



JOSHUA BASIN WATER DISTRICT
REGULAR MEETING OF THE BOARD OF DIRECTORS
WEDNESDAY, JUNE 21, 2017 AT 6:30 PM
61750 CHOLLITA ROAD, JOSHUA TREE, CALIFORNIA 92252

AGENDA

1. **CALL TO ORDER**
2. **PLEDGE OF ALLEGIANCE**
3. **DETERMINATION OF A QUORUM**
4. **APPROVAL OF AGENDA**
5. **PUBLIC COMMENT**
Members of the public may address the Board at this time with regard to matters within the Board's jurisdiction that are not listed on the agenda. State law prohibits the Board of Directors from discussing or taking action on items not included on the agenda. Members of the public will have the opportunity for public comment on any item listed on the agenda when it is addressed on the agenda. Please limit comments to three (3) minutes or less.
6. **CONSENT CALENDAR**
Items on the Consent Calendar are considered routine in nature and will be adopted in total by one action of the Board of Directors unless any Board Member or any individual or organization interested in one or more consent calendar items wishes to be heard.
 - Approve Draft Minutes of the June 7, 2017 Regular Meeting of the Board of Directors
7. **COMBS CUSTOMER ACCOUNT ASSISTANCE PROGRAM DECISION –**
Recommend that the Board deny the Combs' request for additional assistance and direct the General Manager to proceed with the assistance offered to the Combs' as it stands.
8. **UNITED STATES GEOLOGICAL SURVEY(USGS) STUDY CONTINUATION AT A COST OF \$109,100-** Recommend that the Board approve \$109,100 extension to the Joint Funding Agreement with USGS.
9. **STANDING COMMITTEE REPORTS**
 - A. **FINANCE COMMITTEE MEETING:** Vice President Johnson and Director Floen. Next meeting is scheduled for June 26, 2017 from 9 a.m. to 11 a.m.
 - B. **WATER RESOURCES AND OPERATIONS COMMITTEE:** President Luckman and Vice President Johnson. Next meeting is scheduled for June 26, 2017 at 11 a.m.
 - C. **LEGISLATIVE AND PUBLIC INFORMATION COMMITTEE:** President Luckman and Director Unger. Next meeting is scheduled for July 5, 2017 at 9:30 a.m. Kathleen Radnich, Public Outreach Consultant to report.
 - D. **CITIZENS ADVISORY COMMITTEE:** Next meeting is scheduled for July 12, 2017 at 6:00 p.m. (Please note the date change from July 11th to July 12th)

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10. **DISTRICT GENERAL COUNSEL REPORT**
11. **GENERAL MANAGER REPORT**
12. **FUTURE DIRECTOR MEETINGS AND TRAINING OPPORTUNITIES**
 - Mojave Water Agency Board of Directors Meeting – June 22, 2017 at 4:30 p.m.- Director Unger (Kirby Brill’s final hoorah).
 - ASBCSD – July 17, 2017 –Place to be determined, Phelan Pinon Hills
 - Mojave Water Agency Technical Advisory Committee (TAC) – August 3, 2017 at 10 a.m.
13. **DIRECTOR REPORTS ON MEETINGS ATTENDED, COMMENTS/FUTURE AGENDA ITEMS**
14. **ADJOURNMENT**

INFORMATION

The public is invited to comment on any item on the agenda during discussion of that item. Any person with a disability who requires accommodation in order to participate in this meeting should telephone Joshua Basin Water District at (760) 366-8438, at least 48 hours prior to the meeting in order to make a request for a disability-related modification or accommodation.

Materials related to an item on this Agenda submitted to the Board of Directors after distribution of the agenda packet are available for public inspection in the District’s office located at 61750 Chollita Road, Joshua Tree, California 92252 during normal business hours.

JOSHUA BASIN WATER DISTRICT
Minutes of the
REGULAR MEETING OF THE BOARD OF DIRECTORS

June 7, 2017

1. CALL TO ORDER: 6:30 PM

2. PLEDGE OF ALLEGIANCE

3. DETERMINATION OF QUORUM: Mickey Luckman Present
Bob Johnson Present
Geary Hund Present
Rebecca Unger Present
Tom Floen Present

STAFF PRESENT: Curt Sauer, General Manager
Susan Greer, Assistant General Manager
Randy Mayes, Director, Water Resources & Ops.
Beverly Waszak, Executive Assistant

CONSULTANTS PRESENT: Gil Granito, General Counsel
Kathleen Radnich, Public Outreach Consultant

GUESTS 5

4. APPROVAL OF AGENDA –
MSC/ Unger/Johnson 5/0 to approve the Regular Meeting of the Board of Directors, June 7, 2017
Agenda.

Floen Aye
Hund Aye
Luckman Aye
Johnson Aye
Unger Aye

5. PUBLIC COMMENT – None

6. CONSENT CALENDAR:

Items on the Consent Calendar are considered routine in nature and will be adopted in total by one action of the Board of Directors unless any Board Member or any individual or organization interested in one or more consent calendar items wishes to be heard.

A. Approve Draft Minutes of the May 18, 2017 Special Meeting of the Board of Directors.

MSC/ Unger/Johnson 5/0 to approve the Consent Calendar with the addition of “Aye” next to Tom Floen’s name under item 14.

Floen Aye
Hund Aye
Luckman Aye
Johnson Aye
Unger Aye

7. KAREN TRACY TO REPORT ON MAY 9, 2017 CAC MEETING-

Recommend that the Board receive for information only. Karen Tracy gave a brief presentation on the Citizens Advisory Committee meeting on May 9, 2017. The Committee broke into 4 groups to discuss the overaged infrastructure, competitive pay for staff and the aquifer filling. A copy of the presentation is on the JBWD website.

8. NOMINATION OF TOM KAYNE AND JEFF DONGVILLO TO THE CITIZENS ADVISORY COMMITTEE- Recommend that the Board approve the appointment of Tom Kayne and Jeff Dongvillo to the Citizens Advisory Committee.

MSC/ Johnson/Unger 5/0 to appoint Tom Kayne and Jeff Dongvillo to the Citizens Advisory Committee.

Floen	Aye
Hund	Aye
Luckman	Aye
Johnson	Aye
Unger	Aye

9. PUBLIC HEARING TO CONSIDER THE WATER AVAILABILITY (STANDBY) CHARGES FOR FISCAL YEAR 17/18 – Recommend that the Board adopt Resolution No. 17-977, establishing water availability charges for 17/18 and authorizing collection by San Bernardino County. A brief discussion with the Board followed.

MSC/Johnson/Hund 5/0 to approve the Water Availability (Standby) Charges for fiscal years 17-18.

Floen	Aye
Hund	Aye
Luckman	Aye
Johnson	Aye
Unger	Aye

10. MID BUDGET REVIEW –Recommend that the Board approve the proposed changes to the 16/17 and 17/18 budgets (approved by Finance Committee on April 26, 2017). After a brief discussion, the Board voted to send the Mid Budget review back to the Finance Committee for review. AGM Susan Greer gave a short presentation and a brief discussion with the Board followed.

PUBLIC COMMENT –

Karen Tracy commented that she worked with Alex also and he is very easy to understand. **Steven Whitman** pointed out an error within the presentation.

MSC/Luckman/Unger 5/0 to send the Mid Budget Review for the 16/17 and 17/18 budgets back to the Finance Committee for review.

Floen	Aye
Hund	Aye
Luckman	Aye
Johnson	Aye
Unger	Aye

11. DISCUSSION ON RATE STUDY ALTERNATIVES FOR CHROMIUM 6, CAPITAL IMPROVEMENT PLAN, RESERVE FUND AND OTHER ITEMS.
Recommend that the Board approve the proposed alternatives for analysis by the rate study consultant or direct the General Manager to amend or add to alternatives. A brief discussion with the Board followed GM Sauer’s staff report.

MSC/Floen/Unger 5/0 to send the Rate Study Alternatives for Chromium 6, Capital Improvement Plan and the Reserve Fund back to the Finance Committee for review.

