



FEBRUARY 2010 NEWSLETTER

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VIEWPOINT: BIG STORMS

“Is it over yet?” After years of drought, seemingly every desert dweller pops their head up and asks that question after a major precipitation event, such as the one Arizona experienced in late January. And of course the answer is that we don’t know for some period of time, because you never really know that drought is over until it has been over long enough for precipitation and streamflow records to accumulate to prove it is over. So we offer our best guesses, and hedge our answers.

But it was a big storm. Salt River Project noted that this storm event was very large, on the order of the 1993 storm event which produced significant impacts on the state as a whole. SRP will be releasing water down the Salt River for some time. The good news is that a considerable amount of water is now stored in SRP reservoirs. Even if there was no further precipitation for the rest of 2010, there should be plenty of water for those entitled to receive water stored and delivered by SRP. One of the advantages of modern civilization is that we have more advanced technology capable of storing and delivering water sufficient to get us through periods of drought. It was the science of hydrology that helped get us this buffer against natural calamity.

Hydrology is an important science anywhere, but nowhere more critical than in semi-arid environments. The theme of the 2010 Annual Symposium, which will be held at the Westin La Paloma in Tucson on September 1-4, 2010, is Dryland Hydrology—global challenges and local solutions. Tucson always puts on a great symposium. There should be an interesting international flavor to this symposium, and I urge everyone to mark their calendars now to reserve the September 1-4 time frame. Not everyone has access to SRP water, or a similar storage and delivery system, and

there will be a large number of people to hear what other approaches can be taken.

Alan Dulaney,

AHS Corporate Board President, 2010

GOVERNMENT GOINGS-ON

This begins a new venture for our AHS Newsletter. Because so many of the members are consultants who deal with government, or those who work for government, or those who wish to influence government, it seems likely that the membership would be interested in what is happening within government. The things that influence our careers the most seem to happen at the Federal or State level, although what goes on in the county flood control district or in municipal government is often of interest. Therefore we will start a little column on what is going on in government—not everything, because we don't have that much room, but items of interest will be discussed.

This month the interesting item is the funding situation for the Arizona Department of Water Resources. A couple of years ago, ADWR was operating on a budget of \$24 million. In the last fiscal year, this had dropped to \$18 million, and ADWR recently dropped 47 people. In the next fiscal year, funding could drop as low as \$6 million, which would cripple the agency. ADWR has to do something, and has to do it quickly.

In a recent stakeholders meeting, ADWR offered three different approaches to securing funding. One involves charging variable fees at an hourly rate of \$118 for reviewing applications, with the maximum fee determined by the complexity of the application. Non-complex applications would be capped at \$10,000, but complex applications could run a lot more. There is precedent from ADEQ for charging hourly rates for application reviews. A second approach involves new fees that would be fixed for each type of application or report under review. Currently no fees are charged by ADWR for reviewing reports and application fees are relatively low, so increasing fees in fixed amounts would raise money to supplement reduced General Fund money. The final approach would be to bill a new Water Assessment Fee based on amounts used. This fee would be paid primarily by municipal water providers, plus some from industrial users (but only those with over 10 acres of industrial land) and the agricultural sector. The sacred cow of domestic exempt wells remains untouched.

Legislation to create a Water Resources Fund into which all these fees would flow, separate from the General Fund, will be necessary to accomplish any of these alternatives. Also legislation will be needed to allow ADWR to institute any fees through an emergency rule-making process, which is faster but avoids much public scrutiny or comment. The bills have already been introduced (SB1355 and SB1359). ADWR is on a fast track with this process, so pay close attention to the fee structure that you soon may be paying.

Alan Dulaney,

AHS Corporate Board President, 2010

MEMBERSHIP RENEWAL NOTICE

We remind our current and past members, that it is that time again to renew your membership.

If you attended the 2009 Symposium, or renewed your membership after the Symposium, your membership extends through the end of 2010. Otherwise, your membership expired at the end of December 2009.

To renew your membership you can either:

- 1) Renew Online: Regular Membership (\$45)
Student Membership (\$15)
- 2) Download our Renewal Form, and either:
 - a) Fax to (866) 931-3134
 - b) Mail to : Arizona Hydrological Society

3317 S. Higley Road
Suite 114-120
Gilbert, Arizona 85297

PHOENIX CHAPTER NEWS

February Dinner Meeting

Please note that February's meeting is on **Wednesday** instead on Tuesday!

