



## **Analysis of MMWD Staff Report “Climate Change and Water Supply” (07-01-09)**

Authored by James Fryer, MMWD water conservation coordinator 1992-99

### **Introduction**

The MMWD Board will consider an item called “Climate Change and Water Supply” at their July 1, 2009, meeting. Approving the recommended change in methodology to compute MMWD’s sustainable yield has major implications for MMWD’s water reliability planning.

The item appears to be an attempt to obligate the MMWD Board to approve a desalination project based on layers of speculation and misapplication of projected weather change analyses that are also highly speculative. The consensus among most weather change experts indicates generally wetter conditions, more intense runoff events, and more flooding problems as the most likely impact of climate change for the Marin area.

It is important to note the lack of mention anywhere in the staff report that approving this policy would place much increased pressure on the Board to approve a desalination facility. A decision of this magnitude should not occur in the absence of an analysis of the implications and with a robust public input process. This item, and the way it has been handled further demonstrates the need and validity of ratepayer calls for a functioning citizen’s advisory committee to provide a forum for robust input and analysis on these issues.

### **Climate Change Overview**

Climate change is real and measurable. The most reliable measurements are from temperature rise, melting ice packs, and sea level rise. There is consensus among experts that it is being driven at an accelerated pace by human produced green house gases.<sup>i</sup> The effect of these on regional climate change and local weather patterns is highly uncertain and speculative. However, considerable modeling effort is being focused on possible climate and local weather changes. The resolution of the models is at a very coarse scale and while highly speculative for regions, is considered even less reliable in predicting local (county sized) climate and weather changes.

Most climate change models show the region that contains Marin becoming about 5% wetter in average years.<sup>ii</sup> In general, the Pacific Northwest north of Marin is expected to become 5% to 15% wetter in average years and the region south of about the Los Angeles/San Diego area to become drier in average years.<sup>iii</sup>



The climate change experts/modelers (but not necessarily the models) suspect that swings of El Nino and La Nina will become more intense and perhaps more prolonged. However, this can only be characterized as speculation.

Climate change experts/modelers suspect storm events will become more frequent and intense. Although many issues remain highly uncertain, the most consensus of any change probably exists around the view that decreased snow pack in the Sierras and increased flooding will be a serious problem for many areas.

Sea level rise is real and measurable. It is expected to continue and in its climate impact analysis the state of California estimates the sea level rise to range between 3.3 and 4.6 feet by the year 2100.<sup>iv</sup> Most of the sea level rise is from thermal expansion of water, but some is from the melting of glaciers and Antarctic Ice pack that is on land. The melting of floating Arctic and Antarctic ice will not contribute to sea level rise since it already displaces sea water.

### **Implications for California and Marin**

Less snow pack, but not necessarily less precipitation, is expected in the Sierra resulting from warmer temperatures and warmer storm systems. With less precipitation falling as snow, and the possibility of more frequent and intense storm systems and larger precipitation events, significantly increased flood risk is expected for California. The reduction in snow pack in the Sierra is not relevant for the water supply situation in Marin. More frequent and intense storm event has clear implications – it would improve the local water supply. Increased flood risk is relevant to Marin. Projects that both decrease flood risk and improve the water supply reliability are a sensible response to this threat.

The International Panel on Climate Change averaged the various global climate change projection models. The model that represents an average of the various models projects winter conditions to average about 5% wetter for the region that includes Marin County.<sup>v</sup> The models also project the potential for generally much wetter winter conditions in California north of Marin County. The models project the potential for drier winter conditions in very southern region of California, primarily south of the Los Angeles area.<sup>vi</sup>

As noted, climatologists also speculate that we may experience more intense and longer swings of the El Nino/La Nina oscillation. The record indicates that Marin experiences wetter winters in most El Ninos.<sup>vii</sup> Marin also usually experiences average or wetter winters in La Nina events. According to the National Oceanographic and Atmospheric Administration analysis for the North-Central California Coast, which includes Marin, there is a 71% to 75% chance of normal or higher precipitation in La Nina events.<sup>viii</sup>

Droughts in the MMWD rainfall record since 1879 do not correlate with either El Nino or La Nina conditions. However, the 1976-77 drought of record and the milder 6-year drought of the late 1980's and early 1990's occurred during a transition period from La Nina to El Nino.