Floen	Aye
Hund	Aye
Luckman	Aye
Johnson	Aye
Unger	Aye

12. STANDING COMMITTEE REPORTS

- FINANCE COMMITTEE MEETING: President Luckman and Vice President Johnson. Next meeting is scheduled for June 26, 2017 at 9:00 a.m.
- WATER RESOURCES AND OPERATIONS COMMITTEE: President Luckman and Vice President Johnson. Next meeting is scheduled for June 26, 2017 at 10:00 a.m.
- LEGISLATIVE AND PUBLIC INFORMATION COMMITTEE: President Luckman and Director Unger. Next meeting is scheduled for July 5, 2017 at 9:30 a.m. Kathleen Radnich, Public Outreach Consultant reported on the following:
 1. July 11th at 6:00 p.m., we will be holding an important CAC meeting, and we encourage public attendance and participation. At the last meeting, we covered the issues and concerns the District is facing, and discussed the consequences of not addressing the District's operational needs. At our next meeting, we will be asking the public to weigh in on prioritizing the needs, based on anticipated increased revenues.
 2. Water Education Day festival—educating approximately 400 eighth graders at La Contenta Middle School— went down, despite gale force winds.
 3. The next LPIC meeting will be July 5th, at 9:30AM, here in the District Office. Farmers Market June Booth theme: Understanding our Aquifer and presentation of the new CCR.
 4. Spring Wild Crafting session went well, although it was a smaller group. We will be targeting the last week in July, and the first two weeks in August for the summer.
 5. CITIZENS ADVISORY COMMITTEE: Next meeting is scheduled for July 11, 2017 at 6:00 p.m.

13. DISTRICT GENERAL COUNSEL REPORT- Mr. Granito reported that following the Trial Court's May 5, 2017 Order, in the chromium 6 litigation, Superior Court of California, County of Sacramento-California- Manufactures and Technology Association and Solano Taxpayers Association v. State Water Resources Control Board (Case No. 34-2015-80001850, the Trial Court on June 1, 2017 filed the Peremptory Writ of Mandate and the Notice of Entry of Judgment. Mr. Granito reported that the sixty-day time frame, within which an appeal may be filed by the State Water Resources Control Board, starts on August 1, 2017.

14. GENERAL MANAGER REPORT – General Manager Curt Sauer reported on the following:

- Conservation numbers of 22.94% of water savings for May and the District's cumulative water savings is 19+ (18.69%)
- Chrome 6 update
- Well 14 update
- USGS Discussions

15. FUTURE DIRECTOR MEETINGS AND TRAINING OPPORTUNITIES

- Mojave Water Agency Board of Directors Meeting – June 8, 2017 at 4:30 p.m. – President Luckman and Director Floen
- ASBCSD –June 19, 2017-The Wood Grill Buffet, 14135 Main Street, Hesperia, CA 92345
- Mojave Water Agency Technical Advisory Committee (TAC) – August 3, 2017 at 10 a.m. – President Luckman

16. DIRECTOR REPORTS ON MEETINGS ATTENDED, COMMENTS/FUTURE AGENDA ITEMS

Director Unger had nothing.

Vice President Johnson thanked the men and women in uniform for their service.

Director Floen commented on how much he has been learning about the “water world”.

Director Hund attended the MWA Board meeting on May 25th and gave a brief overview of the meeting. He also commented on the Bay Delta Flow Resolution that was approved at the last Board meeting.

President Luckman proposed that the Board attend leadership courses that the CSDA offers throughout the year. Also, there will be a schedule for each of the Board members to attend the JBWD Farmer’s Market booth one Saturday a month for one hour. President Luckman gave a brief overview of the MWA TAC meeting she attended and discussed the numerous grants available for storm water projects.

17. ADJOURNMENT

MSC/Luckman/Johnson 5/0 to adjourn the Regular Meeting of the Board of Directors meeting at 8:16 p.m.

Floen	Aye
Hund	Aye
Luckman	Aye
Johnson	Aye
Unger	Aye

Respectfully submitted:

Curt Sauer, GM and Board Secretary

JOSHUA BASIN WATER DISTRICT STAFF REPORT

Meeting: Board of Directors

June 21, 2017

Report to: President and Members of the Board

Prepared by: Curt Sauer

TOPIC: Request for additional consideration concerning the Combs' Customer Account Assistance Program decision.

RECOMMENDATION: Recommend that the Board deny the Combs' request for additional assistance and direct the General Manager to proceed with the assistance offered to the Combs as it stands.

ANALYSIS:

During the October, 2016 meter read process (November 1), Mr. and Mrs. Combs account had a high read of 1,024 units, compared to their average use of 24 units. This read covered the October 2016 water use at the property. The Combs addressed the Board in April requesting the bill be waived. The Board directed the General Manager to look into the situation.

Notification

Gail noticed the high read on November 9th while importing and allocating the new reads. She contacted the Combs on November 9th, and created a service order to check the meter read, which Val completed on approximately November 14th. Val noticed no signs of a substantial leak.

Water Survey

Val also completed a partial water survey on November 28th. She was unable to survey the second house on the property because it was in use as a vacation rental and the Combs did not want to disturb the renters. Small leaks were detected at the various irrigation boxes on the property but nothing large enough to account for a 1000 unit leak.

It took over two months for the Combs to schedule a time for the rental survey to be conducted due to rental occupancy and the Combs schedule. That survey located no signs of leaks in the rental house.

Water Use

Consumption of water for the months of November 2016, through April 2017, have returned to average use levels.

Meter Test

In January, the meter was replaced and tested. The meter passed the test and was functioning properly when tested. Additionally, since it is not uncommon for customers to assert that their meter is over recording we contacted [Steve Kamiyama, Account Manager, Aqua-Metric Sales Company, Riverside Ca.](#)

The question we asked was "a meter that malfunctions and then repairs itself is not an uncommon allegation from customers, who want their unexplained usage to be a "faulty meter." We have never heard of a meter going bad and then fixing itself and wondered if you had any written information about this subject.

His response was:

"This is a common issue with majority of water districts I deal with on a daily basis. **From what I have seen in the 14 years I have been in the industry, a faulty meter either goes completely dead or becomes inaccurate in the residents favor. In this instance a "malfunction" that occurs will not fix itself and become accurate when tested. Once faulty, a meter will continue to be inaccurate until it is completely stopped. You have taken the right step**

by testing the meter and proving its accuracy, the only option left is what we call a Water Action Report (WAR). A WAR is a complete engineering analysis of the particular meter and every part is inspected and tested. The meter will be destroyed in this process and can take up to 2-3 months for analysis. Please feel free to give me call if you have any further questions or if you would like to proceed with the WAR.”

On May 2nd, Jim Corbin and I went to the Combs property. The Combs were not there because they had a previous appointment. Nonetheless, I went there because of the continued delay from the Combs in letting me have access to the entire property. We observed that the customer side service line is a 2-inch line that runs approximately 1300 feet from the remote meter to a 2-inch valve near the house. There was no observable indication of a significant leak along the customer service line. However, it had been 6 months since the October read. There was moisture at the check valve but it was minimal. I would describe it as a weeping of water, in no way responsible for 1000 units of water loss.

On May 5th, Jim Corbin and I went to the house again, with full access because the rental property was not occupied by a renter. It was occupied by friends of the Combs but they were not renting the house.

We observed that the 2-inch valve at the edge of the residences did in fact shut off water to both houses and the irrigation system. After waiting over 50 minutes for the two-inch line to completely refill from the ¾-inch meter, I observed that the “leak detector” on the meter went off. This confirmed there was no leak in the 2-inch service line.

When the water was turned back on, we observed minimal leaks at the approximately 6 irrigation boxes, each box having approximately 5 to 6 irrigation valves.

Irrigation System

The irrigation system was installed prior to the purchase of the property by the Combs. It appears to be a few decades old, but that is my assumption. There are many bubblers inside the fenced area surrounding the homes, and many bubblers outside the fenced area that are not easily observable. Mr. Combs appeared to be somewhat unfamiliar with the irrigation system outside of the fenced area.

ASSESSMENT:

Possible Leak

I doubt there was a leak of 1000 units. The Combs have not located any sign of a leak, nor repaired a leak. We have not observed any sign of a significant leak. Logically, a leak of this size would not repair itself. I have concluded there was no leak.

Possible Meter Failure

The meter worked fine from the time the account was opened in January 2016 thru September 2016. The October read is what is being questioned. The same meter worked fine for November and December. It was tested in January and passed the inspection. Just as a water line does not repair itself, a meter does not repair itself.

