

PANEL: WATER RIGHTS ISSUES OF PRODUCED WATER

***Bill Hume** was born in Albuquerque and moved to Socorro prior to fourth grade in school. He graduated from Socorro High School, attended the University of New Mexico, with a three-year vacation from 1960-63 spent in the U.S. Army, mostly in southern Germany. Bill started with the Albuquerque Journal in November 1966. He graduated from UNM in the spring of 1967 with a degree in journalism and minors in German language and economics. At the Journal, Bill served as police reporter, general assignment reporter, science and military reporter, state editor, investigative reporter, editorial writer and, for the last 18 years of his tenure there, editorial page editor. On January 1, 2003, he joined the staff of Governor Bill Richardson as director of policy and strategic planning. Bill is married to Elizabeth G. Hume and has two children, a son age 24 and daughter age 19.*



***Mark E. Fesmire** was raised in the area around Cloudcroft, New Mexico. He graduated from the New Mexico Military Institute and spent more than a year on an offshore seismic crew before attending NMSU. After graduating from NMSU with degrees in geological engineering and civil engineering, Mark spent 12 years as a petroleum engineer in the Permian basin. He then went to law school and worked for Criminal District Attorney's offices in El Paso and Lubbock. Mark spent six years practicing oil and gas, environmental, bankruptcy, and criminal law (including representing the defendant in several death penalty murder cases). Mark subsequently moved back to New Mexico and spent five years as the head of the Hydrographic Survey Bureau of the Office of the State Engineer. He has been with the Oil Conservation Division since May of this year.*



Panel Discussion

Matthew Lavery, Director of Water Resources, has been an employee of PNM for 27 years, has held numerous positions of increasing responsibility at PNM, and is the developer of the Kirtland, NM Area Produced Water Project. In his current position, he is responsible for the negotiations and procurement of water supplies for the PNM San Juan Generating Station as well as the management of all other water resources for PNM facilities. Matt oversees the engineering and project management services in support of the gas and oil plants as well as other assigned projects. He serves on the Water Development Steering Committee of the San Juan River Recovery Implementation Program, served as a key member on the San Juan Basin Shortage Sharing Principles and Recommendations team, and helped develop and lobby for the passage of a piece of produced-water legislation that passed in the 2004 legislative session. He was a key developer of the San Juan River Selective Fish Passage.



Paul Saavedra is a 1978 graduate of the University of New Mexico with a bachelor's degree in civil engineering. He is a Professional Engineer registered in New Mexico. Paul has been employed by the Office of the State Engineer for more than 25 years. His duties have included Dam Safety Program, National Flood Insurance Program, Acequia Rehabilitation Program, WATERS Program, Water Rights Administration, Hearing Examiner. Paul has been Director of the Water Rights Division for the past seven years.



Frank Yates, Jr. was raised working in the oil fields around Artesia, New Mexico from the age of fifteen. He earned a bachelor's degree in mechanical engineering from NMSU in 1979 and is a registered Professional Engineer in the states of New Mexico and Arizona. Frank has continued studies in environmental and geosciences and business administration. Currently, he is President of Myco Industries Inc. and a vice president of Yates Petroleum Corporation. Frank is past President of the Independent Petroleum Association of New Mexico and is currently a member of the executive committee of the New Mexico Oil and Gas Association. In addition, Frank has served on many other boards and committees including the boards of First National Bank of Artesia and the Community National Bank of Midland, Texas. Frank is an accomplished multi-engine, instrument-rated pilot with 17 years of experience and more than 2,600 hrs of total time. He enjoys many outdoor sports, primarily snow skiing, but also hiking, golfing, and bicycling. His wife, Mary, is an accomplished business professional. He has three adult children: Tyson, Tao, and Tevis.



PANEL: WATER RIGHTS ISSUES OF PRODUCED WATER

Bill Hume

(moderator)

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I'm Bill Hume, Director of Policy and Strategic Planning for Governor Richardson and before that, longer than I care to remember, I was at the *Albuquerque Journal* where my specialties and interests were water matters and through that path is how I ended up here moderating this panel. I am pleased to be here to participate in what I think will be a very informative discussion on an issue long on backorder in the State of New Mexico water dialog. Here to discuss this topic are Mark Fesmire of the New Mexico Oil Conservation Division, Matt Lavery, of Public Service Company of New Mexico (PNM), Paul Saavedra of the Office of the State Engineer, and Frank Yates of Yates Petroleum Corporation. We

approach this topic from the unique viewpoints of agencies and industry.

So when is water not water? When it is produced water. Strictly speaking, that is a fact under New Mexico water law as it has evolved. Produced water is that which emerges from the far depths of oil and gas wells presumed disconnected from the fresh water aquifers and surface water flows. It comes to the surface with a hydrocarbon as a waste product and usually with a witch's brew of contaminants. Historically, its disposition has been a chore and a problem for the oil and gas industry.

