

PAGOSA DAILY POST

Where Has All The Water Gone? Part One

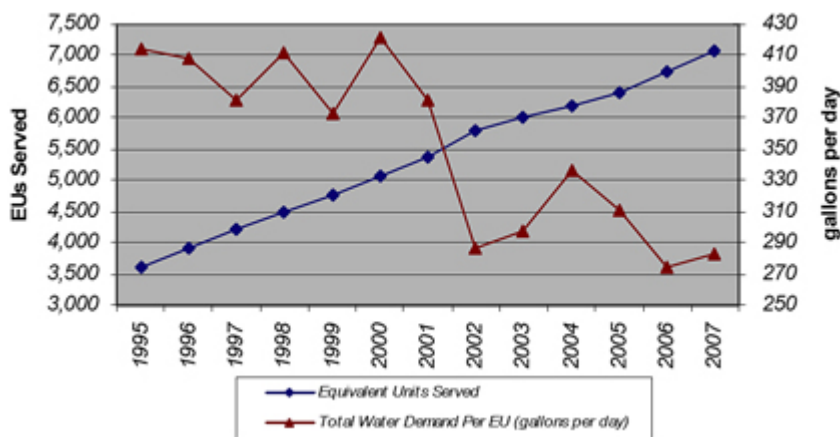
Glenn Walsh | 8/21/08

It is a question which has occurred to many people who worry about the public infrastructure of Archuleta County: Why should the water system running beneath the declining County road system be any better than those roads?

There are of course solid reasons to suspect the fluid system is better. Water and wastewater are subject to a battery of federal and state standards, constantly. Standards which the district generally not only meets but exceeds. And the financial health of PAWSD, apart from a 2002-deep drought in reservoir funds, is surer than that of the County or Town today.

Nothing comparable to the two-year swipes from the Road Capital Improvement Fund has occurred at PAWSD. Indeed, apart from the controversial handling of the Dry Gulch project, the board wins high marks for attempting to reinvest in a water distribution system which was neglected for years. The board also receives public criticism for hikes in fees and rates, which might indicate why that reinvestment was neglected for years.

This article is an investigative report. To PAWSD's credit, the investigation was undertaken not by me, but by the water district itself. There are striking graphics and painstaking tables of water usage and loss. They were compiled by PAWSD and incorporated into its Water Conservation Plan now available online for customers to review. *Continued...*



PAWSD has documented a dramatic decline in water use by its average user during this decade of nearly 25%; and total system use has barely increased over the past ten years

There is very good news in this report. PAWSD measures an incredible decline of 25% in water use by its average customer since 2000 — before adoption of this Conservation Plan, which anticipates another 10% decline over ten years. In fact, total usage of potable water by the entire district, not on a per tap basis but total usage, is essentially unchanged since 1998. The rationale for a 35,000 acre-foot reservoir at Dry Gulch is obviously not buoyed by a report that the last ten years of population, residential and commercial growth has been serviced completely by the same amount of water.

Is it worth the time of customers to review this plan? Well, consider this figure: \$20,000 per acre foot. That is the price the Conservation Plan assesses potential water saving devices and policies against. That \$20,000/AF

figure makes for a potential financial tsunami. A 12,500 acre foot reservoir project would cost \$250 million; a 35,000 AF Project would approach \$700 million.

Those millions would make an eye-catching, but unfair, headline this week. However, the Conservation Plan assesses the savings that can be made over the next ten years, and \$20,000 per acre foot is a frighteningly possible figure at the midpoint of that period, in 2013 or 2014. The likely price in 2009 is scary enough, close to \$10,000, making a 12,500 AF project almost as expensive as the 35,000 AF project was estimated to cost in 2006.

