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BEFORE THE ARIZONA CORPORATION COMMISSION

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Arizona Corporation Commission
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JUL 13 2006

DOCKETED BY

JEFF HATCH-MILLER, Chairman
WILLIAM A. MUNDELL
MARC SPITZER
MIKE GLEASON
KRISTIN K. MAYES

IN THE MATTER OF THE APPLICATION OF PERKINS MOUNTAIN UTILITY COMPANY FOR A CERTIFICATE OF CONVENIENCE AND NECESSITY.	DOCKET NO. SW-20379A-05-0489
IN THE MATTER OF THE APPLICATION OF PERKINS MOUNTAIN WATER COMPANY FOR A CERTIFICATE OF CONVENIENCE AND NECESSITY.	DOCKET NO. W-20380A-05-0490

NOTICE OF FILING

Pursuant to Commissioner's Mayes July 7, 2006 letter to Ernest Johnson, Director, Utilities Division, wherein Commissioner Mayes requested that Staff of the Arizona Corporation Commission docket all data requests and responses to those data requests in this case.

Therefore, Staff hereby provides notice that it is filing the attached Data Requests and Data Responses:

Dated Date	Data Request/Response
May 2, 2006	Perkins Mountain Water Company and Perkins Mountain Utility Company's First Set of Data Requests to Commission Staff;
May 11, 2006	Staff's Responses to Perkins Mountain Water Company and Perkins Mountain Utility Company's First Set of Data Requests;
April 25, 2006	Responses to Staff's First Set of Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company's First Set of Data Requests (BNC 1.1, 1.2, 1.3, 1.4. 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 1.12, 1.13, 1.14, 1.15, 1.19, 1.20, 1.22, 1.24 and 1.25);
April 28, 2006	Response to Staff's First Set of Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company's First Set of Data Requests (BNC 1.21);
May 18, 2006	Supplemental Response to Staff's First Set of Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company's First Set of Data Requests (BNC 1.9);

June 19, 2006	Response to Staff's First Set of Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company's First Set of Data Requests (Objection to BNC 1.13 and 1.25); and
June 21, 2006	Responses to Staff's First Set of Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company's First Set of Data Requests (BNC 1.16, 1.17, 1.18, 1.21, and 1.23);
April 5, 2006	Response to Request for Data to Dr. Lee Allison, Director, Arizona Geological Survey;
April 14, 2006 *(Received)*	Response to Request for Data to United States Geological Survey;
Unknown	Response to Request for Data to Herbert R. Guenther, Director Arizona Department of Water Resources;
May 3, 2006	Response to Request for Data to Christine Ballard, Director, Mohave County Planning and Zoning Department; and
July 12, 2006	Staff's Second Set of Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company.

Please Note the following Data Requests have already been docketed:

March 29, 2006	Request for Data to Dr. Lee Allison, Director, Arizona Geological Survey;
March 29, 2006	Request for Data to United States Geological Survey;
March 29, 2006	Request for Data to Herbert R. Guenther, Director Arizona Department of Water Resources;
March 29, 2006	Request for Data to Christine Ballard, Director, Mohave County Planning and Zoning Department; and
March 31, 2006	Staff's First Set of Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company.

RESPECTFULLY SUBMITTED this 13th day of July, 2006.

David Ronald

David M. Ronald
Attorney, Legal Division
Arizona Corporation Commission
1200 West Washington Street
Phoenix, Arizona 85007
(602) 542-6020

...

...

Original and fifteen (15) copies
of the foregoing were filed this
13th day of July, 2006 with:

Docket Control
Arizona Corporation Commission
1200 West Washington Street
Phoenix, Arizona 85007

Copy of the foregoing mailed this
13th day of July, 2006 to:

Jeffrey W. Crockett
Kimberley A. Grouse
SNELL & WILMER
One Arizona Center
400 East Van Buren Street
Phoenix, Arizona 85004

Booker T. Evans
Kimberley A. Warshawsky
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2375 East Camelback Road, Suite 700
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Kimberly A. Grouse
kgrouse@swlaw.com

May 2, 2006

David M. Ronald, Esq.
Arizona Corporation Commission
1200 W. Washington Street
Phoenix, AZ 85007

Re: Perkins Mountain Water Company and Perkins Mountain Utility Company's First Set of Data Requests to Commission Staff
Docket Nos. W-20380A-05-0490 and SW-20379A-05-0489

Dear David:

Please treat this as Perkins Mountain Water Company and Perkins Mountain Utility Company's First Set of Data Requests to Commission Staff in the above-referenced matter.

These data requests are continuing, and your answers or any documents provided in response to these data requests should be supplemented with any additional information or documents.

Please send all responses to me at the address above.

Yours very truly,

SNELL & WILMER L.L.P.

Kimberly A. Grouse

KAG:lmr
Enclosures

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Snell & Wilmer is a member of LEX MUNDI, The Leading Association of Independent Law Firms.

FIRST SET OF DATA REQUESTS
FROM PERKINS MOUNTAIN WATER COMPANY
AND PERKINS MOUNTAIN UTILITY COMPANY
TO UTILITIES DIVISION STAFF
(DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489)
MAY 2, 2006

Perkins 1-1 Regarding the letter from Blessing Chukwu to the United States Geological Survey dated March 29, 2006 in Docket Nos. W-20380A-05-0490 and SW-20379A-05-0489, please provide the following:

(a) Copies of any written correspondence (including electronic and facsimile communications) received from the United States Geological Survey in response to the March 29, 2006 letter;

(b) Copies of any documents (including but not limited to reports and studies) provided by the United States Geological Survey in response to the March 29, 2006 letter;

(c) The date of any meeting(s) between Utilities Division Staff and any representative of the United States Geological Survey to discuss the March 29, 2006 letter, together with a copy of any summaries or minutes of such meeting(s) and the name or names of those persons attending on behalf of the United States Geological Survey; and

(d) The date of any phone call(s) or conference call(s) between Utilities Division Staff and any representative of the United States Geological Survey to discuss the March 29, 2006 letter, together with a copy of any summaries or minutes of such call(s) or conference call(s) and the name or names of those persons participating on behalf of the United States Geological Survey.

(e) If the United States Geological Survey has not responded to the March 29, 2006 letter, please so state.

FIRST SET OF DATA REQUESTS
FROM PERKINS MOUNTAIN WATER COMPANY
AND PERKINS MOUNTAIN UTILITY COMPANY
TO UTILITIES DIVISION STAFF
(DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489)
MAY 2, 2006

Perkins 1-2 Regarding the letter from Blessing Chukwu to the Arizona Geological Survey dated March 29, 2006 in Docket Nos. W-20380A-05-0490 and SW-20379A-05-0489, please provide the following:

(a) Copies of any written correspondence (including electronic and facsimile communications) received from the Arizona Geological Survey in response to the March 29, 2006 letter;

(b) Copies of any documents (including but not limited to reports and studies) provided by the Arizona Geological Survey in response to the March 29, 2006 letter;

(c) The date of any meeting(s) between Utilities Division Staff and any representative of the Arizona Geological Survey to discuss the March 29, 2006 letter, together with a copy of any summaries or minutes of such meeting(s) and the name or names of those persons attending on behalf of the United States Geological Survey; and

(d) The date of any phone call(s) or conference call(s) between Utilities Division Staff and any representative of the Arizona Geological Survey to discuss the March 29, 2006 letter, together with a copy of any summaries or minutes of such call(s) or conference call(s) and the name or names of those persons participating on behalf of the Arizona Geological Survey.

(e) If the Arizona Geological Survey has not responded to the March 29, 2006 letter, please so state.

FIRST SET OF DATA REQUESTS
FROM PERKINS MOUNTAIN WATER COMPANY
AND PERKINS MOUNTAIN UTILITY COMPANY
TO UTILITIES DIVISION STAFF
(DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489)
MAY 2, 2006

Perkins 1-3 Regarding the letter from Blessing Chukwu to the Mohave County Planning and Zoning Department dated March 29, 2006 in Docket Nos. W-20380A-05-0490 and SW-20379A-05-0489, please provide the following:

(a) Copies of any written correspondence (including electronic and facsimile communications) received from the Mohave County Planning and Zoning Department in response to the March 29, 2006 letter;

(b) Copies of any documents (including but not limited to reports and studies) provided by the Mohave County Planning and Zoning Department in response to the March 29, 2006 letter;

(c) The date of any meeting(s) between Utilities Division Staff and any representative of the Mohave County Planning and Zoning Department to discuss the March 29, 2006 letter, together with a copy of any summaries or minutes of such meeting(s) and the name or names of those persons attending on behalf of the Mohave County Planning and Zoning Department; and

(d) The date of any phone call(s) or conference call(s) between Utilities Division Staff and any representative of the Mohave County Planning and Zoning Department to discuss the March 29, 2006 letter, together with a copy of any summaries or minutes of such call(s) or conference call(s) and the name or names of those persons participating on behalf of the Mohave County Planning and Zoning Department.

(e) If the Mohave County Planning and Zoning Department has not responded to the March 29, 2006 letter, please so state.

FIRST SET OF DATA REQUESTS
FROM PERKINS MOUNTAIN WATER COMPANY
AND PERKINS MOUNTAIN UTILITY COMPANY
TO UTILITIES DIVISION STAFF
(DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489)
MAY 2, 2006

Perkins 1-4 Regarding the letter from Blessing Chukwu to the Arizona Department of Water Resources dated March 29, 2006 in Docket Nos. W-20380A-05-0490 and SW-20379A-05-0489, please provide the following:

(a) Copies of any written correspondence (including electronic and facsimile communications) received from the Arizona Department of Water Resources in response to the March 29, 2006 letter;

(b) Copies of any documents (including but not limited to reports and studies) provided by the Arizona Department of Water Resources in response to the March 29, 2006 letter;

(c) The date of any meeting(s) between Utilities Division Staff and any representative of the Arizona Department of Water Resources to discuss the March 29, 2006 letter, together with a copy of any summaries or minutes of such meeting(s) and the name or names of those persons attending on behalf of the Arizona Department of Water Resources; and

(d) The date of any phone call(s) or conference call(s) between Utilities Division Staff and any representative of the Arizona Department of Water Resources to discuss the March 29, 2006 letter, together with a copy of any summaries or minutes of such call(s) or conference call(s) and the name or names of those persons participating on behalf of the Arizona Department of Water Resources.

(e) If the Arizona Department of Water Resources has not responded to the March 29, 2006 letter, please so state.

FIRST SET OF DATA REQUESTS
FROM PERKINS MOUNTAIN WATER COMPANY
AND PERKINS MOUNTAIN UTILITY COMPANY
TO UTILITIES DIVISION STAFF
(DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489)
MAY 2, 2006

Perkins 1-5 Does the Arizona Corporation Commission have a policy (written or unwritten, formal or informal) that requires an applicant for a water CC&N to submit a letter of water adequacy, a certificate of assured water supply, or a designation of assured water supply as a condition precedent to the issuance of a CC&N to the applicant?

(a) If the answer to this data request is yes, please provide a copy of any written policy (formal or informal) or please summarize any unwritten policy (formal or informal).

Perkins 1-6 Please provide the decision number of any decision where the Arizona Corporation Commission has required an applicant for a water CC&N to submit a letter of water adequacy, a certificate of assured water supply, or a designation of assured water supply as a condition precedent to the issuance of a CC&N to the applicant?

Perkins 1-7 Regarding the adequacy of the water supply available to serve potential customers/developments within the proposed certificated area of an applicant for a new water CC&N, please answer the following questions:

(a) Does Utilities Division Staff ordinarily evaluate the adequacy of the water supply available to serve potential customers/developments within the proposed certificated area as part of Staff's analysis of the application for the water CC&N?

(b) If Utilities Division Staff does not ordinarily evaluate the adequacy of the water supply available to serve potential customers/developments within the proposed certificated area as part of Staff's analysis of the application for the water CC&N, what are the factors that cause Staff to evaluate the adequacy of the water supply for a particular applicant for a water CC&N?

(c) In cases where Utilities Division Staff evaluates the adequacy of the water supply available to serve potential customers/developments within the proposed certificated area of the applicant for the new water CC&N, please describe the steps that Staff takes to perform such an evaluation?

(d) Please identify those persons on Utilities Division Staff who evaluate the adequacy of the water supply available to serve

potential customers/developments within the proposed certificated area of an applicant for a new water CC&N.

(e) In a case where the Arizona Department of Water Resources has found that the water supply for a particular development or service area is adequate, and the Utilities Division Staff disagrees with ADWR's finding of water adequacy, does the Commission have the authority to deny a water CC&N to an applicant on the grounds that the applicant does not have access to an adequate water supply?

COMMISSIONERS
JEFF HATCH-MILLER- Chairman
WILLIAM A. MUNDELL
MARC SPITZER
MIKE GLEASON
KRISTIN K. MAYES

BRIAN C. MCNEIL
Executive Secretary

ARIZONA CORPORATION COMMISSION

May 11, 2006

Kimberly A. Grouse
SNELL & WILMER, L.L.P.
One Arizona Center
400 East Van Buren Street
Phoenix, Arizona 85004

Re: Staff's Responses to Perkins Mountain Water Company and Perkins Mountain Utility Company's First Data Request
Docket Nos. W-20380A-05-0490 and SW-20379A-05-0489

Dear Ms. Grouse:

Enclosed is Staff's response to Perkins Mountain Water Company and Perkins Mountain Utility Company's **first** set of data requests to the Arizona Corporation Commission Utilities Division Staff in the above-referenced matter.

Please do not hesitate to contact me if you have any questions regarding the attached.

Sincerely,

David Ronald

David M. Ronald
Attorney, Legal Division
(602) 541-3402

DMR:sab
Enclosure

cc: Marlin Scott, Jr.

ARIZONA CORPORATION COMMISSION STAFF'S RESPONSE TO PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY'S FIRST SET OF DATA REQUESTS DOCKET NOS. W-20380A-05-0490 & SW-20379A-05-0489 MAY 10, 2006

1.1 Regarding the letter from Blessing Chukwu to the United States Geological Survey dated March 29, 2006 in Docket Nos. W-20380A-05-0490 and SW-20379A-05-0489, please provide the following:

(a) Copies of any written correspondence (including electronic and facsimile communications) received from the United States Geological Survey in response to March 29, 2006 letter;

(b) Copies of any documents (including but not limited to reports and studies) provided by the United States Geological Survey in response to the March 29, 2006 letter;

(c) The date of any meeting(s) between Utilities Division Staff and any representative of the United States Geological Survey to discuss the March 29, 2006 letter, together with a copy of any summaries or minutes of such meeting(s) and the name or names of those persons attending on behalf of the United States Geological Survey; and

(d) The date of any phone call(s) or conference call(s) between Utilities Division Staff and any representative of the United States Geological Survey to discuss the March 29, 2006 letter, together with a copy of any summaries or minutes of such call(s) or conference call(s) and the name or names of those persons participating on behalf of the United States Geological Survey.

(e) If the United States Geological Survey has not responded to the March 29, 2006 letter, please so state.

Response by Marlin Scott, Jr., Utilities Division:

(a) Copies attached.
(b) Copies with above (a).
(c) None.
(d) None.
(e) USGS responded, see above.

ARIZONA CORPORATION COMMISSION STAFF'S RESPONSE TO PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY'S FIRST SET OF DATA REQUESTS DOCKET NOS. W-20380A-05-0490 & SW-20379A-05-0489 MAY 10, 2006

1.2 Regarding the letter from Blessing Chukwu to the Arizona Geological Survey dated March 29, 2006 in Docket Nos. W-20380A-05-0490 and SW-20378A-05-0489, please provide the following:

(a) Copies of any written correspondence (including electronic and facsimiles communications) received from the Arizona Geological Survey in response to the March 29, 2006 letter;

(b) Copies of any documents (including but not limited to reports and studies) provided by the Arizona Geological Survey in response to the March 26, 2006 letter;

(c) The date of any meeting(s) between Utilities Division Staff and any representatives of the Arizona Geological Survey to discuss the March 29, 2006 letter, together with a copy of any summaries or minutes if such meeting(s) and the name or names of those persons attending on behalf of the United States Geological Survey; and

(d) The date of any phone call(s) or conference call(s) between Utilities Division Staff and any representative of the Arizona Geological Survey to discuss the March 29, 2006 letter, together with a copy of any summaries or minutes of such calls(s) or conference call(s) and the name or names of those persons participating on behalf of the Arizona Geological Survey.

(e) Of the Arizona Geological Survey has not responded to the March 29, 206 letter, please so state.

Response by Marlin Scott, Jr., Utilities Division:

(a) Copies attached.
(b) Copies attached.
(c) None.
(d) None.
(e) AGS responded, see above.

ARIZONA CORPORATION COMMISSION STAFF'S RESPONSE TO PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY'S FIRST SET OF DATA REQUESTS DOCKET NOS. W-20380A-05-0490 & SW-20379A-05-0489 MAY 10, 2006

1.3 Regarding the letter from Blessing Chukwu to the Mohave County Planning and Zoning Department dated March 29, 2006 in Docket Nos. W-20380A-05-0490 and SW-20378A-05-0489, please provide the following:

(a) Copies of any written correspondence (including electronic and facsimiles communications) received from the Mohave County Planning and Zoning Department in response to the March 29, 2006 letter;

(b) Copies of any documents (including but not limited to reports and studies) provided by the Mohave County Planning and Zoning Department in response to the March 26, 2006 letter;

(c) The date of any meeting(s) between Utilities Division Staff and any representatives of the Mohave County Planning and Zoning Department to discuss the March 29, 2006 letter, together with a copy of any summaries or minutes if such meeting(s) and the name or names of those persons attending on behalf of the Mohave County Planning and Zoning Department; and

(d) The date of any phone call(s) or conference call(s) between Utilities Division Staff and any representative of the Mohave County Planning and Zoning Department to discuss the March 29, 2006 letter, together with a copy of any summaries or minutes of such calls(s) or conference call(s) and the name or names of those persons participating on behalf of the Mohave County Planning and Zoning Department.

(e) Of the Mohave County Planning and Zoning Department has not responded to the March 29, 206 letter, please so state.

Response by Marlin Scott, Jr., Utilities Division:

(a) Copies attached.
(b) Copies with above (a).
(c) None.
(d) None.
(e) Mohave County Planning & Zoning Department responded, see above.

ARIZONA CORPORATION COMMISSION STAFF'S RESPONSE TO PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY'S FIRST SET OF DATA REQUESTS DOCKET NOS. W-20380A-05-0490 & SW-20379A-05-0489 MAY 10, 2006

1.4 Regarding the letter from Blessing Chukwu to the Arizona Department of Water Resources dated March 29, 2006 in Docket Nos. W-20380A-05-0490 and SW-20378A-05-0489, please provide the following:

(a) Copies of any written correspondence (including electronic and facsimiles communications) received from the Arizona Department of Water Resources in response to the March 29, 2006 letter;

(b) Copies of any documents (including but not limited to reports and studies) provided by the Arizona Department of Water Resources in response to the March 26, 2006 letter;

(c) The date of any meeting(s) between Utilities Division Staff and any representatives of the Arizona Department of Water Resources to discuss the March 29, 2006 letter, together with a copy of any summaries or minutes if such meeting(s) and the name or names of those persons attending on behalf of the Arizona Department of Water Resources; and

(d) The date of any phone call(s) or conference call(s) between Utilities Division Staff and any representative of the Arizona Department of Water Resources to discuss the March 29, 2006 letter, together with a copy of any summaries or minutes of such calls(s) or conference call(s) and the name or names of those persons participating on behalf of the Arizona Department of Water Resources.

(e) Of the Arizona Department of Water Resources has not responded to the March 29, 206 letter, please so state.

Response by Marlin Scott, Jr., Utilities Division:

(a) Copies attached.
(b) Copies with above (a).
(c) None.
(d) None.
(e) ADWR responded, see above.

1.5 Does the Arizona Corporation Commission have a policy (written or unwritten, formal or informal) that requires an applicant for a water CC&N to submit a letter of water adequacy, a certificate of assured water supply, or a designation of assured water supply as a condition precedent to the issuance of CC&N to the applicant?

(a) If the answer to this data request is yes, please provide a copy of any written policy (formal or informal) or please summarize any unwritten policy (formal or informal).

Response by Marlin Scott, Jr., Utilities Division:

No.

1.6 Please provide the decision number of any decision where the Arizona Corporation Commission has required an applicant for a water CC&N to submit a letter of water adequacy, a certificate of assured water supply, or a designation of assured water supply as a condition precedent to the issuance of CC&N to the applicant?

Response by Marlin Scott, Jr., Utilities Division:

None.

1.7 Regarding the adequacy of the water supply available to serve potential customers/development within the proposed certificated area of an applicant for a new water CC&N, please answer the following questions:

(a) Does Utilities Division Staff ordinarily evaluate the adequacy of the water supply available to serve potential customer/development within the proposed certificated area as part of Staff's analysis of the application of the water CC&N?

(b) If Utilities Division Staff does not ordinarily evaluated the adequacy of the water supply available to serve potential customer/development within the proposed certificated area as part of Staff's analysis of the application for the water CC&N, what are the factors that cause Staff to evaluate the adequacy of the water supply for a particular applicant for water CC&N?

(c) In case where Utilities Division Staff evaluates the adequacy of the water supply available to serve potential customer/development within the proposed certificated area of the applicant for the new water CC&N, please describe the steps that Staff takes to perform such an evaluation?

(d) Please identify those persons on Utilities Division Staff who evaluate the adequacy of the water supply available to serve potential customer/development within the proposed certificated area of an applicant for a new water CC&N.

(e) In case where the Arizona Department of Water Resources has found that the water supply for a particular development or service area is adequate, and the Utilities Division Staff disagree with ADWR's finding of water adequacy, does the Commission have the authority to deny a water CC&N to an applicant on the grounds that the applicant does not have access to an adequate water supply?

Response by Marlin Scott, Jr., Utilities Division:

(a) Yes, Staff relies on ADWR to make that determination.
(b) See (a) above.
(c) See (a) above.
(d) Staff Engineering and Staff Executive Consultants usually review the adequacy of the water supply by reviewing ADWR documentation.

Response by David Ronald, Legal Division:

(e) ADWR makes findings related to water adequacy based on its analysis under its statutes. Staff has not disputed the findings that ADWR makes concerning adequacy of water supply. However, ADWR's conclusions are not the only factor that the Commission may consider when the Commission determines whether an applicant should receive a CC&N. A finding of inadequate water by ADWR is a compelling reason that Staff may use in its recommendation that there is not enough water in a given case. On the other hand, a finding by ADWR of water adequacy does not preclude a recommendation by Staff that a CC&N should not be granted. The Commission may examine additional factors not considered by ADWR when it determines whether a CC&N should be granted. The Commission considers all information related to the public interest and is not bound solely by the determinations of ADWR in a particular case.

Chukwu

COMMISSIONERS
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MARC SPITZER
MIKE GLEASON
KRISTIN K. MAYES

BRIAN C. MCNEIL
Executive Director

ARIZONA CORPORATION COMMISSION

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2006 MAR 29 P 3: 53
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March 29, 2006

United States Geological Survey
Attention: Earth Science Information Center
P.O.Box 25286, DFC
Denver, Colorado 80225

RE: Perkins Mountain Water Company and Perkins Mountain Utility Company – Applications for Certificates of Convenience and Necessity (CC&N) Docket Nos. W-20380A-05-0490 and W-20379A-05-0489

Dear Sir/Madam:

The Arizona Corporation Commission ("Commission") is currently reviewing the above referenced applications for Certificates of Convenience and Necessity in Mohave County, Arizona and would appreciate it if you would provide the following information to the Commission:

- Has any groundwater aquifer study been done or envisioned by U.S. Geological Survey for Mohave County? Please explain. If a study has been done, please provide a summary of the findings and conclusions.

If you have any questions concerning this matter, please do not hesitate to contact me at 602-542-0840.

Very truly yours,

Blessing N. Chukwu
Executive Consultant III

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Corporation Commission
Director of Utilities

BNC
cc: Docket Control
Del Smith
Lyn Farmer
Brian Bozzo
Vicki Wallace

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Bowie, J.E., Kam, William, Branson, F.A., and Aro, R.S., 1968, Use of water by riparian vegetation, Cottonwood Wash, Arizona, with a section on vegetation: U.S. Geological Survey, Water-Supply Paper 1858, scale 1:12000.

Wiele, S.M., 1998, Modeling of flood-deposited sand distributions in a reach of the Colorado River below the Little Colorado River, Grand Canyon, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 97-4168, scale 1:20000.

Moosburner, Otto, 1988, Potential flood and debris hazards at Katherine Landing and Telephone Cove, Lake Mead National Recreation Area, Mohave County, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 87-4081, scale 1:32000.

Truini, Margot, 1999, Geohydrology of Pipe Spring National Monument area, northern Arizona: U.S. Geological Survey, Water-Resources Investigations Report 98-4263, scale 1:56000.

Melis, T.S., Phillips, W.M., Webb, R.H., and Bills, D.J., 1996, When the blue-green waters turn red -- historical flooding in Havasu Creek, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 96-4059, scale 1:60000.

Bales, J.T. and Laney, R.L., 1992, Geohydrologic reconnaissance of Lake Mead National Recreation Area - Virgin River, Nevada, to Grand Wash Cliffs, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 91-4185, scale 1:62500.

Bentley, C.B., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area - Hoover Dam to Mount Davis, Arizona: U.S. Geological Survey, Open-File Report OF-79-690, scale 1:62500.

Bentley, C.B., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area - Mount Davis to Davis Dam, Arizona: U.S. Geological Survey, Open-File Report OF-79-691, scale 1:62500.

Laney, R.L., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area - Hoover Dam to Temple Bar, Arizona: U.S. Geological Survey, Open-File Report OF-79-689, scale 1:62500.

Laney, R.L., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area - Temple Bar to Grand Wash Cliffs, Arizona: U.S. Geological Survey, Open-File Report OF-79-688, scale 1:62500.

Wolcott, H.N., Skibitzke, H.E., and Halfpenny, L.C., 1956, Water resources of Bill Williams River valley near Alamo, Arizona: U.S. Geological Survey, Water-Supply Paper 1360-D, scale 1:63360.

Twichell, D.C., Cross, V.A., Rudin, M.J., and Parolski, K.F., 2000, Surficial geology and distribution of post-impoundment sediment of the western part of Lake Mead based on a sidescan sonar and high-resolution seismic-reflection survey: U.S. Geological Survey, Open-File Report OF-99-581, scale 1:75000.

Wilson, R.P. and Owen-Joyce, S.J., 1994, Method to identify wells that yield water that will be replaced by Colorado River water in Arizona, California, Nevada, and Utah: U.S. Geological Survey, Water-Resources Investigations Report 94-4005, scale 1:100000.

Gillespie, J.B. and Bentley, C.B., 1971, Geohydrology of Hualapai and Sacramento Valleys, Mohave County, Arizona: U.S. Geological

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Survey, Water-Supply Paper 1899-H, scale 1:125000.
Levings, G.W. and Farrar, C.D., 1979, Maps showing ground-water conditions in the Kanab area, Coconino and Mohave Counties, Arizona - 1976: U.S. Geological Survey, Open-File Report OF-79-1070, scale 1:125000.
Metzger, D.G. and Loeltz, O.J., 1973, Geohydrology of the Needles area, Arizona, California, and Nevada: U.S. Geological Survey, Professional Paper 486-J, scale 1:125000.
Pfaff, C.L. and Clay, D.M., 1981, Map showing ground-water conditions in the Sacramento Valley area, Mohave County, Arizona - 1979: U.S. Geological Survey, Open-File Report OF-81-418, scale 1:125000.
Remick, W.H., 1980, Map showing ground-water conditions in the Hualapai Basin area, Mohave, Coconino, and Yavapai Counties, Arizona -- 1980: Arizona Department of Water Resources, Hydrologic Map Series Report no. 4, scale 1:125000.
Twenter, F.R., 1962, Geology and promising areas for ground-water development in the Hualapai Indian Reservation, Arizona: U.S. Geological Survey, Water-Supply Paper 1576-A, scale 1:125000.
Levings, G.W. and Farrar, C.D., 1979, Map showing ground-water conditions in the Virgin River, Grand Wash, and Shivwits areas, Mohave County, Arizona - 1976: U.S. Geological Survey, Water-Resources Investigations Report 79-57, scale 1:126000.
Harbeck, G.E., Kohler, M.A., and Koberg, G.E., 1958, Water-loss investigations: Lake Meade Studies: U.S. Geological Survey, Professional Paper 298, scale 1:144000.
Enright, Michael, 1996, Selected hydrologic data for the Beaver Dam Wash area, Washington County, Utah, Lincoln County, Nevada, and Mohave County, Arizona, 1991-95: U.S. Geological Survey, Open-File Report OF-96-493, scale 1:167000.
Etheredge, Devin, Gutzler, D.S., and Pazzaglia, F.J., 2004, Geomorphic response to seasonal variations in rainfall in the southwest United States [Walnut Creek study area, Hualapai Mts]: Geological Society of America, Bulletin v. 116, n. 5/6, p. 606, scale 1:229000.
Flynn, M.E. and Hornewer, N.J., 2003, Variations in sand storage measured at monumented cross sections in the Colorado River between Glen Canyon Dam and Lava Falls Rapid, northern Arizona, 1992-99: U.S. Geological Survey, Water-Resources Investigations Report 03-4104, scale 1:240000.
Heilweil, V.M. and Freethey, G.W., 1992, Simulation of ground-water flow and water-level declines that could be caused by proposed withdrawals, Navajo Sandstone, southwestern Utah and northwestern Arizona: U.S. Geological Survey, Water-Resources Investigations Report 90-4105, scale 1:250000.
Thompson, D.G., 1929, The Mohave Desert region, California, a geographic, geologic, and hydrologic reconnaissance: U.S. Geological Survey, Water-Supply Paper 578, scale 1:250000.
U.S. Geological Survey, 1979, Land use series, Grand Canyon [quadrangle], Arizona: U.S. Geological Survey, Open-File Report OF-79-1494, scale 1:250000.
U.S. Geological Survey, 1980, Land use series, Las Vegas, Nevada, Arizona, California: U.S. Geological Survey, Open-File Report OF-80-272, scale 1:250000.
U.S. Geological Survey, 1980, Land use series, Needles, California - Arizona: U.S. Geological Survey, Open-File Report OF-80-856, scale 1:250000.
U.S. Geological Survey, 1983, Land use series, Prescott [quadrangle], Arizona: U.S. Geological Survey, Open-File

Report OF-83-106, scale 1:250000.
U.S. Geological Survey, 1983, Land use series, Williams [quadrangle], Arizona: U.S. Geological Survey, Open-File Report OF-83-107, scale 1:250000.
Carlson, D.D. and Meyer, D.F., 1995, Flood on the Virgin River, January 1989, in Utah, Arizona, and Nevada: U.S. Geological Survey, Water-Resources Investigations Report 94-4159, scale 1:254000.
Smith, W.O., Vetter, C.P., and Cummings, G.B., 1960, Comprehensive survey of sedimentation in Lake Meade, 1948-49: U.S. Geological Survey, Professional Paper 295, scale 1:265000.
Anning, D.W., 2002, Standard errors of annual discharge and change in reservoir content data from selected stations in the lower Colorado River streamflow-gaging station network, 1995-99: U.S. Geological Survey, Water-Resources Investigations Report 01-4240, scale 1:312500.
Holmes, W.F., Pyper, G.E., Gates, J.S., Schaefer, D.H., and Waddell, K.M., 1997, Hydrology and water quality of the Beaver Dam Wash area, Washington County, Utah, Lincoln County, Nevada, and Mohave County, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 97-4193, scale 1:432000.
Bedinger, M.S., Anderson, T.W., and Langer, W.H., 1984, Maps showing ground-water units and withdrawal, Basin and Range province, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 83-4114-A, scale 1:500000.
Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste - characterization of the Sonora region, Arizona: U.S. Geological Survey, Professional Paper 1370-D, scale 1:500000.
Hely, A.G. and Peck, E.L., 1964, Precipitation, runoff and water loss in the lower Colorado River - Salton Sea area: U.S. Geological Survey, Professional Paper 486-B, scale 1:500000.
Jenness, J.E., Lopez, D.A., and LaFortune, J.R., 1984, Map showing outcrops of pre-Quaternary ash-flow tuffs and volcaniclastic rocks, Basin and Range province, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 83-4114-F, scale 1:500000.
Johnson, W.D., 1984, Maps showing outcrops of thick, dominantly argillaceous sedimentary and metasedimentary rocks, Basin and Range province, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 83-4114-E, scale 1:500000.
Langer, W.H., Mulvihill, D.A., and Anderson, T.W., 1984, Maps showing ground-water levels, springs, and depth to ground water, Basin and Range province, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 83-4114-B, scale 1:500000.
Owen-Joyce, S.J., 1987, Estimates of average annual tributary inflow to the lower Colorado River, Hoover Dam to Mexico: U.S. Geological Survey, Water-Resources Investigations Report 87-4078, scale 1:500000.
Thompson, T.H., Nuter, Janet, and Anderson, T.W., 1984, Maps showing distribution of dissolved solids and dominant chemical type in ground water, Basin and Range province, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 83-4114-C, scale 1:500000.

U.S. Geological Survey, 1988, Hydrologic Unit Map -- 1974, State of Arizona: U.S. Geological Survey, Hydrologic Unit Map HU-3, scale 1:500000.

Hilmes, M.M. and Vaill, J.E., 1997, Estimates of bridge scour at two sites on the Virgin River, southeastern Nevada, using a sediment-transport model and historical geomorphic data: U.S. Geological Survey, Water-Resources Investigations Report 97-4073, scale 1:600000.

Johnson, Michael, Dixon, G.L., Rowley, P.D., Katzer, T.C., and Winters, Michael, 2002, Hydrology and ground-water conditions of the Tertiary Muddy Creek Formation in the lower Virgin River basin of southeastern Nevada and adjacent Arizona and Utah [field trip, Chapter 8]: U.S. Geological Survey, Open-File Report OF-02-172, scale 1:633000.

U.S. Geological Survey, 1981, Annual summary of ground-water conditions in Arizona, spring 1979 to spring 1980: U.S. Geological Survey, Open-File Report OF-81-906, scale 1:652000.

Webb, R.H., Griffiths, P.G., Melis, T.S., and Hartley, D.R., 2000, Sediment delivery by ungaged tributaries of the Colorado River in Grand Canyon, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 00-4055, scale 1:732000.

Covay, K.J. and Beck, D.A., 2001, Sediment-deposition rates and organic compounds in bottom sediment at four sites in Lake Mead, Nevada, May 1998: U.S. Geological Survey, Open-File Report OF-01-282, scale 1:800000.

U.S. Geological Survey, 1985, Annual summary of ground-water conditions in Arizona, spring 1983 to spring 1984: U.S. Geological Survey, Open-File Report OF-85-410, scale 1:937500.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1990, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey, Open-File Report OF-89-378, scale 1:1000000.

Konieczki, A.D. and Wilson, R.P., 1992, Annual summary of ground-water conditions in Arizona, spring 1986 to spring 1987: U.S. Geological Survey, Open-File Report OF-92-54, scale 1:1000000.

U.S. Geological Survey, 1980, Annual summary of ground-water conditions in Arizona, spring 1978 to spring 1979: U.S. Geological Survey, Open-File Report OF-80-330, scale 1:1000000.

U.S. Geological Survey, 1984, Annual summary of ground-water conditions in Arizona, spring 1982 to spring 1983: U.S. Geological Survey, Open-File Report OF-84-428, scale 1:1000000.

U.S. Geological Survey, 1986, Annual summary of ground-water conditions in Arizona, spring 1984 to spring 1985: U.S. Geological Survey, Open-File Report OF-86-422-W, scale 1:1000000.

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Author(s)	Moosburner, Otto
Year	1988
Originating office	Geological Survey Carson City, NV. Water Resources Div.
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April 5, 2006

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Executive Consultant
Arizona Corporation Commission
1200 W. Washington St.
Phoenix, AZ 85007-2927

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Director of Utilities

Dear Ms. Chukwu:

The Arizona Geological Survey (AZGS) has not conducted any original studies of aquifers in Mohave County nor do we envision doing any in the immediate future.

However, AZGS has compiled general information about geology and hydrology of the Bullhead City area under contract with the U.S. Geological Survey. The project was not a new study of groundwater resources but rather produced a compilation of existing information from previous studies conducted by other agencies. I am enclosing a copy of that report:

> Harris, R.C., 1998, A compilation of the geology and hydrology of the Black Mountains - Bullhead City area, Arizona: Arizona Geological Survey Open-File Report 98-26, 40p.

AZGS also maintains a comprehensive statewide bibliography of geology, called AZGEOBIB, which also contains some references about hydrology and water resources. This database is searchable by geographic criteria, including by county or by ADWR groundwater basin. There are a large number of groundwater basins in Mohave County and we are attaching a CD with separate Word file bibliographies for each basin in the county. The bibliography contains several hundred references, including numerous references of studies that have information on groundwater resources. There is some duplication of references that cover multiple groundwater basins.

The Survey works extensively with other state agencies and we are able to undertake specific studies and investigations for you to help meet your needs.

Sincerely,

M. Lee Allison
State Geologist and Director

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A COMPILATION OF THE GEOLOGY AND HYDROLOGY OF THE BLACK MOUNTAINS-BULLHEAD CITY AREA, ARIZONA

by
Raymond C. Harris

Arizona Geological Survey
Open-File Report 98-26

December, 1998

Arizona Geological Survey
416 W. Congress, Suite #100, Tucson, Arizona 85701

(Includes 40 pages text)

Produced in cooperation with the US Geological Survey

This report is preliminary and has not been edited or reviewed
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A COMPILATION OF THE GEOLOGY AND HYDROLOGY OF THE BLACK MOUNTAINS-BULLHEAD CITY AREA, ARIZONA

INTRODUCTION

This report presents a compilation of geologic and hydrologic information for the Bullhead City-Black Mountains area of western Arizona. The purpose of the project is to determine the significance of mining, geology, and geohydrology in the chemistry of Bullhead City area groundwater. Mining in the Black Mountains has taken place since the 1800s, and the region provides a good opportunity to investigate any links between mining and water quality.

The study encompasses the area from the crest of the Black Mountains on the east, the Colorado River on the west, latitude 35° on the south and the top of township 21N at the north (Figure 1). Information was compiled from published and unpublished sources including U.S. Bureau of Land Management, U.S. Geological Survey, U.S. Bureau of Mines, U.S. Natural Resources Conservation Service (Department of Agriculture), Arizona Geological Survey, Arizona State Land Department, Arizona Department of Water Resources, and Arizona Department of Environmental Quality.

LAND STATUS AND LAND USE

Land ownership in the Black Mountains-Bullhead City area includes State, Federal, Indian Reservation, and private lands. This information was obtained in digital format from the Arizona State Land Department, through the Arizona Land Resource Information System (ALRIS). (That version of land status is digitized from 1979 BLM maps, and some changes may have occurred since that time.)

Private land accounts for about 55,309 acres in the study area, of which approximately 12,225 acres are in patented mining claims. Federal land comprises 115,960 acres (Bureau of Land Management: 107, 365 acres; Lake Mead National Recreation Area: 8,595 acres). Approximately15,092 acres are held by the State of Arizona. Tribal land of the Fort Mohave Indian Reservation accounts for approximately 19,340 acres.

Land use in the study area includes developed land (residential, commercial, industrial) at Bullhead City and Oatman, and recreation along the Colorado River and Lake Mohave, part of Lake Mead National Recreation Area. Most of the study area is open desert and hilly range land. This land, consisting of State, Bureau of Land Management, and private land outside developed areas, is used mostly for open space, and intermittent cattle grazing occurs on some portions. Patented mining claims account for approximately 12,225 acres in the study area. Most of the patented land is near Oatman.

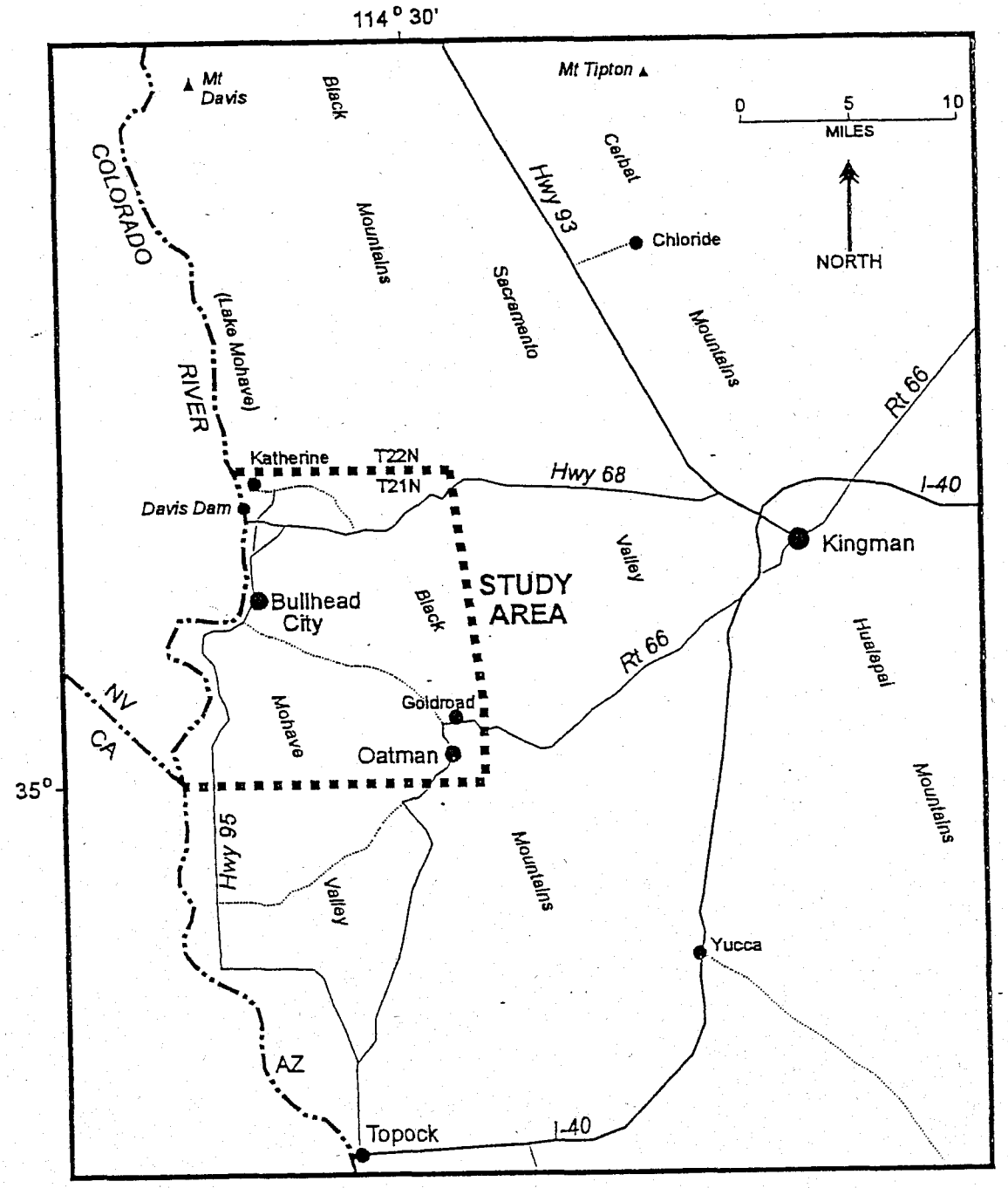


Figure 1. Location of the Black Mountains study area.

Figure 2 continued. Index of geologic maps of the Black Mountains. References:

1) Longwell, 1963: USGS Professional Paper 374-E, Plate 1, scale 1:125,000.

2) Metzger and Loeltz, 1973: USGS Professional Paper 486-J, Plate 1, scale 1:125,000.

3) Lausen, 1931: AZ Bureau of Mines Bulletin 131, Plate II (p. 21), scale 1:100,000.

Wilson and others, 1934: AZ Bureau of Mines Bulletin 137, Figure 6 (p. 102), scale 1:100,000.

Gardner, 1936: US Bureau of Mines IC 6901, Figure 9, scale 1:100,000.

4) DeWitt, 1987: SEG Guidebook, V.1, p. 29, Figure 1, scale 1: 250,000.

5) Gray and others, 1990a: USGS Bulletin 1737-D, Figure 2, scale 1:80,000.

6) Gray and others, 1990b: USGS Bulletin 1737-F, Plate 1, scale 1:62,500.

Gray and others, 1990c: USGS Open-File Report 90-520, Figure 2, scale 1:163,000.

7) Durning and Buchanan, 1984: AZ Geological Society Digest 15, Figure 2, scale 1:85,00; (detailed figures 5, 6, 7, and 8 are within the area of Figure 2).

Clifton and others, 1980: AIME preprint 80-143, Figure 2,scale 1:80,000

DeWitt and others, 1991:USGS Bulletin 1857-I, Fig. 2, scale 1:100,000; Fig. 9, scale 1:50,000.

Ransome, 1923: USGS Bulletin 743, Plate 1, scale 1:48,000.

Gardner, 1936: US Bureau of Mines IC-6901, Figure 2, scale 1:58,000.

Spencer and Welty, 1989: AGS Digest 17, Figure 3, scale 1:80,000.

Smith, 1984: University of Arizona M.S. Thesis, Figure 2, scale 1:48,000.

Lausen, 1931: AZ Bureau of Mines Bulletin 131, Plate 1, scale 1:48,000.

Wilson and others, 1934: AZ Bureau of Mines Bulletin 137, plate 1, scale 1:48,000.

Marsh and McKeon, 1983: Economic Geology, V78, no. 4, Figure 1,scale 1:160,000.

Korzeb, 1988: US Bureau of Mines Open-File Report MLA 48-88, Figure 2, scale 1:24,000

Entire area:

- Reynolds, S.J., 1986, Geologic map of Arizona: ABGMT [AZGS] Map 26, scale 1:1,000,000
- Wilson and Moore, 1959: ABM [AZGS], Geologic map of Mohave County, scale 1:375,000
- Anderson and O'Connell, 1993: US Bur Rec Seismotectonic Report 93-4, Figure 2-2, scale 1:500,000.
- Lee, 1908: USGS Bulletin 352, Plate 1, scale 1:1,000,000.
- Schrader, 1909: USGS Bulletin 397, Plate 1, scale 1:250,000.

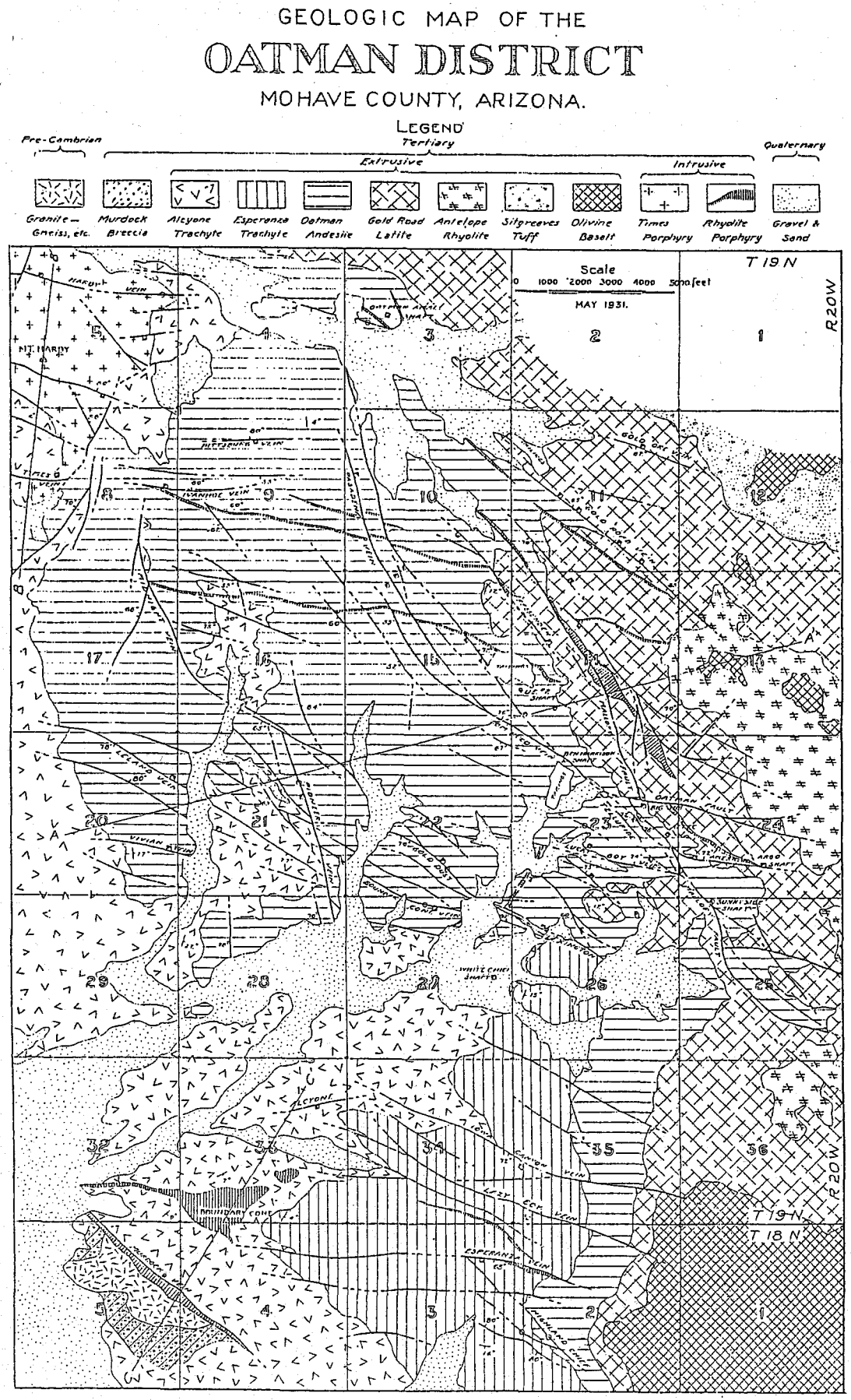


Figure 3. Geologic map of the Oatman area.
(from Lausen, 1931)

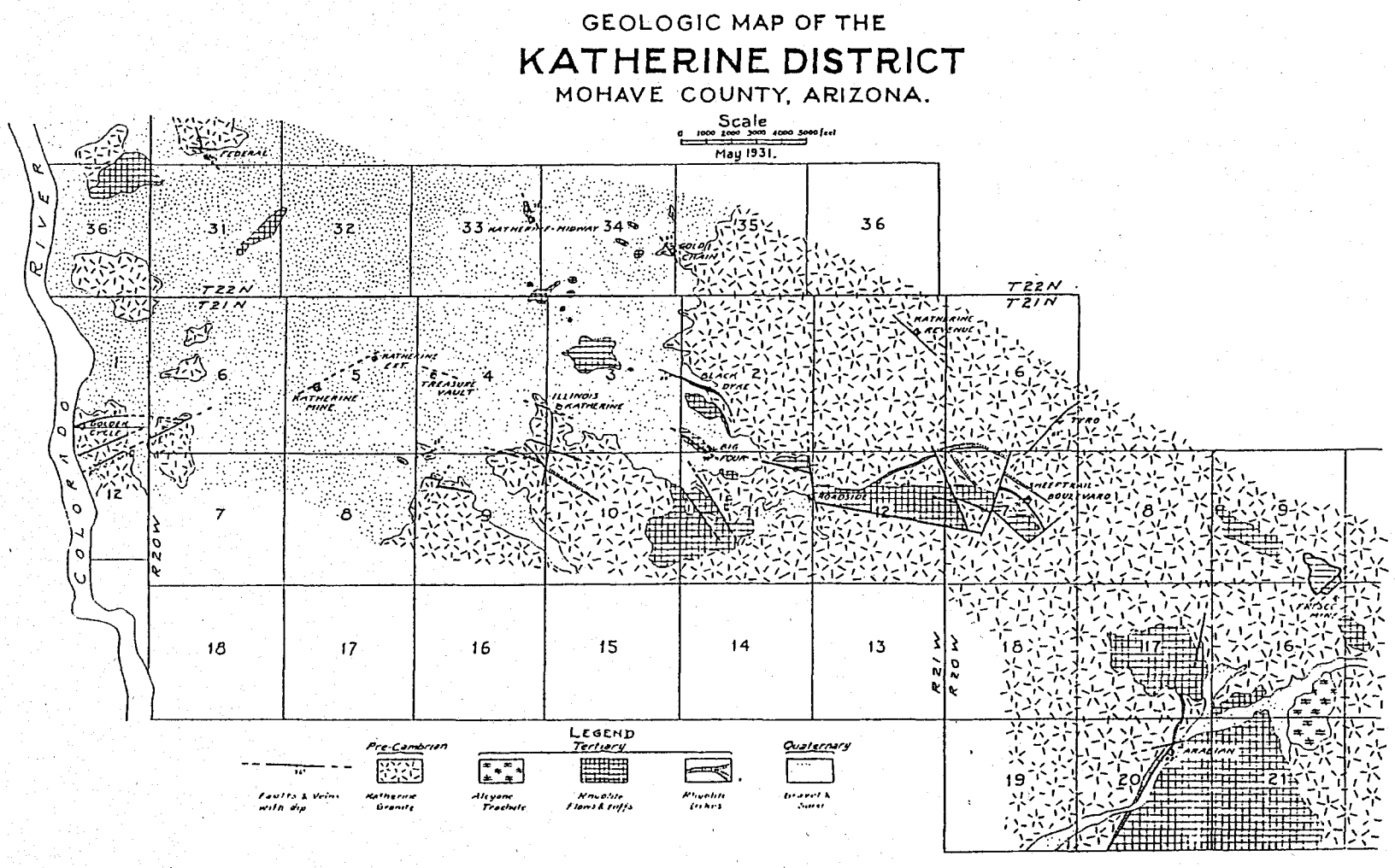


Figure 4. Geologic map of the Katherine District.
(from Lausen, 1931)

(Metzger and Loeltz, 1973) contain unequivocal lacustrine/playa deposits. Although long considered to be of possible marine origin, the Bouse Formation has been shown to be lacustrine on the basis of strontium and carbon isotopes (Spencer and others, 1996, Spencer and Patchett, 1997). Isotope compositions of marls and fossils in the Bouse are identical to Colorado River water and are far removed from the composition of Pliocene seawater.

Integration of drainages into what is now the Colorado River commenced in the study area sometime during or after the deposition of the Muddy Creek and Bouse Formations. The first arrival of Colorado River water into the basins along the present river is recorded by the Bouse Formation (Spencer and Patchett, 1997). A series of prograding deltaic deposits overlie the lacustrine beds (Buising, 1988), marking downcutting through the bedrock highs separating the basins and development of an uninterrupted through-flowing river.

Cycles of downcutting and sedimentation have produced seven geomorphic surfaces between the Black Mountains and the Colorado River (Herriman and Henricks, 1984). Soils developed on the surfaces have been mapped by the Kingman offices of the Bureau of Land Management and Natural Resources Conservation District. (soil maps are available from those offices, and are on file with AZGS) The following summary of these surfaces and their associated soils is from Herriman and Henricks (1984):

Earp (Horseshoe) surface - Lower of the two floodplains, and active slopes of washes; partial abandonment as flood plain less than 500 years ago; subject to flooding. Soils: Carriso, Glenbar, Rositas.

Cimmaron Lake (Ingram) surface - Higher of the two floodplans; age 550-3,290 years B.P. Soils: Antho, Torriorthents, Indio.

Arch Creek (Winkle) surface - Oldest surface directly related to present drainages; early Holocene; Age 3,290-12,240 years B.P. Soils: superstition, Indio variant, Havasu series.

Fort Mohave (Senecal) surface - Low fan terraces and stream terraces; Late Pleistocene; desert varnish. Soils: Gunsight, Superstition, Denure.

McHeffy (Dolph) surface - Displaced from Bullhead surface by fault; narrower interfluves, more eroded vs. Bullhead; Middle Pleistocene. Soils: Chuckwalla.

Bullhead (Dolph) surface - Extensive in region; remnants of alluvial fans; deeply dissected; well-developed desert pavement. Soils: Chuckwalla.

Boundary Cane (Eola) surface - Oldest erosional remnants in region; fan terraces; little or no desert pavement. Soils: Cipriano.

Mountains slopes are actively eroding and no particular age is assignable to them. Soils developed on mountains slopes are Akela, Cellar, Quilotosa, and Laposa.

MINES AND MINERALIZATION

In the early days of mining in the Black Mountains, different authors organized the mines in the study area into various combinations of mining districts including the San Francisco, Katherine, Oatman, Union Pass, Gold Road, Vivian, and Boundary Cone districts. Keith and others (1983) divided ore deposits into two metallic mineral districts, Union Pass at the north edge of the study area, and Oatman, at the south end of the Black Mountains . A summary of mines in the study area is presented in Appendix A.

STREAM SEDIMENTS

An evaluation of uranium in stream sediments was performed for the US Department of Energy (Qualheim, 1978) as part of the National Uranium Resource Evaluation (NURE) Program. The results of that survey are tabulated in Table 2. Uranium in the stream sediment samples for the entire Kingman 1x 2 degree quadrangle averaged 2.16 ppm, and thorium averaged 13.63 ppm. Stream sediments within the present study area averaged 2.63 ppm U and 18.36 ppm Th. As with the survey of mines, no anomalous levels of uranium or thorium were found in the sediments derived from the Black Mountains.

Stream sediment samples were analyzed as part of surveys of several Bureau of Land Management Wilderness Study Areas (WSAs). Stream sediments were analyzed in a study of the Mount Nutt WSA (Gray and others, 1990a). That study found anomalies for mercury (0.1-0.6 ppm), gold (0.05-0.1 ppm), arsenic (10-18 ppm), lead (up to 200 ppm), zinc (up to 250 ppm), and barium (2000-3000 ppm) in the northwest part of the WSA (Union Pass area). Another anomaly of mercury (8-16 ppm) and molybdenum (up to 15 ppm) was delineated in the southeastern part of the WSA (east and outside of this study). Locations of the samples and anomalies were not given in the report.

A thorough sampling of mines, prospects, and stream sediments was performed for the adjacent Warm Springs WSA, in the southern Black Mountains (Bullock and others, 1990). However, none of these samples are within the present study area.

HYDROLOGY

Surface water

Surface water is scarce in western Arizona, owing to the arid climate. Average annual rainfall is about 5 inches. Streams are ephemeral everywhere in the study area, with the exception of the Colorado River. Runoff in the ephemeral streams occurs only during heaviest rains and lasts usually not more than several hours.

Hydrologic conditions in the lower Colorado River region have bee extensively studies by the US Geological Survey. General aspects of water resources in the region are discussed in Hely (1969) and McDonald and Loeltz (1976). Data on precipitation and runoff for the lower Colorado River region are presented in Hely and Peck (1964).

Colorado River water is of good quality for municipal and agricultural use. Weighted-average annual concentrations of TDS below Hoover Dam ranged from 599 to 837 mg/l for the 1935 to 1965 (Irelan, 1971). Variations in flow rates have decreased since construction of Glen Canyon and Hoover Dams upstream from the study area. TDS is also less variable, but has increased slightly due to evaporation from the lakes. Colorado River water is generally of a calcium-sulfate type, with sodium-chloride found in lesser, but important concentrations.

Groundwater

Water from wells along the Colorado River was analyzed by the US Geological Survey (Metzger and Loeltz, 1973) and data from that study is summarized in Table 3. Groundwater samples generally came from wells perforated at shallow depths. These wells receive most or all of their water through infiltration of river water through a shallow alluvial aquifer, and many of the wells have water chemistry identical to that of Colorado River water (Metzger and others, 1973). The Colorado River undergoes a net loss of water from infiltration and evapotranspiration (McDonald and Loeltz, 1976). Contributions to the river by way of subflow from the surrounding valleys is insignificant.

Upon infiltration into the shallow groundwater aquifer, river water is modified by several processes, including bacterial sulfate reduction, concentration by evapotranspiration, and precipitation of calcium and magnesium carbonates (Metzger and Loeltz, 1973). In the deeper wells, TDS is higher and may be influenced by more saline water in contact with the Bouse Formation.

A USGS investigation of groundwater quality in the Colorado River drainage area (Kister, 1973) included wells in the study area. Fluoride levels were 5.0 to 10.0 mg/l in a well near Davis Dam. Six other wells in the study area had fluoride less than 1.0 mg/l. Fluoride levels in the USGS investigation were correlated to the amount of silicic volcanic rocks or Precambrian schist, both of which are common in the region. Most of the groundwater had TDS of less than 1000 mg/l, but an area around Bullhead City and Mohave City had TDS of 1000 to 3000 mg/l. High TDS correlates with the presence of lacustrine deposits, such as the Bouse Formation. Wells farther from the river may tap deeper aquifers and have more variable chemistry and higher TDS than wells closer to the river.

Water quality information for a limited number of wells in the study area for the period 1988-1995 is available from the Arizona Department of Environmental Quality. This information includes well location by township, range, and section, water use, and chemical analyses.

Water quality analyses for these wells are tabulated in Table 4(values in mg/l). Water quality is highly variable, with TDS ranging from 320 to 3800 mg/l. Major cations and anions are similarly variable. Because some labs have different styles of reporting results for different

Table 3. Groundwater quality in the Bullhead city area

Well	Lat	Lon	Date	T.D.	Water Level (ft)	Silica	Ca	Mg	Na + K	% Na	HCO3	SO4	Cl	F	TDS	Ca-Mg hard	Noncarb hard	conduct	pH
(B-19-22)11bab	35.055	-114.5916	5/2/62	21	17.5	22	70	25	265	68	256	362	190	0	1060	278	68	1770	7.3
(B-19-22)11bbd	35.0523	-114.5942	4/13/67		19.4	24	105	34	159	46	224	338	148	1.2	921	400	216	1530	7.6
(B-19-22)14cca	35.0295	-114.5925	4/13/67	230	120	19	82	31	348	70	220	375	365	1.1	1330	332	152	2240	7.5
(B-19-22)15abb	35.0403	-114.6057	6/3/64	130	70	15	76	22	134	51	200	275	87	0.4	709	282	118	1120	7.2
(B-19-22)15acb	35.0367	-114.6058	9/18/62	120	60	18	79	24	121	47	182	283	82	0.2	698	296	147	1080	6.8
(B-19-22)15dad	35.0283	-114.5975	4/13/67		97	18	68	20	152	57	224	183	145	0.5	699	250	66	1230	7.5
(B-19-22)23ccc	35.0133	-114.5967	9/19/62	150	92	24	116	36	121	38	236	267	161	0.4	843	437	224	1350	7.1
(B-19-22)26aab	35.0113	-114.5838	4/11/67	228		21	87	27	279	65	228	250	342	1.1	1220	326	139	2050	7.7
(B-20-22)1aca	35.15	-114.5658	4/23/68	120	27	18	174	56	200	40	272	540	222	0.7	1350	665	442	2090	7.7
(B-20-22)1add	35.1467	-114.5625	6/3/64	249	153	24	180	50	145	32	154	400	302	0.5	1180	655	528	1880	7.2
(B-20-22)19ada	35.1038	-114.6142	9/18/62	150		28	92	29	142	47	180	267	163	0.3	811	348	200	1270	7.0
(B-20-22)25bab	35.095	-114.5733	4/24/68	318	288	37	27	0.6	211	87	188	100	174	9.5	653	70	0	1110	8.1
(B-20-22)26cdb	35.0875	-114.5925	4/24/68	150		38	73	3.4	212	70	152	120	282	4.0	808	196	72	1430	7.4
(B-20-22)26dcd	35.0845	-114.585	4/24/68	220		8	14	2.2	141	88	130	120	82	1.7	434	44	0	746	8.2
(B-20-22)29acc	35.0867	-114.6033	9/18/62	80		24	52	14	73	46	162	95	81	0.4	420	188	55	724	7.2
(B-20-22)35cdd	35.07	-114.5892	5/7/68			44	65	10	805	90	128	140	1200	4.5	2330	204	99	4430	7.7
(B-21-21)21cbb	35.1895	-114.5338	3/7/62	490		11	11	1.2	156	92	124	65	57	4.8	518	28	0	763	8.1

Data from Metzger and Loeltz, 1973

Table 4. Water quality data for the Black Mountains-Bullhead City area.

Well	Name	DEQ#	DWR#	Date	TDS	Spec. Cond.	Alkal CaCO3	Hard. CaCO3	Cl	F	SO4	Mg	Na	Ca	Al	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Se	Ag	Zn	NO3	NO2	Total Nitro	pH	Turb
B(19-20)35bac	Anderson Residence(?)	45640		17-Jul-91	1790	2230	450	996	124	0.92	759	70.3	185	267		nd	nd	0.0006	nd	nd	0.2	nd	1.36	nd	nd	nd	0.64			0.3	7.1	
B(19-20)35bac	Oatman Motel(?)	45642		17-Jul-91	1160	1690	221	531	250	0.26	338	42.4	172	146		nd	nd	0.0025	nd	nd	0.3	nd	0.12	nd	nd	nd	0.05			0.26	7.73	
[illegible]20)35bac	Dillinghane Residence(?)	45643		17-Jul-91	1430	1860	416	794	110	0.46	548	56.8	153	212		nd	nd	nd	nd	nd	0.48	nd	1.31	nd	0.25	nd	0.26			0.54	7.14	
[illegible]22)14ccd	Roberts Residence	46074	55-642478	15-Jun-94	1020		161	292	179	0.44	309	24.2	221	80.6	nd	nd	nd	nd	nd	0.016	nd	nd	nd	nd	nd	nd	nd	5.53	nd	5.53	7.96	0.73
[illegible]22)14ccd	Roberts Residence	46074	55-642478	13-Dec-94	992		158	304	176	0.46	517	24.6	221	80.9	nd	nd	nd	nd	nd	nd	0.11	nd	nd	nd	nd	nd	nd	5.7	nd	5.7	7.79	0.17
[illegible]9-22)15aba	Glaze Residence	46075	55-505320	13-Jun-94	788		149	364	107	0.45	265	27.6	114	93.3	nd	nd	nd	nd	nd	nd	nd	nd	0.06	nd	nd	nd	nd	nd	nd	nd	7.88	0.02
B(19-22)15aba	Glaze Residence	46075	55-505320	29-Nov-94	769		151	358	108	0.5	301	29.5	109	97.2	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd			nd	7.81	
B(19-22)26bbd	Plough Residence	46076	55-527523	27-Jun-94	1240		212	617	255	0.23	322	50.1	139	164	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.78	nd	1.78	7.81	0.08
B(19-22)26bbd	Plough Residence	46076	55-527523	5-Dec-94	1270		nd	679	278	0.26	427	57.7	139	183	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.52		1.52	7.72	
B(19-22)26dcd	Nickerson Residence	46077	55-507171	6-Jun-94	960	1450	180	290	230	0.34	290	26	210	75		<0.005	<0.05	<0.0005	<0.005	<0.05	<0.05	<.005	<0.05	<0.0002	<0.005	<0.005	<0.05			3.1	7.9	
B(19-22)26dcd	Nickerson Residence	46077	55-507171	29-Nov-94	980	1530	190	320	210	0.34	270	27	230	84		0.010	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd			3.40	7.7	
B(19-22)35bad	Stout Residence	46078	55-523024	15-Jun-94	915		181	385	172	0.28	214	33.8	142	104	nd	nd	nd	nd	nd	nd	nd	0.006	nd	nd	nd	nd	nd	7.48	615	7.48	7.74	0.05
B(19-22)35bad	Stout Residence	46078	55-523024	15-Jun-94	894		183	418	184	0.32	255	35.8	135	108	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	7.23		7.23	7.65	
B(19-22)10add	Section 10 WWTP	46282		31-Aug-94						0.46						<0.010	0.07	<0.0005	<0.005			<0.005		<0.0002	<0.005	<0.005				<0.10		
B(19-22)10add	Section 10 WWTP	46282		6-Dec-94	1700	2570	280	540	530	0.44	320	40	360	150		0.005	0.07	nd	nd	nd	1.5	nd	0.36	nd	nd	nd	nd			nd	7.3	
B(20-22)1cdd	AAA Trailer Park	000324	55-607020	15-Jun-94	2140		349	761	387	0.30	649	74.9	412	183	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	14.4	nd	14.4	7.83	0.10
B(20-22)1cdd	AAA Trailer Park (1)	000324	55-607020	12-Dec-94	2560		356	975	541	0.28	867	94.0	525	235	nd	nd	nd	nd	nd	0.074	nd	0.011	nd	nd	nd	nd	nd	15.9	nd	15.9	7.56	0.38
B(20-22)1cdd	AAA Trailer Park (2)	000324	55-607020	12-Dec-94	2600	3655	120	940	540	0.24	1000	95	570	220		<0.005	<0.05	<0.0005	<0.005	<0.05	<0.05	<0.005	<0.05	0.0002	<0.005	<0.005	<0.05			15.0	7.0	
B(20-22)24ddc	?	000732		15-Mar-89												<0.01	<0.1	<0.001	<0.01	<0.1	0.27	<0.01	<0.05	<0.0005	<0.005	<0.001	<0.05					
B(20-22)16aab	Sierra WWTP MW-2(1)	001280	55-515799	10-Aug-88	1690	2630	200	570	534	0.2	316	39	299	165		<0.02	0.11	<0.001	<0.01	<0.1	<0.1	<0.02	<0.05	<0.0005	<0.005	<0.001	<0.05			4.85	7.21	0.55
B(20-22)16aab	Sierra WWTP MW-2(2)	001280	55-515799	10-Aug-88	1690	2600	200	572	554	0.2	311	39.9	410	166		<0.02	0.1	<0.001	<0.01	0.1	<0.1	<0.02	<0.05	<0.0005	<0.005	<0.001	<0.05			4.62	7.21	0.65
B(20-22)16aab	Sierra WWTP MW-2	001280	55-515799	7-Jun-94	650	903	180	330	110	0.44	190	25	82	91		<0.005	0.11	0.001	<0.005	<0.05	0.97	0.009	0.85	<0.0002	<0.005	<0.005	<0.05			0.443	7.6	6.8
B(20-22)16aab	Sierra WWTP MW-2	001280	55-515799	31-Aug-94						0.44						<0.010	0.06	<0.0005	0.017			<0.005		0.0004	<0.005	<0.005				0.10		27
B(20-22)16aab	Sierra WWTP MW-2(1)	001280	55-515799	6-Dec-94	697		169	367	124	0.63	222	25.5	87.9	110	nd	nd	nd	0.0014	nd	0.013	0.55	0.007	0.72	nd	nd	nd	nd	nd	nd	nd	7.68	4.2
B(20-22)16aab	Sierra WWTP MW-2(2)	001280	55-515799	6-Dec-94	690	1154	180	380	120	0.47	270	26	98	110		nd	0.07	0.0021	nd	nd	0.73	0.006	0.72	nd	nd	nd	nd			nd	7.5	
B(20-22)16bbb	Sierra WWTP MW-1	001282	55-515801	10-Aug-88	823	1360	143	423	181	0.37	239	30.3	96.9	116		<0.02	<0.1	<0.001	<0.01	<0.1	<0.1	<0.01	0.43	<0.0005	<0.005	<0.001	<0.05			<0.1	7.7	6.8
B(20-22)16aab	Sierra WWTP MW-3	001283	55-515800	10-Aug-88	810	1150	168	401	131	0.5	255	26.9	96.9	114		<0.02	<0.1	<0.001	<0.01	<0.1	<0.1	<0.02	0.54	<0.0005	<0.005	<0.001	<0.05			<0.1	7.65	0.41
B(20-22)19ada	Riviera Well	21610	55-603474	7-Jun-94	1500	2100	190	730	410	0.18	420	62	220	190		<0.005	0.06	<0.0005	<0.005	<0.05	<0.05	<0.005	<0.05	<0.0002	<0.005	<0.005	0.05			10.5	7.8	0.02
B(20-22)19ada	Riviera Well	21610	55-603474	31-Aug-94						0.18						0.011	0.06	<0.0005	<0.005			<0.005		<0.0002	<0.005	<0.005				11		0.04
B(20-22)19ada	Riviera Well	21610	55-603474	6-Dec-94	1700	2520	180	870	410	0.17	680	72	240	230		nd	0.06	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd			18.1	7.1	
[illegible]0-22)1dac	Super 8 Motel	46079	55-512175	7-Jun-94	1900	2860	230	750	810	0.23	350	73	430	180		0.009	0.11	<0.0005	<0.005	<0.05	<0.05	<0.005	<0.05	<0.0002	<0.005	<0.005	<0.05			7.2	7.7	0.47
[illegible]22)1dac	Super 8 Motel (1)	46079	55-512175	1-Dec-94	2500	3875	250	870	870	0.20	310	79	560	220		0.016	0.12	nd	0.009	nd	0.21	nd	nd	nd	nd	nd	nd			nd	7.3	
[illegible]22)1dac	Super 8 Motel (2)	46079	55-512175	1-Dec-94	2570		247	902	1000	0.28	321	83.0	490	234	nd	nd	0.11	nd	0.012	0.016	0.26	nd	nd	nd	nd	nd	nd	6.06	nd	6.06	7.65	1.22
[illegible]-22)17bbd	Bluewater Manor	46080	55-517150	15-Jun-94	1030		192	400	140	0.25	328	31.3	173	113	nd	nd	nd	nd	nd	nd	nd	nd	0.44	nd	nd	nd	nd	1.42	nd	1.42	8.02	0.26
B(20-22)17bbd	Bluewater Manor	46080	55-517150	5-Dec-94	910		180	402	131	0.30	367	31.7	137	109	nd	nd	nd	nd	nd	0.010	nd	nd	0.43	nd	0.007	nd	nd	0.82		0.82	7.89	
B(20-22)17abc	Cochran Residence(1)	46081	55-602231	7-Jun-94	1100	1368	180	360	180	0.18	370	32	200	90		<0.005	<0.05	<0.0005	0.008	<0.05	0.32	<0.005	<0.05	<0.0002	<0.005	<0.005	<0.05			3.54	7.9	3.7
B(20-22)17abc	Cochran Residence(2)	46081	55-602231	7-Jun-94	1100	1375	180	360	180	0.18	390	32	200	92		<0.005	<0.05	<0.0005	0.006	<0.05	0.35	<0.005	<0.05	<0.0002	<0.005	<0.005	<0.05			3.42	7.9	1.1
B(20-22)17abc	Cochran Residence(2)	46081	55-602231	1-Dec-94	1000	1663	200	370	140	0.18	330	31	210	99		nd	nd	nd	nd	nd	0.14	nd	nd	nd	nd	nd	nd			4.40	7.4	
B(20-22)19cdc	Seventy Residence	46082	55-641497	7-Jun-94	950	1203	200	390	140	0.26	370	36	150	98		<0.005	<0.05	<0.0005	<0.005	<0.05	1.1	<0.05	0.46	<0.0002	<0.005	<0.005	<0.05			0.100	8.0	7.7
B(20-22)19cdc	Seventy Residence	46082	55-641497	1-Dec-94	1300	1773	200	580	180	0.24	470	51	200	150		nd	nd	nd	nd	nd	0.84	nd	0.63	nd	nd	nd	nd			nd	7.7	
B(20-22)19dcd	Askew Residence	46083	55-642105	7-Jun-94	3200	3565	240	1300	690	0.17	1100	130	550	310		<0.005	<0.05	0.0008	<0.005	<0.05	0.64	0.006	<0.05	<0.0002	0.005	<0.005	<0.05			9.63	7.7	0.72
B(20-22)19dcd	Askew Residence	46083	55-642105	1-Dec-94	3800	4790	nd	1600	690	0.16	1600	150	690	400		nd	nd	nd	nd	nd	0.28	nd	nd	nd	nd	nd	nd			9.00	7.3	
B(20-22)26ccd	VFW Post 10005	46084	55-806251	7-Jun-94	840	1240	120	250	280	1.6	120	12	180	79		0.059	<0.05	<0.0005	0.006	<0.05	0.29	<0.005	<0.05	0.0003	<0.005	<0.005	<0.05			7.50	7.9	2.5
B(20-22)26ccd	VFW Post 10005	46084	55-806251	29-Nov-94	840	1367	130	270	320	1.7	94	13	190	88		0.109	nd	nd	nd	nd	0.57	nd	nd	nd	nd	nd	nd			7.50	7.6	
B(20-22)26ccd	VFW Post 10005	46084	55-806251	7-Feb-95	850	1393	120	270	280	1.7	100	12	190	89		0.082	nd	nd	nd	nd	0.11	nd	nd	0.0004	nd	nd	nd			5.72	7.5	
B(20-22)29dba	Hansen Residence	46085	55-637323	27-Jun-94	1190		153	301	313	2.84	229	10.8	247	105	nd	0.017	nd	nd	nd	nd	0.23	nd	nd	0.0015	nd	nd	nd	7.19	nd	7.19	7.96	0.41
B(20-22)29dba	Hansen Residence	46085	55-637323	5-Dec-94	1200		150	371	342	2.66	275	12.9	257	126	nd	0.012	nd	nd	nd	0.036	0.15	nd	nd	0.0017	nd	nd	nd	10.1		10.1	7.93	

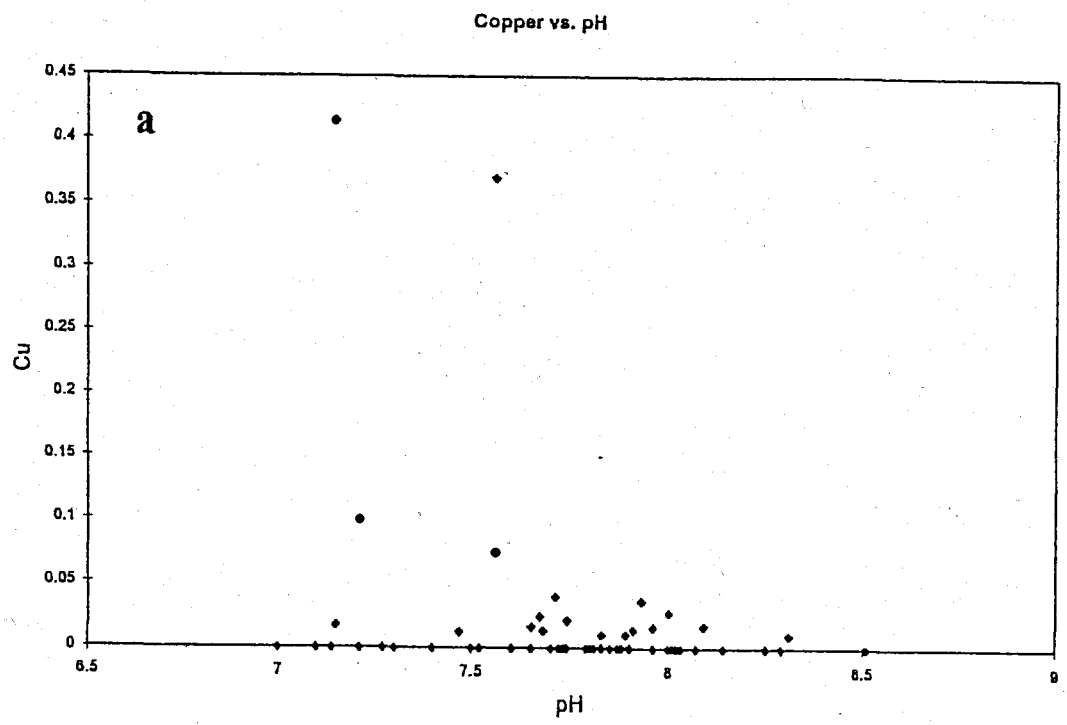
(data from Arizona Department of Environmental Quality)

Table 4. Water quality data for the Black Mountains-Bullhead City area, continued.

Well	Name	DEQ#	DWR#	Date	TDS	Spec. Cond.	Alkal CaCO3	Hard. CaCO3	Cl	F	SO4	Mg	Na	Ca	Al	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Se	Ag	Zn	NO3	NO2	Total Nitro	pH	Turb
B(20-22)29dba	Hansen Residence	46085	55-637323	6-Feb-95			134	283	295		218	9.8	236	94.0	nd	0.015	nd	nd	nd	nd	nd	nd	nd	0.0009	nd	nd	nd	13.2	nd	13.2	7.52	
B(20-22)32aab	Palo Verde Dev East(1)	46086	55-505478	15-Jun-94	1110		123	355	362	1.83	201	18.8	228	108	nd	0.018	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.96	nd	0.96	7.27	0.05
B(20-22)32aab	Palo Verde Dev East(2)	46086	55-505478	15-Jun-94	1160		124	357	359	1.97	223	18.8	231	108	nd	0.018	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.95	nd	0.95	7.52	0.04
[illegible]-22)32aab	Palo Verde Dev East	46086	55-505478	12-Dec-94	1000		219	323	305	1.93	225	17.8	211	101	nd	0.022	nd	nd	nd	0.014	0.20	0.005	nd	nd	nd	nd	nd	0.81		0.81	7.91	
[illegible]22)32dcd	Schwanbeck	46088	55-644518	13-Jun-94	975		140	364	192	0.78	296	24.1	171	103	nd	n	nd	nd	nd	0.021	nd	nd	nd	nd	nd	nd	nd	0.69	nd	0.69	7.74	0.55
[illegible]22)32dcd	Schwanbeck	46088	55-644518	29-Nov-94	1220		170	556	283	0.63	384	38.3	172	146	nd	0.011	nd	nd	nd	0.010	nd	nd	nd	nd	nd	nd	nd	1.07		1.07	7.83	
[illegible]-22)13ddd	Tierra Grande WWTP	46281		6-Dec-94	620	1132	110	190	220	0.66	130	12	100	95		nd	0.08	nd	nd	nd	0.06	nd	nd	nd	nd	nd	nd			6.05	7.4	
B(20-22)13ddd	Tierra Grande WWTP	46281		7-Feb-95	710	1126	100	370	190	0.58	110	16	96	120		nd	0.13	nd	nd	nd	0.07	nd	nd	nd	nd	nd	nd			5.30	7.6	
B(20-22)26dcd	Lewis	46596	55-504216	12-Dec-94	790	1253	120	180	210	3.8	190	8.8	190	59		0.168	<0.05	<0.0005	<0.011	<0.05	0.07	<0.005	<0.05	0.0004	<0.005	<0.005	<0.05			3.56	7.5	
B(20-22)26dcd	Lewis (1)	46596	55-504216	7-Feb-95	760	1256	120	200	210	3.6	130	8.7	190	64		0.12	nd	nd	0.009	nd	nd	nd	nd	nd	nd	nd	nd			2.38	7.5	
B(20-22)26dcd	Lewis (2)	46596	55-504216	7-Feb-95	769		119	188	213		159	8.7	187	60.6	nd	0.133	nd	nd	0.016	nd	nd	nd	nd	nd	nd	nd	nd	1.98	nd	1.98	7.72	0.06
B(20-22)26caa	Mejia Wingfoot Cottages	46597	55-642369	12-Dec-94	910	1512	120	240	300	2.2	200	11	220	77		0.098	nd	nd	nd	nd	nd	nd	nd	0.0006	nd	nd	nd			0.942	7.5	
B(20-22)26caa	Mejia Wingfoot Cottages	46597	55-642369	7-Feb-95	900	1474	120	250	290	2.3	140	11	210	81		0.005	nd	nd	nd	nd	nd	nd	nd	0.0003	nd	nd	nd			0.914	7.5	
B(21-21)21cbb	(no name)	001450		14-Mar-89												0.029	<0.1	<0.001	0.014	<0.1	0.17	<0.01	<0.05	<0.0005	<0.005	<0.001	0.43					
B(21-21)27add	Well #1	21806	55-805519	14-Jun-94	320		127	50	17.3	3.4	28.6	nd	77.9	20.3	nd	0.012	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	5.34	nd	5.34	7.85	0.01
B(21-21)27add	Well #1 (1)	21806	55-805519	6-Dec-94	297		129	49.8	17.8	3.30	32.2	nd	70.9	19.6	nd	0.013	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	5.65	nd	5.65	7.96	0.05
B(21-21)27add	Well #1 (2)	21806	55-805519	6-Dec-94	280	429	140	52	21	3.3	34	0.46	78	20		0.021	nd	nd	0.006	nd	nd	nd	nd	nd	nd	nd	nd			6.2	7.8	
B(21-21)27ccb	Well #2 (1)	21807	55-805518	14-Jun-94	361		128	32	28.5	3.81	35.6	nd	96.4	13.1	nd	0.017	nd	nd	0.015	nd	nd	nd	nd	nd	nd	nd	nd	5.08	nd	5.08	8.07	nd
B(21-21)27ccb	Well #2 (2)	21807	55-805518	14-Jun-94	348		126	32.0	28.5	3.56	36.0	nd	95.9	12.3	nd	0.019	nd	nd	0.016	nd	nd	nd	nd	nd	nd	nd	nd	5.07	nd	5.07	8.0	0.02
B(21-21)27ccb	Well #2	21807	55-805518	6-Dec-94	338		133	33.2	28.4	3.62	40.0	nd	84.2	12.7	nd	0.018	nd	nd	0.019	nd	nd	nd	nd	nd	nd	nd	nd	5.36		5.36	8.14	
B(21-21)30aab	Well #3	21809	55-620581	14-Jun-94	1030		81.8	285	38.2	1.71	133	16.4	247	56.7	nd	nd	nd	nd	nd	nd	1.01	nd	nd	nd	nd	nd	0.07	4.79	nd	4.79	7.72	9.0
B(21-21)30aab	Well #3	21809	55-620581	6-Dec-94	966		94.0	307	381	1.19	153	18.0	197	31.5	nd	nd	nd	nd	nd	nd	0.14	nd	nd	nd	nd	nd	nd	5.49		5.49	7.87	
B(21-21)29add	Well #5	46091	55-507875	14-Jun-94	706		112	55	217	3.48	74.4	1.6	216	18.4	nd	0.037	nd	nd	0.023	nd	nd	nd	nd	nd	nd	nd	nd	7.12	nd	7.12	8.25	0.25
B(21-21)29add	Well #5	46091	55-507875	6-Dec-94	666		116	48.6	221	3.36	73.1	1.5	196	15.7	nd	0.034	nd	nd	0.022	0.010	0.24	nd	nd	nd	nd	nd	nd	6.77		6.77	8.31	
B(21-21)29add	Well #4	46092	55-507876	14-Jun-94	656		125	35	161	5.10	87.1	1.1	206	11.7	nd	0.115	nd	nd	0.029	nd	nd	nd	nd	nd	nd	nd	nd	8.12	nd	8.12	8.51	0.02
B(21-21)29add	Well #4	46092	55-507876	6-Dec-94	693		122	61.8	218	3.62	87.5	2.2	193	19.3	nd	0.031	nd	nd	0.031	nd	nd	nd	nd	nd	nd	nd	nd	7.13		7.13	8.29	
B(21-21)29bca	Well #2	46093	55-608741	14-Jun-94	1200		111	398	421	0.43	135	20.9	220	126	nd	nd	nd	nd	nd	0.024	nd	nd	nd	nd	nd	nd	nd	3.21	nd	3.21	7.67	nd
B(21-21)29bca	Well #2	46093	55-608741	6-Dec-94	1250		114	451	519	0.43	159	22.9	210	131	nd	nd	nd	nd	nd	nd	0.10	nd	nd	nd	nd	nd	nd	1.10		1.10	7.74	
B(21-21)29bcc	Well #1	46094	55-608740	14-Jun-94	1030		114	405	342	0.45	131	21.9	161	116	nd	0.014	nd	nd	0.025	0.370	7.75	0.041	0.09	nd	nd	nd	0.39	0.45	nd	0.45	7.56	53
B(21-21)29bcc	Well #1	46094	55-608740	6-Dec-94	966		115	400	355	0.59	163	23.0	145	112	nd	nd	nd	nd	0.039	0.10	0.014	nd	nd	nd	nd	nd	0.12	2.06		2.06	7.71	
B(21-21)31bac	MW-4	46096	55-536947	14-Jun-94	1110		325	628	165	0.37	289	45.9	158	171	13.8	nd	0.43	nd	0.012	0.012	18.5	0.013	0.55	nd	nd	nd	0.11	nd	nd	nd	7.47	348
B(21-21)31bac	MW-4	46096	55-536947	13-Dec-94	1510		382	840	230	0.34	294	65.0	190	228	25.2	0.018	0.80	0.0010	0.013	0.415	35.2	0.017	1.17	nd	nd	nd	0.12	nd	nd	nd	7.15	340
[illegible]13dbd	Helsing Residence	46096	55-536947	7-Feb-95	1370		382	910	318		363	71.4	183	240	9.00	0.016	0.30	nd	0.017	0.017	12.2	0.016	1.20	nd	nd	nd	0.13	nd	nd	nd	7.15	358
[illegible]13dbd	Helsing Residence	46089	55-641104	14-Jun-94	744		144	337	84.1	0.25	302	23.4	99.4	94.5	nd	nd	nd	nd	nd	nd	nd	nd	0.57	nd	nd	nd	nd	nd		nd	8.01	0.10
B(20-23)24bad	Tipton Residence	46089	55-641104	30-Nov-94	733		148	348	88.8	0.29	292	25.8	98.5	101	nd	nd	nd	nd	nd	nd	nd	nd	0.58	nd	nd	nd	nd	nd		nd	8.03	
B(20-23)24bad	Tipton Residence	46090	55-509401	13-Jun-94	706		140	335	82.2	0.31	247	23.1	93.6	91.5	nd	nd	0.13	nd	nd	0.027	0.26	0.006	0.62	nd	nd	nd	nd	nd	nd	nd	8.00	1.55
B(20-23)24bad	Tipton Residence	46090	55-509401	1-Dec-94	725		143	351	88.3	0.38	293	26.0	90.3	100	nd	0.010	0.12	nd	nd	0.017	0.11	nd	0.62	nd	nd	nd	nd	nd	nd	nd	8.09	0.32

(data from Arizona Department of Environmental Quality)

Figure 5. Water quality relations in the Black Mountains-Bullhead City area



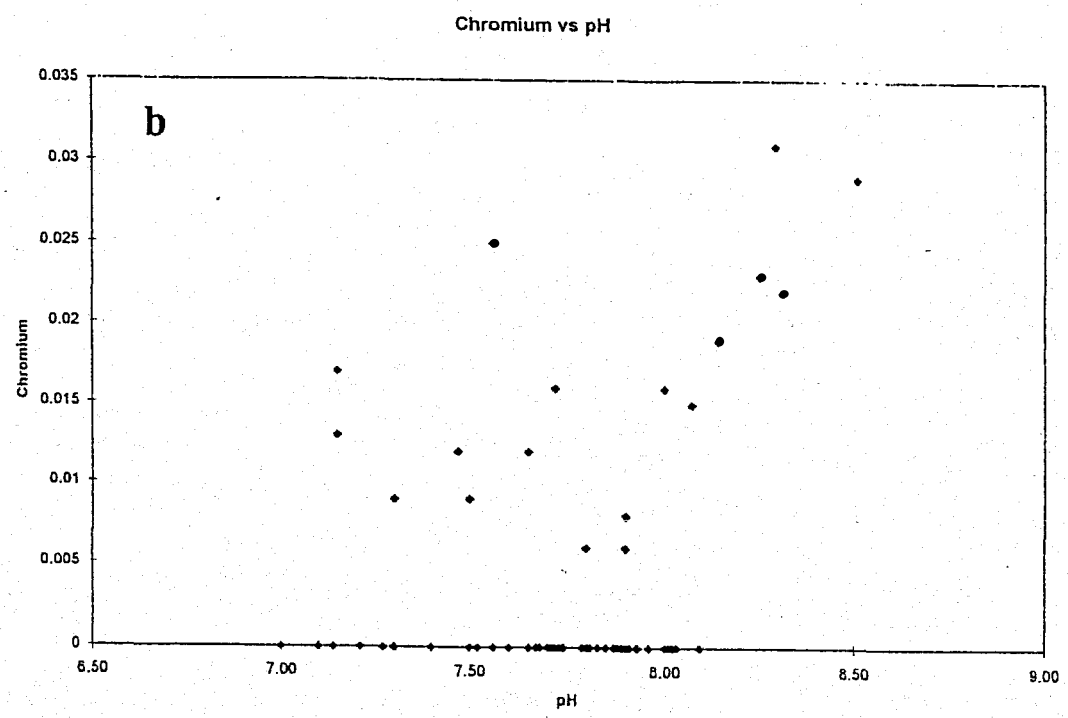
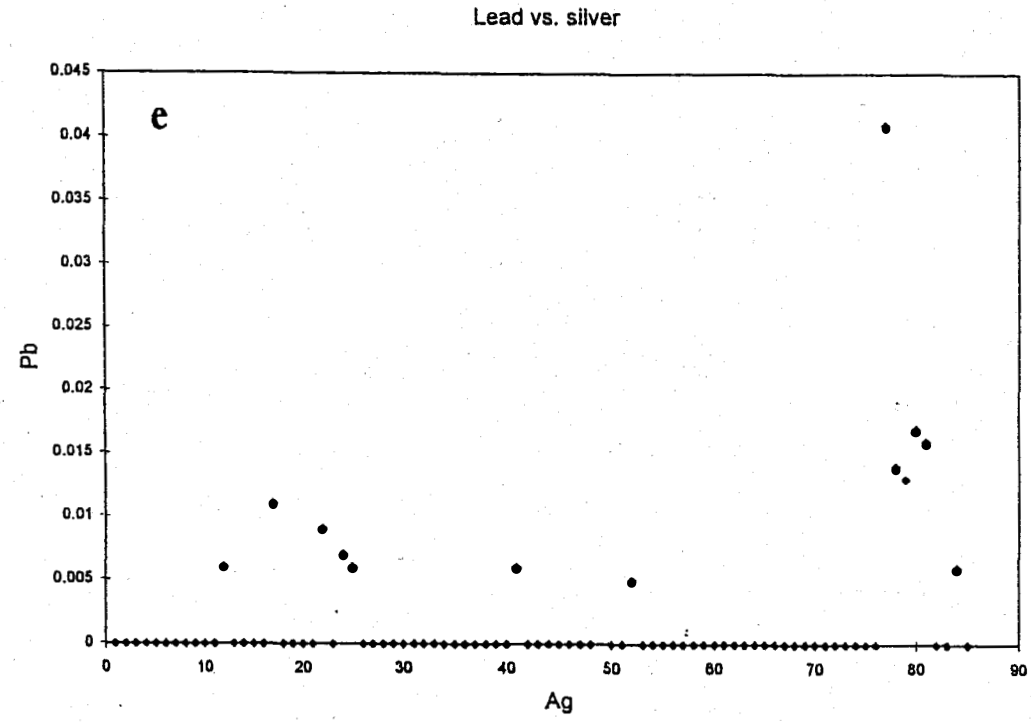


Figure 5, continued.



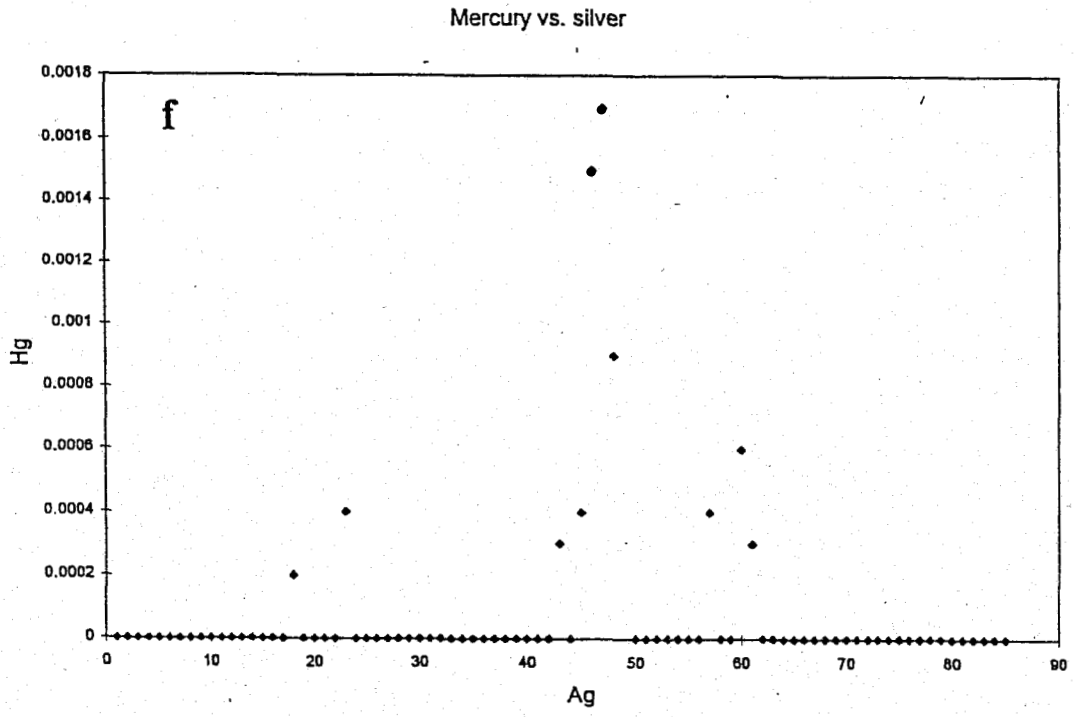
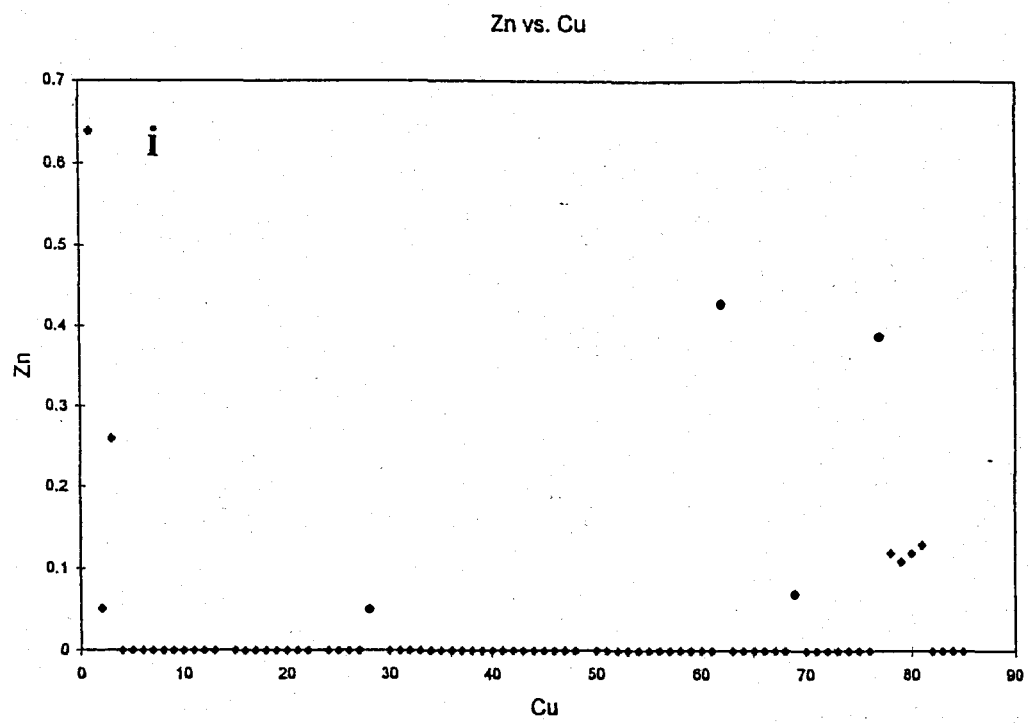
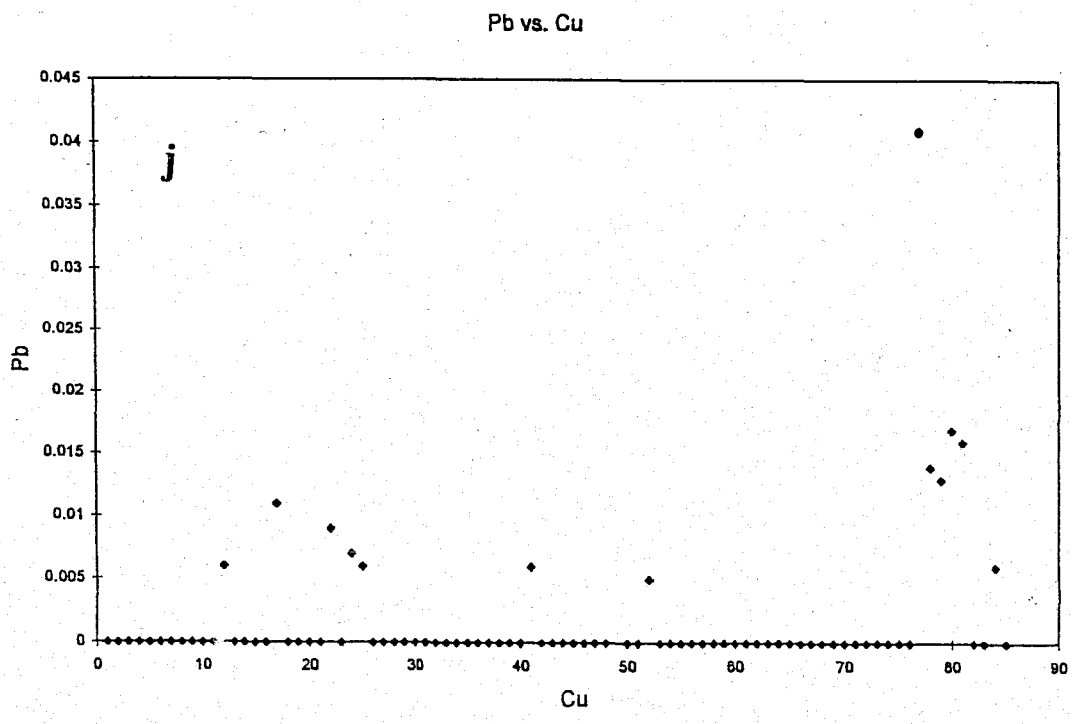


Figure 5, continued





One area of concern with gold mining is the use of cyanide for leaching. This process was fist described as early as 1793 and has been in widespread commercial use since the 1890s, so its application to extracting gold is extensive and well developed (Hiskey, 1985). Although cyanide is very unstable and so is easily destroyed (Rabb, 1978), it poses a potential threat to water if the cyanide is accidentally released before it can be neutralized.

Several steps are taken in modern gold processes plants to avoid such accidental releases. Tanks and circuits containing cyanide solutions are contained within berms or secondary tanks to prevent escape of the solutions outside the plant area. Ponds containing cyanide solutions are lined to prevent infiltration of that water into the ground. Tailings dams and ponds are designed and built to standards in accordance with operating permits and are monitored to assure their integrity.

Current gold mining operations in the Black Mountains address these concerns with preventative measures. For example, at the Gold Road Mine, cyanide-bearing tailings from the gold processing plant are neutralized with copper sulfate and hydrogen peroxide before disposal in tailings ponds (Silver, 1997). Ironically, copper and sulfate released from these kinds of modern operations comes not from mining itself, but from required environmental protection procedures.

Developed land

Bullhead City is the major population center within the project area and is sister to Laughlin, Nevada, directly across the Colorado River. The population of the Bullhead City-Laughlin vicinity is more than 144,000 people. Tourism is by far the major industry of the area, with gambling and river recreation attracting more than 6 million visitors annually.

Residential growth is certain to be one of the most important changes in land use in the Black Mountains -Bullhead City area. Census figures show a steady increase in the population of Arizona. The Mohave County 1996 population of 127,700 is more than double its 1980 population of 55,865. Bullhead City has nearly tripled in 16 years, growing from 10,719 people in 1980 to 27,370 in 1996 (figures from Arizona Department of Commerce).

Areas where high-density residential development is likely to take place first are around the outskirts of existing towns, where infrastructure is already in place. Lower density development is likely to continue in the surrounding areas. Residential development is limited to private land, or State land, which can be sold by the state for development. Areas prone to development can be predicted by looking at land status maps that show private land, and State land adjacent to developed areas (private land makes up about 55, 309 acres of the study area).

As the population along the Colorado River increases, the river is likely to be affected in a number of ways. More people means more municipal wastewater, which is high in TDS, especially nitrates, and sometimes contains heavy metals and other undesirable constituents. Personal use of pesticides, herbicides, and fertilizers in yards, and cleaning products and other toxic chemicals in the home presents the same kinds of potential impact to water quality as those produced and used by industry and agriculture. In residential backyards, fertilizer and pesticides are often applied at a much higher dosage than used by farmers. Chemical use may also high at golf courses and parks.

The acreage of houses, driveways, roads and parking lots will increase with population, leading to increased runoff. Storm runoff from roads and parking lots may carry with it oil, gas, diesel, brake fluid, and radiator fluid dripped from cars and trucks. Production of garbage, which ends up in landfills, will also increase with population.

Grazing

Intermittent cattle grazing occurs on some of the study area. Grazing by livestock can impact water quality, primarily by increasing soil erosion and sedimentation. The importance of rangeland as a source of nonpoint pollution increases as more vegetative cover is removed. Hoof impacts can knock down stream banks and churn soil, increasing erosion and sedimentation. Manure

REFERENCES

Almquist, C.L., 1988, Mineral investigation of a part of the Mount Nutt Wilderness study Area, (AZ-202-024), Mohave County, Arizona: US Bureau of Mines Mineral Land Assessment open File Report MLA 35-88, 20 p.

Anderson, J.L., 1989, Proterozoic anorogenic granites of the southwestern United States, in Jenney, J.P., and Reynolds, S.J., Geologic evolution of Arizona: Arizona Geological Society Digest 17, p. 211-238.

Anderson, L.W., and O'Connell, D.R., 1993, Seismotectonic study of the northern portion of the lower Colorado River, Arizona, California and Nevada: US Bureau of Reclamation Seismotectonic Report 93-4.

BLM, 1993, Kingman Resource Area, Proposed Resource management Plan and final Environmental Impact Statement: Bureau of Land Management Report, 606 p.

Buchanan, L.J., 1981, Precious metal deposits associated with volcanic environments in the southwest, *in* Dickinson, W.R., and Payne, W.D., Relation of tectonics to ore deposits in the southern Cordillera: Arizona Geological Society Digest 14, p. 237-262.

Bullock, J.H., Jr., Welsch, E., Hageman., P., Tippitt, F.W., and Turner, R.L., 1990, Analytical results and sample locality map of stream-sediment, heavy mineral concentrate, and rock samples from the Warm Springs Wilderness Study Area (AZ-020-028/029), Mohave County, Arizona: US Geological Survey Open-File Report 90-296, 39 p.

Buising, A.V., 1988, Depositional and tectonic evolution of the northern proto-Gulf of California and Lower Colorado River , as documented in the Mio-Pliocene Bouse Formation and bracketing units, southeastern California and western Arizona: University of California, Santa Barbara unpublished Ph.D. Dissertation, 196 p.

Clifton, C.G., Buchanan, L.J., and Durning, W.P., 1980, Exploration procedure and controls of mineralization in the Oatman Mining District, Oatman, Arizona: AIME Preprint 80-143.

DeWitt, E., 1987, Proterozoic ore deposits of the southwestern U.S.: Society of Economic Geologists Guidebook Series, Oct. 22-24, 1987 Field Conference, 189 p.

DeWitt, E., Thorson, J.P., and Smith, R.C., 1991, Geology and gold deposits of the Oatman District, northwestern Arizona: US Geological Survey Bulletin 1857-I, p. 1-28.

Durning, W.P., and Buchanan, L.J., 1984, The geology and ore deposits of Oatman, Arizona: Arizona Geological Society Digest 15, p. 141-158.

Elsing, M.J., and Heineman, R.E.S., 1936, Arizona metal production: Arizona Bureau of Mines Bulletin 140, 112 p.

Files, F.G., 1978, Uranium in volcanic environments in the Great Basin: US Department of Energy Report GJBX-98 (78), 20 p.

Frisch-Gleason, R., 1995, Controlling and remediating surface and groundwater pollution from inactive and abandoned mines: A survey of management practices: Arizona Geological Survey Open-File Report 95-13, 79 p.

Gardner, E.D., 1936, Gold mining and milling in the Black Mountains, western Mohave County, Arizona: US Bureau of Mines Information Circular IC-6901, 59 p.

Gray, F., Jachens, R.C., Miller, R.J., Turner, R.C., Livo, E.K., Knepper, D.H., Jr., Mariano, J., and Almquist, C.L., 1990a, Mineral resources of the Mount Nutt Wilderness Study Area, Mohave County, Arizona: US Geological Survey Bulletin 1737-D, 22 p.

Gray, F., Jachens, R.C., Miller, R.J., Turner, R.C., Knepper, D.H., Jr., Pitkin, J.A., Keith, W.J., Mariano, J., Jones, S.L., and Korzeb, S.L., 1990b, Mineral resources of the Warm Springs Wilderness Study Area, Mohave County, Arizona: US Geological Survey Bulletin 1737-F, 24 p.

Menges, C.M., and Pearthree, P.A., 1989, Late Cenozoic tectonism in Arizona and its impact on regional landscape evolution, *in* Jenney, J.P., and Reynolds, S.J., Geologic evolution of Arizona : Arizona Geological Society Digest 17, p. 649-680.

Metzger, D.G., and Loeltz, O.J., 1973, Geohydrology of the Needles area, Arizona, California, and Nevada: US Geological Survey Professional Paper 486-J, 54 p.

Metzger, D.G., Loeltz, O.J., and Irelan, B., 1973, Geohydrology of the Parker-Blythe-Cibola area, Arizona and California: US Geological Survey Professional Paper 486-G, 130 p.

Molitor, D., 1997, Suspended Sediment Monitoring Project, San Simon watershed, southeast Arizona: U.S. Bureau of Land Management [Safford Office] Report, 69 p., 1 sheet, scale 1:155,000.

Moore, R.W., 1928, Mining methods and records at the United Eastern Mine: Transactions of the American Institute of Mining and Metallurgical Engineers, v. 76, p. 56-92.

Qualheim, B.J., 1978, Hydrogeochemical and stream sediment reconnaissance basic data report for Kingman NTMS quadrangle, Arizona, California, and Nevada: University of California Lawrence Livermore Laboratory Report UCRL-52549 [also released as US Department of Energy Report GJBX-122(78), 85 p.

Rabb, D.D., 1978, Safety Corner: Warning-Beware of cyanide: Arizona Bureau of Geology and Mineral Technology Fieldnotes, v. 8, no. 4, p 8.

Ransome, F.L., 1923, Geology of the Oatman Gold District, Arizona: US Geological Survey Bulletin 743, 58 p.

Reynolds, S.J., 1986, Geologic map of Arizona: Arizona Bureau of Geology and Mineral Technology [AZGS] Map 26, scale 1:1,000,000.

Rösner, Ulrike, 1998a, Heavy metals in surface soils and streambed sediments in the Wallapai Mining District, northwestern Arizona, a historic mining district in a semiarid region: Arizona Geological Survey Contributed Report Colorado River-98-A, 43 p.

Rösner, Ulrike, 1998b, Historical mining and its impact on the vegetation, an example from the Cerbat Mountains, Mohave County, Arizona: Journal of the Arizona-Nevada Academy of Sciences, v. 31, no. 1, p. 37-55.

Scarborough, R.B., and Coney, M.L., 1982, Index of published geologic maps of Arizona, 1903 to 1982: Arizona Bureau of Geology and Mineral Technology Map 17, 6 sheets, scale 1:1,000,000.

Schrader, F.C., 1909, Mineral deposits of the Cerbat Range, Black Mountains, and Grand Wash Cliffs, Mohave County, Arizona: US Geological Survey Bulletin 397, 226 p.

Sillitoe, R.H., 1993, Giant and bonanza gold deposits in the epithermal environment: Assessment of potential genetic factors, *in* Whiting, B.H., Hodgson, C.J., and Mason, R., editors, Giant ore deposits: Society of Economic Geologists Special Publication 2, p. 125-156.

Silver, D.B., 1997, Gold Road Mine: Anatomy of a turnaround: Mining Engineering, v. 49, no. 8, p. 28-32

Smith, R.C., 1984, Mineralogy and fluid inclusion studies of epithermal gold-quartz veins in the Oatman District, northwestern Arizona: University of Arizona unpublished M.S. thesis, 233 p.

Spencer, J.E., and Reynolds, S.J., 1989, Middle Tertiary tectonics of Arizona and adjacent areas, *in* Jeney, J.P., and Reynolds, S.J., Geologic evolution of Arizona : Arizona Geological Society Digest 17, p. 539-574.

Spencer, J.E., and Welty, J.W., 1989, Mid-Tertiary ore deposits in Arizona: Arizona Geological Society Digest 17, p. 585-607.

Spencer, J.E., Harris, R.C., Dettmen, D., and Patchett, P.J., 1996, Reconnaissance survey of upper Neogene strata in the Bouse Formation, Hualapai Limestone, and lower Gila Trough, Western Arizona and directly adjacent southeastern California: Arizona Geological Survey Open-File Report 96-17, 23 p.

APPENDIX A

DESCRIPTION OF MINES IN THE BLACK MOUNTAINS-BULLHEAD CITY AREA

Mines in the Black Mountains Study area

Oatman District

Arizona Gold Star Prospect (La Paz)
Location: T19N, R20W, sec 8 Lat. 35.0475N Lon. 114.4292W
Quadrangle: Oatman
Geology: Vein along contact of Tertiary andesite and quartz monzonite dike
Mineralization: Hematite, MnOx
Years of Production: unknown
Mineral production: unknown
References: AZGS files

Aztec Mine (part of Tom Reed Mine)
Location: T19N, R20W, sec 23, NE/SE Lat. 35.018N Lon. 114.3717W
Quadrangle: Mount Nutt
Geology: Quartz veins in fault system in Tertiary volcanic rocks (Tom Reed vein)
Mineralization: Quartz veins with Au, Ag, Pb, Mo. Aztec mine connects with Big Jim, Bald Eagle, and Grey Eagle workings.
Years of Production:
Mineral production: (production included in Tom Reed Mine figures)
References: Gardner, 1936; Lausen, 1931; Durning and Buchanan, 1984.

Bald Eagle Mine (part of Tom Reed Mine)
Location: T19N, R20W, sec 23 Lat. 35.018N Lon. 114.3731W
Quadrangle: Mount Nutt
Geology: Quartz veins in fault system in Tertiary volcanic rocks
Mineralization: Quartz-adularia veins with gold
Years of Production:
Mineral production: (production included in Tom Reed Mine figures)
References: AZGS mine files

Big Jim Mine
Location: T19N, R20W, sec 23 SE/SW Lat. 35.0197N Lon. 114.3722W
Quadrangle: Mount Nutt
Geology: Veins in fault zone in Tertiary volcanic rocks
Mineralization: quartz veins with calcite, gypsum, wulfenite, chalcopyrite, gold
Years of Production: 1915- 1942
Mineral production: 277,000 tons ore, 12,500 oz Au 1917-1942; (220,000 tons ore 1921-1924)
References: Johnson, 1935; Gardner, 1936; Lausen, 1931; Buchanan, 1981; Durning and Buchanan, 1984; AZGS mine files

German-American Mine - see Pioneer

Gold Dust Mine (Victor-Virgin)
Location: T19N, R20W, sec 22, SE Lat. 35.014N Lon. 114.3927W
Quadrangle: Oatman

Geology: Veins in Tertiary granite porphyry
Mineralization: Veins of quartz, calcite, fluorite
Years of production: 1870-1906 (?)
Mineral production: est. $100,000 gold
References: Schrader, 1909; Wilson and others, 1934; Elsing and Heineman, 1936

Homestake Prospect
Location: T19N, R20W, sec 5 Lat. 35.0667 Lon. 114.4353
Quadrangle: Oatman
Geology: Quartz veins in granite porphyry
Mineralization: quartz veins with gold
Years of production: none
References: Schrader, 1909

Jackpot Prospect
Location: T19N, R20W, sec 5 Lat. 35.0647N Lon. 114.4267W
Quadrangle: Oatman
Geology: Quartz vein in Tertiary granite porphyry (part of Hardy Vein)
Mineralization: quartz with gold
Years of production: unknown
Mineral production: unknown
References: Schrader, 1909

Leland Mine (Mitchell vein)
Location: T19N, R20W, sec 20 Lat. 35.023 Lon. 114.4255
Quadrangle: Oatman
Geology: Veins in Tertiary andesite and quartz monzonite porphyry
Mineralization: Quartz-adularia-calcite veins with MnO and gold
Years of production: 1902 - ?
Mineral production: est. 45,000 tons ore at $15 per ton gold
References: Schrader, 1909; Lausen, 1931

Lexington Mine
Location: T19N, R20W, sec 26, NW Lat. 35.008N Lon. 114.3833W
Quadrangle: Oatman
Geology: Vein and fault system in Tertiary andesite, trachyte
Mineralization: Quartz-calcite veins with gold
Years of production: unknown
Mineral production: unknown
References: AZGS mine files

Meals Camp
Location: T20M, R21 W, sec 13 Lat. 35.1131N Lon. 114.4569W
Quadrangle: Oatman
Geology: Veins in Tertiary andesite, quartz syenite porphyry, and Precambrian granite
Mineralization: Quartz veins with gold
Years of production: unknown
Mineral production: unknown
References: Schrader, 1909

Geology: Vein system in Tertiary andesite and trachyte
Mineralization: Quartz veins (extension of Gold Dust Vein)
Years of production: unknown (before 1941)
Mineral production: unknown
References: AZGS files (Location info conflicting)

Oatman United Mine
Location: T19N, R20W, sec 14/23 est. Lat. 35.026N est. Lon. 114.372
Quadrangle: Oatman
Geology: Veins associated wit rhyolite dike in Tertiary andesite
Mineralization: Quartz-calcite veins with gold
Years of production: 1922-1926
Mineral production: unknown (small)
References: AZGS files

Pasadena Prospect
Location: T19N, R20W, sec 10 Lat. 35.0486N Lon. 114.4019W
Quadrangle: Oatman
Geology: Tertiary rhyolite dikes in andesite
Mineralization: Quartz with gold
Mineral production: none
References: Schrader, 1909

Pioneer Mine (German-American)
Location: T19N, R20W, sec 21, E/2 Lat. 35.0186N Lon. 114.4067W
Quadrangle: Oatman
Geology: Vein system in Tertiary andesite
Mineralization: Quartz-calcite-adularia veins with gold
Years of production: 1896 - 1942
Mineral production: 34,000 tons ore 1896- 1942; gold 10,346 oz 1934-1942
References: Gardner, 1936; Schrader, 1909; Lausen, 1931; AZGS mine files

Roosevelt Prospect
Location: T19N, R20W, sec 16 Lat. 35.0314N Lon. 114.42W
Quadrangle: Oatman
Geology: Veins in Tertiary andesite
Mineralization: Quartz-calcite veins with pyrite, gold
Years of production: unknown
Mineral production: unknown
References: Schrader, 1909

Rattan Mine (Ruth)
Location: T20N, R20W, sec 30, NE Lat. 35.0972N
Quadrangle: Oatman
Geology: Veins in Tertiary granite porphyry
Mineralization: Quartz-calcite-fluorite veins with pyrite, gold
Years of production: 1902-1942
Mineral production: est. 27,000 tons ore 1907-1934
References: Schrader, 1909; Lausen ,1931;Gardner, 1936; AZGS files

United American Mine (American)
Location: T19N, R20W, sec 24, SW/SW Lat. 35.0133N Lon. 114.365W
Quadrangle: Mount Nutt
Geology: Veins in Tertiary andesite and latite
Mineralization: Quartz with minor pyrite, gold (connects with Tom Reed/Black Eagle vein)
Years of production: unknown
Mineral production: unknown
References: Lausen, 1931; Ransome, 1923; Durning and Buchanan, 1984.

United Eastern Mine
Location: T19N, R20W, sec 14, SW Lat. 35.0294N Lon. 144.3839W
Quadrangle: Oatman
Geology: Veins in fissure system in Tertiary andesite, latite
Mineralization: Quartz-calcite veins with gold
Years of production: 1917-1925
Mineral production: 511,976 tons ore @ $19.87 per ton; $13,665,000 gold (1917-1924)
References: Moore, 1928; Lausen, 1931; Gardner, 1936; Elsing and Heineman, 1936; Durning and Buchanan, 1984.

United Western Mine
Location: T19N, R20W, sec 15, W2/NE Lat. 35.0363N Lon. 144.3931W
Quadrangle: Oatman
Geology: Vein and fracture system in Tertiary andesite
Mineralization: Calcite-quartz veins
Years of production: 1927-1935
Mineral production: 12, 000 tons ore 1927-1935
References: Gardner, 1936; Durning and Buchanan, 1984.

Vivian Mine
Location: T19N, R20W, sec 20, SE/NE/SE Lat. 35.015N Lon. 114.4214W
Quadrangle: Oatman
Geology: Veins in fracture system in Tertiary andesite
Mineralization: calcite-quartz veins with gold
Years of production: unknown
Mineral production: unknown
References: Schrader, 1909

West Gold Road
Location: T19N, R20W, sec 11 Lat. 35.0456N Lon. 114.3786W
Quadrangle: Oatman
Geology: Vein system assoc. with dike in Tertiary andesite
Mineralization: Quartz vein with gold; extension of Gold Road Vein
Years of production: unknown
Mineral production: unknown - probably included in Gold Road data
References: Schrader, 1909

Frisco Mine
Location: T21N, R20W, sec 16, NE/NE Lat. 35.210N, Lon. 114.4153W
Quadrangle: Union Pass
Geology: Quartz stringers at contact of Tertiary rhyolite flow and tuff with Precambrian granite/gneiss.
Mineralization: Gold-bearing quartz stringers
Years of Production: 1900 to >1935
Mineral production: 44,000 tons of ore 1894-1916 ($14 Au per ton); total of $400,000 gold 1893-1933
References: Gardner, 1936; Lausen, 1931

Golden Cycle Mine
Location: 2000 feet NW of Pyramid Mine
Quadrangle: Davis Dam
Geology: Quartz stringers occupying shear zone in coarse-grained granite
Mineralization: Gold-bearing quartz
Years of Production: unknown
Mineral production: unknown amount of ore, grade $1-$14 per ton gold
References: Lausen, 1931

Katherine Mine
Location: T21N, R21W, sec 5, SW Lat. 35.2336N; Lon. 144.5469W
Quadrangle: Davis Dam
Geology: Tertiary trachyte and rhyolite flows and dikes against Precambrian gneiss/granite
Mineralization: Gold in quartz veins with calcite, adularia, and fluorite. Ore minerals include silver, hematite, chalcocite. Up to 0.03% BeO in mill tailings
Years of Production: 1900-1940
Mineral production: $1,700,000 gold, $100,000 silver (1900-1933)
References: Wilson and others, 1934; Warner and others, 1959 (p. 102); Tenney, 1930; Buchanan, 1981.

New Chance Prospect
Location: T21N, R20W, sec 35 Lat. 35.1572N; Lon. 114.3861W
Quadrangle: Union Pass
Geology: Quartz vein in Tertiary rhyolite and andesite in contact with Precambrian granite.
Mineralization: Quartz vein with gold, silver; minerals include hematite, MnOx, adularia, fluorite.
Years of Production: (no production)
Mineral production: (no production); grade up to $64 per ton gold, 2 oz Ag
References: Schrader, 1909

OK Group
Location: T21N, R20W, sec 4/9 Lat. 35.2261N Lon. 114.4164W
Quadrangle: Union Pass
Geology: Contact of Tertiary rhyolite with Precambrian granite.
Mineralization: Gold, pyrite, and galena in quartz
Years of Production: (no production)
Mineral production: (no production) Grades of 0.05 to 0.9 oz per ton gold
References: Schrader, 1909

Tyro Mine
Location: T21N, R20W, sec 6, SE/SE Lat. 35.2272N Lon. 114.4497W
Quadrangle: Union Pass
Geology: Tertiary rhyolite dikes in Precambrian granite
Mineralization: Quartz-calcite veins with fluorite, Au
Years of Production: 1902-1982(?)
Mineral production: (no production data), grade 0.3 to 11 oz/t Au, up to 56 oz/t Ag
References: Schrader, 1909; AZGS mine files

Union Pass Mine
Location: T21N, R20W, sec 29, NW/SE Lat. 35.1742N Lon. 114.4342W
Quadrangle: Union Pass
Geology: Fault contact of Tertiary rhyolite with Precambrian granite
Mineralization: Quartz veins in fault breccia; contains calcite, adularia, FeOx, MnOx
Years of Production: 1886 to (?)
Mineral production: small - no production data
References: Schrader, 1909

Mines in Union Pass district with no information
Expansion
Philadelphia
Monarch
Sunlight
Gold Chain
Burke
Mandalay
Bonanza
Banner
Quail

Mines in Union Pass district outside study area
King of Secret Pass

imat
Mohave County
Bibliographies of Groundwater Basins
Arizona Geological Survey

Chukwu

MOHAVE COUNTY PLANNING & ZONING DEPARTMENT

P.O. Box 7000 ◆ Kingman, Arizona 86402-7000
3675 E. Highway 66, Suite A ◆ (928) 757-0903 ◆ FAX 757-3577
1130 East Hancock Road ◆ Bullhead City, Arizona 86442 ◆ (928) 758-0707 ◆ FAX 763-0870

CHRISTINE BALLARD
DIRECTOR

RECEIVED
MAY 05 2006
AZ CORP COMM
Director Utilities

May 3, 2006

Arizona Corporation Commission
1200 West Washington Street
Phoenix, Arizona 85007
Attention: Blessing Chukwu

RE: Proposed development

Dear Mrs. Chukwu:

In response to your recent request, I am forwarding the following lists of proposed subdivisions and new cities in the unincorporated parts of Mohave County.

The proposed subdivisions are broken down by groundwater basins, identified in Column H, and on the other data sheet. As the list shows, most of our actual subdivision proposals are located in the South Mohave Valley, in an area reliant upon water that is considered part of the Colorado River aquifer, and subject to formal allocation.

Many of the major new proposals, however, including several planned new cities, are spread across the county, primarily affecting the Hualapai, Sacramento and Detrital Basins.

If you have any questions, or need additional information, please contact me.