Why do I say it is not water? Because the state constitution provides that all waters of the state are

the property of the state subject to beneficial use and priority use. If produced water were treated legally as water, oil and gas users might be obliged to obtain water rights to cover their wastewater that they pump up from below the surface. Heck, they might even face the task of putting that water to beneficial use instead of simply disposing of it as a waste product.

So instead it evolved as an issue under the control of the Oil Conservation Division rather than under the Office of the State Engineer. I think both offices were happy to see it go that way, but the story doesn't end there. I was presented with the produced water problem at the Decision-Makers Conference hosted by New Mexico Tech a couple years ago. We were told of the case where the Four Corners Mine serving the Four Corners Power Plant had made a deal to use produced water from an area hydrocarbon producer to water mine roads to suppress dust - tilt. If that produced water were put to beneficial use, dust suppression, it was transmogrified into wet water instead of a hydrocarbon contaminant and thus came under the aegis of the State Engineer. Oil and gas operations would have to acquire water rights to offset their depletions for their very deep wells. The situation was eventually worked out, but this illustrates exquisitely the contrasting legal treatment of water as wet stuff and water as produced water. We have come a long way in the last two years of modifying the law on produced water and in ways to make it usable as an asset instead of a waste product, but produced water like the conclusion of the Da Vinci Code is something people either know a great deal about or very little.

Consequently, we are going to start this discussion with Paul Saavedra with an overview of the history and recent legislation concerning produced water in the New Mexico oil and gas industry. With that background to work from, we will take questions from the audience, comments from the panelists, and, in general, to see if we can improve everybody's understanding of produced water and its evolving place in water use and conservation in the 21st Century.

Paul Saavedra

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Thank you, Mr. Hume. Our panel got into it before we started and hopefully we have something left for

you. I want to go over a completely neutral presentation. When I first put the presentation together, I put together arguments the State Engineer uses for produced waters. I then revised the presentation and will try to give you just the issues. I think we will all have something to say afterward.

In 1951 the first disposal well was authorized. In 1956 responsibility for inspection of oil drilling operations was delegated to the Oil Conservation Division (OCD). In 1957 the State Engineer did not require an application for brine water flooding but did for fresh water. OCD in 1959 required a permit for water flooding under Rule #701, and in 1961, OCD was given unquestioned jurisdiction over salt water disposal, and an order for lined pits was issued in 1968.

On April 13, 1967 the State Engineer designated all underground water in the State of New Mexico containing 10,000 parts per million or less of dissolved solids as fresh water. This relates directly to an OCD statute to protect fresh water and the State Engineer designated 10,000 parts per million as fresh water.

As Mr. Hume mentioned, the State Engineer has jurisdiction over the appropriation of public waters for beneficial use and a permit from the State Engineer is required to put water to beneficial use. This is reiterated in the New Mexico Constitution in Article XVI and is also reiterated in the New Mexico Statutes, NMSA 1978, Section 72-1-1 being the main statute, but 72-12-1 is the groundwater statute: "The water of underground streams, channels, artesian basins, reservoirs or lakes having reasonably ascertainable boundaries, are hereby declared to be public waters and to belong to the public and to be subject to appropriation for beneficial use."

The Oil Conservation Division has the authority to make rules and regulations and orders for the purposes and with respect to the disposition of any water that is produced or used in conjunction with the drilling for or production of oil or gas. This is in the New Mexico Statutes, NMSA 1978, Section 70-2-12.

There has always been cross jurisdictional rivalries between OCD and the Office of the State Engineer over produced water. Some of the recent legislation that was passed in 2002 was House Bill 388 that allowed for a tax credit for produced water to be delivered to the Pecos River. Once that water was delivered to the Pecos River, it transferred title over to the Interstate Stream Commission. This statute was passed for the purpose of trying to get water into the Pecos River, to give water to Texas, and to alleviate our problems with the Pecos River Compact. The law

does still exist though it has never been used. Many, many problems have been encountered when trying to get it used, mostly regarding the National Pollutant Discharge Elimination System (NPDES) permit for putting water into the Pecos River. The facilities are there, the produced water is there, but the procedure for delivery of the produced water has never been worked out.

This year the main bill, Senate Bill 313, which passed in 2004 and was signed into law, says: “No Permit is required from the State Engineer for the disposition of produced water in accordance with rules promulgated pursuant to Section 70-2-12 NMSA 1978 by the Oil Conservation Division of the Energy, Minerals and Natural Resources Department.”

We met with OCD and we are going to cooperate; rather, the State Engineer is going to be part of the process for the promulgation of rules for the oil and gas division. This legislation also spells out exactly what the produced water can be used for: to regulate the disposition of water produced in connection with the drilling for or producing of oil and gas or both. OCD and the new rules and regulations address direct surface or subsurface disposal of the water including: disposition by use in drilling for or in the production of oil and gas, and use in road construction, other maintenance, or other construction.

