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STATE OF NEW MEXICO
NEW MEXICO WATER QUALITY CONTROL COMMISSION

IN THE MATTER OF PROPOSED AMENDMENTS to 20.6.8 NMAC – *Ground and Surface Water Protection – Supplemental Requirements for Reuse of Treated Produced Water*,

No. WQCC 25-34(R)

Water Access Treatment & Reuse Alliance,
Petitioner.

PETITIONER'S RESPONSE IN OPPOSITION TO NEE MOTION TO REQUIRE PETITIONER TO PROVIDE SCIENCE THAT UNDERGIRDS ITS NEW RULE

The Water Access Treatment & Reuse Alliance (the "WATR Alliance") hereby responds in opposition to the *Motion to Require Petition to Provide Science that Undergirds its New Rule*, filed September 4, 2025 by New Energy Economy ("NEE"). NEE seeks to convert a petition for rulemaking into a merits adjudication. The Water Quality Act ("WQA") requires that any adopted standard or regulation be "based on credible scientific data and other evidence appropriate under the Water Quality Act" NMSA 1978, § 74-6-4(D). However, that requirement is applied to the hearing record supporting the Commission's final action, not to the sufficiency of an initial petition filed under 20.1.6.200(B) NMAC.[1] NEE's request to compel a front-loaded "science statement" at the petition stage adds a procedure the rules and statute do not require and should be denied.

LEGAL STANDARD

NEE argues that the petition filed in this matter is insufficient because it fails to include "new scientific evidence that proves that treated produced water may be discharged and reused before proceeding with a hearing."[2] While WQA regulations at Part 20.1.6 establish certain threshold requirements that must be met for the Commission to set, or not, a petition for hearing,

[1] See 20.1.6.300–.401 NMAC (notice, prehearing management, and hearing procedures governing how the evidentiary record is compiled).
[2] NEE *Motion to Require Petition to Provide Science that Undergirds its New Rule*, WQCC 25-34 at p. 5.

nothing in that Part requires that a petitioner attach expert reports or present a completed scientific record with a petition. There simply is no legal basis supporting NEE's argument that the petition in this matter is insufficient because it does not carry with it the testimony, exhibits, etc. that will ultimately be introduced into the record through the normal course of the hearing and pre-hearing process.

NEE's motion seeks a departure from the process contemplated in administrative rulemakings. WQCC rulemakings, like other administrative rulemakings, are legislative in character and as such, are sustained if they are supported by substantial evidence in the administrative record compiled at hearing.[3] The Water Quality Act specifies what evidence the Commission is to rely on when it establishes water quality standards and regulations to prevent or abate water pollution, including regulations pertaining to discharge. Specifically, the Act requires that the Commission base it's decision to adopt, or not, a proposed rule, on "credible scientific data and other evidence appropriate under the Water Quality Act"[4] and that it give weight to "all relevant facts, and circumstances," including:

1. the character and degree of injury to or interference with health, welfare, environment and property;
2. the public interest, including the social and economic value of the sources of water contaminants;
3. the technical practicability and economic reasonableness of reducing or eliminating water contaminants from the sources involved and previous experience with equipment and methods available to control the water contaminants involved;
4. the successive uses, including domestic, commercial, industrial, pastoral, agricultural, wildlife and recreational uses;
5. feasibility of a user or a subsequent user treating the water before a subsequent use;
6. property rights and accustomed uses; and

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[3] *See N.M. Mining Ass'n v. WQCC*, 2007-NMCA-010, ¶¶ 33–36, 141 N.M. 41, 150 P.3d 991 (upholding rule where record contained "credible scientific data"). See also Bokum Res. Corp. v. WQCC, 93 N.M. 546, 553, 603 P.2d 285, 292 (1979) (Commission acts within broad rulemaking authority when supported by substantial evidence).
[4] Water Quality Act, NMSA 1978, § 74-6-4(D).

7. federal water quality requirements.[5]

Additionally, the Commission is instructed to consider, in addition to the factors listed in Subsection E of the WQA, "the best available scientific information."[6] However, the Act does not speak to how or when this evidence is introduced, that is left to rules adopted to implement the Act, specifically Part 20.1.6 NMAC, which governs the hearing process and the introduction of evidence in WQCC science-based rulemaking proceedings. Part 20.1.6 NMAC provides that,

> *if the commission determines to hold a public hearing on the petition, it may issue such orders specifying procedures for conduct of the hearing, in addition to those provided by this part, as may be necessary and appropriate to fully inform the commission of the matters at issue in the hearing or control the conduct of the hearing. Such orders may include requirements for giving additional public notice, holding pre-hearing conferences, filing direct testimony in writing prior to the hearing, or limiting testimony or cross-examination.*[7]

