Kansas Department of Agriculture
Division of Water Resources
PERMIT OF NEW APPLICATION WORKSHEET

1. File Number:	2. Status Change Date:	3. Field Office:	4. GMD:
47955	10/31/2017	**02**	**02**

5. Status: ☒ Approved ☐ Denied by DWR/GMD ☐ Dismiss by Request/Failure to Return

6. Enclosures: ☒ Check Valve ☒ N of C Form ☒ Water Tube ☒ Driller Copy ☒ Meter

7a. Applicant(s) New to system ☐ Person ID **11618** Add Seq# _____

CITY OF MCPHERSON
BOARD OF PUBLIC UTILITIES
401 W KANSAS PO BOX 768
MCPHERSON KS 67460

7c. Landowner(s) New to system ☐ Person ID _____ Add Seq# _____

7b. Landowner(s) New to system ☐ Person ID _____ Add Seq# _____

SAME AS 7A

7d. Misc. New to system ☐ Person ID _____ Add Seq# _____

8. WUR Correspondent New to system ☐ Person ID **11618** Add Seq# _____ Notarized WUC Form ☐
Overlap File (s) WUC Agree ☒ Yes ☐ No

SAME AS 7a

9. Use of Water: Changing? ☐ Yes ☒ No
☒ Groundwater ☐ Surface Water
☐ IRR ☐ REC ☐ DEW ☒ MUN
☐ STK ☐ SED ☐ DOM ☐ CON
☐ HYD DRG ☐ WTR PWR ☐ ART RECHRG
☐ IND SIC: _____ ☐ OTHER: _____

10. Completion Date: **12/31/2021** 11. Perfection Date: **12/31/2061** 12. Exp Date: _____

13. Conservation Plan Required? ☐ Yes ☒ No Date Required: _____ Date Approved: _____ Date to Comply: _____

14. Water Level Measuring Device? ☐ Yes ☒ No Date to Comply: _____ Date WLMD Installed: _____

Date Prepared: **10/26/17** By: **BAT**
Date Entered: 11/2/2017 By: LM

File No. 47,955 | 15. Formation Code: 190 EQUUS BEDS | Drainage Basin: LITTLE ARKANSAS | County: HARVEY | Special Use: | Stream:

16. Points of Diversion T MOD DEL ENT	PDIV Qualifier	S	T	R	ID	'N	'W	17. Rate and Quantity Authorized Rate gpm	Authorized Quantity mgy	Additional Rate gpm/cfs	Additional Quantity af/mgy	Overlap PD Files
MOD 79139	~~NEWSWSW~~ NC W2 SW SW	32	22	3W	5	660	4590	1750	838.74	1750	130.34	NONE

18. Storage: Rate _____ NF Quantity _____ ac/ft Additional Rate _____ NF Additional Quantity _____ ac/ft

19. Limitation: 1,721.471 mgy af/yr at _____ gpm (_____ cfs) when combined with file number(s) MP5, 1,311, 23,310, 28,151, 28,735, ~~47,958~~ 47957

Limitation: _____ af/yr at _____ gpm (_____ cfs) when combined with file number(s) _____

20. Meter Required? ☒ Yes ☐ No To be installed by 12/31/2022 Date Acceptable Meter Installed _____

21. Place of Use T MOD	NE¼	NW¼	SW¼	SE¼	Total	Owner Chg? Overlap Files
MOD 14673 29 19 3W 1	CITY OF MCPHERSON & IMMEDIATE VICINITY					8C NO MP05 1311 23310 28151 28735 47955 47956 47957
MOD 22615 29 19 3W 2	CITY OF WINDOM & IMMEDIATE VICINITY					8C NO MP05 1311 23310 28151 28735 47955 47956 47957
MOD 58004 29 19 3W 4	INCLUDING CUSTOMERS ALONG PIPELINE SERVING CITY OF WINDOM					8C NO MP05 1311 23310 28151 28735 47955 47956 47957
MOD 11028 29 19 3W 3	WITHIN RWD #2, 3 & 4 MP CO					8C NO MP05 1311 23310 28151 28735 47955 47956 47957
ENT 68596 29 19 3W	SOUTH WELL FIELD S/2 SW/4 & SE/4					8C NO MP05 1311 23310 28151 28735 47955 47956 47957
ENT 68597 29 19 3W	INCLUDING CUSTOMERS ALONG PIPELINE SOUTH WELL FIELD TO CITY					8C NO MP05 1311 23310 28161 28735 47955 47956 47957
ENT 68598 29 19 3W	AREA WITHIN SECTIONS 13-16, 22-26, 32-35					8C NO MP05 1311 23310 28151 28735 47955 47956 47957
ENT 68599 29 19 3W	AREA WITHIN SECTIONS 4 & 5					8C NO MP05 1311 23310 28151 28735 47955 47956 47957

Comments:

KANSAS DEPARTMENT OF AGRICULTURE
Division of Water Resources

MEMORANDUM

TO: Files **DATE:** October 26, 2017

FROM: Brent A. Turney **RE:** New Application
File Nos. 47,955, 47956
& 47,957

The City of McPherson has filed the referenced applications to establish three new wells for the City's municipal water system. The wells are located in Section 32, Township 22 South, Range 3 West, Harvey County, in the Little Arkansas River drainage basin. The water pumped from the South well field 20 miles South of the City of McPhersion. A limited total of 2,909 acre-feet (947.9.4 million gallons) per year is requested from all three files. The total is divided up among the three files as follows:

Application, File No. 47,955 requests 2,574 acre-feet, at 1,750 gpm,
Application, File No. 47,956 requests 2,674 acre-feet, at 2,000 gpm, limited to 2,674 acre-feet when combined with File No. 47,955, and
Application, File No. requests 2,909 acre-feet, at 2,000 gpm, limited to 2,909 acre-feet, when combined with File Nos. 47,955 and 47,956.

All three of the proposed well locations will appropriate water from the Equus Beds Aquifer and all meet the safe yield criteria of GMD-2.

The city has provided data projecting population growth and future water needs in the form of a report from Burns and McDonnel Engineers. The data provided projected water needs of 5,283 acre-feet through the year 2035. The limitation on the total quantity of water is designed to increase at ten year intervals until the year 2061, the year the appropriation rights will be perfected. The initial proposed quantities will be reasonable and comply with the water use standards used by GMD-2.

Letters were sent to five potential domestic well owners, all located within one half mile of the well proposed by Application, File No. 47,957. No responses were received, from to the letters dated December 10, 2012.

The three new applications were submitted to GMD-2 on February 13, 2013, for review and recommendations. The GMD has responded with a recommendation that all three applications be approved. The recommendation required numerous conditions and limitations.

All three applications have been reviewed and recommended for approval by Jeff Lanterman, Water Commissioner, Stafford Field Office. He has no objection to approval of the applications.

Based on the above information, I recommend approval of the applications.

Brent A. Turney, P.G.
Change Application Unit Supervisor
Water Rights Section

1320 Research Park Drive
Manhattan, Kansas 66502
Jackie McClaskey, Secretary

Kansas
Department of Agriculture

Phone: (785) 564-6700
Fax: (785) 564-6777
Email: ksag@kda.ks.gov
www.agriculture.ks.gov
Sam Brownback, Governor

November 7, 2017

FILE COPY

CITY OF MCPHERSON
BOARD OF PUBLIC UTILITIES
ATTN TIM MAIER
PO BOX 768
MCPHERSON KS 67460

RE: Appropriation of Water
File Nos. 47,955, 47,956 and 47,957

Dear Mr. Maier:

There is enclosed permits to appropriate water authorizing you to proceed with construction of the proposed diversion works (except those dams and stream obstructions regulated by K.S.A. 82a-301 through 305a), to divert such unappropriated water as may be available from the source and at the locations specified in the permits, and to use it for the purpose and at the location described in the permit.

Your attention is directed to the enclosures and to the terms, conditions, and limitations specified in these permits. Water meters are required and you must install them prior to water being put to beneficial use in order for you to maintain accurate records of water use. The meters should be used to provide the information required on the annual water use reports.

All wells with a diversion rate of 100 gallons per minute or more shall have a tube or other device installed in a manner acceptable to, and in accordance with specifications adopted by, the Chief Engineer. If a water level measurement tube has not been properly installed on the diversion works, then a separate observation well within 25 feet of the production well must be installed.

Failure to notify the Chief Engineer of the Division of Water Resources of the completion of the diversion works within the time allowed, or within any authorized extension of time thereof, will result in the dismissal of this permit. Enclosed is a form which may be used to notify the Chief Engineer that the proposed diversion works have been completed.

All requests for extensions of time to complete diversion works, or to perfect appropriations, must be submitted to the Chief Engineer before the expiration of time originally set forth in the permit to complete diversion works or to perfect an appropriation. If for any reason, you require an extension of time, you must request it before the expiration of time set forth in this permit. Failure to comply with this regulation will result in the dismissal of your permit or your water right. Any request for an extension of time shall be accompanied by the required statutory fee, which is currently $100.00.

There is also enclosed an information sheet setting forth the procedure to obtain a Certificate of Appropriation which will establish the extent of your water right. If you have any questions, please contact our office. If you wish to discuss this specific file, please have the file number ready so that we may help you more efficiently.

Sincerely,

Brent A. Turney, P.G.
Change Application Unit Supervisor

Enclosures
pc: Stafford Field Office
Equus Beds GMD No. 2

THE STATE OF KANSAS

KANSAS DEPARTMENT OF AGRICULTURE
Jackie McClaskey, Secretary of Agriculture

DIVISION OF WATER RESOURCES
David W. Barfield, Chief Engineer

APPROVAL OF APPLICATION
and
PERMIT TO PROCEED

(This is not a Certificate of Appropriation)

This is to certify that I have examined Application, **File No. 47,955** of the applicant

CITY OF MCPHERSON
BOARD OF PUBLIC UTILITIES
PO BOX 768
MCPHERSON, KANSAS 67460

for a permit to appropriate water for beneficial use, together with the maps, plans and other submitted data, and that the application is hereby approved and the applicant is hereby authorized, subject to vested rights and prior appropriations, to proceed with the construction of the proposed diversion works (except those dams and stream obstructions regulated by K.S.A. 82a-301 through 305a, as amended), and to proceed with all steps necessary for the application of the water to the approved and proposed beneficial use and otherwise perfect the proposed appropriation subject to the following terms, conditions and limitations:

1. That the priority date assigned to such application is October 5, 2011.

2. That the water sought to be appropriated shall be used for municipal purposes on the following described property:

> the City of McPherson and immediate vicinity; the City of Windom and immediate vicinity; the immediate vicinity of the pipeline serving the City of Windom; within the boundaries of the area served by McPherson County Rural Water District Nos. 2, 3 & 4, and the South Well Field located in the South Half of the Southwest Quarter (S½ SW¼) and the Southeast Quarter (SE¼) of Section 32, in Township 22 South, Range 3 West, Harvey County, and the immediate vicinity of the pipeline from the South Well Field to the City of McPherson; and within Sections 13-16, 22-26, 32-35, in Township 19 South, Range 3 West, McPherson County; within Sections 4 & 5, in Township 20 South, Range 3 West, McPherson County, Kansas.

3. That the authorized source from which the appropriation shall be made is groundwater from the Little Arkansas Equus Beds aquifer, to be withdrawn by means of one(1) well (Well 1) located in the near the center of the West Half of the Southwest Quarter of the Southwest Quarter (W½ SW¼ SW¼) of Section 32, more particularly described as being near a point 660 feet North and 4,590 feet West of the Southeast corner of said section, in Township 22 South, Range 3 West, Harvey County, Kansas, located substantially as shown on the topographic map accompanying the application.

4. That the appropriation sought shall be limited to a maximum diversion rate not in excess of **1,750 gallons per minute (3.90 c.f.s.)** and to a quantity not to exceed **838.740 million gallons (2,574 acre-feet)** of water for any calendar year.

5. That installation of works for diversion of water shall be completed on or before **December 31, 2022**, or within any authorized extension thereof. The applicant shall notify the Chief Engineer and pay the statutorily required field inspection fee, which is currently $400.00 when construction of the works has been completed. Failure to timely submit the notice and the fee will result in revocation of the permit. Any request for an extension of time shall be submitted prior to the expiration of the deadline and shall be accompanied by the required statutory fee, which is currently $100.00.

6. That the proposed appropriation shall be perfected by the actual application of water to the proposed beneficial use on or before **December 31, 2061**, or any authorized extension thereof to a maximum of 40 years after the date to complete the diversion works has expired. Any request for an extension of time shall be submitted prior to the expiration of the deadline and shall be accompanied by the required statutory fee which is currently $100.00.

7. That the applicant shall not be deemed to have acquired a water appropriation for a quantity in excess of the amount approved herein nor in excess of the amount found by the Chief Engineer to have been actually used for the approved purpose during one calendar year subsequent to approval of the application and within the time specified for perfection or any authorized extension thereof.

8. That the use of water herein authorized shall not be made so as to impair any use under existing water rights nor prejudicially and unreasonably affect the public interest.

9. That the right of the appropriator shall relate to a specific quantity of water and such right must allow for a reasonable raising or lowering of the static water level and for the reasonable increase or decrease of the streamflow at the appropriator's point of diversion.

10. That this permit does not constitute authority under K.S.A. 82a-30l to 305a to construct any dam or other obstruction; nor does it grant any right-of-way, or authorize entry upon or injury to, public or private property.

11. That all diversion works constructed under the authority of this permit into which any type of chemical or other foreign substance will be injected into the water pumped from the diversion works shall be equipped with an in-line, automatic quick-closing, check valve capable of preventing pollution of the source of the water supply. The type of valve installed shall meet specifications adopted by the Chief Engineer and shall be maintained in an operating condition satisfactory to the Chief Engineer.

12. That all wells with a diversion rate of 100 gallons per minute or more drilled under the authority of this permit shall have a tube or other device installed in a manner acceptable to, and in accordance with specifications adopted by, the Chief Engineer. This tube or device shall be suitable for making water level measurements and shall be maintained in a condition satisfactory to the Chief Engineer

13. That an acceptable water flow meter shall be installed and maintained on the diversion works authorized by this permit in accordance with the Kansas Administrative Regulations 5-1-4 through 5-1-12 adopted by the Chief Engineer. This water flow meter shall be used to provide an accurate quantity of water diverted as required for the annual water use report (including the meter reading at the beginning and end of the report year).

14. That the applicant shall maintain accurate and complete records from which the quantity of water diverted during each calendar year may be readily determined and the applicant shall file an annual water use report with the Chief Engineer by March 1 following the end of each calendar year. Failure to file the annual water use report by the due date shall cause the applicant to be subject to a civil penalty.

15. That no water user shall engage in nor allow the waste of any water diverted under the authority of this permit.

16. That failure without cause to comply with provisions of the permit and its terms, conditions and limitations will result in the forfeiture of the priority date, revocation of the permit and dismissal of the application.

17. That the right to appropriate water under authority of this permit is subject to any minimum desirable streamflow requirements identified and established pursuant to K.S.A. 82a-703c for the source of supply to which this water right applies.

18. That the applicant shall submit to the Chief Engineer a copy of the well log required by the Kansas Department of Health and Environment under the authority of K.S.A. 82a-1212, currently form WWC-5, within 30 days following the drilling of the well at the location authorized herein.

19. That the permit holder must submit a progress report to the office of the Chief Engineer by March 1, after the tenth year from the date of the approval of this application and permit to proceed. The progress report is to contain sufficient details to explain the extent of development (perfection) of the water right during the previous ten (10) years, the extent of population being served by the water right and how the water right, in association with any other water right(s) meets the demonstrated municipal use need.

20. That the Chief Engineer specifically retains jurisdiction in this matter with authority to make such reasonable reductions in the approved rate of diversion and quantity authorized to be perfected, and such changes in other terms, conditions, and limitations set forth in this approval and permit to proceed as may be deemed to be in the public interest.

21. The applicant will develop a groundwater monitoring plan, with input from Equus Beds Equus Beds GMD No. 2, and approval by the Chief Engineer, including water-level and water quality monitoring, at the applicant's expense.

22. The existing monitoring well network of the seven existing monitoring wells previously installed by McPherson BPU will be maintained and incorporated into the groundwater monitoring plan.

23. The constructed well will be equipped with a sample port or ports for water sample collection.

24. Water samples shall be collected from the point of diversion prior to initial operation, and analyzed by a State accredited water quality laboratory to include inorganic analysis comprised of metals and minerals and including chloride, sodium, and specific conductance and drinking water suitability interpretation.

25. The applicant will perform a pumping test simulating the maximum authorized pumping rate for the well in order to demonstrate actual observed and projected drawdowns at monitoring site EB33A, B, and C. The details of the pumping test are to be determined in consultation with Equus Beds Equus Beds GMD No. 2 staff, and will consist of a minimum pumping stress duration of 24 hours, and shall continue until water levels have stabilized, not to exceed a total pumping stress duration of 72 hours.

26. The permits shall be subject to Equus Beds Equus Beds GMD No. 2 Board review if the groundwater monitoring plan indicates, as determined by Equus Beds Equus Beds GMD No. 2 staff, that the operation of the authorized wells are materially impacting the Hollow Nikkel chloride plume leading to a material deterioration of the fresh and usable quality of the area's groundwater supply.

27. The approved application is further limited to an initial aggregate quantity of 1,721.471 million gallons (5,283 acre-feet) per year when combined with Vested Right, File No. MP 005, Water Right, File Nos. 1,311, 23,310, 28,151 and 28,735 and Appropriaiton of Water, File Nos. 47,956 and 47,957, through the year 2061, or 40 years after the date to complete the diversion works has expired.

28. That 10 years after the diversion works are completed, and every 10 years following until the perfection period expires, the applicant shall submit to Equus Beds Equus Beds GMD No. 2 and the Chief Engineer data on water utilization that includes served population, projected population growth, water use per capita data, industrial water use data, and water treatment losses.

29. Following the second 10-year report after the diversion works are completed, and each 10 year period thereafter, the Chief Engineer, after opportunity for review by Equus Beds Equus Beds GMD No. 2, will modify the aggregate quantity limitation by findings and order to meet the applicant indicated projected water use for another 10 years. The new water use projection shall be based on the current and projected population, industry water use, and treatment needs consistent with the methods used with the original application (memo of March 14, 2016), through the year 2061, or 40 years after the date to complete the diversion works has expired. The limitation may be increased to a maximum total quantity of 2,350.363 million gallons (7,213 acre-feet) from Appropriation of Water, File Nos. 47955, 47956 and 47957.

30. Upon demonstration by the applicant at any time within the perfection period, satisfactory to the Chief Engineer, and after review by Equus Beds Equus Beds GMD No. 2, that actual or projected water demand exceeds the rate of growth projected by the most recent 10 year report, the Chief Engineer will modify the aggregate quantity limitation to meet the increased projected water use.

31. That the quantity of water authorized under this permit is further limited to a total quantity when combined with Appropriation of Water, File Nos. 47,956 and 47,957, shall not exceed **947.901 million gallons (2,909 acre-feet)** of water for any calendar year.

RIGHT TO A HEARING AND TO ADMINISTRATIVE REVIEW

If you are aggrieved by this Order, then pursuant to K.S.A. 82a-1901, you may:

1) request an evidentiary hearing before the Chief Engineer, or
2) request administrative review by the Secretary of Agriculture.

Failure to request an evidentiary hearing before the Chief Engineer does not preclude your right to administrative review by the Secretary.

To obtain an evidentiary hearing before the Chief Engineer, a written request for hearing must be filed within 15 days after service of this Order as provided in K.S.A. 77-531 **(i.e., within a total of 18 days after this Order was mailed to you)**, with: Kansas Department of Agriculture, Attn: Legal Section, 1320 Research Park Drive, Manhattan, KS 66502, FAX (785) 564-6777.

If you do not file a request for an evidentiary hearing before the Chief Engineer, you may petition for administrative review of the Order by the Secretary of Agriculture. A petition for review shall be in writing and state the basis for requesting administrative review. The request for hearing may be denied if the request fails to clearly establish factual or legal issues for review. See K.S.A. 77-527. The petition must be filed within 30 days after service of this Order as provided in K.S.A. 77-531 **(i.e., within a total of 33 days after this Order was mailed to you)**, and be filed with: Secretary of Agriculture, Attn: Legal Division, Kansas Department of Agriculture, 1320 Research Park Drive, Manhattan, KS 66502, FAX (785) 564-6777.

If neither a request for an evidentiary hearing nor a petition for administrative review is filed as set forth above, then this Order shall be effective and become a final agency action as defined in K.S.A. 77-607(b). Failure to timely request either an evidentiary hearing or administrative review may preclude further judicial review under the Kansas Judicial Review Act.

Any request for hearing or petition for administrative review shall be in writing and shall be submitted to the attention of: Chief Legal Counsel, Kansas Department of Agriculture, 1320 Research Park Drive, Manhattan, Kansas 66502, Fax: (785) 564 – 6777.

Ordered this 31st day of October, 2017, in Topeka, Shawnee County, Kansas.

DIVISION OF WATER RESOURCES
DAVID W. BARFIELD
CHIEF ENGINEER
KANSAS DEPARTMENT of AGRICULTURE

David W. Barfield, P.E.
Chief Engineer
Division of Water Resources
Kansas Department of Agriculture

State of Kansas)
) SS
County of Riley)

The foregoing instrument was acknowledged before me this 31st day of October, 2017, by David W. Barfield, P.E., Chief Engineer, Division of Water Resources, Kansas Department of Agriculture.

STATE OF KANSAS NOTARY PUBLIC
KAREN HUNTER
My Appointment Expires
October 24, 2018

Notary Public

CERTIFICATE OF SERVICE

On this 7th November, 2017, I hereby certify that the attached Approval of Application and Permit to Proceed for File No. 47,955, dated October 31st, 2017, was mailed postage prepaid, first class, US mail to the following:

City of McPherson Board of Public Utilities
Timothy S. Maier
PO Box 768
McPherson, KS 67460

With photocopies to:

Stafford Field Office
Equus Beds Groundwater Management District No. 2

Danielle Wilson
Division of Water Resources

THE STATE OF KANSAS

WATER RESOURCES RECEIVED
OCT 05 2011
10:00 AM
KS DEPT OF AGRICULTURE

KANSAS DEPARTMENT OF AGRICULTURE
Dale A. Rodman, Secretary of Agriculture

DIVISION OF WATER RESOURCES
David W. Barfield, Chief Engineer

File Number 47955
This item to be completed by the Division of Water Resources.

APPLICATION FOR PERMIT TO APPROPRIATE WATER FOR BENEFICIAL USE

Filing Fee Must Accompany the Application
(Please refer to Fee Schedule attached to this application form.)

APPLICATION COMPLETE
10/25/17
Reviewer BAT

To the Chief Engineer of the Division of Water Resources, Kansas Department of Agriculture, 109 SW 9th Street, Second Floor, Topeka, KS 66612-1283:

1. Name of Applicant (Please Print): Board of Public Utilities

   Address: 401 West Kansas Avenue

   City: McPherson State KS Zip Code 67460

   Telephone Number: (620) 245-2525

2. The source of water is: ☐ surface water in _____ (stream)

   OR ☒ groundwater in Little Arkansas Equus Beds Aquifer (drainage basin)

   Certain streams in Kansas have minimum target flows established by law or may be subject to administration when water is released from storage for use by water assurance district members. If your application is subject to these regulations on the date we receive your application, you will be sent the appropriate form to complete and return to the Division of Water Resources.

3. The maximum quantity of water desired is 25744 acre-feet OR _____ gallons per calendar year, 838.740 mgy*

   to be diverted at a maximum rate of 1750 gallons per minute OR _____ cubic feet per second.

   Once your application has been assigned a priority, the requested maximum rate of diversion and maximum requested quantity of water under that priority number can **NOT** be increased. Please be certain your requested maximum rate of diversion and maximum quantity of water are appropriate and reasonable for your proposed project and are in agreement with the Division of Water Resources' requirements.

4. The water is intended to be appropriated for **(Check use intended)**:

(a) ☐ Artificial Recharge	(b) ☐ Irrigation	(c) ☐ Recreational	(d) ☐ Water Power
(e) ☐ Industrial	(f) ☒ Municipal	(g) ☐ Stockwatering	(h) ☐ Sediment Control
(i) ☐ Domestic	(j) ☐ Dewatering	(k) ☐ Hydraulic Dredging	(l) ☐ Fire Protection
(m) ☐ Thermal Exchange	(n) ☐ Contamination Remediation		

YOU **MUST** COMPLETE AND ATTACH ADDITIONAL DIVISION OF WATER RESOURCES FORM(S) PROVIDING INFORMATION TO SUBSTANTIATE YOUR REQUEST FOR THE AMOUNT OF WATER FOR THE INTENDED USE REFERENCED ABOVE.

For Office Use Only:
F.O. 2 GMD 2 Meets K.A.R. 5-3-1 (YES) NO Use MUN Source G/S County HV By RAR Date 10-5-11
Code ~~REG~~ AF3 Fee $ 760 TR # _____ Receipt Date 10-5-11 Check # 10350

DWR 1-100 (Revised 02/16/2011)

* LD/DWR 4/26/17

10-12-11 BLC

SCANNED

#1

File No. 47,955

5. The location of the proposed wells, pump sites or other works for diversion of water is:

Note: For the application to be accepted, the point of diversion location must be described to at least a 10 acre tract, unless you specifically request a 60 day period of time in which to locate the site within a specifically described, minimal legal quarter section of land.

(A) One in the NC W/2 * quarter of the SW quarter of the SW quarter of Section 32, more particularly described as being near a point 660 feet North and 4590 feet West of the Southeast corner of said section, in Township 22 South, Range 3 East/West (circle one), Harvey County, Kansas.

(B) One in the _____ quarter of the _____ quarter of the _____ quarter of Section _____, more particularly described as being near a point _____ feet North and _____ feet West of the Southeast corner of said section, in Township _____ South, Range _____ East/West (circle one), _____ County, Kansas.

(C) One in the _____ quarter of the _____ quarter of the _____ quarter of Section _____, more particularly described as being near a point _____ feet North and _____ feet West of the Southeast corner of said section, in Township _____ South, Range _____ East/West (circle one), _____ County, Kansas.

(D) One in the _____ quarter of the _____ quarter of the _____ quarter of Section _____, more particularly described as being near a point _____ feet North and _____ feet West of the Southeast corner of said section, in Township _____ South, Range _____ East/West (circle one), _____ County, Kansas.

If the source of supply is groundwater, a separate application shall be filed for each proposed well or battery of wells, except that a single application may include up to four wells within a circle with a quarter (¼) mile radius in the same local source of supply which do not exceed a maximum diversion rate of 20 gallons per minute per well.

A battery of wells is defined as two or more wells connected to a common pump by a manifold; or not more than four wells in the same local source of supply within a 300 foot radius circle which are being operated by pumps not to exceed a total maximum diversion rate of 800 gallons per minute and which supply water to a common distribution system.

6. The owner of the point of diversion, if other than the applicant is (please print):

Jeff & Dana Foster Trust, PO Box 423, McPherson, KS 67460 620-245-9557
(name, address and telephone number)

_____
(name, address and telephone number)

You must provide evidence of legal access to, or control of, the point of diversion from the landowner or the landowner's authorized representative. Provide a copy of a recorded deed, lease, easement or other document with this application. In lieu thereof, you may sign the following sworn statement:

I have legal access to, or control of, the point of diversion described in this application from the landowner or the landowner's authorized representative. I declare under penalty of perjury that the foregoing is true and correct.

Executed on 10/4, 2011. Trinity A Moss
Applicant's Signature

7. The proposed project for diversion of water will consist of One well, buried pipe
(number of wells, pumps or dams, etc.)

and (was)(will be) completed (by) 1/1/2022.
(Month/Day/Year - each was or will be completed)

8. The first actual application of water for the proposed beneficial use was or is estimated to be 12/29/53.
(Mo/Day/Year)

*BAT D WR
2-1-17

SCANNED

File No. 47,955

9. Will pesticide, fertilizer, or other foreign substance be injected into the water pumped from the diversion works?

☐ Yes ☒ No If "yes", a check valve shall be required.

All chemigation safety requirements must be met including a chemigation permit and reporting requirements.

10. If you are planning to impound water, please contact the Division of Water Resources for assistance, prior to submitting the application. Please attach a reservoir area capacity table and inform us of the total acres of surface drainage area above the reservoir.

Have you also made an application for a permit for construction of this dam and reservoir with the Division of Water Resources? ☐ Yes ☐ No

- If yes, show the Water Structures permit number here _____
- If no, explain here why a Water Structures permit is not required _____

11. The application must be supplemented by a U.S.G.S. topographic map, aerial photograph or a detailed plat showing the following information. On the topographic map, aerial photograph, or plat, identify the center of the section, the section lines or the section corners and show the appropriate section, township and range numbers. Also, please show the following information:

(a) The location of the proposed point(s) of diversion (wells, stream-bank installations, dams, or other diversion works) should be plotted as described in Paragraph No. 5 of the application, showing the North-South distance and the East-West distance from a section line or southeast corner of section.

(b) If the application is for groundwater, please show the location of any existing water wells of any kind within ½ mile of the proposed well or wells. Identify each existing well as to its use and furnish the name and mailing address of the property owner or owners. If there are no wells within ½ mile, please advise us.

None

(c) If the application is for surface water, the names and addresses of the landowner(s) ½ mile downstream and ½ mile upstream from your property lines must be shown.

(d) The location of the proposed place of use should be shown by crosshatching on the topographic map, aerial photograph or plat.

(e) Show the location of the pipelines, canals, reservoirs or other facilities for conveying water from the point of diversion to the place of use.

A 7.5 minute U.S.G.S. topographic map may be obtained by providing the section, township and range numbers to: Kansas Geological Survey, 1930 Constant, Campus West, University of Kansas, Lawrence, Kansas 66047.

12. List any application, appropriation of water, water right, or vested right file number that covers the same diversion points or any of the same place of use described in this application. Also list any other recent modifications made to existing permits or water rights in conjunction with the filing of this application.

MP05, Appropriation 1311, 23,310, 24,664, 28,151, 28,735

Appropriation 28,735 has been placed in the Water Right Conservation Plan

File No. 47,955

13. Furnish the following well information if the proposed appropriation is for the use of groundwater. If the well has not been completed, give information obtained from test holes, if available.

Information below is from: ☒ Test holes ☐ Well as completed ☐ Drillers log attached

Well location as shown in paragraph No.	(A)	(B)	(C)	(D)
Date Drilled	10/1/07			
Total depth of well	244'			
Depth to water bearing formation				
Depth to static water level	31.1'			
Depth to bottom of pump intake pipe				

14. The relationship of the applicant to the proposed place where the water will be used is that of Otherwise (owner, tenant, agent or otherwise).

15. The owner(s) of the property where the water is used, if other than the applicant, is (please print):

See attachment for place of use
(name, address and telephone number)

(name, address and telephone number)

16. The undersigned states that the information set forth above is true to the best of his/her knowledge and that this application is submitted in good faith.

Dated at McPherson, Kansas, this 4 day of October (month), 2011 (year).

(Applicant Signature)

APPLICANT(S) SOCIAL SECURITY IDENTIFICATION NUMBER(S)

By Timothy S Maier
(Agent or Officer Signature)

48-6019780
and/or
APPLICANT(S) TAXPAYER I.D. NO.(S)

Timothy S. Maier
(Agent or Officer - Please Print)

Assisted by _____ _____ Date: _____
(office/title)

SCANNED

47,955

GWA

1 Oct 2007

Jeff Foster
Test Hole 5-07

906' N & 215' E of SW cor. Section 32, T22S, R3W — Elev. 1452'
GPS N 38° 5.350' W 97° 40.986'

SWL 31.10'

0 - 9'	Sand br, vf-f
9 – 21	Sand br, vf-f, so. clay gy, streaks
21 – 46	Clay lt br & lt gy, sandy
46 – 55	Clay lt br & tan &gy
55 – 75	Sand br, vf-f
75 – 104	Sand br, vf-c
104 – 110	Clay tan, sandy
110 – 117	Clay lt br & tan, sandy, cemented sand streaks, so. gravel br, f
117 – 130	Clay lt br, sandy, sand br, vf-f
130 – 137	Clay lt br & gy, silty, so. sand br, vf, streaks
137 – 140	Clay lt br & gy, silty, so. caliche layers
140 – 141	Clay lt br & gy, sandy, gravel in clay
141 – 160	Sand br, vf-f, so. clay br & lt br streaks, tight
160 – 178	Sand br, vf-c, so. clay rd-br streaks
178 - 190	Clay rd br & lt br, silty,
190 – 195	Clay rd br , sandy, so. gravel br, f
195 – 205	Clay rd br & gy, sandy, so. gravel br, f
205 – 210	Clay gy- gn, silty
210 – 215	Clay rd br & gy, sandy, so. gravel br, f
215 – 220	Clay rd br & gy, sand br, m-c
220 – 225	Clay rd br, silty
225 – 244	Sand br, f-c, clay rd-br &gy streaks
244 -250	Shale rd, hard
250 – 251	Shale dk gy

Set 2" PVC . Screen 244' – 224'.

Logged by Brad Vincent, P. G., Ground Water Associates
Hand held GPS. Conus 1927 datum

47,955

Water Right Application

Proposed Place of Use

For municipal use for the City of McPherson and immediate vicinity, City of Windom and immediate vicinity and within the areas served by Rural Water District nos. 2, 3, 4, McPherson County, Kansas including customers along the pipeline which serves the City of Windom.

