AGENDA
Borrego Water District Board of Directors
Special Meeting
February 16, 2016 9:00 a.m.
806 Palm Canyon Drive
Borrego Springs, CA 92004

I. OPENING PROCEDURES

A. Call to Order
B. Pledge of Allegiance
C. Roll Call
D. Approval of Agenda
E. Comments from Directors and Requests for Future Agenda Items
F. Comments from the Public and Requests for Future Agenda Items (comments will be limited to 3 minutes)

II. CURRENT BUSINESS MATTERS

A. Public Hearing on Borrego Valley Groundwater Basin (BVGB) boundary adjustment application to the California Department of Water Resources (DWR) (2-24)

B. Discussion of Dudek municipal well water quality monitoring proposal

C. Discussion of USGS depth dependent water quality monitoring proposal (25-36)

D. Discussion of Dudek memo regarding Sustainable Groundwater Management Act (SGMA) compliant 4:1 water credits ratio (37-50)

E. Discussion of budget to develop business case for accepting the donation of farmland to meet Sustainable Groundwater Management Act (SGMA) municipal use reduction targets

F. Discussion of Groundwater Sustainability Agency (GSA) formation coordination with San Diego County

G. Discussion of business case for updating the District's water credits and developer (new connections) policies as soon as possible

H. Discussion of progress regarding Raftelis Financial rate study and reserves policy recommendations

I. Discussion regarding progress towards implementing the Borrego Water Coalition's policy recommendation in a Groundwater Sustainability Plan (GSP) for the Borrego Valley Groundwater Basin (BVGB) (51-55)

J. Discussion and update on mandatory drought-related conservation targets for governor's Drought Executive Order for 2016

K. Discussion of rate increase messaging (56-77)

L. Discussion and approval of Resolution 2016-02-01, ***Resolution of the board of directors of the Borrego water district authorizing the general manager to submit an application for funding under the water quality, supply and infrastructure improvement act of 2014 (Proposition 1)*** (78-80)

M. Discussion of Town Hall agenda and meeting date

N. Discussion of potential agenda items for February 24th board meeting

III. INFORMATION ITEM :

Bill Wright Petition

IV. CLOSING PROCEDURE

The next Regular Meeting of the Board of Directors is scheduled for February 24, 2016 at the Borrego Water District

DUDEK

DRAFT TECHNICAL MEMORANDUM

To:	Jerry Rolwing, General Manager Borrego Water District
From:	Peter T. Quinlan, RG, Jill Weinberger, PhD, PG, Trey Driscoll, PG, CHG
Subject:	Borrego Valley Groundwater Basin (7-24) Boundary Modification
Date:	January 19, 2016
cc:	James Bennett, County of San Diego, Claudia Faunt, USGS, Tim Ross, DWR
Attachment(s):	Figures 1-11,

INTRODUCTION

This memo was written for the Borrego Water District (BWD) to address the issues associated with requesting a groundwater basin boundary modification and to provide the technical rationale for modification to the Borrego Valley Groundwater Basin (BVGB) (7-24) as defined by Department of Water Resources (DWR) Bulletin 118. The BWD provided notice to DWR on October 27, 2015 to become a Groundwater Sustainability Agency (GSA) for the portion of the BVGB within the boundaries of the District.[1] The County of San Diego Board of Supervisors authorized the County of San Diego to become a GSA over BVGB on January 6, 2016. The Sustainable Groundwater Management Act (SGMA) specifies that GSAs be designated for each basin identified in DWR Bulletin 118. When multiple agencies elect to become a GSA over the same basin area, SGMA requires the agencies reach an agreement regarding how multiple GSAs will administer a Groundwater Sustainability Plan (GSP).[2] The BWD and County of San Diego are currently negotiating a joint power agreement or similar legal agreement to coordinate efforts on development of a GSP for the BVGB.[3]

PAST AND CURRENT BASIN BOUNDARIES

SGMA provides for the possibility of re-designating the boundaries of groundwater basins to match basins to logical management units to address overdraft. DWR presented the areal extent of the BVGB as shown in Bulletin 118 in 1975 and revised it slightly in 1980 (Figure 1). The BVGB did not extend southward as far as California State Route 78 (SR 78) in these documents. The Ocotillo Wells Basin (7-25) was located southeast of the BVGB. The 2003 DWR Bulletin 118 revision divided the Ocotillo Wells Basin and extended the BVGB boundary some 30 miles

[1] Borrego Water District Notice of Election to Serve as a Groundwater Sustainability Agency letter dated October 26, 2015. GSA formation notifications are reported on the DWR's website at: http://www.water.ca.gov/groundwater/sgm/gsa_table.cfm
[2] Water Code Section 10727
[3] See DWR and SWRCB Fact Sheet on Memorandums of Agreement, Joint Powers Authorities, and Coordination Agreements dated January 15, 2016. http://www.waterboards.ca.gov/water_issues/programs/gmp/docs/sgma/mou_jpaco_fs.pdf

farther south approximately quadrupling its area (Figure 2). The 2003 revision extended the BVGB boundary well into Imperial County in an area that has little to no habitation. DWR appears to have based this revision on the alignment of the Coyote Creek Fault, the Superstition Mountain Fault and other unnamed faults trending northwest – southeast. The southern extension appears to include several separate watersheds and sparsely populated areas remote from groundwater production and the associated water level declines in Borrego Springs. The current written description of the BVGB excerpted from 2003 Bulletin 118 is as follows:

> *"This basin underlies Borrego and Lower Borrego Valleys in the eastern Imperial and western San Diego Counties. The basin is bounded by the Santa Rosa Mountains on the north, the San Ysidro Mountains on the west, Coyote Creek and Superstition Mountain faults on the northeast, and the Fish Creek and Coyote Mountains on the southwest. The southeastern boundary is a surface drainage divide from the Coyote Mountains northeast to Superstition Mountain. Coyote Creek and San Felipe Creek drain the valley southwestward. Borrego Sink, overlying the northern portion of the basin, is a major collection point for runoff in Borrego Valley (DWR 2003)."*

CRITERIA FOR ADJUSTING BOUNDARIES

DWR has previously indicated a preference that "groundwater resources be sustainably managed within *existing* groundwater basin boundaries defined by Bulletin 118-2003 unless *compelling reasons*, which are supported by adequate technical information and broad agreement, are provided for alternative boundaries that increase the likelihood of sustainable management of the proposed and adjacent basins." (emphasis added.) Final guidance on the Basin Boundary Emergency Regulation in compliance with Water Code Section 10722.2 was issued by DWR and became effective on November 16 2015. This document provides general criteria to be used in evaluating basin boundary adjustments:

"• *How to assess the likelihood that the proposed basin can be sustainably managed.*

• *How to assess whether the proposed basin would limit the sustainable management of adjacent basins.*

• *How to assess whether there is a history of sustainable management of groundwater levels in the proposed basin.*"

The proposed regulation also outlines the process to be followed to pursue a boundary adjustment and modification types. Modifications fall into two categories: 1) Scientific and 2) Jurisdictional. Jurisdictional modifications include internal modifications of sub-basin boundaries, consolidation of sub-basins, and sub-division of a basin into sub-basins. BWD and the County of San Diego would be proposing a jurisdictional sub-division with supporting scientific justification.

In general, basins should be large enough to maximize basin management opportunities and not exclude problem areas. Basin boundaries should be scientifically based reflecting hydrogeologic boundaries rather than arbitrary jurisdictional boundaries. Basins should be properly sized for GSA governance.

The northern portion of the BVGB has witnessed sharp declines in water levels due to increased groundwater production since the 1970s. These declines are most pronounced in the vicinity of Borrego Springs, within the BWD service area boundaries. Since the BWD and the County of San Diego intend to become the GSA(s) to sustainably manage groundwater in the BVGB, it makes sense for BWD to propose that the boundaries of the BVGB encompass all the area experiencing the effects of over-draft, but not extend well beyond the BWD boundaries to include sparsely populated areas of San Diego and Imperial Counties that have not witnessed declining water levels. The logical southern boundary of the BVGB is in the vicinity of San Felipe Wash. This boundary location makes sense for both scientific reasons discussed below and for jurisdictional reasons mentioned above.

Basin boundary modifications must be coordinated with other public agencies, in this case, Imperial Irrigation District and the Counties of San Diego and Imperial.[4] These three agencies would have GSA responsibilities for the parts of the Bulletin 118 – 2003 BVGB excluded by sub-division.[5] Under the proposed change to the BVGB, the DWR Basin Prioritization ranking should be recalculated for the area south of the San Felipe Wash.[6] This ranking calculation accounts for population, population growth, public supply wells, total wells, irrigation acreage, groundwater use, percent of total supply, groundwater reliance and impacts, and other information in order to assign relative priority to each basin in the state. The BVGB is currently a medium priority basin with a draft designation of critical overdraft. However, when the ranking is recalculated, the area south of San Felipe Wash is likely to become a low or very low priority basin because it is sparsely populated, lacks public supply wells, has a low number of wells, has small irrigation acreage, has low groundwater use and has no documented impacts (DWR 2014, 2015).[7]

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[4] On September 3, 2015, the County of Imperial pursuant to the California Water Code (CWC) Section 10723.8 provided notice to the DWR of its election to assume the role of GSA within the County boundaries of all groundwater basins and sub-basins underlying the County including the Borrego Valley (DWR Basin 7-24).
[5] Water Code Section 10724. Presumption that County Will Manage Areas Not Covered by a GSA.
[6] The DWR is required to provide an update to the Basin Prioritization as part of the update of Bulletin 118, which is expected to be published in late 2016.
[7] The Draft List of Designation of Critical Overdraft is located as follows:
http://www.water.ca.gov/groundwater/sgm/pdfs/Draft%20COD%20Basins%20short%20Table.pdf

TECHNICAL RATIONAL FOR BASIN BOUNDARY ADJUSTMENT

Groundwater Levels

A review of historical water levels from 1945 to 2010 indicates that there has been little to no change in groundwater elevations southeast of Borrego Springs where the San Felipe Wash discharges across the basin from a gap in the Vallecito Mountains as indicated by measurements in Wells 11S/7E 20P1 and 11S/7E 32Q1 (Figures 3 and 4). Groundwater elevations in these wells have remained at approximately 500 feet above mean sea level (amsl). In addition, farther to the southeast in Ocotillo Wells, water level measurements in Well 12S/8E 22E1 indicate stable groundwater levels at approximately sea level between 1950 and 1995 (Figure 3 and 5). By contrast, groundwater elevations declined by 160 feet, 6 miles to the northwest in the vicinity of the intersection of Borrego Valley Road and Rango Way and by 145 feet 13 miles to the northwest near the mouth of Coyote Canyon (Figures 6 and 7). Water level hydrographs for Wells 10S/6E 9L1, 10S/6E 18J1, 10S/6E 21A1, and 10S/6E 21A2 have declined by 119 feet between 1955 and 2010 (Figures 3 and 4). Historical water level contours from 1945 and 2010 illustrate pre-pumping conditions and the areal extent of pumping depressions (Figures 6 and 7). Pumping depressions are confined to areas north and west of the Borrego Sink.

These historical water level trends indicate that areas to the southeast of San Felipe Wash are remote from and possibly isolated from effects of pumping in the Borrego Springs area. As a result, focusing the sustainable management area on the Borrego Springs area where the effects of over-drafting have been documented makes sense. Extending the basin boundaries to areas unaffected by historical pumping only increases the administrative burden on the GSAs.

Geologic Structure

The United States Geologic Survey (USGS) prepared an isostatic residual gravity survey of the Borrego Valley in 1993 (Langenheim, V. E. and R. C. Jachens). The resulting map of the variation in gravitational pull throughout the Borrego Valley generally indicates depth to bedrock. Where bedrock is exposed or close to the surface, the gravitational pull is higher. Where bedrock is buried beneath basin sediments, the gravitational pull is lower. The results of the gravity survey show the deepest part of the basin, where bedrock is buried beneath sediments, is in the vicinity of the Borrego Valley Airport, as indicated by the -30 milligal contour on Figure 8. The basement rock underlying the basin is much deeper in the vicinity of Borrego Springs and the Borrego Valley Airport, than where San Felipe wash enters the basin (Figure 8).

The deep portion of the basin is formed by the Borrego syncline, which developed during the early stages of faulting in the San Jacinto fault zone (Lutz et al., 2006; Kirby et al., 2007; Steely, 2006). To the south, in the vicinity of the San Felipe wash, there is a basement high known as the

Yaqui Ridge/ San Felipe anticline, which is also related to deformation in the San Jacinto fault zone. The basement bedrock underlying the basin sediments drops away again southeast of Ocotillo Wells following the southern limb of the San Felipe anticline.

The presence of the Yaqui Ridge/ San Felipe anticline in the vicinity of the San Felipe wash effectively compartmentalizes the deep alluvial sediments beneath Borrego Springs, separating them from the alluvial sediments to the far southeast. The USGS prepared a cross-section running from Borrego Springs in the northwest to the southeast that illustrates basement low in the Borrego syncline and the basement high of the San Felipe anticline (Figures 9 and 10). This cross-section also illustrates that neither the high permeability sediments of the upper aquifer of the BVGB nor the sediments of the middle aquifer extend to the area of the San Felipe anticline. Only the lower permeability sediments of the lower aquifer drape over the San Felipe anticline. This may also help explain why the overdraft resulting from pumping of the upper and middle aquifers has been confined to the Borrego Springs area and has not propagated southeast to the San Felipe Wash area.

The 2008 geologic map of Borrego and the Borrego Mountains prepared by Dibblee identifies some north-south trending faults in the Borrego Mountains that appear to coincide with the San Felipe anticline (Figure 10). Additional north northeast trending faults are mapped in the Vallecito Mountains to the southest adjacent to where the basement drops away near Ocotillo Wells. There are also northeast – southwest trending faults in the Borrego Badlands that align with the Borrego Sink (Dibblee 2008). No faults are mapped in the alluvium, but they may be present and could help explain why the approximately 100 feet of groundwater level declines north of San Felipe Wash did not propagate southeast.

EVALUTATION OF THE PROPOSED BASIN SUB-DIVISION BY THE PROPOSED CRITERIA

What is the likelihood that the proposed basin can be sustainably managed?

The proposed sub-basin boundaries encompass all the area of the larger basin that have experienced dramatic declines in groundwater levels. BWD is the agency producing all of the groundwater for municipal use and has been in groundwater management discussions with agricultural and recreational groundwater producers for several years. As GSA, BWD is well equipped to implement measures to sustainably manage groundwater in the Borrego Springs portion of the BVGB. The County and BWD intend to work cooperatively to ensure that all areas of the proposed basin are successfully managed.

Would proposed basin limit the sustainable management of adjacent basins?

The areas adjacent to the basin to the southeast (Ocotillo Wells) have not experienced significant groundwater declines in the past indicating that this area has not been impacted by over-drafting north of San Felipe Wash. Sustainable management of the Borrrego Springs area will result in ending over-draft and potential impact to the Ocotillo Wells area. Sustainable management of the BVGB north of San Felipe Wash will not limit the ability of the County of San Diego, Imperial Irrigation District or Imperial County to manage groundwater south of the the proposed sub-division.

Is there a history of sustainable management of groundwater levels in the proposed basin?

Although there is not a history of sustainable management of groundwater levels in the Borrego Springs area, there is a history of the BWD, the County of San Diego, DWR and other agricultural and recreational producers meeting, commissioning studies by the USGS, recognizing the over-draft problem, and seeking to formulate a plan to reduce groundwater production. This includes formation of the Borrego Water Coalition (BWC), a stakeholder group consisting of approximately 17 community members representing interests on behalf of Anza-Borrego State Park, recreation, agriculture, public use areas, the BWD, resorts and lodging, the Borrego Springs Unified School District, and commercial businesses to address the significant risks associated with over drafting the BVGB and to work toward a plan to stabilize water levels.

PROPOSED BASIN BOUNDARY FOR BORREGO VALLEY

The proposed basin subdivision for Borrego Valley is a hybrid of previous DWR Bulletin 118 boundaries discussed above and consideraton of both scientific facts and jurisdictional issues. The proposed Borrego Valley Basin boundary is defined by the contact of unconsolidated sediments with plutonic and metamorphic basement to the west (Pinyon Ridge, San Ysidro Mountains); the mapped trace of the Coyote Creek fault that trends northwest – southeast to the north and east of the Basin and by the general location of San Felipe Wash to the south, which is approximately co-located with a basement high known as the Yaqui Ridge/ San Felipe anticline. To easily distinguish the southern boundary of the Basin, SR 78 was selected as the demarcation until it intercepts the Anza Borrego State Park Boundary, which is delineated by the Public Land Survey System (PLSS), where it extends north until it intercepts the trace of the Coyote Creek fault (Figure 11). The placement of the southern boundary at SR 78 and at the boundary of the Anza Borrego State Park is based both on supporting scientific and jurisdicitonal justification; the boundary is approximately coincident with the basement high known as the Yaqui Ridge/ San Felipe anticline and a shared boundary with the Anza Borrego State Park ensures that all of the potential pumpers or pumping areas are captured within the proposed basin subdivision of the

BVGB. The portion of the exising BVGB located to the southeast of the Yaqui Ridge/ San Felipe anticline will be referred to as the "*Ocotillo Wells Groundwater Basin*", or other suitable name, and the area to the north will retain the designation as the BVGB.

REFERENCES

Department of Water Resources (DWR). 1975. California's Ground Water Bulletin No. 118. September 1975.

DWR. 1980. Ground Water Basins in California – A Report to the Legislature in Response to Water Code Section 12924. Bulletin 118-80. January 1980.

DWR. 2003. California's Groundwater Bulletion 118 – Update 2003. October 2003.

DWR. 2014. CASGEM Groundwater Basin Priortization Results. June 2, 2014.

DWR. 2015. Basin Boundary Regulations Discussion Paper. April 10, 2015.

DWR. 2015. Draft List of Crtically Overdrafted Basins. August 6, 2015.

DWR. 2015. SGMA Proposed Basin Regulations Fact Sheet. October 8, 2015.

DWR. 2015. Adopted Basin Boundary Emergency Regulation, CCR Title 23. Waters, Division 2 DWR, Chapter 1.5. Groundwter Management, SubChapter. 1 Groundwater Basin Boundaries. November 16, 2015.

Dibblee, 2008. Geologic Map of the Borrego & Borrego Mountian 15 Minute Quadrangles, San Diego and Imperial Counties. September 2008.

Faunt, C.C., Stamos, C.L., Flint, L.E., Wright, M.T., Burgess, M.K. Sneed, Michelle, Brandt, Justin, Martin, Peter, and Coes, A.L., 2015, Hydrogeology, Hydrologic Effects of Development, and Simulation of Groundwater Flow in the Borrego Valley, San Diego County, California; U.S. Geological Survey Scientific Investigation Report 2015-5150, 135 p., https://pubs.er.usgs.gov/publication/sir20155150

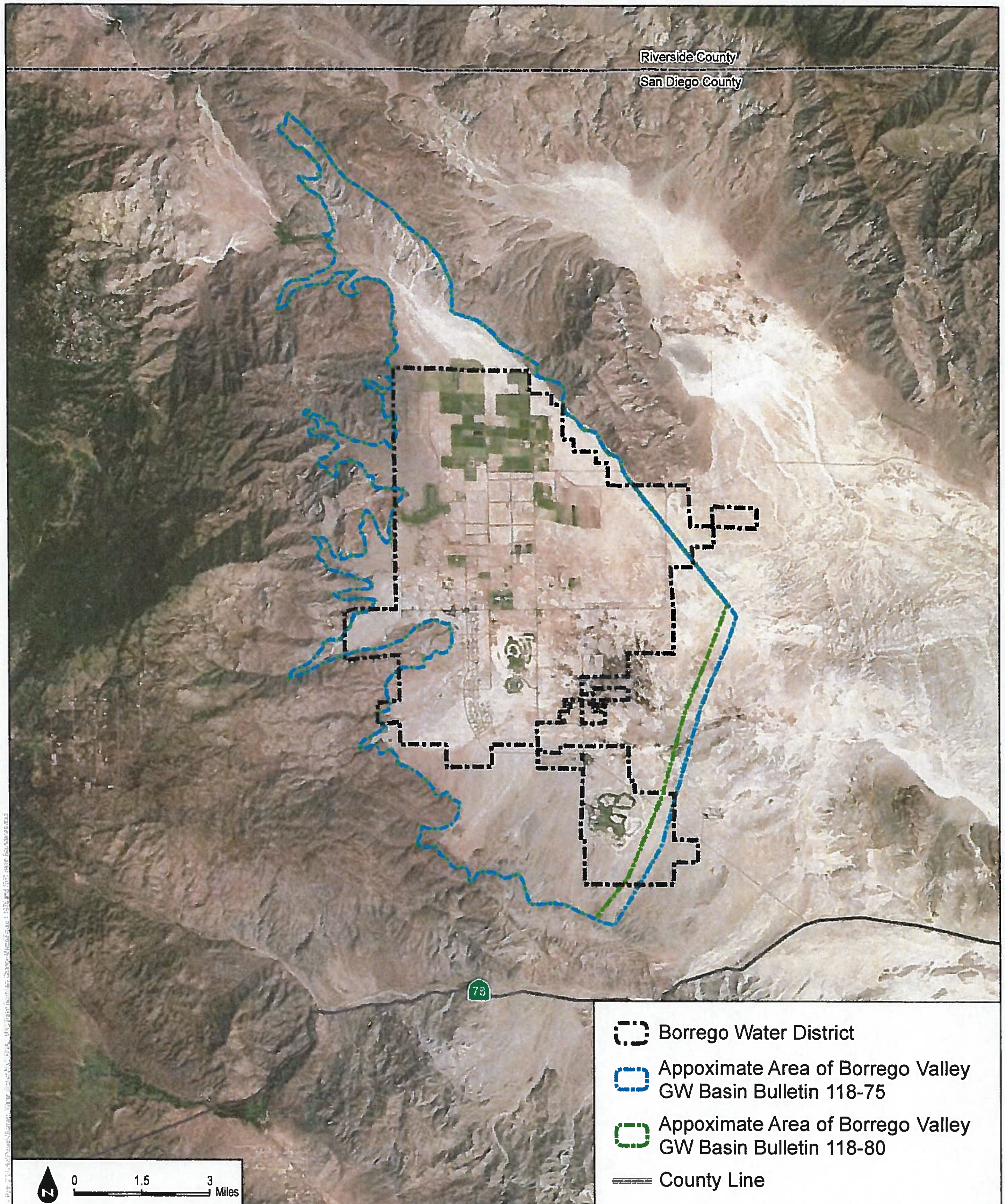
Kirby S. et al. 2007. Pleistocene Brawley and Ocotillo Formations: Evidence for Initial Strike-Slip Deformation along the San Felipe and San Jacinto Fault Zones, Southern California. [The Journal of Geology, 2007, volume 115, p. 43–62] 2007.