The OCD has authority to allow use of produced water in the generation of electricity or in other industrial processes, in a manner that will afford reasonable protection against contamination of fresh water supplies designated by the State Engineer as fresh water supplies of 10,000 parts per million or less of dissolved solids.

As I said before, the Oil Conservation Division and the Office of the State Engineer have been meeting with each other over the years trying to work out our problems with each other and the cross-jurisdiction. We have had discussions over when oil and gas related water becomes water put to beneficial use, and over whose jurisdiction it is.

We are both interested in understanding the effects on New Mexico rivers by oil and gas production. We both support research aimed at maximizing the usefulness of marginal-quality waters and are seeking solutions that will allow the administrative processes at the state level to make these uses possible.

We both, and I’m speaking for OSE and the Oil Conservation Division, and I’m sure Mark Fesmire agrees with me, realize the emerging technologies and physical realities of produced water, and we support

the activities of the New Mexico oil and gas industry and at the same time need to meet the charge of caring for the water rights of the people of New Mexico.

This has been an overview of the conflict between the OSE and OCD over the years and Mr. Hume was right about the mine up in the San Juan Basin. At the time, it was used for gas production; they were pumping out water to get to the gas. The water directly affected the La Plata River so we required an offset. They put in another water pipe line to the river, and they dumped water into the river to offset the effects of pumping out the water for this gas production. About four years ago, we determined that what they were using the water for constituted beneficial use; we did require a permit to use the water and it created a lot of heartache for many people. With that, I’ll let someone else talk.

Mark E. Fesmire

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I think I agree with most of what Paul just said. The one part that I would point out right now is when he read the legislation that said “...the generation of electricity or other industrial processes...” I think he went over ‘other industrial processes’ kind of quickly. Our position is that it is essentially any beneficial use that you can put the water to. Now we can start by looking at the problem of a set of legislation, specifically, the conflicts between NMSA sections 70 and 72. The biggest thing that stuck out was that if we produce water with oil and gas, as long as we dispose of the water, there is no problem. But if we start putting that water to beneficial use, the water that we are going to have to produce anyhow, suddenly the jurisdiction by the Office of the State Engineer was brought in. So we ended up with a situation where as long as people were disposing of this water, as long as they were getting rid of it, there was no problem. But if they wanted to actually do something with the water, it generated a problem that we felt we had to address. And that was – at least since I have been involved – the idea behind the meetings we have been holding. The OCD actually has, as of Friday when I left the office, a first draft of a set of rules. Some of the things we are going to try to cover in the rules I want to lay out here for discussion: the people who put this water

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to beneficial use have to understand that the fact that they are putting the water to use will not create a water right in and of itself. The water right still comes under the jurisdiction of the State Engineer. OCD has the right to regulate the disposition of produced water, and that water right, as long as it is produced water, it can be used, but it does not create a water right. The other thing that we need to emphasize in our rules is that once the economic life of that petroleum well ceases to be, the right of the OCD to regulate that water ends. What happens after that, I am not sure, we are still trying to figure out where that goes.

The two points we must emphasize: no water right will be created and once the well ceases to be an economically viable oil or gas well, the jurisdiction of the OCD, because of the definition of produced water in the statute, no longer exists.

With that I think I will turn it over to...

Moderator Hume: One of our panelists is Matthew Lavery who is with Public Service Company of New Mexico and PNM's wish to use produced water in cooling at the Four Corners Plant was a prime mover behind the most recent law. That is one reason we have an interest in their expertise in this area.

Frank Yates, Jr.

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My name is Frank Yates and I am Vice-President of Yates Petroleum Company in Artesia in the southeastern part of the state. Our issues are a little different from what they are dealing with up in the Northwest. First of all I want to say, I am not a lawyer. I used to be an engineer in my past life. Now I know a little bit about a lot of stuff so that is really dangerous. I guess the reason I am here is that we have one of the few pilot facilities in operation in southeastern New Mexico. I use the term "operation" lightly because it has been somewhat sporadic, and having said that, I want to add to what Paul mentioned a while ago about one of the challenges of utilizing the tax credit for delivering water to the Pecos River because it is very technically challenging. So in addition to having to go through the NPDES permit process with the EPA, there are many technical challenges to cleaning up produced water and one of the points I would like to make with respect to that is that it may be quite sometime, perhaps decades, before we see a

considerable utilization of produced water for agriculture or other uses like residential uses. Having said that, I would like to also suggest that that is not the reason we undertook this project. As was also mentioned earlier, down-hole disposal of produced water from the oil and gas industry is an extremely expensive process. It is a big expense for our industry. So to the extent that we can reduce our costs for the disposal of produced water associated with oil and gas production, it enhances our ability to produce more oil and gas out of those same wells. And that is good for the economy in the state of New Mexico; it is good for the state's budget, which currently, a quarter to a third of the budget is generated by revenues from the oil and gas industry. I will conclude with those remarks at this point and we will probably have some questions later.

