questioning their legal standing).

Combining an aquifer exemption and UIC permit can also be especially problematic in states with Class II UIC primacy, because under EPA rules, the public participation policies related to Class II permits do not have to be equal to the federal requirements if the state demonstrates it has an "effective" UIC program.[253] The public notice and comment provisions of a state's Class II program may therefore not be as stringent as those outlined in the EPA regulations.

The exemption approval process in Wyoming provides a useful example of the problems created by the current ambiguities in EPA's existing rules for public notice and comment. In Wyoming, citizen groups have previously objected to problems with the state's process related to public notice and comment on aquifer exemption applications. In June 2013, the EPA wrote to the state to clarify that "the public should have an opportunity to review and comment on all information submitted with regard to [aquifer] exemptions."[254] Nonetheless, the State combined an application for an aquifer exemption and Class III UIC well permit for an underground coal gasification test project despite citizen groups' objections that the combined contested hearing process created barriers to citizen participation.[255] Only after citizen groups asked the EPA to intervene and the EPA wrote to the state directing it to hold a public comment hearing on the aquifer exemption request was the public afforded this opportunity.[256]

When it comes to a decision regarding whether to allow the contamination of an aquifer that would otherwise qualify as a USDW, the most stringent public notice and comment requirements should apply in all instances.

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[252] *See, e.g.*, Wyo. Envtl. Quality Council, Docket No. 11-4803, Lost Creek ISR, LLC (providing the docket for a contested case hearing in which the Wyoming Outdoor Council challenged an aquifer exemption associated with ISL mining in Sweetwater County, Wyoming) attached as Exhibit A103 and available at https://eqc.wyo.gov/Public/Pleadings.aspx?DocketId=1703.

[253] 42 U.S.C. § 300h-4 (2012).

[254] *See* Letter from Sadie Hoskie, Dir., Water Program, Envtl. Protection Agency Region 8, to Tom Kropatsch, Natural Res. Program Supervisor, Wyo. Oil & Gas Conservation Comm'n, *Re: Further Clarification of the Federal Aquifer Exemption Process, Encana Oil and Gas USA, Madison Formation Aquifer Exemption Application* at 1 (June 7, 2013) attached as Exhibit A104.

[255] *See* Letter from Powder River Basin Resource Council et al. to Shaun McGrath, Reg'l Adm'r, Envtl. Protection Agency Region 8, *Re: Linc Energy Aquifer Exemption* at 1-2 (Dec.10, 2013) attached as Exhibit A105.

[256] *See* Letter from Shaun McGrath, Reg'l Adm'r, Envtl. Protection Agency Region 8, to Todd Parfitt, Dir., Wyo. Dept. of Envtl. Quality, *Re: Linc Energy Aquifer Exemption Request* at 1 (Jan. 28, 2014) attached as Exhibit A106.

B. Existing rules are inadequate to ensure the public is made aware of existing and newly-approved aquifer exemptions

Currently, there are minimal and limited standards for notification of approved or existing aquifer exemptions. We are aware of no federal rules which require that relevant parties receive notice of the issuance of a non-substantial aquifer exemption once it is granted. In the limited circumstances where an aquifer exemption is considered a "substantial" modification to the UIC program, the final decision must be published in the Federal Register. However, as noted in Section V.C, EPA data and a search of the Federal Register indicate that fewer than ten substantial modifications have ever been approved. Additionally, few members of the public monitor the federal register. Regardless of the status of the exemption, there are currently no requirements to notify landowners, water managers, local governments, water well drilling companies, and others who may need the information that an aquifer has been exempted.

