NOTICE OF OPEN MEETING

Notice is given that a **Regular Meeting** of the Board of Directors of the Barton Springs/Edwards Aquifer Conservation District will be held in **the District office**, 1124 Regal Row, Austin, TX, on **Thursday, March 8, 2012,** commencing at **6:00 p.m.** for the following purposes, which may be taken in any order at the discretion of the Board:

Note: The Board of Directors of the Barton Springs/Edwards Aquifer Conservation District reserves the right to adjourn into Executive Session at any time during the course of this meeting to discuss any of the matters listed on this agenda, as authorized by the Texas Government Code Sections §551.071 (Consultation with Attorney), 551.072 (Deliberations about Real Property), 551.073 (Deliberations about Gifts and Donations), 551.074 (Personnel Matters), 551.076 (Deliberations about Security Devices), 551.087 (Economic Development) 418.183 (Homeland Security). No final action or decision will be made in Executive Session.

1. Call to Order.

2. Citizen Communications (Public Comments of a General Nature).

3. Routine Business.

a. Consent Agenda. Note: These items may be considered and approved as one motion. Directors or citizens may request any consent item be removed from the consent agenda, for consideration and possible approval as an item of Regular Business.

1. Approval of Financial Reports under the Public Funds Investment Act, Directors' Compensation Claims, and Specified Expenditures greater than $5,000. **NBU**

2. Approval of minutes from the Board's February 23, 2012, Regular Meeting. **Not for Public Review at this time**

b. General Manager's Report. Note: Topics discussed in the General Manager's Report are intended for general administrative and operational information-transfer purposes. The Directors will not take any action on them in this meeting, unless the topic is specifically listed elsewhere in this as-posted agenda.

1. Standing Topics.

   i. Personnel matters and utilization;
   ii. Upcoming public events of possible interest;
   iii. Aquifer conditions and status of drought indicators.

2. Discussion related to current staff work areas and specific activities of staff teams and directors. Note: Individual topics listed below may be discussed by the Board in this meeting, but no action will be taken unless a topic is specifically posted elsewhere in this agenda as an item for possible action. A Director may request an individual topic

i. Update on recent activities of teams and directors.
ii. Report on the outcome of the TWDB hearing on the DFC petitions in GMA 9 and related TWDB recommendations.
iii. Update on discussions with new landowner of permitted irrigation well and with bankruptcy trustee for non-compliant permittee Don's Grass.

c. Directors' Reports. Note: Board Member comments in this part of the agenda cannot address any aspect of an agenda item posted elsewhere on this agenda, and no substantive discussion among the Board Members or action by the Board on these comments will be allowed in this meeting.

Individual Board Members may, on a voluntary basis, make a brief report to the entire Board on their personal involvement in activities and dialogue that are of likely interest to the rest of the Board, in one or more of the following topical areas:

- Meetings and conferences attended or that will be attended;
- Conversations with public officials, permittees, other stakeholders, and private citizens;
- Kudos and recognition of people doing good things for groundwater management in the District;
- Concerns about specific issues or problems for groundwater management in the District.

4. Regular Business: Board Discussion and Possible Actions.

a. Discussion and possible action related to a Report of Investigations, Notice of Alleged Violations, and Draft Agreed Order for initiating and resolving enforcement proceedings concerning overpumpage of the Edwards Aquifer and waste of Trinity groundwater by the Oak Forest WSC. **Pg. 13**

b. Discussion and possible action related to reported and confirmed substantial non-compliance of certain permittees with their UDCPs in February, if any. **NBU**

c. Discussion and possible action concerning the status of additional funding and other needs for the District's prospective saline-zone hydrogeologic investigation. **NBU**

d. Discussion and possible action related to the significance to the District of the recent Texas Supreme Court decision on *Day & McDaniel v. EAA*. **Pg. 27**

5. Adjournment.

Came to hand and posted on a Bulletin Board in the Courthouse, Travis County, Texas, on this, the _____ day of March, 2012, at_____ .m.

_____, Deputy Clerk

Item 1

Call to Order

Item 2

Citizen Communications

Item 3

Routine Business

a. Consent Agenda

Note: These items may be considered and approved as one motion. Directors or citizens may request any consent item be removed from the consent agenda, for consideration and possible approval as an item of Regular Business.

1. **Approval of Financial Reports under the Public Funds Investment Act, Directors' Compensation Claims, and Specified Expenditures greater than $5,000.**

2. **Approval of minutes from the Board's February 23, 2012, Regular Meeting.**

Item 3
Routine Business

b. General Manager's Report. Note: Topics discussed in the General Manager's Report are intended for administrative and operational information-transfer purposes. The Directors will not deliberate any issues arising from such discussions and no decisions on them will be taken in this meeting, unless the topic is specifically listed elsewhere in this as-posted agenda.