Langenheim, V. E. and R. C. Jachens. 1993. Isostatic Residual Gravity Map of the Borrego Valley 1: 100,000-Scale Quadrangle. Open File Report 93-246.

Lutz et al. 2006. Stratigraphic Record of Pleistocene Faulting and Basin Evolution in the Borrego Badlands, San Jacinto Fault Zone, Southern California. Geological Society of America Bulletin, November/December 2006.

Steely, A.N., 2006, The evolution from Pliocene West Salton detachment faulting to cross-cutting Pleistocene oblique strike-slip faults in the SW Salton Trough, Southern California [M.S. thesis]: Logan, Utah State University, 239 p.

FIGURES



SOURCE: DWR 1975, 1980

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Figure 1
Borrego Valley Groundwater Basin Bulletin 118-75 and 118-80

Borrego Water District - Basin Delineation Change Memo

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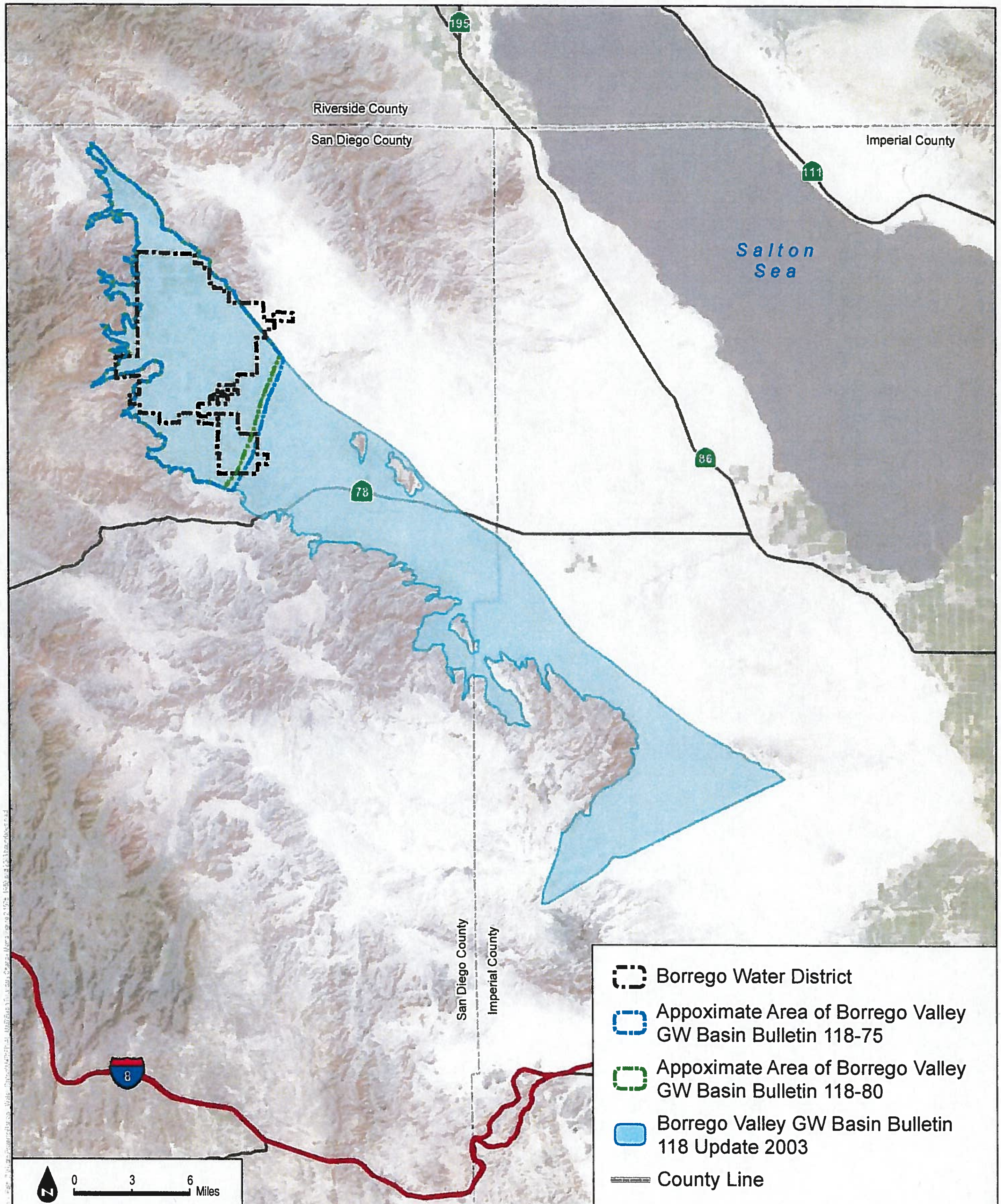

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SOURCE: DWR 1975, 1980, 2003

Figure 2

Borrego Valley Groundwater Basin Bulletin 118-75, 118-80 and 118-2003 Update

Borrego Water District - Basin Delineation Change Memo

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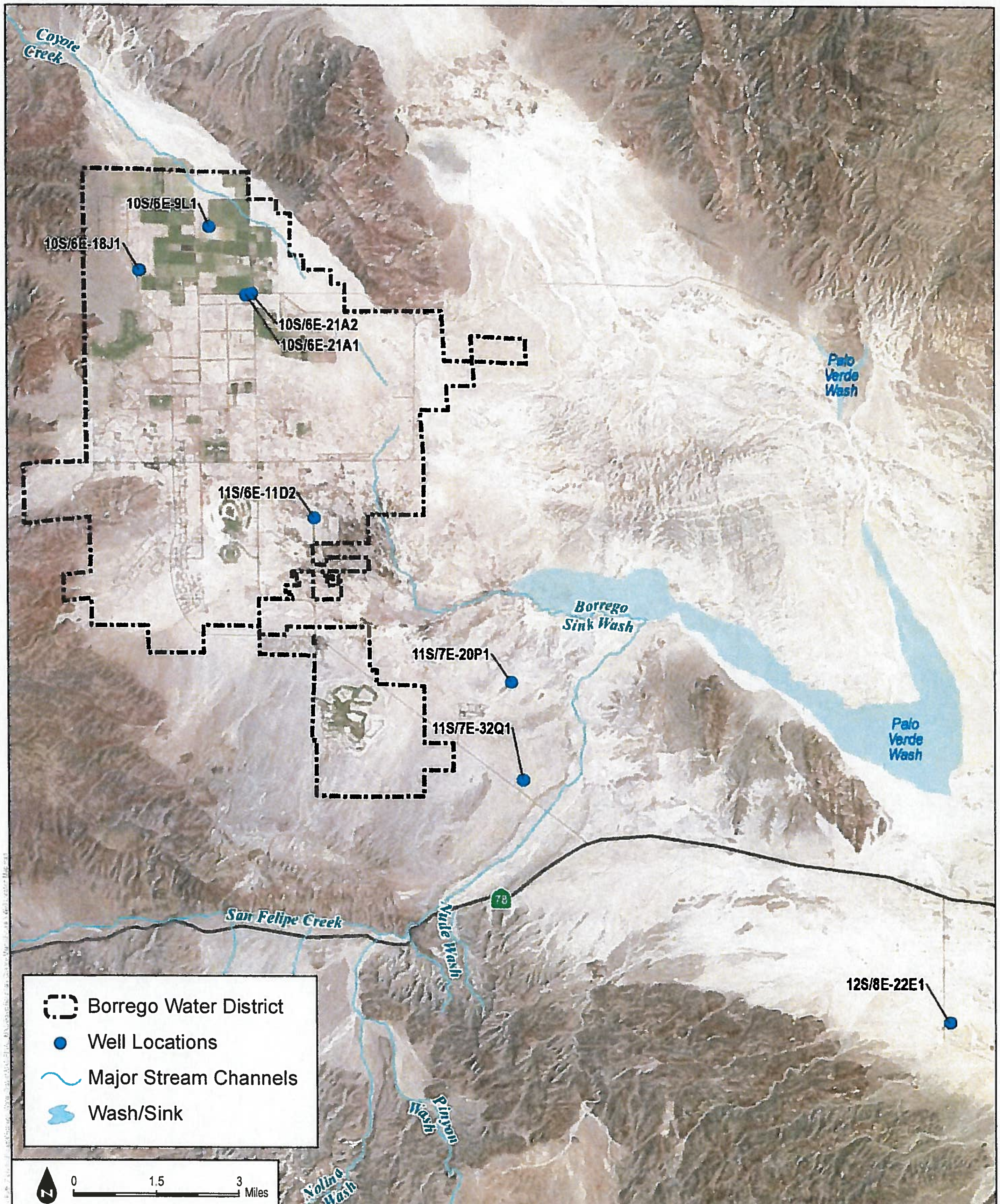

DUDEK

SOURCE: DWR; USGS

Figure 3
Well Location Map

Borrego Water District - Basin Delineation Change Memo

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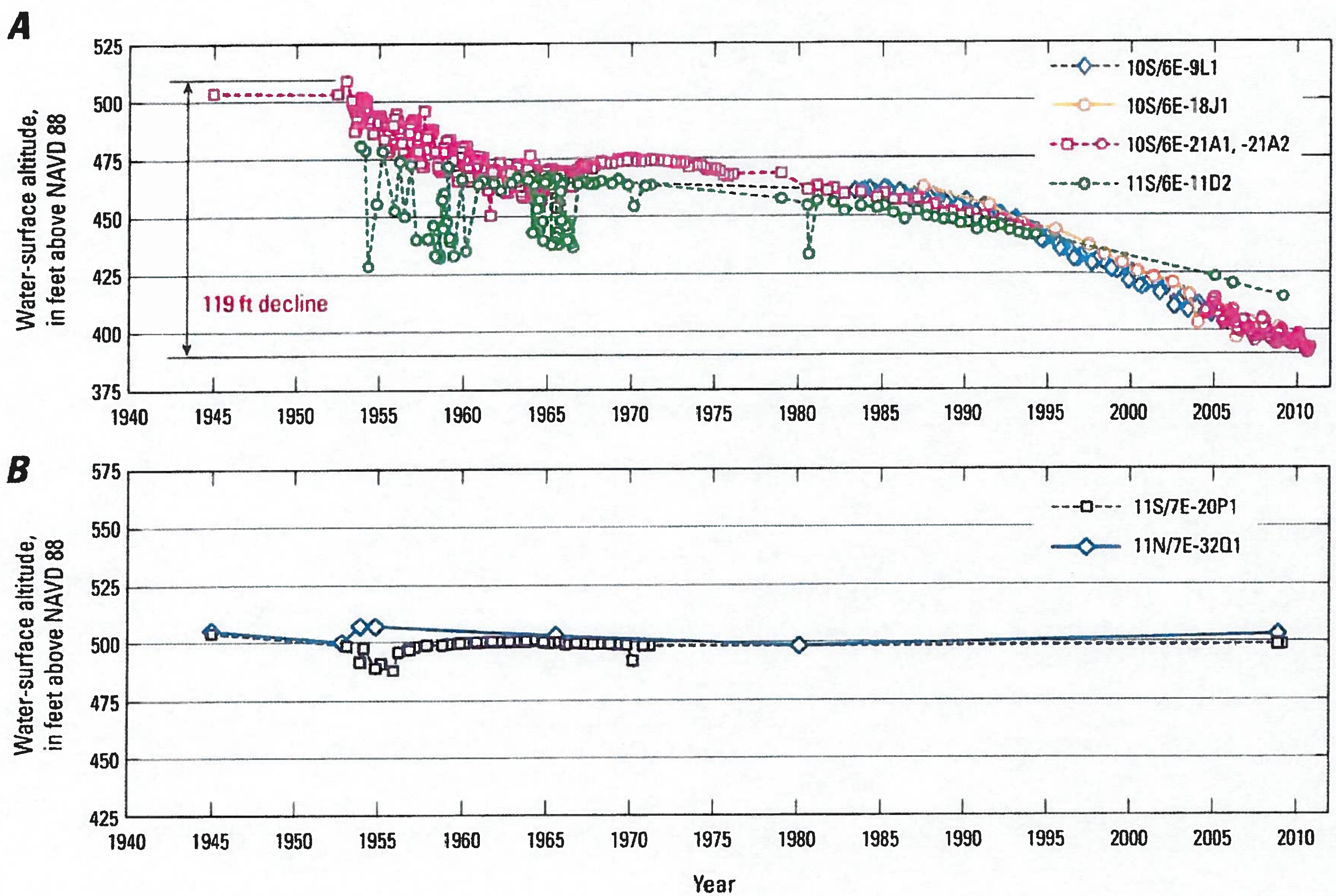

SOURCE: USGS

Figure 4
Water Level Hydrographs

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Borrego Water District - Basin Delineation Change Memo

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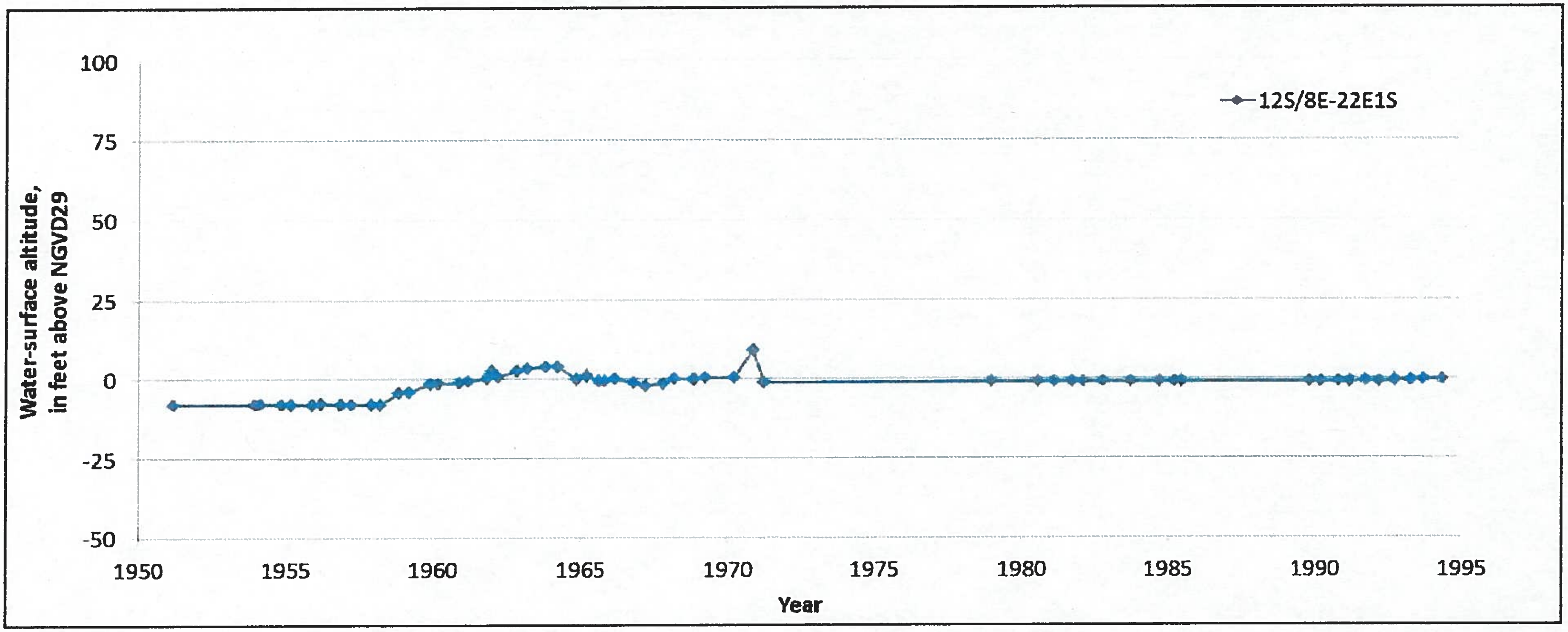

SOURCE: USGS

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Figure 5
Water Level Hydrograph

Borrego Water District - Basin Delineation Change Memo

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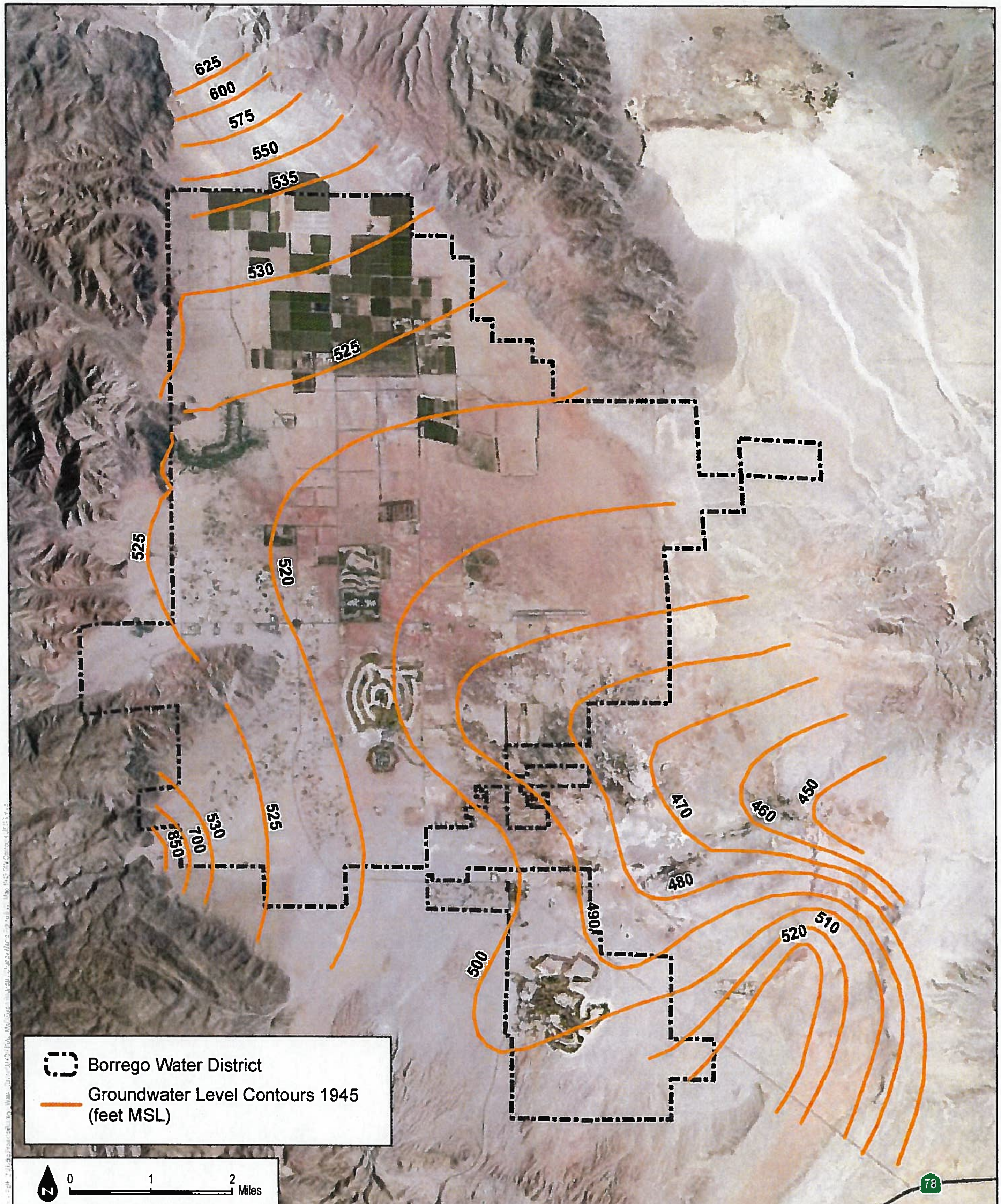

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SOURCE: USGS

Figure 6
Water Level Map 1945 GW Contours from USGS Report

Borrego Water District - Basin Delineation Change Memo

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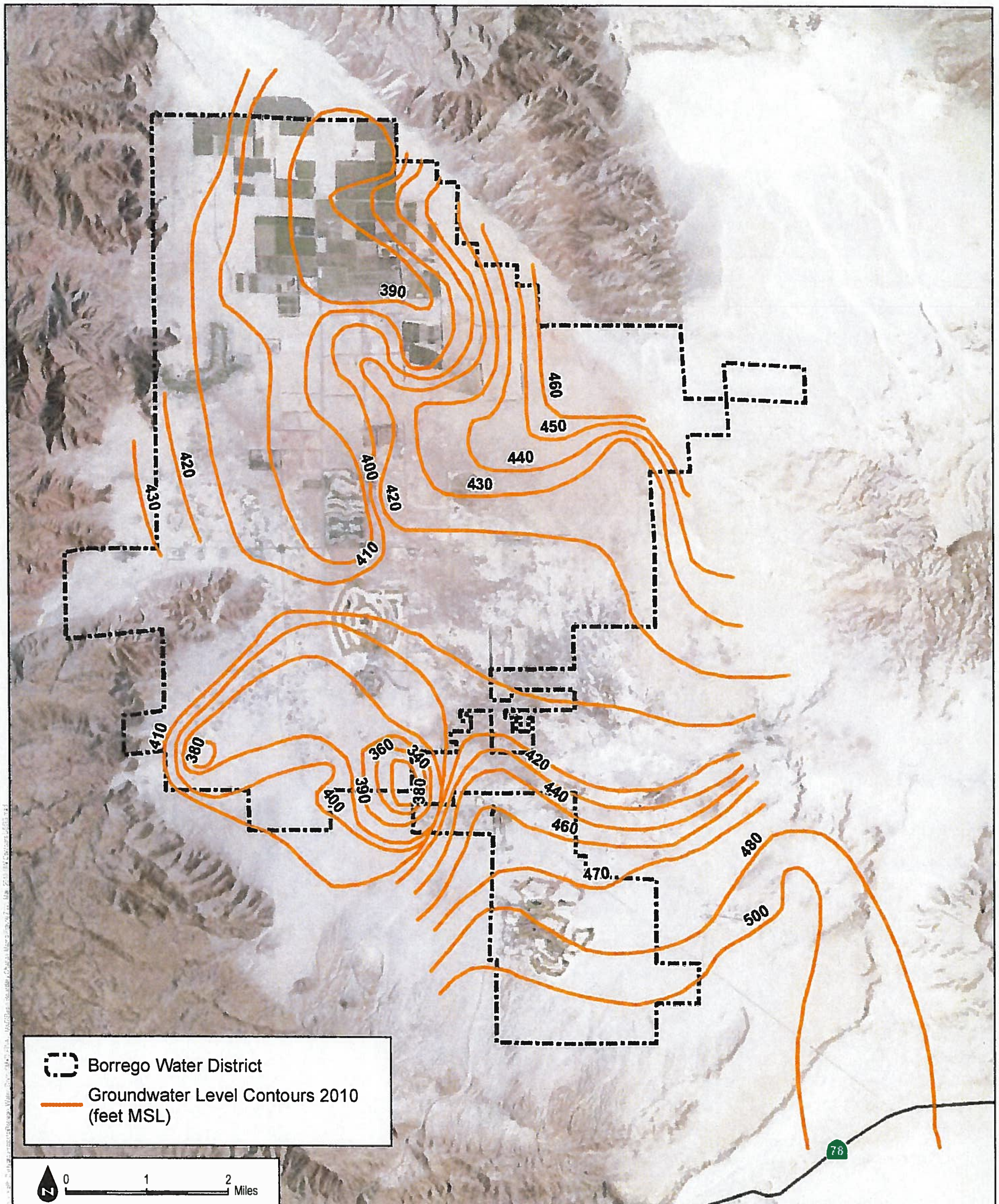


DUDEK

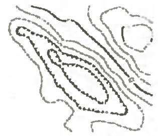
SOURCE: USGS

Figure 7
Water Level Map 2010 GW Contours from USGS Report

Borrego Water District - Basin Delineation Change Memo

DRAFT

Borrego Water District



Gravity anomaly contours. Contour interval 2 milligals. Hachures indicate closed lows. Contours were computer generated based on an 800 m by 600 m grid derived from scattered gravity data. Although the data have been edited, caution should be exercised when interpreting anomalies controlled by only a single gravity station.