47,955

PRELIMINARY SAFEYIELD EVALUATION - Tim Maier, McPherson BPU
LOCATION - NC-SW-SW (660' N & 4590' W) Section 32, T22S, R3W, Harvey Co.
SPECIAL USE AREA - Hollow Nikkel SWQUA
EVALUATION DATE - 9/29/2011

Total Area: 8041.89 acres ; Area in 3 inch discharge zone: 0 acres ; Area in 6 inch discharge zone: 8041.89 acres

FILE_ID	WELL_ID	TOWNSHIP	RANGE	SECTION	QUALIFIER	USE	AUTHQUANTITY
A02930900	1239	22S	03W	29	40532836	IRR	60
AM058	1962	22S	03W	29	51751650		50
A04759200	3610	22S	03W	32	24742497	MUN	2650
AM056	1960	22S	03W	29	25751750		50
AM057	1961	22S	03W	29	39001600		50
A03005000	1892	22S	03W	30	28000050	IRR	190
A01736300	1368	22S	03W	29	40532836	IRR	92
A03653500	1126	22S	03W	30	29403817	IRR	224
AM050	1954	22S	03W	31	40003250		50
AM051	1955	22S	03W	31	45002000		50
AM052	1956	22S	03W	31	51250850		50
AM053	1957	22S	03W	30	9000175		50
AM054	1958	22S	03W	29	14504225		50
AM055	1959	22S	03W	29	20753000		50
A03653600	1896	22S	03W	30	29403817	IRR	11
AM048	1952	22S	04W	36	35000200		50
AM049	1953	22S	03W	31	29004050		50
A04213200	2261	22S	03W	29	40532836	IRR	140
A03709000	423	22S	03W	29	40532836	IRR	30
AM045	1949	22S	04W	36	46003950		50
AM046	1950	22S	04W	36	47752600		50
AM047	1951	22S	04W	36	40501400		50

Small User Quantity	0.00	Total Existing Appropriations	4097.00
Remaining SUQ	45.00	Non Consumptive Appropriations	0.00
		Consumptive Appropriations	4097.00
Note - Values in acre-feet		Allowable Appropriations	4021.00

Turney, Brent

From: TIM MAIER <TIMM@MCPHERSONPOWER.COM>
Sent: Monday, December 12, 2016 5:13 PM
To: Brian Meier; Daniel Clement; Barfield, David
Cc: Turney, Brent; Lanterman, Jeff; Letourneau, Lane
Subject: RE: Draft Conditions McPherson BPU Applications, 47955, 47956, 47957
Attachments: MAIER, TIM.vcf

David,

I am comfortable with your proposed language and want to thank you for taking the time to work with us. As you are aware, these rights are an important part of McPherson's future water supply.

Tim

Timothy S. Maier
General Manager
Board of Public Utilities
McPherson, KS 67460
Ph 620-245-2532
timm@mcphersonpower.com

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Lane and I called Tim.

The change in 13 is fine.

Tim thought the change in #6 too narrow. This was the best we could agree to:

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David

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Sent: Monday, December 12, 2016 1:05 PM
To: Barfield, David <David.Barfield@ks.gov>; MAIER, TIM (TIMM@MCPHERSONPOWER.COM) <TIMM@MCPHERSONPOWER.COM>; Meier, Brian <bmeier@burnsmcd.com>
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Thanks again and always for your thoughts, please let us know if you are available this afternoon for a quick conference call (after 4:30 would work best), or later this week as well.

Daniel Clement \ Burns & McDonnell
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O 316-616-0522 \ M 316-518-0893 \ F 316-941-4730
dwclement@burnsmcd.com \ burnsmcd.com
800 E. 1st Street North, Suite 400 \ Wichita , KS 67202

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Proud to be one of *FORTUNE*'s 100 Best Companies to Work For
Please consider the environment before printing this email.

From: Barfield, David [mailto:David.Barfield@ks.gov]
Sent: Thursday, December 08, 2016 1:02 PM
To: MAIER, TIM (TIMM@MCPHERSONPOWER.COM) <TIMM@MCPHERSONPOWER.COM>; Meier, Brian <bmeier@burnsmcd.com>; Clement, Daniel W <dwclement@burnsmcd.com>
Subject: FW: Draft Conditions McPherson BPU Applications, 47955, 47956, 47957

Tim, Brian and Daniel,

Thanks for the input on the permit conditions. I forwarded them on to Tim. Tim provided some edits, which we discussed. Attached is the end of our discussion.

Attached is a markup, after accepting all of the changes provided by Daniel Clements, with the changes that Tim and I agreed upon. I hope everyone can live with.

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Can you all live with this?

Let me know if you wish to discuss. I am tied up this afternoon and tomorrow morning but could talk in tomorrow afternoon on my way talk from lovely Lamar, Colorado.

David

From: Clement, Daniel W [mailto:dwclement@burnsmcd.com]
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To: Barfield, David <David.Barfield@ks.gov>
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Subject: Draft Conditions McPherson BPU Applications, 47955, 47956, 47957

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We would be happy to discuss the recommended revisions at your convenience by phone, or in person through a short follow-up meeting.

Thanks as always for your thoughts and feedback,

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800 E. 1st Street North, Suite 400 \ Wichita , KS 67202

BOARD OF PUBLIC UTILITIES
McPHERSON, KS

February 10, 2017
(Date)

WATER RESOURCES
RECEIVED
FEB 23 2017
KS DEPT OF AGRICULTURE

Kansas Department of Agriculture
Division of Water Resources
David W. Barfield, Chief Engineer
1320 Research Park Drive
Manhattan, Kansas 66502

Re: Application
File No. 47955

Minimum Desirable Streamflow

Dear Sir:

I understand that a Minimum Desirable Streamflow requirement has been established by the legislature for the source of supply to which the above referenced application applies.

I understand that diversion of water pursuant to this application will be subject to regulation any time Minimum Desirable Streamflow requirements are not being met.

I also understand that if this application is approved, there could be times, as determined by the Division of Water Resources, when I would not be allowed to divert water. I realize that this could affect the economics of my decision to appropriate water.

I am aware of the above factors, and with the knowledge thereof, request that the Division of Water Resources proceed with processing and approval, if possible, of the above referenced application.

Signature of Applicant

State of Kansas)
) ss
County of McPherson)

Timothy S. Maier
(Print Applicant's Name)

I hereby certify that the foregoing instrument was signed in my presence and sworn to before me this 10 day of February, 2017.

CARLA J. PEARSON
Notary Public - State of Kansas
My Appt. Expires 1/29/21

Notary Public

My Commission Expires:

SCANNED

Turney, Brent

From: Tim Boese <tboese@gmd2.org>
Sent: Monday, October 16, 2017 10:04 AM
To: Turney, Brent; Barfield, David; bmeier@burnsmcd.com
Cc: Letourneau, Lane; Baum, Kristen
Subject: RE: Approval File No. 47,957

Brent and others – I have reviewed the draft and find the modifications acceptable.

Thanks.

Tim Boese, Manager
Equus Beds GMD2
313 Spruce, Halstead, Kansas 67056
316-835-2224
Fax: 316-835-2225
tboese@gmd2.org
www.gmd2.org

From: Turney, Brent [mailto:Brent.Turney@ks.gov]
Sent: Thursday, October 05, 2017 9:45 AM
To: Barfield, David; Tim Boese; bmeier@burnsmcd.com
Cc: Letourneau, Lane; Baum, Kristen
Subject: Approval File No. 47,957

David, Tim and Brian,

You will find attached a final draft for the Approval of Application and Permit to Proceed for Application, File No. 47,957. We have made modifications to paragraph Nos. 24, 25 and 27. Please review the document with specific reference to these paragraphs. If these modifications are acceptable I would like to proceed with the three new applications and four change applications as soon as possible.

Thanks,
Brent

Brent A. Turney, P.G.
Kansas Department of Agriculture
Division of Water Resources
1320 Research Park Drive
Manhattan Kansas 66502
(785) 564-6645
Brent.Turney@ks.gov
www.agriculture.ks.gov

Turney, Brent

From: TIM MAIER <TIMM@MCPHERSONPOWER.COM>
Sent: Monday, December 12, 2016 5:13 PM
To: Brian Meier; Daniel Clement; Barfield, David
Cc: Turney, Brent; Lanterman, Jeff; Letourneau, Lane
Subject: RE: Draft Conditions McPherson BPU Applications, 47955, 47956, 47957
Attachments: MAIER, TIM.vcf

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General Manager
Board of Public Utilities
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Ph 620-245-2532
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David

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-------- Original message --------
From: Tim Boese <tboese@gmd2.org>
Date: 12/6/16 12:01 PM (GMT-06:00)
To: "Barfield, David" <David.Barfield@ks.gov>, "Turney, Brent" <Brent.Turney@ks.gov>, "Letourneau, Lane" <Lane.Letourneau@ks.gov>
Subject: RE: Application File Nos. 47,955, 47,956 and 47,957

Here are my suggested revisions. Don't think I can accept all of the applicant's revisions as most of the GMD2 review, etc, was eradicated in their revisions. I changed the applicant's revisions to all blue and my revisions are in purple.

Thanks.

Tim

-----Original Message-----
From: Barfield, David [mailto:David.Barfield@ks.gov]
Sent: Monday, December 05, 2016 3:17 PM
To: Turney, Brent; Letourneau, Lane; Tim Boese - GMD 2 (tboese@gmd2.org)
Subject: RE: Application File Nos. 47,955, 47,956 and 47,957

Tim,

I sent our draft on to Tim Maier and Burns and Mac.

Attached is a markup with their suggestions for the conditions.

I will try to give you a call to discuss tomorrow the status of your review as I will be on the road the rest of the week.

Thanks.

David

-----Original Message-----
From: Barfield, David
Sent: Tuesday, November 22, 2016 3:56 PM
To: Turney, Brent <Brent.Turney@ks.gov>; Letourneau, Lane <Lane.Letourneau@ks.gov>; Tim Boese - GMD 2 (tboese@gmd2.org) <tboese@gmd2.org>
Subject: RE: Application File Nos. 47,955, 47,956 and 47,957

Tim,

Lane and I would like to walk you through the attached. We are trying to stick with what we heard the Board approve, but with more certainty. BPU's focus is on conditions which require either the GMD's or DWR's future

Turney, Brent

From: Tim Boese <tboese@gmd2.org>
Sent: Monday, December 12, 2016 5:41 PM
To: Turney, Brent; Barfield, David; Letourneau, Lane
Subject: RE: Application File Nos. 47,955, 47,956 and 47,957

I am OK with using the emails as documentation.

Thanks.

Tim Boese, Manager
Equus Beds GMD2
313 Spruce, Halstead, Kansas 67056
316-835-2224
Fax: 316-835-2225
tboese@gmd2.org
www.gmd2.org

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Subject: RE: Application File Nos. 47,955, 47,956 and 47,957

Tim,
Do you want to make an official notification or recommendation with these changes, or are you okay if we draft up the approvals using these emails as documentation.
Thanks,
Brent

Brent A. Turney, P.G.
Kansas Department of Agriculture
Division of Water Resources
1320 Research Park Drive
Manhattan Kansas 66502
(785) 564-6645
Brent.Turney@ks.gov
www.agriculture.ks.gov

From: Barfield, David
Sent: Monday, December 12, 2016 5:07 PM
To: Tim Boese <tboese@gmd2.org>; Turney, Brent <Brent.Turney@ks.gov>; Letourneau, Lane <Lane.Letourneau@ks.gov>
Subject: RE: Application File Nos. 47,955, 47,956 and 47,957

Per our discussion, I sent the following language to BPU. They are good with it.

Looks like we can move on to other projects.

approval outside of very clear terms. We went over your draft conditions and believe the following changes are needed to provide them with that certainty so they can move forward.

In addition to making sure the process works, we need to talk about the numbers in yellow. As it is clear this project will not be built and in operation until closer to or after 2020, we would if we can change the initial amount to the 2040 projection.

I am sending a markup and clean copy. The markup on #10 is a bit of a mess as we moved things around.

We have not shared this with BPU. If we can get to agreement, we will need to run it by them.

David

-----Original Message-----
From: Barfield, David
Sent: Monday, November 21, 2016 8:54 AM
To: 'Tim Boese' <tboese@gmd2.org>; Turney, Brent <Brent.Turney@ks.gov>
Cc: Letourneau, Lane <Lane.Letourneau@ks.gov>
Subject: RE: Application File Nos. 47,955, 47,956 and 47,957

Tim,

Thanks for your note. Both the utility and DWR appreciate you and the Board's willingness to provide the utility with some flexibility.

We are not seeking major changes to what we discussed and the Board approved, and thus we are hoping we can characterize the changes sought to be wordsmithing.

To provide a bit of background. At their request, we recently met with Tim Maier and Brian Meier to review your recommendations. As I understand it, the utility has annual budget of $3.5 million, so taking on this $20+ million project is a big deal as you know. Like other cities taking on big projects, they need a lot of certainty to get the financing, etc. They are concerned with some of the wording on your recommended conditions. I said I would reach out to you to with specific wording to see if you agreed it was within the scope of the Board's action. I did not get that done within the 30 days, so we reached out to you on behalf of the utility.

We will get you some language tomorrow so we can hopefully bring this to closure with wording that you are satisfied with and without the need to go back to the Board.

Thanks.

David

-----Original Message-----
From: Tim Boese [mailto:tboese@gmd2.org]
Sent: Sunday, November 20, 2016 11:40 AM
To: Turney, Brent <Brent.Turney@ks.gov

David

-----Original Message-----
From: Tim Boese [mailto:tboese@gmd2.org]
Sent: Sunday, November 20, 2016 11:40 AM

To: Turney, Brent <Brent.Turney@ks.gov>
Cc: Barfield, David <David.Barfield@ks.gov>; Letourneau, Lane <Lane.Letourneau@ks.gov>
Subject: RE: Application File Nos. 47,955, 47,956 and 47,957

Thanks Brent. If there are any substantial changes to the District's recommendation conditions, I will need to take it back to the Board. Since I had discussed the quantity limitation with both David and Lane and thought we had all agreed on the concept, I would be concerned if now DWR would want to make any major changes. I would certainly be open to any wordsmithing. Additionally, if the applicant wants the limitation changed, then the applicant should be the party appealing to the Board, not DWR. It is important to remember that the Maximum Reasonable Quantity for Beneficial Use Regulation K.A.R. 5-22-14 is a District Regulation, and therefore to be granted an exception it must come from the Board as a recommendation to the Chief Engineer. The Board has made the exception recommendation based on the conditions outlined.

I would be glad to discuss this with you, David, and Lane.

Thanks and I look forward to continuing to work together on this and other issues.

Tim Boese, Manager
Equus Beds GMD2
313 Spruce, Halstead, Kansas 67056
316-835-2224
Fax: 316-835-2225
tboese@gmd2.org
www.gmd2.org

-----Original Message-----
From: Turney, Brent [mailto:Brent.Turney@ks.gov]
Sent: Thursday, November 17, 2016 5:18 PM
To: Boese, Tim
Cc: Barfield, David; Letourneau, Lane
Subject: Application File Nos. 47,955, 47,956 and 47,957

Tim,
This email is a follow up to our earlier conversation regarding the Districts letter dated October 18, 2016. The letter states that " A District decision may be appealed to the District Board of Directors by submitting a written petition to the District office with 30 days from the date of this notification, pursuant to K.A.R. 5-22-12." While we are not appealing the recommendation of the Board of Directors, we do however, request additional time to review the conditions of approval as stated in your letter. The Chief Engineer and staff will be reviewing the conditions in depth and will be responding to you in the near future.
As always we appreciate working with you.
Thanks,
Brent

Brent A. Turney, P.G.
Kansas Department of Agriculture
Division of Water Resources
1320 Research Park Drive
Manhattan Kansas 66502
(785) 564-6645

Schemm, Doug

From: TIM MAIER <TIMM@MCPBPU.COM>
Sent: Thursday, November 15, 2012 3:59 PM
To: Schemm, Doug
Cc: CARLA PEARSON
Subject: Re: File Nos. 47,955; 47,956; and 47,957
Attachments: Burns McPherson WS demand analysis 2-16-12.pdf; Bureau of Rec McPherson Water Supply Augmentation Investigation.pdf; Burns mcpherson bpu demand Figure 1 080511.pdf; MAIER, TIM.vcf

Doug,

Attached is a letter and a Bureau of Reclamation Report which should provide justification for the quantity of water requested under the above applications. In general the utility is requesting an additional 1058 AFY with the ability to pump more from the new rights, which should reduce the stress on the aquifer around McPherson's existing well field.

Timothy S. Maier
General Manager
Board of Public Utilities
McPherson, KS 67460
Ph 620-245-2532
Fax 620-245-2529
timm@mcpbpu.com>>> "Schemm, Doug" <Doug.Schemm@KDA.KS.GOV> 11/13/2012 3:47 PM >>>
Tim,
I apologize for not getting to these sooner. After my preliminary review, we are lacking a couple of things. On Application, File No. 47,957 there are several nearby well owners located. However, I need names and addresses for these nearby's. Also, we will need some justification for quantity (20 year projection, population, etc.). I'm attaching a basic MUN use supplemental sheet, but of course if you have more information that would be great. Call me if you have any questions or I can be of any assistance.

Thanks, Doug Schemm

785-296-3495

BOARD OF PUBLIC UTILITIES

CITY OF McPHERSON

401 W. Kansas Ave

P.O. BOX 768 • McPherson, KS 67460 • 620-245-2525

February
14
2012

Division of Water Resources
Kansas Department of Agriculture
109 SW 9th Street, 2nd Floor
Topeka, KS 66612-1283

Re: Additional Information for Applications 47955, 47956, and 47957

Gentlemen:

Enclosed is additional information for the recently filed Applications to Appropriate Water for Beneficial Use. Specifically, the letter from Burns & McDonnell is intended to justify need for the additional quantity of water, while the other information provides property owners with ½ mile that may have a water well.

This submittal should complete the information requirements stated on the application, but if additional information is required please let us know as we would be happy to provide the necessary documentation.

Yours truly,

BOARD OF PUBLIC UTILITIES

Timothy S. Maier, General Manager

TMS/cp

Enclosures

47,955 47,956 47,957

Burns & McDonnell
SINCE 1898

February 16, 2012

Mr. Tim Maier, P.E.
General Manager
McPherson BPU
400 East Kansas Avenue
McPherson, KS 67460

Re: Water Supply and Demand Projections

Dear Mr. Maier:

Presented below is information relating to water demand projections for the City of McPherson BPU and the associated need for an additional future water supply to meet the future demands. Additional water sources are also required to reduce the current stresses on the existing water supply sources and, at a minimum, reduce the rate of aquifer decline.

Existing System:

The existing system includes 12 groundwater wells that supply water to McPherson. Water is collected in raw water lines and conveyed to a Water Blending Plant completed in 2010. Water is provided to the City of McPherson, Kansas and four rural water districts in McPherson County by the McPherson Board of Public Utilities (BPU). In addition to the 12 groundwater wells, the water system includes volatile organic compound (VOC) treatment of three wells, three elevated storage tanks, and distribution pipelines.

All of the wells are located in the western half of the City. Wells 7, 10, 11, 12, 13, and 14 are located on the southwest side of the City along 12th Avenue and Iron Horse Road. Wells 8 and 9 are located along the western edge of the City, just east of Old 81 Bypass Highway. These wells pump water into the raw water collection system for conveyance to the blending facility for disinfection and distribution. Water from Wells 2, 3, and 5 are blended together and treated to remove VOCs before discharging to the raw water collection system which supplies the Water Blending Plant.

The raw water supply system includes 12 deep well pumps and three high service pumps located in the VOC treatment facility. All pumps are in good working order and can provide a firm pumping capacity of 11,500 gpm or 16.6 MGD. Well pumping capacity is adequate to meet 2026 projected maximum day demands of 11.2 MGD.

Wells 2, 3, and 5 are blended at the VOC treatment facility where two air strippers are used to remove perchloroethylene (PCE). Water is stored in a 0.09-MG clearwell and chlorine is added for disinfection and a polyphosphate is added to sequester hardness. Two 700-gpm pumps and one 1400-gpm pump are used to convey the treated water to the Water Blending Plant.

9400 Ward Parkway • Kansas City, MO 64114-3319
Tel: 816 333-9400 • Fax: 816 333-3690 • www.burnsmcd.com

The blending facility currently facilitates management of identified water quality issues such as elevated nitrate levels. A future increase in nitrate levels, or the identification of other water quality challenges, could drive the need for additional treatment processes at the blending facility. The treatment technology selected could significantly increase the raw water supply required to meet finished water demands due to the potential for treatment losses. For example, reverse osmosis (RO) treatment could result in a 15 to 25 percent increase in the amount of water required.

Water quality from the existing wells is summarized in Table 1 below.

Table 1 – McPherson Well Field Water Quality

Parameter	Unit	Range
Alkalinity	mg/L	250 - 315
Chloride	mg/L	31 – 160
Fluoride	mg/L	0.1 – 0.21
Hardness	mg/L	270 - 480
Iron	mg/L	ND – 0.024
Manganese	mg/L	ND – 0.014
Nitrate	mg/L	0.87 - 8.4
Sulfate	mg/L	15 - 41
Sodium	mg/L	16 - 27
TDS	mg/L	350 - 630
Conductance	uS/cm	600 – 1,100
Silica	mg/L	31 - 39
Magnesium	mg/L	8.7 - 15
Calcium	mg/L	93 - 170
pH		7.3 – 8.1

Data from the McPherson BPU 2010 CCR

Net Water Need:

Customer and water demand projections were developed in the 2006 Water Master Plan. Average day and maximum day water demand projections for the McPherson service area through the year 2026 are shown in Figure 1. The projected 2026 average day demand is 4.3 MGD and maximum day demand is 11.2 MGD without cooling water service to National Cooperative Refinery Association (NCRA). Average day demand defines the required system water rights and sustainable yield. Maximum day demands determine the system's firm water supply and treatment capacity.

Water rights total 4,600 acre-feet per year (AFY), or an average of 4.1 MGD, and are adequate through the year 2019, but a projected water supply deficit is anticipated by year 2020. It is projected that an additional 0.19 MGD of water rights will be required to meet year 2026 demands. This deficit will increase to approximately 0.94 MGD in order to meet the projected average day demand of 5.0 MGD in 2050. This projected deficit translates to approximately 2.9 AF/day or 1058 AFY. This deficit represents the potential need for additional supply. These demand projections do not include any increased raw water supply quantities that may be required as a result of treatment plant losses for reject, as these losses are dependent on finished water quality goals, the type of treatment and system recovery. For instance, the use of RO treatment could reasonably require up to an additional 0.75 MGD or 2.3 AF/day. Future economic development in the form of new commercial or industrial entities, or the expansion of existing industrial consumers, could also increase future water supply demands. As stated above, these projections do not include continued service to NCRA at the current level of approximately 0.8 MGD. If NCRA should require additional water from the utility, that demand must be added back into the projections.

Source Sustainability:

The net water need is defined by two primary factors: 1) an adequate quantity of water rights; and 2) the sustainability of the water resources upon which the water rights are based. The purchase of additional water rights (approximately 0.25 MGD that includes five irrigated quarters and the former Culver Fish Farm) and their conversion to municipal use will cover the projected appropriations deficit for a direct well supply. However, it should be noted that these additional water rights fall within the over-appropriated and over-produced area as described below. Thus development of these sources would provide water rights to additional supply but would not alleviate the current over-draft within the McPherson area.

Water levels in the vicinity of the BPU's well field continue to decline even with the wet years of 2007 through 2010. This is due to over-pumping of the aquifer by area municipal, industrial and agricultural wells. The aquifer has declined 20 to 30 feet from pre-development conditions. Continued over-pumping will eventually result in a diminished supply available from the aquifer, thus changing the net water need to a positive quantity even in the absence of increased demand. Water quality will also likely continue to degrade causing the need for additional water treatment processes.

The safe yield of the aquifer in the McPherson IGUCA area has been estimated to be about 10,000 AFY by the Kansas Geological Survey (KGS). The Bureau of Reclamation (BOR) has estimated current total demands including municipal, industrial and irrigation to be approximately 11,657 AFY. BOR also estimates that the demands will increase to over 12,000 AFY by 2040. These estimates result in a current regional supply deficit of approximately 1,675 AFY and a 2040 deficit of greater than 2,000 AFY.

These deficit projections are supported by the observed declining water level trends which are likely to continue or even worsen over time as demands and the associated stresses on the regional aquifer increase. In order to reduce or halt the water level decline, a supplemental source or sources from outside the immediate area will be required to reduce the current demands on the aquifer to a sustainable level, or other means of water reductions must be implemented. Even further reductions in use of the aquifer would be required to allow the aquifer to recover to predevelopment levels. BOR estimates that additional sources totaling over 4,000 AFY would be required to allow the aquifer to return to predevelopment condition over a 60-year period. This evaluation contemplates only the addition of sources commensurate with stabilizing aquifer water levels while meeting current and future demands. Thus the BOR report indicates that the development of a supplemental source capable of providing between 2,000 and 4,000 AFY will be required to sustain the aquifer within the McPherson IGUCA as a viable water supply source.

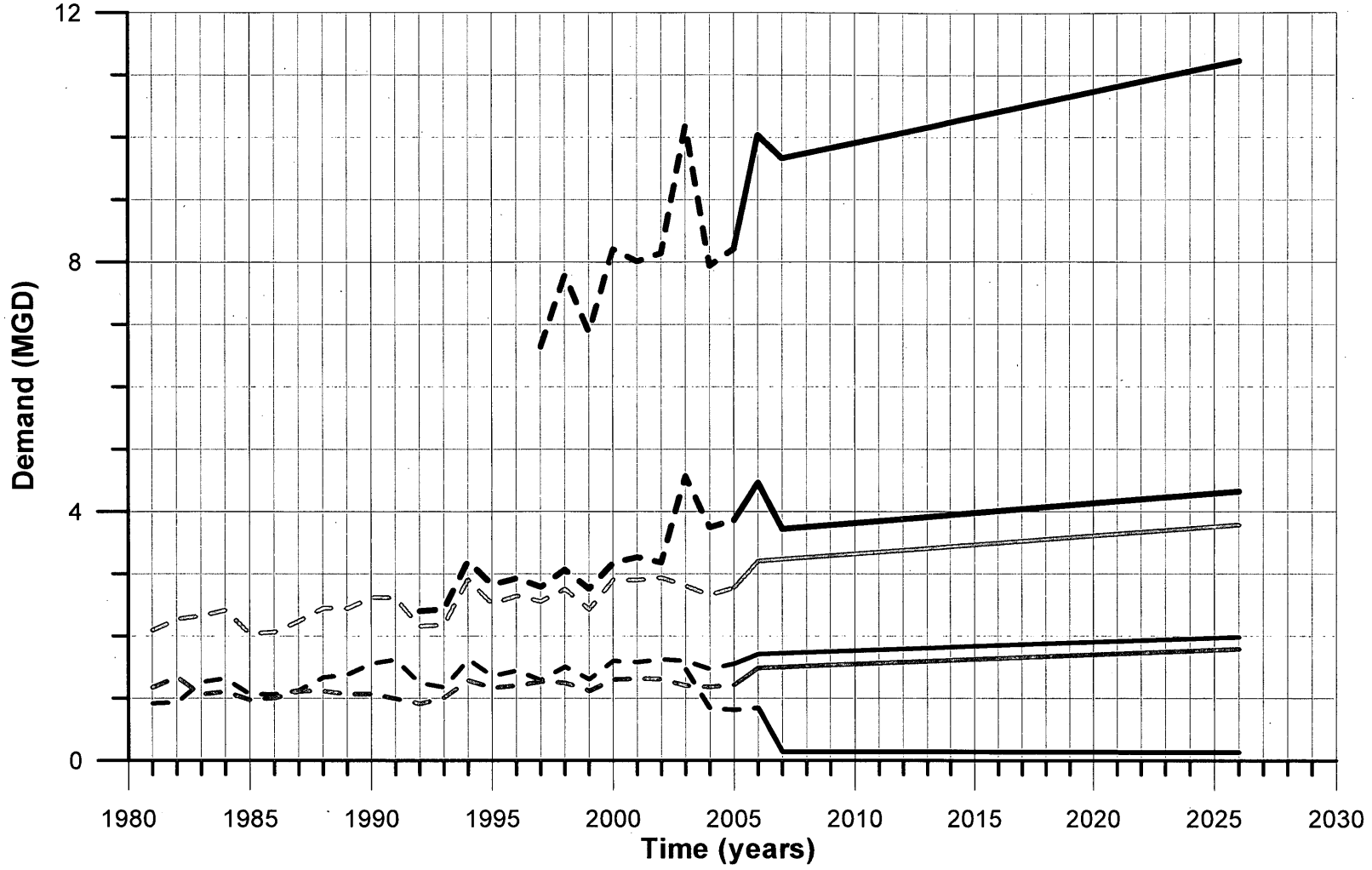
Enclosed you will find a copy of the BOR report dated December 2005. If you have questions or require additional information please contact our office.

Respectfully Submitted,

Brian J. Meier
Managing Associate

Enclosure Attachment

mcpherson bpu demand



Legend

- Residential Average Day Sales
- Commercial Average Day Sales
- NCRA
- Total Average Day Sales
- Average Day Pumpage
- Maximum Day Pumpage

Burns & McDonnell
SINCE 1898

Figure 1
McPherson BPU
Water Demand

Burns & McDonnell
SINCE 1898

February 16, 2012

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General Manager
McPherson BPU
400 East Kansas Avenue
McPherson, KS 67460

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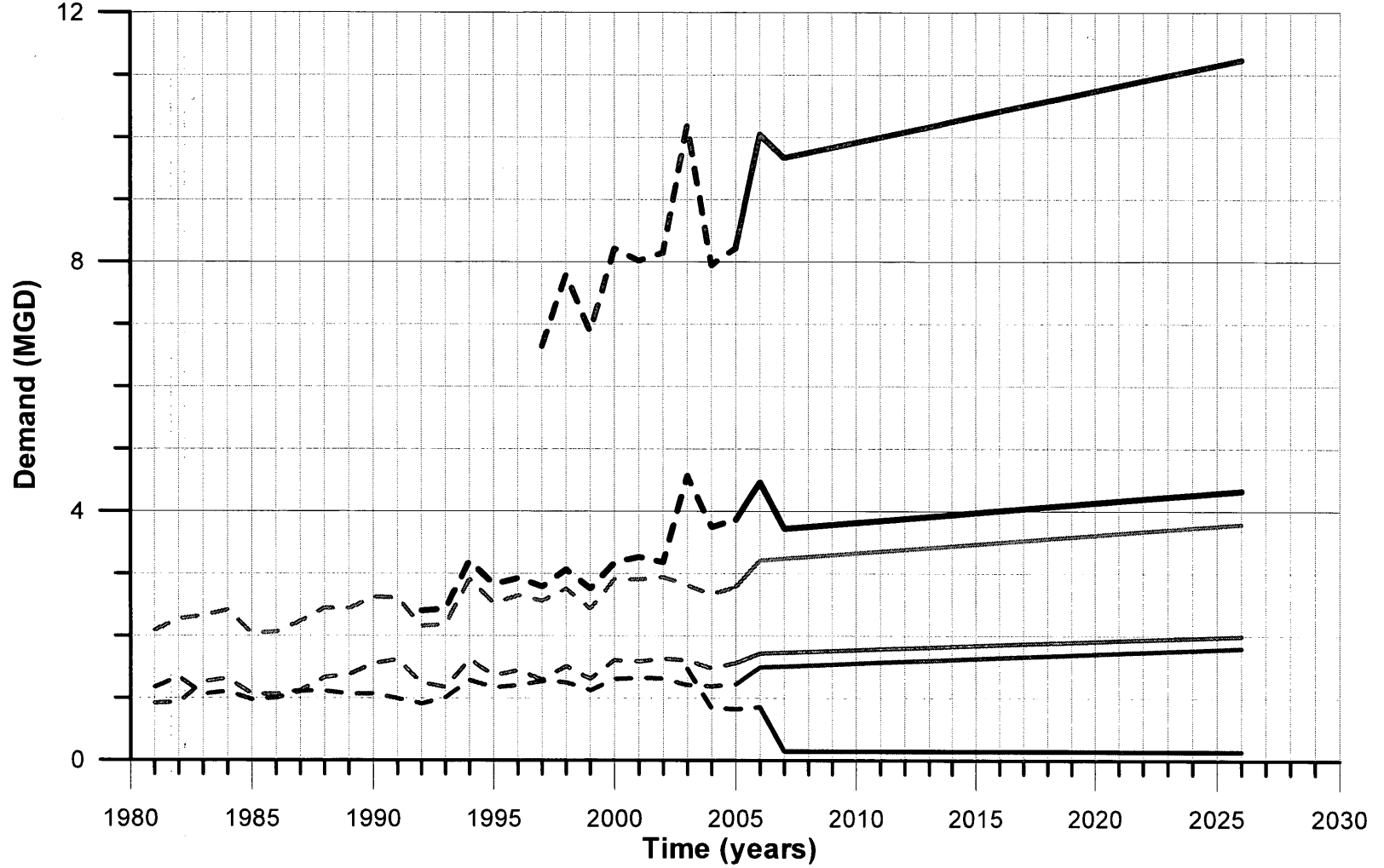
Respectfully Submitted,