Matthew Lavery

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Good afternoon, my name is Matt Lavery. I am the Director of Water Resources for the Public Service Company of New Mexico. I feel kind of underdressed with these other gentlemen with whom I am sitting up here today. I don't wear a tie because I work for a living. PNM's interest in produced water came about because of a resource shortage that we were facing. In 2002, we were looking at having a 30 percent reduction in available water supplies at the San Juan Generating Station; not the Four Corners Generating Station, which has a senior right over part of the water supply that supplies the San Juan Generating Station. We were the junior water rights user for direct flow rights on the San Juan so we were at the highest risk. No shortage sharing agreement existed at the time and PNM is a 46 percent owner of the San Juan Generating Station and we are the operating agent as well. Eight other organizations stretching into California, Utah, Colorado, and Arizona get power from the San Juan Generating Station. We utilize about 22,000 acre-feet, fully consumptive, out of San Juan River. I think the San Juan River water usage is somewhere around 300,000 acre-feet a year. San Juan supplies about 60 percent of the power supply to PNM's New Mexico customers. Now PNM as a regulated utility is also a monopoly. But the flip side of that monopoly, which is a good thing from a business sense, is that you have an obligation to serve. So

regardless of our water situation, we were obligated to serve our customers and provide electricity. That is demanded by the state law that gives us the monopoly powers. We would have to have gone out and replaced power at a premium price, probably with gas generation when APS and PNM were in a 30 percent shortage. Financially, that could have been catastrophic for an organization like the San Juan Generating Station. Thus, our interest in produced water was to diversify our resource base for the supplies of the San Juan Generating Station. Our initial look shows that there was about 8,000 acre-feet of water brought to the surface from oil and gas drilling in the San Juan Basin. Since 1981, the San Juan plant has been a zero discharge plant. We completely recycle and consume all the water on the plant site. We have several million dollars worth of equipment. We have some excess capacity remaining in that equipment. So our initial effort was to go out to see if we could quickly and easily gather that oil and gas wastewater and clean it up with existing capacity. It did not happen. It is expensive and it is complicated. The regulations did not allow for it so we are trying to work through that and still trying to get an economic, viable, alternative diversification for our water supply. That is our interest in this issue.

Moderator Hume: Does anybody have any questions or comments at this stage?

Question: This question is for Mark Fesmire. Mark, on your attempt to try to quote the rules and regulations, you potentially used statutory language to state, in essence, that you could apply produced water to beneficial use in New Mexico and not create a water right. How do you get around the Constitution with this provision?

Fesmire: That is a question we are going to have to address. The way we are going to get around it in the short-run is to not call it beneficial use. We are going to call it dispositional produced water.

Moderator Hume: I am no lawyer but I used to play one in the newspaper business. That is the crux of this whole thing. The Constitution is specific that all the water belongs to the people and the State Engineer is charged with determining who gets to use it. But the water coming out of these wells is an expensive by-product that the oil and gas industry has to dispose of. And so it is a harmonic convergence if

we can figure out uses to put this water to. The legislation and regulations are always trying to shoe-horn this in and trying to make it work with the Constitution and also serve the public interest in putting this water to beneficial use. One man's expensive wastewater is another man's back-up water supply for cooling and power. As the water situation in New Mexico goes forward, the produced water, like everywhere else, as the price of water goes up, the technology and the inclination to take water that heretofore was not worth anything to put it to use goes up. Our water supply gets larger as Mark described.

Saavedra: Produced water has a definite future in the State of New Mexico. We have our rules, regulations, statutes and our Constitution that we must go by. We must protect New Mexico's rivers. We must protect existing water rights. We want to work with OCD and the oil and gas industry to figure out a way to be able to use this water that would help everybody, that would help the State of New Mexico, within somebody's jurisdiction anyway. In 2003, there was about 6 billion barrels of produced water. At 42 gallons a barrel, I think it is around 80,000 acre-feet of water. Now obviously, not all of that water is in a good place to be used and not all of it is of great quality that can be treated and then used. Most likely some of it can be used. So it is a source of water and whatever our problems are, we will work them out.

Yates: I agree with that and I also want to emphasize that this water is very challenging to clean up. It is not something that we are going to be able to take tomorrow or next year or even maybe in five years and show that it can be widely utilized for whatever purpose. It is very challenging water. In our case, in our pilot project currently, we have as far as I am aware, the only 7-11 permit from OCD to properly dispose of that water on the surface of the ground after it has been treated. According to OCD rules, the 7-11 permit process that you go through to land-farm oily waste requires meeting a lot of criteria with respect to where to locate these facilities, to till the soil, and to remediate the oil so that no subsurface or surface fresh waters are contaminated. We must be very careful about that. In our case, we treat this water and then take the resulting fresh water and put it on the ground. We have been working on this project for three years and we haven't put any water on the ground yet but we are getting close. We are always that close. But we haven't yet because it has proven to be very