Please join us **Wednesday**, Feb. 10th at the El Penasco Mexican Kitchen at Mill Ave. and Broadway Rd. in Tempe and have a beverage, share business cards, and talk water.

Location: El Penasco Mexican Kitchen

19 East Broadway Road

Tempe, AZ 85252

Event: **Marketing in a Changing World**, Bruce Robinson, RG

Date: Wednesday, Feb. 10, 2010

Time: Happy Hour & Dinner: 5:30 PM – 7:00 PM

Presentation Program: 7:00 PM – 8:00 PM

Cost: \$15 member, \$20 non-member, \$5 student

RSVP with Kirk Creswick at kcreswick@eecphx.com or 602-248-7702.

Hope to see you then.

Marketing in a Changing World

Look around you, it is difficult to conduct your day to day business without being confronted by conversations or news related to the current economic situation. I remember entering the environmental consulting industry in the late 1980's and being fascinated at the depth of project opportunities. The boom in landfill work was followed by a boom in superfund work and when that was over we were all applying our talents to Underground Storage Tank (UST) work. Each time I was told by my superiors that this boon was a renewable source of income that would last for years. Now we all discuss the decline in environmental consulting opportunities as a given. This current economic downturn has just made adjusting to that decline in opportunities a little more uncomfortable.

In this changing world we are all faced with the same conundrum: how to best use our operating budget to manage sales and marketing efforts. On February 10, 2010 I encourage you to come join me for an enthusiastic discussion of business development and how to use the process to secure your firms success in this changing world. We will look at some of the basic skills and who within your firm should apply them. We will discuss business development strategies and how to identify opportunities that are currently overlooked. Please join us and plan on audience participation.

Bruce Robinson is a Registered Geologist in Arizona, a LEED Accredited Professional with the United States Green Building Council and a member of the Interstate Technology Regulatory Council, has been working in the environmental industry in Arizona for the past 23 years. Two years ago Mr. Robinson took on the challenge of being the Arizona Business Development Manager for a mid-sized national engineering firm. This role has given Mr. Robinson some unique insights into the rewards and challenges of marketing environmental services. Mr. Robinson is interested in sharing his insight related to business development in the environmental market place.

January Kickoff Meeting Summary

Thank you to everyone who came to our January Kickoff Meeting at the SunUp Brewhouse. We had

a good crowd, good food, and a lot of great ideas being tossed around.

2012 Symposium Planning Underway

In the wake of the conclusion of the 2009 Symposium, the Phoenix Chapter has already planning for 2012. Christie O'Day, Ted Lehman, and Mike Hulst have been scoping out possible venues. If you are interested in helping them with the early stages of the planning for 2012, please contact 2012 symposium planning chair, Ted Lehman, at ted@jefuller.com or 480-222-5709.

Future Event Calendar (see also calendar on www.azhydrosoc.org)

- March 9 – Dinner meeting, Topic TBA, SunUp Brewhouse
- March 22 – Bower Internship Application Deadline
- March 22-25 – Arizona Science & Engineering Fair, Phoenix Convention Center
- April 6th – AEG-AHS Student Night, ASU Memorial Union
- April-July Dinner meetings – How 'bout you? Contact [Keith Ross](mailto:Keith.Ross@ars.usda.gov) if you're interested in speaking!

WSP BROWN BAG WATER SPEAKER SERIES: FEBRUARY 2010

Topic: Yuma Desalter and the Cienega de Santa Clara

Speaker: **Karl W. Flessa**, Director, School of Earth & Environmental Sciences, and Professor and Head, Department of Geosciences, The University of Arizona

Location: University of Arizona Cooperative Extension, Maricopa County
Palo Verde Room
4341 E. Broadway
Phoenix, AZ

Date: February 17, 2010

Time: Noon to 1:30

Free and open to the public. Bring your lunch. There will be time for questions and answers. Please RSVP to Nancy Crocker at 602-827-8200 ext. 335 or NCrocker@cals.arizona.edu.