1. **Standing Topics.**
   - i. **Personnel matters and utilization;**
   - ii. **Upcoming public events of possible interest;**
   - iii. **Aquifer conditions and status of drought indicators.**

2. **Special Discussion Topics, related to current staff work areas and specific activities of staff teams and directors. Note: Individual topics listed below may be discussed by the Board in this meeting, but no action will be taken unless a topic is specifically posted elsewhere in this agenda as an item for possible action. A Director may request an individual topic that is presented only under this agenda item be placed on the posted agenda of some future meeting for Board discussion and possible action.**

i. **Update on recent activities of teams and directors.**
ii. **Report on the outcome of the TWDB hearing on the DFC petitions in GMA 9 and related TWDB recommendations.**
iii. **Update on discussions with new landowner of permitted irrigation well and with bankruptcy trustee for non-compliant permittee Don's Grass.**

Item 3
Routine Business

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Individual Board Members may, on a voluntary basis, make a brief report to the entire Board on their personal involvement in activities and dialogue that are of likely interest to the rest of the Board, in one or more of the following topical areas:

- **Meetings and conferences attended or that will be attended;**
- **Conversations with public officials, permittees, other stakeholders, and private citizens;**
- **Kudos and recognition of people doing good things for groundwater management in the District;**
- **Concerns about specific issues or problems for groundwater management in the District.**

Item 4

Board discussions and possible actions

a. Discussion and possible action related to a Report of Investigations, Notice of Alleged Violations, and Draft Agreed Order for initiating and resolving enforcement proceedings concerning overpumpage of the Edwards Aquifer and waste of Trinity groundwater by the Oak Forest WSC.

Barton Springs
Edwards Aquifer
CONSERVATION DISTRICT

MEMORANDUM

Date: March 2, 2012

To: Board of Directors

From: John T. Dupnik, P.G., Regulatory Compliance Team Leader

Re: Agenda Item 4a related to Oak Forest WSC

Please find the attached supporting documentation for the above-referenced agenda item:

1. System drought analysis – Report is provided for FY12 to date. The report indicates a disproportionate reliance on the Edwards well while the system is trying to resolve the water quality issues with the Trinity well.

2. E-mail thread between Phil Suite (Oak Forest WSC Board President) and Clover Clamons (Oak Forest resident) - The thread is evidence of the ongoing well rehabilitations and some of the issues caused by the associated discharge of well development/purge water.

3. OFWSC physical/chemical data analysis report – The report provides information related to the suspected cause of high iron concentrations and the recommended remediation that has been ongoing.

An investigation report with further documentation is being prepared and will be provided to the Board under separate cover.

System Drought Analysis Report

Oak Forest Water Supply Corporation - Oak Forest (TRINITY)

Fiscal Year 2012
Permitted Pumpage 16,500,000
Pumpage Tier 2 (>=12M <120M)

Fiscal	Month	Base Line	Drought Stage	Target	Pumpage	Level	% of Target
2012	September	1,650,000	Alarm	1,320,000	1,545,300	A	17%
2012	October	1,369,500	Critical	958,650	387,290		-60%
2012	November	1,155,000	Critical	808,500	176,660		-78%
2012	December	1,039,500	Critical	727,650	104,200		-86%
2012	January	1,039,500	Critical	727,650	97,390		-87%
2012	February	1,072,500	Critical	750,750	0		-100%
2012	March	1,089,000	Critical	762,300	0		-100%
2012	April	1,221,000	Critical	854,700	0		-100%
2012	May	1,320,000	No Drought	1,320,000	0		-100%
2012	June	1,567,500	No Drought	1,567,500	0		-100%
2012	July	1,996,500	No Drought	1,996,500	0		-100%
2012	August	1,980,000	No Drought	1,980,000	0		-100%

System Drought Analysis Report

Oak Forest Water Supply Corporation - Oak Forest (Edwards)

Fiscal Year 2012
Permitted Pumpage 9,000,000
Pumpage Tier 1 (<12M)

Fiscal	Month	Base Line	Drought Stage	Target	Pumpage	Level	% of Target
2012	September	900,000	Alarm	720,000	753,500	A	5%
2012	October	747,000	Critical	522,900	532,600	A	2%
2012	November	630,000	Critical	441,000	493,700	A	12%
2012	December	567,000	Critical	396,900	552,100	B	39%
2012	January	567,000	Critical	396,900	624,000	B	57%
2012	February	585,000	Critical	409,500			
2012	March	594,000	Critical	415,800			
2012	April	666,000	Critical	466,200			
2012	May	720,000	No Drought	720,000			
2012	June	855,000	No Drought	855,000			
2012	July	1,089,000	No Drought	1,089,000			
2012	August	1,080,000	No Drought	1,080,000			