Consider a second eye-catching figure that we do need to make headline news: 34%. That is how much treated potable water the water district is losing between its treatment plants and our homes. This is a remarkably high figure, if not quite third-worldish. The industry standard is 10% loss of treated water, and 15% is regarded as acceptable. The Republic of Germany loses only 7% of its treated water, after inheriting the East German water systems. *Continued...*

Table 2 - Summary of Water Deliveries by Customer Type 2003

Year	Residential	Commercial	Irrigation	Town of Pagosa Springs	Fill Stations and WWTP	WTP and Other Non-Revenue
2003	308.34	79.93	3.40	11.73	16.80	118.51
2004	298.22	89.83	3.86	11.73	14.43	220.03
2005	300.62	87.77	5.30	11.73	9.98	202.17
2006	288.61	83.70	3.18	11.73	13.90	191.70
2007	300.90	84.25	4.01	11.73	16.05	217.25

Non-revenue or "loss" treated water totals over 34% of all water treated, over 70% of total residential use, and over 250% of total commercial water use.

PAWSD treated approximately 1900 acre feet of water in 2007. It lost almost 670 acre-feet of that water. Applying the \$20,000 per acre foot yardstick of the Conservation Plan, results in costs of over \$13,000,000. Applying the more reasonable (given the present insanity of the Producer Price Index) figure of \$10,000 per acre foot, results in costs of over \$6.5 million to build a reservoir project to supply that lost 670 acre-feet.

And while the district cannot ascertain where this 34% loss went in 2007, one can report where it has gone for the next 100 years: into the district's forecast for future demand. This is the subject of Part Two of the article, where the engineering exactness and political candor of the first three sections of the Conservation Plan give way to the clear influence of Fred Schmidt's flim-flam salesmanship of a 35,000 acre foot reservoir.

That 35,000 AF reservoir, given these new numbers of water usage (about 230 gallons per day per home within ten years), would supply 135,000 homes. This figure assumes that we will still lose 34% of our water in the future, which is highly unlikely. It is left to the reader's imagination to find room on the small fraction of private land in Archuleta County for 135,000 homes, hotel rooms and restaurants.

Political candor

Given the stakes and pointedness involved in the arguments over the Dry Gulch project, the debate at the past few PAWSD meetings has been remarkably candid and fair. There have been over 10 hours of public debate about Dry Gulch and fees associated with its planning and development. I was called upon by Board President Karen Wessels thirteen times at one meeting. Nobody but Michael Whiting has thirteen worthwhile points to make during a two-hour meeting.

The PAWSD board has been dramatically candid about the condition of the water distribution system at these meetings.

At the April PAWSD meeting, board member Bob Huff was remarkably frank, “For about the past thirty years, we built a nice little water system, and it worked, and we just rode it and we sat here with very low fees and I fought with the board and its previous members because there was never any capital replacement. Nobody did it. Any reasonable business knows that you are going to have to replace your capital at some point. We never did.”

Huff added sorrowfully, “Suddenly, we have 290 miles of water pipe and a lot of it is getting rotten.”

Board member Windsor Chacey, at that same meeting, described the predicament resulting from past neglect. “We are trying very hard to upgrade disintegrating infrastructure.”

Assistant District Manager Gene Tautges did not pull any bureaucratic punches. “The Town’s water system is probably good for another 6, 7, 8 years.”

These were not statements surreptitiously taped at a work session, but statements made to a standing room only crowd of critics.

Last month in the County Courthouse during a debate over the size of the Dry Gulch project, Huff reported the same conditions to the Board of County Commissioners:

“A long time ago a developer came to this community and he built a water system and he handed it over to us. I don’t know whether it was good, bad or indifferent. And it has been expanded and the Town has joined it. And we have been riding along for 35 years or so on that water system basically. No capital replacement fund, and it has been depreciating, it has been decaying, and all of a sudden we wake up after 35 years and say, ‘We have got a problem. We have a decayed infrastructure.’”

There is little question, thanks to the frankness of such testimony, that the big losses of treated water are the fault of breakdowns in the distribution system. There are, however, minor losses of treated water which may be due to meter inaccuracy, and there are big questions about the use of unbilled, unmetered water at the district’s wastewater treatment plants. First, why should any large usage of treated water go unmetered? It detracts from the district’s arguments for best conservation practices to its customers. And it leaves a potentially large question mark in every analysis of district usage.