Sincerely,

Karl Taylor
Acting Planning Manager

KT/ajc

Enc: lists of proposed projects, by groundwater basin

Estimates of Proposed Dwelling Units/Lots in the Unincorporated Parts of Mohave County

	B	C	D	E	F	G	H
1	Sagebrush Trails	3815	640	98	T14N R17W	Section 3	Lake Havasu
2	North Pointe	3703	116	475	T14N R20W	Section 17	Lake Havasu
3	Paradise Trails	3802	149	94	T14N R20W	Section 25	Lake Havasu
4	Bella Lago		12	124	T14N R20W	Section 21	Lake Havasu
5	Golden Sands Ranchos		280	192	T15N R19W	Section 5	Lake Havasu
6	Arizona Gateway	3808	143	51	T16N R20W	Section 13	South Mohave Valley
7	Topock Village Estates	4190	82	206	T16N R21W	Section 23	South Mohave Valley
8	Mohave Valley Commons	4212	90	414	T16N R21W	Section 14	South Mohave Valley
9	Topock Overlook		74	113	T16N R21W	Section 23	South Mohave Valley
10	Marina Coves		46	456	T17N R22W	Section 23	South Mohave Valley
11	Mystic Canyon	4197	91	266	T18N R21W	Section 7	South Mohave Valley
12	Valley View at Sunrise Hills	4201	130	371	T18N R21W	Section 6	South Mohave Valley
13	El Rio	4177	386	1367	T18N R22W	Section 11	South Mohave Valley
14	Sun Valley II	4185	34	121	T18N R22W	Section 1	South Mohave Valley
15	The Greens at Los Lagos	4186	306	350	T18N R22W	Section 1	South Mohave Valley
16	Lake Cimarron Estates, Unit II	4187	9	35	T18N R22W	Section 23	South Mohave Valley
17	Los Lagos	4188	2.99	12	T18N R22W	Section 1	South Mohave Valley
18	Village Estates	4198	77	344	T18N R22W	Section 3	South Mohave Valley
19	The Estates at Cimarron Lake	4200	16	57	T18N R22W	Section 23	South Mohave Valley
20	King Estates		95	380	T18N R22W	Section 17	South Mohave Valley
21	Mohave Landing		135	515	T18N R22W	Section 23	South Mohave Valley
22	Mohave Valley Industrial Park		41.67	16	T18N R22W	Section 3	South Mohave Valley
23	Somerset Estates		146	548	T18N R22W	Section 27	South Mohave Valley
24	Mountainside Village	4193	120	320	T18N, R12W	Section 6	South Mohave Valley
25	Sunrise Vistas, Unit II	4108	705	160	T19N R21W	Section 18	South Mohave Valley
26	Sunrise Vistas, Unit II	4202	3	10	T19N R21W	Section 18	South Mohave Valley
27	Desert Lakes Estates	4152	80	272	T19N R22W	Section 36	South Mohave Valley
28	Coyote Run	4176	40	146	T19N R22W	Section 23	South Mohave Valley
29	Sunset Palms	4183	23	126	T19N R22W	Section 26	South Mohave Valley
30	Los Altos	4184	7	21	T19N R22W	Section 26	South Mohave Valley
31	Twin Palm Estates	4189	39	144	T19N R22W	Section 36	South Mohave Valley
32	Las Palmas	4191	2.88	14	T19N R22W	Section 23	South Mohave Valley
33	Patriot Estates	4195	30	122	T19N R22W	Section 32	South Mohave Valley
34	Brett Canyon Estates	4196	11.82	55	T19N R22W	Section 25	South Mohave Valley
35	Valley Springs	4203	24.83	132	T19N R22W	Section 36	South Mohave Valley
36	Fossil Creek,	4204	19.46	67	T19N R22W	Section 14	South Mohave Valley
37	The Borgata at Mountain View	4205	40	107	T19N R22W	Section 14	South Mohave Valley
38	Stetson Ranch	4206	14.42	57	T19N R22W	Section 25	South Mohave Valley
39	Fort Mohave Business Park	4209	18	28	T19N R22W	Section 35	South Mohave Valley
40	Mesa Verde	4210	7.26	31	T19N R22W	Section 23	South Mohave Valley
41	Everglades Estates		45.67	155	T19N R22W	Section 36	South Mohave Valley
42	Westview Estates		38	134	T19N R22W	Section 14	South Mohave Valley
43	Silverado Acre	3805	518	379	T20N R13W	Section 17	Big Sandy
44	Silverado Ridge	3817	440	303	T20N R13W	Section 9	Big Sandy
45	The Dells at Silverado (aka Silverado Golf)		840	139	T20N R13W	Section 28,29	Big Sandy

Estimates of Proposed Dwelling Units/Lots in the Unincorporated Parts of Mohave County

	B	C	D	E	F	G	H
46	Mountain Shadow Estates	3806	161	27	T20N R14W	Section 8	Sacramento Valley
47	Walnut Creek Ranch	3307	279	642	T20N R17W	Section 7	Sacramento Valley
48	Friendly Golden Valley	3305	40	114	T21N R18W	Section 17	Sacramento Valley
49	Mirage Estates	3308	35	100	T21N R18W	Section 17	Sacramento Valley
50	Aztec at Chuar	3309	80	252	T21N R18W	Section 27	Sacramento Valley
51	Bloor Subdivision		67	31	T21N R18W	Section 7	Sacramento Valley
52	Golden Valley Commercial,Ranches		67.64	140	T21N R18W	Section 7	Sacramento Valley
53	Patterson Estates		67	271	T21N R18W	Section 7	Sacramento Valley
54	Secret Pass Estates		101	188	T21N R18W	Section 7	Sacramento Valley
55	Shipp Estates	3310	48	152	T21N R19W	Section 12	Sacramento Valley
56	Greenwood Village	3818	7	40	T22N R12W	Section 29, 31 ,32	Hualapai Valley
57	Chaparrel Mesa	3042	124	510	T22N R16W	Section 28	Hualapai Valley
58	Neal One	3048	175	34	T22N R16W	Section 29	Hualapai Valley
59	Cerbat Vistas	3067	124	559	T22N R16W	Section 19	Hualapai Valley
60	Cedar Creek Estates	3069	90	365	T22N R16W	Section 19	Hualapai Valley
61	Cheyenne Meadows	3070	152	527	T22N R16W	Section 28	Hualapai Valley
62	High Desert Estates	3071	30	127	T22N R16W	Section 29	Hualapai Valley
63	The Ranch at Long Mountain (B-?)	3814	122	316	T22N R16W	Section 27	Hualapai Valley
64	Hunter Ranch		158	450	T22N R16W	Section 21	Hualapai Valley
65	North Valley Estates		238	750	T22N R16W	Section 12, 13	Hualapai Valley
66	Prairie Heights	3068	152	416	T22N R16W	Section 19	Hualapai Valley
67	Desert Fountain Estates	3051	103	300	T22N R17W	Section 13	Hualapai Valley
68	Desert Fountain Estates, Unit II	3072	114	323	T22N R17W	Section 13	Hualapai Valley
69	Tara Estates		80	56	T22N R17W	Section 12	Hualapai Valley
70	Hidden Springs		21	119	T23N R14W	Section 15, 16	Hualapai Valley
71	Camps Bay	3819	160	29	T25N R20W	Section 4	Hualapai Valley
72	White Hills Ranch Equestrian	3812	640	116	T27N R19W	Section 5	Detrital Valley
73	Equestrian at White Hills	3816	640	116	T27N R19W	Section 5	Detrital Valley
74	Woodside Subivision	3820	280	1044	T27N R20W	Section 7	Detrital Valley
75	Woodside Subivision		280.5	1044	T27N R20W	Section 7	Detrital Valley
76	Shadow Ridge	3511	122	393	T39N R16W	Section 27	Arizona Strip
77	Rio Seco	3520	20	71	T39N R16W	Section 14	Arizona Strip
78	High Chaparral		22.9	91	T39N R16W	Section 11	Arizona Strip
79	Vista Montana (aka Mesquite Heights)		34	145	T39N R16W	Section 11	Arizona Strip
80	Vista Rio		34	137	T39N R16W	Section 3	Arizona Strip
81	Coyote Flats(aka Desert Springs Oasis)		32	153	T40N R15W	Section 4	Arizona Strip
82	Hamilton Ranch		10	44	T40N R15W	Section 4	Arizona Strip
83	La Verta Heights		26.78	77	T40N R15W	Section 5	Arizona Strip
84	Running Springs Ranch		105	260	T40N R15W	Section 4	Arizona Strip
85	Vista Verde	3519	37.2	186	T40N R16W	Section 33	Arizona Strip
86	Vista Skies	3521	7	30	T40N R16W	Section 32	Arizona Strip
87	Desert Palms at Beaver Dam	3522	10	47	T41N R15W	Section 33	Arizona Strip
88	The Bluffs at Virgin Mountain		16	76	T41N R15W	Section 33	Arizona Strip
89		Acres	11282	20395	Lots		

ESTIMATES OF PROPOSED DWELLING UNITS/LOTS IN THE UNINCORPORATED PARTS OF MOHAVE COUNTY MAY 1, 2006

	PROPOSED UNITS	BASIN
RHODES HOMES		
Golden Valley Ranch	33,264	Sacramento
Peacock Highlands	46,026	Hualapai
Peacock Vistas	9,490	Hualapai
The Village at White Hills	20,042	Detrital
LEONARD MARDIAN		
Mardian Ranch (White Hills)	34,727	Detrital
Sterling	50,794	Sacramento
The Ranches at Long Mountain (Lingenfelter)	3,880	Hualapai
Silver Ranch (Mike and Leo Horner)	20,281	Big Sandy
All other currently proposed subdivisions (approx. 78 projects)	20,395 +/-	Various Most are in Lake Mohave Basin (reliant on Colorado River allocation water)
TOTAL	**238,899**	

WATER ADEQUACY APPLICATIONS IN MOHAVE COUNTY SINCE 2001

File Number	Subdivision	Water Provider	lication.Recei	AppStatus	AppStatusD	Quad	Township	Range1	Section1	Lots	totalDemand	SubbasinName
21-401425.0000	Walnut Creek Water Company	Walnut Creek Water Company	07/20/2004	Issued	06/27/05	B				870	376.86	Sacramento Valley
21-401654.0000	City of Bullhead City	City of Bullhead City	02/25/2005	Pending		B					14535.00	Lake Mohave
21-401728.0000	Beaver Dam Water Company	Undetermined	04/12/2005	Denied	12/05/05	B	40	16	33		0.00	Virgin River
22-401884.0000	Golden Horseshoe Ranchos Unit 5	Dry Lot	09/27/2005	Issued-Inadequate	10/06/05	B	27	19	19	283	*121.78*	Lake Mohave
22-401889.0000	Havasu RV Resort Phase II	Arizona American Water Company - Havasu	09/30/2005	Issued-Adequate	10/18/05	B	14	20	15	96	18.48	Lake Mohave
22-401941.0000	Lake Havasu Estates Unit 9	Dry Lot	11/10/2005	Issued-Inadequate	12/13/05	B	17	17	25	27	*11.62*	Sacramento Valley
23-401239.0000	North Point	Arizona American Water Company	02/10/2004	Issued-Adequate	03/02/04	B	14	20	17	450	209.00	Lake Havasu
23-401259.0000	Granmar Estates, Tract 4181	Bermuda Water Company	03/11/2004	Issued-Adequate	05/11/04	B	18	22	03	49	20.58	Lake Mohave
23-401423.0000	Twin Palms Estates, Tract 4189	Bermuda Water Company	07/19/2004	Issued-Adequate	08/05/05	B	19	22	36	144	70.80	Lake Mohave
23-401439.0000	Lake Cimarron Estates Unit II, Tract #4187	Willow Valley Water Company	07/26/2004	Issued	03/22/05	B	18	22	23	35	13.71	Lake Mohave
23-401581.0000	Mountainside Village Ranch	Bermuda Water Company, Inc.	11/19/2004	Issued	12/22/04	B	18	21	6	320	134.19	Lake Mohave
23-401619.0000	Patriot Estates Subdivision	Bermuda Water Company	01/07/2005	Issued	02/04/05	B	19	22	36	119	50.00	Lake Mohave
20-400682.0000	Virgin Mountain Utilities	Virgin Mountain Utilities	02/04/2002	Issued-Adequate	06/24/02	B	40	16	1-		0.00	Virgin River
22-400625.0000	The Legends at Desert Foothills Estates Tract 5092	Citizens Utilities Co., Inc.	10/26/2001	Issued-Adequate	11/26/01	B	20	21	5	70	*30.12*	Lake Mohave
22-400660.0000	The Refuge	Citizens Utilities	12/19/2001	Issued-Adequate	02/05/02	B	14	20	20	362	*155.78*	Lake Havasu
22-400683.0000	Canterbury Estates Tract 3702-A	Havasu Water Company	02/08/2002	Issued-Adequate	03/26/02	B	14	20	21	63	*27.11*	Lake Havasu
22-400703.0000	AZ Gateway	Citizens Utilities	03/28/2002	Issued-Adequate	06/11/02	B	16	20	13	51	*21.95*	Sacramento Valley
22-400713.0000	Lake Mead Ranchos Unit 5	Not applicable	04/10/2002	Issued-Inadequate	05/21/02	B	29	18	25	541	*232.81*	Ranegras Plain
22-400727.0000	Walnut Creek Subdivision	Walnut Creek Water Company	04/29/2002	Issued-Inadequate	05/29/02	B	20	17	7	73	*31.41*	Sacramento Valley

NOTE: Demand estimates in italics are based solely on residential demand from lot numbers.

WATER ADEQUACY APPLICATIONS IN MOHAVE COUNTY SINCE 2001

File Number	Subdivision	Water Provider	lication Recei	AppStatus	AppStatusD	Quad	Township	Range1	Section	Lots	totalDemand	SubbasinName
22-400741.0000	Hillview Ranches	Individual Wells	04/30/2002	Issued-Inadequate	07/02/02	B	23	16	7	9	*3.87*	Hualapai Valley
22-400745.0000	Lake Havasu Heights	Havasu Heights Domestic Water District	06/11/2002	Issued-Inadequate	08/16/02	B	15	19	7	21	*9.04*	Sacramento Valley
22-400791.0000	Willow Valley Estates Tract 4134-B	Willow Valley Water Company, Inc.	07/22/2002	Issued-Adequate	09/25/03	B	18	22	21	29	9.70	Lake Mohave
22-400798.0000	Canterbury Estates Tract 3702B	Arizona American Water Company	08/13/2002	Issued-Adequate	10/28/02	B	14	20	21	45	*19.36*	Lake Havasu
22-400801.0000	Sunrise Vistas - Tract 4108-K	Sunrise Vistas Utilities	08/19/2002	Issued-Adequate	12/03/02	B	19	21	18	22	*9.47*	Lake Mohave
22-400832.0000	Hualapai Vista Estates, Tract 3811	Dry Lot Subdivision	09/16/2002	Issued-Inadequate	10/17/02	B	22	16	12,13	41	*17.64*	Hualapai Valley
22-400839.0000	Linda Vista	AZ-American Water Company	10/11/2002	Issued-Adequate	11/19/02	B	19	22	23	42	*18.07*	Lake Mohave
22-400852.0000	Terra Vista Skies	Beaver Dam Water Company	11/21/2002	Pending		B	40	16	32	30	*22.50*	Virgin River
22-400872.0000	Lake Juniper	Lake Juniper HOA & Mohave County	01/06/2003	Issued-Inadequate	01/31/03	B	22	17	11,14	16	*6.89*	Hualapai Valley
22-400877.0000	Sunrise Vistas, Tract 4108-L	Sunrise Vistas Utilities	01/17/2003	Issued-Adequate	05/12/03	B	19	21	18	23	*9.90*	Lake Mohave
22-400912.0000	Flannery & Allen	Individual Wells	03/12/2003	Issued-Inadequate	04/10/03	B	27	20	31	55	*23.67*	Detrital Valley
22-400987.0000	Desert Lakes Estates Tract 4152-C	Bermuda Water Company	06/05/2003	Issued-Adequate	10/22/03	B	19	22	36	42	17.64	Lake Mohave
22-400998.0000	Sunrise Vistas, Tract 4108-N	Sunrise Vistas Utilities	06/20/2003	Issued-Adequate	09/25/03	B	19	21	18	30	*12.91*	Lake Mohave
22-400999.0000	Sunrise Vistas, Tract 4108-M	Sunrise Vistas Utilities	06/20/2003	Issued-Adequate	09/25/03	B	19	21	18	30	*12.91*	Lake Mohave
22-401084.0000	The Villas at Desert Horizons, Tract 4162-B	Bermuda WaterCompany, Inc.	09/17/2003	Issued-Adequate	01/12/04	B	19	22	23	33	13.86	Lake Mohave
22-401105.0000	Gateway Acres, Tracts, 1,2,7 & 8	None	10/03/2003	Issued-Inadequate	05/07/04	B	25	20	3,5,7	352	137.98	Detrital Valley
22-401108.0000	Havasu RV Resort	Arizona American Water Company	10/06/2003	Issued-Adequate	11/12/03	B	14	20	15	169	41.00	Lake Havasu
22-401117.0000	Rodeo Park Tract 4145-C	Bermuda Water Company, Inc.	10/15/2003	Issued-Adequate	11/03/03	B	19	22	23	60	25.20	Lake Mohave
22-401144.0000	Coyote Run Tract, 4176-A	Arizona - American Water Company	11/18/2003	Issued-Adequate	02/18/04	B	19	22	23	42	17.65	Lake Mohave

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WATER ADEQUACY APPLICATIONS IN MOHAVE COUNTY SINCE 2001

File Number	Subdivision	Water Provider	lication Recei	AppStatus	AppStatusD	Quad	Township	Range1	Section1	Lots	totalDemand	SubbasinName
22-401201.0000	Fairway Estates Tract 4097D	Bermuda Water Company	01/05/2004	Issued-Adequate	02/13/04	B	19	22	35	48	20.16	Lake Mohave
22-401219.0000	Sage Hill, Tract 4179-A	Bermuda Water Company, Inc	01/23/2004	Issued-Adequate	02/23/04	B	19	22	25	46	19.32	Lake Mohave
22-401293.0000	Sunset Vista	NA	03/19/2004	Issued-Inadequate	05/07/04	B	25	19	04	10	3.08	Detrital Valley
22-401294.0000	Lake Mohave Ranchos, Unit 6	NA	03/19/2004	Issued-Inadequate	04/26/04	B	26	19	25	6	1.84	Hualapai Valley
22-401347.0000	Sunrise Vista, Tract 4108-O	Sunrise Vista Utilities	08/04/2004	Issued-Adequate	12/15/04	B	19	21	18	50	23.27	Lake Mohave
22-401351.0000	Vineyard at SunRidge Unit 3	North Mohave Valley Corp	05/07/2004	Issued-Adequate	12/20/04	B	21	21	30	8	3.38	Lake Mohave
22-401352.0000	Sun Valley Unit fII, Tract 4185	Bermuda Water Company	05/07/2004	Withdrawn	07/13/05	B	18	22	01	179	75.69	Lake Mohave
22-401366.0000	Fairway Estates Tract 4097C	Bermuda Water Company	05/17/2004	Issued-Adequate	09/09/04	B	19	22	35	47	21.61	Lake Mohave
22-401368.0000	Mohave Valley Industrial Park (Commercial Subdivision)	Bermuda Water Company, Inc.	05/18/2004	Denied	12/29/05	B	18	22	03	32	103.13	Lake Mohave
22-401370.0000	Los Altos, Tract 4184	Arizona-American Water Company	05/19/2004	Issued-Adequate	08/22/05	B	19	22	25	21	9.26	Lake Mohave
22-401383.0000	Pioneer Valley	Dry Lot	06/02/2004	Issued-Adequate	08/02/04	B	18	18	35	64	21.75	Sacramento Valley
22-401466.0000	El Rio Country Club, Tract 4177-A	Bermuda Water Company & Ft Mohave Tribal Utility	07/28/2004	Issued-Adequate	05/04/05	B	18	22	11	161	596.53	Lake Mohave
22-401480.0000	Topock Village Estates, Tract 4190	Golden Shores Water Company	08/06/2004	Denied	09/09/05	B	16	21	23	206	152.50	Lake Mohave
22-401491.0000	Sage Hill, Tract 4179-B	Bermuda Water Company	08/23/2004	Withdrawn	04/27/05	B	19	22	25	53	24.37	Lake Mohave
22-401506.0000	Sage Hill, Tract 4179-B, Phase II	Bermuda Water Company	09/15/2004	Issued-Adequate	11/24/04	B	19	22	25	53	24.37	Lake Havasu
22-401582.0000	North Pointe	Arizona American Water Company - Havasu	11/22/2004	Issued-Adequate	12/28/04	B	14	20	17	455	193.62	Lake Havasu
22-401592.0000	Lake Mohave Knoll Estates	Dry Lot Subdivision	12/03/2004	Issued-Inadequate	12/07/04	B	23	18	21	127	*54.65*	Sacramento Valley
22-401649.0000	Lake Mead Ranchos Unit 4	Dry Lot	02/17/2005	Issued-Inadequate	03/15/05	B	28	18	01	492	*211.72*	Hualapai Valley

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WATER ADEQUACY APPLICATIONS IN MOHAVE COUNTY SINCE 2001

File Number	Subdivision	Water Provider	)lication Recei	AppStatus	AppStatusD	Quad	Township	Range1	Section	Lots	totalDemand	SubbasinName
22-401650.0000	Joshua Park Unit No. 1	Dry Lot	02/17/2005	Issued-Inadequate	03/15/05	B	28	17	09	57	*24.53*	Hualapai Valley
22-401651.0000	Mead-O-Rama	Dry Lot	02/17/2005	Issued-Adequate	03/04/05	B	29	18	35	421	1250.66	Hualapai Valley
22-401661.0000	Lake Cimarron Estates, Unit II, Tract #4187	Willow Valley Water Company	03/08/2005	Issued-Adequate	03/11/05	B	18	22	23	35	14.70	Lake Mohave
22-401688.0000	The Estates at Cimarron Lake Tract 4200	Willow Valley Water Company	03/29/2005	Issued-Adequate	11/03/05	B	18	22	23	35	23.68	Yuma
22-401736.0000	The Trails Tract No. 4194	Willow Valley Water Company	04/19/2005	Issued-Adequate	01/03/06	B	18	22	23	13	5.09	Lake Mohave
22-401760.0000	Sunset Palms, Tr. 4183-A	Bermuda Water Co.	05/10/2005	Issued-Adequate	06/06/05	B	19	22	26	33	14.03	Lake Mohave
22-401766.0000	The Coves on The Colorado River	Fort Mohave Tribal Utility Authority	05/25/2005	Issued-Adequate	03/13/06	B	17	22	23	99	219.87	Lake Mohave
22-401778.0000	El Rio Country Club, Tract 4177-B, Phase II	Bermuda Water Company	06/14/2005	Issued-Adequate	09/01/05	B	18	22	11	143	60.64	Lake Mohave
22-401780.0000	Mountain Vista Ranches Phase I	Dry Lot Subdivision	06/14/2005	Withdrawn	03/10/06	B	24	15	35	7	4.64	Hualapai Valley
22-401784.0000	Sun Valley Unit II, Tract 4185-B	Bermuda Water Company	06/14/2005	Issued-Inadequate	10/06/05	B	18	22	01	18	7.56	Lake Mohave
22-401802.0000	Lake Mohave Ranchos Unit 16	Dry lot	06/29/2005	Issued-Inadequate	07/14/05	B	25	18	07	9	*3.87*	Detrital Valley
22-401809.0000	Brett Canyon Estates, Tract 4196	Bermuda Water Company	07/05/2005	Issued-Adequate	08/04/05	B	19	22	25	55	22.16	Lake Mohave
22-401814.0000	Virgin Acres, aka Biasi Ranch Estates	Biasi Water Company	07/11/2005	Issued-Adequate	09/08/05	B	41	15	29	19	*8.18*	Virgin River
22-401816.0000	Pioneer Valley and Paradise Trail's Tr. 3802	Double R Water Distributors, Inc.	07/13/2005	Issued-Adequate	08/15/05	B	18	18	35 & 25	232	562.25	Sacramento Valley
22-401821.0000	Sagebrush Trails Estates	Sagebrush Trails Domestic Water ID	07/18/2005	Issued	10/06/05	B	14	17	03	97	30.82	Sacramento Valley
22-401832.0000	Mystic Canyon, Tract 4197	Bermuda Water Company	07/28/2005	Issued-Adequate	08/15/05	B	18	21	07	266	108.30	Lake Mohave
22-401837.0000	Desert Canyon at SunRidge	North Mohave Valley Corp.	08/03/2005	Issued-Adequate	02/02/06	B	21	21	21	141	55.23	Lake Mohave
23-401674.0000	The Villages at White Hills	NA	03/18/2005	Pending		B	27	21	25	30464	15737.91	Detrital Valley
23-401774.0000	The Ranch at White Hills	Double Diamond Utilities	06/03/2005	Pending		B				25000	7976.61	Detrital Valley

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WATER ADEQUACY APPLICATIONS IN MOHAVE COUNTY SINCE 2001

File Number	Subdivision	Water Provider	lication Recei	AppStatus	AppStatusD	Quad	Township	Range1	Section1	Lots	totalDemand	SubbasinName
23-401823.0000	Golden Valley 5800	To Be Determined	07/18/2005	Issued	10/19/05	B	21	18	34	32000	15910.90	Sacramento Valley
23-401861.0000	Valley Springs Estates Subdivision	Bermuda Water Company	08/29/2005	Issued	02/01/06	B	19	22	36	132	57.72	Lake Mohave
23-401875.0000	Stetson Ranch	Bermuda Water Company	09/20/2005	Issued	05/01/06	B	19	22	25	57	23.45	Lake Mohave
23-401934.0000	Mesa Verde Subdivision	Arizona American Water Company	11/07/2005	Pending		B	19	22	23	31	13.04	Lake Mohave
22-401954.0000	Sun Valley Unit II, Tract 4185-D	Bermuda Water Company	12/01/2005	Issued-Adequate	01/03/06	B	18	22	01	50	19.76	Lake Mohave
22-402005.0000	Joshua Park Unit 1	Dry Lot	01/24/2006	Issued-Inadequate	01/26/06	B	28	17	09	141	*60.68*	Hualapai Valley
22-402006.0000	Lake Mead Ranchos, Unit 6	Dry Lot	01/24/2006	Issued-Inadequate	01/26/06	B	29	18	27	402	*172.99*	Hualapai Valley
22-402007.0000	Lake Mead Ranchos Unit 7	Dry Lot	01/24/2006	Issued-Inadequate	01/26/06	B	29	18	23	569	*244.86*	Hualapai Valley
22-402045.0000	The Borgata on Mountain View, Tract No. 4205	Bermuda Water Company	03/02/2006	Pending		B	19	22	14	107	63.09	Lake Mohave
22-402048.0000	Desert Palm at Beaver Dam	Biasi Water Company, Inc.	03/06/2006	Pending		B	41	15	33	47	19.30	Virgin River
22-402136.0000	Lake Mead City Unit No. 15-29-17	N/A	04/26/2006	Pending		B	29	17	15	25	33.33	Lake Mohave
not yet assigned	Silverado Estates	N/A	4/28/2006	Pending		B	20	13	9,15,17, 21,22,2 3,27,28, 29,33	17644	14616.00	Big Sandy

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MOHAVE COUNTY APPLICATIONS PRIOR TO 2001 FROM 1WRF.DB

PFX	DWR .	SUBDIVISION	WATER PROVIDER	STATUS	DATE ISSUED	LOC-Q	LOC-T	LOC-T2	LOC-R	LOC-R2	LOC-S	LOTS	ALLOCATION (AF)	GW BASIN
20	400682	Scenic Arizona	Virgin Mountain Utilities Company	Ret-WAL	26-Mar-02	B	39	N	16	W	10,11, 14,15			Virgin River
21	401728	Beaver Dam Water Company	Beaver Dam Water Company	PENDDADE		B								Virgin River
21	300162	Bullhead City, City of		Dead		B		N		W				Lake Mohave
21	300106	Cerbat Water Company	Cerbat Water Company, Inc.	Ret-DADE		B	22	N	17	W	01, 12, 13		882	Hualapai Valley
21	401425	Walnut Creek Water Company	Walnut Creek Water Company	PENDDAWS		B	20	N	17	E	07			Sacramento Valley
22	300115	Beaver Dam Virgin Acres #1	Beaver Dam Water Company	Issued	10-Jul-96	B	41	N	15	W	32	51	18.57	Virgin River
22	300051	Sellan Estates, Tract 5024	North Mohave Valley Water Company	Issued	10-Oct-95	B	21	N	21	W	30	6		
22	300320	Centennial Park Unit 1	Centennial Park Utilities	Issued	11-Aug-99	B	41	N	6	W	18	66	34.5	Kanab Plateau
22	400065	Zafiro Acres-Sunward Ho Ranches	dry lot	Issued	11-May-99	B	22	N	16	W	05	7		Hualapai Valley
22	300139	Vista del Rio Tract 5043	Bermuda Water Company, Inc.	Issued	12-Jul-96	B	19	N	22	W	11	35	9.8	Lake Mohave
22	300085	Willow Valley Estates 20, Tract 4134A	Willow Valley Water Company	Issued	13-Dec-96	B	18	N	22	W	21	27	7.56	Lake Mohave
22	300156	Greater Kingman Industrial Park	dry lot	Issued	14-Jun-96	B	22	N	15	W	05, 17	19		Hualapai Valley
22	400638	Pegasus Ranch Estates,Tract 5083 Unit 3	Citizens Utilities Co.	Issued	15-Jan-02	B	21	N	21	W	29	20	5.6	Lake Mohave
22	400633	Sun Ridge Estates Tract 4042J	North Mohave Valley Water Company	Issued	15-Jan-02	B	21	N	21	W	21	36	9.8	Lake Mohave
22	300221	Sunset Ranchos II, Tract 4156	Bermuda Water Company, Inc.	Issued	15-Jan-97	B	19	N	22	W	13	22	6.16	Lake Mohave
22	400745	Lake Havasu Heights	Havasu Heights Domestic Water Improvement District	Issued	16-Aug-02	B	15	N	19	W	07	21		Sacramento Valley
22	400515	Santa Evinita, Tract 4167-A	Bermuda Water Company, Inc.	Issued	17-Jul-01	B	19	N	22	W	23	34	14.28	Lake Mohave
22	400496	Villas At Desert Horizons, Tract 4162-B	Bermuda Water Company, Inc.	Issued	17-Jul-01	B	19	N	22	W	23	48	20.16	Lake Mohave
22	400832	Hualapai Vista Estates, Tract 3811	dry lot	Issued	17-Oct-02	B	22	N	16	W	12, 13	41		Hualapai Valley
22	300213	Vineyard at Sun Ridge, Tract 5049	North Mohave Water Company	Issued	18-Dec-96	B	21	N	21	W	30	67	22.54	Lake Mohave
22	400330	Palo Verde Shores	Citizens Utilities Company-Mohave	Issued	18-Jul-00	B	20	N	22	W	29	28	9.4	Lake Mohave
22	300215	Arroyo Park at Desert Foothills Estates, Tract 5046	Citizens Utilities Company-Mohave	Issued	18-Nov-96	B	20	N	21	W	05	63	17.6	Lake Mohave

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22	300214	Terraces at Desert Foothills Estates,The	Citizens Utilities Company-Mohave	Issued	18-Nov-96	B	20	N	21	W	05	123	34.4	Lake Mohave
22	300411	Vista del Rio #2, Tract 5061	Bermuda Water Company, Inc.	Issued	19-Jun-98	B	19	N	22	W	11	18	5.7	Lake Mohave
22	300097	Palo Verde Plaza, Tract 5025	Citizens Utilities Company-Mohave	Issued	20-Mar-96	B	20	N	22	W	35	15	4.3	Lake Mohave
22	300066	Paradise Trails Tract #3802	Double R Water Distributors, Inc.	Issued	20-Nov-95	B	18	N	18	W	25, 35	231	407	Sacramento Valley
22	300075	Sunnyvale Acres, Sunward Ho! Ranches #2	dry lot	Issued	20-Nov-95	B	23	N	16	W	09	22		Hualapai Valley
22	400713	Lake Mead Ranchos Unit 5	dry lot	Issued	21-May-02	B	29	N	18	W	25	541		Hualapai Valley
22	400714	Lake Mead Ranchos Unit 7	dry lot	Issued	21-May-02	B	29	N	18	W	23	567		Hualapai Valley
22	400071	Sunrise Vistas Tract 4108-F	Sunrise Vistas Utilities Company	Issued	21-May-99	B	19	N	21	W	18	28	11.8	Lake Mohave
22	400053	Vista del Rio # 4, Tract 5067	Bermuda Water Company, Inc.	Issued	21-May-99	B	19	N	22	W	11	21	7.1	Lake Mohave
22	400113	Desert Horizons, Tract 4161	Bermuda Water Company, Inc.	Issued	21-Sep-99	B	19	N	22	W	23	44	18.48	Lake Mohave
22	300115	Beaver Dam Virgin Acres #1	Beaver Dam Water Company	Issued	22-Mar-96	B	41	N	15	W	32	51	18.57	Virgin River
22	400175	East Shore Villas #1 Tract 5070	Citizens Utilities Company-Mohave	Issued	22-Nov-99	B	20	N	22	W	9 & 16	51	17.1	Lake Mohave
22	400170	Sunrise Vistas Tract 4108-E	Sunrise Vistas Utilities Company	Issued	22-Nov-99	B	19	N	21	W	18	57	23.94	Lake Mohave
22	400987	Desert Lakes Estates, Tract 4152-C	Bermuda Water Company	Issued	22-Oct-03	B	19	N	22	W	36	42		Lake Mohave
22	300043	Greenwood Village #1	dry lot	Issued	23-Aug-95	B	22	N	12	W	29,30, 31,32	214	215	Big Sandy
22	300153	Bullhead Airpark Phase 1 (Tract 5009)	North Mohave Valley Corporation	Issued	23-Jul-96	B	21	N	21	W	31, 32	7	2.1	Lake Mohave
22	300328	Lake Mead Ranchos Unit 3	dry lot	Issued	23-Jul-97	B	28	N	18	W	11	592	35	Hualapai Valley
22	400002	Emerald River Estates Tract 4093-B	Bermuda Water Company, Inc.	Issued	24-Aug-99	B	19	N	22	W	25	62	25.4	Lake Mohave
22	400003	Palm Estates #2, Tract 4104B	Bermuda Water Company, Inc.	Issued	24-Aug-99	B	19	N	22	W	14	25	7	Lake Mohave
22	400081	Sunlake Village Tract 3700-C	Havasu Water Company	Issued	24-Aug-99	B	14	N	20	W	21	52	14.28	Lake Mohave
22	300485	Virgin Acres	Beaver Dam Water Company	Issued	24-Jul-98	B	41	N	15	W	32	65		Virgin River
22	400052	Vista del Rio # 3, Tract 5066	Bermuda Water Company, Inc.	Issued	24-May-99	B	19	N	22	W	11	12	4.03	Lake Mohave
22	400014	Last Lap Subdivision	dry lot	Issued	25-Feb-99	B	15	N	17	W	31	23		Sacramento Valley
22	400683	Canterbury Estates, Tract 3702-A	Havasu Water Company	Issued	26-Mar-02	B	14	N	20	W	21	63	17.64	Lake Havasu
22	300087	Fountain Hills Estates	Cerbat Water Company, Inc.	Issued	26-Sep-96	B	22	N	17	W	13	66		Hualapai Valley
22	300196	Golden Horseshoe Ranchos Units 3 & 4	dry lot	Issued	26-Sep-96	B	27	N	19	W	09,17	192		Detrital Valley
22	400475	Desert Lakes Estates Tract 4159 Unit H	Bermuda Water Company, Inc.	Issued	27-Apr-01	B	19	N	22	W	35	6	2.35	Lake Mohave
22	400296	Rodeo Park Tract 4145-A	Bermuda Water Company, Inc.	Issued	28-Feb-01	B	19	N	22	W	23	24		Lake Mohave

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22	400258	Walnut Creek Estates Unit 3 Tract 3043-B	Walnut Creek Water Company, Inc.	Issued	28-Mar-00	B	20	N	17	W	07	44	12	Sacramento Valley
22	400526	Arroyo Vista Estates Tract 4077 E Unit 2	Bermuda Water Company, Inc.	Issued	29-Jun-01	B	19	N	22	W	12	36		Lake Mohave
22	400727	Walnut Creek Estates	Walnut Creek Water Co., Inc.	Issued	29-May-02	B	20	N	17	W	07	73		Sacramento Valley
22	300326	Desert Lakes Golf Course & Estates # F	Bermuda Water Company, Inc.	Issued	29-Oct-97	B	19	N	22	W	35	38	10.6	Lake Mohave
22	300355	Pegasus Ranch Tract 5030	Citizens Utilities Company-Mohave	Issued	29-Oct-97	B	21	N	22	W	29	14	3.92	Lake Mohave
22	300367	Sun Valley Tract 4064B	Bermuda Water Company, Inc.	Issued	29-Oct-97	B	18	N	22	W	01	99	28	Lake Mohave
22	400082	Sunrise Vistas Tract 4108-G	Sunrise Vistas Utilities Company	Issued	30-Aug-99	B	19	N	21	W	18	27	11.34	Lake Mohave
22	400142	Willows at Cimarron Lake #2 Tract 4130-A	Willow Valley Water Company	Issued	30-Aug-99	B	18	N	22	W	23	79	22	Lake Mohave
22	400514	Valle Vista Unit 3 Tract 1204	Truxton Canyon Water Company	Issued	30-May-01	B	24	N	15	W	34	10		Hualapai Valley
22	400235	Los Pueblos @Desert FoothillsTract#5077	Citizens Utilities Company-Mohave	Issued	31-Jan-00	B	20	N	21	W	05	71	23.9	Lake Mohave
22	300439	Sunward Ho! Ranches	dry lot	Issued	3-Apr-98	B	23	N	16	W	19,30, 31,33	430		Hualapai Valley
22	400081	Sunlake Village Tract 3700-C	Havasu Water Company	Issued	3-Dec-99	B	14	N	20	W	21	52	14.28	Lake Mohave
22	300296	Sunrise Vistas Tract 4108-D	Sunrise Vistas Utilities Company	Issued	3-Jun-97	B	19	N	21	W	18	40	11.2	Lake Mohave
22	300039	Sawmill Creek Tract 3049	dry lot	Issued	4-Aug-95	B	20	N	16	W	02	13	3.64	Sacramento Valley
22	300568	Virgin Acres	Beaver Dam Water Company	Issued	4-Dec-98	B	41	N	15	W	32	40		Virgin River
22	400538	Fairway Estates Tract 4097 E	Bermuda Water Company, Inc.	Issued	4-Mar-02	B	19	N	22	W	35	41	17.2	Lake Mohave
22	300512	Cedar Ridge Estates	dry lot	Issued	4-Sep-98	B	22	N	17	W	11 & 14	38		Hualapai Valley
22	400660	Refuge, The	Citizens Utilities	Issued	5-Feb-02	B	14	N	20	W	20, 21	362	101	Lake Havasu
22	400220	Desert Lakes Estates Tract 4152B	Bermuda Water Company, Inc.	Issued	5-Jan-00	B	19	N	22	W	36	40	16.8	Lake Mohave
22	400213	Chaparral Mesa II	Kingman, City of	Dead	5-Jan-99	B	22	N	16	W	28	40		
22	300025	Desert Lakes Estates Tract 4152A	Bermuda Water Company, Inc.	Issued	5-Mar-96	B	19	N	22	W	36	31	8.68	Lake Mohave
22	400180	Villas at Desert Horizons, The, T 4162-A	Bermuda Water Company, Inc.	Issued	5-Nov-99	B	19	N	22	W	23	51	21.4	Lake Mohave
22	400274	Golden Horseshoe Ranchos Unit #5	White Hills Water Company	Issued	7-Apr-00	B	27	N	19	W	19	375		Detrital Valley
22	300222	Golden Horseshoe Ranchos #2	dry lot	Issued	7-Nov-96	B	27	N	19	W	07	540		Detrital Valley
22	300507	Virgin Village I & II	Biasi Water Company	Issued	7-Oct-98	B	41	N	15	W	32	93		Virgin River

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22	300024	Sunlake Village Tract 3700A	Havasu Water Company	Issued	8-Aug-95	B	14	N	20	W	21	35	9.67	Lake Havasu
22	300407	Sun Lakes Village Tract 3700-B	Havasu Water Company	Issued	9-Mar-98	B	14	N	20	W	21	40	11.2	Lake Mohave
22	400703	Arizona Gateway	Arizona-American Water Company	Issued		B	16	N	20	W	13	51		Sacramento Valley
22	300239	Camp Mohave Heights, Tract 4086-B	Citizens Utilities Company-Mohave	Dead		B	19	N	22	W	23	21		Lake Mohave
22	400798	Canterbury Estates Tract 3702-B	Arizona-American Water Company	Issued		B	14	N	20	W	21	45	12.6	Lake Havasu
22	400697	Desert Lakes Golf Course & Estates Tract 4163	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35	32	13.4	Lake Mohave
22	400524	Coves on the Colorado River, The	Fort Mohave Tribal Utilities Authority	Issued		B	17	N	22	W	23	99		Lake Mohave
22	400542	Del Rio Estates	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	32	7	2.34	Lake Mohave
22	300241	Del Rio Estates, Tract 4102	Citizens Utilities Company-Mohave	Dead		B	20	N	22	W	32	7		Lake Mohave
22	400912	Flannery & Allen	dry lot	Issued		B	27	N	20	W	31	55		Detrital Valley
22	401105	Gateway Acres	dry lot	Issued		B	25	N	20	W	03,05, 07,11, 13-15,17, 21,23	352		Detrital Valley
22	400766	Hillcrest Park Tract 5063 - Phase I	Arizona-American Water Company	Returned		B	21	N	21	W	29, 32	80		Lake Mohave
22	400741	Hillview Ranches	dry lot	Issued		B	23	N	16	W	07	9		Hualapai Valley
22	300558	Joshua Park Unit #1	dry lot	Issued		B	28	N	17	W	09	48	6.7	Hualapai Valley
22	400427	Lake Havasu Estates Unit 13	dry lot	Issued		B	17	N	16	W	31	184		Sacramento Valley
22	400428	Lake Havasu Estates Unit 14	dry lot	Issued		B	17	N	16	W	29	372		Sacramento Valley
22	400425	Lake Havasu Estates Unit 9	dry lot	Issued		B	17	N	17	W	25	120		Sacramento Valley
22	400872	Lake Juniper	dry lot	PENDWAS		B	22	N	17	W	11, 14	16		Hualapai Valley
22	400625	Legends at Desert Foothills Estates, The	Citizens Utilities Co.	Issued		B	20	N	21	W	05	24	23.5	Lake Mohave
22	400625	Legends Unit 2 at Desert Foothills Estates, Tract 5099	Citizens Utilities Company	Issued		B	20	N	21	W	05	46		Lake Mohave
22	400839	Linda Vista	Arizona American Water Company	Issued		B	19	N	22	W	23	42	17.6	Lake Mohave
22	400899	Linda Vista, Tract 4178	American Water Company	PENDWAS		B	19	N	22	W	23	42		Lake Mohave
22	400618	Mesa Vista, Tract 4169	Bermuda Water Company	Issued		B	19	N	22	W	24	131	55	

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22	400579	Moon River Resort, Inc.	Bermuda Water Company, Inc.	Issued		B	18	N	22	W	03	89	19.9	Lake Mohave
22	400466	Mountain Shadow Estates, Tract 3806	subdivision wells	Issued		B	20	N	14	W	08	54		
22	401780	Mountain Vista Ranches Phase I	dry lot	pending		B	24	N	15	W	35	7		Hualapai Valley
22	300149	Paradise(Units)/Sun West(Unit 3)Acres	dry lot	Issued		B	20	N	18	W	19, 21, 27, 29, 31, 33, 35	862		Sacramento Valley
22	401383	Pioneer Valley	dry lot	PENDWAS		B	18	N	18	W	35	35		Sacramento Valley
22	400755	Rodeo Park Tract 4145-B	Bermuda Water Company	Issued		B	19	N	22	W	23	31	13	Lake Mohave
22	400860	Santa Evinita, Tract B	Bermuda Water Company	Issued		B	19	N	22	W	23	40	16.38	Lake Mohave
22	400424	Shadow Mountain Acres Unit Two & Three	dry lot	Issued		B	24	N	14	W	27 & 35	93		Hualapai Valley
22	300264	Silverado Acre Estates Unt 1,Tr 3805	dry lot	Issued		B	20	N	13	W	17	340		Big Sandy
22	400553	Sunrise Vistas Tract 4108-H	Sunrise Vistas Utilities Company	Issued		B	19	N	21	W	18	6	2.52	Lake Mohave
22	400554	Sunrise Vistas Tract 4108-I	Sunrise Vistas Utilities Company	Issued		B	19	N	21	W	18	31	13	Lake Mohave
22	400612	Sunrise Vistas Tract 4108-J	Sunrise Vistas Utilities Company	Issued		B	19	N	21	W	18	22	9.24	Lake Mohave
22	400801	Sunrise Vistas Tract 4108-K	Sunrise Vistas Utilities Company	Issued		B	19	N	21	W	18	22	9.2	Lake Mohave
22	400877	Sunrise Vistas - Tract 4108-L	Sunrise Vistas Utilities Company	Issued		B	19	N	21	W	18	23	9.66	Lake Mohave
22	400999	Sunrise Vistas - Tract4108-M	Sunrise Vistas Utilities	Issued		B	19	N	21	W	18	30	12.6	Lake Mohave
22	400998	Sunrise Vistas - Tract4108-N	Sunrise Vistas Utilities	Issued		B	19	N	21	W	18	30	14.2	Lake Mohave
22	400445	Sunset Ranchos II, Tract 4156	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	13	18		
22	400445	Sunset Ranchos Unit 2		Issued		B	19	N	22	W	13			Detrital Valley
22	401293	Sunset Vista	dry lot	Issued		B	25	N	19	W	04	10		Detrital Valley
22	400852	Terra Vista Skies	Beaver Dam Water Company	PENDWAS		B	40	N	16	W	32	30		Virgin River
22	400791	Willow Valley Estates Tract 4134-B	Willow Valley Water Company	Issued		B	18	N	22	W	21	29	12.1	Lake Mohave
22	401816	Pioneer Valley & Paradise Trails Tr. 3802	Double D Water Distributors, Inc.	PENDWAS		B	18	N	18	W	25,35	232		Sacramento Valley
22	401814	Virgin Acres, aka Biasi Ranch	Biasi Water Company	PENDWAS		B	41	N	15	W	29			Virgin River
22	401821	Sagebrush Trails Estates	Sagebrush Trails Domestic Water Improvement District	PENDWAS		B	14	N	17	W	03	97		Sacramento Valley
23	300230	Sterling, Arizona		Issued	26-Jul-99	B	16	N	20	W				Sacramento Valley

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23	401774	Ranch at White Hills	Double Diamond Utilities	PENDAAWS		B	28	N	19	W				Detrital Valley
23	401774	Ranch at White Hills	Double Diamond Utilities	PENDAAWS		B	27	N	19	W				Detrital Valley
23	401774	Ranch at White Hills	Double Diamond Utilities	PENDAAWS		B	27	N	21	W				Detrital Valley
23	401774	Ranch at White Hills	Double Diamond Utilities	PENDAAWS		B	28	N	20	W				Detrital Valley
23	401774	Ranch at White Hills	Double Diamond Utilities	PENDAAWS		B	27	N	20	W				Detrital Valley
23	401674	Villages at White Hills, The	Double Diamond Utilities	PENDAAWS		B	27	N	20	W	16,20, 21,23, 30	30464		Detrital Valley
23	401674	Villages at White Hills, The	Double Diamond Utilities	PENDAAWS		B	27	N	21	W	25	30464		Detrital Valley
23	401823	Golden Valley 5800		PENDAAWS		B	20	N	18	W	02-04,08-11,14, 16	32000		Sacramento Valley
23	401823	Golden Valley 5800		PENDAAWS		B	21	N	18	W	34	32000		Sacramento Valley
33	96790	Wind Rivers Resources LLC	Virgin Valley Water District			B	39	N	16	W				Virgin River
		Cedar Hill Ranches #8	dry lot	Unsub	10-Jul-96	B	21	N	13	W	33, 34, 35, 36			Big Sandy
		Pioneer Valley		Unsub	12-Aug-97	B	18	N	18	W	35			Sacramento Valley
		Toro Acres, Sunward Ho! #2	dry lot	Issued	12-Feb-02	B	23	N	16	W	18,19	31		Hualapai Valley
		Stagecoach Trails Unit 13		Unsub	13-Jan-99	B	17	N	16	W	31			Sacramento Valley
		Stagecoach Trails Unit 13		Unsub	13-Jan-99	B	17	N	17	W	25			Sacramento Valley
		Golden Valley County Improvement Dist #1		Issued	13-Jul-95									
		Sun Valley Tract 4018A,B		Issued	14-Jul-97	B	19	N	22	W	36	302		
		Stagecoach Trails Unit 8		Unsub	15-Jun-98	B	15	N	17	W	05			Sacramento Valley
		Stagecoach Trails Unit 8		Unsub	15-Jun-98	B	16	N	16	W	19,27			Sacramento Valley

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		Stagecoach Trails Unit 8		Unsub	15-Jun-98	B	16	N	17	W	21,23, 27,29			Sacramento Valley
		Mohave Sunrise Tract 1084B	Bermuda Water Company, Inc.	Issued	18-May-89	B	19	N	22	W	11	99		Lake Mohave
		Mountain End Ranches		Unsub	19-Apr-96	B	24	N	12	W	05			Peach Springs
		Willow Creek Ranch, Unit 3		Unsub	1-Apr-98	B	21	N	11	W	22,27, 29			Big Sandy
		Goldroad Station #11		Unsub	20-Mar-97	B	20	N	18	W	32			Sacramento Valley
		Round Valley Ranches	dry lot	Unsub	22-Jul-96	B	21	N	13	W	33-36			Big Sandy
		Unnamed property, Mohave Co.	dry lot	Unsub	22-May-96	B	23	N	11	W	27,35			Big Sandy
		Courtney Park East Tract 4147-B	Bermuda Water Company, Inc.	Issued	23-Jun-97	B	19	N	22	W	23	64	14.33	Lake Mohave
		Stagecoach Trails Unit 4		Unsub	25-Aug-97	B	15	N	15	W	15			Sacramento Valley
		Stagecoach Trails Unit 4		Unsub	25-Aug-97	B	15	N	16	W	19, 29, 31			Sacramento Valley
		Willow Creek Ranch, Unit 6		Unsub	26-Mar-99	B	22	N	11	W	33			Big Sandy
		Willow Creek Ranch, Unit 6		Unsub	26-Mar-99	B	21	N	11	W	03,05			Big Sandy
		Willow Creek Ranch, Unit 5		Unsub	27-Oct-98	B	22	N	11	W	23,25, 35			Big Sandy
		Round Valley Ranches	dry lot	Unsub	27-Sep-96	B	21	N	12	W	31			Big Sandy
		Round Valley Ranches	dry lot	Unsub	27-Sep-96	B	21	N	13	W	33-36			Big Sandy
		Unnamed property, Mohave Co.	dry lot	Unsub	29-Jan-96	B	23	N	15	W	18-20, 29, 30			Hualapai Valley
		Willow Tree Resort HYDRO STUDY	White Hills Water Company	Dead	29-Nov-95	B	27	N	20	W	19,30	1307	1000	Detrital Valley
		Sun Valley Tract 4063B	Bermuda Water Company, Inc.	Issued	29-Oct-97	B	19	N	22	W	36			Lake Mohave
		Stagecoach Trails Unit 7		Unsub	2-Apr-98	B	15	N	17	W	07,09, 17,19			Sacramento Valley
		Stagecoach Trails Unit 7		Unsub	2-Apr-98	B	16	N	17	W	25,33, 35			
		Willow Creek Ranch, Unit 1		Unsub	30-Jul-97	B	21	N	11	W	17,15, 14,22, 23			Big Sandy

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		Stagecoach Trails Unit 11		Unsub	3-Nov-98	B	16	N	17	W	01,03, 05			Sacramento Valley
		Hidden Meadows Unit 1		Unsub	4-Mar-99	B	23	N	16	W	03			Hualapai Valley
		Stagecoach Trails Unit 12		Unsub	8-Dec-98	B	15	N	17	W	07,17, 21			Sacramento Valley
		Stagecoach Trails Unit 12		Unsub	8-Dec-98	B	16	N	17	W	29			Sacramento Valley
		Stagecoach Trails Unit 5		Unsub	8-Jan-98	B	16	N	16	W	33			
		Stagecoach Trails Unit 5		Unsub	8-Jan-98	B	15	N	16	W	03,05, 07,09, 17			
		Stagecoach Trails Unit 5		Unsub	8-Jan-98	B	15	N	17	W	13			
		Willow Creek Ranch, Unit 2		Unsub	8-Jan-98	B	21	N	11	W	21,22			Big Sandy
		Stagecoach Trails Unit 18		Unsub	8-Mar-00	B	16	N	16	W				Sacramento Valley
		Stagecoach Trails Unit 6		Unsub	9-Feb-98	B	16	N	16	W	29,31			Sacramento Valley
		Stagecoach Trails Unit 6		Unsub	9-Feb-98	B	15	N	17	W	01,03, 11,21, 29,33			Sacramento Valley
		Mountain Shadow Estates	dry lot	Unsub	9-Oct-96	B	20	N	14	W	08			Big Sandy
		Stagecoach Trails Unit 10		Unsub	9-Sep-98	B	17	N	17	W	19,31			Sacramento Valley
		Stagecoach Trails Unit 10		Unsub	9-Sep-98	B	16	N	17	W	07,09, 11			Sacramento Valley
		Agua View Tract 1051	Fort Mohave Tribal Utilities	Issued		B	17	N	22	W	23	56	15.6	Lake Mohave
		Airport Way Ranches		Unsub		B	21	N	16	W	04			Sacramento Valley
		Amatista Acres, Sunward Ho! Rn	dry lot	Issued		B	23	N	16	W	29	17		Hualapai Valley
		American Business Park	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35			Lake Mohave
		American Business Park Tct4075	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35			Lake Mohave
		Antelope Valley Ranch		Unsub		B	23	N	10	W	17, 19			Big Sandy
		Antelope Valley Ranch		Unsub		B	23	N	11	W	25			Big Sandy
		Antelope Valley Ranch		Unsub		B	23	N	11	W	11			Peach Springs
		Antelope Valley Ranch		Unsub		B	22	N	11	W	01			Big Sandy
		Antelope Valley Ranch		Unsub		B	24	N	10	W	21, 31, 33			Peach Springs
		Arizona West Tract 1112	Truxton Canyon Water Company	Issued		B	23	N	15	W	11	256	81.7	Hualapai Valley

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		Arizona West Tract 1112	Truxton Canyon Water Company	Ret-Sub		B	23	N	15	W	11			Hualapai Valley
		Arrowhead Ranch		Dead		B	19	N	22	W	23			Lake Mohave
		Arroyo Vista Estates	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	12			Lake Mohave
		Arroyo Vista Estates Tract 4077E	Bullhead City, City of	Dead		B	19	N	22	W	12	57	16	Lake Mohave
		Aztec Junction Tract 3019	Valley Pioneer Water Company	Issued		B	12	N	18	W	10			Lake Havasu
		Aztec Village Tract 4144		Dead		B	19	N	22	W	23			Lake Mohave
		Aztec Village Tract 4144A	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23	7	5.37	Lake Mohave
		Aztec Villas Tract 4065	Bermuda Water Company, Inc.	Dead		B	19	N	22	W	23			Lake Mohave
		Basinger/Land near Kingman		Dead		B	22	N	16	W	01-03, 09-12, 14, 15, 21, 22			Hualapai Valley
		Beaver Dam Estates	Beaver Dam East Domestic W.I.D.	Issued		B	41	N	15	W	05	48	13.4	Virgin River
		Beaver Dam Oasis	dry lot	Issued		B	41	N	15	W	33	9	1.76	Virgin River
		Beaver Dam Resort, Inc.	Beaver Dam Water Company	Issued		B	40	N	15	W	04, 05			Virgin River
		Bermuda Dunes Tract 4039A	Bermuda Water Company, Inc.	Issued		B	17	N	22	W	15			Lake Mohave
		Bermuda Dunes Tract 4039C	Bermuda Water Company, Inc.	Issued		B	17	N	22	W	15			Lake Mohave
		Bermuda Dunes Tract 4039D	Bermuda Water Company, Inc.	Issued		B	17	N	22	W	15			Lake Mohave
		Bermuda Dunes Tract 4059B	Bermuda Water Company, Inc.	Issued		B	17	N	22	W	15			Lake Mohave
		Bermuda Meadows	Fort Mohave Tribal Utilities Authority	Issued		B	17	N	22	W	15			Lake Mohave
		Bermuda Meadows	Bermuda Water Company, Inc.	Issued		B	17	N	22	W	15			Lake Mohave
		Bermuda Meadows (A)	Fort Mohave Tribal Utilities Authority	Issued		B	17	N	22	W	15	4		Lake Mohave
		Bermuda Meadows (B)	Fort Mohave Tribal Utilities Authority	Issued		B	17	N	22	W	15	8		Lake Mohave
		Beverly Hills Estates Tract 4028	dry lot	Issued		B	19	N	22	W	25			Lake Mohave
		Black Hills Ranchos Tract 3301	Golden Valley Improvement District #1	Issued		B	21	N	19	W	14	23	5.15	Sacramento Valley
		Black Mountain Medical Center,Tract 5045		Dead										Lake Mohave
		Black Mountain Park	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	23	988	574.8	Lake Mohave
		Blue Water Manor Condominiums		Dead		B	20	N	22	W	17			Lake Mohave

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		Bluewater Shores	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	17	4	1.1	Lake Mohave
		Boundary Cone Vista		Dead		B	18	N	21	W	06			Lake Mohave
		Brookfield @ Fox Creek Tract 5064 #3		Pending		B	20	N	21	W	31		20	Lake Mohave
		Buckeye Havasu Heights		Unsub		B	16	N	19	W	01			Sacramento Valley
		Buena Vista #4	Oasis Utility Company	Issued		B	20	N	22	W	16			Lake Mohave
		Bullhead Airpark Phase I	North Mohave Valley Corporation	Dead		B	21	N	21	W	31, 32	30		Lake Mohave
		Bullhead Plaza	Oasis Water Company	Issued		B	20	N	22	W	18			Lake Mohave
		Bullhead/Laughlin Airport		Ret-Sub										Lake Mohave
		Calvary Ranch Estates		Unsub		B	21	N	17	W	11,14			Sacramento Valley
		Camino Colorado Estates		Dead										
		Camp Mohave Heights	Citizens Utilities Company-Mohave	Issued		B	19	N	22	W	23			Lake Mohave
		Canyon Hills Golf Course		Dead		B	20	N	22	W	35			Lake Mohave
		Canyon Ranches		Unsub		B	22	N	17	W	14, 15			Sacramento Valley
		Canyon Ranches		Unsub		B	23	N	17	W	03, 05, 09, 15, 23			Hualapai Valley
		Canyon Ranches		Unsub		B	24	N	17	W	27, 31, 33			Hualapai Valley
		Casa Blanca	Citizens Utilities Company-Mohave	Issued		B	20	N	23	W	13	13	2	Lake Mohave
		Casa de Rio Villas Condos	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	17			
		Casa Grande Condominiums	North Mohave Water Company	Issued		B	21	N	21	W	21	19	4.25	Lake Mohave
		Castle Rock Heights		Unsub		B	22	N	17	W	30,31			
		Cedar Estates Tract 3801	dry lot	Dead		B	21	N	13	W	30			
		Cedar Hills Ranches #1		Unsub		B	21	N	14	W	19,20, 21,28 29,33			
		Cedar Hills Ranches #2		Unsub		B	21	N	14	W	19,29, 30,31, 32			
		Cedar Hills Ranches #3		Unsub		B	21	N	14	W	22,23			

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		Cedar Hills Ranches #4		Unsub		B	21	N	13	W	19			
		Cedar Hills Ranches #4		Unsub		B	21	N	14	W	24			
		Cedar Hills Ranches #5		Unsub		B	21	N	14	W	13-15			
		Cedar Hills Ranches #6		Unsub		B	21	N	14	W				
		Cedar Hills Ranches #7		Unsub		B	21	N	14	W	36	16		Big Sandy
		Cedar Hills Ranches #8		Unsub		B	21	N	13	W	30	8		Big Sandy
		Cedar Hills Ranches #10		Unsub		B	21	N	13	W	15,22, 23,24			Hualapai Valley
		Cedar Hills Ranches #10		Unsub		B	21	N	14	W	05,06, 07,08			Hualapai Valley
		Cedar Hills Ranches #10		Unsub		B	21	N	12	W	19			Hualapai Valley
		Cedar Hills Ranches #11		Unsub		B	21	N	14	W	04,09			Hualapai Valley
		Cedar Hills Ranches #9		Unsub		B	21	N	14	W	16,17, 20			Hualapai Valley
		Cedar Hills Ranches #9		Unsub		B	21	N	13	W	20,25, 26,35, 36			Hualapai Valley
		Cedar Hills Ranches #9		Unsub		B	21	N	12	W	30			Hualapai Valley
		Central Village A	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	19			
		Cerbat Ranches		Unsub		B	22	N	17	W	12			Hualapai Valley
		Cerbat Ranches Unit 1	Cerbat Water Company, Inc.	Issued		B	22	N	17	W	12	125		Hualapai Valley
		Chaparral Country Club Tract 5029	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	29	30	6.72	Lake Mohave
		Chaparral del Rio Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	29			
		Chaparral Terrace	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	29			
		Chaparral Villas Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	29			
		Chaparral Villas Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	29			
		City Hills 320	North Mohave Valley Corporation	Dead		B	21	N	21	W	33			Lake Mohave
		Clearwater Hills #1	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	11			
		Clearwater Hills #2	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	11	75	21.3	
		Clearwater Hills #2,3	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	11			
		Colorado River Estates	dry lot	Issued		B	20	N	22	W	25,26			
		Colorado River Estates	dry lot	Issued		B	20	N	22	W	25,26	128	28.96	Lake Mohave
		Colorado Riverfront Terrace	Bermuda Water Company, Inc.	Issued		B	17	N	22	W	23			
		Colorado Riverfront Terrace #2,Trct 4135		Dead										

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PFX	DWR .	SUBDIVISION	WATER PROVIDER	STATUS	DATE ISSUED	LOC-Q	LOC-T	LOC-T2	LOC-R	LOC-R2	LOC-S	LOTS	ALLOCATION (AF)	GW BASIN
		Delta City #5	Bermuda Water Company, Inc.	Issued		B	17	N	21	W	07			
		Desert Cove Tract 4094		Dead		B	9	N	22	W	26			
		Desert Foothills #1		Dead		B	20	N	21	W	05			
		Desert Foothills Estates #5011	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	05	3353	814.6	Lake Mohave
		Desert Glen	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	13			
		Desert Isle	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	13	15	4.2	Lake Mohave
		Desert Lakes Development	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35,36			
		Desert Lakes Estates Tract 4152		Dead		A	19	N	22	E	36	272	76.2	Lake Mohave
		Desert Lakes Golf Course & Est	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	36	233	65.3	Lake Mohave
		Desert Lakes Golf Course & Est	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35			
		Desert Lakes Golf Course & Estates		Dead		B	19	N	22	W	35			
		Desert Lakes Golf Course & Estates # H		Dead		B	19	N	22	W	35	6	1.68	Lake Mohave
		Desert Lakes Golf Course & Estates #4163		Dead										
		Mauna Kea Village		Dead		B	17	N	22	W	15			
		Mauna Lani Village Tract 4149	Fort Mohave Tribal Utilities Authority	Dead		B	17	N	22	W	15			
		Rio Vista Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	09			
		Rio Vista Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	09			
		Rio Vista Estates	North Mohave Valley Corporation	Dead		B	21	N	21	W	33			Lake Mohave
		Rio Vista Estates	Willow Valley Water Company	Issued		B	18	N	22	W	27	36	12.1	
		Rio Vista Ranches	Citizens Utilities Company-Mohave	Issued		B	19	N	22	W	23			
		Rio Vista Ranches		Unsub		B	16	N	21	W	23,27			
		Copper Creek Ranch		Dead		B	18	N	21	W	06			
		Cottonwood Mountain Ranch		Unsub		B	22	N	12	W	16-20			
		Cottonwood Mountain Ranch		Unsub		B	22	N	13	W	13			
		Cottonwood Mountain Ranches	dry lot	Unsub		B	22	N	12	W	21,22, 27-34			
		Cottonwood Mountain Rnchs #2,3		Unsub		B	22	N	12	W	21,22, 27-34			
		Courtney Greens Tract 4054	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23			
		Courtney Greens #2 Tract 4054B	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23	30	8.4	Lake Mohave
		Courtney Park East 4147A	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23	6	5.38	Lake Mohave
		Courtney Place Tract 4070	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23	5		Lake Mohave

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		Courtney Place Townhomes 4071A	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23	18	5.04	Lake Mohave
		Coves at River Terrace, The, Trct 4139		Dead		B	17	N	22	W	22, 23			
		Coves at River Terrace, The, Trct4139 #2		Dead		B	17	N	22	W	22, 23			
		Covina Gardens Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	29	12	2.7	Lake Mohave
		Curtis Ranch		Unsub		D	18	S	21	E	27,34, 35			Upper San Pedro
		Desert Oasis Farms #1		Unsub		B	20	N	21	W	19			
		Desert Oasis Farms #1		Unsub		B	20	N	21	W	19			
		Desert Ridge Tract 4032A	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	11			
		Desert Shadows Ranchos	dry lot	Issued		B	17	N	17	W	09, 15, 25, 33, 35	947	530	Sacramento Valley
		Desert Shadows Ranchos #03	dry lot	Dead		B	17	N	17	W	33	6	1.7	Sacramento Valley
		Desert Shadows Ranchos #05		Dead		B	17	N	17	W	09			
		Desert Shadows Ranchos #3,4,5		Issued										
		Desert Shadows Ranchos of Arizona Unit 2	dry lot			B	17	N	17	W	31			Sacramento Valley
		Desert Shadows Ranchos of Az #02	dry lot	Issued		B	17	N	17	W	31	12	5.04	Sacramento Valley
		Desert Shores #1L		Dead		B	21	N	21	W	32			
		Desert Shores #1M		Dead		B	21	N	21	W	32			
		Desert Springs Ranchos	dry lot	Issued		B	40	N	15	W	03	21		Virgin River
		Diamond Bar Estates	hauled water	Unsub		B	30	N	17	W	25	14		Meadview
		Diamond M Ranches		Unsub		B	21	N	10	W	09, 15			
		Diamond M Ranches		Unsub		B	21	N	10	W	17			
		Diamond M Ranches		Unsub		B	21	N	10	W	07,09, 19, 21			Big Sandy
		Diamond M Ranches		Unsub		B	21	N	11	W	12, 13			Big Sandy
		Dolan Springs Estates Tract 3009		Dead		B	25	N	19	W	20			Detrital Valley
		Dolan Springs Ranches	dry lot	Unsub		B	26	N	19	W	35			Detrital Valley

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		Dusty Boots Unit 1	dry lot	Unsub		B	28	N	18	W	15	12		Hualapai Valley
		Dusty Boots, Unit II	dry lot	PENDUNSUB		B	28	N	17	W	05			Hualapai Valley
		Dusty Boots, Unit II	dry lot	PENDUNSUB		B	29	N	17	W	33			Hualapai Valley
		Edgewood Condominiums Tr 4021	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	13			
		El Camino Estates	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	01			
		El Camino Village #1	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	01	251	70.3	Lake Mohave
		El Camino Village #2A, Tract 5026	Bullhead City, City of	Dead		B	19	N	22	W	01	5	1.5	Lake Mohave
		El Rodeo Villas Mobile Home Park		Dead		B	19	N	22	W	25			
		Emerald River Estates T4093	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	25	45	12.6	Lake Mohave
		Emerald River Estates Tract 4093B	Bermuda Water Company, Inc.	Dead		B	19	N	22	W	25			Lake Mohave
		Enchantment at Fox Creek, Tract 5069 #1		Pending		B	20	N	21	W	31	40	11.9	
		Esmeralda Acres/Sunward Ho!	dry lot	Issued		B	23	N	16	W	31	19		Hualapai Valley
		Evergreen Addition	Willow Valley Water Company	Issued		B	18	N	22	W	27	38	12.8	
		Evergreen Addition #2	Willow Valley Water Company	Issued		B	18	N	22	W	27	77	25.9	
		Evergreen Addition #3	Willow Valley Water Company	Issued		B	18	N	22	W	27	77	25.9	
		Fairview Mobile Home Estates	Mesquite Farmstead Water Association	Issued		B	40	N	16	W	32			
		Fairway Estates #1-4148A	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35	49	13.7	Lake Mohave
		Fairway Estates #2	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35	28	8.9	Lake Mohave
		Fairway Estates Tract 4097 C		Dead		B	19	N	22	W	35			
		Fairway Estates Tract 4097 D		Dead		B	19	N	22	W	35			
		Fairway Estates Tract 4097 E		Dead		B	19	N	22	W	35			
		Fairway Estates Tract 4097A	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35	100	28	Lake Mohave
		Fairway Estates Tract 4097B	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35	28	7.8	Lake Mohave
		Fox Creek Estates	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	31	1750	494.7	
		Fox Creek Estates #1 Tract 5057	Bullhead City, City of	Dead		B	20	N	21	W	31		6.1	Lake Mohave
		Fox Creek Estates #2 Tract 5058		Pending		B	20	N	21	W	31		13	
		Fox Ridge@Fox Creek Estates Tract 5023		Dead		B	20	N	21	W	31		21.8	Lake Mohave
		Franhi-Chapparal Estates		Unsub		B	39	N	16	W	11			
		Friendly Golden Valley #1	Valley Pioneers Water Company	Issued		B	21	N	18	W	17	63	17.64	Sacramento Valley
		Gateway Acres	dry lot	Issued		B	24	N	19	W	05,07, 17			Detrital Valley

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		Gateway Acres	dry lot	Issued		B	25	N	19	W	19,29			Detrital Valley
		Gateway Acres	dry lot	Issued		B	25	N	19	W	31			Detrital Valley
		Gateway Acres	dry lot	Issued		B	25	N	20	W	01,13			Detrital Valley
		Gateway Acres	dry lot	Issued		B	25	N	19	W	05,07, 09,17, 19,21, 29			Detrital Valley
		Gateway Acres Tract 02	hauled water	Unsub		B	25	N	20	W	33	5		Detrital Valley
		Gateway Acres Tract 03	hauled water	Unsub		B	24	N	20	W	05,09, 17	48		Detrital Valley
		Gateway Acres Tract 05	dry lot	Issued		B	24	N	20	W	23,25			Detrital Valley
		Gateway Acres Tract 06	dry lot	Issued		B	24	N	20	W	13,15			Detrital Valley
		Gateway Acres Tract 06	dry lot	Issued		B	24	N	20	W	11			Detrital Valley
		Gateway Acres Tract 10	hauled water	Issued		B	25	N	19	W	31	14		Detrital Valley
		Gateway Acres Tract 11	dry lot	Issued		B	24	N	19	W	07			Detrital Valley
		Gateway Acres Tract 11	dry lot	Issued		B	24	N	19	W	09			Detrital Valley
		Gateway Acres Tract 12	dry lot	Issued		B	24	N	19	W	19,31			Detrital Valley
		Gold Road Station Unit 11		Unsub		B	20	N	18	W	32			Sacramento Valley
		Golden Acres Tract 4100		Dead		B	21	N	18	W	18			
		Golden Eagle Ranch		Unsub		B	23	N	9	W	06			
		Golden Eagle Ranch		Unsub		B	23	N	10	W	01,29, 30			
		Golden Eagle Ranch #3A		Unsub		B	23	N	10	W	16			Big Sandy
		Golden Horseshoe Ranchos #1	dry lot	Issued		B	27	N	20	W	09			Detrital Valley
		Golden Shores		Ret-Sub		B	16	N	21	W	11			Sacramento Valley
		Golden Shores Tract 4051	Golden Shores Water Company	Issued		B	16	N	21	W	11	32	19	Sacramento Valley
		Golden Valley Project		Dead		B	21	N	18	W	09			
		Goldroad Station #1		Unsub		B	21	N	19	W	22			Sacramento Valley
		Goldroad Station #2		Unsub		B	21	N	19	W	28			Sacramento Valley
		Goldroad Station #3		Unsub		B	20	N	18	W	03			Sacramento Valley
		Goldrush Ranches #2		Pending										
		Goldrush, The, #01, Tract 5044	Bullhead City, City of	Dead		B	20	N	22	W	24	52	11.7	Lake Mohave
		Goldrush, The, #02, Tract 5056		Dead		B	20	N	22	W	24	96		Lake Mohave
		Greater Kingman Industrial Park	dry lot	Issued		B	22	N	15	W	05,17	200		Hualapai Valley
		Greenview Ranches #2		Unsub		B	24	N	10	W	07,17, 19			

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		Greenview Ranches #3		Unsub		B	24	N	10	W	09,21, 33			
		Greenview Ranches #4		Unsub		B	24	N	10	W	31,33			
		Greenview Ranches #5		Unsub		B	23	N	10	W	17			
		Greenview Ranches #6		Unsub		B	23	N	11	W	35			
		Greenview Ranches #6		Unsub		B	23	N	10	W	17			
		Greenview Ranches #7		Unsub		B	23	N	11	W	11			
		Greenview Ranches #7		Unsub		B	24	N	9	W	01			
		Greenview Ranches #7		Unsub		B	25	N	8	W	31			
		Greenview Ranches #7		Unsub		B	25	N	9	W	33			
		Griffith 1500 (see Lazy Y U)		Unsub		B	19	N	17	W	07,19, 31			Sacramento Valley
		Griffith 1500 (see Lazy Y U)		Unsub		B	20	N	17	W	31			Sacramento Valley
		Hidden Meadows Unit 2		Unsub		B	24	N	16	W	26			
		Highlands, The, Tract 4091A		Dead		B	18	N	21	W	07			
		Highlands, The, at Desert Foothills Esta	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	05	211	59.1	Lake Mohave
		Hillcrest Park #1		Dead		B	21	N	21	W	29	83	18.6	Lake Mohave
		Holiday Hills	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	29			
		Holiday Shores	Oasis Utility Company	Issued		B	20	N	22	W	18			
		Holiday Shores #4	Oasis Utility Company	Issued		B	20	N	22	W	18			
		Holiday Shores #6	Oasis Utility Company	Issued		B	20	N	22	W	18			
		Holiday Shores #6	Oasis Utility Company	Issued		B	20	N	22	W	18			
		Holiday Shores #7	Oasis Utility Company	Issued		B	20	N	18	W	18	92		Sacramento Valley
		Hollingsworth Ranch Tract 4111		Dead		B	18	N	22	W	11, 15			
		Hollingsworth Tentative Tract 4091		Dead		B	18	N	21	W	07			
		Hualapai Meadows		Unsub		B	21	N	16	W	01,11			
		Inn at Tamarisk	Havasu Water Company	Issued		B	14	N	21	W	21			
		J. Bar H. Ranches		Unsub		B	22	N	15	W	09			Hualapai Valley
		Joshua Heights at Santa Fe Ranch		Unsub		B	18	N	17	W	20			Sacramento Valley
		Joy Lane Plaza	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	26	13	2.9	Lake Mohave
		Kingman Ranch #1		Unsub		B	21	N	16	W	03			
		Kingman Valley Ranches		Unsub		B	23	N	15	W	27,28, 33			Hualapai Valley
		Kingman, City of, review		Issued										
		La Mesa Acres Tract 4038	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	13			

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		La Paloma Condominiums	North Mohave Valley Corporation	Issued		B	21	N	21	W	21	194.26		Lake Mohave
		Lagoon Estates #6	Lagoon Estates Water Company	Issued		B	17	N	22	W	01			
		Lagoon, The	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	09			
		Lake Havasu Estates # 08 & 09		Issued		B	17	N	17	W	25,35			Sacramento Valley
		Lake Havasu Estates #08	dry lot	Issued		B	17	N	17	W	35			Sacramento Valley
		Lake Havasu Estates #15	dry lot	Issued		B	17	N	16	W	17			Sacramento Valley
		Lake Havasu Heights	dry lot	Issued		B	15	N	19	W	07	18		Sacramento Valley
		Lake Havasu Mobile Home Estate	Havasu Water Company	Ret-Sub		B	14	N	20	W	21			
		Lake Havasu Mobile Home Estate		Ret-Sub		B	14	N	20	W	21			
		Lake Havasu Terrace		Dead		B	17	N	17	W	19			
		Lake Juniper Estates	Lake Juniper Water Company	Issued		B	22	N	17	W	11,14	197	55	Hualapai Valley
		Lake Mead Rancheros #1-12	dry lot	Issued		B	25	N	15	W	12,15, 17,19, 21,23, 25,			Hualapai Valley
		Lake Mead Rancheros #1-12	dry lot	Issued		B	25	N	15	W	27,29 31,33, 35	1606		Hualapai Valley
		Lake Mohave Highlands	Lake Mohave Highlands Water Company	Issued		B	21	N	21	W	29			
		Lake Mohave Highlands	Lake Mohave Highlands Water Company	Issued		B	21	N	21	W	29			
		Lake Mohave Highlands	Lake Mohave Highlands Water Company	Issued		B	21	N	21	W	29			
		Lake Mohave Highlands #4	Lake Mohave Highlands Water Company	Issued		B	21	N	21	W	29			
		Lake Mohave Highlands Ranchett		Unsub		B	21	N	21	W	29			
		Lake Mohave Ranches #13,13A	dry lot, Mt. Tipton Water Co.	Ret-Unsub		B	26	N	18	W	01,11			Hualapai Valley
		Lake Mohave Ranches #15	dry lot, Mt. Tipton Water Company	Ret-Unsub		B	26	N	19	W	01			Hualapai Valley
		Lake Mohave Ranchos	dry lot	Issued		B	25	N	18	W	07			Detrital Valley

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		Lake Mohave Ranchos	dry lot	Issued		B	25	N	19	W	01,11, 12,15, 23,25, 27			Detrital Valley
		Lake Mohave Ranchos	dry lot	Issued		B	26	N	18	W	01,03, 05,07, 09,11, 13,15			Hualapai Valley
		Lake Mohave Ranchos	dry lot	Issued		B	26	N	19	W	21,25, 27,29, 31,33			Hualapai Valley
		Lake Mohave Ranchos	dry lot	Issued		B	26	N	20	W	35			Detrital Valley
		Lakeside Estates	Oasis Utility Company	Issued		B	20	N	22	W	18			
		Lakeview Village Tract 4097	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35	279	79	Lake Mohave
		Lanstarr Properties		Unsub		B	21	N	21	W	23			
		Las Estancias Tract 1199	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	26			
		Laughlin Ranchos		Unsub		B	21	N	15	W	25	13		Hualapai Valley
		Lazy Y-U Ranch #2		Unsub		B	20	N	16	W	04,05, 08,09, 17			Sacramento Valley
		Lazy Y-U Ranch #4		Unsub		B	20	N	17	W	19,31			Sacramento Valley
		Lone Star Commercial Park	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23	9	3	Lake Mohave
		Long Mountain Ranches		Unsub		B	22	N	16	W	03,10, 15	48		Hualapai Valley
		Los Lagos	Bermuda Water Company, Inc.	Issued		B	18	N	22	W	01	457	128	Lake Mohave
		Los Lagos Country Club Villas #4166		Pending										
		Mead-O-Rama #2	dry lot	Issued		B	29	N	19	W	27			Hualapai Valley
		Mead-O-Rama #3	dry lot	Issued		B	29	N	18	W	35	141		Hualapai Valley
		Mead-O-Rama #4	dry lot	Issued		B	29	N	17	W	31	441		Hualapai Valley
		Meadview	Joshua Valley Utility Company	Issued		B	30	N	17	W	01,12			
		Meadview	dry lot	Issued		B	30	N	17	W	35			
		Meadview Highlands	Joshua Valley Utility Company	Issued		B	30	N	17	W	01			
		Meadview Unit #5	dry lot	Issued		B	30	N	17	W	15			
		Meadview Unit #5	dry lot	Issued		B	29	N	17	W	11,13			

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		Mesa Heights		Dead		B	19	N	22	W	12			
		Mesa Villas Tract 4146	Bermuda Water Company, Inc.	Dead		B	19	N	22	W	23			
		Mesa Vista Tract 4117		Dead		B	19	N	22	W	24			
		Miracle View Condominiums		Dead		B	20	N	22	W	26			
		Miracle View Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	26			
		Mission Park Ranch Tract 4072A		Dead		B	19	N	22	W	25			
		Mohave Meadows	Truxton Canyon Water Company	Ret-Sub		B	23	N	15	W	11	72		Hualapai Valley
		Mohave Mesa Estates Tract 4013	dry lot	Issued		B	19	N	22	W	27			
		Mohave Sun Valley Airport	Bermuda Water Company, Inc.	Issued		B	18	N	22	W	25			
		Mohave Sun Valley Airport	Bermuda Water Company, Inc.	Issued		B	18	N	22	W	25			
		Mohave Sunrise Tract 4085	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	11			Lake Mohave
		Mohave Valley Business Park	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23			
		Mohave Valley Business Park	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23			
		Monte Vista Estates	dry lot	Issued		B	18	N	22	W	23			
		Moon Ridge	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	25	99	27.7	Lake Mohave
		Moon Valley Tract 4120	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	25	16	4.4	Lake Mohave
		Moonshine Spring--Exxon		Dead										
		Mountain Meadow Estates Unit 2	dry lot	PENDUNSUB		B	24	N	16	W	6-8,16-18	85		Hualapai Valley
		Mountain Shadows @ Fox Creek		Pending		B	20	N	21	W	31	73	33.1	Lake Mohave
		Mountain View Ranches	dry lot	Issued		B	18	N	21	W	05			
		Mountain View Ranches	dry lot	Issued		B	18	N	21	W	05			
		Mountain View Ranches Tr 4003D	dry lot	Issued		B	18	N	21	W	05			
		Mountain Vista Ranches		Unsub		B	25	N	15	W	01,02, 05,09, 11,13, 15,21, 25,26			Hualapai Valley
		Mountain Vista Ranches Phase 3		Unsub		B	24	N	15	W	04,10, 12,14, 22,24, 26			Hualapai Valley

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		Mountain Vista Ranches Phase 3		Unsub		B	24	N	14	W	18, 20, 30			Hualapai Valley
		Mountain Vista Ranches Phase 3-A		Unsub		B	24	N	15	W	22,28			Hualapai Valley
		Mountainside Ranch by Dave Brown #4106A		Dead		B	18	N	21	W	06			
		Mountainside Ranch by Dave Brown #4106B		Dead		B	18	N	21	W	06			
		Mountainside Ranch by Dave Brown #4106C		Dead		B	18	N	21	W	06			
		Music Mountain Ranches		Unsub		B	25	N	14	W	07,09 17,19, 21,29, 33			Hualapai Valley
		Music Mountain Ranches		Unsub		B	24	N	14	W	09,17, 19,21, 29,33			Hualapai Valley
		Orchards, The Tract 3800	dry lot	Issued		B	16	N	13	W	27			
		Overlook, The Tract 4137		Dead		B	19	N	22	W	14			
		Palm Estates #2 Tract 4104	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	14	56	10.6	Lake Mohave
		Palm Villa Ranchos Tract 1226	Bermuda Water Company, Inc.	Issued		B	10	N	22	W	11			
		Palma Quartz	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	17	33	7.3	Lake Mohave
		Palms on the Mesa Tract #4126		Dead		B	19	N	22	W	26			
		Palo Verde Executive Warehouse #5059		Dead									2	
		Palo Verde Place Tract 4006	Rio Utility Company, Inc.	Issued		B	20	N	22	W	32	420		Lake Mohave
		Palo Verde Place Tract 4006-E	Rio Utility Company, Inc.	Issued		B	20	N	22	W	32	68	19	Lake Mohave
		Palo Verde Plaza #3 Tract 5025		Pending										
		Palo Verde Plaza Tract 5025		Dead										
		Palo Verde Plaza, Tract 5025, $3		Pending										
		Palos Verdes Tract 4131		Dead		B	19	N	22	W	31			
		Paradise Trails	Double R Water Distributors, Inc.	Dead		B	18	N	18	W	25	110		Sacramento Valley
		Park at Mesquite Creek, The	Fort Mohave Tribal Utilities	Issued		B	18	N	22	W	12	226	63.3	Lake Mohave

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		Peacock Mountain Estates		Unsub		B	22	N	15	W	13, 15, 23			
		Peacock Mountain Ranches		Unsub		B	21	N	15	W	07, 17			Hualapai Valley
		Peacock Mountain Ranches #1		Unsub		B	21	N	15	W	05, 07, 09, 17			Hualapai Valley
		Peacock Mountain Ranches #2		Unsub		B	22	N	15	W	11			Hualapai Valley
		Pebble Lake #2	Pebble Lake Water Company	Issued		B	19	N	22	W	34			
		Pebble Lake #2	Pebble Lake Water Company	Ret-Sub		B	19	N	22	W	34			
		Pebble Lake #3	Pebble Lake Water Company	Issued		B	19	N	21	W	34			
		Pegasus Ranch	Citizens Utilities Company-Mohave	Issued		B	21	N	21	W	29	100	44.8	Lake Mohave
		Pegasus Ranch Tract 4019-A	Citizens Utilities Company-Mohave	Issued		B	21	N	21	W	29			
		Peppermill Palms Resort	Mesquite Farmstead Water Association	Dead		B	39	N	16	W	05			
		Perry Acres #2 Tract 4026	Mohave Valley Water Company	Issued		B	18	N	22	W	13			
		Perry Acres Tract 4007	Mohave Valley Water Company	Issued		B	18	N	22	W	13			
		Perry Meadows Tract 4073		Dead		B	18	N	22	W	13			
		Phase I, North 1/2 Section 32		Dead		B	20	N	21	W	32			
		Phase II, North 1/2 Section 32		Dead		B	20	N	21	W	32			
		Pierce Ferry-Meadview 40's		Unsub		B	29	N	17	W	03			
		Pima River Estates	Bermuda Water Company, Inc.	Dead		B	19	N	22	W	25			
		Pine River Estates Tract 4128	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	25	17	4.7	Lake Mohave
		Pinion Pines Estates #2	dry lot	Issued		B	20	N	15	W	06			
		Pioneer Valley	dry lot	Unsub		B	18	N	18	W	35	64		Sacramento Valley
		Pioneer Valley		Unsub		B	18	N	18	W	35			Sacramento Valley
		Pueblo Grove	dry lot	Issued		B	18	N	22	W	35			
		Punto de Vista #5	Thumb Butte Water Association	Issued		B	21	N	21	W	27			
		Punto de Vista, Tract 5021		Dead		B	21	N	21	W	21			
		Punto de Vista, Tract 5022		Dead		B	21	N	21	W	27			
		Quail Valley Estates	Cerbat Water Company, Inc.	Issued		B	22	N	17	W	12	32	15.7	Hualapai Valley
		Rancho Colorado	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	18,19			
		Rancho Colorado	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	13			
		Rancho Grande Tract 4083	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	14	71	22.3	Lake Mohave

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		Rancho Palo Verde Tract 4138		Dead		B	17	N	22	W	01			
		Rancho Rio Bonito #1		Dead		B	19	N	21	W	31			
		Rancho Verde Estates	Valley Pioneers Water Company	Issued		B	21	N	18	W	17	60	23.91	Sacramento Valley
		Rancho Verde Estates #2	Valley Pioneers Water Company	Issued		B	21	N	18	W	17	263	420.1	Sacramento Valley
		Red Wing Canyon Estates	dry lot	Issued		B	23	N	17	W	23	30		Hualapai Valley
		Rio Camino Tract 4123	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23	34	9.5	Lake Mohave
		Rio Colorado Properties Corp.		Dead		B		N		W				
		Rio Hacienda	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	14			
		Rio Lado Villas Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	23	W	13			
		Rio Las Palmas	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	01			
		Rio Lindo Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	23	W	13			
		Rio Lomas #4	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	11			
		River Retreat	Citizens Utilities Company-Mohave	Issued		B	20	N	23	W	13			
		River Road City Tract 1022	Fort Mohave Tribal Utilities	Issued		B	17	N	22	W	11	141	39.4	Lake Mohave
		River View Mall	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	23			
		River View Ranches	dry lot	Issued		B	19	N	22	W	13			
		Riverfront Estates		Dead		B	20	N	22	W	32			
		Rivershore Villas Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	09			
		Riverview Bluffs #2A	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	13			
		Riverview Bluffs Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	13			
		Riverview Estates	Citizens Utilities Company-Mohave	Dead		B	21	N	21	W	29			Lake Mohave
		Riviera Commercial Park	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	19			
		Riviere D' Azur Villas	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	16	243	55	Lake Mohave
		Roadhaven Marina Condominiums	Oasis Utility Company	Issued		B	20	N	22	W	16			
		Roadhaven Marina Condos #2	Oasis Utility Company	Issued		B	20	N	22	W	16			
		Roadhaven Marina Condos #3	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	16			
		Roadhaven Resort of Bullhead Cty	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	24			
		Rodeo Park Tract 4145		Dead		B	19	N	22	W	23			Lake Mohave
		Sacramento Valley Ranches So.		Unsub		B	19	N	18	W	22,24-26,28-30			Sacramento Valley
		Saddle Mountain Acres	dry lot	Issued		B	24	N	14	W	27,35			Hualapai Valley
		Sage Estates Tract 4105		Dead		B	19	N	22	W	25			
		Sagebrush Trails		Unsub		B	14	N	17	W	03			
		Sagebrush Trails		Unsub		B	15	N	17	W	35			
		Santa Claus Acres #2	dry lot	Issued		B	23	N	18	W	19	64		Sacramento Valley

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		Secret Pass Industrial Park #1L		Dead		B	20	N	21	W	06			
		Seventh Street Commerce Park #1		Dead		B	21	N	21	W	06			
		Shadow Canyon Ranches		Unsub		B	23	N	17	W	11	15		Hualapai Valley
		Shores, The	Citizens Utilities Company-Mohave	Issued		B	20	N	23	W	13			
		Sierra Vista	dry lot	Dead		B	20	N	14	W	13	112		Big Sandy
		Silver Creek Hills		Dead		B	20	N	21	W	20			
		Silver Ridge Townhouse Condos	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	19	210	47	Lake Mohave
		Silver Sands Estates	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	26	159	44.5	Lake Mohave
		Silverado Estates		Unsub		B	20	N	13	W	05,09, 15,17, 21-23,28, 29			
		South Valley Park Tract 4068	Bermuda Water Company, Inc.	Issued		B	17	N	22	W	15			
		Spring Valley Ranches		Unsub		B	23	N	13	W	31			
		Spring Valley Ranches		Unsub		B	23	N	14	W	23, 25, 26, 27, 35			
		Spring Valley Ranches #3		Unsub		B	22	N	14	W	03,15			
		Spring Valley Ranches, Unit 2		Unsub		B	22	N	14	W	01, 11, 13			
		Spring Valley Ranches, Unit 2		Unsub		B	22	N	13	W	07			
		Stage Coach Trails Phase II		Unsub		B	16	N	16	W	35			Sacramento Valley
		Stage Coach Trails Phase II		Unsub		B	15	N	15	W	09, 19, 29, 31, 33			Sacramento Valley

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		Stage Coach Trails Phase II		Unsub		B	15	N	16	W	03,11, 13,15, 21,23, 25,27, 29 35			Sacramento Valley
		Stage Coach Trails Phase II		Unsub		B	16	N	15	W	31			Sacramento Valley
		Stagecoach Trails Unit 15		Unsub		B	15	N	15	W	28,30, 32			Sacramento Valley
		Stagecoach Trails Unit 15		Unsub		B	15	N	16	W	26,32, 34,36,			Sacramento Valley
		Stagecoach Trails Unit 15		Unsub		B	15	N	17	W	22,24, 28,32, 24,36			Sacramento Valley
		Stagecoach Trails Unit 16		Unsub		B	15	N	16	W	16,18, 20,22, 24,28, 30			Sacramento Valley
		Stagecoach Trails Unit 16		Unsub		B	15	N	15	W	20,22			Sacramento Valley
		Stagecoach Trails Unit 16		Unsub		B	15	N	17	W	08,10, 14,16, 24,26			Sacramento Valley
		Stagecoach Trails Unit 17		Unsub		B	15	N	15	W	08,16, 18			Sacramento Valley
		Stagecoach Trails Unit 17		Unsub		B	15	N	16	W	02,04, 06,08, 10,12, 14			Sacramento Valley
		Stagecoach Trails Unit 17		Unsub		B	15	N	17	W	02,04, 06,12, 18			Sacramento Valley
		Stagecoach Trails Unit 17		Unsub		B	16	N	17	W	32			Sacramento Valley
		Stagecoach Trails Unit 19		Unsub		B	16	N	16	W	13			Sacramento Valley

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		Stagecoach Trails Unit 19		Unsub		B	16	N	17	W	02,04, 06,08, 10			Sacramento Valley
		Stagecoach Trails Unit 19		Unsub		B	17	N	17	W	20,28, 32,34			Sacramento Valley
		Stagecoach Trails Unit 20		Unsub		B	18	N	18	W	26			Sacramento Valley
		Stagecoach Trails Unit 20		Unsub		B	17	N	18	W	22,26, 28,34			Sacramento Valley
		Stagecoach Trails Unit 20		Unsub		B	16	N	18	W	02,04, 10,12, 14			Sacramento Valley
		Stagecoach Trails Unit 21		Unsub		B	16	N	16	W	13,21, 25			Sacramento Valley
		Stagecoach Trails Unit 22		Unsub		B	17	N	17	W	19,20, 21,22, 23,26-36			Sacramento Valley
		Stagecoach Trails Unit 22		Unsub		B	17	N	18	W	24,36			Sacramento Valley
		Stagecoach Trails Unit 23		Unsub		B	16	N	16	W	09,11, 14,15			Sacramento Valley
		Stagecoach Trails Unit 24		Unsub		B	16	N	17	W	20			Sacramento Valley
		Stagecoach Trails Unit 9		Unsub		B	16	N	16	W	07,17, 21			Sacramento Valley
		Stagecoach Trails Unit 9		Unsub		B	17	N	17	W	13,15, 17			Sacramento Valley
		Stockton Hill Ranches #03		Unsub		B	24	N	16	W	29			
		Stockton Hill Ranches #03		Unsub		B	23	N	16	W	21,28			
		Stockton Hill Ranches #05		Unsub		B	23	N	16	W	28,29			
		Stockton Hill Ranches #06		Unsub		B	23	N	17	W	01,13			Hualapai Valley
		Stockton Hill Ranches #06		Unsub		B	22	N	17	W	13			Hualapai Valley
		Stockton Hill Ranches #06		Unsub		B	23	N	17	W	25,35			Hualapai Valley
		Stockton Hill Ranches #06		Unsub		B	24	N	16	W	21			Hualapai Valley
		Stockton Hill Ranches #07		Unsub		B	23	N	17	W	35			

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		Stockton Hill Ranches #08		Unsub		B	23	N	17	W	36			
		Stockton Hill Ranches #10		Unsub		B	23	N	16	W	07,18, 29			
		Stockton Hill Ranches #11		Unsub		B	22	N	16	W	05-07			
		Stockton Hill Ranches #12		Unsub		B	23	N	16	W	05			Hualapai Valley
		Stockton Hill Ranches #12		Unsub		B	23	N	16	W	05			Hualapai Valley
		Stonecrest		Dead		B	21	N	22	W	23			
		Stoneridge	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	11	14	11.77	Lake Mohave
		Sun Desert Estates	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	25	49	13.7	Lake Mohave
		Sun Ridge Tract 4042F	North Mohave Water Company	Issued		B	21	N	21	W	30			
		Sun Ridge Estates Tract 4024A	North Mohave Valley Water Company	Issued		B	21	N	21	W	21			
		Sun Ridge Estates Tract 4024B	North Mohave Valley Water Company	Issued		B	21	N	21	W	29			
		Sun Ridge Estates Tract 4024C	North Mohave Valley Water Company	Issued		B	21	N	21	W	21			
		Sun Ridge Estates Tract 4042D	North Mohave Valley Water Company	Issued		B	21	N	21	W	30			
		Sun Ridge Estates Tract 4042E	North Mohave Valley Water Comoany	Issued		B	21	N	21	W	29			
		Sun Ridge Estates Tract 4042F	North Mohave Valley Water Company	Issued		B	21	N	21	W	29	59	145	Lake Mohave
		Sun Valley	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	36			
		Sun Valley Tract 4017	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	36			
		Sun Valley Tract 4064A	Bermuda Water Company, Inc.	Issued		B	18	N	22	W	01	210	58.5	Lake Mohave
		Sunrise Estates	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35			
		Sunrise Estates #2	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35			
		Sunrise Mountain Estates	dry lot	Issued		B	23	N	16	W	33	35	10	Hualapai Valley
		Sunrise Vistas Tract 4108-A	Sunrise Vistas Utilities Company	Issued		B	19	N	21	W	18	146	40.9	Lake Mohave
		Sunrise Vistas Tract 4108-B	Sunrise Vistas Utilities Company	Issued		B	19	N	21	W	18	86	24.1	Lake Mohave
		Sunrise Vistas Tract 4108-C	Sunrise Vistas Utilities Company	Issued		B	19	N	21	W	18	92	25.7	Lake Mohave
		Sunset Ranchos, Tract 4046-B	dry lot	Issued		B	19	N	22	W	13			Lake Mohave
		Sunset Ranchos, Tract 4046-C	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	13	284	80	Lake Mohave
		Sunset Ranchos, Tract 4046-A	dry lot	Issued		B	19	N	22	W	13			Lake Mohave
		Sunward Ho! Ranches Turquesa Acres	dry lot	Issued		B	23	N	16	W	30	35		Hualapai Valley
		Tamarisk Resort & Country Club	Havasu Water Company	Issued		B	14	N	20	W	20			

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		Tangerine Terrace Tract 4142	Fort Mohave Tribal Utilities Authority	Issued		B	17	N	22	W	23	22	6.16	Lake Mohave
		Tangerine Terrace #02, Trct 4151	Fort Mohave Tribal Utilities Authority	Dead		B	17	N	22	W	23	95	67.1	Lake Mohave
		Tierra del Rio Tract 4048	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	25			
		Tierra Grande Tract 4023 A	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	19			
		Tierra Grande Tract 4023B	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	19			
		Tierra Grande Tract 4023B	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	24			
		Tierra Grande Tract 4023C	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	19			
		Tierra Grande Tract 4052	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	19			
		Tierra Verde Tract 1073-B	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	14			
		Tierre del Sol	dry lot	Issued		B	19	N	22	W	23			
		Tierre Plaza	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	14			
		Toprock Lake Rancheros	dry lot	Issued		B	17	N	21	W	17	8		Lake Mohave
		Triangle Air Park	dry lot	Issued		B	27	N	21	W	24			Detrital Valley
		Unnamed property, Mohave Co.		Unsub		B	21	N	17	W	06			Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	21	N	18	W	02,04, 06,20, 28,30			Sacramento Valley
		Unnamed property, Mohave Co.		Dead		B	11	N	18	W	09			Lake Havasu/Bill Williams
		Unnamed property, Mohave Co.		Dead		B	12	N	18	W	33			Lake Havasu
		Unnamed property, Mohave Co.		Dead		B	19	N	22	W	25			
		Unnamed property, Mohave Co.		Dead		B	14	N	20	W	17			
		Unnamed property, Mohave Co.		Dead		B	20	N	21	W	19			
		Unnamed property, Mohave Co.		Unsub		B	22	N	12	W	15-22,27-34			
		Unnamed property, Mohave Co.		Unsub		B	22	N	17	W	13	9		Hualapai Valley
		Unnamed property, Mohave Co.		Unsub		B	20	N	13	W	31, 35			Big Sandy
		Unnamed property, Mohave Co.		Unsub		B	18	N	15	W	15,17, 19,21, 27,29, 31			Sacramento Valley

MOHAVE COUNTY APPLICATIONS PRIOR TO 2001 FROM 1WRF.DB

PFX	DWR .	SUBDIVISION	WATER PROVIDER	STATUS	DATE ISSUED	LOC-Q	LOC-T	LOC-T2	LOC-R	LOC-R2	LOC-S	LOTS	ALLOCATION (AF)	GW BASIN
		Unnamed property, Mohave Co.		Unsub		B	15	N	16	W	01,03, 05,07, 09,11, 13			Sacramento Valley
		Unnamed property, Mohave Co.	dry lot	Unsub		B	24	N	17	W	35			Hualapai Valley
		Unnamed property, Mohave Co.	dry lot	Unsub		B	20	N	17	W	04,05, 09			Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	22	N	15	W	05,17			Haulapai Valley
		Unnamed property, Mohave Co.		Unsub		B	22	N	15	W	07			
		Unnamed property, Mohave Co.		Unsub		B	17	N	17	W	19,20, 20,30, 32			Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	19	N	18	W	22,24-26,28-30			Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	15	N	16	W				Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	17	N	17	W	33			Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	21	N	16	W	10			
		Unnamed property, Mohave Co.		Unsub		B	19	N	18	W	21,23			Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	23	N	16	W	07,09, 17-21,28, 29			
		Unnamed property, Mohave Co.		Unsub		B	24	N	16	W	07,19, 29,31, 33			
		Unnamed property, Mohave Co.		Unsub		B	17	N	17	W	11,13, 17			Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	23	N	16	W	21			
		Unnamed property, Mohave Co.		Unsub		B	16	N	17	W	05-08,17, 18			Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	24	N	16	W	29,33			
		Unnamed property, Mohave Co.		Unsub		B	20	N	21	W	31			

MOHAVE COUNTY APPLICATIONS PRIOR TO 2001 FROM 1WRF.DB

PFX	DWR.	SUBDIVISION	WATER PROVIDER	STATUS	DATE ISSUED	LOC-Q	LOC-T	LOC-T2	LOC-R	LOC-R2	LOC-S	LOTS	ALLOCATION (AF)	GW BASIN
		Unnamed property, Mohave Co.		Unsub		B	22	N	14	W	05-08, 17			Hualapai Valley
		Unnamed property, Mohave Co.		Unsub		B	22	N	15	W	01,11			Hualapai Valley
		Unnamed property, Mohave Co.		Unsub		B	22	N	15	W	11			
		Unnamed property, Mohave Co.		Unsub		B	23	N	14	W	19,29, 30			Hualapai Valley
		Unnamed property, Mohave Co.		Unsub		B	23	N	15	W	15,21-26,35			Hualapai Valley
		Unnamed property, Mohave Co.		Unsub		B	23	N	15	W	24,25			
		Unnamed property, Mohave, Co.		Unsub		B	15	N	16	W	01			Sacramento Valley
		Unnamed property, Mohave, Co.		Unsub		B	15	N	15	W	07,17, 21,27			Sacramento Valley
		Valle del Sole	Kingman, City of	Ret-Sub		B	21	N	16	W	10			
		Valle Vista	Truxton Canyon Water Company	Issued		B	23	N	15	W				
		Valle Vista	Truxton Canyon Water Company	Issued		B	24	N	15	W				Hualapai Valley
		Valle Vista #1A,3A	Truxton Canyon Water Company	Issued		B	23	N	15	W	10,15	8728		Hualapai Valley
		Valle Vista #5	Truxton Canyon Water Company	Ret-Sub		B	24	N	15	W	26			Hualapai Valley
		Villa De Rio Condominiums		Dead		B	21	N	21	W	21			
		Villa del Rio Tract 4016 A&B	Rio Verde Water Company	Issued		B	20	N	22	W	29			
		Villa del Sol Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	23	W	24			
		Virgin Acres	Biasi Water Company	Issued		B	41	N	15	W	29	320	129	
		Virgin Village #2		Dead		B	41	N	15	W	32			
		Virgin Village #2	Biasi Water Company	Pending		B	41	N	15	W	32			Virgin River
		Vista del Rio Condominiums	Oasis Utility Company	Issued		B	20	N	22	W	17			
		Vista Grande Condominiums	North Mohave Water Company	Issued		B	21	N	21	W	21	32	7.2	Lake Mohave
		Vock Canyon		Unsub		B	24	N	17	W	35			Hualapai Valley
		Wagon Bow Ranch		Unsub		B	17	N	11	W	13, 14			Bill Williams
		Wagon Bow Ranch Unit II	dry lot	Unsub		B	18	N	11	W	14,24, 25,27, 28,29, 33,35	100		Big Sandy
		Walnut Creek Unit 2, Tract 3043-A	Walnut Creek Water Company, Inc.	Issued		B	20	N	17	W	07	43	12.52	Sacramento Valley

MOHAVE COUNTY APPLICATIONS PRIOR TO 2001 FROM 1WRF.DB

PFX	DWR .	SUBDIVISION	WATER PROVIDER	STATUS	DATE ISSUED	LOC-Q	LOC-T	LOC-T2	LOC-R	LOC-R2	LOC-S	LOTS	ALLOCATION (AF)	GW BASIN
		Walnut Creek Estates #1	unformed water company	Issued		B	20	N	17	W	07	42	11.76	Sacramento Valley
		Walnut Creek Estates #2		Dead		B	20	N	17	W	07			Sacramento Valley
		Walnut Creek Estates #2	Walnut Creek Water Company, Inc.	Issued		B	20	N	17	W	07	109	30.5	Sacramento Valley
		Western Horizon Estates #1		Dead		B	24	N	19	W	27			Detrital Valley
		Western Horizon Estates #1	dry lot	Issued		B	24	N	19	W	27			Detrital Valley
		Western Horizon Estates #2	dry lot	Issued		B	24	N	19	W	27	80		Detrital Valley
		Western Star #1	dry lot	Dead		B	16	N	20	W	03			
		WestSlope		Dead		B	20	N	21	W	17			
		Wickieup Springs Ranches		Unsub		B	14	N	12	W	03			
		Willow Creek Ranch Unit 7		Unsub		B	22	N	11	W	19,29, 31			Big Sandy
		Willow Creek Ranch, Unit 4		Unsub		B	21	N	11	W	01,07, 11			Big Sandy
		Willow Creek Ranch, Unit 8		Unsub		B	21	N	11	W	33			
		Willow Creek Ranch, Unit 8		Unsub		B	22	N	11	W	21,27			Big Sandy
		Willow Creek Ranch, Unit 9		Unsub		B	19	N	11	W				
		Willow Valley Estates	Willow Valley Water Company	Issued		B	18	N	22	W	21	48	16.1	
		Willow Valley Estates		Unsub		B	18	N	22	W	18,21, 25,27, 35			
		Willow Valley Estates 20 Tract 4134		Dead		B	18	N	22	W	21			
		Willow Valley Mobile Homes Est	Willow Valley Water Company	Issued		B	18	N	22	W	27			
		Willows at Cimarron Lake #1 Tract 4130		Dead		B	18	N	22	W	23	79	22	Lake Mohave
		Willows at Cimarron Lake, The	Willow Valley Water Company	Issued		B	18	N	22	W	23	94	38.58	Lake Mohave
		Willows at Cimarron Lake, The #2		Dead		B	18	N	22	W	23	136	38	Lake Mohave
		Windmill Ranch, Phase 1, Unit 1		Unsub		B	19	N	13	W	04,05, 09,16, 17,21, 28,29			Big Sandy
		Windmill Ranch, Phase 1, Unit 2		Unsub		B	19	N	13	W	19,31			Big Sandy

MOHAVE COUNTY APPLICATIONS PRIOR TO 2001 FROM 1WRF.DB

PFX	DWR .	SUBDIVISION	WATER PROVIDER	STATUS	DATE ISSUED	LOC-Q	LOC-T	LOC-T2	LOC-R	LOC-R2	LOC-S	LOTS	ALLOCATION (AF)	GW BASIN
		Windmill Ranch, Phase 2, Unit 1		Unsub		B	19	N	13	W	04,05, 09,16, 17,21, 28,29			
		Windmill Ranch, Phase 2, Unit 2		Unsub		B	19	N	13	W	03			Big Sandy
		Windmill Ranch, Phase 2, Unit 3		Unsub		B	19	N	12	W	09,15, 19			
		Windmill Ranch, Phase 2, Unit 4		Unsub		B	19	N	12	W	13,29			Big Sandy
		Windmill Ranch, Phase 2, Unit 4		Unsub		B	19	N	13	W	23,25, 27,35			Big Sandy
		Winterhaven Estates	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	18			
		Yucca Vista #2	dry lot	Issued		B	16	N	19	W	11	55	6.2	Sacramento Valley
		Cedar Hills Ranches	dry lot	PENDUNSUB		B	22	N	14	W	26,27			Big Sandy

Snell & Wilmer
L.L.P.
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Jeffrey W. Crockett
602.382.6234
jcrockett@swlaw.com

April 25, 2006

HAND-DELIVERED

David M. Ronald, Staff Attorney
Legal Division
ARIZONA CORPORATION COMMISSION
1200 West Washington Street
Phoenix, Arizona 85007

Blessing N. Chukwu
Utilities Division Staff
ARIZONA CORPORATION COMMISSION
1200 West Washington Street
Phoenix, Arizona 85007

Re: Responses to Staff's First Set of Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company (Docket Nos. W-20380A-05-0490 and SW-20379A-05-0489)

Dear David and Blessing:

Enclosed is one copy of responses to Staff's Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company (BNC 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 1.12, 1.13, 1.14, 1.15, 1.19, 1.20, 1.22, 1.24 and 1.25) in the above-referenced docket. Responses to the remaining data requests will be forthcoming.

Please contact me at the direct line listed above if you have any questions or if you need further information or documents.

RECEIVED
APR 25 2006
LEGAL DIV.
ARIZ. CORPORATION COMMISSION

Very truly yours,

SNELL & WILMER

Jeffrey W. Crockett / KPK

Jeffrey W. Crockett

cc (with enclosure): K. Mosley

1825708.1

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.1 **Water Adequacy:** In the Arizona Department of Water Resources ("ADWR") Analysis of Adequate Water Supply for "Golden Valley 5800" dated October 19, 2005, ADWR determined that 9,000 acre-feet per year of groundwater will be **physically available**, which is less than the applicant's build out demands for the development of 15,910.90 acre-feet per year. Please provide a detailed explanation of how and when Perkins Mountain Water Company ("Perkins") plans on obtaining a Letter of Adequacy for the remainder of the 15,910.90 acre-feet water required to serve the Golden Valley South Development?

Response:

Rhodes Homes Arizona, LLC, ("Rhodes Homes"), the developer of Golden Valley South, will pursue the following three-pronged strategy to obtain an analysis of water adequacy and then a water adequacy report from ADWR which covers all of the projected water demand for Golden Valley South at build-out.[1]

1. Rhodes Homes retained Errol L. Montgomery & Associates ("Montgomery & Associates"), one of the premier hydrogeologic consulting firms in the western hemisphere, to investigate and analyze the groundwater supplies available for Golden Valley South. Montgomery & Associates prepared the application for an analysis of adequate water supply which formed the basis for ADWR's October 19, 2005 determination that 9,000 acre-feet of groundwater is physically available for Golden Valley South. Montgomery & Associates is finalizing a second application for an analysis of adequate water supply for additional groundwater supplies for Golden Valley South which will be submitted to ADWR within the next several weeks. The second application will augment the initial application in two major respects:

A. Projected water demand for Golden Valley South is being recalculated based upon the current approved area plan for Golden Valley South (which reduces the number of planned residential units) and updated residential unit water demand (which reduces the projected residential per-unit water demand). Montgomery & Associates' preliminary

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[1] By way of clarification, outside of an active management area, it is the responsibility of the developer to demonstrate the adequacy of water to serve a development, or portion thereof, and not the water company. In addition, outside of an active management area, the developer obtains an analysis of water adequacy and/or a water adequacy report from ADWR, and not a "Letter of Adequacy" as stated in Staff's data request BNC 1.1. Thus, it is the responsibility of Rhodes Homes Arizona, LLC, as developer of Golden Valley South to obtain a water adequacy analysis and then a water adequacy report from ADWR, and not Perkins Mountain Water Company.

BNC 1.1 (Continued)

estimates place the updated Golden Valley South water demand at or below 12,000 acre-feet annually (a reduction of at least 3,910.90 acre-feet from the 15,910.90 acre-feet specified in the application).

B. Additional test well construction since the submittal of the initial application and additional aquifer test data obtained since the submittal of the initial application will be included in the second application which shows the availability of additional groundwater not included in the initial application.

As stated above, Montgomery & Associates has determined that after considering (i) the current approved area plan for Golden Valley South (*i.e.*, a reduction in the number of planned residential units based upon the updated area plan referenced above) and (ii) a reduced projected residential per-unit water demand, the total projected water demand for Golden Valley South will decrease substantially from the 15,910.90 acre-feet stated in the initial application. Additionally, Montgomery & Associates has determined through subsequent aquifer testing that its original hydrogeologic analysis was conservative, meaning that the test wells are demonstrating that the Sacramento Valley aquifer is capable of producing significantly more groundwater than originally projected. Based upon these factors, Montgomery & Associates anticipates that—upon review and approval of the second application by ADWR—the current difference between the projected water demand for Golden Valley South and the groundwater physically available will be significantly reduced or even eliminated. In other words, Montgomery & Associates believes that an increased quantity of water is physically available which will fully satisfy the recalculated reduced demand for all of Golden Valley South based upon the current approved area plan. Assuming ADWR agrees, then ADWR will issue an analysis of water adequacy for the remainder of the full projected demand of Golden Valley South at build-out, making prongs 2 and 3 below unnecessary.

2. If additional physical water supply is required for Golden Valley South after completing prong 1 above, Montgomery & Associates will submit an additional application for analysis of adequate water supply requesting that <u>effluent used directly within Golden Valley South</u> be included as part of the physically available water supply. The inclusion of directly used effluent with the existing physically-available water supply of 9,000 acre-feet would fully meet the revised projected water demand of Golden Valley South. As Staff may be aware, ADWR recently issued an analysis of adequate water supply dated

BNC 1.1 (Continued)

April 11, 2006, for The Ranch at White Hills in Mohave County wherein ADWR determined that "2,734 acre-feet per year of treated effluent projected at build-out will be physically available." A copy of the April 11, 2006 letter is attached to this response. In its analysis, ADWR effectively concluded that approximately 36% of the physically available groundwater would be returned to The Ranch at White Hills for reuse on golf courses and park areas within the development. If the same 36% is applied to Golden Valley South, then approximately 3,240 acre-feet of effluent will be available for meeting water demands on golf courses and parks. When this effluent is added to the 9,000 acre-feet of physically available water that has already been approved by ADWR for Golden Valley South, the total physically available water is 12,240 acre-feet, which exceeds the revised projected demand of 12,000 acre-feet as set forth above (and this is true even if ADWR does not agree that additional groundwater is available following submission of the second filing discussed under prong 1 above).

3. If additional physical water supply is required for Golden Valley South after completing prongs 1 and 2 above, then Montgomery & Associates will submit an additional application for analysis of adequate water supply requesting that effluent recovered from within the area of impact of the planned Perkins Mountain Utility Company effluent recharge facility be included as part of the adequate water supply. This application would require the construction and permitting of a recharge facility prior to approval by ADWR. Consequently, this application would likely not be submitted until approximately two years after issuance of CC&Ns to Perkins Mountain Water Company and Perkins Mountain Utility Company.

It is the expert opinion of Montgomery & Associates that Rhodes Homes can fully satisfy the revised projected water demand for Golden Valley South using some combination of prongs 1, 2 and 3.

As required by ADWR rules, all applications for analysis of adequate water supply will be submitted by Rhodes Homes or an affiliated landowner, and not by Perkins Mountain Water Company. Montgomery & Associates anticipates that once submitted, ADWR will act upon the second application within 3 to 6 months. Analyses of water adequacy and water adequacy reports will be issued to Rhodes Homes or an affiliated landowner, and not Perkins Mountain Water

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BNC 1.1 (Continued) Company. Copies of all ADWR applications, correspondence and letters of water adequacy will be made available to Perkins Mountain Water Company and the Arizona Corporation Commission.

Prepared by: Bill Victor, Principal
Errol L. Montgomery & Associates, Inc.
7949 East Acoma Drive, Suite 100
Scottsdale, Arizona 85260

ARIZONA DEPARTMENT OF WATER RESOURCES
Office of Assured and Adequate Water Supply
3550 North Central Avenue, 2nd Floor, Phoenix, Arizona 85012
Telephone (602) 771-8585
Fax (602) 771-8689

Janet Napolitano
Governor

Herbert R. Guenther
Director

ANALYSIS OF ADEQUATE WATER SUPPLY

April 11, 2006

File Number: 23-401774.0000
Development: The Ranch at White Hills
Complete Location: T29N, R19W, Sec. 21, 29 & 33; T28N, R20W, Sec. 23, 25 & 35; T28N, R19W, Sec. 9, 15, 17, 19, 21, 27, 29, 31, 33 &35; T27 N, R21W, Sec. 13 & 25; T27N, R20W, Sec. 1, 9, 13, 25, 31 & 35; T27 N, R19W, Sec. 1, 3, 9, 11, 13, 15, 19, 21, 23, 25, 27, 29, 31, 33 & 35; T25N, R21W, Sec 35; T25 N, R20W, Sec. 3, 5, 7, 9, 11, 12, 13, 14, 15, 17, 19, 21 & 23; T25N, R19W, Sec. 6, 8, 18 & 30; T24N, R20W, Sec. 13, 33 & 35. Mohave County, Arizona
Land Owners: The Ranch at Temple Bar, LLC, a Nevada limited liability company; Joshua Tree, LLC, a Nevada limited liability company; Arizona Acreage, LLC, a Nevada limited liability company; Arizona Land Development, Inc., a Nevada Corporation; Silver Basin, Inc., a Nevada corporation; Cactus & Stuff, LLC, a Nevada limited liability company; Flannery & Allen LLC, a Nevada limited liability Company; Gateway Lots, LLC, a Nevada limited liability company and Smith Ranch Commercial LLC, a Nevada limited liability company as Owners

The Arizona Department of Water Resources has evaluated the Analysis of Adequate Water Supply application for The Ranch at White Hills pursuant to A.A.C. R12-15-723 and found the application to be complete and correct on March 31, 2006. The proposed development will consist of 20,500 Single-family and 4,500 Multi-family units. There will be a golf course and park areas within the development. The owner has indicated treated effluent will eventually be used to water these non-residential areas. Double Diamond Utilities will serve the master planned community. Conclusions of the review are indicated below based on the adequate water supply criteria referenced in A.R.S. § 45-108 and A.A.C. R12-15-701, 715, 723 *et seq.*

- **Physical, Continuous, and Legal Availability of Water for 100 Years**
  On the basis of the Department's review, the Department has determined that the applicant has demonstrated that 7,573 acre-feet per year of groundwater[1] and 2,734 acre-feet per year of treated effluent projected at build-out will be **physically available**, which exceeds the applicant's projected build-out demands for the development of 7,976 acre-feet per year. The applicant identified Double Diamond Utilities as the possible municipal provider. However, the application did not include a Notice of Intent to Serve form and is not within the service area boundaries of a water provider at this time. Individual Notices of Intent to Serve, evidence of the municipal provider's legal authority to serve the subdivision, and evidence of the wastewater treatment plant capacity will be required for each application for a Water Adequacy Report. Legal and **continuous availability** of the water are not proven at this time.

[1] The projected groundwater demand for this project (7,573 acre-feet per year) combined with the current and committed demand for existing uses and platted but undeveloped lots in the project area (3,472 acre-feet per year) results in a the total groundwater demand of 11,045 acre-feet per year or 1,104,500 acre-feet after 100 years.

- **Adequate Water Quality**
  The water provider's system has not been established at this time and therefore, applications for Water Adequacy Reports will be required to provide evidence that the water supplies are of adequate quality. This water quality requirement of an Analysis of Adequate Water Supply will be re-evaluated for each application for a Water Adequacy Report.

The term of this Analysis of Adequate Water Supply is ten years from the date of this letter and may be renewed upon request, subject to approval by the Department. Throughout the term of this determination, the Department, when reviewing other requests for adequate water supply in the area, will consider the projected demand of this development. The demand projected for this development assumes that the conservation measures the applicant has identified to the Department will be required for the homes in this development, including the water and energy efficient hot water systems, effluent use requirements for public parks, large turf areas and golf courses, low water use landscaping on the property, and water catchment systems for most of the homes and commercial buildings. Additionally, it must be noted that based upon the limited hydrogeologic data available for the proposed development area, the amount of groundwater that may be physically available to 1,200 feet below land surface for this project may be limited. As additional hydrogeologic data becomes available, applications for Water Adequacy Reports and the determination of physical availability in this analysis may be affected by that additional data.

Prior to obtaining plat approval by the local platting authority and approval of the public report by the Department of Real Estate, a Water Adequacy Report must be obtained for each subdivision plat. The findings of this Analysis of Adequate Water Supply may be used to demonstrate that groundwater and treated effluent supplies are physically available for at least 100 years for purposes of an application for Water Adequacy Report, unless new hydrogeologic data indicates otherwise. Applications for Water Adequacy Reports that follow the Analysis of Adequate Supply will need to reference this letter. This determination may be invalidated if the development plan or other conditions change materially prior to filing for a Water Adequacy Report.

Questions may be directed to the Office of Assured/Adequate Water Supply at (602) 771-8598.

Sandra Fabritz-Whitney

Sandra Fabritz-Whitney, Assistant Director
Water Management Division

cc: Mohave County Board of Supervisors
Christine Ballard, Mohave County Planning and Zoning
Paul Beecher, City of Kingman
Greg Wallace, Errol Montgomery & Associates (Villages at White Hills)
Herb Guenther, ADWR
Joan Card, ADEQ
Steve Olea, ACC
Roy Tanney, ADRE

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.2 **Water Adequacy**: Please provide a legal description of the area covered by the 9,000 acre-feet per year of groundwater discussed in the October 19, 2005, ADWR letter. Also, provide confirmation from ADWR that it agrees with such legal description.

Response:

The legal description of the area covered by the 9,000 acre-feet per year of physically available groundwater reported in ADWR's October 19, 2005 letter is contained in the ownership documents that were included as attachment 4 of the application for analysis of water adequacy. For Staff's convenience, a copy of the ownership document is attached to this response. The legal description is also included in the October 19, 2005 letter on page one under the heading "Location." A copy of the October 19, 2005 letter is also attached to this response.

The confirmation that ADWR agrees with the legal description is evidenced by ADWR's inclusion of the legal description under the heading "Location" on page one of the October 19, 2005 letter. By signing the letter, ADWR Assistant Director Sandra Fabritz-Whitney acknowledged that ADWR evaluated the legal description—as stated in the ownership documents included with the application for analysis of water adequacy—and concurred that the property legal description and the area evaluated for the hydrologic report are coincident and properly identified.

Prepared by: Bill Victor, Principal
Errol L. Montgomery & Associates, Inc.
7949 East Acoma Drive, Suite 100
Scottsdale, Arizona 85260

ERROL L. MONTGOMERY & ASSOCIATES, INC.

ATTACHMENT 4

OWNERSHIP DOCUMENTS

Parcel Information (Click for Tax Information)

Tax Year:	2005
Parcel:	215-01-080 **Click for Improvement Information**
Site Address:	UNK STREET ADDRESS
Owner:	DESERT COMMUNITIES INC ATTN: M WALKER
Mailing Address:	4730 S FORT APACHE RD STE 300 , LAS VEGAS , NV 89147
Tax Area:	0430
Full Cash Value:	$60,421.00
Assessed Full Cash Value:	$9,667.00
Limited Value:	$60,421.00
Assessed Limited Value:	$9,667.00
Value Method:	Land Market Model
Exempt Amount:	$0.00
Exemption Type:	
Use Code:	0004
Property Use:	VACANT LAND
Class Code:	Ag, Vacant Land or Non-profit
Assessment Ratio:	16.00%

Last Sale Information (Click for more Sale Info)

Sale Price:	0
Sale Date:	1/3/2005
Recorded Instr Type:	WARRANTY DEED
Book:	5273
Page:	721

Legal Description Information

Parcel Size:	604.21 ACRES
Township, Range and Section:	20N 18W 2
Legal Description:	ALL EXCEPT THE SE4 SE4, W2 NW4 NW4 NW4 NE4 NE4 & EXCEPT THE N & W 50' CONT 604.21 AC 215-01-005(215-01-080 & COUNTY RD)

Parcel Information (Click for Tax Information)

Tax Year:	2005
Parcel:	215-01-092 **Click for Improvement Information**
Site Address:	
Owner:	AMERICAN LAND MANAGEMENT LLC
Mailing Address:	6101 S MUSTANG CIR , SIOUX FALLS , SD 57108
Tax Area:	0430
Full Cash Value:	$62,254.00
Assessed Full Cash Value:	$9,961.00
Limited Value:	$62,254.00
Assessed Limited Value:	$9,961.00
Value Method:	Land Market Model
Exempt Amount:	$0.00
Exemption Type:	
Use Code:	0004
Property Use:	VACANT LAND
Class Code:	Ag, Vacant Land or Non-profit
Assessment Ratio:	16.00%

Last Sale Information (Click for more Sale Info)

Sale Price:	0
Sale Date:	1/1/2005
Recorded Instr Type:	SPECIAL WARRANTY DEED
Book:	5388
Page:	29

Legal Description Information

Parcel Size:	622.54 ACRES
Township, Range and Section:	20N 18W 3
Legal Description:	TRACT: 0 EXCEPT S2 SE4 SE4 NE4 NE4, N2 NE4 NE4 SE4 SE4, N2 NW4 NW4 SW4 SW4, S2 SW4 SW4 NW4 NW4 AND EXCEPT THE N 50', W 50' & E 50' THEREOF(1603/93;1708/361) AND EXCEPT A 100' STRIP OF LAND ACROSS SEC 3, LYING 50' ON EACH SIDE OF THE FOLL DESC CENTERLINE: BEG AT THE PT OF INTERSECTION OF AZTEC RD & THE S R/W AS RECORDED IN 1603/93 OF SAID SEC 3, SAID PT BEING S00 DEG 00'16 E 50'FROM N LN SEC 3 AND N89 DEG 57'15 E ALONG SAID N LINE 2923.56' ML

Parcel Information (Click for Tax Information)

Tax Year:	2005
Parcel:	215-16-005 **Click for Improvement Information**
Site Address:	UNK STREET ADDRESS
Owner:	AMERICAN LAND MANAGEMENT LLC
Mailing Address:	6101 S MUSTANG CIR , SIOUX FALLS , SD 57108
Tax Area:	0430
Full Cash Value:	$63,561.00
Assessed Full Cash Value:	$10,170.00
Limited Value:	$59,265.00
Assessed Limited Value:	$9,482.00
Value Method:	Land Market Model
Exempt Amount:	$0.00
Exemption Type:	
Use Code:	0004
Property Use:	VACANT LAND
Class Code:	Ag, Vacant Land or Non-profit
Assessment Ratio:	16.00%

Last Sale Information (Click for more Sale Info)

Sale Price:	0
Sale Date:	1/1/2005
Recorded Instr Type:	SPECIAL WARRANTY DEED
Book:	5388
Page:	29

Legal Description Information

Parcel Size:	635.61 ACRES
Township, Range and Section:	20N 18W 4
Legal Description:	LOTS 1,2,3 & 4; S2 N2; S2 EXCE PT 5 ACRES LOCATED IN LOT 4 (D SP MILLSITE #7) & EXCEPT BEG AT THE S4 CORNER OF SD SEC 4; TH NLY ALONG THE N-S CENTER SEC LINE 42'; TH WLY PARALLEL TO THE S BNDRY OF SD SEC 4 30' TO THE TPOB; TH NLY PARALLEL TO THE N-S CENTER SEC LINE 233 .35'; TH WLY PARALLEL TO THE S BNDRY OF SEC 4 233.35'; TH SLY PARALLEL TO THE N-S CENTER SEC LINE OF SEC 4 233.35'; TH ELY PARALLEL TO THE S SEC LIN E OF SEC 4 233.35' TO THE TPOB

Parcel Information (Click for Tax Information)

Tax Year:	2005
Parcel:	215-01-048 **Click for Improvement Information**
Site Address:	UNK STREET ADDRESS
Owner:	AMERICAN LAND MANAGEMENT LLC
Mailing Address:	6101 S MUSTANG CIR , SIOUX FALLS , SD 57108
Tax Area:	0430
Full Cash Value:	$63,500.00
Assessed Full Cash Value:	$10,160.00
Limited Value:	$63,500.00
Assessed Limited Value:	$10,160.00
Value Method:	Land Market Model
Exempt Amount:	$0.00
Exemption Type:	
Use Code:	0004
Property Use:	VACANT LAND
Class Code:	Ag, Vacant Land or Non-profit
Assessment Ratio:	16.00%

Last Sale Information (Click for more Sale Info)

Sale Price:	0
Sale Date:	1/1/2005
Recorded Instr Type:	SPECIAL WARRANTY DEED
Book:	5388
Page:	29

Legal Description Information

Parcel Size:	635 ACRES
Township, Range and Section:	20N 18W 8
Legal Description:	E2 NW4 NW4 NE4;NE4 NW4 NE4; S2 NW4 NE4; NE4 NE4;S2 NE4; NW4 & S2; CONT 635 ACRES NEW PARCEL CREATED FROM U S A LAND

Parcel Information (Click for Tax Information)

Tax Year:	2005
Parcel:	215-01-075 **Click for Improvement Information**
Site Address:	UNK STREET ADDRESS
Owner:	AMERICAN LAND MANAGEMENT LLC
Mailing Address:	6101 S MUSTANG CIR , SIOUX FALLS , SD 57108
Tax Area:	0430
Full Cash Value:	$63,394.00
Assessed Full Cash Value:	$10,143.00
Limited Value:	$63,394.00
Assessed Limited Value:	$10,143.00
Value Method:	Land Market Model
Exempt Amount:	$0.00
Exemption Type:	
Use Code:	0004
Property Use:	VACANT LAND
Class Code:	Ag, Vacant Land or Non-profit
Assessment Ratio:	16.00%

Last Sale Information (Click for more Sale Info)

Sale Price:	0
Sale Date:	1/1/2005
Recorded Instr Type:	SPECIAL WARRANTY DEED
Book:	5388
Page:	29

Legal Description Information

Parcel Size:	633.94 ACRES
Township, Range and Section:	20N 18W 9
Legal Description:	ALL EXCEPT THE E 50' CONT 633.94 ACRES M/L 215-01-007 (215-01-075 & RD)

Parcel Information (Click for Tax Information)

Tax Year:	2005
Parcel:	215-01-084 **Click for Improvement Information**
Site Address:	UNK STREET ADDRESS
Owner:	AMERICAN LAND MANAGEMENT LLC
Mailing Address:	6101 S MUSTANG CIR , SIOUX FALLS , SD 57108
Tax Area:	0430
Full Cash Value:	$62,576.00
Assessed Full Cash Value:	$10,012.00
Limited Value:	$62,576.00
Assessed Limited Value:	$10,012.00
Value Method:	Land Market Model
Exempt Amount:	$0.00
Exemption Type:	
Use Code:	0004
Property Use:	VACANT LAND
Class Code:	Ag, Vacant Land or Non-profit
Assessment Ratio:	16.00%

Last Sale Information (Click for more Sale Info)

Sale Price:	1563025
Sale Date:	1/1/2005
Recorded Instr Type:	SPECIAL WARRANTY DEED
Book:	5407
Page:	151

Legal Description Information

Parcel Size:	625.76 ACRES
Township, Range and Section:	20N 18W 10
Legal Description:	EXCEPT N2 NE4 NE4 SE4 SE4; N2 NW4 NW4 SW4 SW4; AND EXCEPT THE W 50' & E 50' CONT 625.76 AC M/L 215-01-076 (215-01-084 & COUNTY ROAD)

Parcel Information (Click for Tax Information)

Tax Year:	2005
Parcel:	215-01-078 **Click for Improvement Information**
Site Address:	UNK STREET ADDRESS
Owner:	DESERT COMMUNITIES INC ATTN: M WALKER
Mailing Address:	4730 S FORT APACHE RD STE 300 , LAS VEGAS , NV 89147
Tax Area:	0430
Full Cash Value:	$62,894.00
Assessed Full Cash Value:	$10,063.00
Limited Value:	$62,894.00
Assessed Limited Value:	$10,063.00
Value Method:	Land Market Model
Exempt Amount:	$0.00
Exemption Type:	
Use Code:	0004
Property Use:	VACANT LAND
Class Code:	Ag, Vacant Land or Non-profit
Assessment Ratio:	16.00%

Last Sale Information (Click for more Sale Info)

Sale Price:	0
Sale Date:	1/3/2005
Recorded Instr Type:	WARRANTY DEED
Book:	5273
Page:	721

Legal Description Information

Parcel Size:	628.94 ACRES
Township, Range and Section:	20N 18W 11
Legal Description:	ALL EXCEPT THE S2 SE4 SE4 SE4 AND EXCEPT THE W 50' CONT 628.94 ACRES M/L 215-01-009(215-01-078 & COUNTY RD)

Parcel Information (Click for Tax Information)

Tax Year:	2005
Parcel:	215-01-079 **Click for Improvement Information**
Site Address:	UNK STREET ADDRESS
Owner:	DESERT COMMUNITIES INC ATTN: M WALKER
Mailing Address:	4730 S FORT APACHE RD STE 300 , LAS VEGAS , NV 89147
Tax Area:	0430
Full Cash Value:	$47,985.00
Assessed Full Cash Value:	$7,678.00
Limited Value:	$47,985.00
Assessed Limited Value:	$7,678.00
Value Method:	Land Market Model
Exempt Amount:	$0.00
Exemption Type:	
Use Code:	0004
Property Use:	VACANT LAND
Class Code:	Ag, Vacant Land or Non-profit
Assessment Ratio:	16.00%

Last Sale Information (Click for more Sale Info)

Sale Price:	0
Sale Date:	1/3/2005
Recorded Instr Type:	WARRANTY DEED
Book:	5273
Page:	721

Legal Description Information

Parcel Size:	479.85 ACRES
Township, Range and Section:	20N 18W 14
Legal Description:	W2, W2 E2, W2 W2 SE4 SE4 EXCEPT THE W 50' AND THE S 42' CONT 479.85 ACRES M/L 215-01-010(215-01-079 & COUNTY ROAD)

Parcel Information (Click for Tax Information)

Tax Year:	2005
Parcel:	215-01-085 **Click for Improvement Information**
Site Address:	UNK STREET ADDRESS
Owner:	AMERICAN LAND MANAGEMENT LLC
Mailing Address:	6101 S MUSTANG CIR , SIOUX FALLS , SD 57108
Tax Area:	0430
Full Cash Value:	$62,890.00
Assessed Full Cash Value:	$10,062.00
Limited Value:	$62,890.00
Assessed Limited Value:	$10,062.00
Value Method:	Land Market Model
Exempt Amount:	$0.00
Exemption Type:	
Use Code:	0004
Property Use:	VACANT LAND
Class Code:	Ag, Vacant Land or Non-profit
Assessment Ratio:	16.00%

Last Sale Information (Click for more Sale Info)

Sale Price:	0
Sale Date:	1/1/2005
Recorded Instr Type:	SPECIAL WARRANTY DEED
Book:	5388
Page:	29

Legal Description Information

Parcel Size:	628.9 ACRES
Township, Range and Section:	20N 18W 16
Legal Description:	EXCEPT THE E 50' & S 42' CONT 628.90 ACRES M/L 215-01-077 (215-01-085 & COUNTY ROAD)

Parcel Information (Click for Tax Information)

Tax Year:	2005
Parcel:	306-63-008 **Click for Improvement Information**
Site Address:	
Owner:	AMERICAN LAND MANAGEMENT LLC
Mailing Address:	6101 S MUSTANG CIR , SIOUX FALLS , SD 57108
Tax Area:	0430
Full Cash Value:	$156,970.00
Assessed Full Cash Value:	$25,115.00
Limited Value:	$156,970.00
Assessed Limited Value:	$25,115.00
Value Method:	Land Market Model
Exempt Amount:	$0.00
Exemption Type:	
Use Code:	0004
Property Use:	VACANT LAND
Class Code:	Ag, Vacant Land or Non-profit
Assessment Ratio:	16.00%

Last Sale Information (Click for more Sale Info)

Sale Price:	0
Sale Date:	1/1/2005
Recorded Instr Type:	SPECIAL WARRANTY DEED
Book:	5388
Page:	29

Legal Description Information

Parcel Size:	156.97 ACRES
Township, Range and Section:	21N 18W 34
Legal Description:	SW4 EXCEPT THE S 50' CONT 156.97 ACRES M/L 306-01-055 (306-01-059 & RD) 306-01-059(306-63-008)TAO

ARIZONA DEPARTMENT OF WATER RESOURCES
Office of Assured and Adequate Water Supply
500 North Third Street, Phoenix, Arizona 85004
Telephone (602) 417-2465
Fax (602) 417-2467

Janet Napolitano
Governor

Herbert R. Guenther
Director

ANALYSIS OF ADEQUATE WATER SUPPLY

October 19, 2005

File Number:	23-401823.0000
Development:	Golden Valley 5800
Location:	Township 20 North, Range 18 West, Sections 2, 3, 4, 8, 9, 10, 11, 14, 16 Township 21 North, Range 18 West, Section 34 Mohave County, Arizona
Land Owner:	American Land Management, L.L.C.

The Arizona Department of Water Resources has evaluated the Analysis of Adequate Water Supply application for Golden Valley 5800 pursuant to A.A.C. R12-15-723. The proposed development includes 32,000 single-family residential lots. Water provider for the master planned community has not yet been selected. Conclusions of the review are indicated below based on the adequate water supply criteria referenced in A.R.S. § 45-108 and A.A.C. R12-15-701, 715, 723 *et seq.*

- **Physical, Continuous, and Legal Availability of Water for 100 Years**
  On the basis of the Department's review, the Department has determined that 9,000.00 acre-feet per year of groundwater will be **physically available**, which is less than the applicant's projected build out demands for the development, including system losses, of 15910.90 acre-feet per year. The application did not specify a provider, and the water provider has not yet been selected. Therefore, both **legal availability** and **continuous availability** of the water are not proven at this time. These requirements of an Analysis of Adequate Water Supply will be re-evaluated for each application for a Water Adequacy Report. Applications for Water Adequacy Reports that follow the Analysis of Adequate Supply will need to reference this letter to demonstrate physical availability. Individual Notices of Intent to Serve will be required for each application for a Water Adequacy Report.