Part 20.1.6 NMAC also provides rather specific instructions governing how a hearing is to proceed:

1. The hearing shall begin with an opening statement from the hearing officer. The statement shall identify the nature and subject matter of the hearing and explain the procedures to be followed.
2. The hearing officer may allow a brief opening statement by any party who wishes to make one.
3. Unless otherwise ordered, the petitioner shall present its case first.
4. The hearing officer shall establish an order for the testimony of other participants. The order may be based upon notices of intent to present technical testimony, sign-in sheets and the availability of witnesses who cannot be present for the entire hearing.
5. If the hearing continues for more than one day, the hearing officer shall provide an opportunity each day for testimony from members of the general public. Members of the general public who wish to present testimony should indicate their intent on a sign-in sheet.
6. The hearing officer may allow a brief closing argument by any person who wishes to make one.

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[5] Water Quality Act, NMSA 1978, § 74-6-4 (E)
[6] *Id* at (K).
[7] 20.1.6.200 NMAC

7. At the close of the hearing, the hearing officer shall determine whether to keep the record open for written submittals in accordance with 20.1.6.304 NMAC. If the record is kept open, the hearing officer shall determine and announce the subject(s) on which submittals will be allowed and the deadline for filing the submittals.

Further, 20.1.6 NMAC provides instructions concerning the introduction and presentation of technical testimony; how testimony is to be taken; criteria for the admission of evidence; when and how cross-examination of witnesses is to be conducted; and the introduction of exhibits.[8]

The common denominator across Part 20.1.6 is a hearing. The introduction of testimony, exhibits, witnesses, management of cross-examination, etc. all occur within the confines of a hearing. The petition in this matter has not yet advanced to hearing. While the Commission has determined to set the petition in this matter for hearing, the petition awaits a hearing schedule and associated pre-hearing scheduling order, and it is that order that will establish dates for identification of witness and submission of testimony and exhibits in this matter. Those yet-to-be-set dates are the moments when, under the rule, the "credible scientific data and other evidence appropriate under the Water Quality Act" and "the best available scientific information", or as NEE has characterized it, the "specific, new scientific evidence" supporting the petition in this matter will be presented and introduced.

ARGUMENT

A. Section 74-6-4(D) is a constraint on rule adoption, not a pleading-stage burden.

NEE's motion misreads § 74-6-4(D) of the Water Quality Act. That subsection constrains the Commission's final rulemaking action—it does not impose a requirement that petitioners append a completed scientific record to a petition. The Commission satisfies § 74-6-4(D) by

[8] 20.1.6.202, 301-302. NMAC

developing and relying upon the hearing record (expert testimony, exhibits, and public input) before taking final action.[9]

B. The Commission's rules already specify how and when science is disclosed; NEE's proposed front-loaded "science statement" is contrary to rulemaking law.

NEE asks the Commission to require a previously unheard of "science statement" now, after the Commission has determined to set the petition for hearing, but before the hearing date or a scheduling order have been set. NEE's request is both unnecessary and legally improper.

Part 20.1.6 NMAC controls procedure. The Commission has promulgated comprehensive rulemaking procedures that govern when parties identify witnesses, exchange exhibits, and file pre-filed, sworn technical testimony—i.e., after docketing and notice, and pursuant to a prehearing scheduling order.[10] This is not a trivial fact. As noted by the United States Court of Appeals for the District of Columbia in *Reuters Ltd. v. F.C.C*, "it is elementary that an agency must adhere to its own rules and regulations. *Ad hoc* departures from those rules, even to achieve laudable aims, cannot be sanctioned."[11] NEE's motion invites precisely the kind of extra-regulatory add-on that *Reuters* discourages.

3. A scheduling order is the proper tool.

Consistent with the undeviated-from practice of the Commission, the appropriate path for the Commission to begin developing the record in this matter, is a pre-hearing scheduling order, not a pleading-stage evidentiary requirement. A scheduling order will no doubt require: (a) identification of expert witnesses and CVs; (b) preliminary bibliographies of principal technical

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[9] See N.M. Mining Ass'n, 2007-NMCA-010, ¶¶ 33–36.

[10] See 20.1.6.300–.401 NMAC (notice and hearing framework); cf. 20.1.6.305 NMAC (prehearing conference/orders) & 20.1.6.401–.405 NMAC (testimony/exhibits). Forcing a merits proffer at the petition stage would rewrite Part 20.1.6.

[11] *Reuters Ltd. v. F.C.C.,* 781 F.2d 946, 950 (D.C. Cir. 1986).

materials; and (c) deadlines for pre-filed direct testimony and exhibits—consistent with 20.1.6 NMAC. The WATR Alliance intends to file all of the science and other bases for the proposed rule in accordance with the eventual pre-hearing scheduling order.

