Know Your Bay Area Day
Ocean Water on Tap - October 2, 2004

Questions from Audience with responses from Jared Huffman, Marin Municipal Water District, member of the Board of Directors.

Desalination Plant Locations Coast vs. Bay

Have any locations for desalination plants already been identified?

Marin Municipal Water District (MMWD) is exploring several locations in its EIR, but believes that the San Rafael location on the bay will probably emerge as the one that makes the most sense.

Would a San Francisco Bay desalination plant be much less acceptable than a Pacific Ocean Coastal plant?

"Acceptable" is a loaded term. If the question relates to Bay water quality perceptions vs. the ocean, Marin Municipal Water District's polling and focus groups (2003) suggests that this is not an issue, so long as MMWD is sure that the finished water quality meets our standards. If "acceptable" refers to regulatory authorities, a strong argument exists that the Bay is more "acceptable" because Bay Conservation and Development Commission already allows for the possibility of desalination plants along the bay (they were specifically listed in the McAteer-Petris Act) and coastal plants have a more difficult regulatory gauntlet to pass (Coastal Commission, Marine Sanctuaries, potentially long and costly distribution pipes to get to population centers, etc.).

Bay vs. Coast? Explain differences in obtaining the water (to be desalinated) from the Pacific Ocean vs. San Francisco Bay.

The desalination process is the same. The difference is primarily cost: Bay water is warmer and less saline, making it easier to desalinate, although higher turbidity (solids) makes pre-treatment more costly. The big item for Marin is closeness to our distribution system and to the CMSA outfall, which enables us to blend/dilute the brine to avoid environmental impacts. Unless the plant is close to the brine dilution/discharge facility, there could be huge costs for a brine line and potentially no acceptable way to dispose of the brine without environmental impacts. The coast also presents serious siting challenges.

Inland vs. Coastal. It was shown that desalination is both an inland as well as coastal strategy to meet California's water needs. How rapid are the advancements in the inland applications compared to the coastal ones?

Inland is moving much faster because it is cheaper – groundwater is generally less saline, and thus requires less energy to desalinate. However, brine disposal can be tricky with inland projects.

Are there any current regional efforts in the Bay area to provide desalination water with intake and outfall in the Pacific Ocean side? If not, should there be?

No. Given the constraints noted (long distances from remote coastline to distribution system, additional costs, additional regulatory hurdles, siting challenges), the Bay makes more sense.

Salty groundwater intrusion into fresh water supplies

As we rely more upon groundwater for drinking water, especially near the Coast, saltwater intrusion occurs further inland. It would seem that communities may need to use

desalination, whether they want to or not. Does this make sense?

This is correct. Small-scale desalination may be necessary for communities whose only supply comes from salty wells. The same goes for communities whose groundwater has been contaminated by substances such as perchlorate, which can only be removed by reverse osmosis.

Do we have a problem of saltwater entering groundwater supplies because of a pulldown of groundwater supplies? For example, as in Florida where so-called development was halted for a period of time due to this problem? Is there an inherent geological problem here?

I have heard anecdotally that this is a problem for some West Marin and Sonoma communities. Bear in mind that it was precisely this problem that led Tampa Bay to build a large desalination plant.

Future Water Demands and Public Health Issues

Are we going to eventually learn that Marin County residents went through every possible water supply alternative and used each one up, including a Pacific Ocean desalination alternative? And is this the inevitable outcome for our planet as well?

My hope is just the opposite: that after 100 years of wrecking our rivers and streams with dams and excessive diversions, we may have found a way to diversify our water supply portfolio and start restoring flows and aquatic habitat to help heal our planet. There is no question that desalination *could* be used in such a beneficial way. The question is whether we will have the foresight and the discipline to make it happen, or whether, as the question asks, the promise of desalination will devolve into just another step on the inexorable march toward exhaustion of our planet's resources. Marin is trying to establish the more hopeful model for desalination.

Why does California still permit rainy climate crops like cotton to be grown using high quality drinking quality water from the California aqueduct?

