

**TOWN OF PARKER COUNCIL
MINUTES
JULY 19, 2021**

Mayor Toborg called the meeting to order at 5 p.m. All Councilmembers were present.

Town Attorney Jim Maloney announced the topics for discussion in Executive Session were three items under C.R.S. § 24-6-402(4)(b); the first item was to hold a conference with the Town's attorney to receive legal advice on specific legal questions regarding HB21-1027 (communal outdoor dining area); HB21-1250 (law enforcement accountability); and SB21-256 (firearms in public buildings); the second item was to hold a conference with the Town's attorney to receive legal advice on specific legal questions, pursuant to C.R.S. § 24-6-402(4)(b) concerning 42 U.S.C. § 2000 (Religious Land Use and Institutional Persons Act – locating a church in a communal area); and the third item was to hold a conference with the Town's attorney to receive legal advice on specific legal questions, pursuant to C.R.S. § 24-6-402(4)(b) concerning Resolution No. 19-023, Series of 2019 (partial waiver for the Anthology North Property to allow for the processing of sketch and preliminary plans by segment).

EXECUTIVE SESSION

Joshua Rivero moved and Todd Hendreks seconded to go into Executive Session at 5:01 p.m., to hold a conference with the Town's attorney to receive legal advice on specific legal questions, pursuant to C.R.S. § 24-6-402(4)(b).

The motion was approved unanimously.

Joshua Rivero moved and Todd Hendreks seconded to come out of Executive Session at 6:31 p.m.

The motion was approved unanimously.

Joshua Rivero moved and Todd Hendreks seconded to recess the regular Town Council meeting until 7:00 p.m.

The motion was approved unanimously.

REGULAR MEETING

Mayor Toborg reconvened the meeting at 7 p.m.

The Mayor led the Pledge of Allegiance.

SPECIAL PRESENTATIONS

None.

PUBLIC COMMENTS

There were five written general public comments which will be attached to the approved minutes.

Kenneth Ramsey, 3862 Elm Avenue, talked about fracking and prairie dogs. He provided a copy of his presentation to the Acting Town Clerk to be included in the minutes.

REPORTS, ITEMS AND COMMENTS FROM MAYOR AND COUNCIL

Each Councilmember reported on meetings they attended since the last Town Council meeting.

CONSENT AGENDA

A. APPROVAL OF MINUTES - July 12, 2021

B. North Parker Road Operational Improvements

Department: Engineering and Public Works, Alex Mestdagh

Second Reading: August 2, 2021

1. ORDINANCE NO. 9.336 First Reading

A Bill for an Ordinance to Approve the Intergovernmental Agreement By and Between the Town of Parker and the Board of County Commissioners of the County of Douglas Regarding Cost Sharing for Parker Road Operational Improvements Project (Lincoln Avenue to Pine Lane)

2. ORDINANCE NO. 9.337 First Reading

A Bill for an Ordinance to Approve the Intergovernmental Agreement By and Between the Town of Parker and the State of Colorado Acting By and Through the Colorado Department of Transportation Concerning Operational Improvements: Lincoln Avenue to Pine Lane (Project # C M039-007 (24455) & MTF M039-009 (24467))

C. ORDINANCE NO. 9.338 First Reading

A Bill for an Ordinance Approving the Agreement Regarding Design and Construction of Drainage and Flood Control Improvements for Upper Jordan Road Tributary at Bradbury Ranch (Agreement No. 21-05.17, Project No. 108522) by and between Urban Drainage and Flood Control District d/b/a Mile High Flood District and the Town of Parker

Department: Engineering and Public Works, Michael Grabczyk

Second Reading: August 2, 2021

- D. *ORDINANCE NO. 9.339 First Reading*
A Bill for an Ordinance Approving the Agreement Regarding Design and Construction of Drainage and Flood Control Improvements for Newlin Gulch at Recreation Drive (Agreement No. 21-05.23, Project No. 108504) by and between Urban Drainage and Flood Control District d/b/a Mile High Flood District and the Town of Parker
Department: Engineering and Public Works, Michael Grabczyk
Second Reading: August 2, 2021

Joshua Rivero moved to approve Consent Agenda items 5A through 5D.

Cheryl Poage seconded the motion.

The motion was approved unanimously.

TOWN ADMINISTRATOR

The Summer Town Administrator's Report has been published on the Town's website.

ORDINANCES

- ORDINANCE NO. 3.193.5 - Second Reading**
A Bill for an Ordinance Amending the Parker Auto Plaza Development Guide Pursuant to the Town of Parker Land Development Ordinance
Department: Community Development, Stacey Nerger

The Town is proposing a rezoning application to revise the list of permitted uses within the Parker Auto Plaza PD, Open Space Planning Area, to allow parks, playgrounds and other outdoor recreation uses. The purpose of the proposed rezoning is to support park improvements along the Baldwin Gulch Trail and Open Space that traverses the area. The planned park improvements would be funded, installed and maintained by the developer of a multi-family residential complex located in the adjacent Eisenberg property within the Parker and Pine Mixed-Use PD at the southwest corner of the intersection of Parker Road and Pine Lane.

For background, the Eisenberg property that is located at the southwest corner of Parker Road and Pine Lane was rezoned from Parker Auto Plaza PD to the Parker and Pine Mixed-Use PD in 2020. The approved Parker and Pine Mixed-Use PD zoning permits a range of commercial and residential uses with multi-family residential housing allowed as a use by-right in Planning Area 4. The Development Plan for the PD zoning locates Planning Area 4 in the southwestern section of the property fronting Twenty Mile Road and Baldwin Gulch.

The property owner and their development partner have submitted a site plan application to develop multi-family residential housing consisting of four (4) buildings in Planning Area 4 as permitted by the Parker and Pine Mixed-Use PD. Under Section 13.07.140 of the Land

Development Ordinance (LDO), the development of a residential use requires the dedication of parks, trails, open space and schools. The property owner may address this requirement by

dedicating land for parks on-site or, subject to Town Council approval, make a cash in-lieu of land payment of equivalent monetary value or donate recreational facilities if there is insufficient land available in a residential development.

The property owner and their development partner have determined that there is insufficient land available within Planning Area 4 to fully address the LDO park land dedication requirement on-site. As a result, they have proposed and staff has been working with them on a concept to use approximately one (1) acre of Tract A in the adjacent Parker Auto Plaza PD as a supplemental park site. In this concept, the property owner would be required to cover all costs for the design, installation and maintenance of park improvements on Tract A as well as the payment of a fee to the Town for using Tract A. For the reason that the Town will retain ownership of Tract A, the obligation of the property owner and their development partner to construct the park improvements will be incorporated into a subdivision agreement and their obligation to maintain the park improvements will be contained in a license agreement. The concept plan for a park on Tract A is attached for review.

Staff believes that allowing the property owner and their development partner to construct park improvements on one (1) acre of Tract A is preferable to accepting a cash in-lieu of land payment. The reason for this is that the cash in-lieu of land option may not be sufficient to fund the development of a park and even if it was there is no guarantee that a future park would be accessible from the Baldwin Gulch Trail and Open Space or be directly accessible to the multi-family residential housing proposed in Planning Area 4 of the Parker and Pine Mixed-Use PD.

The Planning Commission heard this request on July 8, 2021, and unanimously voted to recommend approval.

Public Comment: None.

John Diak moved to approve Ordinance No. 3.193.5 on second reading.

Todd Hendreks seconded the motion.

The motion was approved unanimously.