C. EPA rules do not require public availability of aquifer exemption locations and data

There is currently no requirement for EPA to maintain full records of all exemptions. This is inconsistent with EPA's role in providing a transparent approach to the threats facing the public's access to scarce and diminishing groundwater resources. Additionally, as discussed below, it withholds crucial information from the public that is necessary to ensure that aquifers containing injected contaminants are not later tapped as drinking water sources. It also leads to inconsistent program implementation and documentation standards. This was apparent recently in the miscommunication between California's UIC program and EPA Region 9 on the exact number and physical boundaries of that state's existing aquifer exemptions.[257]

i) *Existing regulations have allowed drilling of new water wells in or near exempted aquifers*

Existing regulations do not prevent the drilling of new water wells in or near an exempted aquifer. Nor do they require notice to local residents, local drilling companies, water managers, municipal officials, or the public about the location of aquifer exemptions and contaminated groundwater in order to prevent the use of these underground water sources by those who may be unaware of the fact that the EPA has effectively changed their regulatory status from drinking water source to waste repository.

An example of failing to notify or inform the public of the potential dangers of using exempted sources is provided by the current situation at the Smith Ranch-Highland uranium mine in Converse County, Wyoming, the largest uranium ISL facility in the United States. Notwithstanding millions of dollars and years of active groundwater restoration efforts

[257] See Cal. Envtl. Protection Agency, *supra* note 242, at 1 ("Three years ago, DOGGR notified U.S. EPA that discrepancies and confusion concerning 30-year-old agreements by which the federal government granted the State regulatory authority over wastewater disposal wells likely led to the permitted injection of oil production wastewater into aquifers that are or could become sources of drinking water.").

throughout the entire mine unit, groundwater in the area remains severely contaminated with uranium. This has prompted the mine operator to apply for a higher alternative concentration limit (ACL).[258] Despite this groundwater contamination, there is evidence that private water well drillers have continued to drill new water wells in the Smith Ranch area. NRC documents identify potential private domestic wells within 2 kilometers of operating [or active restoration] and contaminated mine units.[259]

NRC documentation confirms these concerns, stating:

> "The number, current condition, and use of all water wells within 2 kilometers (km) of [Mine Unit B] have not been satisfactorily established. In Section 1.2.5.4 of the application, surrounding land and water use, no description was provided of the current condition or use of water wells within 2 km of [Mine Unit B]. In an independent search of Wyoming State Engineer's Office (WSEO) records, NRC staff found numerous water wells within 2 km of [Mine Unit B] located in sections 29, 28, 21, 20, 16 and 17. Many were not identified in the application."[260]

However, the NRC disclaims any duty to protect private drinking water supplies and the agency's discussion of the issue highlights the potential dangers posed by the existing regulatory regime:

> "Hazard assessment <u>incorrectly states that aquifer exemption prohibits ground water use by humans now or in the future</u>. NRC staff observes that the aquifer exemption only precludes use as public water supply under the Safe Drinking Water Act. NRC staff's understanding is that state classification of ground water as Class IV is not enforced to prevent future human ingestion.
>
> . . .
>
> "No method to identify or protect the site from ground water use was offered to prevent private well use or installation in the ore zone aquifer or other aquifers in or around MUB. <u>The NRC staff understands that neither WDEQ or WSEO monitors or notifies a potential well applicant of the aquifer exemption, current water quality or class of use of water at any time.</u> Additionally, the NRC staff understands that WDEQ and WSEO also do not have any regulatory authority to stop a potential well applicant or user from accessing water in the aquifer exemption zone for any purpose.

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[258] Memorandum from Douglas Mandeville, Project Manager, Uranium Recovery Licensing Branch, Nuclear Regulatory Comm'n, to Bill Von Till, Chief, Uranium Recovery Licensing Branch, Nuclear Regulatory Comm'n, *Public Meeting Summary* (NRC ADAMS Accession Number ML14010A162) at 1 (Jan. 14, 2014) attached as Exhibit A107 and available at http://pbadupws.nrc.gov/docs/ML1401/ML14010A162.pdf.
[259] *Id.* at 4.
[260] *Id.*

> The NRC staff is aware of WDEQ's requirement of a deed notice for individual wellfields once all wells are plugged and abandoned, but the intent of this notification is unknown. NRC staff is unclear if the 'deed notice' required by the State confers any protection such as identification of the exempted aquifer."[261]

EPA must revisit its aquifer exemption rules to ensure that the public is made aware of groundwater sources that have been exempted from the protections of the Safe Drinking Water Act so that local residents do not unknowingly tap water sources where underground injection has introduced dangerous contaminants.