*Information for additional seminars can be found on the WRRC web site:
www.cals.arizona.edu/azwater*

TUCSON CHAPTER NEWS

February Meeting Announcement

Location: Offices of Montgomery & Associates
1550 E Prince Rd
Tucson, AZ 85719

Event: **Engineers Without Borders**, Terra Michaels

Date: Tuesday, February 9, 2010, 6:00 pm

Time: Social half-hour begins at 6:00 pm; Talk begins at 6:30

Food and beverages provided

Engineers Without Borders

Terra Michaels will present on current and past activities of Engineers Without Borders (EWB) UA Student Chapter, including a recently completed upgrade to a wastewater treatment plant in Ghana and current activities developing and implementing a rainwater harvesting program in Mali. EWB is always looking for professional support for their projects, and would appreciate any support from interested AHS members.

December 2009 Meeting Summary

- Marla Odom, Tucson Chapter Secretary (2009), Montgomery & Associates

Seasonal Weather Forecasting – El Niño and Monsoons, 2009

On December 8th, the Tucson Chapter hosted a meeting at the offices of Montgomery & Associates. Seventeen people were in attendance. The meeting presenter was Erik Pytlak, Science and Operations Officer for the National Weather Service in Tucson. He presented a talk titled “El Nino 2009-10”.

Mr. Pytlak began by comparing El Nino conditions to “normal” conditions and describing measurements used to help differentiate the two. In normal conditions, there is a cool dry area off the west coast of South America, but in El Nino conditions, there is a warming of the tropics. Mr. Pytlak presented the various indicators used to predict an upcoming El Nino year and talked about what those indicators are currently doing, showing recent data up to December 8th. Anomalies represent deviations from normal oscillation of the ocean-atmosphere system.

In general, El Nino signals are seen in ocean temperature anomalies at depth months in advance of surface effects. From October to mid-November of 2009, positive temperature anomalies at thermocline depth increased and expanded eastward across the eastern equatorial Pacific in response to the downwelling phase of an oceanic Kelvin wave. The most recent measured period shows a slight eastward expansion of the positive anomalies in the equatorial Pacific near 50-150 meters depth. Over the preceding four weeks, sea surface temperatures (SST) were at least 1 degree Celsius above average across much of the equatorial Pacific.

Eastward displacement of an atmospheric heat source overlaying the warmest water results in large changes in global atmospheric circulation.

Mr. Pytlak also described Outgoing Longwave Radiation (OLR) and wind anomalies during the last 30 days and how they relate to El Nino. Computer models disagree on the eventual strength, but most indicate that 2009/2010 will be a moderate El Nino year. In general, this means there will be more thunderstorms in the tropics in winter, more frequent subtropical taps, split jet streams (polar & subtropical), a more active southern jet stream, and more storms across the southern United States.

For Arizona, this means that there is an increasing likelihood of above average precipitation. However, El Nino can suppress the summer monsoons because it forces the monsoon high to the south, instead of over Arizona.

The AHS Tucson Chapter extends a very warm thanks to Mr. Pytlak for his informative presentation.

January 2010 Meeting Summary

- Marla Odom, Tucson Chapter Corporate Board Member, Montgomery & Associates

Outlook for ADWR and ADEQ in light of recent budget cuts

On January 12th, the Tucson Chapter hosted a meeting at the offices of Montgomery & Associates. Thirty people were in attendance. The meeting presenters were Bill Ellett, from the Arizona Department of Environmental Quality (ADEQ), and Jeff Tannler, the Area Director for the Tucson Active Management Area of the Arizona Department of Water Resources (ADWR). Both presenters spoke about how recent budget cuts are expected to affect the two State agencies.

Mr. Ellett addressed impacts to ADEQ. He began by describing revenue and expenses of the agency as well as the tasks managed by ADEQ. The Arizona Water Quality Assurance Revolving Fund (WQARF) was created under the Environmental Quality Act of 1986 to support hazardous substance cleanup efforts in the State. The fund is dependent on legislative appropriations, cost recovery from responsible parties, corporate income tax and special fees. The WQARF budget has generally been decreasing over time, with most of the money going to operating treatment systems.

In September, Governor Brewer's office asked each State agency to prepare a 15% budget reduction. This reduction places the 2010 budget at about \$12 million and amounts to \$1,050,000 in proposed WQARF cuts which would have the following implications: changes to hazardous waste response time, shutdown of soil vapor extraction sites as well as smaller sites, reduction in groundwater and soil contamination monitoring, and cuts to other critical activities mandated by statute such as Potential Responsible Party (PRP) searches, community involvement, preliminary investigations, and support to other state agencies.