Irrigation System Failure

We observed no major leaks in the irrigation system. However, it is old, and has been poorly maintained over the past years since its installation. Many bubblers outside the fenced area are not routinely observed. It is possible that one of these many valves could have stuck in the on position, but I observed no proof of that.

Vacation Rental

The second house on this property is used as a vacation rental. What the renters may have done with water inside the house is an unknown. Had they left water on outside the house, the Combs probably would have seen it. Had water been left on inside the house, one would assume the house cleaner or

next tenant would have observed that and shut it off. Again, an assumption that cannot be confirmed.

CONCLUSIONS:

- There was not a major leak in the customer service line.
- The meter recorded the usage accurately.
- It is possible the irrigation system failed and a valve outside the fence remained open for a period of time.
- It is also possible that renters, during this month, used a very large amount of water.

Based on these conclusions I decided there was no leak. This decision prevented the Combs from incurring an expense of \$500 to \$800 to have a leak detection company come to the house. The Combs' bill was \$4,207. I have credited their account \$800, which is the maximum allowed. I also authorized a 2-year repayment plan, because this is the largest bill under the CAAP program. The payment plan is \$134.14 a month plus the monthly bill.

JOSHUA BASIN WATER DISTRICT
MEETING AGENDA REPORT

Meeting of the Board of Directors

June 21, 2017

Report to: President and Members of the Board

Prepared by: Curt Sauer

TOPIC:

UNITED STATES GEOLOGICAL SURVEY (USGS) STUDY CONTINUATION AT A COST OF \$109,100.

RECOMMENDATION:

Approve \$109,100 extension to the Joint Funding Agreement with USGS

ANALYSIS:

The USGS has been working with the District since 2006 when the Board approved a cooperative study. The complete proposal from USGS for this year's activities is included in the Board Packet for your review.

David O'Leary will present information concerning these items, as well as 2 others that are not being recommended for funding in this fiscal year.

For FFY 17

The study consists of three primary tasks:

1. data collection at existing unsaturated-zone monitoring sites at the recharge facility (JTUZ-1, -3 and -4)
2. continuation of the basin-wide water-quality monitoring program
3. flow logging and depth dependent sampling of JBWD -10.

Task 1. Data Collection at Unsaturated-Zone Monitoring Sites JTUZ-1 -3 and -4

Instrumentation at JTUZ-1 -3 and -4 will be maintained to monitor the movement of the wetting-front through the unsaturated zone and water levels in the monitoring well at JTUZ-4

Task 2. Continuation of the basin-wide water-quality monitoring program

Currently production well water-quality samples for the basin-wide water-quality monitoring program are collected and analyzed by JBWD and JBWD contracted laboratories; monitoring well water-quality samples are collected and analyzed by the USGS (Table 1).

Water-quality samples for the basin-wide water-quality monitoring program will be collected once in FFY17 to evaluate any changes to water quality. Based on conversations with JBWD staff, it is our understanding that JBWD will continue to manage the sampling and analysis of JBWD production wells 10, 14, 15, 16, and 17 in FFY17. The USGS will collect one set of samples from monitoring wells JTUZ-1 and JTUZ-4 and from the ponds at the recharge facility in conjunction with JBWD's production well sampling. Samples would also be collected from proposed monitoring site JTUZ-5 (discussed in Task 4), if constructed. Analytical costs associated with the proposed monitoring site are not included as part of this proposal. In addition, the USGS will also collect one replicate sample from a JBWD production well to provide be quality-assurance/quality-control (QA/QC) for JBWD's sampling. The samples will be analyzed for major and minor ions, selected trace elements, and nutrients (including nitrate) at the USGS National Water Quality Laboratory, and the stable isotopes of oxygen and hydrogen at the USGS Reston Stable Isotope Laboratory. Samples collected by JBWD will be analyzed for a similar set of constituents by laboratories contracted by JBWD.

A separate sampling event will collect one additional sample set from monitoring wells JTUZ-1 and JTUZ-4. The JTUZ-4 sample is to monitor changes in groundwater chemistry related to recharge activities; the JTUZ-1 sample is to monitor recent increasing nitrate concentrations in this well (fig. 2). These samples will be analyzed as described above, however one of the sample sets from JTUZ-1 will also be analyzed for tritium and carbon-14 to evaluate if recently recharged water (in the form of septage infiltrated within the last 50 years) has reached the saturated zone at this well.

Based on conversations with JBWD staff, it is our understanding that additional samples will be collected from JBWD production wells 10 and 14 on an approximately quarterly basis to monitor effects of recharge activities on groundwater in the vicinity of the recharge facility. These samples will be analyzed for nutrients (including nitrate) and the stable isotopes of oxygen and hydrogen. A sampling timeline is presented in Figure 7.

Task 3. Flow logging and depth dependent sampling of JBWD - 10

Flow logs will be collected under unpumped and pumped conditions and water-quality samples will be collected under pumped conditions. Well-bore flow logs and water-chemistry data will be evaluated to understand flow and redistribution of chemical constituents through the well under unpumped and pumped conditions.

FISCAL IMPACT: \$63,450

Mr. Curt Sauer, General Manager
Joshua Basin Water District
Post Office Box 675
61750 Chollita Road
Joshua Tree, California 92252

Dear Mr. Sauer:

This letter confirms discussions between our respective staffs, concerning the continuation of the cooperative water-resources program between the Joshua Basin Water District (JBWD) and the U.S. Geological Survey (USGS) for the period May 1, 2017 to June 20, 2018.

Based on conversations with JBWD staff, it is our understanding that JBWD wishes to 1) continue monitoring at the recharge facility; 2) continue the basin-wide water-quality monitoring program; 3) assess the vertical contribution of wellbore flow and nitrate to JBWD production well 10; 4) assess the vertical distribution of septage/nitrate in the unsaturated zone in the vicinity of the residential development west of the recharge facility; and 5) better understand the Yucca Barrier.

Summary of Previous Work (2000-2015):

Groundwater historically has been the sole source of water supply for the community of Joshua Tree. JBWD supplies water to the community from the underlying Joshua Tree and Copper Mountain groundwater subbasins. JBWD is concerned with the long-term sustainability of the underlying aquifer. In order to manage the groundwater resources and to identify future mitigating measures, a thorough understanding of the groundwater system is needed. Since 2000, JBWD has partnered with the USGS to improve the understanding of the geohydrologic and geochemical framework of the Joshua Tree and Copper Mountain groundwater subbasins.

The geohydrologic framework of the subbasin was refined by collecting and interpreting groundwater-level and water-quality data and lithologic and geophysical data. Geology, hydraulic properties, and water-use in Joshua Tree and Copper Mountain subbasins were integrated into a MODFLOW model that simulated transient groundwater flow for the period of groundwater development in the subbasins between 1958 and 2001 (Nishikawa and others, 2004). Four unsaturated-zone monitoring sites were installed by the USGS in the Joshua Tree area (JTUZ-1, JTUZ-2, JTUZ-3, and JTUZ-4) (fig. 1). JTUZ-1 and -2 were installed in residential development areas and JTUZ-3 and 4 were installed within the boundary of the artificial-recharge facility operated by JBWD. Sites JTUZ-1 and -4 include monitoring wells installed at the top of the saturated zone.

Unsaturated-zone data were collected at JTUZ-1 and -2 and water-level data were collected at JTUZ-1 starting in June 2007. Data collection at these sites ceased in 2014. The nitrate concentrations were very high (well above the MCL of 10 mg/L as N) in samples from JTUZ-

1 lysimeters at 91 and 346 feet (ft) below land surface (bls) (as high as 1,000 mg/L as N). These nitrate concentrations greatly exceed the nitrogen concentration commonly associated with septic-tank effluent. A possible source for these high concentrations is the mineralization and subsequent leaching of naturally occurring nitrogen in the unsaturated zone. Because of the desert climate, nitrogen from buried plant material has not been mineralized and leached by the percolation of rainfall for many thousands of years. The nitrate concentrations were low (< 6 mg/L as N) in samples collected from JTUZ-1 lysimeter at 516 ft bls. The low nitrate concentrations may indicate that the wastewater front has not yet reached the depth of the lysimeter or that denitrification is occurring in the unsaturated zone. Nitrate concentrations in samples from JTUZ-2 lysimeter at 61 ft bls ranged from about 20-45 mg/L as N. These nitrate concentrations are in the range of reported nitrate concentrations in septic-tank effluent. The data indicate that the septage in the unsaturated zone at JTUZ-1 had not reached the water table prior to 2015. The matric-potential data indicate that in 2014 the front was between 343 and 461 ft bls while the suction-cup lysimeter data indicate that the wetting front is at least at 346 ft bls. However, elevated nitrate (as N) concentrations in the well at JTUZ-1 indicate that septage, likely from other areas, has reached the water table and has migrated through the saturated zone to the vicinity of JTUZ-1. In addition, water levels at JTUZ-1 appear to have reached their lowest level in 2014 (522.67 ft bls on 8/6/2014) and have recovered by over 2 ft to 520.20 ft bls (7/7/16). Rising water levels at JTUZ-1 have been accompanied by increasing nitrate concentrations in monitoring well JTUZ-1 and have risen from about 12 mg/L (as N) to about 20 mg/L (as N) (fig. 2).