D. Standards for notice and comment pertaining to aquifer exemption applications must be improved

EPA should undertake a rulemaking to improve public notice and comment procedures for aquifer exemption applications. Specifically, the EPA should establish at least the following requirements:

i. Dedicated notice and comment period for aquifer exemptions: Each aquifer exemption must be considered through a dedicated public notice and comment process that is not combined with another type of permit and is accessible to members of the public.
ii. Notification to all interested and affected parties: the EPA should require that primary notification of an aquifer exemption request reaches both "affected" and "interested" segments of the public as described in 40 C.F.R. § 25.3.
    a. At minimum, this list should mirror requirements that the EPA uses in other contexts, such as for Clean Water Act and Resource Conservation and Recovery Act (RCRA) permitting and include notice to:
        i. Any reasonably ascertainable owner of property adjacent to the location of the proposed exemption.[262]
        ii. Any unit of local government having jurisdiction over the area where the exemption is proposed to be located.[263]
        iii. Anyone on a mailing list, which should be developed by:
            1. Including those who request in writing to be on the list;
            2. Soliciting persons for "area lists" from participants in past UIC permit and aquifer exemption related proceedings in that area; and
            3. Notifying the public of the opportunity to be put on the mailing list through periodic publication in the public press and in such publications as Regional and State funded newsletters, environmental bulletins, or State law journals.[264]

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[261] *Id.* at 5-6 (emphasis added).
[262] *See, e.g.*, 40 C.F.R. § 124.10(c)(1)(vi).
[263] *See, e.g.*, *Id.* § 124.10(c)(1)(x).
[264] *See, e.g.*, *Id.* § 124.10(c)(1)(ix).

b. In addition, other parties that have an interest in aquifer exemptions should be notified, including local non-owning residents, Public Water Systems, other water managers, water well drilling companies, and private well users who could be affected by the exemption.

iii. Methods for Notification: the EPA should mail or email a copy of the notice to the aforementioned stakeholders. The notice should be published in major daily and weekly newspapers as well as broadcast over local radio stations, as is required for permits issued pursuant to RCRA.[265] The EPA should also incorporate modern communication technologies (cable television, various internet tools, and popular social media) and post the notice on EPA's website to increase the likelihood of effective public understanding and involvement.

iv. Timing for Public Participation: Existing public notice and comment regulations should be revised to unequivocally satisfy the suggested program elements of the public participation process described in 40 C.F.R. § 25.3(c).[266] Opportunity for thorough public review and participation is essential to fully inform the decision-making process about the risks of aquifer exemptions. A more extended process is already required for permits issued pursuant to RCRA. RCRA permits require a minimum forty-five day public comment period because of the added layer of complexity associated with hazardous waste injection.[267] Aquifer exemption determinations involve similar complexity and risks to health and the environment by potentially removing a source of drinking water from future use, and allowing contamination of a USDW with toxic fluids, and must be given the same extended period of public engagement. A forty-five day minimum should also be applied to public hearing notices and notifications of the right to challenge decisions before the Environmental Appeals Board.

E. <u>Improved public notice and comment procedures are needed for aquifer exemption modifications</u>

All of the public notice and comment recommendations discussed above should also be applied to any requests for aquifer exemption modifications, as well as any modifications to a UIC permit associated with an exemption. Under the existing rules, if a UIC permit is modified and a modification is not considered "minor" [as explained in 40 C.F.R. § 144.39] a draft permit is necessary and must comply with similar public participation procedures as the original draft

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[265] *See Id.* § 124.10(c)(2)(ii).