Second, with storage, treatment and distribution costs heading to \$20,000 per acre foot and reservoir fees on a large house now set at nearly \$25,000, how can water usage in one sanitation district go unbilled when half of the PAWSD water district is in the Town of Pagosa Springs Sanitation District. It might be very difficult to justify to a homebuilder (or their lawyer) that portion of a reservoir fee going to store, treat and distribute water free of charge to a wastewater district he or she does not belong to.

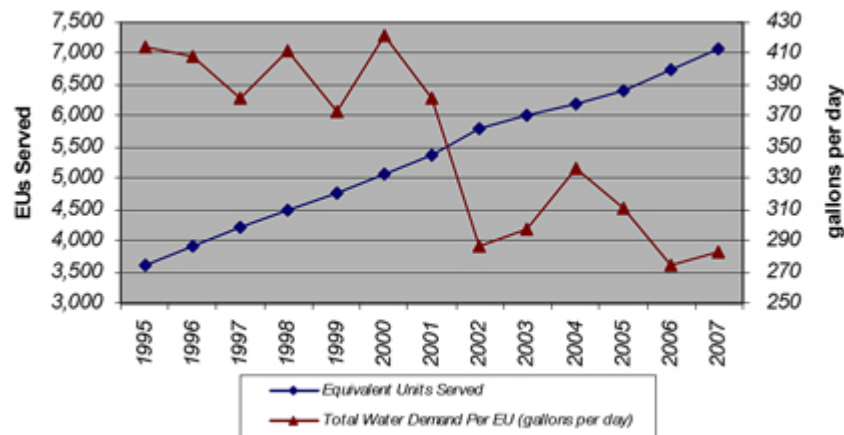
In a sense, the Water Conservation Plan jumps from chapter 3 to chapter 6. Chapters 4 and 5 are devoted to forecasts of future water demand. Forecasts which pretend that the water savings achieved over the past ten years have not occurred, and that future water conservation measures (budgeted for \$3 million over the next ten years) will be unsuccessful. These forecasts for future water demand also assume that the candor of the PAWSD district about the need for capital reinvestment will not result in much reduced losses of treated water, an assumption that is hard to swallow.

Where Has All The Water Gone, Part Two

Glenn Walsh | 8/25/08

Many large numbers are debated about the Dry Gulch Reservoir Project. 35,000 acre-feet or 12,500? Project cost of \$150,000,000 or \$300,000,000? Future Archuleta County population of 30,000? 60,000? 150,000?

In many respects, however, the biggest numbers in the debate today are 0.25, 0.34 and 0.00. Twenty-five percent is the reduction in potable water used by the average home in Archuleta County since 2001. The average home now consumes 255 gallons per day. Curiously, the Pagosa Area Water and Sanitation District (PAWSD) is presently in the midst of a lawsuit remanded from the Colorado Supreme Court in which the water district argues that reduction below 300 gallons per home per day is unachievable before the year 2100. According to its own numbers, PAWSD is already well below that figure.



PAWSD customers have reduced their daily water usage by 25% this decade, and this figure includes raw water delivered to the golf course and transmission losses of 34% of all treated water.

The water district has brought these reductions about with two intelligent policies. First, while Washington, Jefferson and Lincoln are not generally credited with contributions to water conservation policy, Dead Presidents are the most effective tools for water conservation. Increased monthly charges are also the cheapest tool that a water district can use to influence water use —only \$230 dollars per acre foot. PAWSD uses \$20,000 per acre foot as the benchmark to evaluate conservation measures. The block and tier system the district began to adopt in 2003 charges increasingly higher rates for higher use and has clearly reduced per tap water use.

Second, PAWSD has established commercial and residential toilet and washing machine rebate programs to replace older appliances with newer models with 300% greater efficiency. The results of the rebate program to date have been modest — 202 toilets and 35 washers — but the higher efficiency fixtures have become the standard in new construction over the past ten years.

The number 0.34, or 34 percent, represents one positive and one negative development for the local water district. Positively, average water consumption by PAWSD customers plunged 34 percent between 1996 and 2006, a period of almost unprecedented growth in the County.

Yet total use of treated water has been almost unchanged over the same period.