- **Adequate Water Quality**
  Water quality has not been demonstrated at this time. This requirement of an Analysis of Adequate Water Supply will be re-evaluated for each application for a Water Adequacy Report.

The term of this Analysis of Adequate Water Supply is ten years from the date of this letter and may be renewed upon request, subject to approval by the Department. Throughout the term of this determination, the projected demand of this development will be considered when reviewing other requests for adequate water supply in the area.

Prior to obtaining plat approval by the local platting authority and approval of the public report by the Department of Real Estate, a Water Adequacy Report must be obtained for each subdivision plat. The findings of this Analysis of Adequate Water Supply may be used to demonstrate that certain requirements for a Water Adequacy Report have been met. This determination may be invalidated if the development plan or other conditions change prior to filing for a Water Adequacy Report.

Questions may be directed to the Office of Assured/Adequate Water Supply at (602) 417-2465.

Sandra Fabritz-Whitney

Sandra Fabritz-Whitney, Assistant Director
Water Management Division

cc: Greg Wallace, E. L. Montgomery and Associates
Alan R. Dulaney, Office of Assured/Adequate Water Supply

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.3 **Water Adequacy**: Does Perkins plan to use groundwater at the beginning of the project for artificial lakes, golf courses, ornamental structures, open spaces, and any other aesthetic water features, and if so, for how long? Please explain in detail.

Response:

Perkins Mountain Water Company has requested a CC&N to serve two physically separated developments—Golden Valley South and The Villages of White Hills—which are planned by Rhodes Homes Arizona, LLC ("Rhodes Homes"). Rhodes Homes will construct a golf course as part of the initial development of Golden Valley South, and like many other golf courses, the Golden Valley South golf course will incorporate storage lakes as part of the turf watering system. In addition, Rhodes Homes is planning certain park space as a part of its initial development of Golden Valley South and The Villages of White Hills. No golf course is planned for The Villages of White Hills. Other than the storage lakes which will be constructed as part of the turf watering system for the golf course at Golden Valley South, no other artificial lakes, ornamental structures which use water, or aesthetic water features are planned for the initial phases of either development.

Rhodes Homes is developing an age-restricted adult community around the golf course at Golden Valley South. Age-restricted adult communities require construction of the golf course amenity in the initial phase of the development in order to attract buyers. Thus, it is not economically feasible to delay construction of the golf course until effluent is available to satisfy the full water demand of the course. As a result, Rhodes Homes will utilize groundwater initially for the golf course and park areas. However, Perkins Mountain Water Company, Rhodes Homes and Jim Rhodes are each committed to the efficient use of groundwater and will begin to reduce groundwater usage at the golf course and park areas as soon as effluent becomes available.

Beginning in the first phase of development in Golden Valley South, Perkins Mountain Utility Company will start supplying all available effluent to the golf course and the park areas within the development. Perkins Mountain Water Company does not plan on supplying supplemental groundwater to the golf course and park areas in Golden Valley South. Rather Rhodes Homes plans to use limited amounts of groundwater (withdrawn from wells which will not be owned by Perkins Mountain Water Company) to supplement the effluent supplied by Perkins

BNC 1.3 (Continued)

Mountain Utility Company until such time as effluent is available to fully satisfy the water demand of the golf course and park areas, thereby eliminating the use of supplemental groundwater.

The time required to eliminate the use of supplemental groundwater for the golf course and park areas in Golden Valley South will depend upon the rate of home sales and occupancy. However, it is anticipated that supplemental groundwater usage will be quickly reduced and thereafter eliminated in approximately three to five years.

Since planned open space development in The Villages of White Hills is limited to relatively modest park acreage, Perkins Mountain Utility Company is planning to recharge effluent during the early years of development. A reuse system is planned to be constructed in a middle phase of the project, sometime after year five.

Prepared by: David Frohnen
Stanley Consultants, Inc.
5820 S. Eastern Avenue, Suite 200
Las Vegas, Nevada 89119

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.4 **Water Adequacy:** At what point in time does Perkins intend to utilize effluent for artificial lakes, golf courses, ornamental structures, open spaces, and any other aesthetic water features? Please explain in detail. Please be sure to include the number of houses that would have to be built in order to generate enough effluent for such uses.

Response:

As stated in the response to BNC 1.3 above, Perkins Mountain Utility Company will begin to supply the Golden Valley South Development with effluent for the golf course (including the storage lakes which will operate as part of the golf course turf watering system) and park space, as soon as effluent is available from the wastewater treatment plant. The timing for the commencement of the delivery of effluent and the quantities that will be available will depend upon both the timing of approval and construction of the development as well as the rate of home sales and occupancy. Despite the uncertainty with regard to timing, it is estimated that approximately 4,000 homes would have to be occupied in order to generate enough effluent to meet the base irrigation demands for the proposed golf course and park areas within Golden Valley South.

For The Villages at White Hills Development, no groundwater will be used on large golf course type turf areas because the project has no golf course planned. Additionally, any large parks with large turf areas will not be constructed until an intermediate phase of the project. As a result, no groundwater will be used on large turf areas in the initial phases of the project. The effluent estimate is based upon having a reasonable amount of effluent available from the occupancy of new houses and the demand for effluent from the future park areas.

Perkins Mountain Utility Company expects to start generating usable effluent in the Spring or Summer of 2007, based upon current regulatory approval, construction and occupancy schedules. In order that effluent may be made available at the earliest feasible date, Perkins Mountain Utility Company and Rhodes Homes intend to take the following steps: First, Perkins Mountain Utility Company will construct a small capacity wastewater treatment plant as part of the first phase of construction. Smaller capacity plants can begin supplying effluent more quickly than larger capacity plants because they can accept lower flow rates. Second, Rhodes Homes will build and sell homes in

BNC 1.4 (Continued)

releases or waves. This will result in occupancy rates increasing from zero to 50 and then from 50 to 100 in relatively quick order. Under this plan, it will only take a few months for usable effluent to begin to be generated after the first house is occupied. This will allow Perkins Mountain Utility Company to go from no sewage flow to usable sewage flow in only a few months.

Prepared by: David Frohnen
Stanley Consultants, Inc.
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Las Vegas, Nevada 89119

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.5 **Water Adequacy:** Is Perkins aware of competing projects utilizing groundwater in Mohave County that plan on using the same groundwater aquifers as Perkins? If so, please provide a list of all such competing water projects. Also, please identify which aquifer(s) the project would affect.

Response:

Upon information and belief, Perkins Mountain Water Company is not aware of any competing residential projects in the immediate vicinity of Golden Valley South that plan on using the same aquifer as Perkins Mountain Water Company. Perkins Mountain Water Company is aware that limited development is occurring in the service area of Valley Pioneers Water Company located to the north of Golden Valley South. Golden Valley South and any other developments that might compete with Golden Valley South will withdraw groundwater from the Sacramento Valley Basin.

Upon information and belief, Perkins Mountain Water Company is aware of two competing projects near the Villages of White Hills as follows:

Project Size	Developer	Aquifer(s)
The Ranch at White Hills (20,500 single-family units and 4,500 multi-family units as per ADWR Analysis of Adequate Water Supply)	Leonard Mardian	Detrital Valley Basin Hualapai Valley Basin
Unnamed 1,043 lots	Woodside Homes	Detrital Valley Basin

Prepared by: Ray Jones
Aricor Water Solutions LLC
25213 North 49th Drive
Glendale, Arizona 85310

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.6 **Water Adequacy:** Please identify the aquifer(s) that will be affected by the Golden Valley South and the Villages of White Hills Developments.

Response:

The Golden Valley South project will withdraw groundwater entirely from the Sacramento Valley Basin. The Villages of White Hills will withdraw groundwater entirely from the Detrital Valley Basin. It is not expected that withdrawals from either groundwater basin by Perkins Mountain Water Company will affect any other groundwater basin.

Prepared by: Ray Jones
Aricor Water Solutions LLC
25213 North 49th Drive
Glendale, Arizona 85310

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.7 **Water Adequacy:** According to a February 17, 2005 letter from Mr. Herbert R. Guenther, ADWR Director, to American Land Management, LLC (Attention: Mr. Jim Rhodes), regarding the Villages of White Hills and the Ranch at White Hills: "[t]hese two proposed communities ... would require approximately 25,000 acre-feet of groundwater. They would involve portions of three groundwater basins, the Detrital Valley, Sacramento Valley and Hualapi Valley basins." Pursuant to A.R.S. § 45-544(A)(2), "[g]roundwater may not be transported away from a groundwater basin." In essence, ADWR does not allow combining groundwater from different basins. Please provide a detailed explanation of how Perkins plans to abide by this law in light of the water supply issues surrounding the Golden Valley South and the Villages of White Hills Developments?

Response:

The Golden Valley South and The Village of White Hills projects are located nearly 40 miles apart. Due to the distance between the developments, Perkins Mountain Water Company is not planning any interconnection between the water systems that will serve each development. Additionally, Perkins Mountain Water Company is not planning to interconnect the two systems with any water systems owned by others.

As stated in the response to data request BNC 1.6, The Villages of White Hills development is entirely within the Detrital Valley Basin and will withdraw and distribute groundwater only within the Detrital Valley Basin. Likewise, the Golden Valley South development is entirely within the Sacramento Valley Basin and will withdraw and distribute groundwater only within the Sacramento Valley Basin. Both water systems will be in full compliance with A.R.S. § 45-544(A)(2).

Rhodes Homes' hydrologists, Errol L. Montgomery & Associates ("Montgomery & Associates"), recently received a copy of an Analysis of Adequate Water Supply dated April 11, 2006 for 7,573 acre-feet of groundwater and 2,734 acre-feet of treated effluent for use on Leonard Mardian's development known as The Ranch at White Hills ("The Ranch Analysis"). On April 19, 2006, Montgomery & Associates received another letter from ADWR stating that the 7,573 acre-feet of groundwater provided for in The Ranch Analysis will need to be taken into account for the Villages at White Hills analysis of adequate water supply ("April 19th Letter"). Rhodes

BNC 1.7 (Continued) Homes is assessing the impact of The Ranch Analysis and its affect on the Villages of White Hills development. Copies of The Ranch Analysis and the April 19th letter are attached to this response.

Prepared by: Ray Jones
Aricor Water Solutions LLC
25213 North 49th Drive
Glendale, Arizona 85310

ARIZONA DEPARTMENT OF WATER RESOURCES
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Janet Napolitano
Governor

Herbert R. Guenther
Director

ANALYSIS OF ADEQUATE WATER SUPPLY

April 11, 2006

File Number: 23-401774.0000
Development: The Ranch at White Hills
Complete Location: T29N, R19W, Sec. 21, 29 & 33; T28N, R20W, Sec. 23, 25 & 35; T28N, R19W, Sec. 9, 15, 17, 19, 21, 27, 29, 31, 33 &35; T27 N, R21W, Sec. 13 & 25; T27N, R20W, Sec. 1, 9, 13, 25, 31 & 35; T27 N, R19W, Sec. 1, 3, 9, 11, 13, 15, 19, 21, 23, 25, 27, 29, 31, 33 & 35; T25N, R21W, Sec 35; T25 N, R20W, Sec. 3, 5, 7, 9, 11, 12, 13, 14, 15, 17, 19, 21 & 23; T25N, R19W, Sec. 6, 8, 18 & 30; T24N, R20W, Sec. 13, 33 & 35. Mohave County, Arizona
Land Owners: The Ranch at Temple Bar, LLC, a Nevada limited liability company; Joshua Tree, LLC, a Nevada limited liability company; Arizona Acreage, LLC, a Nevada limited liability company; Arizona Land Development, Inc., a Nevada Corporation; Silver Basin, Inc., a Nevada corporation; Cactus & Stuff, LLC, a Nevada limited liability company; Flannery & Allen LLC, a Nevada limited liability Company; Gateway Lots, LLC, a Nevada limited liability company and Smith Ranch Commercial LLC, a Nevada limited liability company as Owners

The Arizona Department of Water Resources has evaluated the Analysis of Adequate Water Supply application for The Ranch at White Hills pursuant to A.A.C. R12-15-723 and found the application to be complete and correct on March 31, 2006. The proposed development will consist of 20,500 Single-family and 4,500 Multi-family units. There will be a golf course and park areas within the development. The owner has indicated treated effluent will eventually be used to water these non-residential areas. Double Diamond Utilities will serve the master planned community. Conclusions of the review are indicated below based on the adequate water supply criteria referenced in A.R.S. § 45-108 and A.A.C. R12-15-701, 715, 723 *et seq.*

- **Physical, Continuous, and Legal Availability of Water for 100 Years**
  On the basis of the Department's review, the Department has determined that the applicant has demonstrated that 7,573 acre-feet per year of groundwater[1] and 2,734 acre-feet per year of treated effluent projected at build-out will be **physically available**, which exceeds the applicant's projected build-out demands for the development of 7,976 acre-feet per year. The applicant identified Double Diamond Utilities as the possible municipal provider. However, the application did not include a Notice of Intent to Serve form and is not within the service area boundaries of a water provider at this time. Individual Notices of Intent to Serve, evidence of the municipal provider's legal authority to serve the subdivision, and evidence of the wastewater treatment plant capacity will be required for each application for a Water Adequacy Report. **Legal and continuous availability** of the water are not proven at this time.

[1] The projected groundwater demand for this project (7,573 acre-feet per year) combined with the current and committed demand for existing uses and platted but undeveloped lots in the project area (3,472 acre-feet per year) results in a the total groundwater demand of 11,045 acre-feet per year or 1,104,500 acre-feet after 100 years.

- **Adequate Water Quality**
  The water provider's system has not been established at this time and therefore, applications for Water Adequacy Reports will be required to provide evidence that the water supplies are of adequate quality. This water quality requirement of an Analysis of Adequate Water Supply will be re-evaluated for each application for a Water Adequacy Report.

The term of this Analysis of Adequate Water Supply is ten years from the date of this letter and may be renewed upon request, subject to approval by the Department. Throughout the term of this determination, the Department, when reviewing other requests for adequate water supply in the area, will consider the projected demand of this development. The demand projected for this development assumes that the conservation measures the applicant has identified to the Department will be required for the homes in this development, including the water and energy efficient hot water systems, effluent use requirements for public parks, large turf areas and golf courses, low water use landscaping on the property, and water catchment systems for most of the homes and commercial buildings. Additionally, it must be noted that based upon the limited hydrogeologic data available for the proposed development area, the amount of groundwater that may be physically available to 1,200 feet below land surface for this project may be limited. As additional hydrogeologic data becomes available, applications for Water Adequacy Reports and the determination of physical availability in this analysis may be affected by that additional data.

Prior to obtaining plat approval by the local platting authority and approval of the public report by the Department of Real Estate, a Water Adequacy Report must be obtained for each subdivision plat. The findings of this Analysis of Adequate Water Supply may be used to demonstrate that groundwater and treated effluent supplies are physically available for at least 100 years for purposes of an application for Water Adequacy Report, unless new hydrogeologic data indicates otherwise. Applications for Water Adequacy Reports that follow the Analysis of Adequate Supply will need to reference this letter. This determination may be invalidated if the development plan or other conditions change materially prior to filing for a Water Adequacy Report.

Questions may be directed to the Office of Assured/Adequate Water Supply at (602) 771-8598.

Sandra Fabritz-Whitney

Sandra Fabritz-Whitney, Assistant Director
Water Management Division

cc: Mohave County Board of Supervisors
Christine Ballard, Mohave County Planning and Zoning
Paul Beecher, City of Kingman
Greg Wallace, Errol Montgomery & Associates (Villages at White Hills)
Herb Guenther, ADWR
Joan Card, ADEQ
Steve Olea, ACC
Roy Tanney, ADRE

ARIZONA DEPARTMENT OF WATER RESOURCES
Office of Assured and Adequate Water Supply
3550 North Central Avenue 2nd Floor A-2, Phoenix, Arizona 85014
Telephone (602) 771-8585 and Fax (602) 771-8689

Janet Napolitano
Governor

Herbert R. Guenther
Director

April 19, 2006

Mr. Greg Wallace
Errol L. Montgomery & Associates
7949 East Acoma Drive, Suite 100
Scottsdale, Arizona 85260

RE: Application Status
Villages at White Hills Analysis of Adequate Water Supply (ADWR #23-401674)

Mr. Wallace:

As a follow up to our meeting April 17, 2006 I would like to give you a summary of the current status of your application. Additionally, I would like to apprise you of changes that have occurred in the area of your proposed development, the impacts to your application, and specific adjustments that will need to be incorporated into your application. We received your application on May 18, 2005, and notified you by letter, dated August 9, 2005, that the application was considered administratively complete. In addition, the August 9th letter stated that although the application was considered complete, it was incorrect. As of the writing of this letter, the application remains complete but incorrect.

You submitted a new work plan dated December 5, 2005, which the Department found acceptable. In that plan you indicated that you intended to submit the following:

- Data obtained for existing wells
- Pumping tests for well WH-3L
- Additional interpretation of existing data
- Additional data for the extent of the thick clay unit
- Conduct additional analytical modeling for the impact analysis
- A supplemental report

As you are aware, the Department recently issued an analysis of adequate water supply to a nearby-proposed development, known as The Ranch at White Hills. All water adequacy determinations must take into account current and committed demands in the area of the supporting hydrologic study. This includes issued water adequacy reports and issued analyses of adequate water supply. In your case, the demand associated with the recently issued Ranch at White Hills analysis will need to be included in your study, as well as the current and committed demands associated with the existing recorded lots in the area.

The groundwater demand associated with the Ranch at White Hills analysis is 7,573 af/yr. The groundwater demand associated with the existing recorded lots in the basin is 3,472 af/yr. The total current and committed demands that will need to be taken into account is 11,045 af/yr. Please note that the current and committed demands associated with the existing recorded lots may be reduced if your study boundary does not cover the entire basin. If you intend on reducing this demand based upon a

smaller study boundary, I would encourage you to discuss this with the Department prior to submitting the new study to ensure that the boundary revisions would be acceptable to the Department.

In addition to the inclusion of the known current and committed demands in the basin as outlined above, several other factors will need to be included in your new study. The following is a summary of items that will need to be addressed to account for this increased demand and recommendations for the hydrology report:

- The hydrologic impact analysis needs to represent known and reasonably projected hydrogeologic conditions throughout the study area. This includes the lateral and vertical extent of the confining (thick clay) unit, a description of how the upper aquifer and lower confining aquifer units are linked and the estimated impact on 100-year water availability in the area.
- In the Department's letter dated February 17, 2006, the Department agreed that it would be acceptable to use an analytical approach for predicting the availability of the 100-year groundwater supply. This analytical approach, if used, must utilize conservative values for aquifer parameters in the analysis and must satisfactorily address and incorporate the varied hydrogeologic conditions found in the area. Given the hydrogeologic conditions in the general area, the wide range of aquifer parameters and the complexity of the hydrogeology, a numerical model may be a better and more practical approach to investigate the impact of all current, committed and projected demands in this area. Complex issues must be addressed, such as water being withdrawn from three or more different zones (based on new committed demands) and how the model will account for the interaction of these aquifer units.
- The hydrologic impact analysis must include all the supporting data and justifications for any interpretations and assumptions.
- The modeling approach used must meet acceptable modeling standards.

Please be aware that you may incorporate other water supply studies in the area into your analysis. This can include other groundwater models and associated data. As always, we highly recommend that you submit a detailed proposal for you new work plan to minimize the possibility of submitting work that the Department would not find acceptable. I look forward to working with you to complete this project. If you have any further questions or would like to meet to discuss details further, I can be reached at (602) 771-8590.

Sincerely,

Doug Dunham, Manager
Office of Assured & Adequate Water Supply

cc: Drew Swieczkowski, ADWR Hydrology Division
Nicole Swindle, ADWR Legal Division
Carlos D. Ronstadt, Snell &Wilmer

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.8 **Water Adequacy:** How many water systems does Perkins intend to utilize to serve the proposed Developments?

Response:

Perkins Mountain Water Company will utilize two water systems to serve the proposed developments. One stand-alone system will serve The Villages of White Hills and a separate stand-alone system will serve Golden Valley South.

Prepared by: Ray Jones
Aricor Water Solutions LLC
25213 North 49th Drive
Glendale, Arizona 85310

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.9 Water Adequacy: Please explain the underlying issue behind the March 6, 2006 letter from Snell & Wilmer to ADWR.

Response:

The March 6, 2006, letter was intended to protect American Land Management, LLC's ("ALM") water priority date with regard to The Villages of White Hills. According to A.A.C. R12-15-716(D), the priority date for an application of analysis of adequate water supply is set when ADWR makes a determination that the application is administratively "complete and correct." This priority date gives a party priority when there are two or more pending conflicting applications for an analysis of adequate water supply.

ALM filed its application for an analysis of adequate water supply on March 18, 2005. ALM supplemented the application on May 10, 2005. On August 9, 2005, ADWR issued a letter stating that ALM's application was administratively complete. Consistent with A.A.C. R12-15-716(D) and A.R.S. §41-1074(C), ADWR's delay in responding to the application, along with its statement that the application was complete, established a water priority date.

However, on February 17, 2006, ADWR Director Herbert Guenther sent a letter to ALM which alleged that ALM's application was "complete but incorrect." Mr. Guenther went on to assert, as a result, that no priority date had been set. Snell & Wilmer's March 6, 2006 letter and corresponding March 17, 2006 letter[2] (a copy of which is attached) were sent to refute Mr. Guenther's erroneous assertion and to protect ALM's priority date, as established under Arizona law. On April 5, 2006, ADWR responded to Snell & Wilmer's March 17, 2006 letter. A copy of ADWR's April 5, 2006 letter is attached to this response.

Prepared by: Jeffrey W. Crockett
Snell & Wilmer
400 E. Van Buren
Phoenix, Arizona 85004

---

[2] The letter dated March 17, 2006 was actually filed with ADWR on March 20, 2006 notwithstanding the date.

Snell & Wilmer
L.L.P.
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LAS VEGAS
ORANGE COUNTY
PHOENIX
SALT LAKE CITY
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Carlos D. Ronstadt
602-382-6355 (work)
602-799-0755 (cell)
cronstadt@swlaw.com

March 17, 2006

VIA HAND DELIVERY

Herb Guenther, Director
Arizona Department of Water Resources
3550 North Central Avenue
Phoenix, Arizona 85012

RE: *Request for review of American Land Management, LLC's application for Analysis of Adequate Water Supply (ADWR #23-401674) and determination of a priority date*

Dear Mr. Guenther:

In response to your February 17, 2006 letter, American Land Management, LLC ("ALM") respectfully requests that the Arizona Department of Water Resources ("ADWR") review ALM's application for an Analysis of Adequate Water Supply ("application") and resolve the following issue:

1. Whether ALM's application establishes a priority date when ADWR sent a letter confirming the application's administrative completeness more than 60 days after the application was filed.

We submit that, consistent with A.R.S. § 41-1074, A.A.C. R12-15-723(D), and ADWR statements, the administrative completeness of the application establishes a priority date and allows ADWR to proceed with its substantive review.

BACKGROUND

On March 18, 2005, Montgomery & Associates, on behalf of ALM, submitted an application in support of an Analysis of Adequate Water Supply for The Village at White Hills in

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Mohave County, Arizona.[1] On May 10, 2005, Montgomery & Associates supplemented the hydrological information by filing additional hydrology studies.[2] Then on June 7, 2005, Montgomery & Associates met with representatives of ADWR to discuss the application and any potential concerns. On August 9, 2005, nearly five months after ALM filed its initial application, ADWR sent a letter acknowledging that ALM's application was administratively complete.[3] Six months later, on February 17, 2006, you sent ALM a letter explaining that ADWR had not made a priority date determination and that ALM's application remained "complete but incorrect."[4]

ARGUMENT

1. ALM's administratively complete application for an Analysis of Adequate Water Supply established a priority date.

Pursuant to A.A.C. R12-15-716(D), an application for an Analysis of Adequate Water Supply establishes a priority date when "a complete and correct application is filed with the Director."[5] Provided the application complies with all statutory and code requirements, it is deemed "complete and correct" when ADWR issues or fails to issue a written notice of administrative completeness within 60 days of the filing.[6] Consistent with A.A.C. R12-15-723(D), once the application is administratively complete, the priority date is established and ADWR may then begin its substantive review of the application.[7] When construing the term "complete and correct" in a similar context regarding underground storage permits, ADWR acknowledged, "An application is deemed complete and correct when all of the information requested in the application has been submitted."[8] ADWR further stated that the substantive review timeframe follows the notice of administrative completeness and correctness.[9]

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[1] *See* Application for an Analysis of Adequate Water Supply, Mar. 18, 2005.
[2] *See* Supplemental filing, May 10, 2005.
[3] *See* Letter from Doug Dunham, ADWR, to Greg Wallace, Montgomery & Associates, Aug. 9, 2005, (hereinafter "Aug. 9 letter"), attached as Exhibit A.
[4] *See* Letter from Herbert Guenther, ADWR, to Jim Rhodes, ALM, Feb. 17, 2006, attached as Exhibit B.
[5] A.A.C. R12-15-716(D).
[6] A.R.S. § 41-1074; A.A.C. R12-15-401 Table A (76); *see also* A.R.S. § 41-1072.
[7] *See* A.A.C. R12-15-723(D)("After determining that the information supplied in the application is complete, the director shall review the application and issue an analysis of adequate water supply.").
[8] See ADWR, *Underground Water Storage, Savings and Replenishment Program* at 2-3 (June 2004) (hereinafter "ADWR Application Guide"), attached as Exhibit C.
[9] *Id.*

In this instance, ALM's application was deemed "complete and correct" by operation of law and by ADWR.[10] ALM filed its application on March 18, 2005, and the 60-day administrative review period expired May 9, 2005.[11] Even if the review period was tolled to account for ALM's supplemental filings, the 60-day period still expired without notice from ADWR.[12] In accordance with A.R.S. § 41-1074(C), ADWR's failure to provide written notice rendered ALM's application administratively complete by operation of law. Moreover, on August 9, 2005 when ADWR finally addressed the issue, it determined that ALM's application was administratively "complete as defined by A.R.S. § 41-1074."[13] This determination of administrative completeness comports with ADWR statements and the requirements of A.A.C. R12-15-716(D) establishing a priority date based upon ALM's "complete and correct" filing.

Contrary to your assertions, ADWR's August 9, 2005 letter did not list any deficiencies that precluded a finding of administrative completeness. The August 9, 2005 letter did, however, ask for additional information as part of ADWR's *substantive review*. This substantive analysis, as construed by ADWR, has no bearing on whether an application is "complete and correct," and therefore, no bearing on ALM's priority date. In fact, under A.R.S. § 41-1075, the August 9, 2005 letter is simply ADWR's "one comprehensive written request for additional information," as part of its substantive review.[14]

Therefore, ADWR's finding that ALM's application was administratively complete is sufficient to establish a priority date. To find otherwise is contrary to ADWR statements; retroactively alters an agency determination; undermines ALM's reliance interest; and establishes a policy that prejudices companies that continue to work with ADWR during the substantive review period by providing additional hydrological and technical information as required.

CONCLUSION

In light of the administrative completeness of ALM's application, as determined through operation of law and by ADWR, ALM respectfully requests that ADWR issue a notice of priority date. In the event ADWR finds that ALM's administratively complete application does not establish a priority date, ALM respectfully requests that ADWR issue a notice of appealable agency action consistent with A.R.S. § 41-1092.03.

---

[10] *See* Aug. 9 letter, attached as Exhibit A.
[11] *See* Application for an Analysis of Adequate Water Supply, Mar. 18, 2005.
[12] ALM made a supplemental filing on May 10, 200;, the corresponding 60-day administrative review period expired July 11, 2005.
[13] Aug. 9 letter, attached as Exhibit A.
[14] A.R.S. § 41-1075.

Snell & Wilmer
L.L.P.

Thank you for your time and consideration on this issue. Should you have any questions or concerns please feel free to contact me at the numbers above.

Very truly yours,
Snell & Wilmer

Carlos D. Ronstadt

Enclosures

EXHIBIT A

ARIZONA DEPARTMENT OF WATER RESOURCES

Office of Assured and Adequate Water Supply
500 North Third Street, Phoenix, Arizona 85004
Telephone 602 417-2465
Fax 602 417-2467

Janet Napolitano
Governor

Herbert R. Guenther
Director

August 9, 2005

Mr. Greg Wallace
Errol L. Montgomery & Associates, Inc.
7949 East Acoma Drive, Suite 100
Scottsdale, Arizona 85260

Re: Application for a Certificate of Assured Water Supply
The Villages at White Hills (DWR No. 23-401674.0000)
Substantive Correctness Review

Mr. Wallace:

The Department has completed its administrative review of the above referenced application and has determined it to be complete as defined by A.R.S. § 41-1074. However, the application does not meet the substantive requirements for issuance of an Analysis of Adequate Water Supply. Pursuant to A.R.S. § 41-1075(A), the Department requests that the following item be submitted:

- Proof of Physical Availability: According to the addendum submitted May 10, 2005, the physical and continuous availability have not been met. Hydrologic issues include over simplification of the aquifer conditions, highly variable data, and over simplified model.

Please submit the requested item to the Office of Assured Water Supply within 60 days, or the Director may take action to deny the application and close the file. Departmental review of your application will not resume until the requested information is received. If you have any questions regarding this letter or any other part of the application process, please do not hesitate to contact Norma Coupaud at (602) 417-2465.

Sincerely,

Douglas W. Dunham, Manager
Office of Assured Water Supply

cc: Carlos Rondstadt

Celebrating 25 Years

EXHIBIT B

ARIZONA DEPARTMENT OF WATER RESOURCES
3550 North Central Avenue, Phoenix, Arizona 85012-2105
Telephone 602 771-8426
Fax 602 771-8681
February 17, 2006

Janet Napolitano
Governor

Herbert R. Guenther
Director

Villages at White Hills
American Land Management, LLC
Attn: Jim Rhodes
4730 South Fort Apache Road, STE 300
Las Vegas, NV 89147

Re: The Villages at White Hills
Analysis of Adequate Water Supply (ADWR #23-401674)

Dear Mr. Rhodes:

The Arizona Department of Water Resources (Department) has received inquiries regarding the status of your application for Analysis of Adequate Water Supply, more specifically as it relates to the priority date of your application. As you are aware there are competing interests for a determination of adequate water supplies in the vicinity of your proposed project. At this time no such priority determination has been made concerning the pending applications within the Detrital Valley groundwater basin. In cases where there are competing applications, such as this, priority is given to the application that has the earliest date that the Department finds the application to be "complete and correct" A.A.C. R12-15-716.D. At this time neither of the pending applications have been found to be complete and correct, and thus no priority date has been assigned. On August 9, 2005 you were notified that the application was determined to be complete but incorrect. At this time your application remains complete but incorrect until you correct the deficiencies identified in the August 9, 2005 letter.

Additionally, I have recently sent a letter to the Mohave County Board of Supervisors to provide them with information regarding the Departments concern about the availability of groundwater supplies in this area.

The Department has seen a significant increase in the demand for adequacy determinations in Mohave County, and is currently reviewing applications for two master-planned communities, yours and The Ranch at White Hills. These two proposed communities total in excess of 62,000 lots and would require approximately 25,000 acre-feet of groundwater. They would involve portions of three groundwater basins, the Detrital Valley, Sacramento Valley and Hualapi Valley basins. Information on the hydrogeological conditions in all three of these basins is currently limited, making site specific evaluation of the adequacy of groundwater supplies challenging. We felt that it was important to bring to your attention that at this time, based on information that is available the Department feels that it is unlikely that adequate supplies of groundwater are physically available for the proposed uses in the pending applications.

Celebrating 25 Years

Of course, the Department will fully consider any and all new information that you may submit. When your application is correct, the information will be verified and the Department will then make its final determination.

The Department is very interested in ensuring that all parties have the most up to date information regarding water supply availability, especially in areas like this where we do not believe that we have sufficient data. We want to make sure that you as an applicant are aware of what the Department is providing to others as well as ensuring that you know what is happening with your application. If you have any questions, please feel free to call me at 602-771-8426.

Sincerely,

Herbert R. Guenther

Herbert R. Guenther

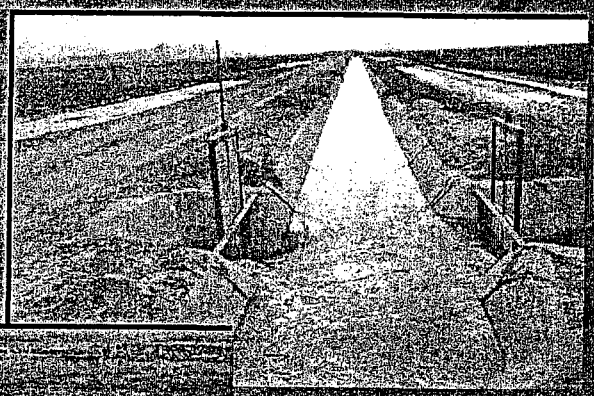
EXHIBIT C

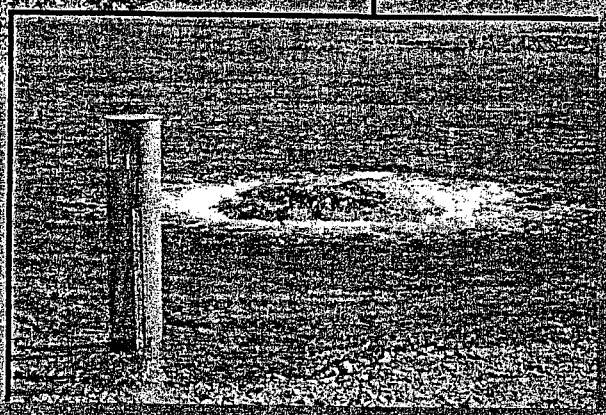
ADWR
ARIZONA DEPARTMENT OF WATER RESOURCES

SECURING ARIZONA'S WATER FUTURE

Underground Water Storage, Savings and Replenishment Program

Water Storage Permit Application Guide





500 NORTH THIRD STREET
PHOENIX, ARIZONA
85004-3921

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FAX: 602-417-2467
www.water.az.gov

JUNE 2004

Underground Water Storage, Savings and Replenishment Program

June 2004

Janet Napolitano, Governor
State of Arizona

Herb Guenther, Director
Arizona Department of Water Resources

Arizona Department of Water Resources
Underground Water Storage, Savings and Replenishment Program
500 North Third Street
Phoenix, Arizona 85004-3921
602-417-2465
1-800-352-8488
Fax: 602-417-2467

Application forms, links to referenced statutes and agencies, and additional information regarding the UWS Program may be found at www.water.az.gov.

WATER STORAGE APPLICATION GUIDE
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WATER STORAGE PERMIT APPLICATION GUIDE

A. INTRODUCTION

Water Storage (WS) permits are issued in accordance with the Underground Water Storage, Savings and Replenishment Program in Arizona Revised Statutes (A.R.S.) § 45-801.01 *et seq.* A WS permit issued pursuant to A.R.S. § 45-831.01 grants the permit holder authority to store water at a permitted Underground Storage Facility (USF) or Groundwater Savings Facility (GSF). This guide provides information on the permit application process and assistance in completing the WS permit application form. Applicants may contact the Department if additional assistance or information regarding the application process is needed.

1. Whom to Contact to Schedule Meetings

The Recharge Coordinator may be contacted to schedule a pre-application meeting. Applicants who have identified questions they want to discuss at the meeting should submit their questions to the Recharge Coordinator prior to the scheduled meeting to allow Department staff to prepare appropriately.

B. APPLICATION SUBMITTAL

1. Filing an Application

A WS permit application form (see Appendix A of this Application Guide for a sample) must be completed to apply for a new WS permit or to modify or renew an existing permit. Application forms are available from the Recharge Coordinator and at AMA offices or they may be printed from http://www.water.az.gov/recharge/forms. All applicable supporting evidence requested on the application must be included in the submittal. To convey a WS permit, refer to the Permit Conveyance Application Guide. The application fee and one original plus four copies of the WS permit application form and supporting evidence must be submitted to the Recharge Coordinator at the address noted on the application form. The application form must be signed by the applicant and notarized.

In order to implement a contingency that is specific in nature and was included as a condition of an existing WS permit, no permit modification application, fee or public notice is required. All other contingencies may only be implemented through a WS permit modification and may be subject to fees and/or public notice as described in Sections B.2 and C.3 of this Application Guide.

2. Fee Schedule

Fees are assessed in accordance with A.R.S. § 45-871.01(A) and Arizona Administrative Code (A.A.C.) R12-15-151(B). The following fee schedule pertains to WS applications/permits, including the modification or renewal of WS permits.

Water Storage Permit Application.....	$ 250.00
Water Storage Permit.....	$ 100.00
Public Notice.....	Assessed after Public Notice Based on Actual Costs.

a. Exceptions to Fees for Permit Modifications

Permit modification and renewal applications require the same fees as new WS permit applications (as described above); however, there are limited circumstances when fees for modifications are waived. Application and permit fees are not assessed for the following modifications:

- Corrections of clerical errors or omissions caused by the Department.
- Changes to a permit that are required by a change in ADWR rule or statute unless a new fee is required by law.

3. Filing an Application to Renew a Water Storage Permit

WS permittees who want to continue to store water at a permitted storage facility after their WS permit is scheduled to expire may apply for a renewal of their permit as provided in A.R.S. § 41-1092.11. If the application is submitted prior to the expiration of the existing permit and satisfies all the preliminary submittal requirements, *i.e.* it includes the appropriate fees and one original plus four copies of the correct, signed and notarized application form, the existing permit will not expire until the Department makes a final determination on the renewal application. If the renewal application is denied or the terms of the renewal are limited, the existing permit remains effective until the conclusion of the administrative appeal process. If the permit holder does not file a timely renewal application that meets all of the preliminary submittal requirements, a new application for a WS permit will be required, and operations pursuant to the existing permit must cease when the permit expires.

C. LICENSING TIMEFRAMES

The licensing timeframes for the permit application process are set forth in A.A.C. R12-15-401. The timeframes consist of a 100-day administrative completeness review timeframe and a 195-day substantive review timeframe, which combine to form the overall timeframe of 295 days. The licensing timeframes pertain to new WS permit applications, as well as permit modifications and renewals.

1. Overall Timeframe

The overall timeframe, 295 days, is the number of days after receipt of an application during which the Department must determine whether to grant or deny the application. The overall timeframe consists of both the administrative completeness review timeframe and the substantive review timeframe. The overall timeframe will be extended if the applicant receives a letter from the Department during the administrative completeness review or substantive review timeframes requesting additional information or if a hearing is held. Therefore, the 295 days may not reflect the actual time it will take for the Department to grant or deny an application for a WS permit.

2. Administrative Completeness Review Timeframe

During the 100-day administrative completeness review timeframe, the Department must determine whether the submittal contains all the information required for a complete and correct application. The 100-day administrative completeness review timeframe begins upon receipt of an application that satisfies all of the preliminary submittal requirements.

E. OTHER FORMS AND PERMITS THAT MAY BE REQUIRED

1. Aquifer Protection Permit (APP)

An APP must be obtained from the Arizona Department of Environmental Quality (ADEQ) for non-CAP water storage projects. A.R.S. Titles 45 and 49 recognize different permitting procedures for USFs depending on whether the source water includes effluent. Provisions of A.R.S. § 49-250(12) and (13) exempt USFs using CAP and certain other non-effluent waters from the requirement to obtain an APP if an operating permit is secured under A.R.S. Title 45. Thus, depending on the facility's source water type, the discharge may or may not require an APP issued by ADEQ. If the source water subjects the facility to APP requirements, the APP must be obtained prior to any water storage at the USF. Please contact the Water Permit Section of the Water Quality Division at ADEQ for further information.

RECEIVED
APR 0 6 2006
SNELL & WILMER

ARIZONA DEPARTMENT OF WATER RESOURCES
Legal Division
3550 North Central Avenue, Phoenix, Arizona 85012
Telephone 602 771-8472
Fax 602 771-8683

Janet Napolitano
Governor

Herbert R. Guenther
Director

April 5, 2006

Robert J. Metli
Carlos D. Ronstadt
Snell & Wilmer L.L.P.
One Arizona Center, 400 E. Van Buren
Phoenix, Arizona 85004-0001

RE: The Villages of White Hills
Analysis of Adequate Water Supply Application No. 23-401674

Dear Mr. Metli and Mr. Ronstadt:

I am responding to your respective letters to Herb Guenther, Director, dated March 6, 2006 and March 17, 2006, regarding the application referenced above. Since the two letters address virtually the same subject matter, I will respond to both letters at this time.

You have asserted that because the application is administratively complete, the application therefore has a priority date for purposes of the Assured and Adequate Water Supply rules. A.A.C. R12-15-701 *et seq.* Although the application in question was deemed administratively complete under A.R.S. § 41-1074(C), the application is *not substantively correct* and, therefore , no priority date has yet been assigned to the application.

According to A.A.C. R12-15-716(D), "the priority date of an application for a water report, designation of adequate water supply, or analysis of adequate water supply shall be the date that a complete *and correct* application is filed with the Director." (Emphasis added.) Pursuant to A.R.S. § 41-1074(C), the application was deemed "administratively complete" on August 9, 2005. The application is not, however, correct.[1] The application is complete *and correct* when the applicant has submitted all the information required to make a determination on the application and the information is verified as acceptable.[2]

Although the application was deemed administratively complete because the Department of Water Resources (Department) did not issue a written notice of administrative completeness or deficiencies within the administrative review time frame, the application did not contain all of

the information requested in the application. In the August 9 letter, the Department requested the additional information needed to review the application and make a determination on the physical availability of groundwater. Until the Department receives that information and verifies it as acceptable,

---

[1] An application may be complete but incorrect, as in this case. *See* A.R.S. § 45-578(A) ("The first publication [of notice of an application for a certificate of assured water supply] shall occur within fifteen days after the application is determined *complete and correct* or at any earlier time as the applicant may request after the application is determined *complete*." (Emphasis added)).

[2] *See* Notice of Proposed Rulemaking, 12 A.A.R. 383, 391, 441, Feb. 10, 2006 (explaining that the proposed rules clarify the procedure for determining the priority date of an application by setting forth the meaning of "complete and correct"). Although the proposed rules are not expressly applicable to the application in question, the change to the rules is not a substantive change, but a clarifying change to explain the Department's current practice.

the application is administratively complete but incorrect.[3] Because Application No. 23-401674 is not complete *and correct*, the Department has not yet assigned the application a priority date.

As the March 6 letter correctly states, the Department approved the proposal submitted in December 2005 by Errol L. Montgomery & Associates, Inc., to obtain and analyze more data. The Department is awaiting the results of the proposal before making a final determination on the application. After the additional information is submitted, the Department will review the information to determine whether the application is complete *and correct*. If at that time the Department determines that the application is complete *and correct*, the Department will assign the application a priority date, as provided by rule. The priority date will be the date that the final requested information was submitted, rather than the date the Department determines the application to be complete *and correct*.

The March 6 letter also expressed confusion regarding two letters sent by the Department, both dated February 17, 2006. One letter, issued by the Department's Hydrology Division, approved the December 2005 proposal to obtain additional data in the area. The second letter, signed by the Director, stated that "based on information that is available the Department feels that it is unlikely that adequate supplies of groundwater are physically available for the proposed uses in the pending applications." The two letters do not conflict with one another. The Hydrology Division has acknowledged the Errol L. Montgomery & Associates proposal as an appropriate method to gather additional data. However, based on the data that is *currently* available, it appears that adequate supplies of groundwater are not physically available for the proposed uses in the pending applications.

Finally, the March 17 letter requests a notice of appealable agency action if the Department does not assign a priority date to the application at this time. However, the Department has not yet made a final determination with respect to the application and therefore cannot issue an appealable agency action at this time. *See* A.R.S. § 41-1092(3).

Please let me know if you need further clarification. As before, the Department wants to ensure that all parties remain updated regarding the availability of water supplies and that all applicants understand the application review process.

Sincerely,

W. Patrick Schiffer
Chief Counsel

cc: Herbert R. Guenther, Director
Mr. Jim Rhodes, Rhodes Homes
Mohave County Board of Supervisors

WPS:kad

---

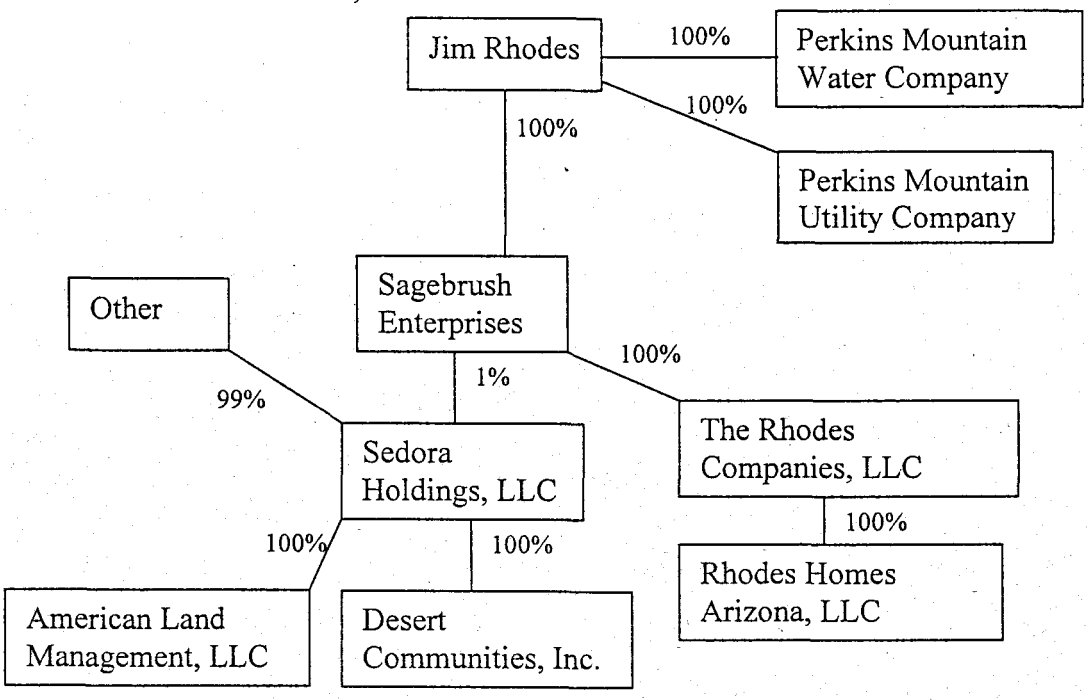
[3] Even if the Department were to apply its Water Storage Permit Application Guide in this case, the Application Guide states, "An application is deemed complete and correct when all of the information requested in the application has been submitted." In this case, the applicant has not submitted all information requested in the application.

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.10 **Fit and Proper:** Please provide a detailed explanation of the relationship between Rhodes Homes Arizona, LLC, Perkins Mountain Water Company, Perkins Mountain Utility Company, Sedora Holdings, LLC, Sagebrush Enterprises, Desert Communities, Inc., and American Land Management, LLC.

Response:

Jim Rhodes owns 100% of Sagebrush Enterprises, Perkins Mountain Utility Company and Perkins Mountain Water Company. Sagebrush Enterprises owns 1% of Sedora Holdings, LLC, and 100% of The Rhodes Companies, LLC. The Rhodes Companies LLC owns 100% of Rhodes Homes Arizona, LLC. Sedora Holdings, LLC, owns 100% of American Land Management, LLC, and 100% of Desert Communities, Inc.



Prepared by: Mark E. Hall
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2215 Hualapai Mountain Road, Suite H
Kingman, AZ 86401

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.11 **Fit and Proper**: According to the application, "Rhodes Homes Arizona, LLC ... a reputable and experienced land developer and homebuilder has built more than a dozen developments in southern Nevada, including Rhodes Ranch ..." Please provide a list of all the affiliates of Rhodes Home Arizona, LLC, Perkins Mountain Water Company, and Perkins Mountain Utility Company. For each of the entities listed, please describe the nature of the business.

Response:

Objection. The Applicants object to the request for a list of "all affiliates of Rhodes Homes Arizona, LLC, Perkins Mountain Water Company, and Perkins Mountain Utility Company" on the grounds that the request seeks information that is confidential, competitive in nature, and proprietary to Rhodes Homes Arizona, LLC. The above-listed entities have a number of affiliates which are used for a variety of business reasons and estate planning purposes. The substantial majority of these affiliates have no relationship to the business of Rhodes Homes Arizona, LLC, Perkins Mountain Water Company and Perkins Mountain Utility Company. Without waiving this objection, set forth below is a description of the nature of the business of the affiliates identified in the response to data request BNC 1.10.

Sagebrush Enterprises, Inc.: investment holding company
Perkins Mountain Utility Company: sewer utility company
Perkins Mountain Water Company: water utility company
Sedora Holdings, LLC: investment and land holding company
American Land Management, LLC: land holding company
Desert Communities, Inc.: development entity and land holding company
The Rhodes Companies, LLC: managing operations of various businesses of Jim Rhodes
Rhodes Homes Arizona, LLC: Arizona development company

Prepared by:

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RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.12 Fit and Proper: Please provide a list of all the officers and directors for each of the above mentioned entities/affiliates and their respective ownership interest.

Response:

Objection. Applicants incorporate herein by reference the objection set forth in the response to data requests 1.11. Without waiving this objection, set forth below is a list of the officers and directors for the affiliates identified in the response to BNC 1.10.

Sagebrush Enterprises, Inc.: Jim Rhodes is the sole director, President and CEO; Paul Huygens is the Treasurer and CFO; Keith Mosley is the Secretary; and Frederick Chin is the COO.

Perkins Mountain Water Company and **Perkins Mountain Utility Company**: Kirk Brynjulson is the President and a director; Paul Huygens is the secretary and treasurer; Frederick Chin is a director; and Keith Mosley serves on the board of directors.

Sedora Holdings, LLC: Jim Rhodes is the President and CEO; Paul Huygens is the Treasurer and CFO; Keith Mosley is the Secretary; and Frederick Chin is the COO.

Desert Communities, Inc.: Jim Rhodes is the sole director and President; Paul Huygens serves as both the Secretary and Treasurer.

American Land Management, LLC: Charles Sakura and Gary Fuchs serve as managers;

The Rhodes Companies, LLC: Jim Rhodes is the President and CEO; Paul Huygens is the Treasurer and CFO; and Keith Mosley is the Secretary.

Rhodes Homes Arizona, LLC: is member managed by its sole member, The Rhodes Companies, LLC. No officers have been appointed.

BNC 1.12 (Continued) Applicants will supplement this response with any additional information, changes or documents that may come to their attention.

Prepared by: Mark E. Hall
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RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.13 **Fit and Proper:** Please provide a copy of the federal and state income tax returns for each of the above mentioned entities for the years 2003 and 2004, and 2005 when completed.

Response:

Objection. Applicants incorporate herein by reference the objection set forth in the response to data requests 1.11. Further, the Applicants object to this request because the federal and state income tax returns requested are confidential, competitively sensitive, not relevant to this proceeding, and the request is not reasonably calculated to lead to the discovery of admissible evidence.

Prepared by: Jeffrey W. Crockett
Snell & Wilmer L.L.P.
400 E. Van Buren
Phoenix, AZ 85004

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.14 **Fit and Proper:** Please provide the name of the entity that built Rhodes Ranch.

Response:

Rhodes Ranch General Partnership built Rhodes Ranch.

Prepared by: Mark E. Hall
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RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.15 **Fit and Proper:** Has Rhodes Homes Arizona, LLC, Perkins Mountain Water Company, and/or Perkins Mountain Utility Company and/or any of their respective affiliates operated a public water and/or wastewater utility company? If so, please provide a detailed explanation of the track record.

Response:

Perkins Mountain Water Company and Perkins Mountain Utility Company (collectively, the "Utilities") were formed to provide water and wastewater services to the areas set forth in their respective applications. Neither of the Utilities has previously operated a public water or wastewater utility company. Likewise, neither Rhodes Homes Arizona, LLC, ("Rhodes Homes") nor any of its affiliates identified in the response to data request BNC 1.10 have previously operated a public water or wastewater utility company. Recognizing the need for highly qualified professionals with all of the necessary experience and expertise to plan for and operate the Utilities in conformity with sound utility practices and procedures, Rhodes Homes and the Utilities have retained the following professionals:

Aricor Water Solutions, LLC ("Aricor")

As stated in the Utilities' respective applications for CC&Ns, Aricor is the contract operator for the Utilities, and Ray Jones, Principal of Aricor, is the certified operator. Mr. Jones has over twenty years experience working with, operating, and managing water and wastewater utility systems in the State of Arizona. He is a registered Professional Engineer and a licensed water and wastewater operator. Mr. Jones served as the President of Arizona-American Water Company, a subsidiary of a national water and wastewater conglomerate, where he provided management and guidance to key operations and support personnel and developed strategic plans. As the Vice President and General Manager of Citizens Water Resources, Arizona Operations, Mr. Jones oversaw regulated and unregulated water and wastewater operations, which served approximately 120,000 customers. As the Principal of Aricor, Mr. Jones has worked with numerous clients on various projects in Arizona including:

Pulte Home Corporation – Anthem
Arizona-American Water Company
Sunrise Water Company
Buckeye Water Conservation and Drainage District

BNC 1.15 Continued

Element Homes – Sun Haven
El Dorado Holding Inc. – Douglas Ranch
DMB Associates
Courtland Land – Austin Ranch
West End Water Company

Stanley Consultants, Inc.

Rhodes Homes and the Utilities have sought the expertise of Stanley Consultants, Inc., a worldwide engineering, construction and environmental services company, with specific water and wastewater utility experience in Arizona. Stanley Consultant's has been retained to provide operation and business planning consulting services. The Utilities' project staff include:

Mr. David Frohnen with 22 years of professional experience, including 6 years in Arizona where he held the position of Operations Manager for Citizens Water Resources. In that position, Mr. Frohnen had full responsibility for all water and wastewater utility operations for 12 utility systems in Central and Southern Arizona. Prior to that Mr. Frohnen was employed by Citizens Utilities Company of California in Northern California, as its Manager of Engineering and Construction in which he planned and executed utility infrastructure projects in 16 separate water utility systems in suburban and rural areas of Northern California. Mr. Frohnen holds a Professional Engineer's License in Arizona and was previously licensed as a Grade 4 Operator in Water, Wastewater, Collection and Distribution by the Arizona Department of Environmental Quality ("ADEQ").

Mr. Mark Clark is also assigned to the Utilities' project as a consultant. As part of Mr. Clark's prior employment with Arizona American Water Company and Citizens Water Resources, he worked on several assignments in Northern Arizona. Most notably, Mr. Clark served as the Operations Manager for Arizona American Water Company supervising operations of all water and wastewater utilities in Mohave County, Arizona. Mr. Clark holds current operator licenses from ADEQ.

Some of Stanley Consultants' water and wastewater projects in Arizona include:

Arizona American Water Company: Staff augmentation; Tubac arsenic treatment plant; Anthem water and wastewater engineering; Sun City

BNC 1.15 Continued

Grand water and wastewater engineering.

Pinewood, Arizona: Planning, design, construction and start-up of wastewater treatment plant.

City of Eloy: Wastewater treatment plant.

City of Phoenix: Various pump stations, lift stations, instrumentation and control projects.

City of Scottsdale: Various wells and pump station projects.

Errol L. Montgomery & Associates ("Montgomery & Associates")

Rhodes Homes has been working with Montgomery & Associates, one of the premier hydrogeologic consulting firms in the western hemisphere, to assist with hydrogeology issues related to Golden Valley South and The Villages of White Hills. The Montgomery & Associates staff which are consulting on Golden Valley South and The Villages of White Hills include:

Mr. Bill Victor is a Principal of Montgomery & Associates, and has over 27 years of experience coordinating, directing and overseeing all aspects of water resource projects. He has investigated and analyzed large-scale groundwater supplies in Maricopa County, and he has served as Principal Consultant on numerous interdisciplinary water resource projects.

Mr. Greg Wallace is a former Assistant Director of the Arizona Department of Water Resources ("ADWR"), and also served as ADWR's Chief Hydrologist. He has extensive professional experience in hydrogeology, groundwater resources management and planning, groundwater recharge, groundwater development and public agency administration. Mr. Wallace is currently responsible for directing water supply development project work for the Phoenix office of Montgomery & Associates.

Over the last twenty years, Montgomery & Associates has provided hydrogeologic consulting services throughout Arizona to clients including:

Lennar Homes Development, Inc.: assisted with well construction, aquifer testing and demonstration of assured water supply to the Arizona

BNC 1.15 Continued

Department of Water Resources ("ADWR") for a large master planned community in Maricopa County.

Capital Pacific Homes: assisted with well construction, aquifer testing and demonstration of assured water supply to ADWR for a large master planned community in Maricopa County.

Chino Grande: performed Analysis of Water Adequacy for 29,000 acre feet of water for a large master planned community of 20,000 homes north of Chino Valley, Arizona.

Belvedere: conducted a water adequacy investigation and report to ADWR for master planned community of 14,000 units in southwestern Maricopa County.

Sopori Ranch: 36,000 acre project in southern Arizona for demonstration of water adequacy to ADWR for master planned community of 30,000 homes.

Prepared by: Mark E. Hall
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RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.19 **Fit and Proper:** Have Rhodes Homes Arizona, LLC, Perkins Mountain Water Company, and/or Perkins Mountain Utility Company and any of their respective affiliates ever filed for bankruptcy? If so, please provide the litigation history and the case disposition.

Response:

Objection. Applicants incorporate herein by reference the objections set forth in the responses to data requests BNC 1.11. Without waiving the foregoing objections, neither Rhodes Homes Arizona, LLC, Perkins Mountain Water Company, Perkins Mountain Utility Company or any of the affiliates identified in the response to data request BNC 1.10 have ever filed for bankruptcy.

Prepared by:

Mark E. Hall
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RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.20 **Fit and Proper:** Have any of the officers and/or directors affiliated to Rhodes Homes Arizona, LLC, Perkins Mountain Water Company and/or Perkins Mountain Utility Company and any of their respective affiliates ever filed for bankruptcy? If so, please provide the litigation history and the case disposition.

Response:

Objection. Applicants incorporate herein by reference the objections set forth in the responses to data requests BNC 1.11. Without waiving the foregoing objections, none of the officers or directors of Rhodes Homes Arizona, LLC, Perkins Mountain Water Company, Perkins Mountain Utility Company or any of the affiliates identified in the response to data request BNC 1.10 have ever filed for bankruptcy.

Prepared by:

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RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.22 **Fit and Proper:** Please provide a listing of the exact legal name of all the entities in which Developer, Mr. Jim Rhodes, and/or family members, has a direct or beneficial equity, partnership, membership or other ownership interest.

Response:

Objection. The Applicants object to this request because the information requested is confidential, sensitive, competitive in nature, overly broad, irrelevant, and not reasonably calculated to lead to the discovery of admissible evidence. Further, Applicants incorporate herein by reference the objection set forth in the response to data request BNC 1.11.

Without waving this objection, the exact legal names of the affiliates identified in the response to BNC 1.10 are:

Sagebrush Enterprises, Inc.
Sedora Holdings, LLC
The Rhodes Companies, LLC
Rhodes Homes Arizona, LLC
American Land Management, LLC
Desert Communities, Inc.
Perkins Mountain Water Company
Perkins Mountain Utility Company

Prepared by: Mark E. Hall
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RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.24 **Fit and Proper**: Please provide a copy of Mr. Jim Rhodes' resume indicating 1) dates, title(s) and companies with whom he was/is employed, 2) any professional organizations of which he is a member or officer, 3) educational background and degrees earned, and 4) any other information relevant to his professional career.

Response:

1) Mr. Rhodes has been building homes since 1985. As a self-employed developer, Mr. Rhodes is the founder and president of land acquisition, design, and development entities.

2) Mr. Rhodes is not a member of any professional organizations.

3) Mr. Rhodes is a lifelong Las Vegas resident. He graduated and received his high school diploma in Las Vegas and continued his education at UNLV, where he took various classes.

4) Mr. Rhodes has made significant contributions to numerous charitable organizations in the community including: the Andre Agassi Charitable Foundation, Nevada Cancer Institute, APPLE Partnership—All People Promoting Literacy Efforts, HELP of Southern Nevada, March of Dimes and Opportunity Village among many others.

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PHOENIX, ARIZONA
TUCSON, ARIZONA
IRVINE, CALIFORNIA
SALT LAKE CITY, UTAH
DENVER, COLORADO
LAS VEGAS, NEVADA

Jeffrey W. Crockett
602.382.6234
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April 28, 2006

HAND-DELIVERED

David M. Ronald, Staff Attorney
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Blessing N. Chukwu
Utilities Division Staff
ARIZONA CORPORATION COMMISSION
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Phoenix, Arizona 85007

Re: Response to Staff's First Set of Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company (Docket Nos. W-20380A-05-0490 and SW-20379A-05-0489)

Dear David and Blessing:

Enclosed is the response of Perkins Mountain Water Company and Perkins Mountain Utility Company to Staff data request BNC 1.21 in the above-referenced dockets. Responses to the Staff data requests BNC 1.16, 1.17, 1.18 and 1.23 will be provided shortly.

Very truly yours,

SNELL & WILMER

Jeffrey W. Crockett

JWC:gb
Enclosure
cc (with enclosure): Keith Mosley
Mark Hall

KIEFERK\PHX\1827482.1

FILE COPY

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.21 **Fit and Proper:** Please describe any and all dissolutions and/or terminations of the entities listed above and/or any of their affiliates that have occurred from January 1, 1996 through and including the date of the response to this data request.

Response:

None of the entities listed in the response to data request BNC 1.10 have been dissolved or terminated.

Objection. With regard to any affiliates of the entities identified in the response to data request BNC 1.10, Applicants incorporate herein by reference the objection set forth in the response to data request BNC 1.11.

Prepared by:

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May 18, 2006

HAND-DELIVERED

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RECEIVED
MAY 18 2006
LEGAL DIV.
ARIZ. CORPORATION COMMISSION

Re: ***Supplemental Response to Staff's First Set of Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company (Docket Nos. W-20380A-05-0490 and SW-20379A-05-0489)***

Dear David and Blessing:

Enclosed is one copy of a supplemental response to Staff's Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company (BNC 1.9) in the above-referenced docket.

Please contact me at the direct line listed above if you have any questions or if you need further information or documents.

Very truly yours,

SNELL & WILMER

Jeffrey W Crockett by KRH

Jeffrey W. Crockett

cc (with enclosure): K. Mosley
M. Hall

FILE COPY

1836691.1

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May 18, 2006

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Blessing N. Chukwu
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Phoenix, Arizona 85007

Re: Supplemental Response to Staff's First Set of Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company (Docket Nos. W-20380A-05-0490 and SW-20379A-05-0489)

Dear David and Blessing:

Enclosed is one copy of a supplemental response to Staff's Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company (BNC 1.9) in the above-referenced docket.

Please contact me at the direct line listed above if you have any questions or if you need further information or documents.

Very truly yours,

SNELL & WILMER

Jeffrey W. Crockett

cc (with enclosure): K. Mosley
M. Hall

1836691.1

Snell & Wilmer is a member of LEX MUNDI, The Leading Association of Independent Law Firms.

SUPPLEMENTAL RESPONSE OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.9 **Water Adequacy:** Please explain the underlying issue behind the March 6, 2006 letter from Snell & Wilmer to ADWR.

Supplemental Response:

See the attached letter to Herb Guenther, Director Arizona Department of Water Resources dated May 11, 2006.

Prepared by: Jeffrey W. Crockett
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May 11, 2006

Herb Guenther, Director
Arizona Department of Water Resources
3550 N. Central Avenue
Phoenix, Arizona 85012

Re: Analysis of Adequate Water Supply
File Number: 23-401774.0000 (The Ranch at White Hills);
Request for Administrative Review

Dear Director Guenther:

This is the first time competing applications for an analysis of adequate water supply for the same underground water have come before the Arizona Department of Water Resources ("ADWR" or "the Department") and the first time that the rule addressing competing applications, A.A.C. R12-15-716(D), has ever been applied. American Land Management, LLC ("ALM") and Rhodes Homes - Arizona, LLC ("Rhodes")[1] submitted an administratively correct application which was first in time, but was delayed in substantive review at ADWR. A later application for the same water in the Detrital Valley Basin was filed by Leonard and Susan Mardian ("Mardian") for The Ranch at White Hills[2] ("the Mardian Application") which received expedited determination of adequate water supply, effectively giving the Mardians priority to groundwater underlying ALM's property.

[1] The land owner of the Villages at White Hills is American Land Management, LLC and the developer of the Villages at White Hills is Rhodes Homes – Arizona, LLC; both of which are affiliated with Jim Rhodes.
[2] The land owners of the Ranch at White Hills are a number of entities: The Ranch at Temple Bar, LLC, Joshua Tree, LLC, Arizona Acreage, LLC, Arizona Land Development, Inc., Silver Basin, Inc., Cactus & Stuff, LLC, Flannery & Allen, LLC, Gateway Lots, LLC and Smith Ranch Commercial LLC; all of which have Leonard, Susan and Lori Mardian as principal owners/shareholders.

ALM has ownership rights to the groundwater that is the subject of the Mardian Application. ADWR's action in issuing an Analysis of Adequate Water Supply for The Ranch at White Hills, without acknowledging ALM's priority and without giving notice, a hearing, or an opportunity to be heard, violates ALM's rights under Arizona law and the United States and Arizona Constitutions.

Pursuant to A.R.S. §41-1092.09, ALM and Rhodes file this Request for Hearing to resolve priority rights in competing applications for issuance of an Analysis of Adequate Water Supply in the Detrital Valley Basin.

I. BACKGROUND

Errol Montgomery & Associates ("Montgomery & Associates") applied, on behalf of ALM and Rhodes, for an Analysis of Adequate Water Supply for The Village at White Hills in Mohave County, Arizona on March 18, 2005 ("the ALM Application").[3] Supplemental hydrological information was submitted to ADWR on May 10, 2005.[4] At that time, no other applications had been filed for water in the Detrital Valley Basin. The Mardian Application was filed, almost three months later, on June 3, 2005.

Nearly three months after ALM's initial filing, ADWR met with Montgomery & Associates on June 7 to discuss the ALM Application. The next day on June 8, 2006, the Department completed its Adequacy Application Review checklist for the ALM Application, noting that the application was complete and that the application had previously been sent to the Hydrology Division for review on March 23, 2005. ADWR further acknowledged that the application was complete and administratively correct in an e-mail from the Office of Assured & Adequate Water Supply to the Department's Water Resources Section Manager on July 29, 2005[5].

In comparison, the Adequacy Application Review checklist for the Mardian Application was completed on June 21, 2005, only three weeks after the initial filing, and it too noted that the application was complete. The Hydrology Division received the Mardian Application for review on June 10, 2005 and Water Quality Division received it on June 21, 2005.

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[3] *See* Application for an Analysis of Adequate Water Supply, Mar. 18, 2005.
[4] *See* Supplemental filing, May 10, 2005.
[5] *See* E-mail from Norma Coupaud to John Kurtz and Karen Modesto, dated July 29, 2005, attached as Exhibit A.

On August 9, 2005, nearly five months after the ALM Application was filed, ADWR acknowledged that the application was administratively complete but substantively incorrect,[6] and requested information to resolve some "hydrologic issues." Montgomery & Associates met with ADWR on September 2, 2005 to discuss the Department's specific concerns. ADWR followed up with a letter to Montgomery & Associates on September 20, 2005 summarizing the Department's "main concerns about the study and report." ADWR also recommended a proposal be submitted for review and comment. A detailed work plan was submitted to ADWR on December 5, 2005. Two months later, on February 17, 2006, ADWR issued two letters: one approved the work plan and the other attempted to rescind ADWR's finding that the application was administratively complete. Furthermore, ADWR stated that it had not made a priority date determination and the ALM Application remained "complete but incorrect."[7]

Although there is nothing in the public record regarding the administrative completeness of the Mardian Application, ADWR issued an Analysis of Adequate Water Supply for The Ranch at White Hills on April 11, 2006, stating that on March 31, 2006 - 11 days earlier - the application was found to be complete and correct. ADWR sent a letter to Montgomery & Associates on April 19, 2006[8], advising them that the ALM Application must now include in its demand calculations the 7,573 acre-feet per year of water reserved to The Ranch at White Hills.

II. Appealable Agency Action

An appealable agency action is an action that determines the legal rights of a party and is not a contested case.[9] Although legal rights were determined by ADWR, it did not review or approve either the ALM or the Mardian application in the context of a contested case. The approval of the Mardian Application for an analysis of adequate water supply was not subject to an administrative hearing. The process for approval did not provide ALM an opportunity to object, intervene or otherwise challenge the data or information provided to ADWR or relied on by the Department in the granting of the application. Nor did it give ALM notice that the Mardian Application would be given priority. ADWR's approval of the Mardian Application has effectively prioritized the

[6] *See* Letter from Doug Dunham to Greg Wallace Aug. 9, 2005, (hereinafter "Aug. 9th letter"), attached as Exhibit B.
[7] *See* Letter from Herbert Guenther to Jim Rhodes, ALM, Feb. 17, 2006, attached as Exhibit C.
[8] *See* Letter from Doug Dunham to Greg Wallace, April 19, 2006, attached as Exhibit D.
[9] A.R.S.§41-1092(1).

rights of both applicants to the groundwater in the Detrital Valley Basin without the benefit of a hearing. This action constitutes an appealable agency action.

III. Contested Case

Alternatively, this matter should have been a contested case. ADWR clearly recognized there were competing applications for the groundwater in the Detrital Valley Basin.[10] Issuance of an analysis of adequate water supply in that basin should have been treated as a contested matter by the Department. A contested case is any proceeding in which legal rights are required or permitted by law to be determined by an agency after an opportunity for an administrative hearing.[11] Due to the potentially limited availability of groundwater in the area, ADWR should have known the profound effect its decision would have upon the rights sought by competing applications.

ADWR acknowledged the extent of the proposed communities for both applications, stating in its letters to both parties that "these two proposed communities total in excess of 62,000 lots and would require approximately 25,000 acre-feet per year of groundwater." The Department further acknowledged that it "feels" adequate supplies of groundwater are not likely available for the uses proposed in the pending applications. ADWR knew that approval of an adequate water supply for one applicant would deny adequate water for the other applicant's proposed use. ADWR's determination of priority between simultaneously pending applications in reliance upon A.A.C. R12-15-716(D), a rule of ambiguous meaning, violates principles so settled and understood that the Arizona Supreme Court called them "obvious."

> "Since there is not enough water to meet everyone's demands, a determination of priorities and a quantification of the water rights accompanying those priorities must be made. Obviously, such a task can be accomplished only in a single proceeding in which all substantial claimants are before the court so that all claims may be examined, priorities determined, and allocations made." *In re General Adjudication of All Rights to Use Water in Gila River System and Source*, 195 Ariz. 411, ¶11, 989 P.2d 739 (1999)

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[10] *See* Letter from Herbert Guenther to Jim Rhodes, ALM, Feb. 17, 2006.
[11] A.R.S. §41-1001(4).

ADWR's action in approving the Mardian Application effectively eliminates 7,573 acre-feet per year of water for use by Rhodes in its development of The Villages at White Hills. This action not only eliminates a substantial quantity of groundwater for use by ALM and Rhodes, it also requires ALM to recalculate its groundwater demand to take into account that amount of existing demand. Despite having invested in excess of three million dollars to produce hydrology information that did not exist prior to ALM's application, ALM and Rhodes must now spend significant amounts more without the benefit of being "first in time, first in right." The total amount of these expenditures will be provided to the Department upon request.

IV. Priority Claim

ALM is entitled to a determination that on May 17, 2005, its application was "complete and correct" as that term is used in R12-15-716(D). Legislation requires this. When an agency does not issue a written notice of administrative completeness or deficiencies within the administrative completeness review time, the application is deemed administratively complete as a matter of law.[12] The ALM Application was filed on March 18, 2005. Although the hydrology information was supplemented on May 5, 2005, the data provided was for the purpose of the substantive review. The licensing time frame for an analysis of water adequacy is 60 days for administrative completeness review, 60 days for substantive review and 120 days overall.[13] ADWR did not issue a written notice of administrative deficiencies within the 60 days, therefore the application was administratively complete on the 61st day after it was filed.

Regardless of whether it was complete as a matter of law, the ALM Application was complete as a matter of *fact* on August 9, 2005. On that date, ADWR sent a letter to Montgomery & Associates stating that it had completed its administrative review of the application and determined that the application was complete and was now under substantive review. Earlier, ADWR acknowledged that the application was complete and administratively correct in an e-mail dated July 29, 2005.

More than six months later, ADWR attempted to rescind the August 9th letter by maintaining that the application was "complete but incorrect."[14] The term "complete but incorrect" is not found in statute or rule; its inclusion in the administrative process has no

[12] A.R.S. §41-1074(C).
[13] A.A.C.R12-15-401, Table A.
[14] *See* Letter from Herbert Guenther to Jim Rhodes, ALM, Feb. 17, 2006.

legal basis. ADWR's application of A.A.C. R12-15-716(D) results in an interpretation of the term "complete and correct" which is inconsistent with statute and other rules and for the reasons set forth below, arbitrary and capricious, and an abuse of discretion. The rule has not been construed or applied at ADWR until now and ADWR's application of the rule in that manner has never been examined before.

According to ADWR's rule for establishing priority date for an analysis of water adequacy, the priority date is the date a "complete and correct" application is filed with ADWR. When there are two or more pending, conflicting applications which the director determines to be complete and correct, priority shall be given to the application with the earliest priority date. [15] ADWR, like any court, is obligated to harmonize the language of rules and read them in conjunction with statutes and other rules.[16] In this instance, ADWR has applied the priority date rule in the Adequate Water Supply Program in a manner which differs from other priority provisions in Arizona water statutes. For example, applications for permits to appropriate water do not lose priority of filing because of defects.[17] An applicant has the opportunity to complete or correct an application within sixty days or within some other timeframe, at the discretion of the director, without the loss of priority. If the director determines that the information contained in an application for grandfathered water rights is incorrect or is insufficient, the applicant may reapply and the reapplication relates back to the filing of the original application.[18]

Furthermore, this priority rule, as construed by ADWR, is inconsistent and in direct conflict with the establishment of priority for competing applications for recharge permits, wells, surface water rights and virtually every other program in which ADWR must approve an application. The standard for these programs is, and always has been, "first in time, first in right."

A. Administrative Completeness

During the administrative completeness review timeframe state law requires an agency to determine that the application contains all components required by statute or

[15] A.A.C. R12-15-716(D).
[16] *Kenneth T. v. Arizona Dept. of Economic Sec.*, 212 Ariz. 150 ¶8, 128 P.3d 773 (App. 2006), *Phoenix of Hartford, Inc. v. Harmony Restaurants, Inc.*, 114 Ariz. 257, 258, 560 P.2d 441, 442 (App. 1977).
[17] A.R.S. §45-154.
[18] A.R.S. §45-480 (B).

rule. This timeframe specifically excludes any substantive review of the application.[19] The substantive review time frame is the number of days after completion of the administrative completeness review time frame during which the agency determines if an application meets all the substantive criteria of the statute or rule.[20] The agency rules must establish separate time frames for each of these reviews.[21]

Customary policy and practice of ADWR is to establish a well-defined administrative completeness review time frame and a separate substantive review time frame for each of its programs and applications. In fact, the standard language in virtually all application instructions is the following:

> In processing your application, the Department will first determine whether the application is administratively complete (administrative completeness review), and then whether the application meets the substantive criteria established by statute or rule (substantive review).
>
> After your application is complete, the Department will proceed with substantive review. If the Department sends you a letter that your application is incomplete, the Department will include a comprehensive list of specific deficiencies.
>
> Within [___] days after the application is complete, the Department will review your application to determine whether it meets the substantive criteria required by statute or rule.

In this instance, all the required components for the Application were complete as indicated by the Office of Assured and Adequate Water Supply in its June 8, 2005 Adequacy Application Review checklist. This was repeatedly confirmed by ADWR in its e-mail of July 29, 2005, and the Aug. 9th letter.

B. Definition Of "Complete And Correct"

The language of ADWR's rule is muddled, confusing and circular as to the establishment of a priority date for two or more pending, conflicting applications. R12-

[19] A.R.S. §41-1072(1).
[20] A.R.S.§41-1072(3).
[21] A.R.S. §41-1073(B).

15-716(D) states that if there are pending, conflicting applications that are determined to be "complete and correct," priority shall be given to the application with the earliest priority date. The priority date is determined by the date that a complete and correct application is filed. The term "complete and correct" is not defined in the rules. If words are not defined within a rule or statute, then the words and phrases must be construed according to common use of the language.[22]

According to Webster's New Twentieth Century Dictionary (unabridged, 2d Ed.), "complete" means "lacking none of the parts; full, whole entire." "Correct" means "1. conforming to or adhering to a conventional standard, or 2. conforming to fact, true, accurate, right, free from errors." Neither of those adjectives are used in the context of the decision making or adjudicating process of ADWR. Rather, they modify the noun "application" –they contemplate only that the application contains all the information required in the rule and that the information provided is what it purports to be; *not* that the application is approved, *not* that the substantive review of the information provided is complete, and *not* that the studies and information provided as part of the application are technically sufficient to merit approval. If ADWR seeks more information after stating it "has determined it to be complete as defined by ARS §41-1074" it does not mean the application was not complete or not correct, only that it wishes to see supplemental information not mandated by the rule, but helpful to its substantive review, as permitted by ARS §41-1075.

The legislature intended that there be two separate review periods: one for administrative completeness and another for substantive review. The agency may establish the length of those time frames by rule.[23] In its treatment of ALM, ADWR actually imposed a third intervening review for administrative "correctness." Without statutory authority, the third review was done simultaneously with the substantive review, as if it was a component of the substantive review. This is also illustrated by the Mardian Application. It was deemed administratively complete and correct on March 31, 2006, yet the analysis of adequate water supply for The Ranch of White Hills was issued April 11, 2006, a mere 11 days later. That could not have occurred without concurrent administrative and substantive review.

Given the complexity of the data needed to support the Mardian Application, it is highly unlikely, indeed somewhat suspect, for ADWR to be able to review and opine on

[22] A.R.S. §1-213.
[23] A.R.S. §41-1073(B).

the underlying studies and data necessary to support the application in just 11 days. It could only have done so by superimposing a substantive review process in deciding whether the *application* was complete and correct. By applying the rule in such a manner as to set a priority date based on when the application is found to be administratively complete and *substantively* correct, ADWR violates state statute.

V. Due Process Claim

The ALM Application was filed 2 ½ months prior to the Mardian Application. There were significant delays and mandates by ADWR in processing the ALM Application. In contrast, the Mardian Application was given expedited treatment and evaluated under less stringent standards, resulting in the Mardian Application being given priority.

The entire process suggests favoritism and bad faith, severely undermining public confidence in any even-handed treatment by government agencies.

A. ADWR's Arbitrary and Capricious Actions

Specifically, ADWR arbitrarily, capriciously and unfairly when it:

a) delayed response and processing of The Village of White Hills' application for analysis of adequate water supply, as set forth below;

b) required additional meetings, testing and studies not required of a competing applicant;

c) imposed a condition, not mandated or authorized by statute, that the application be "correct" before assigning the application priority;

d) failed to determine the application to be complete and correct within 60 days as required by A.A.C. R12-15-401, Table A;

e) refused to acknowledge the application as administratively complete and correct as a matter of law at the conclusion of the 60 days as required by A.R.S. §41-1074(C);

f) delayed its initial response to the application for 144 days after it was first submitted;

g) failed to follow its usual practice, i.e., after confirming that the application was administratively complete on August 9, 2005, it did not "review the application and issue an analysis of adequate water supply" as required by A.C.C. R12-15-723(D), rather, it subsequently claimed - six months later - the application was not "correct," and thus added an additional step to the administrative process not previously required of any other applicant;

h) failed to apply the principle of "first in time, first in right" to the application and in fact, advised a competing applicant prior to filing an application that the "first in time, first in right" doctrine would not be applied;

i) notwithstanding consistent and clear requests for information in that regard, failed to inform ALM in a timely fashion that "first in time, first in right" would not be applied to the process, thus giving no notice to ALM that a competing application may be given priority;

j) failed to incorporate or harmonize in its rules the other statutes and regulatory requirements that give priority to an applicant who is first in time and who later supplements and corrects an application (ARS §45-154), but extended no such rights to applicants who seek use of groundwater and;

k) favored an application for an analysis of adequate water supply filed later by Mardian and gave it priority to groundwater by applying inconsistent and less stringent standards in the following particulars:

1. Despite being outside the zone of the Colorado River accounting surface, and the fact that ADWR's Colorado River Management Office agreed on 3/25/05 that the development was located outside the accounting surface and would not have an affect on the accounting surface, ALM was required to demonstrate that long-term pumping of existing and proposed wells for the Rhodes development would not have an impact on Colorado River subflow. ALM complied with this request. In contrast, while Mardian's northern well field is clearly inside the mapped zone of the Colorado River accounting surface, there is no indication that Mardian was

questioned by ADWR on potential impacts. In fact, the Colorado River Management Office had not approved the Analysis of Adequate Water Supply application at the time it was approved by ADWR on 4/11/06.

2. ADWR did not accept ALM's evaluation of the lateral extent of the aquifer or the aquifer parameters used to substantiate modeling and impacts of groundwater withdrawals. ALM was required to submit additional data to prove the lateral extent and saturated thickness of the deep aquifer, through a more extensive drilling and mapping program and pumping tests of longer duration. ADWR recommended pumping tests of up to 1 to 2 weeks duration. In stark contrast to requirements imposed on ALM, Mardian conducted only 4 pumping tests to derive aquifer parameters used in its modeling and impact analysis consisting of less than 6 hours duration for three tests and only one test of 24 hours duration. In disregard of its own Hydrologic Studies Guidelines, which state that "aquifer tests for such studies (developments over 20 lots) need to be of long duration (from 27-72 hours or longer) and must prove the continuous availability of the supply on a regional scale," ADWR accepted the aquifer test data for the Mardian Application. Furthermore, Mardian was not required to submit any additional data to demonstrate justification for assumptions of the lateral and vertical extent and saturated thickness of the aquifer, yet ADWR gave Mardian credit for significant saturated thickness not supported by its data.

3. The ALM application and analysis relies on groundwater production from existing and proposed wells within its planned 2,705 acre development area. In contrast, Mardian's application relies upon a substantial portion of groundwater to be provided from a well field located over 15 miles from the proposed development. Much of the land across which any pipeline from the well field to the Mardian property would cross is Federal land administered by the U.S. Bureau of Land Management. Acquisition of a right-of-way for a pipeline will require an Environmental Assessment or Environmental Impact Statement pursuant to the National Environmental Policy Act, 42 U.S.C. §§ 4331 et. seq. ADWR approved Mardian's

application without review or consideration of easements, or whether the water could ever be put to use on the property. ADWR's approval of that approach is irreconcilable and inconsistent with recently issued letters for other projects in Arizona.

4. In its review and approval of an analysis of water adequacy, ADWR ordinarily and routinely refuses proposals to use effluent credit. Effluent is never considered until treatment plans are under construction or funded and then only in a water adequacy statement. Additionally, when effluent credit is given in a water adequacy statement, it is typically twenty per cent (20%) of total usage. In pointed contrast to this historical pattern, although effluent was not requested in the Mardian Application, ADWR arbitrarily allocated 36% effluent to The Ranch at White Hills, an amount unheard of before.

5. Mardian's November 30, 2005 submittal to ADWR, at page 5, states that additional data was obtained from the ALM addendum report on the "Villages at White Hills", but does not indicate how that data was obtained from ALM's pending application. Use of this data likely violated A.R.S. §39-121.21. Mardian's use of proprietary data from an already pending application, with the implicit consent and approval of ADWR, gave Mardian an unfair advantage resulting in priority.

6. ALM utilized an analytical groundwater model to project the impact of pumping on long-term water levels with the understanding it provides a more conservative projection of pumping impacts. ADWR typically requires analytical models in circumstances of more complex hydrogeological conditions when there is relatively sparse data to characterize area-wide groundwater conditions. In contrast, Mardian utilized a numerical groundwater model in its impact analysis and ADWR approved the modeling analysis although it is a less-conservative approach to take and there is arguably insufficient data to support such a model. The limited data included in the Mardian groundwater flow model may overestimate the extent and saturated thickness of the aquifer, yet ADWR approved Mardian's

application.

7. Despite critical errors in Mardian's calculations for groundwater demand, ADWR approved Mardian's application. For example, Mardian's application failed to account for additional water demand for 235 square feet per lot of turf due to a large lot adjustment for landscape watering. This results in an increased demand of 1,225 acre-feet per year for The Ranch at White Hills. Additionally, Mardian neglected to factor the large lot adjustment into its calculations of Detrital Valley committed demand and also underestimated water demand by 603.6 acre-feet per year.

8. ADWR normally requires water demand estimates for schools within large planned unit developments. ALM was required to not only submit data regarding the number of students attending schools, but to also factor this information into its calculated water demand. Mardian did not provide, and there is no public record to suggest that Mardian was requested to provide, any information regarding school water demands for a proposed development population in excess of 50,000 people, yet ADWR designated its application complete and correct.

All of the actions discussed above are contrary to the rules, regulations and policies that historically and customarily have governed the processing of applications of all types by the Department. In at least one instance, the Department gave data from one applicant to another, so that the second application could be acted upon to the derogation of the first. Furthermore, the Department applied a double standard when evaluating the applications—the ALM Application was subjected to a higher standard of review, while the Mardian Application was simply deemed administratively and substantively correct, and then the Analysis of Adequate Water Supply was issued. For example, the Department never required Mardian to demonstrate that its withdrawal of water would be outside the Colorado River accounting surface, nor was Mardian ever required to conduct long-term hydrologic testing of its wells. All of the Department's actions were arbitrary, capricious, an abuse of discretion and may have been undertaken in bad faith. When an agency acts in bad faith, its actions constitute an abuse of discretion. *See, Lewis v. Jamieson*, 135 Ariz. 322, 324-325, 660 P.2d 1249, 1251-1252 (App., 1983).

B. **No Notice of Interpretation of "Complete and Correct"**

Montgomery & Associates consistently and continually requested a written determination that the ALM Application was administratively complete, despite the fact that it was deemed administratively complete by operation of law. ADWR finally issued its August 9th letter, stating that the application was administratively complete. ALM was never advised ADWR's interpretation of "complete and correct" as it applied to the priority was different than "administratively complete." Based on the "first in time, first in right" doctrine and the issuance of this letter, ALM and its hydrologists proceeded to work with ADWR over the next six months under the assumption that the ALM Application had priority over any other application. It was this assumption that set the course of the schedule, work, and any other issues related to proving up the water for ALM's property. Fundamental fairness is the cornerstone of due process under the Arizona constitution thus dictating that individuals should have an opportunity to know what the law is and to conform their conduct accordingly.

C. **No Opportunity to Cure**

At no time prior to February 17, 2006, did ADWR advise either Montgomery & Associates or ALM of its interpretation of "complete and correct." For six months, ALM was under the belief that its application had priority. Zoning and planning activities and costs continued with the knowledge that ALM had priority. Montgomery & Associates retained well drillers and continued to test with the assurance that ALM had priority. If ALM had been informed, as Mardian was, that priority was not first in time, first in right, and if ALM had been informed of ADWR's interpretation of complete and correct, ALM would have done many things differently. Emphasis on timing and scheduling for different parts of the hydrology work may have been changed. Perhaps a change of drillers or subcontractors to meet a tighter deadline could have been undertaken. A number of factors may have been altered to get the application to be the first one deemed substantively correct, as is necessary under ADWR's currently-adopted interpretation of complete and correct in this matter.

D. No Opportunity to Be Heard

ADWR recognized that the ALM Application and the Mardian Application were competing applications.[24] ADWR was keenly aware of the limited supply of water in the Detrital Valley Basin and the fact that both applications were making claim to the same water supply. Yet, ADWR did not provide any opportunity to ALM to be heard on the substance of the Mardian Application. There was no opportunity for ALM to question the validity or veracity of the data or information provided to support the application. There was no opportunity for ALM to challenge any of the calculations or assumptions included in the Mardian Application. ALM was competing for water under its own land. ALM has a fundamental right to be heard before a decision is made by a state agency that could very well render its land unsuitable for the purposes for which it was purchased.

E. Misuse of Proprietary Data

ADWR allowed, and in fact encouraged, Mardian to lift data from ALM's Application for use in its own application. As evidenced in a letter to ADWR, Mardian's hydrologist stated "The added data included new information obtained from Montgomery and Associates, 2005 on two wells..."[25] The Mardian Application was approved and supported on the basis of proprietary information paid for and provided by a competing applicant. This action gave Mardian an unfair advantage, resulting in a denial of the competing applicant's request for its full demand requirements. This type of preferential treatment violates the concept of fundamental fairness. Due process requires that a state agency act in accordance with prevailing notions of fundamental fairness.

VI. Detrimental Reliance

ALM, as does every applicant, expects ADWR to apply its rules in a consistent and fair manner when evaluating competing applications. When a state agency notifies an applicant that an application is complete, the applicant should be able to rely on that notice. ALM cannot be expected to speculate if ADWR is going to interpret a particular

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[24] *See* Letter from Herbert Guenther to Jim Rhodes, ALM, February 17, 2006.

[25] *See* Letter from R. Douglas Bartlett, Clear Creek Associates to Karen Modesto, Office of Assured and Adequate Water Supply, November 30, 2005, Comment 4 at 5, attached as Exhibit E. The source of the new information was identified as the Montgomery & Associates, 2005, Addendum to Regional Hydrology, Source of Water Supply, and Projected 100-Year Drawdown Impacts in the Vicinity of the Villages at White Hills, Mojave County, Arizona.

rule differently down the road. When the application was found to be complete, first in time, first in right was the standard practice at ADWR for all other programs. ALM's actions were predicated on this. ALM continued to incur out of pocket costs in excess of two million dollars in reliance on the Aug. 9th letter. It drilled and built four productive municipal water supply wells at substantial cost that they may not be able to utilize. A summary of ALM's monetary losses will be provided in a separate Notice of Claim.

VII. Request for Rescission of the Analysis of Water Adequacy for the Ranch at White Hills

For all of the reasons set forth above, ALM is requesting that the April 11, 2006 Analysis of Adequate Water Supply for Mardian's The Ranch at White Hills be rescinded or revoked. The Analysis of Adequate Water Supply itself clearly puts Mardian on notice that such revocation is possible—the last paragraph of the Analysis states that the determination of the Department may be "invalidated if the development plan *or other conditions* change materially prior to the filing of a Water Adequacy Report." As set forth above, the arbitrary and capricious actions of the Department in favoring one application over another, and the Department's defalcation of the hydrologic data from the ALM Application for use in the Mardian Application clearly are material conditions that warrant such rescission. More importantly, the factual history of how the Department processed both applications is evidence that precludes the Department from issuing any Water Adequacy Report in reliance on the Analysis of Adequate Water Supply for Mardian's The Ranch at White Hills. See A.A.C. R12-15-723.F.

VIII. Relief

ALM requests that ADWR take the following actions:

1) Make a determination of law and fact, that

   a) the ALM Application is deemed complete and correct as of May 17, 2005; and

   b) the ALM Application establishes its priority to groundwater in the Detrital Basin as of May 17, 2005;

2) Vacate the Mardian Analysis of Adequate Water Supply dated April 11, 2006, and

3) Require the Mardian Application to take into account in its demand calculations the 9,200 acre-feet per year of groundwater requested in the ALM Application,

4) Alternatively, set a hearing to address the priority issue or;

5) If ADWR refuses to act, that it serve notice to both Mardian and ALM that its refusal to act is an appealable order under ARS §41-1092.03.

Very truly yours,

SNELL & WILMER L.L.P.

Carlos D. Ronstadt

CDR:lmr

c w-encls:
Jim Rhodes
Robert Greer
Mark Hall
Keith Mosley

From: Norma Coupaud
To: John Kurtz; Karen Modesto
Date: 7/29/05 4:07PM
Subject: 23-401674.0000 The Villages at White Hills

Karen,

The application was received on March 28, 2005. An addendum to the hydrology study was submitted May 10, 2005. The application has passed the completeness review stage and we're getting pressure from the applicant to prepare a completeness review letter for the County Board of Supervisors meeting scheduled in early Sept. The application is administratively correct. The only thing we're waiting for is the completion of the hydrologic review. We need to know if hydro has any comments to be included in the complete and correct letter. Please let me know at your earliest convenience.

thank you,

Norma J. Coupaud
Office of Assured & Adequate Water Supply
Phone: 602.417.2465
Fax: 602.417.2467
e-mail:njcoupaud@adwr.state.az.us
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CC: Doug Dunham; Nicole Swindle

ARIZONA DEPARTMENT OF WATER RESOURCES
Office of Assured and Adequate Water Supply
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Janet Napolitano
Governor

Herbert R. Guenther
Director

August 9, 2005

Mr. Greg Wallace
Errol L. Montgomery & Associates, Inc.
7949 East Acoma Drive, Suite 100
Scottsdale, Arizona 85260

Re: Application for a Certificate of Assured Water Supply
The Villages at White Hills (DWR No. 23-401674.0000)
Substantive Correctness Review

Mr. Wallace:

The Department has completed its administrative review of the above referenced application and has determined it to be complete as defined by A.R.S. § 41-1074. However, the application does not meet the substantive requirements for issuance of an Analysis of Adequate Water Supply. Pursuant to A.R.S. § 41-1075(A), the Department requests that the following item be submitted:

- Proof of Physical Availability: According to the addendum submitted May 10, 2005, the physical and continuous availability have not been met. Hydrologic issues include over simplification of the aquifer conditions, highly variable data, and over simplified model.

Please submit the requested item to the Office of Assured Water Supply within 60 days, or the Director may take action to deny the application and close the file. Departmental review of your application will not resume until the requested information is received. If you have any questions regarding this letter or any other part of the application process, please do not hesitate to contact Norma Coupaud at (602) 417-2465.

Sincerely,

Douglas W. Dunham, Manager
Office of Assured Water Supply

cc: Carlos Rondstadt

Celebrating 25 Years

ARIZONA DEPARTMENT OF WATER RESOURCES
3550 North Central Avenue, Phoenix, Arizona 85012-2105
Telephone 602 771-8426
Fax 602 771-8681
February 17, 2006

Janet Napolitano
Governor

Herbert R. Guenther
Director

Villages at White Hills
American Land Management, LLC
Attn: Jim Rhodes
4730 South Fort Apache Road, STE 300
Las Vegas, NV 89147

Re: The Villages at White Hills
Analysis of Adequate Water Supply (ADWR #23-401674)

Dear Mr. Rhodes:

The Arizona Department of Water Resources (Department) has received inquiries regarding the status of your application for Analysis of Adequate Water Supply, more specifically as it relates to the priority date of your application. As you are aware there are competing interests for a determination of adequate water supplies in the vicinity of your proposed project. At this time no such priority determination has been made concerning the pending applications within the Detrital Valley groundwater basin. In cases where there are competing applications, such as this, priority is given to the application that has the earliest date that the Department finds the application to be "complete and correct" A.A.C. R12-15-716.D. At this time neither of the pending applications have been found to be complete and correct, and thus no priority date has been assigned. On August 9, 2005 you were notified that the application was determined to be complete but incorrect. At this time your application remains complete but incorrect until you correct the deficiencies identified in the August 9, 2005 letter.

Additionally, I have recently sent a letter to the Mohave County Board of Supervisors to provide them with information regarding the Departments concern about the availability of groundwater supplies in this area.

The Department has seen a significant increase in the demand for adequacy determinations in Mohave County, and is currently reviewing applications for two master-planned communities, yours and The Ranch at White Hills. These two proposed communities total in excess of 62,000 lots and would require approximately 25,000 acre-feet of groundwater. They would involve portions of three groundwater basins, the Detrital Valley, Sacramento Valley and Hualapi Valley basins. Information on the hydrogeological conditions in all three of these basins is currently limited, making site specific evaluation of the adequacy of groundwater supplies challenging. We felt that it was important to bring to your attention that at this time, based on information that is available the Department feels that it is unlikely that adequate supplies of groundwater are physically available for the proposed uses in the pending applications.

Celebrating 25 Years

Of course, the Department will fully consider any and all new information that you may submit. When your application is correct, the information will be verified and the Department will then make its final determination.

The Department is very interested in ensuring that all parties have the most up to date information regarding water supply availability, especially in areas like this where we do not believe that we have sufficient data. We want to make sure that you as an applicant are aware of what the Department is providing to others as well as ensuring that you know what is happening with your application. If you have any questions, please feel free to call me at 602-771-8426.

Sincerely,

Herbert R. Guenther

Herbert R. Guenther

ARIZONA DEPARTMENT OF WATER RESOURCES
Office of Assured and Adequate Water Supply
3550 North Central Avenue 2nd Floor A-2, Phoenix, Arizona 85014
Telephone (602) 771-8585 and Fax (602) 771-8689

Janet Napolitano
Governor

Herbert R. Guenther
Director

April 19, 2006

Mr. Greg Wallace
Errol L. Montgomery & Associates
7949 East Acoma Drive, Suite 100
Scottsdale, Arizona 85260

RE: Application Status
Villages at White Hills Analysis of Adequate Water Supply (ADWR #23-401674)

Mr. Wallace:

As a follow up to our meeting April 17, 2006 I would like to give you a summary of the current status of your application. Additionally, I would like to apprise you of changes that have occurred in the area of your proposed development, the impacts to your application, and specific adjustments that will need to be incorporated into your application. We received your application on May 18, 2005, and notified you by letter, dated August 9, 2005, that the application was considered administratively complete. In addition, the August 9th letter stated that although the application was considered complete, it was incorrect. As of the writing of this letter, the application remains complete but incorrect.

You submitted a new work plan dated December 5, 2005, which the Department found acceptable. In that plan you indicated that you intended to submit the following:

- Data obtained for existing wells
- Pumping tests for well WH-3L
- Additional interpretation of existing data
- Additional data for the extent of the thick clay unit
- Conduct additional analytical modeling for the impact analysis
- A supplemental report

As you are aware, the Department recently issued an analysis of adequate water supply to a nearby-proposed development, known as The Ranch at White Hills. All water adequacy determinations must take into account current and committed demands in the area of the supporting hydrologic study. This includes issued water adequacy reports and issued analyses of adequate water supply. In your case, the demand associated with the recently issued Ranch at White Hills analysis will need to be included in your study, as well as the current and committed demands associated with the existing recorded lots in the area.

The groundwater demand associated with the Ranch at White Hills analysis is 7,573 af/yr. The groundwater demand associated with the existing recorded lots in the basin is 3,472 af/yr. The total current and committed demands that will need to be taken into account is 11,045 af/yr. Please note that the current and committed demands associated with the existing recorded lots may be reduced if your study boundary does not cover the entire basin. If you intend on reducing this demand based upon a

smaller study boundary, I would encourage you to discuss this with the Department prior to submitting the new study to ensure that the boundary revisions would be acceptable to the Department.

In addition to the inclusion of the known current and committed demands in the basin as outlined above, several other factors will need to be included in your new study. The following is a summary of items that will need to be addressed to account for this increased demand and recommendations for the hydrology report:

- The hydrologic impact analysis needs to represent known and reasonably projected hydrogeologic conditions throughout the study area. This includes the lateral and vertical extent of the confining (thick clay) unit, a description of how the upper aquifer and lower confining aquifer units are linked and the estimated impact on 100-year water availability in the area.
- In the Department's letter dated February 17, 2006, the Department agreed that it would be acceptable to use an analytical approach for predicting the availability of the 100-year groundwater supply. This analytical approach, if used, must utilize conservative values for aquifer parameters in the analysis and must satisfactorily address and incorporate the varied hydrogeologic conditions found in the area. Given the hydrogeologic conditions in the general area, the wide range of aquifer parameters and the complexity of the hydrogeology, a numerical model may be a better and more practical approach to investigate the impact of all current, committed and projected demands in this area. Complex issues must be addressed, such as water being withdrawn from three or more different zones (based on new committed demands) and how the model will account for the interaction of these aquifer units.
- The hydrologic impact analysis must include all the supporting data and justifications for any interpretations and assumptions.
- The modeling approach used must meet acceptable modeling standards.

Please be aware that you may incorporate other water supply studies in the area into your analysis. This can include other groundwater models and associated data. As always, we highly recommend that you submit a detailed proposal for you new work plan to minimize the possibility of submitting work that the Department would not find acceptable. I look forward to working with you to complete this project. If you have any further questions or would like to meet to discuss details further, I can be reached at (602) 771-8590.

Sincerely,

Doug Dunham, Manager
Office of Assured & Adequate Water Supply

cc: Drew Swieczkowski, ADWR Hydrology Division
Nicole Swindle, ADWR Legal Division
Carlos D. Ronstadt, Snell &Wilmer

November 30, 2005

HAND DELIVERED

Ms. Karen Modesto
Arizona Department of Water Resources
Office of Assured and Adequate Water Supply
500 North 3rd Street
Phoenix, Arizona 85004

RE: **The Ranch at White Hills, Detrital Valley**
Response to ADWR Comments
Application for an Analysis of Water Adequacy

Dear Karen:

The Arizona Department of Water Resources (ADWR) provided comments to Clear Creek Associates in a meeting on September 12, 2005, and in a letter dated October 6, 2005, regarding our Application for Water Adequacy Report (WAR) dated June 3, 2005 for The Ranch at White Hills development. The October 6 letter provides comments on the WAR which have been individually addressed in the following paragraphs.

Comment 1. *Committed Demands. Any analysis will need to include the committed demands of the recorded lots within the study area.*

An analysis and review of the existing land use designations, infra-structure development, parcel and lot densities, and build-out conditions in the Detrital Basin area have been completed as a part of identifying the committed water demand for this project. The total area that has been reviewed includes all of the sections identified on maps provided by the Arizona Department of Water Resources (Plate 1). These include a map titled *Detrital Ground Water Basin, Mohave County, Number of Unimproved platted lots per Section, 2005,* by Mr. Andy Kurtz, and *Detrital Ground Water Basin, Mohave County, Number of Improved platted lots per Section,* also completed by Mr. Kurtz. The total number of sections these lots and parcels encompass, (per the referenced ADWR maps provided) is close to 170, or more than 108,000 acres of land. The total lot count reflected on the maps is approximately 17,700 lots and parcels, which we understand need to be accounted for in the committed water demand analysis. Of the total lots and parcels platted in the basin, the maps further delineate 1,053 lots which have improvements on them.[1] The improved lots equal approximately 6% of the total lots and parcels platted in the basin. An analysis of the ADWR well records / drillers reports indicates that there are a total of 208 wells registered in the basin area. Therefore, close to 20% of the improved lots in the basin have a

[1] It should be noted that although the County indicates the parcel is "improved"; that designation is given to any lot which has any sort of improvement on it including a fence, garage, barn, etc., and does not specifically refer to a residential structure.

registered well on-site and is assumed to represent a reasonable well-use ratio for platted lots. ADWR also identified committed demands from Mt Tipton Water Company totaling 196 AF/yr.

The Mohave County General Plan identifies approximately 93% of the total lots and parcels with a Rural Development Area land use designation. This designation applies to lots and parcels which are rural in nature, can support no more than one single-family residential home, and are a minimum of 5 acres in size. The remaining 7% of the lots are identified as Suburban and Urban development areas, which allow for lots smaller than 5 acres in size, including the scattered, minor commercial uses. A majority of all of the subdivisions of record in this area, including the numerous Units of Gateway Acres, Flannery and Allen, Sunny Lakes Ranchos, etc. were originally platted from the 1920's through the 1960's. In this era of "pre-regulation" development, lots were routinely created without concern for the construction of infrastructure to access the lot, or to adequately develop it.

There are several supporting facts which verify that many of these lots will never be able to be developed, and therefore should not be included in the committed water demand projections, assumptions and requirements. A standard platted subdivision created during these "pre-regulation" dates contains lots which typically do not meet current Mohave County regulations. Several of the platted subdivision lots were not provided with sufficient rights-of-way widths for current Mohave County Public Works road department improvements, and to this day, some 50-70 years later, a majority of these platted lots still do not have physical access to them. Pre-regulation platted subdivisions were also not required to adequately design and provide for flood protection and other adverse drainage impacts. The overall Detrital basin contains significant drainage-ways, including the Detrital Wash, as well as numerous other washes and drainage corridors which have rendered many of the existing lots not suitable for development. A review of the Flood Insurance Rate Maps (FIRM) maps for the areas and lots platted within and along the Detrital Wash, and the network of Zone A washes which feed into it, indicates there are approximately 625 lots which are rendered completely useless because they are in washes, or would be significantly impacted by flow in the washes such that any development of these lots is not reasonable (see Plate 1). The relocation of Highway 93 to its existing alignment, has bifurcated close to 120 lots and created lot sizes which are not compliant with Mohave County regulations, which inhibits development. In addition, ADOT is currently pursuing an Access Management plan for all fronting properties along Highway 93 which will ultimately deny direct access onto the highway. Without this direct access many of these approximately 120 lots will be unable to be developed because they will lack access to any sort of roadway.

Further review of the maps provided by ADWR indicates that there are substantial areas underlain by bedrock which will greatly impact any groundwater development on the lots. The maps show that approximately 1,845 lots are sited on bedrock (see Plate 1). Finally, the process to extend

suitable infra-structure to most of these lots will be financially prohibitive, in part due to the regulations and requirements of the agencies and the utility companies. Most of the Gateway Acres lots are more than 4 miles to the nearest power, telephone and water sources, and many are closer to six miles from these basic infra-structure development needs. From the utilities perspective, extending infrastructure this distance is costly and there is a scarcity of property owners who live in the area. The utility companies place the entire burden of the cost on the requesting party. These longer extensions are normally considered only by Developers or property owners who own numerous lots, parcels, or have significant investments in the area, and not by individual lot owners. Due to the age of these lots and the minimum build-out ratios, the chances of ever realizing these major infra-structure extensions will be greatly lessened. This is added to the fact that many of the sites still lack even a dirt access route to, in, around or near many of the lots.

Based on the above analysis, a reasonable committed demand for Detrital Basin is identified as 1,102 AF/yr as developed in the following analysis:

TOTAL LOTS IN BASIN	=	17,700 Lots,
Total Improved Lots	=	1053 Lots
Established total build out rate	=	6% over 60 years
Established well development ratio	=	20% of the lots have wells.

(Owner/Developer also projects 100% build-out for 542 lots he owns in section 13, T28N, R20W)

We assume that the following lots will not be developed:

HARD-ROCK IMPACTED LOTS	=	-1845 Lots
DETRITAL WASH IMPACTED LOTS	=	-625 Lots
HIGHWAY 93 ACCESS IMPACTED LOTS	=	-120 Lots
LACK OF INFRA-STRUCTURE LOTS	=	-1200 Lots

TOTAL NUMBER OF LOTS NEVER DEVELOPED = -3790 LOTS

Total number of lots estimated at 100% build-out = 542 lots in Section 13, T28N, R20W.

TOTAL NUMBER OF LOTS AVAILABLE FOR POTENTIAL DEVELOPMENT, consistent with established build-out rates and well use ratios = 13,368 LOTS.

13,368 lots times 20% (Established well use ratio) = 2,674 lots have a committed demand in the basin. Including the 542 lots to be developed in Sec. 13, T28N, R20W, the total number of committed demand lots in the basin comes to 3,216. Using the demand assumptions from Table 4 of the WAR Application (Clear Creek Associates, June 3, 2005),

the ADWR demand calculator provides a total demand of 906 AF/yr including water for irrigation. Table 2 presents the demand calculation for the committed demands. Therefore, the total committed demand required for Detrital Basin is as follows:

Platted Lots (3,216)	= 906 AF/yr
Mt Tipton Demand	= 196 AF/yr

TOTAL COMMITTED DEMAND FOR THE DETRITAL BASIN = 1,102 AF/yr

Comment 2. *Hydrogeologic interpretation. In layer 1 of the model, the hydraulic conductivities range from 8 ft per day (ft/d) to 5 ft/d. Please explain the reasoning for the 5 ft/d values in the southern portion of the model.*

First, please note that the hydraulic conductivity (K) value in the southern portion of the model should be 6 ft/d, not 5 ft/d (see Figure 14 of the WAR application). The distribution of K values in the model resulted from a combination of field measurements and model calibration. Conceptually, it is recognized that the aquifer system varies laterally moving from south to north in Detrital Valley. A slightly steeper hydraulic gradient was observed at the southern end of the model as compared to the area near the Central Well field (see Figure 10 of the WAR). A slightly smaller K value of 6 ft/d was input to the model in the south in an attempt to simulate this slightly higher gradient. The difference between 8 and 6 ft/d is relatively insignificant. In earlier calibration runs, this difference was larger but was reduced in later runs to allow the model to better calibrate to observed head values.

Comment 3. *Groundwater Inflow. Additional information or evidence should be provided concerning the 642 af/yr of groundwater inflow from the south being available for 100 years.*

The 642 acre-feet of inflow from the southern boundary was derived from calibration of the steady state model representing current groundwater flow conditions. This is a small amount of inflow to the model; nevertheless, to be conservative, we have removed this inflow to the transient state model and rerun the transient simulation for 100 years. The results are shown on Figures 1 through 4 and indicate that removing the inflow from the south boundary and making it a "no flow" boundary has no impact on the predicted groundwater levels after 100 years of pumping. This simulation included the pumping of 6,341 AF/yr (3,932 gpm) from the Southern well field and 2,362 AF/yr (1,465 gpm) from the Central well field for a total of 8,703 AF/yr (5,397 gpm). At the southern well field, the model predicts a total drawdown of about 200 feet after 100 years of pumping, a groundwater level elevation about 2000 ft AMSL, and a depth to groundwater of about 850 feet. To the north, in the Central well field, the model predicts a drawdown of about 100 feet, a groundwater elevation of about 2020 ft AMSL, and a depth to groundwater of about 500 feet.

Comment 4. *Measured and Simulated Water Levels. The measured water level starting heads and simulated water level starting heads diverge in the southern half of the model. In the northern area of the model the measured and simulated water levels match reasonably well. However, around the central well field the simulated water levels are approximately 75 feet higher than observed values. In the southern well field, the simulated water levels are approximately 180 feet higher. The difference should be taken into account when analyzing the effect of the proposed pumping. Consideration should be given to the appropriateness of the conceptual design of the model as the largest discrepancy of simulated vs. measured heads is in the area directly impacted by the pumping.*

Figure 5 is a revision to Figure 10 of the WAR Application showing the current groundwater contours in the basin. It has been revised through the addition of new well data and for various corrections to the locations of wells. Figures 6 to 8 illustrate predicted versus observed head differences for various areas of the model. Clear Creek Associates has added several observations to the calibration data set, reviewed the locations and measured values of the calibration wells, and deleted one calibration well because the data was suspect. The added data included new information obtained from Montgomery & Associates, 2005[2] on two wells, additional measurements obtained by Clear Creek Associates for existing wells in the valley, and additional wells from the ADWR GWSI database. All of the calibration data were reviewed to assess the accuracy of the posted well location and the quality of the water level measurement used. In one case, well 55-502441, the data in the ADWR database reported the water level depth below the reported total depth of the well. This point was removed from the calibration because the measurement was suspect.

As can be seen on the figures, both positive and negative differences in head[3] were observed in the central well field (Figure 6) ranging from -53 feet to +72 feet. In the southern well field (Figure 7), the head difference in the shallow aquifer ranged from -38 to +13 feet; however, in the lower aquifer[4], the head difference between predicted and observed measurements was -90 and -134 feet in the two wells available east of the southern well field indicating the model is under-predicting water levels. The lower aquifer tends to have a higher measured water level then the shallow aquifer indicating a strong upward vertical gradient. This difference in head between the upper and lower aquifer was not simulated in the model as it is difficult to do and it was more conservative to assume a lower head in the lower aquifer than observed. Water production for the Ranch at White Hills will focus on the shallow aquifer where the calibration tends to be good.

Another way to assess calibration is to the plot the predicted and observed water level data on a graph (Figure 8). From this graph, it is easy to compare the data to the perfect fit line and

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[2] Montgomery & Associates, 2005, Addendum to Regional Hydrogeology, Source of Water Supply, and Projected 100-Year Drawdown Impacts in the Vicinity of the Villages at White Hills, Mojave County, Arizona.

[3] A positive difference indicates the model prediction is higher than the observed water level measurement. A negative difference indicates the model prediction is lower than the observed water level measurement.

[4] Wells that occur in dry cells in layer 1; the brown shaded areas on the figure.

determine if the calibration falls on both sides of this line. It is standard modeling practice to use certain statistical parameters to evaluate the calibration. The statistics normally used include the mean error (ME), the absolute mean error (AME), and percent root mean squared error (%RMS). In this case, the ME is 0.075 feet, the AME is 45.8 feet, and the %RMS is 5.4%. The most important statistic is the %RMS as it is the best measure of the overall calibration of the model. It is standard industry practice to achieve a calibration that has a %RMS of less than 10 percent; therefore, this model is well calibrated for the starting water level condition.

Comment 5. *Availability of groundwater and projected impacts. As the hydrogeology of the area is very likely to be more complex than current interpretations, we believe that the availability of a 100-year supply of groundwater cannot be reliably determined at this time. Although some new data for the area has recently become available, the amount of data is still extremely limited. Within the model area of 860 square miles, there are significant portions of the model where no data is available to verify parameters used in the model or used to calibrate the model. Any revision or update of the model should include a distribution of data points used to construct the model.*

The aquifer system underlying Detrital Valley is hydrogeologically like many other basins in Arizona. Most Arizona basins include an upper coarse sand and gravel unit (the upper Basin Fill) underlain by a silty to clayey sand and gravel unit with local evaporite deposits (the Lower Basin Fill), and pre-Basin and Range sediments. The similarity between many of these basins is evident in regional studies such as Anderson, et al (1990)[5]. The aquifer characteristics of the basins vary from basin to basin, but are generally consistent within each basin. Basins which have been extensively developed with the installation of hundreds of production wells exhibit consistent, mapable hydraulic properties (see Corell and Corkhill, 1994[6] for the Salt River Valley aquifer system, and Hanson and Benedict, 1994[7] for the Tucson Basin).

It is reasonable and appropriate to extrapolate testing data from wells in the Detrital Valley basin into areas of the basin with little or no data. Based on our experience in modeling many other basins in Arizona[8], there are enough wells in the valley to adequately define the aquifer system and construct a groundwater flow model to assess the impact of 100-years of groundwater pumping (see Figures 1 through 4 attached). Nevertheless, Arizona Land Development has conducted additional field testing and well installations to better characterize the aquifer system in Detrital Valley. Attachment A includes a summary of the well installations and well testing that

[5] Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1990, Geohydrology and Water Resources of Alluvial Basins in South-Central Arizona and parts of Adjacent States; U.S. Geological Survey, Open-File Report 89-378, 99p.

[6] Corell, S.W., and Corkhill, E.F., 1994, A Regional Groundwater Flow Model of the Salt River Valley – Phase II, Phoenix Active Management Area, Numerical Model, Calibration, and Recommendations; Arizona Department of Water Resources – Hydrology Division, Modeling Report No. 8.

[7] Hanson, R.T., and Benedict, J.F., 1994, Simulation of ground-water flow and potential land subsidence, upper Santa Cruz Basin, Arizona; U.S. Geological Survey Water-Resources Investigations Report 93-4196, 47p.

[8] Clear Creek Associates has developed 10 basin-wide models for the East Salt River Valley, the West Salt River Valley, the Pinal AMA, the Tucson Basin, Santa Rosa Basin (south of Casa Grande), Harquahala Valley, Rainbow Valley, Vekol Valley, the Carefree-Cave Creek Basin, and Safford Valley, and has reviewed in detail a model for the Little Colorado River basin.

has been conducted since the WAR application was submitted. We believe that this new information fully supports the original model predictions. The test data generally indicate that the assumptions in the model are conservative with respect to the amount of groundwater available for the White Hills development.

We have also decreased the water demand for this development to 8,675 AF/yr (5,379 gpm) from 9,539 AF/yr (5,915 gpm) as originally simulated. The development demand is based on an assumed total buildout of 25,000 lots as indicated in Table 1. The total demand simulated includes 7,573 AF/yr for the development and 1,102 AF/yr for committed and other demands as discussed above yielding the total demand of 8,675 AF/yr. The results of the revised model are presented in Figures 1 through 4, attached, and indicate that even with the conservative assumptions incorporated into the model, there is adequate groundwater to supply The Ranch at White Hills development of 25,000 lots for 100 years.

We hope that these responses to your comments will satisfy the Department that the water demand for The Ranch at White Hills can be achieved as envisioned in the WAR application. If you should have any questions or further comments, we are available at any time to meet with you.

Thank you for your review and comments.

Sincerely,
CLEAR CREEK ASSOCIATES

R. Douglas Bartlett, R. G.
Principal Hydrogeologist

REGISTERED GEOLOGIST
CERTIFICATE NO.
25059
R. DOUGLAS
BARTLETT
Date Signed 11-30-05
ARIZONA, U.S.A.

Enclosures

cc. Doug Dunham (ADWR – Office of Assured Water Supply)
Leonard Mardian (Arizona Land Development)
Kathy Tackett-Hicks (The Mardian Ranch White Hills)
Elno Roundy (Arizona Land Development)
Luis Vega (Del Rayo International)
Dale Armstrong (Golder Associates)

TABLES AND APPENDICES
ARE NOT INCLUDED AS PART OF THIS EXHIBIT E

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DENVER
LAS VEGAS
ORANGE COUNTY
PHOENIX
SALT LAKE CITY
TUCSON

Jeffrey W. Crockett
602.382.6234
jcrockett@swlaw.com

June 19, 2006

HAND-DELIVERED

David M. Ronald, Staff Attorney
Legal Division
ARIZONA CORPORATION COMMISSION
1200 West Washington Street
Phoenix, Arizona 85007

Re: Response to Staff's First Set of Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company (Docket Nos. W-20380A-05-0490 and SW-20379A-05-0489)

Dear David:

Perkins Mountain Water Company and Perkins Mountain Utility Company incorporates the objection to requests BNC 1.13 and 1.25 as previously stated in its April 25, 2006 response to Staff's First Set of data requests in the above-referenced docket. Without waiving the foregoing objection, Perkins Mountain Water Company and Perkins Mountain Utility Company is providing a letter from Mr. Robert M. Evans, CPA verifying that Mr. James M. Rhodes is in compliance with his tax filing requirements. You will also find enclosed a press release from Moody's Investors Service demonstrating the financial stability of Rhodes Companies, LLC.

If you have any questions, please call me at 602-382-6234.

Very truly yours,

SNELL & WILMER

Jeffrey W. Crockett by KAY

Jeffrey W. Crockett

JWC:gb
Enclosure
cc (with enclosure): Blessing N. Chukwu, Arizona Corporation Commission
Keith Mosley, Rhodes Homes
Mark Hall, Rhodes Homes

FILE COPY

Snell & Wilmer is a member of LEX MUNDI, The Leading Association of Independent Law Firms.

BEADLE, MCBRIDE, EVANS & REEVES, LLP
accountants and consultants

2285 Renaissance Drive
Las Vegas, Nevada 89119

Date: 5-29-2006

To Whom It May Concern:

I have been an independent CPA for Mr. James M. Rhodes and his affiliated entities for the last 3 years. Mr. Rhodes and his affiliated entities have received extensions of time to file tax returns for 2005. Since all of the affiliated entities are pass through entities Mr. Rhodes pays the entire tax obligation. The tax obligation for 2005 was paid with the extension. Mr. Rhodes has made a first quarter estimated tax payment for 2006 as well.

All returns prior to 2005 were filed on a timely basis, and there is not any outstanding tax obligation for those years.

Please contact me if you should need further information.

Sincerely,

Robert M. Evans

Robert M. Evans, CPA

Tel: (702) 597-0010
Fax: (702) 597-2767

www.bmercpa.com

Moody's Investors Service

Global Credit Research
Rating Action
7 OCT 2005

Save as PDF

Rating Action: Rhodes Companies, LLC (The)

MOODY'S ASSIGNS FIRST-TIME RATINGS TO THE RHODES COMPANIES, LLC

Approximately $600 Million of Bank Loans Affected

New York, October 07, 2005 -- Moody's Investors Service assigned first-time ratings to The Rhodes Companies, LLC ("Rhodes Homes")., including a B1 Corporate Family Rating, a Ba3 rating on the proposed $450 million senior secured first lien term loan, and a B1 rating on the proposed $150 million senior secured second lien term loan. The ratings outlook is stable.

The stable ratings outlook is based on Moody's expectation that 1) the company will maintain generally level collateral coverage through 2007 before beginning gradually to reduce debt/total net value in 2008 and beyond, and 2) the estimated $280+ million of cash on hand after the close of the transaction will be used largely for seasonal working capital needs and for future land purchases which will be added to the collateral package.

The ratings reflect the company's aggressive pro forma adjusted debt leverage (as measured by adjusted debt/capitalization and adjusted debt/EBITDA), relatively small size and scale, limited geographic reach and product diversity, some prior indications of speculative excess in the Las Vegas housing market, and the cyclical nature of the homebuilding and land development industries.

At the same time, the ratings recognize the significant collateral in the structure (as represented by the Cushman & Wakefield asset appraisal of $1.6 billion), the ongoing strength of the Las Vegas housing market, the company's reasonably strong historical track record, and the considerable infrastructure spending completed to date in the Rhodes Homes master planned communities.

The following ratings were assigned:

B1 Corporate Family Rating

Ba3 rating on the $450 million five-year senior secured first lien term loan

B1 rating on the $150 million six-year senior secured second lien term loan

All of Rhodes Homes' debt is guaranteed by substantially all the company's material operating subsidiaries, except entities that hold unentitled land.

Pro forma for the takedown of $600 million of first and second lien term loans, repayment of $211 million of existing debt, addition of $275 million to the company's cash balances, payment of a $100 million dividend to the owners, and funding of $13.5 million of transaction fees and expenses, the debt leverage metrics as of year-end 2005 are expected to be approximately as follows: 85% debt/capitalization, 5.9x debt/EBITDA, 28.5% first lien debt/total net value, and 38.3% total debt/total net value. Adjusted debt metrics as of the same date, after adding $89.5 million to the consolidated debt totals for specific performance options that the company has in its Tuscany master planned community, would be approximately as follows: 86% debt/capitalization, 6.7x debt/EBITDA, 34.2% first lien debt/total net value, and 44% total debt/total net value. The debt/cap and debt/EBITDA metrics, by which traditional homebuilders are measured, are aggressive for the rating. The debt/net value calculations, by which land developers are measured, are reasonably strong for the rating.

Founded in 1992, Rhodes Homes conducts land development and homebuilding operations in two master planned communities and one planned area development in Las Vegas and is building a base for developing a Las Vegas bedroom community in Kingman, AZ. This geographic concentration, plus the company's relatively limited product and price point diversity as well as its overall small relative size, make the company more susceptible to a cyclical industry downturn and/or regional downturn than its much larger competitors.

The Las Vegas housing market has experienced very rapid price appreciation in recent years, most significantly in the past two years. As a result, speculative buying and flipping have increased, leading to an increase in the number of resales on the market that are competing with new home sales and causing at least one homebuilder (Pulte) to

have to give back some of its 2004 price increases in order to drive cancellation rates back down to more normal levels. Rhodes Homes was affected by the fallout from the Pulte action, saw its own cancellation rates soar, and had fewer deliveries and lower revenues and EBITDA in 2004 as compared to 2003. The company has since instituted stiffer underwriting and down payment requirements and has seen a strong recovery in year-to-date 2005 results.

On the plus side, Rhodes Homes' land and home inventory was valued by Cushman & Wakefield in September 2005 at a Total Net Value of approximately $1.6 billion. As a result, substantial collateral protection for both the first and second lien term loans.

Las Vegas has consistently been one of the strongest residential housing markets in the country with lot supply being constrained by the timing of land sales by the Bureau of Land Management, which is the dominant land owner in the area.

The company's two largest master planned communities, Rhodes Ranch and Tuscany, have been under development since the mid-1990's. To date, the company has invested approximately $335 million in land, infrastructure buildup, and amenities.

Rhodes Homes' pre-transaction metrics were very strong for the ratings, with interest coverage rising from 4x to 11x, debt/capitalization falling from 77% to 62%, debt/EBITDA declining from 3.8x to 3.4x, and gross margins soaring from 37% to 49% over the three-year period 2002-2004.

The $450 million senior secured first lien term loan will mature in 2010 and will benefit from a first lien on substantially all the property of The Rhodes Companies, LLC and its co-borrowers, excepting entities that hold unentitled land. In addition, there will be a 100% excess cash flow sweep in place until half of the total debt outstanding at closing is repaid and total debt/total net value falls below 30% (i.e., when the "trigger date" is reached), at which point the excess cash flow sweep drops down to a 50% rate. A tight restricted payments basket, which permits distributions to pay the taxes of the owners plus up to an additional $2.5 million per year until the trigger date is reached (after which distributions can be up to half of excess cash flow), offers additional protection. The $150 million senior secured second lien term loan will mature in 2011 and benefit from a second lien on substantially all of the property of The Rhodes Companies, LLC and its co-borrowers, excepting entities that hold unentitled land. In addition, there will be additional financial covenants, governing both loans, in the form of first lien debt and total debt/total net value tests and a Cash EBITDA/Cash Interest coverage test. These additional covenants are still being negotiated.

Going forward, the ratings and outlook would be strengthened by a significant build-up in the company's equity base, successful diversification into other markets, and/or a permanent reduction in the company's debt leverage metrics. The ratings and outlook would be stressed by a misstep in the company's expansion process, a significant increase in debt leverage, or use of the $280+ million current cash balances for anything other than seasonal working capital needs and additional land purchases that would be added to the collateral package.

Headquartered in Las Vegas, Nevada, The Rhodes Companies, LLC and its co-borrowers (Heritage Land Company, LLC and Rhodes Ranch General Partnership) comprise the largest private community developer and homebuilder in Las Vegas. Projected revenues and EBITDA for the year that will end December 31, 2005 are $262 million and $103 million, respectively.

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MOODY'S hereby discloses that most issuers of debt securities (including corporate and municipal bonds, debentures, notes and commercial paper) and preferred stock rated by MOODY'S have, prior to assignment of any rating, agreed to pay to MOODY'S for appraisal and rating services rendered by it fees ranging from $1,500 to $2,400,000. Moody's Corporation (MCO) and its wholly-owned credit rating agency subsidiary, Moody's Investors Service (MIS), also maintain policies and procedures to address the independence of MIS's ratings and rating processes. Information regarding certain affiliations that may exist between directors of MCO and rated entities, and between entities who hold ratings from MIS and have also publicly reported to the SEC an ownership interest in MCO of more than 5%, is posted annually on Moody's website at www.moodys.com under the heading "Shareholder Relations - Corporate Governance - Director and Shareholder Affiliation Policy."

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June 21, 2006

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JUN 21 2006
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ARIZ. CORPORATION COMMISSION

HAND-DELIVERED

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ARIZONA CORPORATION COMMISSION
1200 West Washington Street
Phoenix, Arizona 85007

Re: Responses to Staff's First Set of Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company (Docket Nos. W-20380A-05-0490 and SW-20379A-05-0489)

Dear David and Blessing:

Enclosed is one copy of responses to Staff's Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company (BNC 1.16, 1.17, 1.18, 1.21 and 1.23) in the above-referenced docket.

Please contact me at the direct line listed above if you have any questions or if you need further information or documents.

Very truly yours,

SNELL & WILMER

Jeffrey W. Crockett by KAA

Jeffrey W. Crockett

cc (with enclosure): K. Mosley

FILE COPY

Snell & Wilmer is a member of LEX MUNDI, The Leading Association of Independent Law Firms.

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.16 Have any of the (present and past) officers, directors and/or employees of Rhodes Homes Arizona, LLC, Perkins Mountain Water Company, and/or Perkins Mountain Utility Company and their respective affiliates been accused of allegations of political corruption (including but not limited to campaign violations and election law violations); allegations of construction violations; allegations of misconduct; and filings at administrative hearings, at the local, state or federal agencies, including at the Federal Elections Commission, Registrar of Contractors, or any violations of law? If so, please provide a comprehensive list of all affiliated individuals and entities that have been accused of the above mentioned allegations; the litigation history; and the individual case disposition.

Response:

Objection. The Applicants object to this question on the grounds that it is overly broad and unduly burdensome. Because of various ownership interests, common control or contractual relationships among numerous companies, partnerships and trusts, the current number of employees is in excess of 800 people. The Applicants do not have information of the nature described above for the vast majority of those 800 employees. Moreover, the terminology used in this data request is so broad, vague and ambiguous that it is impossible to answer the data request as written. There are no definitions provided for the terms "political corruption," "construction violations," "misconduct," or "violations of law." Additionally, the data request is open ended, not limited to a time frame, and it does not specify the maker(s) of the allegations. By way of illustration, this potentially places the Applicants in the impossible position of responding to unilateral allegations reported by persons quoted in newspaper articles at any point in time, or uncorroborated statements made by members of the public at public comment sessions. Finally, Applicants incorporate herein by reference the objection set forth in the response to data request BNC 1.11.

Without waiving the foregoing objection and upon information and belief, a list of matters involving officers or directors of the entities listed in the response to data request BNC 1.10 is provided. Consistent with the other responses included herein, the list is limited to matters that were filed from January 1, 1996 through and including the date of this response.[1]

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[1] In some instances an officer or director is named in a case along with one or more of the entities. Because the entity is often the primary party, any case that identifies an officer or director and one of the entities is listed in the response to BNC 1.17.

Applicants will supplement this response with additional information, changes or documents that may come to their attention.

BNC 1.16
Continued

Prepared by: Mark E. Hall
Corporate Counsel
Rhodes Homes Arizona, LLC
2215 Hualapai Mountain Road, Suite H
Kingman, AZ 86401

Officer & Director Case List

Case Name	Case Number	Date Filed	Judgment	Status	Comments
Herrera for Congress: In re James A. Bevan	MUR 5305	9/26/02	Civil Penalty of $5,500	Closed	James A. Bevan was the Chief Financial Officer at Rhodes Design and Development Corp.
Herrera for Congress: In re Ronald E. Gillette	MUR 5305	9/26/02	Federal Elections Commission ("FEC") No Further Action Decision 9/20/05; No Civil Liability	Closed	Ronald E. Gillette was President of Sagebrush Enterprises, Inc.; The FEC Decided to Take No Further Action With Regard to Mr. Gillette's Involvement in This Matter
Palm Gardens Ltd. Partnership, James M. Rhodes v. Gardens East, Inc., Prestige Development Corp., Louis E. Goldman, Jr., and Marshall Goldman	A347438	6/21/95	$2,166,498.85 Judgment Entered Against James M. Rhodes On 10/14/00	Reopened	Partnership Dispute; James M. Rhodes is President of Sagebrush Enterprises, Inc., Sedora Holdings, LLC, Desert Communities, Inc., and The Rhodes Companies, LLC
Louise Ruiz v. R and R Concrete, Inc., James M. Rhodes	A341530	1/10/95	$276,554.28 Amended Judgment Entered 10/11/00 in Favor of Plaintiff	Closed	Asset Allocation Dispute; James M. Rhodes is President of Sagebrush Enterprises, Inc., Sedora Holdings, LLC, Desert Communities, Inc., and The Rhodes Companies, LLC

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.17 Have Rhodes Homes Arizona, LLC, Perkins Mountain Water Company, and/or Perkins Mountain Utility Company and/or any of their respective affiliates been accused of allegations of political corruption (including but not limited to campaign violations and election law violations); allegations of construction violations; allegations of misconduct; and filings at administrative hearings, at the local, state, or federal agencies, including at the Federal Elections Commission, Registrar of Contractors, or any violations of law? If so, please provide a comprehensive list of all affiliated individuals and entities that have been accused of the above mentioned allegations; the litigation history; and the individual case disposition.