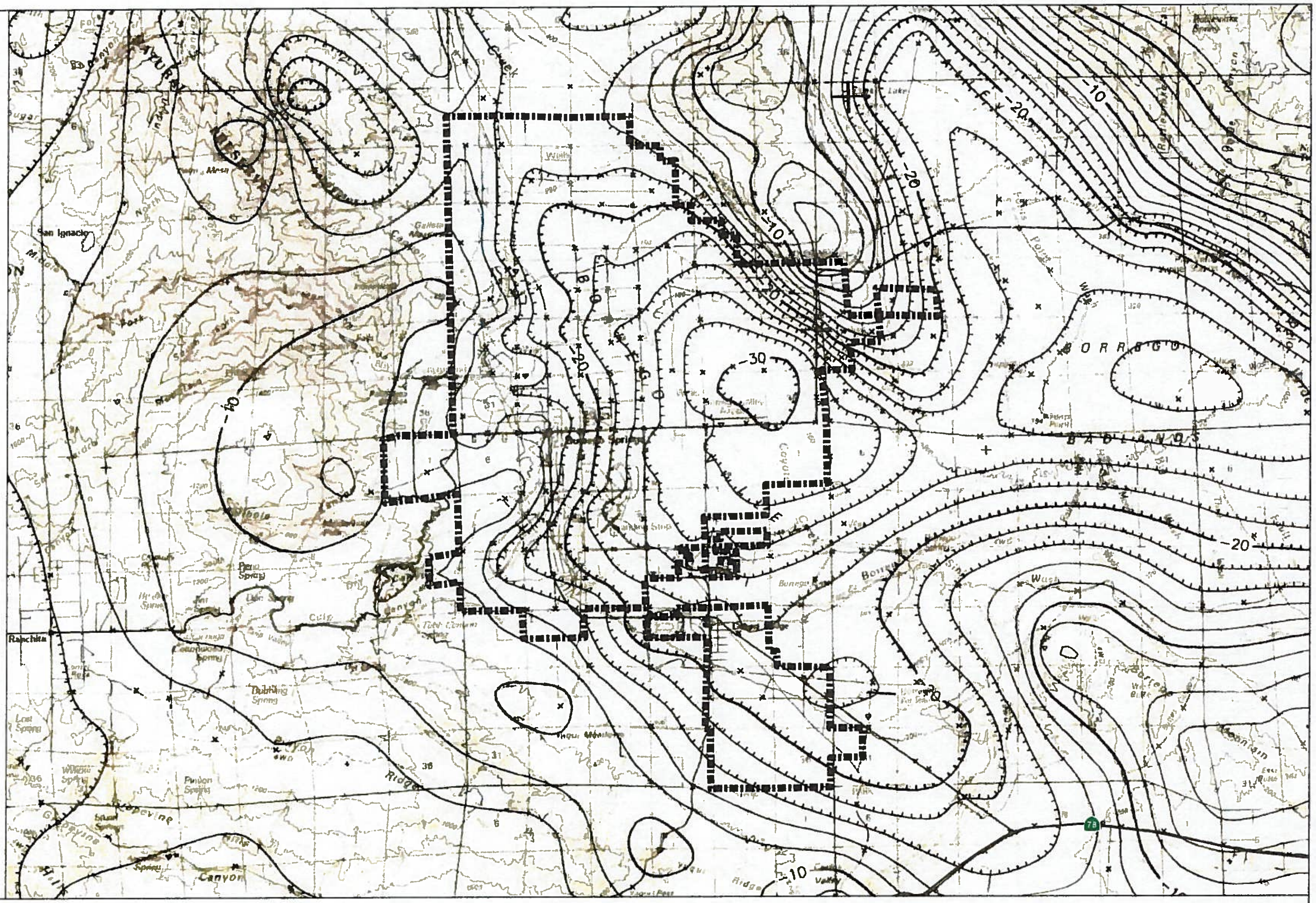
×
Gravity station obtained from University of California at Riverside.

+
Gravity station collected by the U.S. Geological Survey. Offshore stations provided by I. A. Beyer.

▽
Gravity station obtained from the Defense Mapping Agency.

Δ
Gravity station collected by the California Division of Mines and Geology.

0 1 2 Miles



SOURCE: Langenheim and Jachens 1993.

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Figure 8
Gravity Map

Borrego Water District - Basin Delineation Change Memo

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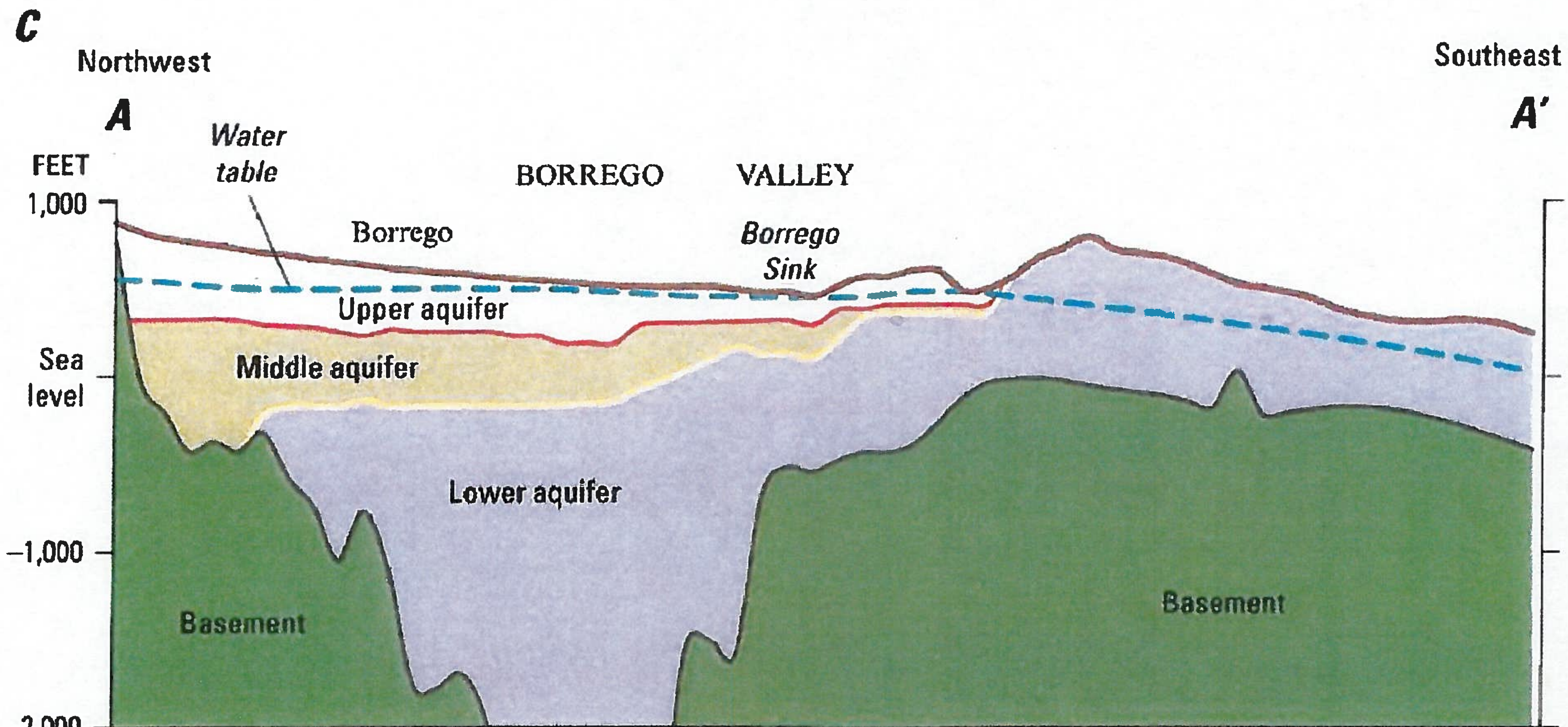

SOURCE: USGS

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Figure 9
Cross Section

Borrego Water District - Basin Delineation Change Memo

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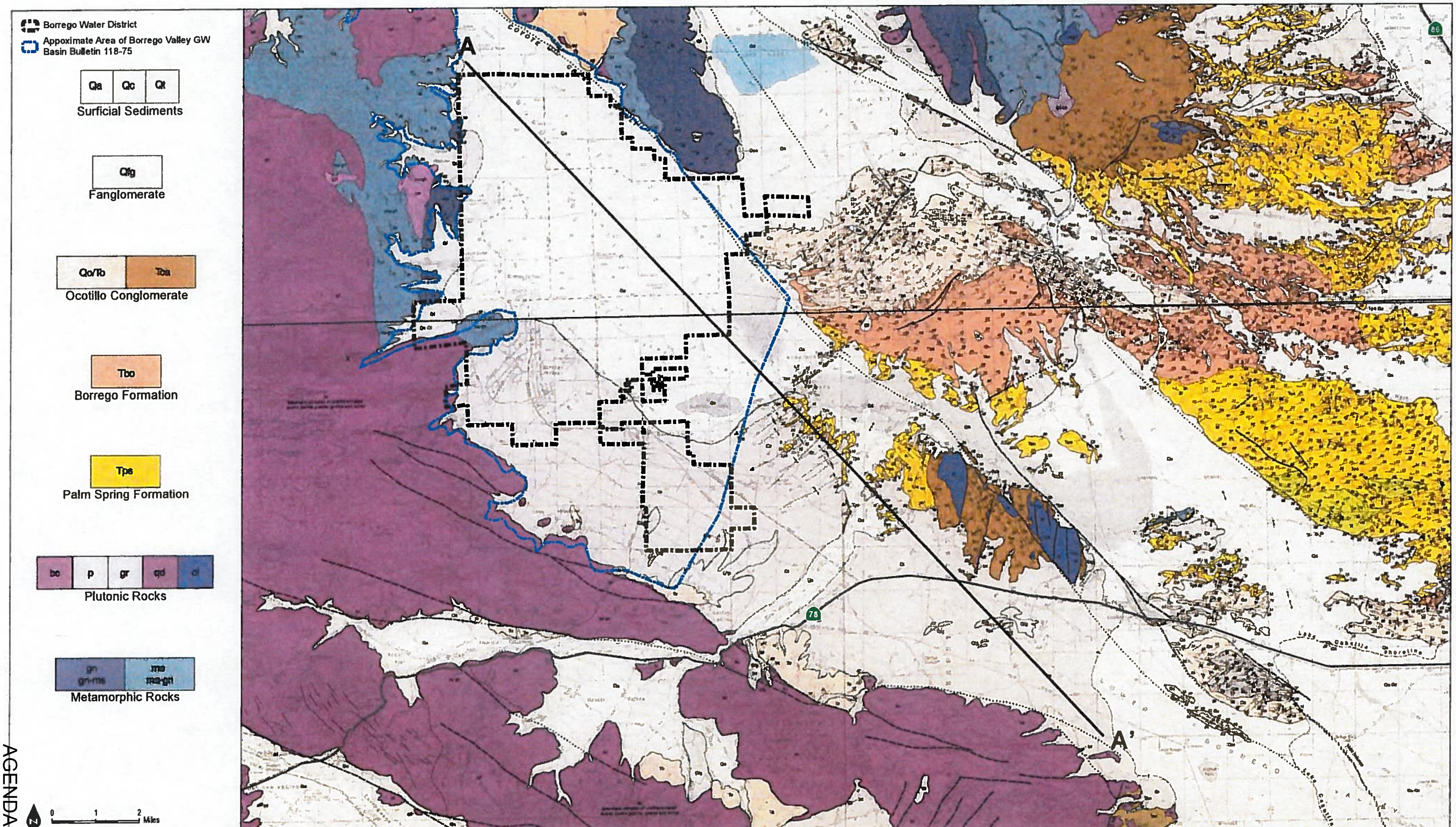

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SOURCE: Dibblee 2008, USGS 2014

Borrego Water District - Basin Delineation Change Memo

Figure 10
Geologic Map

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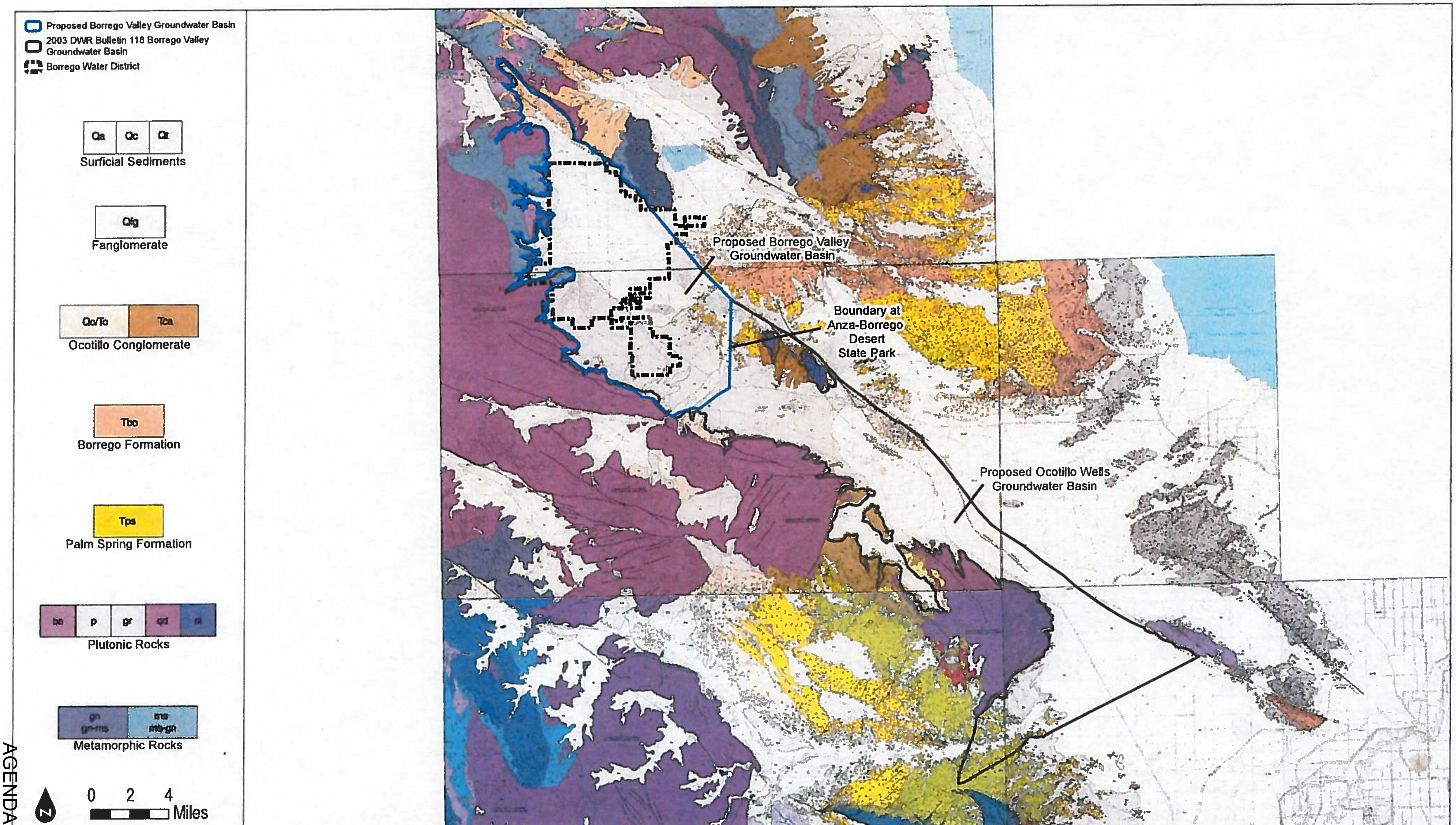

DUDEK

SOURCE: Dibblee 2008.

Borrego Water District - Basin Delineation Change Memo

Figure 11
Proposed Basin Boundary

DRAFT

DISTRICT 1
JOHN RENISON

DISTRICT 2
JACK TERRAZAS

DISTRICT 3
MICHAEL W. KELLEY

DISTRICT 4
RYAN E. KELLEY

DISTRICT 5
RAY CASTILLO

Board of Supervisors
County of Imperial

COUNTY ADMINISTRATION CENTER

940 MAIN STREET, SUITE 209
EL CENTRO, CA, 92243-2871
TELEPHONE: (442) 265-1020
FAX: (442) 265-1027

January 26, 2016

VIA EMAIL (Timothy.Godwin@water.ca.gov)

Mr. Timothy Godwin
Engineering Geologist
California Department of Water Resources
P.O. Box 942836
Sacramento, CA 94236

Re: Proposed Boundary Line Adjustment, Borrego Valley Groundwater Basin

Dear Mr. Godwin:

The County of Imperial and Imperial Irrigation District have each filed notices with the Department of Water Resources confirming their respective decisions to serve as a Groundwater Sustainability Agency for the portion of the Borrego Valley Groundwater Basin (No. 7-24, "Borrego Basin") within Imperial County. I am writing to express Imperial County's support for the basin boundary line adjustment for the Borrego Basin proposed by the County of San Diego and Borrego Water District.

Imperial County believes that the basin boundary modification proposed by San Diego and BWD will promote sustainable groundwater management of the Borrego Basin without hindering basin management activities. Imperial County requests that, as part of the Basin boundary modification process, DWR also take the following actions with respect to the remainder portion of the Borrego Basin that extends southeast into Imperial County:

1. Re-designate the remainder portion of the Basin as a low- or very low-priority basin under the Sustain able Groundwater Management Act (Water Code section 10722.4); and

2. Remove the recent "Critical Overdraft" designation from the remainder portion of the Basin.

If you have any questions, please contact me.

Sincerely,

Jesus J. Terrazas, Chairman
Imperial County Board of Supervisors

cc: Tina Shields, Imperial Irrigation District (tlshields@iid.com)
Jerry Rolwing, Borrego Water District (jerry@borregowd.org)
Mark Wardlaw, County of San Diego (Mark.Wardlaw@sdcounty.ca.gov)

County of San Diego

MARK WARDLAW
DIRECTOR
PHONE (858) 694-2962
FAX (858) 694-2555

PLANNING & DEVELOPMENT SERVICES
5510 OVERLAND AVENUE, SUITE 310, SAN DIEGO, CA 92123
www.sdcounty.ca.gov/pds

DARREN GRETLER
ASSISTANT DIRECTOR
PHONE (858) 694-2962
FAX (858) 694-2555

January 26, 2016

Timothy Godwin, California Department of Water Resources
c/o Jerry Rolwing, Borrego Water District
806 Palm Canyon Drive
Borrego Springs, CA 92004

PROPOSED BASIN BOUNDARY MODIFICATION, BORREGO VALLEY GROUNDWATER BASIN

Dear Mr. Godwin:

In accordance with California Code of Regulations (CCR) Title 23, Division 2, Sections 344.4 and 344.8, the County of San Diego (County) has received notice from and provided input to Borrego Water District (BWD) regarding the BWD's proposed basin boundary modification for Borrego Valley Groundwater Basin (BVGB) [Department of Water Resources Bulletin 118 Basin No. 7-24]. The County is in support of this proposed boundary modification, which will separate areas of known overdraft within the BVGB from those areas southeast of Borrego Springs that are not experiencing the effects of the overdraft.