Halfhearted efforts are made to ascribe this drop to “drought effects” — habits acquired during the Stage 1 drought restrictions imposed six years ago for a few months — though per tap use has dropped from 410 gallons per day per tap in 1996 (six years before the drought) to 270 gallons in 2006 (four years after) – a 34% overall drop. More problematic for the “drought effect” theorists: usage actually increased 14% for the two

years following the 2002 drought and only began to drop again after conservation measures were adopted by PAWSD.

Conservation appears to be working in Archuleta County, whether or not it plays well with the district's water rights application for a 35,000 acre-foot reservoir before the courts.

Negatively, that same number — 34 percent — also describes big losses for PAWSD: the district is losing 34 percent of the total water it treats, somewhere between its treatment plants and our taps. This loss of 666 acre feet of water each year is also equal to 34 percent of the district's current reservoir capacity.

Incredibly, the volume of water that PAWSD loses between plant and tap is equal to 56% of the total water the district delivers to all its residential and commercial customers.

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Water lost between treatment plants and taps amounts to more than 50% of total residential and commercial usage, and water projections for Dry Gulch assume no improvement over next 35 years

Zero, however, is the biggest number in the present debate about the size of the reservoir to be built at Dry Gulch. Because zero is the percent of actual and potential water conservation and loss recapture that district water engineer Steve Harris has incorporated into the forecasts for future demand which support the 35,000 AF Dry Gulch Project.

Forecasts of future demand

While PAWSD does not know where 34% of our treated water goes, we do know one place it appears. The same place where water conservation savings do not appear: Steve Harris's water demand projections for the Dry Gulch Reservoir.

Year	Annual Growth Rate	Equivalent Units	Per EU Daily Usage (gpcd)	Total Annual Demand (acre-feet)
2008	5.0%	7,437	315	3,524
2009	5.0%	7,809	315	3,655
2010	4.0%	8,200	315	3,793
2011	4.0%	8,528	315	3,909

Daily usage by PAWSD customers was down to 255 gallons per day per house by 2006. It won't get there until the 22nd century according to Harris water demand projections. Customers currently use less than 2000 acre feet (including nearly 700 AF of lost water). Harris includes 800 acre feet of water which is not delivered to the golf course, making his demand figures about 80% over par.

Other than justification for a 35,000 AF reservoir, there are few plausible reasons for continuing to use Harris's projections of population growth and water use when they are already, only five years later, unsupported.

Does one suppose that water demand would not have been officially updated in all PAWSD documents and plans (and the water rights brief before the courts) if Harris’s 2003 population projections for 2010 were now 70% low rather than 70% high, and daily use per tap — rather than declining 25% — had increased from 330 gallons per day to 405 gallons per day?

Harris also plays an 800 acre-foot game of three-card monty with the golf course. The district supplies on average 100 acre-feet of raw, untreated water directly to the golf course from Village Lake. The district then throws 900 acre-feet onto total demand.

PAWSD uses the 600 acre-feet of storage in Village Lake to satisfy the 100 acre feet of golf course demand. But the district does not count Village Lake as a source of supply.

Talk about playing around with your scorecard. 800 acre-feet over par for demand, and 600 acre-feet under par for supply. Adding almost 50% to demand and subtracting 30% from reservoir capacity. Effectively making Village Lake disappear.

David Copperfield could scarcely do better.

The Harris demand outlook also assumes that 34% of all water in the PAWSD system will still be wasted 35 years from today. The standard in the industry is 10%, and 15% is considered acceptable. The demand figures PAWSD is using for 2043 contain an awful lot of leakage: almost 4,000 acre-feet. Using the PAWSD yardstick of \$20,000 per acre foot to develop new reservoir systems, that is \$80,000,000.

One assumes that this PAWSD board, with the new AMR meter reading system, will aggressively attempt to reduce this 34% loss figure over the next ten years, and bring the system closer to the industry standard within twenty years. So why shouldn’t a reasonable amount of progress — a reduction by twenty percent over twenty years — be the target? That would bring the PAWSD system within the acceptable standard. Of course, PAWSD exceeds almost all relevant standards by wide margins. Why not here?