In June, ADEQ underwent layoffs, and reduced staff by about 55 employees. They have been in a hiring freeze for a year and a half. Additional budget cuts are likely and the agency is expected to have an extremely reduced budget for the foreseeable future. Priority is being placed on maintaining existing programs so that they can pick back up as money becomes available again.

Mr. Tannler addressed impacts to ADWR. He began by describing how ADWR was authorized in 1980 with the Groundwater Management Act and the duties that ADWR is responsible for. He then took a few minutes to explain several causes that have placed the State in the current financial situation. The economy is down, which leads to reduced revenues from sales tax. More spending has gone to healthcare. Voter initiatives guarantee that money generated by tax increases cannot be re-delegated, and new tax increases are very difficult to pass. Additionally, some programs like ACCHS and education are protected financially, but ADWR is not. Fees collected by ADWR are returned to the State general fund. ADWR receives its budgeted money from the same general fund, but the budget can change from year to year as needed, and the money ADWR generates may be redistributed to other State agencies.

In fiscal year 2007/2008, ADWR received \$24.1 million. This money provided for the tasks of the agency and payroll for about 200 employees, some of whom are Federally funded. For 2008/2009 the budget was reduced to \$19.4 million, and for 2009/2010, it was further reduced to \$18.1 million. The agency has been in a hiring freeze since 2007.

In October, ADWR also submitted a 15% budget cut contingency plan to Governor Brewer, which amounted to a 40% total staff reduction. Unfortunately, the proposed budget cut was realized one week before this AHS meeting, and ADWR laid off 47 employees for a total of 51 positions. This is about half of the total staff reduction laid out in the 15% budget cut contingency plan that was submitted.

The budget cut is expected to have the following implications: increased processing time for applications and other paperwork, delayed submittal of the 4th Management Plan, reduced or halted groundwater level monitoring, delayed database updates, and delayed model updates, including the anticipated update to the Tucson Active Management Area model.

In response ADWR is working with a stakeholder group to try and identify steps that can be taken to avoid additional cuts.

The AHS Tucson Chapter extends sincere thanks to Mr. Ellett and Mr. Tannler for their efforts in keeping the hydrologic community updated on these State agencies and for their candid dialogue with our group. Our thoughts and best wishes go out to colleagues affected by these budget cuts.

March Meeting Announcement

Location: TBA

Date: Tuesday, March 9th 2010, 6:00 pm

Social half-hour begins at 6:00 pm; Talk begins at 6:30

Event: TBA

2010 SYMPOSIUM PLANNING COMMITTEE

The AHS Symposium Planning Committee met on January 27, 2009 at the offices of Montgomery & Associates. Items discussed included:

- call for abstracts going out mid February
- sponsorship materials being updated and will be sent out shortly
- handing out fliers at up-coming events like SME and NWGA conferences
- technical sessions subcommittee up and running
- need additional volunteers and field trip ideas

The next AHS Symposium Planning Committee meeting will be held on **Wednesday February 10, 2010 at 5:30 pm** at the offices of Montgomery & Associates, 1550 East Prince Road, Tucson.

WRRC BROWN BAG SEMINARS: FEBRUARY 2010

Topic: The Pursuit of Sustainable and Reliable Water Supplies in the Desert – The Las Vegas Story

Speaker: Richard Holmes, Southern Nevada Water Authority

Location: Sol Resnick Conference Room
Water Resources Research Center
350 N. Campbell Ave.

Date: February 16, 2010

Time: Noon to 1:30

This presentation will describe the challenges, priorities and plans of the SNWA. From dusty backwater to desert metropolis Las Vegas' growth has depended on its water supplies. The presentation will include a brief history of the early Las Vegas Valley water supplies and water resource management issues and conditions that led to the formation of the Southern Nevada Water Authority. It will chart the progress of water resource plans in the 1990s and early 2000s and discuss the current situation against that backdrop. It will include discussion of current realities, such as drought, climate change, and the requirements for sustainability, and current priorities, including conservation, diversification of resources, regional partnerships, and how the SNWA's 2009 Water Resource Plan addresses them.

Topic: Trans-boundary Water Issues

Speaker: Roberto Salmon-Castelo, Commissioner, International Boundary & Water Commission, Mexico

Location: Sol Resnick Conference Room
Water Resources Research Center
350 N. Campbell Ave.