As detailed in BWD's basin boundary modification request, the proposed basin is bounded on the west by the contact of unconsolidated sediments with plutonic and metamorphic basement rocks; on the north and east by the Coyote Creek fault; and by the general location of San Felipe Wash to the south. To easily distinguish the southern boundary of the Basin, State Route (SR) 78 was selected as the demarcation until it intercepts the Anza Borrego State Park Boundary, where it extends north until it intersects the trace of the Coyote Creek fault. The placement of the southern boundary at SR 78 and at the boundary of the Anza Borrego State Park is based both on supporting scientific and jurisdictional justification.

The County has reviewed the technical information provided by BWD, and believes that the information is sound and represents the best available science for the basin. Further, the County believes that this proposed change will promote sustainable groundwater management within the basin without negatively impacting areas outside of the basin or hindering the ongoing coordination of management activities by the County, BWD, and other entities in this region.

Accordingly, the County provides this letter in support of the basin boundary modification and intends to work cooperatively with BWD to ensure that groundwater in all areas of the proposed basin is sustainably managed. If you have any questions, or require additional information, please contact Jim Bennett, County Groundwater Geologist, at (858) 694-3820.

Sincerely,

DARREN GRETLER, Assistant Director
Planning & Development Services

Scope of Work

Use of Vertical Flow and Chemistry Profiles to Determine Vertical Gradients of Groundwater Quality in Support of Groundwater Management Plan Development, Borrego Valley, CA

Michael T. Wright, Claudia Faunt, Allen Christensen
and Matthew Landon
U.S. Geological Survey, California Water Science Center

Problem: Groundwater is virtually the sole source of water supply in Borrego Valley, California (fig. 1). Groundwater in the Borrego Valley basin has been developed for agricultural, recreational and municipal uses. Because there is relatively little groundwater recharge in the basin, pumping for anthropogenic purposes have resulted in a groundwater-level declines (Moyle, 1982; Mitten and others, 1988; Henderson, 2001; and Netto, 2001). The recent development and calibration of a three-dimensional (3D) integrated hydrologic flow model, the Borrego Valley Hydrologic Model (BVHM), indicates that water levels are likely to continue decline in the foreseeable future (Faunt and others, in review). Model simulations indicate that if current (2010) stresses on the groundwater basin are constant over a 50-year period, groundwater-level decline will be > 125 ft in the largely agricultural northern portion of the basin and 25 - 125 ft in middle portion of the basin where the majority of municipal pumpage occurs. In the most drastic, but realistic, management scenario where municipal and recreational pumpage are reduced by 50 percent and agricultural pumpage by 40 percent over a 20-year period, water levels are still predicted to decline 25-50 ft in the northern and middle portions of the basin.

As groundwater levels decline, there is the potential to change the distribution of flow from the underlying aquifers to wells. Lowering the water table in shallow aquifers may draw chemical constituents (e.g. nitrate and totals dissolved solids) from anthropogenic sources present near the water table into a well. Declining water levels also cause a decrease in the saturated thickness of shallow aquifers, which may result in a larger proportion of the groundwater withdrawn from a well perforated in deeper aquifers and may have poorer water quality. Groundwater from deeper aquifers is typically older, has been in contact with aquifer materials longer, and may can contain more dissolved chemical constituents (e.g. arsenic and fluoride), resulting in the degradation of the water quality.

To ensure long-term dependability of groundwater resources in the Borrego Valley, a groundwater management plan will need to consider how water quality will change over time with corresponding declines in water level. Because the vertical distribution groundwater chemistry will likely vary systematically across the basin, and because little is known about the vertical distribution of water quality in the Borrego Valley basin, collecting detailed profiles of wellbore flow and water quality in select wells will be important for understanding how the quality of groundwater withdrawn from supply wells may change over time. In addition, the installation of an unsaturated zone (UZ)/water table well site to determine rate of movement and water quality of water within the unsaturated zone, and near the water table, would be an important measure of how water quality may change in the future as water moves through unsaturated zone and is recharged at the water table. Data from these analyses, can be used in conjunction with the BVHM particle-tracking simulations to provide groundwater managers with the necessary information on expected timing and changes in groundwater quality and extremely useful when making informed groundwater management decisions.

Objectives: The purpose of this work is to determine the vertical distribution of groundwater flow and chemistry within the perforated intervals of selected wells and to use this data with the particle tracking capabilities of the BVHM to simulate changes in the quality of groundwater withdrawn from supply wells associated with declines in groundwater levels. The UZ well site will provide information about the rate of vertical movement and quality of water that is moving through the thick unsaturated zone. Understanding the rate of movement and quality of the water in the unsaturated zone is needed component for a better understanding of future changes in water level and water quality. These analyses will provide for the identification of chemical constituents, if any, which may be of concern for the management of usable groundwater resources in the Borrego Valley basin.

Science Plan:

Downhole-flow Profile and Vertical Distribution of Water Chemistry within Wells
Detailed data collection, analysis, and modeling of the vertical distribution of groundwater flow and chemistry in three wells will be used to inform groundwater managers on potential issues regarding the management of groundwater quality in the Borrego Valley Basin. The primary analyses proposed are: (1) Examine wellbore flow under ambient (unpumped) conditions to determine if groundwater from different aquifer zones is mixing when wells are not being pumped; (2) Determine wellbore flow under pumping conditions to determine which depths of the aquifer system are contributing water and what the relative contributions are; (3) Determine the vertical distribution of water-quality constituents and isotopic tracers in the aquifer systems being tapped. Based on the vertical distribution of constituents, determine what aquifer zones, if any, have chemical concentrations near, or above, health-based or aesthetic water-quality benchmarks; (4) The BVHM will be used in conjunction with the particle tracking program MODPATH to simulate how concentrations of water quality constituents of interest may change over time in groundwater being pumped by production wells in response to declining water levels.

Monitoring Well Construction (Proposed for Federal Fiscal Year 2017)
The USGS is proposing to construct monitoring well(s) in Borrego area based on land use. The site(s) instrumentation includes a well screened at the water table, matric-potential sensors for determining the direction and magnitude of water movement, and suction-cup lysimeters to collect water samples in the unsaturated zone. Data collected from the proposed monitoring site(s) will be used to determine the vertical rate of movement of water, and to monitor changes in water chemistry from the land surface through the unsaturated zone to the water table. These data will be used to construct profiles of water content and soil water chemistry within the unsaturated zone. Location for monitoring sites should include areas where land use activities may have contributed to the build up of nitrate and other salts in the unsaturated zone and in groundwater near the water table. Possible well locations to consider are areas with agricultural land use, areas where septic tank effluent in discharged to the subsurface and undeveloped areas where natural recharge occurs. Comparison of the vertical rates of water and chemical movement between undeveloped and agricultural land can help determine the effects of agricultural land use on water in the unsaturated zone and in the upper most portion of the water table. This data can also be used to help predict future changes in water quality in the aquifer(s) as water moves through unsaturated zone to the water table.

Task 1: Study Design FY 2016—

The USGS and the Borrego Water District (BWD) shall consult on selecting three production or other suitable wells for measuring profiles of well-bore flow and water quality. Considerations for selecting wells should include: 1) Areal location of a well in the basin. The selected wells should be located in areas where pumping, and water-level decline, is currently the greatest and is likely to remain so in the near future; 2) the depth of the wells. Perforated intervals of selected wells should be open to the aquifer system that is currently used, or planned use, for groundwater production. For example, a well sampled in the northern portion of the basin is likely perforated in the upper and middle aquifers and is important for groundwater extraction for irrigation, whereas in the middle portion of the basin the middle and some cases lower aquifer becomes important for domestic and municipal supply. However, wells that are perforated in all three aquifers, no matter the areal location, would be the most ideal; 3) Pumping water levels should also be considered since setting the temporary well pump above the upper-most well perforations will allow for the most robust analysis of well-bore flow and vertical distribution of water quality.

Task 2: Collection and interpretation of well-bore flow and chemistry, three production wells in FY 2016—

Well-Bore Flow: well-bore flow data, including fluid temperature, fluid resistivity, and well-bore velocity will be collected from the study wells under unpumped conditions using an electromagnetic (EM) flow meter. Prior to data collection, the thickness of any oil that is used to lubricate well pumps and that is floating on the surface of the water column must be measured and possibly removed, if other operational solutions cannot be devised, to avoid contaminating and/or damaging equipment and possibly biasing the data collected. Under some circumstances, it may be possible to work in wells with floating oil. These conditions will have to be assessed on a site by site basis. Costs for removing oil are not included in this proposal.

The EM flow meter has a large dynamic range capable of measuring both unpumped and pumped flows (Newhouse and others, 2005). Fluid temperature and fluid resistivity sensors embedded within the EM flow meter will be used to confirm measurements of unpumped flow. These data will be used to assess redistribution of water having potentially different quality through wells under unpumped conditions. Wellbore flow data will also be collected under pumped conditions using the EM logging tool. The EM flowmeter is typically able to measure flow more accurately than a spinner-type flowmeter, particularly at low flow rates. The velocity measurements will be collected at several different EM flow meter drop rates to check the calibration of the instrument and evaluate the reproducibility of the velocity profile. The velocity profile will be converted to a volumetric flow rate using the cross-sectional area of the wellbore. The flow rates determined from the EM flow meter will be compared to the flow rates measured on the discharge line of the temporary pump using an acoustic flow meter as an additional quality-assurance step.

A temporary pump will be installed by a well services company contracted through the BWD. The well should be pumped at a rate similar to normal or anticipated groundwater pumping rates used for municipal, agricultural or recreation supply. If the temporary pumping rate is less than the expected pumping rate under normal operating conditions, and as long as the induced flow under pumped conditions exceeds ambient flow under un-pumped conditions, the relative contributions of flow and contaminants from different depths is expected to be similar to those measured under normal operating conditions with higher flow rates. The effects of different pumping rates on the system can also be assessed using the groundwater flow modeling analysis (see below). These depth-dependent techniques have been used in many wells throughout California (Izbicki and others, 1998; 2003; 2005a; 2005b;

2006; 2008).

Prior to setting the pump it may be prudent to video log the well casing. A video log will confirm the exact location of well openings and their condition. If well openings are compromised by encrustation then the well should be rehabbed, which would be optimal for well production and obtaining well-bore flow data. The relative cost of well rehab would be small compared to the total cost of removing the dedicated pump and setting a temporary pump in place. The BWD could contract with a well pump company to have this service completed. The USGS can provide the video logging services if needed and a cost for this service would be provided upon request.

Water-quality sampling: Depth-dependent water samples will be collected from the surface discharge and five selected depths within the well. These samples will be analyzed for a wide array of constituents as discussed below, except that age-dating parameters which may only be collected from the surface discharge and two depths in the well. The depth-dependent samples will be collected by installing 2-inch diameter PVC casing in the well to the target depth of the sample and then lowering a submersible pump (Bennett) suitable for sampling for dissolved gases into the PVC pipe. Because the samples will be collected under pumping conditions with the temporary pump intake above or near the top of the perforated interval, there will be upward flow in the well, similar to typical well operating conditions. The sample from each depth integrates the contributions of flow and chemistry from all perforated intervals below the sample point. The chemical composition of water for each depth interval, between sampling depths, is calculated from the wellbore flow data and measured concentrations samples using a mixing calculation (Izbicki et al., 1999). Sample depths will be selected based on the flow log. Five sampling depths in the well perforations are planned, which is expected to provide suitable vertical chemical resolution for the perforated intervals of the wells sampled. Samples will be collected and processed by USGS personnel according to the USGS National Field Manual (USGS, variously dated). Sampling equipment will be cleaned before samples are collected at each depth to prevent cross-contamination between sample points (U.S. Geological Survey, variously dated). Field blanks and replicate samples will be utilized as part of this study to assess the quality of data collection procedures and laboratory results. Approximately 10 percent of the analytical budget within each task has been reserved for quality assurance samples. The nature of samples to be analyzed for quality assurance purposes will vary for each constituent and laboratory to meet project data quality objectives.

Samples will be analyzed for major and minor ions, selected trace elements, and nutrients (table 1) at the USGS National Water Quality Laboratory, Denver, CO. Samples will also be analyzed for the following:

1) Field parameters, including dissolved oxygen, specific conductance, pH, and water temperature using calibrated instruments in a flow-through chamber, and hydrogen sulfide using portable instruments, at the well site during well purging;

2) Delta oxygen-18 and delta deuterium isotopic values in water ($\delta^{18}O$ and δD, respectively), can be used to determine the source of groundwater (local recharge versus agricultural return) Differences in isotopic composition can also be used to help determine general atmospheric conditions at the time of precipitation and the effects of evaporation before water entered the groundwater system These samples will be analyzed at the USGS stable isotope laboratory (RSIL) in Reston, VA (table 2);

3) $\delta^{18}O$ and nitrogen-15 ($\delta^{15}N$) isotopic values of dissolved nitrate (table 2), used to determine sources of nitrate such as from fertilizers used for agricultural versus septic return water. These samples will also be analyzed at USGS RSIL;

4) Radiological analysis for gross alpha and beta radiation (table 3) will be collected and processed on selected samples. Based on recent analysis of water quality data in the basin that indicated gross alpha radiation exceeded the California MCL in two wells (10S/05E-36A1 and 10S/6E-15D4S) located in different parts of the Borrego Valley basin (fig.1). These samples will be analyzed at Test America Laboratory which has a contract through the USGS NWQL;

5) Groundwater age-dating tracers, tritium (recent recharge), and carbon-14 (old water), to determine the time-since recharge of recent (less than 50 years) and older (greater than 50 to more than 20,000 years before present) groundwater, respectively (table 2); Tritium samples will be analyzed at either the USGS Menlo Park Tritium Laboratory or the University of Miami (UOM) which contracts through the USGS NWQL. Carbon-14 samples will be analyzed at the Woods Hole Oceanographic Institute located in Woods Hole, MA.

Task 3: Monitor Well Construction (Proposed for Federal Fiscal Year 2017)

The monitoring well will be constructed by the ODEX drilling method (air rotary with outer casing) to the water table or to a depth not to exceed 500 feet or 25-50ft below the water table. Drilling operations will be conducted on a 12-hour-per-day basis by USGS personnel. Soil cores will be collected at changes in lithology, and if feasible, the bottom of the hole. The borehole will be instrumented with six heat dissipation probes, 3 lysimeters, and one 2-inch PVC piezometer perforated at the water table. All construction equipment and supplies needed for the well construction and instrumentation of the site will be provided by the USGS. A USGS hydrologist will be onsite during the entire construction process to analyze and log the drill cuttings, interpret the borehole geophysical logs, and provide the final monitoring-site design. Most of the instruments will be programmed to collect data on an almost continuous basis, and these data will be stored on site in data loggers. The USGS will visit the site on a quarterly basis to download the data and manually collect data as needed.

Task 4: Model simulation using the BVHM and Modpath particle tracking-FY17

Once the vertical profiles of well-bore flow and water quality are known and data collected from the UZ monitoring site are processed, the BVHM (Faunt and others, in review) can be used to help predict how water quality may change in response to declining water levels and changes in flux from the unsaturated zone. This task would be done using output from the model coupled with MODPATH particle-tracking software. The flowpaths of groundwater having specified water-quality parameters of interest based on measured data can be tracked (forward or backward) between aquifer zones of origin and well screens with MODPATH. These MODPATH simulations can be used to estimate water-quality conditions being contributed to groundwater withdrawn from supply wells from each of the different aquifer zones, based on the measured well-bore flow, depth-dependent water-quality profiles, and data collected in the unsaturated zone. By analyzing the distribution of chemical concentrations, indicated as particles coming from different zones of the aquifer(s) to pumping wells, and how the particle concentration distributions change over time as water levels change, the simulations can be used to understand how changes in groundwater levels and groundwater source zones will affect the quality of water withdrawn from wells.

Task 5: Reporting –FY16/17

Study results will be presented to the BWD in interim presentations or written communications as necessary to inform decisions on groundwater management with respect to water quality in the Borrego Valley Basin. Final results of the study will be described in a USGS report series fact sheet. Data from the project will be publically available in the U.S. Geological Survey's on-line data base NWIS-Web (http://waterdata.usgs.gov/nwis) and will also be made available on the USGS's Borrego Valley project website (U.S. Geological Survey, in review) that was recently developed for the BWD by the USGS.

Budget: The costs for the project, by task, are shown in the following table, along with a breakdown by major expense category. For studies done with non-federal public agencies, the U.S. Geological Survey has Federal Matching Funds (FMF) to share costs for certain expenses, such as labor and travel, to a maximum of 25 percent of the cost for that expense. These FMF cannot be used to match funds from private entities.

Task	Work	Year	BWD Funds	USGS Federal Matching Funds	Total
1	**Study Design**	FFY16[1]			
	Labor		$7,050	$2,100	$9,150
2	**Well Bore Flow and Sample Collection**	FFY16[1]			
	Labor		$48,500	$13,250	$61,750
	Travel, vehicles, shipping		$16,300	$4,800	$21,100
	Equipment, supplies, equipment rental		$35,250	$0	$35,250
	Laboratory analyses		$33,700	$0	$33,700
	Subtotal		**$140,800**	**$20,150**	**$160,950**
3	**Monitoring Well Construction**	FFY17[2]	**$300,000**	**$50,000**	**$350,000**
4	**Modeling**	FFY16[1]			
	Labor		$17,500	$5,100	$22,600
5	**Reporting**	FFY16/17[1,2]			
	Labor		$40,850	$9,050	$49,500
	Total		**$499,150**	**$84,300**	**$583,050**
	Total (Excluding task 3)		**$199,150**	**$34,300**	**$233,050**

[1]Federal Fiscal Year 2016 (Oct 1, 2015 - Sept. 30, 2016)
[2]Federal Fiscal Year 2017 (Oct 1, 2016 - Sept. 30, 2017)

Work Plan: Tasks 1, 2, and 4, will be conducted during Federal Fiscal Year (FFY) 2016 (October 1, 2015 – September 30, 2016). Task 5 is planned for FFY2016/17 (October 1, 2015 – September 30, 2017), after well bore flow logs, depth dependent water quality and modeling data has been collected. Task 3 (If funded) would be completed in late FFY2017 (October 1, 2016 – September 30, 2017)

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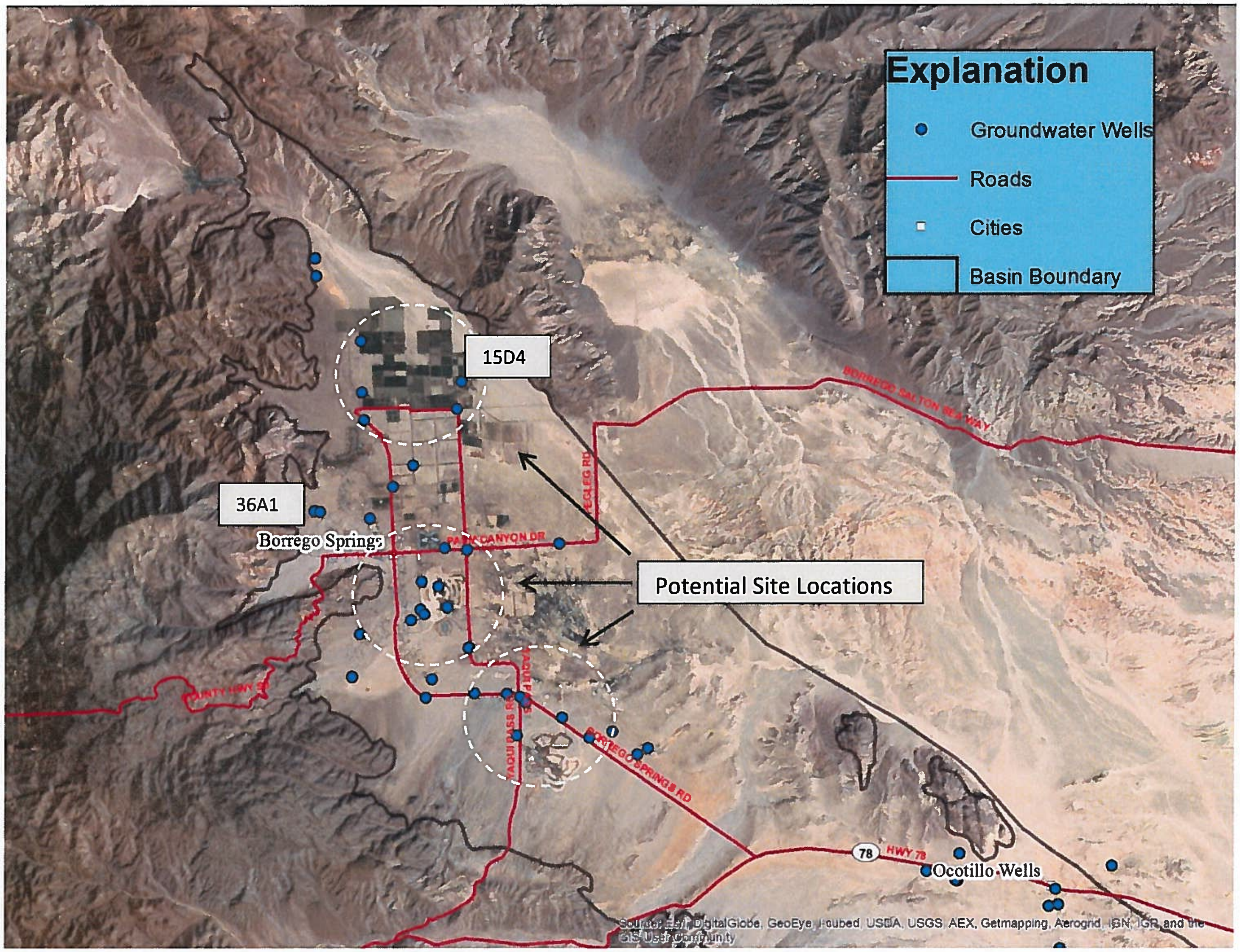

Figure 1. Select groundwater wells and potential areas for selecting sites for well bore flow and water chemistry sampling in the Borrego Valley basin.

Table 1. Major and minor ions, trace elements, and nutrients to be measured at selected wells, Borrego Valley, CA.