And why not include these savings in our future water demand table?

Where Has All The Water Gone, Part Three

Glenn Walsh | 8/28/08

The Pagosa Area Water and Sanitation District has published their draft Water Conservation Plan and made it available for review both online and at government offices around the County.

The plan is comprised of three parts. Part one is an admirably candid assessment of the district’s present state, which details remarkable gains and losses. The district has managed to reduce average water use per customer by 25% over the past ten years, but still loses over 34% of treated water (nearly 700 acre feet) as that water is delivered through the 290 miles of deteriorating pipes which comprise the PAWSD system.

Part two of the report reiterates the fictitious water demand projections from the district’s engineer Steve Harris which have made the case for a 35,000 acre foot reservoir at Dry Gulch — which would serve a County population of 160,000 in the year 2100. That case was rejected by the Colorado Supreme Court last fall.

007 (in 1,000,000 gallon

Total Treated Water Produced	Non-Potable Water
538.71	113.31
638.11	122.62
617.58	108.97
592.81	82.64
634.20	89.50

5:

Double dipping? PAWSD delivers about 100 acre feet of raw water to the golf course, but claims 900 acre feet of demand. At the same time, PAWSD doesn't count 600 AF Village Lake, which meets this demand, as a reservoir.

Part three of the report provides specific recommendations of conservation measures and programs that PAWSD intends to implement over the next ten years. In many ways, part three combines the analytical rigor of part one with the statistical shiftiness of part two.

The district’s consultant Great Western Institute and Water Conservation Director Denise Rue-Pastin have presented the district with a superb, wide-ranging and detailed plan which presents PAWSD with the opportunity to make great strides.

But PAWSD has, apparently, decided to take baby steps.

One statement in the report is difficult to understand. “PAWSD has limited resources to implement its water conservation program.” With reservoir costs predicted to increase to \$20,000 per acre foot over the next ten years by the Plan itself — giving the district’s 35,000 acre-foot model a price tag of \$700 million — why does the district have limited resources for measures which are 90% cheaper?

There appears to be a reluctance to conserve water where measurable success would undermine the district’s legal case and public relations for their 35,000 acre foot Dry Gulch AF project.

Why else would the district decide to invest so little in programs and measures which could save so much?

Again, PAWSD is projecting that reservoir systems will eventually cost \$20,000 per acre foot. Consider that widespread use of the most cost-effective water saving appliances, which account for well over half of inside and outside use, could save almost half our present usage.

The top ten water saving fixtures and measures from the PAWSD water conservation plan are set out in the table below. Many of the most effective of these fixtures cost about 10% of the cost of reservoir development, including installation — and they pay for themselves in reduced water bills within four years. If the district could employ a mix of rebates, regulations and monthly pricing to install these devices in every home and business in the district, water use would be cut almost in half.

The savings from installing these devices in all homes and businesses by 2018 would almost double, according to the Plan's numbers. Yet, the rebate programs proposed by PAWSD aim to replace less than 10% of these fixtures over the next ten years:

Conservation Device	Potential Annual Savings in 2008 (Water Conservation Plan max.)	Potential Annual Savings by 2018 (Water Conservation Plan max.)	PAWSD Planned Savings by 2018	PAWSD Planned Savings (percentage of possible savings)
Low-flush toilets	112 AF	306 AF	15 AF	5%
High-efficiency washers	117 AF	182 AF	5 AF	3%
Whole house audits	146 AF	220 AF	7 AF	3%
HE commercial toilets	168 AF	283 AF	12 AF	4%
HE commercial urinals	41 AF	69 AF	5 AF	7%
Res/Comm Rainfall Sensors	29 AF	47 AF	2 AF	4%
Res/Comm ET Controllers	91 AF	159 AF	4 AF	3%
HE Comm. Spray Nozzles	153 AF	238 AF	66 AF	28%
Total	857 AF	1504 AF	116 AF	8%

The total reservoir cost savings possible over the next ten years — if rebates and regulations place only these least expensive fixtures in every home — over \$30 million.