Unsaturated-zone data were collected at JTUZ-3 starting in February 2010. Unsaturated-zone and water-level data were collected from JTUZ-4 starting in July 2012. Monitoring was discontinued at all unsaturated-zone sites around January 2013 and resumed in the summer of 2014 prior to the start of recharge activities in the vicinity of JTUZ-3 and -4. Water-quality samples were collected from JBWD production wells 10, 14, 15, 16, and 17 and from monitoring wells JTUZ-1 and JTUZ-4 to establish baseline (pre-recharge) conditions.

On October 7, 2014 imported water was first applied at the JBWD recharge facility. About 312 acre-feet of water were applied to pond #3 and application of recharge water ceased on October 27, 2014. The wetting-front arrived at the water table at JTUZ-4 on October 30, 2014 and moved downward to the water table at an average vertical rate of about 18 feet per day (fig. 2).

Periodic recharge activities continue at the recharge facility; the vertical movement of recharge water through the unsaturated zone is currently being monitored at JTUZ-4 (fig. 3).

Water-quality samples were collected periodically from the suction-cup lysimeters and well at JTUZ-4 to monitor the movement of nitrate in the unsaturated-zone and the effect of recharge on the shallow saturated zone. Nitrate concentrations in samples from JTUZ-4 peaked at about 43 milligrams per liter as nitrogen (mg/L as N) in the May 2015 sample (fig. 4). Nitrate

concentrations appear to be related to nitrate mobilized from the unsaturated zone beneath the recharge facility.

Summary of Previous Work (2016):

In Calendar Year 2016 the study consisted of three primary tasks:

- 1) Data collection at existing unsaturated-zone monitoring sites at the recharge facility (JTUZ-3 and -4);
- 2) Continuation of the basin-wide water-quality monitoring program (consisting of one sample collection event from monitoring wells JTUZ-1 and -4 and JBWD-14); and
- 3) Using the existing Joshua Tree and Copper Mountain subbasins groundwater-flow model to calculate inflows and outflows from the subbasins within the model using ZoneBudget (note that this task will be undertaken in 2017).

Based on available data, an increase in nitrate concentrations has been not observed in the nearest production well to the recharge facility (JBWD-14, nitrate as nitrogen = 2.50 mg/L on August 8, 2016 per JBWD). However, total coliform was reportedly detected in samples collected from JBWD-14 on June 23, 2016.

Major-ion data indicate that recharge water had not reached production well JBWD-14 on or prior to August 18, 2016 (fig. 5); stable isotope data indicated that recharge water had reached production well JBWD-14 by October 16, 2016 (fig.6).

Approach:

The study consists of five primary tasks: 1) data collection at existing unsaturated-zone monitoring sites (JTUZ-1, -3, and -4); 2) continuation of the basin-wide water-quality monitoring program; 3) assess the vertical contribution of wellbore flow and nitrate to JBWD production well 10; 4) assess the vertical distribution of septage/nitrate in the unsaturated zone in the vicinity of the residential development west of the recharge facility; and 5) assess and refine the understanding of the structural boundaries (faults) of the western portion of the Joshua Tree subbasin (Yucca Barrier) their potential effects on groundwater flow.

Task 1. Data Collection at Unsaturated-Zone Monitoring Sites JTUZ-1, -3, and -4

Instrumentation at JTUZ-3 and -4, located at the recharge facility, will be maintained to monitor the movement of the wetting front through the unsaturated zone and to monitor water levels in the monitoring well at JTUZ-4.

Instrumentation at JTUZ-1, located along Desert Air Road, will be reactivated to assess conditions in the unsaturated zone related to septage and to monitor water levels in the monitoring well at JTUZ-1.

Unsaturated-zone data will be recorded at 4-hour intervals; water-level data will be recorded hourly. The sites will be visited on a bi-monthly (every two months) basis to download data and change batteries. A submersible pressure transducer will monitor water levels in the recharge ponds.

Unsaturated-zone water-quality samples will be collected bi-annually (approximately every 6 months) from the suction-cup lysimeters at JTUZ-1, -2, -3, and -4 to assess water-chemistry changes in the unsaturated zone. These samples will be analyzed for total dissolved solids (TDS), nitrate, nitrite, bromide, chloride, sulfate, fluoride, orthophosphate, and the stable isotopes of oxygen and hydrogen. These samples will be analyzed at the USGS San Diego geochemistry laboratory by ion chromatography plasma mass spectrometry and the Reston Stable Isotope Laboratory. Field parameter data and samples will be collected and archived following procedures described in the USGS National Field Manual (USGS, variously dated). A proposed sampling timeline is presented in Figure 7.

Task 2. Continuation of the basin-wide water-quality monitoring program

Currently production well water-quality samples for the basin-wide water-quality monitoring program are collected and analyzed by JBWD and JBWD contracted laboratories; monitoring well water-quality samples are collected and analyzed by the USGS (Table 1).

Water-quality samples for the basin-wide water-quality monitoring program will be collected once in FFY17 to evaluate any changes to water quality. Based on conversations with JBWD staff, it is our understanding that JBWD will continue to manage the sampling and analysis of JBWD production wells 10, 14, 15, 16, and 17 in FFY17. The USGS will collect one set of samples from monitoring wells JTUZ-1 and JTUZ-4 and from the ponds at the recharge facility in conjunction with JBWD's production well sampling. Samples would also be collected from proposed monitoring site JTUZ-5 (discussed in Task 4), if constructed. Analytical costs associated with the proposed monitoring site are not included as part of this proposal. In addition, the USGS will also collect one replicate sample from a JBWD production well to provide be quality-assurance/quality-control (QA/QC) for JBWD's sampling. The samples will be analyzed for major and minor ions, selected trace elements, and nutrients (including nitrate) at the USGS National Water Quality Laboratory, and the stable isotopes of oxygen and hydrogen at the USGS Reston Stable Isotope Laboratory. Samples collected by JBWD will be analyzed for a similar set of constituents by laboratories contracted by JBWD.

A separate sampling event will collect one additional sample set from monitoring wells JTUZ-1 and JTUZ-4. The JTUZ-4 sample is to monitor changes in groundwater chemistry related to recharge activities; the JTUZ-1 sample is to monitor recent increasing nitrate concentrations in this well (fig. 2). These samples will be analyzed as described above, however one of the sample sets from JTUZ-1 will also be analyzed for tritium and carbon-14 to evaluate if recently recharged water (in the form of septage infiltrated within the last 50 years) has reached the saturated zone at this well.

Based on conversations with JBWD staff, it is our understanding that additional samples will be collected from JBWD production wells 10 and 14 on an approximately quarterly basis to monitor effects of recharge activities on groundwater in the vicinity of the recharge facility. These

samples will be analyzed for nutrients (including nitrate) and the stable isotopes of oxygen and hydrogen. A sampling timeline is presented in Figure 7.

Task 3. *Flow logging and depth-dependent sampling of JBWD-10*

Chemical concentrations in water samples collected from the surface discharge of production wells are representative of the mixture of water that enters the entire length of the well's producing screen from different depths. For example, the discharge from JBWD well 10 has a nitrate concentration of about 5 milligrams per liter (mg/L) as nitrogen, in excess of background nitrate concentrations (about 2.5 mg/L as nitrogen), and a chromium concentration of about 11 micrograms per liter (µg/L), in excess of the chromium MCL's (Table 1). The concentration of these constituents in the discharge of well 10 is a function of the water contributed over the entire length of the well screen and may vary with depth in the aquifer. Depth-dependent samples when coupled with velocity-log data can be used to estimate the quality and quantity of water entering a well from selected depths in an aquifer. Similar assessments have previously been performed at wells JBWD-14, -15, and -16. Additional information on flow logging and depth dependent sampling can be found at <http://pubs.usgs.gov/fs/2004/3096/>.