RESOLUTIONS

A. RESOLUTION NO. 21-032

A Resolution Setting the Date for Consideration of the Annexation Ordinance for the Town Parker North, 1st Amendment, Tract D Property for Second Reading on September 7, 2021

Department: Community Development, Stacey Nerger
Community Development, BrieAnna Simon

The Town of Parker is proposing to annex and zone a 0.27 acre property it acquired from Douglas County in 2020 to construct a multi-use sidewalk on the east side of Parker Road (the "Town Property"). The Town Property, also known as Tract D, is located in unincorporated Douglas County south of Lincoln Avenue and north of Parkglenn Drive on the east (northbound)

side of Parker Road. Proposed Resolution No. 21-032 will set the date for annexation on September 7, 2021, at second reading of the Annexation Ordinance.

Public Comment: None.

Joshua Rivero moved to approve Resolution No. 21-032.

Anne Barrington seconded the motion.

The motion was approved unanimously.

B. RESOLUTION NO. 21-026.1

A Resolution to Amending Resolution No. 21-026, Series of 2021, to Adopt an Amended Town Council Policy Statement 1-8 Concerning Public Hearing Procedure and Public Comment Policy

Department: Town Attorney, Kristin Hoffmann

Policy Statement 1-8 establishes procedures for public hearings and public comment periods. During the pandemic, public comment could be provided by the public electronically through the Town's website and those comments received by 5 p.m. on the day of the Town Council meeting were provided to the Town Council and included in the minutes. This revision provides for this practice to continue.

Public Comment: None.

Cheryl Poage moved to approve Resolution No. 21-026.1.

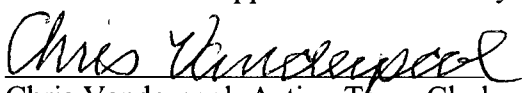
Laura Hefta seconded the motion.

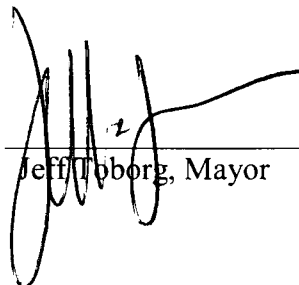
The motion was approved unanimously.

ADJOURNMENT

Joshua Rivero moved and Todd Hendreks seconded to adjourn the meeting at 7:42 p.m.

The motion was approved unanimously.


Chris Vanderpool, Acting Town Clerk


Jeff Toborg, Mayor

Vanderpool, Chris

From: noreply@civicplus.com
Sent: Monday, July 19, 2021 8:13 AM
To: Clerk; Robberson, Dannette; Sullivan, Cheri; Anderson, Andy; Penington, Elise
Subject: Online Form Submittal: Town Council Meetings - General Public Comment

Town Council Meetings - General Public Comment

Regular Town Council meetings are held on the first and third Monday of each month, unless announced otherwise. The general public comment period held during these meetings is an opportunity for the public to provide comments on items that are not on that meeting's agenda. Public comments can be made in writing via the online form below, live during the meeting via the Zoom application, or in person at the public meeting.

Written general public comments via the form below can be submitted from noon on the Friday prior to the next meeting until 5 p.m. Monday (the day of the meeting). To learn how to submit a live public comment during a meeting via the Zoom application, visit www.ParkerOnline.org/Calendar and go to the specific meeting date for details.

This online form will also be used for other virtual meetings held by the Town of Parker's Special Licensing Authority. Public comments that are provided by 5 p.m. on the day of the Special Licensing Authority meeting will be provided to the Authority and will be included with the approved meeting minutes.

General Public Comment is an opportunity for Town residents and other interested individuals to speak about items that are NOT on the agenda. No action will be taken on these items. Public comments will be provided to the Town Council and will be included with the approved minutes of the Town Council meeting. For those unable to provide comments electronically through this form, please contact the Clerk's Office to make arrangements. The Town Clerk can be reached by phone at 303.805.3198.

First Name	James
Last Name	Cahalin
Address	12808 Domingo Ct
City	Parker
State	CO
Zip Code	80134

General Public Comment

The jake braking started at 5:30am today on July 19, 2021. I see the mobile is sign is back up, but where is the enforcement? Please do the right thing and re-route this truck and construction traffic! This is negatively impacting my family's quality of life!!!

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Vanderpool, Chris

From: noreply@civicplus.com
Sent: Monday, July 19, 2021 2:18 AM
To: Clerk; Robberson, Dannette; Sullivan, Cheri; Anderson, Andy; Penington, Elise
Subject: Online Form Submittal: Town Council Meetings - General Public Comment

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First Name	Neva
Last Name	Shearer
Address	12847 Capital Creek St
City	Parker
State	CO
Zip Code	80134

General Public Comment

1. Tires make a clicking noise on Motsenbocker between Hess and Stroh. I've had my tire pressure checked thinking that was the cause. Not all roads create this tire noise. I think it has something to do with the way the road is constructed. This issue needs to be studied to help cut down traffic noise.
2. Brake noise from trucks slowing and stopping is very loud. I've noticed the warning sign about the use of jake brakes is no longer on Motsenbocker. Maybe the truck drivers need to be reminded of this law and the penalty for not obeying it.
3. Overall truck noise seems to be about the same. There are earth hauling trucks and semi trailers loaded with construction materials. Volume of construction truck traffic has not decreased.
4. Auto traffic speeds are very fast on Motsenbocker. The posted speed is 40 miles per hour. Any vehicle traveling at that speed is passed by most of the other traffic. Could a request be made to the police department to set up speed monitoring along this stretch? Could signs for a school zone be placed along sides of the road with a lower speed?
5. Has the monitoring been set up to count number of vehicles traveling on this road? Has a determination been made yet about putting in a stoplight at French Creek and Motsenbocker intersection?
6. Has the developer and the city of Parker come to agreement on the continuation of Chambers across Hess so that Chambers connects with Crowfoot? What is the target completion date?
7. Since I spoke to the City Council in May, there doesn't seem to be much change in traffic noise levels, volume of traffic, or traffic speeds. Thank you for considering my concerns and questions about Motsenbocker from Hess to Stroh.

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Vanderpool, Chris

From: noreply@civicplus.com
Sent: Sunday, July 18, 2021 4:20 PM
To: Clerk; Robberson, Dannette; Sullivan, Cheri; Anderson, Andy; Penington, Elise
Subject: Online Form Submittal: Town Council Meetings - General Public Comment

Town Council Meetings - General Public Comment

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First Name	Mary
Last Name	Harris
Address	12561 S Sopris Creek Dr
City	Parker
State	CO
Zip Code	80134

General Public Comment

We are again writing to urge you to act in stopping the continued deterioration of Parker's Stroh ranch area in allowing traffic and noise problems to get out of control.

We appreciate the action to limit Jake brake use but the root cause of its use is speed of the large construction trucks and your inability to plan Chambers opening earlier. If you were simply to install temp speed monitoring devices you would see that the speed limits are not enforced, causing large vehicles to speed and increasing the necessity for brake use to avoid collisions. Wham can we expect action? You are ruining the quality of life for many loyal Parker residents!