[milligrams per liter, mg/L; micrograms per liter, mg/L; uS/cm, microsiemen per centimeter; CAS, Chemical Abstracting Service; na, not available]

Constituent[1]	USGS parameter code	CAS number	Reporting level	Reporting units
Alkalinity, laboratory	29801	471-34-1	4.6	mg/L
Aluminum	01106	7429-90-5	2.2	ug/L
Arsenic	01000	7440-38-2	0.10	ug/L
Barium	01005	7440-39-3	0.3	ug/L
Boron	01020	7440-42-8	2.0	ug/L
Bromide	71870	24959-67-9	0.03	mg/L
Calcium	00915	7440-70-2	0.022	mg/L
Chloride	00940	16887-00-6	0.02	mg/L
Chromium	01030	7440-47-3	0.3	ug/
Fluoride	00950	16984-48-8	0.01	mg/L
Iodide	71865	7553-56-2	0.001	mg/L
Iron	01046	7439-89-6	4.0	ug/L
Lithium	01130	7439-93-2	0.1	ug/L
Magnesium	00925	7439-95-4	0.011	mg/L
Manganese	01056	7439-96-5	0.20	ug/L
pH, laboratory	00403	na	0.1	pH
Potassium	00935	7440-09-7	0.03	mg/L
Total Dissolved Solids	70300	na	20	mg/L
Silica	00955	7631-86-9	0.018	mg/L
Sodium	00930	7440-23-5	0.06	mg/L
Specific conductance, laboratory	90095	na	5	uS/cm
Strontium	01080	7440-24-6	0.2	ug/L
Sulfate	00945	14808-79-8	0.02	mg/L
Uranium	22703	7440-61-1	0.014	ug/L
Vanadium	01085	7440-62-2	0.08	ug/L
Nitrogen, nitrite + nitrate	00631	na	0.04	mg/L
Nitrogen, nitrite	00613	14797-65-0	0.001	mg/L

[1]U.S. Geological Survey National Water Quality Laboratory, Denver, Colorado

Table 2. Isotopes, groundwater age tracers and reporting information for laboratory analyses.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Elements: H, hydrogen; O, oxygen; C, carbon; N, nitrogen; Other abbreviations: CAS, Chemical Abstract Service; na, not available; pmc, percent modern carbon; pCi/L, picocuries per liter]

Constituent	USGS parameter code	CAS number	Method Uncertainty	Reporting units
Isotope ratios				
$\delta^{2}H$ in water [1]	82082	na	2	per mil
$\delta^{18}O$ in water [1]	82085	na	0.2	per mil
$\delta^{15}N$ in nitrate [1]	82690	na	0.2	per mil
$\delta^{18}O$ in nitrate [1]	63041	na	0.2	per mil
$\delta^{13}C$ in dissolved inorganic carbon [2]	82081	na	0.05	per mil
Age Tracers				
Tritium [3]	7000	10028-17-8	1	pCi/L
Carbon-14 [2]	49933	14762-75-5	0.0015	pmc
Carbon-14, counting error [2]	49934	na	na	pmc

[1] USGS Reston Stable Isotope Laboratory, Reston, Virginia (USGS-RSIL)

[2] Woods Hole Oceanographic Institute, National Ocean Sciences Accelerator Mass Spectrometry Facility, Woods Hole, Massachusetts

[3] USGS Isotope Tracer Laboratory, Menlo Park, California or University of Miami, Miami, Florida

Table 3. Gross alpha and beta radiation to be measured at selected wells, Borrego Valley, CA.

[pCi/L, picocuries per liter; CAS, Chemical Abstracting Service]

Constituent[1]	USGS parameter code	CAS number	Reporting level	Reporting units
Gross-alpha radioactivity, 72/hr	62636	12587-46-1	3	pCi/L
Gross-alpha radioactivity, 30/day	62639	12587-46-1	3	pCi/L
Gross-beta radioactivity, 72/hr	62642	12587-47-2	4	pCi/L
Gross-beta radioactivity, 30/day	62645	12587-47-2	4	pCi/L

[1] Test America Laboratories, Richland, WA

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DRAFT TECHNICAL MEMORANDUM

To: Jerry Rolwing, General Manager Borrego Water District
From: Trey Driscoll, PG, CHG, Ron Schnabel, PG, CHG
Subject: Analysis of Borrego Water District and County of San Diego Demand Offset Water Credit Policy
Date: December 18, 2015

EXECUTIVE SUMMARY

The Borrego Valley Groundwater Basin (BVGB) has been determined to be in "overdraft". Recent studies estimate that water users ("Owners") within the Borrego Valley currently withdrawal approximately 19,000 acre-feet per year (AFY) and that the "sustainable yield" of the BVGB is 5,700 AFY. Thus, the current estimated "overdraft" is 13,300 AFY. The withdrawal value of 19,000 AFY is assumed the "baseline" on which the State required Groundwater Sustainability Plan (GSP) will be established and the "sustainable yield" value of 5,700 AFY is assumed the water usage target at the end of the prescribed 20-year water reduction period.

In order to reach the "sustainable yield" value of 5,700 AFY, a 70% reduction of groundwater pumping is required over the 20-year GSP implementation timeframe. This would require retiring 19,000 water credits (WC), and issuing 5,700 production credits (PC) at a ratio of 3.33:1 (WC:PC). A "slippage" rate of 20% over the 20-year GSP implementation timeframe was applied to account for variability in the actual or realized water usage reduction. This results in a ratio of 3.8:1 (WC:PC). Because of slippage and the inherent uncertainty associated with actual BVGB groundwater production and "sustainable yield" estimates, it is appropriate to apply a ratio of 4:1 (WC:PC) for new development in the Borrego Valley. This would ensure that new development mitigates upfront for its allocated share of the condition of "overdraft" in the BVGB. Furthermore, upfront mitigation provides funds necessary to fallow irrigated agricultural land and gives certainty as to the full costs involved with new development in the Borrego Valley.

BACKGROUND

In order to address the overdraft condition of the BVGB, the Borrego Water District (BWD, District), in cooperation with the County of San Diego (County), developed and implemented a Demand Offset Mitigation Water Credit Policy (WCP).[1 2]

The WCP was first established as 3:1 groundwater mitigation in 2005. In 2007, the 3:1 groundwater mitigation was reduced to 2:1 groundwater mitigation with the premise that one would satisfy the County requirement and one for the District. The current WCP for new development consists of two 1:1 policies: one water credit to satisfy the County New Subdivision Policy and one credit to satisfy the District WCP. For existing platted lots in the area, only one water credit is required to fulfill the District's WCP. For all new subdivisions, both 1:1 policies must be satisfied for a total of two water credits.[3] One water credit is defined as a one acre-foot per year and converts to the approximate water demand of a single equivalent dwelling unit (EDU) or single family residence.[4] Thus, for one new EDU with a projected water use of 1 AFY, an equivalent water reduction of 2 AFY is necessary to meet the current County and District permitting requirements. Water credits are available in limited quantity through the District and/or by establishing agreements with private landowners within the BVGB. The policies establish credit procedures for fallowing of agricultural land based on crop type and a defined watering intensity. Table 1 presents the water credit values for permanently fallowing agricultural land as determined by the County. These values represent assumed water usage by crop-type.

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[1] WCP includes without limitation: the District's Demand Offset Water Credits Policy (BWD 2013a), as amended; the County's Groundwater Ordinance for Borrego (County of San Diego 2013); the Memorandum of Agreement between the County and the District (BWD and County of San Diego 2013); and the Borrego Water Coalition (BWC) Draft Groundwater Management Policy Discussion Document v#4.7 (BWC 2014).
[2] The District has groundwater management authority as per the California Water Code and the County has land use authority, and has adopted a Countywide Groundwater Ordinance (County of San Diego 2013).
[3] Policy for Water and Sewer Service to New Development. February 20, 2013 (BWD 2013a).
[4] BWD's EDU average usage is 0.62 AFY as of 2013 (BWD Pers. comm. 2013).

Table 1
Groundwater Consumptive Use By Crop Type Used to Calculate Water Offset Credits

Vegetation Type	Plant Factor[2]	Reference Evapotranspiration (feet/year)	Irrigation Efficiency	Groundwater Consumptive Use Per Acre (AFY)
Citrus (all types)	0.65	5.97	0.8	4.9
Nursery plants	0.6	5.97	0.8	4.5
Palms (all types)	0.5	5.97	0.8	3.7
Tamarisk	0.2	5.97	0.7	1.7
Turf (warm season)	0.6	5.97	0.7	5.1
Turf (winter cool/summer warm)	0.66	5.97	0.7	5.6
Potatoes[1]				0.8

1. According to the BWD, potatoes are a winter crop and are rotated once every three years. Approximately 2.5 acre-feet per acre are applied to potato field over a three year cycle. Therefore, the annual groundwater consumptive use would be 0.8 acre-feet per acre.
2. Plant factor for other plant types shall be obtained for the most recent publications by the State of California Sources for plant factor: http://www.water.ca.gov/wateruseefficiency/docs/wucols00.pdf
3. 3. Source of Irrigation Efficiency: Turf and Landscape Best Management Practices, April 2005, Water Management Committee of the Irrigation Association

Source: BWD and County of San Diego, 2012. Memorandum of Agreement Between the Borrego Water District and County of San Diego Regarding Water Credits. February 4, 2013.

The WCP was developed on the premise that new development would have no additional impact on the BVGB (i.e. offset demand for groundwater by a ratio of least a one-to-one). While this approach may reduce additional incremental overdraft to the BVGB, it has no direct connection to mitigation of the actual condition of overdraft. In order to mitigate the current overdraft condition, an overall reduction in water demand of the BVGB must occur.

NEED FOR WATER CREDIT POLICY CHANGE

The District has requested recommended changes to the WCP mitigation ratio with the goal of achieving BVGB sustainability in compliance with the Sustainable Groundwater Management Act (SGMA) passed by the California Legislature on August 29, 2014 and signed into law by Governor Brown on September 16, 2014. To this end, the recommended changes should address the 70% pumping reduction required to reach sustainable yield of the BVGB while facilitating the economic growth of Borrego Springs. This requires retiring 19,000 WC, and issuing 5,700 PC at a ratio of 3.33:1 (WC:PC). However, because of slippage and the inherent uncertainty associated with actual BVGB groundwater production and sustainable yield estimates, a ratio of 4:1 (WC:PC) should be applied to new development in the Borrego Valley. This would ensure that new development mitigates upfront for its allocated share of the condition of overdraft in the

BVGB. Furthermore, upfront mitigation provides funds necessary to fallow irrigated agricultural land and gives certainty as to the full costs involved with new development in the Borrego Valley. Sustainable Groundwater Management Act

Due to prolonged drought and historical overreliance on groundwater that has caused "undesirable results" to the groundwater basins of the State, the California Legislature has passed a series of unprecedented bills: SB 1168, SB 1319 and AB 1739; collectively known as the Sustainable Groundwater Management Act (SGMA). The SGMA will govern groundwater use in California and provide the clear authority to proactively mange groundwater resources toward the goal of sustainability.

The legislation that affects the BVGB in particular includes, but not limited to, the following:

Establishing a Groundwater Sustainability Agency (GSA)

- A combination of local agencies may form a groundwater sustainability agency (GSA) by using any of the following methods: (1) A joint powers agreement. (2) A memorandum of agreement or other legal agreement [Section 10723.6].[5] In the event that there is an area within a basin that is not within the management area of a groundwater sustainability agency, the county within which that unmanaged area lies will be presumed to be the groundwater sustainability agency for that area [Section 10724(a)].

GSA Powers and Authorities

- A groundwater sustainability agency may conduct an investigation for the purposes of this part, including, but not limited to, investigations for the following: (1) To determine the need for groundwater management. (2) To prepare and adopt a groundwater sustainability plan and implementing rules and regulations. (3) To propose and update fees. (4) To monitor compliance and enforcement [Section 10725.4(a)].
- In connection with an investigation, a groundwater sustainability agency may inspect the property or facilities of a person or entity to ascertain whether the purposes of this part are being met and compliance with this part. The local agency may conduct an inspection pursuant to this section upon obtaining any necessary consent or obtaining an inspection warrant pursuant to the procedure set forth in Title 13 (commencing with Section 1822.50) of Part 3 of the Code of Civil Procedure [Section 10725.4(c)].

[5] Code references are to the new provisions of the Water Code.

- A groundwater sustainability agency may require registration of a groundwater extraction facility within the management area of the groundwater sustainability agency [Section 10725.6].

- A groundwater sustainability agency may require through its groundwater sustainability plan that the use of every groundwater extraction facility within the management area of the groundwater sustainability agency be measured by a water-measuring device satisfactory to the groundwater sustainability agency [Section 10725.8(a)].

- A groundwater sustainability agency may require, through its groundwater sustainability plan, that the owner or operator of a groundwater extraction facility within the groundwater sustainability agency file an annual statement with the groundwater sustainability agency setting forth the total extraction in acre-feet of groundwater from the facility during the previous water year [Section 10725.8(c)].

- A groundwater sustainability agency shall have the following additional authority and may regulate groundwater extraction using that authority: (1) To impose spacing requirements on new groundwater well construction to minimize well interference and impose reasonable operating regulations on existing groundwater wells to minimize well interference, including requiring extractors to operate on a rotation basis. (2) To control groundwater extractions by regulating, limiting, or suspending extractions from individual groundwater wells or extractions from groundwater wells in the aggregate, construction of new groundwater wells, enlargement of existing groundwater wells, or reactivation of abandoned groundwater wells, or otherwise establishing groundwater extraction allocations. A limitation on extractions by a groundwater sustainability agency shall not be construed to be a final determination of rights to extract groundwater from the basin or any portion of the basin. (3) To authorize temporary and permanent transfers of groundwater extraction allocations within the agency's boundaries, if the total quantity of groundwater extracted in any water year is consistent with the provisions of the groundwater sustainability plan. The transfer is subject to applicable city and county ordinances. (4) To establish accounting rules to allow unused groundwater extraction allocations issued by the agency to be carried over from one year to another and voluntarily transferred, if the total quantity of groundwater extracted in any five-year period is consistent with the provisions of the groundwater sustainability plan [Section 10726.4(a)].

GSA Financial Authority

Under the SGMA, the GSA has the power to regulatory fees. The GSA "may impose fees, including, but not limited to, permit fees and fees on groundwater extraction or other regulated activity, to fund the costs of a groundwater sustainability program, including, but not limited to, preparation, adoption, and amendment of a groundwater sustainability plan, and investigations, inspections, compliance assistance, enforcement, and program administration, including a prudent reserve. A groundwater sustainability agency shall not impose a fee pursuant to this subdivision on a de minimis extractor unless the agency has regulated the users pursuant to this part."

Groundwater Sustainability Plan (GSP)

- By January 31, 2020, all basins designated as high- or medium-priority basins by the department that have been designated in Bulletin 118, as may be updated or revised on or before January 1, 2017, as basins that are subject to critical conditions of overdraft shall be managed under a groundwater sustainability plan or coordinated groundwater sustainability plans [Section 10720.7(a)(1)].[6]

- Measurable objectives, as well as interim milestones in increments of five years, to achieve the sustainability goal in the basin within 20 years of the implementation of the plan [Section 10727.2(b)(1)]. A description of how the plan helps meet each objective and how each objective is intended to achieve the sustainability goal for the basin for long-term beneficial uses of groundwater [Section 10727.2(b)(2)].

- Components relating to the following, as applicable to the basin: (1) The monitoring and management of groundwater levels within the basin. (2) The monitoring and management of groundwater quality, groundwater quality degradation, inelastic land surface subsidence, and changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater extraction in the basin. (3) Mitigation of overdraft. (4) How recharge areas identified in the plan substantially contribute to the replenishment of the basin. (5) A description of surface water supply used or available for use for groundwater recharge or in-lieu use [Section 10727.2(d)].

BVGB OVERDRAFT

The water budget recently developed by the US Geological Survey (USGS) is the benchmark estimate of "sustainable yield" used for this analysis. According to the USGS, estimated

[6] The BVGB is defined in DWR's Bulletin 118 as Basin 7-24 in the Colorado River Hydrologic Region (DWR 2003) and is listed as a medium basin priority in the CASGEM Basin Prioritization Results as pursuant to the California Water Code (CWC §10933) (DWR 2014).

combined annual agricultural, recreational, and municipal groundwater production peaked at around 18,500 acre-feet per year (AFY) between 2005 and 2010 (Faunt 2015). Actual groundwater production data is not available for agricultural and recreational use. In order to estimate agricultural and recreational use, the consumptive water use of each land-use type (e.g. citrus grove, golf course fairway) is estimated based on the acreage of land use, evapotranspiration, crop coefficients, and irrigation inefficiencies (i.e. Reference Evapotranspiration x Crop Coefficient x Acres]/ Irrigation Efficiency). By applying this estimate of consumptive water use to the agricultural and recreation groundwater withdrawals, and by adding the metered municipal withdrawals, the approximate annual groundwater withdrawals from the BVGB is determined. Thus, the rounded withdrawal value of 19,000 AFY is assumed the "baseline" on which the groundwater sustainability plan will be established given the uncertainty of the actual current groundwater production. The 19,000 AFY accounts for water usage across all sectors with agriculture representing the largest usage at 70%, recreational at 20%, and municipal at 10%.

The natural recharge to the BVGB is seepage from the land surface and recharge from streams and underflow from adjacent watersheds. The vast majority of natural recharge is stream flow and underflow and varies from less than 2,000 AFY in drier years to 20,000 AFY in the wettest years (Faunt 2015). The large variability in annual recharge is due to the highly variable annual precipitation in the arid climate. In order to develop a planning number for the sustainable yield, the total recharge estimate of 5,670 AFY by Netto (2001, page 138) is used. This value (5,700 AFY) is a little higher than the 4,500 AFY average natural recharge estimated by Faunt (2015, page 51) for modeled recharge, but is at the lower end of their modeled calibration recharge range from 5,000 AFY to 7,500 AFY used in the modeling. However, it should be noted that the estimate ranges greater than 5,000 AFY considers more local evapotranspiration in the area of the sink. Thus, 5,700 AFY is currently assumed to be the sustainable water usage target at the end of the prescribed 20-year planning implementation period.[7] Due to climatic variability, the sustainable yield target should be reevaluated at each five year GSP milestone to determine whether the 5,700 AFY target is suitable to mitigate overdraft.

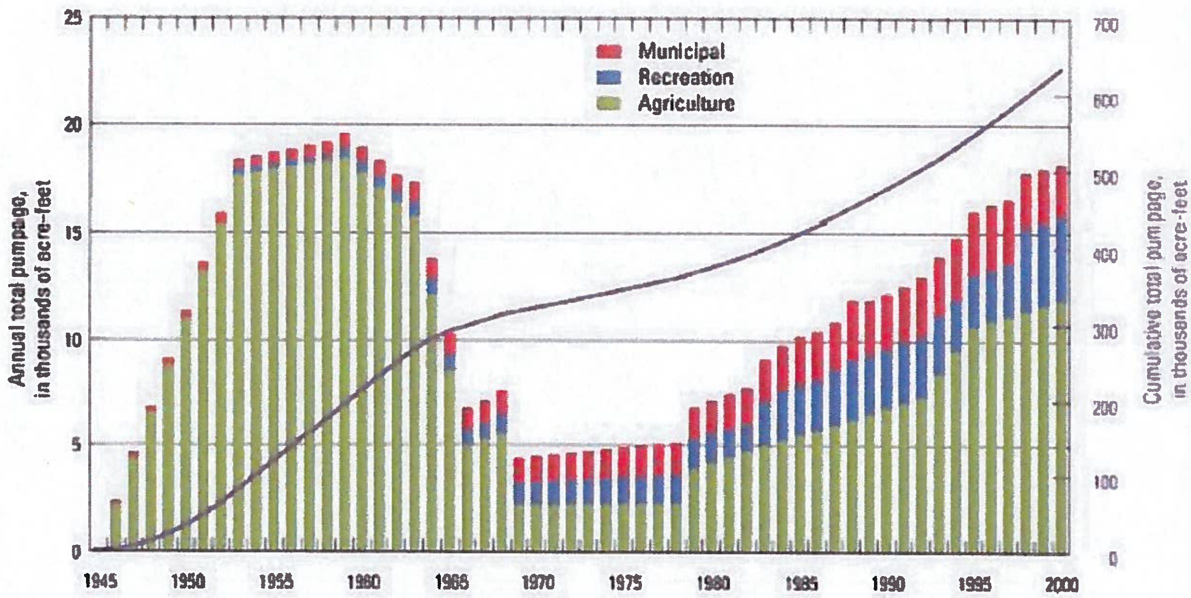
Historical Groundwater Production

Until about the mid-1940s, water use from wells mainly was used for domestic purposes, which probably was less than 300 AFY (Faunt 2015). Agriculture expanded rapidly after 1945 and since the late 1940s or early 1950s, annual groundwater production has exceeded the natural

[7] As indicated in Section 10727.2 of the proposed Water Code (SB 1168) the GSP includes a 20-year sustainability timeframe with up to two 5-year extensions for a maximum 30-year sustainability timeframe.

recharge of the BVGB for most of the years (Faunt 2015). The estimated cumulative historical groundwater production from 1945 until 2000 is in excess of 600,000 acre-feet (Figure 1). The depletion in groundwater storage over this time period in the BVGB is about 410,000 acre-feet (Faunt 2015).

Figure 1
BVGB Historical Groundwater Production 1945-2000



Source: Faunt, 2015.

Future Groundwater Production Estimates

The SGMA will require metering and reporting of groundwater use from each groundwater user (agriculture, recreation, and municipal). Once the groundwater use data is compiled for an entire year and successive years thereafter, the uncertainty of BVGB groundwater production will be minimal (i.e. 1-5% uncertainty due to accuracy of water meters and reporting issues). Accurate groundwater production data will greatly enhance implementation of the BVGB GSP.

BVGB GROUNDWATER SUSTAIANBILITY PLAN (GSP)

The GSP focuses on: (1) reduction of use in the BVGB by 70% across all sectors (reduction from ~19,000 AFY to ~5,700 AFY); (2) Re-allocation of the sustainable yield "production credits" totaling 5,700 AFY by the end of the 20-year planning horizon; and (3) oversight to ensure that new development secure water credits for sustainable water use over its economic life. A 20-

year planning horizon is required as the sustainable management timeframe as per CWC Section 10727.2(b)(1).