Flow logs will be collected under unpumped and pumped conditions and water-quality samples will be collected under pumped conditions. Well-bore flow logs and water-chemistry data will be evaluated to understand flow and redistribution of chemical constituents through the well under unpumped and pumped conditions.

Task 4. *Assess the vertical distribution of septage/nitrate in the unsaturated zone west of the recharge facility*

Existing unsaturated-zone data collected from JTUZ-4 at the recharge facility indicate that nitrate concentrations in the unsaturated zone below about 300 ft are relatively low (<1 mg/kg; fig. 8). However, a high-density residential development (Quail Springs Apartments) is located adjacent to the recharge facility and the vertical extent of nitrate (and associated septage) in the unsaturated zone related to the development is unknown. Rising water levels related to the recharge facility have the potential to entrain nitrate stored in the unsaturated zone thereby affecting the groundwater quality.

An unsaturated-zone monitoring site (JTUZ-5) will be installed west of the recharge facility, situated adjacent to the septic seepage pits at Quail Springs to help characterize the hydraulic and chemical properties of the unsaturated zone beneath a high-density residential seepage-pit installation. The site will include a water-table well to sample the shallow aquifer system. Please note that costs associated with water-quality sampling of the proposed well are not included in this proposal.

JTUZ-5 will be drilled to the top of the saturated-zone (estimated to be at 420 ft below land surface) using the ODEX method, which uses air as the drilling fluid. ODEX drilling is used so

that the water content and matric potential of the cutting materials collected from the unsaturated-zone are minimally altered during drilling (because air and not water is not used as a drilling fluid). A suite of geophysical logs (natural gamma, neutron, and electromagnetic-resistivity) will be collected in the borehole after drilling. Drill cuttings will be collected every foot to define the lithology and stratigraphy at the site. Water extracts from selected cuttings will be analyzed for chloride and nitrate concentrations at the USGS Water Quality Laboratory in San Diego, California and for the stable isotopes of nitrogen and oxygen (of nitrate) at the USGS Stable Isotope Laboratory in Reston Virginia.

JTUZ-5 will be instrumented with a water-table piezometer, up to five suction-cup lysimeters, and three advanced tensiometers; the specific number and placement of instruments will be determined based on observations made during and after drilling. A pressure transducer will be installed in the piezometer to measure water levels in the saturated zone. Data collected from JTUZ-5 will include soil-moisture and water-chemistry data that will be used estimate the vertical distribution of nitrate and to monitor the movement and the chemical transformations of the seepage-pit effluent in the unsaturated-zone.

Task 5. Assessment of Yucca Barrier

Regionally, groundwater flow in the Joshua Tree subbasin is from west to east, flowing from the western boundary of the subbasin (the Yucca Barrier). Faults within the subbasin tend to act as barriers to groundwater flow; most faults have been identified on the basis of differences in water levels between wells; however, due to the lack of wells/monitoring points in the western end of the subbasin, the precise location and depth of the Yucca Barrier as well as detailed information regarding groundwater barriers (faults) and groundwater-flow direction and magnitude are lacking. Similarly, the degree to which the western end of the subbasin may be compartmentalized due to faulting is not well understood. Geophysical surveys will be conducted in the vicinity of the Yucca Barrier to investigate the location of potential barriers to groundwater flow. Existing geophysical data previously collected in the area will be reviewed; available data indicates that seismic and resistivity geophysical surveys may yield the best results; however methodologies and scope of work may change based on the results the data review.

SUMMARY

The total cost of the proposed work is **\$XXX,XXX**. For studies done with local agencies, the U.S. Geological Survey may have funding to share costs for certain expenses such as labor and travel, subject to availability of these funds through congressional appropriations (Cooperative Matching Funds [CMF]). Costs associated with each task are presented in the following table:

Tasks		JBWD	USGS (CMF)	TOTAL
Task 1	Data collection at UZ sites	\$34,800	\$1,900	\$36,700
Task 2	Basin-wide sampling	\$30,400	\$1,400	\$31,800
Task 3	Flow log JBWD-10	\$43,900	\$3,100	\$47,000
Task 4	Drill and construct JTUZ-5	\$196,800	\$7,500	\$204,300
Task 5	Yucca Barrier assessment	\$43,500	\$3,800	\$47,300
Total		\$348,900	\$17,700	\$367,100

Enclosed, you will find four copies of Joint Funding Agreement (JFA) **16WSCXXXXXX** for the period **XXXXX** to **XXXXXX**. Work performed with funds from the JFA will be conducted on a fixed-price basis. If the JFA is acceptable, please return three copies with original signatures to our office for further processing. The fourth copy of each JFA is for your files. After signature by the USGS, a fully executed original of the JFA will be forwarded to HDWD for your records. The USGS is required to have agreements in place prior to any work being performed on a project.

If you have any questions concerning this program, please contact David O'Leary, in our San Diego Project Office at (619) 225-6157. If you have any administrative questions, please contact Irene Rios, in our San Diego Office, at (619) 225-6156.

Enclosures

cc: David O'Leary, USGS
Tracy Nishikawa, USGS

Sincerely,

Eric G. Reichard
Director
USGS California Water Science Center

Figures and Tables

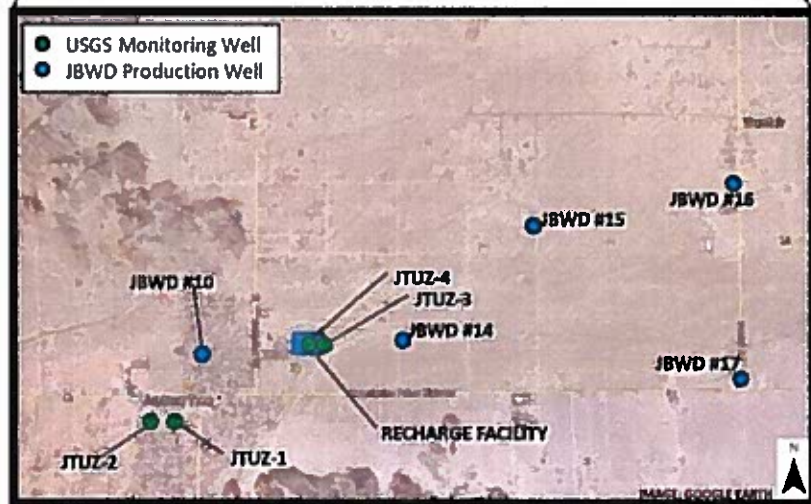
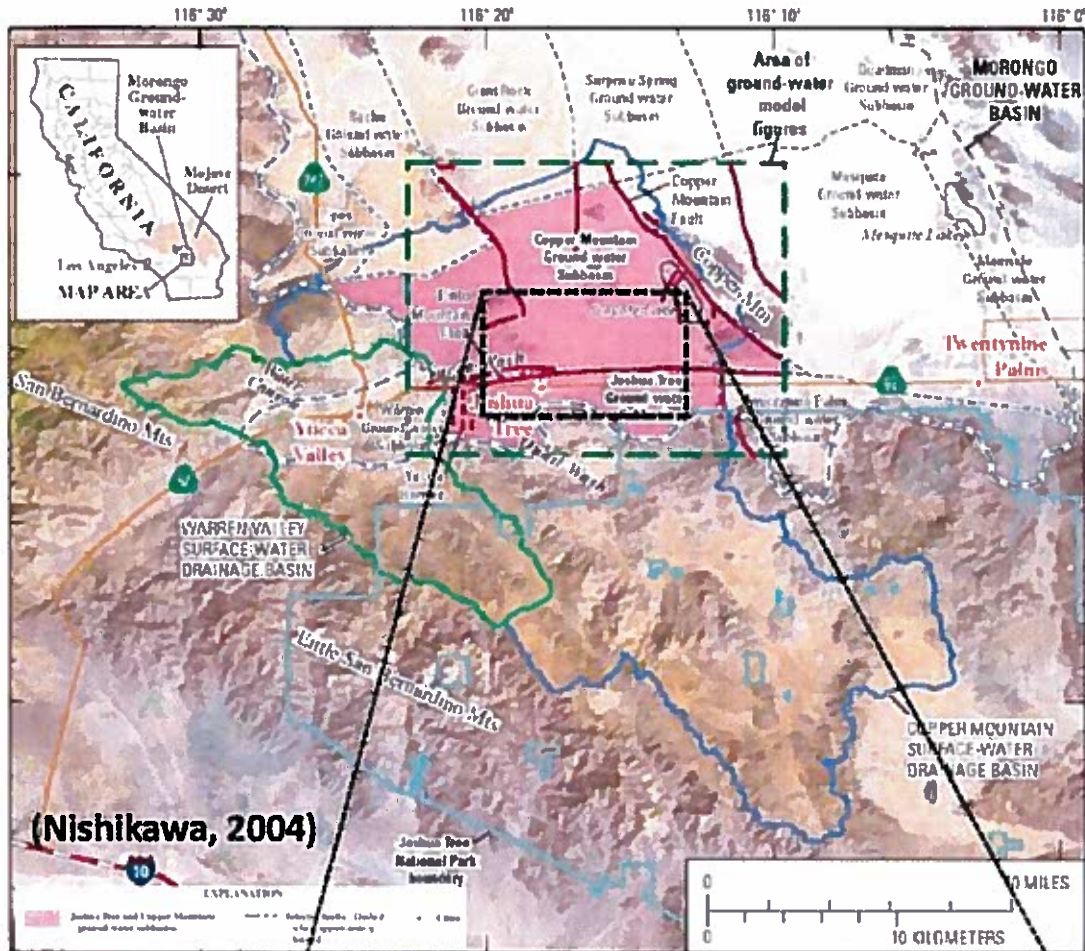