Brian J. Meier
Managing Associate

Enclosure Attachment

mcpherson bpu demand



Burns & McDonnell
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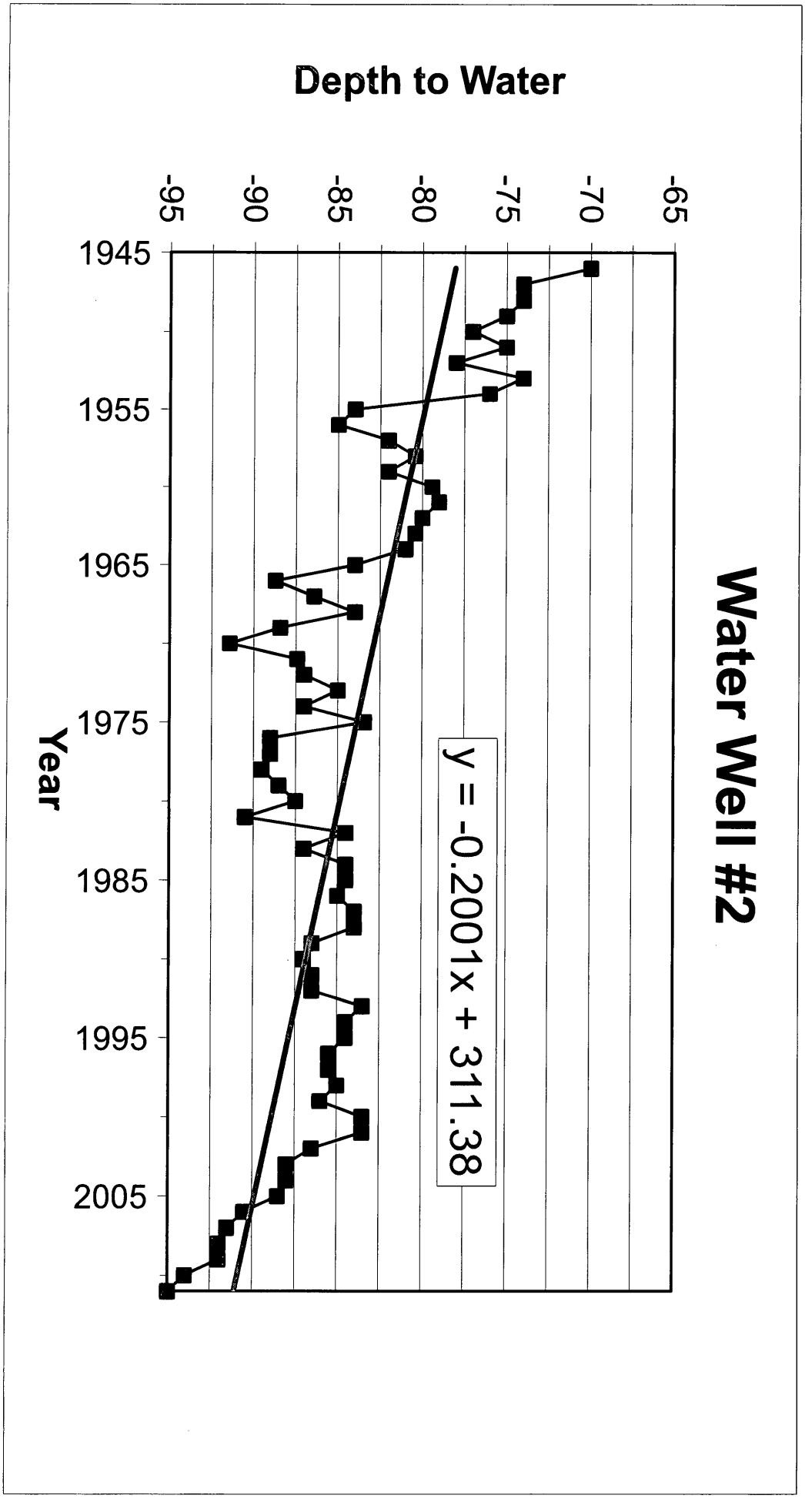
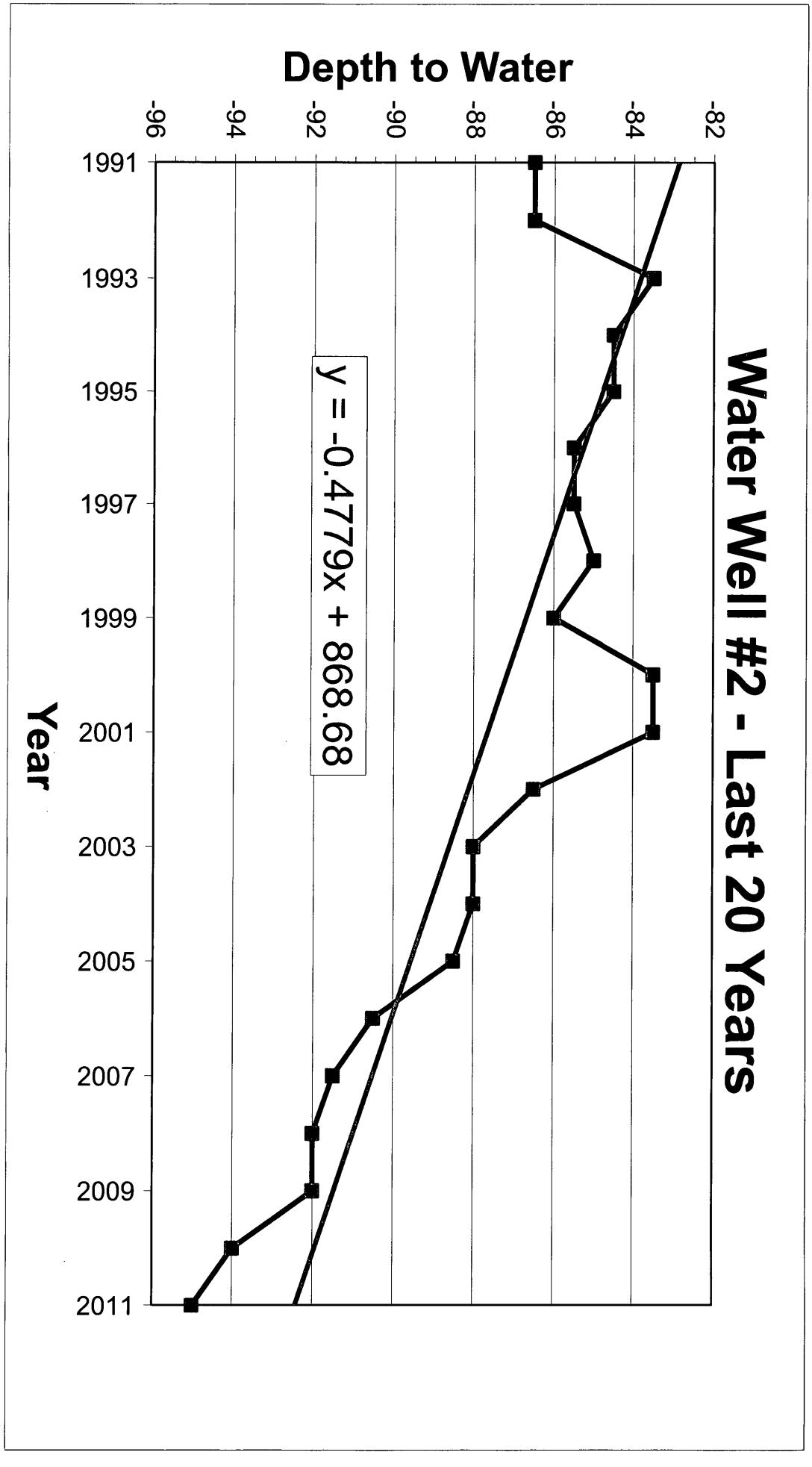
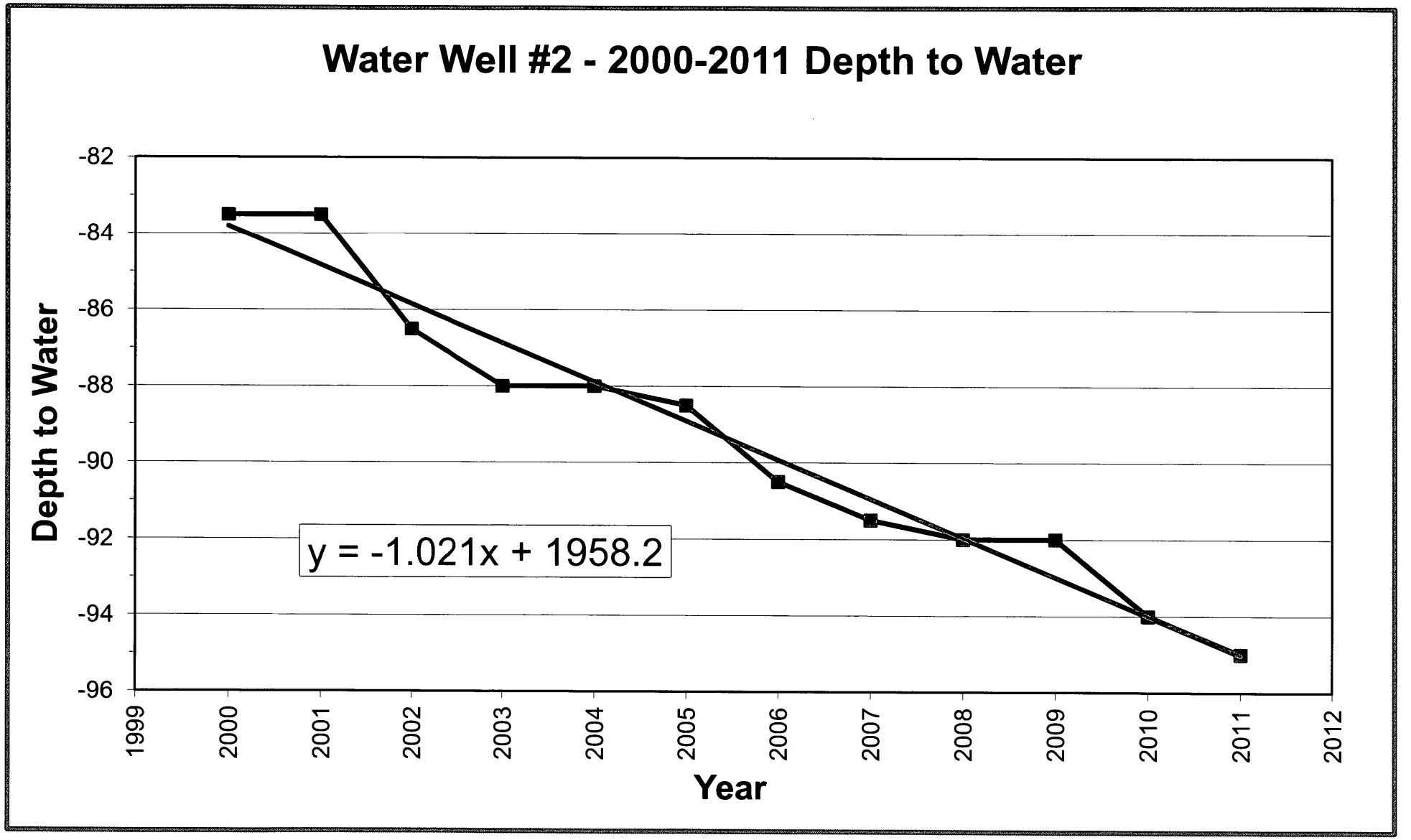
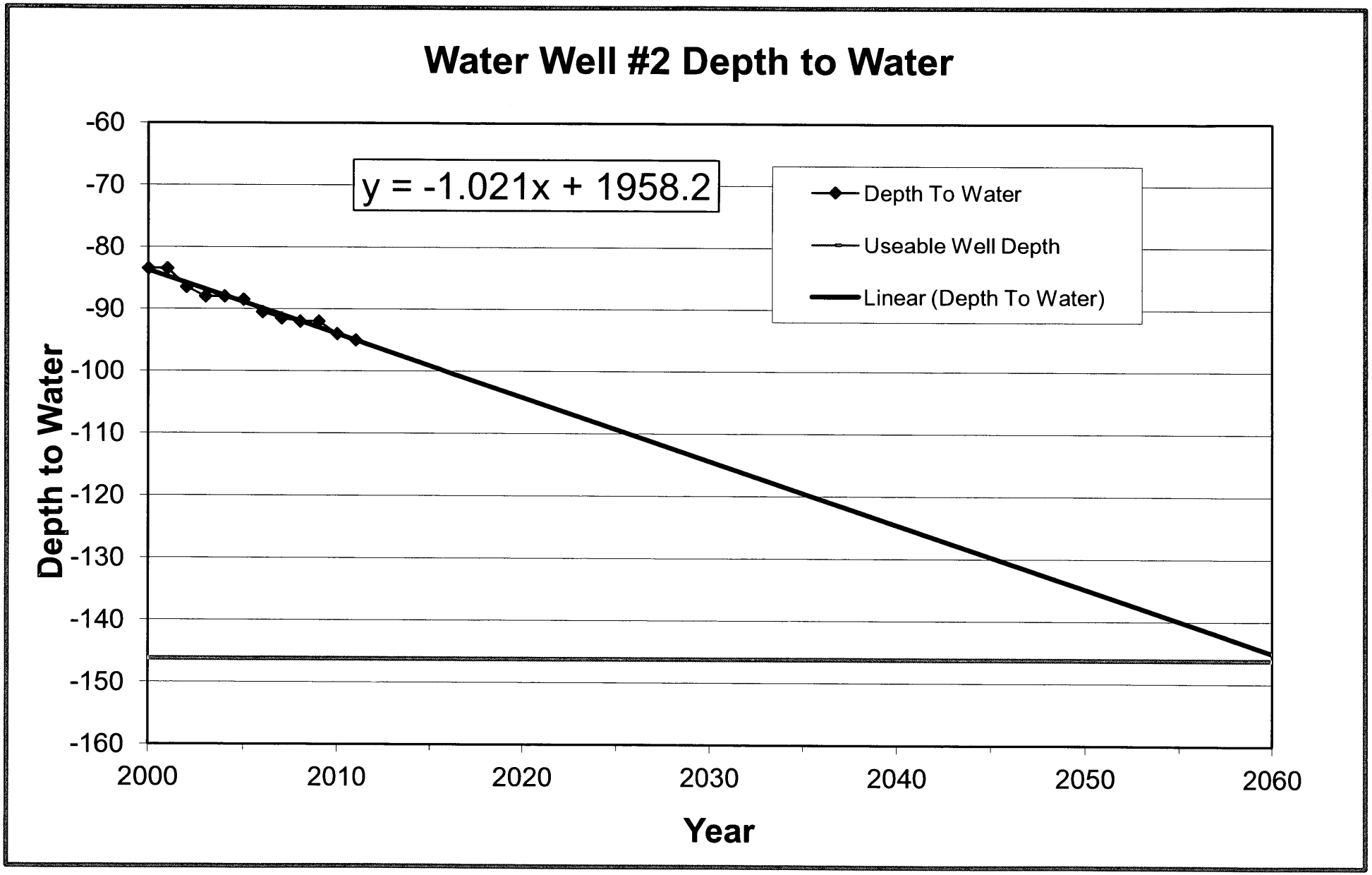
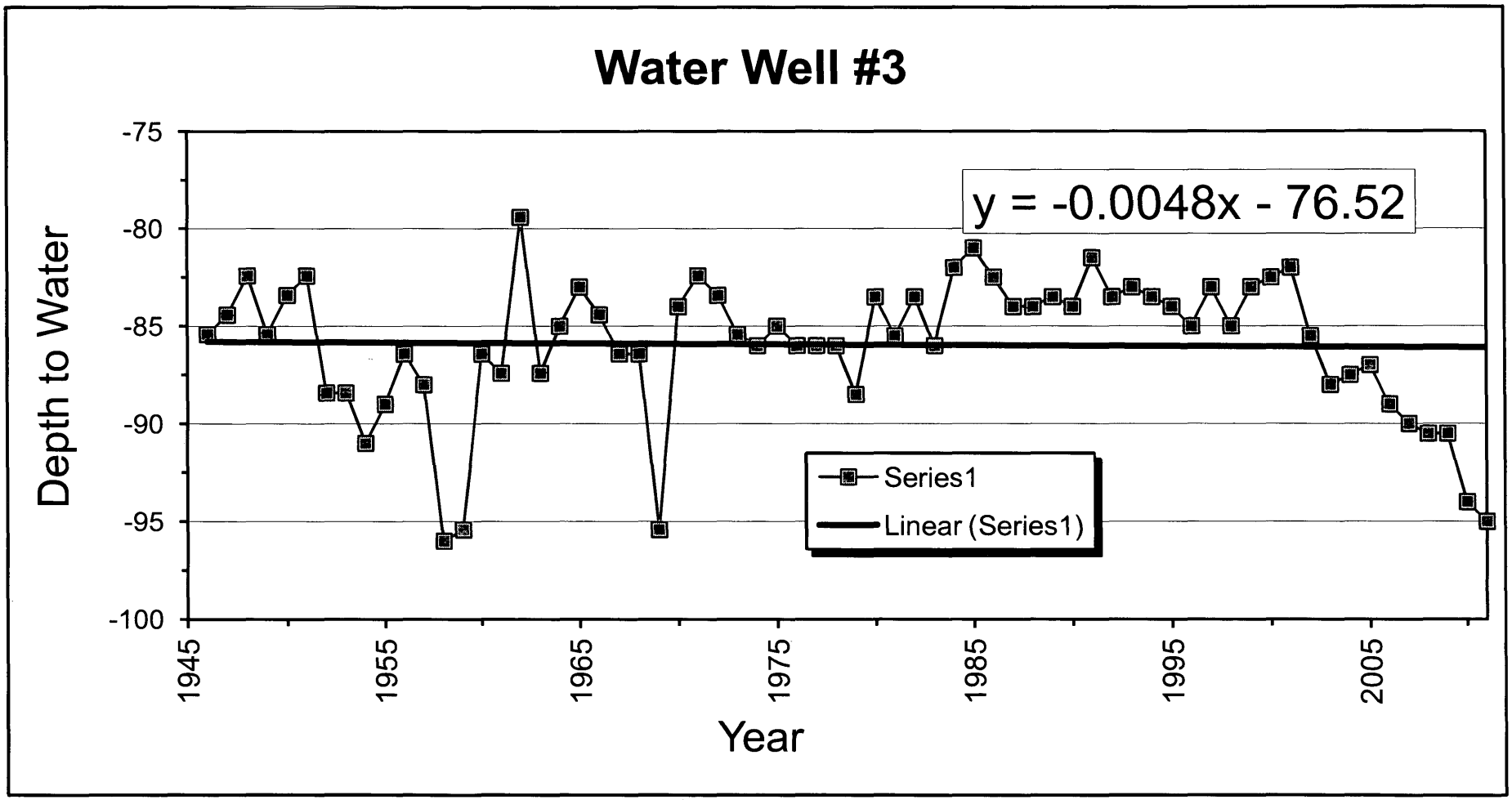
Figure 1
McPherson BPU
Water Demand

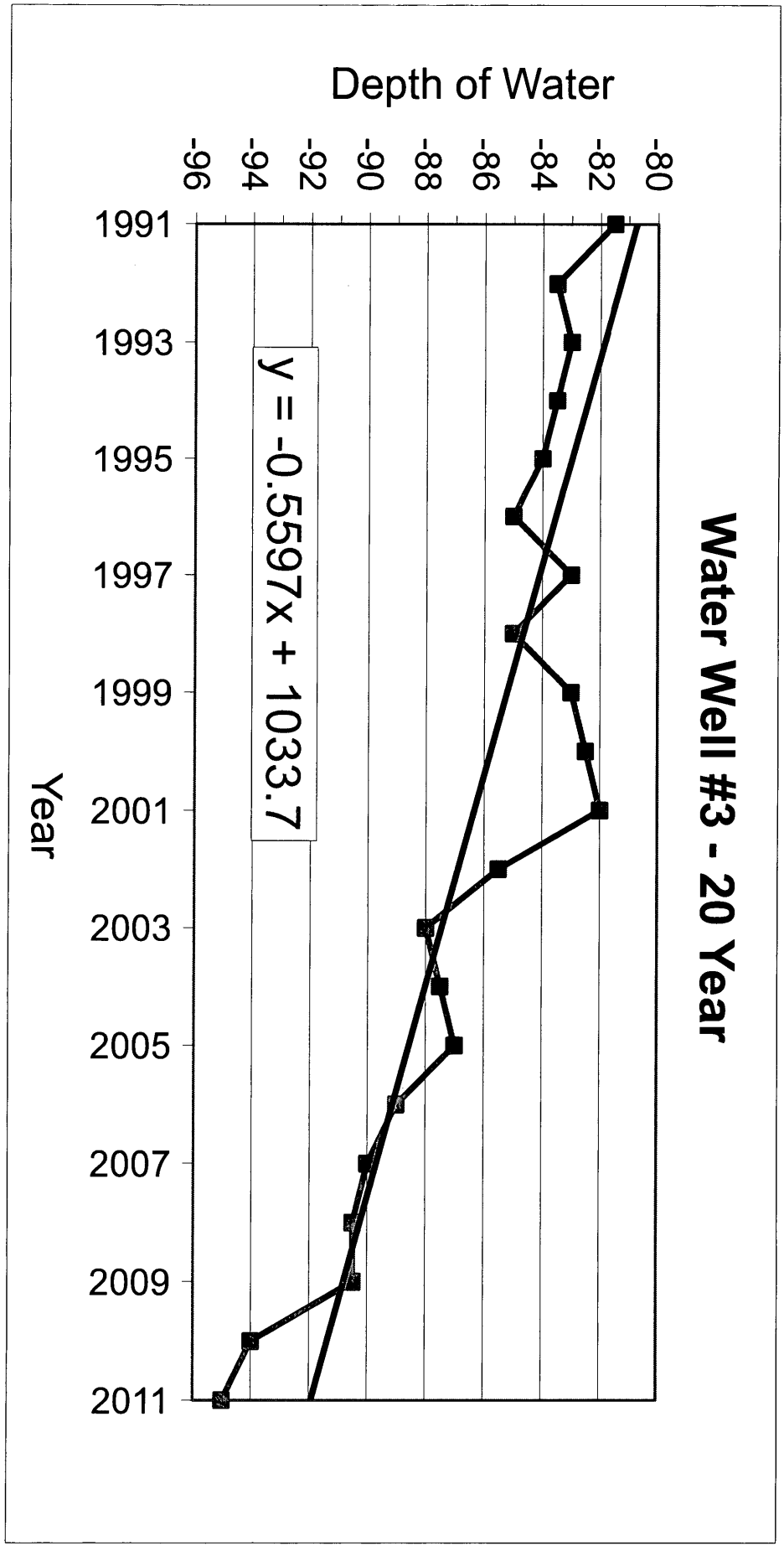

Depth to Water
-95
-90
-85
-80
-75
-70
-65
1945
1955
1965
1975
1985
1995
2005
Year
y = -0.2001x + 311.38
Water Well #2

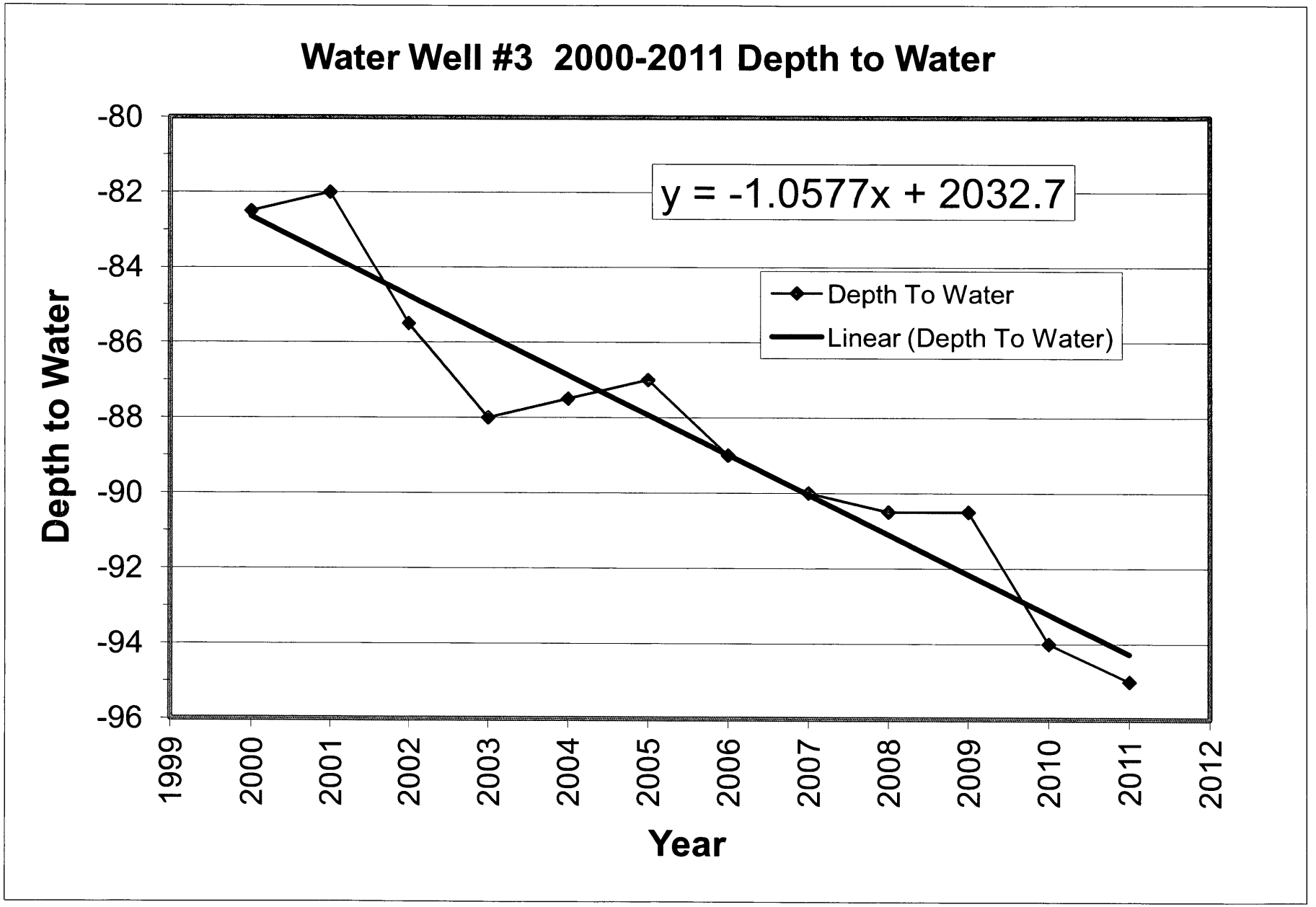

Depth to Water
-96
-94
-92
-90
-88
-86
-84
-82
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
Year
y = -0.4779x + 868.68
Water Well #2 - Last 20 Years

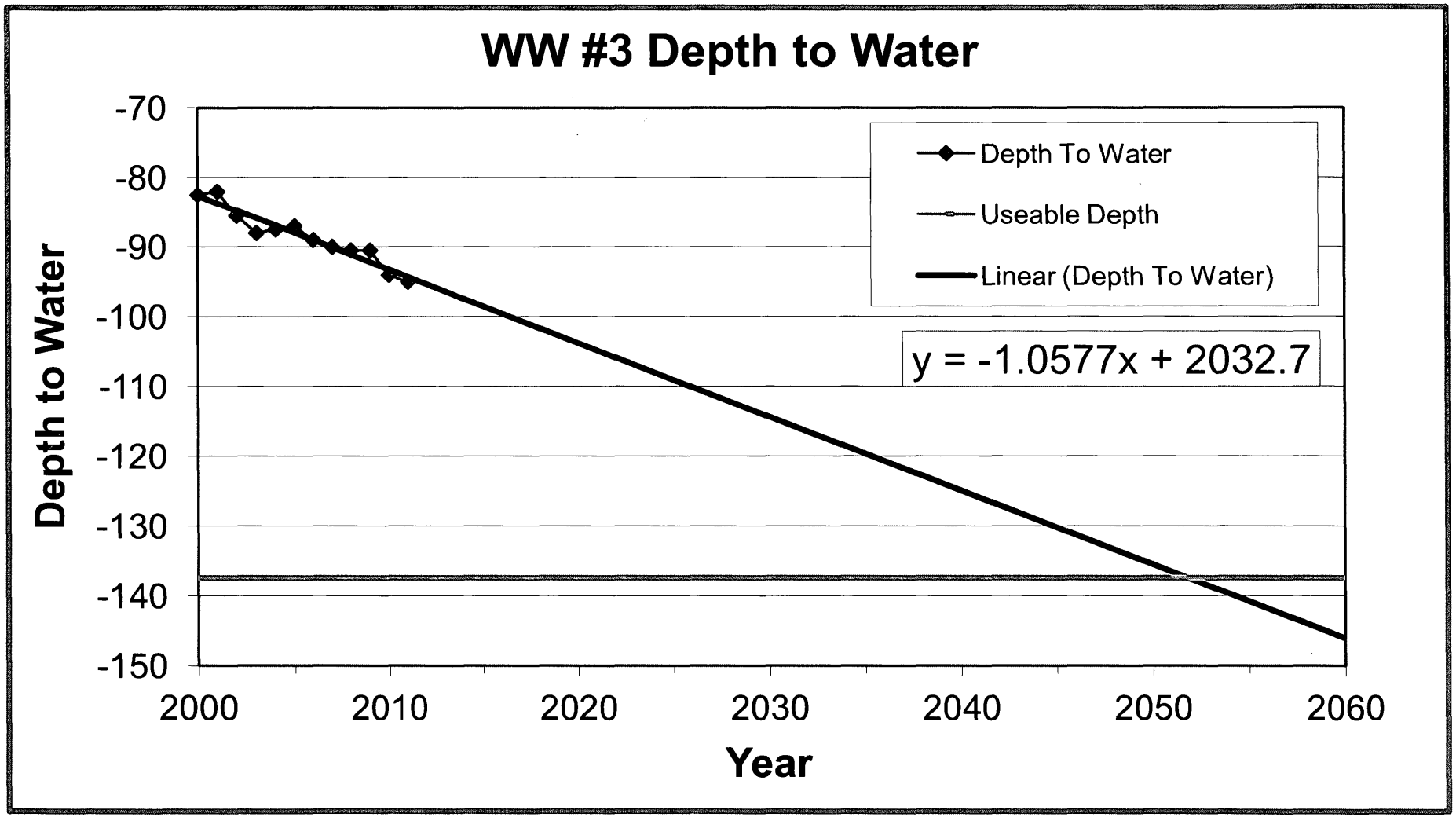

Water Well #2 - 2000-2011 Depth to Water
Depth to Water
-82
-84
-86
-88
-90
-92
-94
-96
y = -1.021x + 1958.2
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year

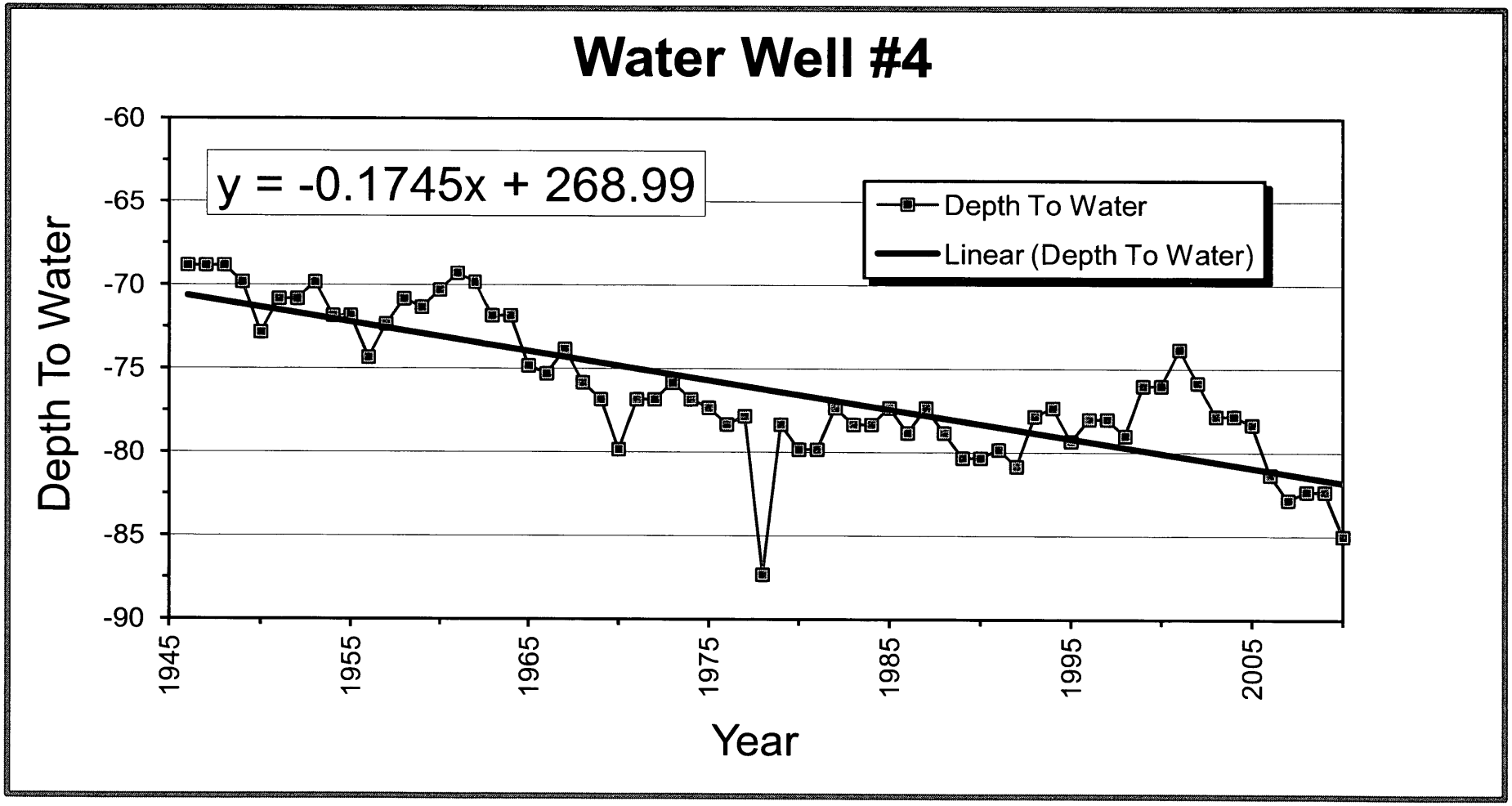

Water Well #2 Depth to Water
y = -1.021x + 1958.2
Depth To Water
Useable Well Depth
Linear (Depth To Water)
Depth to Water
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
2000
2010
2020
2030
2040
2050
2060
Year