Groundwater Overdraft Mitigation Ratio

Reduction of annual water usage from 19,000 AFY to 5,700 AFY, a net reduction of 13,300 AFY, represents an approximate 70% reduction in water usage:

$$\frac{(19{,}000 - 5{,}700)}{19{,}000} = \frac{13{,}300}{19{,}000} = 70\%$$

The 20-year GSP would set targets for water usage reductions at incremental periods. Table 2 presents an example using 5-year incremental targets.

Table 2
Sample 20-Year Incremental Reduction Plan

Year	Water Usage	Net Reduction	Percentage Reduction
(Baseline)	19,000	0	0%
5	15,200	3,800	20%
10	11,400	7,600	40%
15	7,600	11,400	60%
20	5,700	13,400	70%

The working concept for water usage reduction is to require a proportional reduction in water usage across all sectors (agriculture, recreation, and municipal). Certain sectors are more or less flexible in the ability to reduce water usage. Water conservation measures will inevitably change the behaviors within sectors resulting in reduced water usage; however, a significant change in the Borrego Valley land use (i.e., reducing the amount of irrigated land) will be required to meet the reduction goals. Under the proposed Water Credit Program, the BVGB GSA will administer a water credit exchange market by which water and production credits can be bought and sold. The Water Credit Program hinges on the distinction between two water "currencies":

- Water Credits (WC) represent current water usage with one WC = 1 AFY. From the Baseline water usage of 19,000 AFY, it is assumed that the Water Credit Program contains approximately 19,000 WCs.

- Production Credits (PC) represents the permissible water usage to meet the established sustainable yield of 5,700 AFY. It is assumed that the Water Credit Program contains 5,700 PCs and that 1 PC = 1 AFY.

In order to meet the water reduction plan goals, the water credits must be "retired" and exchanged for production credits. The ratio of WC:PC is:

$$\frac{19{,}000}{5{,}700} = 3.33\ OR\ a\ ratio\ of\ 3.33{:}1$$

This ratio does not consider variability in the actual or realized water usage reduction. It can be expected that water usage patterns will change over time in accordance with environmental, social, and economic pressures, which are difficult to predict. To improve confidence level that the water reduction goals will be met at the end of the plan period, consideration should be given to "slippage". Slippage refers to the statistical unpredictability of multi-variable calculations and is observed in real world scenarios involving the "human factor".

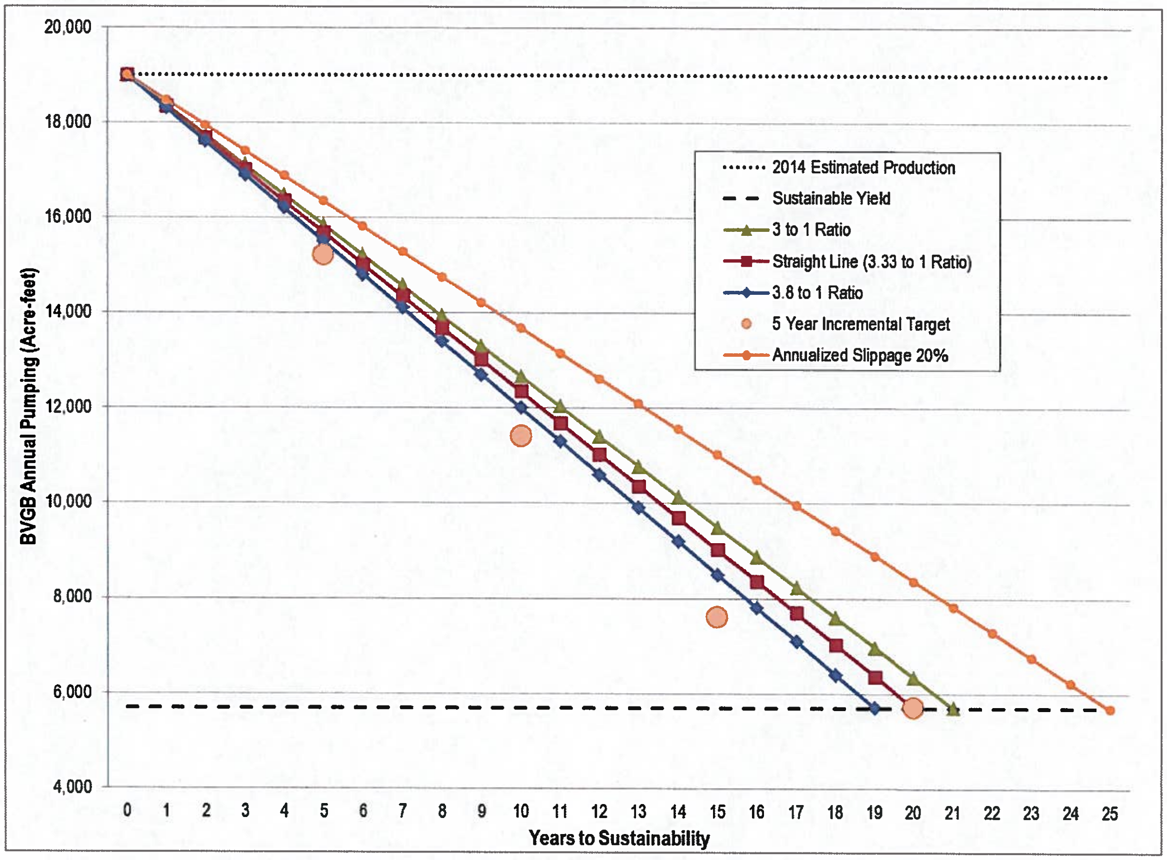
Taking into account an assumed slippage rate of 20%, an unrealized reduction of 2,680 acre-feet does not occur over the 20-year period due to external factors.[8] Thus the revised WC-PC is:

$$\frac{(19{,}000) + (.20\ x\ 13{,}300)}{5{,}700} = 3.8{:}1$$

Because of slippage and the inherent uncertainty associated with actual BVGB groundwater production and "sustainable yield" estimates, it is appropriate to round to a ratio of 4:1. When expressed over the 20-year timeframe of the GSP implementation, the difference between a straight-line ratio of 3.33:1 versus a ratio 3.8:1 ratio appears fairly benign in that it results in only a one year difference in reaching sustainability. However, annualizing the slippage rate of 20% results in an additional 5 years, beyond the 20-year planning timeframe, for the BVGB to reach sustainable yield (Figure 2).

[8] The slippage factor of 20% was selected based on a slippage offset of approximately 20% identified in the US Department of Agriculture's Conservation Reserve Program (CRP) (Wu 2000).

Figure 2
Projection of Reduction Ratios and 5-Year Incremental Targets



It is unlikely that the "sustainable yield" target will be achieved by enacting solely the new development portion of a WCP. It would be necessary to construct 3,400 new EDUs to achieve the sustainable yield production in 20 years. Prior to the recent recession, only 42 EDUs were constructed per year during the housing boom period from 2001 to 2008. Under the 4:1 policy 42 new EDUs per year would retire 126 AFY of groundwater production. Even assuming this peak historical rate of construction for 20 years, only 2,520 AFY production would be retired. This would leave production 10,880 AFY above the sustainable yield goal of 5,700 AFY. Additional programs such as a "Groundwater Sustainability Program" including fees to encourage reduced production will be necessary to achieve sustainable yield. New development is unlikely to bear the cost of "overdraft" mitigation without a complete physical solution.

ECONOMIC ANALYSIS FOR CONVERSION OF WATER CREDITS TO PRODUCTION CREDITS

To finance the conversion of WC to PC, the GSA has several financing options. These are: 1) non-debt, 2) debt or 3) combo of non-debt and debt. Non-debt financing could be done by imposing fees for permits and on groundwater extraction, or by some other regulated GSA activity. The fees would be used to fund the costs of the groundwater sustainability program, including the conversion of WC to PC. A debt financed conversion would necessitate obtaining initial funding from loans. A debt financing structure would be setup that consisted of paying the loan interest rate in additional to principal on any funds obtained. A debt structured financing would cost more and generally require more time to retire the debt, but could allow for earlier conversion of WC to PC. A combination of non-debt/debt financing could allow for an initial conversion of WC to PC, but would reduce the interest payed compared to a total debt option.

In additional to the conversion of WC to PC, other considerations such as land fallowing costs and environmental maintenance of retied irrigated agricultural lands should be addressed through the GSP funding structure. The amount of fallowed irrigated agriculture overlying the BVGB could be as much as 3,700 acres.

Any financing considerations should include consider the rate of WC to PC conversion and the potential risks of groundwater quality degradation by continued overdraft. Groundwater quality related issues may occur and potentially be irreversible with continued lowering of groundwater levels.

ADDITIONAL WATER USER REQUIREMENTS

To preclude potential third party speculation related to PC acquisition, the GSA could require a permit for the conversion of WC to PC, and relate the permits to water use not to exceed an applicant's permitted beneficial use. The GSA can inforce these measures because it can require registration of any groundwater extraction facility within the GSA management area, and it can control the groundwater extractions by regulating, limiting, or suspending extractions from the applicant's individual or group groundwater wells.

CONCLUSIONS AND RECOMMENDATION

The variables of groundwater production and "sustainable yield" have been estimated by the Netto (2001) and Faunt (2015). Current withdrawals are approximately 19,000 AFY (Faunt 2015), and that the "sustainable yield" of the BVGB is 5,700 AFY (Netto, 2001). While the uncertainties of these estimates are not quantified, it is assumed that the percent error is in the range of 10-20%. With metering of recreation and agricultural sector groundwater withdrawals in BVGB, the uncertainty of actual groundwater production can be reduced. Due to future climatic variability, the "sustainable yield" of the basin will potentially vary with time and should be updated at each five-year GSP milestone.

In order to reach the "sustainable yield" value of 5,700 AFY, a 70% reduction of groundwater pumping is required over the 20-year GSP implementation timeframe. This would require retiring 19,000 WC, and issuing 5,700 PC at a ratio of 3.33:1 (WC:PC). To determine a water offset ration, a "slippage" rate of 20% over the 20-year GSP implementation timeframe is suggested to account for variability in the actual or realized water usage reduction. This results in a ratio of 3.8:1 (WC:PC). Because of slippage and the inherent uncertainty associated with actual BVGB groundwater production and "sustainable yield" estimates, it is appropriate to round to a ratio of 4:1. This would improve confidence that the safe yield goal is achieved at the end of the 20-year planning period while ensuring that new development mitigates upfront for its allocated share of the condition of "overdraft" in the BVGB. Furthermore, upfront mitigation provides funds necessary to fallow irrigated agricultural land and gives certainty as to the full costs involved with new development in the Borrego Valley.

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BORREGO WATER COALITION
GROUNDWATER MANAGEMENT
POLICY RECOMMENDATIONS

This document articulates policies the Borrego Water Coalition's (BWC; "the Coalition") members recommend to the Borrego Water District's (BWD; "the District") Board of Directors ("the Board").[1]

The Coalition recommends the inclusion of the following policies in the Borrego Valley's Groundwater Sustainability Plan (GSP) required under the Sustainable Groundwater Management Act (SGMA; the Act; collectively SB 1168, SB 1319 and AB 1739, as amended):[2]

(1) The Coalition recommends a Physical Solution of sufficient reductions in Basin withdrawals from the baseline in order to achieve a Sustainable Yield goal of approximately 5,600 acre-feet per year (AFY).[3] These reductions shall be achieved at a minimum within a 20-year period beginning no later than January 31, 2020, with 5-year minimum interim reduction targets of [4]:

No Later Than February 1, ____:

a. 2025: approximately 20% from the Baseline
b. 2030: approximately 40% from the Baseline
c. 2035: approximately 60% from the Baseline
d. 2040: approximately 70% from the Baseline[5]

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[1] See Memorandum of Understanding for Borrego Water Coalition dated March 29, 2013 at: http://water manager.borregospringschamber.com/bwc/documents/BWCMOUFinal-Revision_12-05-13.pdf.

[2] The Act establishes that it is the policy of the State of California that groundwater resources be managed sustainably for long-term water reliability and multiple economic, social, or environmental benefits for current and future beneficial uses [SB 1168, Section 1.(a)].

[3] United States Geological Survey, 2014, "Hydrogeology, Hydrologic Effects of Development, and Simulation of Groundwater Flow in the Borrego Valley, San Diego County, California. Draft Report." Claudia C. Faunt, Christina L. Stamos, Peter Martin, Lorraine E. Flint, Michael T. Wright, Matthew K. Burgess, Michelle Sneed, Justin Brandt, and Alissa L. Coes.

[4] January 31, 2020 is the final due date established by the SGMA legislation for a basin in critical overdraft to have a GSP approved by DWR. All GSPs must include a reduction schedule with no more than 5-year benchmarks. A GSP may be approved and commence without penalty at any date before this final date.

[5] The precise percentage is the amount necessary to achieve Sustainable Yield. This percentage reduction will be refined during the GSP period based on difference of actual withdrawals from the Sustainable Yield goal.

(2) The Coalition recommends a Baseline be established for each Owner based on either documented metered usage or on estimated average annual usage for the 10-year period 2004-2014 that fairly establishes historical Production at full operation;

(3) The Coalition recommends that the GSP include an annual Non-Compliance Fee based on an Owner's Production (acre-feet of withdrawals) exceeding the interim targets and thereafter exceeding the proportionate permanent reductions in annual withdrawals required to achieve the Physical Solution. The purpose of the Non-Compliance fee is primarily to deter Owners from exceeding their annual extraction limits and secondarily to support implementation of the GSP[6]. Accordingly, the Non-Compliance Fee should be set at a level consistent with a fee for the unauthorized diversion of water;

(4) The Coalition recommends and supports the development of separate funding mechanisms, both public and private, including acquiring and/or fallowing agricultural land as a way to expedite bringing the basin into balance; for transfers of pumping rights among Owners; for paying for the implementation of the Physical Solution. Without such funding, support for these recommendations from all the members of the Coalition should be considered to be non-binding;

(5) The Coalition recommends and supports the imposition of an approved, defined, and reasonable fee to be imposed on Owners specifically to cover the Administrative Costs of the GSP as may be required by the California Department of Water Resources (DWR) SGMA regulations;

(6) The Coalition recommends that the County and District establish a Joint Powers Agreement (JPA), or similar legal structure, comprised of the appropriate Basin agencies and stakeholders, including Borrego Water Coalition members, for purposes of

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[6] AB-1739, Chapter 8 (Financial Authority), 10730(a) states: "A groundwater sustainability agency may impose fees, including, but not limited to, permit fees and fees on groundwater extraction or other regulated activity, to fund the costs of a groundwater sustainability program, including, but not limited to, preparation, adoption, and amendment of a groundwater sustainability plan, and investigations, inspections, compliance assistance, enforcement, and program administration, including a prudent reserve. A groundwater sustainability agency shall not impose a fee pursuant to this subdivision on a de minimis extractor unless the agency has regulated the users pursuant to this part."

effectively implementing the Physical Solution. Also, the JPA should work to align the County's General Plan, land-use policies, and the well permitting practices of the Department of Environmental Health (DEH) with the GSP, in support of Basin sustainability;[7]

(7) The Coalition recommends that the District review its Policy for Water and Sewer Service to New Developments and its Water Credits Policy (WCP) so as to bring these policies into alignment with the Physical Solution and that the policies facilitate economic growth and free market trading among Owners to arrive at a Sustainable Community Solution (SCS);

(8) The Coalition recommends that Owners be mandated to install meters on their Production wells and submit verified withdrawals data twice a year to the Basin Engineer. The Coalition agrees that a penalty be imposed for Owners failing to meter their Production wells no more than two-years from the date of the approved GSP;

(9) The Coalition recommends that Owners be required to allow access to their Production wells for the collection of Water Quality Data (WQD), as required by state regulations. The Coalition agrees that a penalty be imposed for Owners failing to provide access to their Production wells for sampling by the Basin Engineer or other designated qualified water quality professional as specified by the GSP;

(10) The Coalition recommends that the GSP include how it will involve the Coalition in an ongoing role in developing, monitoring, and periodically reviewing the elements of the GSP and include such mechanism(s) as a formal component of the GSP.

<u>Definitions</u>

Acre-feet per year (AFY) - a unit of measuring water usage over time corresponding to covering one acre of land with one foot of water over the course of one year. An acre-foot of water equals 43,560 cubic-feet of water or 325,851.4 U.S. gallons. A football field is about 1.1 acres. One cubic-foot contains 7.48 gallons of water.

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[7] The Act requires the County planning agency, before adopting or substantially amending a general plan, to review and consider the GSP for the Basin.

Administrative Costs – legitimate and necessary GSP administration, legal, engineering, planning, technical and other costs not covered by State and/or Foundation grants and/or bond financing.

Basin – groundwater underlying the Borrego Valley alluvial basin boundaries that underlie the District and San Diego County and under their authority as determined by SGMA. Note: this is only a part of the basin as defined by DWR in its 2003 Bulletin 118, which includes other land within the jurisdiction of San Diego County, Imperial County, the Bureau of Land Management, and potentially the California Department of Parks and Recreation.

Basin Engineer – qualified professional engineering firm hired by the Groundwater Sustainability Agency to administer the implementation of the GSP.

Groundwater Sustainability Agency (GSA) – Agencies that have been created by statute to manage groundwater are deemed the exclusive agency to comply with the Sustainable Groundwater Management Act ("the Act") within their boundaries unless the agency elects to opt out [Section 10723 (c)(1) and (c)(2)]. Otherwise, any local agency or combination of local agencies overlying a groundwater basin may elect to be a GSA [Section 10723]. Local agencies, such as the District [California Water Code Section 35562] and the County, have until June 30, 2017 to form a GSA [Section 10735.2(1)]. A GSA may adopt rules, regulations, ordinances, and resolutions for the purposes of the Act.

Joint Powers Agreement (JPA) – formal agreement of how two or more agencies plan to work together to achieve a common purpose.

Non-Compliance Fee – an annual fee for Owners failing to meet their withdrawals reduction target. The fee would be assessed on the basis of Production exceeding an Owner's reduction target.

Physical Solution - A physical solution is a technical legal term for an operational plan that: (i) preserves water rights and, at the same time; (ii) enables all water users to exercise those rights fully even when there might not be sufficient water if there was strict compliance with the water rights system.

Policy for Water and Sewer Service to New Developments – see http://www.borregowd.org/uploads/Borrego_WD_2013_Proposed_New_Development_Policy_with_Detail_Sheet_and_Who_Pays_for_Growth_Policy_Feb_20_2012_Cle.pdf.

Owner – a person owning a groundwater extraction facility or an interest in a groundwater extraction facility in the Basin.

Production – annual groundwater withdrawals from the Basin.

Sustainable Community Solution – the transfer of sustainable Production among Owners that results in the desired mix of economic activity that achieves withdrawals within the Sustainable Yield of the Basin.

Sustainable Yield – the average annual natural recharge to the Basin as determined by the US Geological Survey (USGS)

Water Credits Policy – http://www.borregowd.org/uploads/Water_Credit_policy_revision_06.25.2014.pdf

Water Quality Data (WQD) – data required under the various state agency programs, as amended (e.g. Salt and Nutrient Monitoring Program) that preserves the privacy of Owners' wells' data.