Figure 1. Location Map

Figure

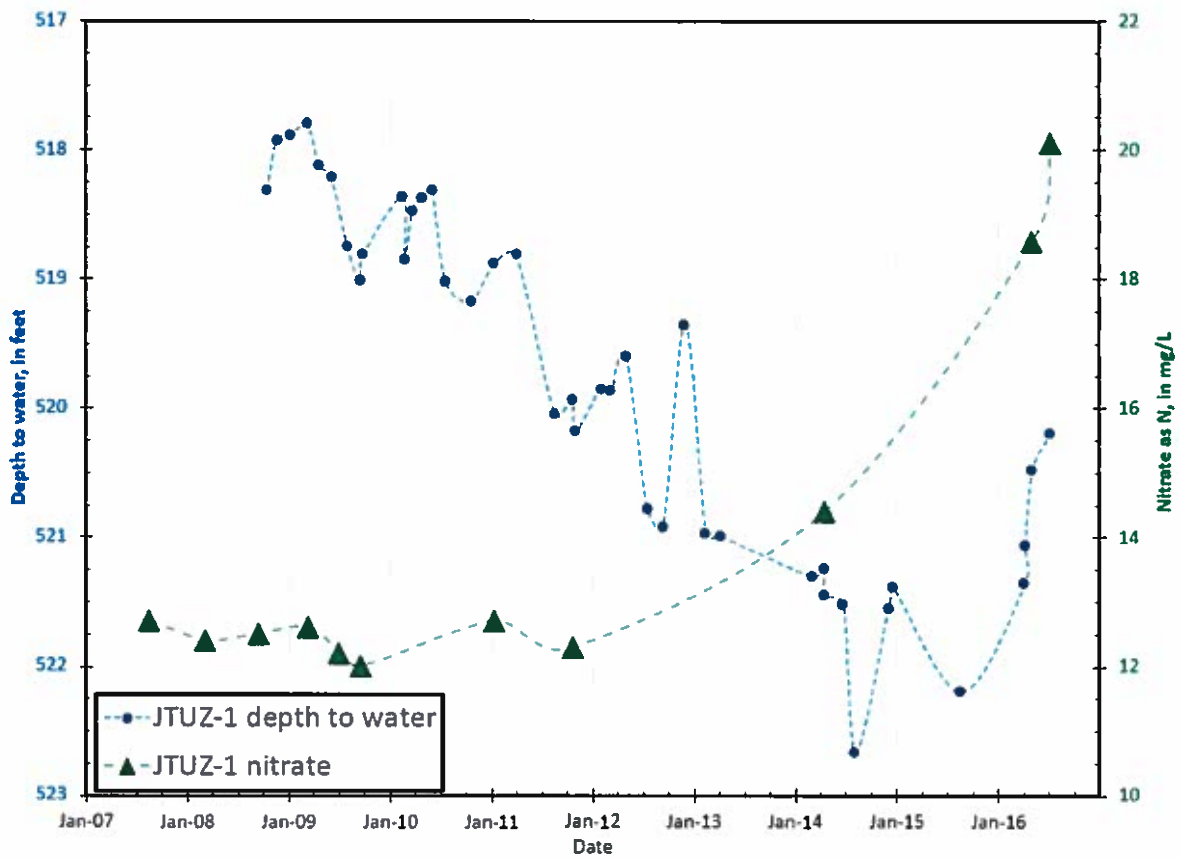


Figure 2. Water levels and nitrate concentrations in monitoring well JTUZ-1.