Response:

Objection. The Applicants object to this question on the grounds that it is overly broad and unduly burdensome. The terminology used in this data request is so broad, vague and ambiguous that it is impossible to answer the data request as written. There are no definitions provided for the terms "political corruption," "construction violations," "misconduct," or "violations of law." Additionally, the data request is open ended, not limited to a time frame, and it does not specify the maker(s) of the allegations. By way of illustration, this potentially places the Applicants in the impossible position of responding to unilateral allegations reported by persons quoted in newspaper articles at any point in time, or uncorroborated statements made by members of the public at public comment sessions. Finally, the Applicants incorporate herein by reference the objection set forth in the response to data request BNC 1.11.

Without waiving the foregoing objection and upon information and belief, a list of matters involving the entities listed in the response to data request BNC 1.10 is provided. Consistent with the other responses included herein, the list is limited to matters that were filed from January 1, 1996 through and including the date of this response.

Perkins Mountain Water Company and Perkins Mountain Utility Company were specifically formed in 2005 to eventually provide water and sewer service in accordance with a Certificate of Convenience and Necessity to the areas specified in these dockets. The Applicants are unaware of any allegations or accusations against Perkins Mountain Water Company or Perkins Mountain Utility Company that would fall within any of the categories listed above.

Various Rhodes entities, including Rhodes Homes Arizona, LLC plan, develop, and construct on a large scale. Unfortunately, it is not uncommon for disputes

and allegations of

BNC 1.17 Continued

construction defects to arise. Since a wide array of individuals and companies work together creating these developments, it may be difficult to determine the party responsible for a particular defect. As a result, the contractors, subcontractors, Mr. Jim Rhodes and some of the Rhodes entities listed in the response to data request BNC 1.10 have found themselves involved in litigation. A list attempting to summarize those cases is attached.

Applicants will supplement this response with additional information, changes or documents that may come to their attention.

Prepared by: Mark E. Hall
Corporate Counsel
Rhodes Homes Arizona, LLC
2215 Hualapai Mountain Road, Suite H
Kingman, AZ 86401

RELATED ENTITIES CASE LIST

Case Name	Case Number	Date Filed	Judgment	Status	Comments
Dennis Ewing, et al. v. Rhodes Design and Development Corp., Rainbow Canyon, LLC, Desert Communities, Inc., Artistic Tile, Inc.	A408473	9/22/99	Settled	Closed	Alleged Construction Defect
Peter Licata, Lauri Licata v. Spanish Hills Community Association, Tropicana Durango Ltd., Tropicana Durango Investments Corp., James M. Rhodes	A402754	5/4/99	$9,529.88 Judgment of Dismissal Entered in Favor of Defendants 7/21/04	Closed	Alleged Misrepresentation of Lot Size Purchased at Spanish Hills
Rhodes Ranch Land Holding Limited Partnership, Rhodes Ranch Land Holdings, Inc., Durango Springs Properties Limited Partners, Mustang Properties, Inc., Southwestern Opportunities Limited Partners, Coronado Properties, Inc., Rhodes Ranch Limited Partnership, Rhodes Ranch General Partnership, Rhodes Design and Development Corp., Bravo, Inc., James Rhodes v. Wes Adams, Asset Management Services, LLC, Western States Contracting, Inc.	A408972	10/4/99	Settled; Rhodes' Motion to Enforce Settlement Agreement Granted 8/17/04	Closed	

Case Name	Case Number	Date Filed	Judgment	Status	Comments
Desert Communities, Inc., Jim Rhodes v. Brad Boe	A514942	12/23/05		Inactive	Case stayed in order to arbitrate claims.
Mark Cluff and Mary A. Cluff v. James Rhodes dba Rhodes Homes, Desert Communities, Inc.	A443560	12/7/01	Settled; Order of Dismissal with Prejudice entered 9/24/02	Closed	
Jerilyn J. Clayton v. James M. Rhodes	A452737	6/28/02		Closed	Dismissed pursuant to NRCP 41(a)(1); Voluntary Dismissal by Plaintiff
Olen Residential Realty Corp. v. James M. Rhodes, Bravo, Inc., dba Rhodes Framing, Dirk Griffith, Rhodes Design & Development Corp.	A394611	10/12/98	Order of Dismissal With Prejudice Entered 9/17/03	Closed	
United Title Company of Nevada, Chicago Title Insurance Co. v. Palm City Developers, LLC, Rhodes Design & Development Corp., Commerce Association, LLC, Rainbow Canyon, LLC, James M. Rhodes	A418517	5/4/00	Order of Dismissal With Prejudice Entered 3/14/03	Closed	
Rhodes Design and Development Corp., James M. Rhodes v. Park West Golf, Inc.	A388049 A401184 (consolidated)	5/7/98 3/26/99	Arbitration Award Confirmed 4/22/02	Closed	

Case Name	Case Number	Date Filed	Judgment	Status	Comments
Phoenixcor, Inc. v. James M. Rhodes, Rhodes Realty, Inc., Rhodes Design & Development Corp.	A407056	8/16/99	Order of Dismissal Without Prejudice Entered 9/4/01	Closed	
Clark County of Nevada v. the Estate of James M. Booth, Catherine Booth, Diane M. Robins, James G. Keller, Marilyn M. Keller, Dale W. Crisp, Donna L. Crisp, E. J. Callery, Ed Callery, Title Insurance and Trust Company, Cara Walstrum, US Office of IRS Special Liens Division, James M. Rhodes, Anthony D. Hunter, Deborah M. Hunter, Familian Corp., dba Familian Pipe & Supply, USAA Property and Casualty Insurance	A397017	12/14/98	Judgment of Condemnation Entered 9/21/01	Closed	
First Security Bank of Nevada v. Rhodes Design & Development Corp., James M. Rhodes	A402327	4/23/99	Notice of Dismissal Without Prejudice Granted 10/18/99	Closed	
Zion Credit Corp. v. Rhodes Design & Development Corp., James M. Rhodes	A400660	3/16/99	Settled	Closed	
MDC Holdings, Inc. v. Ronald Gorski dba Richmond American Homes of Nevada, Inc., James M. Rhodes	A489374	7/26/04		Active; Trial Date 10/17/06	Alleged Breach of Contract, Intentional Interference with Contractual Relationship

Case Name	Case Number	Date Filed	Judgment	Status	Comments
Hart/Volland Enterprises, LLC v. Durango/Springs Properties, Ltd., Partner, Mustang Properties, Inc., Bravo, Inc., James M. Rhodes, United Title of Nevada, Inc.	A386967	4/10/98	Order of Dismissal With Prejudice Entered 6/27/01	Closed	
Indemnity Co. of California v. Bravo, Inc. dba Rhodes Framing, Tropicana Durango Investments Corp., Tropicana Durango Ltd., James M. Rhodes	A383344	1/15/98	Order Entered 3/31/98	Closed	
Wendell Brown v. Rhodes Homes, Madrid Properties, Ltd. Partnership, Madrid Estates Homeowner's Association, Inc., Rhodes Realty, James M. Rhodes, Robert M. Beville, Robert W. Sweeney, Ray Calles	A384183	2/5/98	Order of Dismissal With Prejudice Entered 11/17/98	Closed	
Tileworks, Inc. v. Rhodes Design & Development Corp., Indemnity Co. of California, James M. Rhodes, Deborah L. Rhodes	A372026	4/8/97	Stipulation and Order to Close Case Entered 3/5/98	Closed	
Michael A. Silvaggio, Terra West Realty and Development v. Rhodes Design & Development Corp., Teal Investments General Partnership, James M. Rhodes, Robert M. Beville	A362781	8/12/96	Order of Dismissal With Prejudice Entered 9/5/97	Closed	

Case Name	Case Number	Date Filed	Judgment	Status	Comments
Eamon Springall v. Rhodes Ranch Ltd. Partnership, Sagebrush Enterprises, Inc., Rhodes Ranch, LLC, James Rhodes, Gorman Cook	A477413	12/5/03	Default Judgment Entered Against Gorman Cook on 11/19/04 in the Amount of $820,500	Closed	
Lisa Povill, et al. v. Rhodes Ranch, Ltd. Partnership, Rhodes Design & Development Corp., Sagebrush Enterprises, Inc., Vistana Condominium Owner's Association	A471433 A471463 (consolidated)	7/30/03 7/31/03	A471463 Order of Dismissal Without Prejudice Entered 4/27/04	Closed	Appealed to Supreme Court 6/16/05
Rhodes Ranch Ltd. Partnership, Sagebrush Enterprises, Inc. v. KB Home Nevada, Inc.	A466561	4/21/03	Order of Dismissal With Prejudice Entered 7/1/03	Closed	
Washington Homes-Nevada dba Washington Homes of Nevada v. Southwestern Opportunities, Ltd. Partners, Stewart Title of Nevada, Sagebrush Enterprises, Inc., Rhodes Ranch, LLC, Rhodes Ranch General Partnership	A442581	11/15/01	Order of Dismissal With Prejudice Entered 4/15/03	Closed	

Case Name	Case Number	Date Filed	Judgment	Status	Comments
Delta Plastering Stucco, Inc. v. James Rhodes, Rhodes Design & Development Corp., Elkhorn Partners Limited Partnership, Rhodes Homes	A401733	4/9/99	Order of Dismissal Without Prejudice Entered 2/5/02	Closed	
Ready Mix, Inc., v. Rhodes Ranch, Ltd. Partnership, Durango/Springs, Ltd. Partnership, Sagebrush Enterprises, Inc., Elkhorn Partners, Abraham Benefraim, et al.	A478000	12/17/03	Judgment of Dismissal Entered 5/17/04	Closed	
Walnut Creek Estates, McAlister Investments, Dunton & Dunton, LLP v. American Land Management, LLC, Rhodes Design and Development Corp., Matt Lawson	S-8015-CV-20050026	1/7/05			Mohave County Superior Court
Sedora Holdings, LLC v. Arizona State Department of Revenue, Mohave County	TX2006-050005 TX2006-050006 TX2006-050007	1/6/06	Order of Dismissal Entered 5/18/06		
Vistana Condominium Owners Association, Inc. v. Rhodes Ranch Limited Partnership, Rhodes Design and Development Corp., Sagebrush Enterprises, Inc., Rhodes Ranch, LLC, Rhodes Ranch General Partnership, Rhodes Home, James A. Bevan	CV2006-006306	5/2/2006			

Case Name	Case Number	Date Filed	Judgment	Status	Comments
Claudia Mirkin v. Jim Rhodes, Rhodes Design and Development Corp.	CA795602	6/16/98			
Deutsche Bank Securities, Inc. v. Rhodes Companies, Jim Rhodes	SDNY 1:06cv413	1/19/06		Active	Alleged Breach of Contract
Richard McCleve, Pat McCleve v. James Rhodes, Rhodes Homes, Inc.	A451229	5/28/02	Order of Dismissal With Prejudice Entered 1/15/04	Closed	
Lyon Financial Services, Inc. dba BCL Capital v. Rhodes Design and Development Corp., James M. Rhodes	A420601	6/20/00	$1,251,006.54 Judgment Entered 6/22/00 in Favor of Plaintiff	Closed	Partial Summary Judgment Granted in Favor of Lyon Financial Services; Judgment Lien
Sharon Allen, et al. v. Elkhorn Partners, Elkhorn Investments, Inc., D and B Holdings General Partnership, Rhodes Design and Development Corp. dba Rhodes Homes, Rhodes Realty, Inc., James M. Rhodes, Willis Roof Consulting, Inc.	A478315	12/24/03	Defendants' Motion to Dismiss Granted 5/17/04	Closed	Alleged Construction Defect

Case Name	Case Number	Date Filed	Judgment	Status	Comments
Jerry Argovitz, et al. v. United Title of Nevada, Southwestern Opportunities Ltd. Partnership, Coronado Properties, Inc., Rhodes Design & Development Corp., Durango Springs Properties Ltd. Partners, James Rhodes, Susan Coleman	A417983	4/21/00	Order of Dismissal With Prejudice Entered 1/27/04	Closed	
James Rhodes, Rhodes Design & Development Corp., Gypsum Resources, LLC v. Mark A. James	A466041	4/10/03	Dismissal Pursuant to NRCP 41(a)(1) Entered 6/2/03	Closed	NRCP 41(a)(1); Voluntary Dismissal by Plaintiff
Warthen Services Co. Inc., Nicholas Naff, et al. v. Palm City Developers, LLC, James Rhodes	A421447	7/11/00	Order of Dismissal With Prejudice Entered 6/6/02	Closed	
Rhodes Design & Development Corp., James Rhodes v. Lyon Financial Services, Inc. dba BCL Capital	A424830	9/28/00	Order of Dismissal With Prejudice Entered 3/8/01	Closed	
Vistana Condominium Owners Association, Inc. v. Rhodes Ranch Ltd. Partnership, Rhodes Design and Development Corp., Sagebrush Enterprises, Inc., Rhodes Ranch, LLC, Rhodes Ranch General Partnership, Rhodes Homes, James A. Bevan	A498921	1/31/05	Order of Dismissal Without Prejudice Entered 5/19/06	Active	

Case Name	Case Number	Date Filed	Judgment	Status	Comments
David R. Smith v. James Rhodes, Rhodes Design & Development Corp.	A400855	3/19/99	Defendant's Renewed Motion for Summary Judgment Granted 6/5/00; Order of Dismissal With Prejudice Entered 9/11/00	Closed	
Carmine Iovino v. Darrell Ruiz, James Rhodes, R & R Concrete, Inc., Nevada Department of Motor Vehicles	A382959	1/6/98	Order of Dismissal Entered 12/22/98	Closed	
Rhodes Design & Development Corp., James Rhodes v. Integrity Homes, Inc.	A358227	4/15/96	Order of Dismissal With Prejudice Entered 8/6/97	Closed	
Coldwell Banker, Inc. v. James Rhodes, Jim Rhodes Construction, Inc., Robert Rishling, Phylcon, Inc.	A271417	1/26/98	Order of Dismissal With Prejudice Entered 12/4/91	Closed	Notice of Withdrawal of Appeal 6/29/92
Herrera For Congress: In re James M. Rhodes, Rhodes Design and Development Corp., Bravo, Inc. dba Rhodes Framing, Rhodes Ranch General Partnership	MUR 5305	9/26/02	$148,000 Civil Penalty	Closed	The Parties Entered a Conciliation Agreement With the FEC and Paid a Civil Penalty; The Case Was Not Criminal in Nature

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.18 Have any of the persons or entities listed in No. 16 and 17 above been convicted or admitted to any of the allegations listed?

Response:

None of the allegations listed are criminal in nature; therefore, the persons and entities listed in the responses to data requests BNC 1.16 and 1.17 could not be and were not convicted. Certain parties listed in those responses entered a conciliation agreement with the FEC. Pursuant to that agreement, the parties were required to pay a civil penalty. The remaining matters, for the most part, were either settled or dismissed. Please refer to the case list attached to data request BNC 1.17 for the specific case disposition.

Applicants will supplement this response with additional information, changes or documents that may come to their attention.

Prepared by: Mark E. Hall
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2215 Hualapai Mountain Road, Suite H
Kingman, AZ 86401

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.21 Please describe any and all dissolutions and/or terminations of the entities listed about and/or of their affiliates that have occurred from January 1, 1996 through and including the date of the response to this data request.

Response:

None of the entities listed in response to data request BNC 1.10 have either dissolved or terminated.

RESPONSES OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY TO ARIZONA CORPORATION COMMISSION STAFF'S FIRST SET OF DATA REQUESTS IN DOCKET NOS. W-20380A-05-0490 AND SW-20379A-05-0489 MARCH 31, 2006

BNC 1.23 Please describe any and all mechanics, tax or other liens that have been assessed against any of the above mentioned entities or Mr. Jim Rhodes from January 1, 1996 through and including the date of the response of this data request.

Response:

Objection. As is common in the development business, there are numerous mechanics liens of short duration that are attached and released from parcels of land throughout construction. Therefore, Applicants object to this data request because it is overly broad, unduly burdensome and would require a voluminous response. Further, the Applicants incorporate herein by reference the objection set forth in the response to data request BNC 1.11. Without waiving this objection, a list of tax liens and judgment liens that have been assessed against Mr. Rhodes or the entities listed in the response to data request BNC 1.10 is attached hereto.

Applicants will supplement this response with additional information, changes or documents that may come to their attention.

Prepared by: Mark E. Hall
Corporate Counsel
Rhodes Homes Arizona, LLC
2215 Hualapai Mountain Road, Suite H
Kingman, AZ 86401

Liens

Date Incurred	Lien Holder / Secured Party	Case Number	Type	Amount/Status	Notes/Comments
10/09/2000	The Gardens East, Inc.	A347438	Judgment Lien	$2,166,498.85	Partnership Dispute
12/23/1997	Louise Ruiz	A341530	Judgment Lien	$125,216.10	Asset Allocation Dispute
02/05/1998	Louise Ruiz	A341530	Judgment Lien	$54,844.50	Attorney's Fees
06/20/2000	Lyon Financial Services, Inc.	A420601	Judgment Lien	$1,251,006.54 And $41,951.07 Interest	
02/20/2003	Peter Licata and Laurie Licata	A402754	Judgment Lien	$3,210.27	Attorney's Lien Reduced to Judgment
11/01/1998		Reference # 98794556	Tax Lien	Released	Listed with Orange County Recorder
04/25/2001		Reference # 104251790	Tax Lien	Released	Listed with Sacramento County Recorder

Chukw

State of Arizona
Arizona Geological Survey
416 W. Congress, Suite 100
Tucson, Arizona 85701
(520) 770-3500

Janet Napolitano
Governor

M. Lee Allison
Director and State Geologist

April 5, 2006

Blessing N. Chukwu
Executive Consultant
Arizona Corporation Commission
1200 W. Washington St.
Phoenix, AZ 85007-2927

RECEIVED
APR 05 2006
Z Corporation Commissic
Director of Utilities

Dear Ms. Chukwu:

The Arizona Geological Survey (AZGS) has not conducted any original studies of aquifers in Mohave County nor do we envision doing any in the immediate future.

However, AZGS has compiled general information about geology and hydrology of the Bullhead City area under contract with the U.S. Geological Survey. The project was not a new study of groundwater resources but rather produced a compilation of existing information from previous studies conducted by other agencies. I am enclosing a copy of that report:

> Harris, R.C., 1998, A compilation of the geology and hydrology of the Black Mountains - Bullhead City area, Arizona: Arizona Geological Survey Open-File Report 98-26, 40p.

AZGS also maintains a comprehensive statewide bibliography of geology, called AZGEOBIB, which also contains some references about hydrology and water resources. This database is searchable by geographic criteria, including by county or by ADWR groundwater basin. There are a large number of groundwater basins in Mohave County and we are attaching a CD with separate Word file bibliographies for each basin in the county. The bibliography contains several hundred references, including numerous references of studies that have information on groundwater resources. There is some duplication of references that cover multiple groundwater basins.

The Survey works extensively with other state agencies and we are able to undertake specific studies and investigations for you to help meet your needs.

Sincerely,

M. Lee Allison
State Geologist and Director

Open-File REPORT

PUBLISHED BY THE

ARIZONA GEOLOGICAL SURVEY

416 W. CONGRESS, SUITE 100
TUCSON, ARIZONA 85701
(520) 770-3500

A COMPILATION OF THE GEOLOGY AND HYDROLOGY OF THE BLACK MOUNTAINS-BULLHEAD CITY AREA, ARIZONA

by
Raymond C. Harris

Arizona Geological Survey
Open-File Report 98-26

December, 1998

Arizona Geological Survey
416 W. Congress, Suite #100, Tucson, Arizona 85701

(Includes 40 pages text)

Produced in cooperation with the US Geological Survey

This report is preliminary and has not been edited or reviewed
for conformity with Arizona Geological Survey standards

A COMPILATION OF THE GEOLOGY AND HYDROLOGY OF THE BLACK MOUNTAINS-BULLHEAD CITY AREA, ARIZONA

INTRODUCTION

This report presents a compilation of geologic and hydrologic information for the Bullhead City-Black Mountains area of western Arizona. The purpose of the project is to determine the significance of mining, geology, and geohydrology in the chemistry of Bullhead City area groundwater. Mining in the Black Mountains has taken place since the 1800s, and the region provides a good opportunity to investigate any links between mining and water quality.

The study encompasses the area from the crest of the Black Mountains on the east, the Colorado River on the west, latitude 35° on the south and the top of township 21N at the north (Figure 1). Information was compiled from published and unpublished sources including U.S. Bureau of Land Management, U.S. Geological Survey, U.S. Bureau of Mines, U.S. Natural Resources Conservation Service (Department of Agriculture), Arizona Geological Survey, Arizona State Land Department, Arizona Department of Water Resources, and Arizona Department of Environmental Quality.

LAND STATUS AND LAND USE

Land ownership in the Black Mountains-Bullhead City area includes State, Federal, Indian Reservation, and private lands. This information was obtained in digital format from the Arizona State Land Department, through the Arizona Land Resource Information System (ALRIS). (That version of land status is digitized from 1979 BLM maps, and some changes may have occurred since that time.)

Private land accounts for about 55,309 acres in the study area, of which approximately 12,225 acres are in patented mining claims. Federal land comprises 115,960 acres (Bureau of Land Management: 107, 365 acres; Lake Mead National Recreation Area: 8,595 acres). Approximately15,092 acres are held by the State of Arizona. Tribal land of the Fort Mohave Indian Reservation accounts for approximately 19,340 acres.

Land use in the study area includes developed land (residential, commercial, industrial) at Bullhead City and Oatman, and recreation along the Colorado River and Lake Mohave, part of Lake Mead National Recreation Area. Most of the study area is open desert and hilly range land. This land, consisting of State, Bureau of Land Management, and private land outside developed areas, is used mostly for open space, and intermittent cattle grazing occurs on some portions. Patented mining claims account for approximately 12,225 acres in the study area. Most of the patented land is near Oatman.

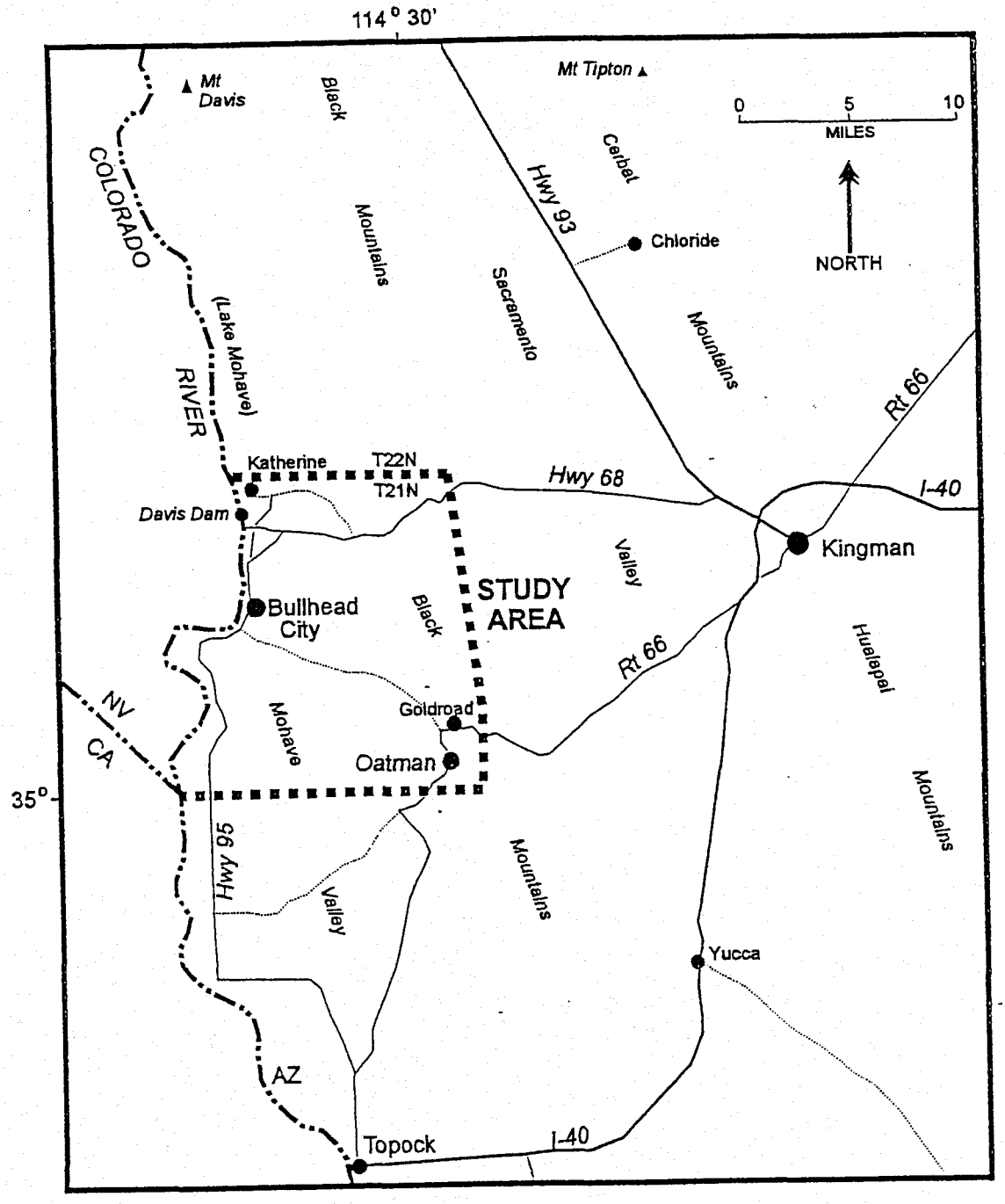


Figure 1. Location of the Black Mountains study area.

Figure 2 continued. Index of geologic maps of the Black Mountains. References:

1) Longwell, 1963: USGS Professional Paper 374-E, Plate 1, scale 1:125,000.

2) Metzger and Loeltz, 1973: USGS Professional Paper 486-J, Plate 1, scale 1:125,000.

3) Lausen, 1931: AZ Bureau of Mines Bulletin 131, Plate II (p. 21), scale 1:100,000.

   Wilson and others, 1934: AZ Bureau of Mines Bulletin 137, Figure 6 (p. 102), scale 1:100,000.

   Gardner, 1936: US Bureau of Mines IC 6901, Figure 9, scale 1:100,000.

4) DeWitt, 1987: SEG Guidebook, V.1, p. 29, Figure 1, scale 1: 250,000.

5) Gray and others, 1990a: USGS Bulletin 1737-D, Figure 2, scale 1:80,000.

6) Gray and others, 1990b: USGS Bulletin 1737-F, Plate 1, scale 1:62,500.

   Gray and others, 1990c: USGS Open-File Report 90-520, Figure 2, scale 1:163,000.

7) Durning and Buchanan, 1984: AZ Geological Society Digest 15, Figure 2, scale 1:85,00; (detailed figures 5, 6, 7, and 8 are within the area of Figure 2).

   Clifton and others, 1980: AIME preprint 80-143, Figure 2,scale 1:80,000

   DeWitt and others, 1991:USGS Bulletin 1857-I, Fig. 2, scale 1:100,000; Fig. 9, scale 1:50,000.

   Ransome, 1923: USGS Bulletin 743, Plate 1, scale 1:48,000.

   Gardner, 1936: US Bureau of Mines IC-6901, Figure 2, scale 1:58,000.

   Spencer and Welty, 1989: AGS Digest 17, Figure 3, scale 1:80,000.

   Smith, 1984: University of Arizona M.S. Thesis, Figure 2, scale 1:48,000.

   Lausen, 1931: AZ Bureau of Mines Bulletin 131, Plate 1, scale 1:48,000.

   Wilson and others, 1934: AZ Bureau of Mines Bulletin 137, plate 1, scale 1:48,000.

   Marsh and McKeon, 1983: Economic Geology, V78, no. 4, Figure 1,scale 1:160,000.

   Korzeb, 1988: US Bureau of Mines Open-File Report MLA 48-88, Figure 2, scale 1:24,000

Entire area:

- Reynolds, S.J., 1986, Geologic map of Arizona: ABGMT [AZGS] Map 26, scale 1:1,000,000
- Wilson and Moore, 1959: ABM [AZGS], Geologic map of Mohave County, scale 1:375,000
- Anderson and O'Connell, 1993: US Bur Rec Seismotectonic Report 93-4, Figure 2-2, scale 1:500,000.
- Lee, 1908: USGS Bulletin 352, Plate 1, scale 1:1,000,000.
- Schrader, 1909: USGS Bulletin 397, Plate 1, scale 1:250,000.

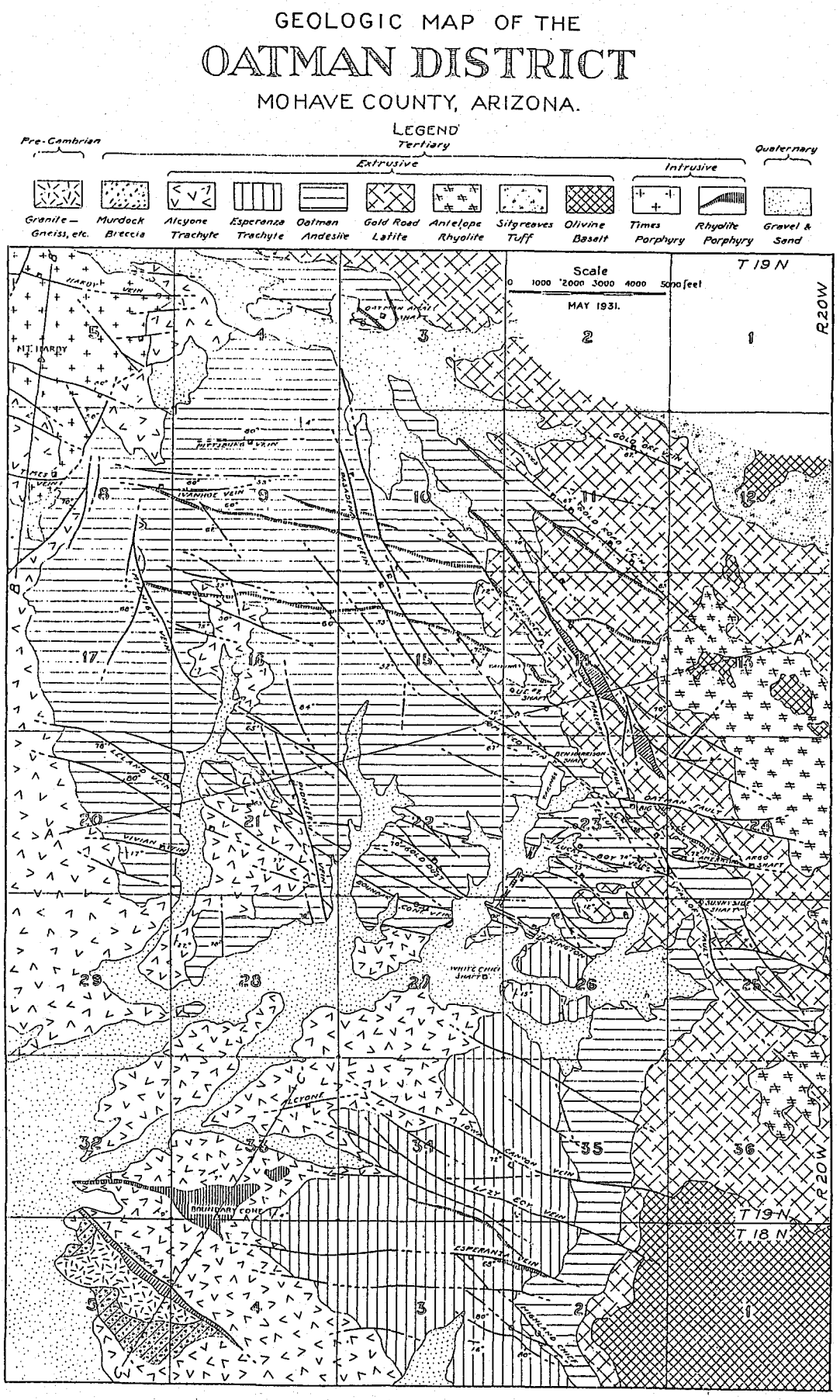


Figure 3. Geologic map of the Oatman area.
(from Lausen, 1931)

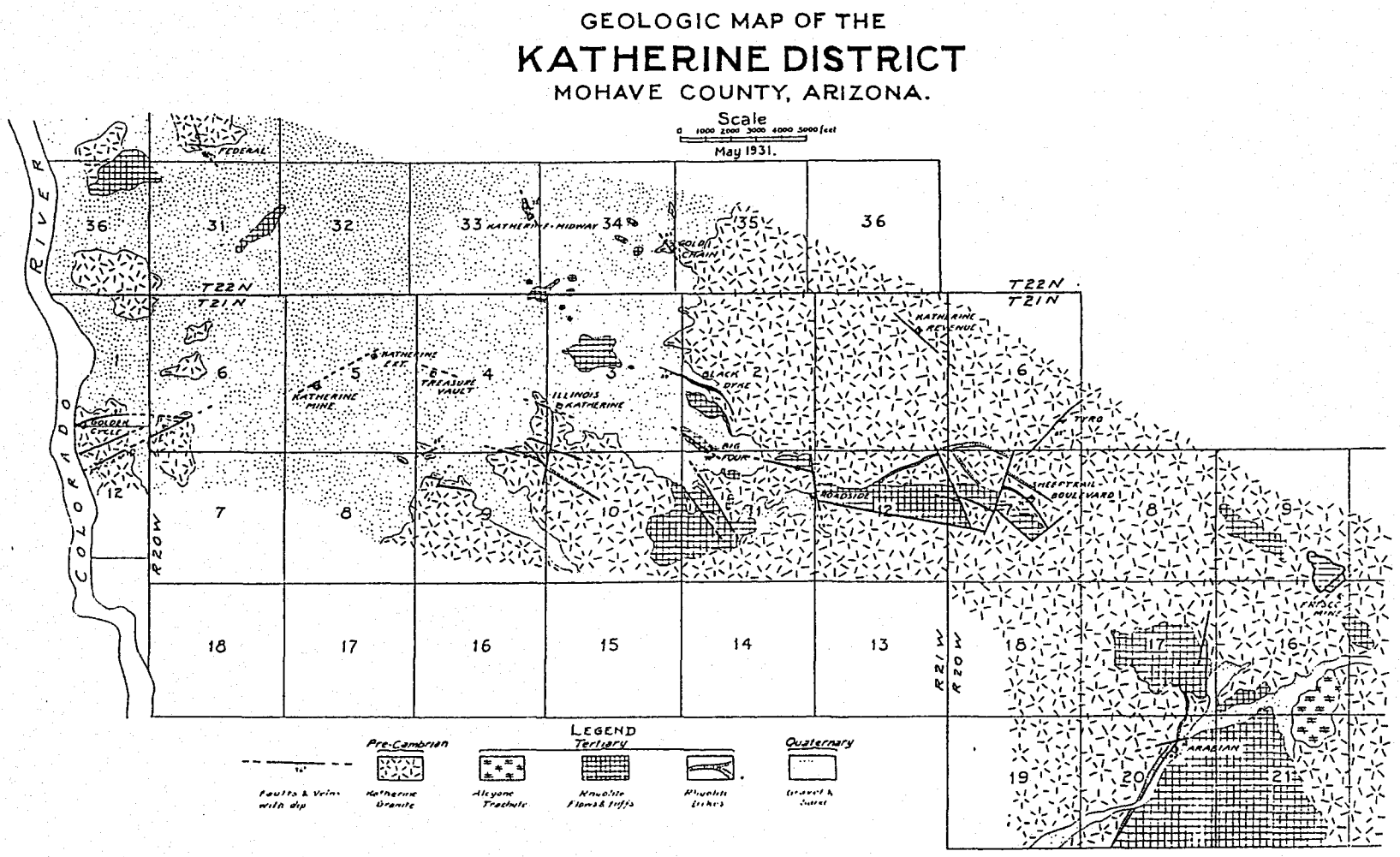


Figure 4. Geologic map of the Katherine District.
(from Lausen, 1931)

(Metzger and Loeltz, 1973) contain unequivocal lacustrine/playa deposits. Although long considered to be of possible marine origin, the Bouse Formation has been shown to be lacustrine on the basis of strontium and carbon isotopes (Spencer and others, 1996, Spencer and Patchett, 1997). Isotope compositions of marls and fossils in the Bouse are identical to Colorado River water and are far removed from the composition of Pliocene seawater.

Integration of drainages into what is now the Colorado River commenced in the study area sometime during or after the deposition of the Muddy Creek and Bouse Formations. The first arrival of Colorado River water into the basins along the present river is recorded by the Bouse Formation (Spencer and Patchett, 1997). A series of prograding deltaic deposits overlie the lacustrine beds (Buising, 1988), marking downcutting through the bedrock highs separating the basins and development of an uninterrupted through-flowing river.

Cycles of downcutting and sedimentation have produced seven geomorphic surfaces between the Black Mountains and the Colorado River (Herriman and Henricks, 1984). Soils developed on the surfaces have been mapped by the Kingman offices of the Bureau of Land Management and Natural Resources Conservation District. (soil maps are available from those offices, and are on file with AZGS) The following summary of these surfaces and their associated soils is from Herriman and Henricks (1984):

Earp (Horseshoe) surface - Lower of the two floodplains, and active slopes of washes; partial abandonment as flood plain less than 500 years ago; subject to flooding. Soils: Carriso, Glenbar, Rositas.

Cimmaron Lake (Ingram) surface - Higher of the two floodplans; age 550-3,290 years B.P. Soils: Antho, Torriorthents, Indio.

Arch Creek (Winkle) surface - Oldest surface directly related to present drainages; early Holocene; Age 3,290-12,240 years B.P. Soils: superstition, Indio variant, Havasu series.

Fort Mohave (Senecal) surface - Low fan terraces and stream terraces; Late Pleistocene; desert varnish. Soils: Gunsight, Superstition, Denure.

McHeffy (Dolph) surface - Displaced from Bullhead surface by fault; narrower interfluves, more eroded vs. Bullhead; Middle Pleistocene. Soils: Chuckwalla.

Bullhead (Dolph) surface - Extensive in region; remnants of alluvial fans; deeply dissected; well-developed desert pavement. Soils: Chuckwalla.

Boundary Cane (Eola) surface - Oldest erosional remnants in region; fan terraces; little or no desert pavement. Soils: Cipriano.

Mountains slopes are actively eroding and no particular age is assignable to them. Soils developed on mountains slopes are Akela, Cellar, Quilotosa, and Laposa.

MINES AND MINERALIZATION

In the early days of mining in the Black Mountains, different authors organized the mines in the study area into various combinations of mining districts including the San Francisco, Katherine, Oatman, Union Pass, Gold Road, Vivian, and Boundary Cone districts. Keith and others (1983) divided ore deposits into two metallic mineral districts, Union Pass at the north edge of the study area, and Oatman, at the south end of the Black Mountains . A summary of mines in the study area is presented in Appendix A.

STREAM SEDIMENTS

An evaluation of uranium in stream sediments was performed for the US Department of Energy (Qualheim, 1978) as part of the National Uranium Resource Evaluation (NURE) Program. The results of that survey are tabulated in Table 2. Uranium in the stream sediment samples for the entire Kingman 1x 2 degree quadrangle averaged 2.16 ppm, and thorium averaged 13.63 ppm. Stream sediments within the present study area averaged 2.63 ppm U and 18.36 ppm Th. As with the survey of mines, no anomalous levels of uranium or thorium were found in the sediments derived from the Black Mountains.

Stream sediment samples were analyzed as part of surveys of several Bureau of Land Management Wilderness Study Areas (WSAs). Stream sediments were analyzed in a study of the Mount Nutt WSA (Gray and others, 1990a). That study found anomalies for mercury (0.1-0.6 ppm), gold (0.05-0.1 ppm), arsenic (10-18 ppm), lead (up to 200 ppm), zinc (up to 250 ppm), and barium (2000-3000 ppm) in the northwest part of the WSA (Union Pass area). Another anomaly of mercury (8-16 ppm) and molybdenum (up to 15 ppm) was delineated in the southeastern part of the WSA (east and outside of this study). Locations of the samples and anomalies were not given in the report.

A thorough sampling of mines, prospects, and stream sediments was performed for the adjacent Warm Springs WSA, in the southern Black Mountains (Bullock and others, 1990). However, none of these samples are within the present study area.

HYDROLOGY

Surface water

Surface water is scarce in western Arizona, owing to the arid climate. Average annual rainfall is about 5 inches. Streams are ephemeral everywhere in the study area, with the exception of the Colorado River. Runoff in the ephemeral streams occurs only during heaviest rains and lasts usually not more than several hours.

Hydrologic conditions in the lower Colorado River region have bee extensively studies by the US Geological Survey. General aspects of water resources in the region are discussed in Hely (1969) and McDonald and Loeltz (1976). Data on precipitation and runoff for the lower Colorado River region are presented in Hely and Peck (1964).

Colorado River water is of good quality for municipal and agricultural use. Weighted-average annual concentrations of TDS below Hoover Dam ranged from 599 to 837 mg/l for the 1935 to 1965 (Irelan, 1971). Variations in flow rates have decreased since construction of Glen Canyon and Hoover Dams upstream from the study area. TDS is also less variable, but has increased slightly due to evaporation from the lakes. Colorado River water is generally of a calcium-sulfate type, with sodium-chloride found in lesser, but important concentrations.

Groundwater

Water from wells along the Colorado River was analyzed by the US Geological Survey (Metzger and Loeltz, 1973) and data from that study is summarized in Table 3. Groundwater samples generally came from wells perforated at shallow depths. These wells receive most or all of their water through infiltration of river water through a shallow alluvial aquifer, and many of the wells have water chemistry identical to that of Colorado River water (Metzger and others, 1973). The Colorado River undergoes a net loss of water from infiltration and evapotranspiration (McDonald and Loeltz, 1976). Contributions to the river by way of subflow from the surrounding valleys is insignificant.

Upon infiltration into the shallow groundwater aquifer, river water is modified by several processes, including bacterial sulfate reduction, concentration by evapotranspiration, and precipitation of calcium and magnesium carbonates (Metzger and Loeltz, 1973). In the deeper wells, TDS is higher and may be influenced by more saline water in contact with the Bouse Formation.

A USGS investigation of groundwater quality in the Colorado River drainage area (Kister, 1973) included wells in the study area. Fluoride levels were 5.0 to 10.0 mg/l in a well near Davis Dam. Six other wells in the study area had fluoride less than 1.0 mg/l. Fluoride levels in the USGS investigation were correlated to the amount of silicic volcanic rocks or Precambrian schist, both of which are common in the region. Most of the groundwater had TDS of less than 1000 mg/l, but an area around Bullhead City and Mohave City had TDS of 1000 to 3000 mg/l. High TDS correlates with the presence of lacustrine deposits, such as the Bouse Formation. Wells farther from the river may tap deeper aquifers and have more variable chemistry and higher TDS than wells closer to the river.

Water quality information for a limited number of wells in the study area for the period 1988-1995 is available from the Arizona Department of Environmental Quality. This information includes well location by township, range, and section, water use, and chemical analyses.

Water quality analyses for these wells are tabulated in Table 4(values in mg/l). Water quality is highly variable, with TDS ranging from 320 to 3800 mg/l. Major cations and anions are similarly variable. Because some labs have different styles of reporting results for different

Table 3. Groundwater quality in the Bullhead city area

Well	Lat	Lon	Date	T.D.	Water Level (ft)	Silica	Ca	Mg	Na + K	% Na	HCO3	SO4	Cl	F	TDS	Ca-Mg hard	Noncarb hard	conduct	pH
(B-19-22)11bab	35.055	-114.5916	5/2/62	21	17.5	22	70	25	265	68	256	362	190	0	1060	278	68	1770	7.3
(B-19-22)11bbd	35.0523	-114.5942	4/13/67		19.4	24	105	34	159	46	224	338	148	1.2	921	400	216	1530	7.6
(B-19-22)14cca	35.0295	-114.5925	4/13/67	230	120	19	82	31	348	70	220	375	365	1.1	1330	332	152	2240	7.5
(B-19-22)15abb	35.0403	-114.6057	6/3/64	130	70	15	76	22	134	51	200	275	87	0.4	709	282	118	1120	7.2
(B-19-22)15acb	35.0367	-114.6058	9/18/62	120	60	18	79	24	121	47	182	283	82	0.2	698	296	147	1080	6.8
(B-19-22)15dad	35.0283	-114.5975	4/13/67		97	18	68	20	152	57	224	183	145	0.5	699	250	66	1230	7.5
(B-19-22)23ccc	35.0133	-114.5967	9/19/62	150	92	24	116	36	121	38	236	267	161	0.4	843	437	224	1350	7.1
(B-19-22)26aab	35.0113	-114.5838	4/11/67	228		21	87	27	279	65	228	250	342	1.1	1220	326	139	2050	7.7
(B-20-22)1aca	35.15	-114.5658	4/23/68	120	27	18	174	56	200	40	272	540	222	0.7	1350	665	442	2090	7.7
(B-20-22)1add	35.1467	-114.5625	6/3/64	249	153	24	180	50	145	32	154	400	302	0.5	1180	655	528	1880	7.2
(B-20-22)19ada	35.1038	-114.6142	9/18/62	150		28	92	29	142	47	180	267	163	0.3	811	348	200	1270	7.0
(B-20-22)25bab	35.095	-114.5733	4/24/68	318	288	37	27	0.6	211	87	188	100	174	9.5	653	70	0	1110	8.1
(B-20-22)26cdb	35.0875	-114.5925	4/24/68	150		38	73	3.4	212	70	152	120	282	4.0	808	196	72	1430	7.4
(B-20-22)26dcd	35.0845	-114.585	4/24/68	220		8	14	2.2	141	88	130	120	82	1.7	434	44	0	746	8.2
(B-20-22)29acc	35.0867	-114.6033	9/18/62	80		24	52	14	73	46	162	95	81	0.4	420	188	55	724	7.2
(B-20-22)35cdd	35.07	-114.5892	5/7/68			44	65	10	805	90	128	140	1200	4.5	2330	204	99	4430	7.7
(B-21-21)21cbb	35.1895	-114.5338	3/7/62	490		11	11	1.2	156	92	124	65	57	4.8	518	28	0	763	8.1

Data from Metzger and Loeltz, 1973

Table 4. Water quality data for the Black Mountains-Bullhead City area.

Well	Name	DEQ#	DWR#	Date	TDS	Spec. Cond.	Alkal CaCO3	Hard. CaCO3	Cl	F	SO4	Mg	Na	Ca	Al	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Se	Ag	Zn	NO3	NO2	Total Nitro	pH	Turb
B(19-20)35bac	Anderson Residence(?)	45640		17-Jul-91	1790	2230	450	996	124	0.92	759	70.3	185	267		nd	nd	0.0006	nd	nd	0.2	nd	1.36	nd	nd	nd	0.64			0.3	7.1	
B(19-20)35bac	Oatman Motel(?)	45642		17-Jul-91	1160	1690	221	531	250	0.26	338	42.4	172	146		nd	nd	0.0025	nd	nd	0.3	nd	0.12	nd	nd	nd	0.05			0.26	7.73	
B(19-20)35bac	Dillinghane Residence(?)	45643		17-Jul-91	1430	1860	416	794	110	0.46	548	56.8	153	212		nd	nd	nd	nd	nd	0.48	nd	1.31	nd	0.25	nd	0.26			0.54	7.14	
B(19-22)14ccd	Roberts Residence	46074	55-642478	15-Jun-94	1020		161	292	179	0.44	309	24.2	221	80.6	nd	nd	nd	nd	nd	0.016	nd	nd	nd	nd	nd	nd	nd	5.53	nd	5.53	7.96	0.73
B(19-22)14ccd	Roberts Residence	46074	55-642478	13-Dec-94	992		158	304	176	0.46	517	24.6	221	80.9	nd	nd	nd	nd	nd	nd	0.11	nd	nd	nd	nd	nd	nd	5.7	nd	5.7	7.79	0.17
B(19-22)15aba	Glaze Residence	46075	55-505320	13-Jun-94	788		149	364	107	0.45	265	27.6	114	93.3	nd	nd	nd	nd	nd	nd	nd	nd	0.06	nd	nd	nd	nd	nd	nd	nd	7.88	0.02
B(19-22)15aba	Glaze Residence	46075	55-505320	29-Nov-94	769		151	358	108	0.5	301	29.5	109	97.2	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd			nd	7.81	
B(19-22)26bbd	Plough Residence	46076	55-527523	27-Jun-94	1240		212	617	255	0.23	322	50.1	139	164	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.78	nd	1.78	7.81	0.08
B(19-22)26bbd	Plough Residence	46076	55-527523	5-Dec-94	1270		nd	679	278	0.26	427	57.7	139	183	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.52		1.52	7.72	
B(19-22)26dcd	Nickerson Residence	46077	55-507171	6-Jun-94	960	1450	180	290	230	0.34	290	26	210	75		<0.005	<0.05	<0.0005	<0.005	<0.05	<0.05	<.005	<0.05	<0.0002	<0.005	<0.005	<0.05			3.1	7.9	
B(19-22)26dcd	Nickerson Residence	46077	55-507171	29-Nov-94	980	1530	190	320	210	0.34	270	27	230	84		0.010	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd			3.40	7.7	
B(19-22)35bad	Stout Residence	46078	55-523024	15-Jun-94	915		181	385	172	0.28	214	33.8	142	104	nd	nd	nd	nd	nd	nd	nd	0.006	nd	nd	nd	nd	nd	7.48	615	7.48	7.74	0.05
B(19-22)35bad	Stout Residence	46078	55-523024	15-Jun-94	894		183	418	184	0.32	255	35.8	135	108	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	7.23		7.23	7.65	
B(19-22)10add	Section 10 WWTP	46282		31-Aug-94						0.46						<0.010	0.07	<0.0005	<0.005			<0.005		<0.0002	<0.005	<0.005				<0.10		
B(19-22)10add	Section 10 WWTP	46282		6-Dec-94	1700	2570	280	540	530	0.44	320	40	360	150		0.005	0.07	nd	nd	nd	1.5	nd	0.36	nd	nd	nd	nd			nd	7.3	
B(20-22)1cdd	AAA Trailer Park	000324	55-607020	15-Jun-94	2140		349	761	387	0.30	649	74.9	412	183	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	14.4	nd	14.4	7.83	0.10
B(20-22)1cdd	AAA Trailer Park (1)	000324	55-607020	12-Dec-94	2560		356	975	541	0.28	867	94.0	525	235	nd	nd	nd	nd	nd	0.074	nd	0.011	nd	nd	nd	nd	nd	15.9	nd	15.9	7.56	0.38
B(20-22)1cdd	AAA Trailer Park (2)	000324	55-607020	12-Dec-94	2600	3655	120	940	540	0.24	1000	95	570	220		<0.005	<0.05	<0.0005	<0.005	<0.05	<0.05	<0.005	<0.05	0.0002	<0.005	<0.005	<0.05			15.0	7.0	
B(20-22)24ddc	?	000732		15-Mar-89												<0.01	<0.1	<0.001	<0.01	<0.1	0.27	<0.01	<0.05	<0.0005	<0.005	<0.001	<0.05					
B(20-22)16aab	Sierra WWTP MW-2(1)	001280	55-515799	10-Aug-88	1690	2630	200	570	534	0.2	316	39	299	165		<0.02	0.11	<0.001	<0.01	<0.1	<0.1	<0.02	<0.05	<0.0005	<0.005	<0.001	<0.05			4.85	7.21	0.55
B(20-22)16aab	Sierra WWTP MW-2(2)	001280	55-515799	10-Aug-88	1690	2600	200	572	554	0.2	311	39.9	410	166		<0.02	0.1	<0.001	<0.01	0.1	<0.1	<0.02	<0.05	<0.0005	<0.005	<0.001	<0.05			4.62	7.21	0.65
B(20-22)16aab	Sierra WWTP MW-2	001280	55-515799	7-Jun-94	650	903	180	330	110	0.44	190	25	82	91		<0.005	0.11	0.001	<0.005	<0.05	0.97	0.009	0.85	<0.0002	<0.005	<0.005	<0.05			0.443	7.6	6.8
B(20-22)16aab	Sierra WWTP MW-2	001280	55-515799	31-Aug-94						0.44						<0.010	0.06	<0.0005	0.017			<0.005		0.0004	<0.005	<0.005				0.10		27
B(20-22)16aab	Sierra WWTP MW-2(1)	001280	55-515799	6-Dec-94	697		169	367	124	0.63	222	25.5	87.9	110	nd	nd	nd	0.0014	nd	0.013	0.55	0.007	0.72	nd	nd	nd	nd	nd	nd	nd	7.68	4.2
B(20-22)16aab	Sierra WWTP MW-2(2)	001280	55-515799	6-Dec-94	690	1154	180	380	120	0.47	270	26	98	110		nd	0.07	0.0021	nd	nd	0.73	0.006	0.72	nd	nd	nd	nd			nd	7.5	
B(20-22)16bbb	Sierra WWTP MW-1	001282	55-515801	10-Aug-88	823	1360	143	423	181	0.37	239	30.3	96.9	116		<0.02	<0.1	<0.001	<0.01	<0.1	<0.1	<0.01	0.43	<0.0005	<0.005	<0.001	<0.05			<0.1	7.7	6.8
B(20-22)16aab	Sierra WWTP MW-3	001283	55-515800	10-Aug-88	810	1150	168	401	131	0.5	255	26.9	96.9	114		<0.02	<0.1	<0.001	<0.01	<0.1	<0.1	<0.02	0.54	<0.0005	<0.005	<0.001	<0.05			<0.1	7.65	0.41
B(20-22)19ada	Riviera Well	21610	55-603474	7-Jun-94	1500	2100	190	730	410	0.18	420	62	220	190		<0.005	0.06	<0.0005	<0.005	<0.05	<0.05	<0.005	<0.05	<0.0002	<0.005	<0.005	0.05			10.5	7.8	0.02
B(20-22)19ada	Riviera Well	21610	55-603474	31-Aug-94						0.18						0.011	0.06	<0.0005	<0.005			<0.005		<0.0002	<0.005	<0.005				11		0.04
B(20-22)19ada	Riviera Well	21610	55-603474	6-Dec-94	1700	2520	180	870	410	0.17	680	72	240	230		nd	0.06	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd			18.1	7.1	
B(20-22)1dac	Super 8 Motel	46079	55-512175	7-Jun-94	1900	2860	230	750	810	0.23	350	73	430	180		0.009	0.11	<0.0005	<0.005	<0.05	<0.05	<0.005	<0.05	<0.0002	<0.005	<0.005	<0.05			7.2	7.7	0.47
B(20-22)1dac	Super 8 Motel (1)	46079	55-512175	1-Dec-94	2500	3875	250	870	870	0.20	310	79	560	220		0.016	0.12	nd	0.009	nd	0.21	nd	nd	nd	nd	nd	nd			nd	7.3	
B(20-22)1dac	Super 8 Motel (2)	46079	55-512175	1-Dec-94	2570		247	902	1000	0.28	321	83.0	490	234	nd	nd	0.11	nd	0.012	0.016	0.26	nd	nd	nd	nd	nd	nd	6.06	nd	6.06	7.65	1.22
B(20-22)17bbd	Bluewater Manor	46080	55-517150	15-Jun-94	1030		192	400	140	0.25	328	31.3	173	113	nd	nd	nd	nd	nd	nd	nd	nd	0.44	nd	nd	nd	nd	1.42	nd	1.42	8.02	0.26
B(20-22)17bbd	Bluewater Manor	46080	55-517150	5-Dec-94	910		180	402	131	0.30	367	31.7	137	109	nd	nd	nd	nd	nd	0.010	nd	nd	0.43	nd	0.007	nd	nd	0.82		0.82	7.89	
B(20-22)17abc	Cochran Residence(1)	46081	55-602231	7-Jun-94	1100	1368	180	360	180	0.18	370	32	200	90		<0.005	<0.05	<0.0005	0.008	<0.05	0.32	<0.005	<0.05	<0.0002	<0.005	<0.005	<0.05			3.54	7.9	3.7
B(20-22)17abc	Cochran Residence(2)	46081	55-602231	7-Jun-94	1100	1375	180	360	180	0.18	390	32	200	92		<0.005	<0.05	<0.0005	0.006	<0.05	0.35	<0.005	<0.05	<0.0002	<0.005	<0.005	<0.05			3.42	7.9	1.1
B(20-22)17abc	Cochran Residence(2)	46081	55-602231	1-Dec-94	1000	1663	200	370	140	0.18	330	31	210	99		nd	nd	nd	nd	nd	0.14	nd	nd	nd	nd	nd	nd			4.40	7.4	
B(20-22)19cdc	Seventy Residence	46082	55-641497	7-Jun-94	950	1203	200	390	140	0.26	370	36	150	98		<0.005	<0.05	<0.0005	<0.005	<0.05	1.1	<0.05	0.46	<0.0002	<0.005	<0.005	<0.05			0.100	8.0	7.7
B(20-22)19cdc	Seventy Residence	46082	55-641497	1-Dec-94	1300	1773	200	580	180	0.24	470	51	200	150		nd	nd	nd	nd	nd	0.84	nd	0.63	nd	nd	nd	nd			nd	7.7	
B(20-22)19dcd	Askew Residence	46083	55-642105	7-Jun-94	3200	3565	240	1300	690	0.17	1100	130	550	310		<0.005	<0.05	0.0008	<0.005	<0.05	0.64	0.006	<0.05	<0.0002	0.005	<0.005	<0.05			9.63	7.7	0.72
B(20-22)19dcd	Askew Residence	46083	55-642105	1-Dec-94	3800	4790	nd	1600	690	0.16	1600	150	690	400		nd	nd	nd	nd	nd	0.28	nd	nd	nd	nd	nd	nd			9.00	7.3	
B(20-22)26ccd	VFW Post 10005	46084	55-806251	7-Jun-94	840	1240	120	250	280	1.6	120	12	180	79		0.059	<0.05	<0.0005	0.006	<0.05	0.29	<0.005	<0.05	0.0003	<0.005	<0.005	<0.05			7.50	7.9	2.5
B(20-22)26ccd	VFW Post 10005	46084	55-806251	29-Nov-94	840	1367	130	270	320	1.7	94	13	190	88		0.109	nd	nd	nd	nd	0.57	nd	nd	nd	nd	nd	nd			7.50	7.6	
B(20-22)26ccd	VFW Post 10005	46084	55-806251	7-Feb-95	850	1393	120	270	280	1.7	100	12	190	89		0.082	nd	nd	nd	nd	0.11	nd	nd	0.0004	nd	nd	nd			5.72	7.5	
B(20-22)29dba	Hansen Residence	46085	55-637323	27-Jun-94	1190		153	301	313	2.84	229	10.8	247	105	nd	0.017	nd	nd	nd	nd	0.23	nd	nd	0.0015	nd	nd	nd	7.19	nd	7.19	7.96	0.41
B(20-22)29dba	Hansen Residence	46085	55-637323	5-Dec-94	1200		150	371	342	2.66	275	12.9	257	126	nd	0.012	nd	nd	nd	0.036	0.15	nd	nd	0.0017	nd	nd	nd	10.1		10.1	7.93	

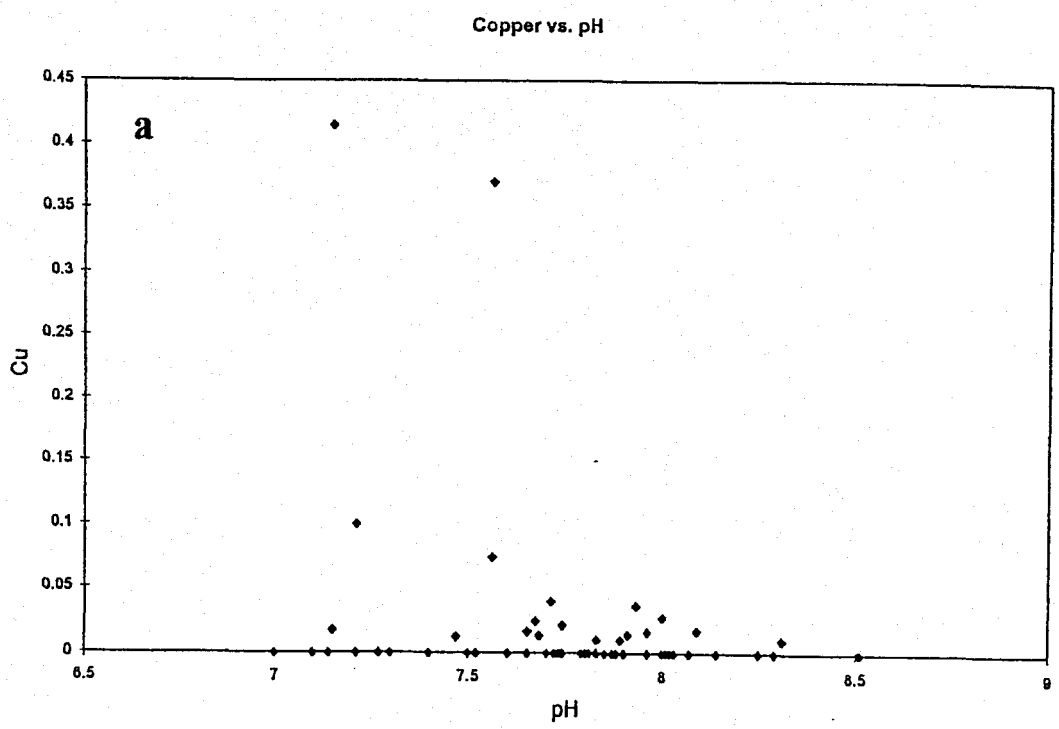
(data from Arizona Department of Environmental Quality)

Table 4. Water quality data for the Black Mountains-Bullhead City area, continued.

Well	Name	DEQ#	DWR#	Date	TDS	Spec. Cond.	Alkal CaCO3	Hard. CaCO3	Cl	F	SO4	Mg	Na	Ca	Al	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Se	Ag	Zn	NO3	NO2	Total Nitro	pH	Turb
B(20-22)29dba	Hansen Residence	46085	55-637323	6-Feb-95			134	283	295		218	9.8	236	94.0	nd	0.015	nd	nd	nd	nd	nd	nd	nd	0.0009	nd	nd	nd	13.2	nd	13.2	7.52	
B(20-22)32aab	Palo Verde Dev East(1)	46086	55-505478	15-Jun-94	1110		123	355	362	1.83	201	18.8	228	108	nd	0.018	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.96	nd	0.96	7.27	0.05
B(20-22)32aab	Palo Verde Dev East(2)	46086	55-505478	15-Jun-94	1160		124	357	359	1.97	223	18.8	231	108	nd	0.018	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.95	nd	0.95	7.52	0.04
B(20-22)32aab	Palo Verde Dev East	46086	55-505478	12-Dec-94	1000		219	323	305	1.93	225	17.8	211	101	nd	0.022	nd	nd	nd	0.014	0.20	0.005	nd	nd	nd	nd	nd	0.81		0.81	7.91	
B(20-22)32dcd	Schwanbeck	46088	55-644518	13-Jun-94	975		140	364	192	0.78	296	24.1	171	103	nd	n	nd	nd	nd	0.021	nd	nd	nd	nd	nd	nd	nd	0.69	nd	0.69	7.74	0.55
B(20-22)32dcd	Schwanbeck	46088	55-644518	29-Nov-94	1220		170	556	283	0.63	384	38.3	172	146	nd	0.011	nd	nd	nd	0.010	nd	nd	nd	nd	nd	nd	nd	1.07		1.07	7.83	
B(20-22)13ddd	Tierra Grande WWTP	46281		6-Dec-94	620	1132	110	190	220	0.66	130	12	100	95		nd	0.08	nd	nd	nd	0.06	nd	nd	nd	nd	nd	nd			6.05	7.4	
B(20-22)13ddd	Tierra Grande WWTP	46281		7-Feb-95	710	1126	100	370	190	0.58	110	16	96	120		nd	0.13	nd	nd	nd	0.07	nd	nd	nd	nd	nd	nd			5.30	7.6	
B(20-22)26dcd	Lewis	46596	55-504216	12-Dec-94	790	1253	120	180	210	3.8	190	8.8	190	59		0.168	<0.05	<0.0005	<0.011	<0.05	0.07	<0.005	<0.05	0.0004	<0.005	<0.005	<0.05			3.56	7.5	
B(20-22)26dcd	Lewis (1)	46596	55-504216	7-Feb-95	760	1256	120	200	210	3.6	130	8.7	190	64		0.12	nd	nd	0.009	nd	nd	nd	nd	nd	nd	nd	nd			2.38	7.5	
B(20-22)26dcd	Lewis (2)	46596	55-504216	7-Feb-95	769		119	188	213		159	8.7	187	60.6	nd	0.133	nd	nd	0.016	nd	nd	nd	nd	nd	nd	nd	nd	1.98	nd	1.98	7.72	0.06
B(20-22)26caa	Mejia Wingfoot Cottages	46597	55-642369	12-Dec-94	910	1512	120	240	300	2.2	200	11	220	77		0.098	nd	nd	nd	nd	nd	nd	nd	0.0006	nd	nd	nd			0.942	7.5	
B(20-22)26caa	Mejia Wingfoot Cottages	46597	55-642369	7-Feb-95	900	1474	120	250	290	2.3	140	11	210	81		0.005	nd	nd	nd	nd	nd	nd	nd	0.0003	nd	nd	nd			0.914	7.5	
B(21-21)21cbb	(no name)	001450		14-Mar-89												0.029	<0.1	<0.001	0.014	<0.1	0.17	<0.01	<0.05	<0.0005	<0.005	<0.001	0.43					
B(21-21)27add	Well #1	21806	55-805519	14-Jun-94	320		127	50	17.3	3.4	28.6	nd	77.9	20.3	nd	0.012	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	5.34	nd	5.34	7.85	0.01
B(21-21)27add	Well #1 (1)	21806	55-805519	6-Dec-94	297		129	49.8	17.8	3.30	32.2	nd	70.9	19.6	nd	0.013	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	5.65	nd	5.65	7.96	0.05
B(21-21)27add	Well #1 (2)	21806	55-805519	6-Dec-94	280	429	140	52	21	3.3	34	0.46	78	20		0.021	nd	nd	0.006	nd	nd	nd	nd	nd	nd	nd	nd			6.2	7.8	
B(21-21)27ccb	Well #2 (1)	21807	55-805518	14-Jun-94	361		128	32	28.5	3.81	35.6	nd	96.4	13.1	nd	0.017	nd	nd	0.015	nd	nd	nd	nd	nd	nd	nd	nd	5.08	nd	5.08	8.07	nd
B(21-21)27ccb	Well #2 (2)	21807	55-805518	14-Jun-94	348		126	32.0	28.5	3.56	36.0	nd	95.9	12.3	nd	0.019	nd	nd	0.016	nd	nd	nd	nd	nd	nd	nd	nd	5.07	nd	5.07	8.0	0.02
B(21-21)27ccb	Well #2	21807	55-805518	6-Dec-94	338		133	33.2	28.4	3.62	40.0	nd	84.2	12.7	nd	0.018	nd	nd	0.019	nd	nd	nd	nd	nd	nd	nd	nd	5.36		5.36	8.14	
B(21-21)30aab	Well #3	21809	55-620581	14-Jun-94	1030		81.8	285	38.2	1.71	133	16.4	247	56.7	nd	nd	nd	nd	nd	nd	1.01	nd	nd	nd	nd	nd	0.07	4.79	nd	4.79	7.72	9.0
B(21-21)30aab	Well #3	21809	55-620581	6-Dec-94	966		94.0	307	381	1.19	153	18.0	197	91.5	nd	nd	nd	nd	nd	nd	0.14	nd	nd	nd	nd	nd	nd	5.49		5.49	7.87	
B(21-21)29add	Well #5	46091	55-507875	14-Jun-94	706		112	55	217	3.48	74.4	1.6	216	18.4	nd	0.037	nd	nd	0.023	nd	nd	nd	nd	nd	nd	nd	nd	7.12	nd	7.12	8.25	0.25
B(21-21)29add	Well #5	46091	55-507875	6-Dec-94	666		116	48.6	221	3.36	73.1	1.5	196	15.7	nd	0.034	nd	nd	0.022	0.010	0.24	nd	nd	nd	nd	nd	nd	6.77		6.77	8.31	
B(21-21)29add	Well #4	46092	55-507876	14-Jun-94	656		125	35	161	5.10	87.1	1.1	206	11.7	nd	0.115	nd	nd	0.029	nd	nd	nd	nd	nd	nd	nd	nd	8.12	nd	8.12	8.51	0.02
B(21-21)29add	Well #4	46092	55-507876	6-Dec-94	693		122	61.8	218	3.62	87.5	2.2	193	19.3	nd	0.031	nd	nd	0.031	nd	nd	nd	nd	nd	nd	nd	nd	7.13		7.13	8.29	
B(21-21)29bca	Well #2	46093	55-608741	14-Jun-94	1200		111	398	421	0.43	135	20.9	220	126	nd	nd	nd	nd	nd	0.024	nd	nd	nd	nd	nd	nd	nd	3.21	nd	3.21	7.67	nd
B(21-21)29bca	Well #2	46093	55-608741	6-Dec-94	1250		114	451	519	0.43	159	22.9	210	131	nd	nd	nd	nd	nd	nd	0.10	nd	nd	nd	nd	nd	nd	1.10		1.10	7.74	
B(21-21)29bcc	Well #1	46094	55-608740	14-Jun-94	1030		114	405	342	0.45	131	21.9	161	116	nd	0.014	nd	nd	0.025	0.370	7.75	0.041	0.09	nd	nd	nd	0.39	0.45	nd	0.45	7.56	53
B(21-21)29bcc	Well #1	46094	55-608740	6-Dec-94	966		115	400	355	0.59	163	23.0	145	112	nd	nd	nd	nd	nd	0.039	0.10	0.014	nd	nd	nd	nd	0.12	2.06		2.06	7.71	
B(21-21)31bac	MW-4	46096	55-536947	14-Jun-94	1110		325	628	165	0.37	289	45.9	158	171	13.8	nd	0.43	nd	0.012	0.012	18.5	0.013	0.55	nd	nd	nd	0.11	nd	nd	nd	7.47	348
B(21-21)31bac	MW-4	46096	55-536947	13-Dec-94	1510		382	840	230	0.34	294	65.0	190	228	25.2	0.018	0.80	0.0010	0.013	0.415	35.2	0.017	1.17	nd	nd	nd	0.12	nd	nd	nd	7.15	340
B(21-21)31bac	MW-4	46096	55-536947	7-Feb-95	1370		382	910	318		363	71.4	183	240	9.00	0.016	0.30	nd	0.017	0.017	12.2	0.016	1.20	nd	nd	nd	0.13	nd	nd	nd	7.15	358
B(20-23)13dbd	Helsing Residence	46089	55-641104	14-Jun-94	744		144	337	84.1	0.25	302	23.4	99.4	94.5	nd	nd	nd	nd	nd	nd	nd	nd	0.57	nd	nd	nd	nd	nd		nd	8.01	0.10
B(20-23)13dbd	Helsing Residence	46089	55-641104	30-Nov-94	733		148	348	88.8	0.29	292	25.8	98.5	101	nd	nd	nd	nd	nd	nd	nd	nd	0.58	nd	nd	nd	nd	nd		nd	8.03	
B(20-23)24bad	Tipton Residence	46090	55-509401	13-Jun-94	706		140	335	82.2	0.31	247	23.1	93.6	91.5	nd	nd	0.13	nd	nd	0.027	0.26	0.006	0.62	nd	nd	nd	nd	nd	nd	nd	8.00	1.55
B(20-23)24bad	Tipton Residence	46090	55-509401	1-Dec-94	725		143	351	88.3	0.38	293	26.0	90.3	100	nd	0.010	0.12	nd	nd	0.017	0.11	nd	0.62	nd	nd	nd	nd	nd	nd	nd	8.09	0.32

(data from Arizona Department of Environmental Quality)

Figure 5. Water quality relations in the Black Mountains-Bullhead City area



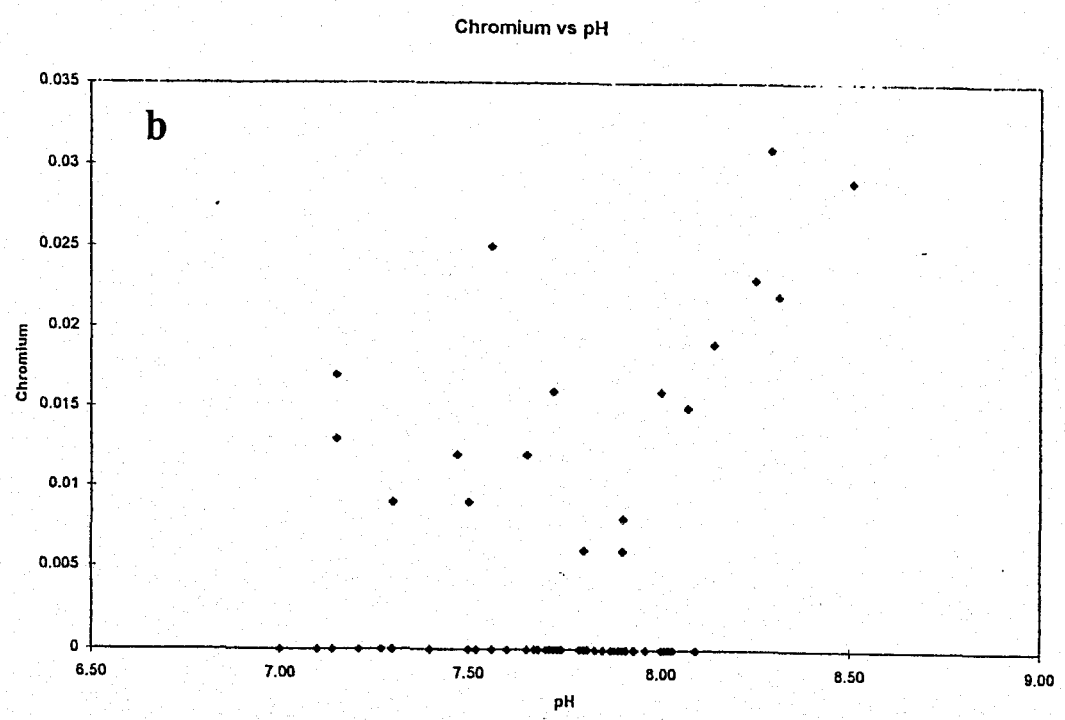
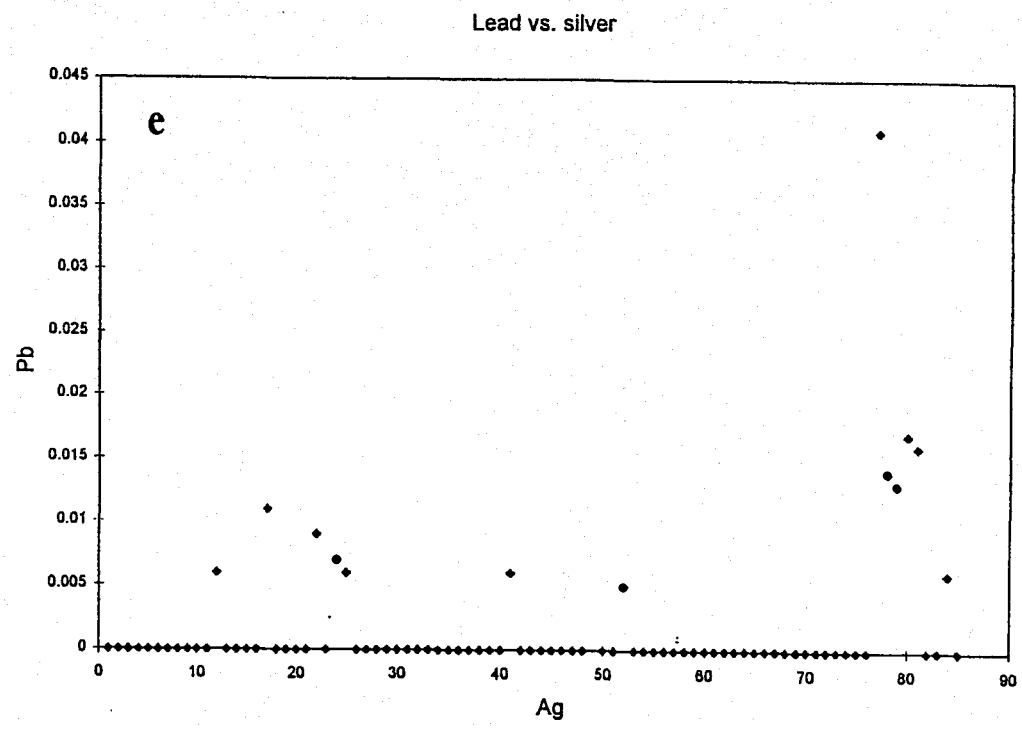


Figure 5, continued.



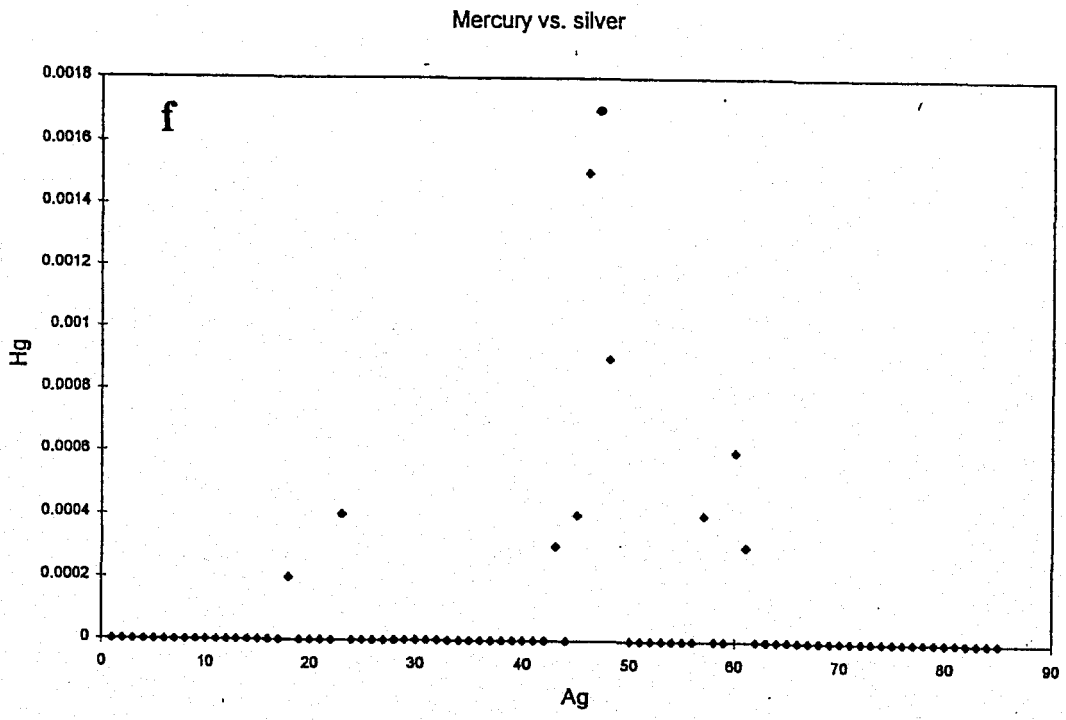
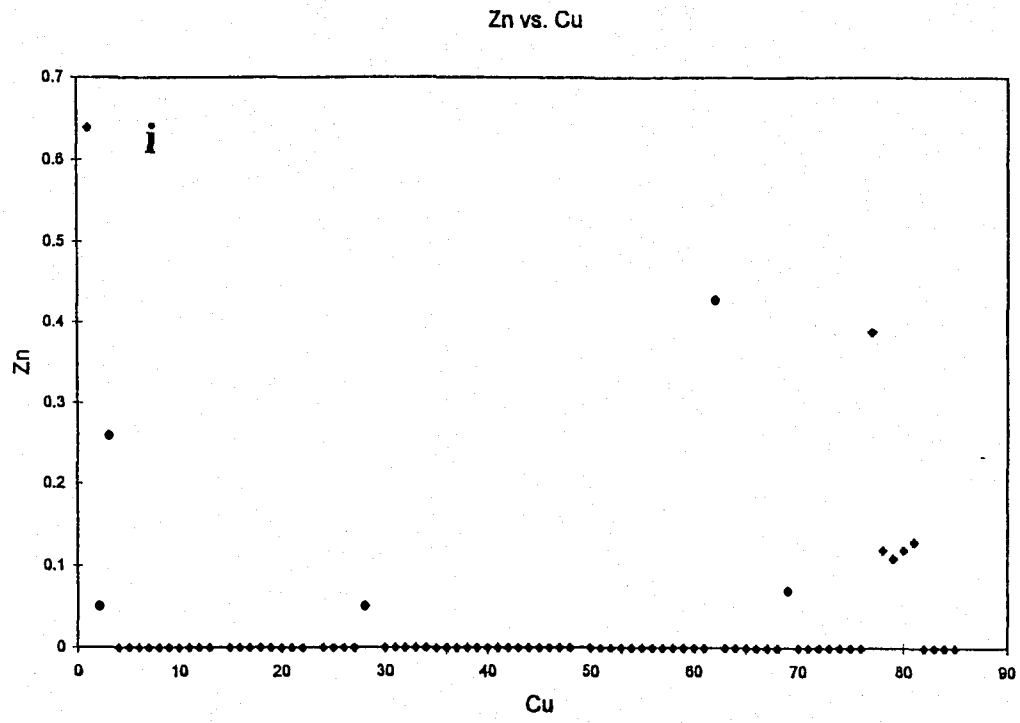
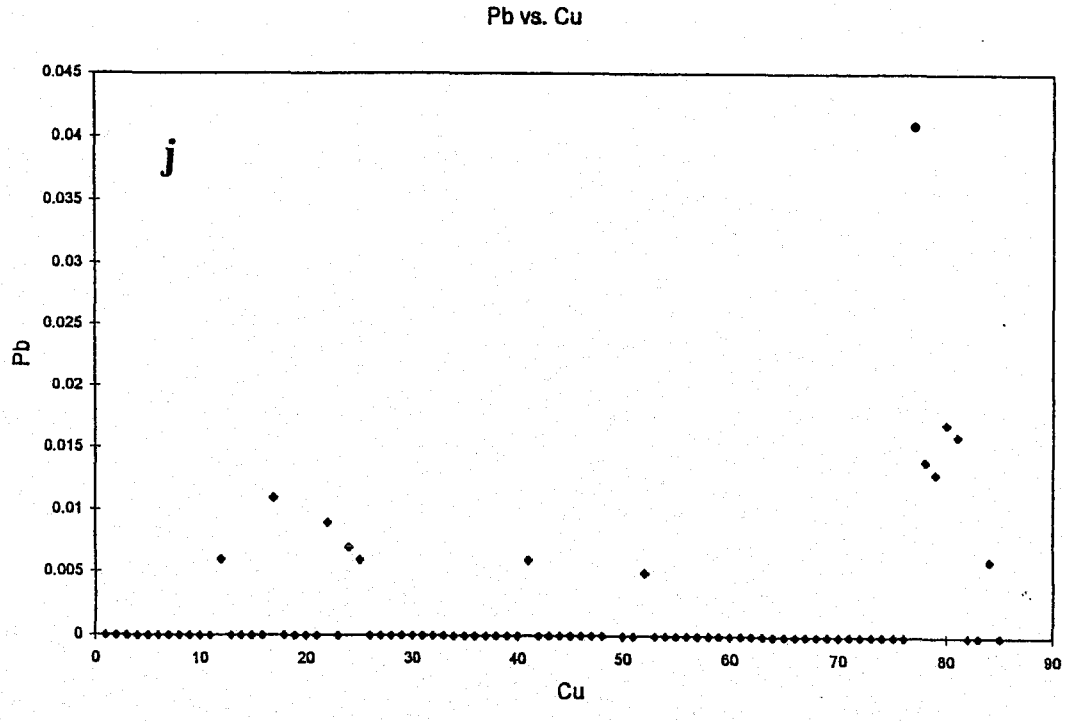


Figure 5, continued





One area of concern with gold mining is the use of cyanide for leaching. This process was fist described as early as 1793 and has been in widespread commercial use since the 1890s, so its application to extracting gold is extensive and well developed (Hiskey, 1985). Although cyanide is very unstable and so is easily destroyed (Rabb, 1978), it poses a potential threat to water if the cyanide is accidentally released before it can be neutralized.

Several steps are taken in modern gold processes plants to avoid such accidental releases. Tanks and circuits containing cyanide solutions are contained within berms or secondary tanks to prevent escape of the solutions outside the plant area. Ponds containing cyanide solutions are lined to prevent infiltration of that water into the ground. Tailings dams and ponds are designed and built to standards in accordance with operating permits and are monitored to assure their integrity.

Current gold mining operations in the Black Mountains address these concerns with preventative measures. For example, at the Gold Road Mine, cyanide-bearing tailings from the gold processing plant are neutralized with copper sulfate and hydrogen peroxide before disposal in tailings ponds (Silver, 1997). Ironically, copper and sulfate released from these kinds of modern operations comes not from mining itself, but from required environmental protection procedures.

Developed land

Bullhead City is the major population center within the project area and is sister to Laughlin, Nevada, directly across the Colorado River. The population of the Bullhead City-Laughlin vicinity is more than 144,000 people. Tourism is by far the major industry of the area, with gambling and river recreation attracting more than 6 million visitors annually.

Residential growth is certain to be one of the most important changes in land use in the Black Mountains -Bullhead City area. Census figures show a steady increase in the population of Arizona. The Mohave County 1996 population of 127,700 is more than double its 1980 population of 55,865. Bullhead City has nearly tripled in 16 years, growing from 10,719 people in 1980 to 27,370 in 1996 (figures from Arizona Department of Commerce).

Areas where high-density residential development is likely to take place first are around the outskirts of existing towns, where infrastructure is already in place. Lower density development is likely to continue in the surrounding areas. Residential development is limited to private land, or State land, which can be sold by the state for development. Areas prone to development can be predicted by looking at land status maps that show private land, and State land adjacent to developed areas (private land makes up about 55, 309 acres of the study area).

As the population along the Colorado River increases, the river is likely to be affected in a number of ways. More people means more municipal wastewater, which is high in TDS, especially nitrates, and sometimes contains heavy metals and other undesirable constituents. Personal use of pesticides, herbicides, and fertilizers in yards, and cleaning products and other toxic chemicals in the home presents the same kinds of potential impact to water quality as those produced and used by industry and agriculture. In residential backyards, fertilizer and pesticides are often applied at a much higher dosage than used by farmers. Chemical use may also high at golf courses and parks.

The acreage of houses, driveways, roads and parking lots will increase with population, leading to increased runoff. Storm runoff from roads and parking lots may carry with it oil, gas, diesel, brake fluid, and radiator fluid dripped from cars and trucks. Production of garbage, which ends up in landfills, will also increase with population.

Grazing

Intermittent cattle grazing occurs on some of the study area. Grazing by livestock can impact water quality, primarily by increasing soil erosion and sedimentation. The importance of rangeland as a source of nonpoint pollution increases as more vegetative cover is removed. Hoof impacts can knock down stream banks and churn soil, increasing erosion and sedimentation. Manure

REFERENCES

Almquist, C.L., 1988, Mineral investigation of a part of the Mount Nutt Wilderness study Area, (AZ-202-024), Mohave County, Arizona: US Bureau of Mines Mineral Land Assessment open File Report MLA 35-88, 20 p.

Anderson, J.L., 1989, Proterozoic anorogenic granites of the southwestern United States, in Jenney, J.P., and Reynolds, S.J., Geologic evolution of Arizona: Arizona Geological Society Digest 17, p. 211-238.

Anderson, L.W., and O'Connell, D.R., 1993, Seismotectonic study of the northern portion of the lower Colorado River, Arizona, California and Nevada: US Bureau of Reclamation Seismotectonic Report 93-4.

BLM, 1993, Kingman Resource Area, Proposed Resource management Plan and final Environmental Impact Statement: Bureau of Land Management Report, 606 p.

Buchanan, L.J., 1981, Precious metal deposits associated with volcanic environments in the southwest, *in* Dickinson, W.R., and Payne, W.D., Relation of tectonics to ore deposits in the southern Cordillera: Arizona Geological Society Digest 14, p. 237-262.

Bullock, J.H., Jr., Welsch, E., Hageman., P., Tippitt, F.W., and Turner, R.L., 1990, Analytical results and sample locality map of stream-sediment, heavy mineral concentrate, and rock samples from the Warm Springs Wilderness Study Area (AZ-020-028/029), Mohave County, Arizona: US Geological Survey Open-File Report 90-296, 39 p.

Buising, A.V., 1988, Depositional and tectonic evolution of the northern proto-Gulf of California and Lower Colorado River , as documented in the Mio-Pliocene Bouse Formation and bracketing units, southeastern California and western Arizona: University of California, Santa Barbara unpublished Ph.D. Dissertation, 196 p.

Clifton, C.G., Buchanan, L.J., and Durning, W.P., 1980, Exploration procedure and controls of mineralization in the Oatman Mining District, Oatman, Arizona: AIME Preprint 80-143.

DeWitt, E., 1987, Proterozoic ore deposits of the southwestern U.S.: Society of Economic Geologists Guidebook Series, Oct. 22-24, 1987 Field Conference, 189 p.

DeWitt, E., Thorson, J.P., and Smith, R.C., 1991, Geology and gold deposits of the Oatman District, northwestern Arizona: US Geological Survey Bulletin 1857-I, p. 1-28.

Durning, W.P., and Buchanan, L.J., 1984, The geology and ore deposits of Oatman, Arizona: Arizona Geological Society Digest 15, p. 141-158.

Elsing, M.J., and Heineman, R.E.S., 1936, Arizona metal production: Arizona Bureau of Mines Bulletin 140, 112 p.

Files, F.G., 1978, Uranium in volcanic environments in the Great Basin: US Department of Energy Report GJBX-98 (78), 20 p.

Frisch-Gleason, R., 1995, Controlling and remediating surface and groundwater pollution from inactive and abandoned mines: A survey of management practices: Arizona Geological Survey Open-File Report 95-13, 79 p.

Gardner, E.D., 1936, Gold mining and milling in the Black Mountains, western Mohave County, Arizona: US Bureau of Mines Information Circular IC-6901, 59 p.

Gray, F., Jachens, R.C., Miller, R.J., Turner, R.C., Livo, E.K., Knepper, D.H., Jr., Mariano, J., and Almquist, C.L., 1990a, Mineral resources of the Mount Nutt Wilderness Study Area, Mohave County, Arizona: US Geological Survey Bulletin 1737-D, 22 p.

Gray, F., Jachens, R.C., Miller, R.J., Turner, R.C., Knepper, D.H., Jr., Pitkin, J.A., Keith, W.J., Mariano, J., Jones, S.L., and Korzeb, S.L., 1990b, Mineral resources of the Warm Springs Wilderness Study Area, Mohave County, Arizona: US Geological Survey Bulletin 1737-F, 24 p.

Menges, C.M., and Pearthree, P.A., 1989, Late Cenozoic tectonism in Arizona and its impact on regional landscape evolution, *in* Jenney, J.P., and Reynolds, S.J., Geologic evolution of Arizona : Arizona Geological Society Digest 17, p. 649-680.

Metzger, D.G., and Loeltz, O.J., 1973, Geohydrology of the Needles area, Arizona, California, and Nevada: US Geological Survey Professional Paper 486-J, 54 p.

Metzger, D.G., Loeltz, O.J., and Irelan, B., 1973, Geohydrology of the Parker-Blythe-Cibola area, Arizona and California: US Geological Survey Professional Paper 486-G, 130 p.

Molitor, D., 1997, Suspended Sediment Monitoring Project, San Simon watershed, southeast Arizona: U.S. Bureau of Land Management [Safford Office] Report, 69 p., 1 sheet, scale 1:155,000.

Moore, R.W., 1928, Mining methods and records at the United Eastern Mine: Transactions of the American Institute of Mining and Metallurgical Engineers, v. 76, p. 56-92.

Qualheim, B.J., 1978, Hydrogeochemical and stream sediment reconnaissance basic data report for Kingman NTMS quadrangle, Arizona, California, and Nevada: University of California Lawrence Livermore Laboratory Report UCRL-52549 [also released as US Department of Energy Report GJBX-122(78), 85 p.

Rabb, D.D., 1978, Safety Corner: Warning-Beware of cyanide: Arizona Bureau of Geology and Mineral Technology Fieldnotes, v. 8, no. 4, p 8.

Ransome, F.L., 1923, Geology of the Oatman Gold District, Arizona: US Geological Survey Bulletin 743, 58 p.

Reynolds, S.J., 1986, Geologic map of Arizona: Arizona Bureau of Geology and Mineral Technology [AZGS] Map 26, scale 1:1,000,000.

Rösner, Ulrike, 1998a, Heavy metals in surface soils and streambed sediments in the Wallapai Mining District, northwestern Arizona, a historic mining district in a semiarid region: Arizona Geological Survey Contributed Report Colorado River-98-A, 43 p.

Rösner, Ulrike, 1998b, Historical mining and its impact on the vegetation, an example from the Cerbat Mountains, Mohave County, Arizona: Journal of the Arizona-Nevada Academy of Sciences, v. 31, no. 1, p. 37-55.

Scarborough, R.B., and Coney, M.L., 1982, Index of published geologic maps of Arizona, 1903 to 1982: Arizona Bureau of Geology and Mineral Technology Map 17, 6 sheets, scale 1:1,000,000.

Schrader, F.C., 1909, Mineral deposits of the Cerbat Range, Black Mountains, and Grand Wash Cliffs, Mohave County, Arizona: US Geological Survey Bulletin 397, 226 p.

Sillitoe, R.H., 1993, Giant and bonanza gold deposits in the epithermal environment: Assessment of potential genetic factors, *in* Whiting, B.H., Hodgson, C.J., and Mason, R., editors, Giant ore deposits: Society of Economic Geologists Special Publication 2, p. 125-156.

Silver, D.B., 1997, Gold Road Mine: Anatomy of a turnaround: Mining Engineering, v. 49, no. 8, p. 28-32

Smith, R.C., 1984, Mineralogy and fluid inclusion studies of epithermal gold-quartz veins in the Oatman District, northwestern Arizona: University of Arizona unpublished M.S. thesis, 233 p.

Spencer, J.E., and Reynolds, S.J., 1989, Middle Tertiary tectonics of Arizona and adjacent areas, *in* Jeney, J.P., and Reynolds, S.J., Geologic evolution of Arizona : Arizona Geological Society Digest 17, p. 539-574.

Spencer, J.E., and Welty, J.W., 1989, Mid-Tertiary ore deposits in Arizona: Arizona Geological Society Digest 17, p. 585-607.

Spencer, J.E., Harris, R.C., Dettmen, D., and Patchett, P.J., 1996, Reconnaissance survey of upper Neogene strata in the Bouse Formation, Hualapai Limestone, and lower Gila Trough, Western Arizona and directly adjacent southeastern California: Arizona Geological Survey Open-File Report 96-17, 23 p.

APPENDIX A

DESCRIPTION OF MINES IN THE BLACK MOUNTAINS-BULLHEAD CITY AREA

Mines in the Black Mountains Study area

Oatman District

Arizona Gold Star Prospect (La Paz)
Location: T19N, R20W, sec 8 Lat. 35.0475N Lon. 114.4292W
Quadrangle: Oatman
Geology: Vein along contact of Tertiary andesite and quartz monzonite dike
Mineralization: Hematite, MnOx
Years of Production: unknown
Mineral production: unknown
References: AZGS files

Aztec Mine (part of Tom Reed Mine)
Location: T19N, R20W, sec 23, NE/SE Lat. 35.018N Lon. 114.3717W
Quadrangle: Mount Nutt
Geology: Quartz veins in fault system in Tertiary volcanic rocks (Tom Reed vein)
Mineralization: Quartz veins with Au, Ag, Pb, Mo. Aztec mine connects with Big Jim, Bald Eagle, and Grey Eagle workings.
Years of Production:
Mineral production: (production included in Tom Reed Mine figures)
References: Gardner, 1936; Lausen, 1931; Durning and Buchanan, 1984.

Bald Eagle Mine (part of Tom Reed Mine)
Location: T19N, R20W, sec 23 Lat. 35.018N Lon. 114.3731W
Quadrangle: Mount Nutt
Geology: Quartz veins in fault system in Tertiary volcanic rocks
Mineralization: Quartz-adularia veins with gold
Years of Production:
Mineral production: (production included in Tom Reed Mine figures)
References: AZGS mine files

Big Jim Mine
Location: T19N, R20W, sec 23 SE/SW Lat. 35.0197N Lon. 114.3722W
Quadrangle: Mount Nutt
Geology: Veins in fault zone in Tertiary volcanic rocks
Mineralization: quartz veins with calcite, gypsum, wulfenite, chalcopyrite, gold
Years of Production: 1915- 1942
Mineral production: 277,000 tons ore, 12,500 oz Au 1917-1942; (220,000 tons ore 1921-1924)
References: Johnson, 1935; Gardner, 1936; Lausen, 1931; Buchanan, 1981; Durning and Buchanan, 1984; AZGS mine files

German-American Mine - see Pioneer

Gold Dust Mine (Victor-Virgin)
Location: T19N, R20W, sec 22, SE Lat. 35.014N Lon. 114.3927W
Quadrangle: Oatman

Geology: Veins in Tertiary granite porphyry
Mineralization: Veins of quartz, calcite, fluorite
Years of production: 1870-1906 (?)
Mineral production: est. $100,000 gold
References: Schrader, 1909; Wilson and others, 1934; Elsing and Heineman, 1936

Homestake Prospect
Location: T19N, R20W, sec 5 Lat. 35.0667 Lon. 114.4353
Quadrangle: Oatman
Geology: Quartz veins in granite porphyry
Mineralization: quartz veins with gold
Years of production: none
References: Schrader, 1909

Jackpot Prospect
Location: T19N, R20W, sec 5 Lat. 35.0647N Lon. 114.4267W
Quadrangle: Oatman
Geology: Quartz vein in Tertiary granite porphyry (part of Hardy Vein)
Mineralization: quartz with gold
Years of production: unknown
Mineral production: unknown
References: Schrader, 1909

Leland Mine (Mitchell vein)
Location: T19N, R20W, sec 20 Lat. 35.023 Lon. 114.4255
Quadrangle: Oatman
Geology: Veins in Tertiary andesite and quartz monzonite porphyry
Mineralization: Quartz-adularia-calcite veins with MnO and gold
Years of production: 1902 - ?
Mineral production: est. 45,000 tons ore at $15 per ton gold
References: Schrader, 1909; Lausen, 1931

Lexington Mine
Location: T19N, R20W, sec 26, NW Lat. 35.008N Lon. 114.3833W
Quadrangle: Oatman
Geology: Vein and fault system in Tertiary andesite, trachyte
Mineralization: Quartz-calcite veins with gold
Years of production: unknown
Mineral production: unknown
References: AZGS mine files

Meals Camp
Location: T20M, R21 W, sec 13 Lat. 35.1131N Lon. 114.4569W
Quadrangle: Oatman
Geology: Veins in Tertiary andesite, quartz syenite porphyry, and Precambrian granite
Mineralization: Quartz veins with gold
Years of production: unknown
Mineral production: unknown
References: Schrader, 1909

Geology: Vein system in Tertiary andesite and trachyte
Mineralization: Quartz veins (extension of Gold Dust Vein)
Years of production: unknown (before 1941)
Mineral production: unknown
References: AZGS files (Location info conflicting)

Oatman United Mine
Location: T19N, R20W, sec 14/23 est. Lat. 35.026N est. Lon. 114.372
Quadrangle: Oatman
Geology: Veins associated wit rhyolite dike in Tertiary andesite
Mineralization: Quartz-calcite veins with gold
Years of production: 1922-1926
Mineral production: unknown (small)
References: AZGS files

Pasadena Prospect
Location: T19N, R20W, sec 10 Lat. 35.0486N Lon. 114.4019W
Quadrangle: Oatman
Geology: Tertiary rhyolite dikes in andesite
Mineralization: Quartz with gold
Mineral production: none
References: Schrader, 1909

Pioneer Mine (German-American)
Location: T19N, R20W, sec 21, E/2 Lat. 35.0186N Lon. 114.4067W
Quadrangle: Oatman
Geology: Vein system in Tertiary andesite
Mineralization: Quartz-calcite-adularia veins with gold
Years of production: 1896 - 1942
Mineral production: 34,000 tons ore 1896- 1942; gold 10,346 oz 1934-1942
References: Gardner, 1936; Schrader, 1909; Lausen, 1931; AZGS mine files

Roosevelt Prospect
Location: T19N, R20W, sec 16 Lat. 35.0314N Lon. 114.42W
Quadrangle: Oatman
Geology: Veins in Tertiary andesite
Mineralization: Quartz-calcite veins with pyrite, gold
Years of production: unknown
Mineral production: unknown
References: Schrader, 1909

Rattan Mine (Ruth)
Location: T20N, R20W, sec 30, NE Lat. 35.0972N
Quadrangle: Oatman
Geology: Veins in Tertiary granite porphyry
Mineralization: Quartz-calcite-fluorite veins with pyrite, gold
Years of production: 1902-1942
Mineral production: est. 27,000 tons ore 1907-1934
References: Schrader, 1909; Lausen ,1931;Gardner, 1936; AZGS files

United American Mine (American)
Location: T19N, R20W, sec 24, SW/SW Lat. 35.0133N Lon. 114.365W
Quadrangle: Mount Nutt
Geology: Veins in Tertiary andesite and latite
Mineralization: Quartz with minor pyrite, gold (connects with Tom Reed/Black Eagle vein)
Years of production: unknown
Mineral production: unknown
References: Lausen, 1931; Ransome, 1923; Durning and Buchanan, 1984.

United Eastern Mine
Location: T19N, R20W, sec 14, SW Lat. 35.0294N Lon. 144.3839W
Quadrangle: Oatman
Geology: Veins in fissure system in Tertiary andesite, latite
Mineralization: Quartz-calcite veins with gold
Years of production: 1917-1925
Mineral production: 511,976 tons ore @ $19.87 per ton; $13,665,000 gold (1917-1924)
References: Moore, 1928; Lausen, 1931; Gardner, 1936; Elsing and Heineman, 1936; Durning and Buchanan, 1984.

United Western Mine
Location: T19N, R20W, sec 15, W2/NE Lat. 35.0363N Lon. 144.3931W
Quadrangle: Oatman
Geology: Vein and fracture system in Tertiary andesite
Mineralization: Calcite-quartz veins
Years of production: 1927-1935
Mineral production: 12, 000 tons ore 1927-1935
References: Gardner, 1936; Durning and Buchanan, 1984.

Vivian Mine
Location: T19N, R20W, sec 20, SE/NE/SE Lat. 35.015N Lon. 114.4214W
Quadrangle: Oatman
Geology: Veins in fracture system in Tertiary andesite
Mineralization: calcite-quartz veins with gold
Years of production: unknown
Mineral production: unknown
References: Schrader, 1909

West Gold Road
Location: T19N, R20W, sec 11 Lat. 35.0456N Lon. 114.3786W
Quadrangle: Oatman
Geology: Vein system assoc. with dike in Tertiary andesite
Mineralization: Quartz vein with gold; extension of Gold Road Vein
Years of production: unknown
Mineral production: unknown - probably included in Gold Road data
References: Schrader, 1909

Frisco Mine
Location: T21N, R20W, sec 16, NE/NE Lat. 35.210N, Lon. 114.4153W
Quadrangle: Union Pass
Geology: Quartz stringers at contact of Tertiary rhyolite flow and tuff with Precambrian granite/gneiss.
Mineralization: Gold-bearing quartz stringers
Years of Production: 1900 to >1935
Mineral production: 44,000 tons of ore 1894-1916 ($14 Au per ton); total of $400,000 gold 1893-1933
References: Gardner, 1936; Lausen, 1931

Golden Cycle Mine
Location: 2000 feet NW of Pyramid Mine
Quadrangle: Davis Dam
Geology: Quartz stringers occupying shear zone in coarse-grained granite
Mineralization: Gold-bearing quartz
Years of Production: unknown
Mineral production: unknown amount of ore, grade $1-$14 per ton gold
References: Lausen, 1931

Katherine Mine
Location: T21N, R21W, sec 5, SW Lat. 35.2336N; Lon. 144.5469W
Quadrangle: Davis Dam
Geology: Tertiary trachyte and rhyolite flows and dikes against Precambrian gneiss/granite
Mineralization: Gold in quartz veins with calcite, adularia, and fluorite. Ore minerals include silver, hematite, chalcocite. Up to 0.03% BeO in mill tailings
Years of Production: 1900-1940
Mineral production: $1,700,000 gold, $100,000 silver (1900-1933)
References: Wilson and others, 1934; Warner and others, 1959 (p. 102); Tenney, 1930; Buchanan, 1981.

New Chance Prospect
Location: T21N, R20W, sec 35 Lat. 35.1572N; Lon. 114.3861W
Quadrangle: Union Pass
Geology: Quartz vein in Tertiary rhyolite and andesite in contact with Precambrian granite.
Mineralization: Quartz vein with gold, silver; minerals include hematite, MnOx, adularia, fluorite.
Years of Production: (no production)
Mineral production: (no production); grade up to $64 per ton gold, 2 oz Ag
References: Schrader, 1909

OK Group
Location: T21N, R20W, sec 4/9 Lat. 35.2261N Lon. 114.4164W
Quadrangle: Union Pass
Geology: Contact of Tertiary rhyolite with Precambrian granite.
Mineralization: Gold, pyrite, and galena in quartz
Years of Production: (no production)
Mineral production: (no production) Grades of 0.05 to 0.9 oz per ton gold
References: Schrader, 1909

Tyro Mine
Location: T21N, R20W, sec 6, SE/SE Lat. 35.2272N Lon. 114.4497W
Quadrangle: Union Pass
Geology: Tertiary rhyolite dikes in Precambrian granite
Mineralization: Quartz-calcite veins with fluorite, Au
Years of Production: 1902-1982(?)
Mineral production: (no production data), grade 0.3 to 11 oz/t Au, up to 56 oz/t Ag
References: Schrader, 1909; AZGS mine files

Union Pass Mine
Location: T21N, R20W, sec 29, NW/SE Lat. 35.1742N Lon. 114.4342W
Quadrangle: Union Pass
Geology: Fault contact of Tertiary rhyolite with Precambrian granite
Mineralization: Quartz veins in fault breccia; contains calcite, adularia, FeOx, MnOx
Years of Production: 1886 to (?)
Mineral production: small - no production data
References: Schrader, 1909

Mines in Union Pass district with no information
Expansion
Philadelphia
Monarch
Sunlight
Gold Chain
Burke
Mandalay
Bonanza
Banner
Quail

Mines in Union Pass district outside study area
King of Secret Pass

MOHAVE COUNTY

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Aldridge, B.N., 1978, Unusual hydraulic phenomena of flash floods in Arizona, *in* Peck, E.L, ed., Conference on flash floods, Hydrometeorological aspects, Los Angeles, Calif., May 2-3, 1978: American Meteorological Society, p. 117-120.

Anderson, T.W., 1979, Development of groundwater models of alluvial basins in south-central Arizona, *in* Arizona Water Symposium, 23rd and 24th annual, Phoenix, September 27, 1979, and September 24, 1980, Proceedings: Arizona Department of Water Resources Report no. 2, p. 13-17.

Anderson, T.W., 1980, Study plan for the Regional Aquifer-System Analysis of alluvial basins in south-central Arizona and adjacent states: U.S. Geological Survey Open-File Report 80-1197, 22 p.

Anderson, T.W., 1984, Southwest alluvial basins, RASA study - An overview, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, sponsored by the Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: New York, American Society of Civil Engineers, p. 606-614 [available for inspection at Arizona Geological Survey, 416 W. Congress, Suite 100, Tucson, Ariz.].

Anderson, T.W., 1986, Study in southern and central Arizona and parts of adjacent states, *in* Sun, R.J., ed., Regional Aquifer-System Analysis program of the U.S. Geological Survey, Summary of projects, 1978-84: U.S. Geological Survey Circular 1002, p. 116-131.

Anderson, T.W., 1986, Hydrologic setting, objectives, and approach of the southwest alluvial basins, RASA study, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 5-16.

Anderson, T.W., 1986, Geohydrology of the southwest alluvial basins, Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 99-111.

Anderson, T.W., 1995, Summary of the Southwest alluvial basins, Regional Aquifer-System Analysis, South-central Arizona and parts of adjacent states: U.S. Geological Survey Professional Paper 1406-A, p. A1-A33.

Anderson, T.W., and Freethey, G.W., 1995, Simulation of ground-water flow in alluvial basins in south-central Arizona and parts of adjacent states, Regional Aquifer-System Analysis: U.S. Geological Survey Professional Paper 1406-D, 78 p.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1990, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey Open-File Report 89-0378, 99 p., 3 sheets, scale 1:1,000,000.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1992, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey Professional Paper 1406-B, p. B1-B67, 3 sheets, scale 1:1,000,000.

Anderson, T.W., and Johnson, A.I., eds., 1986, Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, 116 p.

Anderson, T.W., Welder, G.E., Lesser, Gustavo, and Trujillo, A., 1988, Region 7, Central alluvial basins, *in* Back, William, and others, eds., Hydrogeology: Geological Society of America, The Geology of North America, v. O-2, p. 81-86.

Anderson, T.W., and White, N.D., 1986, Arizona surface-water resources, *in* Moody, D.W., and others, comps., National water summary, 1985 - Hydrologic events and surface-water resources: U.S. Geological Survey Water-Supply Paper 2300, p. 145-150.

Anning, D.W., and Duet, N.R., 1994, Summary of ground-water conditions in Arizona, 1987-90: U.S. Geological Survey Open-File Report 94-476, 2 sheets, scales 1:1,000,000 and 1:2,500,000.

Arizona Department of Water Resources, 1990, Map showing Arizona groundwater basins with index of cities, towns, settlements and sites: Arizona Department of Water Resources Open File Report no. 7, 1 sheet, scale 1:1,000,000.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. I, Inventory and analysis: Arizona Department of Water Resources, 253 p.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. II, Hydrologic summary: Arizona Department of Water Resources, Hydrology Division, 236 [266] p.

Arizona Water Commission, 1975, Arizona State Water Plan, Phase 1, Inventory of resource and uses: Arizona Water Commission, 224 p., 2 sheets, approx. scale 1:670,000.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1967 to Spring 1968: Arizona State Land Department Water Resources Report no. 38, 54 p.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1968 to Spring 1969: Arizona State Land Department Water Resources Report no. 42, 46 p.

Babcock, H.M., 1970, Annual report on ground water in Arizona, Spring 1969 to Spring 1970: Arizona State Land Department Water Resources Report no. 43, 44 p.

Babcock, H.M., 1972, Annual report on ground water in Arizona, Spring 1970 to Spring 1971: Arizona Water Commission Bulletin 1, 45 p.

Babcock, H.M., 1972, Bibliography of U.S. Geological Survey water-resources reports for Arizona, May 1965 through June 1971: Arizona Water Commission Bulletin 2, 60 p.

Babcock, H.M., 1973, Annual report on ground water in Arizona, Spring 1971 to Spring 1972: Arizona Water Commission Bulletin 5, 48 p.

Babcock, H.M., 1974, Annual report on ground water in Arizona, Spring 1972 to Spring 1973: Arizona Water Commission Bulletin 7, 46 p., 3 sheets, scale 1:250,000.

Babcock, H.M., 1976, Annual summary of ground-water conditions in Arizona, Spring 1974 to Spring 1975: U.S. Geological Survey Water-Resources Investigations Open-File Report 76-59, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1976 to Spring 1977: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-106, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1975 to Spring 1976: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-10, 2 sheets, scale 1:1,000,000.

Bedinger, M.S., Anderson, T.W., and Langer, W.H., 1984, Maps showing ground-water units and withdrawal, Basin and Range Province, Arizona: U.S. Geological Survey Water-Resources Investigations Report 83-4114-A, 2 sheets, scales 1:500,000 and 1:1,000,000.

Bedinger, M.S., Langer, W.H., and Reed, J.E., 1984, Ground-water hydrology, *in* Bedinger, M.S. and others, eds., Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: U.S. Geological Survey Open-File Report 84-741, p. 98-114, 5 sheets 2, 3, and 4, scale 1:500,000.

Bedinger, M.S., Sargent, K.A., and Brady, B.T., 1985, Geologic and hydrologic characterization of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part III, Geologic and hydrologic evaluation: U.S. Geological Survey Circular 904-C, 27 p.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1984, Sonoran region, Arizona, *in* Bedinger, M.S. and others, Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: Evaluation of the regions: U.S. Geological Survey Open-File Report 84-745, p. 81-108, 2 sheets, scale 1:300,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States for isolation of high-level radioactive waste - Evaluation of the regions: U.S. Geological Survey Professional Paper 1370-H, p. H1-61, 7 plates, scale 1:1,000,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., eds., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States for isolation of high-level radioactive waste - Characterization of the Sonoran region, Arizona: U.S. Geological Survey Professional Paper 1370-D, p. D1-D40, 6 plates, scales 1:500,000 and 1:1,000,000.

Bedinger, M.S., Sargent, K.A., and Reed, J.E., 1984, Geologic and hydrologic characterization and evaluation of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part I, Introduction and guidelines: U.S. Geological Survey Circular 904-A, 16 p.

Boner, F.C., Garrett, W.B., and Konieczki, A.D., 1989, Water resources data, Arizona, Water year 1988: U.S. Geological Survey Water-Data Report AZ-88-1, 391 p.

Boner, F.C., Konieczki, A.D., and Davis, R.G., 1991, Water resources data, Arizona, Water year 1990: U.S. Geological Survey Water-Data Report AZ-90-1, 381 p.

Boner, F.C., Smith, C.F., Garrett, W.B., and Konieczki, A., 1990, Water resources data, Arizona, Water year 1989: U.S. Geological Survey Water-Data Report AZ-89-1, 391 p.

Bowie, J.E., and Kam, William, 1968, Use of water by riparian vegetation, Cottonwood Wash, Arizona, *with a section on* Vegetation, by F.A. Branson and R.S. Aro: U.S. Geological Survey Water-Supply Paper 1858, 62 p., 1 sheet, scale 1:12,000.

Briggs, P.C., and Nemecek, E.A., 1986, Technical aspects of Arizona groundwater law, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 93-98.

Brown, S.G., 1976, Preliminary maps showing ground-water resources in the lower Colorado River region, Arizona, Nevada, New Mexico, and Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-542, 1 sheet, scale 1:1,000,000.

Buol, S.W., 1964, Calculated actual and potential evapotranspiration in Arizona: Tucson, University of Arizona, Agricultural Experiment Station Technical Bulletin 162, 48 p.

Cady, C.V., 1981, Map showing ground-water conditions in the Big Sandy area, Yavapai and Mohave Counties, Arizona - 1980: Arizona Department of Water Resources Hydrologic Map Series Report no. 5, 1 sheet, scale 1:125,000.

Campbell, A., and Jones, N.O., 1979, Preliminary geothermal assessment of the Big Sandy Valley, Mohave County, Arizona: Arizona Bureau of Geology and Mineral Technology Open-File Report 79-15, 26 p., 6 sheets, scale 1:250,000.

Clark, T.C., 1975, The Arizona Water Plan, A status report, *in* Arizona Watershed Symposium, 19th annual, Phoenix, September 24, 1975, Proceedings: Arizona Water Commission Report no. 7, p. 9-23.

Cox, C.J., and others, 1968, Annual report on ground water in Arizona, Spring 1966 to Spring 1967: Arizona State Land Department Water Resources Report no. 36, 43 p.

Daniel, D.L., 1981, Maps showing total dissolved solids content of groundwater in Arizona: Arizona Department of Water Resources Hydrologic Map Series Report no. 2, 2 sheets, scale 1:1,000,000.

Davidson, E.S., 1979, Summary appraisals of the nation's ground-water resources - Lower Colorado region: U.S. Geological Survey Professional Paper 813-R, 23 p., 3 sheets, scale 1:1,000,000.

Eberly, L.D., and Stanley, T.B., Jr., 1978, Cenozoic stratigraphy and geologic history of southwestern Arizona: Geological Society of America Bulletin, v. 89, no. 6, p. 921-940.

Evans, L.G., and Haimson, J.S., 1982, SWAB/RASA aquifer parameter study, Final report for U.S. Geological Survey contract 14-08-0001-18268: Arizona Department of Water Resources, 21 p.

Feth, J.H., and others, 1964, Preliminary map of the conterminous United States showing depth to and quality of shallowest ground water containing more than 1,000 parts per million dissolved solids: U.S. Geological Survey Hydrologic Investigations Atlas HA-199, 31 p., 2 sheets, scale 1:3,168,000.

Fields, R.L., 1986, Data-processing activities of the southwest alluvial basins, RASA study, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 17-23.

Freethey, G.W., 1986, Considerations in modeling ground-water flow in the alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 57-67.

Freethey, G.W., and Anderson, T.W., 1986, Predevelopment hydrologic conditions in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-664, 3 sheets, scale 1:500,000.

Freethey, G.W., Pool, D.R., Anderson, T.W., and Tucci, P., 1986, Description and generalized distribution of aquifer materials in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-663, 4 sheets, scale 1:500,000.

Garrett, J.M., and Gellenbeck, D.J., 1991, Basin characteristics and streamflow statistics in Arizona as of 1989: U.S. Geological Survey Water-Resources Investigations Report 91-4041, 612 p.

Gillespie, J.B., Bentley, C.B., and Kam, W., 1966, Basic hydrologic data of the Hualapai, Sacramento, and Big Sandy Valleys, Mohave County, Arizona: Arizona State Land Department Water Resources Report no. 26, 39 p.

Goetz, A.F.H., Billingsley, F.C., Gillespie, A.R., Abrams, M.J., Squires, R.L., Shoemaker, E.M., Lucchitta, I., and Elston, D.P., 1975, Application of ERTS images and image processing to regional geologic problems and geologic mapping in northern Arizona: Pasadena, California Institute of Technology, Jet Propulsion Laboratory Technical Report 32-1597, 188 p.

Hahman, W.R., Sr., Stone, C., and Witcher, J.C., comps., 1978, Preliminary map - Geothermal energy resources of Arizona: Arizona Bureau of Geology and Mineral Technology Geothermal Map No. 1 [also listed as Arizona Geological Survey Map 15-1], 1 sheet, scale 1:1,000,000.

Halpenny, L.C., and others, 1952, Ground water in the Gila River basin and adjacent areas, Arizona--A summary: U.S. Geological Survey Open-File Report [unnumbered], Tucson, Ariz., October 1952, 224 p.

Hardt, W.F., Cahill, J.M., and Booher, M.B., 1958, Annual report on ground water in Arizona, Spring 1957 to Spring 1958: Arizona State Land Department Water Resources Report no. 5, 60 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1959, Annual report on ground water in Arizona, Spring 1958 to Spring 1959: Arizona State Land Department Water Resources Report no. 6, 61 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1960, Annual report on ground water in Arizona, Spring 1959 to Spring 1960: Arizona State Land Department Water Resources Report no. 7, [89] p.

Harshbarger, J.W., Lewis, D.D., Skibitzke, H.E., Heckler, W.L., and Kister, L.R., revised by H.L. Baldwin, 1966, Arizona water: U.S. Geological Survey Water-Supply Paper 1648, 85 p.

Helmstaedt, H., and Schultze, D.J., 1978, Petrologic constraints for upper mantle models of the Colorado Plateau [abs.], *in* Papers presented to the Conference on Plateau Uplift: Mode and Mechanism, A Lunar and Planetary Institute Topical Conference: Houston, Lunar and Planetary Institute, LPI Contribution 329, p. 16-18.

Hendricks, E.L., Kam, William, and Bowie, J.E., 1960, Progress report on use of water by riparian vegetation, Cottonwood Wash, Arizona: U.S. Geological Survey Circular 434, 11 p.

Hodges, E.B., and others, 1967, Annual report on ground water in Arizona, Spring 1965 to Spring 1966: Arizona State Land Department Water Resources Report no. 32, 61 p.

Keller, G.R., Braile, L.W., and Morgan, P., 1978, Regional crustal structure of the Colorado Plateau [abs.], *in* Papers presented to the Conference on Plateau Uplift: Mode and Mechanism, A Lunar and Planetary Institute Topical Conference: Houston, Lunar and Planetary Institute, LPI Contribution 329, p. 26.

Lee, W.T., 1908, Geologic reconnaissance of a part of western Arizona, *with notes on* the Igneous rocks of western Arizona, by Albert Johannsen: U.S. Geological Survey Bulletin 352, 96 p.

Ligner, J.J., White, N.D., Kister, L.R., and Moss, M.E., 1969, Water resources: Part II of Mineral and water resources of Arizona: Arizona Bureau of Mines Bulletin 180, p. 471-580.

Loghry, J.D., and Heinrichs, W.E., Jr., 1980, Geologic evaluation of uranium in plutonic rocks, northwestern Arizona: U.S. Department of Energy Report GJBX-213(80), 214 p.

Longsworth, S.A., Van De Vanter, E.K., and Alwin, S.H., 1998, Activities of the Water Resources Division in Arizona, 1996-97: U.S. Geological Survey Open-File Report 98-185, 90 p.

Marie, J.R., Van De Vanter, E.K., and Moss, C.L., 1996, Activities of the Water Resources Division in Arizona, 1995-1996: U.S. Geological Survey Open-File Report 95-772, 69 p.

May, R.T., White, D.L., and Nystrom, R.J., 1982, National Uranium Resource Evaluation, Prescott quadrangle, Arizona: U.S. Department of Energy Report GJQ-015(82), 62 p., 10 microfiche, 35 sheets, scale 1:250,000.

McGuinness, C.L., 1964, Generalized map showing annual runoff and productive aquifers in the conterminous United States: U.S. Geological Survey Hydrologic Investigations Atlas HA-194, scale 1:5,000,000.

Montgomery, E.L., and Harshbarger, J.W., 1989, Arizona hydrogeology and water supply, *in* Jenney, J.P., and Reynolds, S.J., eds., Geologic evolution of Arizona: Arizona Geological Society Digest 17, p. 827-840.

Montgomery, E.L., and Harshbarger, J.W., 1992, Arizona hydrogeology and water supply: Applied Hydrogeology, v. 1, no. 1, p. 25-37.

Morrison, R.B., 1940, Ground-water resources of the Big Sandy Valley, Mohave County, Arizona: Arizona Water Commissioner, 6 p.

Peirce, H.W., and Scurlock, J.R., 1972, Arizona well information: Arizona Bureau of Mines Bulletin 185, 195 p. [reprinted 1988, Arizona Geological Survey].

Pool, D.R., 1984, Aquifer geology of alluvial basins of Arizona, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 683-690.

Pool, D.R., 1986, Aquifer geology of alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 25-36.

Pope, G.L., Rigas, P.D., and Smith, C.F., 1998, Statistical summaries of streamflow data and characteristics of drainage basins for selected streamflow-gaging stations in Arizona through water year 1996: U.S. Geological Survey Water-Resources Investigations Report 98-4225, 907 p.

Reiter, M., Mansure, A.J., and Shearer, C., 1978, Geothermal characteristics of the Colorado Plateau [abs.], *in* Papers presented to the Conference on Plateau Uplift: Mode and Mechanism, A Lunar and Planetary Institute Topical Conference: Houston, Lunar and Planetary Institute, LPI Contribution 329, p. 43.

Remick, W.H., 1981, Map showing ground-water conditions in the Hualapai Basin area, Mohave, Coconino, and Yavapai Counties, Arizona - 1980: Arizona Department of Water Resources Hydrologic Map Series Report no. 4, 1 sheet, scale 1:125,000.

Robertson, F.N., 1986, Occurrence and solubility controls of trace elements in ground water in alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 69-80.

Robertson, F.N., 1989, Ground-water geochemistry and information transfer in alluvial basins in Arizona [abs.], *in* International Geological Congress, 28th, Washington, D.C., July 9-19, 1989, Abstracts, V. 2: International Geological Congress, p. 2.709-2.710.

Robertson, F.N., 1989, Arsenic in ground-water under oxidizing conditions, south-west United States: Environmental Geochemistry and Health, v. 11, no. 3/4, p. 171-185.

Robertson, F.N., 1991, Geochemistry of ground-water in alluvial basins of Arizona and adjacent parts of Nevada, New Mexico, and California: U.S. Geological Survey Professional Paper 1406-C, p. C1-C90.

Robertson, F.N., and Garrett, W.B., 1988, Distribution of fluoride in ground water in the alluvial basins of Arizona and adjacent parts of California, Nevada, and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-665, 3 sheets, scale 1:500,000.

Robson, S.G., and Banta, E.R., 1995, Ground water atlas of the United States, Segment 2, Arizona, Colorado, New Mexico, Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-730-C, 32 p.

Sargent, K.A., and Bedinger, M.S., 1985, Geologic and hydrologic characterization and evaluation of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part II, Geologic and hydrologic characterization: U.S. Geological Survey Circular 904-B, 30 p.

Smith, C.F., Anning, D.W., Duet, N.R., Fisk, G.G., McCormack, H.F., Pope, G.L., Rigas, P.D., and Wallace, B.L., 1995, Water resources data, Arizona, Water year 1994: U.S. Geological Survey Water-Data Report AZ-94-1, 320 p.

Smith, C.F., Boner, F.C., Davis, R.G., Duet, N.R., and Rigas, P.D., 1993, Water resources data, Arizona, Water year 1992: U.S. Geological Survey Water-Data Report AZ-92-1, 360 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., and Rigas, P.D., 1997, Water resources data, Arizona, Water year 1996: U.S. Geological Survey Water-Data Report AZ-96-1, 328 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., Rigas, P.D., and Tadayon, S., 1996, Water resources data, Arizona, Water year 1995: U.S. Geological Survey Water-Data Report AZ-95-1, 306 p.

Smith, C.F., Rigas, P.D., Ham, L.K., Duet, N.R., and Anning, D.W., 1994, Water resources data, Arizona, Water year 1993: U.S. Geological Survey Water-Data Report AZ-93-1, 360 p.

Smith, G.E.P., 1938, The physiography of Arizona valleys and the occurrence of ground water: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Technical Bulletin no. 77, 91 p.

Smith, H.V., Caster, A.B., Fuller, W.H., Breazeale, E.L., and Draper, George, 1949, The chemical composition of representative Arizona waters: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Bulletin 225, 76 p.

Spicer, L.M., and Van De Vanter, E.K., comps., 1993, Activities of the Water Resources Division in Arizona, 1986-91: U.S. Geological Survey Open-File Report 93-0165, 144 p.

Stone, Claudia, and Witcher, J.C., 1982, Geothermal energy in Arizona - Final contract report: Arizona Bureau of Geology and Mineral Technology Open-File Report 83-12, 398 p.

Texas Instruments, Inc., 1982, National Uranium Resource Evaluation, Variable premise evaluation system data report, Interpretation of hydrogeochemical and stream sediment reconnaissance data, Williams quadrangle, Arizona: U.S. Department of Energy Report GJD-93(81), 264 p.

U.S. Geological Survey, [1965?], Water quality records in Arizona - 1964: U.S. Geological Survey, 80 p.

U.S. Geological Survey, [1966?], 1965 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 89 p.

U.S. Geological Survey, [1968?], 1967 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 85 p.

U.S. Geological Survey, 1971, 1971 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 167 p. [NTIS PB-287 165].

U.S. Geological Survey, 1972, 1972 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 166 p. [NTIS PB-287 167].

U.S. Geological Survey, 1973, 1973 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 188 p. [NTIS PB-287 169].

U.S. Geological Survey, 1974, 1974 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 192 p. [NTIS PB-287 171].

U.S. Geological Survey, 1976, Water resources data for Arizona, Water year 1975: U.S. Geological Survey Water-Data Report AZ-75-1, 440 p.

U.S. Geological Survey, 1978, Water resources data for Arizona, Water year 1977: U.S. Geological Survey Water-Data Report AZ-77-1, 550 p.
U.S. Geological Survey, 1978, Annual summary of ground-water conditions in Arizona, Spring 1977 to Spring 1978: U.S. Geological Survey Water-Resources Investigations Open-File Report 78-144, 1 sheet, scale 1:1,000,000.
U.S. Geological Survey, 1979, Water resources data for Arizona, Water year 1978: U.S. Geological Survey Water-Data Report AZ-78-1, 604 p.
U.S. Geological Survey, 1980, Water resources data for Arizona, Water year 1979: U.S. Geological Survey Water-Data Report AZ-79-1, 614 p.
U.S. Geological Survey, 1980, Annual summary of ground-water conditions in Arizona, Spring 1978 to Spring 1979: U.S. Geological Survey Water-Resources Investigations Open-File Report 80-330, 1 sheet, scale 1:1,000,000.
U.S. Geological Survey, 1981, Annual summary of ground-water conditions in Arizona, Spring 1979 to Spring 1980: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-906, 2 sheets, scale 1:1,000,000.
U.S. Geological Survey, 1982, Annual summary of ground-water conditions in Arizona, Spring 1980 to Spring 1981: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scale 1:1,000,000.
U.S. Geological Survey, 1982, Water resources data for Arizona, Water year 1980: U.S. Geological Survey Water-Data Report AZ-80-1, 568 p.
U.S. Geological Survey, 1983, Water resources data, Arizona, Water year 1981: U.S. Geological Survey Water-Data Report AZ-81-1, 532 p.
U.S. Geological Survey, 1983, Annual summary of ground-water conditions in Arizona, Spring 1981 to Spring 1982: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scales 1:1,000,000 and 1:3,200,000.
U.S. Geological Survey, 1984, Annual summary of ground-water conditions in Arizona, Spring 1982 to Spring 1983: U.S. Geological Survey Water-Resources Investigations Open-File Report 84-428, 2 sheets, scales 1:1,000,000 and 1:3,300,000.
U.S. Geological Survey, 1985, Annual summary of ground-water conditions in Arizona, Spring 1983 to Spring 1984: U.S. Geological Survey Water-Resources Investigations Open-File Report 85-410, 2 sheets, scales 1:1,000,000 and 1:3,400,000.
U.S. Geological Survey, 1986, Annual summary of ground-water conditions in Arizona, Spring 1984 to Spring 1985: U.S. Geological Survey Water-Resources Investigations Open-File Report 86-422W, 2 sheets, scales 1:1,000,000 and 1:3,300,000.
Wagoner, J.L., 1979, Hydrogeochemical and stream sediment reconnaissance basic data report for Williams NTMS quadrangle, Arizona: U.S. Department of Energy Report GJBX-71(79), 74 p., 6 sheets, scale 1:250,000, 5 microfiche.
White, N.D., and Garrett, W.B., 1984, Water resources data, Arizona, Water year 1982: U.S. Geological Survey Water-Data Report AZ-82-1, 440 p.
White, N.D., and Garrett, W.B., 1986, Water resources data, Arizona, Water year 1983: U.S. Geological Survey Water-Data Report AZ-83-1, 387 p.
White, N.D., and Garrett, W.B., 1987, Water resources data, Arizona, Water year 1984: U.S. Geological Survey Water-Data Report AZ-84-1, 381 p.
White, N.D., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1985: U.S. Geological Survey Water-Data Report AZ-85-1, 343 p.

White, N.D., and others, 1967, Annual report on ground water in Arizona, Spring 1964 to Spring 1965: Arizona State Land Department Water Resources Report no. 24, 62 p.

White, N.D., Stulik, R.S., and others, 1962, Annual report on ground water in Arizona, Spring 1961 to Spring 1962: Arizona State Land Department Water Resources Report no. 11, 116 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1961, Annual report on ground water in Arizona, Spring 1960 to Spring 1961: Arizona State Land Department Water Resources Report no. 10, 93 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1963, Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, 136 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1964, Annual report on ground water in Arizona, Spring 1963 to Spring 1964: Arizona State Land Department Water Resources Report no. 19, 60 p.

Wilson, L.G., DeCook, K.J., and Neuman, S.P., 1980, Regional recharge research for southwest alluvial basins - Final report, U.S. Geological Survey contract 14-08-0001-18257: Tucson, University of Arizona, Water Resources Research Center, 389 p.

Wilson, R.P., 1990, Arizona water supply and use, *in* Carr, J.E., and others, National water summary, 1987 - Hydrologic events and water supply and uses: U.S. Geological Survey Water-Supply Paper 2350, p. 157-164.