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From: noreply@civicplus.com
Sent: Saturday, July 17, 2021 3:41 PM
To: Clerk; Robberson, Dannette; Sullivan, Cheri; Anderson, Andy; Penington, Elise
Subject: Online Form Submittal: Town Council Meetings - General Public Comment

Town Council Meetings - General Public Comment

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First Name	Lindsay
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Last Name	Barron
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Address	12858 Domingo Ct
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City	Parker
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State	CO
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Zip Code	80134
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General Public Comment

Hello Council Members:

I am writing the council in regards to the Motsenbocker traffic noise issues that have been presented by residents in the Anthology and Stroh Ranch neighborhoods. I am a 17-year resident of the Anthology neighborhood, and my home backs directly to Motsenbocker Road. It was my impression from the inception of the neighborhood that Motsenbocker was never intended to be the main thoroughfare it has become with the increase in construction. The noise from all of the construction vehicles can be heard and felt inside my house. There have been several instances when large construction semi-trucks pass my home the vibrations are felt throughout my house. My windows and floors shake at the disturbance. While I understand there will be some traffic noise as I back to the road, the commuter traffic does not have the same effect as the construction traffic. While the completion of Chambers Road would be the best solution for this issue, other municipalities have had to make adjustments to construction routes due to traffic noise. For example, the Town of Castle Rock has developed specific haul routes for construction traffic due to resident noise complaints in the Terrain neighborhood. Perhaps this option could be looked into by the Town to help alleviate traffic pressure on Motsenbocker until Chambers Road is completed.

Thank you for your time and consideration with this issue.

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From: noreply@civicplus.com
Sent: Friday, July 16, 2021 4:33 PM
To: Clerk; Robberson, Dannette; Sullivan, Cheri; Anderson, Andy; Penington, Elise
Subject: Online Form Submittal: Town Council Meetings - General Public Comment

Town Council Meetings - General Public Comment

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First Name	Edward
Last Name	Corbett
Address	12545 S Sopris Creek Drive
City	Parker
State	Co
Zip Code	80134

General Public Comment Council Members,

I live off of Montsenbacher Road near the corner of Hess, in the Stroh Ranch Subdivision.

I grew up in NYC 3 blocks from the train and 2 blocks from a city bus depot. The noise there is not even comparable at this point. Around 6:15-6:30 in the morning, since they can't work until 7:00 am usually, trucks and their crews are flying up and down Montsbacher. I am very concerned as the entire house can move, as it just did when a large hauler

Truck went by. It's not just the noise, my rear fence backs up to Motsenbacher and I believe it is only a matter of time before I meet someone in their car in my backyard. You see there is a merge point and folks race to get there or even worse apparently understand Road signs. Over the last couple of weeks I was very appreciative as a police SUV sat at the entrance, hopefully to slow them down and pay attention. We are very grateful to live in a such a community where the police are respected and the folks who already live here are as important as our soon to be new neighbors.

I am hopeful that there is a plan in place to mitigate these issues.

Thank you for your time and energy, I want to say we appreciate your efforts on any additional work and time this may cause you.

Edward J Corbett Jr.

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*Parker Town Council Meeting
July 19, 2021*

1/1

I grew up in Colorado and I have lived here since 1984. Falling in love with Colorado is easy. The hard part is keeping Colorado lovable.

On July first The Denver Post reported that a Colorado Rancher donated one million dollars to the Colorado State University Center for Human-Carnivore Coexistence. This gift is intended to minimize conflict between people and animals. This is true love! This is the kind of love I get excited about. Ecosystems exist only with top predators and bottom food sources like Prairie Dogs. Making excuses to kill predators or Prairie Dogs means there will be.....nothing.

Is spreading poisons all over Colorado a good idea? What kind of love is this? The Environmental Working Group (EWG) has come to Colorado. Their latest report was given to the Denver Post on July 15, 2021. So far EWG has found that "toxic 'forever chemicals' (PFAS) likely are used and discharged into water at 501 sites in Colorado". These sites include carwashes, petroleum stations, sewage facilities, parts makers, printing plants, and others.

Did you know 'forever chemicals' (PFAS) are used in oil and gas drilling and fracking? A report from The New York Times Co. and printed in The Denver Post on July 13, 2021 reviews this issue. Did you know fracking waste water and waste fracking chemicals are used in road building and maintenance operations in Colorado? This issue has been discussed in Colorado without knowledge of the health effects (Sulfate reducing bacteria overgrowth and many others) from the 'forever chemicals' or other chemicals involved. A Gunnison County Commissioner told me that Gunnison County Commissioners banned this practice in their county some years ago. And our doctors are just now beginning to understand what all the poisons in food, water, air and products do to our health.

Prairie Dogs have lived in Parker for thousands of years. Give our Prairie Dogs a few safe homes of their own! Let's keep Colorado lovable!

Thank you. Kenneth Ramsey 3862 Elm Avenue, Parker, Colorado 80134

Colorado rancher donates \$1M to CSU

By Elizabeth Hernandez

The Denver Post

An anonymous Colorado rancher donated \$1 million to Colorado State University's Center for Human-Carnivore Coexistence, intended to minimize conflict between people and animals such as wolves, bears, mountain lions and other natural predators, the school announced Wednesday.

"Although predators play a critical role in maintaining the ecological balance our world depends on, I have come to realize that top carnivores will not exist unless humans allow them," the anonymous donor said in a CSU news release. "As someone who believes in science and ecological balance, I understand that humans will choose profit over balance unless they learn how to achieve both."

The center will receive the money in \$200,000 increments over five years to support research, outreach and education, and to prepare for the future of the program.

"With such support, we can strengthen our efforts to ensure that humans and carnivores can share landscapes with fewer impacts to both," said Kevin Crooks, the center's director and professor of fish, wildlife and conservation biology at CSU.

The donor originally supported the center's community engagement and education efforts around Colorado's wolf reintroduction ballot initiative, which directs wildlife managers to restore gray wolves on public lands in the western part of the state. The initiative passed with 50.4% in favor in 2020.

"My desire was to support the dissemination of good science, facts and information from a respected institution so the public could vote with informed, unbiased messaging," the anonymous donor said in the news release.

Impressed by the sciencebased information CSU distributed about wolf reintroduction, the donor decided to contribute even further.

The center's team focuses on debunking misinformation and convening groups of people intent on conflict reduction and mitigation, the news release said.

"There is a lot of misinformation, and sometimes mythology, about wolves and other carnivores," Crooks said.

Part of the money will be used to hire more staff for the center and create more engagement opportunities.

Elizabeth Hernandez: 303-9541311,
ehernandez@denverpost.com or [@ehernandez](https://twitter.com/ehernandez)

Colorado and Montana share an anti-carnivore bias

By John Horning

Writers on the Range

Last spring, at the height of some of the most anxiety-ridden moments of the pandemic, my father read a poem to me over the phone. He's 89 this year, and while he's vibrant and healthy I don't take for granted any opportunity to hear his voice — especially when he's reciting a poem.

The poem, Mary Oliver's *Spring*, describes the emergence of a black bear from its winter slumber. Oliver writes: "There is only one question: how to love this world."

This spring, as bruins emerged across the American West, I found myself wondering about the secret lives bears lead. As their hunger grows, do they imagine eating trout from a Rocky Mountain stream?

Is it hunger pangs or some deeper yearning — perhaps to experience the new world — that drives bears from the comfort and warmth of their dens?

I've been thinking about bears and how to love their world because bear management practices have been in the spotlight recently, a light that intensified after two people were killed by bears, one in Montana and one in Colorado.

The death of those people was tragic. Yet, we must remember that fatal attacks remain rare. A bear does not wake up in the morning, pack a rifle, and set out to kill a human being. Bears struggle to survive in an increasingly diminishing wild that brings them in contact with humans more frequently.

Humanity's mission, I believe, is not to kill them but to find ways to coexist.