John Dupnik

From: Phil Suitt [psuitt@austin.rr.com]
Sent: Friday, February 24, 2012 11:28 AM
To: 'Clover Clamons'
Cc: Russell Taylor; 'Bob Davis'; 'Bryan LaRue'; 'David Cowan'; 'Nancy & Randy Ellsworth'; 'Perry Watson'; poaboard@oakforestpoa.org; Joe Vickers; John Dupnik; David Smith
Subject: RE: Please stop pumping to east

As you are aware, The Oak Forest Water Supply Corporation (OFWSC) is owned by our subdivision property owners and you are one of the owners. It is a nonprofit corporation ran by volunteer board of directors who receive no compensation; therefore, all decisions are made with the improvement of the whole subdivision in mind. The OFWSC does not have the knowledge it takes to develop the well therefore we must utilize the advice of the experts in the field. These experts are telling us the well must be pumped to develop it so we will continue to do so.
The Texas Commission on Environmental Quality and Barton Springs/Edwards Aquifer are continuously being advised of the development plan of the OFWSC and their input is also incorporated in our development program.
The OFWSC needs more capacity and drilled a well in the Trinity Formation at the insistence of Barton Springs/Edwards Aquifer Conservation District (BSEACD). This was not a choice between the Edwards Aquifer and Trinity Aquifer because BSEACD would not issue a permit for the Edwards Formation. There is only one other public well in this formation and it is at Ruby Ranch. Their well also has high iron content. Because these are the only public wells in this formation their development is an indistinct plan.
Please accept the Oak Forest Water Supply Corporations sincere apology for any nuisance the unintentional drainage of the OFWSC water development program may have created on your lot. The content of iron in the well water must to be corrected for the longevity of the well, water quality, and betterment of the entire subdivision. Water from the drainage ditch naturally flows in your direction. The proper development of the well has been restricted because the well development water naturally drains in your homes direction. It cannot be pumped as much as it needs to be due to this problem. This is not being done to cause you or your family any difficulty. The OFWSC has made a genuine effort to divert the water from its natural drainage direction and keep it away from your property. When the development water flows in your direction it is due to unintentional line separation. Other property owners could complain that we are intentionally diverting the water in their direction and that would be true.
We have taken steps to insure that the line separation does not occur again.

Phil A. Suitt
512/312-2795
psuitt@austin.rr.com

-----Original Message-----

From: Clover Clamons [mailto:cclamons@gmail.com]
Sent: Tuesday, February 21, 2012 10:19 AM
To: Phil Suitt
Cc: Russell Taylor; Bob Davis; Bryan LaRue; David Cowan; Nancy & Randy Ellsworth; Perry Watson; poaboard@oakforestpoa.org
Subject: Re: Please stop pumping to east

WSC Board Members -

I hate that it has come to this, but based on a brief conversation I had with Bob Davis at the well site this morning, I have made calls to TCEQ, BS/EACD, and Hays County regarding the ongoing pumping of the Trinity well and the nuisance it has created.

I will be seeking any avenue I can to legally require that you cease and desist with pumping excess water from the Trinity well and allowing it to flow out on the ground an impact my property.

Best Regards,

--
Clover Clamons
cclamons@gmail.com

On Mon, Feb 20, 2012 at 8:04 AM, Clover Clamons <cclamons@gmail.com> wrote:
Hi there -

Not sure if Phil is back in town yet, but my front yard is full of water again this morning and its flowing over the driveway. It hasn't rained since Saturday (it had actually mostly dried up yesterday), so I'm guessing one of the pipes has become disconnected. Unfortunately, I do not have time to go inspect because I have to work today.

Could someone please check the pipe and well output and redirect it to the west of at all possible?

Many thanks!

-
Clover Clamons
cclamons@gmail.com
200 Woodland Oaks
512-468-8319

On Tue, Feb 14, 2012 at 11:02 AM, Phil Suitt <psuitt@austin.rr.com> wrote:

I apologize for the problem. The direction of the water was not intentional. A line blew off and the natural drainage is through the eastern ditch. I hadn't learned about the problem until I went to the utility. The line was repaired at 8:30 AM more than two hours before this email. The well is running a pumping cycle that turns it on and off every 30 minutes so let me know ASAP if you learn of a line separation.
Thank you.

Phil A. Suitt

-----Original Message-----
From: Clover Clamons [mailto:cclamons@gmail.com]
Sent: Tuesday, February 14, 2012 10:49 AM
To: Phil Suitt
Subject: Please stop pumping to east

Phil - with the ground already saturated, the well pumping water is flowing over my driveway and towards the garage. Please re-direct the flow ASAP.

Thank you.