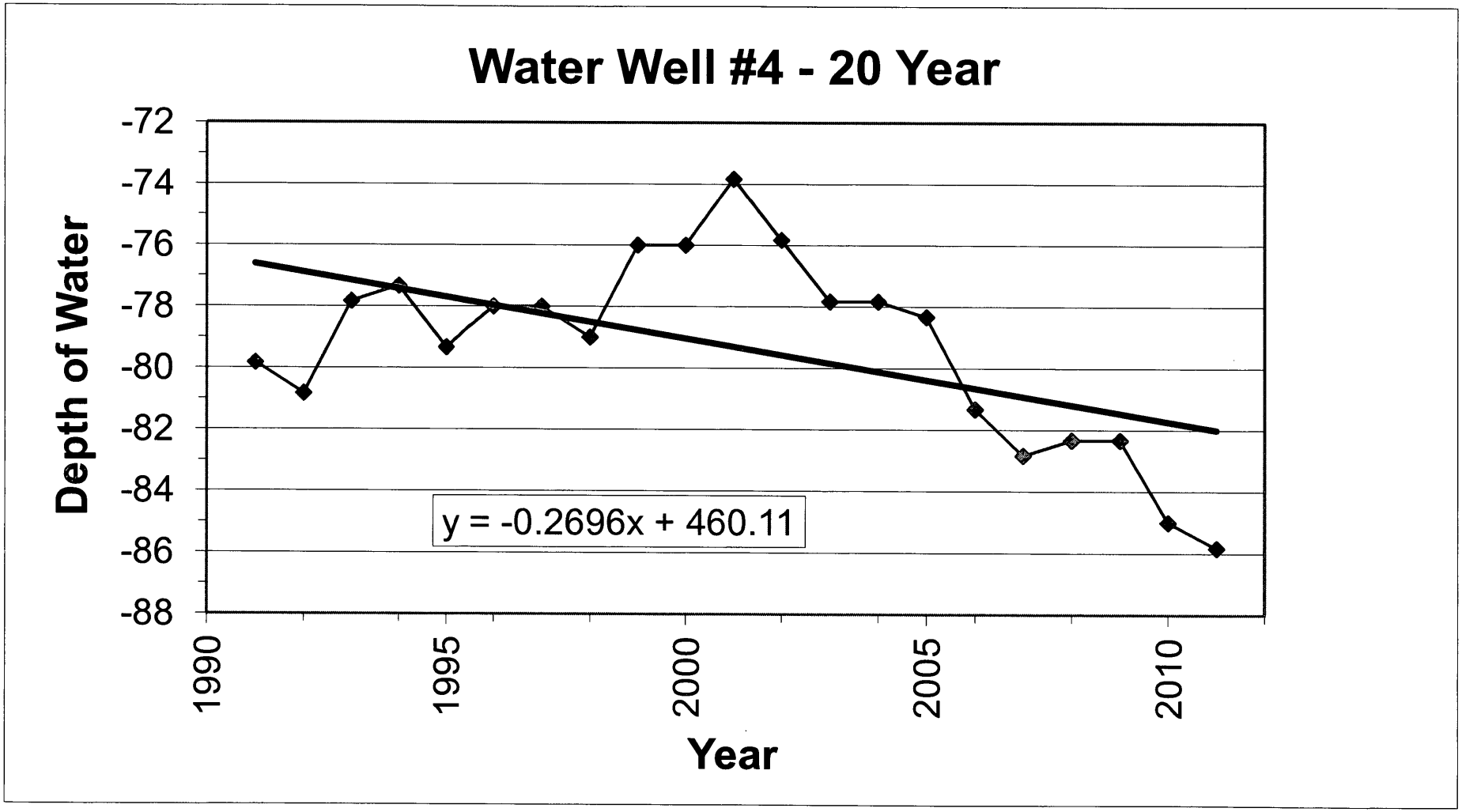

Water Well #3
y = -0.0048x - 76.52
Depth to Water
-75
-80
-85
-90
-95
-100
1945
1955
1965
1975
1985
1995
2005
Year
Series1
Linear (Series1)

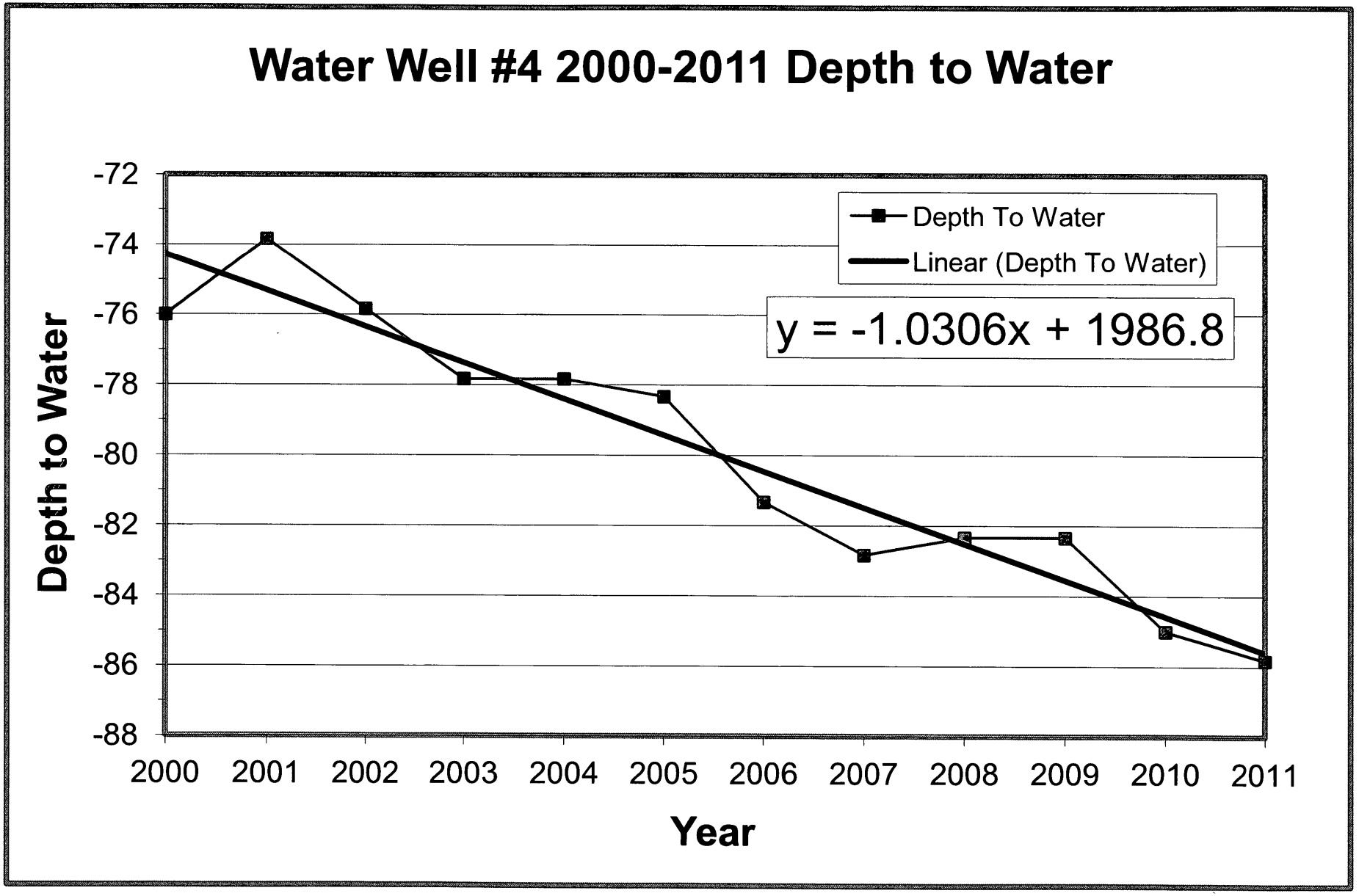

Depth of Water
-96
-94
-92
-90
-88
-86
-84
-82
-80
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
Year
y = -0.5597x + 1033.7
Water Well #3 - 20 Year

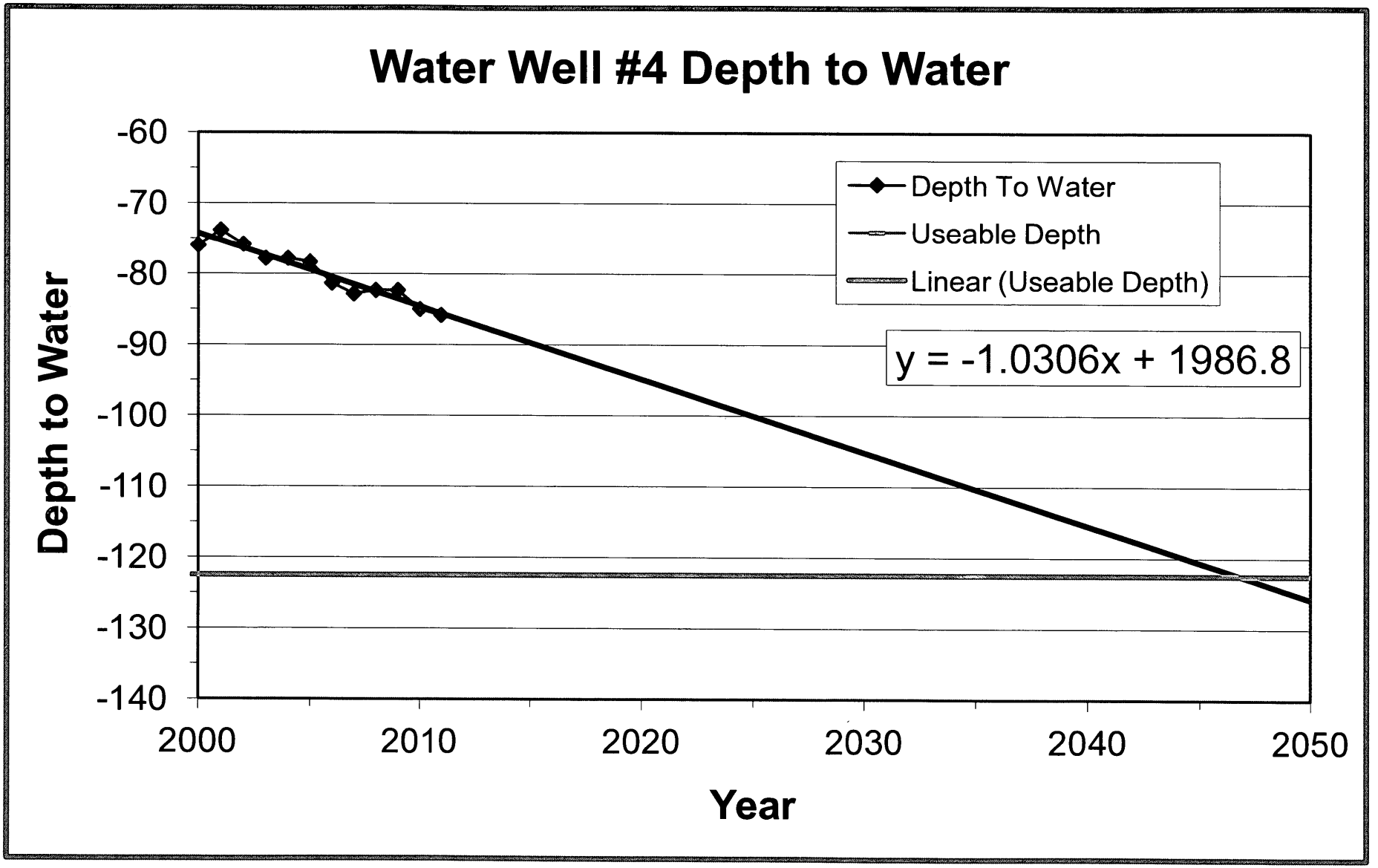

Water Well #3 2000-2011 Depth to Water
y = -1.0577x + 2032.7
Depth To Water
Linear (Depth To Water)
Depth to Water
-80
-82
-84
-86
-88
-90
-92
-94
-96
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year

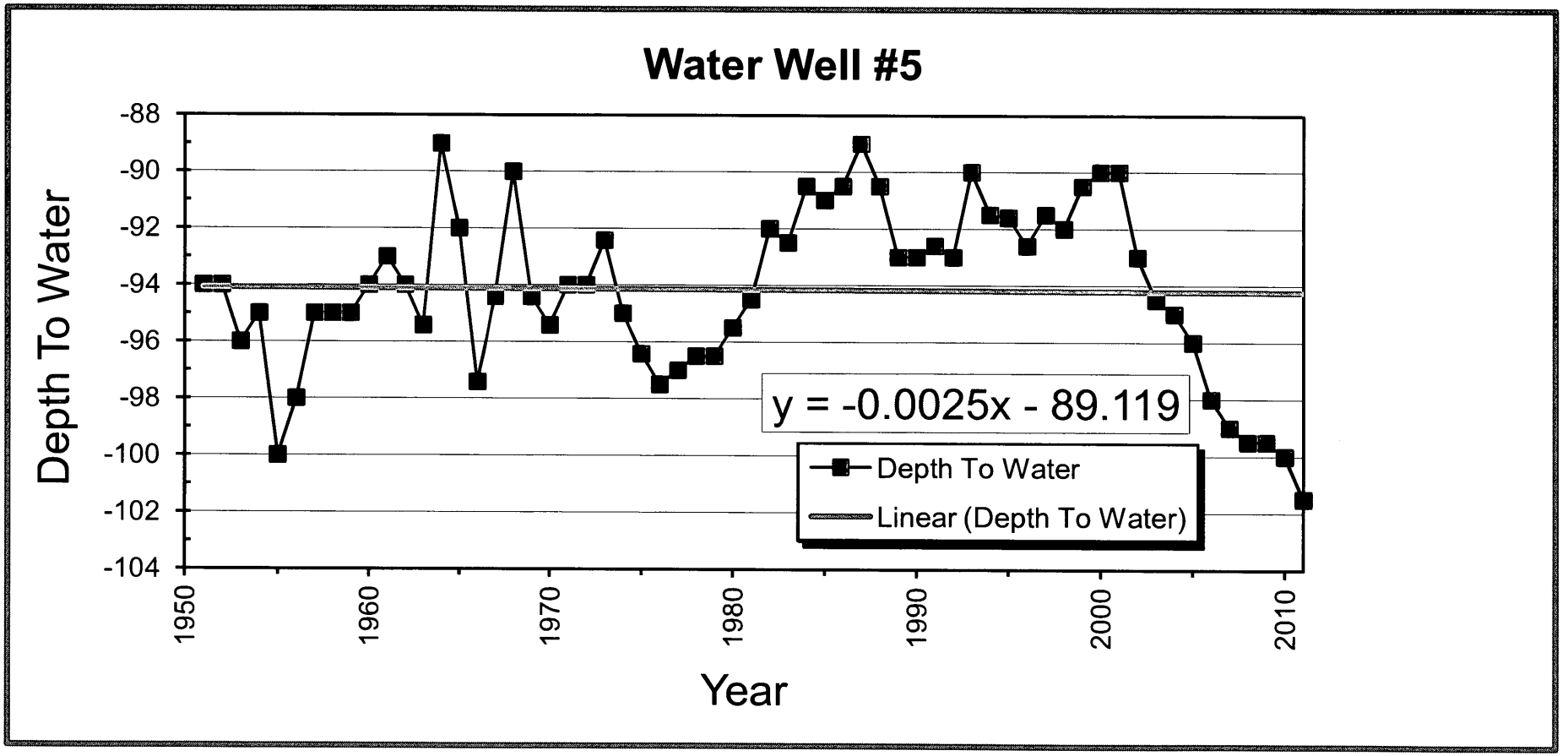

WW #3 Depth to Water
Depth to Water
-70
-80
-90
-100
-110
-120
-130
-140
-150
2000
2010
2020
2030
2040
2050
2060
Year
Depth To Water
Useable Depth
Linear (Depth To Water)
y = -1.0577x + 2032.7

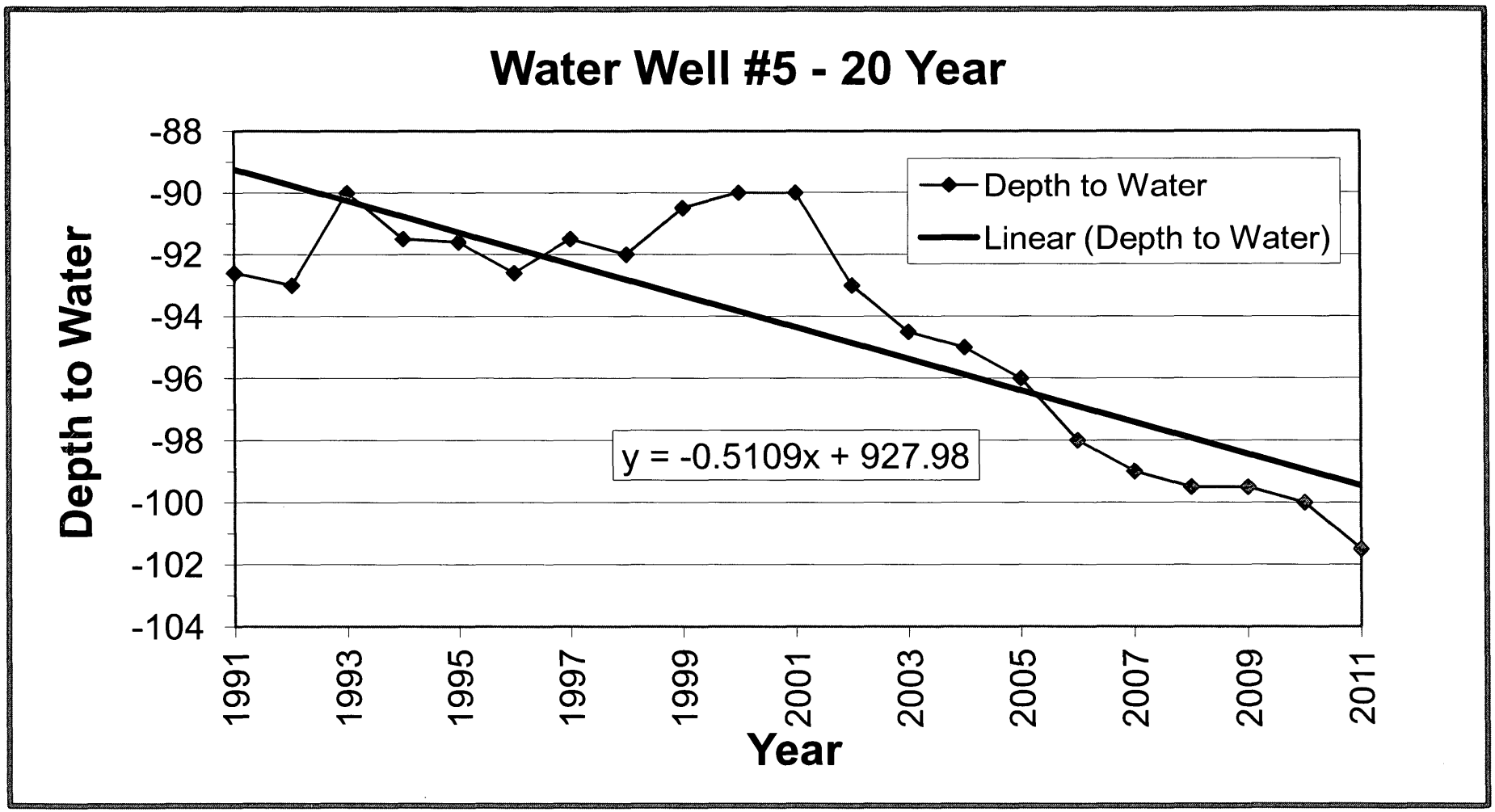

Water Well #4
y = -0.1745x + 268.99
Depth To Water
Linear (Depth To Water)
Depth To Water
-60
-65
-70
-75
-80
-85
-90
1945
1955
1965
1975
1985
1995
2005
Year

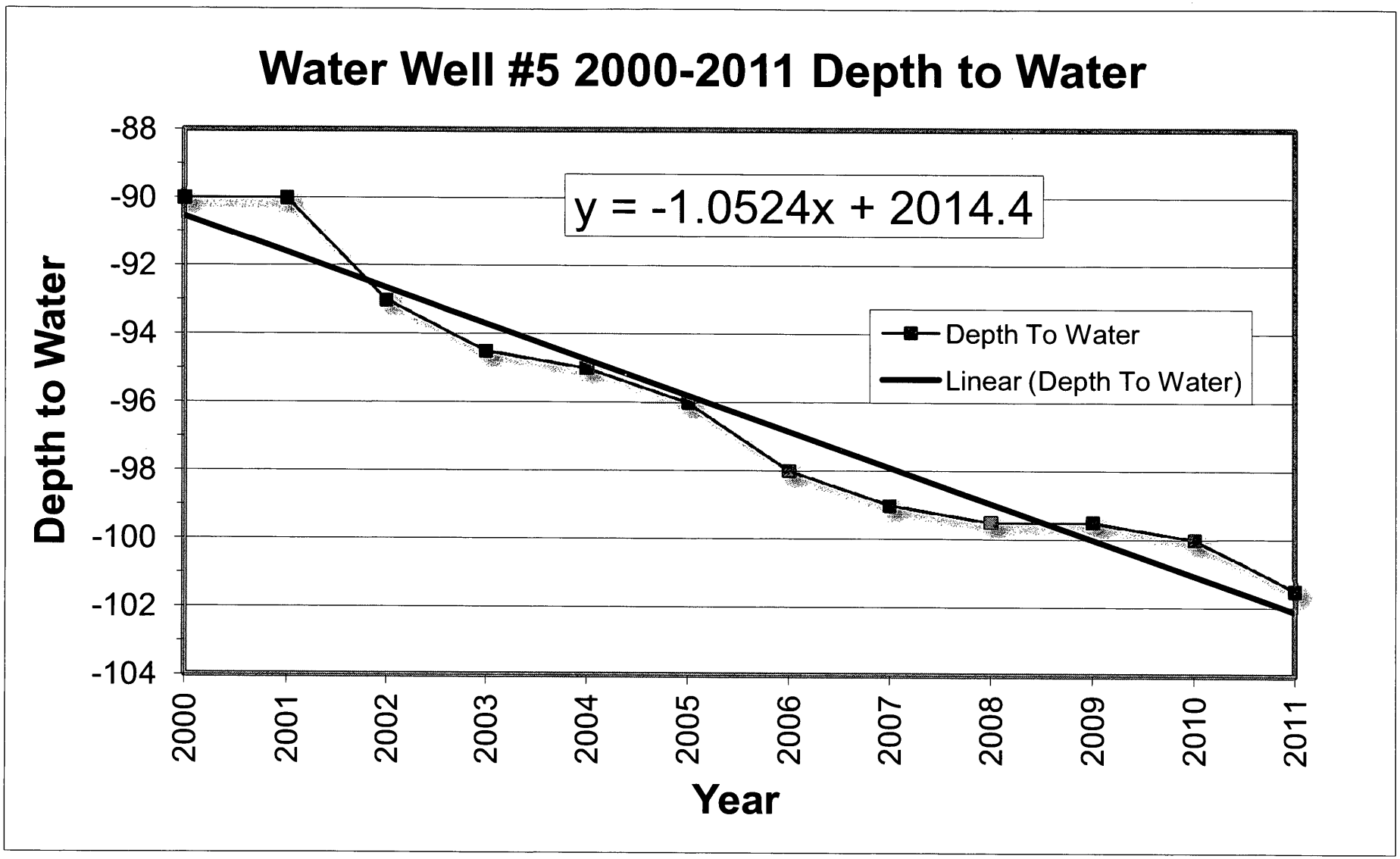

Water Well #4 - 20 Year
Depth of Water
-72
-74
-76
-78
-80
-82
-84
-86
-88
y = -0.2696x + 460.11
1990
1995
2000
2005
2010
Year

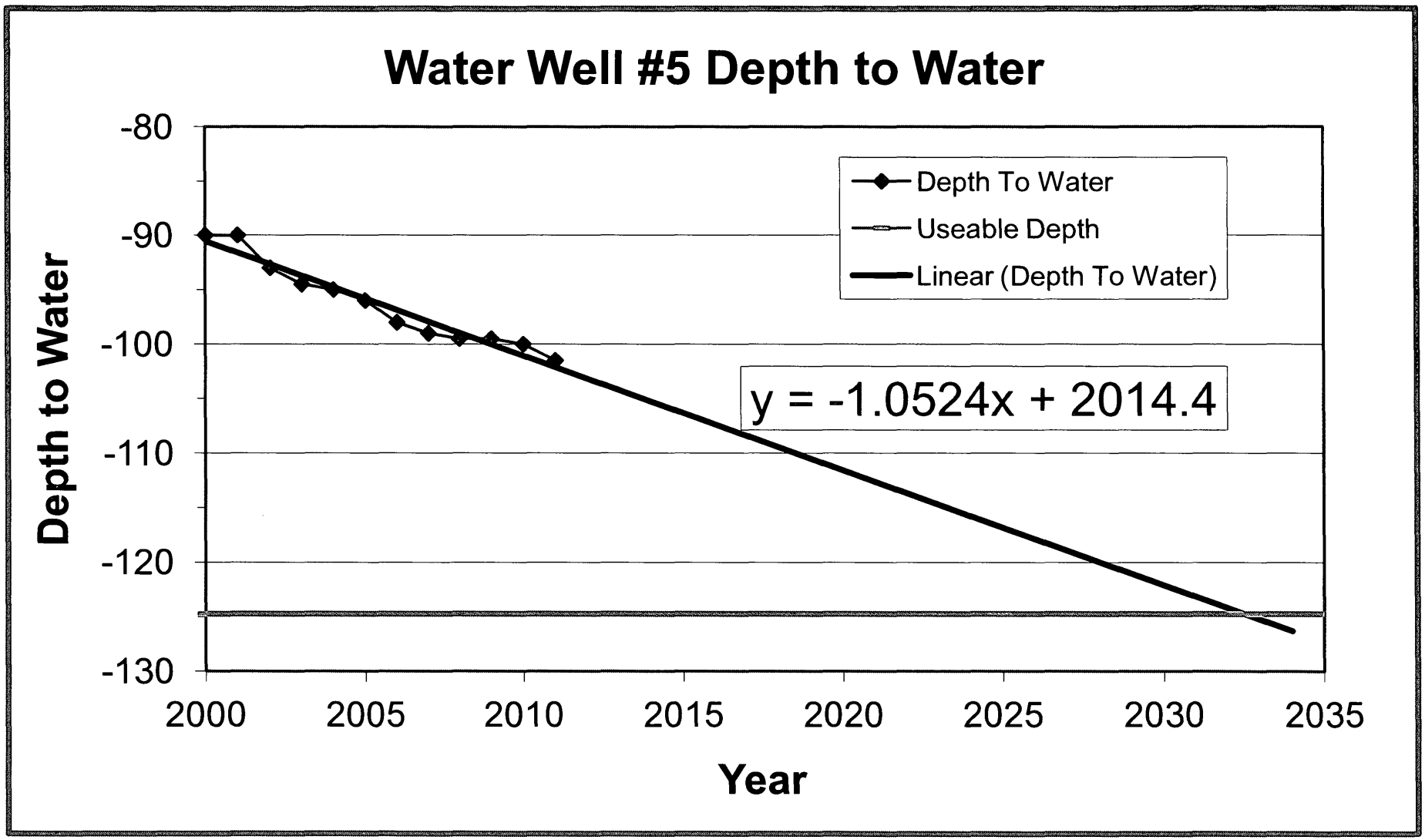

Water Well #4 2000-2011 Depth to Water
Depth to Water
-72
-74
-76
-78
-80
-82
-84
-86
-88
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Year
Depth To Water
Linear (Depth To Water)
y = -1.0306x + 1986.8

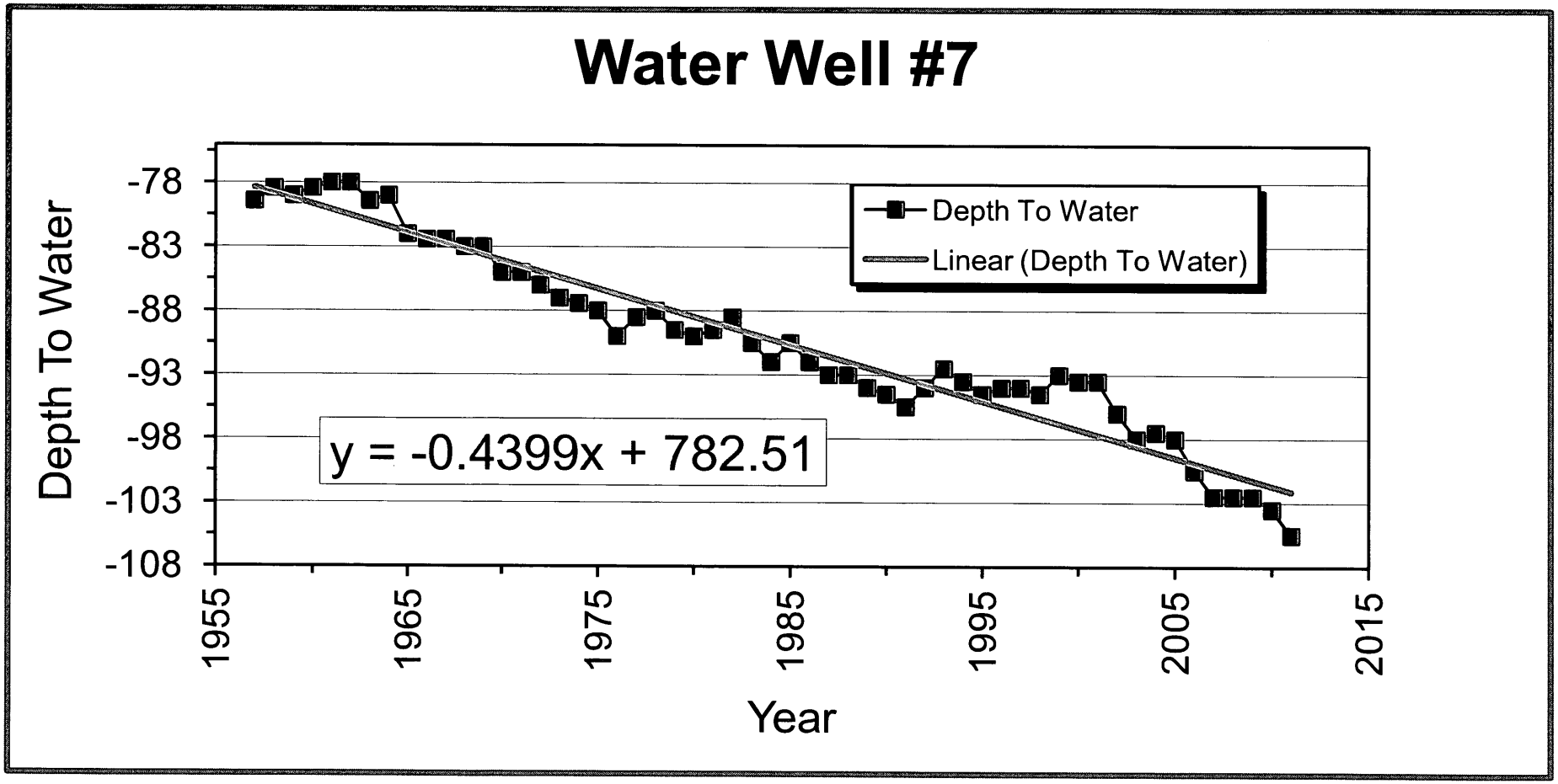

Water Well #4 Depth to Water
Depth to Water
-60
-70
-80
-90
-100
-110
-120
-130
-140
2000
2010
2020
2030
2040
2050
Year
Depth To Water
Useable Depth
Linear (Useable Depth)
y = -1.0306x + 1986.8

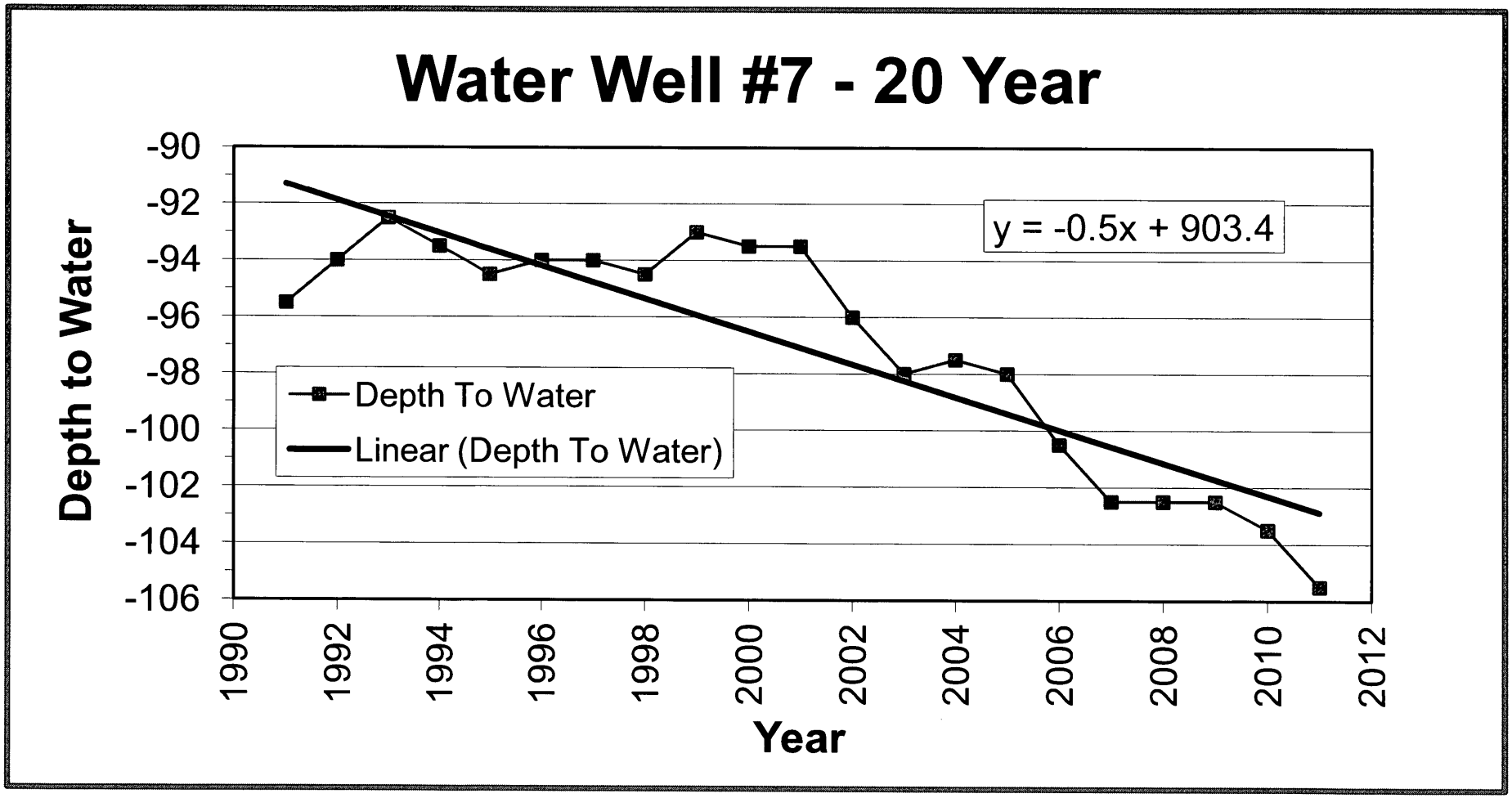

Water Well #5
Depth To Water
-88
-90
-92
-94
-96
-98
-100
-102
-104
1950
1960
1970
1980
1990
2000
2010
Year
y = -0.0025x - 89.119
Depth To Water
Linear (Depth To Water)