On April 30, Montana Republican Gov. Greg Gianforte signed a bill that allows hunters to use hounds to hunt black bears in the spring, when they're with cubs and ravenous for food. This is the same governor who illegally trapped and killed one of Yellowstone's iconic wolves. One of the bills' key sponsors, state Sen. Tom MacGillivray, offered a consistent refrain about bears: "Over the last seven, eight years we've seen a dramatic decrease in the whitetail population, and, interestingly enough, a dramatic increase in the black bear population," he said. "This bill helps to balance that out."

Not a shred of science supports this contention. There's a long-standing war on carnivores and blaming bears is a convenient excuse for what ails the deer and the deer hunter's world. In reality, a complex host of factors including habitat loss due to sprawl, climate change and other dynamics are to blame.

Meanwhile, in Colorado, a federal judge struck down a controversial plan supported by the state's wildlife agency, the Colorado Parks and Wildlife Department, to "study" whether killing black bears — and mountain lions — would benefit mule deer. Sadly, the judge's ruling denying federal funding of the

bear-killing plan came too late for the dozens of Colorado bears that were killed in the study, one the agency's scientists had to know was laden with anti-carnivore bias.

Though Colorado and Montana are worlds apart on the political spectrum, the hostility towards bears and other carnivores is a tie that binds, whether it originates in a state legislature or in the state agency charged with managing wildlife.

At a time when the attitudes of most Montanans, Coloradans and Americans at large are shifting dramatically to favor greater coexistence with fanged creatures, those in power over the lives of wild animals are digging in their heels. Instead of figuring out how to live with them, Montana and Colorado are making it easier to kill bears.

The word poetry comes from the Greek *poetes*, meaning "to create." Whenever possible, I believe we should attempt to create opportunities for all life to thrive. It pains me that often those at the state level responsible for overseeing the management of wildlife seem to take more pleasure in the destruction of bears than in figuring out better ways for humans to coexist with them.

Wildlife management needs a new reason to exist, one that isn't based on killing. Its mission might read like this: We aim to protect wildlife, making no distinction between predator and prey. We aim to enhance that sense of wonder most of us experience when we see animals in the wild.

And instead of taking more courses in traditional wildlife management, the profession might consider including reading some of the best American poetry inspired by nature and the creatures that depend on still-wild places.

They could start with Mary Oliver's *Spring*. *John Horning is a contributor to Writers on the Range, writersontherange.org, an independent nonprofit dedicated to*

spurring lively conversation about the West. He is the executive director of WildEarth Guardians.



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Thursday, 07/01/2021 Page .A15

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Analysis: PFAS may seep into Colorado's water at 501 sites**"FOREVER
CHEMICALS"**JULY 15, 2021
PAGE 2**By Bruce Finley***The Denver Post*

Toxic "forever chemicals" likely are used and discharged into water at 501 sites in Colorado and at least 29,900 across the United States, according to a new analysis by an environmental advocacy nonprofit.

The Environmental Working Group unveiled the analysis Wednesday as the Environmental Protection Agency considers setting regulatory limits for perfluoroalkyl and polyfluoroalkyl substances (PFAS). Lawmakers also are pushing for limits on PFAS discharges in wastewater.

According to the EWG's analysis of federal documents and data, PFAS may be released from tens of thousands of sewage treatment plants, landfills, petroleum facilities, electronic parts factories, mines, metal plating shops and carwashes. Previously, EWG researchers had estimated 2,500 sites across the U.S. based on company self-reported pollution data.

An interactive map by EWG shows industry sites that are known to or are suspected of making, using or discharging PFAS. Colorado's 501 is more than twice the number in each of seven other Rocky Mountain states, and more than the 193 facilities that voluntarily disclosed their storage and use of PFAS chemicals in a 2020 Colorado Department of Public Health and Environment survey.

The EWG-identified sites are scattered beyond the areas south of Colorado Springs, in north metro Denver and west of Boulder where tests over the past five years of groundwater and public drinking water detected PFAS contamination. (A federal Agency for Toxic Substances and Disease Registry blood-sampling study south of Colorado Springs in 2019 found chemicals at levels up to eight times above national norms.)

PFAs » 4A

« FROM 2A

EWG's map shows possible PFAS chemicals discharges at a carwash in Monument, a petroleum bulk station in Durango, a landfill in Custer County, a sewage treatment facility in Fort Collins, an electronic parts maker in Grand Junction, a chemical factory in Greeley and a printing ink plant in Colorado Springs. "Anytime we learn of or hear that PFAS is being discharged into our environment, we're concerned," said Trisha Oeth. She is the Colorado Department of Public Health and the Environment's director of environmental policy and acting director of water quality. "We appreciate the work other organizations have done to find out where these chemicals are so that we can start taking the right steps to inform, educate and reduce Coloradans' exposure."

This year EPA officials proposed possible regulatory limits and formal designation of PFAS as hazardous, as well as increasing the tracking of 1,000 PFAS chemicals the government

approved for commercial use. In March the EPA identified industries “likely to be discharging PFAS in wastewater.”

PFAS chemicals are man-made, nonstick, waterproof, stain-resistant compounds used in several things, from carpets to firefighting foam. A growing body of research links exposure to PFAS to health issues such as cancer, birth defects, weakened immunity and kidney trouble.

Congressional lawmakers have proposed setting discharge limits under the Clean Water Standards for PFAS Act, which is part of the bipartisan infrastructure investment that has passed the House. Colorado business leaders haven’t taken a position on possible federal regulations.

“We haven’t been hearing about this from any of our members,” Denver Metro Chamber spokeswoman Jennifer Beck said. “The chamber and its members advocate strongly for the health of Coloradans and our state’s environment.”

The EPA in 2016 issued a health advisory warning that just two chemicals used in firefighting foam, out of more than 9,000 known PFAS chemicals, can cause harm at levels as low as 70 parts per trillion.

“If we’re going to address the PFAS crisis in Colorado and other states, the first step is to turn off the tap. ... Until the EPA uses the power Congress gave 50 years ago to put limits on those discharges, we are simply going to be making a big problem bigger,” EWG senior vice president Scott Faber said.

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Toxic fluids OK'd**FRACKING****Despite worries, EPA backed chemicals that turn into PFAS in 2011****By Hiroko Tabuchi**© *The New York Times Co.*

For much of the past decade, oil companies engaged in drilling and fracking have been allowed to pump into the ground chemicals that, over time, can break down into toxic substances known as PFAS — a class of long-lasting compounds known to pose a threat to people and wildlife — according to internal documents from the Environmental Protection Agency.

The EPA in 2011 approved the use of these chemicals, used to ease the flow of oil from the ground, despite the agency's own grave concerns about their toxicity, according to the documents, which were reviewed by The New York Times. The EPA's approval of the three chemicals wasn't previously publicly known.

The records, obtained under the Freedom of Information Act by a nonprofit group, Physicians for Social Responsibility, are among the first public indications that PFAS, long-lasting compounds also known as "forever chemicals," may be present in the fluids used during drilling and hydraulic fracturing, or fracking.

In a consent order issued for the three chemicals on Oct. 26, 2011, EPA scientists pointed to preliminary evidence that, under some conditions, the chemicals could "degrade in the environment" into substances akin to PFOA, a

kind of PFAS chemical, and could "persist in the environment" and "be toxic to people, wild mammals, and birds." The EPA scientists recommended additional testing. Those tests were not mandatory and there is no indication that they were carried out.

"The EPA identified serious health risks associated with chemicals proposed for use in oil and gas extraction, and yet allowed those chemicals to be used commercially with very lax regulation," said Dusty Horwitt, researcher at Physicians for Social Responsibility.