OAK FOREST WATER SUPPLY CORPORATION
WELL NO. 3
PHYSICAL/CHEMICAL DATA ANALYSIS

Introduction

Steven L. Winton P. E. was asked by Joe Vickers to perform an evaluation of chemistry and related documentation regarding Oak Forest Water Supply Corporation (WSC) Well No. 3 and Ruby Ranch Well No. 5. Both wells are experiencing relatively high iron concentrations in the well water reaching the surface. Due to the availability of data, Oak Forest No. 3 is the focus of this report. The evaluation that follows attempts to identify potential causes of the high iron concentrations in the well water through discussions with Joe Vickers and a review of the following documentation:

- A well conductivity, resistivity and temperature logs under static and flowing conditions performed by GEO CAM on June 15, 2010,
- The chemical and bacterial analysis of samples of the well water and the water in the ground water storage tank (GST) where the water is stored. These samples were collected on February 23, 2011. The analysis was performed by Water Systems Engineering Inc. for a limited number of water quality parameters, the screening analysis for the presence of a bacterial population, total coliform, E. coli, iron and sulfate reducing bacteria.
- The chemical and bacterial analysis of a sample of the well water collected August 17, 2011. The analysis was performed on the same day by WUC Inc. for general water quality parameters and the BART tests for iron reducing bacteria (IRB) and sulfate reducing bacteria (SRB).
- A summary of daily morning and evening sampling and analysis for dissolved iron in the Well No. 3 produced and stored water was reviewed. The produced water morning and evening samples were collected from October 1st through the 10th, 12th through the 14th, 17th through the 20th, and the 22nd through the 25th for a total of 21 days. All the data was collected in 2011. The well was allowed to sit idle for 11 hours followed by the pumping of 2,000 to 3,000 gallons before the morning sample was taken. Before the evening sampling, the well was allowed to sit idle for 5 to 6 hours after which 1,500 to 2,100 gallons were pumped before the sample was taken. The evening sample was taken during the same sampling period as the morning sample but only for 12 days. And finally the GST was sampled in the morning and evening every day from October 1st through the 24st except for one evening sample that was missed on October 2nd.

Due to the relatively high total dissolved solids of the well, it is pumped intermittently at a flow rate of 60 gpm. The water leaving Well No. 3 is stored in the GST whose volume is 25,300 gallons. The water is blended with other well waters prior to treatment and distribution.

In the following sections the four data items listed above will be discussed in light of the relatively high iron concentrations currently being experienced. The information provided regarding well design, well operation and the ongoing effort to resolve the iron issue by Joe Vickers will also be included as the data are pertinent to the evaluation in each of the following sections.

Well Conductivity Log Evaluation

In June of 2010 the entire depth (~1,180 feet) of Well No. 3 was logged under both static and flowing conditions. During the flowing logging run, a temporary pump was set at ~350 feet and the well was logged from the well bottom to the pump. Then, the temporary pump was removed and the well logging continued from the temporary pump setting to the top of the water column. Direct measurements of temperature and resistivity were made and conductivity was calculated from the resistivity readings and logged. The conductivity and temperature were the most critical parameters to evaluate with respect to the well water iron concentrations and are evaluated in the remainder of this section.

Corrosion is an electrochemical process where iron in the presence of stray electrical current, dissolved oxygen or iron reducing or other bacteria will dissolve iron in the casing pipe or the pump. The dissolved iron which is a byproduct of corrosion reactions will enter the water stream. If sufficient dissolved oxygen or other anions are present the iron will oxidize or react and precipitate as iron oxide (rust) or mineral particles. Since corrosion is an electrochemical process then the conductivity of the well water will have an effect on the rate of corrosion. The higher the conductivity of a well water, the higher the rate of corrosion of iron that will occur in the well system. Temperature also influences the corrosion rate by increasing the corrosion rate as the water temperature increases. Thus, reviewing the temperature/conductivity profile of the well will provide an indication of the potential to sustain the corrosion currently experienced.

Table 1
Well Temperature and Conductivity Profile

Well Test:	Static		Dynamic (Flowing)	
	Temperature °C	Conductivity µSiemens	Temperature °C	Conductivity µSiemens
Well Depth				
0 feet	23	1,000	23.5	1,100
Mid Temp	25.5 (640 feet)	1,160	27 (285 feet)	1,730
1180 feet	28	2,300	30.5	2,600

The conductivity is impacted by the temperature of the water. Higher water temperature increases conductivity by encouraging the formation of more ions in the water and vice versa with lower water temperature. The higher the conductivity in the well water, the higher the potential rate of corrosion and the rate of iron dissolution into the water. Thus, based on Table 1 data, corrosion rates would be expected to be higher near the bottom of the well casing due to the higher conductivity and temperature of the well water. The flowing well water would also have potentially higher corrosion rates than the static test water since the conductivity and temperatures are higher than the static test. It should be noted that relatively high conductivity throughout the well water column provides an ideal environment for galvanic, stray current

induced and bacterial induced corrosion. Thus, the dynamic test will be the primary focus of the following discussion.