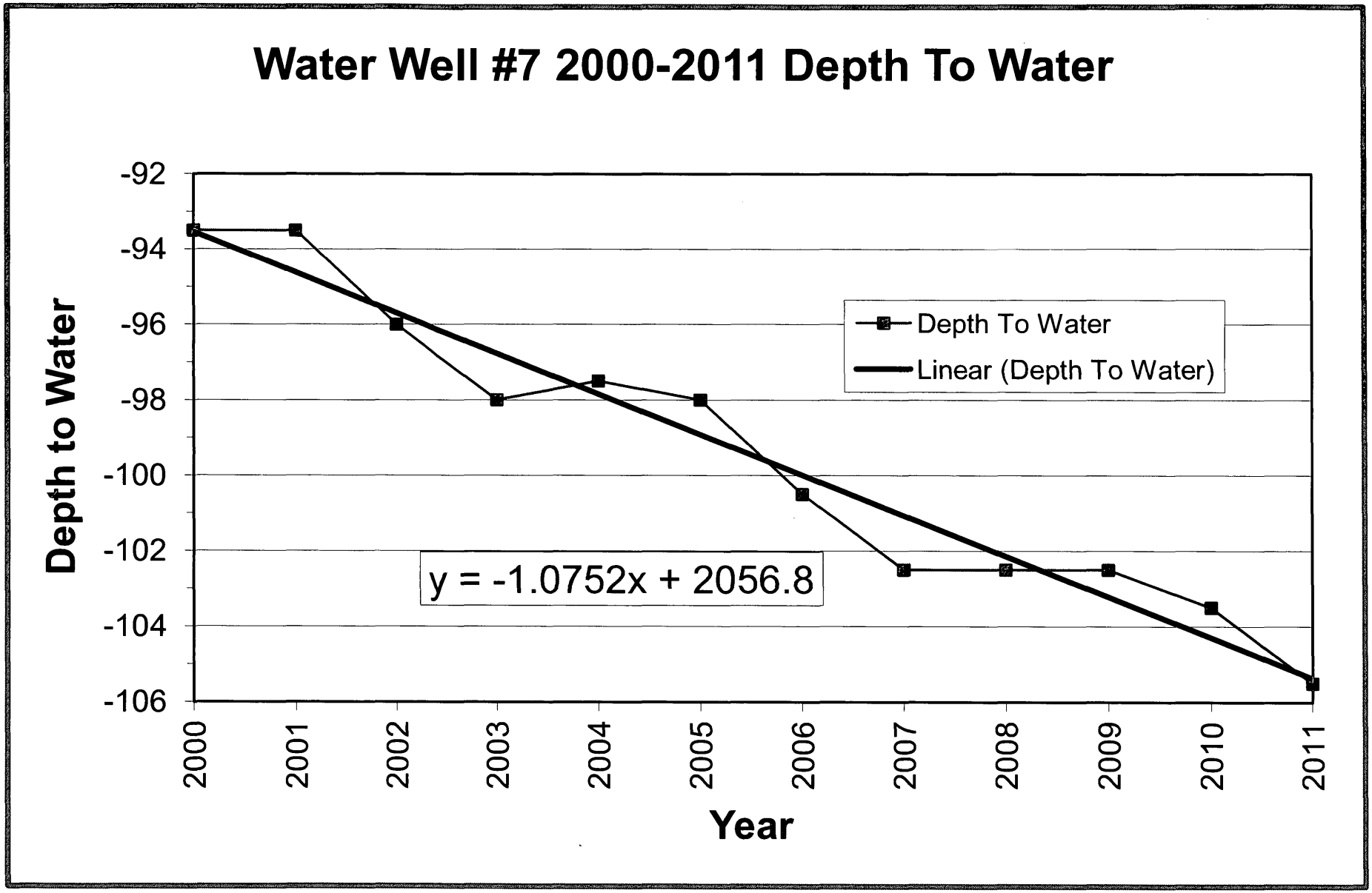

Water Well #5 - 20 Year
Depth to Water
-88
-90
-92
-94
-96
-98
-100
-102
-104
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
Year
Depth to Water
Linear (Depth to Water)
y = -0.5109x + 927.98

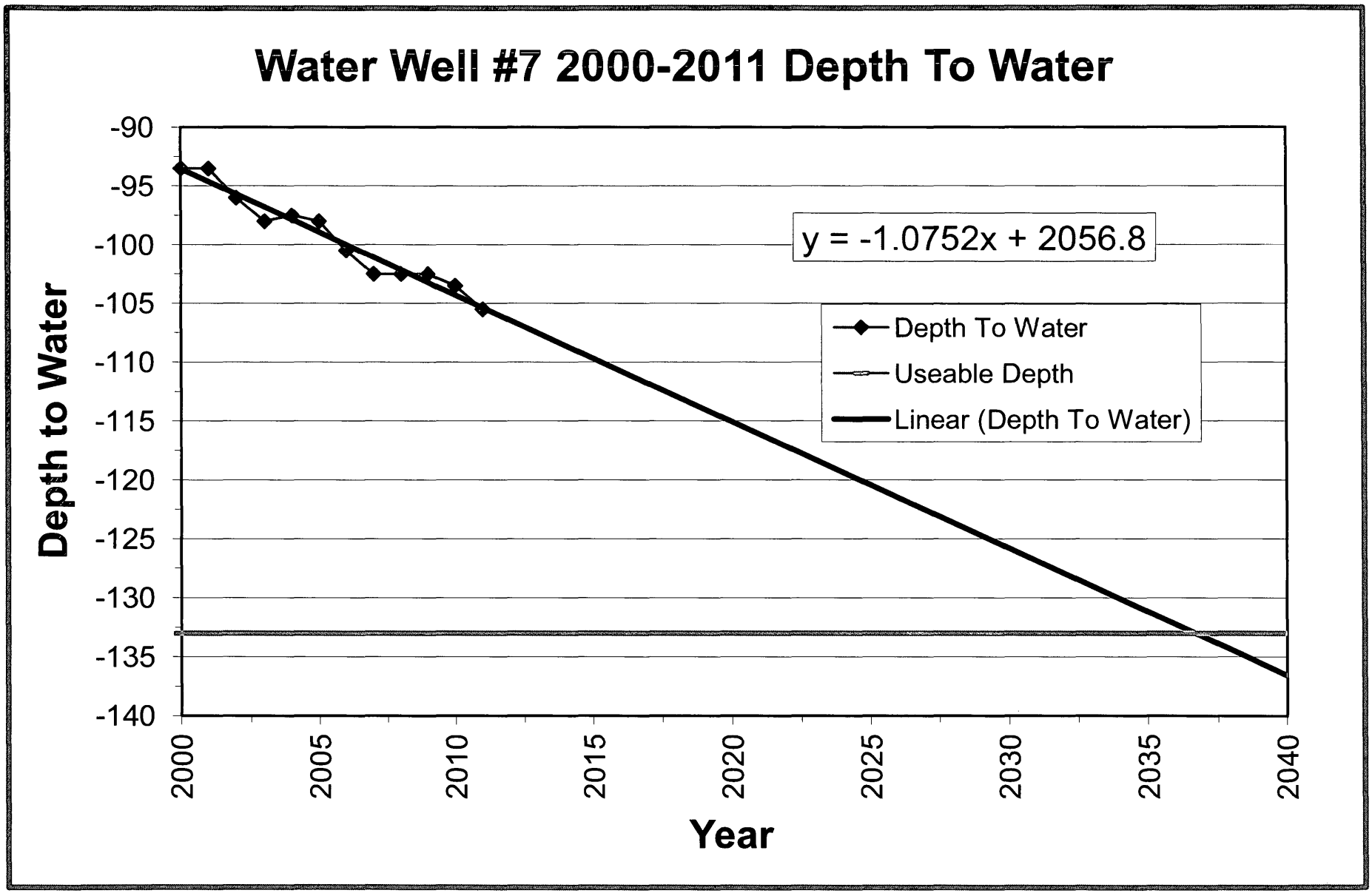

Water Well #5 2000-2011 Depth to Water
y = -1.0524x + 2014.4
Depth To Water
Linear (Depth To Water)
Depth to Water
-88
-90
-92
-94
-96
-98
-100
-102
-104
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Year

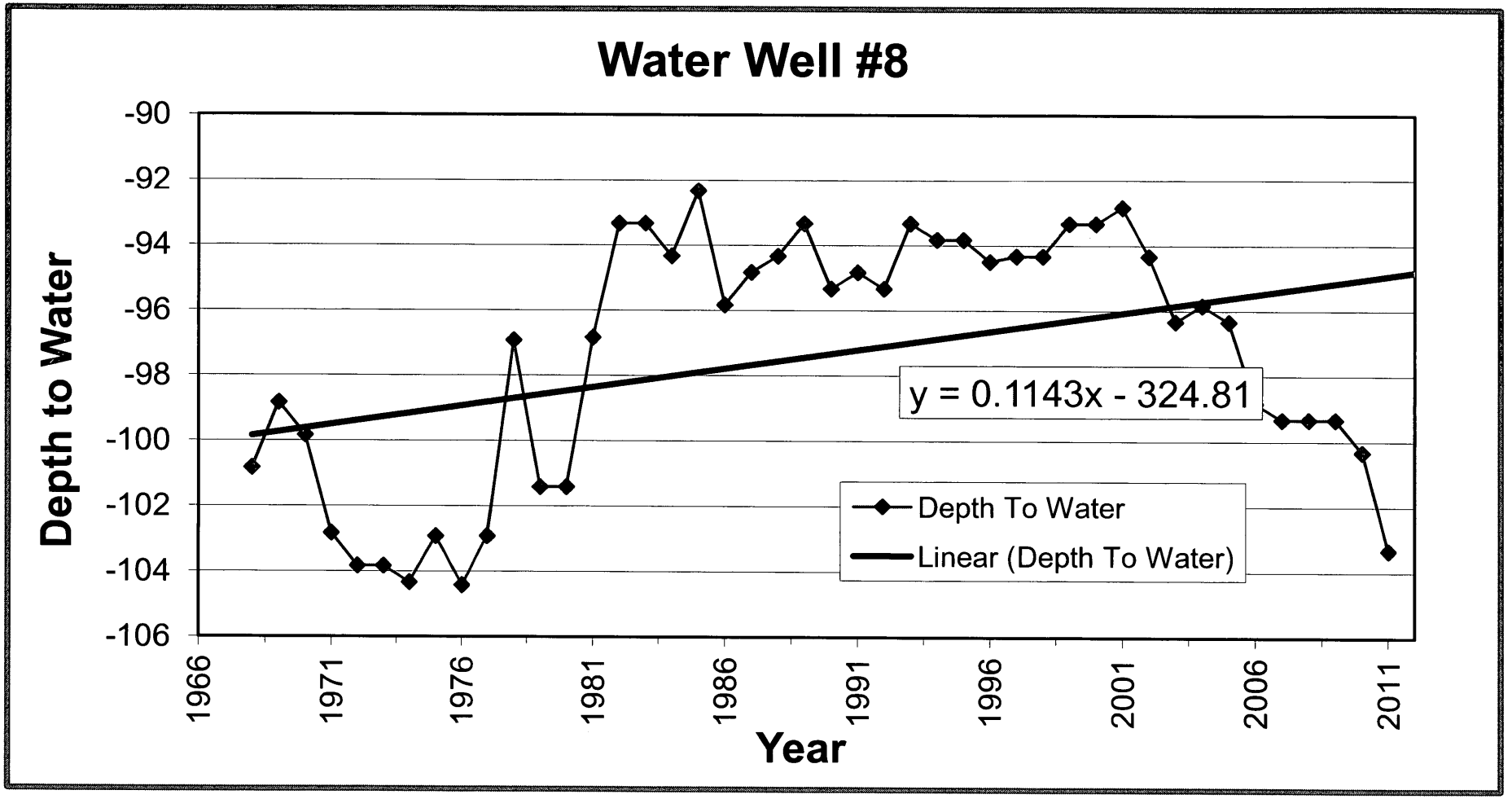

Water Well #5 Depth to Water
Depth to Water
-80
-90
-100
-110
-120
-130
2000
2005
2010
2015
2020
2025
2030
2035
Year
Depth To Water
Useable Depth
Linear (Depth To Water)
y = -1.0524x + 2014.4

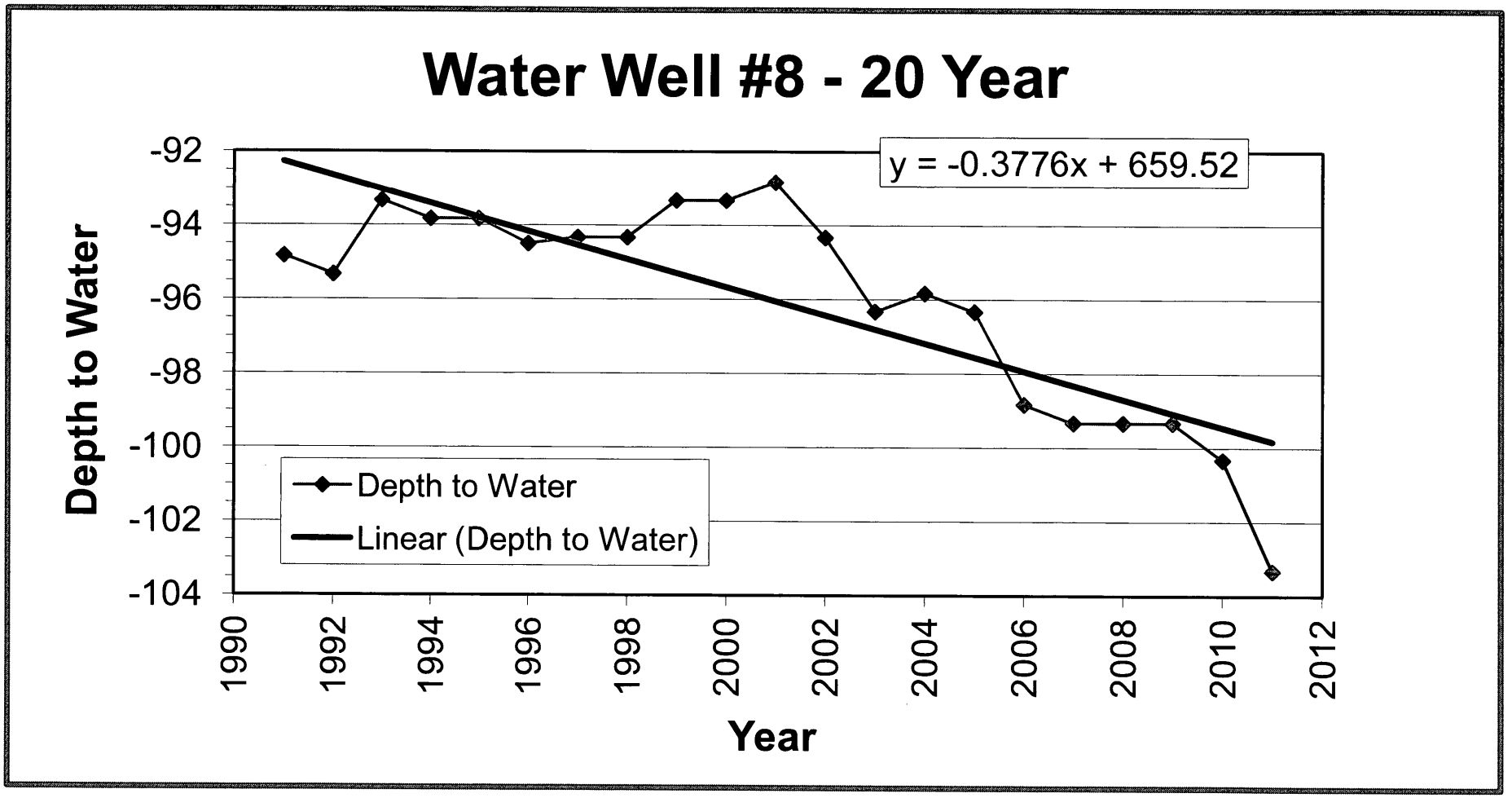

Water Well #7
Depth To Water
-78
-83
-88
-93
-98
-103
-108
Depth To Water
Linear (Depth To Water)
y = -0.4399x + 782.51
1955
1965
1975
1985
1995
2005
2015
Year

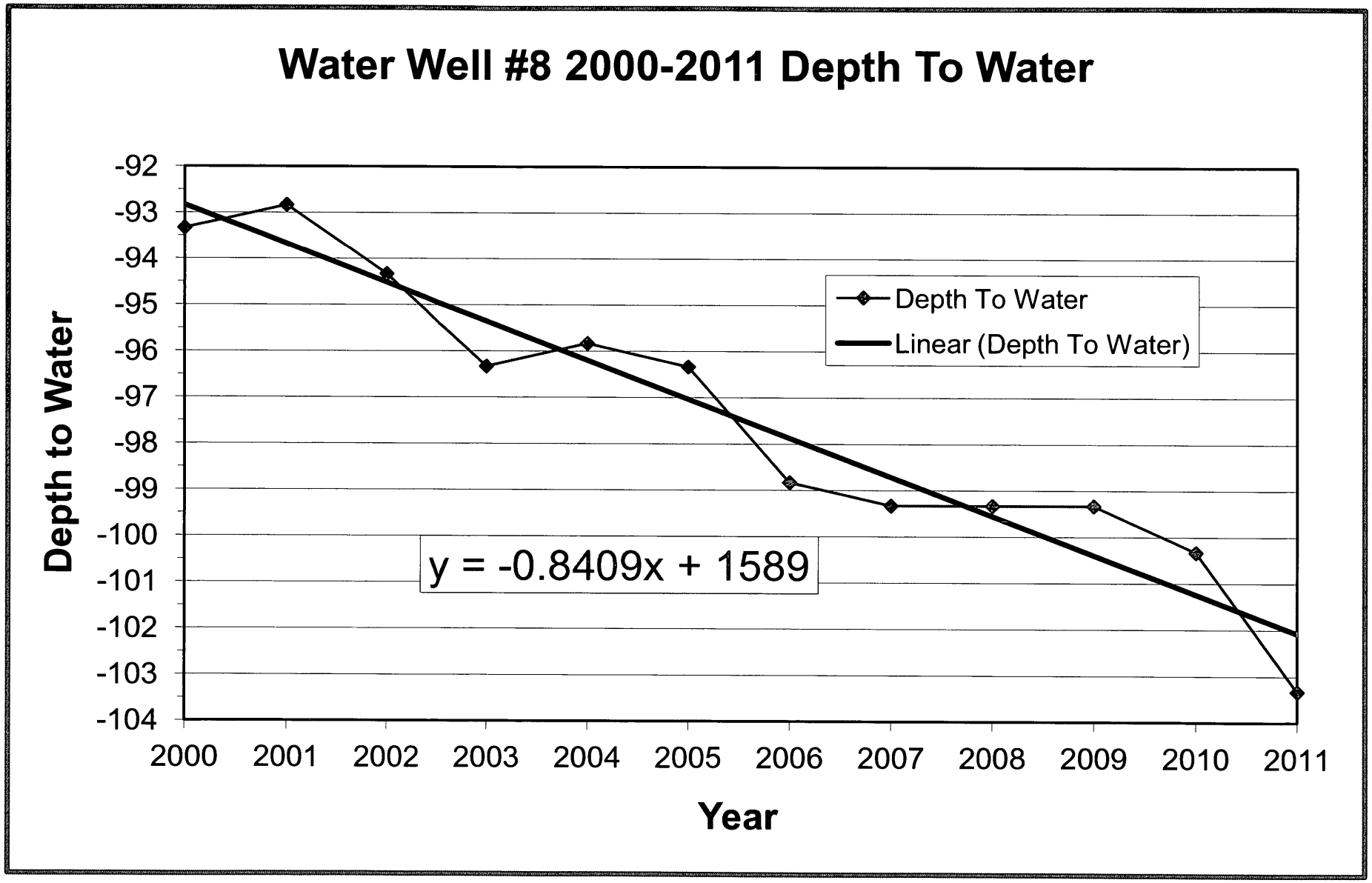

Water Well #7 - 20 Year
Depth to Water
-90
-92
-94
-96
-98
-100
-102
-104
-106
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
Year
y = -0.5x + 903.4
Depth To Water
Linear (Depth To Water)

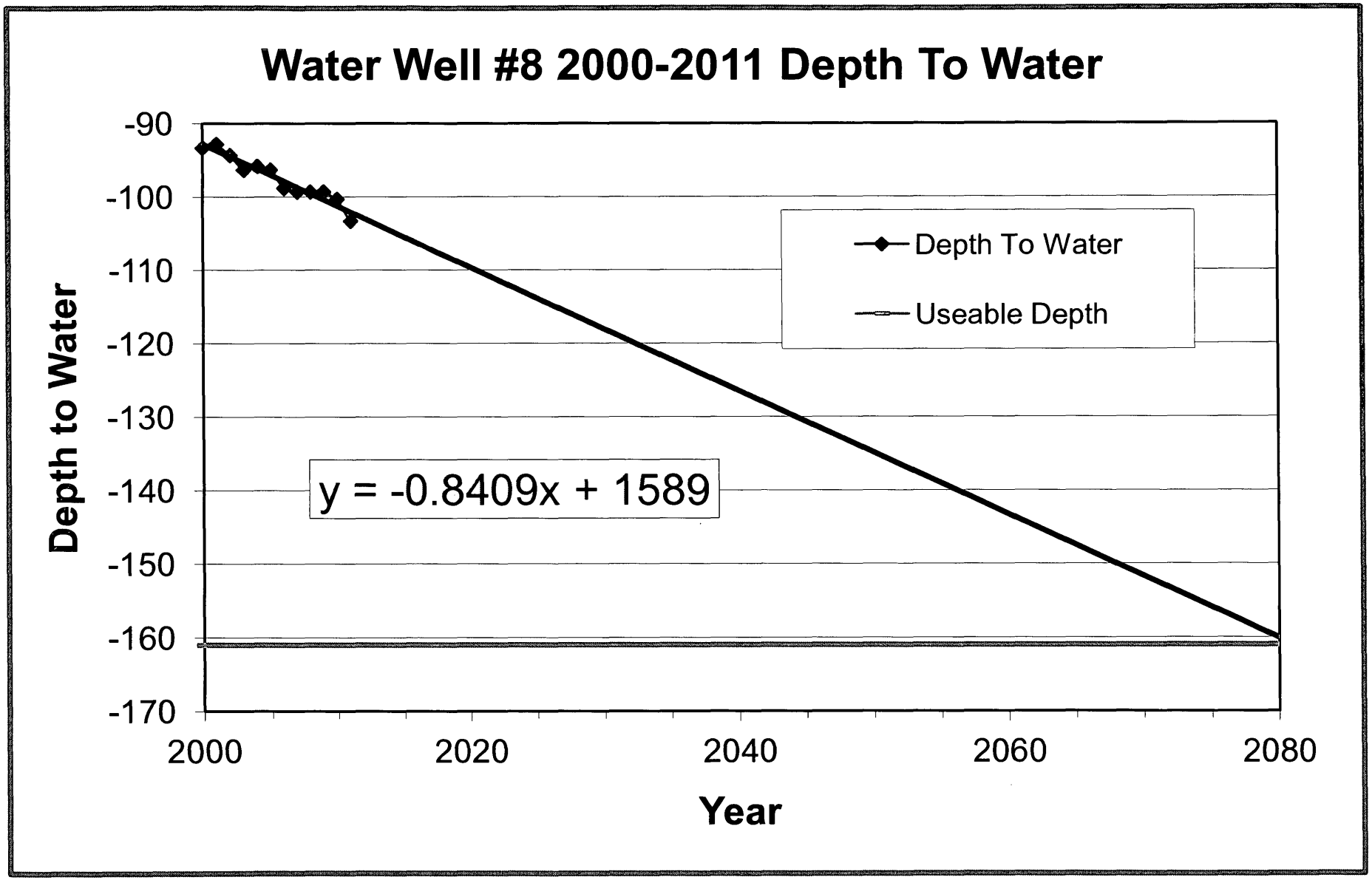

Water Well #7 2000-2011 Depth To Water
Depth to Water
-92
-94
-96
-98
-100
-102
-104
-106
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Year
Depth To Water
Linear (Depth To Water)
y = -1.0752x + 2056.8

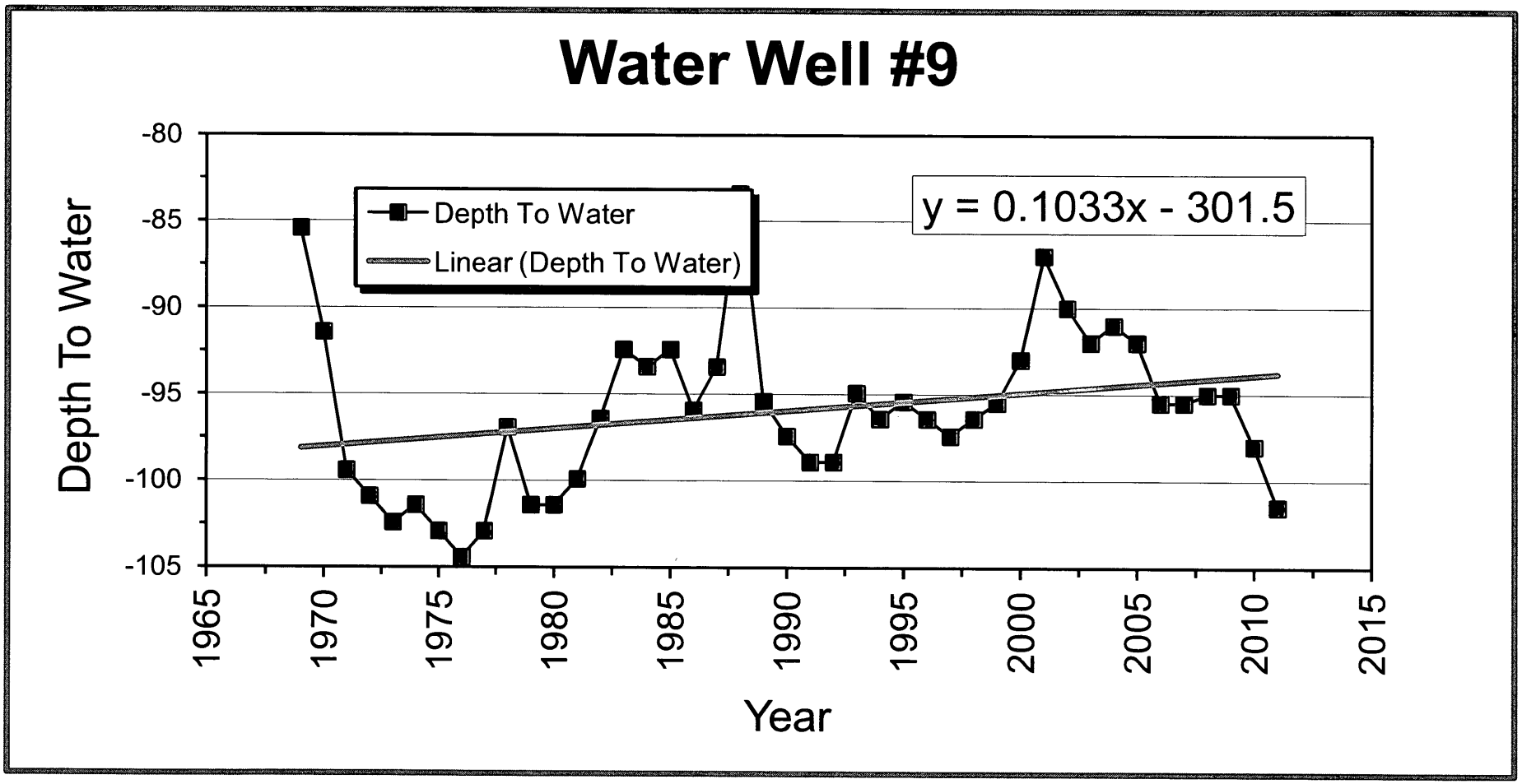

Water Well #7 2000-2011 Depth To Water
Depth to Water
-90
-95
-100
-105
-110
-115
-120
-125
-130
-135
-140
2000
2005
2010
2015
2020
2025
2030
2035
2040
Year
y = -1.0752x + 2056.8
Depth To Water
Useable Depth
Linear (Depth To Water)

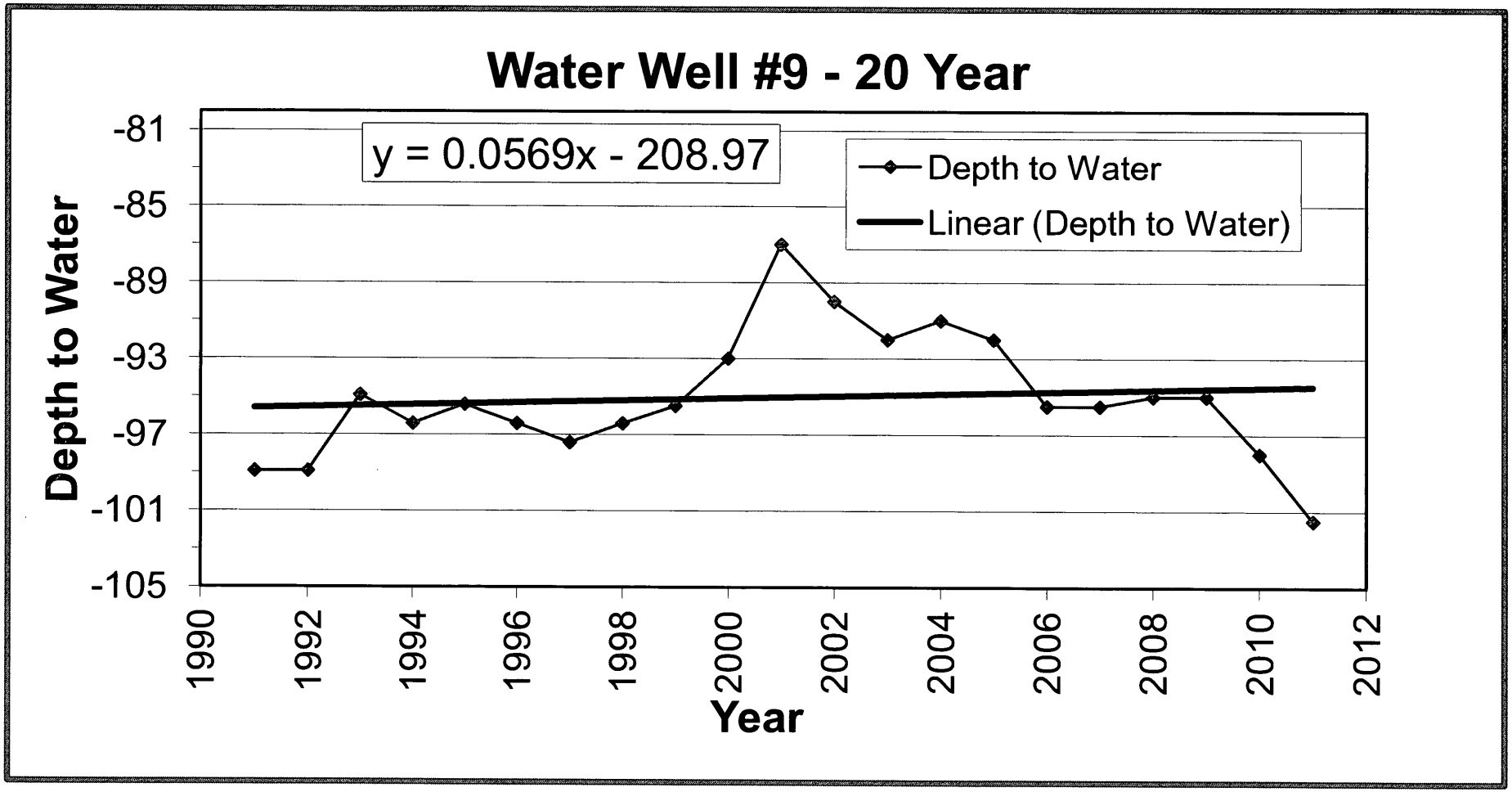

Water Well #8
Depth to Water
-90
-92
-94
-96
-98
-100
-102
-104
-106
1966
1971
1976
1981
1986
1991
1996
2001
2006
2011
Year
y = 0.1143x - 324.81
Depth To Water
Linear (Depth To Water)

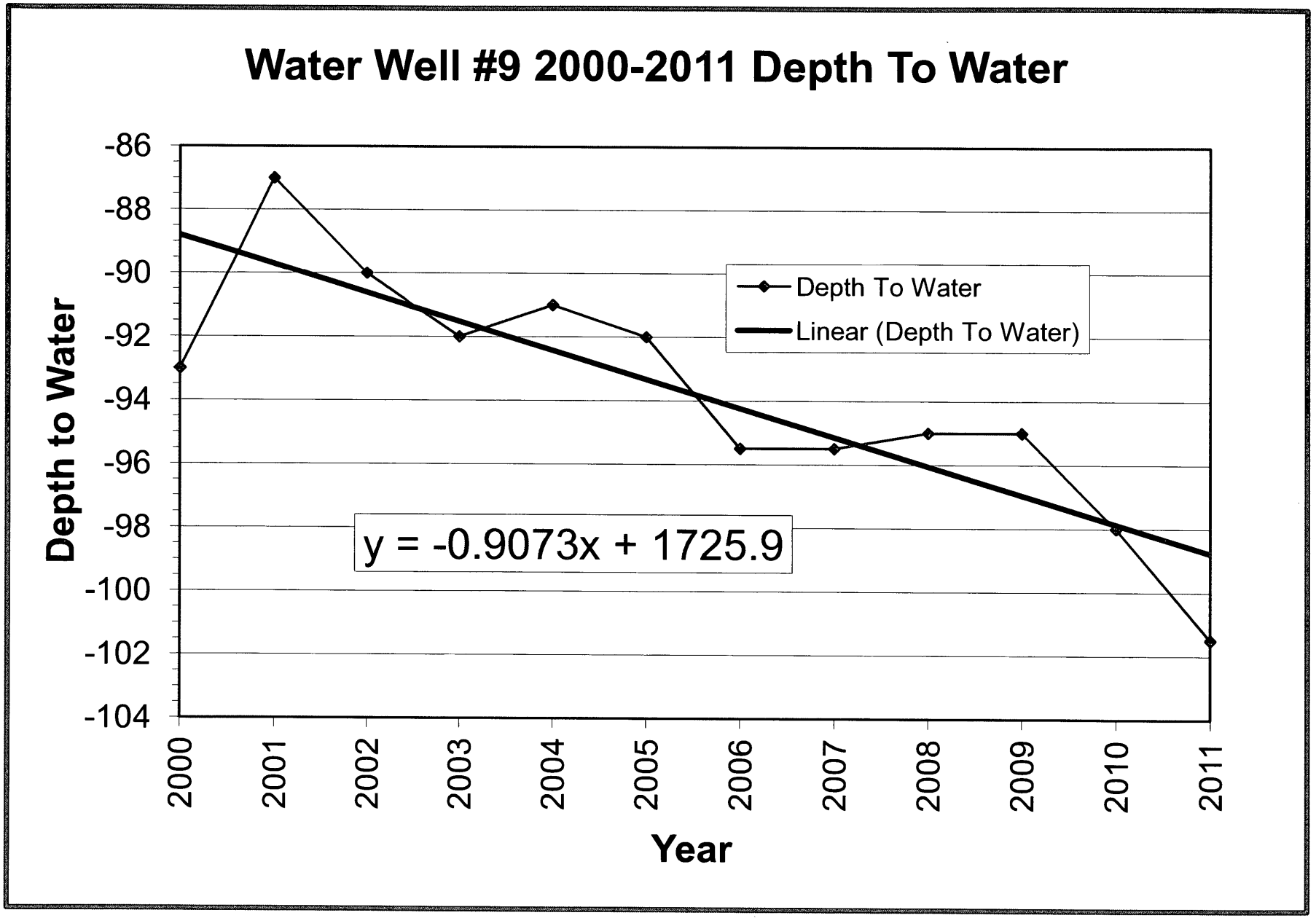

Water Well #8 - 20 Year
y = -0.3776x + 659.52
Depth to Water
Linear (Depth to Water)
Depth to Water
Year
-92
-94
-96
-98
-100
-102
-104
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012