Business of the Water District

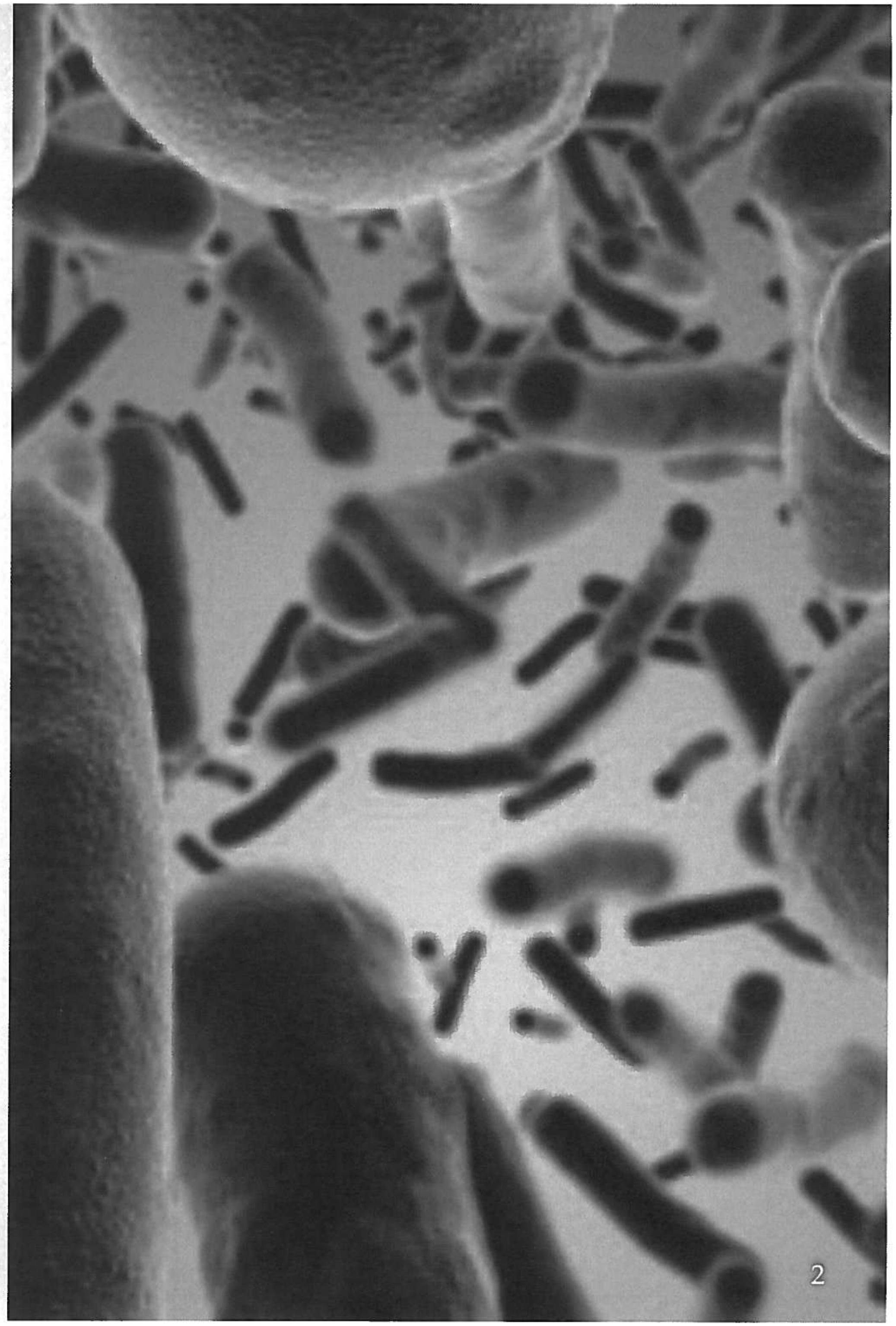
An Economic View

DRAFT - for discussion purposes only

January 2, 2016

Problems

Up until the modern era, almost all public water systems were plagued by severe public health issues

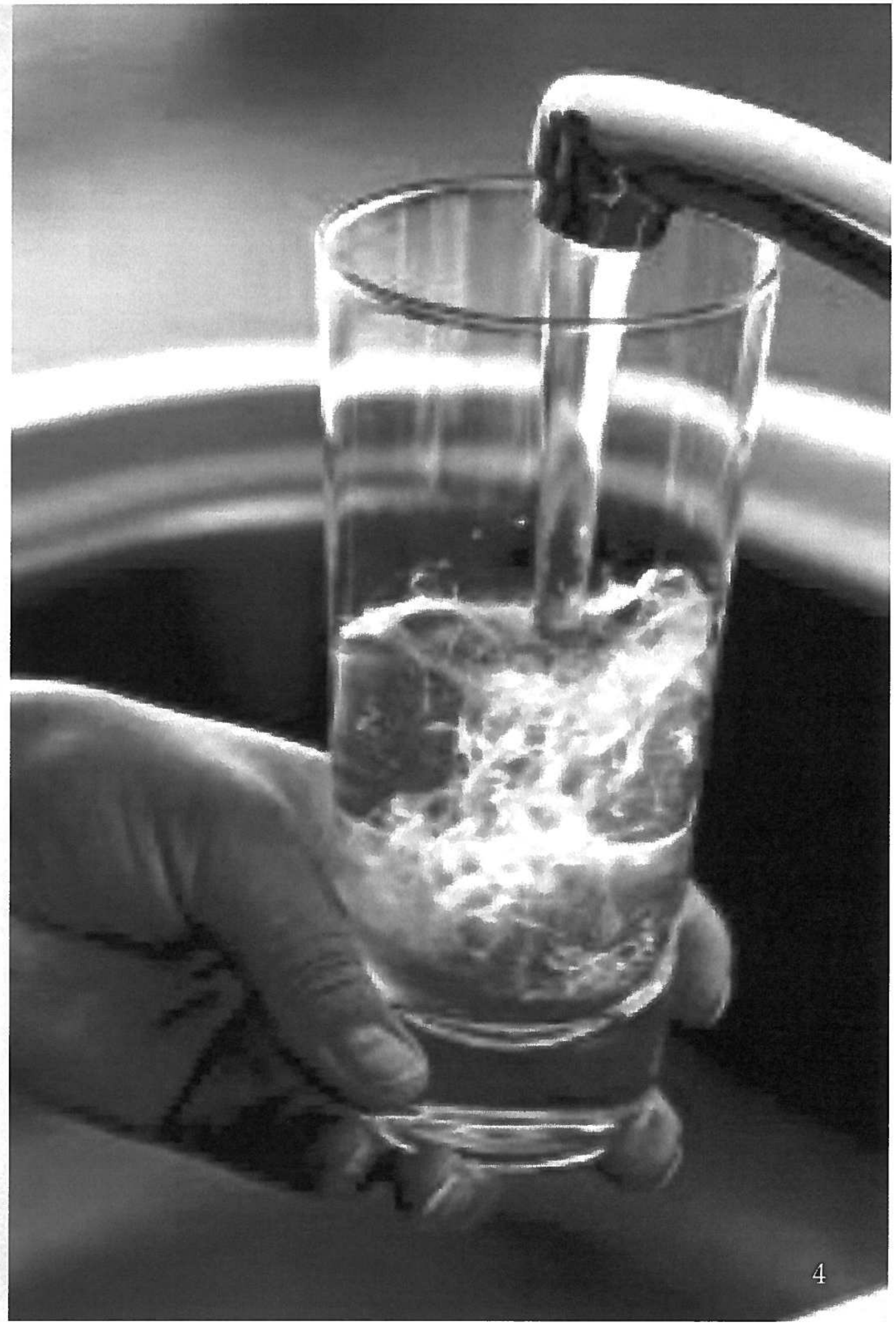


Health Issues

up until the later part of the 19th century, epidemics of typhoid fever, cholera, and other water borne diseases could kill as many as 10% of a community's population. Every few years a new pandemic might occur.

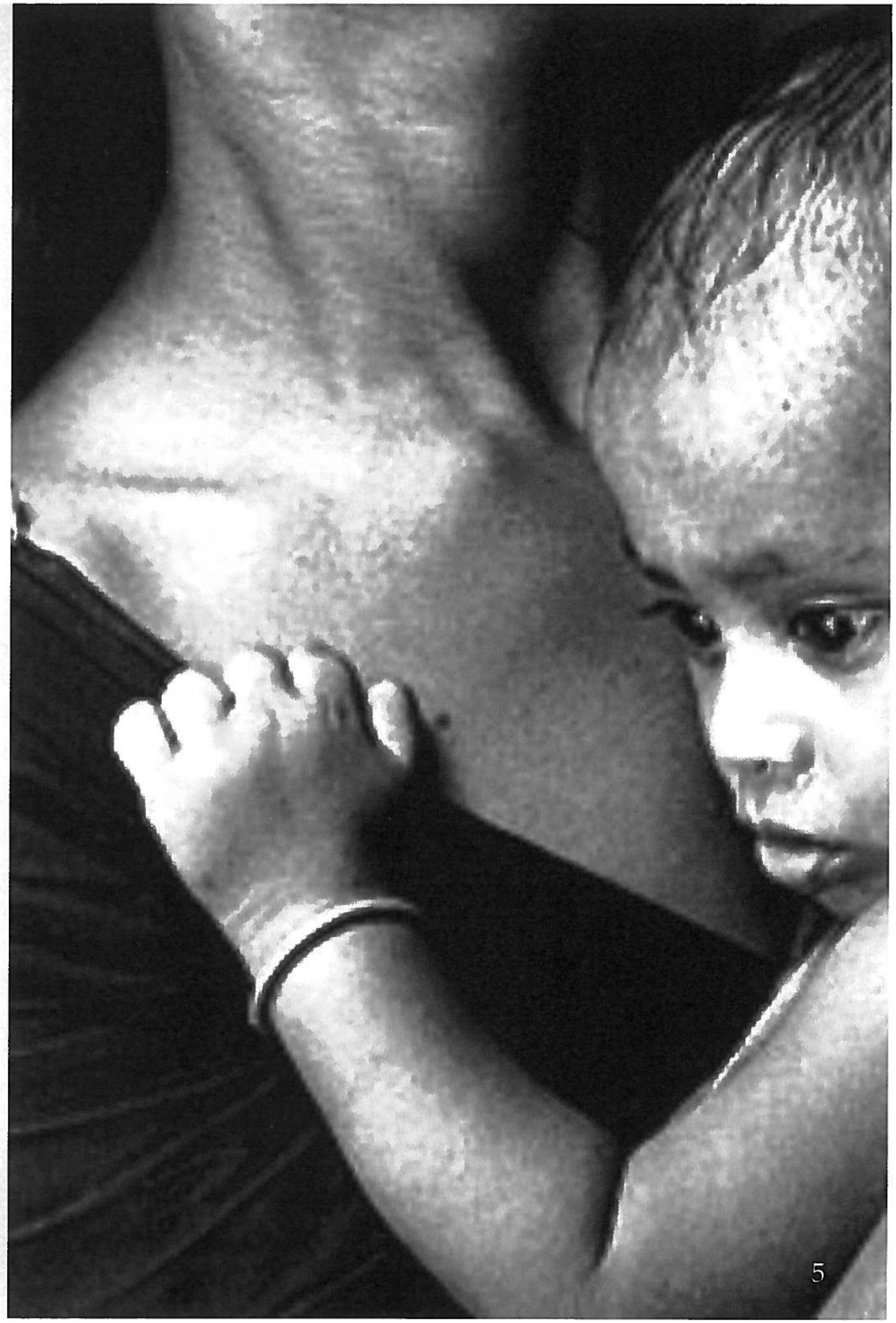
What Changed?

- separate sewer systems for waste disposal
- filtration of water supply
- addition of chlorine to public water supply
- treatment of wastewater before discharge into waterways



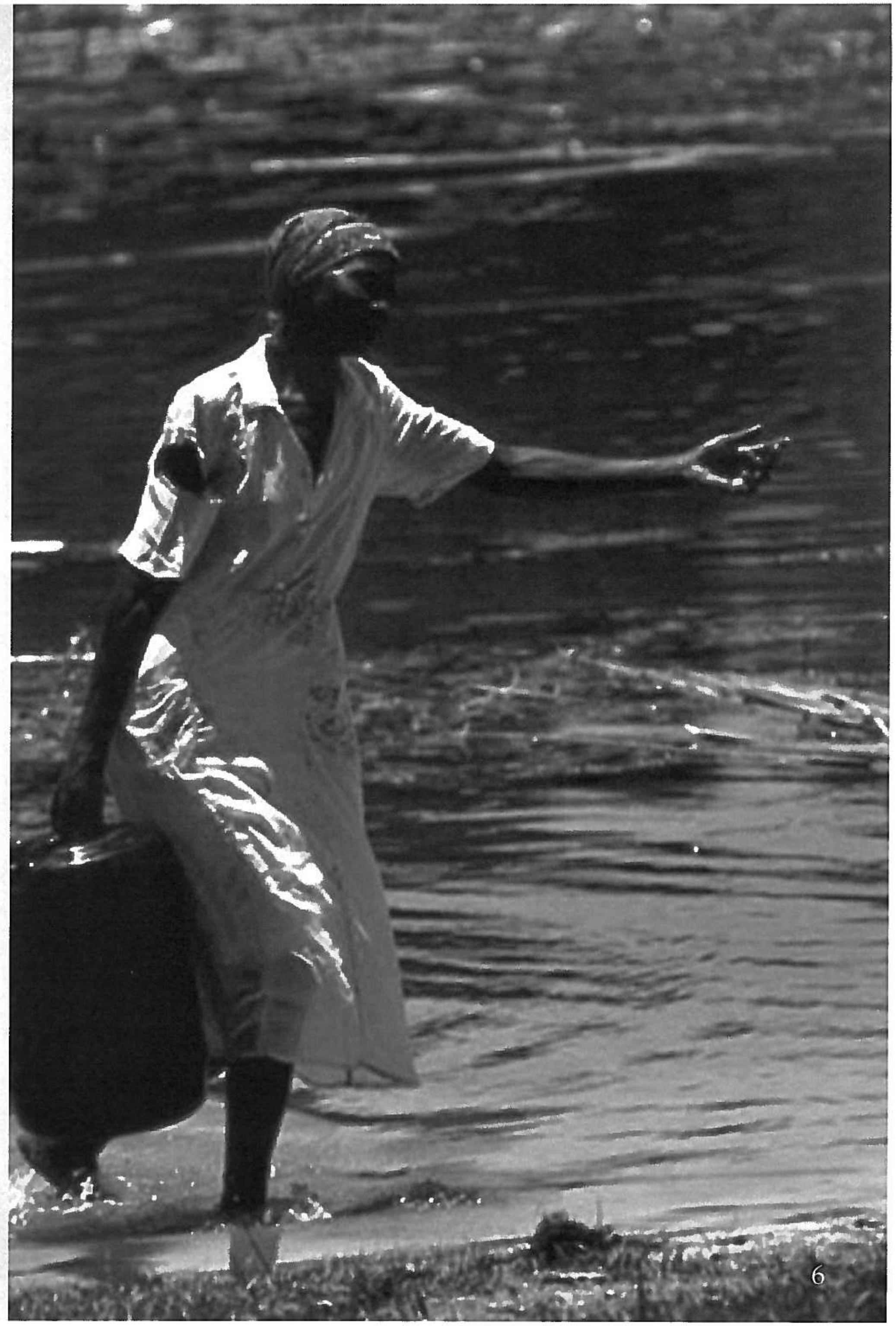
Changes Only for Some

- globally, water borne diseases are still the #1 cause of human mortality
- more than famine; war; accidents; all other causes
- from 1900 to 1947, the lifespan of an average American increased from 47 to 63 years. About 50% of this increase has been attributed solely to the treatment of drinking water



Globally

- few countries in the world are able to afford a *24x7 positive pressure potable* water supply system
- many countries only supply public water for a few hours each day or a few days out of every week
- about 1/5th of the world's 7.3 billion population still lacks ready access to *potable* water supply
- less people have access to a *public* wastewater system today than own or use mobile phones
- bottled water is typically better than public water available in many countries, but sometimes not as pure as public water in many parts of the US. That is because commercially bottled water is unregulated as to federal drinking water standards



Borrego Water District

- the water district operates and maintains a 24x7 positive pressure system to supply *potable* water to its customers
- the *potability* of the District's public water supply is regulated by state and federal drinking water standards and is tested regularly to make certain these standards are met
- by delivering *potable* water on demand 24/7 to its customers, the district helps support the public health and economic well-being of the community

SERVICE TO OTHERS

District Economics

- 24x7 positive pressure *potable* water systems are expensive. If they are not maintained adequately and operated properly, people get sick
- replacement cost of the District's water, sewer & wastewater treatment systems is ~$62.5M
- deferring replacement and repair (R&R) of this infrastructure too long can be 3x more expensive than timely R&R

District Economics

- presently, rates do not cover the *economic value* of the water withdrawn from the groundwater basin. The water itself is treated as a *free common pool resource*
- what rates presently cover are the *system* costs that assure *continual potability* (fit for human consumption) of the water delivered directly to your home or business (intermittent systems as in many parts of the world cannot deliver continual potability water to their customers)
- the cost of groundwater will change under the Sustainable Groundwater Management Act (SGMA)
- economics 101 - groundwater was *never really free*. Under conditions of scarcity (supply & water quality uncertainty), municipal water can only get more expensive. This is universal; it is happening almost everywhere in California, in the nation, in the world, not just in Borrego

District Economics

- assuming the district is being well-managed and properly governed by a responsible Board
    - from a *public health* perspective, most of the district's costs are non-discretionary. Costs are primarily driven by safe drinking water regulations and *potable* water supply economics
    - from an *economic development* perspective, most of the district's costs are non-discretionary. Water quality and supply uncertainty constrains *sustainable* economic development

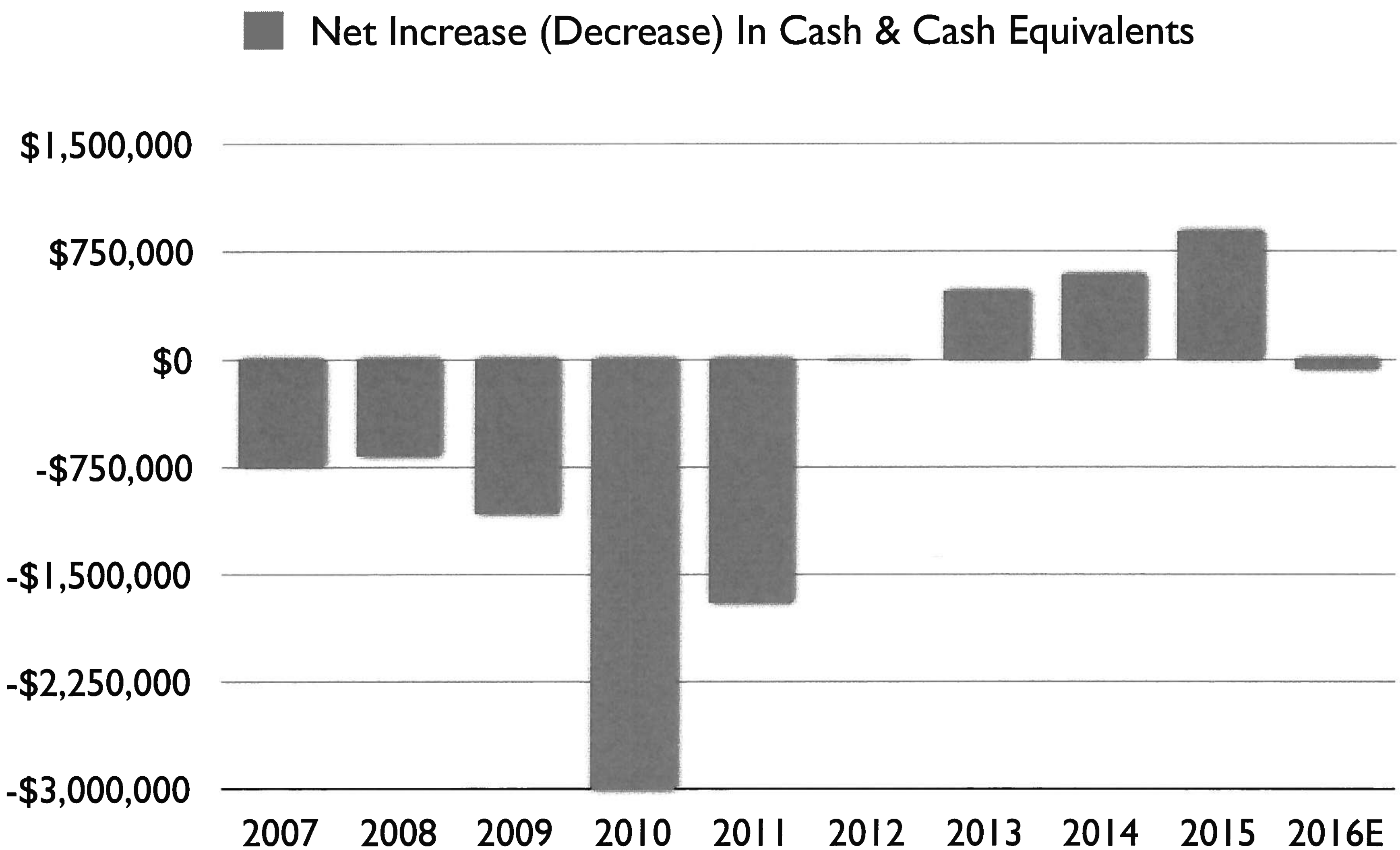
Inadequate Budgeting is Expensive!

- In April 1993, inadequate water repair & replacement budgeting caused 400,000 customers to became ill, 4,000 were hospitalized, and 100 people died from exposure to *cryptosporidium oocysts* in Milwaukee's drinking water

- In May 2000, inadequate water operating & maintenance budgeting in Walkerton, Ontario, a town of 5,000, introduced *E coli 0157:H7* into the public water supply sickening 2,300. Hundreds were hospitalized and seven people died

- In April 2014, a decision to cut Flint, Michigan's water supply budget caused widespread lead poisoning of the children in Flint. Lead poisoning interferes with the development of the nervous system in children, causing potentially permanent learning and behavioral disorders

Financial Health of the District



Financial Shape of District in 2010

- 2007 Board had been spending ~$1M/yr more in O&M expenses than annual revenues
- the previous GM had capitalized more than $1M in costs that should have been expensed
- this Board had agreed to a $1M subsidy of the Club Circle golf course over a period of 20-years
- in other "deals" this Board had agreed to spend ~$6M in the future that could not be paid for by projected revenues
- this Board adopted a Cadillac pension program for District employees that cost ~$300,000 cash in the short term and created a future liability of ~$1.6M
- this Board had added Tier 2 rates that did not meet Proposition 218 nexus requirements for cost-justification
- Results:
    - the District had consumed almost all of its ~$6M+ cash reserves accumulated over ~20-years
    - the District lost its good credit rating
    - thus, the District was out of cash; it could not borrow to pay for necessary R&R expenses

2011 & 2015 Board Actions Taken to Restore Financial Stability

- reduced annual O&M spending by ~$1.2M
- wrote off more than $1M in previously capitalized items that had no value
- renegotiated Club Hill Golf Course agreement so that there would be zero cost to ratepayers rather than $1M cost
- cancelled as much of the $6M in existing deals from the past Board possible that had no business value for the District
- renegotiated financing on one deal that will save the ratepayers ~$1M in future interest costs
- restored the pre-Cadillac pension program the District had previously for future employees to reduce future pension liabilities
- agreed to refund 3-years of Tier 2 rates to ratepayers rather than an obligatory 1-year of refunds