Date: February 26, 2010

Time: Noon to 1:30

Information for additional seminars can be found on the WRRC web site: www.cals.arizona.edu/azwater

FLAGSTAFF CHAPTER NEWS

Next Flagstaff Chapter meeting:

Our February meeting will be a planning session focusing on this year's Fund Raiser; Symposium 2011 in Flagstaff and a field trip. Presentation meetings will now be held every other month. The March meeting will feature a presentation by Charlie Ester of the Salt River Project (details to be announced). Stay tuned and visit the AHS Flagstaff Chapter website for updates.

Location: TBA

Date: TBA

Mark your calendars for the following presentation at NAU!

Speaker: Paul Marinos, 2010 Jahns Distinguished Lecturer of the Association of Environmental & Engineering Geologists and the Engineering Geology Division of the Geological Society of America

Date: March 5 at 12:30, location TBD

Topic: Geology of Athens, Greece: A case of urban geology for land use, construction of major engineering structures, hazard assessment and sustainable development.

January 2010 Meeting Summary- Flagstaff

- Erin Young, Flagstaff Chapter Secretary, Fluid Solutions

The Flagstaff Chapter would like to thank Margot Truini from the Flagstaff Water Science Center, U.S. Geological Survey (USGS) office for a compelling presentation of the USGS regional study on the groundwater occurrence and movement and water level changes in the Detrital, Hualapai, and Sacramento Valley basins in Mohave County, Arizona. The following is an overview of her presentation.

The USGS, in cooperation with Arizona Department of Water Resources (ADWR), have completed evaluations of hydrogeology, well data, spring data, groundwater chemistry data and potentiometric surface information for the Detrital, Hualapai, and Sacramento Valley basins (Anning and others, 2007). These basins are large distinct, northwest trending alluvial basins located in Mohave County, where groundwater is the primary source of water. As in many parts of the western US, population growth in these basins is substantial. The USGS and ADWR are completing investigations in the three basins as part of the Rural Watershed Initiative Program to improve understanding of hydrogeologic systems of the three basins.

The groundwater gradient in Detrital and Hualapai basins moves from south to the north, and the groundwater gradient in Sacramento Valley moves from north to south. All three basins represent structural basins that formed during the Basin and Range disturbance. The potentiometric surface for groundwater in the Basin-Fill aquifer of each basin is generally parallel to topography, with groundwater flow from the mountain front towards the basin center and then along the basin axis toward the Colorado River or Lake Mead. Water-saturated sediments that fill the structural basins form the principal aquifers are referred to as the Basin-Fill aquifer. Observed water levels in all three basins have fluctuated during the period of historic water level records (1943 through 2006). In the Detrital Valley Basin, water levels in monitored area have either remaining the same or have steadily increased as much as 3.5 feet since the 1980s. Similar steady conditions or water level rises were observed for much of the northern and central parts of the Hualapai Valley Basin. However, during the period of historic record, steady water level declines as large as 60 feet were found in wells penetrating the Basin Fill aquifer in areas near Kingman, northwest of Hackberry and northeast of

Dolan Springs, within the Hualapai Valley Basin. Within the Sacramento Valley Basin, water level declines as large as 55 feet were observed in wells penetrating the Basin-Fill aquifer in the Kingman and Golden Valley areas.

In 1991, combined annual groundwater withdrawal for the three valleys was about 6,000 acre-feet, almost all of which was from the Hualapai and Sacramento Valleys. By 2000, groundwater withdrawals had nearly doubled to about 11,000 acre-feet per year

The USGS is currently merging the water level data with data from several different types of geophysical methods combined with well logs and surface geologic mapping to develop a hydrogeologic framework (HFM) for Hualapai, Detrital, and Sacramento basins. The results from the HFM and the water budget component (on-going) will be used to develop a predictive numerical ground water model.

Anning, David, W., Truini, Margot, Flynn, Marilyn E., and Remick, William, H., Groundwater Occurrence and Movement, 2006, and Water-Level changes in the Detrital, Hualapai, and Sacramento Valley Basins, Mohave County, Arizona: U.S. Geological Survey Scientific Investigation Report 2007-5182, 24 p. (<http://pubs.usgs.gov/fs/2006/3008/>)

AHS FOUNDATION UPDATE

The **AHS Foundation** starts its fifth year with a new slate of officers. Marvin Glotfelty takes over as President of the Board of Directors for Howard Grahn, who will become the Foundation Treasurer. Errol Montgomery remains as Vice President and Ted Lehman continues as Secretary. Other Directors include Gail Cordy, Chuck Graf, Gary Small and Michael Pearce. Many thanks to Mike Geddis, retiring treasurer and Foundation founding director. AHS will appoint one additional Director to the Foundation at its January meeting.