C. NEE inappropriately reargues issues already determined by the Commission and asserts authorities that are inapposite or premature.

NEE cites cases addressing when an agency changes policy without adequate explanation or record support. While the cited authorities have force, that force is at the end of a rulemaking, not at the point of petition screening. In an attempt to make caselaw that is otherwise inapplicable to the present circumstance somehow applicable, NEE renews its argument that the WATR Alliance is somehow in privity with a party in WQCC 23-84, and thus this matter should be considered a reconsideration of WQCC 23-84. This argument is a re-submission of NEE's argument in its *Joint Motion to Dispose of the WATR Alliance Petition Outright* (July 24, 2025), which argument and motion the Commission already denied.

In a legislative rulemaking under Part 20.1.6 NMAC, repetitive motions that merely re-argue prior rulings are improper absent a showing of materially changed circumstances, intervening authority, or clear error. Consequently, NEE's argument on this point should be summarily, rejected. Alternatively, NEE should seek leave to file further motions on this issue accompanied by a proffer of new facts or law. The WATR Alliance is not in privity with any party to, this matter is not a reconsideration of WQCC 23-84, and the Commission has already considered and rejected this argument.

Nevertheless, it is worth examining the caselaw cited by NEE. NEE asserts that various cases support its conclusion that because there is, "no evidence of reasoned decision-making… no written rationalization and no explanation of why NMED (and other) scientific testimony is being

ignored", that the Commission's decision to set the petition in this matter for hearing is somehow objectionable or inappropriate. None of the cases cited by NEE support this conclusion.[12]

Neither *Motor Vehicle Mfrs. Ass'n v. State Farm* nor *Encino Motorcars, LLC v. Navarro* erect a pleading-stage hurdle, they ask whether the Commission's final order and statement of reasons (see 20.1.6.500 NMAC) are supported by the record. We do not yet have a record in this matter because a hearing date has not been set nor a pre-hearing scheduling order entered. These are both forthcoming as is the entirety of the credible science and other supporting basis for the proposed rule, consistent with the forthcoming schedule.

Similarly, *Hobbs Gas Co. v. N.M. Pub. Serv. Comm'n and Pub. Serv. Co. of NM v. N.M. Pub. Regulation Comm'n* evaluated final actions under arbitrary-and-capricious review—thus, reviewing evidence and materials that had been admitted into the administrative record. These cases do not require a petitioner to preview all science before a hearing is even noticed.[13]

Finally, NEE's reference to both *Forest Watch v. U.S. Forest Serv. And N.M. Mining Ass'n v. NM Water Quality Control* Commission, are inapposite. These cases confirm that the scientific sufficiency inquiry occurs on the record at hearing, not at the petition gate.[14] 2007-NMCA-010, ¶¶ 33–36 (upholding Commission where the record contained "credible scientific data" and expert testimony; the substantial-evidence test applies to the compiled record).

In short, NEE's citations reinforce the correct principle that at the conclusion of the rulemaking process, the Commission must produce a reasoned, evidence-based final decisions, however, none of the cases support the argument that there is some new petition-stage proffer

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[12] *See Motor Vehicle Mfrs. Ass'n v. State Farm*, 463 U.S. 29, 42-44, 52 (1983); *Encino Motorcars, LLC v. Navarro,* 579 U.S. 211, 222–24 (2016).

[13] *Hobbs Gas Co. v. N.M. Pub. Serv. Comm'n*, 1993-NMSC-032, ¶¶ 8–12, 115 N.M. 678, 858 P.2d 54; *Serv. Co. of N.M. v. N.M. Pub. Regulation Comm'n*, 2019-NMSC-012, ¶ 11, 444 P.3d.

[14] *Forest Watch v. U.S. Forest Serv.,* 410 F.3d 115 (2d Cir. 2005); *N.M. Mining Ass'n v. NM Water Quality Control Commission,* 2007-NMCA-010, ¶ 34,141 N.M. 41, 150 P. 3d 991.

requirement prior to a hearing record even being opened by and through a pre-hearing scheduling order.

D. This proceeding will stand or fall on the new record developed under Part 20.1.6; due process is protected by the hearing, not by a petition-stage merits preview.

The Commission's transparent process—noticed hearing, pre-filed sworn testimony, cross-examination, public comment, rebuttal, and an order with a statement of reasons (see 20.1.6.300–.500 NMAC)—is the safeguard for the WQA requirement that Commission rules be based on "credible scientific data and other evidence appropriate under the Water Quality Act."[15] Compelling a mid-stream "science statement" divorced from sworn testimony would confuse what is and is not evidence and undermine orderly process.