The documents, dating from the Obama administration, are heavily redacted because the EPA allows companies to invoke tradeseecret claims to keep basic information on new chemicals from public release. Even the name of the company that applied for approval is redacted, and the records give only a generic name for the chemicals: fluorinated acrylic alkylamino copolymer.

However, an identification number for one of the chemicals issued by the EPA appears in separate EPA data and identifies Chemours, previously Dupont, as the submitter. A separate EPA document shows that a chemical with the same EPA-issued number was first imported for commercial use in November

2011. (Chemours did not exist until 2015, though it would have had the responsibility to report chemicals on behalf of its predecessor, Dupont.) There is no public data that details where the EPA-approved chemicals have been used.

But the FracFocus database, which tracks chemicals used in fracking, shows that about 120 companies used PFAS — or chemicals that can break down into PFAS; the most common of which was “nonionic fluorosurfactant” and various misspellings — in more than 1,000 wells between 2012 and 2020 in Texas, Arkansas, Louisiana, Oklahoma, New Mexico and Wyoming. Because not all states require companies to report chemicals to the database, the number of wells could be higher.

Nine of those wells were in Carter County, Okla., within the boundaries of Chickasaw Nation. “This isn’t something I was aware of,” said Tony Choate, a Chickasaw Nation spokesman.

Nick Conger, an EPA spokesman, said that the chemicals in question were approved a decade ago, and that amendments to laws since then now required the agency to affirm the safety of new chemicals before they are allowed into the marketplace. He said the redactions in the documents were mandated by a statute protecting confidential business information. The Biden administration had made addressing PFAS a top priority, Conger added, for example by proposing a rule to require all manufacturers and importers of PFAS since 2011 to disclose more information on the chemicals, including their environmental and health effects.

Chemours, which has in the past agreed to pay hundreds of millions of dollars to settle injury claims related to PFOA pollution, did not provide comment.

An Exxon spokesman, in response to questions regarding whether it uses the chemicals, said, “We do not manufacture PFAS.”

Chevron did not respond to a request for comment.

The presence of PFAS in oil and gas extraction threatens to expose oil-field employees and emergency workers handling fires and spills as well as people who live near, or downstream from, drilling sites to a class of chemicals that has faced increasing scrutiny for its links to cancer, birth defects and other serious health problems.

A class of man-made chemicals that are toxic even in minuscule concentrations, for decades PFAS were used to make products like nonstick pans, stain-resistant carpeting and firefighting foam. The substances have come under scrutiny in recent years for their tendency to persist in the environment, and to accumulate inside the human body, as well as for their links to health problems like cancer and birth defects.

PFAS from page A1 to A6

*The first 20 pages of this report
by Coady Goodman are here.
The full 82 page report can be viewed at;
<https://www.ecos.org>*

BENEFICIAL USE OF PRODUCED WATER FOR ROADSPREADING:
PERSPECTIVES FOR COLORADO POLICYMAKERS

Beneficial Use of Produced Water for Roadspreading:

Perspectives for Colorado Policymakers

Coady Goodman

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BENEFICIAL USE OF PRODUCED WATER FOR ROADSPREADING: PERSPECTIVES FOR COLORADO POLICYMAKERS

Abstract

The multifaceted and controversial practice of applying produced water to roads for dust and ice control has now gained the attention of Colorado policymakers. The state is deciding whether to permit the beneficial use of produced water on roads, including that from hydraulic fracturing operations, but a number of uncertainties hamper the decision-making process. Among these uncertainties are the precise practices and policies surrounding roadspreading in other American states, particularly in regards to how decisions are justified and framed to the general public. Academic studies on both policy and technical aspects of roadspreading are scant, necessitating further research. This paper provides a Colorado-tailored comparative study of state-level roadspreading policies, including the context under which current policy has been developed. Interview results from relevant administrators in government agencies across a sample of both roadspreading and non-roadspreading states are presented. Select interviews with relevant experts and key players are also featured. Finally, insights from these conversations, state-specific experiences surrounding roadspreading, and recommendations to policymakers in Colorado are provided. A lack of knowledge on the chemical constituents found in produced water, as well as the effects they may have on public health and the environment when released via road applications, cautions against state approval of off-site, wide-scale roadspreading.

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Introduction/Background

As shale gas development expands and its costs continue to drop, management of waste byproducts from hydraulic fracturing is as complex as ever. When this expansion is combined with water shortages in the Western United States, efficient re-use of produced water from oil and gas operations becomes increasingly prudent. Therefore, treatment and recycling toward beneficial use has gained attention recently as Western states cope with stressed water resources.

The opportunity to utilize conventional and fracking-based produced water for dust suppression and de-icing on roads, which is one example of beneficial use, has garnered both positive and negative feedback in Colorado. The Colorado Department of Public Health and Environment (CDPHE) is at a crossroads on the issue of whether to permit and promote the application of produced water from hydraulic fracturing operations on roads for dust suppression and de-icing, also known as roadspreading. Compounds such as magnesium chloride along with other commercially available products are currently used for these purposes and feature a measurable track record regarding impacts on public health and the environment. However, one industrial facility on the state's Western Slope is petitioning CDPHE to allow usage of produced water containing hydraulic fracturing flowback for roadspreading. Said facility intends to accept payments from oil and gas producers in exchange for receiving and treating produced water, including that which contains flowback. It then desires to sell this brine to other entities partly for application toward dust suppression. This facility had previously been allowed to sell brine to Montezuma County, among other jurisdictions, but it fell out of compliance with CDPHE in May 2017 due to reporting and labelling violations and its permit was revoked (Mimiaga, 2017).

In the meantime, the agency has deliberated over whether allowing roadspreading of produced water (also known as oilfield brine) is consistent with safeguarding public health and

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the environment. CDPHE must now determine the best course of action, as its decision may set a precedent in a state where several other facilities desire to apply such on-site or purchased produced water toward beneficial use and roadspraying.

The purpose of this project is to provide CDPHE with added knowledge and perspective on how produced water, including that which originates from fracking operations, is dealt with elsewhere vis-à-vis beneficial use and roadspraying. This paper tackles two primary research questions: What dust suppression-related policies and practices govern beneficial use of produced water in other states? And under what conditions should produced water be approved for beneficial use on Colorado roads? In gathering data on policies and practices seen in other states and applying this information to Colorado, the paper develops recommendations to CDPHE on whether to allow produced water for these purposes. Further recommendations are offered on how CDPHE can best proceed in the areas of implementation, consideration of alternatives, solicitation of stakeholder input, framing, and justifying its decision.

Organizational Profile

The Colorado Department of Public Health and Environment (CDPHE) is a cabinet-level state agency of Colorado whose primary responsibility is protection of public health and the environment, as its title suggests. CDPHE's mission is "to protect and improve the health of Colorado's people and the quality of its environment", while its official vision is that "Colorado will be the healthiest state with the highest quality environment." CDPHE uses evidence-based practices and responds to emerging issues with the goal of creating a healthy state populated by healthy people. The Department head functions as the state's chief medical officer, and the agency's budget is approximately \$563 million. Originally founded in 1876 as a nine-person health board, CDPHE now employs 1,311 people, most of whom are based at the agency's

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Glendale campus as well as its central laboratory in Denver.

Literature Review

As a relatively young policy issue, beneficial use of produced water does not feature an enormous amount of extant literature, especially when narrowed down further to dust suppression and de-icing practices, specifically. While comprehensive, reliable studies focusing on the use of produced water for dust suppression and de-icing are practically nonexistent, a body of research on the beneficial use of produced water in general is available and, taken together with literature on water management at oil and gas sites, the environmental and public health impacts of hydraulic fracturing and other energy extraction, energy production in Colorado, and public engagement, it is possible to build a foundation for the research at hand.