The drop in conductivity is 1,300 micro Siemens (μSiemens) for the static test and 1,500 μSiemens for the dynamic (pumping) test. The drop in conductivity in both cases represent the effect of decreasing temperature (5 to 7.5 degrees Celsius or °C) and the potential loss of calcium and alkalinity from the water through precipitation which reduces the ionic concentration and thus lowers conductivity also. The chemical analyses that will be discussed in a following section indicate that the well water is slightly corrosive. Thus, the scaling tendency of the well water is relatively low. Thus, the amount of precipitation expected would have very little impact on the corrosion occurring in the Well No. 3 system.

The conductivity of the well water at the bottom of the casing is greater than two times the conductivity at the surface. This higher conductivity indicates that the corrosion rates should be greater at the bottom of the well. The temperature at the well bottom is also 7.5 °C higher than at the top of the well casing in the flowing test. The rule of thumb is that a chemical reaction such as the corrosion rates in well water will double with an increase of 10 °C. Applying this rule of thumb indicates that the corrosion rate will be at least 50 percent higher at the bottom of the well. Thus, any remedial action to mitigate the corrosion rate should be focused below the well pump.

There is a concern regarding the almost 60 percent drop in the conductivity over a relatively small (<10 °C) temperature decrease. This conductivity drop appears to be very high but there is no documented temperature versus conductivity data for waters with total dissolved solids (TDS) in the 1,100 mg/L range. The relationship between conductivity and temperature is linear in waters with TDS in the 300 mg/L range. A plot of the logging conductivity versus temperature results in a nonlinear curve which is probably just characteristic of this well water. All instruments were calibrated prior to the well logging and samples of produced water were cross checked with two additional conductivity meters during the logging. All instruments were consistent. However, no samples from the bottom of water could be checked. To insure that there was no disparity and that the conductivity change encountered is truly a property of water in Well No. 3, it is recommended that a sample of produced water be collected and the conductivity be measured. Then, heat the water sample to approximately 28 °C and check the conductivity at this temperature. The difference in conductivity at the two temperatures should reflect the difference in the static test conductivities measured during the well logging. This will insure that no anomalies were encountered during the logging and that data are reliable.

Chemical and Bacteriological Analysis

A water sample of the produced well water was analyzed by Water Systems Engineering Inc. in March of 2011. The March analysis was limited to 8 water quality parameters, ORP analysis and bacteriological analysis in both a produced water sample and the groundwater storage tank where the produced water was stored. The GST holds about 7 hours of produced water volume. Comparison of the Well No. 3 water and the GST water indicates that all water quality parameters performed on both samples were comparable except the resuspended iron samples. Resuspended iron is an analysis developed by the laboratory to simulate downhole conditions. The water sample is analyzed for total iron (dissolved and particulate or suspended solids) and it is then allowed to stand for at least 24 hours. The sample is then shaken and analyzed for total iron again. The 24 hour holding period allows iron to be released from any bacterial mass present in the water sample. The resuspended iron concentration in the analysis is more than

twice as high as the original total iron analysis performed on the sample. This indicates that a significant portion of the iron corrosion occurring is bacterial induced.

The March bacterial analysis indicated the presence of bacteria via general parameters such as heterotrophic plate counts, adenosine triphosphate (ATP) and analysis for specific bacteria such as anaerobic, sulfate reducing, iron oxidizing, total coliform and E. coli. The general parameters indicate that there is bacterial material present in the produced water and even more in the GST water. Specific bacterial analysis indicated that there was no sulfate reducing, iron oxidizing, total coliform or E. coli. However, 10 percent of the bacteria identified were anaerobic. The other 90 percent of the bacteria present were not identified. Microscopic analysis indicated very few bacteria in the well water but iron oxide biofilm was noted in the GST samples.

The August analysis was limited to the produced water from Well No. 3. The analysis included a relatively complete water quality analysis summary and a BART screening test for iron and sulfate reducing bacteria. The water quality parameters that duplicated the March analysis were comparable indicating only a minor variability in the quality of Well No. 3 water. The more complete August analysis allowed the calculation of various stability indicators including the Langelier Stability Index (STI). The STI indicated that the well water was non-scaling and slightly corrosive.

The BART screening indicated the presence of both iron and sulfate reducing bacteria in the well. These bacteria will cause iron to be released from the steel surfaces in contact with the water via chemical reaction (iron reducing) or by acid corrosion from the products of the sulfate reducing reactions. Observations of the produced water show no signs of iron oxides (red water) formation. The impact of each of these bacteria is discussed in the following paragraphs in light of the observations and bacterial analysis performed in the August screening analysis.