Nevertheless, and without waiving its opposition to NEE's present motion, the WATR Alliance provides, as Exhibit 1, an affidavit from Adrianne Lopez, Research and Development Manager at Texas Pacific Water Resources, providing an overview of much of the latest scientific development and data that support the reuse of treated produced water and thus the rule proposed in this matter. Exhibit 1 is not intended to summarize all of the testimony or evidence that the WATR Alliance seeks to introduce at hearing. Exhibit 1 merely provides information further showing that there have been significant scientific developments that justify hearing the proposed rule, which aligns with the Commissions recent rulings deciding to set this matter for hearing.

The WATR Alliance is working with scientists from various research institutions and other professional organizations in preparation for the hearing on its petition in this matter, including New Mexico State University, New Mexico Tech University, the Colorado School of Mines, Texas Tech University, the University of Colorado as well as firms that focus on water treatment technologies. Collectively, it will take several days during the hearing for the WATR Alliance to

[15] Water Quality Act, NMSA 1978, § 74-6-4(D).

present all the scientific and technical testimony underpinning the proposed rule. The WATR Alliance respectfully requests that it be given the same time or a similar timeframe as the other parties in this case to prepare its Notices of Intent to Prepare Technical Testimony. Additionally, a hearing date must be set before this information is presented in the record so that members of the public can also hear and comment on this scientific testimony.

V. CONCLUSION

NEE asks the Commission to impose an extra-regulatory, pleading-stage "science statement" that neither the Water Quality Act nor its implementing regulations require or even contemplate. The motion should be denied. The Commission voted to set this matter for hearing, and it is through the hearing process that the basis for a rule is introduced into the record for the Commission's consideration. Rather than waste time negotiating some novel petition-stage evidence proffer, the Commission should schedule the hearing and enter a scheduling order within the framework of 20.1.6 NMAC to ensure a fair, transparent, and science-grounded record on which to decide any amendments to 20.6.8 NMAC.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that on September 19, 2025, a true and correct copy of the foregoing *Response in Opposition to NEE Motion to Require Petitioner to Provide Science That Undergirds its New Rule* was sent by electronic mail to the following:

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Exhibit 1

STATE OF NEW MEXICO
BEFORE THE WATER QUALITY CONTROL COMMISSION

IN THE MATTER OF PROPOSED
AMENDMENTS to 20.6.8 NMAC –
Ground and Surface Water Protection –
Supplemental Requirements
For Reuse of Treated Produced Water

No. WQCC 25-34 (R)

Water Access Treatment & Reuse Alliance,

Petitioner.

SELF-AFFIRMED STATEMENT OF ADRIANNE LOPEZ

My name is Adrianne Lopez, I am the Research and Development Manager at Texas Pacific Water Resources (TPWR). My background includes Geo-chemistry, Hydrology, and Water Treatment and I hold a Bachelor of Science in Geology from UTSA, and a Master of Environmental Science in Hydrology & Water Security from Oklahoma University. I have direct knowledge of recent scientific research and operational pilot studies on produced water (PW) treatment and assessment. This Self-Affirmed Statement summarizes and explains the science demonstrating the use of treated produced water can occur in a manner that is protective of human health and the environment, referencing peer-reviewed studies and large-scale pilot projects focused on characterization, toxicology, treatment monitoring, and policy development. I am over the age of 18, have personal knowledge of the matters addressed herein, and am competent to provide this Self-Affirmed Statement.

Background

1. Texas Pacific Water Resources (TPWR) has constructed large-scale treated produced water projects in West Texas that generated reliable water quality, soil quality, water

characterization, and toxicological data related to the safe and effective treatment of produced water for use outside of the oil field.

2. In my role at TPWR, I have worked with regulators at the Environmental Protection Agency, the Texas Commission on Environmental Quality (TCEQ), and researchers from the New Mexico Produced Water Research Consortium and Texas Produced Water Research Consortium to develop water treatment, testing, and monitoring recommendations.

3. TPWR has an application pending with the Texas Commission for Environmental Quality for the safe discharge of treated produced water into the Pecos River in Texas. Based on my professional experience, it is my opinion that this discharge permit application is supported by science.

4. In August 2025, Secretary James Kenney was interviewed on PBS by reporter Jerry Redfern. *See* NM Environment Secretary Advocates to Expand Use of Wastewater - New Mexico In Focus. During this interview, Secretary Kenney stated that the Rulemaking in Case WQCC 23-84(R) included only research on produced water through the year 2022, and that no later research was incorporated into the initial rulemaking. This highlights that subsequent research, including that referenced herein, was not part of the regulatory consideration in Case WQCC 23-84(R) but may inform future updates.