challenging to clean this water up. One other question that I would like to address that popped into my mind was the issue of how this water might affect existing aquifers. Where are oil and gas found? I am not a geologist—my background is engineering, but in Oilfield Geology 101, you learn that in order to find oil and gas in the subsurface, you must have a source of hydrocarbons, which requires a reservoir. You must have rock with porosity and permeability and you must have a mechanism that will trap that oil and gas in the subsurface. By virtue of the fact that it is trapped gives you the opportunity to pull that water out of the ground without having an adverse impact on existing water rights in the subsurface or the surface. Now, certainly, there are questions of quality and we have quite a sophisticated set of rules and regulations that we have to comply with in order to ensure that we don't contaminate existing water sources. We have drilled some 70,000 wells in the state of New Mexico and by and large the vast majority of those wells have been drilled without any contamination problems. The point being that water comes from trapped reservoirs and doesn't affect existing water rights and water resources.

Moderator Hume: I have a question I would like to pose to Mr. Yates and Mr. Fesmire and it is a fact question. How much water do you get from a gas well and an oil well, the quality and the duration of the supply? The parameters of it would go toward how much you could invest in infrastructure to pipe that water somewhere and use it.

Yates: I think with respect to New Mexico, if I recall some of my numbers correctly, there is on the average about eight or nine barrels of water produced for every barrel of oil equivalent. Some wells make quite a lot more water than that and other wells don't make any water. Certainly if I am out drilling an oil and gas well, I would prefer to drill a well that doesn't make any water, just oil and gas. Unfortunately, that is not always the case. Having said that, oil and gas wells are not always conveniently located so as to facilitate their use and pipelines are extremely expensive. So generally, disposal wells are developed in the vicinity of a particular producing field in order to minimize the infrastructure needed to dispose of that waste.

Fesmire: Mr. Saavedra was very accurate. In calendar year 2003 in New Mexico, we produced a little over 636 million barrels of produced water. That

compares to 67 million barrels of oil or about 9.5 to 1. In some places, operators reported disposal costs for water in the neighborhood of \$4 to \$5 a barrel. It doesn't take much math to figure out that could be a problem. The biggest challenge we are seeing right now is in coal-bed methane and the amount of water it takes to de-water a coal-bed methane well and get it producing gas. We have some in place where it takes as long as a year before they get any gas whatsoever out of the well. So the problem is that we have a lot more water than we have oil and gas. We are hoping that through discussions like this, we can come up with some ways to deal with the situation; \$4 or \$5 a barrel just isn't economical to dispose of that water right now. We have some projects that the operator really has to look at and if oil and gas prices start to fall, we are going to lose some production.

Moderator Hume: Any questions from our audience?

Question: I want to pose a hypothetical question. My understanding is that you are spending millions of dollars getting rid of the water and you are spending millions of dollars trying to acquire the water or its economic market value. According to the desalination process we heard about earlier...if that filter works with this nasty stuff that is coming out of the ground, which is possibly 30-40 percent of the cost for just getting the water to the surface and whether it is a desalination plant here or wherever...there is an energy cost that will be reduced and then there is more energy used putting it back into the ground. If we leave it on the surface and come up with a membrane that works... would this group even entertain the thought about legislation...whether it might be economic development capital or R&D money for the desalination facility...and I am thinking particularly to the Clean Energy State Alliance...There was a piece of legislation introduced about three or four years ago that got smashed into nothing because of some environmental stuff...but it sounds like maybe that type of legislation [is needed] so that we could approach [the situation] from PNM's standpoint on the energy side and from the petroleum [industry] on cost savings...if we could come up with something...and from the State Engineer's standpoint for funding the millions and millions of dollars that Saavedra's organization needs to just implement...and get our arms around this huge problem. I would pose [the question] to [our moderator] Bill [Hume]. If we could draft some legislation that would be a cooperative effort...you

have the millions and millions of dollars that will make this or break this. Either this is going to be a novelty industry that will continue to flounder or New Mexico can step on board with this facility and really make it something special for the country.

Moderator Hume: In response to that I would say it is my impression, and I will be corrected if I am mistaken, but it is not just a matter of taking subquality water and treating it for use. I think there is a lot of brackish water that could be extracted and cleaned up for a lot cheaper than this produced water. So if it were strictly developing water supplies we would go in that direction first. And with regard to going there, the Governor got a \$10 million Water Innovation Fund from the Legislature last session...and the executive [branch] is in the process of going through a very interesting and varied set of applications from people who think that they have an idea that would work and be generally applicable to improve water supplies or water conservation in the state. I need to go back and find out how that is going because we should be getting close to an answer on that. Lastly, I learned a little bit—just before we started—about the nature of produced water. It varies considerably from one point to another, from produced water from the coal-bed methane wells, if I remember correctly, to relatively clean and relatively easy to treat water. Some water, from the very deep oil, is quite different and quite expensive. So in answer to your policy question, you are right, we should be and we are trying to get out in front of some of these technologies to help them develop and find better ways to make use of this water. With specific regard to produced water as a source of water for development, I think it ranks behind some other subquality water for development and treatment.