Wilson, R.P., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1986: U.S. Geological Survey Water-Data Report AZ-86-1, 341 p.

Wilson, R.P., and Garrett, W.B., 1989, Water resources data, Arizona, Water year 1987: U.S. Geological Survey Water-Data Report AZ-87-1, 385 p.

Witcher, J.C., 1979, Proven, potential, and inferred geothermal resources of Arizona and their heat contents: Arizona Bureau of Geology and Mineral Technology Open-File Report 79-05, 64 p., 1 sheet, scale 1:1,000,000 [also published in Pasadena, California Institute of Technology, Jet Propulsion Laboratory Publication 80-41, p. A-3 to A-74].

Witcher, J.C., Stone, Claudia, and Hahman, W.R., Sr., 1982, Geothermal resources of Arizona: Arizona Bureau of Geology and Mineral Technology [also listed as Arizona Geological Survey Map 15-2], 1 sheet, scale 1:500,000.

Wolcott, H.N., Skibitzke, H.E., and Halpenny, L.C., 1956, Water resources of Bill Williams River Valley near Alamo, Arizona, *in* Contributions to the hydrology of the United States: U.S. Geological Survey Water-Supply Paper 1360-D, p. 291-319, 1 sheet, scale 1:64,000.

Wright, J.J., 1971, The occurrence of thermal ground-water in the Basin and Range Province of Arizona, *in* Evans, D.D., ed., Hydrology and water resources in Arizona and the Southwest, V. 1: American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, Annual Meeting, Tempe, Ariz., 1971, Proceedings, p. 269-290.

Young, R.A., 1966, Cenozoic geology along the edge of the Colorado Plateau in northwestern Arizona: St. Louis, Mo., Washington University, Ph.D. dissertation, 167 p., 4 sheets, scale 1:31,680; abstract in Dissertation Abstracts International, v. 27, p. 1994B-1995B.

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GROUNDWATER HYDROLOGY BIBLIOGRAPHY

Adams, F., 1930, Progress report of special Colorado River investigations: U.S. Congress, 71st, 2nd Session, House Document 359, p. 94-158.

Adams, F., 1930, Report of inspection trip over Colorado River levee systems below Yuma, Ariz., September 17, 18, and 19, 1929: U.S. Congress, 71st, 2nd Session, House Document 359, p. 178-191.

Adams, F., Favela, J.L., and Santacruz, A., Jr., 1930, Data on irrigated areas, stream flow, use of water, etc., in the United States and Mexico, Colorado River basin: U.S. Congress, 71st, 2nd Session, House Document 359, p. 85-93.

Adams, M.A., Hillemeyer, F.L., and Frost, E.G., 1983, Anastomising shear zones--A geometric explanation for mid-Tertiary crustal extension in the detachment terrane of the Colorado River region, CA, AZ, and NV [abs.]: Geological Society of America Abstracts with Programs, v. 15, no. 5, p. 375.

Adrian, B.M., Hassemer, J.R., Eppinger, R.G., and Tippitt, F.W., 1989, Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate, and rock samples from in and around the Mount Wilson Wilderness Study Area, Mohave County, Arizona: U.S. Geological Survey Open-File Report 89-23, 31 p., 1 sheet, scale 1:62,500.

Agenbroad, L.D., 1984, Recent valley deposits in southern Arizona, *in* Smiley, T.L., and others, eds., Landscapes of Arizona - The geological story: Lanham, Md., University Press of America, p. 253-268.

Anderson, T.W., 1979, Development of groundwater models of alluvial basins in south-central Arizona, *in* Arizona Water Symposium, 23rd and 24th annual, Phoenix, September 27, 1979, and September 24, 1980, Proceedings: Arizona Department of Water Resources Report no. 2, p. 13-17.

Anderson, T.W., 1980, Study plan for the Regional Aquifer-System Analysis of alluvial basins in south-central Arizona and adjacent states: U.S. Geological Survey Open-File Report 80-1197, 22 p.

Anderson, T.W., 1984, Southwest alluvial basins, RASA study - An overview, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, sponsored by the Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: New York, American Society of Civil Engineers, p. 606-614.

Anderson, T.W., 1986, Study in southern and central Arizona and parts of adjacent states, *in* Sun, R.J., ed., Regional Aquifer-System Analysis program of the U.S. Geological Survey, Summary of projects, 1978-84: U.S. Geological Survey Circular 1002, p. 116-131.

Anderson, T.W., 1986, Hydrologic setting, objectives, and approach of the southwest alluvial basins, RASA study, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 5-16.

Anderson, T.W., 1986, Geohydrology of the southwest alluvial basins, Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 99-111.

Anderson, T.W., 1995, Summary of the Southwest alluvial basins, Regional Aquifer-System Analysis, South-central Arizona and parts of adjacent states: U.S. Geological Survey Professional Paper 1406-A, p. A1-A33.

Anderson, T.W., and Freethey, G.W., 1995, Simulation of ground-water flow in alluvial basins in south-central Arizona and parts of adjacent states, Regional Aquifer-System Analysis: U.S. Geological Survey Professional Paper 1406-D, 78 p.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1990, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey Open-File Report 89-378, 99 p., 3 sheets, scale 1:1,000,000.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1992, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey Professional Paper 1406-B, p. B1-B67, 3 sheets, scale 1:1,000,000.

Anderson, T.W., Welder, G.E., Lesser, Gustavo, and Trujillo, A., 1988, Region 7, Central alluvial basins, *in* Back, William, and others, eds., Hydrogeology: Geological Society of America, The Geology of North America, v. O-2, p. 81-86.

Anderson, T.W., and White, N.D., 1986, Arizona surface-water resources, *in* Moody, D.W., and others, comps., National water summary, 1985 - Hydrologic events and surface-water resources: U.S. Geological Survey Water-Supply Paper 2300, p. 145-150.

Anning, D.W., and Duet, N.R., 1994, Summary of ground-water conditions in Arizona, 1987-90: U.S. Geological Survey Open-File Report 94-476, 2 sheets, scales 1:1,000,000 and 1:2,500,000.

Arizona Department of Water Resources, 1990, Map showing Arizona groundwater basins with index of cities, towns, settlements and sites: Arizona Department of Water Resources Open File Report no. 7, 1 sheet, scale 1:1,000,000.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. I, Inventory and analysis: Arizona Department of Water Resources, 253 p.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. II, Hydrologic summary: Arizona Department of Water Resources, Hydrology Division, 236 [266] p.

Arizona Water Commission, 1975, Arizona State Water Plan, Phase 1, Inventory of resource and uses: Arizona Water Commission, 224 p., 2 sheets, approx. scale 1:670,000.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1967 to Spring 1968: Arizona State Land Department Water Resources Report no. 38, 54 p.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1968 to Spring 1969: Arizona State Land Department Water Resources Report no. 42, 46 p.

Babcock, H.M., 1970, Annual report on ground water in Arizona, Spring 1969 to Spring 1970: Arizona State Land Department Water Resources Report no. 43, 44 p.

Babcock, H.M., 1972, Annual report on ground water in Arizona, Spring 1970 to Spring 1971: Arizona Water Commission Bulletin 1, 45 p.

Babcock, H.M., 1972, Bibliography of U.S. Geological Survey water-resources reports for Arizona, May 1965 through June 1971: Arizona Water Commission Bulletin 2, 60 p.

Babcock, H.M., 1973, Annual report on ground water in Arizona, Spring 1971 to Spring 1972: Arizona Water Commission Bulletin 5, 48 p.

Babcock, H.M., 1974, Annual report on ground water in Arizona, Spring 1972 to Spring 1973: Arizona Water Commission Bulletin 7, 46 p., 3 sheets, scale 1:250,000.

Babcock, H.M., 1976, Annual summary of ground-water conditions in Arizona, Spring 1974 to Spring 1975: U.S. Geological Survey Water-Resources Investigations Open-File Report 76-59, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1976 to Spring 1977: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-106, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1975 to Spring 1976: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-10, 2 sheets, scale 1:1,000,000.

Bales, J.T., and Laney, R.L., 1992, Geohydrologic reconnaissance of Lake Mead National Recreation Area: Virgin River, Nevada, to Grand Wash Cliffs, Arizona: U.S. Geological Survey Water-Resources Investigations Report 91-4185, 29 p., 1 sheet, scale 1:62,500.

Bales, Jim, and Laney, R.L., 1987, Hydrogeology of the Lake Mead National Recreation Area, Arizona-Nevada [abs.]: Geological Society of America Abstracts with Programs, v. 19, no. 7, p. 578.

Bedinger, M.S., Anderson, T.W., and Langer, W.H., 1984, Maps showing ground-water units and withdrawal, Basin and Range Province, Arizona: U.S. Geological Survey Water-Resources Investigations Report 83-4114-A, 2 sheets, scales 1:500,000 and 1:1,000,000.

Bedinger, M.S., Langer, W.H., and Reed, J.E., 1984, Ground-water hydrology, *in* Bedinger, M.S. and others, eds., Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: U.S. Geological Survey Open-File Report 84-741, p. 98-114, 5 sheets 2, 3, and 4, scale 1:500,000.

Bedinger, M.S., Sargent, K.A., and Brady, B.T., 1985, Geologic and hydrologic characterization of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part III, Geologic and hydrologic evaluation: U.S. Geological Survey Circular 904-C, 27 p.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1984, Sonoran region, Arizona, *in* Bedinger, M.S. and others, Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: Evaluation of the regions: U.S. Geological Survey Open-File Report 84-745, p. 81-108, 2 sheets, scale 1:300,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States for isolation of high-level radioactive waste - Evaluation of the regions: U.S. Geological Survey Professional Paper 1370-H, p. H1-61, 7 plates, scale 1:1,000,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., eds., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States for isolation of high-level radioactive waste - Characterization of the Sonoran region, Arizona: U.S. Geological Survey Professional Paper 1370-D, p. D1-D40, 6 plates, scales 1:500,000 and 1:1,000,000.

Bedinger, M.S., Sargent, K.A., and Reed, J.E., 1984, Geologic and hydrologic characterization and evaluation of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part I, Introduction and guidelines: U.S. Geological Survey Circular 904-A, 16 p.

Boner, F.C., Garrett, W.B., and Konieczki, A.D., 1989, Water resources data, Arizona, Water year 1988: U.S. Geological Survey Water-Data Report AZ-88-1, 391 p.

Boner, F.C., Konieczki, A.D., and Davis, R.G., 1991, Water resources data, Arizona, Water year 1990: U.S. Geological Survey Water-Data Report AZ-90-1, 381 p.

Boner, F.C., Smith, C.F., Garrett, W.B., and Konieczki, A., 1990, Water resources data, Arizona, Water year 1989: U.S. Geological Survey Water-Data Report AZ-89-1, 391 p.

Briggs, P.C., and Nemecek, E.A., 1986, Technical aspects of Arizona groundwater law, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 93-98.

Brown, S.G., 1976, Preliminary maps showing ground-water resources in the lower Colorado River region, Arizona, Nevada, New Mexico, and Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-542, 1 sheet, scale 1:1,000,000.

Buol, S.W., 1964, Calculated actual and potential evapotranspiration in Arizona: Tucson, University of Arizona, Agricultural Experiment Station Technical Bulletin 162, 48 p.

Clark, T.C., 1975, The Arizona Water Plan, A status report, *in* Arizona Watershed Symposium, 19th annual, Phoenix, September 24, 1975, Proceedings: Arizona Water Commission Report no. 7, p. 9-23.

Cox, C.J., and others, 1968, Annual report on ground water in Arizona, Spring 1966 to Spring 1967: Arizona State Land Department Water Resources Report no. 36, 43 p.

Daniel, D.L., 1981, Maps showing total dissolved solids content of groundwater in Arizona: Arizona Department of Water Resources Hydrologic Map Series Report no. 2, 2 sheets, scale 1:1,000,000.

Davidson, E.S., 1979, Summary appraisals of the nation's ground-water resources - Lower Colorado region: U.S. Geological Survey Professional Paper 813-R, 23 p., 3 sheets, scale 1:1,000,000.

Dillenburg, R.A., 1987, Map showing groundwater conditions in the Detrital Wash Basin, Mohave County, Arizona - 1987: Arizona Department of Water Resources Hydrologic Map Series Report no. 14, 1 sheet, scale 1:125,000.

Evans, L.G., and Haimson, J.S., 1982, SWAB/RASA aquifer parameter study, Final report for U.S. Geological Survey contract 14-08-0001-18268: Arizona Department of Water Resources, 21 p.

Feth, J.H., and others, 1964, Preliminary map of the conterminous United States showing depth to and quality of shallowest ground water containing more than 1,000 parts per million dissolved solids: U.S. Geological Survey Hydrologic Investigations Atlas HA-199, 31 p., 2 sheets, scale 1:3,168,000.

Fields, R.L., 1986, Data-processing activities of the southwest alluvial basins, RASA study, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 17-23.

Freethey, G.W., 1986, Considerations in modeling ground-water flow in the alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 57-67.

Freethey, G.W., and Anderson, T.W., 1986, Predevelopment hydrologic conditions in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-664, 3 sheets, scale 1:500,000.

Freethey, G.W., Pool, D.R., Anderson, T.W., and Tucci, P., 1986, Description and generalized distribution of aquifer materials in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-663, 4 sheets, scale 1:500,000.

Garrett, J.M., and Gellenbeck, D.J., 1991, Basin characteristics and streamflow statistics in Arizona as of 1989: U.S. Geological Survey Water-Resources Investigations Report 91-4041, 612 p.

Hardt, W.F., Cahill, J.M., and Booher, M.B., 1958, Annual report on ground water in Arizona, Spring 1957 to Spring 1958: Arizona State Land Department Water Resources Report no. 5, 60 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1959, Annual report on ground water in Arizona, Spring 1958 to Spring 1959: Arizona State Land Department Water Resources Report no. 6, 61 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1960, Annual report on ground water in Arizona, Spring 1959 to Spring 1960: Arizona State Land Department Water Resources Report no. 7, [89] p.

Harshbarger, J.W., Lewis, D.D., Skibitzke, H.E., Heckler, W.L., and Kister, L.R., revised by H.L. Baldwin, 1966, Arizona water: U.S. Geological Survey Water-Supply Paper 1648, 85 p.

Hodges, E.B., and others, 1967, Annual report on ground water in Arizona, Spring 1965 to Spring 1966: Arizona State Land Department Water Resources Report no. 32, 61 p.

Holbert, K.E., Stewart, B.D., and Eshraghi, P., 1995, Measurement of radioactivity in Arizona groundwater using improved analytical techniques for samples with high dissolved solids: Health Physics, v. 68, no. 2, p. 185-194.

Johnson, C., and Glynn, J., 1982, National Uranium Resource Evaluation, Las Vegas quadrangle, Nevada, Arizona, and California: U.S. Department of Energy Report PGJ/F-121(82), 51 p., 5 microfiche, 16 sheets.

Laney, R.L., 1977, Geohydrologic reconnaissance of Lake Mead National Recreation Area - Temple Bar to Grand Wash Cliffs, Arizona: U.S. Geological Survey Administrative Report, 72 p., 1 sheet, scale 1:62,500.

Laney, R.L., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area; Temple Bar to Grand Wash Cliffs, Arizona: U.S. Geological Survey Open-File Report 79-688, 70 p.

Laney, R.L., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area; Hoover Dam to Temple Bar, Arizona: U.S. Geological Survey Open-File Report 79-689, 42 p.

Lee, W.T., 1908, Geologic reconnaissance of a part of western Arizona, *with notes on* the Igneous rocks of western Arizona, by Albert Johannsen: U.S. Geological Survey Bulletin 352, 96 p.

Ligner, J.J., White, N.D., Kister, L.R., and Moss, M.E., 1969, Water resources: Part II of Mineral and water resources of Arizona: Arizona Bureau of Mines Bulletin 180, p. 471-580.

Longsworth, S.A., Van De Vanter, E.K., and Alwin, S.H., 1998, Activities of the Water Resources Division in Arizona, 1996-97: U.S. Geological Survey Open-File Report 98-185, 90 p.

Marie, J.R., Van De Vanter, E.K., and Moss, C.L., 1996, Activities of the Water Resources Division in Arizona, 1995-1996: U.S. Geological Survey Open-File Report 95-772, 69 p.

McGuinness, C.L., 1964, Generalized map showing annual runoff and productive aquifers in the conterminous United States: U.S. Geological Survey Hydrologic Investigations Atlas HA-194, scale 1:5,000,000.

Peirce, H.W., and Scurlock, J.R., 1972, Arizona well information: Arizona Bureau of Mines Bulletin 185, 195 p. [reprinted 1988, Arizona Geological Survey].

Pool, D.R., 1984, Aquifer geology of alluvial basins of Arizona, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 683-690.

Pool, D.R., 1986, Aquifer geology of alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 25-36.

Pope, G.L., Rigas, P.D., and Smith, C.F., 1998, Statistical summaries of streamflow data and characteristics of drainage basins for selected streamflow-gaging stations in Arizona through water year 1996: U.S. Geological Survey Water-Resources Investigations Report 98-4225, 907 p.

Qualheim, B.J., 1978, Hydrogeochemical and stream sediment reconnaissance basic data report for Kingman NTMS quadrangle, Arizona, California, and Nevada: U.S. Department of Energy Report GJBX-122(78), 83 p., 6 sheets, scale 1:250,000, 5 microfiche.

Qualheim, B.J., 1978, Hydrogeochemical and stream sediment reconnaissance basic data report for Las Vegas NTMS quadrangle, Arizona, California, and Nevada: U.S. Department of Energy Report GJBX-123(78), 85 p., 6 sheets, scale 1:250,000, 5 microfiche.

Rauzi, S.L., 2002, Arizona has salt!: Arizona Geological Survey, Circular 30, 36 p.

Robertson, F.N., 1984, Trace elements in ground water in southern Arizona [abs.], *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 674.

Robertson, F.N., 1986, Occurrence and solubility controls of trace elements in ground water in alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 69-80.

Robertson, F.N., 1989, Ground-water geochemistry and information transfer in alluvial basins in Arizona [abs.], *in* International Geological Congress, 28th, Washington, D.C., July 9-19, 1989, Abstracts, V. 2: International Geological Congress, p. 2.709-2.710.

Robertson, F.N., 1989, Arsenic in ground-water under oxidizing conditions, south-west United States: Environmental Geochemistry and Health, v. 11, no. 3/4, p. 171-185.

Robertson, F.N., 1991, Geochemistry of ground-water in alluvial basins of Arizona and adjacent parts of Nevada, New Mexico, and California: U.S. Geological Survey Professional Paper 1406-C, p. C1-C90.

Robertson, F.N., and Garrett, W.B., 1988, Distribution of fluoride in ground water in the alluvial basins of Arizona and adjacent parts of California, Nevada, and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-0665, 3 sheets, scale 1:500,000.

Robson, S.G., and Banta, E.R., 1995, Ground water atlas of the United States, Segment 2, Arizona, Colorado, New Mexico, Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-730-C, 32 p.

Sargent, K.A., and Bedinger, M.S., 1985, Geologic and hydrologic characterization and evaluation of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part II, Geologic and hydrologic characterization: U.S. Geological Survey Circular 904-B, 30 p.

Smith, C.F., Anning, D.W., Duet, N.R., Fisk, G.G., McCormack, H.F., Pope, G.L., Rigas, P.D., and Wallace, B.L., 1995, Water resources data, Arizona, Water year 1994: U.S. Geological Survey Water-Data Report AZ-94-1, 320 p.

Smith, C.F., Boner, F.C., Davis, R.G., Duet, N.R., and Rigas, P.D., 1993, Water resources data, Arizona, Water year 1992: U.S. Geological Survey Water-Data Report AZ-92-1, 360 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., and Rigas, P.D., 1997, Water resources data, Arizona, Water year 1996: U.S. Geological Survey Water-Data Report AZ-96-1, 328 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., Rigas, P.D., and Tadayon, S., 1996, Water resources data, Arizona, Water year 1995: U.S. Geological Survey Water-Data Report AZ-95-1, 306 p.

Smith, C.F., Rigas, P.D., Ham, L.K., Duet, N.R., and Anning, D.W., 1994, Water resources data, Arizona, Water year 1993: U.S. Geological Survey Water-Data Report AZ-93-1, 360 p.

Smith, G.E.P., 1938, The physiography of Arizona valleys and the occurrence of ground water: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Technical Bulletin no. 77, 91 p.

Smith, H.V., Caster, A.B., Fuller, W.H., Breazeale, E.L., and Draper, George, 1949, The chemical composition of representative Arizona waters: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Bulletin 225, 76 p.

Spicer, L.M., and Van De Vanter, E.K., comps., 1993, Activities of the Water Resources Division in Arizona, 1986-91: U.S. Geological Survey Open-File Report 93-165, 144 p.

Stone, Claudia, and Witcher, J.C., 1982, Geothermal energy in Arizona - Final contract report: Arizona Bureau of Geology and Mineral Technology Open-File Report 83-12, 398 p.

Texas Instruments, Inc., 1982, National Uranium Resource Evaluation, Variable premise evaluation system data report, Interpretation of aerial radiometric reconnaissance data, Hydrogeochemical and stream sediment reconnaissance data, Grand Canyon quadrangle, Arizona: U.S. Department of Energy Report GJD-32(81), 210 p.

Thomas, H.E., 1956, Changes in quantities and qualities of ground and surface waters, *in* Thomas, W.L., Jr, ed., and others, Man's role in changing the face of the earth: University of Chicago Press, p. 542-563.

Thomas, H.E., 1960, Drainage basin tributary to Lake Mead, in Smith, W.O., and others, Comprehensive survey of sedimentation in Lake Mead, 1948-49: U.S. Geological Survey Professional Paper 295, p. 21-30.

U.S. Bureau of Reclamation, 1938-1947, Boulder Canyon Project: Final reports: Denver, U.S. Bureau of Reclamation, 7 parts in 12 volumes.

U.S. Geological Survey, [1965?], Water quality records in Arizona - 1964: U.S. Geological Survey, 80 p.

U.S. Geological Survey, [1966?], 1965 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 89 p.

U.S. Geological Survey, [1968?], 1967 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 85 p.

U.S. Geological Survey, 1971, 1971 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 167 p. [NTIS PB-287 165].

U.S. Geological Survey, 1972, 1972 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 166 p. [NTIS PB-287 167].

U.S. Geological Survey, 1972, Aeromagnetic map of the Gold Butte-Chloride area, Arizona and Nevada: U.S. Geological Survey Geophysical Investigations Map GP-757, 2 sheets, scale 1:62,500.

U.S. Geological Survey, 1973, 1973 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 188 p. [NTIS PB-287 169].

U.S. Geological Survey, 1974, 1974 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 192 p. [NTIS PB-287 171].

U.S. Geological Survey, 1976, Water resources data for Arizona, Water year 1975: U.S. Geological Survey Water-Data Report AZ-75-1, 440 p.

U.S. Geological Survey, 1978, Water resources data for Arizona, Water year 1977: U.S. Geological Survey Water-Data Report AZ-77-1, 550 p.
U.S. Geological Survey, 1978, Annual summary of ground-water conditions in Arizona, Spring 1977 to Spring 1978: U.S. Geological Survey Water-Resources Investigations Open-File Report 78-0144, 1 sheet, scale 1:1,000,000.
U.S. Geological Survey, 1979, Water resources data for Arizona, Water year 1978: U.S. Geological Survey Water-Data Report AZ-78-1, 604 p.
U.S. Geological Survey, 1979, Land use and land cover and associated maps for Grand Canyon, Arizona: U.S. Geological Survey Open-File Report 79-1494, 5 sheets, scale 1:250,000.
U.S. Geological Survey, 1980, Water resources data for Arizona, Water year 1979: U.S. Geological Survey Water-Data Report AZ-79-1, 614 p.
U.S. Geological Survey, 1980, Annual summary of ground-water conditions in Arizona, Spring 1978 to Spring 1979: U.S. Geological Survey Water-Resources Investigations Open-File Report WRI 80-330, 1 sheet, scale 1:1,000,000.
U.S. Geological Survey, 1981, Annual summary of ground-water conditions in Arizona, Spring 1979 to Spring 1980: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-906, 2 sheets, scale 1:1,000,000.
U.S. Geological Survey, 1982, Annual summary of ground-water conditions in Arizona, Spring 1980 to Spring 1981: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scale 1:1,000,000.
U.S. Geological Survey, 1982, Water resources data for Arizona, Water year 1980: U.S. Geological Survey Water-Data Report AZ-80-1, 568 p.
U.S. Geological Survey, 1983, Water resources data, Arizona, Water year 1981: U.S. Geological Survey Water-Data Report AZ-81-1, 532 p.
U.S. Geological Survey, 1983, Annual summary of ground-water conditions in Arizona, Spring 1981 to Spring 1982: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scales 1:1,000,000 and 1:3,200,000.
U.S. Geological Survey, 1984, Annual summary of ground-water conditions in Arizona, Spring 1982 to Spring 1983: U.S. Geological Survey Water-Resources Investigations Open-File Report 84-428, 2 sheets, scales 1:1,000,000 and 1:3,300,000.
U.S. Geological Survey, 1985, Annual summary of ground-water conditions in Arizona, Spring 1983 to Spring 1984: U.S. Geological Survey Water-Resources Investigations Open-File Report 85-0410, 2 sheets, scales 1:1,000,000 and 1:3,400,000.
U.S. Geological Survey, 1986, Annual summary of ground-water conditions in Arizona, Spring 1984 to Spring 1985: U.S. Geological Survey Water-Resources Investigations Open-File Report 86-422W, 2 sheets, scales 1:1,000,000 and 1:3,300,000.
White, N.D., and Garrett, W.B., 1984, Water resources data, Arizona, Water year 1982: U.S. Geological Survey Water-Data Report AZ-82-1, 440 p.
White, N.D., and Garrett, W.B., 1986, Water resources data, Arizona, Water year 1983: U.S. Geological Survey Water-Data Report AZ-83-1, 387 p.
White, N.D., and Garrett, W.B., 1987, Water resources data, Arizona, Water year 1984: U.S. Geological Survey Water-Data Report AZ-84-1, 381 p.
White, N.D., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1985: U.S. Geological Survey Water-Data Report AZ-85-1, 343 p.
White, N.D., and others, 1967, Annual report on ground water in Arizona, Spring 1964 to Spring 1965: Arizona State Land Department Water Resources Report no. 24, 62 p.

White, N.D., Stulik, R.S., and others, 1962, Annual report on ground water in Arizona, Spring 1961 to Spring 1962: Arizona State Land Department Water Resources Report no. 11, 116 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1961, Annual report on ground water in Arizona, Spring 1960 to Spring 1961: Arizona State Land Department Water Resources Report no. 10, 93 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1963, Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, 136 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1964, Annual report on ground water in Arizona, Spring 1963 to Spring 1964: Arizona State Land Department Water Resources Report no. 19, 60 p.

Wilson, L.G., DeCook, K.J., and Neuman, S.P., 1980, Regional recharge research for southwest alluvial basins - Final report, U.S. Geological Survey contract 14-08-0001-18257: Tucson, University of Arizona, Water Resources Research Center, 389 p.

Wilson, R.P., 1990, Arizona water supply and use, *in* Carr, J.E., and others, National water summary, 1987 - Hydrologic events and water supply and uses: U.S. Geological Survey Water-Supply Paper 2350, p. 157-164.

Wilson, R.P., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1986: U.S. Geological Survey Water-Data Report AZ-86-1, 341 p.

Wilson, R.P., and Garrett, W.B., 1989, Water resources data, Arizona, Water year 1987: U.S. Geological Survey Water-Data Report AZ-87-1, 385 p.

Wilson, R.P., and Owen-Joyce, S.J., 1993, Determining the source of water pumped from wells along the lower Colorado River: U.S. Geological Survey Open-File Report 93-0405, 2 p.

Wilson, R.P., and Owen-Joyce, S.J., 1994, Methods to identify wells that yield water that will be replaced by Colorado River water in Arizona, California, Nevada, and Utah: U.S. Geological Survey Water-Resources Investigations Report 94-4005, 36 p., 19 sheets, scale 1:100,000.

Witcher, J.C., Stone, Claudia, and Hahman, W.R., Sr., 1982, Geothermal resources of Arizona: Arizona Bureau of Geology and Mineral Technology [also listed as Arizona Geological Survey Map 15-2], 1 sheet, scale 1:500,000.

Woesner, W.M., 1982, Groundwater and surface water interaction in Echo Bay detected by seepage meter and portable piezometer, Lake Mead National Recreation Area, Arizona and Nevada [abs.]: Geological Society of America Abstracts with Programs, v. 14, no. 6, p. 354-355.

GRAND WASH BASIN

GROUNDWATER HYDROLOGY BIBLIOGRAPHY

Anderson, T.W., and White, N.D., 1986, Arizona surface-water resources, *in* Moody, D.W., and others, comps., National water summary, 1985 - Hydrologic events and surface-water resources: U.S. Geological Survey Water-Supply Paper 2300, p. 145-150.

Anning, D.W., and Duet, N.R., 1994, Summary of ground-water conditions in Arizona, 1987-90: U.S. Geological Survey Open-File Report 94-476, 2 sheets, scales 1:1,000,000 and 1:2,500,000.

Arizona Department of Water Resources, 1990, Map showing Arizona groundwater basins with index of cities, towns, settlements and sites: Arizona Department of Water Resources Open File Report no. 7, 1 sheet, scale 1:1,000,000.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. I, Inventory and analysis: Arizona Department of Water Resources, 253 p.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. II, Hydrologic summary: Arizona Department of Water Resources, Hydrology Division, 236 [266] p.

Arizona Water Commission, 1975, Arizona State Water Plan, Phase 1, Inventory of resource and uses: Arizona Water Commission, 224 p., 2 sheets, approx. scale 1:670,000.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1967 to Spring 1968: Arizona State Land Department Water Resources Report no. 38, 54 p.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1968 to Spring 1969: Arizona State Land Department Water Resources Report no. 42, 46 p.

Babcock, H.M., 1970, Annual report on ground water in Arizona, Spring 1969 to Spring 1970: Arizona State Land Department Water Resources Report no. 43, 44 p.

Babcock, H.M., 1972, Annual report on ground water in Arizona, Spring 1970 to Spring 1971: Arizona Water Commission Bulletin 1, 45 p.

Babcock, H.M., 1972, Bibliography of U.S. Geological Survey water-resources reports for Arizona, May 1965 through June 1971: Arizona Water Commission Bulletin 2, 60 p.

Babcock, H.M., 1973, Annual report on ground water in Arizona, Spring 1971 to Spring 1972: Arizona Water Commission Bulletin 5, 48 p.

Babcock, H.M., 1974, Annual report on ground water in Arizona, Spring 1972 to Spring 1973: Arizona Water Commission Bulletin 7, 46 p., 3 sheets, scale 1:250,000.

Babcock, H.M., 1976, Annual summary of ground-water conditions in Arizona, Spring 1974 to Spring 1975: U.S. Geological Survey Water-Resources Investigations Open-File Report 76-59, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1976 to Spring 1977: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-106, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1975 to Spring 1976: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-10, 2 sheets, scale 1:1,000,000.

Bales, J.T., and Laney, R.L., 1992, Geohydrologic reconnaissance of Lake Mead National Recreation Area: Virgin River, Nevada, to Grand Wash Cliffs, Arizona: U.S. Geological Survey Water-Resources Investigations Report 91-4185, 29 p., 1 sheet, scale 1:62,500.

Bedinger, M.S., Anderson, T.W., and Langer, W.H., 1984, Maps showing ground-water units and withdrawal, Basin and Range Province, Arizona: U.S. Geological Survey Water-Resources Investigations Report 83-4114-A, 2 sheets, scales 1:500,000 and 1:1,000,000.

Bedinger, M.S., Langer, W.H., and Reed, J.E., 1984, Ground-water hydrology, *in* Bedinger, M.S. and others, eds., Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: U.S. Geological Survey Open-File Report 84-741, p. 98-114, 5 sheets 2, 3, and 4, scale 1:500,000.

Bedinger, M.S., Sargent, K.A., and Brady, B.T., 1985, Geologic and hydrologic characterization of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part III, Geologic and hydrologic evaluation: U.S. Geological Survey Circular 904-C, 27 p.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1984, Sonoran region, Arizona, *in* Bedinger, M.S. and others, Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: Evaluation of the regions: U.S. Geological Survey Open-File Report 84-745, p. 81-108, 2 sheets, scale 1:300,000.

Bedinger, M.S., Sargent, K.A., and Reed, J.E., 1984, Geologic and hydrologic characterization and evaluation of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part I, Introduction and guidelines: U.S. Geological Survey Circular 904-A, 16 p.

Boner, F.C., Garrett, W.B., and Konieczki, A.D., 1989, Water resources data, Arizona, Water year 1988: U.S. Geological Survey Water-Data Report AZ-88-1, 391 p.

Boner, F.C., Konieczki, A.D., and Davis, R.G., 1991, Water resources data, Arizona, Water year 1990: U.S. Geological Survey Water-Data Report AZ-90-1, 381 p.

Boner, F.C., Smith, C.F., Garrett, W.B., and Konieczki, A., 1990, Water resources data, Arizona, Water year 1989: U.S. Geological Survey Water-Data Report AZ-89-1, 391 p.

Briggs, P.C., and Nemecek, E.A., 1986, Technical aspects of Arizona groundwater law, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 93-98.

Brown, S.G., 1976, Preliminary maps showing ground-water resources in the lower Colorado River region, Arizona, Nevada, New Mexico, and Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-542, 1 sheet, scale 1:1,000,000.

Buol, S.W., 1964, Calculated actual and potential evapotranspiration in Arizona: Tucson, University of Arizona, Agricultural Experiment Station Technical Bulletin 162, 48 p.

Clark, T.C., 1975, The Arizona Water Plan, A status report, in Arizona Watershed Symposium, 19th annual, Phoenix, September 24, 1975, Proceedings: Arizona Water Commission Report no. 7, p. 9-23.

Cooley, M.E., 1963, Hydrology of the Plateau Uplands Province, *in* White, N.D., and others, and others, Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, p. 27-38.

Cox, C.J., and others, 1968, Annual report on ground water in Arizona, Spring 1966 to Spring 1967: Arizona State Land Department Water Resources Report no. 36, 43 p.

Daniel, D.L., 1981, Maps showing total dissolved solids content of groundwater in Arizona: Arizona Department of Water Resources Hydrologic Map Series Report no. 2, 2 sheets, scale 1:1,000,000.

Davidson, E.S., 1979, Summary appraisals of the nation's ground-water resources - Lower Colorado region: U.S. Geological Survey Professional Paper 813-R, 23 p., 3 sheets, scale 1:1,000,000.

Feth, J.H., and others, 1964, Preliminary map of the conterminous United States showing depth to and quality of shallowest ground water containing more than 1,000 parts per million dissolved solids: U.S. Geological Survey Hydrologic Investigations Atlas HA-199, 31 p., 2 sheets, scale 1:3,168,000.

Garrett, J.M., and Gellenbeck, D.J., 1991, Basin characteristics and streamflow statistics in Arizona as of 1989: U.S. Geological Survey Water-Resources Investigations Report 91-4041, 612 p.

Goetz, A.F.H., Billingsley, F.C., Gillespie, A.R., Abrams, M.J., Squires, R.L., Shoemaker, E.M., Lucchitta, I., and Elston, D.P., 1975, Application of ERTS images and image processing to regional geologic problems and geologic mapping in northern Arizona: Pasadena, California Institute of Technology, Jet Propulsion Laboratory Technical Report 32-1597, 188 p.

Hahman, W.R., Sr., Stone, C., and Witcher, J.C., comps., 1978, Preliminary map - Geothermal energy resources of Arizona: Arizona Bureau of Geology and Mineral Technology Geothermal Map No. 1 [also listed as Arizona Geological Survey Map 15-1], 1 sheet, scale 1:1,000,000.

Hardt, W.F., Cahill, J.M., and Booher, M.B., 1958, Annual report on ground water in Arizona, Spring 1957 to Spring 1958: Arizona State Land Department Water Resources Report no. 5, 60 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1959, Annual report on ground water in Arizona, Spring 1958 to Spring 1959: Arizona State Land Department Water Resources Report no. 6, 61 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1960, Annual report on ground water in Arizona, Spring 1959 to Spring 1960: Arizona State Land Department Water Resources Report no. 7, [89] p.

Harshbarger, J.W., Lewis, D.D., Skibitzke, H.E., Heckler, W.L., and Kister, L.R., revised by H.L. Baldwin, 1966, Arizona water: U.S. Geological Survey Water-Supply Paper 1648, 85 p.

Hodges, E.B., and others, 1967, Annual report on ground water in Arizona, Spring 1965 to Spring 1966: Arizona State Land Department Water Resources Report no. 32, 61 p.

Huntoon, P.W., 1977, Relationship of tectonic structure to aquifer mechanics in the western Grand Canyon district, Arizona - Completion report, Project B-31-WYO (14-34-0001-6134) to Office of Water Research and Technology, U.S. Department of the Interior: Laramie, University of Wyoming, Water Resources Institute, Water Resources Series no. 66, 51 p., 2 sheets, scale 1:125,000.

Huntoon, P.W., 1996, Large-basin ground water circulation and paleo-reconstruction of circulation leading to uranium mineralization in Grand Canyon breccia pipes, Arizona: Mountain Geologist, v. 33, no. 3, p. 71-84.

Johnson, C., and Glynn, J., 1982, National Uranium Resource Evaluation, Las Vegas quadrangle, Nevada, Arizona, and California: U.S. Department of Energy Report PGJ/F-121(82), 51 p., 5 microfiche, 16 sheets.

Johnson, P.W., and Sanderson, R.B., 1968, Spring flow into the Colorado River, Lees Ferry to Lake Mead, Arizona: Arizona State Land Department Water Resources Report no. 34, 26 p.

Laney, R.L., 1977, Geohydrologic reconnaissance of Lake Mead National Recreation Area - Temple Bar to Grand Wash Cliffs, Arizona: U.S. Geological Survey Administrative Report, 72 p., 1 sheet, scale 1:62,500.

Laney, R.L., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area; Temple Bar to Grand Wash Cliffs, Arizona: U.S. Geological Survey Open-File Report 79-688, 70 p.

Levings, G.W., and Farrar, C.D., 1979, Map showing ground-water conditions in the Virgin River, Grand Wash, and Shivwits areas, Mohave County, Arizona - 1976: U.S. Geological Survey Water-Resources Investigations Open-File Report 79-57, 1 sheet, scale 1:125,000.

Ligner, J.J., White, N.D., Kister, L.R., and Moss, M.E., 1969, Water resources: Part II of Mineral and water resources of Arizona: Arizona Bureau of Mines Bulletin 180, p. 471-580.

Lohman, S.W., and Petersen, M.S., 1972, Water, *in* Mallory, W.W., ed.-in-chief, Geologic atlas of the Rocky Mountain region: Denver, Rocky Mountain Association of Geologists, p. 324-327.

Longsworth, S.A., Van De Vanter, E.K., and Alwin, S.H., 1998, Activities of the Water Resources Division in Arizona, 1996-97: U.S. Geological Survey Open-File Report 98-185, 90 p.

Marie, J.R., Van De Vanter, E.K., and Moss, C.L., 1996, Activities of the Water Resources Division in Arizona, 1995-1996: U.S. Geological Survey Open-File Report 95-772, 69 p.

Mariner, R.H., Presser, T.S., and Evans, W.C., 1977, Chemical, isotopic, and gas compositions of selected thermal springs in Arizona, New Mexico, and Utah: U.S. Geological Survey Open-File Report 77-654, 12 p.

McGuinness, C.L., 1964, Generalized map showing annual runoff and productive aquifers in the conterminous United States: U.S. Geological Survey Hydrologic Investigations Atlas HA-0194, scale 1:5,000,000.

Peirce, H.W., and Scurlock, J.R., 1972, Arizona well information: Arizona Bureau of Mines Bulletin 185, 195 p. [reprinted 1988, Arizona Geological Survey].

Pope, G.L., Rigas, P.D., and Smith, C.F., 1998, Statistical summaries of streamflow data and characteristics of drainage basins for selected streamflow-gaging stations in Arizona through water year 1996: U.S. Geological Survey Water-Resources Investigations Report 98-4225, 907 p.

Qualheim, B.J., 1978, Hydrogeochemical and stream sediment reconnaissance basic data report for Las Vegas NTMS quadrangle, Arizona, California, and Nevada: U.S. Department of Energy Report GJBX-123(78), 85 p., 6 sheets, scale 1:250,000, 5 microfiche.

Reiter, M., Mansure, A.J., and Shearer, C., 1978, Geothermal characteristics of the Colorado Plateau [abs.], *in* Papers presented to the Conference on Plateau Uplift: Mode and Mechanism, A Lunar and Planetary Institute Topical Conference: Houston, Lunar and Planetary Institute, LPI Contribution 329, p. 43.

Robertson, F.N., 1989, Arsenic in ground-water under oxidizing conditions, south-west United States: Environmental Geochemistry and Health, v. 11, no. 3/4, p. 171-185.

Robson, S.G., and Banta, E.R., 1995, Ground water atlas of the United States, Segment 2, Arizona, Colorado, New Mexico, Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-730-C, 32 p.

Sargent, K.A., and Bedinger, M.S., 1985, Geologic and hydrologic characterization and evaluation of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part II, Geologic and hydrologic characterization: U.S. Geological Survey Circular 904-B, 30 p.

Scott, R.C., and Barker, F.B., 1962, Data on uranium and radium in ground water in the United States 1954 to 1957: U.S. Geological Survey Professional Paper 426, 115 p., 2 sheets, scale 1:7,000,000.

Smith, C.F., Anning, D.W., Duet, N.R., Fisk, G.G., McCormack, H.F., Pope, G.L., Rigas, P.D., and Wallace, B.L., 1995, Water resources data, Arizona, Water year 1994: U.S. Geological Survey Water-Data Report AZ-94-1, 320 p.

Smith, C.F., Boner, F.C., Davis, R.G., Duet, N.R., and Rigas, P.D., 1993, Water resources data, Arizona, Water year 1992: U.S. Geological Survey Water-Data Report AZ-92-1, 360 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., and Rigas, P.D., 1997, Water resources data, Arizona, Water year 1996: U.S. Geological Survey Water-Data Report AZ-96-1, 328 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., Rigas, P.D., and Tadayon, S., 1996, Water resources data, Arizona, Water year 1995: U.S. Geological Survey Water-Data Report AZ-95-1, 306 p.

Smith, C.F., Rigas, P.D., Ham, L.K., Duet, N.R., and Anning, D.W., 1994, Water resources data, Arizona, Water year 1993: U.S. Geological Survey Water-Data Report AZ-93-1, 360 p.

Spicer, L.M., and Van De Vanter, E.K., comps., 1993, Activities of the Water Resources Division in Arizona, 1986-91: U.S. Geological Survey Open-File Report 93-165, 144 p.

Stone, Claudia, and Witcher, J.C., 1982, Geothermal energy in Arizona - Final contract report: Arizona Bureau of Geology and Mineral Technology Open-File Report 83-12, 398 p.

Texas Instruments, Inc., 1982, National Uranium Resource Evaluation, Variable premise evaluation system data report, Interpretation of hydrogeochemical and stream sediment reconnaissance data, Williams quadrangle, Arizona: U.S. Department of Energy Report GJD-93(81), 264 p.

Texas Instruments, Inc., 1982, National Uranium Resource Evaluation, Variable premise evaluation system data report, Interpretation of aerial radiometric reconnaissance data, Hydrogeochemical and stream sediment reconnaissance data, Grand Canyon quadrangle, Arizona: U.S. Department of Energy Report GJD-32(81), 210 p.

U.S. Geological Survey, [1965?], Water quality records in Arizona - 1964: U.S. Geological Survey, 80 p.

U.S. Geological Survey, [1966?], 1965 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 89 p.

U.S. Geological Survey, [1968?], 1967 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 85 p.

U.S. Geological Survey, 1971, 1971 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 167 p. [NTIS PB-287 165].

U.S. Geological Survey, 1972, 1972 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 166 p. [NTIS PB-287 167].

U.S. Geological Survey, 1972, Aeromagnetic map of the Gold Butte-Chloride area, Arizona and Nevada: U.S. Geological Survey Geophysical Investigations Map GP-757, 2 sheets, scale 1:62,500.

U.S. Geological Survey, 1973, 1973 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 188 p. [NTIS PB-287 169].

U.S. Geological Survey, 1974, 1974 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 192 p. [NTIS PB-287 171].

U.S. Geological Survey, 1976, Water resources data for Arizona, Water year 1975: U.S. Geological Survey Water-Data Report AZ-75-1, 440 p.

U.S. Geological Survey, 1978, Water resources data for Arizona, Water year 1977: U.S. Geological Survey Water-Data Report AZ-77-1, 550 p.

U.S. Geological Survey, 1978, Annual summary of ground-water conditions in Arizona, Spring 1977 to Spring 1978: U.S. Geological Survey Water-Resources Investigations Open-File Report 78-144, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1979, Water resources data for Arizona, Water year 1978: U.S. Geological Survey Water-Data Report AZ-78-1, 604 p.

U.S. Geological Survey, 1979, Land use and land cover and associated maps for Grand Canyon, Arizona: U.S. Geological Survey Open-File Report 79-1494, 5 sheets, scale 1:250,000.

U.S. Geological Survey, 1980, Water resources data for Arizona, Water year 1979: U.S. Geological Survey Water-Data Report AZ-79-1, 614 p.

U.S. Geological Survey, 1980, Annual summary of ground-water conditions in Arizona, Spring 1978 to Spring 1979: U.S. Geological Survey Water-Resources Investigations Open-File Report 80-330, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1981, Annual summary of ground-water conditions in Arizona, Spring 1979 to Spring 1980: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-906, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Annual summary of ground-water conditions in Arizona, Spring 1980 to Spring 1981: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Water resources data for Arizona, Water year 1980: U.S. Geological Survey Water-Data Report AZ-80-1, 568 p.

U.S. Geological Survey, 1983, Water resources data, Arizona, Water year 1981: U.S. Geological Survey Water-Data Report AZ-81-1, 532 p.

U.S. Geological Survey, 1983, Annual summary of ground-water conditions in Arizona, Spring 1981 to Spring 1982: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scales 1:1,000,000 and 1:3,200,000.

U.S. Geological Survey, 1984, Annual summary of ground-water conditions in Arizona, Spring 1982 to Spring 1983: U.S. Geological Survey Water-Resources Investigations Open-File Report 84-428, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

U.S. Geological Survey, 1985, Annual summary of ground-water conditions in Arizona, Spring 1983 to Spring 1984: U.S. Geological Survey Water-Resources Investigations Open-File Report 85-410, 2 sheets, scales 1:1,000,000 and 1:3,400,000.

U.S. Geological Survey, 1986, Annual summary of ground-water conditions in Arizona, Spring 1984 to Spring 1985: U.S. Geological Survey Water-Resources Investigations Open-File Report 86-422W, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

Wagoner, J.L., 1979, Hydrogeochemical and stream sediment reconnaissance basic data report for Williams NTMS quadrangle, Arizona: U.S. Department of Energy Report GJBX-71(79), 74 p., 6 sheets, scale 1:250,000, 5 microfiche.

White, N.D., and Garrett, W.B., 1984, Water resources data, Arizona, Water year 1982: U.S. Geological Survey Water-Data Report AZ-82-1, 440 p.

White, N.D., and Garrett, W.B., 1986, Water resources data, Arizona, Water year 1983: U.S. Geological Survey Water-Data Report AZ-83-1, 387 p.

White, N.D., and Garrett, W.B., 1987, Water resources data, Arizona, Water year 1984: U.S. Geological Survey Water-Data Report AZ-84-1, 381 p.

White, N.D., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1985: U.S. Geological Survey Water-Data Report AZ-85-1, 343 p.

White, N.D., and others, 1967, Annual report on ground water in Arizona, Spring 1964 to Spring 1965: Arizona State Land Department Water Resources Report no. 24, 62 p.

White, N.D., Stulik, R.S., and others, 1962, Annual report on ground water in Arizona, Spring 1961 to Spring 1962: Arizona State Land Department Water Resources Report no. 11, 116 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1961, Annual report on ground water in Arizona, Spring 1960 to Spring 1961: Arizona State Land Department Water Resources Report no. 10, 93 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1963, Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, 136 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1964, Annual report on ground water in Arizona, Spring 1963 to Spring 1964: Arizona State Land Department Water Resources Report no. 19, 60 p.

Wilson, L.G., DeCook, K.J., and Neuman, S.P., 1980, Regional recharge research for southwest alluvial basins - Final report, U.S. Geological Survey contract 14-08-0001-18257: Tucson, University of Arizona, Water Resources Research Center, 389 p.

Wilson, R.P., 1990, Arizona water supply and use, *in* Carr, J.E., and others, National water summary, 1987 - Hydrologic events and water supply and uses: U.S. Geological Survey Water-Supply Paper 2350, p. 157-164.

Wilson, R.P., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1986: U.S. Geological Survey Water-Data Report AZ-86-1, 341 p.

Wilson, R.P., and Garrett, W.B., 1989, Water resources data, Arizona, Water year 1987: U.S. Geological Survey Water-Data Report AZ-87-1, 385 p.

Wilson, R.P., and Owen-Joyce, S.J., 1993, Determining the source of water pumped from wells along the lower Colorado River: U.S. Geological Survey Open-File Report 93-405, 2 p.

Wilson, R.P., and Owen-Joyce, S.J., 1994, Methods to identify wells that yield water that will be replaced by Colorado River water in Arizona, California, Nevada, and Utah: U.S. Geological Survey Water-Resources Investigations Report 94-4005, 36 p., 19 sheets, scale 1:100,000.

Witcher, J.C., Stone, Claudia, and Hahman, W.R., Sr., 1982, Geothermal resources of Arizona: Arizona Bureau of Geology and Mineral Technology [also listed as Arizona Geological Survey Map 15-2], 1 sheet, scale 1:500,000.

HUALAPAI VALLEY BASIN
GROUNDWATER HYDROLOGY BIBLIOGRAPHY

Anderson, T.W., 1979, Development of groundwater models of alluvial basins in south-central Arizona, *in* Arizona Water Symposium, 23rd and 24th annual, Phoenix, September 27, 1979, and September 24, 1980, Proceedings: Arizona Department of Water Resources Report no. 2, p. 13-17.

Anderson, T.W., 1980, Study plan for the Regional Aquifer-System Analysis of alluvial basins in south-central Arizona and adjacent states: U.S. Geological Survey Open-File Report 80-1197, 22 p.

Anderson, T.W., 1984, Southwest alluvial basins, RASA study - An overview, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, sponsored by the Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: New York, American Society of Civil Engineers, p. 606-614 [available for inspection at Arizona Geological Survey, 416 W. Congress, Suite 100, Tucson, Ariz.].

Anderson, T.W., 1986, Study in southern and central Arizona and parts of adjacent states, *in* Sun, R.J., ed., Regional Aquifer-System Analysis program of the U.S. Geological Survey, Summary of projects, 1978-84: U.S. Geological Survey Circular 1002, p. 116-131.

Anderson, T.W., 1986, Hydrologic setting, objectives, and approach of the southwest alluvial basins, RASA study, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 5-16.

Anderson, T.W., 1986, Geohydrology of the southwest alluvial basins, Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 99-111.

Anderson, T.W., 1995, Summary of the Southwest alluvial basins, Regional Aquifer-System Analysis, South-central Arizona and parts of adjacent states: U.S. Geological Survey Professional Paper 1406-A, p. A1-A33.

Anderson, T.W., and Freethey, G.W., 1995, Simulation of ground-water flow in alluvial basins in south-central Arizona and parts of adjacent states, Regional Aquifer-System Analysis: U.S. Geological Survey Professional Paper 1406-D, 78 p.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1990, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey Open-File Report 89-378, 99 p., 3 sheets, scale 1:1,000,000.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1992, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey Professional Paper 1406-B, p. B1-B67, 3 sheets, scale 1:1,000,000.

Anderson, T.W., and Johnson, A.I., eds., 1986, Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, 116 p.

Anderson, T.W., Welder, G.E., Lesser, Gustavo, and Trujillo, A., 1988, Region 7, Central alluvial basins, *in* Back, William, and others, eds., Hydrogeology: Geological Society of America, The Geology of North America, v. O-2, p. 81-86.

Anderson, T.W., and White, N.D., 1986, Arizona surface-water resources, *in* Moody, D.W., and others, comps., National water summary, 1985 - Hydrologic events and surface-water resources: U.S. Geological Survey Water-Supply Paper 2300, p. 145-150.

Anning, D.W., and Duet, N.R., 1994, Summary of ground-water conditions in Arizona, 1987-90: U.S. Geological Survey Open-File Report 94-476, 2 sheets, scales 1:1,000,000 and 1:2,500,000.

Arizona Department of Water Resources, 1990, Map showing Arizona groundwater basins with index of cities, towns, settlements and sites: Arizona Department of Water Resources Open File Report no. 7, 1 sheet, scale 1:1,000,000.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. I, Inventory and analysis: Arizona Department of Water Resources, 253 p.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. II, Hydrologic summary: Arizona Department of Water Resources, Hydrology Division, 236 [266] p.

Arizona Water Commission, 1975, Arizona State Water Plan, Phase 1, Inventory of resource and uses: Arizona Water Commission, 224 p., 2 sheets, approx. scale 1:670,000.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1967 to Spring 1968: Arizona State Land Department Water Resources Report no. 38, 54 p.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1968 to Spring 1969: Arizona State Land Department Water Resources Report no. 42, 46 p.

Babcock, H.M., 1970, Annual report on ground water in Arizona, Spring 1969 to Spring 1970: Arizona State Land Department Water Resources Report no. 43, 44 p.

Babcock, H.M., 1972, Annual report on ground water in Arizona, Spring 1970 to Spring 1971: Arizona Water Commission Bulletin 1, 45 p.

Babcock, H.M., 1972, Bibliography of U.S. Geological Survey water-resources reports for Arizona, May 1965 through June 1971: Arizona Water Commission Bulletin 2, 60 p.

Babcock, H.M., 1973, Annual report on ground water in Arizona, Spring 1971 to Spring 1972: Arizona Water Commission Bulletin 5, 48 p.

Babcock, H.M., 1974, Annual report on ground water in Arizona, Spring 1972 to Spring 1973: Arizona Water Commission Bulletin 7, 46 p., 3 sheets, scale 1:250,000.

Babcock, H.M., 1976, Annual summary of ground-water conditions in Arizona, Spring 1974 to Spring 1975: U.S. Geological Survey Water-Resources Investigations Open-File Report 76-59, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1976 to Spring 1977: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-106, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1975 to Spring 1976: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-10, 2 sheets, scale 1:1,000,000.

Bales, J.T., and Laney, R.L., 1992, Geohydrologic reconnaissance of Lake Mead National Recreation Area: Virgin River, Nevada, to Grand Wash Cliffs, Arizona: U.S. Geological Survey Water-Resources Investigations Report 91-4185, 29 p., 1 sheet, scale 1:62,500.

Bales, Jim, and Laney, R.L., 1987, Hydrogeology of the Lake Mead National Recreation Area, Arizona-Nevada [abs.]: Geological Society of America Abstracts with Programs, v. 19, no. 7, p. 578.

Bedinger, M.S., Anderson, T.W., and Langer, W.H., 1984, Maps showing ground-water units and withdrawal, Basin and Range Province, Arizona: U.S. Geological Survey Water-Resources Investigations Report 83-4114-A, 2 sheets, scales 1:500,000 and 1:1,000,000.

Bedinger, M.S., Langer, W.H., and Reed, J.E., 1984, Ground-water hydrology, in Bedinger, M.S. and others, eds., Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: U.S. Geological Survey Open-File Report 84-741, p. 98-114, 5 sheets 2, 3, and 4, scale 1:500,000.

Bedinger, M.S., Sargent, K.A., and Brady, B.T., 1985, Geologic and hydrologic characterization of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part III, Geologic and hydrologic evaluation: U.S. Geological Survey Circular 904-C, 27 p.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1984, Sonoran region, Arizona, *in* Bedinger, M.S. and others, Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: Evaluation of the regions: U.S. Geological Survey Open-File Report 84-745, p. 81-108, 2 sheets, scale 1:300,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States for isolation of high-level radioactive waste - Evaluation of the regions: U.S. Geological Survey Professional Paper 1370-H, p. H1-61, 7 plates, scale 1:1,000,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., eds., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States for isolation of high-level radioactive waste - Characterization of the Sonoran region, Arizona: U.S. Geological Survey Professional Paper 1370-D, p. D1-D40, 6 plates, scales 1:500,000 and 1:1,000,000.

Bedinger, M.S., Sargent, K.A., and Reed, J.E., 1984, Geologic and hydrologic characterization and evaluation of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part I, Introduction and guidelines: U.S. Geological Survey Circular 904-A, 16 p.

Boner, F.C., Garrett, W.B., and Konieczki, A.D., 1989, Water resources data, Arizona, Water year 1988: U.S. Geological Survey Water-Data Report AZ-88-1, 391 p.

Boner, F.C., Konieczki, A.D., and Davis, R.G., 1991, Water resources data, Arizona, Water year 1990: U.S. Geological Survey Water-Data Report AZ-90-1, 381 p.

Boner, F.C., Smith, C.F., Garrett, W.B., and Konieczki, A., 1990, Water resources data, Arizona, Water year 1989: U.S. Geological Survey Water-Data Report AZ-89-1, 391 p.

Briggs, P.C., and Nemecek, E.A., 1986, Technical aspects of Arizona groundwater law, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 93-98.

Brown, S.G., 1976, Preliminary maps showing ground-water resources in the lower Colorado River region, Arizona, Nevada, New Mexico, and Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-542, 1 sheet, scale 1:1,000,000.

Buol, S.W., 1964, Calculated actual and potential evapotranspiration in Arizona: Tucson, University of Arizona, Agricultural Experiment Station Technical Bulletin 162, 48 p.

Clark, T.C., 1975, The Arizona Water Plan, A status report, *in* Arizona Watershed Symposium, 19th annual, Phoenix, September 24, 1975, Proceedings: Arizona Water Commission Report no. 7, p. 9-23.

Cox, C.J., and others, 1968, Annual report on ground water in Arizona, Spring 1966 to Spring 1967: Arizona State Land Department Water Resources Report no. 36, 43 p.

Daniel, D.L., 1981, Maps showing total dissolved solids content of groundwater in Arizona: Arizona Department of Water Resources Hydrologic Map Series Report no. 2, 2 sheets, scale 1:1,000,000.

Davidson, E.S., 1979, Summary appraisals of the nation's ground-water resources - Lower Colorado region: U.S. Geological Survey Professional Paper 813-R, 23 p., 3 sheets, scale 1:1,000,000.

Evans, L.G., and Haimson, J.S., 1982, SWAB/RASA aquifer parameter study, Final report for U.S. Geological Survey contract 14-08-0001-18268: Arizona Department of Water Resources, 21 p.

Feth, J.H., and others, 1964, Preliminary map of the conterminous United States showing depth to and quality of shallowest ground water containing more than 1,000 parts per million dissolved solids: U.S. Geological Survey Hydrologic Investigations Atlas HA-199, 31 p., 2 sheets, scale 1:3,168,000.

Fields, R.L., 1986, Data-processing activities of the southwest alluvial basins, RASA study, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 17-23.

Freethey, G.W., 1986, Considerations in modeling ground-water flow in the alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 57-67.

Freethey, G.W., and Anderson, T.W., 1986, Predevelopment hydrologic conditions in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-664, 3 sheets, scale 1:500,000.

Freethey, G.W., Pool, D.R., Anderson, T.W., and Tucci, Patrick, 1986, Description and generalized distribution of aquifer materials in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-663, 4 sheets, scale 1:500,000.

Garrett, J.M., and Gellenbeck, D.J., 1991, Basin characteristics and streamflow statistics in Arizona as of 1989: U.S. Geological Survey Water-Resources Investigations Report 91-4041, 612 p.

Gillespie, J.B., and Bentley, C.B., 1971, Geohydrology of Hualapai and Sacramento Valleys, Mohave County, Arizona: U.S. Geological Survey Water-Supply Paper 1899-H, p. H1-H37, 2 sheets, scale 1:125,000.

Gillespie, J.B., Bentley, C.B., and Kam, W., 1966, Basic hydrologic data of the Hualapai, Sacramento, and Big Sandy Valleys, Mohave County, Arizona: Arizona State Land Department Water Resources Report no. 26, 39 p.

Hardt, W.F., Cahill, J.M., and Booher, M.B., 1958, Annual report on ground water in Arizona, Spring 1957 to Spring 1958: Arizona State Land Department Water Resources Report no. 5, 60 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1959, Annual report on ground water in Arizona, Spring 1958 to Spring 1959: Arizona State Land Department Water Resources Report no. 6, 61 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1960, Annual report on ground water in Arizona, Spring 1959 to Spring 1960: Arizona State Land Department Water Resources Report no. 7, [89] p.

Harshbarger, J.W., Lewis, D.D., Skibitzke, H.E., Heckler, W.L., and Kister, L.R., revised by H.L. Baldwin, 1966, Arizona water: U.S. Geological Survey Water-Supply Paper 1648, 85 p.

Hodges, E.B., and others, 1967, Annual report on ground water in Arizona, Spring 1965 to Spring 1966: Arizona State Land Department Water Resources Report no. 32, 61 p.

Holbert, K.E., Stewart, B.D., and Eshraghi, P., 1995, Measurement of radioactivity in Arizona groundwater using improved analytical techniques for samples with high dissolved solids: Health Physics, v. 68, no. 2, p. 185-194.

Huntoon, P.W., 1979, Reply to Discussion [by R.A. Young] of 'Cambrian stratigraphic nomenclature and ground-water prospecting failures on the Hualapai Plateau, Arizona' by P.W. Huntoon: Ground Water (Journal of Association of Ground Water Scientists and Engineers), v. 17, p. 287-291.

Huntoon, P.W., 1996, Large-basin ground water circulation and paleo-reconstruction of circulation leading to uranium mineralization in Grand Canyon breccia pipes, Arizona: Mountain Geologist, v. 33, no. 3, p. 71-84.

Johnson, Cady, and Glynn, Jack, 1982, National Uranium Resource Evaluation, Las Vegas quadrangle, Nevada, Arizona, and California: U.S. Department of Energy Report PGJ/F-121(82), 51 p., 5 microfiche, 16 sheets.

Lee, W.T., 1908, Geologic reconnaissance of a part of western Arizona, with notes on the Igneous rocks of western Arizona, by Albert Johannsen: U.S. Geological Survey Bulletin 352, 96 p.

Ligner, J.J., White, N.D., Kister, L.R., and Moss, M.E., 1969, Water resources: Part II of Mineral and water resources of Arizona: Arizona Bureau of Mines Bulletin 180, p. 471-580.

Longsworth, S.A., Van De Vanter, E.K., and Alwin, S.H., 1998, Activities of the Water Resources Division in Arizona, 1996-97: U.S. Geological Survey Open-File Report 98-185, 90 p.

Marie, J.R., Van De Vanter, E.K., and Moss, C.L., 1996, Activities of the Water Resources Division in Arizona, 1995-1996: U.S. Geological Survey Open-File Report 95-772, 69 p.

McGuinness, C.L., 1964, Generalized map showing annual runoff and productive aquifers in the conterminous United States: U.S. Geological Survey Hydrologic Investigations Atlas HA-194, scale 1:5,000,000.

Pataya Storage Company, 1981, Red Lake salt cavern gas storage project, Draft environmental impact statement - Docket no. CP 80-581: U.S. Federal Energy Regulatory Commission, 171 p.

Peirce, H.W., and Scurlock, J.R., 1972, Arizona well information: Arizona Bureau of Mines Bulletin 185, 195 p. [reprinted 1988, Arizona Geological Survey].

Pool, D.R., 1984, Aquifer geology of alluvial basins of Arizona, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 683-690.

Pool, D.R., 1986, Aquifer geology of alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 25-36.

Rauzi, S.L., 2002, Arizona has salt!: Arizona Geological Survey, Circular 30, 36 p.

Remick, W.H., 1981, Map showing ground-water conditions in the Hualapai Basin area, Mohave, Coconino, and Yavapai Counties, Arizona - 1980: Arizona Department of Water Resources Hydrologic Map Series Report no. 4, 1 sheet, scale 1:125,000.

Robertson, F.N., 1984, Trace elements in ground water in southern Arizona [abs.], *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 674.

Robertson, F.N., 1986, Occurrence and solubility controls of trace elements in ground water in alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 69-80.

Robertson, F.N., 1989, Ground-water geochemistry and information transfer in alluvial basins in Arizona [abs.], *in* International Geological Congress, 28th, Washington, D.C., July 9-19, 1989, Abstracts, V. 2: International Geological Congress, p. 2.709-2.710.

Robertson, F.N., 1989, Arsenic in ground-water under oxidizing conditions, south-west United States: Environmental Geochemistry and Health, v. 11, no. 3/4, p. 171-185.

Robertson, F.N., 1991, Geochemistry of ground-water in alluvial basins of Arizona and adjacent parts of Nevada, New Mexico, and California: U.S. Geological Survey Professional Paper 1406-C, p. C1-C90.

Robson, S.G., and Banta, E.R., 1995, Ground water atlas of the United States, Segment 2, Arizona, Colorado, New Mexico, Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-730-C, 32 p.

Sargent, K.A., and Bedinger, M.S., 1985, Geologic and hydrologic characterization and evaluation of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part II, Geologic and hydrologic characterization: U.S. Geological Survey Circular 904-B, 30 p.

Smith, C.F., Anning, D.W., Duet, N.R., Fisk, G.G., McCormack, H.F., Pope, G.L., Rigas, P.D., and Wallace, B.L., 1995, Water resources data, Arizona, Water year 1994: U.S. Geological Survey Water-Data Report AZ-94-1, 320 p.

Smith, C.F., Boner, F.C., Davis, R.G., Duet, N.R., and Rigas, P.D., 1993, Water resources data, Arizona, Water year 1992: U.S. Geological Survey Water-Data Report AZ-92-1, 360 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., and Rigas, P.D., 1997, Water resources data, Arizona, Water year 1996: U.S. Geological Survey Water-Data Report AZ-96-1, 328 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., Rigas, P.D., and Tadayon, S., 1996, Water resources data, Arizona, Water year 1995: U.S. Geological Survey Water-Data Report AZ-95-1, 306 p.

Smith, C.F., Rigas, P.D., Ham, L.K., Duet, N.R., and Anning, D.W., 1994, Water resources data, Arizona, Water year 1993: U.S. Geological Survey Water-Data Report AZ-93-1, 360 p.

Smith, G.E.P., 1938, The physiography of Arizona valleys and the occurrence of ground water: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Technical Bulletin no. 77, 91 p.

Smith, H.V., Caster, A.B., Fuller, W.H., Breazeale, E.L., and Draper, George, 1949, The chemical composition of representative Arizona waters: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Bulletin 225, 76 p.

Spicer, L.M., and Van De Vanter, E.K., comps., 1993, Activities of the Water Resources Division in Arizona, 1986-91: U.S. Geological Survey Open-File Report 93-165, 144 p.

Stone, Claudia, and Witcher, J.C., 1982, Geothermal energy in Arizona - Final contract report: Arizona Bureau of Geology and Mineral Technology Open-File Report 83-12, 398 p.

Texas Instruments, Inc., 1982, National Uranium Resource Evaluation, Variable premise evaluation system data report, Interpretation of hydrogeochemical and stream sediment reconnaissance data, Williams quadrangle, Arizona: U.S. Department of Energy Report GJD-93(81), 264 p.

Texas Instruments, Inc., 1982, National Uranium Resource Evaluation, Variable premise evaluation system data report, Interpretation of aerial radiometric reconnaissance data, Hydrogeochemical and stream sediment reconnaissance data, Grand Canyon quadrangle, Arizona: U.S. Department of Energy Report GJD-32(81), 210 p.

Thomas, H.E., 1956, Changes in quantities and qualities of ground and surface waters, in Thomas, W.L., Jr., ed., and others, Man's role in changing the face of the earth: University of Chicago Press, p. 542-563.

Twenter, F.R., 1962, Geology and promising areas for ground-water development in the Hualapai Indian Reservation, Arizona, *in* Water Supply of Indian Reservations: U.S. Geological Survey Water-Supply Paper 1576-A, 38 p., 1 sheet, scale 1:125,000.

U.S. Bureau of Reclamation, 1938-1947, Boulder Canyon Project: Final reports: Denver, U.S. Bureau of Reclamation, 7 parts in 12 volumes.

U.S. Geological Survey, [1965?], Water quality records in Arizona - 1964: U.S. Geological Survey, 80 p.

U.S. Geological Survey, [1966?], 1965 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 89 p.

U.S. Geological Survey, [1968?], 1967 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 85 p.

U.S. Geological Survey, 1971, 1971 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 167 p. [NTIS PB-287 165].

U.S. Geological Survey, 1972, 1972 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 166 p. [NTIS PB-287 167].

U.S. Geological Survey, 1972, Aeromagnetic map of the Gold Butte-Chloride area, Arizona and Nevada: U.S. Geological Survey Geophysical Investigations Map GP-0757, 2 sheets, scale 1:62,500.

U.S. Geological Survey, 1973, 1973 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 188 p. [NTIS PB-287 169].

U.S. Geological Survey, 1974, 1974 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 192 p. [NTIS PB-287 171].

U.S. Geological Survey, 1976, Water resources data for Arizona, Water year 1975: U.S. Geological Survey Water-Data Report AZ-75-1, 440 p.

U.S. Geological Survey, 1978, Water resources data for Arizona, Water year 1977: U.S. Geological Survey Water-Data Report AZ-77-1, 550 p.

U.S. Geological Survey, 1978, Annual summary of ground-water conditions in Arizona, Spring 1977 to Spring 1978: U.S. Geological Survey Water-Resources Investigations Open-File Report WRI 78-0144, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1979, Water resources data for Arizona, Water year 1978: U.S. Geological Survey Water-Data Report AZ-78-1, 604 p.

U.S. Geological Survey, 1979, Land use and land cover and associated maps for Grand Canyon, Arizona: U.S. Geological Survey Open-File Report 79-1494, 5 sheets, scale 1:250,000.

U.S. Geological Survey, 1980, Water resources data for Arizona, Water year 1979: U.S. Geological Survey Water-Data Report AZ-79-1, 614 p.

U.S. Geological Survey, 1980, Annual summary of ground-water conditions in Arizona, Spring 1978 to Spring 1979: U.S. Geological Survey Water-Resources Investigations Open-File Report 80-330, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1981, Annual summary of ground-water conditions in Arizona, Spring 1979 to Spring 1980: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-906, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Annual summary of ground-water conditions in Arizona, Spring 1980 to Spring 1981: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Water resources data for Arizona, Water year 1980: U.S. Geological Survey Water-Data Report AZ-80-1, 568 p.

U.S. Geological Survey, 1983, Water resources data, Arizona, Water year 1981: U.S. Geological Survey Water-Data Report AZ-81-1, 532 p.

U.S. Geological Survey, 1983, Annual summary of ground-water conditions in Arizona, Spring 1981 to Spring 1982: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scales 1:1,000,000 and 1:3,200,000.

U.S. Geological Survey, 1984, Annual summary of ground-water conditions in Arizona, Spring 1982 to Spring 1983: U.S. Geological Survey Water-Resources Investigations Open-File Report 84-428, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

U.S. Geological Survey, 1985, Annual summary of ground-water conditions in Arizona, Spring 1983 to Spring 1984: U.S. Geological Survey Water-Resources Investigations Open-File Report 85-410, 2 sheets, scales 1:1,000,000 and 1:3,400,000.

U.S. Geological Survey, 1986, Annual summary of ground-water conditions in Arizona, Spring 1984 to Spring 1985: U.S. Geological Survey Water-Resources Investigations Open-File Report 86-422W, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

White, N.D., and Garrett, W.B., 1984, Water resources data, Arizona, Water year 1982: U.S. Geological Survey Water-Data Report AZ-82-1, 440 p.

White, N.D., and Garrett, W.B., 1986, Water resources data, Arizona, Water year 1983: U.S. Geological Survey Water-Data Report AZ-83-1, 387 p.

White, N.D., and Garrett, W.B., 1987, Water resources data, Arizona, Water year 1984: U.S. Geological Survey Water-Data Report AZ-84-1, 381 p.

White, N.D., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1985: U.S. Geological Survey Water-Data Report AZ-85-1, 343 p.

White, N.D., and others, 1967, Annual report on ground water in Arizona, Spring 1964 to Spring 1965: Arizona State Land Department Water Resources Report no. 24, 62 p.

White, N.D., Stulik, R.S., and others, 1962, Annual report on ground water in Arizona, Spring 1961 to Spring 1962: Arizona State Land Department Water Resources Report no. 11, 116 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1961, Annual report on ground water in Arizona, Spring 1960 to Spring 1961: Arizona State Land Department Water Resources Report no. 10, 93 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1963, Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, 136 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1964, Annual report on ground water in Arizona, Spring 1963 to Spring 1964: Arizona State Land Department Water Resources Report no. 19, 60 p.

Wilson, L.G., DeCook, K.J., and Neuman, S.P., 1980, Regional recharge research for southwest alluvial basins - Final report, U.S. Geological Survey contract 14-08-0001-18257: Tucson, University of Arizona, Water Resources Research Center, 389 p.

Wilson, R.P., 1990, Arizona water supply and use, *in* Carr, J.E., and others, National water summary, 1987 - Hydrologic events and water supply and uses: U.S. Geological Survey Water-Supply Paper 2350, p. 157-164.

Wilson, R.P., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1986: U.S. Geological Survey Water-Data Report AZ-86-1, 341 p.

Wilson, R.P., and Garrett, W.B., 1989, Water resources data, Arizona, Water year 1987: U.S. Geological Survey Water-Data Report AZ-87-1, 385 p.

Witcher, J.C., Stone, Claudia, and Hahman, W.R., Sr., 1982, Geothermal resources of Arizona: Arizona Bureau of Geology and Mineral Technology [also listed as Arizona Geological Survey Map 15-2], 1 sheet, scale 1:500,000.

Woesner, W.M., 1982, Groundwater and surface water interaction in Echo Bay detected by seepage meter and portable piezometer, Lake Mead National Recreation Area, Arizona and Nevada [abs.]: Geological Society of America Abstracts with Programs, v. 14, no. 6, p. 354-355.

Young, R.A., 1966, Cenozoic geology along the edge of the Colorado Plateau in northwestern Arizona: St. Louis, Mo., Washington University, Ph.D. dissertation, 167 p., 4 sheets, scale 1:31,680; abstract in Dissertation Abstracts International, v. 27, p. 1994B-1995B.

KANAB PLATEAU BASIN

GROUNDWATER HYDROLOGY BIBLIOGRAPHY

Ackerman, E.A., and Lof, G.O.G., with C. Seipp, 1959, Technology in American water development: Baltimore, Md., Johns Hopkins Press for The Future, Inc., 709 p.

Adler, H.H., 1963, Concepts of genesis of sandstone-type uranium ore deposits: Economic Geology, v. 58, no. 6, p. 839-852.

Adler, H.H., 1974, Concepts of uranium-ore formation in reducing environments in sandstones and other sediments [IAEA-SM-183/43], *in* Formation of uranium ore deposits, Proceedings of a symposium on the Formation of uranium ore deposits: Vienna, International Atomic Energy Agency, Proceedings Series, STI/PUB/374, p. 141-168.

Akers, J.P., 1962, Coconino County, *in* Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, p. 122-125.

Anderson, T.W., 1986, Geohydrology of the southwest alluvial basins, Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 99-111.

Anderson, T.W., and White, N.D., 1986, Arizona surface-water resources, *in* Moody, D.W., and others, comps., National water summary, 1985 - Hydrologic events and surface-water resources: U.S. Geological Survey Water-Supply Paper 2300, p. 145-150.

Anning, D.W., and Duet, N.R., 1994, Summary of ground-water conditions in Arizona, 1987-90: U.S. Geological Survey Open-File Report 94-476, 2 sheets, scales 1:1,000,000 and 1:2,500,000.

Arizona Department of Water Resources, 1990, Map showing Arizona groundwater basins with index of cities, towns, settlements and sites: Arizona Department of Water Resources Open File Report no. 7, 1 sheet, scale 1:1,000,000.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. I, Inventory and analysis: Arizona Department of Water Resources, 253 p.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. II, Hydrologic summary: Arizona Department of Water Resources, Hydrology Division, 236 [266] p.

Arizona Water Commission, 1975, Arizona State Water Plan, Phase 1, Inventory of resource and uses: Arizona Water Commission, 224 p., 2 sheets, approx. scale 1:670,000.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1967 to Spring 1968: Arizona State Land Department Water Resources Report no. 38, 54 p.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1968 to Spring 1969: Arizona State Land Department Water Resources Report no. 42, 46 p.

Babcock, H.M., 1970, Annual report on ground water in Arizona, Spring 1969 to Spring 1970: Arizona State Land Department Water Resources Report no. 43, 44 p.

Babcock, H.M., 1972, Annual report on ground water in Arizona, Spring 1970 to Spring 1971: Arizona Water Commission Bulletin 1, 45 p.

Babcock, H.M., 1972, Bibliography of U.S. Geological Survey water-resources reports for Arizona, May 1965 through June 1971: Arizona Water Commission Bulletin 2, 60 p.

Babcock, H.M., 1973, Annual report on ground water in Arizona, Spring 1971 to Spring 1972: Arizona Water Commission Bulletin 5, 48 p.

Babcock, H.M., 1974, Annual report on ground water in Arizona, Spring 1972 to Spring 1973: Arizona Water Commission Bulletin 7, 46 p., 3 sheets, scale 1:250,000.

Babcock, H.M., 1976, Annual summary of ground-water conditions in Arizona, Spring 1974 to Spring 1975: U.S. Geological Survey Water-Resources Investigations Open-File Report 76-59, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1976 to Spring 1977: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-106, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1975 to Spring 1976: U.S. Geological Survey Water-Resources Investigations Open-File Report WRI 77-10, 2 sheets, scale 1:1,000,000.

Beck, G.L., 1967, Quantitative analysis of the Muav aquifer, Grand Canyon National Park, Arizona [abs.]: National Speleological Society Bulletin, v. 29, p. 105-106.

Beck, G.L., 1968, Quantitative analysis of the Muav aquifer, Grand Canyon National Park, Arizona [abs.], *in* Abstracts for 1966: Geological Society of America Special Paper 101, p. 431.

Beck, G.L., and Dunn, J.R., 1967, A preliminary report on the Muav aquifer, Grand Canyon, Arizona [abs.]: National Speleological Society Bulletin, v. 29, p. 97.

Bennett, J.B., Parnell, R.A., Meyer, W.A., Black, C.R., Petroutson, William, and Webb, K.T., 1994, Impacts of flow regulation of the Colorado River on biogeochemical cycling in riparian environments, Grand Canyon National Park, Az. [abs.]: Geological Society of America Abstracts with Programs, v. 26, no. 7, p. A.99.

Beus, S.S., and Morales, Michael, eds., 1990, Grand Canyon geology: New York, Oxford University Press, 518 p.

Boner, F.C., Garrett, W.B., and Konieczki, A.D., 1989, Water resources data, Arizona, Water year 1988: U.S. Geological Survey Water-Data Report AZ-88-1, 391 p.

Boner, F.C., Konieczki, A.D., and Davis, R.G., 1991, Water resources data, Arizona, Water year 1990: U.S. Geological Survey Water-Data Report AZ-90-1, 381 p.

Boner, F.C., Smith, C.F., Garrett, W.B., and Konieczki, A., 1990, Water resources data, Arizona, Water year 1989: U.S. Geological Survey Water-Data Report AZ-89-1, 391 p.

Brown, S.G., 1976, Preliminary maps showing ground-water resources in the lower Colorado River region, Arizona, Nevada, New Mexico, and Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-542, 1 sheet, scale 1:1,000,000.

Buol, S.W., 1964, Calculated actual and potential evapotranspiration in Arizona: Tucson, University of Arizona, Agricultural Experiment Station Technical Bulletin 162, 48 p.

Cadigan, R.A., and Felmlee, J.K., 1978, Radioactive spring site guides to uranium in southwestern United States, *in* Geological Survey research 1978: U.S. Geological Survey Professional Paper 1100, p. 12.

Chapman, D.S., Furlong, K.P., Smith, R.B., and Wechsler, D.J., 1978, Geophysical characteristics of the Colorado Plateau and its transition to the Basin and Range province in Utah [abs.], *in* Papers presented to the Conference on Plateau Uplift: Mode and Mechanism, A Lunar and Planetary Institute Topical Conference: Houston, Lunar and Planetary Institute, LPI Contribution 329, p. 10-11.

Clark, T.C., 1975, The Arizona Water Plan, A status report, *in* Arizona Watershed Symposium, 19th annual, Phoenix, September 24, 1975, Proceedings: Arizona Water Commission Report no. 7, p. 9-23.

Cooley, M.E., 1963, Hydrology of the Plateau Uplands Province, *in* White, N.D., and others, Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, p. 27-38.

Cox, C.J., and others, 1968, Annual report on ground water in Arizona, Spring 1966 to Spring 1967: Arizona State Land Department Water Resources Report no. 36, 43 p.

Daniel, D.L., 1981, Maps showing total dissolved solids content of groundwater in Arizona: Arizona Department of Water Resources Hydrologic Map Series Report no. 2, 2 sheets, scale 1:1,000,000.

Davidson, E.S., 1979, Summary appraisals of the nation's ground-water resources - Lower Colorado region: U.S. Geological Survey Professional Paper 813-R, 23 p., 3 sheets, scale 1:1,000,000.

Felmlee, J.K., and Cadigan, R.A., 1978, Radium and uranium data for mineral springs in eight western states: U.S. Geological Survey Open-File Report 78-0561, 45 p.

Feth, J.H., and others, 1964, Preliminary map of the conterminous United States showing depth to and quality of shallowest ground water containing more than 1,000 parts per million dissolved solids: U.S. Geological Survey Hydrologic Investigations Atlas HA-199, 31 p., 2 sheets, scale 1:3,168,000.

Foster, K.E., and DeCook, K.J., 1980, Groundwater exploration in northeastern Arizona using Landsat imagery, in Harwood, Gerald, ed., Hydrology and water resources in Arizona and the Southwest, V. 10: American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, Annual Meeting, Las Vegas, Nev., 1980, Proceedings, p. 187-192.

Garrett, J.M., and Gellenbeck, D.J., 1991, Basin characteristics and streamflow statistics in Arizona as of 1989: U.S. Geological Survey Water-Resources Investigations Report 91-4041, 612 p.

Gauger, R.W., 1996, River-stage data, Colorado River, Glen Canyon Dam to upper Lake Mead, Arizona, 1990-94: U.S. Geological Survey Open-File Report 96-626, 20 p.

Geldon, A.L., 1988, Ground-water systems in Paleozoic rocks of the upper Colorado River basin, Arizona, Colorado, Utah, and Wyoming [abs.]: Geological Society of America Abstracts with Programs, v. 20, no. 7, p. A172.

Goetz, A.F.H., Billingsley, F.C., Gillespie, A.R., Abrams, M.J., Squires, R.L., Shoemaker, E.M., Lucchitta, I., and Elston, D.P., 1975, Application of ERTS images and image processing to regional geologic problems and geologic mapping in northern Arizona: Pasadena, California Institute of Technology, Jet Propulsion Laboratory Technical Report 32-1597, 188 p.

Gregory, H.E., 1950, Geology and geography of the Zion Park region, Utah and Arizona: U.S. Geological Survey Professional Paper 220, 200 p., 5 sheets, scale 1:125,000.

Griffiths, P.G., Webb, R.H., and Melis, T.S., 1996, Initiation and frequency of debris flows in Grand Canyon, Arizona: U.S. Geological Survey Open-File Report 96-491, 35 p.

Hahman, W.R., Sr., Stone, C., and Witcher, J.C., comps., 1978, Preliminary map - Geothermal energy resources of Arizona: Arizona Bureau of Geology and Mineral Technology Geothermal Map No. 1 [also listed as Arizona Geological Survey Map 15-1], 1 sheet, scale 1:1,000,000.

Hardt, W.F., Cahill, J.M., and Booher, M.B., 1958, Annual report on ground water in Arizona, Spring 1957 to Spring 1958: Arizona State Land Department Water Resources Report no. 5, 60 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1959, Annual report on ground water in Arizona, Spring 1958 to Spring 1959: Arizona State Land Department Water Resources Report no. 6, 61 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1960, Annual report on ground water in Arizona, Spring 1959 to Spring 1960: Arizona State Land Department Water Resources Report no. 7, [89] p.

Harshbarger, J.W., 1970, Source, movement and development of water in arid regions, *in* Peters, W.C., ed., Conference on mining and ecology in the arid environment, Tucson, Ariz., 1970, Proceedings: Tucson, Ariz, Department of Mining and Geological Engineering, College of Mines, University of Arizona, p. 122-134.

Harshbarger, J.W., Lewis, D.D., Skibitzke, H.E., Heckler, W.L., and Kister, L.R., revised by H.L. Baldwin, 1966, Arizona water: U.S. Geological Survey Water-Supply Paper 1648, 85 p.

Heilweil, V.M., and Freethey, G.W., 1992, Simulation of ground-water flow and water-level declines that could be caused by proposed withdrawals, Navajo Sandstone, southwestern Utah and northwestern Arizona: U.S. Geological Survey Water-Resources Investigations Report 90-4105, 51 p., 3 sheets, scale 1:250,000.

Helmstaedt, H., and Schultze, D.J., 1978, Petrologic constraints for upper mantle models of the Colorado Plateau [abs.], in Papers presented to the Conference on Plateau Uplift: Mode and Mechanism, A Lunar and Planetary Institute Topical Conference: Houston, Lunar and Planetary Institute, LPI Contribution 329, p. 16-18.

Hem, J.D., 1985, Study and interpretation of the chemical characteristics of natural water: U.S. Geological Survey Water-Supply Paper 2254, 263 p., 4 sheets.

Hodges, E.B., and others, 1967, Annual report on ground water in Arizona, Spring 1965 to Spring 1966: Arizona State Land Department Water Resources Report no. 32, 61 p.

Huntoon, P.W., 1967, Karst springs in the Tapeats Amphitheater, Grand Canyon [abs.]: Caves and Karst, v. 9, p. 50.

Huntoon, P.W., 1968, Hydrogeology of the Tapeats amphitheater and Deer Basin, Grand Canyon, Arizona - A study in karst hydrology: Tucson, University of Arizona, M.S. thesis, 124 p.

Huntoon, P.W., 1970, The hydro-mechanics of the ground water system in the southern portion of the Kaibab plateau, Arizona: Tucson, University of Arizona, Ph.D. dissertation, 381 p.

Huntoon, P.W., 1974, The karstic groundwater basins of the Kaibab Plateau, Arizona: Water Resources Research, v. 10, no. 3, p. 579-590.

Huntoon, P.W., 1977, Relationship of tectonic structure to aquifer mechanics in the western Grand Canyon district, Arizona - Completion report, Project B-31-WYO (14-34-0001-6134) to Office of Water Research and Technology, U.S. Department of the Interior: Laramie, University of Wyoming, Water Resources Institute, Water Resources Series no. 66, 51 p., 2 sheets, scale 1:125,000.

Huntoon, P.W., 1981, Fault controlled ground-water circulation under the Colorado River, Marble Canyon, Arizona: Ground Water (Journal of Association of Ground Water Scientists and Engineers), v. 19, p. 20-27.

Huntoon, P.W., 1986, Ground water flow directions in Colorado Plateau breccia pipes [abs.]: Geological Society of America Abstracts with Programs, v. 18, no. 5, p. 363.

Huntoon, P.W., 1996, Large-basin ground water circulation and paleo-reconstruction of circulation leading to uranium mineralization in Grand Canyon breccia pipes, Arizona: Mountain Geologist, v. 33, no. 3, p. 71-84.

Johnson, P.W., and Sanderson, R.B., 1968, Spring flow into the Colorado River, Lees Ferry to Lake Mead, Arizona: Arizona State Land Department Water Resources Report no. 34, 26 p.

Keller, G.R., Braile, L.W., and Morgan, P., 1978, Regional crustal structure of the Colorado Plateau [abs.], *in* Papers presented to the Conference on Plateau Uplift: Mode and Mechanism, A Lunar and Planetary Institute Topical Conference: Houston, Lunar and Planetary Institute, LPI Contribution 329, p. 26.

Koller, G.R., 1980, Grand Canyon 1° x 2° NTMS area, Arizona, Data report, National Uranium Resource Evaluation Program, Hydrogeochemical and stream sediment reconnaissance: U.S. Department of Energy Report GJBX-142(80), 49 p., 1 sheet, scale 1:250,000, 9 microfiche.

Levings, G.W., and Farrar, C.D., 1978, Map showing ground-water conditions in the House Rock area, Coconino County, Arizona - 1976: U.S. Geological Survey Water-Resources Investigations Open-File Report 78-15, 1 sheet, scale 1:125,000.

Levings, G.W., and Farrar, C.D., 1979, Maps showing ground-water conditions in the Kanab area, Coconino and Mohave Counties, Arizona--1976: U.S. Geological Survey Water-Resources Investigations Open-File Report 79-1070, 2 sheets, scale 1:125,000.

Ligner, J.J., White, N.D., Kister, L.R., and Moss, M.E., 1969, Water resources: Part II of Mineral and water resources of Arizona: Arizona Bureau of Mines Bulletin 180, p. 471-580.

Lohman, S.W., and Petersen, M.S., 1972, Water, *in* Mallory, W.W., ed.-in-chief, Geologic atlas of the Rocky Mountain region: Denver, Rocky Mountain Association of Geologists, p. 324-327.

Longsworth, S.A., Van De Vanter, E.K., and Alwin, S.H., 1998, Activities of the Water Resources Division in Arizona, 1996-97: U.S. Geological Survey Open-File Report 98-185, 90 p.

Marie, J.R., Van De Vanter, E.K., and Moss, C.L., 1996, Activities of the Water Resources Division in Arizona, 1995-1996: U.S. Geological Survey Open-File Report 95-772, 69 p.

McGuinness, C.L., 1964, Generalized map showing annual runoff and productive aquifers in the conterminous United States: U.S. Geological Survey Hydrologic Investigations Atlas HA-194, scale 1:5,000,000.

Metzger, D.G., 1961, Geology in relation to availability of water along the South Rim, Grand Canyon National Park, Arizona: U.S. Geological Survey Water-Supply Paper 1475-C, p. 105-138, 2 sheets, scale 1:125,000.

Morganthau, T., 1983, The Colorado - Man-made flood: Newsweek, v. 102, p. 28.

Ortiz, N.V., Ferentchak, J.A., Ethridge, F.G., Granger, H.C., and Sunada, D.K., 1980, Ground-water flow and uranium in Colorado Plateau: Ground Water, v. 18, no. 6, p. 596-606.

Pederson, J.L., 1994, Sedimentology of separation deposits along the Colorado River, Grand Canyon: Upper recirculation zone hydrodynamics and sand bar preservation [abs.]: Geological Society of America Abstracts with Programs, v. 26, no. 7, p. A.493.

Peirce, H.W., and Scurlock, J.R., 1972, Arizona well information: Arizona Bureau of Mines Bulletin 185, 195 p. [reprinted 1988, Arizona Geological Survey].

Petroutson, W.D., Bennett, J.B., Parnell, R.A., and Springer, A.E., 1995, Hydraulic-conductivity measurements of reattachment bars on the Colorado River, in Baker, M.B., Jr., and Avery, C.C., eds., Hydrology and water resources in Arizona and the Southwest, V. 22-25: American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, Annual Meeting, Flagstaff, Ariz., 1995, Proceedings, p. 7-10.

Pope, G.L., Rigas, P.D., and Smith, C.F., 1998, Statistical summaries of streamflow data and characteristics of drainage basins for selected streamflow-gaging stations in Arizona through water year 1996: U.S. Geological Survey Water-Resources Investigations Report 98-4225, 907 p.

Reilly, P.T., 1967, The pirated spring at Stanton's Cave: Cave Notes [Cave Research Associates, Castro Valley, Calif.], v. 9, p. 5.

Reiter, M., Mansure, A.J., and Shearer, C., 1978, Geothermal characteristics of the Colorado Plateau [abs.], *in* Papers presented to the Conference on Plateau Uplift: Mode and Mechanism, A Lunar and Planetary Institute Topical Conference: Houston, Lunar and Planetary Institute, LPI Contribution 329, p. 43.

Robertson, F.N., 1989, Ground-water geochemistry and information transfer in alluvial basins in Arizona [abs.], *in* International Geological Congress, 28th, Washington, D.C., July 9-19, 1989, Abstracts, V. 2: International Geological Congress, p. 2.709-2.710.

Robson, S.G., and Banta, E.R., 1995, Ground water atlas of the United States, Segment 2, Arizona, Colorado, New Mexico, Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-730-C, 32 p.

Scott, R.C., and Barker, F.B., 1962, Data on uranium and radium in ground water in the United States 1954 to 1957: U.S. Geological Survey Professional Paper 426, 115 p., 2 sheets, scale 1:7,000,000.

Smith, C.F., Anning, D.W., Duet, N.R., Fisk, G.G., McCormack, H.F., Pope, G.L., Rigas, P.D., and Wallace, B.L., 1995, Water resources data, Arizona, Water year 1994: U.S. Geological Survey Water-Data Report AZ-94-1, 320 p.

Smith, C.F., Boner, F.C., Davis, R.G., Duet, N.R., and Rigas, P.D., 1993, Water resources data, Arizona, Water year 1992: U.S. Geological Survey Water-Data Report AZ-92-1, 360 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., and Rigas, P.D., 1997, Water resources data, Arizona, Water year 1996: U.S. Geological Survey Water-Data Report AZ-96-1, 328 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., Rigas, P.D., and Tadayon, S., 1996, Water resources data, Arizona, Water year 1995: U.S. Geological Survey Water-Data Report AZ-95-1, 306 p.

Smith, C.F., Rigas, P.D., Ham, L.K., Duet, N.R., and Anning, D.W., 1994, Water resources data, Arizona, Water year 1993: U.S. Geological Survey Water-Data Report AZ-93-1, 360 p.

Smith, H.V., Caster, A.B., Fuller, W.H., Breazeale, E.L., and Draper, George, 1949, The chemical composition of representative Arizona waters: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Bulletin 225, 76 p.

Spamer, E.E., 1989, The development of geological studies in the Grand Canyon - Prepared for the 28th International Geological Congress Colorado River field trips through the Grand Canyon, Lees Ferry to Temple Bar, Lake Mead, Arizona, June-July 1989: Tryonia, no. 17 (Contribution of the Invertebrate Paleontology Section, no. 1), 87 p.

Spicer, L.M., and Van De Vanter, E.K., comps., 1993, Activities of the Water Resources Division in Arizona, 1986-91: U.S. Geological Survey Open-File Report 93-165, 144 p.

Stone, Claudia, and Witcher, J.C., 1982, Geothermal energy in Arizona - Final contract report: Arizona Bureau of Geology and Mineral Technology Open-File Report 83-12, 398 p.

Stover, C.W., 1986, Seismicity map of the conterminous United States and adjacent areas, 1975-1984: U.S. Geological Survey Geophysical Investigations Map GP-984, 1 sheet, scale 1:5,000,000.

Swanberg, C.A., and Morgan, Paul, 1985, Silica heat flow estimates and heat flow in the Colorado Plateau and adjacent areas: Journal of Geodynamics, v. 3, no. 1/2, p. 65-85.

Taylor, O.J., Freethey, Geoffrey, and Glover, K.C., 1986, Upper Colorado River Basin regional aquifer-system study, *in* Sun, R.J., ed., Regional Aquifer-System Analysis program of the U.S. Geological Survey, Summary of projects, 1978-84: U.S. Geological Survey Circular 1002, p. 223-233.

Texas Instruments, Inc., 1982, National Uranium Resource Evaluation, Variable premise evaluation system data report, Interpretation of aerial radiometric reconnaissance data, Hydrogeochemical and stream sediment reconnaissance data, Grand Canyon quadrangle, Arizona: U.S. Department of Energy Report GJD-32(81), 210 p.

Thomas, B.E., Hjalmarson, H.W., and Waltemeyer, S.D., 1994, Methods for estimating magnitude and frequency of floods in the southwestern United States: U.S. Geological Survey Open-File Report 93-419, 211 p.

Thomas, B.E., Hjalmarson, H.W., and Waltemeyer, S.D., 1997, Methods for estimating magnitude and frequency of floods in the southwestern United States: U.S. Geological Survey Water-Supply Paper 2433, 195 p.

Thomas, H.E., 1960, Drainage basin tributary to Lake Mead, *in* Smith, W.O., and others, Comprehensive survey of sedimentation in Lake Mead, 1948-49: U.S. Geological Survey Professional Paper 295, p. 21-30.

Truini, Margot, 1999, Geohydrology of Pipe Spring National Monument area, Arizona: U.S. Geological Survey Water-Resources Investigations Report 98-4263, 25 p.

U.S. Geological Survey, [1965?], Water quality records in Arizona - 1964: U.S. Geological Survey, 80 p.

U.S. Geological Survey, [1966?], 1965 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 89 p.

U.S. Geological Survey, [1968?], 1967 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 85 p.

U.S. Geological Survey, 1971, 1971 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 167 p. [NTIS PB-287 165].

U.S. Geological Survey, 1972, 1972 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 166 p. [NTIS PB-287 167].

U.S. Geological Survey, 1973, 1973 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 188 p. [NTIS PB-287 169].

U.S. Geological Survey, 1974, 1974 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 192 p. [NTIS PB-287 171].

U.S. Geological Survey, 1976, Water resources data for Arizona, Water year 1975: U.S. Geological Survey Water-Data Report AZ-75-1, 440 p.

U.S. Geological Survey, 1978, Water resources data for Arizona, Water year 1977: U.S. Geological Survey Water-Data Report AZ-77-1, 550 p.

U.S. Geological Survey, 1978, Annual summary of ground-water conditions in Arizona, Spring 1977 to Spring 1978: U.S. Geological Survey Water-Resources Investigations Open-File Report WRI 78-144, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1979, Water resources data for Arizona, Water year 1978: U.S. Geological Survey Water-Data Report AZ-78-1, 604 p.

U.S. Geological Survey, 1979, Land use and land cover and associated maps for Grand Canyon, Arizona: U.S. Geological Survey Open-File Report 79-1494, 5 sheets, scale 1:250,000.

U.S. Geological Survey, 1980, Water resources data for Arizona, Water year 1979: U.S. Geological Survey Water-Data Report AZ-79-1, 614 p.

U.S. Geological Survey, 1980, Annual summary of ground-water conditions in Arizona, Spring 1978 to Spring 1979: U.S. Geological Survey Water-Resources Investigations Open-File Report WRI 80-330, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1981, Annual summary of ground-water conditions in Arizona, Spring 1979 to Spring 1980: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-906, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Annual summary of ground-water conditions in Arizona, Spring 1980 to Spring 1981: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Water resources data for Arizona, Water year 1980: U.S. Geological Survey Water-Data Report AZ-80-1, 568 p.

U.S. Geological Survey, 1983, Water resources data, Arizona, Water year 1981: U.S. Geological Survey Water-Data Report AZ-81-1, 532 p.

U.S. Geological Survey, 1983, Annual summary of ground-water conditions in Arizona, Spring 1981 to Spring 1982: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scales 1:1,000,000 and 1:3,200,000.

U.S. Geological Survey, 1984, Annual summary of ground-water conditions in Arizona, Spring 1982 to Spring 1983: U.S. Geological Survey Water-Resources Investigations Open-File Report 84-428, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

U.S. Geological Survey, 1985, Annual summary of ground-water conditions in Arizona, Spring 1983 to Spring 1984: U.S. Geological Survey Water-Resources Investigations Open-File Report 85-410, 2 sheets, scales 1:1,000,000 and 1:3,400,000.

U.S. Geological Survey, 1986, Annual summary of ground-water conditions in Arizona, Spring 1984 to Spring 1985: U.S. Geological Survey Water-Resources Investigations Open-File Report 86-422W, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

Webb, R.H., Melis, T.S., Wise, T.W., and Elliott, J.G., 1996, "The Great Cataract": Effects of Late Holocene debris flows on Lava Falls Rapid, Grand Canyon National Park and Hualapai Indian Reservation, Arizona: U.S. Geological Survey Open-File Report 96-460, 96 p., 1 sheet, scale 1:1,000.

Wells, J.D., 1959, Preliminary geologic map of the House Rock Spring SE [House Rock Spring] quadrangle, Coconino County, Arizona: U.S. Geological Survey Mineral Investigations Field Studies Map MF-189, 1 sheet, scale 1:24,000.

White, N.D., and others, 1967, Annual report on ground water in Arizona, Spring 1964 to Spring 1965: Arizona State Land Department Water Resources Report no. 24, 62 p.

White, N.D., and Garrett, W.B., 1984, Water resources data, Arizona, Water year 1982: U.S. Geological Survey Water-Data Report AZ-82-1, 440 p.

White, N.D., and Garrett, W.B., 1986, Water resources data, Arizona, Water year 1983: U.S. Geological Survey Water-Data Report AZ-83-1, 387 p.

White, N.D., and Garrett, W.B., 1987, Water resources data, Arizona, Water year 1984: U.S. Geological Survey Water-Data Report AZ-84-1, 381 p.

White, N.D., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1985: U.S. Geological Survey Water-Data Report AZ-85-1, 343 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1961, Annual report on ground water in Arizona, Spring 1960 to Spring 1961: Arizona State Land Department Water Resources Report no. 10, 93 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1963, Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, 136 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1964, Annual report on ground water in Arizona, Spring 1963 to Spring 1964: Arizona State Land Department Water Resources Report no. 19, 60 p.

White, N.D., Stulik, R.S., and others, 1962, Annual report on ground water in Arizona, Spring 1961 to Spring 1962: Arizona State Land Department Water Resources Report no. 11, 116 p.

Wilson, R.P., 1990, Arizona water supply and use, *in* Carr, J.E., and others, National water summary, 1987 - Hydrologic events and water supply and uses: U.S. Geological Survey Water-Supply Paper 2350, p. 157-164.

Wilson, R.P., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1986: U.S. Geological Survey Water-Data Report AZ-86-1, 341 p.

Wilson, R.P., and Garrett, W.B., 1989, Water resources data, Arizona, Water year 1987: U.S. Geological Survey Water-Data Report AZ-87-1, 385 p.

Witcher, J.C., Stone, Claudia, and Hahman, W.R., Sr., 1982, Geothermal resources of Arizona: Arizona Bureau of Geology and Mineral Technology [also listed as Arizona Geological Survey Map 15-2], 1 sheet, scale 1:500,000.

Zukosky, K.A., 1995, An assessment of the potential to use water chemistry parameters to define ground water flow pathways at Grand Canyon National Park, Arizona: Las Vegas, University of Nevada, M.S. thesis, 105 p.

LAKE HAVASU BASIN
GROUNDWATER HYDROLOGY BILIOGRAPHY

Anderson, T.W., 1979, Development of groundwater models of alluvial basins in south-central Arizona, *in* Arizona Water Symposium, 23rd and 24th annual, Phoenix, September 27, 1979, and September 24, 1980, Proceedings: Arizona Department of Water Resources Report no. 2, p. 13-17.

Anderson, T.W., 1980, Study plan for the Regional Aquifer-System Analysis of alluvial basins in south-central Arizona and adjacent states: U.S. Geological Survey Open-File Report 80-1197, 22 p.

Anderson, T.W., 1984, Southwest alluvial basins, RASA study - An overview, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, sponsored by the Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: New York, American Society of Civil Engineers, p. 606-614.

Anderson, T.W., 1986, Study in southern and central Arizona and parts of adjacent states, *in* Sun, R.J., ed., Regional Aquifer-System Analysis program of the U.S. Geological Survey, Summary of projects, 1978-84: U.S. Geological Survey Circular 1002, p. 116-131.

Anderson, T.W., 1986, Hydrologic setting, objectives, and approach of the southwest alluvial basins, RASA study, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 5-16.

Anderson, T.W., 1986, Geohydrology of the southwest alluvial basins, Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 99-111.

Anderson, T.W., 1995, Summary of the Southwest alluvial basins, Regional Aquifer-System Analysis, South-central Arizona and parts of adjacent states: U.S. Geological Survey Professional Paper 1406-A, p. A1-A33.

Anderson, T.W., and Freethey, G.W., 1995, Simulation of ground-water flow in alluvial basins in south-central Arizona and parts of adjacent states, Regional Aquifer-System Analysis: U.S. Geological Survey Professional Paper 1406-D, 78 p.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1990, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey Open-File Report 89-378, 99 p., 3 sheets, scale 1:1,000,000.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1992, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey Professional Paper 1406-B, p. B1-B67, 3 sheets, scale 1:1,000,000.

Anderson, T.W., and Johnson, A.I., eds., 1986, Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, 116 p.

Anderson, T.W., Welder, G.E., Lesser, Gustavo, and Trujillo, A., 1988, Region 7, Central alluvial basins, *in* Back, William, and others, eds., Hydrogeology: Geological Society of America, The Geology of North America, v. O-2, p. 81-86.

Anderson, T.W., and White, N.D., 1986, Arizona surface-water resources, *in* Moody, D.W., Chase E.B., and Aronson, D.A., comps., National water summary, 1985 - Hydrologic events and surface-water resources: U.S. Geological Survey Water-Supply Paper 2300, p. 145-150.

Anning, D.W., and Duet, N.R., 1994, Summary of ground-water conditions in Arizona, 1987-90: U.S. Geological Survey Open-File Report 94-476, 2 sheets, scales 1:1,000,000 and 1:2,500,000.

Arizona Department of Water Resources, 1990, Map showing Arizona groundwater basins with index of cities, towns, settlements and sites: Arizona Department of Water Resources Open File Report no. 7, 1 sheet, scale 1:1,000,000.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. I, Inventory and analysis: Arizona Department of Water Resources, 253 p.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. II, Hydrologic summary: Arizona Department of Water Resources, Hydrology Division, 236 [266] p.

Arizona Engineering Commission, 1923, Report based on reconnaissance investigation of Arizona land irrigable from the Colorado River: Arizona Engineering Commission, 72 p.

Arizona Water Commission, 1975, Arizona State Water Plan, Phase 1, Inventory of resource and uses: Arizona Water Commission, 224 p., 2 sheets, approx. scale 1:670,000.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1967 to Spring 1968: Arizona State Land Department Water Resources Report no. 38, 54 p.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1968 to Spring 1969: Arizona State Land Department Water Resources Report no. 42, 46 p.

Babcock, H.M., 1970, Annual report on ground water in Arizona, Spring 1969 to Spring 1970: Arizona State Land Department Water Resources Report no. 43, 44 p.

Babcock, H.M., 1972, Annual report on ground water in Arizona, Spring 1970 to Spring 1971: Arizona Water Commission Bulletin 1, 45 p.

Babcock, H.M., 1972, Bibliography of U.S. Geological Survey water-resources reports for Arizona, May 1965 through June 1971: Arizona Water Commission Bulletin 2, 60 p.

Babcock, H.M., 1973, Annual report on ground water in Arizona, Spring 1971 to Spring 1972: Arizona Water Commission Bulletin 5, 48 p.

Babcock, H.M., 1974, Annual report on ground water in Arizona, Spring 1972 to Spring 1973: Arizona Water Commission Bulletin 7, 46 p., 3 sheets, scale 1:250,000.

Babcock, H.M., 1976, Annual summary of ground-water conditions in Arizona, Spring 1974 to Spring 1975: U.S. Geological Survey Water-Resources Investigations Open-File Report 76-59, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1976 to Spring 1977: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-106, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1975 to Spring 1976: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-10, 2 sheets, scale 1:1,000,000.

Bedinger, M.S., Anderson, T.W., and Langer, W.H., 1984, Maps showing ground-water units and withdrawal, Basin and Range Province, Arizona: U.S. Geological Survey Water-Resources Investigations Report 83-4114-A, 2 sheets, scales 1:500,000 and 1:1,000,000.

Bedinger, M.S., Langer, W.H., and Reed, J.E., 1984, Ground-water hydrology, *in* Bedinger, M.S. and others, eds., Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: U.S. Geological Survey Open-File Report 84-741, p. 98-114, 5 sheets 2, 3, and 4, scale 1:500,000.

Bedinger, M.S., Sargent, K.A., and Brady, B.T., 1985, Geologic and hydrologic characterization of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part III, Geologic and hydrologic evaluation: U.S. Geological Survey Circular 904-C, 27 p.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1984, Sonoran region, Arizona, *in* Bedinger, M.S. and others, Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: Evaluation of the regions: U.S. Geological Survey Open-File Report 84-745, p. 81-108, 2 sheets, scale 1:300,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States for isolation of high-level radioactive waste - Evaluation of the regions: U.S. Geological Survey Professional Paper 1370-H, p. H1-61, 7 plates, scale 1:1,000,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., eds., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States for isolation of high-level radioactive waste - Characterization of the Sonoran region, Arizona: U.S. Geological Survey Professional Paper 1370-D, p. D1-D40, 6 plates, scales 1:500,000 and 1:1,000,000.

Bedinger, M.S., Sargent, K.A., and Reed, J.E., 1984, Geologic and hydrologic characterization and evaluation of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part I, Introduction and guidelines: U.S. Geological Survey Circular 904-A, 16 p.

Bentley, C.B., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area; Opal Mountain to Davis Dam, Nevada: U.S. Geological Survey Open-File Report 79-692, 36 p.

Bentley, C.B., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area; Mt. Davis to Davis Dam, Arizona: U.S. Geological Survey Open-File Report 79-691, 29 p.

Boner, F.C., Garrett, W.B., and Konieczki, A.D., 1989, Water resources data, Arizona, Water year 1988: U.S. Geological Survey Water-Data Report AZ-88-1, 391 p.

Boner, F.C., Konieczki, A.D., and Davis, R.G., 1991, Water resources data, Arizona, Water year 1990: U.S. Geological Survey Water-Data Report AZ-90-1, 381 p.

Boner, F.C., Smith, C.F., Garrett, W.B., and Konieczki, A., 1990, Water resources data, Arizona, Water year 1989: U.S. Geological Survey Water-Data Report AZ-89-1, 391 p.

Briggs, P.C., and Nemecek, E.A., 1986, Technical aspects of Arizona groundwater law, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 93-98.

Brown, S.G., 1976, Preliminary maps showing ground-water resources in the lower Colorado River region, Arizona, Nevada, New Mexico, and Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-542, 1 sheet, scale 1:1,000,000.

Buol, S.W., 1964, Calculated actual and potential evapotranspiration in Arizona: Tucson, University of Arizona, Agricultural Experiment Station Technical Bulletin 162, 48 p.

Clark, T.C., 1975, The Arizona Water Plan, A status report, *in* Arizona Watershed Symposium, 19th annual, Phoenix, September 24, 1975, Proceedings: Arizona Water Commission Report no. 7, p. 9-23.

Colorado River Commission, 1923, Letter from the Chairman of the Colorado River Commission transmitting report of the proceedings of the Colorado River Commission and the compact or agreement entered into between the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming respecting the apportionment of the waters of the Colorado River: U.S. Congress, 67th, 4th Session, House document 605, 12 p.

Cook, J.R., 1981, Needles 1° x 2° NTMS area, California and Arizona, Data report (abbreviated), National Uranium Resource Evaluation Program, Hydrogeochemical and stream sediment reconnaissance: U.S. Department of Energy Report GJBX-232(81), 17 p., 6 microfiche.

Cooper, E.N., DeCook, K.J., Foster, K.E., Scherer, C.R., Dracup, J.A., Lyon, D.K., Lybeck, L., Valencia, M.A., and others, 1976, Water resources research in the lower Colorado River basin: U.S. Department of the Interior Bureau of Reclamation and Office of the Water Resources and Technology, 186 p.

Cooper, E.N., Lyon, D.K., DeCook, K.J., Foster, K.E., Lybeck, L., Valencia, H.A., and others, 1978, Water resources research in the Lower Colorado River basin, 1977-1978: U.S. Bureau of Reclamation Report, 90 p.

Cox, C.J., and others, 1968, Annual report on ground water in Arizona, Spring 1966 to Spring 1967: Arizona State Land Department Water Resources Report no. 36, 43 p.

Croxen, Fred, III, Burnett, Earl, and Watt, Dennis, 1985, Effects on the ground water in the Yuma area due to the recent high Colorado River flows [abs.]: Arizona-Nevada Academy of Science, Journal, v. 20, Proceedings Supplement, p. 38-39.

Daniel, D.L., 1981, Maps showing total dissolved solids content of groundwater in Arizona: Arizona Department of Water Resources Hydrologic Map Series Report no. 2, 2 sheets, scale 1:1,000,000.

Davidson, E.S., 1979, Summary appraisals of the nation's ground-water resources - Lower Colorado region: U.S. Geological Survey Professional Paper 813-R, 23 p., 3 sheets, scale 1:1,000,000.

Eberly, L.D., and Stanley, T.B., Jr., 1978, Cenozoic stratigraphy and geologic history of southwestern Arizona: Geological Society of America Bulletin, v. 89, no. 6, p. 921-940.

El-Ashry, M.T., 1980, Ground-water salinity problems related to irrigation in the Colorado River basin: Ground Water (Journal of Association of Ground Water Scientists and Engineers), v. 18, p. 37-45.

Ellingson, S.B., and Redding, M.B., 1988, Random survey of VOC's, pesticides and inorganics in Arizona's drinking water wells, in FOCUS Conference on Southwestern Ground Water Issues March 23-25, 1988, Proceedings: Dublin, Ohio, National Water Well Association, p. 223-247.

Evans, L.G., and Haimson, J.S., 1982, SWAB/RASA aquifer parameter study, Final report for U.S. Geological Survey contract 14-08-0001-18268: Arizona Department of Water Resources, 21 p.

Everett, L.G., and Schultz, T.R., 1974, The effect of development on groundwater in the Parker Strip, *in* Boster, R.S., ed., Hydrology and water resources in Arizona and the Southwest, V. 4: American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, Annual Meeting, Flagstaff, Ariz., 1974, Proceedings, p. 176-182.

Favour, A.H., 1929, Arizona's rights in the Colorado River: Proposals of Arizona and the counter proposals of California submitted to the Tri-state Conference now in progress: Arizona Colorado River Commission.

Feldman, A.D., 1966, Chemical quality of water in relation to water use and basin characteristics, Tucson Basin, Arizona: Tucson, University of Arizona, M.S. thesis, 74 p.

Feth, J.H., and others, 1964, Preliminary map of the conterminous United States showing depth to and quality of shallowest ground water containing more than 1,000 parts per million dissolved solids: U.S. Geological Survey Hydrologic Investigations Atlas HA-199, 31 p., 2 sheets, scale 1:3,168,000.

Fields, R.L., 1986, Data-processing activities of the southwest alluvial basins, RASA study, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 17-23.

Freethey, G.W., 1984, Ground-water modeling, alluvial basins of Arizona, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 57-67.

Freethey, G.W., 1986, Considerations in modeling ground-water flow in the alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 57-67.

Freethey, G.W., and Anderson, T.W., 1986, Predevelopment hydrologic conditions in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-664, 3 sheets, scale 1:500,000.

Freethey, G.W., Pool, D.R., Anderson, T.W., and Tucci, Patrick, 1986, Description and generalized distribution of aquifer materials in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-663, 4 sheets, scale 1:500,000.

Hardt, W.F., Cahill, J.M., and Booher, M.B., 1958, Annual report on ground water in Arizona, Spring 1957 to Spring 1958: Arizona State Land Department Water Resources Report no. 5, 60 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1959, Annual report on ground water in Arizona, Spring 1958 to Spring 1959: Arizona State Land Department Water Resources Report no. 6, 61 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1960, Annual report on ground water in Arizona, Spring 1959 to Spring 1960: Arizona State Land Department Water Resources Report no. 7, [89] p.

Harshbarger, J.W., Lewis, D.D., Skibitzke, H.E., Heckler, W.L., and Kister, L.R., revised by H.L. Baldwin, 1966, Arizona water: U.S. Geological Survey Water-Supply Paper 1648, 85 p.

Hely, A.G., 1969, Lower Colorado River water supply--Its magnitude and distribution: U.S. Geological Survey Professional Paper 486-D, 54 p.

Hely, A.G., and Peck, E.L., 1964, Precipitation, runoff, and water loss in the lower Colorado River-Salton Sea area: U.S. Geological Survey Professional Paper 486-B, 16 p, 7 sheets, scales 1:500,000 and 1:1,000,000.

Hodges, E.B., and others, 1967, Annual report on ground water in Arizona, Spring 1965 to Spring 1966: Arizona State Land Department Water Resources Report no. 32, 61 p.

Johnson, Cady, and Glynn, Jack, 1982, National Uranium Resource Evaluation, Las Vegas quadrangle, Nevada, Arizona, and California: U.S. Department of Energy Report PGJ/F-121(82), 51 p., 5 microfiche, 16 sheets.

Khalaf, J.M., 1951, The water resources of the lower Colorado River basin: Chicago, University of Chicago, Department of Geography, Research Paper 22, 2 vols., 234 p.

Khalaf, J.M., 1952, The water resources of the lower Colorado River basin: Chicago, University of Chicago, Ph.D. Dissertation.

Ligner, J.J., White, N.D., Kister, L.R., and Moss, M.E., 1969, Water resources: Part II of Mineral and water resources of Arizona: Arizona Bureau of Mines Bulletin 180, p. 471-580.

Longsworth, S.A., Van De Vanter, E.K., and Alwin, S.H., 1998, Activities of the Water Resources Division in Arizona, 1996-97: U.S. Geological Survey Open-File Report 98-185, 90 p.

Marie, J.R., Van De Vanter, E.K., and Moss, C.L., 1996, Activities of the Water Resources Division in Arizona, 1995-1996: U.S. Geological Survey Open-File Report 95-772, 69 p.

McDonald, C.C., and Hughes, G.H., 1968, Studies of consumptive use of water by phreatophytes and hydrophytes near Yuma, Arizona: U.S. Geological Survey Professional Paper 486-F, p. F1-F24.

McDonald, C.C., and Loeltz, O.J., 1976, Water resources of the lower Colorado River-Salton Sea area as of 1971, Summary report: U.S. Geological Survey Professional Paper 486-A, p. A1-A34.

McGuinness, C.L., 1964, Generalized map showing annual runoff and productive aquifers in the conterminous United States: U.S. Geological Survey Hydrologic Investigations Atlas HA-0194, scale 1:5,000,000.

McKay, W.A., 1981, Hydrogeochemical inventory and analysis of thermal springs in the Black Canyon-Hoover Dam area, Nevada and Arizona, *in* Edmiston, R.C., chairperson, Geothermal energy; The international success story: Geothermal Resources Council, Transactions , v. 5, p. 185-187.

Montgomery, E.L., and Harshbarger, J.W., 1989, Arizona hydrogeology and water supply, *in* Jenney, J.P., and Reynolds, S.J., eds., Geologic evolution of Arizona: Arizona Geological Society Digest 17, p. 827-840.

Montgomery, E.L., and Harshbarger, J.W., 1992, Arizona hydrogeology and water supply: Applied Hydrogeology, v. 1, no. 1, p. 25-37.

Olmsted, F.H., Loeltz, O.J., and Irelan, B., 1973, Geohydrology of the Yuma area, Arizona and California, *in* Water resources of Lower Colorado River - Salton Sea area: U.S. Geological Survey Professional Paper 486-H, p. H1-H227, 17 sheets, scales 1:24,000, 1:62,500, 1:125,000, and 1:250,000.

Owen-Joyce, S.J., 1987, Estimates of average annual tributary inflow to the lower Colorado River, Hoover Dam to Mexico: U.S. Geological Survey Water-Resources Investigations Report 87-4078, p.

Owen-Joyce, S.J., and Raymond, L.H., 1996, An accounting system for water and consumptive use along the Colorado River, Hoover Dam to Mexico: U.S. Geological Survey Water-Supply Paper 2407, 94 p., 3 sheets, scale 1:500,000.

Peirce, H.W., and Scurlock, J.R., 1972, Arizona well information: Arizona Bureau of Mines Bulletin 185, 195 p. [reprinted 1988, Arizona Geological Survey].

Pool, D.R., 1984, Aquifer geology of alluvial basins of Arizona, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 683-690.

Pool, D.R., 1986, Aquifer geology of alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 25-36.

Robertson, F.N., 1984, Isotopic content of ground water along the Colorado River in Arizona and California [abs.]: Geological Society of America Abstracts with Programs, v. 16, no. 6, p. 636.

Robertson, F.N., 1984, Trace elements in ground water in southern Arizona [abs.], *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 674.

Robertson, F.N., 1986, Origin and chemistry of ground water along the Colorado River in Arizona, Nevada, and California [abs.]: Arizona-Nevada Academy of Science, Journal, v. 21, Proceedings Supplement, p. 56.

Robertson, F.N., 1986, Occurrence and solubility controls of trace elements in ground water in alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 69-80.

Robertson, F.N., 1989, Ground-water geochemistry and information transfer in alluvial basins in Arizona [abs.], *in* International Geological Congress, 28th, Washington, D.C., July 9-19, 1989, Abstracts, V. 2: International Geological Congress, p. 2.709-2.710.

Robertson, F.N., 1989, Arsenic in ground-water under oxidizing conditions, south-west United States: Environmental Geochemistry and Health, v. 11, no. 3/4, p. 171-185.

Robertson, F.N., 1991, Geochemistry of ground-water in alluvial basins of Arizona and adjacent parts of Nevada, New Mexico, and California: U.S. Geological Survey Professional Paper 1406-C, p. C1-C90.

Robertson, F.N., and Garrett, W.B., 1988, Distribution of fluoride in ground water in the alluvial basins of Arizona and adjacent parts of California, Nevada, and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-665, 3 sheets, scale 1:500,000.

Robson, S.G., and Banta, E.R., 1995, Ground water atlas of the United States, Segment 2, Arizona, Colorado, New Mexico, Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-730-C, 32 p.

Ross, C.P., 1923, The lower Gila region, Arizona, A geographic, geologic, and hydrologic reconnaissance, with a guide to desert watering places: U.S. Geological Survey Water-Supply Paper 498, 237 p., 4 sheets, scales 1:50,000 and 1:250,000.

Sargent, K.A., and Bedinger, M.S., 1985, Geologic and hydrologic characterization and evaluation of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part II, Geologic and hydrologic characterization: U.S. Geological Survey Circular 904-B, 30 p.

Smith, C.F., Anning, D.W., Duet, N.R., Fisk, G.G., McCormack, H.F., Pope, G.L., Rigas, P.D., and Wallace, B.L., 1995, Water resources data, Arizona, Water year 1994: U.S. Geological Survey Water-Data Report AZ-94-1, 320 p.

Smith, C.F., Boner, F.C., Davis, R.G., Duet, N.R., and Rigas, P.D., 1993, Water resources data, Arizona, Water year 1992: U.S. Geological Survey Water-Data Report AZ-92-1, 360 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., and Rigas, P.D., 1997, Water resources data, Arizona, Water year 1996: U.S. Geological Survey Water-Data Report AZ-96-1, 328 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., Rigas, P.D., and Tadayon, S., 1996, Water resources data, Arizona, Water year 1995: U.S. Geological Survey Water-Data Report AZ-95-1, 306 p.

Smith, C.F., Rigas, P.D., Ham, L.K., Duet, N.R., and Anning, D.W., 1994, Water resources data, Arizona, Water year 1993: U.S. Geological Survey Water-Data Report AZ-93-1, 360 p.

Smith, G.E.P., 1938, The physiography of Arizona valleys and the occurrence of ground water: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Technical Bulletin no. 77, 91 p.

Smith, H.V., Caster, A.B., Fuller, W.H., Breazeale, E.L., and Draper, George, 1949, The chemical composition of representative Arizona waters: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Bulletin 225, 76 p.

Spicer, L.M., and Van De Vanter, E.K., comps., 1993, Activities of the Water Resources Division in Arizona, 1986-91: U.S. Geological Survey Open-File Report 93-165, 144 p.

Stone, Claudia, and Jones, N.O., 1980, Preliminary geothermal assessment of the Yuma area, Arizona, *with a section on* the Hydrology, by Alice Campbell: Arizona Bureau of Geology and Mineral Technology Open-File Report 80-13, 32 p., 7 sheets, scale 1:250,000.

Stone, Claudia, and Witcher, J.C., 1982, Geothermal energy in Arizona - Final contract report: Arizona Bureau of Geology and Mineral Technology Open-File Report 83-12, 398 p.

Tellier, A.H., 1973, Geothermal waters of Arizona: Tempe, Arizona State University, M.S. thesis, 30 p.

U.S. Department of the Interior, 1981, Quality of water; Colorado River basin: U.S. Department of the Interior, 190 p. [Quality of Water, Colorado River basin, no. 10.].

U.S. Geological Survey, [1965?], Water quality records in Arizona - 1964: U.S. Geological Survey, 80 p.

U.S. Geological Survey, [1966?], 1965 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 89 p.

U.S. Geological Survey, [1968?], 1967 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 85 p.

U.S. Geological Survey, 1971, 1971 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 167 p. [NTIS PB-287 165].

U.S. Geological Survey, 1972, 1972 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 166 p. [NTIS PB-287 167].

U.S. Geological Survey, 1973, 1973 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 188 p. [NTIS PB-287 169].

U.S. Geological Survey, 1974, 1974 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 192 p. [NTIS PB-287 171].

U.S. Geological Survey, 1976, Water resources data for Arizona, Water year 1975: U.S. Geological Survey Water-Data Report AZ-75-1, 440 p.

U.S. Geological Survey, 1978, Water resources data for Arizona, Water year 1977: U.S. Geological Survey Water-Data Report AZ-77-1, 550 p.

U.S. Geological Survey, 1978, Annual summary of ground-water conditions in Arizona, Spring 1977 to Spring 1978: U.S. Geological Survey Water-Resources Investigations Open-File Report 78-144, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1979, Water resources data for Arizona, Water year 1978: U.S. Geological Survey Water-Data Report AZ-78-1, 604 p.

U.S. Geological Survey, 1979, Land use and land cover and associated maps for El Centro, California, Arizona: U.S. Geological Survey Open-File Report 79-1175, 2 sheets, scale 1:250,000.

U.S. Geological Survey, 1980, Water resources data for Arizona, Water year 1979: U.S. Geological Survey Water-Data Report AZ-79-1, 614 p.

U.S. Geological Survey, 1980, Annual summary of ground-water conditions in Arizona, Spring 1978 to Spring 1979: U.S. Geological Survey Water-Resources Investigations Open-File Report 80-330, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1981, Annual summary of ground-water conditions in Arizona, Spring 1979 to Spring 1980: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-906, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Annual summary of ground-water conditions in Arizona, Spring 1980 to Spring 1981: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Water resources data for Arizona, Water year 1980: U.S. Geological Survey Water-Data Report AZ-80-1, 568 p.

U.S. Geological Survey, 1983, Water resources data, Arizona, Water year 1981: U.S. Geological Survey Water-Data Report AZ-81-1, 532 p.

U.S. Geological Survey, 1983, Annual summary of ground-water conditions in Arizona, Spring 1981 to Spring 1982: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scales 1:1,000,000 and 1:3,200,000.

U.S. Geological Survey, 1984, Annual summary of ground-water conditions in Arizona, Spring 1982 to Spring 1983: U.S. Geological Survey Water-Resources Investigations Open-File Report 84-428, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

U.S. Geological Survey, 1985, Annual summary of ground-water conditions in Arizona, Spring 1983 to Spring 1984: U.S. Geological Survey Water-Resources Investigations Open-File Report 85-410, 2 sheets, scales 1:1,000,000 and 1:3,400,000.

U.S. Geological Survey, 1986, Annual summary of ground-water conditions in Arizona, Spring 1984 to Spring 1985: U.S. Geological Survey Water-Resources Investigations Open-File Report 86-422W, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

White, N.D., and Anderson, T.W., 1986, Arizona ground-water resources, *in* National water summary, 1984 - Hydrologic events, selected water quality trends, and ground-water resources: U.S. Geological Survey Water-Supply Paper 2275, p. 135-140.

White, N.D., and Garrett, W.B., 1984, Water resources data, Arizona, Water year 1982: U.S. Geological Survey Water-Data Report AZ-82-1, 440 p.

White, N.D., and Garrett, W.B., 1986, Water resources data, Arizona, Water year 1983: U.S. Geological Survey Water-Data Report AZ-83-1, 387 p.

White, N.D., and Garrett, W.B., 1987, Water resources data, Arizona, Water year 1984: U.S. Geological Survey Water-Data Report AZ-84-1, 381 p.

White, N.D., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1985: U.S. Geological Survey Water-Data Report AZ-85-1, 343 p.

White, N.D., and others, 1967, Annual report on ground water in Arizona, Spring 1964 to Spring 1965: Arizona State Land Department Water Resources Report no. 24, 62 p.

White, N.D., Stulik, R.S., and others, 1962, Annual report on ground water in Arizona, Spring 1961 to Spring 1962: Arizona State Land Department Water Resources Report no. 11, 116 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1961, Annual report on ground water in Arizona, Spring 1960 to Spring 1961: Arizona State Land Department Water Resources Report no. 10, 93 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1963, Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, 136 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1964, Annual report on ground water in Arizona, Spring 1963 to Spring 1964: Arizona State Land Department Water Resources Report no. 19, 60 p.

Wilson, L.G., DeCook, K.J., and Neuman, S.P., 1980, Regional recharge research for southwest alluvial basins - Final report, U.S. Geological Survey contract 14-08-0001-18257: Tucson, University of Arizona, Water Resources Research Center, 389 p.

Wilson, R.P., 1990, Arizona water supply and use, *in* Carr, J.E., and others, National water summary, 1987 - Hydrologic events and water supply and uses: U.S. Geological Survey Water-Supply Paper 2350, p. 157-164.

Wilson, R.P., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1986: U.S. Geological Survey Water-Data Report AZ-86-1, 341 p.

Wilson, R.P., and Garrett, W.B., 1989, Water resources data, Arizona, Water year 1987: U.S. Geological Survey Water-Data Report AZ-87-1, 385 p.

Wilson, R.P., and Owen-Joyce, S.J., 1993, Determining the source of water pumped from wells along the lower Colorado River: U.S. Geological Survey Open-File Report 93-405, 2 p.

Wilson, R.P., and Owen-Joyce, S.J., 1994, Methods to identify wells that yield water that will be replaced by Colorado River water in Arizona, California, Nevada, and Utah: U.S. Geological Survey Water-Resources Investigations Report 94-4005, 36 p., 19 sheets, scale 1:100,000.

Wilson, R.P., and Owen-Joyce, S.J., 2002, Hydrologic conditions in the Bill Williams River National Wildlife Refuge and Planet Valley, Arizona, 2000: U.S. Geological Survey Water-Resources Investigations Report 02-4214, p. 1-11, 1 sheet.

Witcher, J.C., Stone, Claudia, and Hahman, W.R., Sr., 1982, Geothermal resources of Arizona: Arizona Bureau of Geology and Mineral Technology [also listed as Arizona Geological Survey Map 15-2], 1 sheet, scale 1:500,000.

LAKE MOHAVE BASIN
GROUNDWATER HYDROLOGY BIBLIOGRAPHY

Agenbroad, L.D., 1984, Recent valley deposits in southern Arizona, *in* Smiley, T.L., and others, eds., Landscapes of Arizona - The geological story: Lanham, Md., University Press of America, p. 253-268.

Anderson, T.W., 1979, Development of groundwater models of alluvial basins in south-central Arizona, *in* Arizona Water Symposium, 23rd and 24th annual, Phoenix, September 27, 1979, and September 24, 1980, Proceedings: Arizona Department of Water Resources Report no. 2, p. 13-17.

Anderson, T.W., 1980, Study plan for the Regional Aquifer-System Analysis of alluvial basins in south-central Arizona and adjacent states: U.S. Geological Survey Open-File Report 80-1197, 22 p.

Anderson, T.W., 1984, Southwest alluvial basins, RASA study - An overview, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, sponsored by the Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: New York, American Society of Civil Engineers, p. 606-614.