5. Since 2022, there have been significant scientific research developments related to the treatment and use of treated produced water. These scientific developments are sufficient to support water characterization, testing, monitoring for discharge permits and similarly are sufficient to support the promulgation of science-based standards for uses of treated produced water in New Mexico regulatory applications.

Collaborative Scientific Input for Proposed Treated Produced Water Rule

6. The Water Access, Treatment & Reuse Alliance drafted a proposed treated produced water rule based on input from a multidisciplinary group of technical experts and scientists who met regularly from late 2024 through spring 2025, ensuring the rule reflects current science and operational experience. I participated in this group.
7. The group of experts contributing to the proposed rule included over a dozen participants, including participants from research institutions across the state and region specializing in the treatment and characterization of produced water, participants from large and small water midstream and water treatment firms with expertise in produced water treatment and characterization, participants with expertise in wastewater treatment and management from large energy producers, and legal and regulatory experts.
8. This multidisciplinary collaboration brought legal, scientific, engineering, and operational perspectives to develop effective, science-based policies for safe produced water treatment and reuse.
9. When drafting the proposed rule, this multidisciplinary team of water treatment professionals and scientists discussed their professional experience related to the following topics: produced water characterization, the use of feasibility studies, discharging and non-discharging types of uses, whole effluent toxicity testing, data from recent pilot studies, non-targeted and targeted analysis of treated and untreated produced water, the use of surrogates in water monitoring, the National Pollutant Discharge Elimination System program established by the Clean Water Act (NPDES) permit policies and regulations implemented by other states and jurisdictions, the use of water testing and monitoring

policies for other water treatment systems (such as direct potable reuse regulatory programs), financial assurance, disposal requirements, and other related topics.

10. The following outlines some of the recent scientific developments related to these topics that I was aware of and that informed my input in the WATR Alliance meetings. This declaration is not intended to be a complete or comprehensive summary of all science or information that informs my opinions on the topic of safe science-based standards for the reuse of treated produced water.

11. The input from participants in the WATR Alliance meetings largely came from personal and professional experience in recently conducted and on-going research projects.

Produced Water Characterization

12. Produced water is a byproduct of oil and gas extraction, characterized by elevated salinity, organic and inorganic constituents, and sometimes naturally occurring radioactive materials (NORMs). A characterization study of PW from the Permian Basin was conducted by Jiang et al. (2022), which determined both the specific constituents as well as the variability in salinity, as shown in that study. These findings establish critical baseline data demonstrating that while PW contains a complex mixture of constituents, these are quantifiable and manageable using modern analytical techniques. This foundational work enables risk assessment and tailored treatment processes. In 2023 – 2024, this characterization research continued to develop, resulting in additional treated produced water characterization studies that have been published in peer-reviewed articles and presentations provided at scientific conferences. *See* Tarazona, Y., Hightower, M., Xu, P., Zhang, Y. (2024/2025), Treatment of produced water from the Permian Basin: Chemical and toxicological characterization of the effluent from a pilot-scale low-

temperature distillation system, *Journal of Water Process Engineering*, 67, 106146; Redman, A., Puglis, H.J., Xu, P., Reible, D.D. (2024), Treatment and Characterization of Permian Produced Water to Support Re-Use, *SETAC North America 45th Annual Meeting;* Jiang, W., Xu, X., Hall, R., Zhang, Y., Carroll, K.C., Ramos, F., Engle, M.A., Lin, L., ... (2024), Characterization of produced water and surrounding surface water in the Permian Basin, the United States. *Journal of Hazardous Materials*, 430, 128409.

13. Scientists and industry experts have largely coalesced around utilizing the list of analytes typically used for NPDES discharge permits when conducting characterization of treated produced water.

The Role of the NMPWRC and the NPDES+ Analyte List

14. The New Mexico Produced Water Research Consortium (NMPWRC), a partnership between the New Mexico Environment Department and New Mexico State University, developed the NPDES+ analyte list—which consists of an extensive inventory of close to 400 constituents. This list of anolytes is larger than most conventional water quality regulatory lists. This list characterizes produced water samples from New Mexico basins using advanced methods to identify both regulated and emerging substances and adds water constituents regulated in the New Mexico Administrative Code. The NPDES+ list enables comprehensive targeted analysis. The NMPWRC recently hosted in August 2025 a seminar in New Mexico for academics and interested persons to learn more about the NPDES+ list.