[266] The section relates to public participation for programs under the Safe Drinking Water Act, as well as the Clean Water Act and RCRA. It states: "The following are the objectives of EPA, State, interstate, and substate agencies in carrying out activities covered by this part: (1) To assure that the public has the opportunity to understand official programs and proposed actions, and that the government fully considers the public's concerns; (2) To assure that the government does not make any significant decision on any activity covered by this part without consulting interested and affected segments of the public; (3) To assure that government action is as responsive as possible to public concerns; (4) To encourage public involvement in implementing environmental laws; (5) To keep the public informed about significant issues and proposed project or program changes as they arise; (6) To foster a spirit of openness and mutual trust among EPA, States, substate agencies and the public; and (7) To use all feasible means to create opportunities for public participation, and to stimulate and support participation." 40 C.F.R. § 25.3(c).

[267] *See* 40 C.F.R. § 124.10(b)(1).

permit. However, it is unclear whether aquifer exemption modifications (e.g., adding acreage) would fall under these procedural provisions. This should be made clear.

The EPA must also modify its rules so that the public and all potentially affected parties are notified when any state or federal agency has made a decision to approve an aquifer exemption. This notification should occur regardless of whether the parties commented on the exemption request, and whether it is a newly granted exemption or a modification of an existing exemption. The EPA should utilize a robust and thorough notification process, including notice to landowners, water managers, local governments, drilling companies and other interested parties. The EPA should also post final decisions on the Agency's website.

F. EPA must keep a public database of aquifer exemptions

EPA Headquarters should obtain from Regions and states a list of all existing aquifer exemptions, including their precise extent, depth, and other details, as well as the Statement of Basis and other documentation, and maintain this information in a public database on EPA's website. New exemptions should be routinely added to this inventory. As noted in Section IV, EPA has admitted that its current database of aquifer exemptions is incomplete and is not made available to the public except through a Freedom of Information Act request. A national list updated in real time with strict reporting standards is the only way to avoid similar documentation failures in the future. It is also necessary to ensure that the public can access crucial information like whether underground water sources they may plan to use are safe to drink, or whether they have been previously exempted and should not be tapped.

Such a real-time database is essential to protect USDWs, to prevent any more drilling of water wells into exempted aquifers, and to ensure the protection of aquifers that are not exempt. The EPA's failure to provide basic information to members of the public to avoid future scenarios in which water wells are unknowingly drilled into exempted formations, on the other hand, violates the agency's duty to prevent endangerment of public health via contaminated drinking water.

To the extent that states possess important information regarding aquifer exemptions that the EPA lacks, the EPA should require the states to provide that information to the agency and include it in the public database. Aquifer exemption updates should also be included in state program annual reports to the relevant Region. Information on aquifer exemptions is clearly important to the public health, as well as a required aspect of state recordkeeping requirements under the Safe Drinking Water Act, and is therefore legally available to the EPA.[268] Further, while some states have purportedly refused to provide information on the basis that it is confidential, there is no legitimate argument that any of the information that the EPA and the public would need to be able to avoid inadvertent future use of contaminated aquifers is confidential or subject to any of the exemptions enumerated in the Freedom of Information Act.[269] This includes information about the location, depth, formation name, aerial and vertical

[268] *See Id.* § 145.14 ("Any information obtained or used in the administration of a State program shall be available to EPA upon request without restriction.").
[269] *See* 5 U.S.C. § 552(b) (2012).

extent, and confining zones of the aquifer, the regulatory criteria under which the approval was made, approval date, and the water quality in the formation. All of the information detailed above should be published on a public website that is easily accessible to the general public at any time.

The EPA already agrees that careful documentation is necessary to protect USDWs having stated that, "[r]obust recordkeeping and management of decision memos and aquifer exemption data is critically important to support informed decisions related to public and private ground water uses for drinking water."[270] EPA rules must be updated to reflect the need for robust recordkeeping and for the public to obtain adequate information.