Anderson, T.W., 1986, Study in southern and central Arizona and parts of adjacent states, *in* Sun, R.J., ed., Regional Aquifer-System Analysis program of the U.S. Geological Survey, Summary of projects, 1978-84: U.S. Geological Survey Circular 1002, p. 116-131.

Anderson, T.W., 1986, Hydrologic setting, objectives, and approach of the southwest alluvial basins, RASA study, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 5-16.

Anderson, T.W., 1986, Geohydrology of the southwest alluvial basins, Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 99-111.

Anderson, T.W., 1995, Summary of the Southwest alluvial basins, Regional Aquifer-System Analysis, South-central Arizona and parts of adjacent states: U.S. Geological Survey Professional Paper 1406-A, p. A1-A33.

Anderson, T.W., and Freethey, G.W., 1995, Simulation of ground-water flow in alluvial basins in south-central Arizona and parts of adjacent states, Regional Aquifer-System Analysis: U.S. Geological Survey Professional Paper 1406-D, 78 p.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1990, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey Open-File Report 89-378, 99 p., 3 sheets, scale 1:1,000,000.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1992, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey Professional Paper 1406-B, p. B1-B67, 3 sheets, scale 1:1,000,000.

Anderson, T.W., Welder, G.E., Lesser, Gustavo, and Trujillo, A., 1988, Region 7, Central alluvial basins, *in* Back, William, and others, eds., Hydrogeology: Geological Society of America, The Geology of North America, v. O-2, p. 81-86.

Anderson, T.W., and White, N.D., 1986, Arizona surface-water resources, *in* Moody, D.W., and others, comps., National water summary, 1985 - Hydrologic events and surface-water resources: U.S. Geological Survey Water-Supply Paper 2300, p. 145-150.

Anning, D.W., and Duet, N.R., 1994, Summary of ground-water conditions in Arizona, 1987-90: U.S. Geological Survey Open-File Report 94-476, 2 sheets, scales 1:1,000,000 and 1:2,500,000.

Arizona Department of Water Resources, 1990, Map showing Arizona groundwater basins with index of cities, towns, settlements and sites: Arizona Department of Water Resources Open File Report no. 7, 1 sheet, scale 1:1,000,000.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. I, Inventory and analysis: Arizona Department of Water Resources, 253 p.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. II, Hydrologic summary: Arizona Department of Water Resources, Hydrology Division, 236 [266] p.

Arizona Engineering Commission, 1923, Report based on reconnaissance investigation of Arizona land irrigable from the Colorado River: Arizona Engineering Commission, 72 p.

Arizona Water Commission, 1975, Arizona State Water Plan, Phase 1, Inventory of resource and uses: Arizona Water Commission, 224 p., 2 sheets, approx. scale 1:670,000.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1967 to Spring 1968: Arizona State Land Department Water Resources Report no. 38, 54 p.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1968 to Spring 1969: Arizona State Land Department Water Resources Report no. 42, 46 p.

Babcock, H.M., 1970, Annual report on ground water in Arizona, Spring 1969 to Spring 1970: Arizona State Land Department Water Resources Report no. 43, 44 p.

Babcock, H.M., 1972, Annual report on ground water in Arizona, Spring 1970 to Spring 1971: Arizona Water Commission Bulletin 1, 45 p.

Babcock, H.M., 1972, Bibliography of U.S. Geological Survey water-resources reports for Arizona, May 1965 through June 1971: Arizona Water Commission Bulletin 2, 60 p.

Babcock, H.M., 1973, Annual report on ground water in Arizona, Spring 1971 to Spring 1972: Arizona Water Commission Bulletin 5, 48 p.

Babcock, H.M., 1974, Annual report on ground water in Arizona, Spring 1972 to Spring 1973: Arizona Water Commission Bulletin 7, 46 p., 3 sheets, scale 1:250,000.

Babcock, H.M., 1976, Annual summary of ground-water conditions in Arizona, Spring 1974 to Spring 1975: U.S. Geological Survey Water-Resources Investigations Open-File Report 76-59, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1976 to Spring 1977: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-106, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1975 to Spring 1976: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-10, 2 sheets, scale 1:1,000,000.

Bedinger, M.S., Anderson, T.W., and Langer, W.H., 1984, Maps showing ground-water units and withdrawal, Basin and Range Province, Arizona: U.S. Geological Survey Water-Resources Investigations Report 83-4114-A, 2 sheets, scales 1:500,000 and 1:1,000,000.

Bedinger, M.S., Langer, W.H., and Reed, J.E., 1984, Ground-water hydrology, *in* Bedinger, M.S. and others, eds., Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: U.S. Geological Survey Open-File Report 84-741, p. 98-114, 5 sheets 2, 3, and 4, scale 1:500,000.

Bedinger, M.S., Sargent, K.A., and Brady, B.T., 1985, Geologic and hydrologic characterization of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part III, Geologic and hydrologic evaluation: U.S. Geological Survey Circular 904-C, 27 p.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1984, Sonoran region, Arizona, *in* Bedinger, M.S. and others, Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: Evaluation of the regions: U.S. Geological Survey Open-File Report 84-745, p. 81-108, 2 sheets, scale 1:300,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States for isolation of high-level radioactive waste - Evaluation of the regions: U.S. Geological Survey Professional Paper 1370-H, p. H1-61, 7 plates, scale 1:1,000,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., eds., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States for isolation of high-level radioactive waste - Characterization of the Sonoran region, Arizona: U.S. Geological Survey Professional Paper 1370-D, p. D1-D40, 6 plates, scales 1:500,000 and 1:1,000,000.

Bedinger, M.S., Sargent, K.A., and Reed, J.E., 1984, Geologic and hydrologic characterization and evaluation of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part I, Introduction and guidelines: U.S. Geological Survey Circular 904-A, 16 p.

Bentley, C.B., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area; Opal Mountain to Davis Dam, Nevada: U.S. Geological Survey Open-File Report 79-692, 36 p.

Bentley, C.B., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area; Mt. Davis to Davis Dam, Arizona: U.S. Geological Survey Open-File Report 79-691, 29 p.

Bentley, C.B., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area; Hoover Dam to Mt. Davis, Arizona: U.S. Geological Survey Open-File Report 79-690, 38 p.

Boner, F.C., Garrett, W.B., and Konieczki, A.D., 1989, Water resources data, Arizona, Water year 1988: U.S. Geological Survey Water-Data Report AZ-88-1, 391 p.

Boner, F.C., Konieczki, A.D., and Davis, R.G., 1991, Water resources data, Arizona, Water year 1990: U.S. Geological Survey Water-Data Report AZ-90-1, 381 p.

Boner, F.C., Smith, C.F., Garrett, W.B., and Konieczki, A., 1990, Water resources data, Arizona, Water year 1989: U.S. Geological Survey Water-Data Report AZ-89-1, 391 p.

Briggs, P.C., and Nemecek, E.A., 1986, Technical aspects of Arizona groundwater law, in Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 93-98.

Brown, S.G., 1976, Preliminary maps showing ground-water resources in the lower Colorado River region, Arizona, Nevada, New Mexico, and Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-542, 1 sheet, scale 1:1,000,000.

Buol, S.W., 1964, Calculated actual and potential evapotranspiration in Arizona: Tucson, University of Arizona, Agricultural Experiment Station Technical Bulletin 162, 48 p.

Clark, T.C., 1975, The Arizona Water Plan, A status report, *in* Arizona Watershed Symposium, 19th annual, Phoenix, September 24, 1975, Proceedings: Arizona Water Commission Report no. 7, p. 9-23.

Colorado River Commission, 1923, Letter from the Chairman of the Colorado River Commission transmitting report of the proceedings of the Colorado River Commission and the compact or agreement entered into between the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming respecting the apportionment of the waters of the Colorado River: U.S. Congress, 67th, 4th Session, House document 605, 12 p.

Cook, J.R., 1981, Needles 1° x 2° NTMS area, California and Arizona, Data report (abbreviated), National Uranium Resource Evaluation Program, Hydrogeochemical and stream sediment reconnaissance: U.S. Department of Energy Report GJBX-232(81), 17 p., 6 microfiche.

Cooper, E.N., DeCook, K.J., Foster, K.E., Scherer, C.R., Dracup, J.A., Lyon, D.K., Lybeck, L., Valencia, M.A., and others, 1976, Water resources research in the lower Colorado River basin: U.S. Department of the Interior Bureau of Reclamation and Office of the Water Resources and Technology, 186 p.

Cooper, E.N., Lyon, D.K., DeCook, K.J., Foster, K.E., Lybeck, L., Valencia, H.A., and others, 1978, Water resources research in the Lower Colorado River basin, 1977-1978: U.S. Bureau of Reclamation Report, 90 p.

Cox, C.J., and others, 1968, Annual report on ground water in Arizona, Spring 1966 to Spring 1967: Arizona State Land Department Water Resources Report no. 36, 43 p.

Croxen, Fred, III, Burnett, Earl, and Watt, Dennis, 1985, Effects on the ground water in the Yuma area due to the recent high Colorado River flows [abs.]: Arizona-Nevada Academy of Science, Journal, v. 20, Proceedings Supplement, p. 38-39.

Daniel, D.L., 1981, Maps showing total dissolved solids content of groundwater in Arizona: Arizona Department of Water Resources Hydrologic Map Series Report no. 2, 2 sheets, scale 1:1,000,000.

Davidson, E.S., 1979, Summary appraisals of the nation's ground-water resources - Lower Colorado region: U.S. Geological Survey Professional Paper 813-R, 23 p., 3 sheets, scale 1:1,000,000.

El-Ashry, M.T., 1980, Ground-water salinity problems related to irrigation in the Colorado River basin: Ground Water (Journal of Association of Ground Water Scientists and Engineers), v. 18, p. 37-45.

Ellingson, S.B., and Redding, M.B., 1988, Random survey of VOC's, pesticides and inorganics in Arizona's drinking water wells, in FOCUS Conference on Southwestern Ground Water Issues March 23-25, 1988, Proceedings: Dublin, Ohio, National Water Well Association, p. 223-247.

Evans, L.G., and Haimson, J.S., 1982, SWAB/RASA aquifer parameter study, Final report for U.S. Geological Survey contract 14-08-0001-18268: Arizona Department of Water Resources, 21 p.

Everett, L.G., and Schultz, T.R., 1974, The effect of development on groundwater in the Parker Strip, *in* Boster, R.S., ed., Hydrology and water resources in Arizona and the Southwest, V. 4: American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, Annual Meeting, Flagstaff, Ariz., 1974, Proceedings, p. 176-182.

Favour, A.H., 1929, Arizona's rights in the Colorado River: Proposals of Arizona and the counter proposals of California submitted to the Tri-state Conference now in progress: Arizona Colorado River Commission.

Feldman, A.D., 1966, Chemical quality of water in relation to water use and basin characteristics, Tucson Basin, Arizona: Tucson, University of Arizona, M.S. thesis, 74 p.

Feth, J.H., and others, 1964, Preliminary map of the conterminous United States showing depth to and quality of shallowest ground water containing more than 1,000 parts per million dissolved solids: U.S. Geological Survey Hydrologic Investigations Atlas HA-199, 31 p., 2 sheets, scale 1:3,168,000.

Fields, R.L., 1986, Data-processing activities of the southwest alluvial basins, RASA study, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 17-23.

Freethey, G.W., 1984, Ground-water modeling, alluvial basins of Arizona, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 57-67.

Freethey, G.W., 1986, Considerations in modeling ground-water flow in the alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 57-67.

Freethey, G.W., and Anderson, T.W., 1986, Predevelopment hydrologic conditions in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-664, 3 sheets, scale 1:500,000.

Freethey, G.W., Pool, D.R., Anderson, T.W., and Tucci, Patrick, 1986, Description and generalized distribution of aquifer materials in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-663, 4 sheets, scale 1:500,000.

Hahman, W.R., Sr., Stone, C., and Witcher, J.C., comps., 1978, Preliminary map - Geothermal energy resources of Arizona: Arizona Bureau of Geology and Mineral Technology Geothermal Map No. 1 [also listed as Arizona Geological Survey Map 15-1], 1 sheet, scale 1:1,000,000.

Hardt, W.F., Cahill, J.M., and Booher, M.B., 1958, Annual report on ground water in Arizona, Spring 1957 to Spring 1958: Arizona State Land Department Water Resources Report no. 5, 60 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1959, Annual report on ground water in Arizona, Spring 1958 to Spring 1959: Arizona State Land Department Water Resources Report no. 6, 61 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1960, Annual report on ground water in Arizona, Spring 1959 to Spring 1960: Arizona State Land Department Water Resources Report no. 7, [89] p.

Harris, R.C., 1998, A compilation of the geology and hydrology of the Black Mountains - Bullhead City area, Arizona: Arizona Geological Survey Open-File Report 98-26, 40 p.

Harshbarger, J.W., Lewis, D.D., Skibitzke, H.E., Heckler, W.L., and Kister, L.R., revised by H.L. Baldwin, 1966, Arizona water: U.S. Geological Survey Water-Supply Paper 1648, 85 p.

Hely, A.G., 1969, Lower Colorado River water supply--Its magnitude and distribution: U.S. Geological Survey Professional Paper 486-D, 54 p.

Hely, A.G., and Peck, E.L., 1964, Precipitation, runoff, and water loss in the lower Colorado River-Salton Sea area: U.S. Geological Survey Professional Paper 486-B, 16 p, 7 sheets, scales 1:500,000 and 1:1,000,000.

Hodges, E.B., and others, 1967, Annual report on ground water in Arizona, Spring 1965 to Spring 1966: Arizona State Land Department Water Resources Report no. 32, 61 p.

Johnson, Cady, and Glynn, Jack, 1982, National Uranium Resource Evaluation, Las Vegas quadrangle, Nevada, Arizona, and California: U.S. Department of Energy Report PGJ/F-121(82), 51 p., 5 microfiche, 16 sheets.

Khalaf, J.M., 1951, The water resources of the lower Colorado River basin: Chicago, University of Chicago, Department of Geography, Research Paper 22, 2 vols., 234 p.

Khalaf, J.M., 1952, The water resources of the lower Colorado River basin: Chicago, University of Chicago, Ph.D. Dissertation.

Laney, R.L., 1977, Geohydrologic reconnaissance of Lake Mead National Recreation Area - Temple Bar to Grand Wash Cliffs, Arizona: U.S. Geological Survey Administrative Report, 72 p., 1 sheet, scale 1:62,500.

Ligner, J.J., White, N.D., Kister, L.R., and Moss, M.E., 1969, Water resources: Part II of Mineral and water resources of Arizona: Arizona Bureau of Mines Bulletin 180, p. 471-580.

Longsworth, S.A., Van De Vanter, E.K., and Alwin, S.H., 1998, Activities of the Water Resources Division in Arizona, 1996-97: U.S. Geological Survey Open-File Report 98-185, 90 p.

Marie, J.R., Van De Vanter, E.K., and Moss, C.L., 1996, Activities of the Water Resources Division in Arizona, 1995-1996: U.S. Geological Survey Open-File Report 95-772, 69 p.

McDonald, C.C., and Loeltz, O.J., 1976, Water resources of the lower Colorado River-Salton Sea area as of 1971, Summary report: U.S. Geological Survey Professional Paper 486-A, p. A1-A34.

McGuinness, C.L., 1964, Generalized map showing annual runoff and productive aquifers in the conterminous United States: U.S. Geological Survey Hydrologic Investigations Atlas HA-194, scale 1:5,000,000.

McKay, W.A., 1981, Hydrogeochemical inventory and analysis of thermal springs in the Black Canyon-Hoover Dam area, Nevada and Arizona, *in* Edmiston, R.C., chairperson, Geothermal energy; The international success story: Geothermal Resources Council, Transactions , v. 5, p. 185-187.

Montgomery, E.L., and Harshbarger, J.W., 1989, Arizona hydrogeology and water supply, *in* Jenney, J.P., and Reynolds, S.J., eds., Geologic evolution of Arizona: Arizona Geological Society Digest 17, p. 827-840.

Montgomery, E.L., and Harshbarger, J.W., 1992, Arizona hydrogeology and water supply: Applied Hydrogeology, v. 1, no. 1, p. 25-37.

Olmsted, F.H., Loeltz, O.J., and Irelan, B., 1973, Geohydrology of the Yuma area, Arizona and California, *in* Water resources of Lower Colorado River - Salton Sea area: U.S. Geological Survey Professional Paper 486-H, p. H1-H227, 17 sheets, scales 1:24,000, 1:62,500, 1:125,000, and 1:250,000.

Owen-Joyce, S.J., 1987, Estimates of average annual tributary inflow to the lower Colorado River, Hoover Dam to Mexico: U.S. Geological Survey Water-Resources Investigations Report 87-4078, p.

Owen-Joyce, S.J., and Raymond, L.H., 1996, An accounting system for water and consumptive use along the Colorado River, Hoover Dam to Mexico: U.S. Geological Survey Water-Supply Paper 2407, 94 p., 3 sheets, scale 1:500,000.

Peirce, H.W., and Scurlock, J.R., 1972, Arizona well information: Arizona Bureau of Mines Bulletin 185, 195 p. [reprinted 1988, Arizona Geological Survey].

Pool, D.R., 1984, Aquifer geology of alluvial basins of Arizona, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 683-690.

Pool, D.R., 1986, Aquifer geology of alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 25-36.

Robertson, F.N., 1984, Isotopic content of ground water along the Colorado River in Arizona and California [abs.]: Geological Society of America Abstracts with Programs, v. 16, no. 6, p. 636.

Robertson, F.N., 1984, Trace elements in ground water in southern Arizona [abs.], *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 674.

Robertson, F.N., 1986, Origin and chemistry of ground water along the Colorado River in Arizona, Nevada, and California [abs.]: Arizona-Nevada Academy of Science, Journal, v. 21, Proceedings Supplement, p. 56.

Robertson, F.N., 1986, Occurrence and solubility controls of trace elements in ground water in alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 69-80.

Robertson, F.N., 1989, Ground-water geochemistry and information transfer in alluvial basins in Arizona [abs.], *in* International Geological Congress, 28th, Washington, D.C., July 9-19, 1989, Abstracts, V. 2: International Geological Congress, p. 2.709-2.710.

Robertson, F.N., 1989, Arsenic in ground-water under oxidizing conditions, south-west United States: Environmental Geochemistry and Health, v. 11, no. 3/4, p. 171-185.

Robertson, F.N., 1991, Geochemistry of ground-water in alluvial basins of Arizona and adjacent parts of Nevada, New Mexico, and California: U.S. Geological Survey Professional Paper 1406-C, p. C1-C90.

Robertson, F.N., and Garrett, W.B., 1988, Distribution of fluoride in ground water in the alluvial basins of Arizona and adjacent parts of California, Nevada, and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-665, 3 sheets, scale 1:500,000.

Robson, S.G., and Banta, E.R., 1995, Ground water atlas of the United States, Segment 2, Arizona, Colorado, New Mexico, Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-730-C, 32 p.

Ross, C.P., 1923, The lower Gila region, Arizona, A geographic, geologic, and hydrologic reconnaissance, with a guide to desert watering places: U.S. Geological Survey Water-Supply Paper 498, 237 p., 4 sheets, scales 1:50,000 and 1:250,000.

Sargent, K.A., and Bedinger, M.S., 1985, Geologic and hydrologic characterization and evaluation of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part II, Geologic and hydrologic characterization: U.S. Geological Survey Circular 904-B, 30 p.

Smith, C.F., Anning, D.W., Duet, N.R., Fisk, G.G., McCormack, H.F., Pope, G.L., Rigas, P.D., and Wallace, B.L., 1995, Water resources data, Arizona, Water year 1994: U.S. Geological Survey Water-Data Report AZ-94-1, 320 p.

Smith, C.F., Boner, F.C., Davis, R.G., Duet, N.R., and Rigas, P.D., 1993, Water resources data, Arizona, Water year 1992: U.S. Geological Survey Water-Data Report AZ-92-1, 360 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., and Rigas, P.D., 1997, Water resources data, Arizona, Water year 1996: U.S. Geological Survey Water-Data Report AZ-96-1, 328 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., Rigas, P.D., and Tadayon, S., 1996, Water resources data, Arizona, Water year 1995: U.S. Geological Survey Water-Data Report AZ-95-1, 306 p.

Smith, C.F., Rigas, P.D., Ham, L.K., Duet, N.R., and Anning, D.W., 1994, Water resources data, Arizona, Water year 1993: U.S. Geological Survey Water-Data Report AZ-93-1, 360 p.

Smith, G.E.P., 1938, The physiography of Arizona valleys and the occurrence of ground water: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Technical Bulletin no. 77, 91 p.

Smith, H.V., Caster, A.B., Fuller, W.H., Breazeale, E.L., and Draper, George, 1949, The chemical composition of representative Arizona waters: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Bulletin 225, 76 p.

Spicer, L.M., and Van De Vanter, E.K., comps., 1993, Activities of the Water Resources Division in Arizona, 1986-91: U.S. Geological Survey Open-File Report 93-165, 144 p.

Stone, Claudia, and Jones, N.O., 1980, Preliminary geothermal assessment of the Yuma area, Arizona, *with a section on* the Hydrology, by Alice Campbell: Arizona Bureau of Geology and Mineral Technology Open-File Report 80-13, 32 p., 7 sheets, scale 1:250,000.

Stone, Claudia, and Witcher, J.C., 1982, Geothermal energy in Arizona - Final contract report: Arizona Bureau of Geology and Mineral Technology Open-File Report 83-12, 398 p.

Tellier, A.H., 1973, Geothermal waters of Arizona: Tempe, Arizona State University, M.S. thesis, 30 p.

Texas Instruments, Inc., 1982, National Uranium Resource Evaluation, Variable premise evaluation system data report, Interpretation of aerial radiometric reconnaissance data, Hydrogeochemical and stream sediment reconnaissance data, Grand Canyon quadrangle, Arizona: U.S. Department of Energy Report GJD-32(81), 210 p.

Thomas, H.E., 1956, Changes in quantities and qualities of ground and surface waters, *in* Thomas, W.L., Jr, ed., with Sauer, C.O., Bates, M., and Mumford, L., Man's role in changing the face of the earth: University of Chicago Press, p. 542-563.

U.S. Bureau of Reclamation, 1938-1947, Boulder Canyon Project: Final reports: Denver, U.S. Bureau of Reclamation, 7 parts in 12 volumes.

U.S. Department of the Interior, 1981, Quality of water; Colorado River basin: U.S. Department of the Interior, 190 p. [Quality of Water, Colorado River basin, no. 10.].

U.S. Geological Survey, [1965?], Water quality records in Arizona - 1964: U.S. Geological Survey, 80 p.

U.S. Geological Survey, [1966?], 1965 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 89 p.

U.S. Geological Survey, [1968?], 1967 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 85 p.

U.S. Geological Survey, 1971, 1971 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 167 p. [NTIS PB-287 165].

U.S. Geological Survey, 1972, 1972 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 166 p. [NTIS PB-287 167].

U.S. Geological Survey, 1973, 1973 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 188 p. [NTIS PB-287 169].

U.S. Geological Survey, 1974, 1974 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 192 p. [NTIS PB-287 171].

U.S. Geological Survey, 1976, Water resources data for Arizona, Water year 1975: U.S. Geological Survey Water-Data Report AZ-75-1, 440 p.

U.S. Geological Survey, 1978, Water resources data for Arizona, Water year 1977: U.S. Geological Survey Water-Data Report AZ-77-1, 550 p.

U.S. Geological Survey, 1978, Annual summary of ground-water conditions in Arizona, Spring 1977 to Spring 1978: U.S. Geological Survey Water-Resources Investigations Open-File Report 78-144, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1979, Water resources data for Arizona, Water year 1978: U.S. Geological Survey Water-Data Report AZ-78-1, 604 p.

U.S. Geological Survey, 1979, Land use and land cover and associated maps for Grand Canyon, Arizona: U.S. Geological Survey Open-File Report 79-1494, 5 sheets, scale 1:250,000.

U.S. Geological Survey, 1979, Land use and land cover and associated maps for El Centro, California, Arizona: U.S. Geological Survey Open-File Report 79-1175, 2 sheets, scale 1:250,000.

U.S. Geological Survey, 1980, Water resources data for Arizona, Water year 1979: U.S. Geological Survey Water-Data Report AZ-79-1, 614 p.

U.S. Geological Survey, 1980, Annual summary of ground-water conditions in Arizona, Spring 1978 to Spring 1979: U.S. Geological Survey Water-Resources Investigations Open-File Report 80-330, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1981, Annual summary of ground-water conditions in Arizona, Spring 1979 to Spring 1980: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-906, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Annual summary of ground-water conditions in Arizona, Spring 1980 to Spring 1981: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Water resources data for Arizona, Water year 1980: U.S. Geological Survey Water-Data Report AZ-80-1, 568 p.

U.S. Geological Survey, 1983, Water resources data, Arizona, Water year 1981: U.S. Geological Survey Water-Data Report AZ-81-1, 532 p.

U.S. Geological Survey, 1983, Annual summary of ground-water conditions in Arizona, Spring 1981 to Spring 1982: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scales 1:1,000,000 and 1:3,200,000.

U.S. Geological Survey, 1984, Annual summary of ground-water conditions in Arizona, Spring 1982 to Spring 1983: U.S. Geological Survey Water-Resources Investigations Open-File Report 84-428, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

U.S. Geological Survey, 1985, Annual summary of ground-water conditions in Arizona, Spring 1983 to Spring 1984: U.S. Geological Survey Water-Resources Investigations Open-File Report 85-410, 2 sheets, scales 1:1,000,000 and 1:3,400,000.

U.S. Geological Survey, 1986, Annual summary of ground-water conditions in Arizona, Spring 1984 to Spring 1985: U.S. Geological Survey Water-Resources Investigations Open-File Report 86-422W, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

White, N.D., and Anderson, T.W., 1986, Arizona ground-water resources, in National water summary, 1984 - Hydrologic events, selected water quality trends, and ground-water resources: U.S. Geological Survey Water-Supply Paper 2275, p. 135-140.

White, N.D., and Garrett, W.B., 1984, Water resources data, Arizona, Water year 1982: U.S. Geological Survey Water-Data Report AZ-82-1, 440 p.
White, N.D., and Garrett, W.B., 1986, Water resources data, Arizona, Water year 1983: U.S. Geological Survey Water-Data Report AZ-83-1, 387 p.
White, N.D., and Garrett, W.B., 1987, Water resources data, Arizona, Water year 1984: U.S. Geological Survey Water-Data Report AZ-84-1, 381 p.
White, N.D., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1985: U.S. Geological Survey Water-Data Report AZ-85-1, 343 p.
White, N.D., and others, 1967, Annual report on ground water in Arizona, Spring 1964 to Spring 1965: Arizona State Land Department Water Resources Report no. 24, 62 p.
White, N.D., Stulik, R.S., and others, 1962, Annual report on ground water in Arizona, Spring 1961 to Spring 1962: Arizona State Land Department Water Resources Report no. 11, 116 p.
White, N.D., Stulik, R.S., Morse, E.K., and others, 1961, Annual report on ground water in Arizona, Spring 1960 to Spring 1961: Arizona State Land Department Water Resources Report no. 10, 93 p.
White, N.D., Stulik, R.S., Morse, E.K., and others, 1963, Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, 136 p.
White, N.D., Stulik, R.S., Morse, E.K., and others, 1964, Annual report on ground water in Arizona, Spring 1963 to Spring 1964: Arizona State Land Department Water Resources Report no. 19, 60 p.
Wilson, L.G., DeCook, K.J., and Neuman, S.P., 1980, Regional recharge research for southwest alluvial basins - Final report, U.S. Geological Survey contract 14-08-0001-18257: Tucson, University of Arizona, Water Resources Research Center, 389 p.
Wilson, R.P., 1990, Arizona water supply and use, *in* Carr, J.E., and others, National water summary, 1987 - Hydrologic events and water supply and uses: U.S. Geological Survey Water-Supply Paper 2350, p. 157-164.
Wilson, R.P., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1986: U.S. Geological Survey Water-Data Report AZ-86-1, 341 p.
Wilson, R.P., and Garrett, W.B., 1989, Water resources data, Arizona, Water year 1987: U.S. Geological Survey Water-Data Report AZ-87-1, 385 p.
Wilson, R.P., and Owen-Joyce, S.J., 1993, Determining the source of water pumped from wells along the lower Colorado River: U.S. Geological Survey Open-File Report 93-405, 2 p.
Wilson, R.P., and Owen-Joyce, S.J., 1994, Methods to identify wells that yield water that will be replaced by Colorado River water in Arizona, California, Nevada, and Utah: U.S. Geological Survey Water-Resources Investigations Report 94-4005, 36 p., 19 sheets, scale 1:100,000.
Witcher, J.C., Stone, Claudia, and Hahman, W.R., Sr., 1982, Geothermal resources of Arizona: Arizona Bureau of Geology and Mineral Technology [also listed as Arizona Geological Survey Map 15-2], 1 sheet, scale 1:500,000.
Woesner, W.M., 1982, Groundwater and surface water interaction in Echo Bay detected by seepage meter and portable piezometer, Lake Mead National Recreation Area, Arizona and Nevada [abs.]: Geological Society of America Abstracts with Programs, v. 14, no. 6, p. 354-355.

MEADVIEW BASIN
GROUNDWATER HYDROLOGY BIBLIOGRAPHY

Anderson, T.W., 1979, Development of groundwater models of alluvial basins in south-central Arizona, *in* Arizona Water Symposium, 23rd and 24th annual, Phoenix, September 27, 1979, and September 24, 1980, Proceedings: Arizona Department of Water Resources Report no. 2, p. 13-17.

Anderson, T.W., 1980, Study plan for the Regional Aquifer-System Analysis of alluvial basins in south-central Arizona and adjacent states: U.S. Geological Survey Open-File Report 80-1197, 22 p.

Anderson, T.W., 1984, Southwest alluvial basins, RASA study - An overview, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, sponsored by the Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: New York, American Society of Civil Engineers, p. 606-614.

Anderson, T.W., 1986, Study in southern and central Arizona and parts of adjacent states, *in* Sun, R.J., ed., Regional Aquifer-System Analysis program of the U.S. Geological Survey, Summary of projects, 1978-84: U.S. Geological Survey Circular 1002, p. 116-131.

Anderson, T.W., 1986, Hydrologic setting, objectives, and approach of the southwest alluvial basins, RASA study, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 5-16.

Anderson, T.W., 1986, Geohydrology of the southwest alluvial basins, Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 99-111.

Anderson, T.W., 1995, Summary of the Southwest alluvial basins, Regional Aquifer-System Analysis, South-central Arizona and parts of adjacent states: U.S. Geological Survey Professional Paper 1406-A, p. A1-A33.

Anderson, T.W., and Freethey, G.W., 1995, Simulation of ground-water flow in alluvial basins in south-central Arizona and parts of adjacent states, Regional Aquifer-System Analysis: U.S. Geological Survey Professional Paper 1406-D, 78 p.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1990, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey Open-File Report 89-378, 99 p., 3 sheets, scale 1:1,000,000.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1992, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey Professional Paper 1406-B, p. B1-B67, 3 sheets, scale 1:1,000,000.

Anderson, T.W., Welder, G.E., Lesser, Gustavo, and Trujillo, A., 1988, Region 7, Central alluvial basins, *in* Back, William, and others, eds., Hydrogeology: Geological Society of America, The Geology of North America, v. O-2, p. 81-86.

Anderson, T.W., and White, N.D., 1986, Arizona surface-water resources, *in* Moody, D.W., and others, comps., National water summary, 1985 - Hydrologic events and surface-water resources: U.S. Geological Survey Water-Supply Paper 2300, p. 145-150.

Anning, D.W., and Duet, N.R., 1994, Summary of ground-water conditions in Arizona, 1987-90: U.S. Geological Survey Open-File Report 94-476, 2 sheets, scales 1:1,000,000 and 1:2,500,000.

Arizona Department of Water Resources, 1990, Map showing Arizona groundwater basins with index of cities, towns, settlements and sites: Arizona Department of Water Resources Open File Report no. 7, 1 sheet, scale 1:1,000,000.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. I, Inventory and analysis: Arizona Department of Water Resources, 253 p.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. II, Hydrologic summary: Arizona Department of Water Resources, Hydrology Division, 236 [266] p.

Arizona Water Commission, 1975, Arizona State Water Plan, Phase 1, Inventory of resource and uses: Arizona Water Commission, 224 p., 2 sheets, approx. scale 1:670,000.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1967 to Spring 1968: Arizona State Land Department Water Resources Report no. 38, 54 p.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1968 to Spring 1969: Arizona State Land Department Water Resources Report no. 42, 46 p.

Babcock, H.M., 1970, Annual report on ground water in Arizona, Spring 1969 to Spring 1970: Arizona State Land Department Water Resources Report no. 43, 44 p.

Babcock, H.M., 1972, Annual report on ground water in Arizona, Spring 1970 to Spring 1971: Arizona Water Commission Bulletin 1, 45 p.

Babcock, H.M., 1972, Bibliography of U.S. Geological Survey water-resources reports for Arizona, May 1965 through June 1971: Arizona Water Commission Bulletin 2, 60 p.

Babcock, H.M., 1973, Annual report on ground water in Arizona, Spring 1971 to Spring 1972: Arizona Water Commission Bulletin 5, 48 p.

Babcock, H.M., 1974, Annual report on ground water in Arizona, Spring 1972 to Spring 1973: Arizona Water Commission Bulletin 7, 46 p., 3 sheets, scale 1:250,000.

Babcock, H.M., 1976, Annual summary of ground-water conditions in Arizona, Spring 1974 to Spring 1975: U.S. Geological Survey Water-Resources Investigations Open-File Report 76-59, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1976 to Spring 1977: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-106, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1975 to Spring 1976: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-10, 2 sheets, scale 1:1,000,000.

Bedinger, M.S., Anderson, T.W., and Langer, W.H., 1984, Maps showing ground-water units and withdrawal, Basin and Range Province, Arizona: U.S. Geological Survey Water-Resources Investigations Report 83-4114-A, 2 sheets, scales 1:500,000 and 1:1,000,000.

Bedinger, M.S., Langer, W.H., and Reed, J.E., 1984, Ground-water hydrology, *in* Bedinger, M.S. and others, eds., Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: U.S. Geological Survey Open-File Report 84-741, p. 98-114, 5 sheets 2, 3, and 4, scale 1:500,000.

Bedinger, M.S., Sargent, K.A., and Brady, B.T., 1985, Geologic and hydrologic characterization of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part III, Geologic and hydrologic evaluation: U.S. Geological Survey Circular 904-C, 27 p.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1984, Sonoran region, Arizona, *in* Bedinger, M.S. and others, Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: Evaluation of the regions: U.S. Geological Survey Open-File Report 84-745, p. 81-108, 2 sheets, scale 1:300,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States for isolation of high-level radioactive waste - Evaluation of the regions: U.S. Geological Survey Professional Paper 1370-H, p. H1-61, 7 plates, scale 1:1,000,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., eds., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States for isolation of high-level radioactive waste - Characterization of the Sonoran region, Arizona: U.S. Geological Survey Professional Paper 1370-D, p. D1-D40, 6 plates, scales 1:500,000 and 1:1,000,000.

Bedinger, M.S., Sargent, K.A., and Reed, J.E., 1984, Geologic and hydrologic characterization and evaluation of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part I, Introduction and guidelines: U.S. Geological Survey Circular 904-A, 16 p.

Boner, F.C., Garrett, W.B., and Konieczki, A.D., 1989, Water resources data, Arizona, Water year 1988: U.S. Geological Survey Water-Data Report AZ-88-1, 391 p.

Boner, F.C., Konieczki, A.D., and Davis, R.G., 1991, Water resources data, Arizona, Water year 1990: U.S. Geological Survey Water-Data Report AZ-90-1, 381 p.

Boner, F.C., Smith, C.F., Garrett, W.B., and Konieczki, A., 1990, Water resources data, Arizona, Water year 1989: U.S. Geological Survey Water-Data Report AZ-89-1, 391 p.

Briggs, P.C., and Nemecek, E.A., 1986, Technical aspects of Arizona groundwater law, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 93-98.

Buol, S.W., 1964, Calculated actual and potential evapotranspiration in Arizona: Tucson, University of Arizona, Agricultural Experiment Station Technical Bulletin 162, 48 p.

Clark, T.C., 1975, The Arizona Water Plan, A status report, *in* Arizona Watershed Symposium, 19th annual, Phoenix, September 24, 1975, Proceedings: Arizona Water Commission Report no. 7, p. 9-23.

Cox, C.J., and others, 1968, Annual report on ground water in Arizona, Spring 1966 to Spring 1967: Arizona State Land Department Water Resources Report no. 36, 43 p.

Daniel, D.L., 1981, Maps showing total dissolved solids content of groundwater in Arizona: Arizona Department of Water Resources Hydrologic Map Series Report no. 2, 2 sheets, scale 1:1,000,000.

Davidson, E.S., 1979, Summary appraisals of the nation's ground-water resources - Lower Colorado region: U.S. Geological Survey Professional Paper 813-R, 23 p., 3 sheets, scale 1:1,000,000.

Eberly, L.D., and Stanley, T.B., Jr., 1978, Cenozoic stratigraphy and geologic history of southwestern Arizona: Geological Society of America Bulletin, v. 89, no. 6, p. 921-940.

Feth, J.H., and others, 1964, Preliminary map of the conterminous United States showing depth to and quality of shallowest ground water containing more than 1,000 parts per million dissolved solids: U.S. Geological Survey Hydrologic Investigations Atlas HA-199, 31 p., 2 sheets, scale 1:3,168,000.

Fields, R.L., 1986, Data-processing activities of the southwest alluvial basins, RASA study, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States -

Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 17-23.

Freethey, G.W., 1986, Considerations in modeling ground-water flow in the alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 57-67.

Freethey, G.W., and Anderson, T.W., 1986, Predevelopment hydrologic conditions in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-664, 3 sheets, scale 1:500,000.

Freethey, G.W., Pool, D.R., Anderson, T.W., and Tucci, Patrick, 1986, Description and generalized distribution of aquifer materials in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-663, 4 sheets, scale 1:500,000.

Hardt, W.F., Cahill, J.M., and Booher, M.B., 1958, Annual report on ground water in Arizona, Spring 1957 to Spring 1958: Arizona State Land Department Water Resources Report no. 5, 60 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1959, Annual report on ground water in Arizona, Spring 1958 to Spring 1959: Arizona State Land Department Water Resources Report no. 6, 61 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1960, Annual report on ground water in Arizona, Spring 1959 to Spring 1960: Arizona State Land Department Water Resources Report no. 7, [89] p.

Harshbarger, J.W., Lewis, D.D., Skibitzke, H.E., Heckler, W.L., and Kister, L.R., revised by H.L. Baldwin, 1966, Arizona water: U.S. Geological Survey Water-Supply Paper 1648, 85 p.

Hodges, E.B., and others, 1967, Annual report on ground water in Arizona, Spring 1965 to Spring 1966: Arizona State Land Department Water Resources Report no. 32, 61 p.

Johnson, P.W., and Sanderson, R.B., 1968, Spring flow into the Colorado River, Lees Ferry to Lake Mead, Arizona: Arizona State Land Department Water Resources Report no. 34, 26 p.

Laney, R.L., 1977, Geohydrologic reconnaissance of Lake Mead National Recreation Area - Temple Bar to Grand Wash Cliffs, Arizona: U.S. Geological Survey Administrative Report, 72 p., 1 sheet, scale 1:62,500.

Ligner, J.J., White, N.D., Kister, L.R., and Moss, M.E., 1969, Water resources: Part II of Mineral and water resources of Arizona: Arizona Bureau of Mines Bulletin 180, p. 471-580.

Longsworth, S.A., Van De Vanter, E.K., and Alwin, S.H., 1998, Activities of the Water Resources Division in Arizona, 1996-97: U.S. Geological Survey Open-File Report 98-185, 90 p.

Marie, J.R., Van De Vanter, E.K., and Moss, C.L., 1996, Activities of the Water Resources Division in Arizona, 1995-1996: U.S. Geological Survey Open-File Report 95-772, 69 p.

McGuinness, C.L., 1964, Generalized map showing annual runoff and productive aquifers in the conterminous United States: U.S. Geological Survey Hydrologic Investigations Atlas HA-194, scale 1:5,000,000.

Montgomery, E.L., and Harshbarger, J.W., 1989, Arizona hydrogeology and water supply, *in* Jenney, J.P., and Reynolds, S.J., eds., Geologic evolution of Arizona: Arizona Geological Society Digest 17, p. 827-840.

Montgomery, E.L., and Harshbarger, J.W., 1992, Arizona hydrogeology and water supply: Applied Hydrogeology, v. 1, no. 1, p. 25-37.

Peirce, H.W., and Scurlock, J.R., 1972, Arizona well information: Arizona Bureau of Mines Bulletin 185, 195 p. [reprinted 1988, Arizona Geological Survey].

Pool, D.R., 1984, Aquifer geology of alluvial basins of Arizona, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 683-690.

Pool, D.R., 1986, Aquifer geology of alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 25-36.

Remick, W.H., 1981, Map showing ground-water conditions in the Hualapai Basin area, Mohave, Coconino, and Yavapai Counties, Arizona - 1980: Arizona Department of Water Resources Hydrologic Map Series Report no. 4, 1 sheet, scale 1:125,000.

Robertson, F.N., 1984, Trace elements in ground water in southern Arizona [abs.], *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 674.

Robertson, F.N., 1986, Occurrence and solubility controls of trace elements in ground water in alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 69-80.

Robertson, F.N., 1989, Ground-water geochemistry and information transfer in alluvial basins in Arizona [abs.], *in* International Geological Congress, 28th, Washington, D.C., July 9-19, 1989, Abstracts, V. 2: International Geological Congress, p. 2.709-2.710.

Robertson, F.N., 1989, Arsenic in ground-water under oxidizing conditions, south-west United States: Environmental Geochemistry and Health, v. 11, no. 3/4, p. 171-185.

Robson, S.G., and Banta, E.R., 1995, Ground water atlas of the United States, Segment 2, Arizona, Colorado, New Mexico, Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-0730-C, 32 p.

Sargent, K.A., and Bedinger, M.S., 1985, Geologic and hydrologic characterization and evaluation of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part II, Geologic and hydrologic characterization: U.S. Geological Survey Circular 904-B, 30 p.

Scott, R.C., and Barker, F.B., 1962, Data on uranium and radium in ground water in the United States 1954 to 1957: U.S. Geological Survey Professional Paper 426, 115 p., 2 sheets, scale 1:7,000,000.

Smith, C.F., Anning, D.W., Duet, N.R., Fisk, G.G., McCormack, H.F., Pope, G.L., Rigas, P.D., and Wallace, B.L., 1995, Water resources data, Arizona, Water year 1994: U.S. Geological Survey Water-Data Report AZ-94-1, 320 p.

Smith, C.F., Boner, F.C., Davis, R.G., Duet, N.R., and Rigas, P.D., 1993, Water resources data, Arizona, Water year 1992: U.S. Geological Survey Water-Data Report AZ-92-1, 360 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., and Rigas, P.D., 1997, Water resources data, Arizona, Water year 1996: U.S. Geological Survey Water-Data Report AZ-96-1, 328 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., Rigas, P.D., and Tadayon, S., 1996, Water resources data, Arizona, Water year 1995: U.S. Geological Survey Water-Data Report AZ-95-1, 306 p.

Smith, C.F., Rigas, P.D., Ham, L.K., Duet, N.R., and Anning, D.W., 1994, Water resources data, Arizona, Water year 1993: U.S. Geological Survey Water-Data Report AZ-93-1, 360 p.

Smith, G.E.P., 1938, The physiography of Arizona valleys and the occurrence of ground water: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Technical Bulletin no. 77, 91 p.

Smith, H.V., Caster, A.B., Fuller, W.H., Breazeale, E.L., and Draper, George, 1949, The chemical composition of representative Arizona waters: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Bulletin 225, 76 p.

Spicer, L.M., and Van De Vanter, E.K., comps., 1993, Activities of the Water Resources Division in Arizona, 1986-91: U.S. Geological Survey Open-File Report 93-165, 144 p.

Stone, Claudia, and Witcher, J.C., 1982, Geothermal energy in Arizona - Final contract report: Arizona Bureau of Geology and Mineral Technology Open-File Report 83-12, 398 p.

Texas Instruments, Inc., 1982, National Uranium Resource Evaluation, Variable premise evaluation system data report, Interpretation of hydrogeochemical and stream sediment reconnaissance data, Williams quadrangle, Arizona: U.S. Department of Energy Report GJD-93(81), 264 p.

U.S. Geological Survey, [1965?], Water quality records in Arizona - 1964: U.S. Geological Survey, 80 p.

U.S. Geological Survey, [1966?], 1965 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 89 p.

U.S. Geological Survey, [1968?], 1967 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 85 p.

U.S. Geological Survey, 1971, 1971 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 167 p. [NTIS PB-287 165].

U.S. Geological Survey, 1972, 1972 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 166 p. [NTIS PB-287 167].

U.S. Geological Survey, 1972, Aeromagnetic map of the Gold Butte-Chloride area, Arizona and Nevada: U.S. Geological Survey Geophysical Investigations Map GP-757, 2 sheets, scale 1:62,500.

U.S. Geological Survey, 1973, 1973 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 188 p. [NTIS PB-287 169].

U.S. Geological Survey, 1974, 1974 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 192 p. [NTIS PB-287 171].

U.S. Geological Survey, 1976, Water resources data for Arizona, Water year 1975: U.S. Geological Survey Water-Data Report AZ-75-1, 440 p.

U.S. Geological Survey, 1978, Water resources data for Arizona, Water year 1977: U.S. Geological Survey Water-Data Report AZ-77-1, 550 p.

U.S. Geological Survey, 1978, Annual summary of ground-water conditions in Arizona, Spring 1977 to Spring 1978: U.S. Geological Survey Water-Resources Investigations Open-File Report 78-144, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1979, Water resources data for Arizona, Water year 1978: U.S. Geological Survey Water-Data Report AZ-78-1, 604 p.

U.S. Geological Survey, 1979, Land use and land cover and associated maps for Grand Canyon, Arizona: U.S. Geological Survey Open-File Report 79-1494, 5 sheets, scale 1:250,000.

U.S. Geological Survey, 1980, Water resources data for Arizona, Water year 1979: U.S. Geological Survey Water-Data Report AZ-79-1, 614 p.

U.S. Geological Survey, 1980, Annual summary of ground-water conditions in Arizona, Spring 1978 to Spring 1979: U.S. Geological Survey Water-Resources Investigations Open-File Report 80-330, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1981, Annual summary of ground-water conditions in Arizona, Spring 1979 to Spring 1980: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-906, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Annual summary of ground-water conditions in Arizona, Spring 1980 to Spring 1981: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Water resources data for Arizona, Water year 1980: U.S. Geological Survey Water-Data Report AZ-80-1, 568 p.

U.S. Geological Survey, 1983, Water resources data, Arizona, Water year 1981: U.S. Geological Survey Water-Data Report AZ-81-1, 532 p.

U.S. Geological Survey, 1983, Annual summary of ground-water conditions in Arizona, Spring 1981 to Spring 1982: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scales 1:1,000,000 and 1:3,200,000.

U.S. Geological Survey, 1984, Annual summary of ground-water conditions in Arizona, Spring 1982 to Spring 1983: U.S. Geological Survey Water-Resources Investigations Open-File Report 84-428, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

U.S. Geological Survey, 1985, Annual summary of ground-water conditions in Arizona, Spring 1983 to Spring 1984: U.S. Geological Survey Water-Resources Investigations Open-File Report 85-410, 2 sheets, scales 1:1,000,000 and 1:3,400,000.

U.S. Geological Survey, 1986, Annual summary of ground-water conditions in Arizona, Spring 1984 to Spring 1985: U.S. Geological Survey Water-Resources Investigations Open-File Report 86-422W, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

White, N.D., and Garrett, W.B., 1984, Water resources data, Arizona, Water year 1982: U.S. Geological Survey Water-Data Report AZ-82-1, 440 p.

White, N.D., and Garrett, W.B., 1986, Water resources data, Arizona, Water year 1983: U.S. Geological Survey Water-Data Report AZ-83-1, 387 p.

White, N.D., and Garrett, W.B., 1987, Water resources data, Arizona, Water year 1984: U.S. Geological Survey Water-Data Report AZ-84-1, 381 p.

White, N.D., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1985: U.S. Geological Survey Water-Data Report AZ-85-1, 343 p.

White, N.D., and others, 1967, Annual report on ground water in Arizona, Spring 1964 to Spring 1965: Arizona State Land Department Water Resources Report no. 24, 62 p.

White, N.D., Stulik, R.S., and others, 1962, Annual report on ground water in Arizona, Spring 1961 to Spring 1962: Arizona State Land Department Water Resources Report no. 11, 116 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1961, Annual report on ground water in Arizona, Spring 1960 to Spring 1961: Arizona State Land Department Water Resources Report no. 10, 93 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1963, Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, 136 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1964, Annual report on ground water in Arizona, Spring 1963 to Spring 1964: Arizona State Land Department Water Resources Report no. 19, 60 p.

Wilson, L.G., DeCook, K.J., and Neuman, S.P., 1980, Regional recharge research for southwest alluvial basins - Final report, U.S. Geological Survey contract 14-08-0001-18257: Tucson, University of Arizona, Water Resources Research Center, 389 p.

Wilson, R.P., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1986: U.S. Geological Survey Water-Data Report AZ-86-1, 341 p.

Wilson, R.P., and Garrett, W.B., 1989, Water resources data, Arizona, Water year 1987: U.S. Geological Survey Water-Data Report AZ-87-1, 385 p.

PEACH SPRINGS BASIN

GROUNDWATER HYDROLOGY BILIOGRAPHY

Anderson, T.W., 1984, Southwest alluvial basins, RASA study - An overview, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, sponsored by the Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: New York, American Society of Civil Engineers, p. 606-614.

Anderson, T.W., 1986, Geohydrology of the southwest alluvial basins, Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 99-111.

Anderson, T.W., and Johnson, A.I., eds., 1986, Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, 116 p.

Anderson, T.W., Welder, G.E., Lesser, Gustavo, and Trujillo, A., 1988, Region 7, Central alluvial basins, *in* Back, William, and others, eds., Hydrogeology: Geological Society of America, The Geology of North America, v. O-2, p. 81-86.

Anderson, T.W., and White, N.D., 1986, Arizona surface-water resources, *in* Moody, D.W., and others, comps., National water summary, 1985 - Hydrologic events and surface-water resources: U.S. Geological Survey Water-Supply Paper 2300, p. 145-150.

Anning, D.W., and Duet, N.R., 1994, Summary of ground-water conditions in Arizona, 1987-90: U.S. Geological Survey Open-File Report 94-476, 2 sheets, scales 1:1,000,000 and 1:2,500,000.

Arizona Department of Water Resources, 1990, Map showing Arizona groundwater basins with index of cities, towns, settlements and sites: Arizona Department of Water Resources Open File Report no. 7, 1 sheet, scale 1:1,000,000.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. II, Hydrologic summary: Arizona Department of Water Resources, Hydrology Division, 236 [266] p.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. I, Inventory and analysis: Arizona Department of Water Resources, 253 p.

Arizona Water Commission, 1975, Arizona State Water Plan, Phase 1, Inventory of resource and uses: Arizona Water Commission, 224 p., 2 sheets, approx. scale 1:670,000.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1967 to Spring 1968: Arizona State Land Department Water Resources Report no. 38, 54 p.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1968 to Spring 1969: Arizona State Land Department Water Resources Report no. 42, 46 p.

Babcock, H.M., 1970, Annual report on ground water in Arizona, Spring 1969 to Spring 1970: Arizona State Land Department Water Resources Report no. 43, 44 p.

Babcock, H.M., 1972, Annual report on ground water in Arizona, Spring 1970 to Spring 1971: Arizona Water Commission Bulletin 1, 45 p.

Babcock, H.M., 1972, Bibliography of U.S. Geological Survey water-resources reports for Arizona, May 1965 through June 1971: Arizona Water Commission Bulletin 2, 60 p.

Babcock, H.M., 1973, Annual report on ground water in Arizona, Spring 1971 to Spring 1972: Arizona Water Commission Bulletin 5, 48 p.

Babcock, H.M., 1974, Annual report on ground water in Arizona, Spring 1972 to Spring 1973: Arizona Water Commission Bulletin 7, 46 p., 3 sheets, scale 1:250,000.

Babcock, H.M., 1976, Annual summary of ground-water conditions in Arizona, Spring 1974 to Spring 1975: U.S. Geological Survey Water-Resources Investigations Open-File Report 76-59, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1976 to Spring 1977: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-106, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1975 to Spring 1976: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-10, 2 sheets, scale 1:1,000,000.

Bedinger, M.S., Anderson, T.W., and Langer, W.H., 1984, Maps showing ground-water units and withdrawal, Basin and Range Province, Arizona: U.S. Geological Survey Water-Resources Investigations Report 83-4114-A, 2 sheets, scales 1:500,000 and 1:1,000,000.

Bedinger, M.S., Langer, W.H., and Reed, J.E., 1984, Ground-water hydrology, *in* Bedinger, M.S. and others, eds., Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: U.S. Geological Survey Open-File Report 84-741, p. 98-114, 5 sheets 2, 3, and 4, scale 1:500,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1984, Sonoran region, Arizona, *in* Bedinger, M.S. and others, Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: Evaluation of the regions: U.S. Geological Survey Open-File Report 84-745, p. 81-108, 2 sheets, scale 1:300,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States for isolation of high-level radioactive waste - Evaluation of the regions: U.S. Geological Survey Professional Paper 1370-H, p. H1-61, 7 plates, scale 1:1,000,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., eds., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States for isolation of high-level radioactive waste - Characterization of the Sonoran region, Arizona: U.S. Geological Survey Professional Paper 1370-D, p. D1-D40, 6 plates, scales 1:500,000 and 1:1,000,000.

Beus, S.S., and Morales, Michael, eds., 1990, Grand Canyon geology: New York, Oxford University Press, 518 p.

Bevlin, N.J., 1976, Engineer's report on the possibilities of developing additional water supplies for Hualapai Indian Tribe at Peach Springs, Arizona: Kingman, Ariz., unpublished report, 38 p.

Bills, D.J., and Flynn, M.E., 2002, Hydrogeologic data for the Coconino Plateau and adjacent areas, Coconino and Yavapai Counties, Arizona: U.S. Geological Survey Open-File Report 02-265, 29 p. [includes CD containing tables of source data at back of report]

Boner, F.C., Garrett, W.B., and Konieczki, A.D., 1989, Water resources data, Arizona, Water year 1988: U.S. Geological Survey Water-Data Report AZ-88-1, 391 p.

Boner, F.C., Konieczki, A.D., and Davis, R.G., 1991, Water resources data, Arizona, Water year 1990: U.S. Geological Survey Water-Data Report AZ-90-1, 381 p.

Boner, F.C., Smith, C.F., Garrett, W.B., and Konieczki, A., 1990, Water resources data, Arizona, Water year 1989: U.S. Geological Survey Water-Data Report AZ-89-1, 391 p.

Boyer, D.G., 1977, Water resources information survey for the Hualapai Indian Reservation, Arizona: Tucson, University of Arizona, Office of Arid Lands Studies, Laboratory of Native Development.

Brown, S.G., 1976, Preliminary maps showing ground-water resources in the lower Colorado River region, Arizona, Nevada, New Mexico, and Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-542, 1 sheet, scale 1:1,000,000.

Buol, S.W., 1964, Calculated actual and potential evapotranspiration in Arizona: Tucson, University of Arizona, Agricultural Experiment Station Technical Bulletin 162, 48 p.

Clark, T.C., 1975, The Arizona Water Plan, A status report, *in* Arizona Watershed Symposium, 19th annual, Phoenix, September 24, 1975, Proceedings: Arizona Water Commission Report no. 7, p. 9-23.

Cox, C.J., and others, 1968, Annual report on ground water in Arizona, Spring 1966 to Spring 1967: Arizona State Land Department Water Resources Report no. 36, 43 p.

Daniel, D.L., 1981, Maps showing total dissolved solids content of groundwater in Arizona: Arizona Department of Water Resources Hydrologic Map Series Report no. 2, 2 sheets, scale 1:1,000,000.

Davidson, E.S., 1979, Summary appraisals of the nation's ground-water resources - Lower Colorado region: U.S. Geological Survey Professional Paper 813-R, 23 p., 3 sheets, scale 1:1,000,000.

Eberly, L.D., and Stanley, T.B., Jr., 1978, Cenozoic stratigraphy and geologic history of southwestern Arizona: Geological Society of America Bulletin, v. 89, no. 6, p. 921-940.

Feth, J.H., and others, 1964, Preliminary map of the conterminous United States showing depth to and quality of shallowest ground water containing more than 1,000 parts per million dissolved solids: U.S. Geological Survey Hydrologic Investigations Atlas HA-199, 31 p., 2 sheets, scale 1:3,168,000.

Goetz, A.F.H., Billingsley, F.C., Gillespie, A.R., Abrams, M.J., Squires, R.L., Shoemaker, E.M., Lucchitta, I., and Elston, D.P., 1975, Application of ERTS images and image processing to regional geologic problems and geologic mapping in northern Arizona: Pasadena, California Institute of Technology, Jet Propulsion Laboratory Technical Report 32-1597, 188 p.

Griffiths, P.G., Webb, R.H., and Melis, T.S., 1996, Initiation and frequency of debris flows in Grand Canyon, Arizona: U.S. Geological Survey Open-File Report 96-0491, 35 p.

Hardt, W.F., Cahill, J.M., and Booher, M.B., 1958, Annual report on ground water in Arizona, Spring 1957 to Spring 1958: Arizona State Land Department Water Resources Report no. 5, 60 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1959, Annual report on ground water in Arizona, Spring 1958 to Spring 1959: Arizona State Land Department Water Resources Report no. 6, 61 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1960, Annual report on ground water in Arizona, Spring 1959 to Spring 1960: Arizona State Land Department Water Resources Report no. 7, [89] p.

Harshbarger, J.W., Lewis, D.D., Skibitzke, H.E., Heckler, W.L., and Kister, L.R., revised by H.L. Baldwin, 1966, Arizona water: U.S. Geological Survey Water-Supply Paper 1648, 85 p.

Hodges, E.B., and others, 1967, Annual report on ground water in Arizona, Spring 1965 to Spring 1966: Arizona State Land Department Water Resources Report no. 32, 61 p.

Huntoon, P.W., 1977, Cambrian stratigraphic nomenclature and ground-water prospecting failures on the Hualapai Plateau, Arizona: Ground Water (Journal of Association of Ground Water Scientists and Engineers), v. 15, p. 426-433.

Johnson, P.W., and Sanderson, R.B., 1968, Spring flow into the Colorado River, Lees Ferry to Lake Mead, Arizona: Arizona State Land Department Water Resources Report no. 34, 26 p.

Ligner, J.J., White, N.D., Kister, L.R., and Moss, M.E., 1969, Water resources: Part II of Mineral and water resources of Arizona: Arizona Bureau of Mines Bulletin 180, p. 471-580.

Longsworth, S.A., Van De Vanter, E.K., and Alwin, S.H., 1998, Activities of the Water Resources Division in Arizona, 1996-97: U.S. Geological Survey Open-File Report 98-185, 90 p.

Marie, J.R., Van De Vanter, E.K., and Moss, C.L., 1996, Activities of the Water Resources Division in Arizona, 1995-1996: U.S. Geological Survey Open-File Report 95-772, 69 p.

McGavock, E.H., 1968, Basic ground-water data for southern Coconino County, Arizona: Arizona State Land Department Water Resources Report no. 33, 49 p.

McGuinness, C.L., 1964, Generalized map showing annual runoff and productive aquifers in the conterminous United States: U.S. Geological Survey Hydrologic Investigations Atlas HA-194, scale 1:5,000,000.

Myers, S.M., 1987, Map showing groundwater conditions in the Peach Springs Basin, Mohave, Coconino, and Yavapai Counties, Arizona - 1987: Arizona Department of Water Resources Hydrologic Map Series Report no. 15, 1 sheet, scale 1:125,000.

Peirce, H.W., and Scurlock, J.R., 1972, Arizona well information: Arizona Bureau of Mines Bulletin 185, 195 p. [reprinted 1988, Arizona Geological Survey].

Pool, D.R., 1984, Aquifer geology of alluvial basins of Arizona, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 683-690.

Pool, D.R., 1986, Aquifer geology of alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 25-36.

Reiter, M., Mansure, A.J., and Shearer, C., 1978, Geothermal characteristics of the Colorado Plateau [abs.], in Papers presented to the Conference on Plateau Uplift: Mode and Mechanism, A Lunar and Planetary Institute Topical Conference: Houston, Lunar and Planetary Institute, LPI Contribution 329, p. 43.

Remick, W.H., 1981, Map showing ground-water conditions in the Hualapai Basin area, Mohave, Coconino, and Yavapai Counties, Arizona - 1980: Arizona Department of Water Resources Hydrologic Map Series Report no. 4, 1 sheet, scale 1:125,000.

Robertson, F.N., 1989, Ground-water geochemistry and information transfer in alluvial basins in Arizona [abs.], *in* International Geological Congress, 28th, Washington, D.C., July 9-19, 1989, Abstracts, V. 2: International Geological Congress, p. 2.709-2.710.

Robertson, F.N., 1991, Geochemistry of ground-water in alluvial basins of Arizona and adjacent parts of Nevada, New Mexico, and California: U.S. Geological Survey Professional Paper 1406-C, p. C1-C90.

Robson, S.G., and Banta, E.R., 1995, Ground water atlas of the United States, Segment 2, Arizona, Colorado, New Mexico, Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-730-C, 32 p.

Scott, R.C., and Barker, F.B., 1962, Data on uranium and radium in ground water in the United States 1954 to 1957: U.S. Geological Survey Professional Paper 426, 115 p., 2 sheets, scale 1:7,000,000.

Smith, C.F., Anning, D.W., Duet, N.R., Fisk, G.G., McCormack, H.F., Pope, G.L., Rigas, P.D., and Wallace, B.L., 1995, Water resources data, Arizona, Water year 1994: U.S. Geological Survey Water-Data Report AZ-94-1, 320 p.

Smith, C.F., Boner, F.C., Davis, R.G., Duet, N.R., and Rigas, P.D., 1993, Water resources data, Arizona, Water year 1992: U.S. Geological Survey Water-Data Report AZ-92-1, 360 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., and Rigas, P.D., 1997, Water resources data, Arizona, Water year 1996: U.S. Geological Survey Water-Data Report AZ-96-1, 328 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., Rigas, P.D., and Tadayon, S., 1996, Water resources data, Arizona, Water year 1995: U.S. Geological Survey Water-Data Report AZ-95-1, 306 p.

Smith, C.F., Rigas, P.D., Ham, L.K., Duet, N.R., and Anning, D.W., 1994, Water resources data, Arizona, Water year 1993: U.S. Geological Survey Water-Data Report AZ-93-1, 360 p.

Smith, H.V., Caster, A.B., Fuller, W.H., Breazeale, E.L., and Draper, George, 1949, The chemical composition of representative Arizona waters: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Bulletin 225, 76 p.

Spicer, L.M., and Van De Vanter, E.K., comps., 1993, Activities of the Water Resources Division in Arizona, 1986-91: U.S. Geological Survey Open-File Report 93-165, 144 p.

Stone, Claudia, and Witcher, J.C., 1982, Geothermal energy in Arizona - Final contract report: Arizona Bureau of Geology and Mineral Technology Open-File Report 83-12, 398 p.

Twenter, F.R., 1962, Geology and promising areas for ground-water development in the Hualapai Indian Reservation, Arizona, *in* Water Supply of Indian Reservations: U.S. Geological Survey Water-Supply Paper 1576-A, 38 p., 1 sheet, scale 1:125,000.

U.S. Geological Survey, [1965?], Water quality records in Arizona - 1964: U.S. Geological Survey, 80 p.

U.S. Geological Survey, [1966?], 1965 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 89 p.

U.S. Geological Survey, [1968?], 1967 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 85 p.

U.S. Geological Survey, 1971, 1971 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 167 p. [NTIS PB-287 165].

U.S. Geological Survey, 1972, 1972 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 166 p. [NTIS PB-287 167].

U.S. Geological Survey, 1972, Aeromagnetic map of the Gold Butte-Chloride area, Arizona and Nevada: U.S. Geological Survey Geophysical Investigations Map GP-757, 2 sheets, scale 1:62,500.

U.S. Geological Survey, 1973, 1973 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 188 p. [NTIS PB-287 169].

U.S. Geological Survey, 1974, 1974 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 192 p. [NTIS PB-287 171].

U.S. Geological Survey, 1976, Water resources data for Arizona, Water year 1975: U.S. Geological Survey Water-Data Report AZ-75-1, 440 p.

U.S. Geological Survey, 1978, Water resources data for Arizona, Water year 1977: U.S. Geological Survey Water-Data Report AZ-77-1, 550 p.

U.S. Geological Survey, 1978, Annual summary of ground-water conditions in Arizona, Spring 1977 to Spring 1978: U.S. Geological Survey Water-Resources Investigations Open-File Report 78-144, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1979, Water resources data for Arizona, Water year 1978: U.S. Geological Survey Water-Data Report AZ-78-1, 604 p.

U.S. Geological Survey, 1980, Water resources data for Arizona, Water year 1979: U.S. Geological Survey Water-Data Report AZ-79-1, 614 p.

U.S. Geological Survey, 1980, Annual summary of ground-water conditions in Arizona, Spring 1978 to Spring 1979: U.S. Geological Survey Water-Resources Investigations Open-File Report 80-330, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1981, Annual summary of ground-water conditions in Arizona, Spring 1979 to Spring 1980: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-906, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Annual summary of ground-water conditions in Arizona, Spring 1980 to Spring 1981: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Water resources data for Arizona, Water year 1980: U.S. Geological Survey Water-Data Report AZ-80-1, 568 p.

U.S. Geological Survey, 1983, Water resources data, Arizona, Water year 1981: U.S. Geological Survey Water-Data Report AZ-81-1, 532 p.

U.S. Geological Survey, 1983, Annual summary of ground-water conditions in Arizona, Spring 1981 to Spring 1982: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scales 1:1,000,000 and 1:3,200,000.

U.S. Geological Survey, 1984, Annual summary of ground-water conditions in Arizona, Spring 1982 to Spring 1983: U.S. Geological Survey Water-Resources Investigations Open-File Report 84-428, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

U.S. Geological Survey, 1985, Annual summary of ground-water conditions in Arizona, Spring 1983 to Spring 1984: U.S. Geological Survey Water-Resources Investigations Open-File Report 85-410, 2 sheets, scales 1:1,000,000 and 1:3,400,000.

U.S. Geological Survey, 1986, Annual summary of ground-water conditions in Arizona, Spring 1984 to Spring 1985: U.S. Geological Survey Water-Resources Investigations Open-File Report 86-422W, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

Wagoner, J.L., 1979, Hydrogeochemical and stream sediment reconnaissance basic data report for Williams NTMS quadrangle, Arizona: U.S. Department of Energy Report GJBX-71(79), 74 p., 6 sheets, scale 1:250,000, 5 microfiche.

Wenrich, K.J., 1986, Geochemical exploration for mineralized breccia pipes in northern Arizona, U.S.A.: Applied Geochemistry, v. 1, p. 469-485.

Wenrich, K.J., 1986, Exploration techniques for locating uranium-mineralized breccia pipes in northern Arizona [abs.]: American Association of Petroleum Geologists Bulletin, v. 70, no. 5, p. 662.

Wenrich, K.J., Boundy, S.Q., Aumente-Modreski, Regina, Schwarz, S.P., Sutphin, H.B., and Been, J.M., 1994, A hydrogeochemical survey for mineralized breccia pipes - data from springs, wells, and streams on the Hualapai Indian Reservation, northwestern Arizona: U.S. Geological Survey Open-File Report 93-0619, 66 p.

White, N.D., and Garrett, W.B., 1984, Water resources data, Arizona, Water year 1982: U.S. Geological Survey Water-Data Report AZ-82-1, 440 p.

White, N.D., and Garrett, W.B., 1986, Water resources data, Arizona, Water year 1983: U.S. Geological Survey Water-Data Report AZ-83-1, 387 p.

White, N.D., and Garrett, W.B., 1987, Water resources data, Arizona, Water year 1984: U.S. Geological Survey Water-Data Report AZ-84-1, 381 p.

White, N.D., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1985: U.S. Geological Survey Water-Data Report AZ-85-1, 343 p.

White, N.D., and others, 1967, Annual report on ground water in Arizona, Spring 1964 to Spring 1965: Arizona State Land Department Water Resources Report no. 24, 62 p.

White, N.D., Stulik, R.S., and others, 1962, Annual report on ground water in Arizona, Spring 1961 to Spring 1962: Arizona State Land Department Water Resources Report no. 11, 116 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1961, Annual report on ground water in Arizona, Spring 1960 to Spring 1961: Arizona State Land Department Water Resources Report no. 10, 93 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1963, Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, 136 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1964, Annual report on ground water in Arizona, Spring 1963 to Spring 1964: Arizona State Land Department Water Resources Report no. 19, 60 p.

Wilson, L.G., DeCook, K.J., and Neuman, S.P., 1980, Regional recharge research for southwest alluvial basins - Final report, U.S. Geological Survey contract 14-08-0001-18257: Tucson, University of Arizona, Water Resources Research Center, 389 p.

Wilson, R.P., 1990, Arizona water supply and use, *in* Carr, J.E., and others, National water summary, 1987 - Hydrologic events and water supply and uses: U.S. Geological Survey Water-Supply Paper 2350, p. 157-164.

Wilson, R.P., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1986: U.S. Geological Survey Water-Data Report AZ-86-1, 341 p.

Wilson, R.P., and Garrett, W.B., 1989, Water resources data, Arizona, Water year 1987: U.S. Geological Survey Water-Data Report AZ-87-1, 385 p.

Young, R.A., 1966, Cenozoic geology along the edge of the Colorado Plateau in northwestern Arizona: St. Louis, Mo., Washington University, Ph.D. dissertation, 167 p., 4 sheets, scale 1:31,680; abstract in Dissertation Abstracts International, v. 27, p. 1994B-1995B.

Young, R.A., 1979, Discussion of 'Cambrian stratigraphic nomenclature and ground-water prospecting failures on the Hualapai Plateau, Arizona' by P.W. Huntoon: Ground Water (Journal of Association of Ground Water Scientists and Engineers), v. 17, p. 287-291.

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GROUNDWATER HYDROLOGY BIBLIOGRAPHY

Allison, J.C., 1917, Control of Colorado River as related to the protection of Imperial Valley: American Society of Civil Engineers, Transactions, v. 81, p. 297-340.

Anderson, T.W., 1979, Development of groundwater models of alluvial basins in south-central Arizona, *in* Arizona Water Symposium, 23rd and 24th annual, Phoenix, September 27, 1979, and September 24, 1980, Proceedings: Arizona Department of Water Resources Report no. 2, p. 13-17.

Anderson, T.W., 1980, Study plan for the Regional Aquifer-System Analysis of alluvial basins in south-central Arizona and adjacent states: U.S. Geological Survey Open-File Report 80-1197, 22 p.

Anderson, T.W., 1984, Southwest alluvial basins, RASA study - An overview, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, sponsored by the Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: New York, American Society of Civil Engineers, p. 606-614.

Anderson, T.W., 1986, Study in southern and central Arizona and parts of adjacent states, *in* Sun, R.J., ed., Regional Aquifer-System Analysis program of the U.S. Geological Survey, Summary of projects, 1978-84: U.S. Geological Survey Circular 1002, p. 116-131.

Anderson, T.W., 1986, Hydrologic setting, objectives, and approach of the southwest alluvial basins, RASA study, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 5-16.

Anderson, T.W., 1986, Geohydrology of the southwest alluvial basins, Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 99-111.

Anderson, T.W., 1995, Summary of the Southwest alluvial basins, Regional Aquifer-System Analysis, South-central Arizona and parts of adjacent states: U.S. Geological Survey Professional Paper 1406-A, p. A1-A33.

Anderson, T.W., and Freethey, G.W., 1995, Simulation of ground-water flow in alluvial basins in south-central Arizona and parts of adjacent states, Regional Aquifer-System Analysis: U.S. Geological Survey Professional Paper 1406-D, 78 p.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1990, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey Open-File Report 89-378, 99 p., 3 sheets, scale 1:1,000,000.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1992, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey Professional Paper 1406-B, p. B1-B67, 3 sheets, scale 1:1,000,000.

Anderson, T.W., and Johnson, A.I., eds., 1986, Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, 116 p.

Anderson, T.W., Welder, G.E., Lesser, Gustavo, and Trujillo, A., 1988, Region 7, Central alluvial basins, *in* Back, William, and others, eds., Hydrogeology: Geological Society of America, The Geology of North America, v. O-2, p. 81-86.

Anderson, T.W., and White, N.D., 1986, Arizona surface-water resources, *in* Moody, D.W., and others, comps., National water summary, 1985 - Hydrologic events and surface-water resources: U.S. Geological Survey Water-Supply Paper 2300, p. 145-150.

Anning, D.W., and Duet, N.R., 1994, Summary of ground-water conditions in Arizona, 1987-90: U.S. Geological Survey Open-File Report 94-476, 2 sheets, scales 1:1,000,000 and 1:2,500,000.

Arizona Department of Water Resources, 1990, Map showing Arizona groundwater basins with index of cities, towns, settlements and sites: Arizona Department of Water Resources Open File Report no. 7, 1 sheet, scale 1:1,000,000.

Arizona Department of Water Resources, 1990, Water source potential for the Chloride Water Corporation, Community of Chloride, Mohave County, Arizona: Arizona Department of Water Resources, Hydrology Division, Hydrological Services Section.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. I, Inventory and analysis: Arizona Department of Water Resources, 253 p.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. II, Hydrologic summary: Arizona Department of Water Resources, Hydrology Division, 236 [266] p.

Arizona Water Commission, 1975, Arizona State Water Plan, Phase 1, Inventory of resource and uses: Arizona Water Commission, 224 p., 2 sheets, approx. scale 1:670,000.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1967 to Spring 1968: Arizona State Land Department Water Resources Report no. 38, 54 p.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1968 to Spring 1969: Arizona State Land Department Water Resources Report no. 42, 46 p.

Babcock, H.M., 1970, Annual report on ground water in Arizona, Spring 1969 to Spring 1970: Arizona State Land Department Water Resources Report no. 43, 44 p.

Babcock, H.M., 1972, Annual report on ground water in Arizona, Spring 1970 to Spring 1971: Arizona Water Commission Bulletin 1, 45 p.

Babcock, H.M., 1972, Bibliography of U.S. Geological Survey water-resources reports for Arizona, May 1965 through June 1971: Arizona Water Commission Bulletin 2, 60 p.

Babcock, H.M., 1973, Annual report on ground water in Arizona, Spring 1971 to Spring 1972: Arizona Water Commission Bulletin 5, 48 p.

Babcock, H.M., 1974, Annual report on ground water in Arizona, Spring 1972 to Spring 1973: Arizona Water Commission Bulletin 7, 46 p., 3 sheets, scale 1:250,000.

Babcock, H.M., 1976, Annual summary of ground-water conditions in Arizona, Spring 1974 to Spring 1975: U.S. Geological Survey Water-Resources Investigations Open-File Report 76-59, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1976 to Spring 1977: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-106, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1975 to Spring 1976: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-10, 2 sheets, scale 1:1,000,000.

Bedinger, M.S., Anderson, T.W., and Langer, W.H., 1984, Maps showing ground-water units and withdrawal, Basin and Range Province, Arizona: U.S. Geological Survey Water-Resources Investigations Report 83-4114-A, 2 sheets, scales 1:500,000 and 1:1,000,000.

Bedinger, M.S., Langer, W.H., and Reed, J.E., 1984, Ground-water hydrology, *in* Bedinger, M.S. and others, eds., Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: U.S. Geological Survey Open-File Report 84-741, p. 98-114, 5 sheets 2, 3, and 4, scale 1:500,000.

Bedinger, M.S., Sargent, K.A., and Brady, B.T., 1985, Geologic and hydrologic characterization of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part III, Geologic and hydrologic evaluation: U.S. Geological Survey Circular 904-C, 27 p.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1984, Sonoran region, Arizona, *in* Bedinger, M.S. and others, Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste: Evaluation of the regions: U.S. Geological Survey Open-File Report 84-745, p. 81-108, 2 sheets, scale 1:300,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States for isolation of high-level radioactive waste - Evaluation of the regions: U.S. Geological Survey Professional Paper 1370-H, p. H1-61, 7 plates, scale 1:1,000,000.

Bedinger, M.S., Sargent, K.A., and Langer, W.H., eds., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States for isolation of high-level radioactive waste - Characterization of the Sonoran region, Arizona: U.S. Geological Survey Professional Paper 1370-D, p. D1-D40, 6 plates, scales 1:500,000 and 1:1,000,000.

Bedinger, M.S., Sargent, K.A., and Reed, J.E., 1984, Geologic and hydrologic characterization and evaluation of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part I, Introduction and guidelines: U.S. Geological Survey Circular 904-A, 16 p.

Boner, F.C., Garrett, W.B., and Konieczki, A.D., 1989, Water resources data, Arizona, Water year 1988: U.S. Geological Survey Water-Data Report AZ-88-1, 391 p.

Boner, F.C., Konieczki, A.D., and Davis, R.G., 1991, Water resources data, Arizona, Water year 1990: U.S. Geological Survey Water-Data Report AZ-90-1, 381 p.

Boner, F.C., Smith, C.F., Garrett, W.B., and Konieczki, A., 1990, Water resources data, Arizona, Water year 1989: U.S. Geological Survey Water-Data Report AZ-89-1, 391 p.

Briggs, P.C., and Nemecek, E.A., 1986, Technical aspects of Arizona groundwater law, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 93-98.

Brown, S.G., 1976, Preliminary maps showing ground-water resources in the lower Colorado River region, Arizona, Nevada, New Mexico, and Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-542, 1 sheet, scale 1:1,000,000.

Buol, S.W., 1964, Calculated actual and potential evapotranspiration in Arizona: Tucson, University of Arizona, Agricultural Experiment Station Technical Bulletin 162, 48 p.

Clark, T.C., 1975, The Arizona Water Plan, A status report, *in* Arizona Watershed Symposium, 19th annual, Phoenix, September 24, 1975, Proceedings: Arizona Water Commission Report no. 7, p. 9-23.

Cox, C.J., and others, 1968, Annual report on ground water in Arizona, Spring 1966 to Spring 1967: Arizona State Land Department Water Resources Report no. 36, 43 p.

Daniel, D.L., 1981, Maps showing total dissolved solids content of groundwater in Arizona: Arizona Department of Water Resources Hydrologic Map Series Report no. 2, 2 sheets, scale 1:1,000,000.

Davidson, E.S., 1979, Summary appraisals of the nation's ground-water resources - Lower Colorado region: U.S. Geological Survey Professional Paper 813-R, 23 p., 3 sheets, scale 1:1,000,000.

Duncan, J.T., Spencer, J.E., Eshraghi, P., and Emrick, S.M., 1993, A reconnaissance study of radon and other radionuclides in Arizona well water, *in* Spencer, J.E., ed., Radon in Arizona: Arizona Geological Survey Bulletin 199, p. 86-92.

Ellingson, S.B., and Redding, M.B., 1988, Random survey of VOC's, pesticides and inorganics in Arizona's drinking water wells, *in* FOCUS Conference on Southwestern Ground Water Issues March 23-25, 1988, Proceedings: Dublin, Ohio, National Water Well Association, p. 223-247.

Evans, L.G., and Haimson, J.S., 1982, SWAB/RASA aquifer parameter study, Final report for U.S. Geological Survey contract 14-08-0001-18268: Arizona Department of Water Resources, 21 p.

Feth, J.H., and others, 1964, Preliminary map of the conterminous United States showing depth to and quality of shallowest ground water containing more than 1,000 parts per million dissolved solids: U.S. Geological Survey Hydrologic Investigations Atlas HA-199, 31 p., 2 sheets, scale 1:3,168,000.

Fields, R.L., 1986, Data-processing activities of the southwest alluvial basins, RASA study, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 17-23.

Freethey, G.W., 1986, Considerations in modeling ground-water flow in the alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 57-67.

Freethey, G.W., and Anderson, T.W., 1986, Predevelopment hydrologic conditions in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-664, 3 sheets, scale 1:500,000.

Freethey, G.W., Pool, D.R., Anderson, T.W., and Tucci, Patrick, 1986, Description and generalized distribution of aquifer materials in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-663, 4 sheets, scale 1:500,000.

Gillespie, J.B., and Bentley, C.B., 1971, Geohydrology of Hualapai and Sacramento Valleys, Mohave County, Arizona: U.S. Geological Survey Water-Supply Paper 1899-H, p. H1-H37, 2 sheets, scale 1:125,000.

Gillespie, J.B., Bentley, C.B., and Kam, W., 1966, Basic hydrologic data of the Hualapai, Sacramento, and Big Sandy Valleys, Mohave County, Arizona: Arizona State Land Department Water Resources Report no. 26, 39 p.

Hahman, W.R., Sr., Stone, C., and Witcher, J.C., comps., 1978, Preliminary map - Geothermal energy resources of Arizona: Arizona Bureau of Geology and Mineral Technology Geothermal Map No. 1 [also listed as Arizona Geological Survey Map 15-1], 1 sheet, scale 1:1,000,000.

Hardt, W.F., Cahill, J.M., and Booher, M.B., 1958, Annual report on ground water in Arizona, Spring 1957 to Spring 1958: Arizona State Land Department Water Resources Report no. 5, 60 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1959, Annual report on ground water in Arizona, Spring 1958 to Spring 1959: Arizona State Land Department Water Resources Report no. 6, 61 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1960, Annual report on ground water in Arizona, Spring 1959 to Spring 1960: Arizona State Land Department Water Resources Report no. 7, [89] p.

Harshbarger, J.W., Lewis, D.D., Skibitzke, H.E., Heckler, W.L., and Kister, L.R., revised by H.L. Baldwin, 1966, Arizona water: U.S. Geological Survey Water-Supply Paper 1648, 85 p.

Hodges, E.B., and others, 1967, Annual report on ground water in Arizona, Spring 1965 to Spring 1966: Arizona State Land Department Water Resources Report no. 32, 61 p.

Holbert, K.E., Stewart, B.D., and Eshraghi, P., 1995, Measurement of radioactivity in Arizona groundwater using improved analytical techniques for samples with high dissolved solids: Health Physics, v. 68, no. 2, p. 185-194.

Hyde, P., 1994, Cerbat Mountains, Mohave County, AZ - Water and soil characterization of the American Legion, Stockton, and Neal watersheds - February 7-10 and April 15, 1994: Arizona Department of Environmental Quality, Division of Water Quality, Aquifer Protection Program.

Lee, W.T., 1908, Geologic reconnaissance of a part of western Arizona, *with notes on* the Igneous rocks of western Arizona, by Albert Johannsen: U.S. Geological Survey Bulletin 352, 96 p.

Ligner, J.J., White, N.D., Kister, L.R., and Moss, M.E., 1969, Water resources: Part II of Mineral and water resources of Arizona: Arizona Bureau of Mines Bulletin 180, p. 471-580.

Longsworth, S.A., Van De Vanter, E.K., and Alwin, S.H., 1998, Activities of the Water Resources Division in Arizona, 1996-97: U.S. Geological Survey Open-File Report 98-185, 90 p.

Marie, J.R., Van De Vanter, E.K., and Moss, C.L., 1996, Activities of the Water Resources Division in Arizona, 1995-1996: U.S. Geological Survey Open-File Report 95-772, 69 p.

McGuinness, C.L., 1964, Generalized map showing annual runoff and productive aquifers in the conterminous United States: U.S. Geological Survey Hydrologic Investigations Atlas HA-194, scale 1:5,000,000.

Montgomery, E.L., and Harshbarger, J.W., 1989, Arizona hydrogeology and water supply, *in* Jenney, J.P., and Reynolds, S.J., eds., Geologic evolution of Arizona: Arizona Geological Society Digest 17, p. 827-840.

Montgomery, E.L., and Harshbarger, J.W., 1992, Arizona hydrogeology and water supply: Applied Hydrogeology, v. 1, no. 1, p. 25-37.

Peirce, H.W., and Scurlock, J.R., 1972, Arizona well information: Arizona Bureau of Mines Bulletin 185, 195 p. [reprinted 1988, Arizona Geological Survey].

Pfaff, C.L., and Clay, D.M., 1981, Map showing ground-water conditions in the Sacramento Valley area, Mohave County, Arizona - 1979: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-418, 1 sheet, scale 1:125,000.

Pool, D.R., 1984, Aquifer geology of alluvial basins of Arizona, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 683-690.

Pool, D.R., 1986, Aquifer geology of alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 25-36.

Rascona, S.J., 1991, Map showing groundwater conditions in the Sacramento Valley Basin, Mohave County, Arizona -- 1990: Arizona Department of Water Resources Hydrologic Map Series Report no. 21, 1 sheet, scale 1:125,000.

Rauzi, S.L., 2002, Arizona has salt!: Arizona Geological Survey, Circular 30, 36 p.

Robertson, F.N., 1984, Trace elements in ground water in southern Arizona [abs.], *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 674.

Robertson, F.N., 1986, Occurrence and solubility controls of trace elements in ground water in alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 69-80.

Robertson, F.N., 1989, Ground-water geochemistry and information transfer in alluvial basins in Arizona [abs.], *in* International Geological Congress, 28th, Washington, D.C., July 9-19, 1989, Abstracts, V. 2: International Geological Congress, p. 2.709-2.710.

Robertson, F.N., 1989, Arsenic in ground-water under oxidizing conditions, south-west United States: Environmental Geochemistry and Health, v. 11, no. 3/4, p. 171-185.

Robertson, F.N., 1991, Geochemistry of ground-water in alluvial basins of Arizona and adjacent parts of Nevada, New Mexico, and California: U.S. Geological Survey Professional Paper 1406-C, p. C1-C90.

Robertson, F.N., and Garrett, W.B., 1988, Distribution of fluoride in ground water in the alluvial basins of Arizona and adjacent parts of California, Nevada, and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-665, 3 sheets, scale 1:500,000.

Robson, S.G., and Banta, E.R., 1995, Ground water atlas of the United States, Segment 2, Arizona, Colorado, New Mexico, Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-730-C, 32 p.

Rosner, Ulrike, 1995, Water quality investigations in the historic mining district of Chloride and adjacent areas in the Cerbat Mountains (Mohave County, Arizona): Arizona Geological Survey Contributed Report CR-95-I, 33 p. 2 sheets, scale 1:24,000.

Sargent, K.A., and Bedinger, M.S., 1985, Geologic and hydrologic characterization and evaluation of the Basin and Range Province relative to the disposal of high-level radioactive waste, Part II, Geologic and hydrologic characterization: U.S. Geological Survey Circular 904-B, 30 p.

Smith, C.F., Anning, D.W., Duet, N.R., Fisk, G.G., McCormack, H.F., Pope, G.L., Rigas, P.D., and Wallace, B.L., 1995, Water resources data, Arizona, Water year 1994: U.S. Geological Survey Water-Data Report AZ-94-1, 320 p.

Smith, C.F., Boner, F.C., Davis, R.G., Duet, N.R., and Rigas, P.D., 1993, Water resources data, Arizona, Water year 1992: U.S. Geological Survey Water-Data Report AZ-92-1, 360 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., and Rigas, P.D., 1997, Water resources data, Arizona, Water year 1996: U.S. Geological Survey Water-Data Report AZ-96-1, 328 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., Rigas, P.D., and Tadayon, S., 1996, Water resources data, Arizona, Water year 1995: U.S. Geological Survey Water-Data Report AZ-95-1, 306 p.

Smith, C.F., Rigas, P.D., Ham, L.K., Duet, N.R., and Anning, D.W., 1994, Water resources data, Arizona, Water year 1993: U.S. Geological Survey Water-Data Report AZ-93-1, 360 p.

Smith, G.E.P., 1938, The physiography of Arizona valleys and the occurrence of ground water: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Technical Bulletin no. 77, 91 p.

Smith, H.V., Caster, A.B., Fuller, W.H., Breazeale, E.L., and Draper, George, 1949, The chemical composition of representative Arizona waters: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Bulletin 225, 76 p.

Spicer, L.M., and Van De Vanter, E.K., comps., 1993, Activities of the Water Resources Division in Arizona, 1986-91: U.S. Geological Survey Open-File Report 93-165, 144 p.

Stone, Claudia, and Witcher, J.C., 1982, Geothermal energy in Arizona - Final contract report: Arizona Bureau of Geology and Mineral Technology Open-File Report 83-12, 398 p.

Towne, D.C., and Freark, M.C., 2001, Ambient groundwater quality of the Sacramento Valley basin: A 1999 baseline study: Arizona Department of Environmental Quality Open-File Report 01-04, 78 p.

U.S. Geological Survey, [1965?], Water quality records in Arizona - 1964: U.S. Geological Survey, 80 p.

U.S. Geological Survey, [1966?], 1965 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 89 p.

U.S. Geological Survey, [1968?], 1967 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 85 p.

U.S. Geological Survey, 1971, 1971 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 167 p. [NTIS PB-287 165].

U.S. Geological Survey, 1972, 1972 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 166 p. [NTIS PB-287 167].

U.S. Geological Survey, 1972, Aeromagnetic map of the Gold Butte-Chloride area, Arizona and Nevada: U.S. Geological Survey Geophysical Investigations Map GP-757, 2 sheets, scale 1:62,500.

U.S. Geological Survey, 1973, 1973 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 188 p. [NTIS PB-287 169].

U.S. Geological Survey, 1974, 1974 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 192 p. [NTIS PB-287 171].

U.S. Geological Survey, 1976, Water resources data for Arizona, Water year 1975: U.S. Geological Survey Water-Data Report AZ-75-1, 440 p.

U.S. Geological Survey, 1978, Water resources data for Arizona, Water year 1977: U.S. Geological Survey Water-Data Report AZ-77-1, 550 p.

U.S. Geological Survey, 1978, Annual summary of ground-water conditions in Arizona, Spring 1977 to Spring 1978: U.S. Geological Survey Water-Resources Investigations Open-File Report 78-144, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1979, Water resources data for Arizona, Water year 1978: U.S. Geological Survey Water-Data Report AZ-78-1, 604 p.

U.S. Geological Survey, 1980, Water resources data for Arizona, Water year 1979: U.S. Geological Survey Water-Data Report AZ-79-1, 614 p.

U.S. Geological Survey, 1980, Annual summary of ground-water conditions in Arizona, Spring 1978 to Spring 1979: U.S. Geological Survey Water-Resources Investigations Open-File Report 80-330, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1981, Annual summary of ground-water conditions in Arizona, Spring 1979 to Spring 1980: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-906, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Annual summary of ground-water conditions in Arizona, Spring 1980 to Spring 1981: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Water resources data for Arizona, Water year 1980: U.S. Geological Survey Water-Data Report AZ-80-1, 568 p.

U.S. Geological Survey, 1983, Water resources data, Arizona, Water year 1981: U.S. Geological Survey Water-Data Report AZ-81-1, 532 p.

U.S. Geological Survey, 1983, Annual summary of ground-water conditions in Arizona, Spring 1981 to Spring 1982: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scales 1:1,000,000 and 1:3,200,000.

U.S. Geological Survey, 1984, Annual summary of ground-water conditions in Arizona, Spring 1982 to Spring 1983: U.S. Geological Survey Water-Resources Investigations Open-File Report 84-428, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

U.S. Geological Survey, 1985, Annual summary of ground-water conditions in Arizona, Spring 1983 to Spring 1984: U.S. Geological Survey Water-Resources Investigations Open-File Report 85-410, 2 sheets, scales 1:1,000,000 and 1:3,400,000.

U.S. Geological Survey, 1986, Annual summary of ground-water conditions in Arizona, Spring 1984 to Spring 1985: U.S. Geological Survey Water-Resources Investigations Open-File Report 86-422W, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

White, N.D., and Garrett, W.B., 1984, Water resources data, Arizona, Water year 1982: U.S. Geological Survey Water-Data Report AZ-82-1, 440 p.

White, N.D., and Garrett, W.B., 1986, Water resources data, Arizona, Water year 1983: U.S. Geological Survey Water-Data Report AZ-83-1, 387 p.

White, N.D., and Garrett, W.B., 1987, Water resources data, Arizona, Water year 1984: U.S. Geological Survey Water-Data Report AZ-84-1, 381 p.

White, N.D., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1985: U.S. Geological Survey Water-Data Report AZ-85-1, 343 p.

White, N.D., and others, 1967, Annual report on ground water in Arizona, Spring 1964 to Spring 1965: Arizona State Land Department Water Resources Report no. 24, 62 p.

White, N.D., Stulik, R.S., and others, 1962, Annual report on ground water in Arizona, Spring 1961 to Spring 1962: Arizona State Land Department Water Resources Report no. 11, 116 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1961, Annual report on ground water in Arizona, Spring 1960 to Spring 1961: Arizona State Land Department Water Resources Report no. 10, 93 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1963, Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, 136 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1964, Annual report on ground water in Arizona, Spring 1963 to Spring 1964: Arizona State Land Department Water Resources Report no. 19, 60 p.

Wilson, L.G., DeCook, K.J., and Neuman, S.P., 1980, Regional recharge research for southwest alluvial basins - Final report, U.S. Geological Survey contract 14-08-0001-18257: Tucson, University of Arizona, Water Resources Research Center, 389 p.

Wilson, R.P., 1990, Arizona water supply and use, *in* Carr, J.E., and others, National water summary, 1987 - Hydrologic events and water supply and uses: U.S. Geological Survey Water-Supply Paper 2350, p. 157-164.

Wilson, R.P., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1986: U.S. Geological Survey Water-Data Report AZ-86-1, 341 p.

Wilson, R.P., and Garrett, W.B., 1989, Water resources data, Arizona, Water year 1987: U.S. Geological Survey Water-Data Report AZ-87-1, 385 p.

Witcher, J.C., 1979, Proven, potential, and inferred geothermal resources of Arizona and their heat contents: Arizona Bureau of Geology and Mineral Technology Open-File Report 79-05, 64 p., 1 sheet, scale 1:1,000,000 [also published in Pasadena, California Institute of Technology, Jet Propulsion Laboratory Publication 80-41, p. A-3 to A-74].

Witcher, J.C., Stone, Claudia, and Hahman, W.R., Sr., 1982, Geothermal resources of Arizona: Arizona Bureau of Geology and Mineral Technology [also listed as Arizona Geological Survey Map 15-2], 1 sheet, scale 1:500,000.

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GROUNDWATER HYDROLOGY BIBLIOGRAPHY

Adler, H.H., 1974, Concepts of uranium-ore formation in reducing environments in sandstones and other sediments [IAEA-SM-183/43], *in* Formation of uranium ore deposits, Proceedings of a symposium on the Formation of uranium ore deposits: Vienna, International Atomic Energy Agency, Proceedings Series, STI/PUB/374, p. 141-168.

Anderson, T.W., 1986, Geohydrology of the southwest alluvial basins, Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 99-111.

Anderson, T.W., and White, N.D., 1986, Arizona surface-water resources, *in* Moody, D.W., Chase E.B., and Aronson, D.A., comps., National water summary, 1985 - Hydrologic events and surface-water resources: U.S. Geological Survey Water-Supply Paper 2300, p. 145-150.

Anning, D.W., and Duet, N.R., 1994, Summary of ground-water conditions in Arizona, 1987-90: U.S. Geological Survey Open-File Report 94-476, 2 sheets, scales 1:1,000,000 and 1:2,500,000.

Arizona Department of Water Resources, 1990, Map showing Arizona groundwater basins with index of cities, towns, settlements and sites: Arizona Department of Water Resources Open File Report no. 7, 1 sheet, scale 1:1,000,000.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. II, Hydrologic summary: Arizona Department of Water Resources, Hydrology Division, 236 [266] p.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. I, Inventory and analysis: Arizona Department of Water Resources, 253 p.

Arizona Water Commission, 1975, Arizona State Water Plan, Phase 1, Inventory of resource and uses: Arizona Water Commission, 224 p., 2 sheets, approx. scale 1:670,000.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1967 to Spring 1968: Arizona State Land Department Water Resources Report no. 38, 54 p.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1968 to Spring 1969: Arizona State Land Department Water Resources Report no. 42, 46 p.

Babcock, H.M., 1970, Annual report on ground water in Arizona, Spring 1969 to Spring 1970: Arizona State Land Department Water Resources Report no. 43, 44 p.

Babcock, H.M., 1972, Annual report on ground water in Arizona, Spring 1970 to Spring 1971: Arizona Water Commission Bulletin 1, 45 p.

Babcock, H.M., 1972, Bibliography of U.S. Geological Survey water-resources reports for Arizona, May 1965 through June 1971: Arizona Water Commission Bulletin 2, 60 p.

Babcock, H.M., 1973, Annual report on ground water in Arizona, Spring 1971 to Spring 1972: Arizona Water Commission Bulletin 5, 48 p.

Babcock, H.M., 1974, Annual report on ground water in Arizona, Spring 1972 to Spring 1973: Arizona Water Commission Bulletin 7, 46 p., 3 sheets, scale 1:250,000.

Babcock, H.M., 1976, Annual summary of ground-water conditions in Arizona, Spring 1974 to Spring 1975: U.S. Geological Survey Water-Resources Investigations Open-File Report 76-59, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1976 to Spring 1977: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-106, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1975 to Spring 1976: U.S. Geological Survey Water-Resources Investigations Open-File Report WRI 77-10, 2 sheets, scale 1:1,000,000.

Bennett, J.B., Parnell, R.A., Meyer, W.A., Black, C.R., Petroutson, William, and Webb, K.T., 1994, Impacts of flow regulation of the Colorado River on biogeochemical cycling in riparian environments, Grand Canyon National Park, Az. [abs.]: Geological Society of America Abstracts with Programs, v. 26, no. 7, p. A.99.

Beus, S.S., and Morales, Michael, eds., 1990, Grand Canyon geology: New York, Oxford University Press, 518 p.

Boner, F.C., Garrett, W.B., and Konieczki, A.D., 1989, Water resources data, Arizona, Water year 1988: U.S. Geological Survey Water-Data Report AZ-88-1, 391 p.

Boner, F.C., Konieczki, A.D., and Davis, R.G., 1991, Water resources data, Arizona, Water year 1990: U.S. Geological Survey Water-Data Report AZ-90-1, 381 p.

Boner, F.C., Smith, C.F., Garrett, W.B., and Konieczki, A., 1990, Water resources data, Arizona, Water year 1989: U.S. Geological Survey Water-Data Report AZ-89-1, 391 p.

Brown, S.G., 1976, Preliminary maps showing ground-water resources in the lower Colorado River region, Arizona, Nevada, New Mexico, and Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-542, 1 sheet, scale 1:1,000,000.

Buol, S.W., 1964, Calculated actual and potential evapotranspiration in Arizona: Tucson, University of Arizona, Agricultural Experiment Station Technical Bulletin 162, 48 p.

Cadigan, R.A., and Felmlee, J.K., 1978, Radioactive spring site guides to uranium in southwestern United States, *in* Geological Survey research 1978: U.S. Geological Survey Professional Paper 1100, p. 12.

Clark, T.C., 1975, The Arizona Water Plan, A status report, *in* Arizona Watershed Symposium, 19th annual, Phoenix, September 24, 1975, Proceedings: Arizona Water Commission Report no. 7, p. 9-23.

Cooley, M.E., 1963, Hydrology of the Plateau Uplands Province, *in* White, N.D., and others, Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, p. 27-38.

Cox, C.J., and others, 1968, Annual report on ground water in Arizona, Spring 1966 to Spring 1967: Arizona State Land Department Water Resources Report no. 36, 43 p.

Daniel, D.L., 1981, Maps showing total dissolved solids content of groundwater in Arizona: Arizona Department of Water Resources Hydrologic Map Series Report no. 2, 2 sheets, scale 1:1,000,000.

Davidson, E.S., 1979, Summary appraisals of the nation's ground-water resources - Lower Colorado region: U.S. Geological Survey Professional Paper 813-R, 23 p., 3 sheets, scale 1:1,000,000.

Eberly, L.D., and Stanley, T.B., Jr., 1978, Cenozoic stratigraphy and geologic history of southwestern Arizona: Geological Society of America Bulletin, v. 89, no. 6, p. 921-940.

Feth, J.H., and others, 1964, Preliminary map of the conterminous United States showing depth to and quality of shallowest ground water containing more than 1,000 parts per million dissolved solids: U.S. Geological Survey Hydrologic Investigations Atlas HA-199, 31 p., 2 sheets, scale 1:3,168,000.

Garrett, J.M., and Gellenbeck, D.J., 1991, Basin characteristics and streamflow statistics in Arizona as of 1989: U.S. Geological Survey Water-Resources Investigations Report 91-4041, 612 p.

Gauger, R.W., 1996, River-stage data, Colorado River, Glen Canyon Dam to upper Lake Mead, Arizona, 1990-94: U.S. Geological Survey Open-File Report 96-626, 20 p.

Goetz, A.F.H., Billingsley, F.C., Elston, D.P., Lucchitta, Ivo, and Shoemaker, E.M., 1974, Geologic applications of ERTS images on the Colorado Plateau, Arizona, *in* Freden, S.C., and others, eds., Third Earth Resources Technology Satellite-1 Symposium - V. I: Technical presentations, Section A: U.S. National Aeronautics and Space Administration Special Publication 351, p. 719-744.

Goetz, A.F.H., Billingsley, F.C., Gillespie, A.R., Abrams, M.J., Squires, R.L., Shoemaker, E.M., Lucchitta, I., and Elston, D.P., 1975, Application of ERTS images and image processing to regional geologic problems and geologic mapping in northern Arizona: Pasadena, California Institute of Technology, Jet Propulsion Laboratory Technical Report 32-1597, 188 p.

Gregory, H.E., 1950, Geology and geography of the Zion Park region, Utah and Arizona: U.S. Geological Survey Professional Paper 220, 200 p., 5 sheets, scale 1:125,000.

Griffiths, P.G., Webb, R.H., and Melis, T.S., 1996, Initiation and frequency of debris flows in Grand Canyon, Arizona: U.S. Geological Survey Open-File Report 96-491, 35 p.

Hahman, W.R., Sr., Stone, C., and Witcher, J.C., comps., 1978, Preliminary map - Geothermal energy resources of Arizona: Arizona Bureau of Geology and Mineral Technology Geothermal Map No. 1 [also listed as Arizona Geological Survey Map 15-1], 1 sheet, scale 1:1,000,000.

Hardt, W.F., Cahill, J.M., and Booher, M.B., 1958, Annual report on ground water in Arizona, Spring 1957 to Spring 1958: Arizona State Land Department Water Resources Report no. 5, 60 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1959, Annual report on ground water in Arizona, Spring 1958 to Spring 1959: Arizona State Land Department Water Resources Report no. 6, 61 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1960, Annual report on ground water in Arizona, Spring 1959 to Spring 1960: Arizona State Land Department Water Resources Report no. 7, [89] p.

Harshbarger, J.W., Lewis, D.D., Skibitzke, H.E., Heckler, W.L., and Kister, L.R., revised by H.L. Baldwin, 1966, Arizona water: U.S. Geological Survey Water-Supply Paper 1648, 85 p.

Hodges, E.B., and others, 1967, Annual report on ground water in Arizona, Spring 1965 to Spring 1966: Arizona State Land Department Water Resources Report no. 32, 61 p.

Huntoon, P.W., 1977, Relationship of tectonic structure to aquifer mechanics in the western Grand Canyon district, Arizona - Completion report, Project B-31-WYO (14-34-0001-6134) to Office of Water Research and Technology, U.S. Department of the Interior: Laramie, University of Wyoming, Water Resources Institute, Water Resources Series no. 66, 51 p., 2 sheets, scale 1:125,000.

Huntoon, P.W., 1986, Ground water flow directions in Colorado Plateau breccia pipes [abs.]: Geological Society of America Abstracts with Programs, v. 18, no. 5, p. 363.

Johnson, P.W., and Sanderson, R.B., 1968, Spring flow into the Colorado River, Lees Ferry to Lake Mead, Arizona: Arizona State Land Department Water Resources Report no. 34, 26 p.

Keller, G.R., Braile, L.W., and Morgan, P., 1978, Regional crustal structure of the Colorado Plateau [abs.], in Papers presented to the Conference on Plateau Uplift: Mode and Mechanism, A Lunar and Planetary Institute Topical Conference: Houston, Lunar and Planetary Institute, LPI Contribution 329, p. 26.

Koller, G.R., 1980, Grand Canyon 1° x 2° NTMS area, Arizona, Data report, National Uranium Resource Evaluation Program, Hydrogeochemical and stream sediment reconnaissance: U.S. Department of Energy Report GJBX-142(80), 49 p., 1 sheet, scale 1:250,000, 9 microfiche.

Levings, G.W., and Farrar, C.D., 1979, Map showing ground-water conditions in the Virgin River, Grand Wash, and Shivwits areas, Mohave County, Arizona - 1976: U.S. Geological Survey Water-Resources Investigations Open-File Report WRI 79-57, 1 sheet, scale 1:125,000.

Ligner, J.J., White, N.D., Kister, L.R., and Moss, M.E., 1969, Water resources: Part II of Mineral and water resources of Arizona: Arizona Bureau of Mines Bulletin 180, p. 471-580.

Lohman, S.W., and Petersen, M.S., 1972, Water, *in* Mallory, W.W., ed.-in-chief, Geologic atlas of the Rocky Mountain region: Denver, Rocky Mountain Association of Geologists, p. 324-327.

Longsworth, S.A., Van De Vanter, E.K., and Alwin, S.H., 1998, Activities of the Water Resources Division in Arizona, 1996-97: U.S. Geological Survey Open-File Report 98-185, 90 p.

Lucchitta, Ivo, 1975, Water on the Shivwits Plateau, *in* Goetz, A.F.H., and others, Application of ERTS images and image processing to regional geologic problems and geologic mapping in northern Arizona: Pasadena, California Institute of Technology, Jet Propulsion Laboratory Technical Report 32-1597, p. 97-101.

Marie, J.R., Van De Vanter, E.K., and Moss, C.L., 1996, Activities of the Water Resources Division in Arizona, 1995-1996: U.S. Geological Survey Open-File Report 95-772, 69 p.

McGuinness, C.L., 1964, Generalized map showing annual runoff and productive aquifers in the conterminous United States: U.S. Geological Survey Hydrologic Investigations Atlas HA-194, scale 1:5,000,000.

Ortiz, N.V., Ferentchak, J.A., Ethridge, F.G., Granger, H.C., and Sunada, D.K., 1980, Ground-water flow and uranium in Colorado Plateau: Ground Water, v. 18, no. 6, p. 596-606.

Peirce, H.W., and Scurlock, J.R., 1972, Arizona well information: Arizona Bureau of Mines Bulletin 185, 195 p. [reprinted 1988, Arizona Geological Survey].

Pope, G.L., Rigas, P.D., and Smith, C.F., 1998, Statistical summaries of streamflow data and characteristics of drainage basins for selected streamflow-gaging stations in Arizona through water year 1996: U.S. Geological Survey Water-Resources Investigations Report 98-4225, 907 p.

Reiter, M., Mansure, A.J., and Shearer, C., 1978, Geothermal characteristics of the Colorado Plateau [abs.], *in* Papers presented to the Conference on Plateau Uplift: Mode and Mechanism, A Lunar and Planetary Institute Topical Conference: Houston, Lunar and Planetary Institute, LPI Contribution 329, p. 43.

Robertson, F.N., 1989, Ground-water geochemistry and information transfer in alluvial basins in Arizona [abs.], *in* International Geological Congress, 28th, Washington, D.C., July 9-19, 1989, Abstracts, V. 2: International Geological Congress, p. 2.709-2.710.

Robson, S.G., and Banta, E.R., 1995, Ground water atlas of the United States, Segment 2, Arizona, Colorado, New Mexico, Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-730-C, 32 p.

Scott, R.C., and Barker, F.B., 1962, Data on uranium and radium in ground water in the United States 1954 to 1957: U.S. Geological Survey Professional Paper 426, 115 p., 2 sheets, scale 1:7,000,000.

Smith, C.F., Anning, D.W., Duet, N.R., Fisk, G.G., McCormack, H.F., Pope, G.L., Rigas, P.D., and Wallace, B.L., 1995, Water resources data, Arizona, Water year 1994: U.S. Geological Survey Water-Data Report AZ-94-1, 320 p.

Smith, C.F., Boner, F.C., Davis, R.G., Duet, N.R., and Rigas, P.D., 1993, Water resources data, Arizona, Water year 1992: U.S. Geological Survey Water-Data Report AZ-92-1, 360 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., and Rigas, P.D., 1997, Water resources data, Arizona, Water year 1996: U.S. Geological Survey Water-Data Report AZ-96-1, 328 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., Rigas, P.D., and Tadayon, S., 1996, Water resources data, Arizona, Water year 1995: U.S. Geological Survey Water-Data Report AZ-95-1, 306 p.

Smith, C.F., Rigas, P.D., Ham, L.K., Duet, N.R., and Anning, D.W., 1994, Water resources data, Arizona, Water year 1993: U.S. Geological Survey Water-Data Report AZ-93-1, 360 p.

Smith, H.V., Caster, A.B., Fuller, W.H., Breazeale, E.L., and Draper, George, 1949, The chemical composition of representative Arizona waters: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Bulletin 225, 76 p.

Spicer, L.M., and Van De Vanter, E.K., comps., 1993, Activities of the Water Resources Division in Arizona, 1986-91: U.S. Geological Survey Open-File Report 93-165, 144 p.

Stone, Claudia, and Witcher, J.C., 1982, Geothermal energy in Arizona - Final contract report: Arizona Bureau of Geology and Mineral Technology Open-File Report 83-12, 398 p.

Swanberg, C.A., and Morgan, Paul, 1985, Silica heat flow estimates and heat flow in the Colorado Plateau and adjacent areas: Journal of Geodynamics, v. 3, no. 1/2, p. 65-85.

Taylor, O.J., Freethey, Geoffrey, and Glover, K.C., 1986, Upper Colorado River Basin regional aquifer-system study, *in* Sun, R.J., ed., Regional Aquifer-System Analysis program of the U.S. Geological Survey, Summary of projects, 1978-84: U.S. Geological Survey Circular 1002, p. 223-233.

Texas Instruments, Inc., 1982, National Uranium Resource Evaluation, Variable premise evaluation system data report, Interpretation of aerial radiometric reconnaissance data, Hydrogeochemical and stream sediment reconnaissance data, Grand Canyon quadrangle, Arizona: U.S. Department of Energy Report GJD-32(81), 210 p.

Texas Instruments, Inc., 1982, National Uranium Resource Evaluation, Variable premise evaluation system data report, Interpretation of hydrogeochemical and stream sediment reconnaissance data, Williams quadrangle, Arizona: U.S. Department of Energy Report GJD-93(81), 264 p.

U.S. Geological Survey, [1965?], Water quality records in Arizona - 1964: U.S. Geological Survey, 80 p.

U.S. Geological Survey, [1966?], 1965 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 89 p.

U.S. Geological Survey, [1968?], 1967 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 85 p.

U.S. Geological Survey, 1971, 1971 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 167 p. [NTIS PB-287 165].

U.S. Geological Survey, 1972, 1972 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 166 p. [NTIS PB-287 167].

U.S. Geological Survey, 1973, 1973 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 188 p. [NTIS PB-287 169].

U.S. Geological Survey, 1974, 1974 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 192 p. [NTIS PB-287 171].

U.S. Geological Survey, 1976, Water resources data for Arizona, Water year 1975: U.S. Geological Survey Water-Data Report AZ-75-1, 440 p.

U.S. Geological Survey, 1978, Water resources data for Arizona, Water year 1977: U.S. Geological Survey Water-Data Report AZ-77-1, 550 p.
U.S. Geological Survey, 1978, Annual summary of ground-water conditions in Arizona, Spring 1977 to Spring 1978: U.S. Geological Survey Water-Resources Investigations Open-File Report WRI 78-144, 1 sheet, scale 1:1,000,000.
U.S. Geological Survey, 1979, Water resources data for Arizona, Water year 1978: U.S. Geological Survey Water-Data Report AZ-78-1, 604 p.
U.S. Geological Survey, 1979, Land use and land cover and associated maps for Grand Canyon, Arizona: U.S. Geological Survey Open-File Report 79-1494, 5 sheets, scale 1:250,000.
U.S. Geological Survey, 1980, Water resources data for Arizona, Water year 1979: U.S. Geological Survey Water-Data Report AZ-79-1, 614 p.
U.S. Geological Survey, 1980, Annual summary of ground-water conditions in Arizona, Spring 1978 to Spring 1979: U.S. Geological Survey Water-Resources Investigations Open-File Report WRI 80-330, 1 sheet, scale 1:1,000,000.
U.S. Geological Survey, 1981, Annual summary of ground-water conditions in Arizona, Spring 1979 to Spring 1980: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-906, 2 sheets, scale 1:1,000,000.
U.S. Geological Survey, 1982, Annual summary of ground-water conditions in Arizona, Spring 1980 to Spring 1981: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scale 1:1,000,000.
U.S. Geological Survey, 1982, Water resources data for Arizona, Water year 1980: U.S. Geological Survey Water-Data Report AZ-80-1, 568 p.
U.S. Geological Survey, 1983, Water resources data, Arizona, Water year 1981: U.S. Geological Survey Water-Data Report AZ-81-1, 532 p.
U.S. Geological Survey, 1983, Annual summary of ground-water conditions in Arizona, Spring 1981 to Spring 1982: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scales 1:1,000,000 and 1:3,200,000.
U.S. Geological Survey, 1984, Annual summary of ground-water conditions in Arizona, Spring 1982 to Spring 1983: U.S. Geological Survey Water-Resources Investigations Open-File Report 84-428, 2 sheets, scales 1:1,000,000 and 1:3,300,000.
U.S. Geological Survey, 1985, Annual summary of ground-water conditions in Arizona, Spring 1983 to Spring 1984: U.S. Geological Survey Water-Resources Investigations Open-File Report 85-410, 2 sheets, scales 1:1,000,000 and 1:3,400,000.
U.S. Geological Survey, 1986, Annual summary of ground-water conditions in Arizona, Spring 1984 to Spring 1985: U.S. Geological Survey Water-Resources Investigations Open-File Report 86-422W, 2 sheets, scales 1:1,000,000 and 1:3,300,000.
Wagoner, J.L., 1979, Hydrogeochemical and stream sediment reconnaissance basic data report for Williams NTMS quadrangle, Arizona: U.S. Department of Energy Report GJBX-71(79), 74 p., 6 sheets, scale 1:250,000, 5 microfiche.
White, N.D., and Garrett, W.B., 1984, Water resources data, Arizona, Water year 1982: U.S. Geological Survey Water-Data Report AZ-82-1, 440 p.
White, N.D., and Garrett, W.B., 1986, Water resources data, Arizona, Water year 1983: U.S. Geological Survey Water-Data Report AZ-83-1, 387 p.
White, N.D., and Garrett, W.B., 1987, Water resources data, Arizona, Water year 1984: U.S. Geological Survey Water-Data Report AZ-84-1, 381 p.

White, N.D., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1985: U.S. Geological Survey Water-Data Report AZ-85-1, 343 p.

White, N.D., and others, 1967, Annual report on ground water in Arizona, Spring 1964 to Spring 1965: Arizona State Land Department Water Resources Report no. 24, 62 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1961, Annual report on ground water in Arizona, Spring 1960 to Spring 1961: Arizona State Land Department Water Resources Report no. 10, 93 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1963, Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, 136 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1964, Annual report on ground water in Arizona, Spring 1963 to Spring 1964: Arizona State Land Department Water Resources Report no. 19, 60 p.

White, N.D., Stulik, R.S., and others, 1962, Annual report on ground water in Arizona, Spring 1961 to Spring 1962: Arizona State Land Department Water Resources Report no. 11, 116 p.

Wilson, R.P., 1990, Arizona water supply and use, *in* Carr, J.E., and others, National water summary, 1987 - Hydrologic events and water supply and uses: U.S. Geological Survey Water-Supply Paper 2350, p. 157-164.

Wilson, R.P., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1986: U.S. Geological Survey Water-Data Report AZ-86-1, 341 p.

Wilson, R.P., and Garrett, W.B., 1989, Water resources data, Arizona, Water year 1987: U.S. Geological Survey Water-Data Report AZ-87-1, 385 p.

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GROUNDWATER HYDROLOGY BIBLIOGRAPHY

Akers, J.P., 1962, Coconino County, *in* Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, p. 122-125.

Aldon, E.F., 1959, Watershed management research in the ponderosa pine type, *in* Watershed Management Research in Arizona Progress Report, 1959: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, p. 17-24.

Aldridge, B.N., 1978, Unusual hydraulic phenomena of flash floods in Arizona, *in* Peck, E.L, ed., Conference on flash floods, Hydrometeorological aspects, Los Angeles, Calif., May 2-3, 1978: American Meteorological Society, p. 117-120.

Anderson, T.W., 1976, Evapotranspiration losses from flood-plain areas in central Arizona: U.S. Geological Survey Open-File Report 76-864, 91 p.

Anderson, T.W., 1979, Development of groundwater models of alluvial basins in south-central Arizona, *in* Arizona Water Symposium, 23rd and 24th annual, Phoenix, September 27, 1979, and September 24, 1980, Proceedings: Arizona Department of Water Resources Report no. 2, p. 13-17.

Anderson, T.W., 1980, Study plan for the Regional Aquifer-System Analysis of alluvial basins in south-central Arizona and adjacent states: U.S. Geological Survey Open-File Report 80-1197, 22 p.

Anderson, T.W., 1984, Southwest alluvial basins, RASA study - An overview, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, sponsored by the Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: New York, American Society of Civil Engineers, p. 606-614.

Anderson, T.W., 1986, Study in southern and central Arizona and parts of adjacent states, *in* Sun, R.J., ed., Regional Aquifer-System Analysis program of the U.S. Geological Survey, Summary of projects, 1978-84: U.S. Geological Survey Circular 1002, p. 116-131.

Anderson, T.W., 1986, Hydrologic setting, objectives, and approach of the southwest alluvial basins, RASA study, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 5-16.

Anderson, T.W., 1986, Geohydrology of the southwest alluvial basins, Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 99-111.

Anderson, T.W., 1995, Summary of the Southwest alluvial basins, Regional Aquifer-System Analysis, South-central Arizona and parts of adjacent states: U.S. Geological Survey Professional Paper 1406-A, p. A1-A33.

Anderson, T.W., and Freethey, G.W., 1995, Simulation of ground-water flow in alluvial basins in south-central Arizona and parts of adjacent states, Regional Aquifer-System Analysis: U.S. Geological Survey Professional Paper 1406-D, 78 p.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1990, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey Open-File Report 89-378, 99 p., 3 sheets, scale 1:1,000,000.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1992, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey Professional Paper 1406-B, p. B1-B67, 3 sheets, scale 1:1,000,000.

Anderson, T.W., and Johnson, A.I., eds., 1986, Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, 116 p.

Anderson, T.W., Welder, G.E., Lesser, Gustavo, and Trujillo, A., 1988, Region 7, Central alluvial basins, *in* Back, William, and others, eds., Hydrogeology: Geological Society of America, The Geology of North America, v. O-2, p. 81-86.

Anderson, T.W., and White, N.D., 1986, Arizona surface-water resources, *in* Moody, D.W., and others, comps., National water summary, 1985 - Hydrologic events and surface-water resources: U.S. Geological Survey Water-Supply Paper 2300, p. 145-150.

Anning, D.W., and Duet, N.R., 1994, Summary of ground-water conditions in Arizona, 1987-90: U.S. Geological Survey Open-File Report 94-476, 2 sheets, scales 1:1,000,000 and 1:2,500,000.

Arizona Department of Water Resources, 1990, Map showing Arizona groundwater basins with index of cities, towns, settlements and sites: Arizona Department of Water Resources Open File Report no. 7, 1 sheet, scale 1:1,000,000.

Arizona Department of Water Resources, 1994, Arizona Riparian Protection Program legislative report: Arizona Department of Water Resources, 507 p., 3 sheets, scales 1:48,941, 1:66,858, and 1:5,268.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. I, Inventory and analysis: Arizona Department of Water Resources, 253 p.

Arizona Department of Water Resources, 1994, Arizona water resources assessment, V. II, Hydrologic summary: Arizona Department of Water Resources, Hydrology Division, 236 [266] p.

Arizona Department of Water Resources, 2000, Verde River watershed study: Arizona Department of Water Resources, 1 CD-ROM.

Arizona Water Commission, 1975, Arizona State Water Plan, Phase 1, Inventory of resource and uses: Arizona Water Commission, 224 p., 2 sheets, approx. scale 1:670,000.

Arizona Water Commission, 1977, Basic data for selected wells and springs in the Pine-Payson-Kohl's Ranch area, Gila County, Arizona: Arizona Water Commission Report no. 9, 24 p.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1967 to Spring 1968: Arizona State Land Department Water Resources Report no. 38, 54 p.

Babcock, H.M., 1969, Annual report on ground water in Arizona, Spring 1968 to Spring 1969: Arizona State Land Department Water Resources Report no. 42, 46 p.

Babcock, H.M., 1970, Annual report on ground water in Arizona, Spring 1969 to Spring 1970: Arizona State Land Department Water Resources Report no. 43, 44 p.

Babcock, H.M., 1972, Annual report on ground water in Arizona, Spring 1970 to Spring 1971: Arizona Water Commission Bulletin 1, 45 p.

Babcock, H.M., 1972, Bibliography of U.S. Geological Survey water-resources reports for Arizona, May 1965 through June 1971: Arizona Water Commission Bulletin 2, 60 p.

Babcock, H.M., 1973, Annual report on ground water in Arizona, Spring 1971 to Spring 1972: Arizona Water Commission Bulletin 5, 48 p.

Babcock, H.M., 1974, Annual report on ground water in Arizona, Spring 1972 to Spring 1973: Arizona Water Commission Bulletin 7, 46 p., 3 sheets, scale 1:250,000.

Babcock, H.M., 1976, Annual summary of ground-water conditions in Arizona, Spring 1974 to Spring 1975: U.S. Geological Survey Water-Resources Investigations Open-File Report 76-59, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1976 to Spring 1977: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-106, 2 sheets, scale 1:1,000,000.

Babcock, H.M., 1977, Annual summary of ground-water conditions in Arizona, Spring 1975 to Spring 1976: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-10, 2 sheets, scale 1:1,000,000.

Baldys, Stanley, III, 1990, Trend analysis of selected water-quality constituents in the Verde River Basin, central Arizona: U.S. Geological Survey Water-Resources Investigations Report 90-4128, 55 p.

Bedinger, M.S., Anderson, T.W., and Langer, W.H., 1984, Maps showing ground-water units and withdrawal, Basin and Range Province, Arizona: U.S. Geological Survey Water-Resources Investigations Report 83-4114-A, 2 sheets, scales 1:500,000 and 1:1,000,000.

Bell, R.T., VTN Consolidated, Inc., 1974, Fort Apache, San Carlos and Camp Verde, Yavapai Indian Reservations, Arizona, Report on water supply and demand: U.S. Bureau of Indian Affairs, 174 p., 11 sheets, scales 1:250,000, 1:288,000, 1:300,000, and 1:1,500,000.

Bills, D.J., and Flynn, M.E., 2002, Hydrogeologic data for the Coconino Plateau and adjacent areas, Coconino and Yavapai Counties, Arizona: U.S. Geological Survey Open-File Report 02-265, 29 p. [includes CD containing tables of source data at back of report]

Boner, F.C., Garrett, W.B., and Konieczki, A.D., 1989, Water resources data, Arizona, Water year 1988: U.S. Geological Survey Water-Data Report AZ-88-1, 391 p.

Boner, F.C., Konieczki, A.D., and Davis, R.G., 1991, Water resources data, Arizona, Water year 1990: U.S. Geological Survey Water-Data Report AZ-90-1, 381 p.

Boner, F.C., Smith, C.F., Garrett, W.B., and Konieczki, A., 1990, Water resources data, Arizona, Water year 1989: U.S. Geological Survey Water-Data Report AZ-89-1, 391 p.

Brazel, A.J., 1976, A preliminary water and energy budget analysis of Montezuma Well, Arizona: Arizona Academy of Science, Journal, v. 11, p. 9-15.

Briggs, P.C., and Nemecek, E.A., 1986, Technical aspects of Arizona groundwater law, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 93-98.

Brown, S.G., 1976, Preliminary maps showing ground-water resources in the lower Colorado River region, Arizona, Nevada, New Mexico, and Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-542, 1 sheet, scale 1:1,000,000.

Buol, S.W., 1964, Calculated actual and potential evapotranspiration in Arizona: Tucson, University of Arizona, Agricultural Experiment Station Technical Bulletin 162, 48 p.

Claggett, S.P., 2001, Evaluation of the utility of satellite rainfall estimates for water resource applications using sub-basin areal averages and pixel-to-pixel comparisons: Tucson, University of Arizona, M.S. thesis, 120 p.

Clark, T.C., 1975, The Arizona Water Plan, A status report, *in* Arizona Watershed Symposium, 19th annual, Phoenix, September 24, 1975, Proceedings: Arizona Water Commission Report no. 7, p. 9-23.

Catlin, C.N., 1926, Character of the ground-water resources of Arizona: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Bulletin 114, p. 173-293.

Cordy, G.E., Gellenbeck, D.J., Gebler, J.B., Anning, D.W., Coes, A.L., Edmonds, R.J., Rees, J.A.H., and Sanger, H.W., 2000, Water quality in the central Arizona basins, Arizona, 1995-98: U.S. Geological Survey Circular 1213, 38 p.

Cordy, G.E., Rees, J.A., Edmonds, R.J., Gebler, J.B., Wirt, Laurie, Gellenbeck, D.J., and Anning, D.W., 1998, Water-quality assessment of the central Arizona basins, Arizona and northern Mexico - Environmental setting and overview of water quality: U.S. Geological Survey Water-Resources Investigations Report 98-4097, 72 p.

Corkhill, E.F., and Mason, D.A., 1995, Hydrogeology and simulation of groundwater flow, Prescott Active Management Area, Yavapai County, Arizona: Arizona Department of Water Resources Modeling Report no. 9, 143 p., 3 app., 3 sheets, scales 1:170,000 and 1:300,000.

Cox, C.J., and others, 1968, Annual report on ground water in Arizona, Spring 1966 to Spring 1967: Arizona State Land Department Water Resources Report no. 36, 43 p.

Daniel, D.L., 1981, Maps showing total dissolved solids content of groundwater in Arizona: Arizona Department of Water Resources Hydrologic Map Series Report no. 2, 2 sheets, scale 1:1,000,000.

Darr, M.J., 1989, Hydrogeology of the Oak Creek area, Verde Valley, Arizona: Flagstaff, Northern Arizona University, M.S. thesis, 286 p.

Davidson, E.S., 1979, Summary appraisals of the nation's ground-water resources - Lower Colorado region: U.S. Geological Survey Professional Paper 813-R, 23 p., 3 sheets, scale 1:1,000,000.

Dempsey, W.J., Hill, M.E., and others, 1963, Aeromagnetic map of central Yavapai County, Arizona, including the Jerome mining district: U.S. Geological Survey Geophysical Investigations Map GP-402, 1 sheet, scale 1:62,500.

Duncan, J.T., Spencer, J.E., Eshraghi, P., and Emrick, S.M., 1993, A reconnaissance study of radon and other radionuclides in Arizona well water, *in* Spencer, J.E., ed., Radon in Arizona: Arizona Geological Survey Bulletin 199, p. 86-92.

Eberly, L.D., and Stanley, T.B., Jr., 1978, Cenozoic stratigraphy and geologic history of southwestern Arizona: Geological Society of America Bulletin, v. 89, no. 6, p. 921-940.

Evans, L.G., and Haimson, J.S., 1982, SWAB/RASA aquifer parameter study, Final report for U.S. Geological Survey contract 14-08-0001-18268: Arizona Department of Water Resources, 21 p.

Ferguson, Morris and Associates, Inc., 1975, A wastewater facilities plan for the Verde River Basin, Arizona, prepared for the Arizona Department of Health Services, Bureau of Water Quality Control: Scottsdale, Ariz., Ferguson, Morris and Associates, Inc., [329] p.

Feth, J.H., 1954, Preliminary report of investigations of springs in the Mogollon Rim region, Arizona, *with sections on*: Base flow of streams, by N.D. White, and Quality of water, by J.D. Hem: U.S. Geological Survey Open-File Report [unnumbered], Tucson, Ariz., June 1954, 100 p., 4 sheets, scales 1:80,000, 1:95,000, and 1:1,600,000.

Feth, J.H., and Hem, J.D., 1962, Springs along the Mogollon Rim in Arizona, *in* Weber, R.H., and Peirce, H.W., eds., Guidebook of the Mogollon Rim region, east-central Arizona: New Mexico Geological Society 13th Field Conference Guidebook, p. 129-134.

Feth, J.H., and Hem, J.D., 1963, Reconnaissance of headwater springs in the Gila River drainage basin, Arizona: U.S. Geological Survey Water-Supply Paper 1619-H, 54 p., 4 sheets, scales 1:63,360, and 1:500,000.

Feth, J.H., and others, 1964, Preliminary map of the conterminous United States showing depth to and quality of shallowest ground water containing more than 1,000 parts per million dissolved solids: U.S. Geological Survey Hydrologic Investigations Atlas HA-199, 31 p., 2 sheets, scale 1:3,168,000.

Fields, R.L., 1986, Data-processing activities of the southwest alluvial basins, RASA study, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 17-23.

Foster, K.E., and DeCook, K.J., 1980, Groundwater exploration in northeastern Arizona using Landsat imagery, *in* Harwood, Gerald, ed., Hydrology and water resources in Arizona and the Southwest, V. 10: American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, Annual Meeting, Las Vegas, Nev., 1980, Proceedings, p. 187-192.

Freethey, G.W., 1986, Considerations in modeling ground-water flow in the alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 57-67.

Freethey, G.W., and Anderson, T.W., 1986, Predevelopment hydrologic conditions in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-664, 3 sheets, scale 1:500,000.

Freethey, G.W., Pool, D.R., Anderson, T.W., and Tucci, Patrick, 1986, Description and generalized distribution of aquifer materials in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-663, 4 sheets, scale 1:500,000.

Garrett, J.M., and Gellenbeck, D.J., 1991, Basin characteristics and streamflow statistics in Arizona as of 1989: U.S. Geological Survey Water-Resources Investigations Report 91-4041, 612 p.

Gellenbeck, D.J., and Anning, D.W., 2002, Occurrence and distribution of pesticides and volatile organic compounds in ground water and surface water in central Arizona basins, 1996-98, and their relation to land use: U.S. Geological Survey Water-Resources Investigations Report 01-4144, 107 p.

Glotfelty, M.F., 1985, Hydrogeology of the Camp Verde area, central Arizona [abs.], *in* Hydrology and water resources in Arizona and the Southwest, V. 15: American Water Resources Association, Arizona Section, and Arizona-Nevada Academy of Science, Hydrology Section, Annual Meeting, Las Vegas, Nev., 1985, Proceedings, p. 2.

Glotfelty, M.F., 1985, Hydrogeology of the Camp Verde Area, Yavapai County, Arizona: Flagstaff, Northern Arizona University, M.S. thesis, 142 p., 4 sheets, scale 1:24,000.

Goetz, A.F.H., Billingsley, F.C., Elston, D.P., Lucchitta, Ivo, and Shoemaker, E.M., 1973, Preliminary geologic investigations in the Colorado Plateau using enhanced ERTS images, *in* Freden, S.C., Mercanti, E.P., and Becker, M.A., eds., Symposium on significant results obtained from the Earth Resources Technology Satellite-1 - V. I: Technical presentations, Section A: U.S. National Aeronautics and Space Administration Special Publication 327, p. 403-411.