As noted in the MMWD staff report discussed below,<sup>ix</sup> 400 year tree ring studies suggest the 1976-77 drought of record conditions in Marin was the most severe drought event in 400 years. It is well documented to be the most severe by over 130 years of local rainfall records.

A further climate change question worthy of consideration is the potential for summer precipitation in Marin. Presently, the Pacific Northwest from about Newport, Oregon and north receives summer rain from low pressure centers and fronts that sweep across the north Pacific or down from the Gulf of Alaska. The climate change models and climate change expert speculation do not suggest these fronts will move further south in the summer to provide Marin with summer rain.

However, if California experiences a warming of ocean conditions along the coast, and more frequent and intense tropical storms occur off the Pacific Coast of Mexico, it is conceivable that some remnant tropical storm system precipitation may reach further north along the coast in the summer and fall and reach Marin County.<sup>x</sup> Southern California is occasionally affected by these systems in the summer and fall. The remnants of these systems would only have to reach about 300-400 miles further north to reach Marin. If this occurred in future years, and I emphasize it is highly speculative, the need for summer irrigation may be reduced and rain catchment systems would become more cost-effective in Marin.

#### **Comments on MMWD Staff Report “Climate Change and Water Supply” July 1, 2009, MMWD Board Meeting, Item 5**

April 28, 2009 report was from an operations committee meeting, not from a Board meeting as stated in the July 1, 2009, staff report. This is the first time this information will be presented to the full Board with public notice at Board level.

#### *MMWD Staff Report Statement:*

“While none of these studies has been able to produce a prediction specific and detailed enough to be used in anything but the most general of water resources studies, there appears to be an emerging consensus that climate change will have an adverse impact on water resources in California.”<sup>xi</sup>

Nonetheless, the recommendation in the staff report is very specific and would require specific, substantial, and expensive changes in water supply planning and implementation costing about \$399.5 million or more to ratepayers.

Furthermore, the primary worry by water managements in California is for less snow pack in the Sierra, which is not applicable to Marin, and more frequent and intense flooding events, which would be better addressed with local urban watershed improvement projects.



*MMWD Staff Report Statement:*

“As noted in the April 28 report, while the two year 1976-78 drought was very dry, tree ring studies, indicate that it could have been the driest 2 year period in the last 400 years, the District has not experienced a statistically significant three year drought.” And “...staff concentrated its efforts on developing a three year drought with a frequency of about once in 200 years...”<sup>xii</sup>

Staff indicates it used the 1976-77 drought of record (a 400+ year event according to tree ring records) and added a third year drier than 70% of all years on record and labeled it a 200 year event.

A 200 year event based on such speculation is an interesting exercise but not an appropriate bases for such fundamental policy change without a great deal of public review and input, particularly given the Marin public record regarding new water project votes and opinion surveys expressing a preference for increased conservation, even during drought events.<sup>xiii</sup>

*MMWD Staff Report Statement:*

“...on our water conservation plans, the most recent iteration of the Maddaus report indicates that 21% rationing is the new 25% rationing.”<sup>xiv</sup>

The analysis indicated in this statement has not been approved by the Board or undergone public review or comment. Furthermore, it is entirely contradictory to detailed analysis of the issue of demand elasticity during drought addressed in two reports based on MMWD data and records.<sup>xv</sup>

*MMWD Staff Report Statement:*

“If we want to reward our customers for their increased water use efficiency it would seem appropriate that we reduce our drought year expectations of them. If we do this it will, as shown on Exhibit 1, lower our sustainable yield, with the new reservoir operations project complete, intertie deliveries as they are today and for with proposed new design drought, to a little less than 25,500 AFA.”<sup>xvi</sup>

As documented by many MMWD customer opinion surveys, most people adopt conservation practices and technologies with the intention of saving money and improving environmental conditions. Adopting this serious policy change will “reward” the efforts of ratepayers to conserve with the burden of a \$399.5 million or more desalination project on top of much of the \$77 million direct customer cost cited by MMWD for replacing aging/malfunctioning water use fixtures. It will also further contribute to the climate change problem and risk harm to San Francisco Bay marine life. This is not the “reward” ratepayers seek when adopting conservation practices and technologies.

*MMWD Staff Report Statement:*

“A graph showing the impact of the proposed new design drought on the projected water supply-water demand comparison presented in our Urban Water Management Plan is attached as Exhibit 2.”<sup>xvii</sup>



The graph uses a present demand of 31,700 acre-feet per year as the starting point. This demand is not supported by MMWD's water production records.<sup>xviii</sup> Present demand is averaging about 29,700 afy.