IX. Conclusion

As set forth above, in order to adequately protect underground sources of drinking water and comply with the Safe Drinking Water Act, the EPA must (a) repeal or amend the aquifer exemption provisions of EPA regulations, (b) impose an immediate moratorium on any new or expanded exemptions, and (c) conduct a full review of all previously granted exemptions, protecting any aquifers which may still have the potential to be used as a drinking water source, now or in the future.

Thank you for your consideration of this petition. Please do not hesitate to contact us with any questions.

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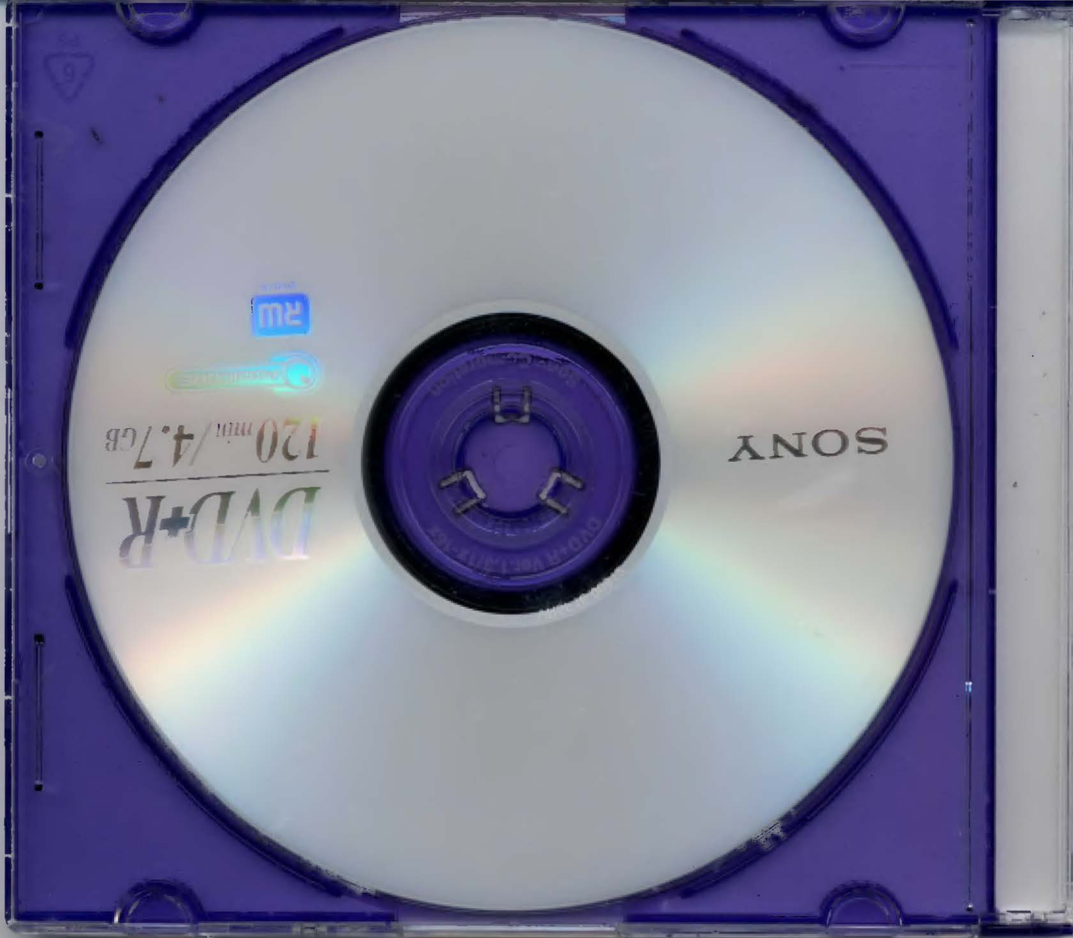
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