Non-Targeted Analysis: Identifying Unknown Unknowns

15. There is also research from 2024 – 2025 related to the use of non-targeted analysis of produced water. Non-targeted analysis (NTA) employing high-resolution mass spectrometry creates an unbiased chemical profile of PW, which can effectively identify

thousands of constituents including unknown or emerging contaminants in the water being tested (Delanka-Pedige et al. 2024). NTA benchmarks advanced treatments like photocatalytic membrane distillation, compares performance against traditional methods, and predicts toxicity of residual constituents. This holistic approach supports thorough risk assessments and regulatory oversight. Once an analyte of concern is identified in non-targeted analysis, those analytes can be added to a company's targeted water analysis and water monitoring efforts, which is precisely how the state of California manages for unknowns in its direct potable reuse programs.

Toxicological Assessment and Whole Effluent Toxicity (WET) Testing

16. Systematic toxicity evaluations of Permian Basin PW have identified salinity, metals, ammonia, and organics as primary toxicity drivers (Hu et al. 2022). Recent research shows that advanced treatment and water polishing operations successfully eliminate the toxic analytes in the treated produced water (Wijekoon et al., 2025). WET testing, a biological monitoring method used by EPA since 1974, predicts both acute and chronic toxic effects of treated water discharges on aquatic and terrestrial organisms using indicator species such as green algae, Daphnia water flea, minnows, trout, and zebrafish. This testing assesses growth, maturation, and reproduction to forecast long-term toxicity. NMPWRC collaborates with certified labs, NMSU, and EPA to expand WET testing to ecologically sensitive species like freshwater mussels and zebrafish, enhancing safety assurance.

Use of Surrogate Parameters and Indicators for Real-Time Monitoring of Treated Produced Water

17. To enable real-time monitoring and ensure consistent treatment performance, surrogate parameters and indicator compounds have historically been developed and validated for various types of water treatment systems (Drewes et al. 2008). Surrogate parameters are

bulk water quality measures indicating treatment unit operation, while indicator compounds represent constituent classes with similar characteristics. Together, they provide a conservative, practical framework to detect system failures and to confirm the removal or reduction of certain constituent classes during treatment, therefore supporting regulatory compliance and public health protection.

18. Participants in the WATR Alliance meetings researched the use of surrogates and indicator compounds for effective and science-based monitoring of treated produced water. These systems have been effective tools in water monitoring for decades and scientists participating in the WATR Alliance meetings confirmed that they could be used to help monitor treated produced water quality.

Toxicological Evaluations

19. In 2023 – present, there have been various studies and pilot projects that have researched toxicology for treated produced water in several different contexts. Some of these projects have focused on traditional Whole Effluent Toxicity tests (WET tests). Other projects have branched out to conduct soil testing and analysis, crop testing and analysis for crops grown in greenhouses using treated produced water, while other recent studies have researched human cell lines and animal studies. Collectively, this body of research shows that produced water can be effectively treated and safely used for a variety of different uses.

20. Research has evaluated toxicity of untreated and treated desalinated PW from the Permian Basin on human cell lines including intestinal epithelial (Caco-2), breast cancer (MCF-7), and embryonic kidney (HEK293) cells (Wijekoon et al. 2025). Cells exposed to untreated PW showed significant cytotoxicity, oxidative stress, and apoptosis. Thermal distillate reduced toxicity but retained estrogenic activity and AhR activation. Post-treatment with

granular activated carbon (GAC) and zeolite eliminated toxicity and hormonal activity, rendering treated desalinated PW comparable to controls. This integrated treatment process demonstrates that measures and methods exist that allow for the reuse of treated produced water treatment in ways that are protective of human health and the environment.

21. Texas A&M AgriLife Research: Multiscale Studies on Produced Water for Agriculture Led by Drs. Katie Lewis and Joseph Burke, Texas A&M AgriLife Research has conducted field and lab research on treated PW irrigation of non-consumptive crops in water-scarce West Texas and the High Plains. Findings include:
    - Treated PW blended with groundwater irrigated cotton without yield or quality loss, reducing soil salinity.
    - Comparative trials showed minimal negative impacts on plant growth and mineral uptake; soil carbon, pH, and micronutrients improved.
    - Ongoing studies assess novel treatment impacts on forage crops, soil health, and greenhouse gas emissions.
    - DOE-funded collaborations with NMSU study cost-effective reuse for cotton, bioenergy sorghum, and peanuts at large scale. These results supported treated PW as a safe and sustainable supplemental agricultural water resource.
22. The Texas Railroad Commission has established beneficial reuse frameworks with pilot parameters and water quality limits (RRC, 2024). Scientific literature supports safe agricultural and land restoration use of treated PW under appropriate controls (Niemeyer et al., 2020; Andrade et al., 2011; Ferreira et al., 2015; Rossetto et al., 2021; Sousa et al., 2016; Davis et al., 2022, 2024). Public perception studies (Du et al., 2025) show cautious optimism with growing safety data.