Lavery: I would like to respond to the question if I may. Purely from a legislative and regulatory perspective, there is a whole set of issues here. I have had the opportunity to spend the last two years working on a business case where we had a situation exactly like what you are talking about. Right away we went out and identified and estimated treatment that we think is currently the best in the industry, the lowest cost treatment. We have looked at the pipeline costs and the installation costs. We have looked at the regulatory costs and the legal costs and we came up with a project where it would take a 28-mile pipeline, about \$37 million in capital, and about 18 months to actually get it into service. The price comes out to

about \$1,200 dollars per acre-foot. Today we have a water contract that was negotiated in 1972 in which we get water from the Bureau of Reclamation for \$9 per acre-foot. PNM rate payers would have to pay the bill so what is prudent given the risk and given the cost of our current water? How far down the road do I look? One of the assumptions that I made in this case is that we would go out to the well producers and we would look at taking their water from them for 50 percent of their current cost. The current cost is about \$1 per barrel to reinject the water. The other \$3-\$4 dollars per barrel is usually transportation costs so even if you could put a very high-cost capital facility in place that could manage this water, you are not going to reduce, by straight reduction, the cost of disposing of the water. You still have to get the water to the facility whether it goes through a pipeline or it is trucked. You will still see three-fifths or four-fifths of the cost of disposal remaining because we have over 19,000 wells in the San Juan basin with 10,000 acre-feet. You have to gather the water up before you can treat it and that results in very high capital costs. Two years of study have gone into this. Senate Bill 313 was introduced by Representative Joe Stell and I thought it was very insightful that many people recognized the tax credit benefits that we were asking for. The state does not have the kind of money needed; it didn't last year and I don't know what the budget is going to look like this year, but we were asking for a \$1,000 per acre-foot. The people who are out in the field will have to develop the other half of the system with that \$1,000 an acre-foot. Our cost-benefit analysis for the project indicates that if we got \$6 million out of the \$10 million that the governor has for water project development and IF we could get a tax credit, the best we could do would be to get the cost of this water down to about \$250 an acre-foot. When we are currently paying \$9 an acre-foot that begs the notion of being prudent for the rate-payers who ultimately must pay. So theoretically it is possible, but in reality, it is much, much, more complicated. We entered into a cooperative agreement with LANL and the Electric Power Research Institute. We have worked with them trying to get the best technologies, the best information available, and we think we have an optimized model but it is quite expensive still. But given the risk, what is your price tolerance?

Comment: Thank you. That is the dialogue that I am sure we were all hoping for. I don't know what the

answers are. My only comment is, I would love to buy your \$9 per acre-foot water...

Lavery: It is not for sale. (laughter)

Question: I understand you are protecting shareholders value. Santa Fe water rights are about \$36,000 per acre-foot. In Albuquerque, I hear the numbers of about \$6,800 to \$10,000 per acre. I understand PNM's position. There are definitely economic models that will work quite well at \$1,200 an acre-foot. And I believe there is a private enterprising gentleman here who would write you a check this afternoon if we can get this legislation through. I think that spending ungodly amounts of energy on pulling water up and putting it back down is just ridiculous. I think you need to be paid for it. I think it was very generous of them to pay half of what it takes to go in.

Question: For those of us who are real laymen here, I am from Arizona, and we don't have water. What contaminants are you talking about and which ones are most refractory? Are you talking about a handful verses thousands or would this equate to a chapter in an organic chemistry book?

Lavery: The short answer is to go to the PRRC website. Martha Cather has one heck of a good database and you can get all the information that you will ever want to know on produced water from around the state. The database is quite diverse.

Yates: I can tell you that in our water, one of the challenges is hydrogen sulfide gas dissolved in the water. It is dangerous and we go through great lengths to protect ourselves and employees from H₂S gas. We also see BTEX (benzene, toluene, ethylbenzene, and xylene) and other volatile organics. Once we have removed these organics, we have the typical challenge of what else you find in the water, typical minerals and so forth like calcium, magnesium, manganese, chloride, and so on. That is the short answer.

Fesmire: To lengthen that short answer, we have found that we can more easily treat the hydrocarbon content than we can the salts. The salts are more of a problem than anything else. Then besides the salts, you can have man introduced constituents like corrosion inhibitors, naturally occurring radioactive material, and such.

Question: Has anyone gone down the path of looking at what sort of water quality permitting issues we are going to have to deal with? How we are going to deal with the New Mexico Environment Department and the State of New Mexico in putting this water down as irrigation water or into surface water...[how do we deal] with the regulator and permitting issues associated with water quality?

Lavery: Yes, PNM has looked at it. We think a lot of this has to do with the one-year application and site-specific permitting. We already have water permitting at PNM. We do take river water right now, we do have an NPDES permit, but we are a zero discharge plant, so I think the particular circumstances around your use and your industry and current permitting is a major driver.