As a legal/regulatory matter, California does not control what crops are grown where, although if one could prove that growing a certain crop was an unreasonable or wasteful use of water, the California Constitution would theoretically bar it. As a practical matter, the cotton growers of the San Joaquin Valley are among the richest, most powerful political forces in the western United States. They have built their highly subsidized empire on sheer political and financial power, and that is also how they defend it. To learn more about this, see the recent book by Mark Arax, *The King of California*. Finally, we should clarify that water from the California Aqueduct is not high quality; it is impaired by any number of pollutants from bromides to pesticides, and municipal water agencies that rely on this water are struggling to meet current and future drinking water standards.

Why is cotton grown in the desert in California?

See above. Note also that one of the largest cotton growing areas is in the Tulare basin – formerly the inland sea known as Tulare Lake, the largest freshwater lake west of the Mississippi. *The King of California* chronicles how powerful cotton interests succeeded in drying up the lake with dams and levies, so that today, it no longer exists.

Is rainwater being caught for reuse in northern California as it has been for eight years in Southern California? Do we maximize the use of rainwater?

Yes, dams have been built in most all of our wettest watersheds, in many cases with great

environmental costs. In Marin, for example, 75% of our supply comes from local reservoirs that capture rainfall.

How can we be sure desalinated water is safe to drink? What information is available on the long-term health effects of drinking desalination water, particularly with respect to endocrine disruptors that exist in our water supply? Will the desalination process remove endocrine disruptors?

Water quality experts familiar with reverse osmosis consistently affirm that it produces the highest quality drinking water possible. Currently, water suppliers generally do not test for endocrine disruptors and other substances of emerging concern. MMWD is the exception, in that we have been testing for these things for the past couple of years. We believe desalination will remove these contaminants, but one of the reasons for our forthcoming pilot project is to verify that. Bear in mind that 22 million Californians currently get their drinking water from the Delta, which is more polluted than the Bay, and they use only conventional water treatment. As agencies begin to test for endocrine disruptors and other contaminants, we could see pressure for reverse osmosis treatment of Delta water supplies. This, in turn, would cause the cost of desalination to compare more favorably to imported water for southern California, a factor which would greatly accelerate the move toward desalination in that part of the state (and potentially reduce their reliance on Delta diversions).

Please describe "double use" of water supply possibilities: irrigation bowling (?) and drinking water quality at two residences and businesses. Feasibilities including timeline and cost. Is this just a "pipe dream"?

I do not understand this question. If it refers to dual plumbing to allow for use of recycled water in residences and businesses, it is virtually impossible to do this for residences – the cost of building out the distribution system, retrofitting existing plumbing, and getting necessary health permits, is prohibitive. However, for businesses located in close proximity to existing recycled water infrastructure, it is possible to use recycled water not only for landscaping but for toilet flushing. That is currently being done at the Marin County Jail, for example. Marin currently has more toilets flushing with recycled water than any county in the nation. It is far cheaper to dual-plumb buildings when they are first built than to retrofit them later.

What guarantee do we have that any water we in Marin give up from the Russian River, will ever reach the salmon in the Eel River (which is why we gave it up)?

None, because we do not control the water rights to our north. The same can be said of many other beneficiaries of water diversions around the state: while they can reduce *pressure* for diversions, individual districts often cannot control what happens to the water they leave behind. However, practically and politically, it becomes harder for diverters to justify continuing or increased diversions when the demand for those diversions is reduced. By taking pressure off threatened rivers and streams, we put pressure on diverters and resource management agencies to do the right thing.

Why not slow down the increased need for water by stricter land use regulations in the short-term?

Water districts have a legal obligation to take reasonable steps to provide water for approved land use plans. In the case of MMWD, if the existing 10% deficit is not addressed, then a building moratorium would likely be necessary, although it would surely be challenged in the courts. It is hard to argue that Marin is growing too fast when it is the slowest growing county in the state.

Desalination is a reaction to a much larger issue that is typically unaddressed in the public forum: population growth. One alternative seldom addressed is to reduce the rate of population growth below current levels. Please comment on the interrelationship of an increased need for water and an increased population?

This is exactly right. California is growing at the rate of 500,000 people every year not because of immigration, but because births exceed deaths. There is little we can do about that at the local level, but clearly there is a dire need to address this at the state and national, if not global, levels.

Conservation: would outlawing garbage disposals help conservation significantly?

No. This is not a significant percentage of residential water use.

If there is no desalination plant and if 30 percent conservation is applied across the board will we be at this same decision point, needing an alternative water supply soon? In 10 years, in 20 years?