Iron reducing bacteria (IRB) require the presence of dissolved oxygen since the primary products of this type of corrosion are iron oxides. Since the well water column is probably oxygen limited, the iron products of the IRB reactions are incomplete and produce iron products that do not impart the red color to the well water. However, if the IRB are in the water formation, they can interact with the soil fixed iron oxides to generate dissolved oxygen which can later be used in IRB reaction in the well. This released oxygen will be consumed in the well water column and will not be present in the produced water. Typically, when IRB are abundant in a well, there is a source of naturally occurring dissolved organic material in the water. A total organic carbon (TOC) analysis could be run on the produced water to see if any organic residual is present that would cause the IRB to thrive. Thus, these IRB are thriving in the well and are probably making a contribution to the corrosion process to the extent that there is dissolved oxygen.

The presence of sulfate reducing bacteria (SRB) is consistent with the March bacterial analysis which identified anaerobic bacteria present in the Well No. 3 water even though there were no SRB detected. SRB are anaerobic bacteria. Very often SRB will grow on the casing surface under other anaerobic bacteria making them difficult to detect by screening level bacterial analysis. To have significant quantities of anaerobic bacterial there must be some dissolved organic present in the well water. The August analysis indicates that some SRB are present. However, the well water is high in sulfates (590 mg/L) and has traces of hydrogen sulfide which is a product of SRB reduction reactions. The high sulfate concentration and low oxygen conditions would encourage SRB growth. Sulfate reducing bacteria (SRB) produce iron products that do not color the water in low dissolved oxygen environments such as in a water

well. Hydrogen sulfide corrosion would leave black or brown deposits on the casing surface. Thus, SRB are probably making a contribution to the iron corrosion in the system.

October 2011 – Daily Dissolved Iron Analysis

In October of 2011 daily water samples for dissolved iron analysis were collected in the morning after pumping 2,000 to 3,000 gallon and in the evening after pumping between 1,500 and 2,000 gallons. Prior to the morning pump period there was an 11 hour idle period with no pumping and prior to the evening pumping period there was a 5 to 6 hour idle period. Samples were taken in the morning on 21 days total and in the evening on 12 days out of a possible 31 days for the month. Analyses of dissolved iron on days in which there was no pumping were not included in this evaluation. The GST was also sampled in the morning and the evening over a 24 day period.

Dissolved iron analysis results for the morning samples ranged from 1.80 to 2.75 mg/L with an average of 1.98 mg/L. The dissolved iron is fairly consistent around 2 mg/L with nine analyses below 2.0 mg/L and 11 above. The high concentration stands out as an outlier since the next closest high concentration is 2.29 mg/L. This indicates that the corrosion going on is fairly consistent under controlled idle and pumping periods.

Dissolved iron analysis results for the evening samples ranged from 1.75 to 4.35 mg/L with an average of 2.21 mg/L. There were 10 dissolved iron concentrations measured below the average and two above. The high concentration of 4.35mg/L stands out as an outlier since the next closest high concentration is 2.90 mg/L. This indicates that the corrosion going on is fairly consistent under controlled idle and pumping periods. The results of the two periods are not significantly different.

The GST morning samples ranged from 0.23 mg/L up to 1.76 mg/L. There were 20 dissolved iron concentrations at or below 0.75 mg/L and four above 1.00 mg/L. The GST evening samples ranged from 0.46 mg/L up to 1.62 mg/L. There were 19 dissolved iron concentrations at or below 0.82 mg/L and four above 1.00 mg/L. It appears the dissolved iron concentrations from the morning and evening sampling periods is consistent and not significantly different. Since the GST is not the focus of this evaluation and there is a time, settling and mixing regime that is not well defined, the remainder of this section will deal with the implications of the Well No. 3 data.

The more detailed laboratory reports from March and August indicate that total iron (dissolved and particulate) range from 0.92 to 1.80 mg/L. Since the dissolved iron concentrations in both morning and evening sampling periods averaged 2.0 to 2.2 mg/L, then the daily dissolved iron test run indicates that the problem is related to the presence of dissolved iron and not particulate. As dissolved iron is a product of galvanic (dissimilar metal contact), stray current effects or bacterial corrosion. The consistency of the dissolved iron concentrations in the October testing indicates that galvanic or stray current induced corrosion may be the source of the current corrosion in the Well No. 3 system. Iron and sulfate reducing bacteria are probably contributing to the corrosion problem and may release iron from the biomass or slimes on the pipe surface resulting in the peak concentrations seen about 20 percent of the time (morning and evening samples).