Despite the global financial meltdown, donations from both individuals and corporations have allowed the Foundation to continue its shared support of the AHS scholarships and interns AND continue to grow its Endowment Fund nest egg. Currently the Foundation has assets of about \$67,000, of which approximately \$56,000 is locked in the permanent Endowment Fund. The goals of the Foundation are to eventually become self sufficient from proceeds of the Endowment, and eventually expand our charitable activities. Thanks to our many supporters.

Howard Grahn

AHSF Treasurer

INA ROAD WASTEWATER TREATMENT PLANT – AN ANALYSIS

Contributed by **Mark T. Gregory**, U of A Civil Engineering Student

After attending the October 24, 2009 Tucson Water field trip of the SAVSARP recharging project, I started to wonder about the total cycle our fresh water supply. With a greater understanding of how our water source is procured and distributed, I wanted to obtain an understanding of what happens with our resource after it is used. After making a few calls to the Pima County Wastewater Department, I was put in contact with David Bartos, Ina Road Reclamation Facility Operations Supervisor. Mr. Bartos was gracious enough to give me a tour of his facility on December 30, 2009. The plant is located just south of Ina Road and along the I-10 frontage highway right next to Mike Jacob Sports Park with softball and soccer fields. Actually, the park was the first thing I noticed when I drove through the entry gates and was greeted by a friendly security guard to take my information and direct me to the administration office to meet Mr. Bartos. We'll get back to the park in a minute.

The Ina Wastewater Treatment Plant, which has a classification of IV, which is the highest classification that can be obtained due to its complexity, and takes in 30% of Pima County's wastewater's 3200 miles of sewer, which is now defined as conveyance piping, is actually comprised of two different plants. The original plant was built in 1977 and is now known as the West Plant. Its capacity was 25 million gallons of effluent

wastewater per day. Due to growth of the city of Tucson and ample room for treatment plant growth, it was expanded with an upgraded that went online in 2000 at a cost of \$40 million. With the addition of the new East Plant, the total capacity of the plant was increased to treating 37.5 million gallons of wastewater per day.

In a weird twist, during the tour of SAVSARP, Dick Thompson had commented that one of the limiting factors of water flow to the recharge facility was the water pipes at the older Roger Road Treatment, which is located on Roger Road east of I-10. Mr. Bartos explained that the Ina Plant was once again being upgraded, at a cost of \$210 million, and the older Roger Plant which is to be shut down and replaced with a new treatment facility. One of the foresights of the 2000 plant upgrade was the installation of piping to handle this increase CAP water flow to SAVSARP. Once the upgrades are complete in January 2014, the plant will not only host the connection of CAP water to SAVSARP but also will be able to handle up to 90 million of wastewater per day.

Our first stop found us standing atop the East Plant Blower Building giving a nice panoramic view of the facility in its entirety. Mr. Bartos said the 2000 upgrade replaced the old preliminary treatment "headworks", with a new "headworks" capable of handling up to 60 million gallons of wastewater per day. The first step of the preliminary treatment is a two inch bar screen that screens all large trash such as food, golf balls, anything you could possibly think would fit down a four inch pipe. The wastewater is then lifted up by three Archimedes' Screws to the highest point in the plant. The wastewater then flows through a quarter inch screen, which further reduces the trash. After the two screening procedures, all that is left in the wastewater is grit size particles. The grit drifts to the bottom of the grit basin and is removed. At this point, all that is left is suspended sediment in the water. All of the debris removed by these three processes is washed, "dewatered," and taken to the local landfill. The plant produces approximately six tons of trash from the wastewater per day.

Now, going back to the park; one of the first things I noticed about the plant was the lack of smell. Mr. Bartos explained that every area that is exposed to open wastewater is enclosed and has an air filtration system to remove odor. The odor scrubbing system is comprised of the main charcoal system and a back up chemical system. As a matter of fact, all systems within the plant are redundant to prevent breakdown of the system. The reason for such stringent odor control is because operators and maintenance personnel work in the buildings and the plant also must be an environmental steward of the community.