Basics of produced water in the West: Arid Western areas of the United States, such as Colorado, lie at the forefront of the water-energy nexus. This nexus pits the health and volume of water systems that citizens depend on for drinking water, agriculture, recreation, and other functions against the needs of oil and gas interests, which depend equally on an ample, accessible water supply for everyday operations (Sullivan Graham, Jakle, & David Martin, 2015). As droughts continue to afflict the West, one major implication of the water-energy nexus is that wastewater from Western oil and gas operations is slowly coming to be regarded as an asset, rather than a liability (Dallbauman & Sirivedhin, 2005).

In Colorado, the number of active unconventional gas wells more than doubled between 2000 and 2015 from 22,228 to 53,228, with much of this growth occurring in the Wattenberg Field of the Denver-Julesburg Basin (Rosenblum et al., 2017). Over 41,000 acre-feet of produced water was generated in the state in 2012, with about half of this total originating from the Western Slope (Colorado Energy Office & Colorado Mesa University Water Center, 2014).

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Broadly speaking, Colorado water law regards industrial re-use of produced water as a valid use of water. If withdrawn and used within the same geological basin, Colorado regulators may allow well operators to re-use this produced water for dust suppression on operators' lease roads without a permit, as long as it is non-tributary, as per CRS § 37-90-137(7) (Colorado Energy Office et al., 2014). If an underground body of produced water is classified as tributary, a permit must be sought from the State Engineer prior to extraction so as to safeguard vested water rights (Vance v. Wolfe, 2009).

Management, treatment, and composition of produced water: Fracking fluids are used to puncture, widen, and otherwise create passageways within rock through which hydrocarbons can be extracted. Fracking fluids normally re-emerge at the surface on the first day and in the first two to three weeks after initial fracturing of shale-containing rock, when approximately 10-40% of fracking fluid returns out through the wellbore (Gregory, Vidic, & Dzombak, 2011), but remnants of fracking fluid may persist below ground for years. On the other hand, produced water (also known as formation water or oilfield brine) is water that naturally exists in geological formations underground and which flows up to the surface gradually via the wellbore upon drilling. Produced water typically features high salinity, with varying salt levels depending on site-specific geology, but aside from the addition of some maintenance chemicals over the life of a well, produced water contains fewer, only trace amounts, or sometimes none of the industrial chemicals that are a signature of fracking fluids (Konkel, 2016; Silva et al., 2017). In other words, fracking fluids are distinct from produced water, but at times produced water may contain lingering constituents from fracking fluids and flowback.

Water management in the field of unconventional gas drilling entails a water life cycle

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consisting of five primary stages: water acquisition, chemical mixing, well injection, flowback and produced water generation, and treatment and disposal (Torres, Yadav, & Khan, 2016, 480-483). As Schaffer et al. (2013) indicate, management of produced water from oil and gas operations is highly dependent on underlying economic factors which are shaped by the volume and quality of produced water at hand, the nature of state and federal regulations, infrastructure available for treatment and handling, geography, and geology. In the oil and gas industry, a full 5-15% of all drilling and related management expenditures are spent on water management, transport, storage, disposal, and treatment (Silva et al., 2017). By some estimates, over 98% of produced water in the United States is currently reinjected underground (Schaffer et al., 2013; Farag & Harper, 2014). A total of 20 billion barrels of produced water are created each year in the United States from all conventional and unconventional oil and gas operations, of which an estimated 3.5 billion barrels can be attributed to unconventional gas drilling such as fracking (Silva et al., 2017).

As many researchers note (Schaffer et al., 2013; Pichtel, 2015; Silva et al. 2017; Torres et al., 2016), produced water can contain a variety of constituents known to deleteriously impact environmental and human health, including total dissolved solids (TDS), suspended solids, dissolved and suspended organic compounds (including volatile organic compounds [VOC's]), high concentrations of salt (brine), industrial chemicals introduced during fracturing, heavy metals, bacteria, scaly (hard or course) substances that can corrode storage or treatment infrastructure that they come into contact with, hydrocarbons, and radioactive isotopes. Plenty of these compounds and substances are toxic to humans even at exceedingly miniscule concentrations (Silva et al., 2017). This is especially true of VOC's, including benzene, toluene, ethylbenzene, and xylenes (Silva et al., 2017; Schaffer et al., 2013). According to Farag &

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Harper (2014), both acute and chronic exposure to sodium chloride and bicarbonate adversely affect the health of aquatic species, possibly through ionoregulatory upset, which alters enzyme levels in aquatic populations. These constituents are common in produced water, and if applied to roads for dust suppression and de-icing, may migrate into water bodies and harm aquatic life. It follows that drier ecologies like Colorado are less well-equipped to flush out salinity and sodicity, since there is less precipitation to help dilute values (Dallbauman & Sirivedhin, 2005).

Treatment and desalination prior to re-use most often aims to reduce TDS levels through thermal or reverse osmosis membrane technologies, but other target constituents and treatment technologies are frequently combined and included as well (Schaffer et al., 2013; Pichtel, 2015). As illustrated by Pennsylvania's recent experience, produced water should not be sent directly to municipal water treatment plants after extraction. The state found that concentrations of radionuclides, heavy metals, and chlorides were actually higher in water bodies downstream than upstream from municipal treatment plants that were receiving produced water. Upon this discovery, Pennsylvania compelled pre-treatment of virtually all produced water at central industrial sites in 2011, and by 2015 the Environmental Protection Agency (EPA) had promulgated national rules and guidelines on pre-treatment prior to processing at municipal facilities (Silva et al., 2017). Proppants, gellants, foamers, cross-linkers, breakers, acids, pH control, biocides, corrosion inhibitors, scale inhibitors, iron control, clay stabilizers, defoamers, friction reducers, and surfactants are among the multitude of chemical classes found in injected fracking fluids and, taken together with traditional constituents found in formation water, create immense challenges in unpacking possible threats to public health and the environment (Pichtel, 2015; Silva et al., 2017).

The specific geological characteristics of each hydrocarbon basin dictate TDS levels and

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other produced water characteristics that inform treatment and management. In the case of hydraulic fracturing flowback, it is common to find industrial chemicals, unlike in produced water, but salinity levels and TDS are typically lower than that of produced water (Hume, 2015; Colorado Energy Office et al., 2014). This allows for easier and more cost-effective treatment, as high salinity presents an impediment to treatment processes. On the other hand, saltier samples of produced water also tend to possess heightened concentrations of radionuclides (Rosenblum et al., 2017; Brown, 2014; Silva et al., 2017). Some researchers have found that diluting radioactive oilfield water with acid mine drainage, another common pollutant in the West, can reduce these heightened radioactivity levels and double beneficial use (Brown, 2014).

By some accounts, and contrary to estimated reinjection rates noted above, up to 5% of all wastewater from oil and gas operations in the United States is released to the environment illegally or accidentally (Konkel, 2016). This reality, along with the fact that each horizontal fracturing well uses between 2 million and 5 million gallons of water in its lifetime (Konkel, 2016; Pichtel, 2015), has created an added impetus to re-use water in the West. Re-use and recycling of produced water, however, requires infrastructure overhauls and capital expenditures such as enhancement of treatment systems, tank and pit storage, pipelines, and pump stations (Sullivan Graham et al., 2015).