Conclusions and Recommendations

The corrosion occurring in the Oak Forest Well No. 3 appears to be a combination of both galvanic and stray current corrosion with bacterial induced corrosion. Due to the limited bacterial analyses at this time, emphasis should be placed on the mitigation of all mechanisms of corrosion in the well. Mitigation efforts should be focused in the following areas:

- To mitigate galvanic corrosion all dissimilar metal contact must we eliminated. Where possible contact points exist between dissimilar metals, these points must be isolated using inert gaskets, plastic bolts or the use of plastic pipe or other isolation techniques that may be appropriate.
- Stray current is most likely the major source of the corrosion going on in the system. Any steel surface with a current flow is probably experiencing corrosion. This especially holds true for the casing below the pump where the well water is highly conductive and the preponderance of any biological slime may cover the casing walls. The slime coating can accelerate the corrosion rate. Isolation of the source of this current needs to be determined and eliminated via some form of conductive isolation. Sacrificial anodes may be considered as a last resort. However, if the stray current source is not isolated, then there will probably be a high rate of sacrificial anode deterioration. Sacrificial anodes may be more manageable than the current corrosion but it should be noted that it is shifting the same problem to a different point in the system.
- Any modification of the well metallurgy will require downtime and the pulling of the pump. During this time, it is recommended that the well be chlorinated and jetted to remove any biomass or slime adhering to the casing or pump piping walls. When the well is cleaned the material removed from the well should be inspected. The preliminary nature of the current bacterial analyses does not allow a determination of the probable extent of any bacteria related corrosion occurring. Any black or brown hard deposits, black or dark slime removed from the well is evidence of bacterial growth. A large quantity of the bacterial solids will indicate that the biological problem is serious and periodic cleaning and chlorination may be required.
- If the presence of significant bacterial growth is confirmed, then maintenance practices may need to be changed. Iron reducing bacteria live in the soil and can be picked up by simply laying the pump or piping down on the ground. Thus, the pump and any downhole piping should be placed on a clean tarp during removal from the well. The surfaces of any equipment or piping removed from the well should be disinfected before replacement in the well.
- It is recommended that a TOC test be performed on the produced water to determine if there is a significant concentration of naturally occurring organic material. The TOC concentration will indicate that there is a significant food source for the bacteria in the well. This analysis will provide the operator with an indicator of the potential for bacteria to return to the well and the required interval for well cleaning and/or disinfection.

Since the Ruby Ranch Well No. 5 is experiencing similar problems, the conclusions and recommendations above should also be applicable.

Item 4

Board discussions and possible actions

b. Discussion and possible action related to reported and confirmed substantial non-compliance of certain permittees with their UDCPs in February, if any.

Item 4

Board discussions and possible actions

c. Discussion and possible action concerning the status of additional funding and other needs for the District's prospective saline-zone hydrogeologic investigation.

Item 4

Board discussions and possible actions

d. Discussion and possible action related to the significance to the District of the recent Texas Supreme Court decision on *Day & McDaniel v. EAA*.

TEXAS SUPREME COURT ADVISORY

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ORDERS AND OPINION ISSUED FEBRUARY 24, 2012

FEBRUARY 24 ORDERS (in HTML)
Decisions in cases from February 16 through Wednesday (PDF)

OPINION

08-0964
Edwards Aquifer Authority and State of Texas v. Burrell Day and Joel McDaniel
from Atascosa County and the Fourth District Court of Appeals, San Antonio
For petitioner Edwards Aquifer Authority: Pamela Stanton Baron, Austin
For petitioner State of Texas: Kristofer S. Monson, Austin
For cross-petitioners/respondents: Tom Joseph, San Antonio

AFFIRMED, opinion by Justice Hecht:

The principal issue is whether landowners within the Edwards Aquifer boundaries own the groundwater under their property and are entitled to a constitutional takings claim based on the Edwards Aquifer Authority's restrictions on its use. This appeal arises from Day and McDaniel's challenge to the aquifer authority's limited irrigation permit to pump water on their property. In an appeal from the aquifer authority's permit ruling, allowing a permit for 600 acre-feet of water to be drawn from a well instead of 700 acre-feet Day and McDaniel sought, an administrative law judge found historical use – the basis for the aquifer authority's permits to use aquifer water – justified only 14 acre-feet. On appeal to the district court, the court determined that water filling a 50-acre lake on the Day-McDaniel property and used at one time for irrigation came from the aquifer and established their right to a permit to take more water. The court rejected their constitutional takings claim. The court of appeals reversed, holding in part that the landowners had a vested right to aquifer water beneath their land but that groundwater flowing into the reservoir was "state water" subject to state regulation.

The Supreme Court HOLDS that groundwater "in place" beneath real property is owned by the landowner and the Edwards Aquifer Authority's restrictions on it based on historical use can constitute a takings claim against the state. The Court reasons, based in part *Lingle v. Chevron U.S.A. Inc.* [at 538-39, citing *Penn Central Transportation Co. v. New York*], that the aquifer authority's permitting based on historical use is a policy departure from the Texas Water Code's permitting factors without justification. Neither the authority nor the state has suggested a reason why the Edwards Aquifer Authority Act must be more restrictive in permitting groundwater use than Water Code chapter 36, nor does the act suggest any justification. But even if one existed, a landowner cannot be deprived of all beneficial use of the groundwater below his property merely because he did not use it during an historical period and supply is limited.