The graph also uses the highly questionable ABAG growth projections for Marin to project increased water use in future years and ignores the Marin County code requirement that all new growth occur with no net increase in water use. While, in the absence of serious new conservation programs some future increase in water use may

occur, this issue should be carefully analyzed and reviewed by a citizen's advisory committee and the MMWD Board before approving this proposed drastic policy change.

Furthermore, the graph also ignores the new Maddaus "Program E" summarized by MMWD staff at the June 24, 2009 Board meeting, and the findings of the report "Sustaining Our Water Future". MMWD Board members noted that the Maddaus "Program E" and "Sustaining Our Water Future" report water reliability improvement figures that are very similar. Yet this graph ignores both new findings.

*MMWD Staff Report Statement:*

"The resulting 3 year drought would have a recurrence interval of about once in 200 years, using current hydrologic statistics. This is somewhat worse than the worst three year drought in our history, which was about a once in 100 year event."<sup>xix</sup>

The resulting theoretical three year drought has never happened in over 130 years of record keeping in the MMWD service area and, as noted in the same MMWD staff memo, is much more severe than anything indicated in 400 year tree ring study. While it may be possible to devise a statistical analysis (which was not disclosed in the staff memo) that supports a once in 200 years event, it defies common sense and logic given the real world data.

- <sup>i</sup> “Global Climate Change Impacts in the US.” US Global Climate Change Research Program. p.12. Available at: <http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/download-the-report>
- <sup>ii</sup> Intergovernmental Panel on Climate Change “WG1 AR4 Report.” p.890. Available at: [http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1\\_Print\\_Ch11.pdf](http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch11.pdf)
- <sup>iii</sup> Intergovernmental Panel on Climate Change “WG1 AR4 Report.” p.890.
- <sup>iv</sup> Cooley, Heather. “Letter to MMWD Board of Directors.” Pacific Institute. April 21, 2009.
- <sup>v</sup> Intergovernmental Panel on Climate Change “WG1 AR4 Report.” p.890.
- <sup>vi</sup> Intergovernmental Panel on Climate Change “WG1 AR4 Report.” p.890.
- <sup>vii</sup> Based on an analysis of El Nino year 1915, 1919, 1941, 1958, 1966, 1969, 1969, 1973, 1983, 1987, 1992 and MMWD rainfall records. Five of these El Nino years were very wet, two years were wet, and three years were moderately dry.
- <sup>viii</sup> National Oceanic and Atmospheric Administration, Climate Prediction Center. “La Nina Precipitation Probabilities.” Available at: [http://www.cpc.noaa.gov/products/analysis\\_monitoring/lanina/usdivtp/writeup.shtml#rgnstats](http://www.cpc.noaa.gov/products/analysis_monitoring/lanina/usdivtp/writeup.shtml#rgnstats)
- <sup>ix</sup> MMWD Board Item No. 5, “Climate Change and Water Supply.” July 1, 2009. p.2.
- <sup>x</sup> Author’s contribution to speculation regarding local impacts of global climate change.
- <sup>xi</sup> MMWD “Climate Change and Water Supply.” p.1.
- <sup>xii</sup> MMWD “Climate Change and Water Supply.” p.2.
- <sup>xiii</sup> A discussion of the MMWD sanctioned public opinion surveys and history of MMWD public votes for new water supply can be found in the report “Sustaining Our Water Future” Available at: <http://www.foodandwaterwatch.org/water/desalination/sustaining-our-water-future-a-review-of-the-marin-municipal-water-district2019s-alternatives-to-improve-water-supply-reliability>
- <sup>xiv</sup> MMWD “Climate Change and Water Supply.” p.3.
- <sup>xv</sup> A further discussion of demand elasticity during drought events can be found in the report “Sustain Our Water Future” and the technical paper “Demand Elasticity during Droughts” by James Fryer, found in the American Water Works Association’s Conserv99 Conference Proceedings, January 1999.
- <sup>xvi</sup> MMWD “Climate Change and Water Supply.” p.3.
- <sup>xvii</sup> MMWD “Climate Change and Water Supply.” p.4.
- <sup>xviii</sup> “Sustaining Our Water Future” p.2 & 3.
- <sup>xix</sup> MMWD “Climate Change and Water Supply.” p.4.