The problem is, Marin is already conserving at a level of 20% or so from our usage in the late 1980's. We can say "conserve an additional 30%," but given our existing baseline of conservation, what does this mean and how do you make it happen? Based on an independent audit of MMWD's conservation options two years ago, an outside conservation expert concluded that the best case for additional conservation was perhaps another 2,000-acre feet, or about 5%. That did not include raising rates and modifying the rate structure to increase conservation, which MMWD did last year. Our rate structure was already seen as a very progressive conservation rate structure, but now stands alone as sending perhaps the strongest conservation price signals anywhere in the state. At this point, the only ways to fully eliminate the supply deficit with "conservation" would be to impose sweeping, mandatory measures such as banning large landscapes, physically restricting water deliveries to large users, etc. The legal and political opposition to such actions would be overwhelming and would probably set back the worthy cause of "conservation" for decades. Opponents would point out that such measures amount to a *de facto* system of permanent rationing. Finally, the question is correct: even if the supply deficit could be bridged for a few years, we will inevitably need supplemental supply in light of the modest additional growth that is planned, and factors such as climate change, reduced deliveries of Russian River water, siltation of reservoirs, etc.

<u>Other Uses for Desalination Process</u>
Brackish groundwater. Most discussion has centered on seawater desalination. Are they are significant differences between the two applications?

The technology and basic process is the same. The difference is primarily one of cost: less saline source water is cheaper to desalinate.

At what point does co-operation with the sewer treatment agencies begin?

At the earliest stages of scoping a project.

Is reverse osmosis water equivalents to distilled water? Are any minerals left?

Correct. The treated water is so "pure" that it must be re-mineralized to prevent it from corroding pipes.

What about wastewater as a source of potable water?

Theoretically and scientifically possible. Singapore does it. Orange County uses desalination technology to treat wastewater that is injected into the aquifer and eventually used for drinking water. In Marin, we have no major aquifer to use in this manner, meaning that "direct potable reuse" (aka, "toilet to tap" or "loop the poop") would be the only option. Most agree that the public would not accept this alternative, especially since the cost would be comparable to desalination.

Energy Use and Air Quality

California has through bad planning and legislation suffered from an energy droughts as well as a water routes. Shouldn't these two resources be planned, coordinated, and related to get there?

Yes. If energy is included in the water supply planning process, conservation and recycling become even more attractive for districts that import water over large distances. The state could also help by encouraging the development of energy-saving desalination technologies. For example, MMWD will be testing an energy recovery system (made here in the Bay Area) in its pilot project that has the potential to reduce energy costs of desalination by as much as 40%. The energy efficiency trend of desalination technology is encouraging, and if it continues, desalination will soon be *less* energy-intensive than many imported water supplies around the state.

Describe the air quality implications in the siting of desalination plants. Codes of A.B., the refineries that creates so many air quality problems of today?

Unless there is onsite energy generation that causes emissions, there are few if any emissions associated with the desalination plant itself.

Help me understand the desalination energy costs. How far uphill could water be pumped with the energy needed to push water through desalination membranes?

I will let the engineers answer this, but it's important to remember that the character of the source water is a key variable in defining the energy needed for desalination. Less energy is required for brackish water than seawater.

Could solar energy be used for desalination plants? Could ocean tidal wave action be used?

Yes. The challenge is developing a mature and competitive market for these renewable energy sources, and making sure renewable energy generation facilities are sited in places that make the most sense. For example, MMWD could not generate enough solar power *onsite* to support its desalination plant, but a solar facility in the Mojave Desert could do the job. MMWD is exploring an interesting possibility in this regard: forming a coalition of desalination proponents that would jointly invest in renewable energy facilities that could be used for desalination.

Energy droughts require that we coordinate a declining oil supply. What does desalination do for a declining oil supply?

Nothing, although visionary desalination proponents could help drive the market toward energy diversification (see above). Note that even if desalination was implemented all over California, a far greater energy threat is the proliferation of electrical supplies for various consumer devices such as "set top" boxes. And as noted above, if/when desalination becomes *less* energy-intensive than

imported water, it could actually help improve the energy picture for California.

One speaker pointed out the energy costs of transporting the current East Bay Municipal Utility District drinking water. Wouldn't it makes sense to site a desalination plant by both a water and energy source? Wouldn't a liquefied natural gas port facility to be a logical location?