Over 60% of waste is removed from the water in the next process, the primary treatment. This is where the biology really starts to kick in. In fact, this process started in the populations' homes at the first flush. The human body carries trillions of microorganisms to help with digesting food and those organisms are carried by the sewer system to the various treatment plants. These "Bugs" are really put to work in the primary and secondary treatment process. With a two to four hour theoretical detention time, primary clarifiers allow greases to float to the top of the tank and, what is now going to be referred to as sludge, settles to the bottom of the tank. Screens remove the grease from the top of the water while the active sludge is pumped out to wet wells. Before the active sludge is screened, yet again, a polymer is added to thicken the sludge from 3 to 5.5 parts per million (ppm). After the screening of sludge, the effluent water is returned to the primary clarifiers as Return Active Sludge (RAS). The thickened sludge and bugs are sent to the anaerobic digesters.

After the primary treatment the effluent water flows to the secondary treatment. There are numerous different types of "bugs" in the system. Some become active in low Dissolved Oxygen (DO) and others in high levels. The more food the bugs consume the more oxygen they use up. The oxygen levels are used to keep the bugs happy and to control their reproduction. This measurement of oxygen is called Biochemical Oxygen Demand (BOD). All of the secondary treatment takes place in the long slow-flow water tanks. At the beginning of the secondary process, DO is very low to keep the low oxygen bugs happy and active. As the water flows down the tank more oxygen is added to the water. Thankfully, the bugs do not care where their DO comes from, the Ina plant uses atmospheric air. Since bugs cannot use the nitrogen, it is separated from the oxygen and discharged, along with other gases, into the atmosphere. Towards the end of the process taking place within the tanks the bugs that like the oxygen rich environment are feasting and reproducing happily. More grease is screened at the top of the long tanks while the Waste Activate Sludge (WAS) settles to the bottom of the tank and is pumped to wet wells to be "dewatered" and sent to the anaerobic digesters, the "bugs". The bugs are then removed by the secondary clarifiers. The secondary clarifiers are circular tanks that hold 2.2 million gallons of liquid mixture of bugs and water. At this point, there are 2,500 pounds of bug per 143,000 gallons of water. When the water leaves the secondary clarifiers, there are only 30 pounds of bugs per the 143,000 gallons of water. The rest of the bugs are returned to the secondary treatment to continue their slave work. Unfortunately for the escaping bugs, their usefulness has ended and it's off to the disinfection process.

There are different ways to treat effluent water such as, liquid chlorine, bromine, iodine, and even ultraviolet light. According to Mr. Bartos, the Ina plant uses sodium hypochlorite, 2.2 ppm, to create liquid chlorine in lieu of shipping in the substance due to the dangers involved with liquid chlorine. He further stated that bromine and iodine are cost prohibited and ultraviolet light works great for small flows; but, the Ina plant is just too large. After the disinfection process, the influent water is 99.9% clean. A total of 30 million gallons of

influent water is discharged into the Santa Cruz River each day.

The anaerobic digesters and the Ina plant's power house work simultaneously with each other. The bugs turn raw sludge, with potential diseases, into digested sludge with by-products of methane, carbon dioxide, and nitrogen. The latter two are released into the atmosphere while the methane is used by the onsite power plant. The Ina plant receives 50% of its electricity from the local utility provider while utilizing the methane to run the rest of the plant. In turn, the coolant water used by the generators is used to keep the anaerobic digesters at body temperature, the bug's favorite environment. The detention time is between 15 and 30 days and produces approximately 300K~450K Ft³ of methane gas and 10 tons of liquid fertilizer per day. Mr. Bartos explained that future upgrades will include a more advanced power plant.

As the tour ended, I was amazed to find that raw wastewater is eventually turned into clean water, energy for the plant, and nutrient-rich liquid fertilizer. The treatment plant works every efficiently when everything is in equilibrium. It's all about keeping the bugs happy and that is only accomplished by aerating with the correct amount of oxygen, maintaining correct ph, and temperature. However, I understand the true ingredient is the well trained personnel at the Ina Wastewater Treatment Plant.

Special thanks to David Bartos and his crew for taking time out of their busy day for an enjoyable and educational experience.

HYDRO-NEWS

AMID STATE'S PUSH FOR SOLAR POWER, WATER-SUPPLY WORRIES ARISE

by Shaun McKinnon - Jan. 17, 2010 12:00 AM

The Arizona Republic

Ingle: Ranch a glimmer of renewable energy's potential

Arizona can offer solar-energy developers legendary sun-drenched skies and thousands of empty square miles but not nearly so ample a supply of a third essential resource.