So, why has PAWSD decided to pursue only \$2 million of these savings?

Luckily, new homes and businesses will be installing many of these devices, even though PAWSD will only extend rebates to a small fraction of these new units. Low flush residential toilets are in 70% of Archuleta homes in 2008, and will rise to 90% by 2018 thanks to federal requirements on new units. Commercial high efficiency toilets comprise only 25% of local market today, but will be nearly 60% by 2018, again thanks to requirements placed on new growth. High efficiency commercial urinals comprise only 27% of such fixtures today, but will comprise over 60% by 2018. But rebates for older wasteful toilets are *planned* for less than 10% of such fixtures. These fixtures pay for themselves in a few years.

Adding up these numbers leads to one conclusion: even with a very modest plan, water conservation is going to save this community thousands of acre feet of water, and tens of million of dollars over the next thirty-five years. Over 213 million gallons of treated water in 2008 – over half of potable water billed to customers — is being used in residential and commercial toilets and urinals. Only about 35% of these fixtures are high efficiency today. About 70% of these fixtures will be high efficiency units in 2018. These fixtures are three times as efficient as the fixtures they replace (assuming no further improvement in these devices over the next 30 years).

In sum, over half of our potable water use will become 300% more efficient over the next 30 years.

But add this up: 0% of that savings is reflected in the Harris water projections for Dry Gulch.

Consider that these savings, in themselves and without any price increases for high-use customers, would amount — under PAWSD's own growth assumptions — to over 3,000 acre feet of water savings by 2043, leaving the entire PAWSD district with a demand of 6300 acre feet of demand, including a loss rate of 34%.

Should PAWSD construct a 12,500 acre-foot reservoir at Dry Gulch, total storage in 2043 would be 16,600 acre-feet of storage, or 260% of demand.

But what if we base future growth and water usage on more reasonable numbers for population growth and water demand?

If we base population growth on the Colorado Demographer's Office prediction of uninterrupted 3% growth in population over the next 35 years, the PAWSD district almost triples in size from 7000 taps to almost 20,000. This would still make Archuleta the third fastest growing County in all of Colorado, a very ambitious assertion for a County which has lost perhaps 10% of its population over the past two years.

What would daily water use of each of these houses and businesses be in 2043, if usage has already fallen to 255 gallons per day in 2008?

Well, is it unreasonable to think that PAWSD could reduce water losses by half over the next 35 years? That would still leave the district losing 17% of all the water it treats. There is little reason to doubt, given the technical ability of PAWSD engineering staff —and commitment of a fraction of intended reservoir spending — that the district could reduce losses to the industry standard of 10% (this standard is very likely to be lowered over the next 35 years). But let's assume 17% of all water treated is lost out the pipes.

This brings usage down to 211 gallons per day. Now let's subtract the 10% savings that this initial Water Conservation Plan assumes over the next 10 years. The average home or business is now using 190 gallons per day.

Now, let's do something unfair to PAWSD. The suggestion is insulting, really. Let's assume that for the years 2018-2043, the district fails to conserve a single gallon more than they achieve by 2018. We assume that every one of the 103 conservation measures and programs considered in Appendix B of the report fails to conserve a single gallon. Districts across Colorado require aerated shower heads and faucets, low water grasses and professionally installed lawn irrigation systems, whole house audits and leak detection. These districts create low-use and high-use tiers and peak week pricing for second homeowners which both reduce overall usage and generate revenue to fund their conservation programs. These districts achieve another 25% gain in conservation.

I am sorry to have suggested that PAWSD would fail to accomplish any further conservation. It is insulting to the professionalism of the PAWSD staff, who I expect will conserve another 1% per year over the next 25 years. But let's assume all the district's efforts are inept (Steve Harris's water demand projections do). How much water would the 19,600 taps within the PAWSD district consume in 2043 if only these minimal improvements in water delivery and conservation are accomplished?

Total water usage by PAWSD customers in 2043 would then be about 4,175 acre-feet of water per year, or the approximate amount of water the district will have in its reservoirs at the end of this year.

Or about 12% of the water contained within a 35,000 acre-foot reservoir.