Goetz, A.F.H., Billingsley, F.C., Elston, D.P., Lucchitta, Ivo, and Shoemaker, E.M., 1974, Geologic applications of ERTS images on the Colorado Plateau, Arizona, *in* Freden, S.C., Mercanti, E.P., and Becker, M.A., eds., Third Earth Resources Technology Satellite-1 Symposium - V. I: Technical presentations, Section A: U.S. National Aeronautics and Space Administration Special Publication 351, p. 719-744.

Goetz, A.F.H., Billingsley, F.C., Gillespie, A.R., Abrams, M.J., Squires, R.L., Shoemaker, E.M., Lucchitta, I., and Elston, D.P., 1975, Application of ERTS images and image processing to regional geologic problems and geologic mapping in northern Arizona: Pasadena, California Institute of Technology, Jet Propulsion Laboratory Technical Report 32-1597, 188 p.

Hackbarth, M.R., 1992, Prehistoric and historic occupation of the Lower Verde River Valley: The State Route 87 Verde Bridge Project, Contract No. 89-28: Arizona Department of Transportation, 641 p.

Hahman, W.R., Sr., Stone, C., and Witcher, J.C., comps., 1978, Preliminary map - Geothermal energy resources of Arizona: Arizona Bureau of Geology and Mineral Technology Geothermal Map No. 1 [also listed as Arizona Geological Survey Map 15-1], 1 sheet, scale 1:1,000,000.

Halpenny, L.C., and others, 1952, Ground water in the Gila River basin and adjacent areas, Arizona--A summary: U.S. Geological Survey Open-File Report [unnumbered], Tucson, Ariz., October 1952, 224 p.

Hardt, W.F., Cahill, J.M., and Booher, M.B., 1958, Annual report on ground water in Arizona, Spring 1957 to Spring 1958: Arizona State Land Department Water Resources Report no. 5, 60 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1959, Annual report on ground water in Arizona, Spring 1958 to Spring 1959: Arizona State Land Department Water Resources Report no. 6, 61 p.

Hardt, W.F., Stulik, R.S., and Booher, M.B., 1960, Annual report on ground water in Arizona, Spring 1959 to Spring 1960: Arizona State Land Department Water Resources Report no. 7, [89] p.

Harshbarger, J.W., 1970, Source, movement and development of water in arid regions, *in* Peters, W.C., ed., Conference on mining and ecology in the arid environment, Tucson, Ariz., 1970, Proceedings: Tucson, Ariz, Department of Mining and Geological Engineering, College of Mines, University of Arizona, p. 122-134.

Harshbarger, J.W., Lewis, D.D., Skibitzke, H.E., Heckler, W.L., and Kister, L.R., revised by H.L. Baldwin, 1966, Arizona water: U.S. Geological Survey Water-Supply Paper 1648, 85 p.

Harwood, Gerald, and DeCook, K.J., eds., 1979, Hydrology and water resources in Arizona and the Southwest, V. 9: American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, Annual Meeting, Tempe, Ariz., 1979, Proceedings, 173 p.

Heiss, H.W., 1978, Regional geology series: Part VII, The Colorado Plateau: Water Well Journal, v. 32, no. 10, p. 63-64.

Hodges, E.B., and others, 1967, Annual report on ground water in Arizona, Spring 1965 to Spring 1966: Arizona State Land Department Water Resources Report no. 32, 61 p.

Karlstrom, T.N.V., Swann, G.A., and Eastwood, R.L., eds., 1974, Geology of northern Arizona with notes on archaeology and paleoclimate, Part 2 - Area studies and field guides: Geological Society of America, Rocky Mountain Section, Annual Meeting, 27th, Flagstaff, Ariz., 1974, p. 409-805.

Konieczki, A.D., and Leake, 1997, Hydrology and water chemistry of Montezuma well in Montezuma Castle National Monument and surrounding area, Arizona: U.S. Geological Survey Water Resources Investigations Report 97-4156, 49 p.

Landry, Larry, 1980, Yavapai-Apache Indian Reservation environmental service study: Arizona Office of Economic Planning and Development, Indian Planning Program, 38 p.

Levings, G.W., 1975, Geology and ground-water resources of the Sedona area, *in* Geological Survey research 1975: U.S. Geological Survey Professional Paper 975, p. 110.

Levings, G.W., 1980, Water resources in the Sedona area, Yavapai and Coconino Counties, Arizona: Arizona Water Commission Bulletin 11, 37 p., 3 sheets, scale 1:50,000.

Levings, G.W., and Mann, L.J., 1980, Maps showing ground-water conditions in the upper Verde River area, Yavapai and Coconino Counties, Arizona - 1978: U.S. Geological Survey Water-Resources Investigations Open-File Report 80-726, 2 sheets, scale 1:125,000.

Ligner, J.J., White, N.D., Kister, L.R., and Moss, M.E., 1969, Water resources: Part II of Mineral and water resources of Arizona: Arizona Bureau of Mines Bulletin 180, p. 471-580.

Longsworth, S.A., Van De Vanter, E.K., and Alwin, S.H., 1998, Activities of the Water Resources Division in Arizona, 1996-97: U.S. Geological Survey Open-File Report 98-185, 90 p.

Marie, J.R., Van De Vanter, E.K., and Moss, C.L., 1996, Activities of the Water Resources Division in Arizona, 1995-1996: U.S. Geological Survey Open-File Report 95-772, 69 p.

Mariner, R.H., Presser, T.S., and Evans, W.C., 1977, Chemical, isotopic, and gas compositions of selected thermal springs in Arizona, New Mexico, and Utah: U.S. Geological Survey Open-File Report 77-654, 12 p.

Matlock, W.G., and Davis, P.R., 1970, Computer aids groundwater resources research project: Progressive Agriculture in Arizona, v. 22, no. 5, p. 3-5.

May, R.T., White, D.L., and Nystrom, R.J., 1982, National Uranium Resource Evaluation, Prescott quadrangle, Arizona: U.S. Department of Energy Report GJQ-015(82), 62 p., 10 microfiche, 35 sheets, scale 1:250,000.

McDonald, H.R., and Padgett, H.D., Jr., 1945, Geology and groundwater resources of the Verde River Valley near Ft. McDowell, Arizona: U.S. Geological Survey Open-File Report, 99 p., 2 sheets, scale 1:12,000 and 1:63,360.

McDonald, H.R., and Bluhm, F.I., 1946, Further investigations of the ground-water resources of the Verde River Valley near Fort McDowell, Arizona: U.S. Geological Survey Open-File Report [unnumbered], 20 p.

McGavock, E.H., 1968, Basic ground-water data for southern Coconino County, Arizona: Arizona State Land Department Water Resources Report no. 33, 49 p.

McGavock, E.H., Anderson, T.W., Moosburner, O., and Mann, L.J., 1986, Water resources of southern Coconino County, Arizona: Arizona Department of Water Resources Bulletin 4, 53 p., 2 sheets, scale 1:250,000.

McGuinness, C.L., 1964, Generalized map showing annual runoff and productive aquifers in the conterminous United States: U.S. Geological Survey Hydrologic Investigations Atlas HA-194, scale 1:5,000,000.

Montgomery, E.L., and DeWitt, R.H., 1982, Hydrogeology of sources of municipal water, Flagstaff, Arizona: Arizona Water and Pollution Control Association, Spring Meeting, May 1982, presented paper.

Montgomery, E.L., and Harshbarger, J.W., 1989, Arizona hydrogeology and water supply, *in* Jenney, J.P., and Reynolds, S.J., eds., Geologic evolution of Arizona: Arizona Geological Society Digest 17, p. 827-840.

Montgomery, E.L., and Harshbarger, J.W., 1992, Arizona hydrogeology and water supply: Applied Hydrogeology, v. 1, no. 1, p. 25-37.

Nations, J.D., and Ranney, W.D.R., 1989, Geologic model of a Cenozoic basin in Arizona, *in* Tooker, E.W., comp.-ed., Arizona's industrial rock and mineral resources--Workshop proceedings: U.S. Geological Survey Bulletin 1905, p. 44-48, 49-52.

Ostenaa, D.A., Schimschal, U., King, C.E., Jr., and Wright, J.W., 1993, Big Chino Valley groundwater study, Geologic framework investigations: U.S. Bureau of Reclamation Seismotectonic Report no. 93-2, 2 v., 9 sheets, scale 1:24,000.

Owen-Joyce, S.J., 1980, Arsenic concentrations in Verde Valley [abs.], *in* U.S. Geological Survey research 1980: U.S. Geological Survey Professional Paper 1175, P. 142-143.

Owen-Joyce, S.J., 1984, Hydrology of a stream-aquifer system in the Camp Verde area, Yavapai County, Arizona: Arizona Department of Water Resources Bulletin 3, 60 p., 3 sheets, scale 1:24,000.

Owen-Joyce, S.J., and Bell, C.K., 1983, Appraisal of water resources in the Upper Verde River area, Yavapai and Coconino Counties, Arizona: Arizona Department of Water Resources Bulletin 2, 219 p., 3 sheets, scale 1:125,000.

Parker, J.T.C., and Flynn, M.E., 2000, Investigations of the geohydrology and hydrology of the Mogollon Highlands of central Arizona: A project of the Arizona Rural Watershed Initiative: U.S. Geological Survey Fact Sheet FS-159-00, 4 p.

Parker, J.T.C., and Flynn, M.E., 2001, Hydrogeology and isotope hydrology of the Mogollon Highlands of central Arizona: Preliminary findings [abs.], *in* Annual Symposium, 14th, September 12-15, 2001, Proceedings: Arizona Hydrological Society, p. 57-58

Parker, Timothy, Tanaka, K.L., and Hirsch, D.D., eds., 2001, Abstracts of the annual Planetary Geologic Mappers meeting, *with a section on* Field trip notes: Geologic controls on select springs near Flagstaff, Arizona, by D.J. Bills: U.S. Geological Survey Open-File Report 01-18, [24] p.

Peirce, H.W., and Scurlock, J.R., 1972, Arizona well information: Arizona Bureau of Mines Bulletin 185, 195 p. [reprinted 1988, Arizona Geological Survey].

Pool, D.R., 1984, Aquifer geology of alluvial basins of Arizona, *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 683-690.

Pool, D.R., 1986, Aquifer geology of alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 25-36.

Rauzi, S.L., 2002, Arizona has salt!: Arizona Geological Survey, Circular 30, 36 p.

Reiter, M., Mansure, A.J., and Shearer, C., 1978, Geothermal characteristics of the Colorado Plateau [abs.], *in* Papers presented to the Conference on Plateau Uplift: Mode and Mechanism, A Lunar and Planetary Institute Topical Conference: Houston, Lunar and Planetary Institute, LPI Contribution 329, p. 43.

Robertson, F.N., 1984, Solubility controls of fluorine, barium and chromium in ground water in alluvial basins of Arizona, *in* Hitchon, Brian, and Wallick, E.I., eds., Canadian/American Conference on Hydrogeology, First, Proceedings: Worthington, Ohio, National Water Well Association, p. 96-102.

Robertson, F.N., 1984, Trace elements in ground water in southern Arizona [abs.], *in* Repogle, J.A., and Renard, K.G., eds., Water today and tomorrow, Specialty Conference, Irrigation and Drainage Division of the American Society of Civil Engineers, Flagstaff, Ariz., July 24-26, 1984, Proceedings: American Society of Civil Engineers, p. 674.

Robertson, F.N., 1986, Occurrence and solubility controls of trace elements in ground water in alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional aquifer systems of the United States - Southwest alluvial basins of Arizona: Bethesda, Md., American Water Resources Association Monograph Series no. 7, p. 69-80.

Robertson, F.N., 1989, Ground-water geochemistry and information transfer in alluvial basins in Arizona [abs.], *in* International Geological Congress, 28th, Washington, D.C., July 9-19, 1989, Abstracts, V. 2: International Geological Congress, p. 2.709-2.710.

Robertson, F.N., 1989, Arsenic in ground-water under oxidizing conditions, south-west United States: Environmental Geochemistry and Health, v. 11, no. 3/4, p. 171-185.

Robertson, F.N., 1991, Geochemistry of ground-water in alluvial basins of Arizona and adjacent parts of Nevada, New Mexico, and California: U.S. Geological Survey Professional Paper 1406-C, p. C1-C90.

Robertson, F.N., and Garrett, W.B., 1988, Distribution of fluoride in ground water in the alluvial basins of Arizona and adjacent parts of California, Nevada, and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-665, 3 sheets, scale 1:500,000.

Robson, S.G., and Banta, E.R., 1995, Ground water atlas of the United States, Segment 2, Arizona, Colorado, New Mexico, Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-730-C, 32 p.

Ross, P.P., 1977, Map showing ground-water conditions in the lower Verde River area, Maricopa, Yavapai, and Gila Counties, Arizona - 1976: U.S. Geological Survey Water-Resources Investigations Open-File Report 77-113, 1 sheet, scale 1:125,000.

Ross, P.P., and Farrar, C.D., 1978, Geothermal water studies in the Verde Valley of Arizona, *in* Geological Survey research 1978: U.S. Geological Survey Professional Paper 1100, p. 40.

Ross, P.P., and Farrar, C.D., 1979, Intermediate-temperature geothermal waters found in the Verde Valley, Arizona *in* Geological Survey research 1979: U.S. Geological Survey Professional Paper 1150, p. 194.

Ross, P.P., and Farrar, C.D., 1980, Map showing potential geothermal-resource areas, as indicated by the chemical character of ground water, in Verde Valley, Yavapai County, Arizona: U.S. Geological Survey Water-Resources Investigations Open-File Report 80-0013, 1 sheet, scale 1:125,000.

Sass, J.H., Stone, Claudia, and Bills, D.J., 1982, Shallow subsurface temperatures and some estimates of heat flow from the Colorado Plateau of northeastern Arizona: U.S. Geological Survey Open-File Report 82-994, 112 p.

Schumann, H.H., 1967, Water resources of lower Sycamore Creek, Maricopa County, Arizona: U.S. Geological Survey Open-File Report [unnumbered], 54 p.

Schwab, K.J., 1995, Maps showing groundwater conditions in the Big Chino Sub-basin of the Verde River Basin, Coconino and Yavapai Counties, Arizona - 1992: Arizona Department of Water Resources Hydrologic Map Series Report no. 28, 1 sheet, scale 1:250,000.

Schwalen, H.C., 1967, Little Chino Valley artesian area and groundwater basin: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Technical Bulletin 178, 63 p., 14 sheets, scale 1:165,000.

Scott, R.C., and Barker, F.B., 1962, Data on uranium and radium in ground water in the United States 1954 to 1957: U.S. Geological Survey Professional Paper 426, 115 p., 2 sheets, scale 1:7,000,000.

Segall, B.A., 1973, Report on the effects of second homes and related vacation developments on the quality of Arizona streams and groundwater, Phase 2, Oak Creek Canyon: Tempe, Arizona State University.

Smith, C.F., Anning, D.W., Duet, N.R., Fisk, G.G., McCormack, H.F., Pope, G.L., Rigas, P.D., and Wallace, B.L., 1995, Water resources data, Arizona, Water year 1994: U.S. Geological Survey Water-Data Report AZ-94-1, 320 p.

Smith, C.F., Boner, F.C., Davis, R.G., Duet, N.R., and Rigas, P.D., 1993, Water resources data, Arizona, Water year 1992: U.S. Geological Survey Water-Data Report AZ-92-1, 360 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., and Rigas, P.D., 1997, Water resources data, Arizona, Water year 1996: U.S. Geological Survey Water-Data Report AZ-96-1, 328 p.

Smith, C.F., Duet, N.R., Fisk, G.G., McCormack, H.F., Partin, C.K., Pope, G.L., Rigas, P.D., and Tadayon, S., 1996, Water resources data, Arizona, Water year 1995: U.S. Geological Survey Water-Data Report AZ-95-1, 306 p.

Smith, C.F., Rigas, P.D., Ham, L.K., Duet, N.R., and Anning, D.W., 1994, Water resources data, Arizona, Water year 1993: U.S. Geological Survey Water-Data Report AZ-93-1, 360 p.

Smith, H.V., Caster, A.B., Fuller, W.H., Breazeale, E.L., and Draper, George, 1949, The chemical composition of representative Arizona waters: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Bulletin 225, 76 p.

Smith, H.V., Draper, G.E., Buehrer, T.F., Fuller, W.H., and Marx, G.W., 1963, Quality of Arizona domestic waters: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Report 217, 77 p.

Smith, H.V., Draper, G.E., and Fuller, W.H., 1964, The quality of Arizona irrigation waters: Tucson, University of Arizona, College of Agriculture, Agricultural Experiment Station, Report 223, 96 p.

Spencer, J.E., 2002, Natural occurrence of arsenic in Southwest ground water: Southwest Hydrology, v. 1, no. 1, p. 14-15.

Spicer, L.M., and Van De Vanter, E.K., comps., 1993, Activities of the Water Resources Division in Arizona, 1986-91: U.S. Geological Survey Open-File Report 93-165, 144 p.

Stone, Claudia, and Witcher, J.C., 1982, Geothermal energy in Arizona - Final contract report: Arizona Bureau of Geology and Mineral Technology Open-File Report 83-12, 398 p.

Tellier, A.H., 1973, Geothermal waters of Arizona: Tempe, Arizona State University, M.S. thesis, 30 p.

Texas Instruments, Inc., 1982, National Uranium Resource Evaluation, Variable premise evaluation system data report, Interpretation of aerial radiometric reconnaissance data, Hydrogeochemical and stream sediment reconnaissance data, Grand Canyon quadrangle, Arizona: U.S. Department of Energy Report GJD-32(81), 210 p.

Texas Instruments, Inc., 1982, National Uranium Resource Evaluation, Variable premise evaluation system data report, Interpretation of hydrogeochemical and stream sediment reconnaissance data, Williams quadrangle, Arizona: U.S. Department of Energy Report GJD-93(81), 264 p.

Thiele, H.J., 1965, Present and future water use and its effect on planning in Maricopa County, Arizona: Phoenix, Ariz., Maricopa County Planning and Zoning Commission-Department, 60 p.

Thomsen, B.W., and Dennis, P.E., 1963, Water salvage possibilities on Sycamore Creek, Maricopa County, Arizona, *in* Water conservation from mountains to desert, Arizona Watershed Symposium, 7th Annual Meeting, Phoenix, September 18, 1963, Proceedings: Arizona Water Resources Committee and Arizona State Land Department, Watershed Management Division, p. 16-18.

Thomsen, B.W., and Schumann, H.H., 1968, Water resources of the Sycamore Creek watershed, Maricopa County, Arizona: U.S. Geological Survey Water-Supply Paper 1861, 53 p., 1 sheet, scales 1:24,000, 1:125,000, and 1:185,000.

Towler, W.L., 1982, Verde Valley water quality management plan: Flagstaff, Northern Arizona Council of Governments, 71 p.

Twenter, F.R., 1962, Rocks and water in Verde Valley, Arizona, *in* Weber, R.H., and Peirce, H.W., eds., Guidebook of the Mogollon Rim region, east-central Arizona: New Mexico Geological Society 13th Field Conference Guidebook, p. 135-139.

Twenter, F.R., and Metzger, D.G., 1963, Geology and ground water in Verde Valley--The Mogollon Rim region, Arizona: U.S. Geological Survey Bulletin 1177, 132 p., 1 sheet, scale 1:62,500.

U.S. Geological Survey, [1965?], Water quality records in Arizona - 1964: U.S. Geological Survey, 80 p.

U.S. Geological Survey, [1966?], 1965 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 89 p.

U.S. Geological Survey, [1968?], 1967 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 85 p.

U.S. Bureau of Reclamation, 1974, Chino Valley unit appraisal report, Western states water plan, State of Arizona: U.S. Bureau of Reclamation, 125 p.

U.S. Geological Survey, 1971, 1971 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 167 p. [NTIS PB-287 165].

U.S. Geological Survey, 1972, 1972 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 166 p. [NTIS PB-287 167].

U.S. Geological Survey, 1973, 1973 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey Water-Resources Data Report, 188 p. [NTIS PB-287 169].

U.S. Geological Survey, 1974, 1974 water resources data for Arizona - Part 2. Water quality records: U.S. Geological Survey, 192 p. [NTIS PB-287 171].

U.S. Geological Survey, 1976, Water resources data for Arizona, Water year 1975: U.S. Geological Survey Water-Data Report AZ-75-1, 440 p.

U.S. Geological Survey, 1978, Water resources data for Arizona, Water year 1977: U.S. Geological Survey Water-Data Report AZ-77-1, 550 p.

U.S. Geological Survey, 1978, Annual summary of ground-water conditions in Arizona, Spring 1977 to Spring 1978: U.S. Geological Survey Water-Resources Investigations Open-File Report 78-144, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1979, Water resources data for Arizona, Water year 1978: U.S. Geological Survey Water-Data Report AZ-78-1, 604 p.

U.S. Geological Survey, 1980, Water resources data for Arizona, Water year 1979: U.S. Geological Survey Water-Data Report AZ-79-1, 614 p.

U.S. Geological Survey, 1980, Annual summary of ground-water conditions in Arizona, Spring 1978 to Spring 1979: U.S. Geological Survey Water-Resources Investigations Open-File Report 80-330, 1 sheet, scale 1:1,000,000.

U.S. Geological Survey, 1981, Annual summary of ground-water conditions in Arizona, Spring 1979 to Spring 1980: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-906, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Annual summary of ground-water conditions in Arizona, Spring 1980 to Spring 1981: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scale 1:1,000,000.

U.S. Geological Survey, 1982, Water resources data for Arizona, Water year 1980: U.S. Geological Survey Water-Data Report AZ-80-1, 568 p.

U.S. Geological Survey, 1983, Water resources data, Arizona, Water year 1981: U.S. Geological Survey Water-Data Report AZ-81-1, 532 p.

U.S. Geological Survey, 1983, Annual summary of ground-water conditions in Arizona, Spring 1981 to Spring 1982: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-368, 2 sheets, scales 1:1,000,000 and 1:3,200,000.

U.S. Geological Survey, 1984, Annual summary of ground-water conditions in Arizona, Spring 1982 to Spring 1983: U.S. Geological Survey Water-Resources Investigations Open-File Report 84-428, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

U.S. Geological Survey, 1985, Annual summary of ground-water conditions in Arizona, Spring 1983 to Spring 1984: U.S. Geological Survey Water-Resources Investigations Open-File Report 85-410, 2 sheets, scales 1:1,000,000 and 1:3,400,000.

U.S. Geological Survey, 1986, Annual summary of ground-water conditions in Arizona, Spring 1984 to Spring 1985: U.S. Geological Survey Water-Resources Investigations Open-File Report 86-422W, 2 sheets, scales 1:1,000,000 and 1:3,300,000.

University of Arizona, Water Resources Research Center, 1978, Groundwater projections for 11 basins: Arizona Water Resources News Bulletin 78-3, 4 p.

Wagner, D.V., 1987, Isotopic and chemical characterization of ground waters in the vicinity of Flagstaff, Arizona: Tucson, University of Arizona, M.S. thesis, 111 p.

Wagoner, J.L., 1979, Hydrogeochemical and stream sediment reconnaissance basic data report for Williams NTMS quadrangle, Arizona: U.S. Department of Energy Report GJBX-71(79), 74 p., 6 sheets, scale 1:250,000, 5 microfiche.

Wallace, B.L., and Laney, R.L., 1976, Maps showing ground-water conditions in the lower Big Chino Valley and Williamson Valley areas, Yavapai and Coconino Counties, Arizona – 1975-76: U.S. Geological Survey Water Resources Investigations Report 76-78, 2 sheets, scale 1:125,000.

Weitzman, Morley, 2002, Geology and hydrology of the Payson-Strawberry-Diamond Rim area, Gila and Coconino Counties, central Arizona: Arizona Geological Survey Contributed Report CR-02-B, 17 p., 3 sheets, scale 1:62,500.

White, N.D., and Garrett, W.B., 1984, Water resources data, Arizona, Water year 1982: U.S. Geological Survey Water-Data Report AZ-82-1, 440 p.

White, N.D., and Garrett, W.B., 1986, Water resources data, Arizona, Water year 1983: U.S. Geological Survey Water-Data Report AZ-83-1, 387 p.

White, N.D., and Garrett, W.B., 1987, Water resources data, Arizona, Water year 1984: U.S. Geological Survey Water-Data Report AZ-84-1, 381 p.

White, N.D., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1985: U.S. Geological Survey Water-Data Report AZ-85-1, 343 p.

White, N.D., and others, 1967, Annual report on ground water in Arizona, Spring 1964 to Spring 1965: Arizona State Land Department Water Resources Report no. 24, 62 p.

White, N.D., Stulik, R.S., and others, 1962, Annual report on ground water in Arizona, Spring 1961 to Spring 1962: Arizona State Land Department Water Resources Report no. 11, 116 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1961, Annual report on ground water in Arizona, Spring 1960 to Spring 1961: Arizona State Land Department Water Resources Report no. 10, 93 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1963, Annual report on ground water in Arizona, Spring 1962 to Spring 1963: Arizona State Land Department Water Resources Report no. 15, 136 p.

White, N.D., Stulik, R.S., Morse, E.K., and others, 1964, Annual report on ground water in Arizona, Spring 1963 to Spring 1964: Arizona State Land Department Water Resources Report no. 19, 60 p.

Wilson, L.G., DeCook, K.J., and Neuman, S.P., 1980, Regional recharge research for southwest alluvial basins - Final report, U.S. Geological Survey contract 14-08-0001-18257: Tucson, University of Arizona, Water Resources Research Center, 389 p.

Wilson, R.P., 1990, Arizona water supply and use, *in* Carr, J.E., and others, National water summary, 1987 - Hydrologic events and water supply and uses: U.S. Geological Survey Water-Supply Paper 2350, p. 157-164.

Wilson, R.P., and Garrett, W.B., 1988, Water resources data, Arizona, Water year 1986: U.S. Geological Survey Water-Data Report AZ-86-1, 341 p.

Wilson, R.P., and Garrett, W.B., 1989, Water resources data, Arizona, Water year 1987: U.S. Geological Survey Water-Data Report AZ-87-1, 385 p.

Wirt, Laurie, and Hjalmarson, H.W., 2000, Sources of springs supplying base flow to the Verde River headwaters, Yavapai County, Arizona: U.S. Geological Survey Open-File Report 99-378, 50 p.

Witcher, J.C., 1979, Proven, potential, and inferred geothermal resources of Arizona and their heat contents: Arizona Bureau of Geology and Mineral Technology Open-File Report 79-05, 64 p., 1 sheet, scale 1:1,000,000 [also published in Pasadena, California Institute of Technology, Jet Propulsion Laboratory Publication 80-41, p. A-3 to A-74].

Witcher, J.C., Stone, Claudia, and Hahman, W.R., Sr., 1982, Geothermal resources of Arizona: Arizona Bureau of Geology and Mineral Technology [also listed as Arizona Geological Survey Map 15-2], 1 sheet, scale 1:500,000.

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RE: Perkins Mountain Water Company and Perkins Mountain Utility Company – Applications for Certificates of Convenience and Necessity (CC&N) Docket Nos. W-20380A-05-0490 and W-20379A-05-0489

Dear Sir/Madam:

The Arizona Corporation Commission ("Commission") is currently reviewing the above referenced applications for Certificates of Convenience and Necessity in Mohave County, Arizona and would appreciate it if you would provide the following information to the Commission:

- Has any groundwater aquifer study been done or envisioned by U.S. Geological Survey for Mohave County? Please explain. If a study has been done, please provide a summary of the findings and conclusions.

If you have any questions concerning this matter, please do not hesitate to contact me at 602-542-0840.

Very truly yours,

Blessing N. Chukwu
Executive Consultant III

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Bowie, J.E., Kam, William, Branson, F.A., and Aro, R.S., 1968, Use of water by riparian vegetation, Cottonwood Wash, Arizona, with a section on vegetation: U.S. Geological Survey, Water-Supply Paper 1858, scale 1:12000.

Wiele, S.M., 1998, Modeling of flood-deposited sand distributions in a reach of the Colorado River below the Little Colorado River, Grand Canyon, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 97-4168, scale 1:20000.

Moosburner, Otto, 1988, Potential flood and debris hazards at Katherine Landing and Telephone Cove, Lake Mead National Recreation Area, Mohave County, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 87-4081, scale 1:32000.

Truini, Margot, 1999, Geohydrology of Pipe Spring National Monument area, northern Arizona: U.S. Geological Survey, Water-Resources Investigations Report 98-4263, scale 1:56000.

Melis, T.S., Phillips, W.M., Webb, R.H., and Bills, D.J., 1996, When the blue-green waters turn red -- historical flooding in Havasu Creek, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 96-4059, scale 1:60000.

Bales, J.T. and Laney, R.L., 1992, Geohydrologic reconnaissance of Lake Mead National Recreation Area - Virgin River, Nevada, to Grand Wash Cliffs, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 91-4185, scale 1:62500.

Bentley, C.B., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area - Hoover Dam to Mount Davis, Arizona: U.S. Geological Survey, Open-File Report OF-79-690, scale 1:62500.

Bentley, C.B., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area - Mount Davis to Davis Dam, Arizona: U.S. Geological Survey, Open-File Report OF-79-691, scale 1:62500.

Laney, R.L., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area - Hoover Dam to Temple Bar, Arizona: U.S. Geological Survey, Open-File Report OF-79-689, scale 1:62500.

Laney, R.L., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area - Temple Bar to Grand Wash Cliffs, Arizona: U.S. Geological Survey, Open-File Report OF-79-688, scale 1:62500.

Wolcott, H.N., Skibitzke, H.E., and Halfpenny, L.C., 1956, Water resources of Bill Williams River valley near Alamo, Arizona: U.S. Geological Survey, Water-Supply Paper 1360-D, scale 1:63360.

Twichell, D.C., Cross, V.A., Rudin, M.J., and Parolski, K.F., 2000, Surficial geology and distribution of post-impoundment sediment of the western part of Lake Mead based on a sidescan sonar and high-resolution seismic-reflection survey: U.S. Geological Survey, Open-File Report OF-99-581, scale 1:75000.

Wilson, R.P. and Owen-Joyce, S.J., 1994, Method to identify wells that yield water that will be replaced by Colorado River water in Arizona, California, Nevada, and Utah: U.S. Geological Survey, Water-Resources Investigations Report 94-4005, scale 1:100000.

Gillespie, J.B. and Bentley, C.B., 1971, Geohydrology of Hualapai and Sacramento Valleys, Mohave County, Arizona: U.S. Geological

THESE ARE RESULTS FOR ANY WATER OR ENVIRONMEN HAZARDS MAP AT SCALE 1 MILLION AND MORE DETAILED.

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Survey, Water-Supply Paper 1899-H, scale 1:125000.
Levings, G.W. and Farrar, C.D., 1979, Maps showing ground-water conditions in the Kanab area, Coconino and Mohave Counties, Arizona - 1976: U.S. Geological Survey, Open-File Report OF-79-1070, scale 1:125000.
Metzger, D.G. and Loeltz, O.J., 1973, Geohydrology of the Needles area, Arizona, California, and Nevada: U.S. Geological Survey, Professional Paper 486-J, scale 1:125000.
Pfaff, C.L. and Clay, D.M., 1981, Map showing ground-water conditions in the Sacramento Valley area, Mohave County, Arizona - 1979: U.S. Geological Survey, Open-File Report OF-81-418, scale 1:125000.
Remick, W.H., 1980, Map showing ground-water conditions in the Hualapai Basin area, Mohave, Coconino, and Yavapai Counties, Arizona -- 1980: Arizona Department of Water Resources, Hydrologic Map Series Report no. 4, scale 1:125000.
Twenter, F.R., 1962, Geology and promising areas for ground-water development in the Hualapai Indian Reservation, Arizona: U.S. Geological Survey, Water-Supply Paper 1576-A, scale 1:125000.
Levings, G.W. and Farrar, C.D., 1979, Map showing ground-water conditions in the Virgin River, Grand Wash, and Shivwits areas, Mohave County, Arizona - 1976: U.S. Geological Survey, Water-Resources Investigations Report 79-57, scale 1:126000.
Harbeck, G.E., Kohler, M.A., and Koberg, G.E., 1958, Water-loss investigations: Lake Meade Studies: U.S. Geological Survey, Professional Paper 298, scale 1:144000.
Enright, Michael, 1996, Selected hydrologic data for the Beaver Dam Wash area, Washington County, Utah, Lincoln County, Nevada, and Mohave County, Arizona, 1991-95: U.S. Geological Survey, Open-File Report OF-96-493, scale 1:167000.
Etheredge, Devin, Gutzler, D.S., and Pazzaglia, F.J., 2004, Geomorphic response to seasonal variations in rainfall in the southwest United States [Walnut Creek study area, Hualapai Mts]: Geological Society of America, Bulletin v. 116, n. 5/6, p. 606, scale 1:229000.
Flynn, M.E. and Hornewer, N.J., 2003, Variations in sand storage measured at monumented cross sections in the Colorado River between Glen Canyon Dam and Lava Falls Rapid, northern Arizona, 1992-99: U.S. Geological Survey, Water-Resources Investigations Report 03-4104, scale 1:240000.
Heilweil, V.M. and Freethey, G.W., 1992, Simulation of ground-water flow and water-level declines that could be caused by proposed withdrawals, Navajo Sandstone, southwestern Utah and northwestern Arizona: U.S. Geological Survey, Water-Resources Investigations Report 90-4105, scale 1:250000.
Thompson, D.G., 1929, The Mohave Desert region, California, a geographic, geologic, and hydrologic reconnaissance: U.S. Geological Survey, Water-Supply Paper 578, scale 1:250000.
U.S. Geological Survey, 1979, Land use series, Grand Canyon [quadrangle], Arizona: U.S. Geological Survey, Open-File Report OF-79-1494, scale 1:250000.
U.S. Geological Survey, 1980, Land use series, Las Vegas, Nevada, Arizona, California: U.S. Geological Survey, Open-File Report OF-80-272, scale 1:250000.
U.S. Geological Survey, 1980, Land use series, Needles, California - Arizona: U.S. Geological Survey, Open-File Report OF-80-856, scale 1:250000.
U.S. Geological Survey, 1983, Land use series, Prescott [quadrangle], Arizona: U.S. Geological Survey, Open-File

Report OF-83-106, scale 1:250000.
U.S. Geological Survey, 1983, Land use series, Williams [quadrangle], Arizona: U.S. Geological Survey, Open-File Report OF-83-107, scale 1:250000.
Carlson, D.D. and Meyer, D.F., 1995, Flood on the Virgin River, January 1989, in Utah, Arizona, and Nevada: U.S. Geological Survey, Water-Resources Investigations Report 94-4159, scale 1:254000.
Smith, W.O., Vetter, C.P., and Cummings, G.B., 1960, Comprehensive survey of sedimentation in Lake Meade, 1948-49: U.S. Geological Survey, Professional Paper 295, scale 1:265000.
Anning, D.W., 2002, Standard errors of annual discharge and change in reservoir content data from selected stations in the lower Colorado River streamflow-gaging station network, 1995-99: U.S. Geological Survey, Water-Resources Investigations Report 01-4240, scale 1:312500.
Holmes, W.F., Pyper, G.E., Gates, J.S., Schaefer, D.H., and Waddell, K.M., 1997, Hydrology and water quality of the Beaver Dam Wash area, Washington County, Utah, Lincoln County, Nevada, and Mohave County, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 97-4193, scale 1:432000.
Bedinger, M.S., Anderson, T.W., and Langer, W.H., 1984, Maps showing ground-water units and withdrawal, Basin and Range province, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 83-4114-A, scale 1:500000.
Bedinger, M.S., Sargent, K.A., and Langer, W.H., 1990, Studies of geology and hydrology in the Basin and Range province, southwestern United States, for isolation of high-level radioactive waste - characterization of the Sonora region, Arizona: U.S. Geological Survey, Professional Paper 1370-D, scale 1:500000.
Hely, A.G. and Peck, E.L., 1964, Precipitation, runoff and water loss in the lower Colorado River - Salton Sea area: U.S. Geological Survey, Professional Paper 486-B, scale 1:500000.
Jenness, J.E., Lopez, D.A., and LaFortune, J.R., 1984, Map showing outcrops of pre-Quaternary ash-flow tuffs and volcaniclastic rocks, Basin and Range province, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 83-4114-F, scale 1:500000.
Johnson, W.D., 1984, Maps showing outcrops of thick, dominantly argillaceous sedimentary and metasedimentary rocks, Basin and Range province, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 83-4114-E, scale 1:500000.
Langer, W.H., Mulvihill, D.A., and Anderson, T.W., 1984, Maps showing ground-water levels, springs, and depth to ground water, Basin and Range province, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 83-4114-B, scale 1:500000.
Owen-Joyce, S.J., 1987, Estimates of average annual tributary inflow to the lower Colorado River, Hoover Dam to Mexico: U.S. Geological Survey, Water-Resources Investigations Report 87-4078, scale 1:500000.
Thompson, T.H., Nuter, Janet, and Anderson, T.W., 1984, Maps showing distribution of dissolved solids and dominant chemical type in ground water, Basin and Range province, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 83-4114-C, scale 1:500000.

U.S. Geological Survey, 1988, Hydrologic Unit Map -- 1974, State of Arizona: U.S. Geological Survey, Hydrologic Unit Map HU-3, scale 1:500000.

Hilmes, M.M. and Vaill, J.E., 1997, Estimates of bridge scour at two sites on the Virgin River, southeastern Nevada, using a sediment-transport model and historical geomorphic data: U.S. Geological Survey, Water-Resources Investigations Report 97-4073, scale 1:600000.

Johnson, Michael, Dixon, G.L., Rowley, P.D., Katzer, T.C., and Winters, Michael, 2002, Hydrology and ground-water conditions of the Tertiary Muddy Creek Formation in the lower Virgin River basin of southeastern Nevada and adjacent Arizona and Utah [field trip, Chapter 8]: U.S. Geological Survey, Open-File Report OF-02-172, scale 1:633000.

U.S. Geological Survey, 1981, Annual summary of ground-water conditions in Arizona, spring 1979 to spring 1980: U.S. Geological Survey, Open-File Report OF-81-906, scale 1:652000.

Webb, R.H., Griffiths, P.G., Melis, T.S., and Hartley, D.R., 2000, Sediment delivery by ungaged tributaries of the Colorado River in Grand Canyon, Arizona: U.S. Geological Survey, Water-Resources Investigations Report 00-4055, scale 1:732000.

Covay, K.J. and Beck, D.A., 2001, Sediment-deposition rates and organic compounds in bottom sediment at four sites in Lake Mead, Nevada, May 1998: U.S. Geological Survey, Open-File Report OF-01-282, scale 1:800000.

U.S. Geological Survey, 1985, Annual summary of ground-water conditions in Arizona, spring 1983 to spring 1984: U.S. Geological Survey, Open-File Report OF-85-410, scale 1:937500.

Anderson, T.W., Freethey, G.W., and Tucci, Patrick, 1990, Geohydrology and water resources of alluvial basins in south-central Arizona and parts of adjacent states: U.S. Geological Survey, Open-File Report OF-89-378, scale 1:1000000.

Konieczki, A.D. and Wilson, R.P., 1992, Annual summary of ground-water conditions in Arizona, spring 1986 to spring 1987: U.S. Geological Survey, Open-File Report OF-92-54, scale 1:1000000.

U.S. Geological Survey, 1980, Annual summary of ground-water conditions in Arizona, spring 1978 to spring 1979: U.S. Geological Survey, Open-File Report OF-80-330, scale 1:1000000.

U.S. Geological Survey, 1984, Annual summary of ground-water conditions in Arizona, spring 1982 to spring 1983: U.S. Geological Survey, Open-File Report OF-84-428, scale 1:1000000.

U.S. Geological Survey, 1986, Annual summary of ground-water conditions in Arizona, spring 1984 to spring 1985: U.S. Geological Survey, Open-File Report OF-86-422-W, scale 1:1000000.

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Edition	-
Language	ENGLISH
Author(s)	Moosburner, Otto
Year	1988
Originating office	Geological Survey Carson City, NV. Water Resources Div.
USGS Library Call Number	(200) WRi no.87-4081
Physical description	iv, 19 p. :ill., maps ;28 cm.
ISBN	Not Applicable

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- Southwest Biological Science Center
  2255 N. Gemini Drive
  Flagstaff, AZ 86001
  Phone: (928) 556-7094
  Fax: (928) 556-7092

- National Spatial Data Infrastructure Partnership Office (Liason for: AZ, NV)
  U.S. Geological Survey
  Western Region Geography
  345 Middlefield Road
  Menlo Park, CA 94025
  Phone: (650) 329-4326

- Arizona Cooperative Fish and Wildlife Research Unit
  Email: azcoopunit@ag.arizona.edu
  University of Arizona
  104 Biological Sciences East Building
  Tucson, Arizona 85721
  Phone: 520-621-1959
  Fax: 520-621-8801

Chukw

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M. Lee Allison
Director and State Geologist

April 5, 2006

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Z Corporation Commissic
Director of Utilities

Blessing N. Chukwu
Executive Consultant
Arizona Corporation Commission
1200 W. Washington St.
Phoenix, AZ 85007-2927

Dear Ms. Chukwu:

The Arizona Geological Survey (AZGS) has not conducted any original studies of aquifers in Mohave County nor do we envision doing any in the immediate future.

However, AZGS has compiled general information about geology and hydrology of the Bullhead City area under contract with the U.S. Geological Survey. The project was not a new study of groundwater resources but rather produced a compilation of existing information from previous studies conducted by other agencies. I am enclosing a copy of that report:

> Harris, R.C., 1998, A compilation of the geology and hydrology of the Black Mountains - Bullhead City area, Arizona: Arizona Geological Survey Open-File Report 98-26, 40p.

AZGS also maintains a comprehensive statewide bibliography of geology, called AZGEOBIB, which also contains some references about hydrology and water resources. This database is searchable by geographic criteria, including by county or by ADWR groundwater basin. There are a large number of groundwater basins in Mohave County and we are attaching a CD with separate Word file bibliographies for each basin in the county. The bibliography contains several hundred references, including numerous references of studies that have information on groundwater resources. There is some duplication of references that cover multiple groundwater basins.

The Survey works extensively with other state agencies and we are able to undertake specific studies and investigations for you to help meet your needs.

Sincerely,

M. Lee Allison
State Geologist and Director

Open-File REPORT

PUBLISHED BY THE

ARIZONA GEOLOGICAL SURVEY

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TUCSON, ARIZONA 85701
(520) 770-3500

A COMPILATION OF THE GEOLOGY AND HYDROLOGY OF THE BLACK MOUNTAINS-BULLHEAD CITY AREA, ARIZONA

by
Raymond C. Harris

Arizona Geological Survey
Open-File Report 98-26

December, 1998

Arizona Geological Survey
416 W. Congress, Suite #100, Tucson, Arizona 8570 1

(Includes 40 pages text)

Produced in cooperation with the US Geological Survey

This report is preliminary and has not been edited or reviewed
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A COMPILATION OF THE GEOLOGY AND HYDROLOGY OF THE BLACK MOUNTAINS-BULLHEAD CITY AREA, ARIZONA

INTRODUCTION

This report presents a compilation of geologic and hydrologic information for the Bullhead City-Black Mountains area of western Arizona. The purpose of the project is to determine the significance of mining, geology, and geohydrology in the chemistry of Bullhead City area groundwater. Mining in the Black Mountains has taken place since the 1800s, and the region provides a good opportunity to investigate any links between mining and water quality.

The study encompasses the area from the crest of the Black Mountains on the east, the Colorado River on the west, latitude 35° on the south and the top of township 21N at the north (Figure 1). Information was compiled from published and unpublished sources including U.S. Bureau of Land Management, U.S. Geological Survey, U.S. Bureau of Mines, U.S. Natural Resources Conservation Service (Department of Agriculture), Arizona Geological Survey, Arizona State Land Department, Arizona Department of Water Resources, and Arizona Department of Environmental Quality.

LAND STATUS AND LAND USE

Land ownership in the Black Mountains-Bullhead City area includes State, Federal, Indian Reservation, and private lands. This information was obtained in digital format from the Arizona State Land Department, through the Arizona Land Resource Information System (ALRIS). (That version of land status is digitized from 1979 BLM maps, and some changes may have occurred since that time.)

Private land accounts for about 55,309 acres in the study area, of which approximately 12,225 acres are in patented mining claims. Federal land comprises 115,960 acres (Bureau of Land Management: 107, 365 acres; Lake Mead National Recreation Area: 8,595 acres). Approximately15,092 acres are held by the State of Arizona. Tribal land of the Fort Mohave Indian Reservation accounts for approximately 19,340 acres.

Land use in the study area includes developed land (residential, commercial, industrial) at Bullhead City and Oatman, and recreation along the Colorado River and Lake Mohave, part of Lake Mead National Recreation Area. Most of the study area is open desert and hilly range land. This land, consisting of State, Bureau of Land Management, and private land outside developed areas, is used mostly for open space, and intermittent cattle grazing occurs on some portions. Patented mining claims account for approximately 12,225 acres in the study area. Most of the patented land is near Oatman.

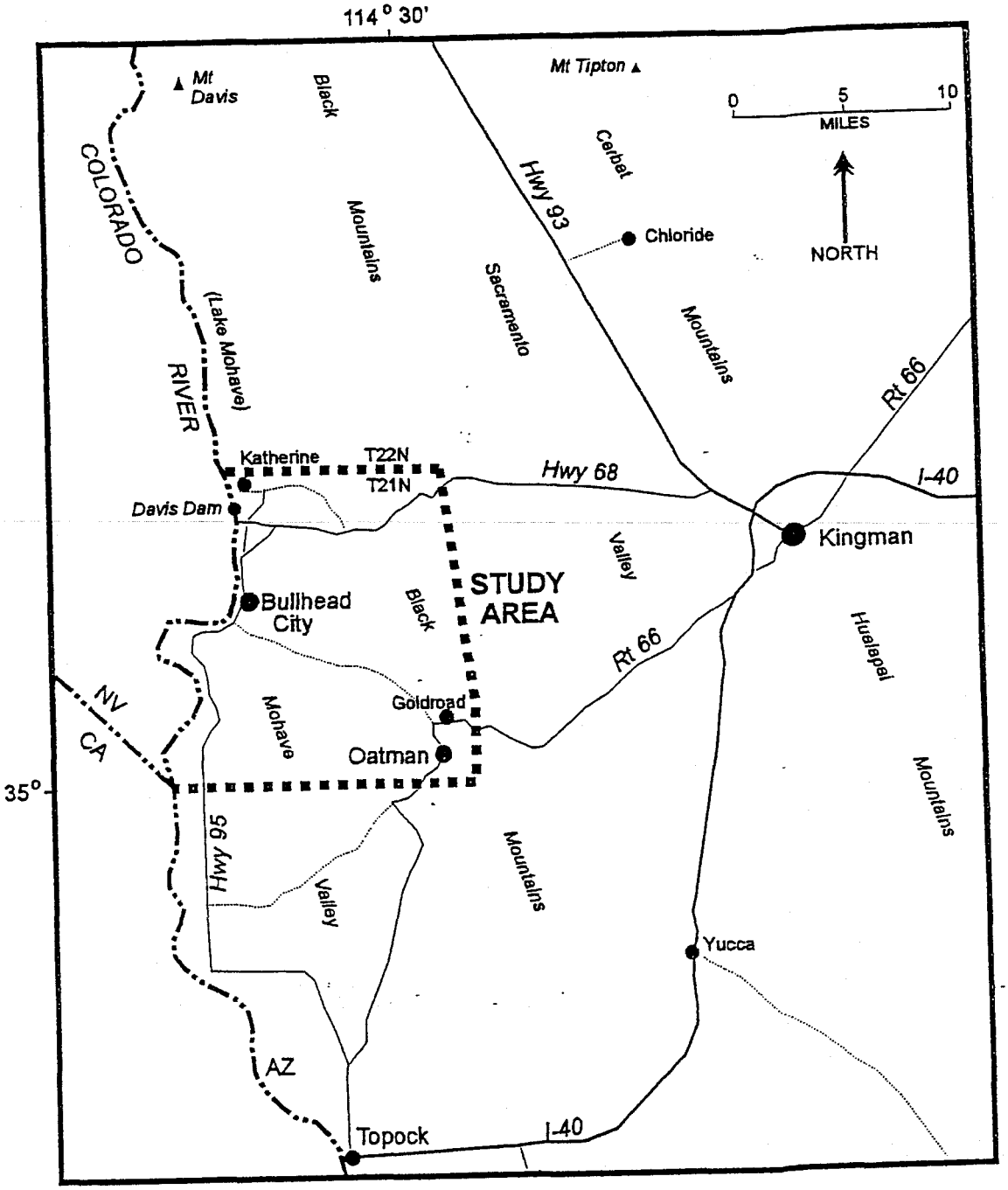


Figure 1. Location of the Black Mountains study area.

Figure 2 continued. Index of geologic maps of the Black Mountains. References:

1) Longwell, 1963: USGS Professional Paper 374-E, Plate 1, scale 1:125,000.

2) Metzger and Loeltz, 1973: USGS Professional Paper 486-J, Plate 1, scale 1:125,000.

3) Lausen, 1931: AZ Bureau of Mines Bulletin 131, Plate II (p. 21), scale 1:100,000.

   Wilson and others, 1934: AZ Bureau of Mines Bulletin 137, Figure 6 (p. 102), scale 1:100,000.

   Gardner, 1936: US Bureau of Mines IC 6901, Figure 9, scale 1:100,000.

4) DeWitt, 1987: SEG Guidebook, V.1, p. 29, Figure 1, scale 1: 250,000.

5) Gray and others, 1990a: USGS Bulletin 1737-D, Figure 2, scale 1:80,000.

6) Gray and others, 1990b: USGS Bulletin 1737-F, Plate 1, scale 1:62,500.

   Gray and others, 1990c: USGS Open-File Report 90-520, Figure 2, scale 1:163,000.

7) Durning and Buchanan, 1984: AZ Geological Society Digest 15, Figure 2, scale 1:85,00; (detailed figures 5, 6, 7, and 8 are within the area of Figure 2).

   Clifton and others, 1980: AIME preprint 80-143, Figure 2,scale 1:80,000

   DeWitt and others, 1991:USGS Bulletin 1857-I, Fig. 2, scale 1:100,000; Fig. 9, scale 1:50,000.

   Ransome, 1923: USGS Bulletin 743, Plate 1, scale 1:48,000.

   Gardner, 1936: US Bureau of Mines IC-6901, Figure 2, scale 1:58,000.

   Spencer and Welty, 1989: AGS Digest 17, Figure 3, scale 1:80,000.

   Smith, 1984: University of Arizona M.S. Thesis, Figure 2, scale 1:48,000.

   Lausen, 1931: AZ Bureau of Mines Bulletin 131, Plate 1, scale 1:48,000.

   Wilson and others, 1934: AZ Bureau of Mines Bulletin 137, plate 1, scale 1:48,000.

   Marsh and McKeon, 1983: Economic Geology, V78, no. 4, Figure 1,scale 1:160,000.

   Korzeb, 1988: US Bureau of Mines Open-File Report MLA 48-88, Figure 2, scale 1:24,000

Entire area:

- Reynolds, S.J., 1986, Geologic map of Arizona: ABGMT [AZGS] Map 26, scale 1 :1,000,000
- Wilson and Moore, 1959: ABM [AZGS], Geologic map of Mohave County, scale 1 :375,000
- Anderson and O'Connell, 1993: US Bur Rec Seismotectonic Report 93-4, Figure 2–2, scale 1:500,000.
- Lee, 1908: USGS Bulletin 352, Plate 1, scale 1:1,000,000.
- Schrader, 1909: USGS Bulletin 397, Plate 1, scale 1:250,000.

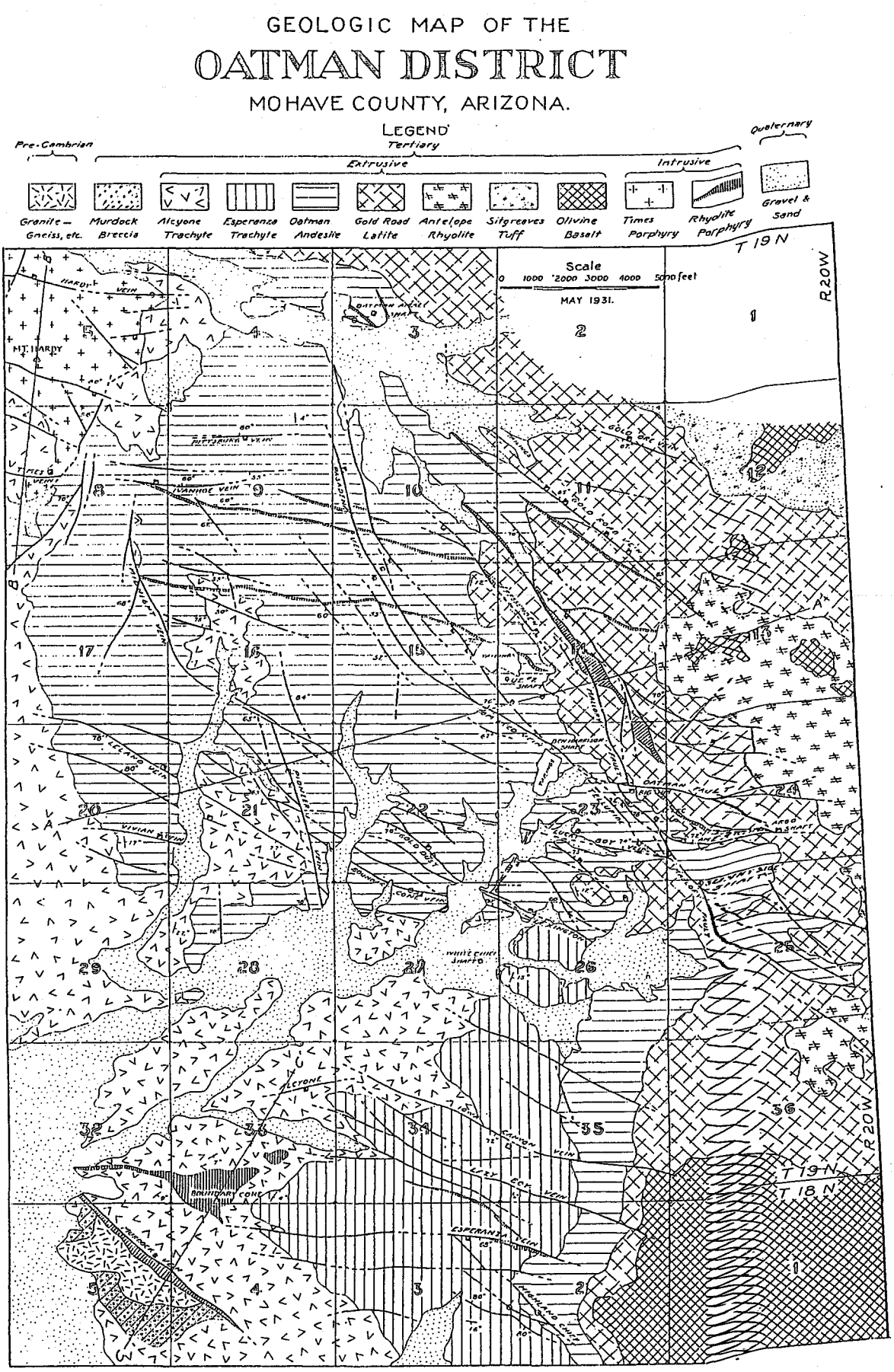


Figure 3. Geologic map of the Oatman area.
(from Lausen, 1931)

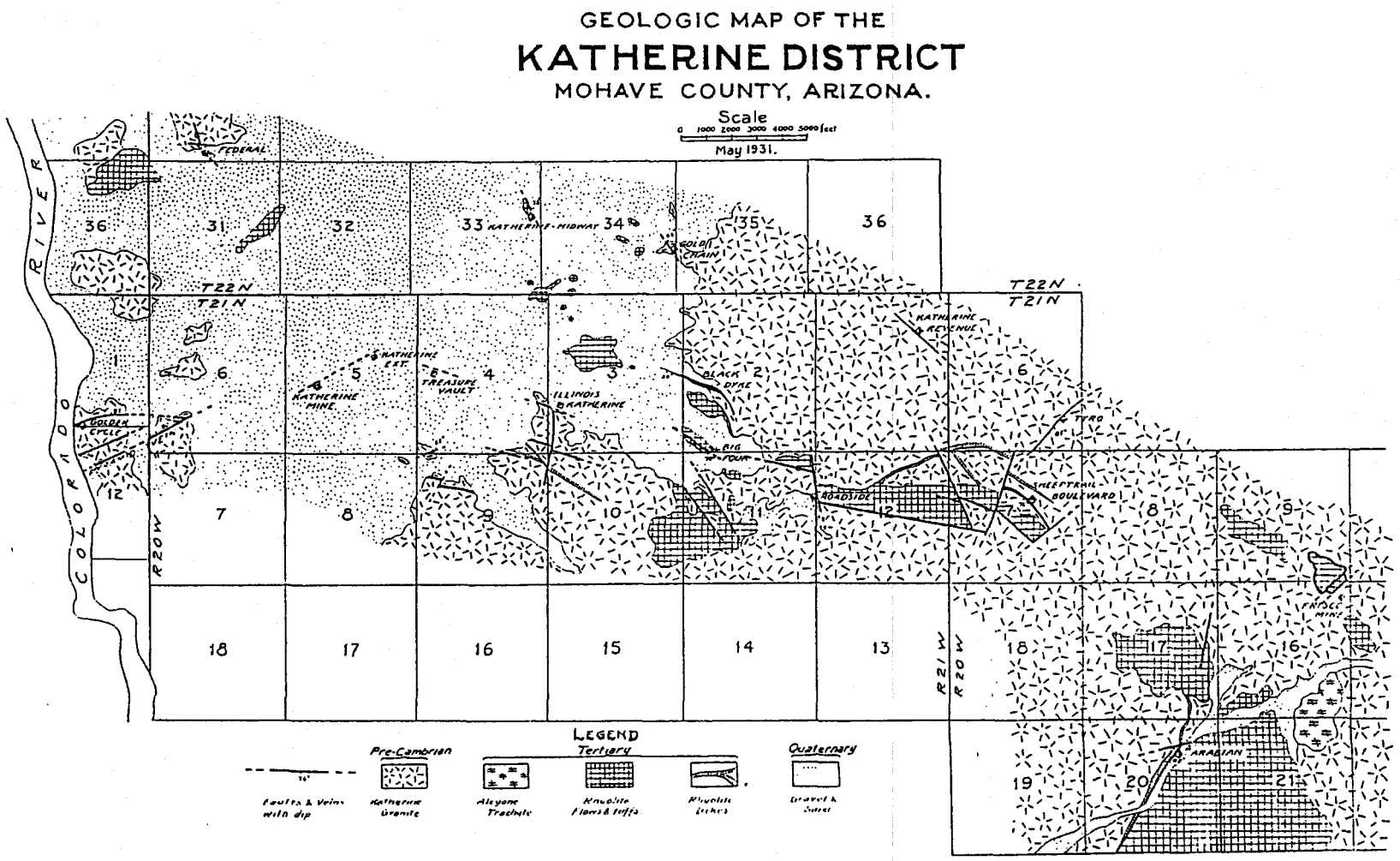


Figure 4. Geologic map of the Katherine District.
(from Lausen, 1931)

(Metzger and Loeltz, 1973) contain unequivocal lacustrine/playa deposits. Although long considered to be of possible marine origin, the Bouse Formation has been shown to be lacustrine on the basis of strontium and carbon isotopes (Spencer and others, 1996, Spencer and Patchett, 1997). Isotope compositions of marls and fossils in the Bouse are identical to Colorado River water and are far removed from the composition of Pliocene seawater.

Integration of drainages into what is now the Colorado River commenced in the study area sometime during or after the deposition of the Muddy Creek and Bouse Formations. The first arrival of Colorado River water into the basins along the present river is recorded by the Bouse Formation (Spencer and Patchett, 1997). A series of prograding deltaic deposits overlie the lacustrine beds (Buising, 1988), marking downcutting through the bedrock highs separating the basins and development of an uninterrupted through-flowing river.

Cycles of downcutting and sedimentation have produced seven geomorphic surfaces between the Black Mountains and the Colorado River (Herriman and Henricks, 1984). Soils developed on the surfaces have been mapped by the Kingman offices of the Bureau of Land Management and Natural Resources Conservation District. (soil maps are available from those offices, and are on file with AZGS) The following summary of these surfaces and their associated soils is from Herriman and Henricks (1984):

Earp (Horseshoe) surface - Lower of the two floodplains, and active slopes of washes; partial abandonment as flood plain less than 500 years ago; subject to flooding. Soils: Carriso, Glenbar, Rositas.

Cimmaron Lake (Ingram) surface - Higher of the two floodplans; age 550-3,290 years B.P. Soils: Antho, Torriorthents, Indio.

Arch Creek (Winkle) surface - Oldest surface directly related to present drainages; early Holocene; Age 3,290-12,240 years B.P. Soils: superstition, Indio variant, Havasu series.

Fort Mohave (Senecal) surface - Low fan terraces and stream terraces; Late Pleistocene; desert varnish. Soils: Gunsight, Superstition, Denure.

McHeffy (Dolph) surface - Displaced from Bullhead surface by fault; narrower interfluves, more eroded vs. Bullhead; Middle Pleistocene. Soils: Chuckwalla.

Bullhead (Dolph) surface - Extensive in region; remnants of alluvial fans; deeply dissected; well-developed desert pavement. Soils: Chuckwalla.

Boundary Cane (Eola) surface - Oldest erosional remnants in region; fan terraces; little or no desert pavement. Soils: Cipriano.

Mountains slopes are actively eroding and no particular age is assignable to them. Soils developed on mountains slopes are Akela, Cellar, Quilotosa, and Laposa.

MINES AND MINERALIZATION

In the early days of mining in the Black Mountains, different authors organized the mines in the study area into various combinations of mining districts including the San Francisco, Katherine, Oatman, Union Pass, Gold Road, Vivian, and Boundary Cone districts. Keith and others (1983) divided ore deposits into two metallic mineral districts, Union Pass at the north edge of the study area, and Oatman, at the south end of the Black Mountains . A summary of mines in the study area is presented in Appendix A.

STREAM SEDIMENTS

An evaluation of uranium in stream sediments was performed for the US Department of Energy (Qualheim, 1978) as part of the National Uranium Resource Evaluation (NURE) Program. The results of that survey are tabulated in Table 2. Uranium in the stream sediment samples for the entire Kingman 1x 2 degree quadrangle averaged 2.16 ppm, and thorium averaged 13.63 ppm. Stream sediments within the present study area averaged 2.63 ppm U and 18.36 ppm Th. As with the survey of mines, no anomalous levels of uranium or thorium were found in the sediments derived from the Black Mountains.

Stream sediment samples were analyzed as part of surveys of several Bureau of Land Management Wilderness Study Areas (WSAs). Stream sediments were analyzed in a study of the Mount Nutt WSA (Gray and others, 1990a). That study found anomalies for mercury (0.1-0.6 ppm), gold (0.05-0.1 ppm), arsenic (10-18 ppm), lead (up to 200 ppm), zinc (up to 250 ppm), and barium (2000-3000 ppm) in the northwest part of the WSA (Union Pass area). Another anomaly of mercury (8-16 ppm) and molybdenum (up to 15 ppm) was delineated in the southeastern part of the WSA (east and outside of this study). Locations of the samples and anomalies were not given in the report.

A thorough sampling of mines, prospects, and stream sediments was performed for the adjacent Warm Springs WSA, in the southern Black Mountains (Bullock and others, 1990). However, none of these samples are within the present study area.

HYDROLOGY

Surface water

Surface water is scarce in western Arizona, owing to the arid climate. Average annual rainfall is about 5 inches. Streams are ephemeral everywhere in the study area, with the exception of the Colorado River. Runoff in the ephemeral streams occurs only during heaviest rains and lasts usually not more than several hours.

Hydrologic conditions in the lower Colorado River region have bee extensively studies by the US Geological Survey. General aspects of water resources in the region are discussed in Hely (1969) and McDonald and Loeltz (1976). Data on precipitation and runoff for the lower Colorado River region are presented in Hely and Peck (1964).

Colorado River water is of good quality for municipal and agricultural use. Weighted-average annual concentrations of TDS below Hoover Dam ranged from 599 to 837 mg/l for the 1935 to 1965 (Irelan, 1971). Variations in flow rates have decreased since construction of Glen Canyon and Hoover Dams upstream from the study area. TDS is also less variable, but has increased slightly due to evaporation from the lakes. Colorado River water is generally of a calcium-sulfate type, with sodium-chloride found in lesser, but important concentrations.

Groundwater

Water from wells along the Colorado River was analyzed by the US Geological Survey (Metzger and Loeltz, 1973) and data from that study is summarized in Table 3. Groundwater samples generally came from wells perforated at shallow depths. These wells receive most or all of their water through infiltration of river water through a shallow alluvial aquifer, and many of the wells have water chemistry identical to that of Colorado River water (Metzger and others, 1973). The Colorado River undergoes a net loss of water from infiltration and evapotranspiration (McDonald and Loeltz, 1976). Contributions to the river by way of subflow from the surrounding valleys is insignificant.

Upon infiltration into the shallow groundwater aquifer, river water is modified by several processes, including bacterial sulfate reduction, concentration by evapotranspiration, and precipitation of calcium and magnesium carbonates (Metzger and Loeltz, 1973). In the deeper wells, TDS is higher and may be influenced by more saline water in contact with the Bouse Formation.

A USGS investigation of groundwater quality in the Colorado River drainage area (Kister, 1973) included wells in the study area. Fluoride levels were 5.0 to 10.0 mg/l in a well near Davis Dam. Six other wells in the study area had fluoride less than 1.0 mg/l. Fluoride levels in the USGS investigation were correlated to the amount of silicic volcanic rocks or Precambrian schist, both of which are common in the region. Most of the groundwater had TDS of less than 1000 mg/l, but an area around Bullhead City and Mohave City had TDS of 1000 to 3000 mg/l. High TDS correlates with the presence of lacustrine deposits, such as the Bouse Formation. Wells farther from the river may tap deeper aquifers and have more variable chemistry and higher TDS than wells closer to the river.

Water quality information for a limited number of wells in the study area for the period 1988-1995 is available from the Arizona Department of Environmental Quality. This information includes well location by township, range, and section, water use, and chemical analyses.

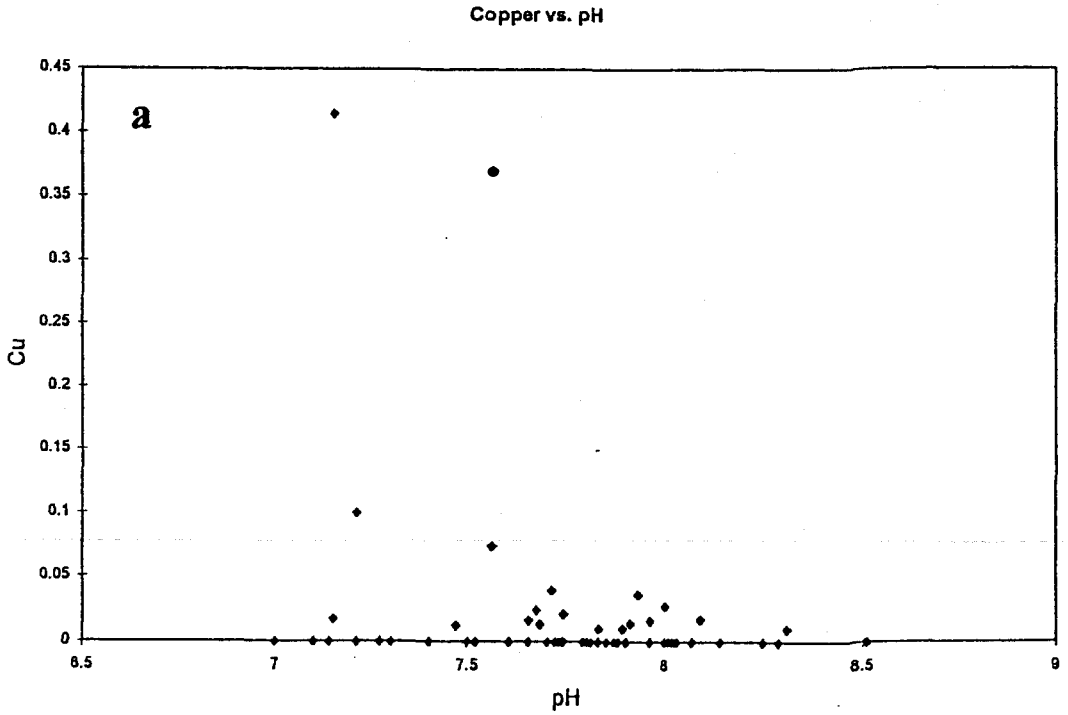
Water quality analyses for these wells are tabulated in Table 4(values in mg/l). Water quality is highly variable, with TDS ranging from 320 to 3800 mg/l. Major cations and anions are similarly variable. Because some labs have different styles of reporting results for different

Table 3. Groundwater quality in the Bullhead city area

Well	Lat	Lon	Date	T.D.	Water Level (ft)	Silica	Ca	Mg	Na + K	% Na	HCO3	SO4	Cl	F	TDS	Ca-Mg hard	Noncarb hard	conduct	pH
(B-19-22)11bab	35.055	-114.5916	5/2/62	21	17.5	22	70	25	265	68	256	362	190	0	1060	278	68	1770	7.3
(B-19-22)11bbd	35.0523	-114.5942	4/13/67		19.4	24	105	34	159	46	224	338	148	1.2	921	400	216	1530	7.6
(B-19-22)14cca	35.0295	-114.5925	4/13/67	230	120	19	82	31	348	70	220	375	365	1.1	1330	332	152	2240	7.5
(B-19-22)15abb	35.0403	-114.6057	6/3/64	130	70	15	76	22	134	51	200	275	87	0.4	709	282	118	1120	7.2
(B-19-22)15acb	35.0367	-114.6058	9/18/62	120	60	18	79	24	121	47	182	283	82	0.2	698	296	147	1080	6.8
(B-19-22)15dad	35.0283	-114.5975	4/13/67		97	18	68	20	152	57	224	183	145	0.5	699	250	66	1230	7.5
(B-19-22)23ccc	35.0133	-114.5967	9/19/62	150	92	24	116	36	121	38	236	267	161	0.4	843	437	224	1350	7.1
(B-19-22)26aab	35.0113	-114.5838	4/11/67	228		21	87	27	279	65	228	250	342	1.1	1220	326	139	2050	7.7
(B-20-22)1aca	35.15	-114.5658	4/23/68	120	27	18	174	56	200	40	272	540	222	0.7	1350	665	442	2090	7.7
(B-20-22)1add	35.1467	-114.5625	6/3/64	249	153	24	180	50	145	32	154	400	302	0.5	1180	655	528	1880	7.2
(B-20-22)19ada	35.1038	-114.6142	9/18/62	150		28	92	29	142	47	180	267	163	0.3	811	348	200	1270	7.0
(B-20-22)25bab	35.095	-114.5733	4/24/68	318	288	37	27	0.6	211	87	188	100	174	9.5	653	70	0	1110	8.1
(B-20-22)26cdb	35.0875	-114.5925	4/24/68	150		38	73	3.4	212	70	152	120	282	4.0	808	196	72	1430	7.4
(B-20-22)26dcd	35.0845	-114.585	4/24/68	220		8	14	2.2	141	88	130	120	82	1.7	434	44	0	746	8.2
(B-20-22)29acc	35.0867	-114.6033	9/18/62	80		24	52	14	73	46	162	95	81	0.4	420	188	55	724	7.2
(B-20-22)35cdd	35.07	-114.5892	5/7/68			44	65	10	805	90	128	140	1200	4.5	2330	204	99	4430	7.7
(B-21-21)21cbb	35.1895	-114.5338	3/7/62	490		11	11	1.2	156	92	124	65	57	4.8	518	28	0	763	8.1

Data from Metzger and Loeltz, 1973

Figure 5. Water quality relations in the Black Mountains-Bullhead City area



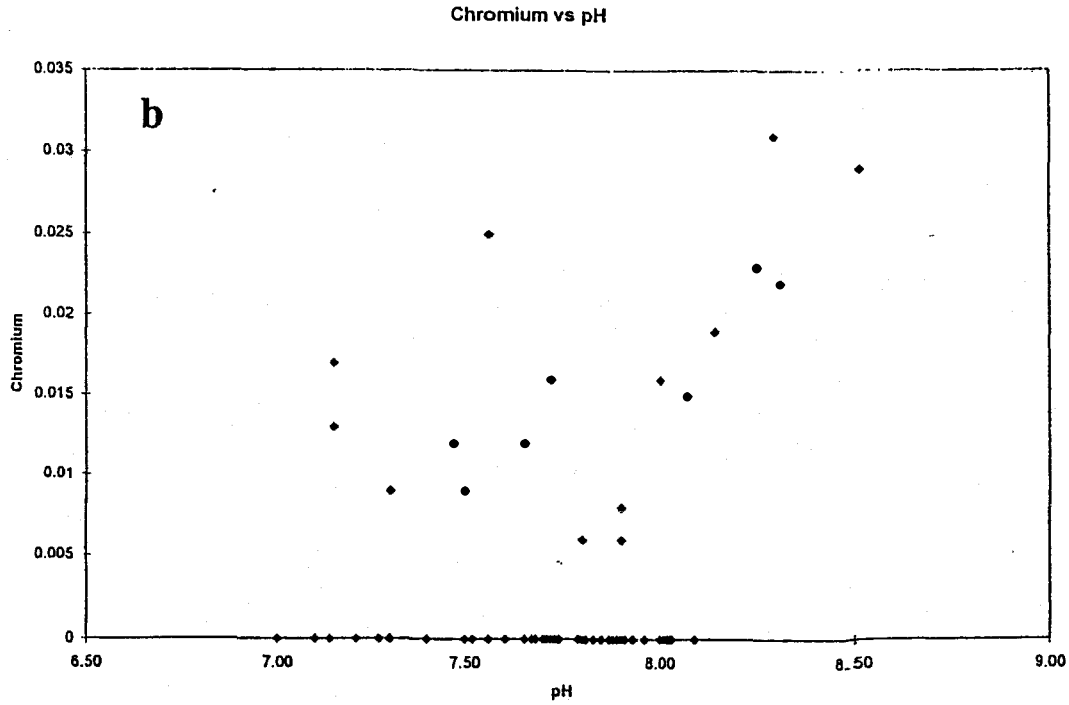
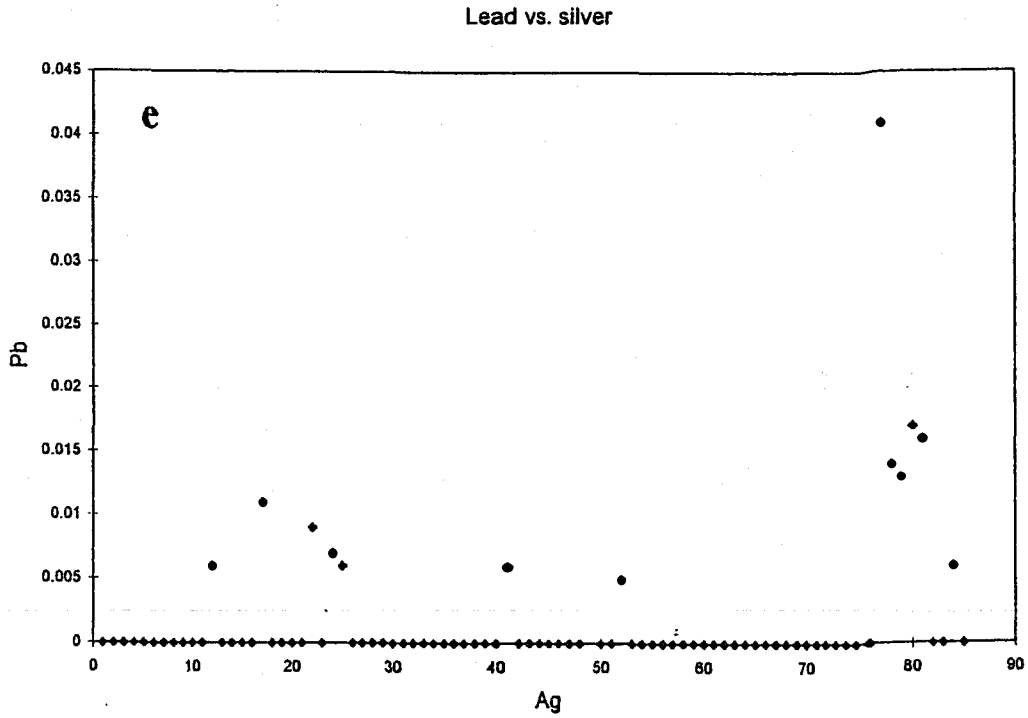


Figure 5, continued.



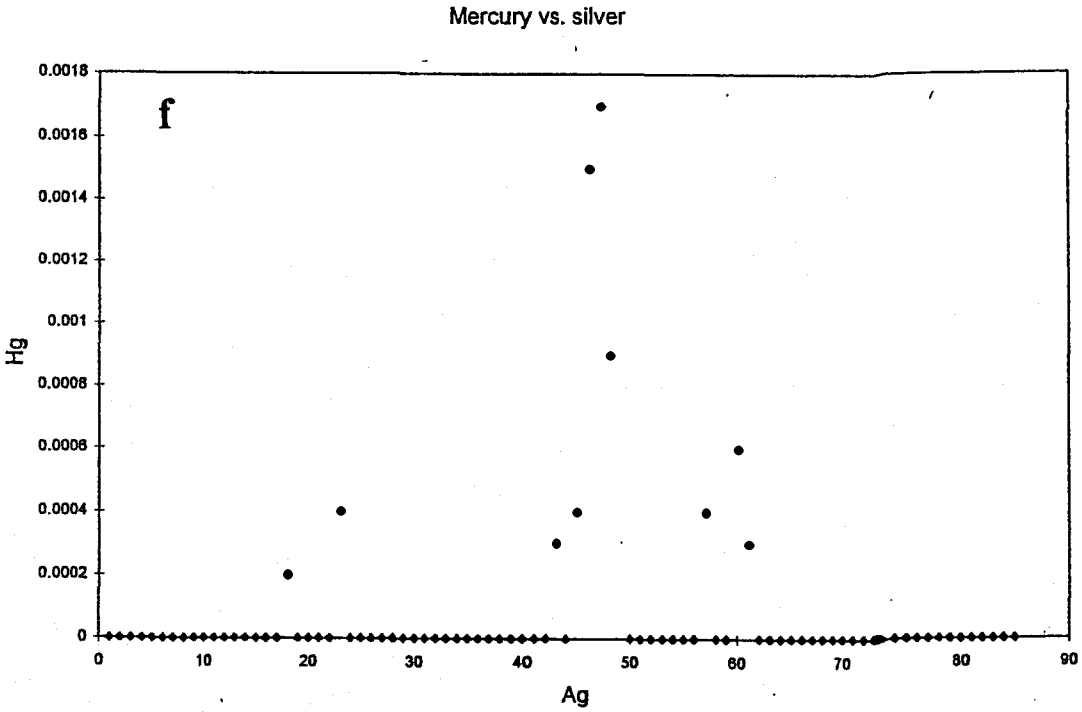
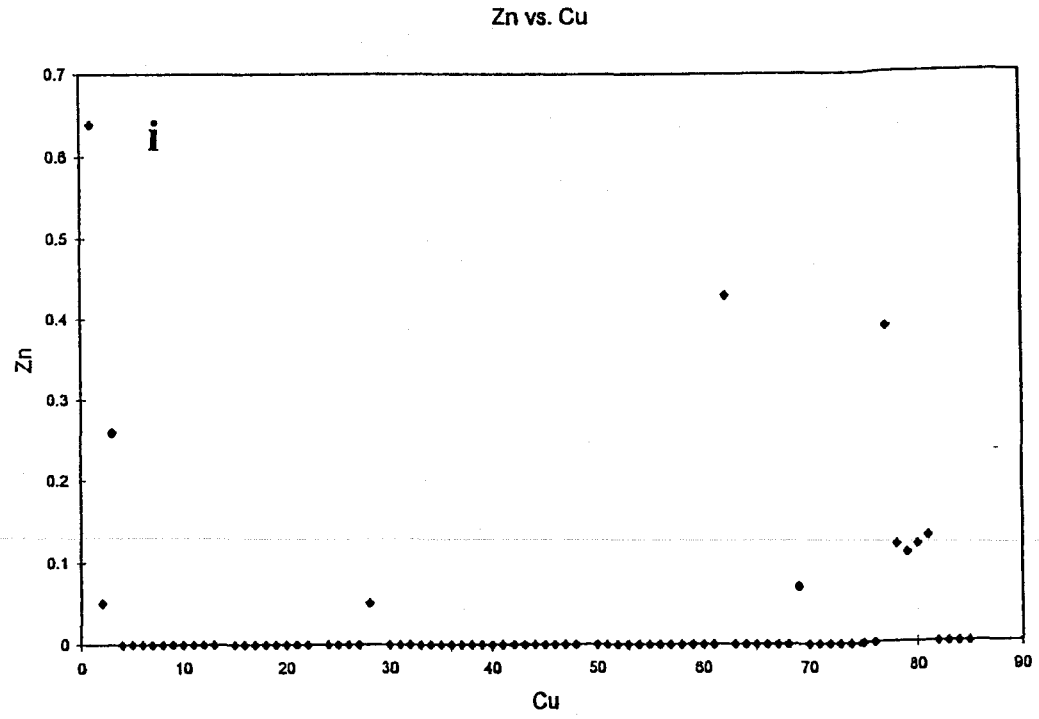
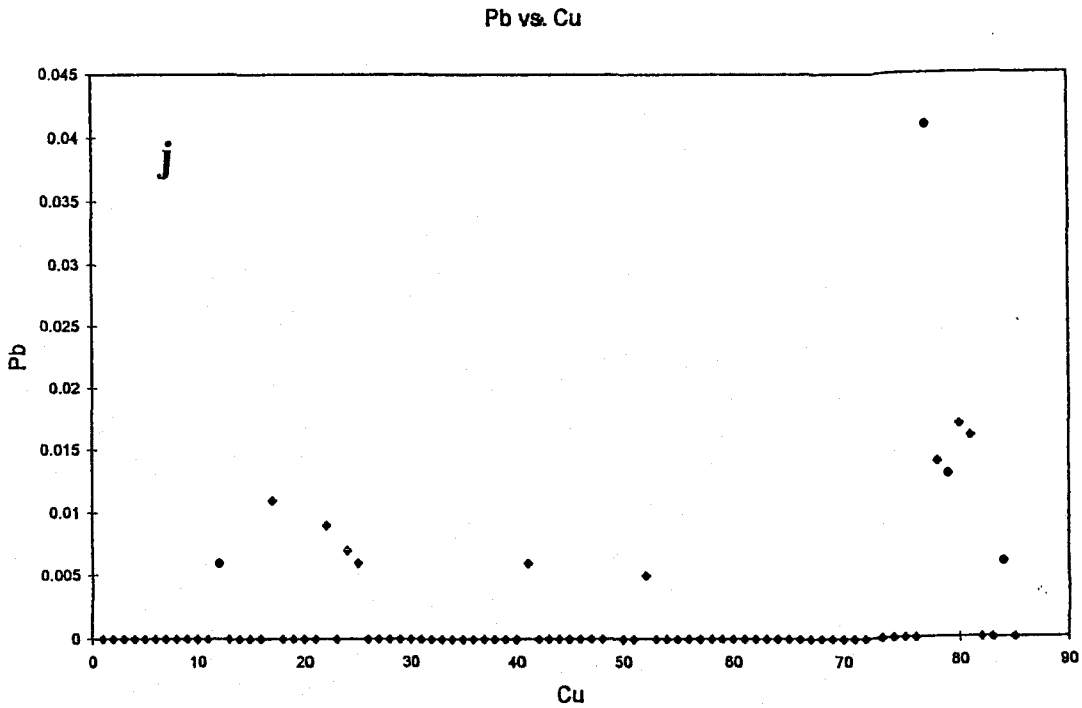


Figure 5, continued





One area of concern with gold mining is the use of cyanide for leaching. This process was fist described as early as 1793 and has been in widespread commercial use since the 1890s, so its application to extracting gold is extensive and well developed (Hiskey, 1985). Although cyanide is very unstable and so is easily destroyed (Rabb, 1978), it poses a potential threat to water if the cyanide is accidentally released before it can be neutralized.

Several steps are taken in modern gold processes plants to avoid such accidental releases. Tanks and circuits containing cyanide solutions are contained within berms or secondary tanks to prevent escape of the solutions outside the plant area. Ponds containing cyanide solutions are lined to prevent infiltration of that water into the ground. Tailings dams and ponds are designed and built to standards in accordance with operating permits and are monitored to assure their integrity.

Current gold mining operations in the Black Mountains address these concerns with preventative measures. For example, at the Gold Road Mine, cyanide-bearing tailings from the gold processing plant are neutralized with copper sulfate and hydrogen peroxide before disposal in tailings ponds (Silver, 1997). Ironically, copper and sulfate released from these kinds of modern operations comes not from mining itself, but from required environmental protection procedures.

Developed land

Bullhead City is the major population center within the project area and is sister to Laughlin, Nevada, directly across the Colorado River. The population of the Bullhead City-Laughlin vicinity is more than 144,000 people. Tourism is by far the major industry of the area, with gambling and river recreation attracting more than 6 million visitors annually.

Residential growth is certain to be one of the most important changes in land use in the Black Mountains -Bullhead City area. Census figures show a steady increase in the population of Arizona. The Mohave County 1996 population of 127,700 is more than double its 1980 population of 55,865. Bullhead City has nearly tripled in 16 years, growing from 10,719 people in 1980 to 27,370 in 1996 (figures from Arizona Department of Commerce).

Areas where high-density residential development is likely to take place first are around the outskirts of existing towns, where infrastructure is already in place. Lower density development is likely to continue in the surrounding areas. Residential development is limited to private land, or State land, which can be sold by the state for development. Areas prone to development can be predicted by looking at land status maps that show private land, and State land adjacent to developed areas (private land makes up about 55, 309 acres of the study area).

As the population along the Colorado River increases, the river is likely to be affected in a number of ways. More people means more municipal wastewater, which is high in TDS, especially nitrates, and sometimes contains heavy metals and other undesirable constituents. Personal use of pesticides, herbicides, and fertilizers in yards, and cleaning products and other toxic chemicals in the home presents the same kinds of potential impact to water quality as those produced and used by industry and agriculture. In residential backyards, fertilizer and pesticides are often applied at a much higher dosage than used by farmers. Chemical use may also high at golf courses and parks.

The acreage of houses, driveways, roads and parking lots will increase with population, leading to increased runoff. Storm runoff from roads and parking lots may carry with it oil, gas, diesel, brake fluid, and radiator fluid dripped from cars and trucks. Production of garbage, which ends up in landfills, will also increase with population.

Grazing

Intermittent cattle grazing occurs on some of the study area. Grazing by livestock can impact water quality, primarily by increasing soil erosion and sedimentation. The importance of rangeland as a source of nonpoint pollution increases as more vegetative cover is removed. Hoof impacts can knock down stream banks and churn soil, increasing erosion and sedimentation. Manure

REFERENCES

Almquist, C.L., 1988, Mineral investigation of a part of the Mount Nutt Wilderness study Area, (AZ-202-024), Mohave County, Arizona: US Bureau of Mines Mineral Land Assessment open File Report MLA 35-88, 20 p.

Anderson, J.L., 1989, Proterozoic anorogenic granites of the southwestern United States, in Jenney, J.P., and Reynolds, S.J., Geologic evolution of Arizona: Arizona Geological Society Digest 17, p. 211-238.

Anderson, L.W., and O'Connell, D.R., 1993, Seismotectonic study of the northern portion of the lower Colorado River, Arizona, California and Nevada: US Bureau of Reclamation Seismotectonic Report 93-4.

BLM, 1993, Kingman Resource Area, Proposed Resource management Plan and final Environmental Impact Statement: Bureau of Land Management Report, 606 p.

Buchanan, L.J., 1981, Precious metal deposits associated with volcanic environments in the southwest, *in* Dickinson, W.R., and Payne, W.D., Relation of tectonics to ore deposits in the southern Cordillera: Arizona Geological Society Digest 14, p. 237-262.

Bullock, J.H., Jr., Welsch, E., Hageman., P., Tippitt, F.W., and Turner, R.L., 1990, Analytical results and sample locality map of stream-sediment, heavy mineral concentrate, and rock samples from the Warm Springs Wilderness Study Area (AZ-020-028/029), Mohave County, Arizona: US Geological Survey Open-File Report 90-296, 39 p.

Buising, A.V., 1988, Depositional and tectonic evolution of the northern proto-Gulf of California and Lower Colorado River , as documented in the Mio-Pliocene Bouse Formation and bracketing units, southeastern California and western Arizona: University of California, Santa Barbara unpublished Ph.D. Dissertation, 196 p.

Clifton, C.G., Buchanan, L.J., and Durning, W.P., 1980, Exploration procedure and controls of mineralization in the Oatman Mining District, Oatman, Arizona: AIME Preprint 80-143.

DeWitt, E., 1987, Proterozoic ore deposits of the southwestern U.S.: Society of Economic Geologists Guidebook Series, Oct. 22-24, 1987 Field Conference, 189 p.

DeWitt, E., Thorson, J.P., and Smith, R.C., 1991, Geology and gold deposits of the Oatman District, northwestern Arizona: US Geological Survey Bulletin 1857-I, p. 1-28.

Durning, W.P., and Buchanan, L.J., 1984, The geology and ore deposits of Oatman, Arizona: Arizona Geological Society Digest 15, p. 141-158.

Elsing, M.J., and Heineman, R.E.S., 1936, Arizona metal production: Arizona Bureau of Mines Bulletin 140, 112 p.

Files, F.G., 1978, Uranium in volcanic environments in the Great Basin: US Department of Energy Report GJBX-98 (78), 20 p.

Frisch-Gleason, R., 1995, Controlling and remediating surface and groundwater pollution from inactive and abandoned mines: A survey of management practices: Arizona Geological Survey Open-File Report 95-13, 79 p.

Gardner, E.D., 1936, Gold mining and milling in the Black Mountains, western Mohave County, Arizona: US Bureau of Mines Information Circular IC-6901, 59 p.

Gray, F., Jachens, R.C., Miller, R.J., Turner, R.C., Livo, E.K., Knepper, D.H., Jr., Mariano, J., and Almquist, C.L., 1990a, Mineral resources of the Mount Nutt Wilderness Study Area, Mohave County, Arizona: US Geological Survey Bulletin 1737-D, 22 p.

Gray, F., Jachens, R.C., Miller, R.J., Turner, R.C., Knepper, D.H., Jr., Pitkin, J.A., Keith, W.J., Mariano, J., Jones, S.L., and Korzeb, S.L., 1990b, Mineral resources of the Warm Springs Wilderness Study Area, Mohave County, Arizona: US Geological Survey Bulletin 1737-F, 24 p.

Menges, C.M., and Pearthree, P.A., 1989, Late Cenozoic tectonism in Arizona and its impact on regional landscape evolution, *in* Jenney, J.P., and Reynolds, S.J., Geologic evolution of Arizona : Arizona Geological Society Digest 17, p. 649-680.

Metzger, D.G., and Loeltz, O.J., 1973, Geohydrology of the Needles area, Arizona, California, and Nevada: US Geological Survey Professional Paper 486-J, 54 p.

Metzger, D.G., Loeltz, O.J., and Irelan, B., 1973, Geohydrology of the Parker-Blythe-Cibola area, Arizona and California: US Geological Survey Professional Paper 486-G, 130 p.

Molitor, D., 1997, Suspended Sediment Monitoring Project, San Simon watershed, southeast Arizona: U.S. Bureau of Land Management [Safford Office] Report, 69 p., 1 sheet, scale 1:155,000.

Moore, R.W., 1928, Mining methods and records at the United Eastern Mine: Transactions of the American Institute of Mining and Metallurgical Engineers, v. 76, p. 56-92.

Qualheim, B.J., 1978, Hydrogeochemical and stream sediment reconnaissance basic data report for Kingman NTMS quadrangle, Arizona, California, and Nevada: University of California Lawrence Livermore Laboratory Report UCRL-52549 [also released as US Department of Energy Report GJBX-122(78), 85 p.

Rabb, D.D., 1978, Safety Corner: Warning-Beware of cyanide: Arizona Bureau of Geology and Mineral Technology Fieldnotes, v. 8, no. 4, p 8.

Ransome, F.L., 1923, Geology of the Oatman Gold District, Arizona: US Geological Survey Bulletin 743, 58 p.

Reynolds, S.J., 1986, Geologic map of Arizona: Arizona Bureau of Geology and Mineral Technology [AZGS] Map 26, scale 1:1,000,000.

Rösner, Ulrike, 1998a, Heavy metals in surface soils and streambed sediments in the Wallapai Mining District, northwestern Arizona, a historic mining district in a semiarid region: Arizona Geological Survey Contributed Report Colorado River-98-A, 43 p.

Rösner, Ulrike, 1998b, Historical mining and its impact on the vegetation, an example from the Cerbat Mountains, Mohave County, Arizona: Journal of the Arizona-Nevada Academy of Sciences, v. 31, no. 1, p. 37-55.

Scarborough, R.B., and Coney, M.L., 1982, Index of published geologic maps of Arizona, 1903 to 1982: Arizona Bureau of Geology and Mineral Technology Map 17, 6 sheets, scale 1:1,000,000.

Schrader, F.C., 1909, Mineral deposits of the Cerbat Range, Black Mountains, and Grand Wash Cliffs, Mohave County, Arizona: US Geological Survey Bulletin 397, 226 p.

Sillitoe, R.H., 1993, Giant and bonanza gold deposits in the epithermal environment: Assessment of potential genetic factors, *in* Whiting, B.H., Hodgson, C.J., and Mason, R., editors, Giant ore deposits: Society of Economic Geologists Special Publication 2, p. 125-156.

Silver, D.B., 1997, Gold Road Mine: Anatomy of a turnaround: Mining Engineering, v. 49, no. 8, p. 28-32

Smith, R.C., 1984, Mineralogy and fluid inclusion studies of epithermal gold-quartz veins in the Oatman District, northwestern Arizona: University of Arizona unpublished M.S. thesis, 233 p.

Spencer, J.E., and Reynolds, S.J., 1989, Middle Tertiary tectonics of Arizona and adjacent areas, *in* Jeney, J.P., and Reynolds, S.J., Geologic evolution of Arizona : Arizona Geological Society Digest 17, p. 539-574.

Spencer, J.E., and Welty, J.W., 1989, Mid-Tertiary ore deposits in Arizona: Arizona Geological Society Digest 17, p. 585-607.

Spencer, J.E., Harris, R.C., Dettmen, D., and Patchett, P.J., 1996, Reconnaissance survey of upper Neogene strata in the Bouse Formation, Hualapai Limestone, and lower Gila Trough, Western Arizona and directly adjacent southeastern California: Arizona Geological Survey Open-File Report 96-17, 23 p.

APPENDIX A

DESCRIPTION OF MINES IN THE BLACK MOUNTAINS-BULLHEAD CITY AREA

Mines in the Black Mountains Study area

Oatman District

Arizona Gold Star Prospect (La Paz)
Location: T19N, R20W, sec 8 Lat. 35.0475N Lon. 114.4292W
Quadrangle: Oatman
Geology: Vein along contact of Tertiary andesite and quartz monzonite dike
Mineralization: Hematite, MnOx
Years of Production: unknown
Mineral production: unknown
References: AZGS files

Aztec Mine (part of Tom Reed Mine)
Location: T19N, R20W, sec 23, NE/SE Lat. 35.018N Lon. 114.3717W
Quadrangle: Mount Nutt
Geology: Quartz veins in fault system in Tertiary volcanic rocks (Tom Reed vein)
Mineralization: Quartz veins with Au, Ag, Pb, Mo. Aztec mine connects with Big Jim, Bald Eagle, and Grey Eagle workings.
Years of Production:
Mineral production: (production included in Tom Reed Mine figures)
References: Gardner, 1936; Lausen, 1931; Durning and Buchanan, 1984.

Bald Eagle Mine (part of Tom Reed Mine)
Location: T19N, R20W, sec 23 Lat. 35.018N Lon. 114.3731W
Quadrangle: Mount Nutt
Geology: Quartz veins in fault system in Tertiary volcanic rocks
Mineralization: Quartz-adularia veins with gold
Years of Production:
Mineral production: (production included in Tom Reed Mine figures)
References: AZGS mine files

Big Jim Mine
Location: T19N, R20W, sec 23 SE/SW Lat. 35.0197N Lon. 114.3722W
Quadrangle: Mount Nutt
Geology: Veins in fault zone in Tertiary volcanic rocks
Mineralization: quartz veins with calcite, gypsum, wulfenite, chalcopyrite, gold
Years of Production: 1915- 1942
Mineral production: 277,000 tons ore, 12,500 oz Au 1917-1942; (220,000 tons ore 1921-1924)
References: Johnson, 1935; Gardner, 1936; Lausen, 1931; Buchanan, 1981; Durning and Buchanan, 1984; AZGS mine files

German-American Mine - see Pioneer

Gold Dust Mine (Victor-Virgin)
Location: T19N, R20W, sec 22, SE Lat. 35.014N Lon. 114.3927W
Quadrangle: Oatman

Geology: Veins in Tertiary granite porphyry
Mineralization: Veins of quartz, calcite, fluorite
Years of production: 1870-1906 (?)
Mineral production: est. $100,000 gold
References: Schrader, 1909; Wilson and others, 1934; Elsing and Heineman, 1936

Homestake Prospect
Location: T19N, R20W, sec 5 Lat. 35.0667 Lon. 114.4353
Quadrangle: Oatman
Geology: Quartz veins in granite porphyry
Mineralization: quartz veins with gold
Years of production: none
References: Schrader, 1909

Jackpot Prospect
Location: T19N, R20W, sec 5 Lat. 35.0647N Lon. 114.4267W
Quadrangle: Oatman
Geology: Quartz vein in Tertiary granite porphyry (part of Hardy Vein)
Mineralization: quartz with gold
Years of production: unknown
Mineral production: unknown
References: Schrader, 1909

Leland Mine (Mitchell vein)
Location: T19N, R20W, sec 20 Lat. 35.023 Lon. 114.4255
Quadrangle: Oatman
Geology: Veins in Tertiary andesite and quartz monzonite porphyry
Mineralization: Quartz-adularia-calcite veins with MnO and gold
Years of production: 1902 - ?
Mineral production: est. 45,000 tons ore at $15 per ton gold
References: Schrader, 1909; Lausen, 1931

Lexington Mine
Location: T19N, R20W, sec 26, NW Lat. 35.008N Lon. 114.3833W
Quadrangle: Oatman
Geology: Vein and fault system in Tertiary andesite, trachyte
Mineralization: Quartz-calcite veins with gold
Years of production: unknown
Mineral production: unknown
References: AZGS mine files

Meals Camp
Location: T20M, R21 W, sec 13 Lat. 35.1131N Lon. 114.4569W
Quadrangle: Oatman
Geology: Veins in Tertiary andesite, quartz syenite porphyry, and Precambrian granite
Mineralization: Quartz veins with gold
Years of production: unknown
Mineral production: unknown
References: Schrader, 1909

Geology: Vein system in Tertiary andesite and trachyte
Mineralization: Quartz veins (extension of Gold Dust Vein)
Years of production: unknown (before 1941)
Mineral production: unknown
References: AZGS files (Location info conflicting)

Oatman United Mine
Location: T19N, R20W, sec 14/23 est. Lat. 35.026N est. Lon. 114.372
Quadrangle: Oatman
Geology: Veins associated wit rhyolite dike in Tertiary andesite
Mineralization: Quartz-calcite veins with gold
Years of production: 1922-1926
Mineral production: unknown (small)
References: AZGS files

Pasadena Prospect
Location: T19N, R20W, sec 10 Lat. 35.0486N Lon. 114.4019W
Quadrangle: Oatman
Geology: Tertiary rhyolite dikes in andesite
Mineralization: Quartz with gold
Mineral production: none
References: Schrader, 1909

Pioneer Mine (German-American)
Location: T19N, R20W, sec 21, E/2 Lat. 35.0186N Lon. 114.4067W
Quadrangle: Oatman
Geology: Vein system in Tertiary andesite
Mineralization: Quartz-calcite-adularia veins with gold
Years of production: 1896 - 1942
Mineral production: 34,000 tons ore 1896- 1942; gold 10,346 oz 1934-1942
References: Gardner, 1936; Schrader, 1909; Lausen, 1931; AZGS mine files

Roosevelt Prospect
Location: T19N, R20W, sec 16 Lat. 35.0314N Lon. 114.42W
Quadrangle: Oatman
Geology: Veins in Tertiary andesite
Mineralization: Quartz-calcite veins with pyrite, gold
Years of production: unknown
Mineral production: unknown
References: Schrader, 1909

Rattan Mine (Ruth)
Location: T20N, R20W, sec 30, NE Lat. 35.0972N
Quadrangle: Oatman
Geology: Veins in Tertiary granite porphyry
Mineralization: Quartz-calcite-fluorite veins with pyrite, gold
Years of production: 1902-1942
Mineral production: est. 27,000 tons ore 1907-1934
References: Schrader, 1909; Lausen ,1931;Gardner, 1936; AZGS files

United American Mine (American)
Location: T19N, R20W, sec 24, SW/SW Lat. 35.0133N Lon. 114.365W
Quadrangle: Mount Nutt
Geology: Veins in Tertiary andesite and latite
Mineralization: Quartz with minor pyrite, gold (connects with Tom Reed/Black Eagle vein)
Years of production: unknown
Mineral production: unknown
References: Lausen, 1931; Ransome, 1923; Durning and Buchanan, 1984.

United Eastern Mine
Location: T19N, R20W, sec 14, SW Lat. 35.0294N Lon. 144.3839W
Quadrangle: Oatman
Geology: Veins in fissure system in Tertiary andesite, latite
Mineralization: Quartz-calcite veins with gold
Years of production: 1917-1925
Mineral production: 511,976 tons ore @ $19.87 per ton; $13,665,000 gold (1917-1924)
References: Moore, 1928; Lausen, 1931; Gardner, 1936; Elsing and Heineman, 1936; Durning and Buchanan, 1984.

United Western Mine
Location: T19N, R20W, sec 15, W2/NE Lat. 35.0363N Lon. 144.3931W
Quadrangle: Oatman
Geology: Vein and fracture system in Tertiary andesite
Mineralization: Calcite-quartz veins
Years of production: 1927-1935
Mineral production: 12, 000 tons ore 1927-1935
References: Gardner, 1936; Durning and Buchanan, 1984.

Vivian Mine
Location: T19N, R20W, sec 20, SE/NE/SE Lat. 35.015N Lon. 114.4214W
Quadrangle: Oatman
Geology: Veins in fracture system in Tertiary andesite
Mineralization: calcite-quartz veins with gold
Years of production: unknown
Mineral production: unknown
References: Schrader, 1909

West Gold Road
Location: T19N, R20W, sec 11 Lat. 35.0456N Lon. 114.3786W
Quadrangle: Oatman
Geology: Vein system assoc. with dike in Tertiary andesite
Mineralization: Quartz vein with gold; extension of Gold Road Vein
Years of production: unknown
Mineral production: unknown - probably included in Gold Road data
References: Schrader, 1909

Frisco Mine
Location: T21N, R20W, sec 16, NE/NE Lat. 35.210N, Lon. 114.4153W
Quadrangle: Union Pass
Geology: Quartz stringers at contact of Tertiary rhyolite flow and tuff with Precambrian granite/gneiss.
Mineralization: Gold-bearing quartz stringers
Years of Production: 1900 to >1935
Mineral production: 44,000 tons of ore 1894-1916 ($14 Au per ton); total of $400,000 gold 1893-1933
References: Gardner, 1936; Lausen, 1931

Golden Cycle Mine
Location: 2000 feet NW of Pyramid Mine
Quadrangle: Davis Dam
Geology: Quartz stringers occupying shear zone in coarse-grained granite
Mineralization: Gold-bearing quartz
Years of Production: unknown
Mineral production: unknown amount of ore, grade $1-$14 per ton gold
References: Lausen, 1931

Katherine Mine
Location: T21N, R21W, sec 5, SW Lat. 35.2336N; Lon. 144.5469W
Quadrangle: Davis Dam
Geology: Tertiary trachyte and rhyolite flows and dikes against Precambrian gneiss/granite
Mineralization: Gold in quartz veins with calcite, adularia, and fluorite. Ore minerals include silver, hematite, chalcocite. Up to 0.03% BeO in mill tailings
Years of Production: 1900-1940
Mineral production: $1,700,000 gold, $100,000 silver (1900-1933)
References: Wilson and others, 1934; Warner and others, 1959 (p. 102); Tenney, 1930; Buchanan, 1981.

New Chance Prospect
Location: T21N, R20W, sec 35 Lat. 35.1572N; Lon. 114.3861W
Quadrangle: Union Pass
Geology: Quartz vein in Tertiary rhyolite and andesite in contact with Precambrian granite.
Mineralization: Quartz vein with gold, silver; minerals include hematite, MnOx, adularia, fluorite.
Years of Production: (no production)
Mineral production: (no production); grade up to $64 per ton gold, 2 oz Ag
References: Schrader, 1909

OK Group
Location: T21N, R20W, sec 4/9 Lat. 35.2261N Lon. 114.4164W
Quadrangle: Union Pass
Geology: Contact of Tertiary rhyolite with Precambrian granite.
Mineralization: Gold, pyrite, and galena in quartz
Years of Production: (no production)
Mineral production: (no production) Grades of 0.05 to 0.9 oz per ton gold
References: Schrader, 1909

Tyro Mine
Location: T21N, R20W, sec 6, SE/SE Lat. 35.2272N Lon. 114.4497W
Quadrangle: Union Pass
Geology: Tertiary rhyolite dikes in Precambrian granite
Mineralization: Quartz-calcite veins with fluorite, Au
Years of Production: 1902-1982(?)
Mineral production: (no production data), grade 0.3 to 11 oz/t Au, up to 56 oz/t Ag
References: Schrader, 1909; AZGS mine files

Union Pass Mine
Location: T21N, R20W, sec 29, NW/SE Lat. 35.1742N Lon. 114.4342W
Quadrangle: Union Pass
Geology: Fault contact of Tertiary rhyolite with Precambrian granite
Mineralization: Quartz veins in fault breccia; contains calcite, adularia, FeOx, MnOx
Years of Production: 1886 to (?)
Mineral production: small - no production data
References: Schrader, 1909

Mines in Union Pass district with no information
Expansion
Philadelphia
Monarch
Sunlight
Gold Chain
Burke
Mandalay
Bonanza
Banner
Quail

Mines in Union Pass district outside study area
King of Secret Pass

Table 4. Water quality data for the Black Mountains-Bullhead City area.

Well	Name	DEQ#	DWR#	Date	TDS	Spec. Cond.	Alkal CaCO3	Hard. CaCO3	Cl	F	SO4	Mg	Na	Ca	Al	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Se	Ag	Zn	NO3	NO2	Total Nitro	pH	Turb
B(19-20)35bac	Anderson Residence(?)	45640		17-Jul-91	1790	2230	450	996	124	0.92	759	70.3	185	267		nd	nd	0.0006	nd	nd	0.2	nd	1.36	nd	nd	nd	0.64			0.3	7.1	
B(19-20)35bac	Oatman Motel(?)	45642		17-Jul-91	1160	1690	221	531	250	0.26	338	42.4	172	146		nd	nd	0.0025	nd	nd	0.3	nd	0.12	nd	nd	nd	0.05			0.26	7.73	
B(19-20)35bac	Dillinghane Residence(?)	45643		17-Jul-91	1430	1860	416	794	110	0.46	548	56.8	153	212		nd	nd	nd	nd	nd	0.48	nd	1.31	nd	0.25	nd	0.26			0.54	7.14	
B(19-22)14ccd	Roberts Residence	46074	55-642478	15-Jun-94	1020		161	292	179	0.44	309	24.2	221	80.6	nd	nd	nd	nd	nd	0.016	nd	nd	nd	nd	nd	nd	nd	5.53	nd	5.53	7.96	0.73
B(19-22)14ccd	Roberts Residence	46074	55-642478	13-Dec-94	992		158	304	176	0.46	517	24.6	221	80.9	nd	nd	nd	nd	nd	nd	0.11	nd	nd	nd	nd	nd	nd	5.7	nd	5.7	7.79	0.17
B(19-22)15aba	Glaze Residence	46075	55-505320	13-Jun-94	788		149	364	107	0.45	265	27.6	114	93.3	nd	nd	nd	nd	nd	nd	nd	nd	0.06	nd	nd	nd	nd	nd	nd	nd	7.88	0.02
B(19-22)15aba	Glaze Residence	46075	55-505320	29-Nov-94	769		151	358	108	0.5	301	29.5	109	97.2	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd		nd	7.81	
B(19-22)26bbd	Plough Residence	46076	55-527523	27-Jun-94	1240		212	617	255	0.23	322	50.1	139	164	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.78	nd	1.78	7.81	0.08
B(19-22)26bbd	Plough Residence	46076	55-527523	5-Dec-94	1270		nd	679	278	0.26	427	57.7	139	183	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.52		1.52	7.72	
B(19-22)26dcd	Nickerson Residence	46077	55-507171	6-Jun-94	960	1450	180	290	230	0.34	290	26	210	75		<0.005	<0.05	<0.0005	<0.005	<0.05	<0.05	<.005	<0.05	<0.0002	<0.005	<0.005	<0.05			3.1	7.9	
B(19-22)26dcd	Nickerson Residence	46077	55-507171	29-Nov-94	980	1530	190	320	210	0.34	270	27	230	84		0.010	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd			3.40	7.7	
B(19-22)35bad	Stout Residence	46078	55-523024	15-Jun-94	915		181	385	172	0.28	214	33.8	142	104	nd	nd	nd	nd	nd	nd	nd	0.006	nd	nd	nd	nd	nd	7.48	615	7.48	7.74	0.05
B(19-22)35bad	Stout Residence	46078	55-523024	15-Jun-94	894		183	418	184	0.32	255	35.8	135	108	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	7.23		7.23	7.65	
B(19-22)10add	Section 10 WWTP	46282		31-Aug-94						0.46						<0.010	0.07	<0.0005	<0.005			<0.005		<0.0002	<0.005	<0.005				<0.10		
B(19-22)10add	Section 10 WWTP	46282		6-Dec-94	1700	2570	280	540	530	0.44	320	40	360	150		0.005	0.07	nd	nd	nd	1.5	nd	0.36	nd	nd	nd	nd			nd	7.3	
B(20-22)1cdd	AAA Trailer Park	000324	55-607020	15-Jun-94	2140		349	761	387	0.30	649	74.9	412	183	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	14.4	nd	14.4	7.83	0.10
B(20-22)1cdd	AAA Trailer Park (1)	000324	55-607020	12-Dec-94	2560		356	975	541	0.28	867	94.0	525	235	nd	nd	nd	nd	nd	0.074	nd	0.011	nd	nd	nd	nd	nd	15.9	nd	15.9	7.56	0.38
B(20-22)1cdd	AAA Trailer Park (2)	000324	55-607020	12-Dec-94	2600	3655	120	940	540	0.24	1000	95	570	220		<0.005	<0.05	<0.0005	<0.005	<0.05	<0.05	<0.005	<0.05	0.0002	<0.005	<0.005	<0.05			15.0	7.0	
B(20-22)24ddc	?	000732		15-Mar-89												<0.01	<0.1	<0.001	<0.01	<0.1	,0.27	<0.01	<0.05	<0.0005	<0.005	<0.001	<0.05					
B(20-22)16aab	Sierra WWTP MW-2(1)	001280	55-515799	10-Aug-88	1690	2630	200	570	534	0.2	316	39	299	165		<0.02	0.11	<0.001	<0.01	<0.1	<0.1	<0.02	<0.05	<0.0005	<0.005	<0.001	<0.05			4.85	7.21	0.55
B(20-22)16aab	Sierra WWTP MW-2(2)	001280	55-515799	10-Aug-88	1690	2600	200	572	554	0.2	311	39.9	410	166		<0.02	0.1	<0.001	<0.01	0.1	<0.1	<0.02	<0.05	<0.0005	<0.005	<0.001	<0.05			4.62	7.21	0.65
B(20-22)16aab	Sierra WWTP MW-2	001280	55-515799	7-Jun-94	650	903	180	330	110	0.44	190	25	82	91		<0.005	0.11	0.001	<0.005	<0.05	0.97	0.009	0.85	<0.0002	<0.005	<0.005	<0.05			0.443	7.6	6.8
B(20-22)16aab	Sierra WWTP MW-2	001280	55-515799	31-Aug-94						0.44						<0.010	0.06	<0.0005	0.017			<0.005		0.0004	<0.005	<0.005				0.10		27
B(20-22)16aab	Sierra WWTP MW-2(1)	001280	55-515799	6-Dec-94	697		169	367	124	0.63	222	25.5	87.9	110	nd	nd	nd	0.0014	nd	0.013	0.55	0.007	0.72	nd	nd	nd	nd	nd	nd	nd	7.68	4.2
B(20-22)16aab	Sierra WWTP MW-2(2)	001280	55-515799	6-Dec-94	690	1154	180	380	120	0.47	270	26	98	110		nd	0.07	0.0021	nd	nd	0.73	0.006	0.72	nd	nd	nd	nd			nd	7.5	
B(20-22)16bbb	Sierra WWTP MW-1	001282	55-515801	10-Aug-88	823	1360	143	423	181	0.37	239	30.3	96.9	116		<0.02	<0.1	<0.001	<0.01	<0.1	<0.1	<0.01	0.43	<0.0005	<0.005	<0.001	<0.05			<0.1	7.7	6.8
B(20-22)16aab	Sierra WWTP MW-3	001283	55-515800	10-Aug-88	810	1150	168	401	131	0.5	255	26.9	96.9	114		<0.02	<0.1	<0.001	<0.01	<0.1	<0.1	<0.02	0.54	<0.0005	<0.005	<0.001	<0.05			<0.1	7.65	0.41
B(20-22)19ada	Riviera Well	21610	55-603474	7-Jun-94	1500	2100	190	730	410	0.18	420	62	220	190		<0.005	0.06	<0.0005	<0.005	<0.05	<0.05	<0.005	<0.05	<0.0002	<0.005	<0.005	0.05			10.5	7.8	0.02
B(20-22)19ada	Riviera Well	21610	55-603474	31-Aug-94						0.18						0.011	0.06	<0.0005	<0.005			<0.005		<0.0002	<0.005	<0.005				11		0.04
B(20-22)19ada	Riviera Well	21610	55-603474	6-Dec-94	1700	2520	180	870	410	0.17	680	72	240	230		nd	0.06	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd			18.1	7.1	
B(20-22)1dac	Super 8 Motel	46079	55-512175	7-Jun-94	1900	2860	230	750	810	0.23	350	73	430	180		0.009	0.11	<0.0005	<0.005	<0.05	<0.05	<0.005	<0.05	<0.0002	<0.005	<0.005	<0.05			7.2	7.7	0.47
B(20-22)1dac	Super 8 Motel (1)	46079	55-512175	1-Dec-94	2500	3875	250	870	870	0.20	310	79	560	220		0.016	0.12	nd	0.009	nd	0.21	nd	nd	nd	nd	nd	nd			nd	7.3	
B(20-22)1dac	Super 8 Motel (2)	46079	55-512175	1-Dec-94	2570		247	902	1000	0.28	321	83.0	490	234	nd	nd	0.11	nd	0.012	0.016	0.26	nd	nd	nd	nd	nd	nd	6.06	nd	6.06	7.65	1.22
B(20-22)17bbd	Bluewater Manor	46080	55-517150	15-Jun-94	1030		192	400	140	0.25	328	31.3	173	113	nd	nd	nd	nd	nd	nd	nd	nd	0.44	nd	nd	nd	nd	1.42	nd	1.42	8.02	0.26
B(20-22)17bbd	Bluewater Manor	46080	55-517150	5-Dec-94	910		180	402	131	0.30	367	31.7	137	109	nd	nd	nd	nd	nd	0.010	nd	nd	0.43	nd	0.007	nd	nd	0.82		0.82	7.89	
B(20-22)17abc	Cochran Residence(1)	46081	55-602231	7-Jun-94	1100	1368	180	360	180	0.18	370	32	200	90		<0.005	<0.05	<0.0005	0.008	<0.05	0.32	<0.005	<0.05	<0.0002	<0.005	<0.005	<0.05			3.54	7.9	3.7
B(20-22)17abc	Cochran Residence(2)	46081	55-602231	7-Jun-94	1100	1375	180	360	180	0.18	390	32	200	92		<0.005	<0.05	<0.0005	0.006	<0.05	0.35	<0.005	<0.05	<0.0002	<0.005	<0.005	<0.05			3.42	7.9	1.1
B(20-22)17abc	Cochran Residence(2)	46081	55-602231	1-Dec-94	1000	1663	200	370	140	0.18	330	31	210	99		nd	nd	nd	nd	nd	0.14	nd	nd	nd	nd	nd	nd			4.40	7.4	
B(20-22)19cdc	Seventy Residence	46082	55-641497	7-Jun-94	950	1203	200	390	140	0.26	370	36	150	98		<0.005	<0.05	<0.0005	<0.005	<0.05	1.1	<0.05	0.46	<0.0002	<0.005	<0.005	<0.05			0.100	8.0	7.7
B(20-22)19cdc	Seventy Residence	46082	55-641497	1-Dec-94	1300	1773	200	580	180	0.24	470	51	200	150		nd	nd	nd	nd	nd	0.84	nd	0.63	nd	nd	nd	nd			nd	7.7	
B(20-22)19dcd	Askew Residence	46083	55-642105	7-Jun-94	3200	3565	240	1300	690	0.17	1100	130	550	310		<0.005	<0.05	0.0008	<0.005	<0.05	0.64	0.006	<0.05	<0.0002	0.005	<0.005	<0.05			9.63	7.7	0.72
B(20-22)19dcd	Askew Residence	46083	55-642105	1-Dec-94	3800	4790	nd	1600	690	0.16	1600	150	690	400		nd	nd	nd	nd	nd	0.28	nd	nd	nd	nd	nd	nd			9.00	7.3	
B(20-22)26ccd	VFW Post 10005	46084	55-806251	7-Jun-94	840	1240	120	250	280	1.6	120	12	180	79		0.059	<0.05	<0.0005	0.006	<0.05	0.29	<0.005	<0.05	0.0003	<0.005	<0.005	<0.05			7.50	7.9	2.5
B(20-22)26ccd	VFW Post 10005	46084	55-806251	29-Nov-94	840	1367	130	270	320	1.7	94	13	190	88		0.109	nd	nd	nd	nd	0.57	nd	nd	nd	nd	nd	nd			7.50	7.6	
B(20-22)26ccd	VFW Post 10005	46084	55-806251	7-Feb-95	850	1393	120	270	280	1.7	100	12	190	89		0.082	nd	nd	nd	nd	0.11	nd	nd	0.0004	nd	nd	nd			5.72	7.5	
B(20-22)29dba	Hansen Residence	46085	55-637323	27-Jun-94	1190		153	301	313	2.84	229	10.8	247	105	nd	0.017	nd	nd	nd	nd	0.23	nd	nd	0.0015	nd	nd	nd	7.19	nd	7.19	7.96	0.41
B(20-22)29dba	Hansen Residence	46085	55-637323	5-Dec-94	1200		150	371	342	2.66	275	12.9	257	126	nd	0.012	nd	nd	nd	0.036	0.15	nd	nd	0.0017	nd	nd	nd	10.1		10.1	7.93	

(data from Arizona Department of Environmental Quality)

Table 4. Water quality data for the Black Mountains-Bullhead City area, continued.

Well	Name	DEQ#	DWR#	Date	TDS	Spec. Cond.	Alkal CaCO3	Hard. CaCO3	Cl	F	SO4	Mg	Na	Ca	Al	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Se	Ag	Zn	NO3	NO2	Total Nitro	pH	Turb
B(20-22)29dba	Hansen Residence	46085	55-637323	6-Feb-95			134	283	295		218	9.8	236	94.0	nd	0.015	nd	nd	nd	nd	nd	nd	nd	0.0009	nd	nd	nd	13.2	nd	13.2	7.52	
B(20-22)32aab	Palo Verde Dev East(1)	46086	55-505478	15-Jun-94	1110		123	355	362	1.83	201	18.8	228	108	nd	0.018	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.96	nd	0.96	7.27	0.05
B(20-22)32aab	Palo Verde Dev East(2)	46086	55-505478	15-Jun-94	1160		124	357	359	1.97	223	18.8	231	108	nd	0.018	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.95	nd	0.95	7.52	0.04
B(20-22)32aab	Palo Verde Dev East	46086	55-505478	12-Dec-94	1000		219	323	305	1.93	225	17.8	211	101	nd	0.022	nd	nd	nd	0.014	0.20	0.005	nd	nd	nd	nd	nd	0.81		0.81	7.91	
B(20-22)32dcd	Schwanbeck	46088	55-644518	13-Jun-94	975		140	364	192	0.78	296	24.1	171	103	nd	n	nd	nd	nd	0.021	nd	nd	nd	nd	nd	nd	nd	0.69	nd	0.69	7.74	0.55
B(20-22)32dcd	Schwanbeck	46088	55-644518	29-Nov-94	1220		170	556	283	0.63	384	38.3	172	146	nd	0.011	nd	nd	nd	0.010	nd	nd	nd	nd	nd	nd	nd	1.07		1.07	7.83	
B(20-22)13ddd	Tierra Grande WWTP	46281		6-Dec-94	620	1132	110	190	220	0.66	130	12	100	95		nd	0.08	nd	nd	nd	0.06	nd	nd	nd	nd	nd	nd			6.05	7.4	
B(20-22)13ddd	Tierra Grande WWTP	46281		7-Feb-95	710	1126	100	370	190	0.58	110	16	96	120		nd	0.13	nd	nd	nd	0.07	nd	nd	nd	nd	nd	nd			5.30	7.6	
B(20-22)26dcd	Lewis	46596	55-504216	12-Dec-94	790	1253	120	180	210	3.8	190	8.8	190	59		0.168	<0.05	<0.0005	<0.011	<0.05	0.07	<0.005	<0.05	0.0004	<0.005	<0.005	<0.05			3.56	7.5	
B(20-22)26dcd	Lewis (1)	46596	55-504216	7-Feb-95	760	1256	120	200	210	3.6	130	8.7	190	64		0.12	nd	nd	0.009	nd	nd	nd	nd	nd	nd	nd	nd			2.38	7.5	
B(20-22)26dcd	Lewis (2)	46596	55-504216	7-Feb-95	769		119	188	213		159	8.7	187	60.6	nd	0.133	nd	nd	0.016	nd	nd	nd	nd	nd	nd	nd	nd	1.98	nd	1.98	7.72	0.06
B(20-22)26caa	Mejia Wingfoot Cottages	46597	55-642369	12-Dec-94	910	1512	120	240	300	2.2	200	11	220	77		0.098	nd	nd	nd	nd	nd	nd	nd	0.0006	nd	nd	nd			0.942	7.5	
B(20-22)26caa	Mejia Wingfoot Cottages	46597	55-642369	7-Feb-95	900	1474	120	250	290	2.3	140	11	210	81		0.005	nd	nd	nd	nd	nd	nd	nd	0.0003	nd	nd	nd			0.914	7.5	
B(21-21)21cbb	(no name)	001450		14-Mar-89			127	50	17.3	3.4	28.6	nd	77.9	20.3	nd	0.029	<0.1	<0.001	0.014	<0.1	0.17	<0.01	<0.05	<0.0005	<0.005	<0.001	0.43					
B(21-21)27add	Well #1	21806	55-805519	14-Jun-94	320		129	49.8	17.8	3.30	32.2	nd	70.9	19.6	nd	0.012	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	5.34	nd	5.34	7.85	0.01
B(21-21)27add	Well #1 (1)	21806	55-805519	6-Dec-94	297		140	52	21	3.3	34	0.46	78	20		0.013	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	5.65	nd	5.65	7.96	0.05
B(21-21)27add	Well #1 (2)	21806	55-805519	6-Dec-94	280	429	128	32	28.5	3.81	35.6	nd	96.4	13.1	nd	0.021	nd	nd	0.006	nd	nd	nd	nd	nd	nd	nd	nd			6.2	7.8	
B(21-21)27ccb	Well #2 (1)	21807	55-805518	14-Jun-94	361		126	32.0	28.5	3.56	36.0	nd	95.9	12.3	nd	0.017	nd	nd	0.015	nd	nd	nd	nd	nd	nd	nd	nd	5.08	nd	5.08	8.07	nd
B(21-21)27ccb	Well #2 (2)	21807	55-805518	14-Jun-94	348		133	33.2	28.4	3.62	40.0	nd	84.2	12.7	nd	0.019	nd	nd	0.016	nd	nd	nd	nd	nd	nd	nd	nd	5.07	nd	5.07	8.0	0.02
B(21-21)27ccb	Well #2	21807	55-805518	6-Dec-94	338		81.8	285	38.2	1.71	133	16.4	247	66.7	nd	0.018	nd	nd	0.019	nd	nd	nd	nd	nd	nd	nd	nd	5.36		5.36	8.14	
B(21-21)30aab	Well #3	21809	55-620581	14-Jun-94	1030		94.0	307	381	1.19	153	18.0	197	91.5	nd	nd	nd	nd	nd	nd	1.01	nd	nd	nd	nd	nd	nd	4.79	nd	4.79	7.72	9.0
B(21-21)30aab	Well #3	21809	55-620581	6-Dec-94	966		112	55	217	3.48	74.4	1.6	216	18.4	nd	0.037	nd	nd	0.023	nd	0.14	nd	nd	nd	nd	nd	nd	5.49		5.49	7.87	
B(21-21)29add	Well #5	46091	55-507875	14-Jun-94	706		116	48.6	221	3.36	73.1	1.5	196	15.7	nd	0.034	nd	nd	0.022	0.010	0.24	nd	nd	nd	nd	nd	nd	7.12	nd	7.12	8.25	0.25
B(21-21)29add	Well #5	46091	55-507875	6-Dec-94	666		125	35	161	5.10	87.1	1.1	206	11.7	nd	0.115	nd	nd	0.029	nd	nd	nd	nd	nd	nd	nd	nd	6.77		6.77	8.31	
B(21-21)29add	Well #4	46092	55-507876	14-Jun-94	656		122	61.8	218	3.62	87.5	2.2	193	19.3	nd	0.031	nd	nd	0.031	nd	nd	nd	nd	nd	nd	nd	nd	8.12	nd	8.12	8.51	0.02
B(21-21)29add	Well #4	46092	55-507876	6-Dec-94	693		111	398	421	0.43	135	20.9	220	126	nd	nd	nd	nd	nd	0.024	nd	nd	nd	nd	nd	nd	nd	7.13		7.13	8.29	
B(21-21)29bca	Well #2	46093	55-608741	14-Jun-94	1200		114	451	519	0.43	159	22.9	210	131	nd	nd	nd	nd	nd	nd	0.10	nd	nd	nd	nd	nd	nd	3.21	nd	3.21	7.67	nd
B(21-21)29bca	Well #2	46093	55-608741	6-Dec-94	1250		114	405	342	0.45	131	21.9	161	116	nd	0.014	nd	nd	0.025	0.370	7.75	0.041	0.09	nd	nd	nd	nd	1.10		1.10	7.74	
B(21-21)29bcc	Well #1	46094	55-608740	14-Jun-94	1030		115	400	355	0.59	163	23.0	145	112	nd	nd	nd	nd	nd	0.039	0.10	0.014	nd	nd	nd	nd	nd	0.45	nd	0.45	7.56	53
B(21-21)29bcc	Well #1	46094	55-608740	6-Dec-94	966		325	628	165	0.37	289	45.9	158	171	13.8	nd	0.43	nd	0.012	0.012	18.5	0.013	0.55	nd	nd	nd	0.39	2.06		2.06	7.71	
B(21-21)31bac	MW-4	46096	55-536947	14-Jun-94	1110		382	840	230	0.34	294	65.0	190	228	25.2	0.018	0.80	0.0010	0.013	0.415	35.2	0.017	1.17	nd	nd	nd	0.12	nd	nd	nd	7.47	348
B(21-21)31bac	MW-4	46096	55-536947	13-Dec-94	1510		382	910	318		363	71.4	183	240	9.00	0.016	0.30	nd	0.017	0.017	12.2	0.016	1.20	nd	nd	nd	0.13	nd	nd	nd	7.15	340
B(20-23)13dbd	Helsing Residence	46096	55-536947	7-Feb-95	1370		144	337	84.1	0.25	302	23.4	99.4	94.5	nd	nd	nd	nd	nd	nd	nd	nd	0.57	nd	nd	nd	nd			nd	7.15	358
B(20-23)13dbd	Helsing Residence	46089	55-641104	14-Jun-94	744		148	348	88.8	0.29	292	25.8	98.5	101	nd	nd	nd	nd	nd	nd	nd	nd	0.58	nd	nd	nd	nd			nd	8.01	0.10
B(20-23)24bad	Tipton Residence	46089	55-641104	30-Nov-94	733		140	335	82.2	0.31	247	23.1	93.6	91.5	nd	nd	0.13	nd	nd	0.027	0.26	0.006	0.62	nd	nd	nd	nd			nd	8.03	
B(20-23)24bad	Tipton Residence	46090	55-509401	13-Jun-94	706		143	351	88.3	0.38	293	26.0	90.3	100	nd	0.010	0.12	nd	nd	0.017	0.11	nd	0.62	nd	nd	nd	nd	nd	nd	nd	8.00	1.55
		46090	55-509401	1-Dec-94	725																									nd	8.09	0.32

(data from Arizona Department of Environmental Quality)

CHUKWU

MOHAVE COUNTY PLANNING & ZONING DEPARTMENT

P.O. Box 7000 ◆ Kingman, Arizona 86402-7000
3675 E. Highway 66, Suite A ◆ (928) 757-0903 ◆ FAX 757-3577
1130 East Hancock Road ◆ Bullhead City, Arizona 86442 ◆ (928) 758-0707 ◆ FAX 763-0870

CHRISTINE BALLARD
DIRECTOR

RECEIVED
MAY 05 2006
AZ CORP COMM
Director Utilities

May 3, 2006

Arizona Corporation Commission
1200 West Washington Street
Phoenix, Arizona 85007
Attention: Blessing Chukwu

RE: Proposed development

Dear Mrs. Chukwu:

In response to your recent request, I am forwarding the following lists of proposed subdivisions and new cities in the unincorporated parts of Mohave County.

The proposed subdivisions are broken down by groundwater basins, identified in Column H, and on the other data sheet. As the list shows, most of our actual subdivision proposals are located in the South Mohave Valley, in an area reliant upon water that is considered part of the Colorado River aquifer, and subject to formal allocation.

Many of the major new proposals, however, including several planned new cities, are spread across the county, primarily affecting the Hualapai, Sacramento and Detrital Basins.

If you have any questions, or need additional information, please contact me.