23. Greenhouse and field trials (Ali et al. 2024; Ben Ali et al. 2022) confirm properly treated or diluted PW safely irrigates salt-tolerant crops and rangelands when heavy metals and NORMs are controlled. Economic analyses (Edirisooriya et al. 2024) acknowledge treated PW's viability with consideration of energy and cost factors.

Emerging and Potential Reuse Applications of Produced Water

24. Recent research published in peer-reviewed studies also encourages the use of treated produced water in other types of uses.
25. Hydrogen is an effective form of energy storage that supports renewable energy sources such as wind and solar, which are intermittent. Hydrogen, produced mainly through electrolysis or steam methane reforming (SMR), can be stored long-term and produces water upon combustion, releasing energy. However, hydrogen production requires large volumes of high quality water, limiting its viability in arid regions. Utilizing treated wastewater, including produced water, for hydrogen production could simultaneously aid renewable energy use and promote beneficial PW reuse (Cull-Host, 2025).
26. Another reuse opportunity is carbon sequestration via carbonated water injection, where CO2 is added to produced water before underground reinjection (Cull-Host, 2025). Although highly saline water has reduced CO2 solubility, the large volume of PW reinjected for disposal could make this approach worthwhile. Carbonated water used in enhanced oil recovery (EOR) offers dual benefits of carbon sequestration and increased oil recovery. While not the most efficient carbon sequestration method, this process requires limited water treatment and adds value to PW disposal.
27. Another proposed use for produced water is the extraction of critical minerals present as constituents in the PW. However, due to temporal and locational variability in PW

constituents across different areas, not all PW contains economically viable concentrations of critical minerals. The PW characterization study of the Permian Basin conducted by Jiang et al. (2022), shown in Table 2 of their report, determined that the mean lithium concentration in Permian Basin PW is approximately 22.39 mg/L (Jiang et al., 2022). Following desalination processes, the residual brine exhibits increased concentrations of these minerals, improving the efficiency of extraction methods. Realizing critical mineral extraction from PW would improve domestic access to lithium and other essential minerals for energy technologies and industrial uses.

28. Pumped Hydro Energy Storage (PHES) is a mature energy storage technology involving pumping water to a higher elevation reservoir during excess energy production and generating energy by releasing water to a lower reservoir through turbines. Used in U.S. hydropower since 1929, modern PHES systems favor closed-loop/off-stream designs that reduce ecological impacts by avoiding natural waterways. Closed-loop systems can utilize abandoned mines as lower reservoirs for vertical pumping. Given New Mexico's mining history, it potentially offers promising sites for vertical PHES deployment (Cull-Host, 2025).

Summary and Conclusions

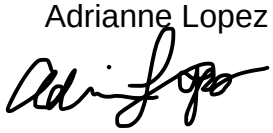
18. The combined evidence from peer-reviewed research, comprehensive chemical and toxicity testing, advanced treatment pilots, agricultural studies, emerging reuse applications, monitoring frameworks, regulatory programs, and expert collaboration provides compelling support that:

    - Produced water can be treated consistently to meet or exceed safety standards for reuse outside oil fields.

- Integrated treatment trains using multi-phase water treatment systems and water polishing have effectively reduced salinity and removed contaminants to non-toxic levels.
- Long-standing questions regarding constituent identification and water characterization can now be addressed through targeted and non-targeted analysis.
- Surrogate parameters and indicator compounds enable real-time monitoring of treatment performance and safety.
- Large-scale pilots and field trials validate beneficial reuse feasibility for irrigation and other applications.
- Emerging reuse pathways such as hydrogen production, carbon sequestration, and energy storage offer additional value for treated PW.
- Collaborative expert efforts ensure policy development is informed by latest science and practical experience.

19. It is my professional opinion, based on scientific literature, operational data, toxicity testing, and regulatory review, that the use of treated produced water can occur in a manner that is protective of human health and the environment, provided treatment is robust, monitoring comprehensive, and regulatory safeguards enforced.
20. Attached to my declaration as **Exhibit A** is a list of citations for the materials referenced herein, unless otherwise fully cited above.
21. Pursuant to Rule 1-011 NMRA, I declare and affirm under penalty of perjury under the laws of the State of New Mexico that the foregoing statements are true and correct to the best of my knowledge and belief.