**JTUZ-4 WETTING FRONT
PRELIMINARY DATA - SUBJECT TO REVISION**

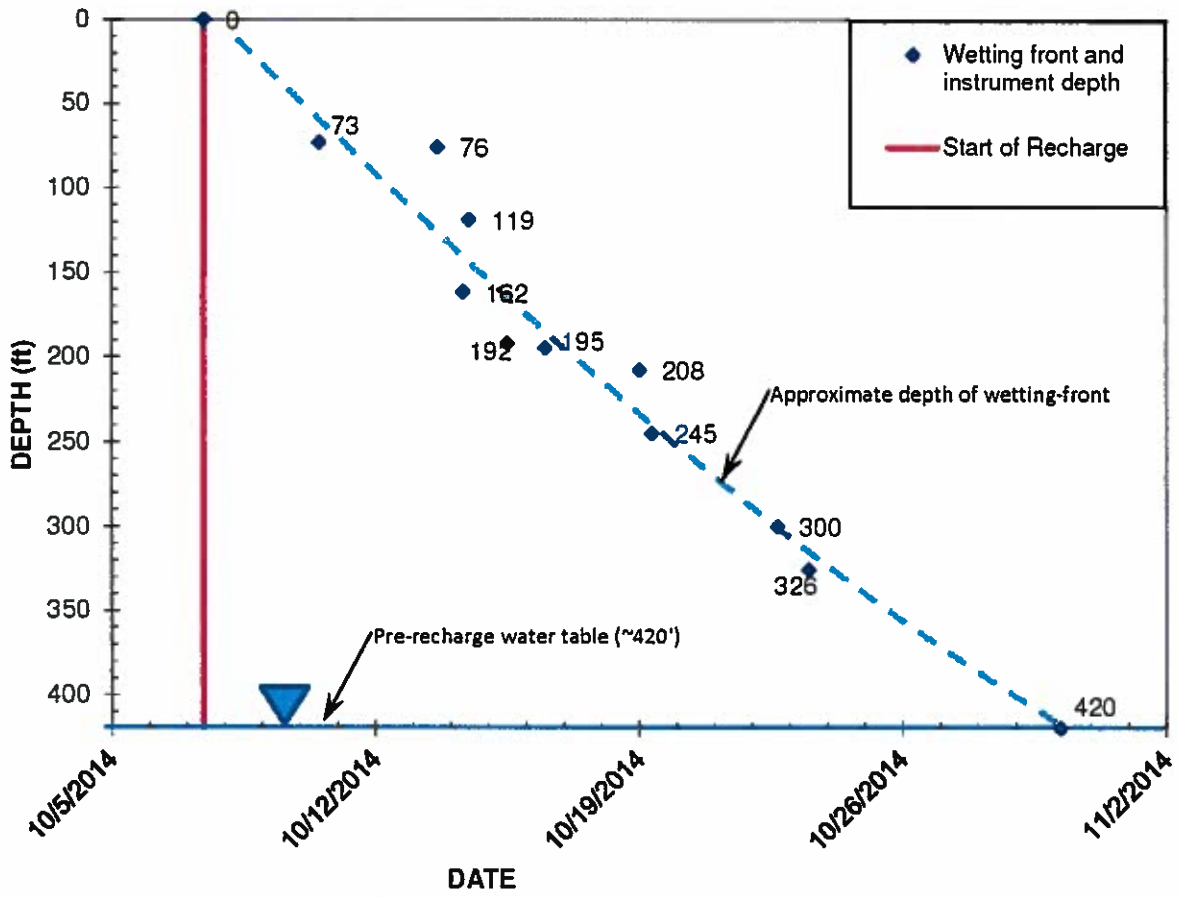


Figure 3. Movement of wetting front at recharge facility

**Unsaturated-zone monitoring site JTUZ-4
Nitrate in milligrams per liter**

PRELIMINARY DATA - SUBJECT TO REVISION

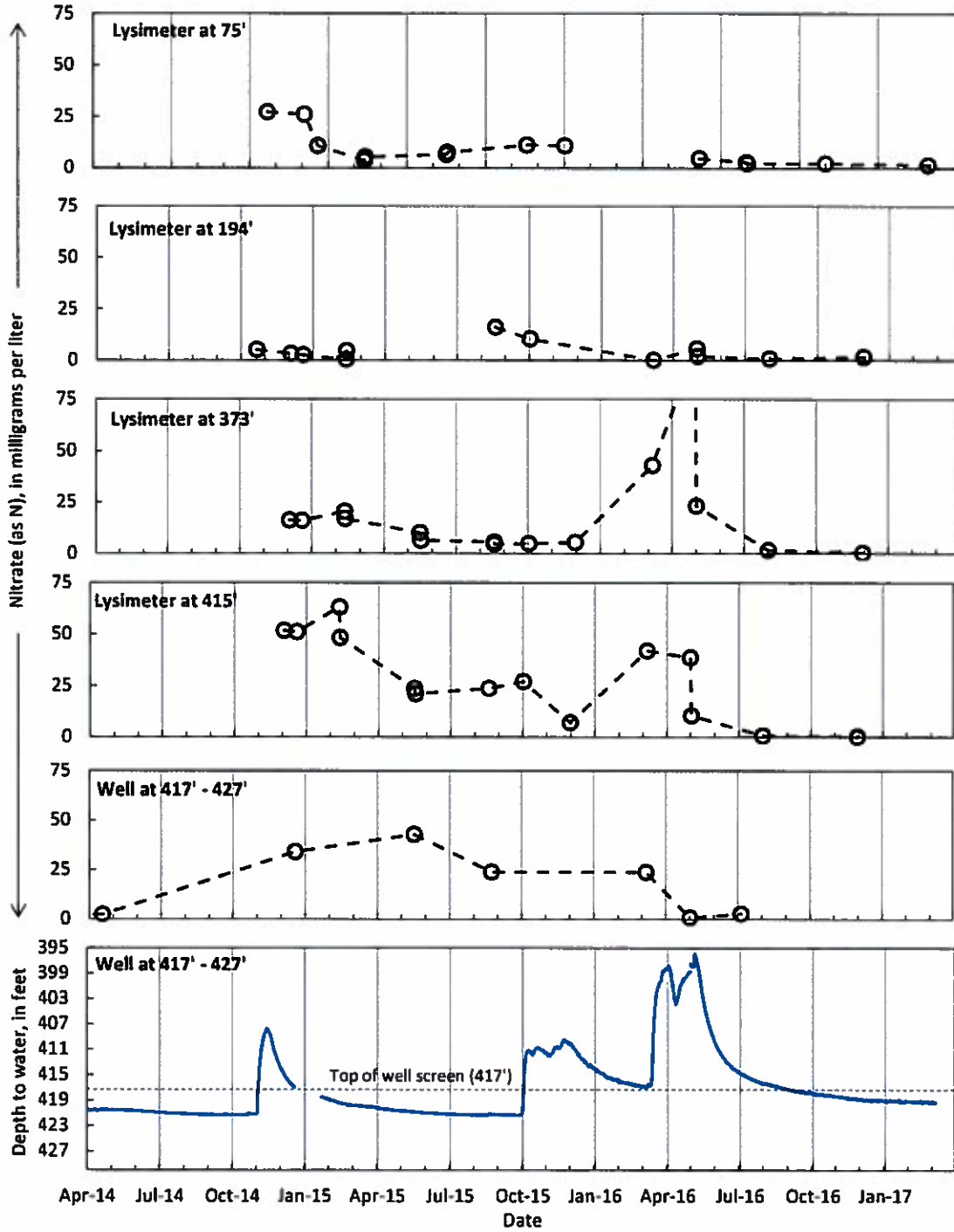


Figure 4. Nitrate concentrations (as N) and water levels at monitoring site JTUZ-4

Legend

- JBWD-14 (bacteria absent)
- JBWD-14 (bacteria present; 8/18/16)
- JTUZ-4 (native)
- ▲ JTUZ-4 (recharge)

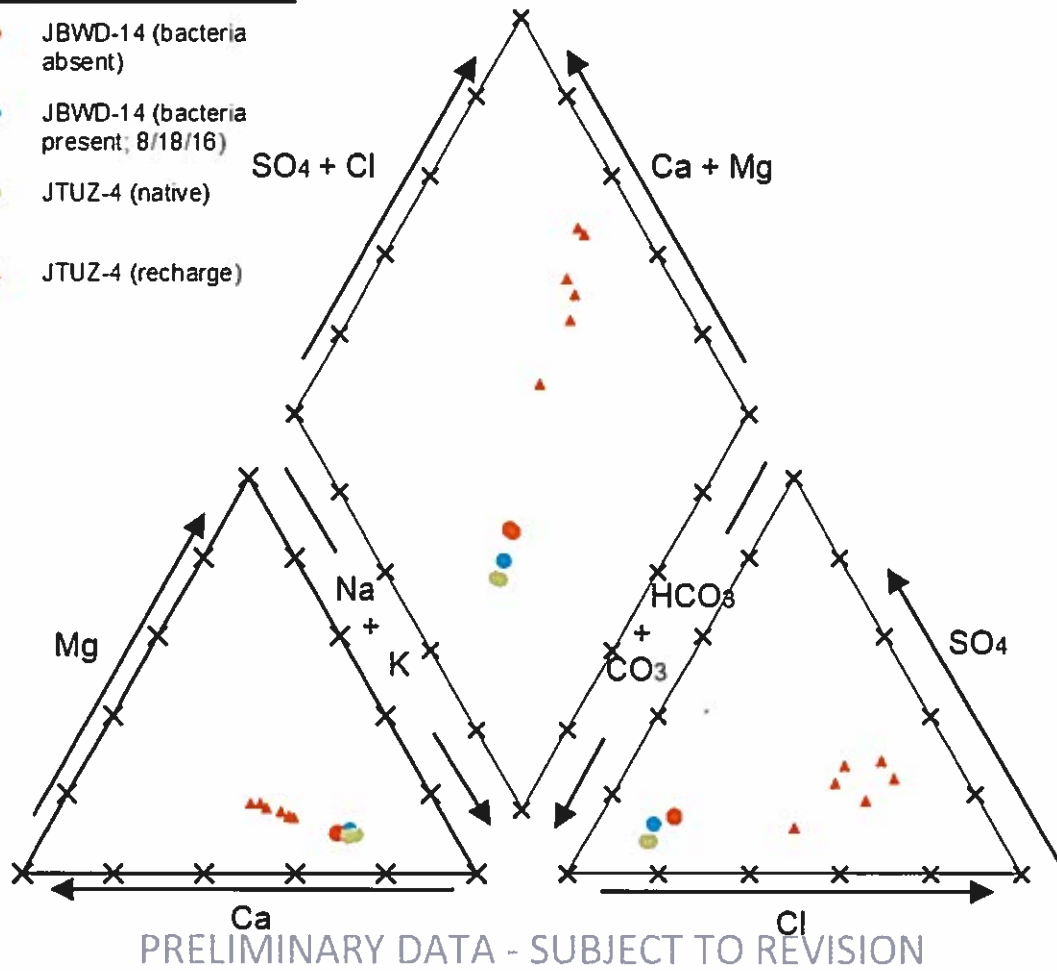


Figure 5. Major ion data.