Implications for ecological and human health: Konkel (2016) uncovers several other items of note relating to produced water. Most importantly, very little is known about how various carcinogens and other toxicants found in produced water affect human health and the environment, as studies on specific compounds are rare and establishing correlation-causation is difficult. Although the EPA has gathered and released to the public a list of toxicity values for over 1,600 chemicals found in fracking operations, the effort suffers from enormous gaps in

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toxicological data that could ideally be used to form risk assessments and gauge what levels of daily exposure present a threat to public and environmental health (Konkel, 2016). As it stands, a sizeable and growing body of epidemiological research demonstrates an association between close proximity to drilling operations, including fracking, and incidence of birth defects, miscarriage, decreased semen quality, and other endocrine disruptions. One experiment on mice found that exposure to both high and low levels of fracking-related chemicals increased hormonal and estrogenic abnormalities, and a separate study of water samples in spill-prone drilling areas of Garfield County, Colorado found well-above-average levels of endocrine disruptors that affect humans (Konkel, 2016).

Moreover, Colborn, Kwiatkowski, Schultz, and Bachran (2011) identified 353 chemicals found in ingredients used for natural gas drilling and discovered that a large percentage may damage human health in both the short- and long-term, even if symptoms are not expressed right away. Specifically, over 75% of these chemicals can affect the respiratory system, the gastrointestinal system, the liver, and sensory organs such as eyes and skin, while over half exhibit effects on the nervous system and brain. Highlighting organs susceptible to long-term, chronic damage, 52% of these 353 chemicals affect the nervous system, 40% affect the immune system and kidneys, 46% affect the cardiovascular system, 37% affect the endocrine system, and over 25% can cause cancer. More than 40% have also been demonstrated to harm ecological systems. Further, according to Colborn et. al, the little-studied chemical makeup of evaporation ponds and pits feature the most extreme toxicity of the natural gas process, and all but one out of the 40 evaporation infrastructure-related chemicals researched appear on the EPA's Superfund registry. But without expanded data and testing that accounts for baseline health outcomes measured against human health near drilling sites, there is no way to accurately associate specific

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chemicals found in produced water and flowback with adverse health effects (Konkel, 2016).

Salinity and geological chemicals in fracking fluid-laced flowback water are generally more diluted than in produced water (Silva et al., 2017), but said water does contain a range of contaminants that do not naturally occur in liberated underground water formations. New figures indicate that about 18.9% of chemicals in fracking fluids (one to two percent by volume) are withheld from public disclosure (Konschnik & Dayalu, 2016). The exact makeup of these varying proprietary mixes is likely to be unknown to authorities, but such mixtures are now widely recognized to contain endocrine disruptors and other constituents toxic to human health (Konkel, 2016; Pichtel, 2015). Nevertheless, in some cases, produced water can be more hazardous than fracking fluid used at the same well, owing to millennia-long geological seepage into the ancient seabeds from whence produced water is drawn. Additionally, depending on underground geology, a drilling site may generate more flowback water than produced water (usually in the case of dry formations), or vice versa (Silva et al., 2017). When not re-used on-site toward further drilling, these wastewaters are most often disposed of via off-site injection wells, evaporation ponds, transport to treatment plants, controlled release to natural water bodies (when deemed safe), and agricultural application (Pichtel, 2015; Torres et al., 2016). Gregory et al. (2011) articulate the benefits of on-site re-use, including a lessening of water volumes that need treatment, lower costs as transport and hauling are obviated, and a geographical reduction in environmental risk and footprint, but technical drawbacks such as potential declines in gas production may also occur when the same produced water is repetitively used in gas wells.

Roadspreading of Produced Water: Currently, the utilization of produced water for dust suppression only accounts for a miniscule portion of produced water re-use, but momentum is gaining to divert increased amounts of wastewater toward roadspreading, rather than to deep-

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well injection. In 2009-2010, only 0.007% of all produced water generated in the Marcellus Shale region was directed toward dust suppression on roads, although a separate figure indicates that 3% of Pennsylvania's produced water is roadspread (Torres et al., 2016; Skalak et al., 2014). One study found that beneficial use of produced water for de-icing elevates radium, strontium, sodium, and calcium levels in roadside soils (Skalak et al., 2014). Another study examined the effectiveness of dust suppression using produced water on three unpaved North Dakota roads, concluding that the produced water at hand failed to decrease dust loading (Graber, Hargiss, Norland, and DeSutter, 2017). Yet another study found that inadequate administrative oversight and an absence of site-specific pre-assessment of environmental impacts led to harmful spreading of oilfield brines in an aquifer recharge zone in Ohio (Eckstein, 2011). Data on existing roadspreading is otherwise scarce.

Public attitudes and involvement: As for public perceptions of energy development, hydraulic fracturing, and related regulatory oversight of public health, Hagstrom, Lyles, Pattanayek, DeShields, and Berkman (2016) explain that skepticism and alarm are coursing through many citizens and advocacy organizations. Recent well-publicized incidents, such as the lead crisis in Flint, Michigan, and the questionable application of Chevron's produced water on California agriculture, have brought increased negative attention to industry practices and governmental failures to safeguard public health. Therefore, it is important that policy decisions surrounding produced water account for sensitivities and misgivings expressed by members of the public and interest groups who are wary of contamination. To better understand public perceptions on fracking flowback re-use and management, Theodori et al. (2014) surveyed residents of the Marcellus Shale region of Pennsylvania, the setting of a major ongoing shale gas play. This study is summarized in Appendix A. Both Hagstrom et al. (2016) and Theodori et al. (2014)

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agree that increased collaboration, transparency, and trust-building with the public on the part of government and industry will be necessary to assuage citizen concerns.

When setting policy and practice on hydraulic fracturing, Perry (2012) recommends a distinct framework for gauging nonmonetary and non-quantitative impacts of natural gas and other drilling. Since purely scientific and technical appraisals often fail to account for the full effects of an action or policy on a social, community, cultural, environmental justice, or psychobehavioral level, a more holistic approach to risk assessment is appropriate. With ecological, regulatory, and industry variables as inputs, Perry develops a community-based method of calculating risk that supplements scientific and technical considerations. This same framework can be applied to policymaking on beneficial use of produced water so that a more wholesome picture of risk may emerge and the under-measured long-term and cumulative impacts on ordinary people may be better understood by policymakers from the outset. To Perry, consultation with the public is an integral first step in crafting policy rather than a last step that precedes a final decision and follows the heavy lifting of technical and practical analysis.

A 2014 Grand Junction stakeholder summit on produced water, hosted by the Colorado Energy Office and Colorado Mesa University, revealed a willingness among myriad actors across Colorado to enhance re-use and recycling. A summary of this summit can be found in Appendix B. All in all, participants broadly agreed that clarification of the state's regulatory structure relating to dust suppression is overdue (Colorado Energy Office & Colorado Mesa University Water Center, 2014).

As a whole, a review of the literature suggests that increased unconventional oil and gas development in the West has created a bevy of water management challenges that interact with the West's need to conserve clean water. As production brine has been displaced from

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geological formations and put to beneficial use, many negative ecological and human health impacts have been recorded, raising the suspicions of the public, academia, government, and others. To this day, though, very little research has been carried out on roads spreading of produced water, and where it has, generalizable findings are few and far between.

Methods

This research project is of a qualitative, descriptive nature, and aims to answer the following research questions:

- What dust suppression-related policies and practices govern beneficial use of produced water, including that which contains constituents from hydraulic fracturing flowback, in other states?
 - When deciding to approve or disallow produced water for beneficial use on roads, how have other states framed and justified their decisions? What experiences influenced these decisions?
- How do Colorado's particular circumstances affect the decision to approve or deny produced water for beneficial use on roads, and what helps or hinders the effort in Colorado to implement this decision? In other words, under what conditions should produced water be approved for beneficial use on Colorado roads?
 - What regulatory approach should Colorado decide to take?