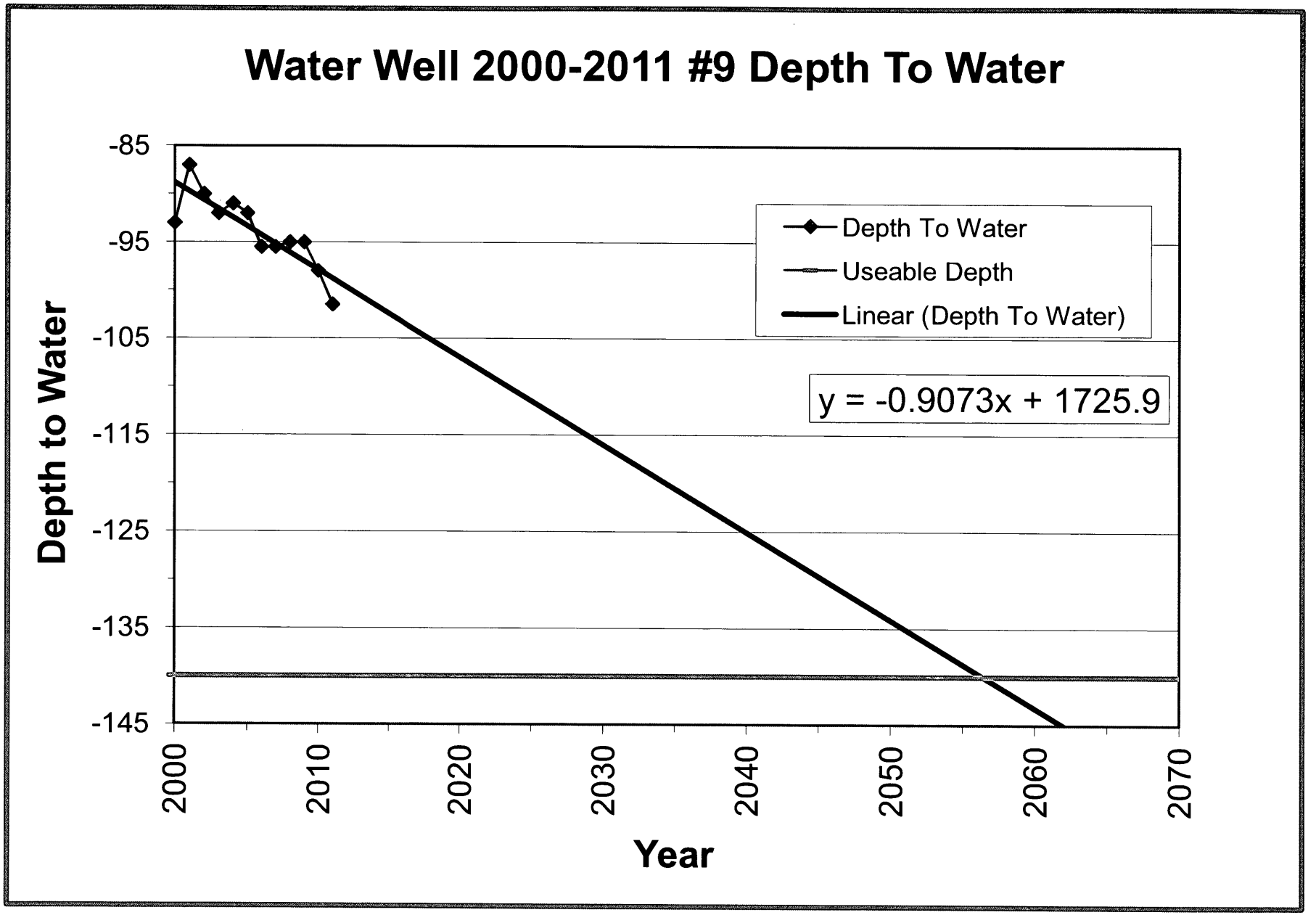

Water Well #8 2000-2011 Depth To Water
Depth to Water
-92
-93
-94
-95
-96
-97
-98
-99
-100
-101
-102
-103
-104
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Year
Depth To Water
Linear (Depth To Water)
y = -0.8409x + 1589

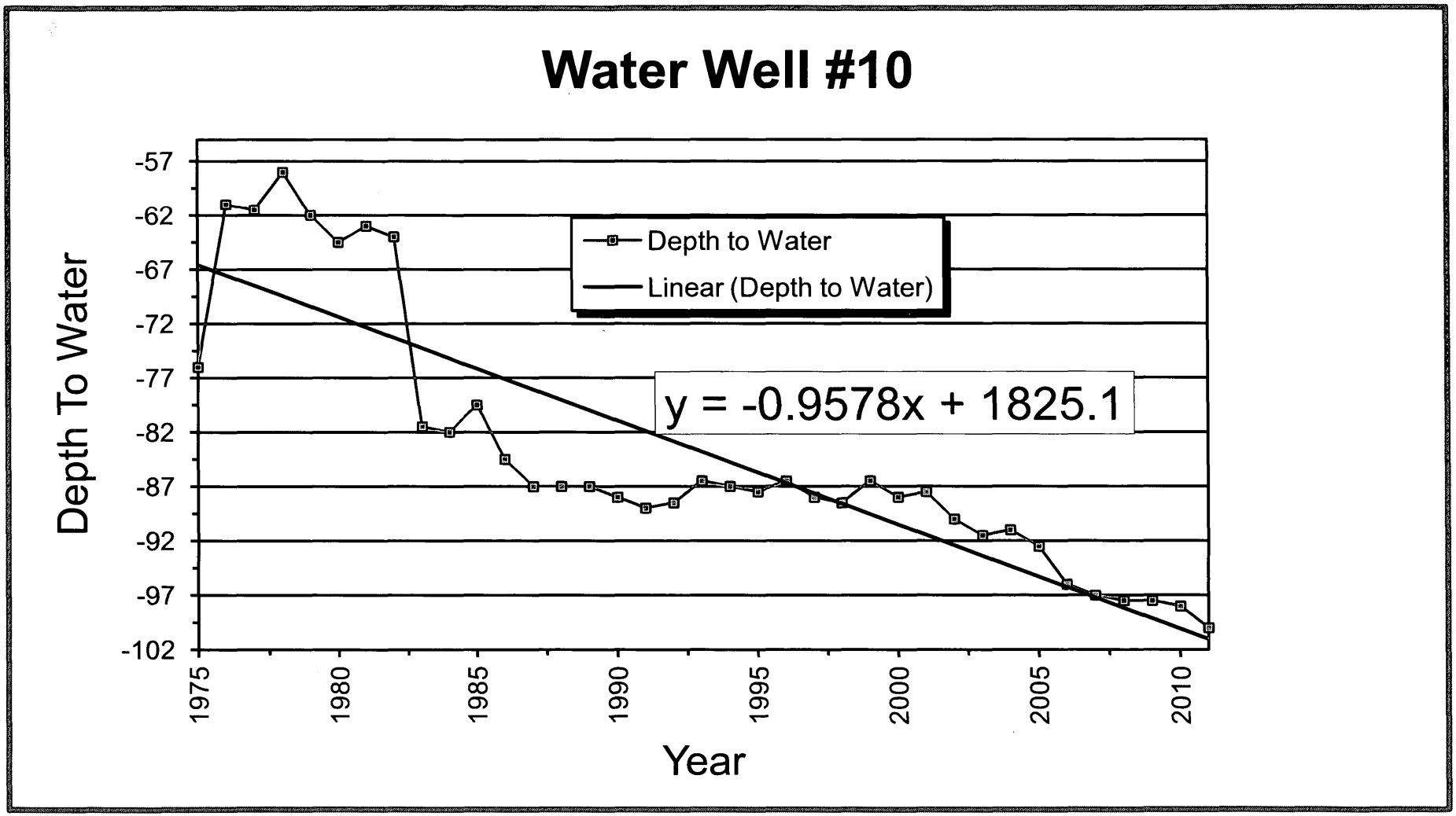

Water Well #8 2000-2011 Depth To Water
Depth to Water
-90
-100
-110
-120
-130
-140
-150
-160
-170
2000
2020
2040
2060
2080
Year
Depth To Water
Useable Depth
y = -0.8409x + 1589

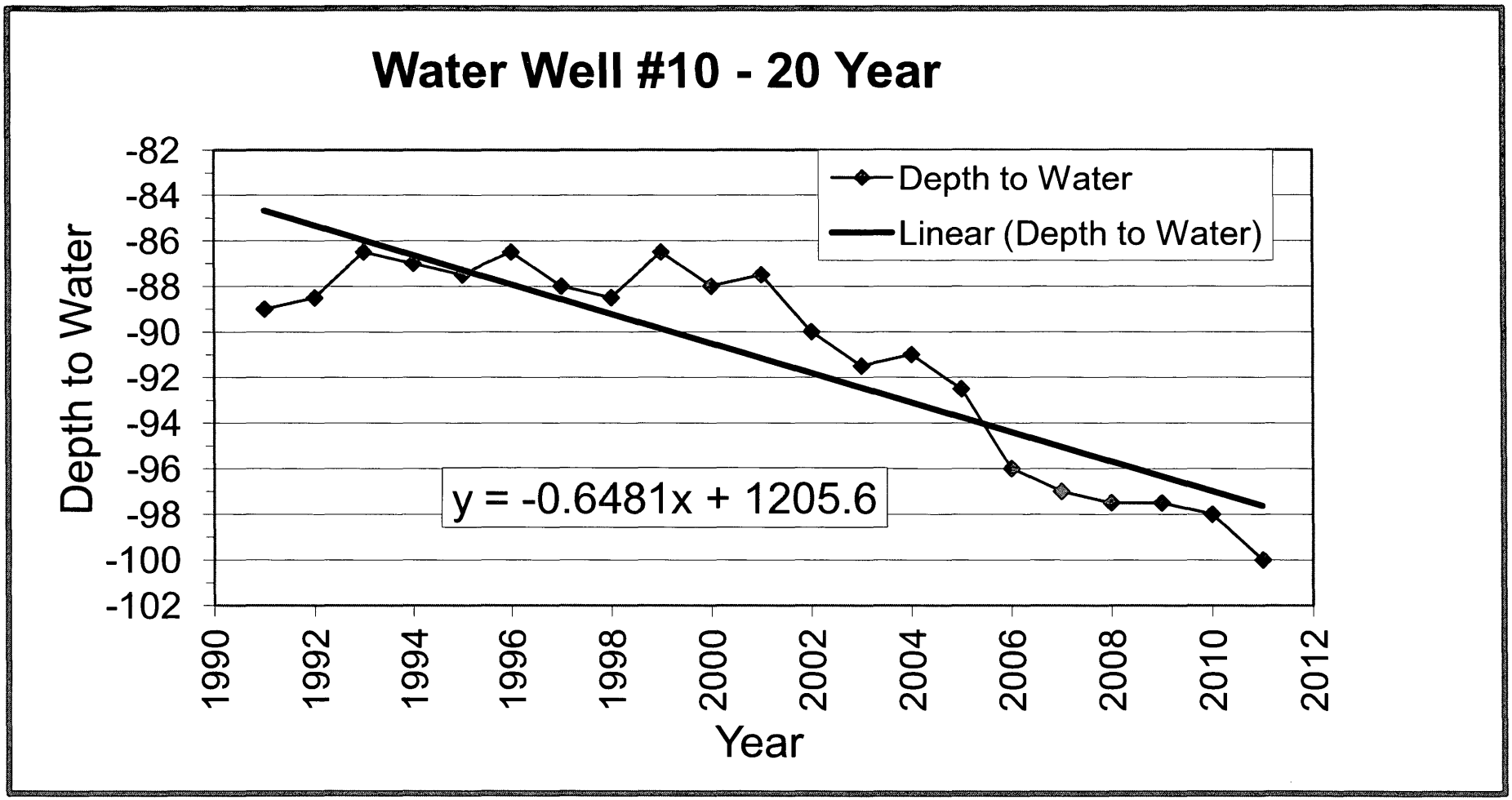

Water Well #9
Depth To Water
Linear (Depth To Water)
y = 0.1033x - 301.5
-80
-85
-90
-95
-100
-105
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year

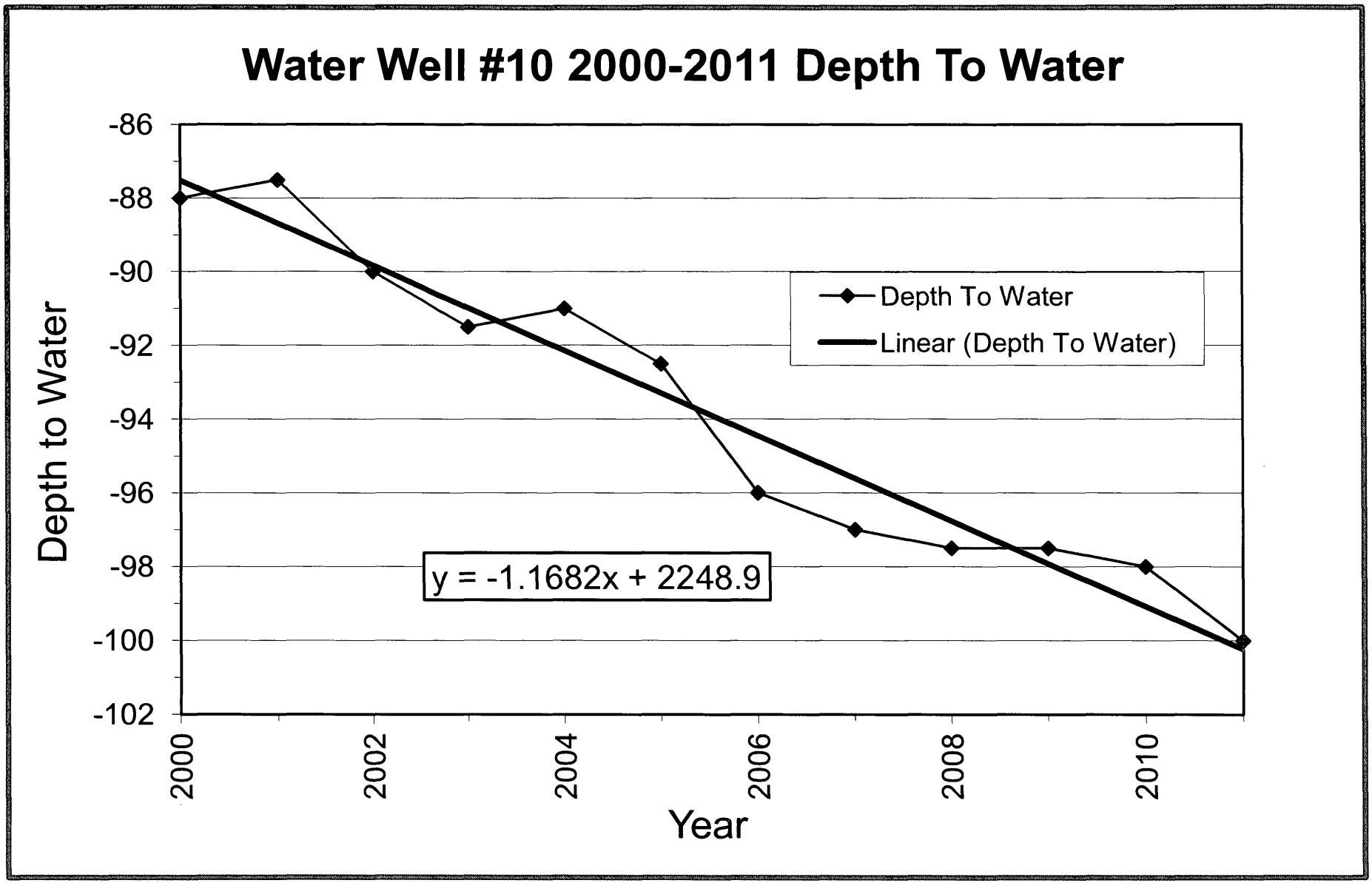

Water Well #9 - 20 Year
y = 0.0569x - 208.97
Depth to Water
Linear (Depth to Water)
Depth to Water
-81
-85
-89
-93
-97
-101
-105
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
Year

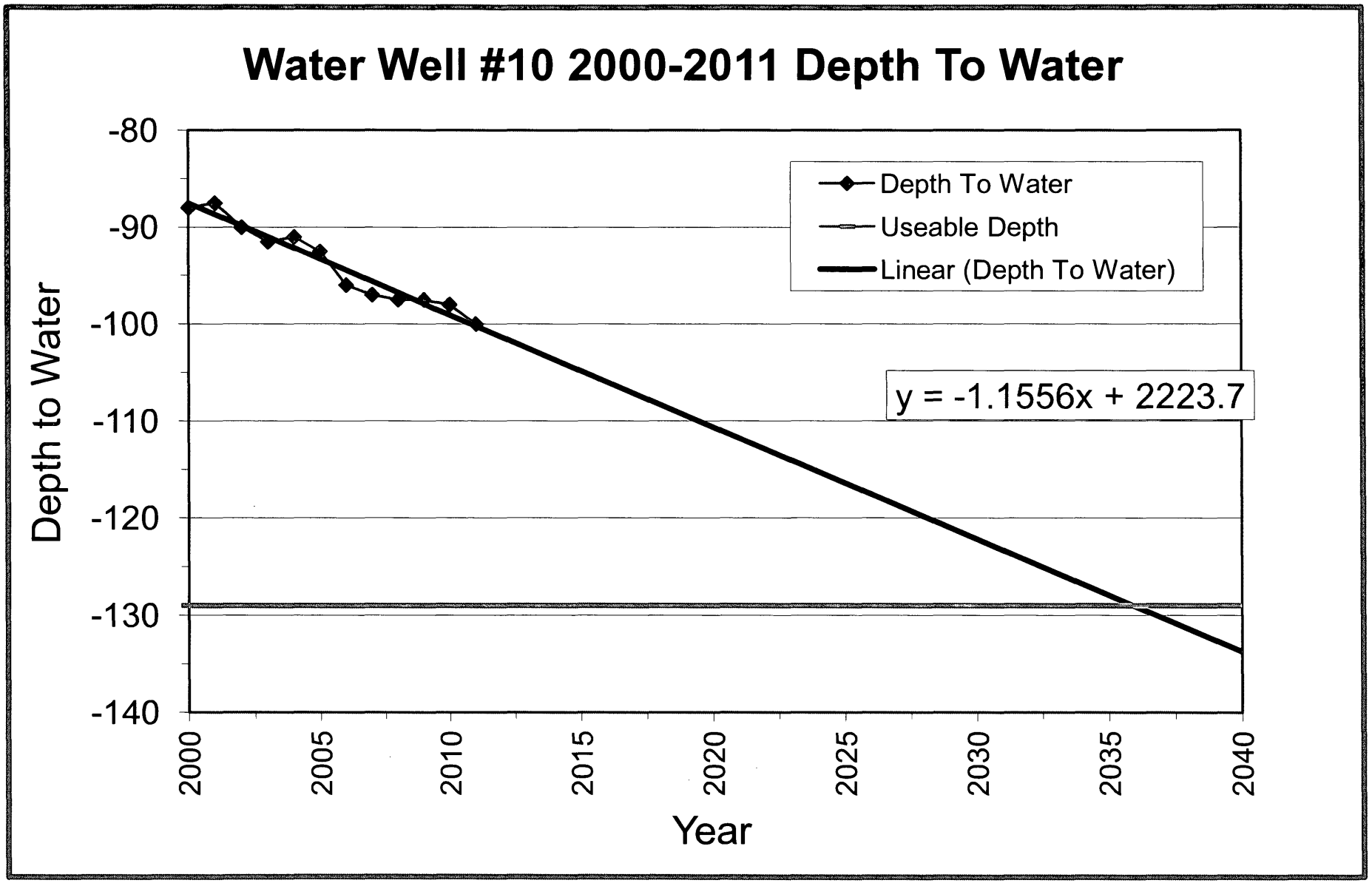

Water Well #9 2000-2011 Depth To Water
Depth to Water
-86
-88
-90
-92
-94
-96
-98
-100
-102
-104
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Year
Depth To Water
Linear (Depth To Water)
y = -0.9073x + 1725.9

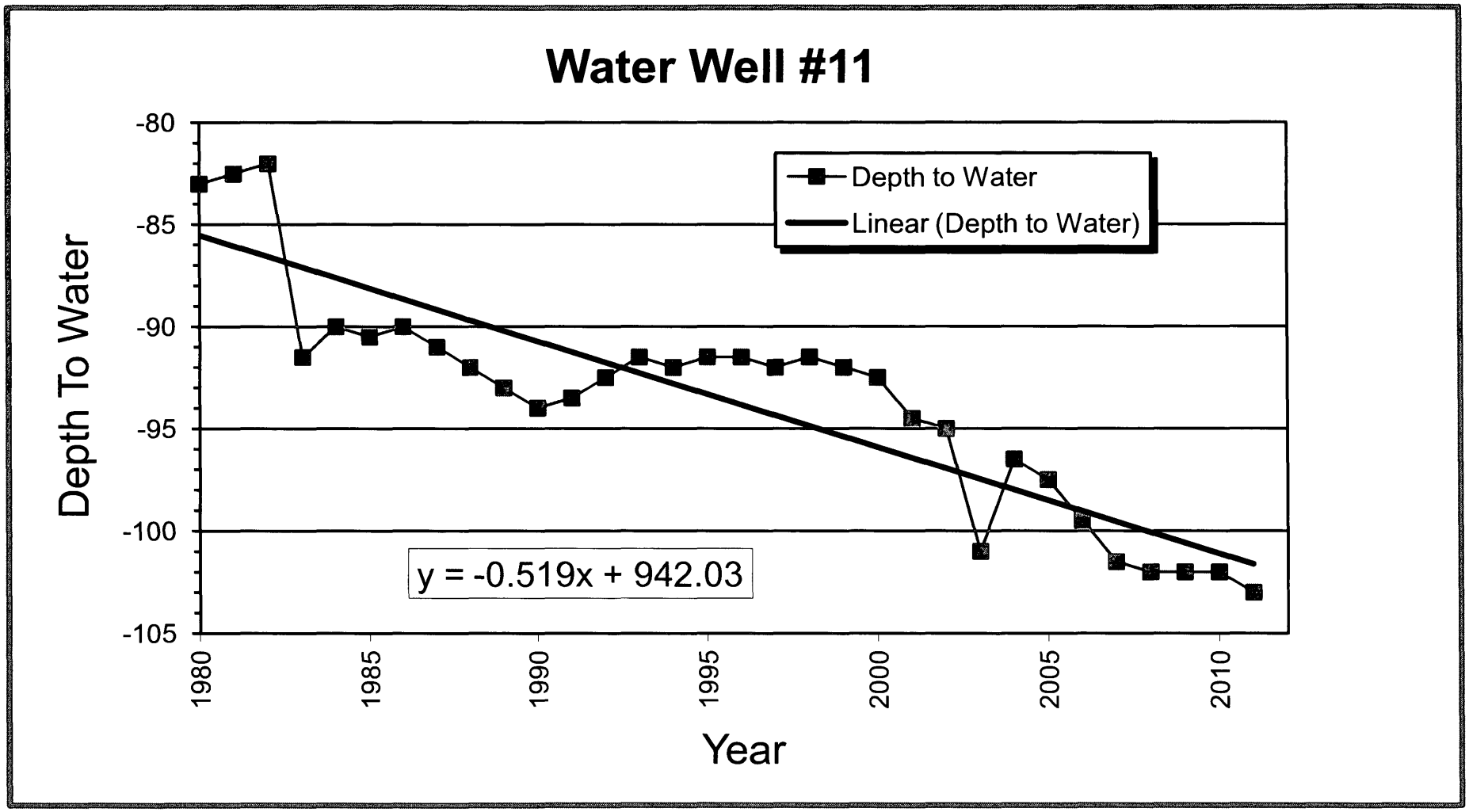

Water Well 2000-2011 #9 Depth To Water
Depth to Water
-85
-95
-105
-115
-125
-135
-145
2000
2010
2020
2030
2040
2050
2060
2070
Year
Depth To Water
Useable Depth
Linear (Depth To Water)
y = -0.9073x + 1725.9

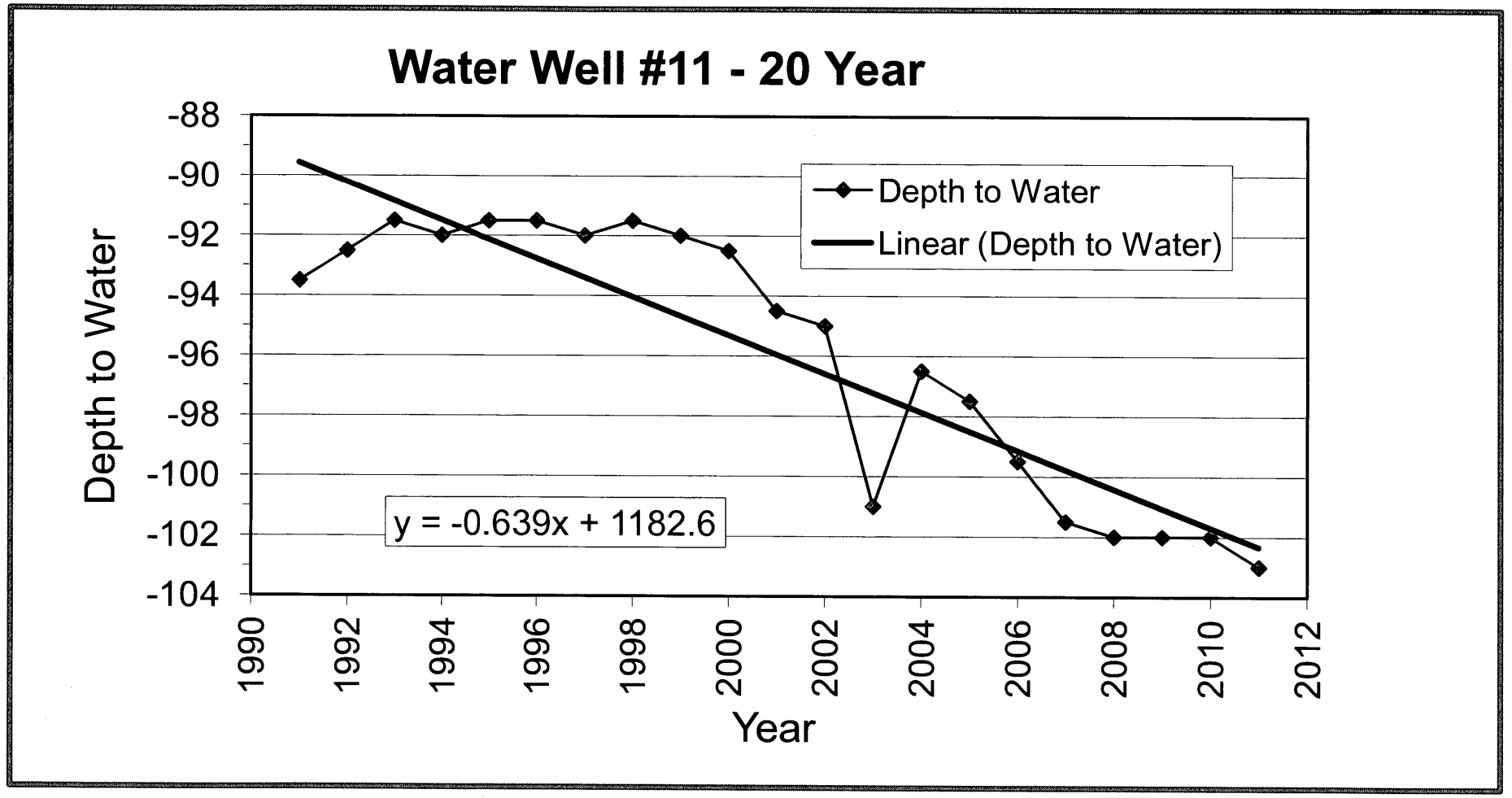

Water Well #10
Depth To Water
-57
-62
-67
-72
-77
-82
-87
-92
-97
-102
1975
1980
1985
1990
1995
2000
2005
2010
Year
Depth to Water
Linear (Depth to Water)
y = -0.9578x + 1825.1

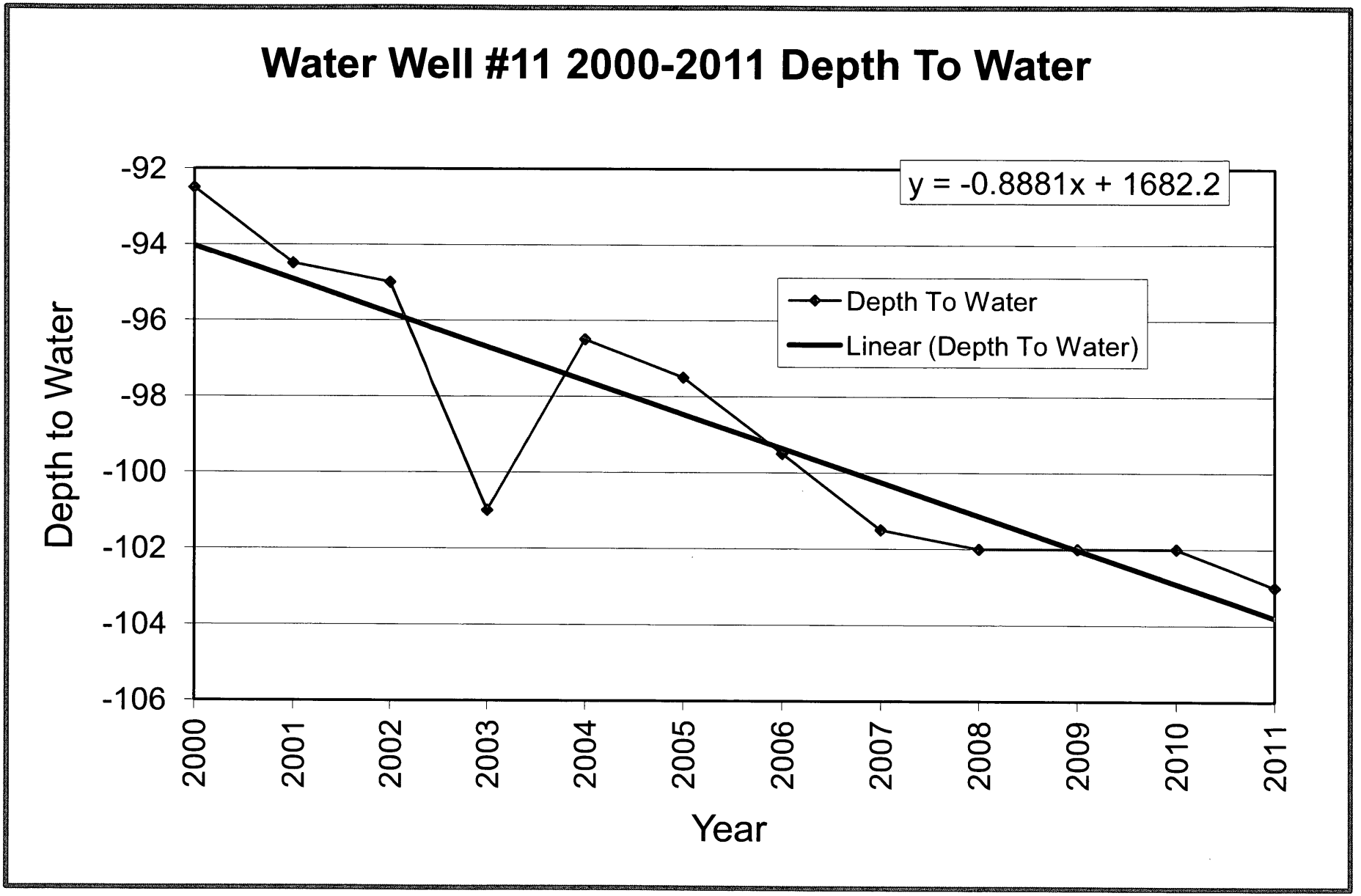

Water Well #10 - 20 Year
Depth to Water
Linear (Depth to Water)
y = -0.6481x + 1205.6
Depth to Water
-82
-84
-86
-88
-90
-92
-94
-96
-98
-100
-102
Year
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012