One speaker mentioned "green energy credits" and use of renewable energy sources, inevitably the near-term energy source will be natural gas, a fuel that appears to be oversubscribed. Is it possible that we could be alleviating resource shortages while exacerbating another one

See above: this does not have to be natural gas, whether done as energy "credits" or as part of a consortium investing in green energy.

Brine

How will California desalination projects protect our fishing industry to avoid what has happened in Saudi Arabia (die-off of fish species)? We have seen how our nuclear energy plants lacks serious oversight to maintain safety standards. Will desalination plants pose similar hazards if not appropriately monitored?

The speaker who referenced the decline in Persian Gulf fisheries as being caused by desalination plants did not cite a source for that information, nor am I aware of any study that has ever linked the two. However, the Pew Oceans Commission and many other sources have identified chronic over fishing as the cause of fishery declines in most oceans of the world, including the Persian Gulf. It is highly doubtful that the localized impact of brine discharge – which admittedly must be managed more sensitively than they have done in the Persian Gulf – is the reason for the loss of entire fisheries. The State Desalination Task Force looked carefully at this issue and concluded that if desalination brine is properly diluted and discharged, it does not pose a serious environmental problem.

How great is the amount of sodium (brine) created in the desalination process compared to the amount of sodium in seawater? What are the health impacts of continuous use of treated saltwater (seawater)?

It is generally a 2:1 ration: the brine is twice the salinity of the source water, which is why it should be diluted in order to be safely discharged.

To what extent would desalination increased the salt level of the Ocean's? Could fish and other Ocean live survive? The oceans are big but not infinite.

I asked the same question of experts involved in the State Desalination Task Force because I realize that ocean health is of critical importance right now. The answer is that even if desalination were implemented all along the coast and run at full capacity 24/7, it would literally be a drop in the bucket and no detectable change in ocean salinity. For perspective on this, remember that "desalination" is happening constantly by virtue of evaporation and condensation, leaving salt behind in the process – and in quantities many orders of magnitude greater than what we could generate with desalination plants.

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Brine water discharge, how about retention ponds? Let it evaporate and process the salt for

consumption?

Requires huge areas of land – not practical in most locations.

Legal and Other

Please clarify your comments regarding 'a vote is not necessary but advisable' (on a desalination facility). Why would a vote not be necessary? (By whom?)

The statement was that a public vote is not legally required unless certain types and amounts of bonds are used. In MMWD's case, based on our financial situation, it appears that existing capital reserves plus current bonding capacity, and hopefully some grant funds as well, would enable the district to build a desalination plant without a mandatory public vote. However, some believe that the district should do an "advisory" vote to make sure the public supports desalination. This is an open issue that will likely be decided in the months ahead.

Water basin planning and management and/or California-wide water planning and management: are there any prospects of rationalized, unified, simplified planning and control?

Marx stated that water belongs to all of us. Does this also apply to all groundwater or only to surface water?

In California, groundwater is virtually unregulated and overlying landowners can generally take as much as they want. Surface water is much more regulated, with a complex system of riparian and appropriative rights (imperfectly) designed to balance competing needs for water.

We have heard of pro con positions. How can we waive the positions in looking at making decisions? Most of us not being expert engineers.

The technical and engineering part of desalination is the easy part: it works, it provides good quality water and is totally reliable in droughts, but it's generally more expensive than conventional supplies. Beyond that, lay people are just as well suited as engineers to sort out the various policies and tradeoffs.

Florida has a large desalination plants at Tampa Bay. What lessons, if any, can we learn from that project?

The lessons from Tampa are both good and bad:

1. Good: a large-scale desalination plant can be successfully permitted and built on an estuarine water source in the US, and can produce high-quality drinking water. Tampa will iron out its problems and the plant will function as designed, providing a reliable long-term supply source to alleviate chronic groundwater overdraft in that area.
2. Bad: Careful design and pilot testing of pretreatment process is critical: Tampa's private sector partners cut corners and ended up implementing a different pretreatment system than the one they pilot tested.
3. Bad: Using private capital and relying on corporations to design, build, own, and operate the plant looks like a great way to save money, but it has serious risks. With Tampa, the corporations cut corners in order to save money, and several of them went bankrupt for unrelated reasons over which Tampa had no control. Tampa was essentially at the mercy of several corporations who made mistakes and then pointed fingers at each other.

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