Interviews via phone were conducted with relevant agencies in a total of 11 states. Of these, all six states that allow off-site roads spreading of produced water (Michigan, New York, North Dakota, Ohio, Pennsylvania, and West Virginia) were sampled, as well as five that do not permit off-site roads spreading (Arizona, California [Central Valley Region], Oklahoma, South Dakota, and Texas). In-depth interviews were used for the former states, while the latter were asked a less-expansive series of questions due to their restrictive policies. Prior to interviews, familiarity with the basics of pertinent state policies was attained so as to help guide interviews.

This research also entailed a supplementary stage-setting element that helps answer the second research question relating to underlying circumstances that would be necessary for approval in Colorado. To provide added insights, a small series of interviews were conducted

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with in-state and out-of-state experts and relevant actors. Industry representatives, environmental protection specialists, university researchers, and others that boast high levels of relevant knowledge and expertise on produced water and dust suppression were consulted and their perspectives and experiences on the matter chronicled. This element helped develop recommendations and translate state-to-state findings to the Colorado context.

During the process of gathering data, various components of the issue were grouped together into four categories according to general theme:

Regulatory/Legal:

- Legal and regulatory status of roadspraying using produced water;
- Types of beneficial use allowed, such as dust suppression and de-icing;
- Agency jurisdiction over regulation/management: on-site, off-site, types of waste, delineation of regulatory tasks, etc.;
- Who, exactly, may physically apply the water (operator, intermediary, etc.);
- Whether beneficial use rules are codified in law/official policy, or through guidance;
- Whether there is a uniform policy or a case-by-case basis for permitting roadspraying;
- Any proposed changes, including rejected proposals (and reasons for rejection);

Practical Considerations:

- States' positions on application and measurement of fracking flowback water (distinct from normal produced water);
- Runoff controls for road applications, such as rules on frequency, duration, and volume;
- Tracking and monitoring;
- Facilitators for implementing beneficial use of produced water on roads;
- Impediments to implementing beneficial use of produced water on roads;
- Level of concern over increased salinity and related harmful effects on ecology;
- Costs of transporting produced water, and other economic aspects;

Technical/Scientific:

- Specific chemicals/substances required to be tested in order to grant beneficial use;
- Overall testing criteria, including if brine is tested for accurately;
- Whether current testing and sampling is considered adequate;
- Extent of knowledge on the makeup of produced water and flowback;
- Alternative commercial products used, compared, or tested;
- Treatment options and present realities;
- Geological considerations;

Stakeholder/Public Input, and Framing/Justification of Current Policy:

- Stakeholder process(es) surrounding promulgation of rules/guidelines on produced water;

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- Whether states' decisions on the matter are political, economic, or technical/scientific;
- Justifications for current policies to the public, industry, and government;
- Conditions necessary for permission of roadspraying using produced water;
- State-specific experiences that influenced decision-making

Trends, patterns, and phenomena useful to CDPHE's decision-making process contained within these four categories are unpacked and presented in the *Results* section.

In selecting the most appropriate sample of states for the research at hand, it was decided that an attempt would be made to gather data from every roadspraying state, which was successful. The remainder of the sample comprises states whose geographies, geologies, political and regulatory traditions, and industrial bases substantially resemble those of Colorado. Other such states were contacted, but only the five included here were available for interviews.

Internal validity is achieved, as the data gathered from representatives of state agencies is truthful and relatively complete. Reliability is achieved, as a subsequent researcher can use the same framework and interview questions to piece together similar results on beneficial use of produced water as presented in this paper. It was crucial to construct clear questions, ensure confidentiality, and meticulously record responses so that validity and reliability are upheld.

Results

Findings from interviews shed light on roadspraying practices and experiences throughout the country. Detailed results from roadspraying states can be found in Appendix C, from non-roadspraying states in Appendix D, and from experts/relevant actors in Appendix E.

Roadspraying States:

Regulatory/Legal: Six states in total currently allow the use of produced water for roadspraying on a wide scale beyond lease roads, with all banning fracking fluids. West Virginia only allows oilfield brine for winter management such as pre-wetting, anti-icing, and de-icing on roads, and Pennsylvania limits roadspraying to dust suppression and road stabilization, but Michigan, New

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York, Ohio, and North Dakota allow roadsreading during any season for both dust and ice management. These states regulate roadsreading through their respective environmental, health, and natural resources agencies, with some shared duties at times. Additionally, Ohio's Department of Natural Resources and New York's Department of Environmental Conservation leave the decision of whether or not to allow roadsreading of produced water up to local and county governments, only choosing to set and enforce standards for those jurisdictions that do elect to roadsread. Many counties in the Western, energy-producing region of New York permit the spreading of oilfield brines, while other Downstate/Eastern counties expressly prohibit the practice, partially for political reasons and fear of public outcry. In Ohio, local governments must pass an authorizing resolution before roadsreading can be initiated within their jurisdiction. Formal Beneficial Use Determinations (BUDs) are only required in New York, but the other states often feature approval processes that function similarly.

Table 1: Brief Summary of Roadsreading States

State	Regulatory/Legal	Practical	Technical/Scientific	Rationale/Framing
Michigan	Allowed for dust/ice control, codified	Historical use	7 constituents tested	Legal, public safety on roads, no contamination seen
New York	Allowed for dust/ice control, codified	Historical use	15 constituents tested	Economic/scientific, environmentally sound
North Dakota	Allowed for dust/ice control, guidance	Historical use	20 constituents tested	Scientific, comparison to market alternatives
Ohio	Allowed for dust/ice control, codified	No major historical use	0 constituents tested	Political/economic at first, scientific after, no contamination seen
Pennsylvania	Allowed for ice control/road stabilization, guidance	Historical use	5 constituents tested	Political/scientific/economic, no widespread impacts
West Virginia	Allowed for ice control, guidance	No major historical use	13 constituents tested	Economic/scientific, comparison to market alternatives

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Typically, these states require brine storage plans and roadspreading plans detailing application rates, volumes, durations, runoff control, and locations prior to approval. Parameters on runoff controls and rules on application are set by all states, which are in place to prevent oversaturation and migration to water bodies. West Virginia, for instance, sets a maximum application rate of 10 gallons per ton during pre-wetting, 50 gallons per lane mile during anti-icing, and 100 gallons per lane mile during de-icing. However, in some cases such as Pennsylvania's and North Dakota's, application specifications are simply guidelines and not stringent rules. Moreover, New York delegates rules on application rate, frequency, duration, and volume to local governments. In all permitting states, logs must be kept by spreader trucks detailing time, location, volumes, rates, and geological sources of produced water applied, but in practice tracking and monitoring is nearly nonexistent in most states, and it is difficult for state agencies to access roadspreading records, some of which are not well-maintained, from busy county supervisors. Some states also require hauling and waste transporter permits.

Three states have codified their roadspreading regulations, while the other three regulate through guidance. Criteria during initial permitting are more stringent than afterward, and annual re-approval is found in Pennsylvania. High-volume fracking well water is ineligible for roadspreading in all states, while only low-volume fracking operations may provide brine in Michigan and New York (where fracking flowback and fluids are banned), and only very few cases of horizontal wells in specific formations supply brine in Ohio. Unconventional wells are banned from providing brine in Pennsylvania and West Virginia, while shale formations only very rarely supply brine in North Dakota, where flowback and fracking fluids are also banned. Despite approval, roadspreading does not occur in West Virginia due to the economics of testing.