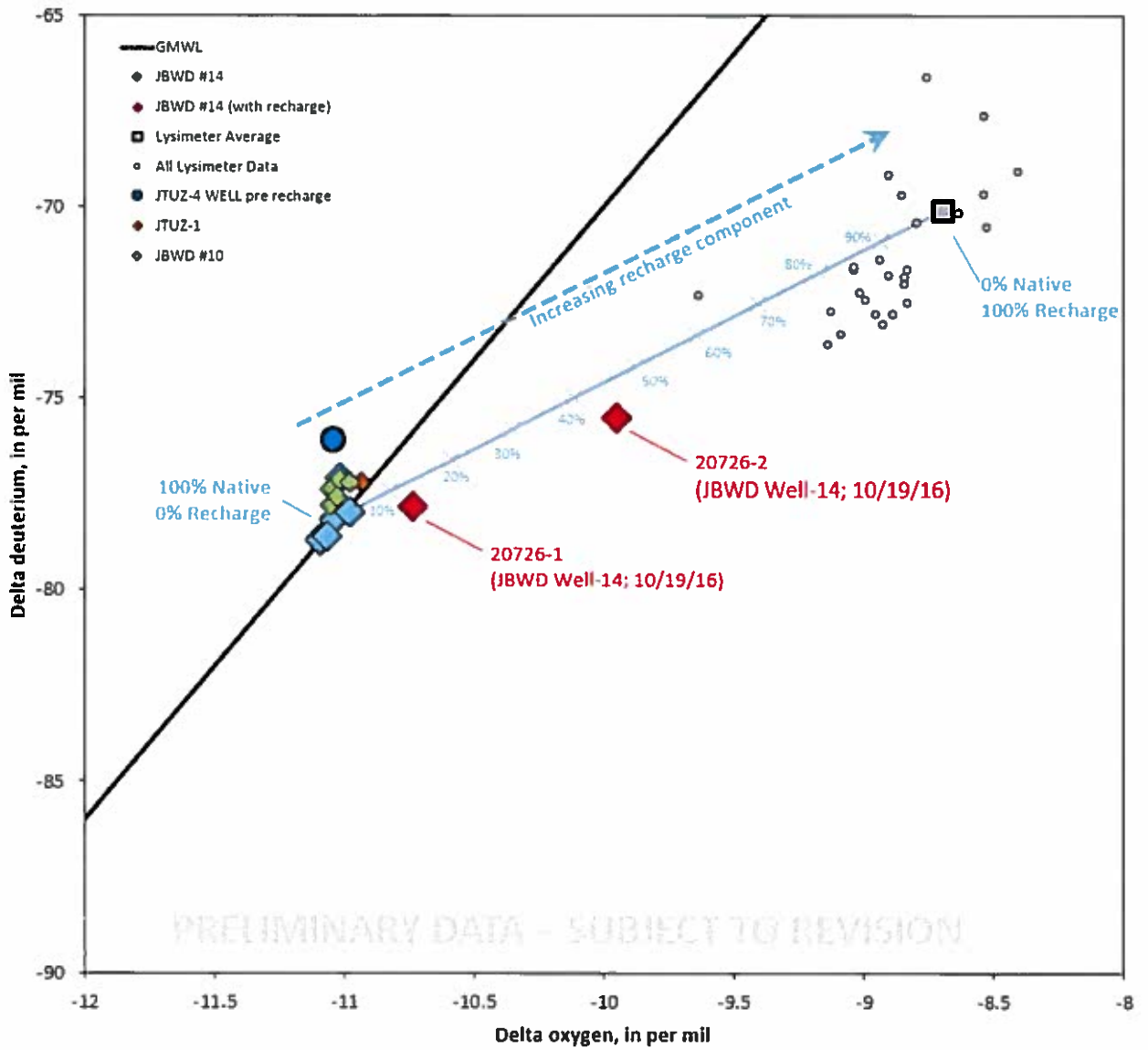


Figure 6. Stable isotope data.

Sample Location	Summer	Fall	Winter	Spring
Lysimeter Sampling (USGS)	X		X	
JTUZ-1 well sampling (USGS)	X			
JTUZ-4 well sampling (USGS)	X		X	
JTUZ-5 well sampling (USGS)			X	
Production Well Sampling (JBWD)			X	
Production wells 10/14 sampling (JBWD)	X	X	X	X

Figure 7. Proposed timeline.

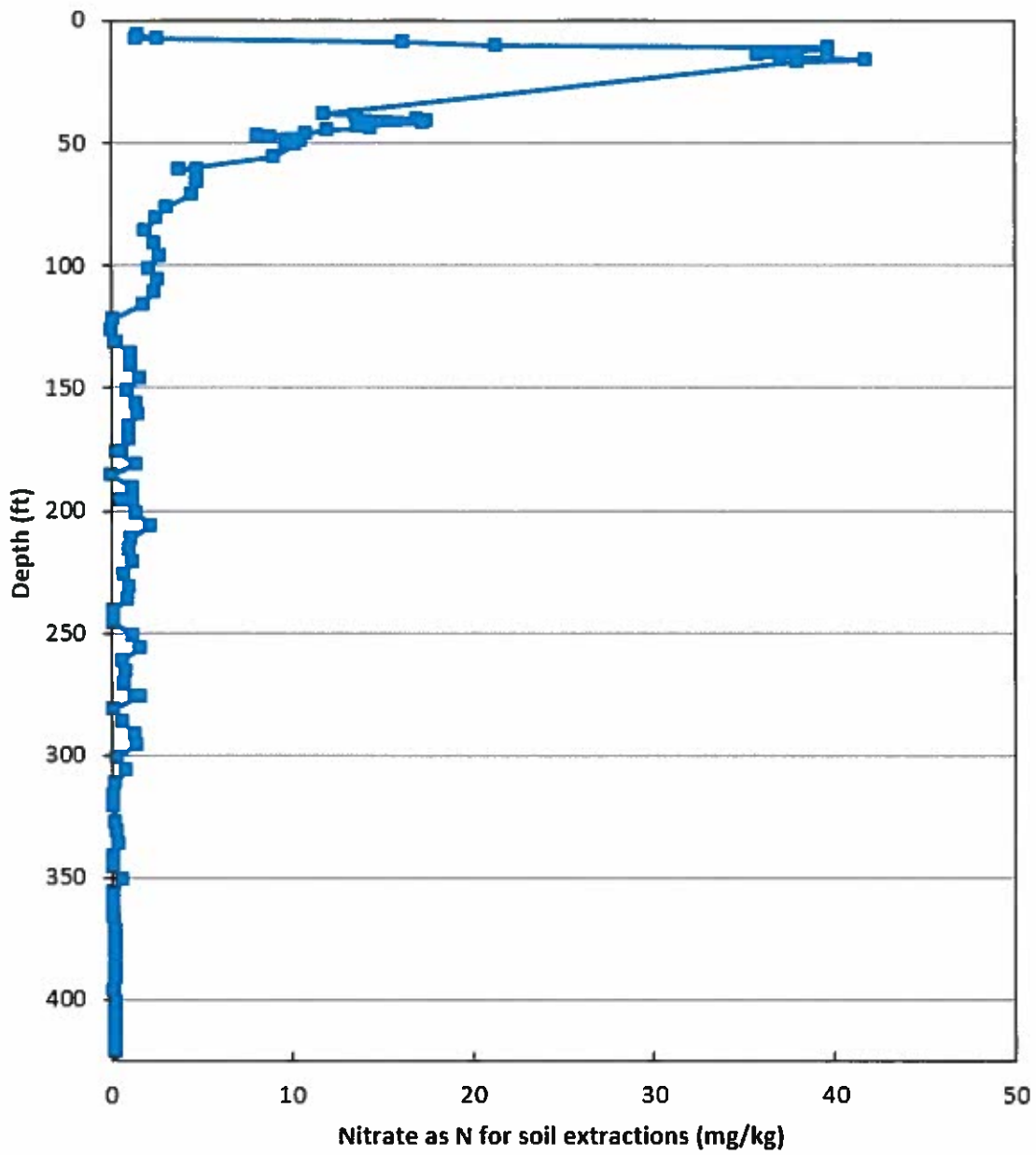


Figure 8. Nitrate concentrations in soil extractions from JTUZ-4.