Sincerely,

Karl Taylor

Karl Taylor
Acting Planning Manager

KT/ajc

Enc: lists of proposed projects, by groundwater basin

Estimates of Proposed Dwelling Units/Lots in the Unincorporated Parts of Mohave County

	B	C	D	E	F	G	H
1	Sagebrush Trails	3815	640	98	T14N R17W	Section 3	Lake Havasu
2	North Pointe	3703	116	475	T14N R20W	Section 17	Lake Havasu
3	Paradise Trails	3802	149	94	T14N R20W	Section 25	Lake Havasu
4	Bella Lago		12	124	T14N R20W	Section 21	Lake Havasu
5	Golden Sands Ranchos		280	192	T15N R19W	Section 5	Lake Havasu
6	Arizona Gateway	3808	143	51	T16N R20W	Section 13	South Mohave Valley
7	Topock Village Estates	4190	82	206	T16N R21W	Section 23	South Mohave Valley
8	Mohave Valley Commons	4212	90	414	T16N R21W	Section 14	South Mohave Valley
9	Topock Overlook		74	113	T16N R21W	Section 23	South Mohave Valley
10	Marina Coves		46	456	T17N R22W	Section 23	South Mohave Valley
11	Mystic Canyon	4197	91	266	T18N R21W	Section 7	South Mohave Valley
12	Valley View at Sunrise Hills	4201	130	371	T18N R21W	Section 6	South Mohave Valley
13	El Rio	4177	386	1367	T18N R22W	Section 11	South Mohave Valley
14	Sun Valley II	4185	34	121	T18N R22W	Section 1	South Mohave Valley
15	The Greens at Los Lagos	4186	306	350	T18N R22W	Section 1	South Mohave Valley
16	Lake Cimarron Estates, Unit II	4187	9	35	T18N R22W	Section 23	South Mohave Valley
17	Los Lagos	4188	2.99	12	T18N R22W	Section 1	South Mohave Valley
18	Village Estates	4198	77	344	T18N R22W	Section 3	South Mohave Valley
19	The Estates at Cimarron Lake	4200	16	57	T18N R22W	Section 23	South Mohave Valley
20	King Estates		95	380	T18N R22W	Section 17	South Mohave Valley
21	Mohave Landing		135	515	T18N R22W	Section 23	South Mohave Valley
22	Mohave Valley Industrial Park		41.67	16	T18N R22W	Section 3	South Mohave Valley
23	Somerset Estates		146	548	T18N R22W	Section 27	South Mohave Valley
24	Mountainside Village	4193	120	320	T18N, R12W	Section 6	South Mohave Valley
25	Sunrise Vistas, Unit II	4108	705	160	T19N R21W	Section 18	South Mohave Valley
26	Sunrise Vistas, Unit II	4202	3	10	T19N R21W	Section 18	South Mohave Valley
27	Desert Lakes Estates	4152	80	272	T19N R22W	Section 36	South Mohave Valley
28	Coyote Run	4176	40	146	T19N R22W	Section 23	South Mohave Valley
29	Sunset Palms	4183	23	126	T19N R22W	Section 26	South Mohave Valley
30	Los Altos	4184	7	21	T19N R22W	Section 26	South Mohave Valley
31	Twin Palm Estates	4189	39	144	T19N R22W	Section 36	South Mohave Valley
32	Las Palmas	4191	2.88	14	T19N R22W	Section 23	South Mohave Valley
33	Patriot Estates	4195	30	122	T19N R22W	Section 32	South Mohave Valley
34	Brett Canyon Estates	4196	11.82	55	T19N R22W	Section 25	South Mohave Valley
35	Valley Springs	4203	24.83	132	T19N R22W	Section 36	South Mohave Valley
36	Fossil Creek,	4204	19.46	67	T19N R22W	Section 14	South Mohave Valley
37	The Borgata at Mountain View	4205	40	107	T19N R22W	Section 14	South Mohave Valley
38	Stetson Ranch	4206	14.42	57	T19N R22W	Section 25	South Mohave Valley
39	Fort Mohave Business Park	4209	18	28	T19N R22W	Section 35	South Mohave Valley
40	Mesa Verde	4210	7.26	31	T19N R22W	Section 23	South Mohave Valley
41	Everglades Estates		45.67	155	T19N R22W	Section 36	South Mohave Valley
42	Westview Estates		38	134	T19N R22W	Section 14	South Mohave Valley
43	Silverado Acre	3805	518	379	T20N R13W	Section 17	Big Sandy
44	Silverado Ridge	3817	440	303	T20N R13W	Section 9	Big Sandy
45	The Dells at Silverado (aka Silverado Golf)		840	139	T20N R13W	Section 28,29	Big Sandy

Estimates of Proposed Dwelling Units/Lots in the Unincorporated Parts of Mohave County

	B	C	D	E	F	G	H
46	Mountain Shadow Estates	3806	161	27	T20N R14W	Section 8	Sacramento Valley
47	Walnut Creek Ranch	3307	279	642	T20N R17W	Section 7	Sacramento Valley
48	Friendly Golden Valley	3305	40	114	T21N R18W	Section 17	Sacramento Valley
49	Mirage Estates	3308	35	100	T21N R18W	Section 17	Sacramento Valley
50	Aztec at Chuar	3309	80	252	T21N R18W	Section 27	Sacramento Valley
51	Bloor Subdivision		67	31	T21N R18W	Section 7	Sacramento Valley
52	Golden Valley Commercial Ranches		67.64	140	T21N R18W	Section 7	Sacramento Valley
53	Patterson Estates		67	271	T21N R18W	Section 7	Sacramento Valley
54	Secret Pass Estates		101	188	T21N R18W	Section 7	Sacramento Valley
55	Shipp Estates	3310	48	152	T21N R19W	Section 12	Sacramento Valley
56	Greenwood Village	3818	7	40	T22N R12W	Section 29, 31 ,32	Hualapai Valley
57	Chaparrel Mesa	3042	124	510	T22N R16W	Section 28	Hualapai Valley
58	Neal One	3048	175	34	T22N R16W	Section 29	Hualapai Valley
59	Cerbat Vistas	3067	124	559	T22N R16W	Section 19	Hualapai Valley
60	Cedar Creek Estates	3069	90	365	T22N R16W	Section 19	Hualapai Valley
61	Cheyenne Meadows	3070	152	527	T22N R16W	Section 28	Hualapai Valley
62	High Desert Estates	3071	30	127	T22N R16W	Section 29	Hualapai Valley
63	The Ranch at Long Mountain (B-?)	3814	122	316	T22N R16W	Section 27	Hualapai Valley
64	Hunter Ranch		158	450	T22N R16W	Section 21	Hualapai Valley
65	North Valley Estates		238	750	T22N R16W	Section 12, 13	Hualapai Valley
66	Prairie Heights	3068	152	416	T22N R16W	Section 19	Hualapai Valley
67	Desert Fountain Estates	3051	103	300	T22N R17W	Section 13	Hualapai Valley
68	Desert Fountain Estates, Unit II	3072	114	323	T22N R17W	Section 13	Hualapai Valley
69	Tara Estates		80	56	T22N R17W	Section 12	Hualapai Valley
70	Hidden Springs		21	119	T23N R14W	Section 15, 16	Hualapai Valley
71	Camps Bay	3819	160	29	T25N R20W	Section 4	Hualapai Valley
72	White Hills Ranch Equestrian	3812	640	116	T27N R19W	Section 5	Detrital Valley
73	Equestrian at White Hills	3816	640	116	T27N R19W	Section 5	Detrital Valley
74	Woodside Subivision	3820	280	1044	T27N R20W	Section 7	Detrital Valley
75	Woodside Subivision		280.5	1044	T27N R20W	Section 7	Detrital Valley
76	Shadow Ridge	3511	122	393	T39N R16W	Section 27	Arizona Strip
77	Rio Seco	3520	20	71	T39N R16W	Section 14	Arizona Strip
78	High Chaparral		22.9	91	T39N R16W	Section 11	Arizona Strip
79	Vista Montana (aka Mesquite Heights)		34	145	T39N R16W	Section 11	Arizona Strip
80	Vista Rio		34	137	T39N R16W	Section 3	Arizona Strip
81	Coyote Flats(aka Desert Springs Oasis)		32	153	T40N R15W	Section 4	Arizona Strip
82	Hamilton Ranch		10	44	T40N R15W	Section 4	Arizona Strip
83	La Verta Heights		26.78	77	T40N R15W	Section 5	Arizona Strip
84	Running Springs Ranch		105	260	T40N R15W	Section 4	Arizona Strip
85	Vista Verde	3519	37.2	186	T40N R16W	Section 33	Arizona Strip
86	Vista Skies	3521	7	30	T40N R16W	Section 32	Arizona Strip
87	Desert Palms at Beaver Dam	3522	10	47	T41N R15W	Section 33	Arizona Strip
88	The Bluffs at Virgin Mountain		16	76	T41N R15W	Section 33	Arizona Strip
89		Acres	11282	20395	Lots		

ESTIMATES OF PROPOSED DWELLING UNITS/LOTS IN THE UNINCORPORATED PARTS OF MOHAVE COUNTY MAY 1, 2006

	PROPOSED UNITS	BASIN
RHODES HOMES		
Golden Valley Ranch	33,264	Sacramento
Peacock Highlands	46,026	Hualapai
Peacock Vistas	9,490	Hualapai
The Village at White Hills	20,042	Detrital
LEONARD MARDIAN		
Mardian Ranch (White Hills)	34,727	Detrital
Sterling	50,794	Sacramento
The Ranches at Long Mountain (Lingenfelter)	3,880	Hualapai
Silver Ranch (Mike and Leo Horner)	20,281	Big Sandy
All other currently proposed subdivisions (approx. 78 projects)	20,395 +/-	Various Most are in Lake Mohave Basin (reliant on Colorado River allocation water)
TOTAL	**238,899**	

Scott Jr

OPEN MEETING AGENDA ITEM

COMMISSIONERS
JEFF HATCH-MILLER- Chairman
WILLIAM MUNDELL
MARC SPITZER
MIKE GLEASON
KRISTIN K. MAYES

RECEIVED

BRIAN C. MCNEIL
Executive Director

ARIZONA CORPORATION COMMISSION

2006 MAR 29 P 3: 55

AZ CORP COMMISSION
DOCUMENT CONTROL

March 29, 2006

RECEIVED

MAR 29 2006

AZ Corporation Commission
Director of Utilities

Herbert R. Guenther, Director
Arizona Department of Water Resources
3550 North Central Avenue
Phoenix, Arizona 85012-2105

RE: Perkins Mountain Water Company and Perkins Mountain Utility Company – Applications for Certificates of Convenience and Necessity (CC&N) Docket Nos. W-20380A-05-0490 and W-20379A-05-0489

Dear Mr. Guenther:

The Arizona Corporation Commission ("Commission") is currently reviewing the above referenced applications for Certificates of Convenience and Necessity in Mohave County, Arizona and would appreciate it if you would provide the following information to the Commission:

1. Please provide a list of all known projects utilizing groundwater that are planned in Mohave County?

2. Please identify which aquifer(s) the projects would affect.

3. Please provide an explanation of the competing projects in relation to issuance of a water adequacy reports. Please include discussion of the Ranch at White Hills (by Mr. & Mrs. Leor ... y Rhodes Dev ... l to obtain wate ... n Mohave Cou ... BLESSING,

4. Has ... t of Water Resc ... PLEASE NOTE — MULTIPLE ENTRIES ... has been done ... OCCUR FOR THE SAME SUBDIVISION BECAUSE

5. Plea ... t and how efflu ... THIS OLDER DATABASE (IWRF) REQUIRED MULTIPLE LINES FOR LOCATIONS WITH MORE THAN ONE TOWNSHIP OR RANGE. HOPE THIS HELPS.

WATER ADEQUACY APPLICATIONS IN MOHAVE COUNTY SINCE 2001

File Number	Subdivision	Water Provider	lication Recei	AppStatus	AppStatusD	Quad	Township	Range1	Section1	Lots	totalDemand	SubbasinName
21-401425.0000	Walnut Creek Water Company	Walnut Creek Water Company	07/20/2004	Issued	06/27/05	B				870	376.86	Sacramento Valley
21-401654.0000	City of Bullhead City	City of Bullhead City	02/25/2005	Pending		B					14535.00	Lake Mohave
21-401728.0000	Beaver Dam Water Company	Undetermined	04/12/2005	Denied	12/05/05	B	40	16	33		0.00	Virgin River
22-401884.0000	Golden Horseshoe Ranchos Unit 5	Dry Lot	09/27/2005	Issued-Inadequate	10/06/05	B	27	19	19	283	*121.78*	Lake Mohave
22-401889.0000	Havasu RV Resort Phase II	Arizona American Water Company - Havasu	09/30/2005	Issued-Adequate	10/18/05	B	14	20	15	96	18.48	Lake Mohave
22-401941.0000	Lake Havasu Estates Unit 9	Dry Lot	11/10/2005	Issued-Inadequate	12/13/05	B	17	17	25	27	*11.62*	Sacramento Valley
23-401239.0000	North Point	Arizona American Water Company	02/10/2004	Issued-Adequate	03/02/04	B	14	20	17	450	209.00	Lake Havasu
23-401259.0000	Granmar Estates, Tract 4181	Bermuda Water Company	03/11/2004	Issued-Adequate	05/11/04	B	18	22	03	49	20.58	Lake Mohave
23-401423.0000	Twin Palms Estates, Tract 4189	Bermuda Water Company	07/19/2004	Issued-Adequate	08/05/05	B	19	22	36	144	70.80	Lake Mohave
23-401439.0000	Lake Cimarron Estates Unit II, Tract #4187	Willow Valley Water Company	07/26/2004	Issued	03/22/05	B	18	22	23	35	13.71	Lake Mohave
23-401581.0000	Mountainside Village Ranch	Bermuda Water Company, Inc.	11/19/2004	Issued	12/22/04	B	18	21	6	320	134.19	Lake Mohave
23-401619.0000	Patriot Estates Subdivision	Bermuda Water Company	01/07/2005	Issued	02/04/05	B	19	22	36	119	50.00	Lake Mohave
20-400682.0000	Virgin Mountain Utilities	Virgin Mountain Utilities	02/04/2002	Issued-Adequate	06/24/02	B	40	16	1-		0.00	Virgin River
22-400625.0000	The Legends at Desert Foothills Estates Tract 5092	Citizens Utilities Co., Inc.	10/26/2001	Issued-Adequate	11/26/01	B	20	21	5	70	*30.12*	Lake Mohave
22-400660.0000	The Refuge	Citizens Utilities	12/19/2001	Issued-Adequate	02/05/02	B	14	20	20	362	*155.78*	Lake Havasu
22-400683.0000	Canterbury Estates Tract 3702-A	Havasu Water Company	02/08/2002	Issued-Adequate	03/26/02	B	14	20	21	63	*27.11*	Lake Havasu
22-400703.0000	AZ Gateway	Citizens Utilities	03/28/2002	Issued-Adequate	06/11/02	B	16	20	13	51	*21.95*	Sacramento Valley
22-400713.0000	Lake Mead Ranchos Unit 5	Not applicable	04/10/2002	Issued-Inadequate	05/21/02	B	29	18	25	541	*232.81*	Ranegras Plain
22-400727.0000	Walnut Creek Subdivision	Walnut Creek Water Company	04/29/2002	Issued-Inadequate	05/29/02	B	20	17	7	73	*31.41*	Sacramento Valley

NOTE: Demand estimates in italics are based solely on residential demand from lot numbers.

WATER ADEQUACY APPLICATIONS IN MOHAVE COUNTY SINCE 2001

File Number	Subdivision	Water Provider	lication Recei	AppStatus	AppStatusD	Quad	Township	Range1	Section1	Lots	totalDemand	SubbasinName
22-400741.0000	Hillview Ranches	Individual Wells	04/30/2002	Issued-Inadequate	07/02/02	B	23	16	7	9	*3.87*	Hualapai Valley
22-400745.0000	Lake Havasu Heights	Havasu Heights Domestic Water District	06/11/2002	Issued-Inadequate	08/16/02	B	15	19	7	21	*9.04*	Sacramento Valley
22-400791.0000	Willow Valley Estates Tract 4134-B	Willow Valley Water Company, Inc.	07/22/2002	Issued-Adequate	09/25/03	B	18	22	21	29	9.70	Lake Mohave
22-400798.0000	Canterbury Estates Tract 3702B	Arizona American Water Company	08/13/2002	Issued-Adequate	10/28/02	B	14	20	21	45	*19.36*	Lake Havasu
22-400801.0000	Sunrise Vistas - Tract 4108-K	Sunrise Vistas Utilities	08/19/2002	Issued-Adequate	12/03/02	B	19	21	18	22	*9.47*	Lake Mohave
22-400832.0000	Hualapai Vista Estates, Tract 3811	Dry Lot Subdivision	09/16/2002	Issued-Inadequate	10/17/02	B	22	16	12,13	41	*17.64*	Hualapai Valley
22-400839.0000	Linda Vista	AZ-American Water Company	10/11/2002	Issued-Adequate	11/19/02	B	19	22	23	42	*18.07*	Lake Mohave
22-400852.0000	Terra Vista Skies	Beaver Dam Water Company	11/21/2002	Pending		B	40	16	32	30	*22.50*	Virgin River
22-400872.0000	Lake Juniper	Lake Juniper HOA & Mohave County	01/06/2003	Issued-Inadequate	01/31/03	B	22	17	11,14	16	*6.89*	Hualapai Valley
22-400877.0000	Sunrise Vistas, Tract 4108-L	Sunrise Vistas Utilities	01/17/2003	Issued-Adequate	05/12/03	B	19	21	18	23	*9.90*	Lake Mohave
22-400912.0000	Flannery & Allen	Individual Wells	03/12/2003	Issued-Inadequate	04/10/03	B	27	20	31	55	*23.67*	Detrital Valley
22-400987.0000	Desert Lakes Estates Tract 4152-C	Bermuda Water Company	06/05/2003	Issued-Adequate	10/22/03	B	19	22	36	42	17.64	Lake Mohave
22-400998.0000	Sunrise Vistas, Tract 4108-N	Sunrise Vistas Utilities	06/20/2003	Issued-Adequate	09/25/03	B	19	21	18	30	*12.91*	Lake Mohave
22-400999.0000	Sunrise Vistas, Tract 4108-M	Sunrise Vistas Utilities	06/20/2003	Issued-Adequate	09/25/03	B	19	21	18	30	*12.91*	Lake Mohave
22-401084.0000	The Villas at Desert Horizons, Tract 4162-B	Bermuda WaterCompany, Inc.	09/17/2003	Issued-Adequate	01/12/04	B	19	22	23	33	13.86	Lake Mohave
22-401105.0000	Gateway Acres, Tracts, 1,2,7 & 8	None	10/03/2003	Issued-Inadequate	05/07/04	B	25	20	3,5,7	352	137.98	Detrital Valley
22-401108.0000	Havasu RV Resort	Arizona American Water Company	10/06/2003	Issued-Adequate	11/12/03	B	14	20	15	169	41.00	Lake Havasu
22-401117.0000	Rodeo Park Tract 4145-C	Bermuda Water Company, Inc.	10/15/2003	Issued-Adequate	11/03/03	B	19	22	23	60	25.20	Lake Mohave
22-401144.0000	Coyote Run Tract, 4176-A	Arizona - American Water Company	11/18/2003	Issued-Adequate	02/18/04	B	19	22	23	42	17.65	Lake Mohave

NOTE: Demand estimates in italics are based solely on residential demand from lot numbers.

WATER ADEQUACY APPLICATIONS IN MOHAVE COUNTY SINCE 2001

File Number	Subdivision	Water Provider	lication Recei	AppStatus	AppStatusD	Quad	Township	Range1	Section1	Lots	totalDemand	SubbasinName
22-401201.0000	Fairway Estates Tract 4097D	Bermuda Water Company	01/05/2004	Issued-Adequate	02/13/04	B	19	22	35	48	20.16	Lake Mohave
22-401219.0000	Sage Hill, Tract 4179-A	Bermuda Water Company, Inc	01/23/2004	Issued-Adequate	02/23/04	B	19	22	25	46	19.32	Lake Mohave
22-401293.0000	Sunset Vista	NA	03/19/2004	Issued-Inadequate	05/07/04	B	25	19	04	10	3.08	Detrital Valley
22-401294.0000	Lake Mohave Ranchos, Unit 6	NA	03/19/2004	Issued-Inadequate	04/26/04	B	26	19	25	6	1.84	Hualapai Valley
22-401347.0000	Sunrise Vista, Tract 4108-O	Sunrise Vista Utilities	08/04/2004	Issued-Adequate	12/15/04	B	19	21	18	50	23.27	Lake Mohave
22-401351.0000	Vineyard at SunRidge Unit 3	North Mohave Valley Corp	05/07/2004	Issued-Adequate	12/20/04	B	21	21	30	8	3.38	Lake Mohave
22-401352.0000	Sun Valley Unit fII, Tract 4185	Bermuda Water Company	05/07/2004	Withdrawn	07/13/05	B	18	22	01	179	75.69	Lake Mohave
22-401366.0000	Fairway Estates Tract 4097C	Bermuda Water Company	05/17/2004	Issued-Adequate	09/09/04	B	19	22	35	47	21.61	Lake Mohave
22-401368.0000	Mohave Valley Industrial Park (Commercial Subdivision)	Bermuda Water Company, Inc.	05/18/2004	Denied	12/29/05	B	18	22	03	32	103.13	Lake Mohave
22-401370.0000	Los Altos, Tract 4184	Arizona-American Water Company	05/19/2004	Issued-Adequate	08/22/05	B	19	22	25	21	9.26	Lake Mohave
22-401383.0000	Pioneer Valley	Dry Lot	06/02/2004	Issued-Adequate	08/02/04	B	18	18	35	64	21.75	Sacramento Valley
22-401466.0000	El Rio Country Club, Tract 4177-A	Bermuda Water Company & Ft Mohave Tribal Utility	07/28/2004	Issued-Adequate	05/04/05	B	18	22	11	161	596.53	Lake Mohave
22-401480.0000	Topock Village Estates, Tract 4190	Golden Shores Water Company	08/06/2004	Denied	09/09/05	B	16	21	23	206	152.50	Lake Mohave
22-401491.0000	Sage Hill, Tract 4179-B	Bermuda Water Company	08/23/2004	Withdrawn	04/27/05	B	19	22	25	53	24.37	Lake Mohave
22-401506.0000	Sage Hill, Tract 4179-B, Phase II	Bermuda Water Company	09/15/2004	Issued-Adequate	11/24/04	B	19	22	25	53	24.37	Lake Havasu
22-401582.0000	North Pointe	Arizona American Water Company - Havasu	11/22/2004	Issued-Adequate	12/28/04	B	14	20	17	455	193.62	Lake Havasu
22-401592.0000	Lake Mohave Knoll Estates	Dry Lot Subdivision	12/03/2004	Issued-Inadequate	12/07/04	B	23	18	21	127	54.65	Sacramento Valley
22-401649.0000	Lake Mead Ranchos Unit 4	Dry Lot	02/17/2005	Issued-Inadequate	03/15/05	B	28	18	01	492	*211.72*	Hualapai Valley

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WATER ADEQUACY APPLICATIONS IN MOHAVE COUNTY SINCE 2001

File Number	Subdivision	Water Provider	plication Rece	AppStatus	AppStatusD	Quad	Township	Range1	Section1	Lots	totalDemand	SubbasinName
22-401650.0000	Joshua Park Unit No. 1	Dry Lot	02/17/2005	Issued-Inadequate	03/15/05	B	28	17	09	57	*24.53*	Hualapai Valley
22-401651.0000	Mead-O-Rama	Dry Lot	02/17/2005	Issued-Adequate	03/04/05	B	29	18	35	421	1250.66	Hualapai Valley
22-401661.0000	Lake Cimarron Estates, Unit II, Tract #4187	Willow Valley Water Company	03/08/2005	Issued-Adequate	03/11/05	B	18	22	23	35	14.70	Lake Mohave
22-401688.0000	The Estates at Cimarron Lake Tract 4200	Willow Valley Water Company	03/29/2005	Issued-Adequate	11/03/05	B	18	22	23	35	23.68	Yuma
22-401736.0000	The Trails Tract No. 4194	Willow Valley Water Company	04/19/2005	Issued-Adequate	01/03/06	B	18	22	23	13	5.09	Lake Mohave
22-401760.0000	Sunset Palms, Tr. 4183-A	Bermuda Water Co.	05/10/2005	Issued-Adequate	06/06/05	B	19	22	26	33	14.03	Lake Mohave
22-401766.0000	The Coves on The Colorado River	Fort Mohave Tribal Utility Authority	05/25/2005	Issued-Adequate	03/13/06	B	17	22	23	99	219.87	Lake Mohave
22-401778.0000	El Rio Country Cllub, Tract 4177-B, Phase II	Bermuda Water Company	06/14/2005	Issued-Adequate	09/01/05	B	18	22	11	143	60.64	Lake Mohave
22-401780.0000	Mountain Vista Ranches Phase I	Dry Lot Subdivision	06/14/2005	Withdrawn	03/10/06	B	24	15	35	7	4.64	Hualapai Valley
22-401784.0000	Sun Valley Unit II, Tract 4185-B	Bermuda Water Company	06/14/2005	Issued-Inadequate	10/06/05	B	18	22	01	18	7.56	Lake Mohave
22-401802.0000	Lake Mohave Ranchos Unit 16	Dry lot	06/29/2005	Issued-Inadequate	07/14/05	B	25	18	07	9	*3.87*	Detrital Valley
22-401809.0000	Brett Canyon Estates, Tract 4196	Bermuda Water Company	07/05/2005	Issued-Adequate	08/04/05	B	19	22	25	55	22.16	Lake Mohave
22-401814.0000	Virgin Acres, aka Biasi Ranch Estates	Biasi Water Company	07/11/2005	Issued-Adequate	09/08/05	B	41	15	29	19	*8.18*	Virgin River
22-401816.0000	Pioneer Valley and Paradise Trail's Tr. 3802	Double R Water Distributors, Inc.	07/13/2005	Issued-Adequate	08/15/05	B	18	18	35 & 25	232	562.25	Sacramento Valley
22-401821.0000	Sagebrush Trails Estates	Sagebrush Trails Domestic Water ID	07/18/2005	Issued	10/06/05	B	14	17	03	97	30.82	Sacramento Valley
22-401832.0000	Mystic Canyon, Tract 4197	Bermuda Water Company	07/28/2005	Issued-Adequate	08/15/05	B	18	21	07	266	108.30	Lake Mohave
22-401837.0000	Desert Canyon at SunRidge	North Mohave Valley Corp.	08/03/2005	Issued-Adequate	02/02/06	B	21	21	21	141	55.23	Lake Mohave
23-401674.0000	The Villages at White Hills	NA	03/18/2005	Pending		B	27	21	25	30464	15737.91	Detrital Valley
23-401774.0000	The Ranch at White Hills	Double Diamond Utilities	06/03/2005	Pending		B				25000	7976.61	Detrital Valley

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WATER ADEQUACY APPLICATIONS IN MOHAVE COUNTY SINCE 2001

File Number	Subdivision	Water Provider	lication Recei	AppStatus	AppStatusD	Quad	Township	Range1	Section1	Lots	totalDemand	SubbasinName
23-401823.0000	Golden Valley 5800	To Be Determined	07/18/2005	Issued	10/19/05	B	21	18	34	32000	15910.90	Sacramento Valley
23-401861.0000	Valley Springs Estates Subdivision	Bermuda Water Company	08/29/2005	Issued	02/01/06	B	19	22	36	132	57.72	Lake Mohave
23-401875.0000	Stetson Ranch	Bermuda Water Company	09/20/2005	Issued	05/01/06	B	19	22	25	57	23.45	Lake Mohave
23-401934.0000	Mesa Verde Subdivision	Arizona American Water Company	11/07/2005	Pending		B	19	22	23	31	13.04	Lake Mohave
22-401954.0000	Sun Valley Unit II, Tract 4185-D	Bermuda Water Company	12/01/2005	Issued-Adequate	01/03/06	B	18	22	01	50	19.76	Lake Mohave
22-402005.0000	Joshua Park Unit 1	Dry Lot	01/24/2006	Issued-Inadequate	01/26/06	B	28	17	09	141	*60.68*	Hualapai Valley
22-402006.0000	Lake Mead Ranchos, Unit 6	Dry Lot	01/24/2006	Issued-Inadequate	01/26/06	B	29	18	27	402	*172.99*	Hualapai Valley
22-402007.0000	Lake Mead Ranchos Unit 7	Dry Lot	01/24/2006	Issued-Inadequate	01/26/06	B	29	18	23	569	*244.86*	Hualapai Valley
22-402045.0000	The Borgata on Mountain View, Tract No. 4205	Bermuda Water Company	03/02/2006	Pending		B	19	22	14	107	63.09	Lake Mohave
22-402048.0000	Desert Palm at Beaver Dam	Biasi Water Company, Inc.	03/06/2006	Pending		B	41	15	33	47	19.30	Virgin River
22-402136.0000	Lake Mead City Unit No. 15-29-17	N/A	04/26/2006	Pending		B	29	17	15	25	33.33	Lake Mohave
not yet assigned	Silverado Estates	N/A	4/28/2006	Pending		B	20	13	9,15,17, 21,22,2 3,27,28, 29,33	17644	14616.00	Big Sandy

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MOHAVE COUNTY APPLICATIONS PRIOR TO 2001 FROM 1WRF.DB

PFX	DWR .	SUBDIVISION	WATER PROVIDER	STATUS	DATE ISSUED	LOC-Q	LOC-T	LOC-T2	LOC-R	LOC-R2	LOC-S	LOTS	ALLOCATION (AF)	GW BASIN
20	400682	Scenic Arizona	Virgin Mountain Utilities Company	Ret-WAL	26-Mar-02	B	39	N	16	W	10,11, 14,15			Virgin River
21	401728	Beaver Dam Water Company	Beaver Dam Water Company	PENDDADE		B								Virgin River
21	300162	Bullhead City, City of		Dead		B		N		W				Lake Mohave
21	300106	Cerbat Water Company	Cerbat Water Company, Inc.	Ret-DADE		B	22	N	17	W	01, 12, 13		882	Hualapai Valley
21	401425	Walnut Creek Water Company	Walnut Creek Water Company	PENDDAWS		B	20	N	17	E	07			Sacramento Valley
22	300115	Beaver Dam Virgin Acres #1	Beaver Dam Water Company	Issued	10-Jul-96	B	41	N	15	W	32	51	18.57	Virgin River
22	300051	Sellan Estates, Tract 5024	North Mohave Valley Water Company	Issued	10-Oct-95	B	21	N	21	W	30	6		
22	300320	Centennial Park Unit 1	Centennial Park Utilities	Issued	11-Aug-99	B	41	N	6	W	18	66	34.5	Kanab Plateau
22	400065	Zafiro Acres-Sunward Ho Ranches	dry lot	Issued	11-May-99	B	22	N	16	W	05	7		Hualapai Valley
22	300139	Vista del Rio Tract 5043	Bermuda Water Company, Inc.	Issued	12-Jul-96	B	19	N	22	W	11	35	9.8	Lake Mohave
22	300085	Willow Valley Estates 20, Tract 4134A	Willow Valley Water Company	Issued	13-Dec-96	B	18	N	22	W	21	27	7.56	Lake Mohave
22	300156	Greater Kingman Industrial Park	dry lot	Issued	14-Jun-96	B	22	N	15	W	05, 17	19		Hualapai Valley
22	400638	Pegasus Ranch Estates,Tract 5083 Unit 3	Citizens Utilities Co.	Issued	15-Jan-02	B	21	N	21	W	29	20	5.6	Lake Mohave
22	400633	Sun Ridge Estates Tract 4042J	North Mohave Valley Water Company	Issued	15-Jan-02	B	21	N	21	W	21	36	9.8	Lake Mohave
22	300221	Sunset Ranchos II, Tract 4156	Bermuda Water Company, Inc.	Issued	15-Jan-97	B	19	N	22	W	13	22	6.16	Lake Mohave
22	400745	Lake Havasu Heights	Havasu Heights Domestic Water Improvement District	Issued	16-Aug-02	B	15	N	19	W	07	21		Sacramento Valley
22	400515	Santa Evinita, Tract 4167-A	Bermuda Water Company, Inc.	Issued	17-Jul-01	B	19	N	22	W	23	34	14.28	Lake Mohave
22	400496	Villas At Desert Horizons, Tract 4162-B	Bermuda Water Company, Inc.	Issued	17-Jul-01	B	19	N	22	W	23	48	20.16	Lake Mohave
22	400832	Hualapai Vista Estates, Tract 3811	dry lot	Issued	17-Oct-02	B	22	N	16	W	12, 13	41		Hualapai Valley
22	300213	Vineyard at Sun Ridge, Tract 5049	North Mohave Water Company	Issued	18-Dec-96	B	21	N	21	W	30	67	22.54	Lake Mohave
22	400330	Palo Verde Shores	Citizens Utilities Company-Mohave	Issued	18-Jul-00	B	20	N	22	W	29	28	9.4	Lake Mohave
22	300215	Arroyo Park at Desert Foothills Estates, Tract 5046	Citizens Utilities Company-Mohave	Issued	18-Nov-96	B	20	N	21	W	05	63	17.6	Lake Mohave

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22	300214	Terraces at Desert Foothills Estates,The	Citizens Utilities Company-Mohave	Issued	18-Nov-96	B	20	N	21	W	05	123	34.4	Lake Mohave
22	300411	Vista del Rio #2, Tract 5061	Bermuda Water Company, Inc.	Issued	19-Jun-98	B	19	N	22	W	11	18	5.7	Lake Mohave
22	300097	Palo Verde Plaza, Tract 5025	Citizens Utilities Company-Mohave	Issued	20-Mar-96	B	20	N	22	W	35	15	4.3	Lake Mohave
22	300066	Paradise Trails Tract #3802	Double R Water Distributors, Inc.	Issued	20-Nov-95	B	18	N	18	W	25, 35	231	407	Sacramento Valley
22	300075	Sunnyvale Acres, Sunward Ho! Ranches #2	dry lot	Issued	20-Nov-95	B	23	N	16	W	09	22		Hualapai Valley
22	400713	Lake Mead Ranchos Unit 5	dry lot	Issued	21-May-02	B	29	N	18	W	25	541		Hualapai Valley
22	400714	Lake Mead Ranchos Unit 7	dry lot	Issued	21-May-02	B	29	N	18	W	23	567		Hualapai Valley
22	400071	Sunrise Vistas Tract 4108-F	Sunrise Vistas Utilities Company	Issued	21-May-99	B	19	N	21	W	18	28	11.8	Lake Mohave
22	400053	Vista del Rio # 4, Tract 5067	Bermuda Water Company, Inc.	Issued	21-May-99	B	19	N	22	W	11	21	7.1	Lake Mohave
22	400113	Desert Horizons, Tract 4161	Bermuda Water Company, Inc.	Issued	21-Sep-99	B	19	N	22	W	23	44	18.48	Lake Mohave
22	300115	Beaver Dam Virgin Acres #1	Beaver Dam Water Company	Issued	22-Mar-96	B	41	N	15	W	32	51	18.57	Virgin River
22	400175	East Shore Villas #1 Tract 5070	Citizens Utilities Company-Mohave	Issued	22-Nov-99	B	20	N	22	W	9 & 16	51	17.1	Lake Mohave
22	400170	Sunrise Vistas Tract 4108-E	Sunrise Vistas Utilities Company	Issued	22-Nov-99	B	19	N	21	W	18	57	23.94	Lake Mohave
22	400987	Desert Lakes Estates, Tract 4152-C	Bermuda Water Company	Issued	22-Oct-03	B	19	N	22	W	36	42		Lake Mohave
22	300043	Greenwood Village #1	dry lot	Issued	23-Aug-95	B	22	N	12	W	29,30, 31,32	214	215	Big Sandy
22	300153	Bullhead Airpark Phase 1 (Tract 5009)	North Mohave Valley Corporation	Issued	23-Jul-96	B	21	N	21	W	31, 32	7	2.1	Lake Mohave
22	300328	Lake Mead Ranchos Unit 3	dry lot	Issued	23-Jul-97	B	28	N	18	W	11	592	35	Hualapai Valley
22	400002	Emerald River Estates Tract 4093-B	Bermuda Water Company, Inc.	Issued	24-Aug-99	B	19	N	22	W	25	62	25.4	Lake Mohave
22	400003	Palm Estates #2, Tract 4104B	Bermuda Water Company, Inc.	Issued	24-Aug-99	B	19	N	22	W	14	25	7	Lake Mohave
22	400081	Sunlake Village Tract 3700-C	Havasu Water Company	Issued	24-Aug-99	B	14	N	20	W	21	52	14.28	Lake Mohave
22	300485	Virgin Acres	Beaver Dam Water Company	Issued	24-Jul-98	B	41	N	15	W	32	65		Virgin River
22	400052	Vista del Rio # 3, Tract 5066	Bermuda Water Company, Inc.	Issued	24-May-99	B	19	N	22	W	11	12	4.03	Lake Mohave
22	400014	Last Lap Subdivision	dry lot	Issued	25-Feb-99	B	15	N	17	W	31	23		Sacramento Valley
22	400683	Canterbury Estates, Tract 3702-A	Havasu Water Company	Issued	26-Mar-02	B	14	N	20	W	21	63	17.64	Lake Havasu
22	300087	Fountain Hills Estates	Cerbat Water Company, Inc.	Issued	26-Sep-96	B	22	N	17	W	13	66		Hualapai Valley
22	300196	Golden Horseshoe Ranchos Units 3 & 4	dry lot	Issued	26-Sep-96	B	27	N	19	W	09,17	192		Detrital Valley
22	400475	Desert Lakes Estates Tract 4159 Unit H	Bermuda Water Company, Inc.	Issued	27-Apr-01	B	19	N	22	W	35	6	2.35	Lake Mohave
22	400296	Rodeo Park Tract 4145-A	Bermuda Water Company, Inc.	Issued	28-Feb-01	B	19	N	22	W	23	24		Lake Mohave

MOHAVE COUNTY APPLICATIONS PRIOR TO 2001 FROM 1WRF.DB

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22	400258	Walnut Creek Estates Unit 3 Tract 3043-B	Walnut Creek Water Company, Inc.	Issued	28-Mar-00	B	20	N	17	W	07	44	12	Sacramento Valley
22	400526	Arroyo Vista Estates Tract 4077 E Unit 2	Bermuda Water Company, Inc.	Issued	29-Jun-01	B	19	N	22	W	12	36		Lake Mohave
22	400727	Walnut Creek Estates	Walnut Creek Water Co., Inc.	Issued	29-May-02	B	20	N	17	W	07	73		Sacramento Valley
22	300326	Desert Lakes Golf Course & Estates # F	Bermuda Water Company, Inc.	Issued	29-Oct-97	B	19	N	22	W	35	38	10.6	Lake Mohave
22	300355	Pegasus Ranch Tract 5030	Citizens Utilities Company-Mohave	Issued	29-Oct-97	B	21	N	22	W	29	14	3.92	Lake Mohave
22	300367	Sun Valley Tract 4064B	Bermuda Water Company, Inc.	Issued	29-Oct-97	B	18	N	22	W	01	99	28	Lake Mohave
22	400082	Sunrise Vistas Tract 4108-G	Sunrise Vistas Utilities Company	Issued	30-Aug-99	B	19	N	21	W	18	27	11.34	Lake Mohave
22	400142	Willows at Cimarron Lake #2 Tract 4130-A	Willow Valley Water Company	Issued	30-Aug-99	B	18	N	22	W	23	79	22	Lake Mohave
22	400514	Valle Vista Unit 3 Tract 1204	Truxton Canyon Water Company	Issued	30-May-01	B	24	N	15	W	34	10		Hualapai Valley
22	400235	Los Pueblos @Desert FoothillsTract#5077	Citizens Utilities Company-Mohave	Issued	31-Jan-00	B	20	N	21	W	05	71	23.9	Lake Mohave
22	300439	Sunward Ho! Ranches	dry lot	Issued	3-Apr-98	B	23	N	16	W	19,30, 31,33	430		Hualapai Valley
22	400081	Sunlake Village Tract 3700-C	Havasu Water Company	Issued	3-Dec-99	B	14	N	20	W	21	52	14.28	Lake Mohave
22	300296	Sunrise Vistas Tract 4108-D	Sunrise Vistas Utilities Company	Issued	3-Jun-97	B	19	N	21	W	18	40	11.2	Lake Mohave
22	300039	Sawmill Creek Tract 3049	dry lot	Issued	4-Aug-95	B	20	N	16	W	02	13	3.64	Sacramento Valley
22	300568	Virgin Acres	Beaver Dam Water Company	Issued	4-Dec-98	B	41	N	15	W	32	40		Virgin River
22	400538	Fairway Estates Tract 4097 E	Bermuda Water Company, Inc.	Issued	4-Mar-02	B	19	N	22	W	35	41	17.2	Lake Mohave
22	300512	Cedar Ridge Estates	dry lot	Issued	4-Sep-98	B	22	N	17	W	11 & 14	38		Hualapai Valley
22	400660	Refuge, The	Citizens Utilities	Issued	5-Feb-02	B	14	N	20	W	20, 21	362	101	Lake Havasu
22	400220	Desert Lakes Estates Tract 4152B	Bermuda Water Company, Inc.	Issued	5-Jan-00	B	19	N	22	W	36	40	16.8	Lake Mohave
22	400213	Chaparral Mesa II	Kingman, City of	Dead	5-Jan-99	B	22	N	16	W	28	40		
22	300025	Desert Lakes Estates Tract 4152A	Bermuda Water Company, Inc.	Issued	5-Mar-96	B	19	N	22	W	36	31	8.68	Lake Mohave
22	400180	Villas at Desert Horizons, The, T 4162-A	Bermuda Water Company, Inc.	Issued	5-Nov-99	B	19	N	22	W	23	51	21.4	Lake Mohave
22	400274	Golden Horseshoe Ranchos Unit #5	White Hills Water Company	Issued	7-Apr-00	B	27	N	19	W	19	375		Detrital Valley
22	300222	Golden Horseshoe Ranchos #2	dry lot	Issued	7-Nov-96	B	27	N	19	W	07	540		Detrital Valley
22	300507	Virgin Village I & II	Blasi Water Company	Issued	7-Oct-98	B	41	N	15	W	32	93		Virgin River

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22	300024	Sunlake Village Tract 3700A	Havasu Water Company	Issued	8-Aug-95	B	14	N	20	W	21	35	9.67	Lake Havasu
22	300407	Sun Lakes Village Tract 3700-B	Havasu Water Company	Issued	9-Mar-98	B	14	N	20	W	21	40	11.2	Lake Mohave
22	400703	Arizona Gateway	Arizona-American Water Company	Issued		B	16	N	20	W	13	51		Sacramento Valley
22	300239	Camp Mohave Heights, Tract 4086-B	Citizens Utilities Company-Mohave	Dead		B	19	N	22	W	23	21		Lake Mohave
22	400798	Canterbury Estates Tract 3702-B	Arizona-American Water Company	Issued		B	14	N	20	W	21	45	12.6	Lake Havasu
22	400697	Desert Lakes Golf Course & Estates Tract 4163	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35	32	13.4	Lake Mohave
22	400524	Coves on the Colorado River, The	Fort Mohave Tribal Utilities Authority	Issued		B	17	N	22	W	23	99		Lake Mohave
22	400542	Del Rio Estates	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	32	7	2.34	Lake Mohave
22	300241	Del Rio Estates, Tract 4102	Citizens Utilities Company-Mohave	Dead		B	20	N	22	W	32	7		Lake Mohave
22	400912	Flannery & Allen	dry lot	Issued		B	27	N	20	W	31	55		Detrital Valley
22	401105	Gateway Acres	dry lot	Issued		B	25	N	20	W	03,05, 07,11, 13-15,17, 21,23	352		Detrital Valley
22	400766	Hillcrest Park Tract 5063 - Phase I	Arizona-American Water Company	Returned		B	21	N	21	W	29, 32	80		Lake Mohave
22	400741	Hillview Ranches	dry lot	Issued		B	23	N	16	W	07	9		Hualapai Valley
22	300558	Joshua Park Unit #1	dry lot	Issued		B	28	N	17	W	09	48	6.7	Hualapai Valley
22	400427	Lake Havasu Estates Unit 13	dry lot	Issued		B	17	N	16	W	31	184		Sacramento Valley
22	400428	Lake Havasu Estates Unit 14	dry lot	Issued		B	17	N	16	W	29	372		Sacramento Valley
22	400425	Lake Havasu Estates Unit 9	dry lot	Issued		B	17	N	17	W	25	120		Sacramento Valley
22	400872	Lake Juniper	dry lot	PENDWAS		B	22	N	17	W	11, 14	16		Hualapai Valley
22	400625	Legends at Desert Foothills Estates, The	Citizens Utilities Co.	Issued		B	20	N	21	W	05	24	23.5	Lake Mohave
22	400625	Legends Unit 2 at Desert Foothills Estates, Tract 5099	Citizens Utilities Company	Issued		B	20	N	21	W	05	46		Lake Mohave
22	400839	Linda Vista	Arizona American Water Company	Issued		B	19	N	22	W	23	42	17.6	Lake Mohave
22	400899	Linda Vista, Tract 4178	American Water Company	PENDWAS		B	19	N	22	W	23	42		Lake Mohave
22	400618	Mesa Vista, Tract 4169	Bermuda Water Company	Issued		B	19	N	22	W	24	131	55	

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22	400579	Moon River Resort, Inc.	Bermuda Water Company, Inc.	Issued		B	18	N	22	W	03	89	19.9	Lake Mohave
22	400466	Mountain Shadow Estates, Tract 3806	subdivision wells	Issued		B	20	N	14	W	08	54		
22	401780	Mountain Vista Ranches Phase I	dry lot	pending		B	24	N	15	W	35	7		Hualapai Valley
22	300149	Paradise(Units)/Sun West(Unit 3)Acres	dry lot	Issued		B	20	N	18	W	19, 21, 27, 29, 31, 33, 35	862		Sacramento Valley
22	401383	Pioneer Valley	dry lot	PENDWAS		B	18	N	18	W	35	35		Sacramento Valley
22	400755	Rodeo Park Tract 4145-B	Bermuda Water Company	Issued		B	19	N	22	W	23	31	13	Lake Mohave
22	400860	Santa Evinita, Tract B	Bermuda Water Company	Issued		B	19	N	22	W	23	40	16.38	Lake Mohave
22	400424	Shadow Mountain Acres Unit Two & Three	dry lot	Issued		B	24	N	14	W	27 & 35	93		Hualapai Valley
22	300264	Silverado Acre Estates Unt 1,Tr 3805	dry lot	Issued		B	20	N	13	W	17	340		Big Sandy
22	400553	Sunrise Vistas Tract 4108-H	Sunrise Vistas Utilities Company	Issued		B	19	N	21	W	18	6	2.52	Lake Mohave
22	400554	Sunrise Vistas Tract 4108-I	Sunrise Vistas Utilities Company	Issued		B	19	N	21	W	18	31	13	Lake Mohave
22	400612	Sunrise Vistas Tract 4108-J	Sunrise Vistas Utilities Company	Issued		B	19	N	21	W	18	22	9.24	Lake Mohave
22	400801	Sunrise Vistas Tract 4108-K	Sunrise Vistas Utilities Company	Issued		B	19	N	21	W	18	22	9.2	Lake Mohave
22	400877	Sunrise Vistas - Tract 4108-L	Sunrise Vistas Utilities Company	Issued		B	19	N	21	W	18	23	9.66	Lake Mohave
22	400999	Sunrise Vistas - Tract4108-M	Sunrise Vistas Utilities	Issued		B	19	N	21	W	18	30	12.6	Lake Mohave
22	400998	Sunrise Vistas - Tract4108-N	Sunrise Vistas Utilities	Issued		B	19	N	21	W	18	30	14.2	Lake Mohave
22	400445	Sunset Ranchos II, Tract 4156	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	13	18		
22	400445	Sunset Ranchos Unit 2		Issued		B	19	N	22	W	13			Detrital Valley
22	401293	Sunset Vista	dry lot	Issued		B	25	N	19	W	04	10		Detrital Valley
22	400852	Terra Vista Skies	Beaver Dam Water Company	PENDWAS		B	40	N	16	W	32	30		Virgin River
22	400791	Willow Valley Estates Tract 4134-B	Willow Valley Water Company	Issued		B	18	N	22	W	21	29	12.1	Lake Mohave
22	401816	Pioneer Valley & Paradise Trails Tr. 3802	Double D Water Distributors, Inc.	PENDWAS		B	18	N	18	W	25,35	232		Sacramento Valley
22	401814	Virgin Acres, aka Biasi Ranch	Biasi Water Company	PENDWAS		B	41	N	15	W	29			Virgin River
22	401821	Sagebrush Trails Estates	Sagebrush Trails Domestic Water Improvement District	PENDWAS		B	14	N	17	W	03	97		Sacramento Valley
23	300230	Sterling, Arizona		Issued	26-Jul-99	B	16	N	20	W				Sacramento Valley

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23	401774	Ranch at White Hills	Double Diamond Utilities	PENDAAWS		B	28	N	19	W				Detrital Valley
23	401774	Ranch at White Hills	Double Diamond Utilities	PENDAAWS		B	27	N	19	W				Detrital Valley
23	401774	Ranch at White Hills	Double Diamond Utilities	PENDAAWS		B	27	N	21	W				Detrital Valley
23	401774	Ranch at White Hills	Double Diamond Utilities	PENDAAWS		B	28	N	20	W				Detrital Valley
23	401774	Ranch at White Hills	Double Diamond Utilities	PENDAAWS		B	27	N	20	W				Detrital Valley
23	401674	Villages at White Hills, The	Double Diamond Utilities	PENDAAWS		B	27	N	20	W	16,20, 21,23, 30	30464		Detrital Valley
23	401674	Villages at White Hills, The	Double Diamond Utilities	PENDAAWS		B	27	N	21	W	25	30464		Detrital Valley
23	401823	Golden Valley 5800		PENDAAWS		B	20	N	18	W	02-04,08-11,14, 16	32000		Sacramento Valley
23	401823	Golden Valley 5800		PENDAAWS		B	21	N	18	W	34	32000		Sacramento Valley
33	96790	Wind Rivers Resources LLC	Virgin Valley Water District			B	39	N	16	W				Virgin River
		Cedar Hill Ranches #8	dry lot	Unsub	10-Jul-96	B	21	N	13	W	33, 34, 35, 36			Big Sandy
		Pioneer Valley		Unsub	12-Aug-97	B	18	N	18	W	35			Sacramento Valley
		Toro Acres, Sunward Ho! #2	dry lot	Issued	12-Feb-02	B	23	N	16	W	18,19	31		Hualapai Valley
		Stagecoach Trails Unit 13		Unsub	13-Jan-99	B	17	N	16	W	31			Sacramento Valley
		Stagecoach Trails Unit 13		Unsub	13-Jan-99	B	17	N	17	W	25			Sacramento Valley
		Golden Valley County Improvement Dist #1		Issued	13-Jul-95									
		Sun Valley Tract 4018A,B		Issued	14-Jul-97	B	19	N	22	W	36	302		
		Stagecoach Trails Unit 8		Unsub	15-Jun-98	B	15	N	17	W	05			Sacramento Valley
		Stagecoach Trails Unit 8		Unsub	15-Jun-98	B	16	N	16	W	19,27			Sacramento Valley

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		Stagecoach Trails Unit 8		Unsub	15-Jun-98	B	16	N	17	W	21,23, 27,29			Sacramento Valley
		Mohave Sunrise Tract 1084B	Bermuda Water Company, Inc.	Issued	18-May-89	B	19	N	22	W	11	99		Lake Mohave
		Mountain End Ranches		Unsub	19-Apr-96	B	24	N	12	W	05			Peach Springs
		Willow Creek Ranch, Unit 3		Unsub	1-Apr-98	B	21	N	11	W	22,27, 29			Big Sandy
		Goldroad Station #11		Unsub	20-Mar-97	B	20	N	18	W	32			Sacramento Valley
		Round Valley Ranches	dry lot	Unsub	22-Jul-96	B	21	N	13	W	33-36			Big Sandy
		Unnamed property, Mohave Co.	dry lot	Unsub	22-May-96	B	23	N	11	W	27,35			Big Sandy
		Courtney Park East Tract 4147-B	Bermuda Water Company, Inc.	Issued	23-Jun-97	B	19	N	22	W	23	64	14.33	Lake Mohave
		Stagecoach Trails Unit 4		Unsub	25-Aug-97	B	15	N	15	W	15			Sacramento Valley
		Stagecoach Trails Unit 4		Unsub	25-Aug-97	B	15	N	16	W	19, 29, 31			Sacramento Valley
		Willow Creek Ranch, Unit 6		Unsub	26-Mar-99	B	22	N	11	W	33			Big Sandy
		Willow Creek Ranch, Unit 6		Unsub	26-Mar-99	B	21	N	11	W	03,05			Big Sandy
		Willow Creek Ranch, Unit 5		Unsub	27-Oct-98	B	22	N	11	W	23,25, 35			Big Sandy
		Round Valley Ranches	dry lot	Unsub	27-Sep-96	B	21	N	12	W	31			Big Sandy
		Round Valley Ranches	dry lot	Unsub	27-Sep-96	B	21	N	13	W	33-36			Big Sandy
		Unnamed property, Mohave Co.	dry lot	Unsub	29-Jan-96	B	23	N	15	W	18-20, 29, 30			Hualapai Valley
		Willow Tree Resort HYDRO STUDY	White Hills Water Company	Dead	29-Nov-95	B	27	N	20	W	19,30	1307	1000	Detrital Valley
		Sun Valley Tract 4063B	Bermuda Water Company, Inc.	Issued	29-Oct-97	B	19	N	22	W	36			Lake Mohave
		Stagecoach Trails Unit 7		Unsub	2-Apr-98	B	15	N	17	W	07,09, 17,19			Sacramento Valley
		Stagecoach Trails Unit 7		Unsub	2-Apr-98	B	16	N	17	W	25,33, 35			
		Willow Creek Ranch, Unit 1		Unsub	30-Jul-97	B	21	N	11	W	17,15, 14,22, 23			Big Sandy

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		Stagecoach Trails Unit 11		Unsub	3-Nov-98	B	16	N	17	W	01,03, 05			Sacramento Valley
		Hidden Meadows Unit 1		Unsub	4-Mar-99	B	23	N	16	W	03			Hualapai Valley
		Stagecoach Trails Unit 12		Unsub	8-Dec-98	B	15	N	17	W	07,17, 21			Sacramento Valley
		Stagecoach Trails Unit 12		Unsub	8-Dec-98	B	16	N	17	W	29			Sacramento Valley
		Stagecoach Trails Unit 5		Unsub	8-Jan-98	B	16	N	16	W	33			
		Stagecoach Trails Unit 5		Unsub	8-Jan-98	B	15	N	16	W	03,05, 07,09, 17			
		Stagecoach Trails Unit 5		Unsub	8-Jan-98	B	15	N	17	W	13			
		Willow Creek Ranch, Unit 2		Unsub	8-Jan-98	B	21	N	11	W	21,22			Big Sandy
		Stagecoach Trails Unit 18		Unsub	8-Mar-00	B	16	N	16	W				Sacramento Valley
		Stagecoach Trails Unit 6		Unsub	9-Feb-98	B	16	N	16	W	29,31			Sacramento Valley
		Stagecoach Trails Unit 6		Unsub	9-Feb-98	B	15	N	17	W	01,03, 11,21, 29,33			Sacramento Valley
		Mountain Shadow Estates	dry lot	Unsub	9-Oct-96	B	20	N	14	W	08			Big Sandy
		Stagecoach Trails Unit 10		Unsub	9-Sep-98	B	17	N	17	W	19,31			Sacramento Valley
		Stagecoach Trails Unit 10		Unsub	9-Sep-98	B	16	N	17	W	07,09, 11			Sacramento Valley
		Agua View Tract 1051	Fort Mohave Tribal Utilities	Issued		B	17	N	22	W	23	56	15.6	Lake Mohave
		Airport Way Ranches		Unsub		B	21	N	16	W	04			Sacramento Valley
		Amatista Acres, Sunward Ho! Rn	dry lot	Issued		B	23	N	16	W	29	17		Hualapai Valley
		American Business Park	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35			Lake Mohave
		American Business Park Tct4075	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35			Lake Mohave
		Antelope Valley Ranch		Unsub		B	23	N	10	W	17, 19			Big Sandy
		Antelope Valley Ranch		Unsub		B	23	N	11	W	25			Big Sandy
		Antelope Valley Ranch		Unsub		B	23	N	11	W	11			Peach Springs
		Antelope Valley Ranch		Unsub		B	22	N	11	W	01			Big Sandy
		Antelope Valley Ranch		Unsub		B	24	N	10	W	21, 31, 33			Peach Springs
		Arizona West Tract 1112	Truxton Canyon Water Company	Issued		B	23	N	15	W	11	256	81.7	Hualapai Valley

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		Arizona West Tract 1112	Truxton Canyon Water Company	Ret-Sub		B	23	N	15	W	11			Hualapai Valley
		Arrowhead Ranch		Dead		B	19	N	22	W	23			Lake Mohave
		Arroyo Vista Estates	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	12			Lake Mohave
		Arroyo Vista Estates Tract 4077E	Bullhead City, City of	Dead		B	19	N	22	W	12	57	16	Lake Mohave
		Aztec Junction Tract 3019	Valley Pioneer Water Company	Issued		B	12	N	18	W	10			Lake Havasu
		Aztec Village Tract 4144		Dead		B	19	N	22	W	23			Lake Mohave
		Aztec Village Tract 4144A	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23	7	5.37	Lake Mohave
		Aztec Villas Tract 4065	Bermuda Water Company, Inc.	Dead		B	19	N	22	W	23			Lake Mohave
		Basinger/Land near Kingman		Dead		B	22	N	16	W	01-03, 09-12, 14, 15, 21, 22			Hualapai Valley
		Beaver Dam Estates	Beaver Dam East Domestic W.I.D.	Issued		B	41	N	15	W	05	48	13.4	Virgin River
		Beaver Dam Oasis	dry lot	Issued		B	41	N	15	W	33	9	1.76	Virgin River
		Beaver Dam Resort, Inc.	Beaver Dam Water Company	Issued		B	40	N	15	W	04, 05			Virgin River
		Bermuda Dunes Tract 4039A	Bermuda Water Company, Inc.	Issued		B	17	N	22	W	15			Lake Mohave
		Bermuda Dunes Tract 4039C	Bermuda Water Company, Inc.	Issued		B	17	N	22	W	15			Lake Mohave
		Bermuda Dunes Tract 4039D	Bermuda Water Company, Inc.	Issued		B	17	N	22	W	15			Lake Mohave
		Bermuda Dunes Tract 4059B	Bermuda Water Company, Inc.	Issued		B	17	N	22	W	15			Lake Mohave
		Bermuda Meadows	Fort Mohave Tribal Utilities Authority	Issued		B	17	N	22	W	15			Lake Mohave
		Bermuda Meadows	Bermuda Water Company, Inc.	Issued		B	17	N	22	W	15			Lake Mohave
		Bermuda Meadows (A)	Fort Mohave Tribal Utilities Authority	Issued		B	17	N	22	W	15	4		Lake Mohave
		Bermuda Meadows (B)	Fort Mohave Tribal Utilities Authority	Issued		B	17	N	22	W	15	8		Lake Mohave
		Beverly Hills Estates Tract 4028	dry lot	Issued		B	19	N	22	W	25			Lake Mohave
		Black Hills Ranchos Tract 3301	Golden Valley Improvement District #1	Issued		B	21	N	19	W	14	23	5.15	Sacramento Valley
		Black Mountain Medical Center,Tract 5045		Dead										Lake Mohave
		Black Mountain Park	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	23	988	574.8	Lake Mohave
		Blue Water Manor Condominiums		Dead		B	20	N	22	W	17			Lake Mohave

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		Bluewater Shores	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	17	4	1.1	Lake Mohave
		Boundary Cone Vista		Dead		B	18	N	21	W	06			Lake Mohave
		Brookfield @ Fox Creek Tract 5064 #3		Pending		B	20	N	21	W	31		20	Lake Mohave
		Buckeye Havasu Heights		Unsub		B	16	N	19	W	01			Sacramento Valley
		Buena Vista #4	Oasis Utility Company	Issued		B	20	N	22	W	16			Lake Mohave
		Bullhead Airpark Phase I	North Mohave Valley Corporation	Dead		B	21	N	21	W	31, 32	30		Lake Mohave
		Bullhead Plaza	Oasis Water Company	Issued		B	20	N	22	W	18			Lake Mohave
		Bullhead/Laughlin Airport		Ret-Sub										Lake Mohave
		Calvary Ranch Estates		Unsub		B	21	N	17	W	11,14			Sacramento Valley
		Camino Colorado Estates		Dead										
		Camp Mohave Heights	Citizens Utilities Company-Mohave	Issued		B	19	N	22	W	23			Lake Mohave
		Canyon Hills Golf Course		Dead		B	20	N	22	W	35			Lake Mohave
		Canyon Ranches		Unsub		B	22	N	17	W	14, 15			Sacramento Valley
		Canyon Ranches		Unsub		B	23	N	17	W	03, 05, 09, 15, 23			Hualapai Valley
		Canyon Ranches		Unsub		B	24	N	17	W	27, 31, 33			Hualapai Valley
		Casa Blanca	Citizens Utilities Company-Mohave	Issued		B	20	N	23	W	13	13	2	Lake Mohave
		Casa de Rio Villas Condos	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	17			
		Casa Grande Condominiums	North Mohave Water Company	Issued		B	21	N	21	W	21	19	4.25	Lake Mohave
		Castle Rock Heights		Unsub		B	22	N	17	W	30,31			
		Cedar Estates Tract 3801	dry lot	Dead		B	21	N	13	W	30			
		Cedar Hills Ranches #1		Unsub		B	21	N	14	W	19,20, 21,28 29,33			
		Cedar Hills Ranches #2		Unsub		B	21	N	14	W	19,29, 30,31, 32			
		Cedar Hills Ranches #3		Unsub		B	21	N	14	W	22,23			

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		Cedar Hills Ranches #4		Unsub		B	21	N	13	W	19			
		Cedar Hills Ranches #4		Unsub		B	21	N	14	W	24			
		Cedar Hills Ranches #5		Unsub		B	21	N	14	W	13-15			
		Cedar Hills Ranches #6		Unsub		B	21	N	14	W				
		Cedar Hills Ranches #7		Unsub		B	21	N	14	W	36	16		Big Sandy
		Cedar Hills Ranches #8		Unsub		B	21	N	13	W	30	8		Big Sandy
		Cedar Hills Ranches #10		Unsub		B	21	N	13	W	15,22, 23,24			Hualapai Valley
		Cedar Hills Ranches #10		Unsub		B	21	N	14	W	05,06, 07,08			Hualapai Valley
		Cedar Hills Ranches #10		Unsub		B	21	N	12	W	19			Hualapai Valley
		Cedar Hills Ranches #11		Unsub		B	21	N	14	W	04,09			Hualapai Valley
		Cedar Hills Ranches #9		Unsub		B	21	N	14	W	16,17, 20			Hualapai Valley
		Cedar Hills Ranches #9		Unsub		B	21	N	13	W	20,25, 26,35, 36			Hualapai Valley
		Cedar Hills Ranches #9		Unsub		B	21	N	12	W	30			Hualapai Valley
		Central Village A	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	19			
		Cerbat Ranches		Unsub		B	22	N	17	W	12			Hualapai Valley
		Cerbat Ranches Unit 1	Cerbat Water Company, Inc.	Issued		B	22	N	17	W	12	125		Hualapai Valley
		Chaparral Country Club Tract 5029	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	29	30	6.72	Lake Mohave
		Chaparral del Rio Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	29			
		Chaparral Terrace	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	29			
		Chaparral Villas Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	29			
		Chaparral Villas Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	29			
		City Hills 320	North Mohave Valley Corporation	Dead		B	21	N	21	W	33			Lake Mohave
		Clearwater Hills #1	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	11			
		Clearwater Hills #2	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	11	75	21.3	
		Clearwater Hills #2,3	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	11			
		Colorado River Estates	dry lot	Issued		B	20	N	22	W	25,26			
		Colorado River Estates	dry lot	Issued		B	20	N	22	W	25,26	128	28.96	Lake Mohave
		Colorado Riverfront Terrace	Bermuda Water Company, Inc.	Issued		B	17	N	22	W	23			
		Colorado Riverfront Terrace #2,Trct 4135		Dead										

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		Delta City #5	Bermuda Water Company, Inc.	Issued		B	17	N	21	W	07			
		Desert Cove Tract 4094		Dead		B	9	N	22	W	26			
		Desert Foothills #1		Dead		B	20	N	21	W	05			
		Desert Foothills Estates #5011	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	05	3353	814.6	Lake Mohave
		Desert Glen	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	13			
		Desert Isle	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	13	15	4.2	Lake Mohave
		Desert Lakes Development	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35,36			
		Desert Lakes Estates Tract 4152		Dead		A	19	N	22	E	36	272	76.2	Lake Mohave
		Desert Lakes Golf Course & Est	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	36	233	65.3	Lake Mohave
		Desert Lakes Golf Course & Est	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35			
		Desert Lakes Golf Course & Estates		Dead		B	19	N	22	W	35			
		Desert Lakes Golf Course & Estates # H		Dead		B	19	N	22	W	35	6	1.68	Lake Mohave
		Desert Lakes Golf Course & Estates #4163		Dead										
		Mauna Kea Village		Dead		B	17	N	22	W	15			
		Mauna Lani Village Tract 4149	Fort Mohave Tribal Utilities Authority	Dead		B	17	N	22	W	15			
		Rio Vista Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	09			
		Rio Vista Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	09			
		Rio Vista Estates	North Mohave Valley Corporation	Dead		B	21	N	21	W	33			Lake Mohave
		Rio Vista Estates	Willow Valley Water Company	Issued		B	18	N	22	W	27	36	12.1	
		Rio Vista Ranches	Citizens Utilities Company-Mohave	Issued		B	19	N	22	W	23			
		Rio Vista Ranches		Unsub		B	16	N	21	W	23,27			
		Copper Creek Ranch		Dead		B	18	N	21	W	06			
		Cottonwood Mountain Ranch		Unsub		B	22	N	12	W	16-20			
		Cottonwood Mountain Ranch		Unsub		B	22	N	13	W	13			
		Cottonwood Mountain Ranches	dry lot	Unsub		B	22	N	12	W	21,22, 27-34			
		Cottonwood Mountain Rnchs #2,3		Unsub		B	22	N	12	W	21,22, 27-34			
		Courtney Greens Tract 4054	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23			
		Courtney Greens #2 Tract 4054B	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23	30	8.4	Lake Mohave
		Courtney Park East 4147A	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23	6	5.38	Lake Mohave
		Courtney Place Tract 4070	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23	5		Lake Mohave

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		Courtney Place Townhomes 4071A	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23	18	5.04	Lake Mohave
		Coves at River Terrace, The, Trct 4139		Dead		B	17	N	22	W	22, 23			
		Coves at River Terrace, The, Trct4139 #2		Dead		B	17	N	22	W	22, 23			
		Covina Gardens Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	29	12	2.7	Lake Mohave
		Curtis Ranch		Unsub		D	18	S	21	E	27,34, 35			Upper San Pedro
		Desert Oasis Farms #1		Unsub		B	20	N	21	W	19			
		Desert Oasis Farms #1		Unsub		B	20	N	21	W	19			
		Desert Ridge Tract 4032A	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	11			
		Desert Shadows Ranchos	dry lot	Issued		B	17	N	17	W	09, 15, 25, 33, 35	947	530	Sacramento Valley
		Desert Shadows Ranchos #03	dry lot	Dead		B	17	N	17	W	33	6	1.7	Sacramento Valley
		Desert Shadows Ranchos #05		Dead		B	17	N	17	W	09			
		Desert Shadows Ranchos #3,4,5		Issued										
		Desert Shadows Ranchos of Arizona Unit 2	dry lot			B	17	N	17	W	31			Sacramento Valley
		Desert Shadows Ranchos of Az #02	dry lot	Issued		B	17	N	17	W	31	12	5.04	Sacramento Valley
		Desert Shores #1L		Dead		B	21	N	21	W	32			
		Desert Shores #1M		Dead		B	21	N	21	W	32			
		Desert Springs Ranchos	dry lot	Issued		B	40	N	15	W	03	21		Virgin River
		Diamond Bar Estates	hauled water	Unsub		B	30	N	17	W	25	14		Meadview
		Diamond M Ranches		Unsub		B	21	N	10	W	09, 15			
		Diamond M Ranches		Unsub		B	21	N	10	W	17			
		Diamond M Ranches		Unsub		B	21	N	10	W	07,09, 19, 21			Big Sandy
		Diamond M Ranches		Unsub		B	21	N	11	W	12, 13			Big Sandy
		Dolan Springs Estates Tract 3009		Dead		B	25	N	19	W	20			Detrital Valley
		Dolan Springs Ranches	dry lot	Unsub		B	26	N	19	W	35			Detrital Valley

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		Dusty Boots Unit 1	dry lot	Unsub		B	28	N	18	W	15	12		Hualapai Valley
		Dusty Boots, Unit II	dry lot	PENDUNSUB		B	28	N	17	W	05			Hualapai Valley
		Dusty Boots, Unit II	dry lot	PENDUNSUB		B	29	N	17	W	33			Hualapai Valley
		Edgewood Condominiums Tr 4021	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	13			
		El Camino Estates	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	01			
		El Camino Village #1	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	01	251	70.3	Lake Mohave
		El Camino Village #2A, Tract 5026	Bullhead City, City of	Dead		B	19	N	22	W	01	5	1.5	Lake Mohave
		El Rodeo Villas Mobile Home Park		Dead		B	19	N	22	W	25			
		Emerald River Estates T4093	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	25	45	12.6	Lake Mohave
		Emerald River Estates Tract 4093B	Bermuda Water Company, Inc.	Dead		B	19	N	22	W	25			Lake Mohave
		Enchantment at Fox Creek, Tract 5069 #1		Pending		B	20	N	21	W	31	40	11.9	
		Esmeralda Acres/Sunward Ho!	dry lot	Issued		B	23	N	16	W	31	19		Hualapai Valley
		Evergreen Addition	Willow Valley Water Company	Issued		B	18	N	22	W	27	38	12.8	
		Evergreen Addition #2	Willow Valley Water Company	Issued		B	18	N	22	W	27	77	25.9	
		Evergreen Addition #3	Willow Valley Water Company	Issued		B	18	N	22	W	27	77	25.9	
		Fairview Mobile Home Estates	Mesquite Farmstead Water Association	Issued		B	40	N	16	W	32			
		Fairway Estates #1-4148A	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35	49	13.7	Lake Mohave
		Fairway Estates #2	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35	28	8.9	Lake Mohave
		Fairway Estates Tract 4097 C		Dead		B	19	N	22	W	35			
		Fairway Estates Tract 4097 D		Dead		B	19	N	22	W	35			
		Fairway Estates Tract 4097 E		Dead		B	19	N	22	W	35			
		Fairway Estates Tract 4097A	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35	100	28	Lake Mohave
		Fairway Estates Tract 4097B	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35	28	7.8	Lake Mohave
		Fox Creek Estates	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	31	1750	494.7	
		Fox Creek Estates #1 Tract 5057	Bullhead City, City of	Dead		B	20	N	21	W	31		6.1	Lake Mohave
		Fox Creek Estates #2 Tract 5058		Pending		B	20	N	21	W	31		13	
		Fox Ridge@Fox Creek Estates Tract 5023		Dead		B	20	N	21	W	31		21.8	Lake Mohave
		Franhi-Chapparal Estates		Unsub		B	39	N	16	W	11			
		Friendly Golden Valley #1	Valley Pioneers Water Company	Issued		B	21	N	18	W	17	63	17.64	Sacramento Valley
		Gateway Acres	dry lot	Issued		B	24	N	19	W	05,07, 17			Detrital Valley

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		Gateway Acres	dry lot	Issued		B	25	N	19	W	19,29			Detrital Valley
		Gateway Acres	dry lot	Issued		B	25	N	19	W	31			Detrital Valley
		Gateway Acres	dry lot	Issued		B	25	N	20	W	01,13			Detrital Valley
		Gateway Acres	dry lot	Issued		B	25	N	19	W	05,07, 09,17, 19,21, 29			Detrital Valley
		Gateway Acres Tract 02	hauled water	Unsub		B	25	N	20	W	33	5		Detrital Valley
		Gateway Acres Tract 03	hauled water	Unsub		B	24	N	20	W	05,09, 17	48		Detrital Valley
		Gateway Acres Tract 05	dry lot	Issued		B	24	N	20	W	23,25			Detrital Valley
		Gateway Acres Tract 06	dry lot	Issued		B	24	N	20	W	13,15			Detrital Valley
		Gateway Acres Tract 06	dry lot	Issued		B	24	N	20	W	11			Detrital Valley
		Gateway Acres Tract 10	hauled water	Issued		B	25	N	19	W	31	14		Detrital Valley
		Gateway Acres Tract 11	dry lot	Issued		B	24	N	19	W	07			Detrital Valley
		Gateway Acres Tract 11	dry lot	Issued		B	24	N	19	W	09			Detrital Valley
		Gateway Acres Tract 12	dry lot	Issued		B	24	N	19	W	19,31			Detrital Valley
		Gold Road Station Unit 11		Unsub		B	20	N	18	W	32			Sacramento Valley
		Golden Acres Tract 4100		Dead		B	21	N	18	W	18			
		Golden Eagle Ranch		Unsub		B	23	N	9	W	06			
		Golden Eagle Ranch		Unsub		B	23	N	10	W	01,29, 30			
		Golden Eagle Ranch #3A		Unsub		B	23	N	10	W	16			Big Sandy
		Golden Horseshoe Ranchos #1	dry lot	Issued		B	27	N	20	W	09			Detrital Valley
		Golden Shores		Ret-Sub		B	16	N	21	W	11			Sacramento Valley
		Golden Shores Tract 4051	Golden Shores Water Company	Issued		B	16	N	21	W	11	32	19	Sacramento Valley
		Golden Valley Project		Dead		B	21	N	18	W	09			
		Goldroad Station #1		Unsub		B	21	N	19	W	22			Sacramento Valley
		Goldroad Station #2		Unsub		B	21	N	19	W	28			Sacramento Valley
		Goldroad Station #3		Unsub		B	20	N	18	W	03			Sacramento Valley
		Goldrush Ranches #2		Pending										
		Goldrush, The, #01, Tract 5044	Bullhead City, City of	Dead		B	20	N	22	W	24	52	11.7	Lake Mohave
		Goldrush, The, #02, Tract 5056		Dead		B	20	N	22	W	24	96		Lake Mohave
		Greater Kingman Industrial Park	dry lot	Issued		B	22	N	15	W	05,17	200		Hualapai Valley
		Greenview Ranches #2		Unsub		B	24	N	10	W	07,17, 19			

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		Greenview Ranches #3		Unsub		B	24	N	10	W	09,21, 33			
		Greenview Ranches #4		Unsub		B	24	N	10	W	31,33			
		Greenview Ranches #5		Unsub		B	23	N	10	W	17			
		Greenview Ranches #6		Unsub		B	23	N	11	W	35			
		Greenview Ranches #6		Unsub		B	23	N	10	W	17			
		Greenview Ranches #7		Unsub		B	23	N	11	W	11			
		Greenview Ranches #7		Unsub		B	24	N	9	W	01			
		Greenview Ranches #7		Unsub		B	25	N	8	W	31			
		Greenview Ranches #7		Unsub		B	25	N	9	W	33			
		Griffith 1500 (see Lazy Y U)		Unsub		B	19	N	17	W	07,19, 31			Sacramento Valley
		Griffith 1500 (see Lazy Y U)		Unsub		B	20	N	17	W	31			Sacramento Valley
		Hidden Meadows Unit 2		Unsub		B	24	N	16	W	26			
		Highlands, The, Tract 4091A		Dead		B	18	N	21	W	07			
		Highlands, The, at Desert Foothills Esta	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	05	211	59.1	Lake Mohave
		Hillcrest Park #1		Dead		B	21	N	21	W	29	83	18.6	Lake Mohave
		Holiday Hills	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	29			
		Holiday Shores	Oasis Utility Company	Issued		B	20	N	22	W	18			
		Holiday Shores #4	Oasis Utility Company	Issued		B	20	N	22	W	18			
		Holiday Shores #6	Oasis Utility Company	Issued		B	20	N	22	W	18			
		Holiday Shores #6	Oasis Utility Company	Issued		B	20	N	22	W	18			
		Holiday Shores #7	Oasis Utility Company	Issued		B	20	N	18	W	18	92		Sacramento Valley
		Hollingsworth Ranch Tract 4111		Dead		B	18	N	22	W	11, 15			
		Hollingsworth Tentative Tract 4091		Dead		B	18	N	21	W	07			
		Hualapai Meadows		Unsub		B	21	N	16	W	01,11			
		Inn at Tamarisk	Havasu Water Company	Issued		B	14	N	21	W	21			
		J. Bar H. Ranches		Unsub		B	22	N	15	W	09			Hualapai Valley
		Joshua Heights at Santa Fe Ranch		Unsub		B	18	N	17	W	20			Sacramento Valley
		Joy Lane Plaza	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	26	13	2.9	Lake Mohave
		Kingman Ranch #1		Unsub		B	21	N	16	W	03			
		Kingman Valley Ranches		Unsub		B	23	N	15	W	27,28, 33			Hualapai Valley
		Kingman, City of, review		Issued										
		La Mesa Acres Tract 4038	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	13			

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		La Paloma Condominiums	North Mohave Valley Corporation	Issued		B	21	N	21	W	21	194.26		Lake Mohave
		Lagoon Estates #6	Lagoon Estates Water Company	Issued		B	17	N	22	W	01			
		Lagoon, The	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	09			
		Lake Havasu Estates # 08 & 09		Issued		B	17	N	17	W	25,35			Sacramento Valley
		Lake Havasu Estates #08	dry lot	Issued		B	17	N	17	W	35			Sacramento Valley
		Lake Havasu Estates #15	dry lot	Issued		B	17	N	16	W	17			Sacramento Valley
		Lake Havasu Heights	dry lot	Issued		B	15	N	19	W	07	18		Sacramento Valley
		Lake Havasu Mobile Home Estate	Havasu Water Company	Ret-Sub		B	14	N	20	W	21			
		Lake Havasu Mobile Home Estate		Ret-Sub		B	14	N	20	W	21			
		Lake Havasu Terrace		Dead		B	17	N	17	W	19			
		Lake Juniper Estates	Lake Juniper Water Company	Issued		B	22	N	17	W	11,14	197	55	Hualapai Valley
		Lake Mead Rancheros #1-12	dry lot	Issued		B	25	N	15	W	12,15, 17,19, 21,23, 25,			Hualapai Valley
		Lake Mead Rancheros #1-12	dry lot	Issued		B	25	N	15	W	27,29 31,33, 35	1606		Hualapai Valley
		Lake Mohave Highlands	Lake Mohave Highlands Water Company	Issued		B	21	N	21	W	29			
		Lake Mohave Highlands	Lake Mohave Highlands Water Company	Issued		B	21	N	21	W	29			
		Lake Mohave Highlands	Lake Mohave Highlands Water Company	Issued		B	21	N	21	W	29			
		Lake Mohave Highlands #4	Lake Mohave Highlands Water Company	Issued		B	21	N	21	W	29			
		Lake Mohave Highlands Ranchett		Unsub		B	21	N	21	W	29			
		Lake Mohave Ranches #13,13A	dry lot, Mt. Tipton Water Co.	Ret-Unsub		B	26	N	18	W	01,11			Hualapai Valley
		Lake Mohave Ranches #15	dry lot, Mt. Tipton Water Company	Ret-Unsub		B	26	N	19	W	01			Hualapai Valley
		Lake Mohave Ranchos	dry lot	Issued		B	25	N	18	W	07			Detrital Valley

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		Lake Mohave Ranchos	dry lot	Issued		B	25	N	19	W	01,11, 12,15, 23,25, 27			Detrital Valley
		Lake Mohave Ranchos	dry lot	Issued		B	26	N	18	W	01,03, 05,07, 09,11, 13,15			Hualapai Valley
		Lake Mohave Ranchos	dry lot	Issued		B	26	N	19	W	21,25, 27,29, 31,33			Hualapai Valley
		Lake Mohave Ranchos	dry lot	Issued		B	26	N	20	W	35			Detrital Valley
		Lakeside Estates	Oasis Utility Company	Issued		B	20	N	22	W	18			
		Lakeview Village Tract 4097	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35	279	79	Lake Mohave
		Lanstarr Properties		Unsub		B	21	N	21	W	23			
		Las Estancias Tract 1199	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	26			
		Laughlin Ranchos		Unsub		B	21	N	15	W	25	13		Hualapai Valley
		Lazy Y-U Ranch #2		Unsub		B	20	N	16	W	04,05, 08,09, 17			Sacramento Valley
		Lazy Y-U Ranch #4		Unsub		B	20	N	17	W	19,31			Sacramento Valley
		Lone Star Commercial Park	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23	9	3	Lake Mohave
		Long Mountain Ranches		Unsub		B	22	N	16	W	03,10, 15	48		Hualapai Valley
		Los Lagos	Bermuda Water Company, Inc.	Issued		B	18	N	22	W	01	457	128	Lake Mohave
		Los Lagos Country Club Villas #4166		Pending										
		Mead-O-Rama #2	dry lot	Issued		B	29	N	19	W	27			Hualapai Valley
		Mead-O-Rama #3	dry lot	Issued		B	29	N	18	W	35	141		Hualapai Valley
		Mead-O-Rama #4	dry lot	Issued		B	29	N	17	W	31	441		Hualapai Valley
		Meadview	Joshua Valley Utility Company	Issued		B	30	N	17	W	01,12			
		Meadview	dry lot	Issued		B	30	N	17	W	35			
		Meadview Highlands	Joshua Valley Utility Company	Issued		B	30	N	17	W	01			
		Meadview Unit #5	dry lot	Issued		B	30	N	17	W	15			
		Meadview Unit #5	dry lot	Issued		B	29	N	17	W	11,13			

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		Mesa Heights		Dead		B	19	N	22	W	12			
		Mesa Villas Tract 4146	Bermuda Water Company, Inc.	Dead		B	19	N	22	W	23			
		Mesa Vista Tract 4117		Dead		B	19	N	22	W	24			
		Miracle View Condominiums		Dead		B	20	N	22	W	26			
		Miracle View Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	26			
		Mission Park Ranch Tract 4072A		Dead		B	19	N	22	W	25			
		Mohave Meadows	Truxton Canyon Water Company	Ret-Sub		B	23	N	15	W	11	72		Hualapai Valley
		Mohave Mesa Estates Tract 4013	dry lot	Issued		B	19	N	22	W	27			
		Mohave Sun Valley Airport	Bermuda Water Company, Inc.	Issued		B	18	N	22	W	25			
		Mohave Sun Valley Airport	Bermuda Water Company, Inc.	Issued		B	18	N	22	W	25			
		Mohave Sunrise Tract 4085	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	11			Lake Mohave
		Mohave Valley Business Park	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23			
		Mohave Valley Business Park	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23			
		Monte Vista Estates	dry lot	Issued		B	18	N	22	W	23			
		Moon Ridge	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	25	99	27.7	Lake Mohave
		Moon Valley Tract 4120	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	25	16	4.4	Lake Mohave
		Moonshine Spring--Exxon		Dead										
		Mountain Meadow Estates Unit 2	dry lot	PENDUNSUB		B	24	N	16	W	6-8,16-18	85		Hualapai Valley
		Mountain Shadows @ Fox Creek		Pending		B	20	N	21	W	31	73	33.1	Lake Mohave
		Mountain View Ranches	dry lot	Issued		B	18	N	21	W	05			
		Mountain View Ranches	dry lot	Issued		B	18	N	21	W	05			
		Mountain View Ranches Tr 4003D	dry lot	Issued		B	18	N	21	W	05			
		Mountain Vista Ranches		Unsub		B	25	N	15	W	01,02, 05,09, 11,13, 15,21, 25,26			Hualapai Valley
		Mountain Vista Ranches Phase 3		Unsub		B	24	N	15	W	04,10, 12,14, 22,24, 26			Hualapai Valley

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		Mountain Vista Ranches Phase 3		Unsub		B	24	N	14	W	18, 20, 30			Hualapai Valley
		Mountain Vista Ranches Phase 3-A		Unsub		B	24	N	15	W	22,28			Hualapai Valley
		Mountainside Ranch by Dave Brown #4106A		Dead		B	18	N	21	W	06			
		Mountainside Ranch by Dave Brown #4106B		Dead		B	18	N	21	W	06			
		Mountainside Ranch by Dave Brown #4106C		Dead		B	18	N	21	W	06			
		Music Mountain Ranches		Unsub		B	25	N	14	W	07,09 17,19, 21,29, 33			Hualapai Valley
		Music Mountain Ranches		Unsub		B	24	N	14	W	09,17, 19,21, 29,33			Hualapai Valley
		Orchards, The Tract 3800	dry lot	Issued		B	16	N	13	W	27			
		Overlook, The Tract 4137		Dead		B	19	N	22	W	14			
		Palm Estates #2 Tract 4104	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	14	56	10.6	Lake Mohave
		Palm Villa Ranchos Tract 1226	Bermuda Water Company, Inc.	Issued		B	10	N	22	W	11			
		Palma Quartz	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	17	33	7.3	Lake Mohave
		Palms on the Mesa Tract #4126		Dead		B	19	N	22	W	26			
		Palo Verde Executive Warehouse #5059		Dead									2	
		Palo Verde Place Tract 4006	Rio Utility Company, Inc.	Issued		B	20	N	22	W	32	420		Lake Mohave
		Palo Verde Place Tract 4006-E	Rio Utility Company, Inc.	Issued		B	20	N	22	W	32	68	19	Lake Mohave
		Palo Verde Plaza #3 Tract 5025		Pending										
		Palo Verde Plaza Tract 5025		Dead										
		Palo Verde Plaza, Tract 5025, $3		Pending										
		Palos Verdes Tract 4131		Dead		B	19	N	22	W	31			
		Paradise Trails	Double R Water Distributors, Inc.	Dead		B	18	N	18	W	25	110		Sacramento Valley
		Park at Mesquite Creek, The	Fort Mohave Tribal Utilities	Issued		B	18	N	22	W	12	226	63.3	Lake Mohave

MOHAVE COUNTY APPLICATIONS PRIOR TO 2001 FROM 1WRF.DB

PFX	DWR.	SUBDIVISION	WATER PROVIDER	STATUS	DATE ISSUED	LOC-Q	LOC-T	LOC-T2	LOC-R	LOC-R2	LOC-S	LOTS	ALLOCATION (AF)	GW BASIN
		Peacock Mountain Estates		Unsub		B	22	N	15	W	13, 15, 23			
		Peacock Mountain Ranches		Unsub		B	21	N	15	W	07, 17			Hualapai Valley
		Peacock Mountain Ranches #1		Unsub		B	21	N	15	W	05, 07, 09, 17			Hualapai Valley
		Peacock Mountain Ranches #2		Unsub		B	22	N	15	W	11			Hualapai Valley
		Pebble Lake #2	Pebble Lake Water Company	Issued		B	19	N	22	W	34			
		Pebble Lake #2	Pebble Lake Water Company	Ret-Sub		B	19	N	22	W	34			
		Pebble Lake #3	Pebble Lake Water Company	Issued		B	19	N	21	W	34			
		Pegasus Ranch	Citizens Utilities Company-Mohave	Issued		B	21	N	21	W	29	100	44.8	Lake Mohave
		Pegasus Ranch Tract 4019-A	Citizens Utilities Company-Mohave	Issued		B	21	N	21	W	29			
		Peppermill Palms Resort	Mesquite Farmstead Water Association	Dead		B	39	N	16	W	05			
		Perry Acres #2 Tract 4026	Mohave Valley Water Company	Issued		B	18	N	22	W	13			
		Perry Acres Tract 4007	Mohave Valley Water Company	Issued		B	18	N	22	W	13			
		Perry Meadows Tract 4073		Dead		B	18	N	22	W	13			
		Phase I, North 1/2 Section 32		Dead		B	20	N	21	W	32			
		Phase II, North 1/2 Section 32		Dead		B	20	N	21	W	32			
		Pierce Ferry-Meadview 40's		Unsub		B	29	N	17	W	03			
		Pima River Estates	Bermuda Water Company, Inc.	Dead		B	19	N	22	W	25			
		Pine River Estates Tract 4128	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	25	17	4.7	Lake Mohave
		Pinion Pines Estates #2	dry lot	Issued		B	20	N	15	W	06			
		Pioneer Valley	dry lot	Unsub		B	18	N	18	W	35	64		Sacramento Valley
		Pioneer Valley		Unsub		B	18	N	18	W	35			Sacramento Valley
		Pueblo Grove	dry lot	Issued		B	18	N	22	W	35			
		Punto de Vista #5	Thumb Butte Water Association	Issued		B	21	N	21	W	27			
		Punto de Vista, Tract 5021		Dead		B	21	N	21	W	21			
		Punto de Vista, Tract 5022		Dead		B	21	N	21	W	27			
		Quail Valley Estates	Cerbat Water Company, Inc.	Issued		B	22	N	17	W	12	32	15.7	Hualapal Valley
		Rancho Colorado	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	18,19			
		Rancho Colorado	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	13			
		Rancho Grande Tract 4083	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	14	71	22.3	Lake Mohave

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		Rancho Palo Verde Tract 4138		Dead		B	17	N	22	W	01			
		Rancho Rio Bonito #1		Dead		B	19	N	21	W	31			
		Rancho Verde Estates	Valley Pioneers Water Company	Issued		B	21	N	18	W	17	60	23.91	Sacramento Valley
		Rancho Verde Estates #2	Valley Pioneers Water Company	Issued		B	21	N	18	W	17	263	420.1	Sacramento Valley
		Red Wing Canyon Estates	dry lot	Issued		B	23	N	17	W	23	30		Hualapai Valley
		Rio Camino Tract 4123	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	23	34	9.5	Lake Mohave
		Rio Colorado Properties Corp.		Dead		B		N		W				
		Rio Hacienda	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	14			
		Rio Lado Villas Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	23	W	13			
		Rio Las Palmas	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	01			
		Rio Lindo Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	23	W	13			
		Rio Lomas #4	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	11			
		River Retreat	Citizens Utilities Company-Mohave	Issued		B	20	N	23	W	13			
		River Road City Tract 1022	Fort Mohave Tribal Utilities	Issued		B	17	N	22	W	11	141	39.4	Lake Mohave
		River View Mall	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	23			
		River View Ranches	dry lot	Issued		B	19	N	22	W	13			
		Riverfront Estates		Dead		B	20	N	22	W	32			
		Rivershore Villas Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	09			
		Riverview Bluffs #2A	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	13			
		Riverview Bluffs Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	13			
		Riverview Estates	Citizens Utilities Company-Mohave	Dead		B	21	N	21	W	29			Lake Mohave
		Riviera Commercial Park	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	19			
		Riviere D' Azur Villas	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	16	243	55	Lake Mohave
		Roadhaven Marina Condominiums	Oasis Utility Company	Issued		B	20	N	22	W	16			
		Roadhaven Marina Condos #2	Oasis Utility Company	Issued		B	20	N	22	W	16			
		Roadhaven Marina Condos #3	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	16			
		Roadhaven Resort of Bullhead Cty	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	24			
		Rodeo Park Tract 4145		Dead		B	19	N	22	W	23			Lake Mohave
		Sacramento Valley Ranches So.		Unsub		B	19	N	18	W	22,24-26,28-30			Sacramento Valley
		Saddle Mountain Acres	dry lot	Issued		B	24	N	14	W	27,35			Hualapai Valley
		Sage Estates Tract 4105		Dead		B	19	N	22	W	25			
		Sagebrush Trails		Unsub		B	14	N	17	W	03			
		Sagebrush Trails		Unsub		B	15	N	17	W	35			
		Santa Claus Acres #2	dry lot	Issued		B	23	N	18	W	19	64		Sacramento Valley

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		Secret Pass Industrial Park #1L		Dead		B	20	N	21	W	06			
		Seventh Street Commerce Park #1		Dead		B	21	N	21	W	06			
		Shadow Canyon Ranches		Unsub		B	23	N	17	W	11	15		Hualapai Valley
		Shores, The	Citizens Utilities Company-Mohave	Issued		B	20	N	23	W	13			
		Sierra Vista	dry lot	Dead		B	20	N	14	W	13	112		Big Sandy
		Silver Creek Hills		Dead		B	20	N	21	W	20			
		Silver Ridge Townhouse Condos	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	19	210	47	Lake Mohave
		Silver Sands Estates	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	26	159	44.5	Lake Mohave
		Silverado Estates		Unsub		B	20	N	13	W	05,09, 15,17, 21-23,28, 29			
		South Valley Park Tract 4068	Bermuda Water Company, Inc.	Issued		B	17	N	22	W	15			
		Spring Valley Ranches		Unsub		B	23	N	13	W	31			
		Spring Valley Ranches		Unsub		B	23	N	14	W	23, 25, 26, 27, 35			
		Spring Valley Ranches #3		Unsub		B	22	N	14	W	03,15			
		Spring Valley Ranches, Unit 2		Unsub		B	22	N	14	W	01, 11, 13			
		Spring Valley Ranches, Unit 2		Unsub		B	22	N	13	W	07			
		Stage Coach Trails Phase II		Unsub		B	16	N	16	W	35			Sacramento Valley
		Stage Coach Trails Phase II		Unsub		B	15	N	15	W	09, 19, 29, 31, 33			Sacramento Valley

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		Stage Coach Trails Phase II		Unsub		B	15	N	16	W	03,11, 13,15, 21,23, 25,27, 29 35			Sacramento Valley
		Stage Coach Trails Phase II		Unsub		B	16	N	15	W	31			Sacramento Valley
		Stagecoach Trails Unit 15		Unsub		B	15	N	15	W	28,30, 32			Sacramento Valley
		Stagecoach Trails Unit 15		Unsub		B	15	N	16	W	26,32, 34,36,			Sacramento Valley
		Stagecoach Trails Unit 15		Unsub		B	15	N	17	W	22,24, 28,32, 24,36			Sacramento Valley
		Stagecoach Trails Unit 16		Unsub		B	15	N	16	W	16,18, 20,22, 24,28, 30			Sacramento Valley
		Stagecoach Trails Unit 16		Unsub		B	15	N	15	W	20,22			Sacramento Valley
		Stagecoach Trails Unit 16		Unsub		B	15	N	17	W	08,10, 14,16, 24,26			Sacramento Valley
		Stagecoach Trails Unit 17		Unsub		B	15	N	15	W	08,16, 18			Sacramento Valley
		Stagecoach Trails Unit 17		Unsub		B	15	N	16	W	02,04, 06,08, 10,12, 14			Sacramento Valley
		Stagecoach Trails Unit 17		Unsub		B	15	N	17	W	02,04, 06,12, 18			Sacramento Valley
		Stagecoach Trails Unit 17		Unsub		B	16	N	17	W	32			Sacramento Valley
		Stagecoach Trails Unit 19		Unsub		B	16	N	16	W	13			Sacramento Valley

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		Stagecoach Trails Unit 19		Unsub		B	16	N	17	W	02,04, 06,08, 10			Sacramento Valley
		Stagecoach Trails Unit 19		Unsub		B	17	N	17	W	20,28, 32,34			Sacramento Valley
		Stagecoach Trails Unit 20		Unsub		B	18	N	18	W	26			Sacramento Valley
		Stagecoach Trails Unit 20		Unsub		B	17	N	18	W	22,26, 28,34			Sacramento Valley
		Stagecoach Trails Unit 20		Unsub		B	16	N	18	W	02,04, 10,12, 14			Sacramento Valley
		Stagecoach Trails Unit 21		Unsub		B	16	N	16	W	13,21, 25			Sacramento Valley
		Stagecoach Trails Unit 22		Unsub		B	17	N	17	W	19,20, 21,22, 23,26-36			Sacramento Valley
		Stagecoach Trails Unit 22		Unsub		B	17	N	18	W	24,36			Sacramento Valley
		Stagecoach Trails Unit 23		Unsub		B	16	N	16	W	09,11, 14,15			Sacramento Valley
		Stagecoach Trails Unit 24		Unsub		B	16	N	17	W	20			Sacramento Valley
		Stagecoach Trails Unit 9		Unsub		B	16	N	16	W	07,17, 21			Sacramento Valley
		Stagecoach Trails Unit 9		Unsub		B	17	N	17	W	13,15, 17			Sacramento Valley
		Stockton Hill Ranches #03		Unsub		B	24	N	16	W	29			
		Stockton Hill Ranches #03		Unsub		B	23	N	16	W	21,28			
		Stockton Hill Ranches #05		Unsub		B	23	N	16	W	28,29			
		Stockton Hill Ranches #06		Unsub		B	23	N	17	W	01,13			Hualapai Valley
		Stockton Hill Ranches #06		Unsub		B	22	N	17	W	13			Hualapai Valley
		Stockton Hill Ranches #06		Unsub		B	23	N	17	W	25,35			Hualapai Valley
		Stockton Hill Ranches #06		Unsub		B	24	N	16	W	21			Hualapai Valley
		Stockton Hill Ranches #07		Unsub		B	23	N	17	W	35			

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		Stockton Hill Ranches #08		Unsub		B	23	N	17	W	36			
		Stockton Hill Ranches #10		Unsub		B	23	N	16	W	07,18, 29			
		Stockton Hill Ranches #11		Unsub		B	22	N	16	W	05-07			
		Stockton Hill Ranches #12		Unsub		B	23	N	16	W	05			Hualapai Valley
		Stockton Hill Ranches #12		Unsub		B	23	N	16	W	05			Hualapai Valley
		Stonecrest		Dead		B	21	N	22	W	23			
		Stoneridge	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	11	14	11.77	Lake Mohave
		Sun Desert Estates	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	25	49	13.7	Lake Mohave
		Sun Ridge Tract 4042F	North Mohave Water Company	Issued		B	21	N	21	W	30			
		Sun Ridge Estates Tract 4024A	North Mohave Valley Water Company	Issued		B	21	N	21	W	21			
		Sun Ridge Estates Tract 4024B	North Mohave Valley Water Company	Issued		B	21	N	21	W	29			
		Sun Ridge Estates Tract 4024C	North Mohave Valley Water Company	Issued		B	21	N	21	W	21			
		Sun Ridge Estates Tract 4042D	North Mohave Valley Water Company	Issued		B	21	N	21	W	30			
		Sun Ridge Estates Tract 4042E	North Mohave Valley Water Comoany	Issued		B	21	N	21	W	29			
		Sun Ridge Estates Tract 4042F	North Mohave Valley Water Company	Issued		B	21	N	21	W	29	59	145	Lake Mohave
		Sun Valley	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	36			
		Sun Valley Tract 4017	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	36			
		Sun Valley Tract 4064A	Bermuda Water Company, Inc.	Issued		B	18	N	22	W	01	210	58.5	Lake Mohave
		Sunrise Estates	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35			
		Sunrise Estates #2	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	35			
		Sunrise Mountain Estates	dry lot	Issued		B	23	N	16	W	33	35	10	Hualapai Valley
		Sunrise Vistas Tract 4108-A	Sunrise Vistas Utilities Company	Issued		B	19	N	21	W	18	146	40.9	Lake Mohave
		Sunrise Vistas Tract 4108-B	Sunrise Vistas Utilities Company	Issued		B	19	N	21	W	18	86	24.1	Lake Mohave
		Sunrise Vistas Tract 4108-C	Sunrise Vistas Utilities Company	Issued		B	19	N	21	W	18	92	25.7	Lake Mohave
		Sunset Ranchos, Tract 4046-B	dry lot	Issued		B	19	N	22	W	13			Lake Mohave
		Sunset Ranchos, Tract 4046-C	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	13	284	80	Lake Mohave
		Sunset Ranchos, Tract 4046-A	dry lot	Issued		B	19	N	22	W	13			Lake Mohave
		Sunward Ho! Ranches Turquesa Acres	dry lot	Issued		B	23	N	16	W	30	35		Hualapai Valley
		Tamarisk Resort & Country Club	Havasu Water Company	Issued		B	14	N	20	W	20			

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		Tangerine Terrace Tract 4142	Fort Mohave Tribal Utilities Authority	Issued		B	17	N	22	W	23	22	6.16	Lake Mohave
		Tangerine Terrace #02, Trct 4151	Fort Mohave Tribal Utilities Authority	Dead		B	17	N	22	W	23	95	67.1	Lake Mohave
		Tierra del Rio Tract 4048	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	25			
		Tierra Grande Tract 4023 A	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	19			
		Tierra Grande Tract 4023B	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	19			
		Tierra Grande Tract 4023B	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	24			
		Tierra Grande Tract 4023C	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	19			
		Tierra Grande Tract 4052	Citizens Utilities Company-Mohave	Issued		B	20	N	21	W	19			
		Tierra Verde Tract 1073-B	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	14			
		Tierre del Sol	dry lot	Issued		B	19	N	22	W	23			
		Tierre Plaza	Bermuda Water Company, Inc.	Issued		B	19	N	22	W	14			
		Toprock Lake Rancheros	dry lot	Issued		B	17	N	21	W	17	8		Lake Mohave
		Triangle Air Park	dry lot	Issued		B	27	N	21	W	24			Detrital Valley
		Unnamed property, Mohave Co.		Unsub		B	21	N	17	W	06			Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	21	N	18	W	02,04, 06,20, 28,30			Sacramento Valley
		Unnamed property, Mohave Co.		Dead		B	11	N	18	W	09			Lake Havasu/Bill Williams
		Unnamed property, Mohave Co.		Dead		B	12	N	18	W	33			Lake Havasu
		Unnamed property, Mohave Co.		Dead		B	19	N	22	W	25			
		Unnamed property, Mohave Co.		Dead		B	14	N	20	W	17			
		Unnamed property, Mohave Co.		Dead		B	20	N	21	W	19			
		Unnamed property, Mohave Co.		Unsub		B	22	N	12	W	15-22,27-34			
		Unnamed property, Mohave Co.		Unsub		B	22	N	17	W	13	9		Hualapai Valley
		Unnamed property, Mohave Co.		Unsub		B	20	N	13	W	31, 35			Big Sandy
		Unnamed property, Mohave Co.		Unsub		B	18	N	15	W	15,17, 19,21, 27,29, 31			Sacramento Valley

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		Unnamed property, Mohave Co.		Unsub		B	15	N	16	W	01,03, 05,07, 09,11, 13			Sacramento Valley
		Unnamed property, Mohave Co.	dry lot	Unsub		B	24	N	17	W	35			Hualapai Valley
		Unnamed property, Mohave Co.	dry lot	Unsub		B	20	N	17	W	04,05, 09			Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	22	N	15	W	05,17			Haulapai Valley
		Unnamed property, Mohave Co.		Unsub		B	22	N	15	W	07			
		Unnamed property, Mohave Co.		Unsub		B	17	N	17	W	19,20, 20,30, 32			Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	19	N	18	W	22,24-26,28-30			Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	15	N	16	W				Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	17	N	17	W	33			Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	21	N	16	W	10			
		Unnamed property, Mohave Co.		Unsub		B	19	N	18	W	21,23			Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	23	N	16	W	07,09, 17-21,28, 29			
		Unnamed property, Mohave Co.		Unsub		B	24	N	16	W	07,19, 29,31, 33			
		Unnamed property, Mohave Co.		Unsub		B	17	N	17	W	11,13, 17			Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	23	N	16	W	21			
		Unnamed property, Mohave Co.		Unsub		B	16	N	17	W	05-08,17, 18			Sacramento Valley
		Unnamed property, Mohave Co.		Unsub		B	24	N	16	W	29,33			
		Unnamed property, Mohave Co.		Unsub		B	20	N	21	W	31			

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		Unnamed property, Mohave Co.		Unsub		B	22	N	14	W	05-08, 17			Hualapai Valley
		Unnamed property, Mohave Co.		Unsub		B	22	N	15	W	01,11			Hualapai Valley
		Unnamed property, Mohave Co.		Unsub		B	22	N	15	W	11			
		Unnamed property, Mohave Co.		Unsub		B	23	N	14	W	19,29, 30			Hualapai Valley
		Unnamed property, Mohave Co.		Unsub		B	23	N	15	W	15,21-26,35			Hualapai Valley
		Unnamed property, Mohave Co.		Unsub		B	23	N	15	W	24,25			
		Unnamed property, Mohave, Co.		Unsub		B	15	N	16	W	01			Sacramento Valley
		Unnamed property, Mohave, Co.		Unsub		B	15	N	15	W	07,17, 21,27			Sacramento Valley
		Valle del Sole	Kingman, City of	Ret-Sub		B	21	N	16	W	10			
		Valle Vista	Truxton Canyon Water Company	Issued		B	23	N	15	W				
		Valle Vista	Truxton Canyon Water Company	Issued		B	24	N	15	W				Hualapai Valley
		Valle Vista #1A,3A	Truxton Canyon Water Company	Issued		B	23	N	15	W	10,15	8728		Hualapai Valley
		Valle Vista #5	Truxton Canyon Water Company	Ret-Sub		B	24	N	15	W	26			Hualapai Valley
		Villa De Rio Condominiums		Dead		B	21	N	21	W	21			
		Villa del Rio Tract 4016 A&B	Rio Verde Water Company	Issued		B	20	N	22	W	29			
		Villa del Sol Condominiums	Citizens Utilities Company-Mohave	Issued		B	20	N	23	W	24			
		Virgin Acres	Biasi Water Company	Issued		B	41	N	15	W	29	320	129	
		Virgin Village #2		Dead		B	41	N	15	W	32			
		Virgin Village #2	Biasi Water Company	Pending		B	41	N	15	W	32			Virgin River
		Vista del Rio Condominiums	Oasis Utility Company	Issued		B	20	N	22	W	17			
		Vista Grande Condominiums	North Mohave Water Company	Issued		B	21	N	21	W	21	32	7.2	Lake Mohave
		Vock Canyon		Unsub		B	24	N	17	W	35			Hualapai Valley
		Wagon Bow Ranch		Unsub		B	17	N	11	W	13, 14			Bill Williams
		Wagon Bow Ranch Unit II	dry lot	Unsub		B	18	N	11	W	14,24, 25,27, 28,29, 33,35	100		Big Sandy
		Walnut Creek Unit 2, Tract 3043-A	Walnut Creek Water Company, Inc.	Issued		B	20	N	17	W	07	43	12.52	Sacramento Valley

MOHAVE COUNTY APPLICATIONS PRIOR TO 2001 FROM 1WRF.DB

PFX	DWR.	SUBDIVISION	WATER PROVIDER	STATUS	DATE ISSUED	LOC-Q	LOC-T	LOC-T2	LOC-R	LOC-R2	LOC-S	LOTS	ALLOCATION (AF)	GW BASIN
		Walnut Creek Estates #1	unformed water company	Issued		B	20	N	17	W	07	42	11.76	Sacramento Valley
		Walnut Creek Estates #2		Dead		B	20	N	17	W	07			Sacramento Valley
		Walnut Creek Estates #2	Walnut Creek Water Company, Inc.	Issued		B	20	N	17	W	07	109	30.5	Sacramento Valley
		Western Horizon Estates #1		Dead		B	24	N	19	W	27			Detrital Valley
		Western Horizon Estates #1	dry lot	Issued		B	24	N	19	W	27			Detrital Valley
		Western Horizon Estates #2	dry lot	Issued		B	24	N	19	W	27	80		Detrital Valley
		Western Star #1	dry lot	Dead		B	16	N	20	W	03			
		WestSlope		Dead		B	20	N	21	W	17			
		Wickieup Springs Ranches		Unsub		B	14	N	12	W	03			
		Willow Creek Ranch Unit 7		Unsub		B	22	N	11	W	19,29, 31			Big Sandy
		Willow Creek Ranch, Unit 4		Unsub		B	21	N	11	W	01,07, 11			Big Sandy
		Willow Creek Ranch, Unit 8		Unsub		B	21	N	11	W	33			
		Willow Creek Ranch, Unit 8		Unsub		B	22	N	11	W	21,27			Big Sandy
		Willow Creek Ranch, Unit 9		Unsub		B	19	N	11	W				
		Willow Valley Estates	Willow Valley Water Company	Issued		B	18	N	22	W	21	48	16.1	
		Willow Valley Estates		Unsub		B	18	N	22	W	18,21, 25,27, 35			
		Willow Valley Estates 20 Tract 4134		Dead		B	18	N	22	W	21			
		Willow Valley Mobile Homes Est	Willow Valley Water Company	Issued		B	18	N	22	W	27			
		Willows at Cimarron Lake #1 Tract 4130		Dead		B	18	N	22	W	23	79	22	Lake Mohave
		Willows at Cimarron Lake, The	Willow Valley Water Company	Issued		B	18	N	22	W	23	94	38.58	Lake Mohave
		Willows at Cimarron Lake, The #2		Dead		B	18	N	22	W	23	136	38	Lake Mohave
		Windmill Ranch, Phase 1, Unit 1		Unsub		B	19	N	13	W	04,05, 09,16, 17,21, 28,29			Big Sandy
		Windmill Ranch, Phase 1, Unit 2		Unsub		B	19	N	13	W	19,31			Big Sandy

MOHAVE COUNTY APPLICATIONS PRIOR TO 2001 FROM 1WRF.DB

PFX	DWR.	SUBDIVISION	WATER PROVIDER	STATUS	DATE ISSUED	LOC-Q	LOC-T	LOC-T2	LOC-R	LOC-R2	LOC-S	LOTS	ALLOCATION (AF)	GW BASIN
		Windmill Ranch, Phase 2, Unit 1		Unsub		B	19	N	13	W	04,05, 09,16, 17,21, 28,29			
		Windmill Ranch, Phase 2, Unit 2		Unsub		B	19	N	13	W	03			Big Sandy
		Windmill Ranch, Phase 2, Unit 3		Unsub		B	19	N	12	W	09,15, 19			
		Windmill Ranch, Phase 2, Unit 4		Unsub		B	19	N	12	W	13,29			Big Sandy
		Windmill Ranch, Phase 2, Unit 4		Unsub		B	19	N	13	W	23,25, 27,35			Big Sandy
		Winterhaven Estates	Citizens Utilities Company-Mohave	Issued		B	20	N	22	W	18			
		Yucca Vista #2	dry lot	Issued		B	16	N	19	W	11	55	6.2	Sacramento Valley
		Cedar Hills Ranches	dry lot	PENDUNSUB		B	22	N	14	W	26,27			Big Sandy

MOHAVE COUNTY PLANNING & ZONING DEPARTMENT

P.O. Box 7000 ◆ Kingman, Arizona 86402-7000
3675 E. Highway 66, Suite A ◆ (928) 757-0903 ◆ FAX 757-3577
1130 East Hancock Road ◆ Bullhead City, Arizona 86442 ◆ (928) 758-0707 ◆ FAX 763-0870

CHRISTINE BALLARD
DIRECTOR

RECEIVED
MAY 05 2006
AZ CORP COMM
Director Utilities

May 3, 2006

Arizona Corporation Commission
1200 West Washington Street
Phoenix, Arizona 85007
Attention: Blessing Chukwu

RE: Proposed development

Dear Mrs. Chukwu:

In response to your recent request, I am forwarding the following lists of proposed subdivisions and new cities in the unincorporated parts of Mohave County.

The proposed subdivisions are broken down by groundwater basins, identified in Column H, and on the other data sheet. As the list shows, most of our actual subdivision proposals are located in the South Mohave Valley, in an area reliant upon water that is considered part of the Colorado River aquifer, and subject to formal allocation.

Many of the major new proposals, however, including several planned new cities, are spread across the county, primarily affecting the Hualapai, Sacramento and Detrital Basins.

If you have any questions, or need additional information, please contact me.

Sincerely,

Karl Taylor
Acting Planning Manager

KT/ajc

Enc: lists of proposed projects, by groundwater basin

Estimates of Proposed Dwelling Units/Lots in the Unincorporated Parts of Mohave County

	B	C	D	E	F	G	H
1	Sagebrush Trails	3815	640	98	T14N R17W	Section 3	Lake Havasu
2	North Pointe	3703	116	475	T14N R20W	Section 17	Lake Havasu
3	Paradise Trails	3802	149	94	T14N R20W	Section 25	Lake Havasu
4	Bella Lago		12	124	T14N R20W	Section 21	Lake Havasu
5	Golden Sands Ranchos		280	192	T15N R19W	Section 5	Lake Havasu
6	Arizona Gateway	3808	143	51	T16N R20W	Section 13	South Mohave Valley
7	Topock Village Estates	4190	82	206	T16N R21W	Section 23	South Mohave Valley
8	Mohave Valley Commons	4212	90	414	T16N R21W	Section 14	South Mohave Valley
9	Topock Overlook		74	113	T16N R21W	Section 23	South Mohave Valley
10	Marina Coves		46	456	T17N R22W	Section 23	South Mohave Valley
11	Mystic Canyon	4197	91	266	T18N R21W	Section 7	South Mohave Valley
12	Valley View at Sunrise Hills	4201	130	371	T18N R21W	Section 6	South Mohave Valley
13	El Rio	4177	386	1367	T18N R22W	Section 11	South Mohave Valley
14	Sun Valley II	4185	34	121	T18N R22W	Section 1	South Mohave Valley
15	The Greens at Los Lagos	4186	306	350	T18N R22W	Section 1	South Mohave Valley
16	Lake Cimarron Estates, Unit II	4187	9	35	T18N R22W	Section 23	South Mohave Valley
17	Los Lagos	4188	2.99	12	T18N R22W	Section 1	South Mohave Valley
18	Village Estates	4198	77	344	T18N R22W	Section 3	South Mohave Valley
19	The Estates at Cimarron Lake	4200	16	57	T18N R22W	Section 23	South Mohave Valley
20	King Estates		95	380	T18N R22W	Section 17	South Mohave Valley
21	Mohave Landing		135	515	T18N R22W	Section 23	South Mohave Valley
22	Mohave Valley Industrial Park		41.67	16	T18N R22W	Section 3	South Mohave Valley
23	Somerset Estates		146	548	T18N R22W	Section 27	South Mohave Valley
24	Mountainside Village	4193	120	320	T18N, R12W	Section 6	South Mohave Valley
25	Sunrise Vistas, Unit II	4108	705	160	T19N R21W	Section 18	South Mohave Valley
26	Sunrise Vistas, Unit II	4202	3	10	T19N R21W	Section 18	South Mohave Valley
27	Desert Lakes Estates	4152	80	272	T19N R22W	Section 36	South Mohave Valley
28	Coyote Run	4176	40	146	T19N R22W	Section 23	South Mohave Valley
29	Sunset Palms	4183	23	126	T19N R22W	Section 26	South Mohave Valley
30	Los Altos	4184	7	21	T19N R22W	Section 26	South Mohave Valley
31	Twin Palm Estates	4189	39	144	T19N R22W	Section 36	South Mohave Valley
32	Las Palmas	4191	2.88	14	T19N R22W	Section 23	South Mohave Valley
33	Patriot Estates	4195	30	122	T19N R22W	Section 32	South Mohave Valley
34	Brett Canyon Estates	4196	11.82	55	T19N R22W	Section 25	South Mohave Valley
35	Valley Springs	4203	24.83	132	T19N R22W	Section 36	South Mohave Valley
36	Fossil Creek,	4204	19.46	67	T19N R22W	Section 14	South Mohave Valley
37	The Borgata at Mountain View	4205	40	107	T19N R22W	Section 14	South Mohave Valley
38	Stetson Ranch	4206	14.42	57	T19N R22W	Section 25	South Mohave Valley
39	Fort Mohave Business Park	4209	18	28	T19N R22W	Section 35	South Mohave Valley
40	Mesa Verde	4210	7.26	31	T19N R22W	Section 23	South Mohave Valley
41	Everglades Estates		45.67	155	T19N R22W	Section 36	South Mohave Valley
42	Westview Estates		38	134	T19N R22W	Section 14	South Mohave Valley
43	Silverado Acre	3805	518	379	T20N R13W	Section 17	Big Sandy
44	Silverado Ridge	3817	440	303	T20N R13W	Section 9	Big Sandy
45	The Dells at Silverado (aka Silverado Golf)		840	139	T20N R13W	Section 28,29	Big Sandy

Estimates of Proposed Dwelling Units/Lots in the Unincorporated Parts of Mohave County

	B	C	D	E	F	G	H
46	Mountain Shadow Estates	3806	161	27	T20N R14W	Section 8	Sacramento Valley
47	Walnut Creek Ranch	3307	279	642	T20N R17W	Section 7	Sacramento Valley
48	Friendly Golden Valley	3305	40	114	T21N R18W	Section 17	Sacramento Valley
49	Mirage Estates	3308	35	100	T21N R18W	Section 17	Sacramento Valley
50	Aztec at Chuar	3309	80	252	T21N R18W	Section 27	Sacramento Valley
51	Bloor Subdivision		67	31	T21N R18W	Section 7	Sacramento Valley
52	Golden Valley Commercial Ranches		67.64	140	T21N R18W	Section 7	Sacramento Valley
53	Patterson Estates		67	271	T21N R18W	Section 7	Sacramento Valley
54	Secret Pass Estates		101	188	T21N R18W	Section 7	Sacramento Valley
55	Shipp Estates	3310	48	152	T21N R19W	Section 12	Sacramento Valley
56	Greenwood Village	3818	7	40	T22N R12W	Section 29, 31 ,32	Hualapai Valley
57	Chaparrel Mesa	3042	124	510	T22N R16W	Section 28	Hualapai Valley
58	Neal One	3048	175	34	T22N R16W	Section 29	Hualapai Valley
59	Cerbat Vistas	3067	124	559	T22N R16W	Section 19	Hualapai Valley
60	Cedar Creek Estates	3069	90	365	T22N R16W	Section 19	Hualapai Valley
61	Cheyenne Meadows	3070	152	527	T22N R16W	Section 28	Hualapai Valley
62	High Desert Estates	3071	30	127	T22N R16W	Section 29	Hualapai Valley
63	The Ranch at Long Mountain (B-?)	3814	122	316	T22N R16W	Section 27	Hualapai Valley
64	Hunter Ranch		158	450	T22N R16W	Section 21	Hualapai Valley
65	North Valley Estates		238	750	T22N R16W	Section 12, 13	Hualapai Valley
66	Prairie Heights	3068	152	416	T22N R16W	Section 19	Hualapai Valley
67	Desert Fountain Estates	3051	103	300	T22N R17W	Section 13	Hualapai Valley
68	Desert Fountain Estates, Unit II	3072	114	323	T22N R17W	Section 13	Hualapai Valley
69	Tara Estates		80	56	T22N R17W	Section 12	Hualapai Valley
70	Hidden Springs		21	119	T23N R14W	Section 15, 16	Hualapai Valley
71	Camps Bay	3819	160	29	T25N R20W	Section 4	Hualapai Valley
72	White Hills Ranch Equestrian	3812	640	116	T27N R19W	Section 5	Detrital Valley
73	Equestrian at White Hills	3816	640	116	T27N R19W	Section 5	Detrital Valley
74	Woodside Subivision	3820	280	1044	T27N R20W	Section 7	Detrital Valley
75	Woodside Subivision		280.5	1044	T27N R20W	Section 7	Detrital Valley
76	Shadow Ridge	3511	122	393	T39N R16W	Section 27	Arizona Strip
77	Rio Seco	3520	20	71	T39N R16W	Section 14	Arizona Strip
78	High Chaparral		22.9	91	T39N R16W	Section 11	Arizona Strip
79	Vista Montana (aka Mesquite Heights)		34	145	T39N R16W	Section 11	Arizona Strip
80	Vista Rio		34	137	T39N R16W	Section 3	Arizona Strip
81	Coyote Flats(aka Desert Springs Oasis)		32	153	T40N R15W	Section 4	Arizona Strip
82	Hamilton Ranch		10	44	T40N R15W	Section 4	Arizona Strip
83	La Verta Heights		26.78	77	T40N R15W	Section 5	Arizona Strip
84	Running Springs Ranch		105	260	T40N R15W	Section 4	Arizona Strip
85	Vista Verde	3519	37.2	186	T40N R16W	Section 33	Arizona Strip
86	Vista Skies	3521	7	30	T40N R16W	Section 32	Arizona Strip
87	Desert Palms at Beaver Dam	3522	10	47	T41N R15W	Section 33	Arizona Strip
88	The Bluffs at Virgin Mountain		16	76	T41N R15W	Section 33	Arizona Strip
89		Acres	11282	20395	Lots		

ESTIMATES OF PROPOSED DWELLING UNITS/LOTS IN THE UNINCORPORATED PARTS OF MOHAVE COUNTY MAY 1, 2006

	PROPOSED UNITS	BASIN
RHODES HOMES		
Golden Valley Ranch	33,264	Sacramento
Peacock Highlands	46,026	Hualapai
Peacock Vistas	9,490	Hualapai
The Village at White Hills	20,042	Detrital
LEONARD MARDIAN		
Mardian Ranch (White Hills)	34,727	Detrital
Sterling	50,794	Sacramento
The Ranches at Long Mountain (Lingenfelter)	3,880	Hualapai
Silver Ranch (Mike and Leo Horner)	20,281	Big Sandy
All other currently proposed subdivisions (approx. 78 projects)	20,395 +/-	Various Most are in Lake Mohave Basin (reliant on Colorado River allocation water)
TOTAL	**238,899**	

COMMISSIONERS
JEFF HATCH-MILLER - Chairman
WILLIAM A. MUNDELL
MARC SPITZER
MIKE GLEASON
KRISTIN K. MAYES

BRIAN C. MCNEIL
Executive Director

ARIZONA CORPORATION COMMISSION

July 12, 2006

Jeffrey W. Crockett
SNELL & WILMER, L.L.P.
One Arizona Center
400 East Van Buren Street
Phoenix, Arizona 85004

Sent via E-mail and Registered US Mail

Re: Staff's Second Set of Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company
Docket Nos. W-20380A-05-0490 and SW-20379A-05-0489

Dear Mr. Crockett:

Please treat this as Staff's Second Set of Data Requests to Perkins Mountain Water Company and Perkins Mountain Utility Company, in the above-reference matter.

For purposes of this data request set, the words "Perkins Mountain Water and Perkins Mountain Utility" or "Company," "you," and "your" refer to Perkins Mountain Water Company and/or Perkins Mountain Utility Company and any representative, including every person and/or entity acting with, under the control of, or on behalf of Perkins Mountain Water Company and Perkins Mountain Utility Company. For each answer, please identify by name, title, and address each person providing information that forms the basis for the response provided.

These data requests are continuing, and your answers or any documents supplied in response to these data requests should be supplemented with any additional information or documents that come to your attention after you have provided your initial responses.

Please respond within **ten** calendar days of your receipt of the copy of this letter. However, if you require additional time, please let us know.

Please provide one hard copy (ONLY) of the requested data directly to the following address:

(1) Jim J. Dorf, Utilities Division, Arizona Corporation Commission, 1200 W. Washington Street, Phoenix, Arizona 85007.

Please provide one original copy (ONLY) of the requested data directly to the following address:

(1) David M. Ronald, Attorney, Arizona Corporation Commission, 1200 W. Washington Street, Phoenix, Arizona 85007.

Sincerely,

David Ronald

David M. Ronald
Attorney, Legal Division
(602) 542-3402

DMR:sab
Enclosure
cc: Docket Control
Jim J. Dorf

ARIZONA CORPORATION COMMISSION STAFF'S SECOND SET OF DATA REQUESTS REGARDING THE APPLICATION OF PERKINS MOUNTAIN WATER COMPANY AND PERKINS MOUNTAIN UTILITY COMPANY DOCKET NO. W-20380A-05-0490 & SW20379A-05-0489 JULY 12, 2006

JJD 2.1 In response to Staff Data Request BNC-1.11 ("provide a list of all of the affiliates of Rhodes Homes, LLC; Perkins Mountain Water Company; and Perkins Mountain Utility Company"), a listing of affiliates was provided and is summarized on the attached Exhibit A. In its response to Staff Data Request BNC 1.13 and BNC 1.25, the Company provided a Moody's press release on The Rhodes Companies, LLC and indicates that there are two co-borrowers, Heritage Land Company, LLC and Rhodes Ranch General Partnership. Please indicate as to whether these two entities are affiliated with The Rhodes Companies, LLC or other entities in which Mr. Rhodes has an ownership interest. Please provide the exact legal name of any and all other entities in which Mr. Rhodes is a direct or beneficial ownership interest if not already listed on the attached Exhibit A.

JJD 2.2 In the Company's response to Staff's Motion to Compel, the ownership of Perkins Mountain Water Company and Perkins Mountain Utility Company has been transferred to Rhodes Homes Arizona, LLC. Please confirm that Exhibit B attached accurately reflects the revised ownership structure.

JJD 2.3 Please provide any documents executed to support or effectuate the transfer of ownership to Rhodes Homes Arizona, LLC.

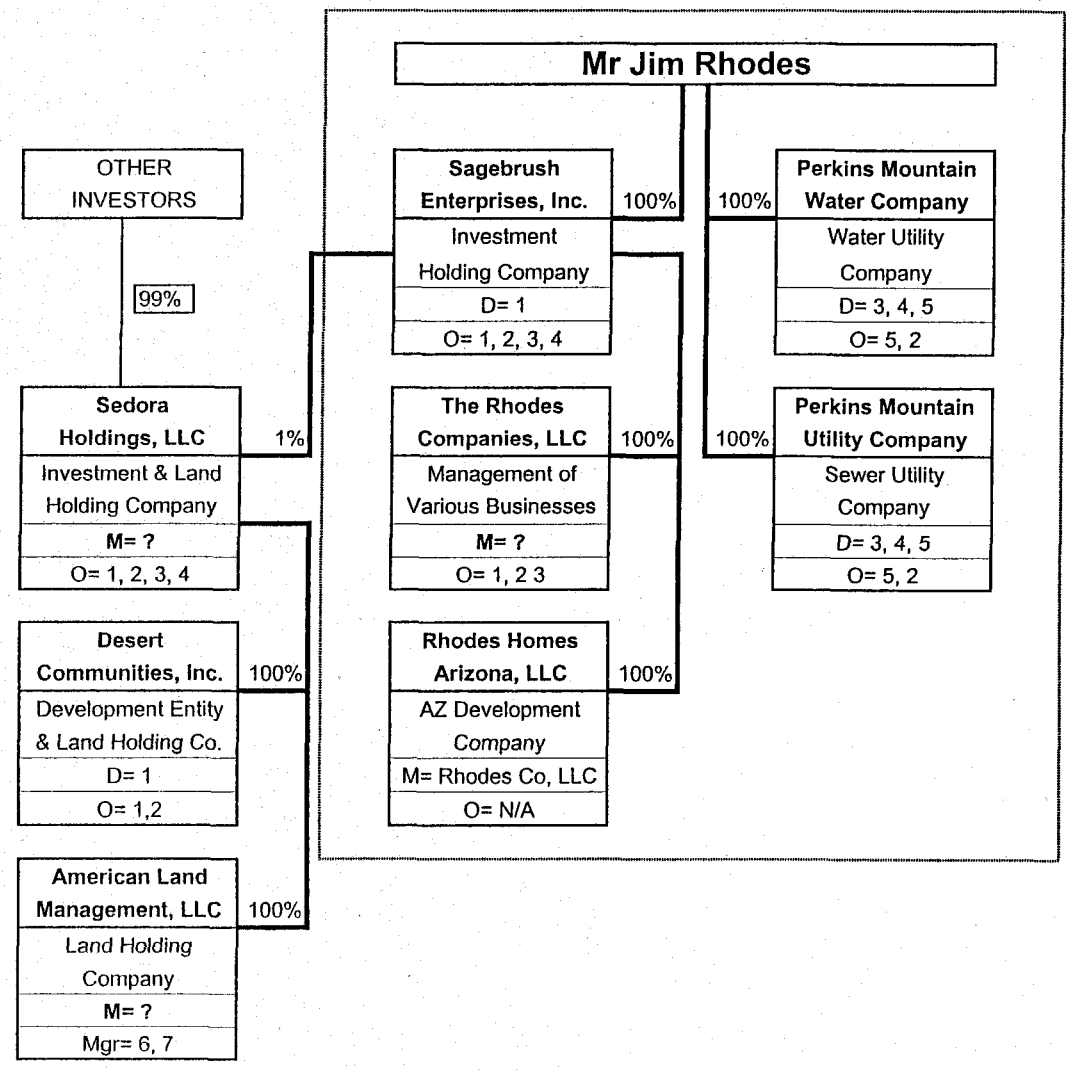
JJD 2.4 Please provide any financial or presentation information utilized in securing the Moody's credit rating.

JJD 2.5 Will the revised ownership structure have any effect on the Moody's credit rating?

JJD 2.6 Please provide the most recently available financial statements for Rhodes Home Arizona, LLC and The Rhodes Companies, LLC.

Perkins Mountain Water Company
Docket No. W-20380-05-0490
Ownership Summary

Data Request BNC 1.13 - Exhibit A

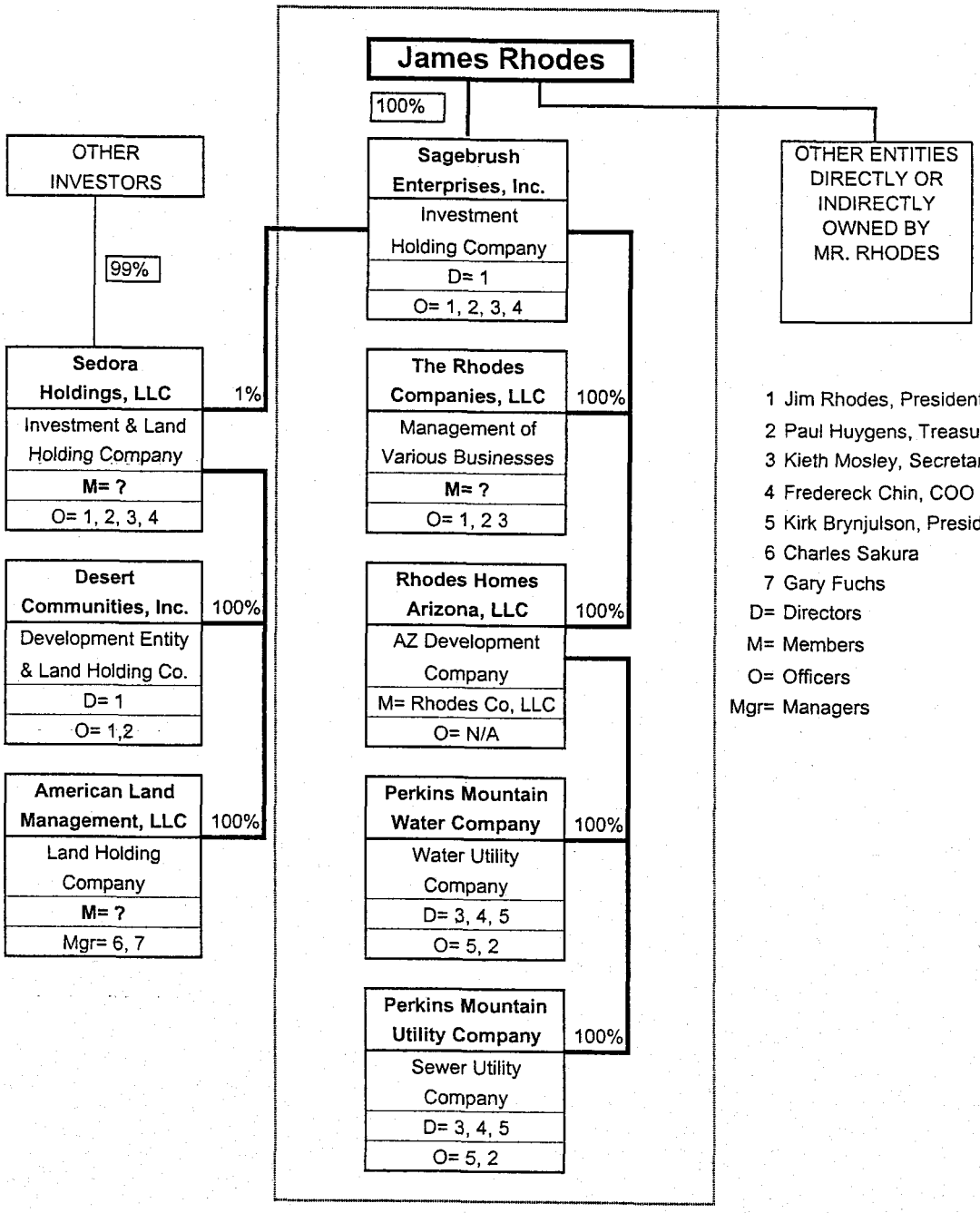


1 Jim Rhodes, President & CEO
2 Paul Huygens, Treasurer & CFO
3 Kieth Mosley, Secretary
4 Fredereck Chin, COO
5 Kirk Brynjulson, President
6 Charles Sakura
7 Gary Fuchs

D= Directors
M= Members
O= Officers
Mgr= Managers

Perkins Mountain Water Company
Docket No. W-20380-05-0490
Ownership Summary

Exhibit B
REVISED



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D= Directors
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