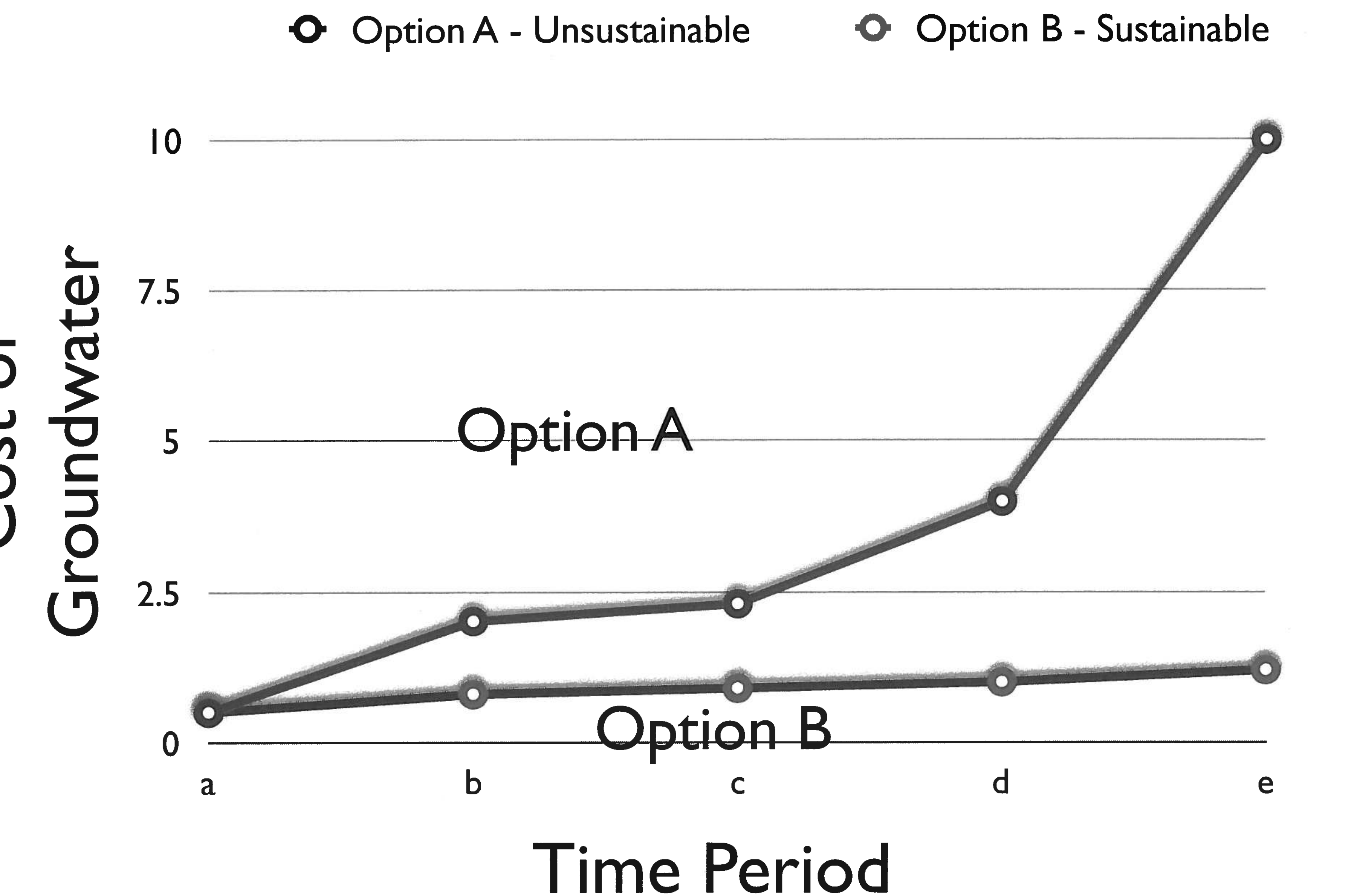
2011 & 2015 Board & Management Actions Taken to Restore Financial Stability

- retained legal advisors and consultants that had experience with such severe financial work-outs
- raised rates 100% over 5-years rather than over 1-year recommended by the District's advisors and financial consultants. Without the support of the community for these rate increases, the District would have been forced to cut-back water service [in some communities that were unwilling to support rate increases, property values fell, business revenues fell, and economic development ground to a standstill]
- revised the District's CIP to reflect least cost economic management of the District's $62.5M infrastructure investment going forward, but deferred costly R&R until the District is creditworthy again
- held District salaries to small increases, while reducing staff from 17 to 11

Longer-Term, Larger Financial Issues

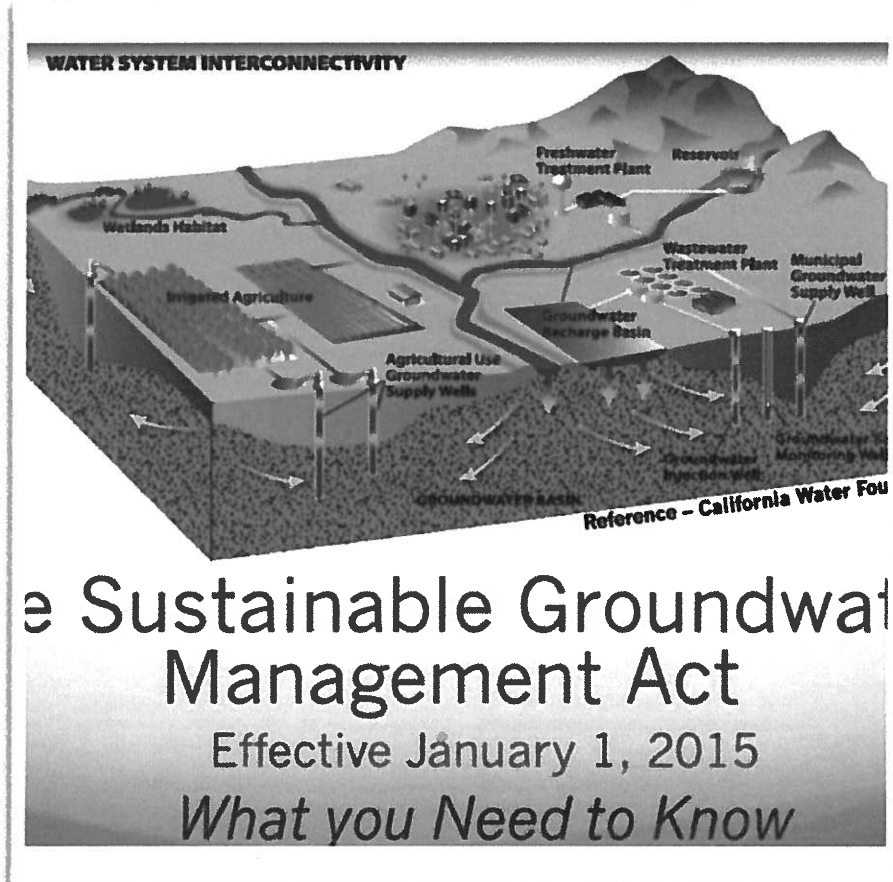
- from past boards deferring necessary R&R into the future (allowing assets to operate past their economically useful lives), today, the District is facing ~$15M-$20M in catch-up infrastructure R&R expenditures to keep its ~$62.5M in replacement cost system in top (least economic cost) operating shape
- but, by far the largest cost that can potentially be avoided or put off to the distant future is to solve the critical overdraft situation. If the overdraft is not eliminated soon, the potential cost to District ratepayers in the medium-future may be ~$40M-$70M in increased rates
- the Good News:
  - the future financial costs the District is facing are entirely addressable and much smaller on a per capita basis than many other water districts in California and other parts of the nation, *assuming the community has the willingness to tackle the overdraft in a timely fashion*
  - why are we potentially in good shape? Because, the District does not rely on any other water source other than the BVGB; we are surrounded by the ABDSP which protects the watershed from being destroyed or polluted; and most recently, the community has rallied to financially support the District in its work protecting water service to its customers!

Economics of Unsustainable vs Sustainable Management of the Groundwater Basin



SUSTAINABLE GROUNDWATER MANAGEMENT ACT (SGMA)

- SGMA's sole objective: *eliminate* overdraft by bringing groundwater basins into *sustainability* (balancing the water budget to maintain water levels within a range that prevents *undesirable* results)
- essentially, SGMA mandates that we achieve cost curve of Option B
- SGMA changes the cost of groundwater for all users from nothing to something. How much groundwater will cost is affected by the economics of each specific basin
- for the Borrego Valley Groundwater Basin (BVGB) this economic value of groundwater has been calculated. This does not mean rates will suddenly increase by the economic value of groundwater. Groundwater costs will be carefully factored in over the 20-year SGMA process.

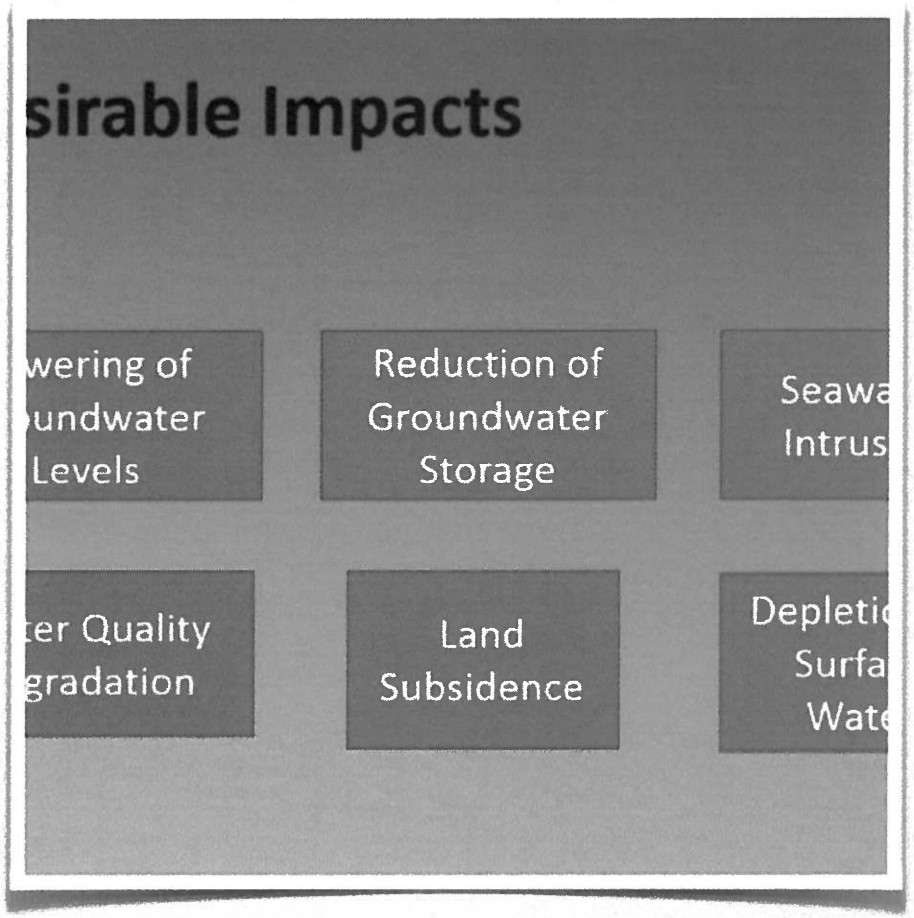


ECONOMICS OF GROUNDWATER MANAGEMENT UNDER SGMA

- the economic value of groundwater will be factored into the cost of groundwater for all present users of BVGB water, not just District ratepayers, in a variety of ways over the 20-year SGMA process

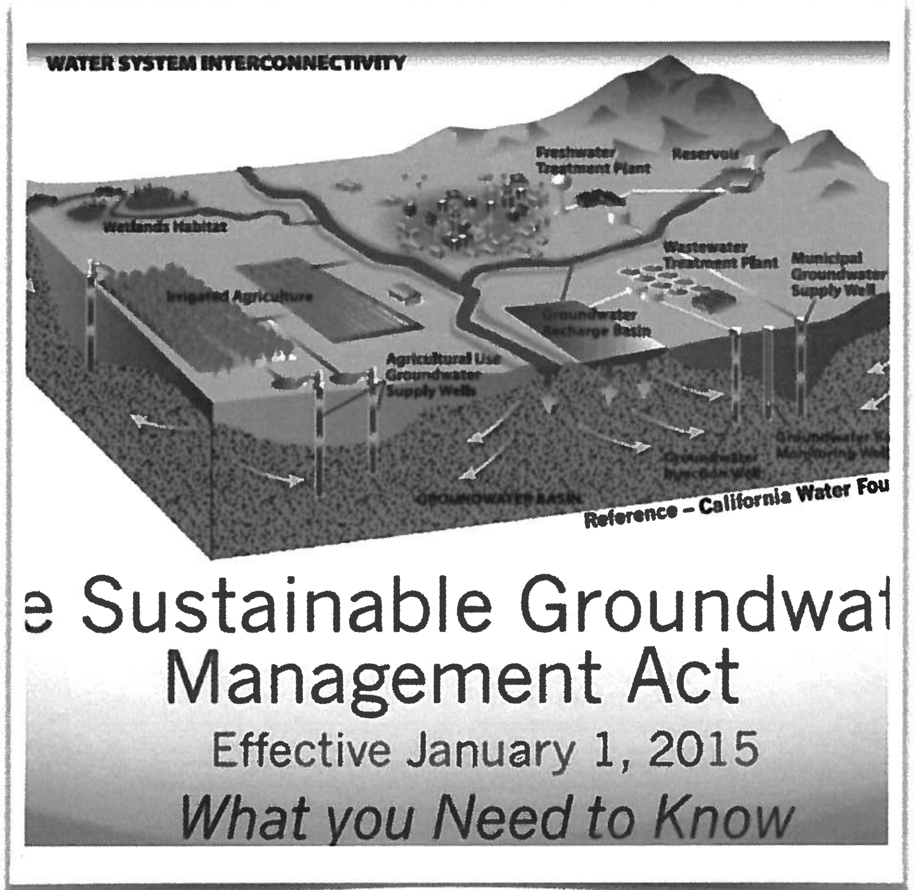
- the California State Water Resources Control Board (SWRCB) will enforce mandatory reductions if an adequate Groundwater Sustainability Plan (GSP) is not adopted by the District & County before 2020; if expected 5-year GSP reduction targets are not met; or if by 2040 at the latest, the BVGB is not *sustainable (i.e. is not being managed to reduce large scale uneconomic impacts for potential future economic development)*

WHY SGMA NOW?



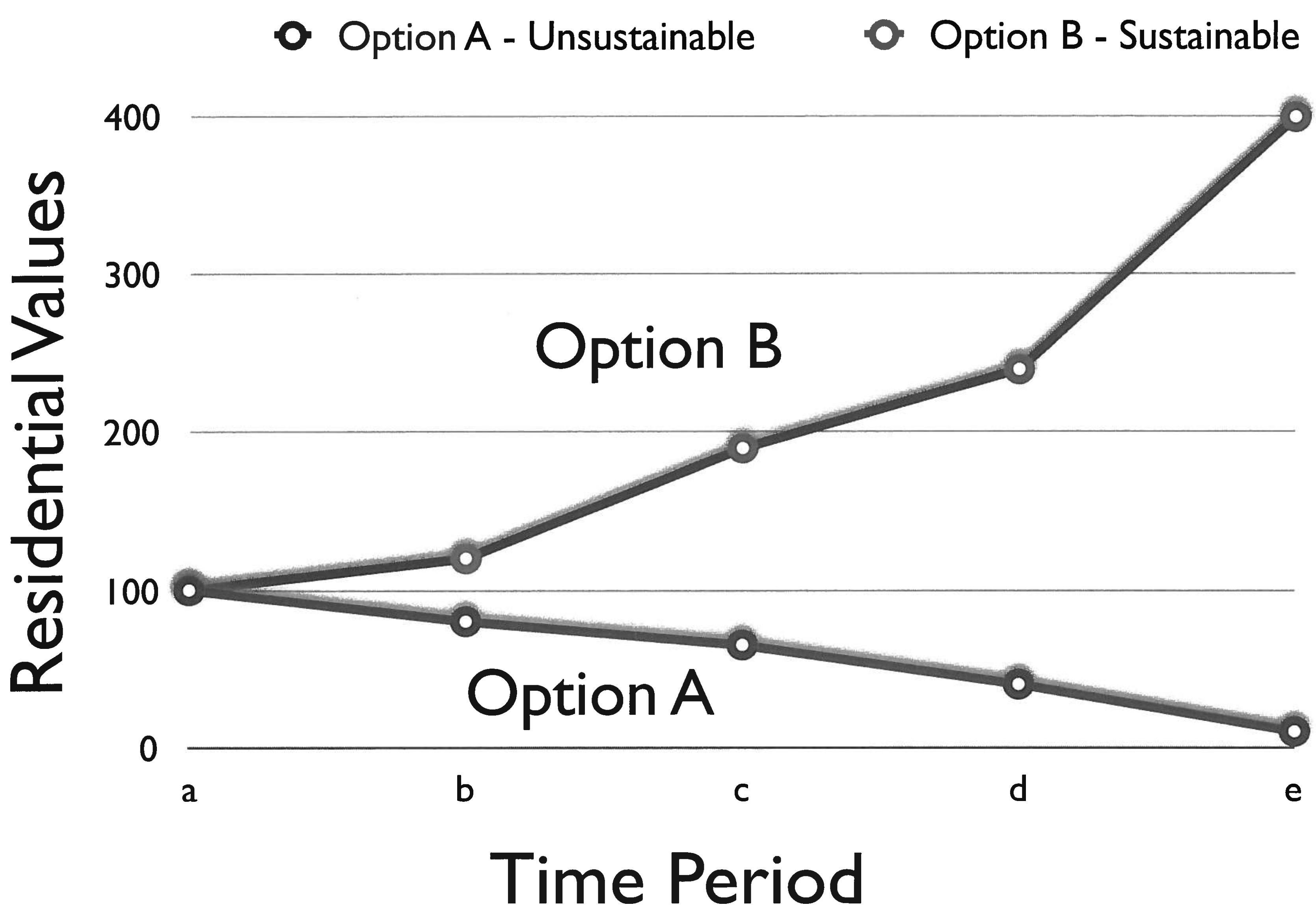
- CONTEXT: California is the 8th largest economy in the world
- CONTEXT: over past 5-years California has been experiencing the lowest snowpack in 500-years; the driest soil in 1,200-years
- groundwater basin overdrafts collectively cause billions of $$ in lost business revenue
- overdrafts have caused billions of $$ in property damage
- overdrafts will require billions of $$ for advanced water treatment
- overdrafts ultimately may prevent future economic development

BUT WHY SGMA?



- water markets have not efficiently reduced basin overdrafts
- adjudications have not been an efficient means to achieve sustainable use of groundwater basins
- past state regulations have not led to *sustainable* use of groundwater
- with markets, adjudications and past regulations, overdrafts have become larger, not smaller, over the past 30-years
- design of SGMA is to address overdraft as a complex systems problem that requires both regulations and markets dynamically working together to achieve timely improvements in basin management that enable future economic growth

OVERDRAFT'S ECONOMIC EFFECT ON RESIDENTIAL PROPERTY VALUES



RESOLUTION NO. 2016-02-01

RESOLUTION OF THE BOARD OF DIRECTORS OF THE BORREGO WATER DISTRICT AUTHORIZING THE GENERAL MANAGER TO SUBMIT AN APPLICATION FOR FUNDING UNDER THE WATER QUALITY, SUPPLY AND INFRASTRUTURE IMPROVEMENT ACT OF 2014 (PROPOSITION 1)

WHEREAS, and the Board of Directors of the Borrego Water District (BWD), a public agency, has the authority to govern the Borrego Water District; and

WHEREAS, the Board of Directors of the Borrego Water District desires to enhance the water quality, water supply, water supply reliability and infrastructure for the customers within the jurisdictional boundaries of the Borrego Water District;

NOW, THEREFORE, the Board of Directors of the Borrego Water District does hereby resolve, determine, and order as follows:

Section 1. The General Manager (the "General Manager") of the Borrego Water District (the "District"), or such person or persons designated by the General Manager, is hereby designated to provide the assurances, certifications, and commitments required for the financial assistance application, including executing a financial assistance agreement with State Water Resources Control Board (the "SWRCB") through application to the State Revolving Fund (the "SRF") and any amendments or changes thereto.

Section 2. The General Manager, or such person or persons designated by the General Manager, is designated to represent the District in carrying out the District's responsibilities under the financing agreement, including certifying disbursement requests on behalf of the District and compliance with applicable state and federal laws, is hereby authorized to approve claims for reimbursement under Clean, Safe and Reliable Drinking Water Program (the "Program") for work to be completed by the District in accordance with project identified in the District's application for SRF funding under for Tertiary Treatment Conversion Project Feasibility Study, Project No. 3705-010 (the "Project").

Section 3. The President of the Board of Directors, the General Manager, and David Dale a registered engineer, are each hereby authorized to review and sign claim forms to be submitted to the State of California for reimbursement under the Program on behalf of the District.

Section 4. The President of the Board of Directors, the General Manager, and David Dale, a registered engineer, are each hereby authorized to execute the Budget and Expenditure Summary under the Program.

Section 5. The General Manager is hereby authorized to sign the Final Release Form under the Program, and to submit such forms, certifications, and documents, including the Final Release Form, to the SWRCB necessary to complete the District's participation in the Program.

Section 6. David Dale a registered engineer, is hereby authorized to certify that the project is complete and ready for final inspection.

Section 7. The Borrego Water District Board of Directors does hereby designate revenues from the water rates and charges, assessments, or any other legally available source, as the dedicated source of revenue to pay for operation and maintenance costs associated with the Project. This dedication shall remain in full force and effect for the life of this Project, which is estimated to be three (3) years, unless modification or change of such dedication is approved in writing by the State of California, Department of Public Health. If for any reason, said source of revenues prove insufficient to satisfy the operations and maintenance costs associated with this Project, sufficient funds shall be raised through increased water rates, user charges, or assessments or any other legal means available to operate and maintain this Project. ***(NOTE: The above paragraph is intended for construction projects that may significantly increase O&M, such as treatment plants. This paragraph should be removed for feasibility studies)***

ADOPTED, SIGNED AND APPROVED this 16th day of February, 2016.

____

Beth Hart, President of the Board of Directors of
Borrego Water District

ATTEST:

____

Joseph Tatusko, Secretary of the Board of Directors of Borrego Water District

{Seal}

STATE OF CALIFORNIA)

) ss.

COUNTY OF SAN DIEGO)

I, Joseph Tatusko, Secretary of the Board of Directors of the Borrego Water District, do hereby certify that the foregoing resolution was duly adopted by the Board of Directors of said District at a regular meeting held on the 16th day of February, 2016, and that it was so adopted by the following vote:

AYES: DIRECTORS:

NOES: DIRECTORS:

ABSENT: DIRECTORS:

ABSTAIN: DIRECTORS:

____

Joseph Tatusko, Secretary of the Board of Directors of
Borrego Water District

STATE OF CALIFORNIA)

) ss.

COUNTY OF SAN DIEGO)

I, Joseph Tatusko, Secretary of the Board of Directors of the Borrego Water District, do hereby certify that the above and foregoing is a full, true and correct copy of RESOLUTION NO. 2016-02-1, of said Board, and that the same has not been amended or repealed.

Dated: February 16, 2016

____

Joseph Tatusko, Secretary of the Board of Directors of
Borrego Water District