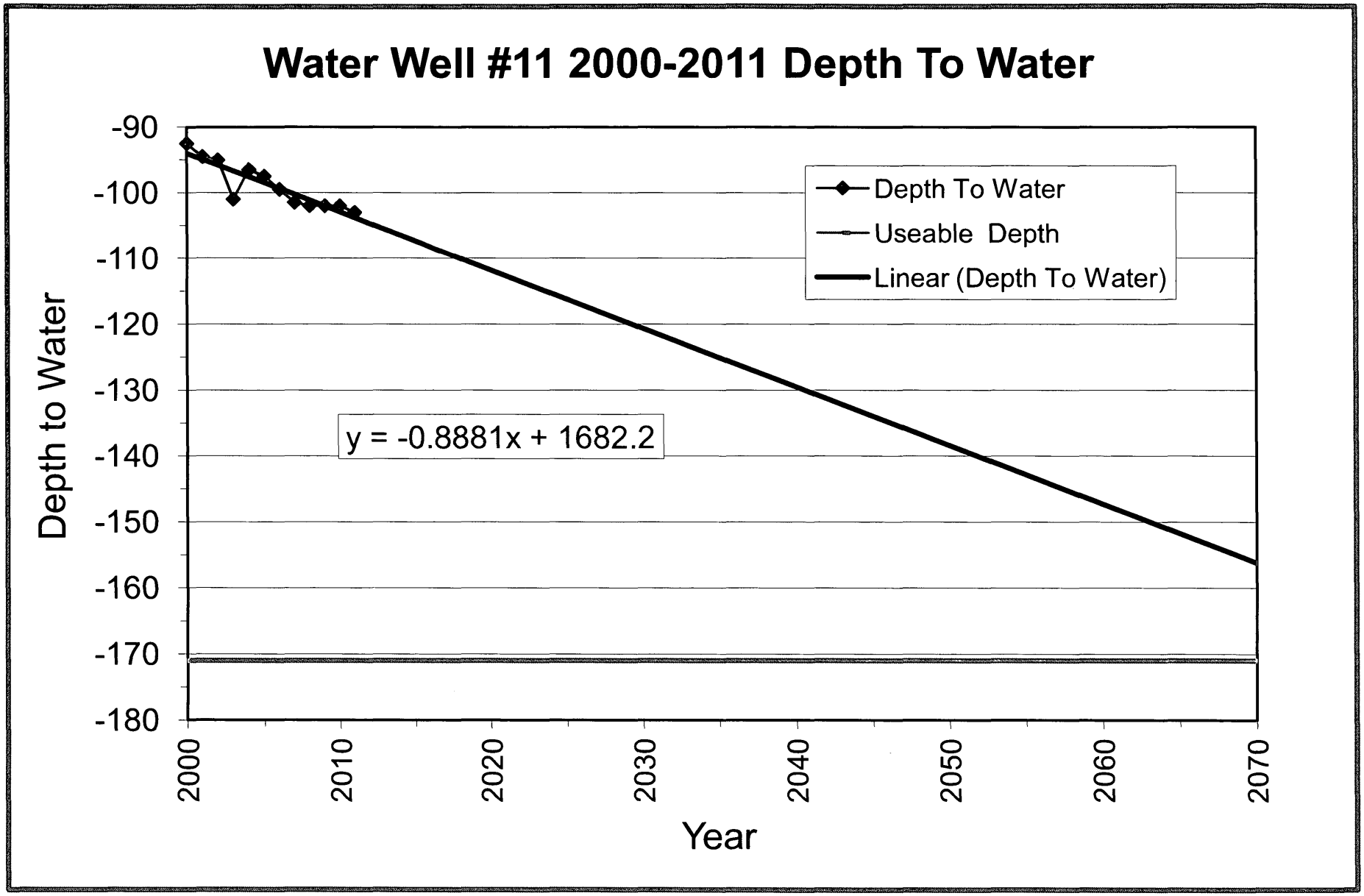

Water Well #10 2000-2011 Depth To Water
Depth to Water
-86
-88
-90
-92
-94
-96
-98
-100
-102
2000
2002
2004
2006
2008
2010
Year
Depth To Water
Linear (Depth To Water)
y = -1.1682x + 2248.9

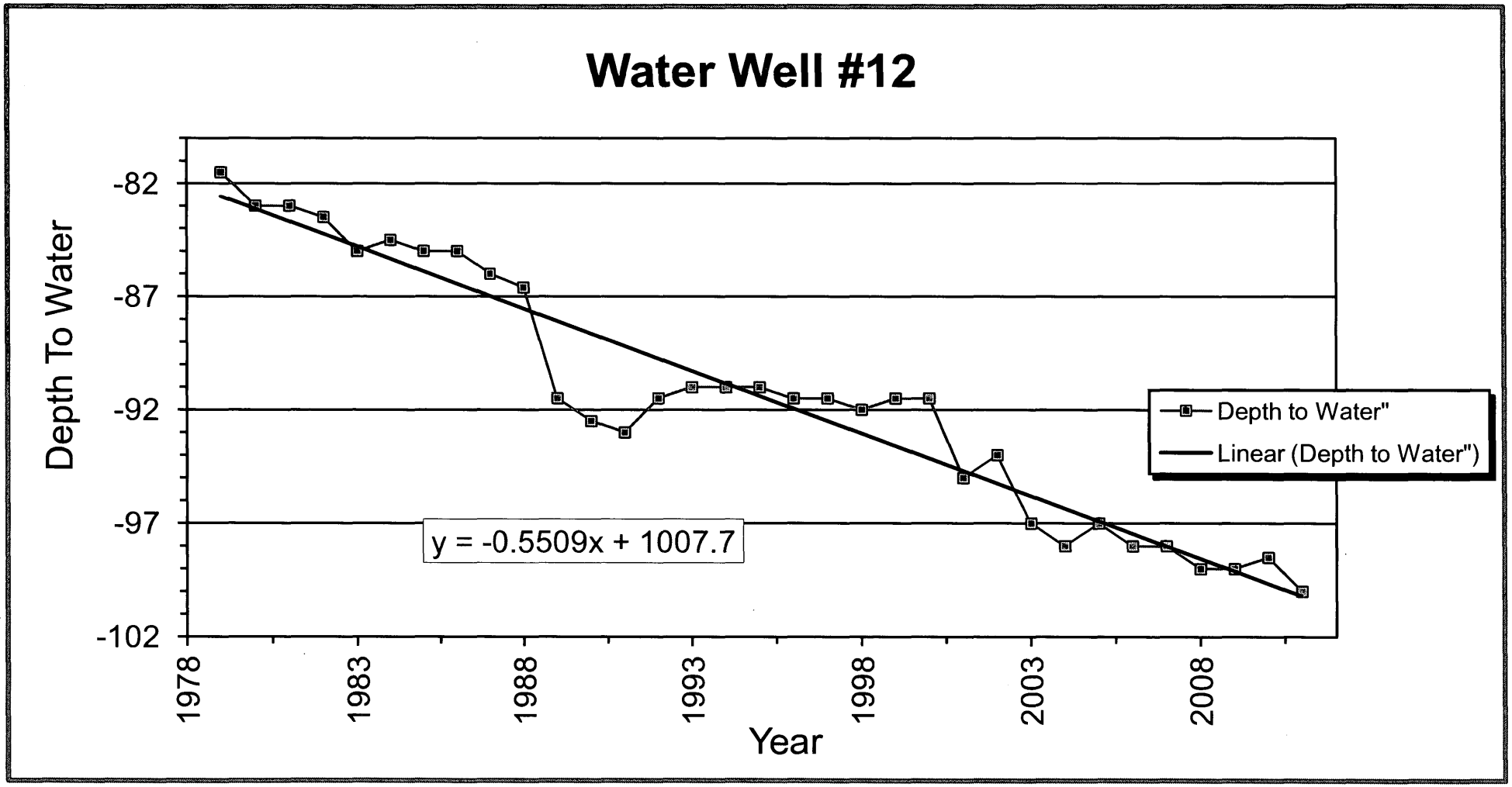

Water Well #10 2000-2011 Depth To Water
-80
-90
-100
-110
-120
-130
-140
Depth to Water
2000
2005
2010
2015
2020
2025
2030
2035
2040
Year
Depth To Water
Useable Depth
Linear (Depth To Water)
y = -1.1556x + 2223.7

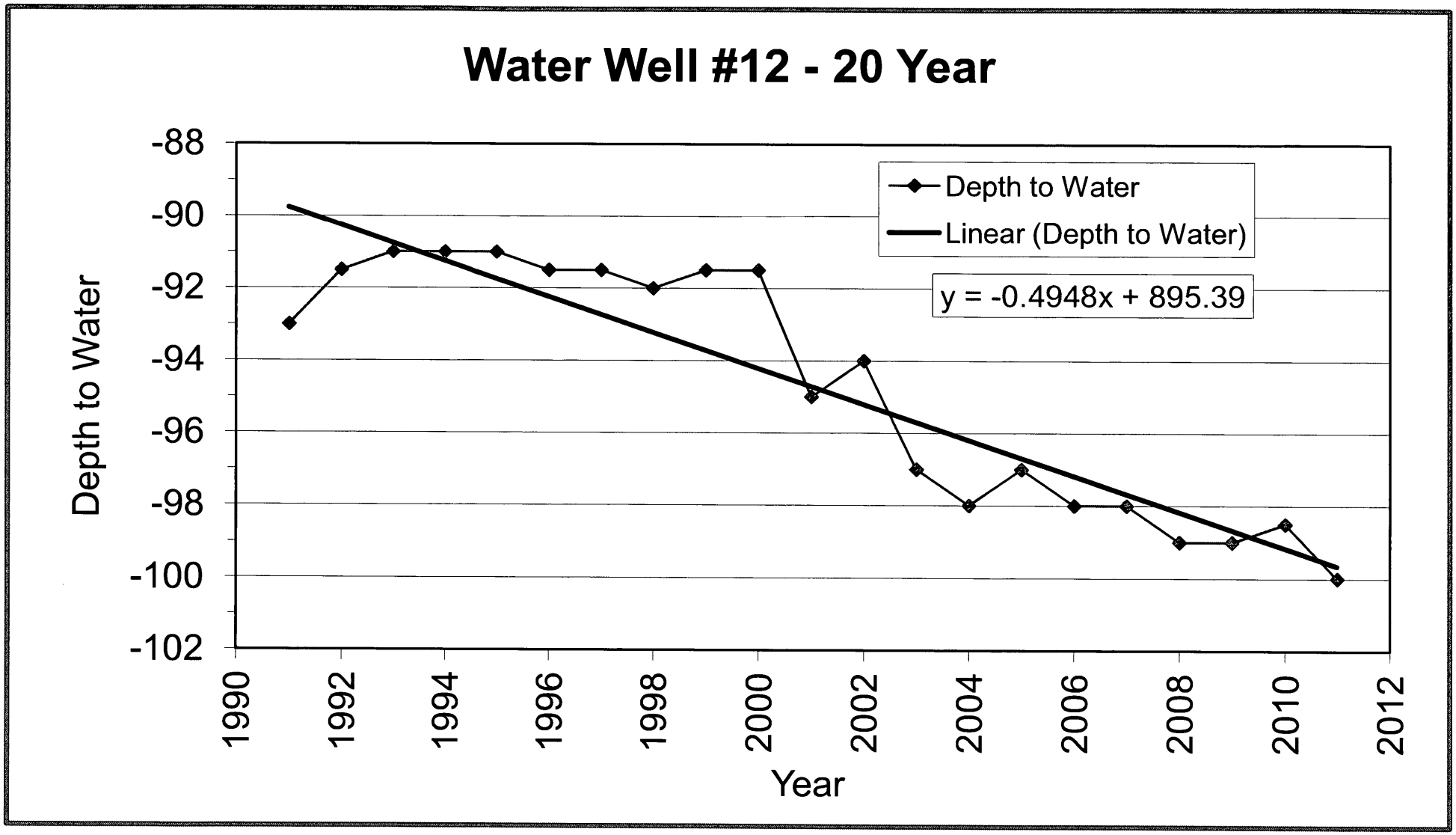

Water Well #11
Depth to Water
Linear (Depth to Water)
y = -0.519x + 942.03
Depth To Water
-80
-85
-90
-95
-100
-105
1980
1985
1990
1995
2000
2005
2010
Year

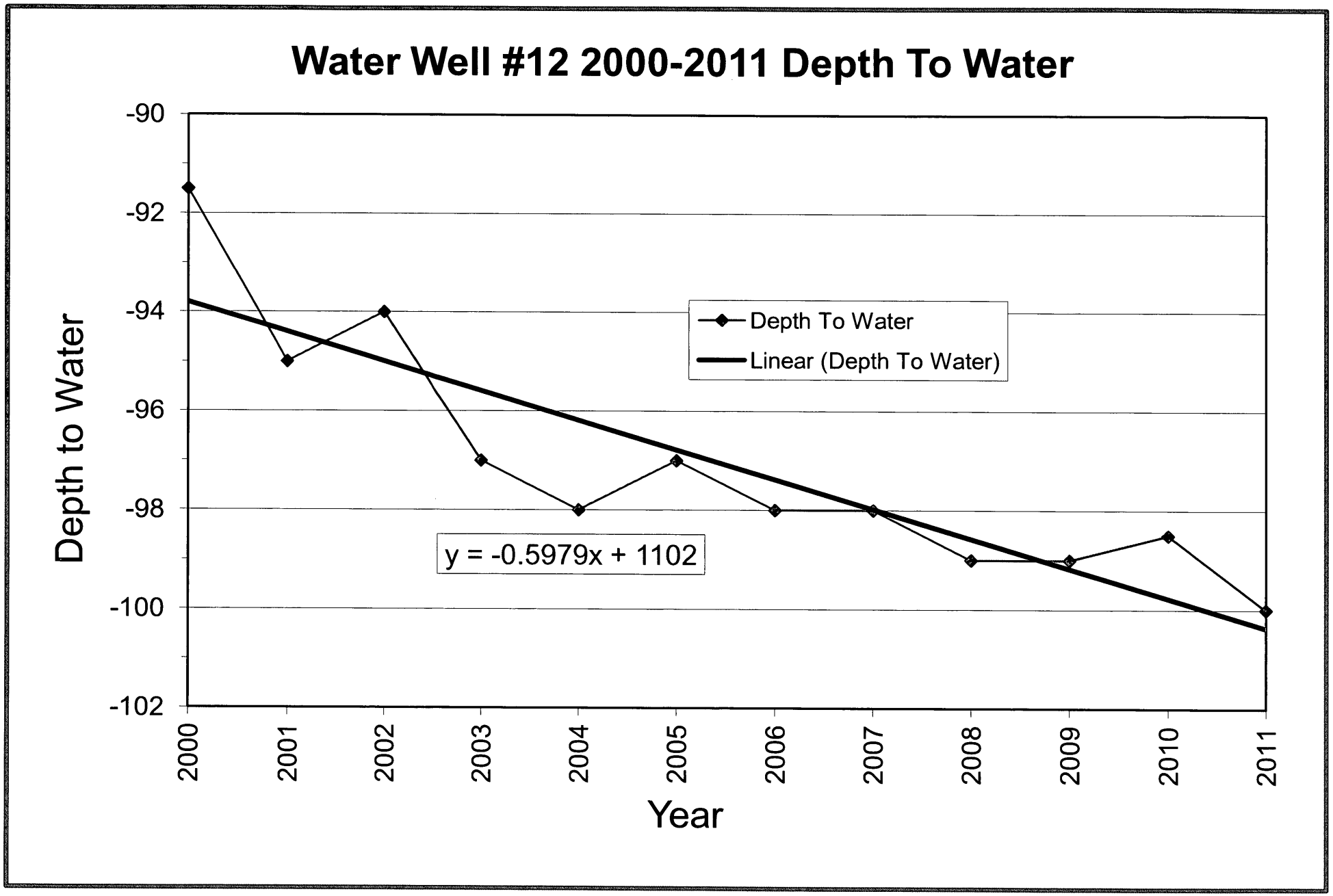

Water Well #11 - 20 Year
Depth to Water
-88
-90
-92
-94
-96
-98
-100
-102
-104
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
Year
Depth to Water
Linear (Depth to Water)
y = -0.639x + 1182.6

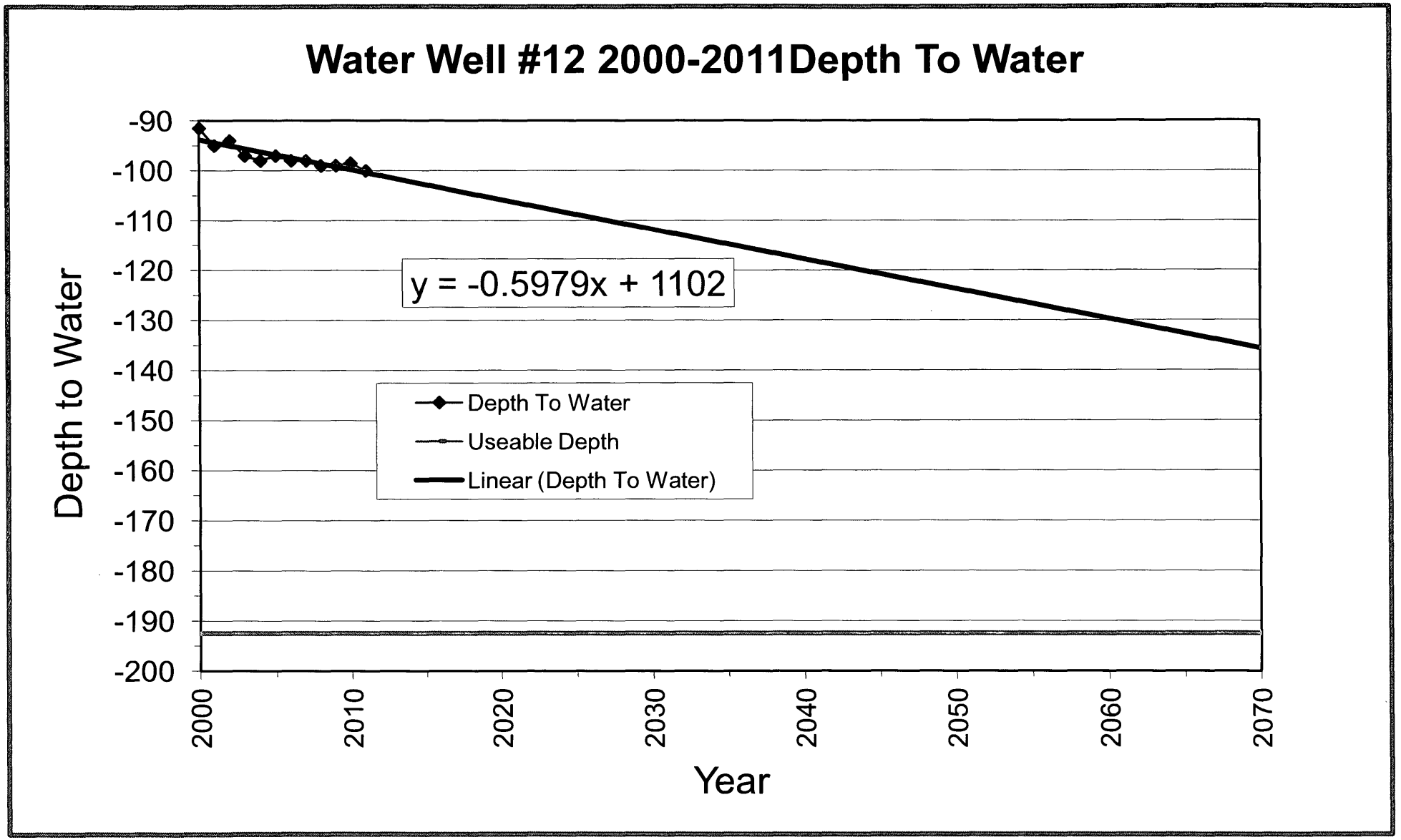

Water Well #11 2000-2011 Depth To Water
y = -0.8881x + 1682.2
Depth To Water
Linear (Depth To Water)
Depth to Water
-92
-94
-96
-98
-100
-102
-104
-106
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Year

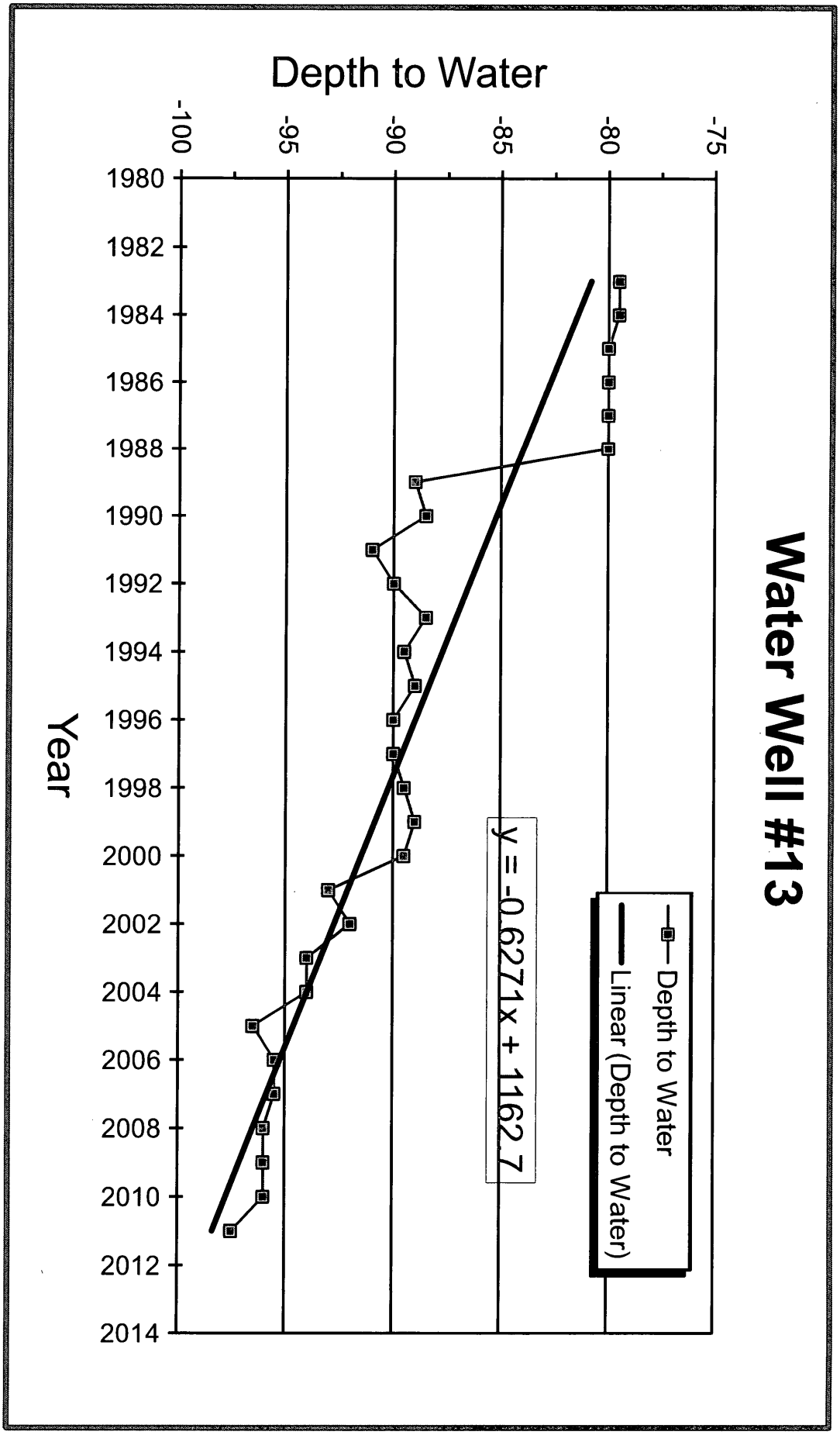

Water Well #11 2000-2011 Depth To Water
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
Depth to Water
2000
2010
2020
2030
2040
2050
2060
2070
Year
Depth To Water
Useable Depth
Linear (Depth To Water)
y = -0.8881x + 1682.2

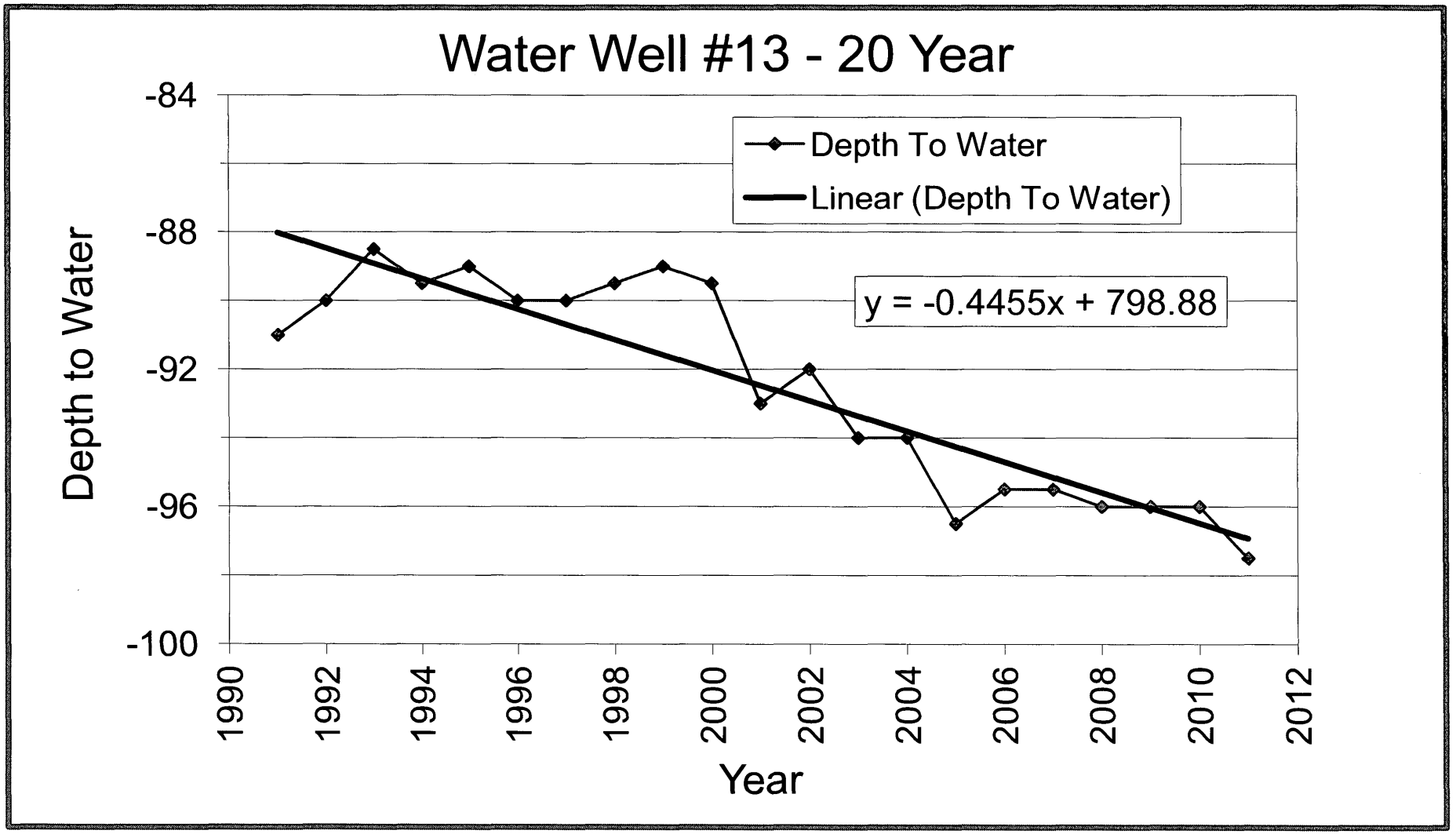

Water Well #12
Depth To Water
-82
-87
-92
-97
-102
1978
1983
1988
1993
1998
2003
2008
Year
y = -0.5509x + 1007.7
Depth to Water"
Linear (Depth to Water")

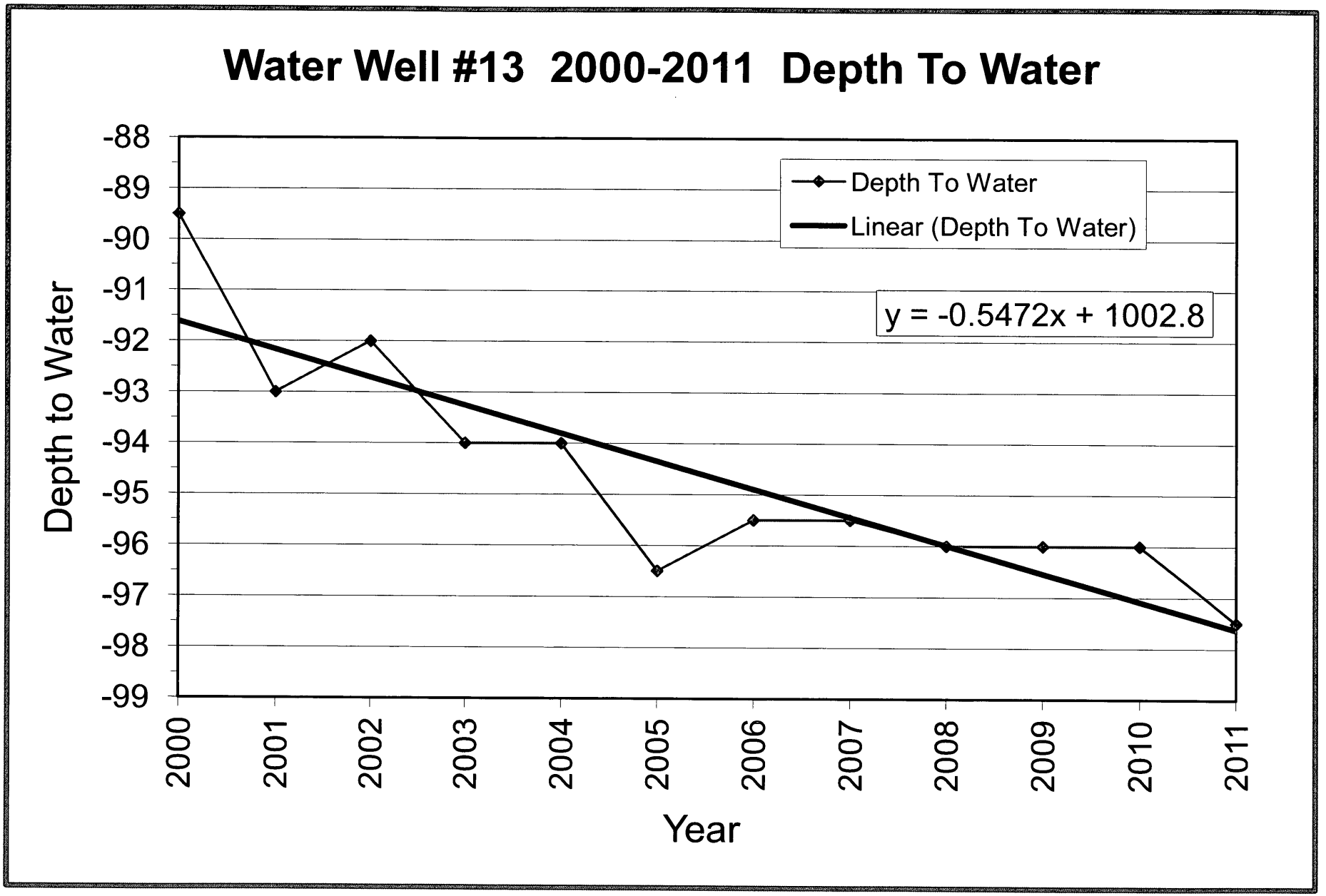

Water Well #12 - 20 Year
Depth to Water
Linear (Depth to Water)
y = -0.4948x + 895.39
Depth to Water
-88
-90
-92
-94
-96
-98
-100
-102
Year
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012

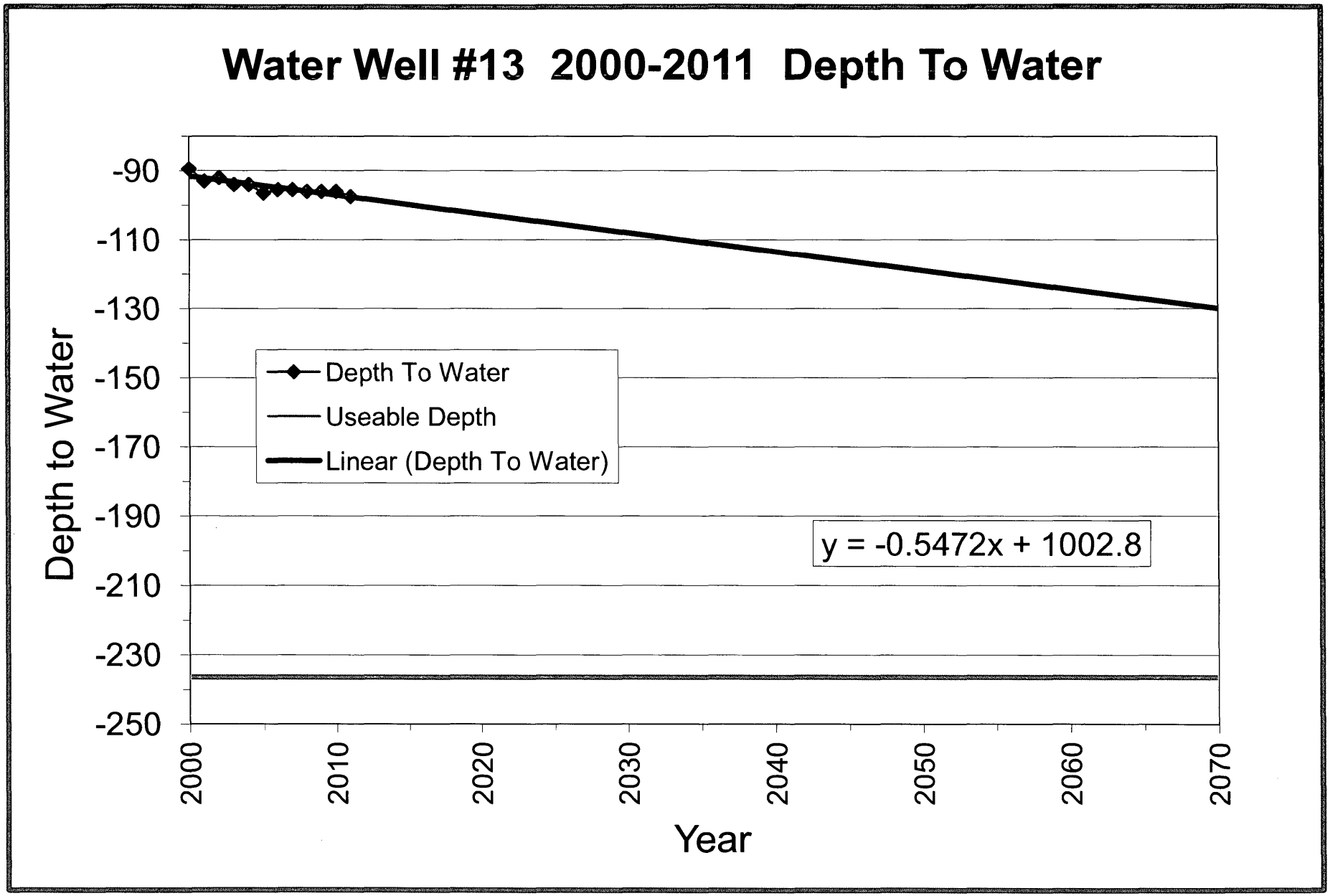

Water Well #12 2000-2011 Depth To Water
Depth to Water
-90
-92
-94
-96
-98
-100
-102
Depth To Water
Linear (Depth To Water)
y = -0.5979x + 1102
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Year