Moderator Hume: You are right. When and if you reach the point where there is water, it will come up against all the regulations for quality of water.

Yates: As I mentioned earlier, we have one of the first 7-11 permits from the Oil Conservation Division to land-farm this fresh water that we have treated in our facility. We have taken the position that this water, with the method that we are utilizing, is still oil waste. Having said that, the 7-11 permitting process is still fairly complex. It addresses location and we had to test and monitor the ground where the application would occur. It was quite an extensive process and we have not done any NPDES permitting at this point ourselves. We have prepared only the land application, but as we go further on down the line and we look at monitoring that process, we will call on individuals in New Mexico in our organization who have extensive NPDES permitting experience from the state of Wyoming. I suspect we may look at that once we have perfected the operation of our facility that will enable us to take this water to the Pecos River. We have looked at it in detail and it is an ongoing process.

Fesmire: We don't envision any changes in the NPDES permit requirements, NM Environment Department requirements or in OCD environmental requirements. All we have talked about to date is basically the right to use it and the right to permit that use.

Question Part I: I have a couple of questions. One is for Matt Lavery. Matt, you have mentioned that PNM

is looking at leasing water to make up that risk difference and that new water that you have to lease for ground mitigation would cost more than \$9 per acre-foot. Where is that in relation to the \$1,200 for using the produced water?

Lavery: Yes, we have looked at all of that. The \$9 per acre-foot goes away after the end of 2005. That contract will expire and then the cost will obviously go up. Our total drought relief package of our aggregated resource cost for our drought water, which we picked up another 10 percent (we went out and contracted), so we had another 110% of maximum demand. That amounts to about \$228 per acre foot aggregated water cost for the plant. The cost of produced water is still significantly above that. However, the best case water project that we looked at produced between 8 and 10 percent of supply. That was the case I described earlier that requires \$37 million in capital costs and a 28-mile pipeline. Now there is one more thing that is deceiving about this project. These costs take into consideration that we already have massive infrastructure at the plant for handling the water. If we went out and found a green field site, you would probably double the costs.

Reply by person asking Question Part I: All the more reason for PNM to act as a role model in New Mexico and take on this project.

Lavery: We are trying. (laughter)

Question Part II: The second part of my question is directed to Mark's naturally occurring radioactive materials. This comes up at almost every conference that I've been to, but I've never heard anyone give a definitive answer as to whether or not the State has any regulations to deal with produced water that has naturally radioactive materials in it. Also, once we treat that water, what happens to those radioactive materials and how is it disposed? I guess that so far, since we dispose of them in wells, it hasn't been an issue, but since people are starting to develop a regulatory framework, have they considered this issue, and if they have, what is it?

Fesmire: Since I brought it up, I guess I better answer. It has not been a problem that we have paid a lot of attention to because where the radioactive materials are concentrated, it generally has to do with equipment retirement and we have been maybe a bit more lax than we should have been. Where it does show up in

the water, like you said, most oil field waters are being reinjected (a significant percent). We haven't come across the problem to where we believe we have to address it further than the federal government does, but sometime in the future we are going to have to pay attention to it.

Moderator Hume: Naturally occurring means naturally occurring. I recall the case of the Church Rock Tailings Pond break some years ago with one of the most radioactive spills anywhere in the country. The state health people were catching animals and testing them for radioactive materials that were collecting in their organs. I remember asking them if this spill was contaminating all the animal life down there. They couldn't say with certainty because they have naturally occurring outcroppings of radium and no baseline for knowing what concentration of radioactive materials would have already been in the wildlife living there. This isn't too exciting, this is not a concern that we should followed very closely because this stuff is everywhere and is probably in all of us.

Question: Just one question for Mark Fesmire. Mark, you mentioned early the number of barrels of produced water a year in New Mexico. How many barrels did you say?

Fesmire: During the year 2003, there were 635,744,000 barrels. This equates to about 82,000 acre-feet. That is statewide, not just Carlsbad. (laughter)

Moderator Hume: That's another factor with this produced water. You can't tap into it anywhere in the state. You have to be up in the northwest or down in the southeastern part of the state if you want to make use of produced water unless you want to pipe it a long ways. And that's on top of all the other expenses we have discussed.

Question from Lavery: Bill, I have a question for my fellow panelists. I'm under the impression that produced water is just the tip of the iceberg when it comes to using degraded groundwater. This water is more economical because it is already at the surface and you don't have to pump it. I think it would be in the best interest of the State, when we begin drawing up rules and regulations dealing with produced water, for that water to transition into standard utilization of groundwater as a routine water supply. I would like to know what the others think about that.

Moderator Hume: The very first thing I would say is that standard degraded water around the state all very securely belongs under the control and supervision of the State Engineer. So it doesn't really overlap with produced water. The produced water, the definition that I understand, sets it apart from all other water because of the fact that it is water that comes up incidental to oil and gas production.