¶ The Court notes the authority's arguments that holding its restrictions to be subject to compensation would "disastrous," but says the authority identified only three takings claims in more than 15 years. The expense of possible litigation cannot be denied, but groundwater regulation need not result in takings liability. The Legislature's general approach to such regulation has been to require that all relevant factors be taken into account. The Legislature can discharge its responsibility under the

Conservation Amendment without triggering the Takings Clause. But the takings clause ensures that the problems of a limited public resource — the water supply — are shared by the public, not foisted onto a few. The burden of the takings clause on government is no reason to excuse its applicability.

¶ The Court reasons that groundwater in place is owned by the landowner on the basis of oil and gas law. No basis in the differences between groundwater and oil and gas leads to the conclusion that the common law allows ownership of oil and gas in place but not groundwater, citing *Eliff v. Texon Drilling Co.*, 210 S.W.2d 558, 561 (Tex. 1948), and legislative decision in the Texas Water Code chapter 36. Groundwater rights are property rights subject to constitutional protection, whatever difficulties may lie in determining adequate compensation for a taking.

Opinion

Briefs

statesman.com

Groundwater ruling potentially unleashes geyser of future cases

Editorial Board

Updated: 7:28 p.m. Monday, Feb. 27, 2012
Published: 7:17 p.m. Monday, Feb. 27, 2012

Prompted by the severity of the current drought, Texans have been earnestly discussing how to manage the state's water resources for the next several decades to meet the needs of a growing population and dynamic economy. This necessary discussion must now consider last week's ruling on property rights and groundwater by the Texas Supreme Court and how it potentially threatens efforts to regulate and conserve aquifers.

The court unanimously ruled Friday that property owners own the water beneath their land just as surely as they own the oil and gas. Regulations limiting the amount of groundwater they can pump could, in some cases, amount to an unconstitutional taking of property, the court said.

More litigation is the only certainty the decision has produced. The ruling will encourage property owners who think they've been denied access to their water to sue for compensation.

The decision is being hailed as a victory for property rights. Clearly, landowners have an interest in the water that lies under their property, but how Friday's ruling affects the 60 percent of Texans who use groundwater will not be known for a long time.

There are 96 groundwater districts in Texas. These districts grant landowners permission to put a well on their land to take a certain amount of water. The districts try to strike a balance among the landowner's needs, the needs of other Texans who rely on the same water supply and the needs of the aquifer to keep it environmentally sound.

Every one of these districts now is vulnerable to being sued by an aggrieved landowner. Regulators must consider the possibility of being ordered to pay thousands of dollars, if not more, to a landowner whenever they issue a permit. The likely effect is to freeze regulators with fear of litigation.

The case in question involved two Bexar County ranch owners, Burrell Day and Joel McDaniel, who sued the Edwards Aquifer Authority when it issued a permit that limited the amount of water they could pump to grow crops on their 350-acre ranch to 14 acre-feet — about 4.6 million gallons — rather than the 700 acre-feet, or 228.1 million gallons, they had requested. Day and McDaniel claimed the authority unconstitutionally took their property without compensation. The Texas Supreme Court agreed.

The court equated the ownership of groundwater with the ownership of oil and gas, but did acknowledge that water should not be regulated in the same way as oil and gas.

"Unquestionably, the state is empowered to regulate groundwater production," the court opinion, written by Justice Nathan Hecht, says. "In many areas of the state, and certainly in the Edwards Aquifer, demand exceeds supply."

The question in the regulation of groundwater, the court found, is whether the regulation is reasonable or whether it is an unreasonable government taking of property.

Lawsuits await as landowners and regulators fight over the meaning of "reasonable."

How much of the water underneath their land do landowners own? When landowners pump water from an aquifer, they are drawing water from the entire aquifer, not just from the part that lies immediately beneath their land.

A couple of million Central Texans rely on the Edwards Aquifer. Where do an individual's property rights end and those 2 million others' rights begin?

If the right applies to individuals, then we assume it also applies to industry. Power plants, refineries and any other large industrial user of water struggling to access surface water supplies — Texas law treats surface water differently from groundwater, regulating it more tightly — could potentially access without limits any groundwater that lies under land it owns.

In 1904, the Texas Supreme Court agreed that groundwater was such a complete mystery — "so secret, occult, and concealed" — that it was foolish to try to legally control it. We know a lot more today about groundwater — its sources, its movements and its connection to surface water — than we did in the early 20th century. It's important to preserve property rights, but it's equally important to conserve and protect all our water supplies.

As we explore how to best manage our water in the years ahead, perhaps the time has come for the Legislature to think about treating groundwater the way state law now treats lakes, rivers and streams.

Item 5

Adjournment