Water.

As the state vies for a place among the renewable-energy leaders, seeking the jobs and tax revenue a vibrant solar industry would create, officials face a fundamental and all-too-familiar obstacle that could slow the green power rush.

Some of the most widely used and economical solar-energy technologies require significant amounts of water, as much as or more than the coal, natural-gas or nuclear power plants the solar projects are meant to replace.

Yet the sites most attractive for solar plants, the wide open plateaus and deserts, are also some of the hottest, driest parts of Arizona.

What emerges is an uncomfortable question for a state trying to secure its economic future: Should Arizona support a renewable resource with one that is finite?

Sen. Jon Kyl, R-Ariz., warns that an uninformed embrace of solar power could threaten the state's already uncertain water resources. But others say the conflict is not so clear-cut. Solar energy's benefits - a free fuel source, no air pollution, no hazardous waste - could still balance or even outweigh its demand for water.

Some of those issues are playing out in Mohave County, 14,000 sparsely populated square miles of northwestern Arizona that could have been custom-ordered for solar-power developers.

Stung by the real-estate crash, county officials rolled out a red-carpeted welcome to several large solar projects that could help the state make deep inroads in fulfilling its solar-energy promise. So far four projects have been proposed, and two are on the regulatory fast track and could begin generating power within two or three years.

The first two plants could require more than 1.5 billion gallons of groundwater annually. That's less than would be used by the sprawling subdivisions once planned for the area but still as much as a city the size of Kingman, population 27,000, requires in a year. "This technology uses gobs of water," said

Robert Glennon, a University of Arizona law professor who has written two books about water use. "We are not paying enough attention to energy and its water needs, and solar energy needs a lot of water."

Find the rest at <http://www.azcentral.com/arizonarepublic/news/articles/2010/01/17/20100117water-solar0117.html>.

WINTER STORMS COULD BE SIGN OF WANING DROUGHT

ONE WET WEEK NOT ENOUGH, EXPERTS SAY, BUT EL NIÑO MAY DELIVER MORE

by **Shaun McKinnon** - Jan. 25, 2010 12:00 AM
The Arizona Republic

So is the drought over now?

Arizona's water managers

were prepared for the question after last week's storms soaked much of the state and, for now, the answer is still "no." One wet week won't end a dry streak that has persisted for a decade and a half.

But ask again after a few more wet weeks and the answer might change.

"If we get some more storms like these, I think it's going to be a fair question," said Charlie Ester, water operations manager for Salt River Project. "After this year, if we get a lot more statewide storms, it's going to be real hard to say with a straight face that the drought's ongoing."

What gives Ester and other experts pause when asked the "Is it over?" question is history. Each of the past two winters dripped with rain and snow early on, then turned dry before spring. A promising round of storms in December 2008 sputtered into 2009, which ended as the fourth-driest year on record statewide.

This year could take a different turn because of El Niño, the periodic ocean-warming phenomenon that tends to steer wetter weather over Arizona and the southern tier of states. A strong El Niño effect could help improve conditions and put the drought's end in sight. But the dry streak has persisted long enough that its effects can't be erased overnight. Climate experts point to a moisture deficit created by years of below-normal precipitation as an indicator of the drought's severity.

Find the rest at <http://www.azcentral.com/news/articles/2010/01/25/20100125drought-storm0125.html>.

Check out Shaun McKinnon's blog – **Waterblogged** – for more up-to-date information on storm totals and news and analysis about water, drought, conservation, climate change, natural resources, wildlife and the environment, from the forests to the deserts, from Arizona across the West at <http://www.azcentral.com/members/Blog/ShaunMcKinnon>.

ADDITIONAL INFORMATION

For more information about the Arizona Hydrological Society, or to view current job listings and announcements, please visit our web site at:

<http://www.azhydrosoc.org/>

Your membership may be renewed for 2010 by credit card through the AHS website or by mailing a check to

the Arizona Hydrological Society, c/o Christie O'Day, 3317 S. Higley Road, Suite #114, Box 120, Gilbert, Arizona 85297. Dues remain at \$45.00 year for regular membership and \$15.00 for students. Looking forward to a great 2010 with your continuing support. For those who attended the 2009 Water Symposium, be reminded that membership dues for 2010 were included in the registration fee.