[Name] Adrianne Lopez

[Signature] 

[Date] Sept. 18, 2025

EXHIBIT A

References

Ali, A. B., Armijo, M., & Shukla, M. (2024). Irrigation of Atriplex species with highly saline produced water for rangelands improvement in southeastern New Mexico. *Rangelands*. https://doi.org/10.1016/j.rala.2024.04.001

Ben Ali, A. R., Mekki, A., Jebara, S., & Jebara, M. (2022). Irrigation with desalinated and raw produced waters: Impacts on soil and plant health. *Agricultural Water Management, 274*, 107966. https://doi.org/10.1016/j.agwat.2022.107966

Cull-Host, J., Sharan, P., Van Wijk, J., & Mehana, M. (2025). New Mexico as a testbed for safe beneficial produced water reuse. *Environmental Challenges, 19*, 101116. https://doi.org/10.1016/j.envc.2025.101116

Delanka-Pedige, H. M. K., Young, R. B., Abutokaikah, M. T., Chen, L., Wang, H., Imihamillage, K. A. B. I., Thimons, S., Jahne, M. A., Williams, A. J., Zhang, Y., & Xu, P. (2024). Non-targeted analysis and toxicity prediction for evaluation of photocatalytic membrane distillation removing organic contaminants from hypersaline oil-and-gas-field produced water. *Journal of Hazardous Materials, 471*, 134436. https://doi.org/10.1016/j.jhazmat.2024.134436

Delanka-Pedige, H. M. K., Zhang, Y., Young, R. B., Wang, H., Hu, L., Danforth, C., & Xu, P. (2023). Safe reuse of treated produced water outside oil and gas fields? A review of current practices, challenges, opportunities, and a risk-based pathway for produced water treatment and fit-for-purpose reuse. *Current Opinion in Chemical Engineering, 42*, 100973. https://doi.org/10.1016/j.coche.2023.100973

Drewes, J. E., et al. (2008). *Development of indicators and surrogate for chemical contaminant*. Water Environment Research Foundation, Bureau of Reclamation, California State Water Resources Control Board.

Edirisooriya, E. M. N. T., Wang, H., Banerjee, S., Longley, K., Wright, W., Mizuno, W., & Xu, P. (2024). Economic feasibility of developing alternative water supplies for agricultural irrigation. *Current Opinion in Chemical Engineering, 43*, 100987. https://doi.org/10.1016/j.coche.2023.100987

Hu, L., Jiang, W., Xu, X., Wang, H., Carroll, K. C., Xu, P., & Zhang, Y. (2022). Toxicological characterization of produced water from the Permian Basin. *Science of the Total Environment, 815*, 152943. https://doi.org/10.1016/j.scitotenv.2022.152943

Jiang, W., Xu, X., Hall, R., Zhang, Y., Carroll, K. C., Ramos, F., Engle, M. A., Lin, L., Wang, H., Sayer, M., & Xu, P. (2022). Characterization of produced water and surrounding surface water in the Permian Basin, United States. *Journal of Hazardous Materials, 430*, 128409. https://doi.org/10.1016/j.jhazmat.2022.128409

New Mexico Produced Water Research Consortium. (n.d.). Retrieved from https://nmpwrc.nmsu.edu/

NMED. Notice of Intent to Discharge (NOI) and No Discharge Permit policies.

Tarazona, Y., Hightower, M., Xu, P., & Zhang, Y. (2024). Treatment of produced water from the Permian Basin: Chemical and toxicological characterization of the effluent from a pilot-scale low-temperature distillation system. *Journal of Water Process Engineering, 67*, 106146. https://doi.org/10.1016/j.jwpe.2024.106146

Tarazona, Y., Wang, H. B., Hightower, M., Xu, P., & Zhang, Y. (2024). Benchmarking produced water treatment strategies for non-toxic effluents: Integrating thermal distillation with granular activated carbon and zeolite post-treatment. *Journal of Hazardous Materials, 478*, 135549. https://doi.org/10.1016/j.jhazmat.2024.135549

Texas Produced Water Research Consortium. (2024). *Legislative Report*.

U.S. Environmental Protection Agency. (n.d.). WET Testing: Whole effluent toxicity methods. https://www.epa.gov/cwa-methods/whole-effluent-toxicity-methods

Wijekoon, S., Tarazona, Y., Hightower, M., Wang, H., Xu, P., & Zhang, Y. (2025). Comprehensive cytotoxicity assessment of the treated produced water from thermal distillation using human cell lines. *Ecotoxicology and Environmental Safety, 302*, 118726. https://doi.org/10.1016/j.ecoenv.2025.118726

Why use zebrafish to study human diseases. (2016). National Institutes of Health. https://irp.nih.gov/blog/post/2016/08/why-use-zebrafish-to-study-human-diseases

Zebrafish as a model vertebrate for investigating chemical toxicity. (2005). *Toxicological Sciences, 86*(1), 6–8. https://academic.oup.com/toxsci/article/86/1/6/165409

Zebrafish help unlock clues to human disease. (n.d.). Johns Hopkins Medicine. https://www.hopkinsmedicine.org/news/articles/zebrafish-help-unlock-clues-to-dise