Lavery: Currently we don't regulate anything over 10,000 TDS or, I think, greater than 2,000 to 2,500 feet. We actually looked at going to that depth to get water around the San Juan Plant as opposed to going out and trying to gather the produced water. The aquifer there is very secure and traps all the oil and gas, but it does not yield much water. Going to greater than 2,500 feet, taking water greater than 10,000 TDS, I think, may become a viable opportunity for someone down the road.

Saavedra: The statute you are referring to is Section 72-12-25 and 26. It says that you can get water below 2,500 of which the top of the aquifer is 2,500 feet below the land's surface, but you must advertise it, and it is subject to anybody's protest and/or taking to court. It is a little more lax, but again the State Engineer will want to see those and you must file an application or information with the State Engineer. We would like to see those cases and make sure you are not impairing the aquifer above it or the aquifer next to it. We want to make sure that the rivers are protected and the existing water rights are protected. But it does give a little more flexibility in water rights and it is considered, so to speak, a separate underground water basin unregulated by the State Engineer.

Moderator Hume: It is important to keep in mind, too, of the one that is above 2,500 feet or running on the surface. If nobody out there is using it and its use is not impairing anybody else, all you have to do is go to the State Engineer and say that you have a beneficial use for this water and you can use it.

Saavedra: But an application still has to be filed and is subject to protest.

Yates: I think we must be very cautious in drafting new regulations or whatever we do, that we do not end up with unintended consequences, and perhaps the unintended consequence of jeopardizing the oil and gas production that we currently have in the state New

Mexico. That is regardless of what you think we are going to be using oil and gas for in the years to come. The fact remains that it is a substantial revenue source for New Mexico's budget. We need to be very cautious that as we go through this process that we don't end up shooting ourselves in the foot, so to speak, and jeopardizing our ability to go out and explore for oil and gas. There is a side benefit to being able to treat and properly dispose of the water by whatever new and conventional methods might become available in this treatment process. There's the fact that we might be able to go into oil and gas reservoirs that are currently not economical to produce because of the excessive water disposal, as was mentioned earlier, in some case \$3, \$4, and \$5 a barrel. We may be able to produce that natural gas and oil and have that produced water available to use or dispose of under OCD rules. There is still a tremendous amount of value to be realized in that production of oil and gas. I think we need to be careful that we don't jeopardize our ability to continue along that path for the state of New Mexico.

Saavedra: I just want to say at eight or nine barrels of water to one barrel of oil from these oil wells? (laughter)

Moderator Hume: I want to add to what Mr. Yates said. Certainly nothing in the regulation of produced water should stand in the way of the environmentally sound exploration of the oil and gas reserves in areas suitable for drilling. Again, what we are focusing on is produced water and it is not a new source of water. It is a new and different way of disposing of water that heretofore has been a disposal problem for the oil and gas industry. We are not talking about water that is defined by the virtue of being 2,500 feet below the surface. We are talking about water that comes to the surface attended through production of oil and gas and new and different ways to allow this waste byproduct to be put to some beneficial use in a matter that hopeful continues to skirt around the clear language of the New Mexico Constitution. It's safe to say that all the water from the center of the earth up is under the jurisdiction of the State Engineer.

Question: Again, Bill, is there dialogue going on at the Capitol that if we were successful in our desalination efforts and we are able to get through the Legislature's unwillingness to support a bill that will allow brackish water to be allocated in the proper

context, from the economic standpoint of the state, what happens if you have a million acre-feet of water hitting the market on Day One? Have you created a kind of downward push on the value of water? Has there been any economic talk about that?

Moderator Hume: Actually, discussions have been going on in the Governor's Office in conjunction with people from the Office of the State Engineer on trying to help stimulate the development of water resources in the state. Yes, those discussions are going on and yes, we are trying to figure out ways to stimulate and assist in developing these supplies. Yet, these things happen irrespective of activities by governments. I remember back when El Paso sued New Mexico in the 1980s for the right to drill wells in New Mexico and pump that water to El Paso for M&I use. We said to them that you have lots of not-too-bad brackish water in the area; why don't you pump it up and use it? They said that it wasn't economically feasible. But today their water plan has 40 to 60 percent of their water supply in the foreseeable future coming from their desalination plant that they have up and running. So as the price of water rises, the availability of water increases with the application of capital and the stimulation to technology that it brings. This will continue, but we in the government are going to try very hard to get out in front and stimulate in a manner that really gets it going. The trick is in knowing which one is the ultimate computer package before you spring for the computer—or the ultimate desalination plant before you spend several millions of dollars on it. We are playing with those questions and trying to come up with procedures and ways to go forward.

Moderator Hume: Any more comments or questions from the rest of us on the panel?

Saavedra: The price of water will overtake the price of oil. (laughter)

Moderator Hume: Thank you very much.