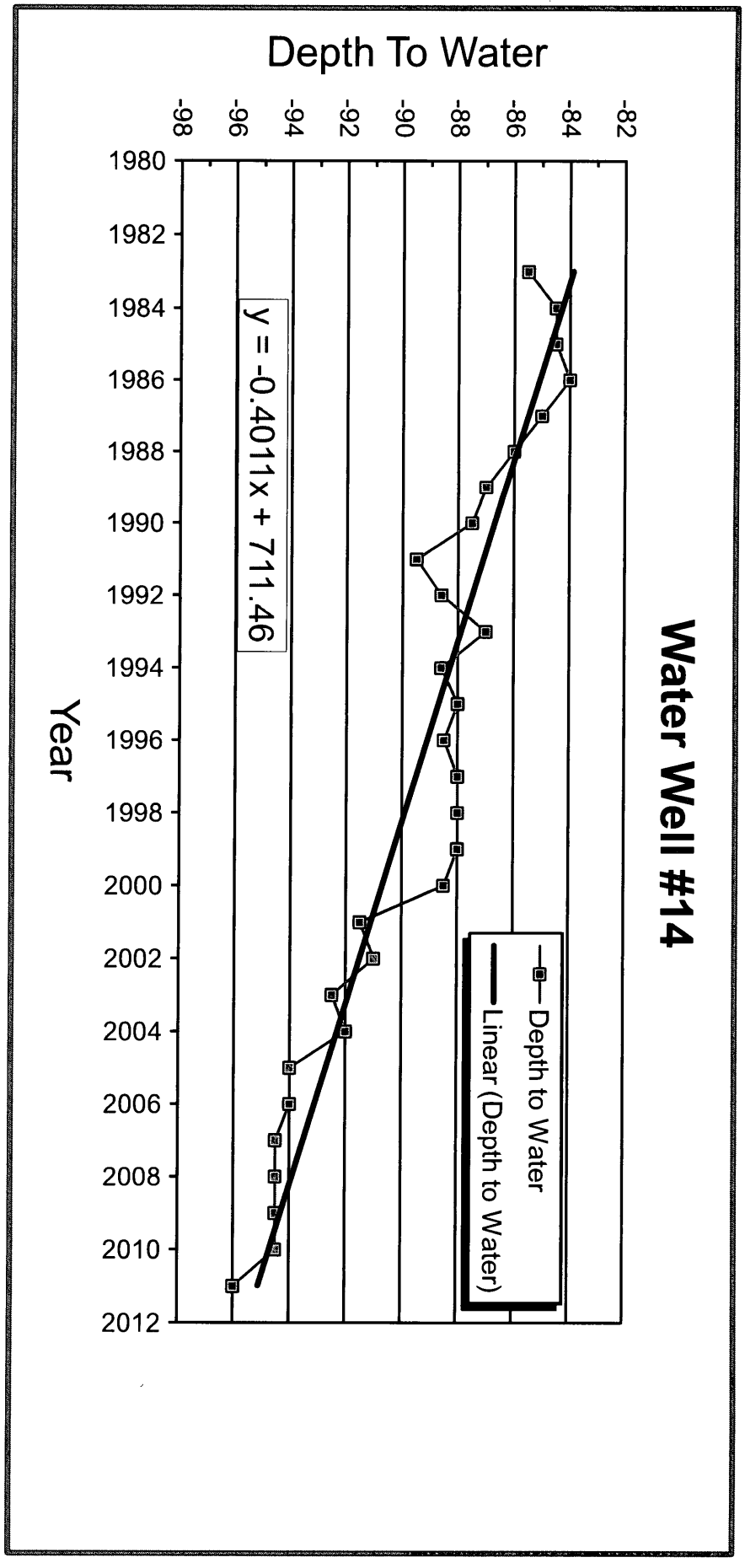

Water Well #12 2000-2011Depth To Water
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
Depth to Water
y = -0.5979x + 1102
Depth To Water
Useable Depth
Linear (Depth To Water)
2000
2010
2020
2030
2040
2050
2060
2070
Year


Water Well #13
Depth to Water
-100
-95
-90
-85
-80
-75
Year
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
y = -0.6271x + 1162.7
Depth to Water
Linear (Depth to Water)


Water Well #13 - 20 Year
Depth to Water
-84
-88
-92
-96
-100
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
Year
Depth To Water
Linear (Depth To Water)
y = -0.4455x + 798.88


Water Well #13 2000-2011 Depth To Water
Depth to Water
-88
-89
-90
-91
-92
-93
-94
-95
-96
-97
-98
-99
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Year
Depth To Water
Linear (Depth To Water)
y = -0.5472x + 1002.8


Water Well #13 2000-2011 Depth To Water
-90
-110
-130
-150
-170
-190
-210
-230
-250
Depth to Water
Depth To Water
Useable Depth
Linear (Depth To Water)
y = -0.5472x + 1002.8
2000
2010
2020
2030
2040
2050
2060
2070
Year


Depth To Water
-98
-96
-94
-92
-90
-88
-86
-84
-82
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
Year
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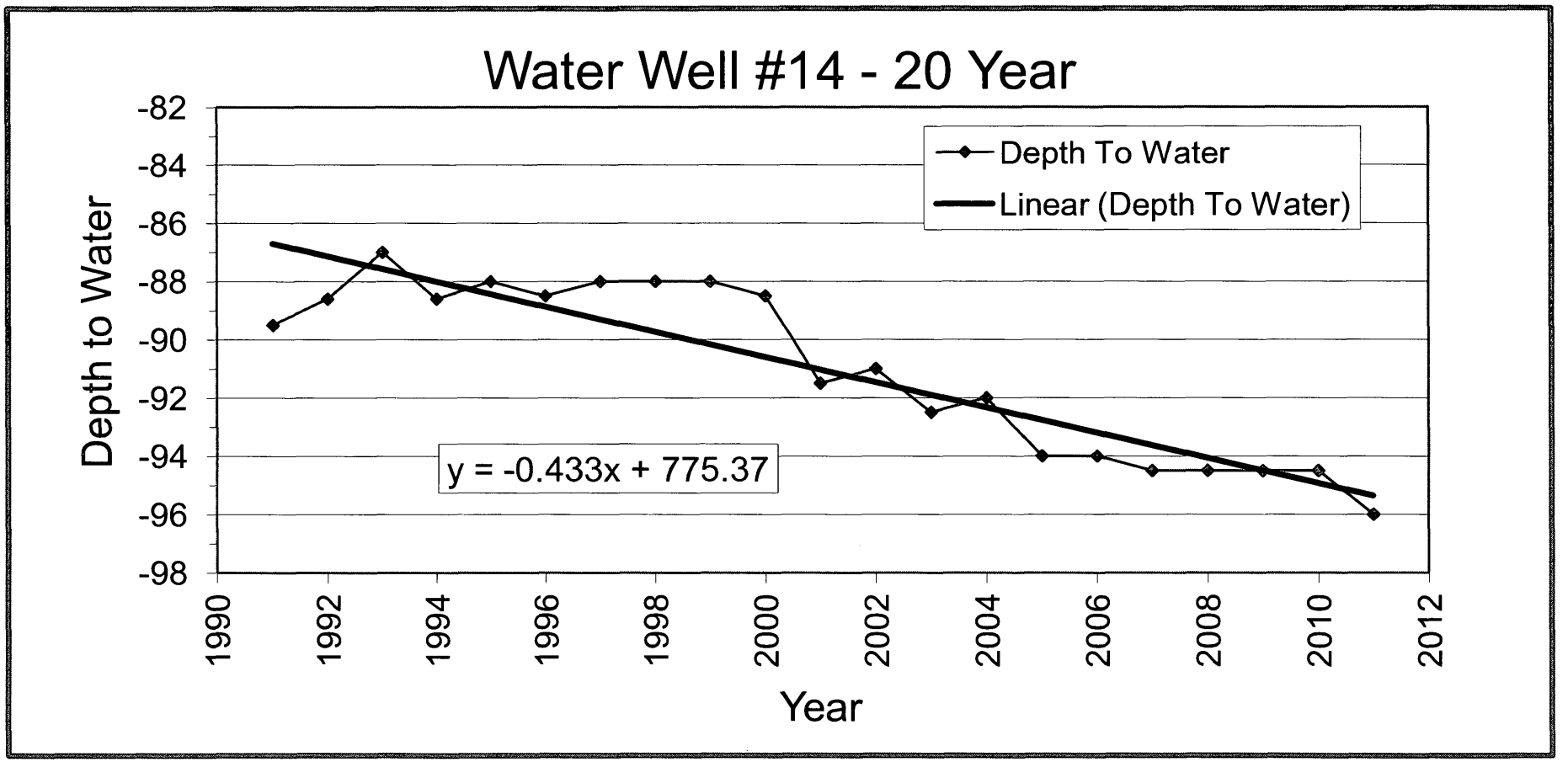
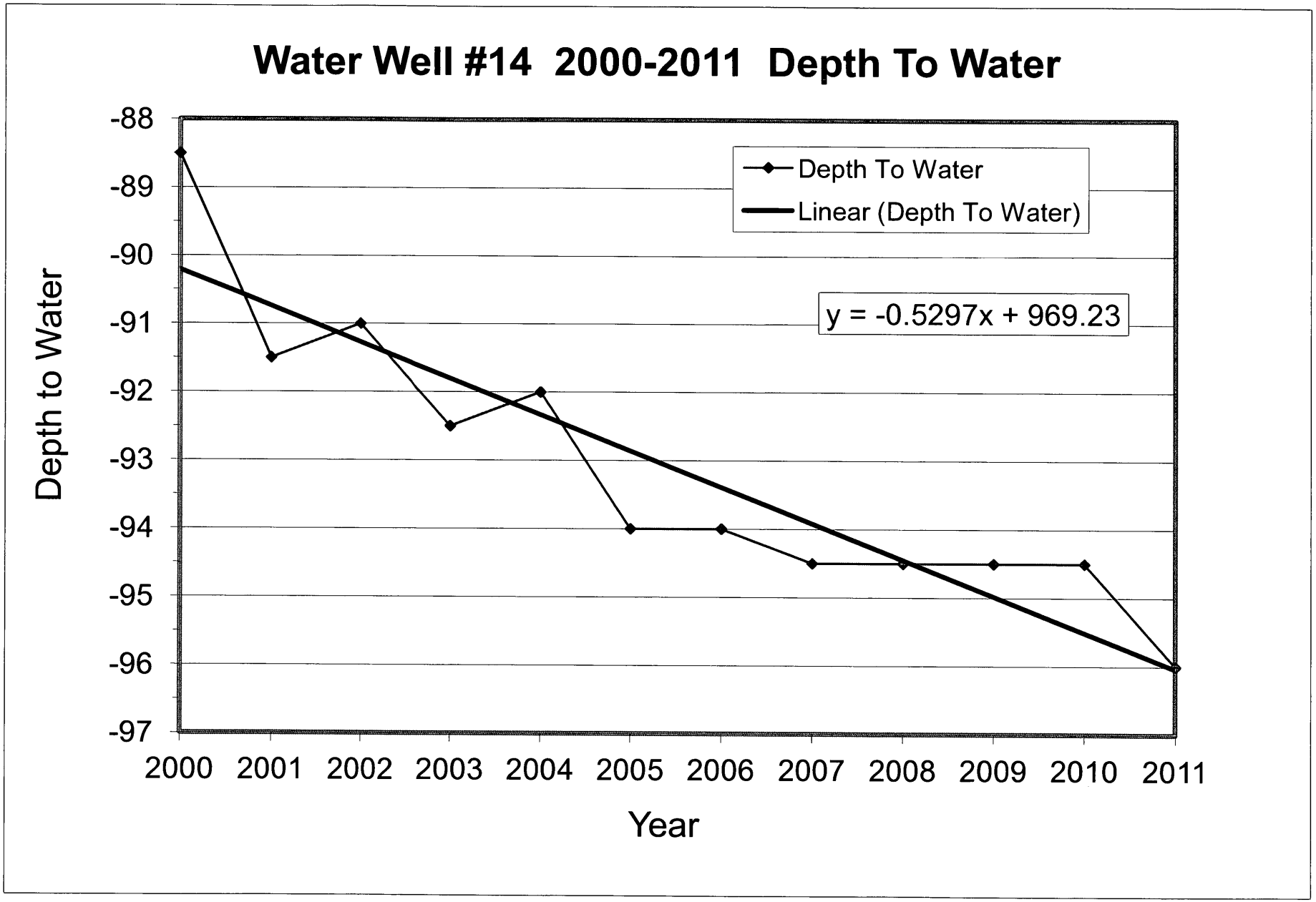
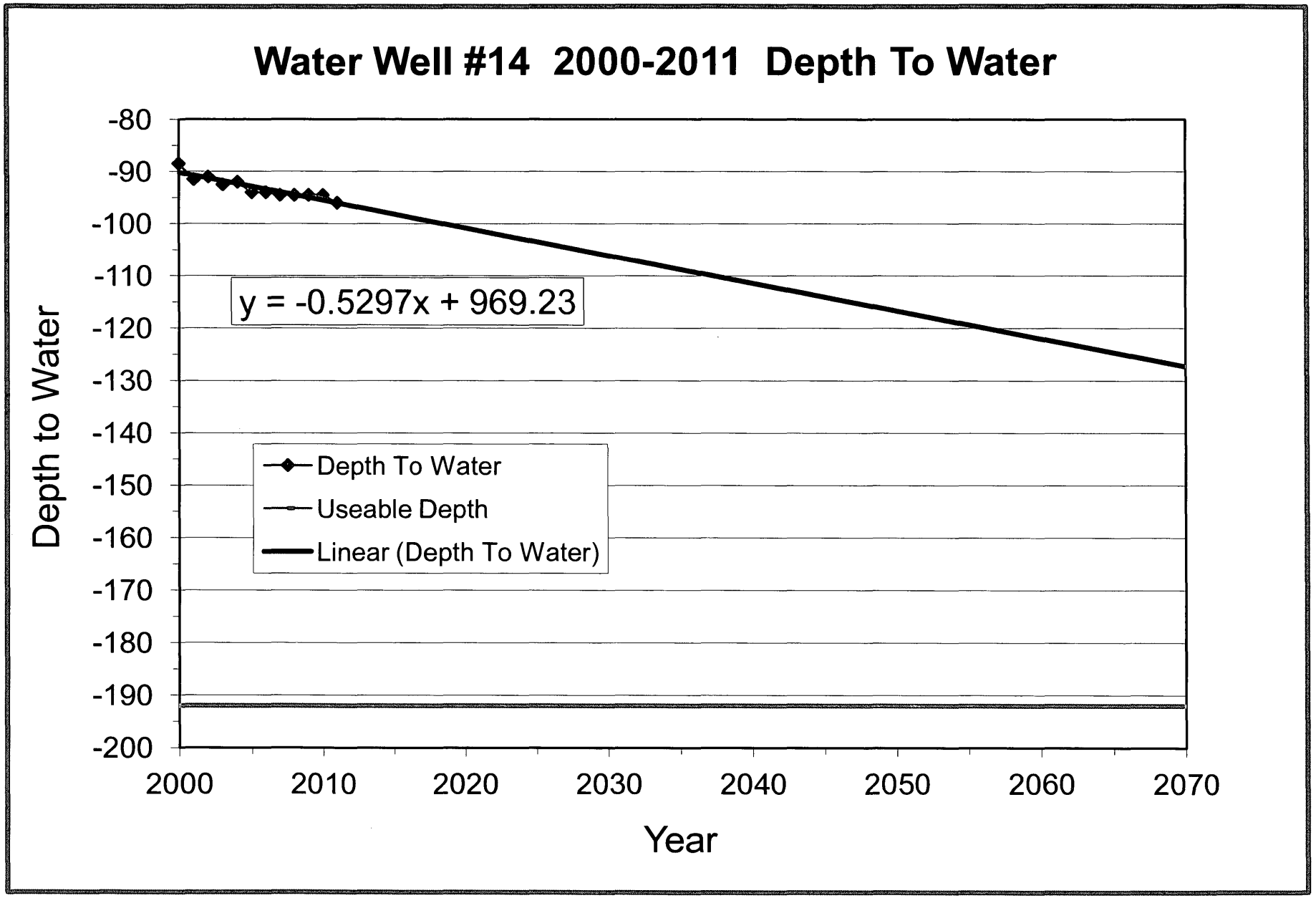
Depth to Water
Linear (Depth to Water)
Water Well #14


Water Well #14 - 20 Year
Depth to Water
-82
-84
-86
-88
-90
-92
-94
-96
-98
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
Year
Depth To Water
Linear (Depth To Water)
y = -0.433x + 775.37


Water Well #14 2000-2011 Depth To Water
Depth to Water
-88
-89
-90
-91
-92
-93
-94
-95
-96
-97
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Year
Depth To Water
Linear (Depth To Water)
y = -0.5297x + 969.23


Water Well #14 2000-2011 Depth To Water
Depth to Water
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
y = -0.5297x + 969.23
Depth To Water
Useable Depth
Linear (Depth To Water)
2000
2010
2020
2030
2040
2050
2060
2070
Year

FEE SCHEDULE

1. The fee for an application for a permit to appropriate water for beneficial use, except for domestic use, shall be (see paragraph No. 2 below if requesting storage):

ACRE-FEET	FEE
0-100	$200.00
101-320	$300.00
More than 320	$300.00 plus $20.00 for each additional 100 acre-feet or any part thereof.

2. The fee for an application in which storage is requested, except for domestic use, shall be:

ACRE-FEET	FEE
0-250	$200.00
More than 250	$200.00 plus $20.00 for each additional 250 acre-feet of storage or any part thereof.

Note: If an application requests both direct use *and* storage, the fee charged shall be as determined under No. 1 or No. 2 above, whichever is greater, but not both fees.

3. The fee for an application for a permit to appropriate water for water power or dewatering purposes shall be $100.00 plus $200.00 for each 100 cubic feet per second, or part thereof, of the diversion rate requested.

Note: The applicant shall notify the Chief Engineer and pay the statutorily required field inspection fee of $400.00 when construction of the works for diversion has been completed, except that for applications filed on or after July 1, 2009, for works constructed for sediment control use and for evaporation from a groundwater pit for industrial use shall be accompanied by a field inspection fee of $200.00.

MAKE CHECKS PAYABLE TO THE KANSAS DEPARTMENT OF AGRICULTURE

ATTENTION

A Water Conservation Plan may be required per K.S.A. 82a-733. A statement that your application for permit to appropriate water may be subject to the minimum desirable streamflow requirements per K.S.A. 82a-703a, b, and c may also be required from you. After the Division of Water Resources has had the opportunity to review your application, you will be notified whether or not you will need to submit a Water Conservation Plan. You also may be required to install a water flow meter or water stage measuring device on your diversion works prior to diverting water. There may be other special conditions or Groundwater Management District regulations that you will need to comply with if this application is approved.

CONVERSION FACTORS

1 acre-foot equals 325,851 gallons

1 million gallons equal 3.07 acre-feet

RECLAMATION

Managing Water in the West

Water Supply Augmentation Investigation for McPherson, Kansas

Appraisal Report

U.S. Department of the Interior
Bureau of Reclamation
Great Plains Region
Oklahoma-Texas Area Office

December 2005

TABLE OF CONTENTS

List of Figures

Acronyms and Abbreviations

AMSL	average mean sea level
ASR	Aquifer Storage and Recovery
Aquifer	Equus Beds Aquifer
BPU	Kansas Board of Public Utilities
Board	Equus Beds Groundwater Management District Board of Directors
cfs	cubic feet per second
District	Equus Beds Groundwater Management District No.2
gpcd	gallons per capita per day
gpm	gallons per minute
IGUCA	Intensive Groundwater Use Control Area
KWO	Kansas Water Office
mgd	million gallons per day
mg/L	milligrams per liter
NEPA	National Environmental Policy Act
NPDES	National Pollution Discharge Elimination System
O&M	operation and maintenance
SMCL	secondary maximum contaminate level
TDS	total dissolved solids
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service

EXECUTIVE

Summary

This document presents the appraisal-level findings of a water supply augmentation investigation in and around the city of McPherson located in south-central Kansas. Groundwater from the Equus Beds Aquifer (Aquifer), that currently supplies all the existing needs in the study area, has been adversely affected by depletion and an inadequate recharge rates sufficient to replace withdrawals, especially during periods of drought. The purpose of this investigation is to assist the State of Kansas, local water suppliers, and water users in addressing public water supply problems and needs for the McPherson area through the year 2040.

Need for Action

The McPherson area communities currently use groundwater from the Aquifer as the only water supply source for agricultural, rural, domestic, municipal and industrial needs. It is critical that potential methods to enhance water supplies for future growth and development be identified. Additional objectives of the investigation are to ensure a safe, reliable, and sustainable source of water to meet the 2040 demands.

In response to the serious depletion problem, the McPherson Intensive Groundwater Use Control Area (IGUCA) was established in 1980 as the first IGUCA in the state. In addition, conservation measures and careful management of the area water resources were implemented. Groundwater levels have stabilized in some areas of the Aquifer in recent years since water use controls were implemented within the IGUCA. The water levels still remain as much as 20-30 feet from the 1940's levels at certain locations in this portion of the Aquifer. If action is not taken to augment the water supplies in the study area, water shortages could restrict the growth of existing and new industries and businesses in the McPherson economic development area.

Resources, Opportunities, and Constraints

Opportunities exist in this Kansas area to reduce the impacts on the Aquifer water levels by reducing or eliminating the Aquifer overdraft. This could be accomplished by using water from Federal reservoirs, water from the Little Arkansas River, water from the Smoky-Hill River, recycled water, water from treatment of oil field brine pollution plumes, or a combination of the alternatives identified. Development of new surface storage, recharge of the Aquifer, and irrigated land retirement also appear to be viable alternatives. Conservation and recycling, where appropriate, will help to sustain supplies and lessen groundwater depletion.

Alternatives

Alternative water supplies are required to meet local user needs, to stem the decline of the Aquifer, to provide additional recharge, and to stem the movement of high saline groundwater from the east to the Equus Beds in the McPherson area. The use of surface

water to augment the total water supply would allow the Aquifer levels to recover to near pre-1940 levels through recharge and reduced pumping.

For this appraisal-level report, Reclamation has investigated several alternatives which alone or in combination, could meet the projected water demands in the McPherson area. The alternatives include:

- Little Arkansas River Diversion
- Sharps Creek Diversion
- Wastewater recharge of the Aquifer.
- Transport of water from the Smoky Hill River via pipeline.
- Purchase water from Kanopolis Reservoir and transport to McPherson Area via pipeline.
- Groundwater near Burrton

Non-Injection Options

All alternatives are based on the assumption that 12,365 acre-feet of water is needed to meet 2040 demand, that there is a sustainable aquifer yield of 10,000 acre-feet per year, and that 4,260 acre-feet of supplemental water is needed; 2,365 acre-feet to meet the demand beyond the sustainable yield and 1,895 acre-feet to be injected for "aquifer recovery" which will aid in restoring the aquifer to pre-1940 levels.

The recovery portion of each alternative could be accomplished by "in-situ" (natural) recovery rather than by injection. For example, instead of pumping the 10,000 acre-feet sustainable yield from the Aquifer followed by injecting 1,895 acre-feet for net withdrawal of 8,105 acre-feet, simply limit aquifer pumping to 8,105 acre-feet per year and allocate the entire 4,260 acre-feet of supplemental water for the city's direct use. The net result is the same either way: 12,365 acre-feet of water available for city use and a gain of 1,895 acre-feet in the Aquifer each year.

Based on appraisal-level estimates and on available information, construction costs could range between $25 and $48 million dollars, while annual operation and maintenance (O&M) costs could range between $1.8 and $3 million dollars per year. Actual construction costs, along with the long-term O&M costs, would be determined for each alternative as part of the feasibility study if one is conducted.

Potential Environmental Impacts

The potential environmental impacts of each of the alternatives would be specific and every effort to minimize adverse environmental impacts would be made. In some cases, mitigation may be required. If a feasibility study is conducted, the alternatives and their impacts would be fully evaluated.

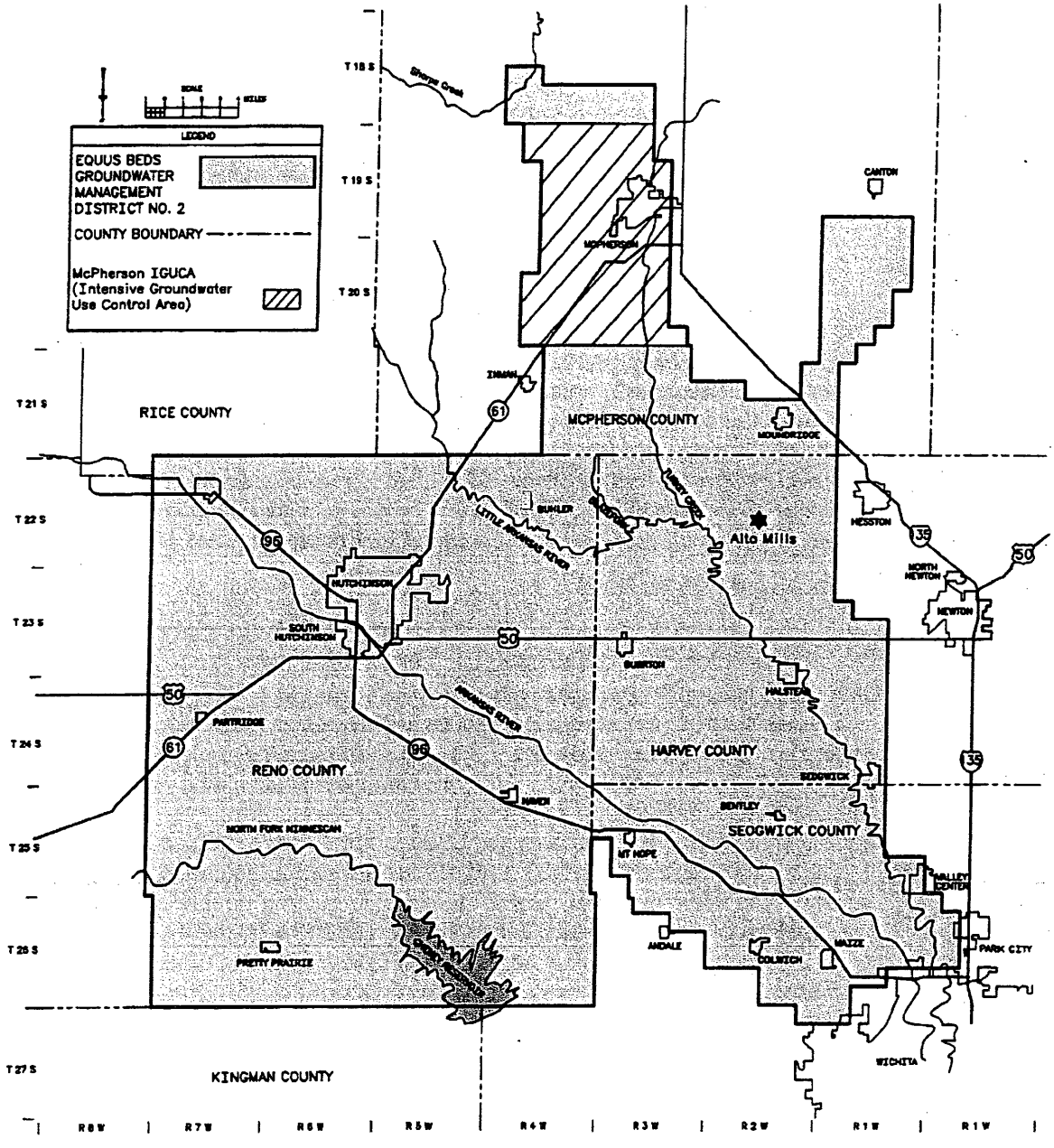


Figure 1 Location Map

CHAPTER 1

Purpose and Need

This appraisal report documents the appraisal-level findings of a water supply augmentation investigation which would serve McPherson, Kansas. Groundwater from the Aquifer that currently supplies all the existing needs in the study area has been affected by withdrawals and inadequate recharge rates during prolonged drought periods.

Study Area

The primary study area of this appraisal report is the McPherson Intensive Groundwater Use Control Area (IGUCA), located in McPherson County. The overall study area includes the Little Arkansas River Basin and parts of several other river basins near McPherson. The boundaries of the Equus Beds Groundwater Management District No. 2 (District), as well as the boundaries of the IGUCA, in the northernmost part of the management district, are shown on Figure 1. The IGUCA encompasses a 56-square-mile area, including the area adjacent to McPherson.

Study Purpose and Scope

The purpose of this study is to assist Kansas in comprehensively addressing public water supply problems and needs in the McPherson area through the year 2040. Kansas is represented by the Kansas Water Office (KWO), the District, basin advisory committees, and citizens living within the McPherson area.

The McPherson Board of Public Utilities (BPU) has undertaken several steps to ensure a water supply for customers during the past 30 years. The city has developed a water conservation plan with the primary objectives to develop long-term water conservation plans (Long-Term Water Use Efficiency Section) and short-term emergency plans (Drought/Emergency Contingency Section). Efficient water use is a priority of McPherson.

The Kansas Geological Survey estimates the current average recharge rate for the McPherson IGUCA is approximately 10,000 acre-feet per year, which is slightly less than the current demand. The McPherson area currently utilizes groundwater as the only water supply source for domestic, rural, agricultural, municipal, and industrial needs. This report identifies alternatives which would provide recharge for the Aquifer in the McPherson area, allow a sustainable pumping level, and in some cases combine multiple available water sources in order to meet projected demands through the year 2040. The recharge of the Aquifer is also important to the overall area water supply. Storing additional water in the Aquifer would provide a more reliable water supply during the critical drought periods, increase the hydraulic barrier between the fresh and salt water, and reduce future pumping costs.

Study Authority

This study is authorized under the Reclamation Act of June 17, 1902 (32 Stat. 388, 43 U.S.C. 391), and acts amendatory thereof and supplementary thereto, including the Reclamation Project Act of 1939, approved February 25, 1956, (Ch. 71, 70 Stat.28)

Need for Action

The IGUCA was established in 1980 by the Kansas, Division of Water Resources, at the request of the District's Board of Directors (Board). Action was requested as a result of declining groundwater levels in and around McPherson. Since the 1940s, water well withdrawals have exceeded the natural recharge rate of the Aquifer, resulting in a decline of the water level. Groundwater levels have stabilized but the Aquifer has been lowered 20-30 feet. One of the management controls enacted in the 56-square-mile IGUCA was to restrict new groundwater usage to domestic use only and excluded any new wells for agriculture.

Action is needed to recharge the Aquifer, and determine a sustainable yield which will support the projected population growth and existing and new industries in the McPherson economic development area through the year 2040.

Previous Studies in the Area

Reconnaissance Report and Environmental Assessment, Water Supply Storage Reallocation for Wilson Lake, Kansas, September 1997, Corps of Engineers.

Equus Beds Groundwater and Bank Storage Recharge Project Studies, various years of the 1990s, Burns and McDonnell.

Reallocation and Environmental Assessment Report for Kanopolis Reservoir, U.S. Army Corps of Engineers, Kansas City District, June 2002.

Water Resources Study, Round Mound Dam and Reservoir, Smoky Hill River Basin, November 1963, U.S. Department of Health, Education and Welfare for Bureau of Reclamation.

Special Report, Smoky Hill Division, December 1960, Bureau of Reclamation.

CHAPTER 2

Resources, Opportunities, and Constraints

Opportunities exist to manage groundwater aquifer water levels and develop a sustainable water supply through the year 2040 for McPherson. Additional supplies could include water from existing Federal reservoirs (Kanopolis or Marion), water from the Little Arkansas River or the Smoky Hill River, adjacent streams (Sharps Creek), or other sources such as recycled wastewater, reclaimed salt water in the Burton area, water rights retirement, or any combination of these.

As shown in Figure 1, the Aquifer is the principal source of fresh, usable water in south-central Kansas. The Aquifer underlies portions of a four-county area totaling approximately 900,000 acres. Depth to water in the northern portion of the Aquifer in the McPherson area ranges from about 40 to 110 feet. The saturated thickness of the Aquifer ranges from about 50 to 300 feet. Areas of greatest thickness correspond to the McPherson and Ancestral Arkansas River bedrock channels. Areas of least thickness are associated with highs or ridges in the bedrock surface. The water quality of the Aquifer is slowly deteriorating because some high chloride water is slowly migrating into the well field from an old oilfield near Wichita, Kansas and the Arkansas River in the southern end of the study area. Additional background information and details on the Aquifer are available in a report titled *Equus Beds Groundwater Management District No. 2, Management Program*, released by the Board on May 1, 1995. The report includes contour maps of the entire district, depicting depth of water below land surface, water table configuration, saturated thickness, and configuration of the bedrock surface. The soil in the IGUCA is generally impermeable, thus reducing recharge to the Aquifer. In a normal year, approximately 3 inches of rainfall recharges the Aquifer; the remaining 27 inches is used by plants, drains to rivers or streams, or evaporates.

Current Water Uses

Industrial, municipal, and agricultural groundwater use reported in 2002 in the IGUCA water use study area totaled 13,521 acre-feet, a 25 percent increase over the average use of 10,547 acre-feet.

In past years, groundwater use in the study area has typically been divided evenly among municipal, industrial, and agricultural uses. Historical pumping for each use is displayed in Figure 2. Agricultural use can be seen to vary and is closely tied to precipitation during the growing season in any particular year. The historic municipal use is the total water supplied by McPherson and includes the domestic use and the commercial/ industrial use by businesses that obtain their water supply from the city. There are private domestic wells in use which are estimated to account for about 1 percent of the annual demand.

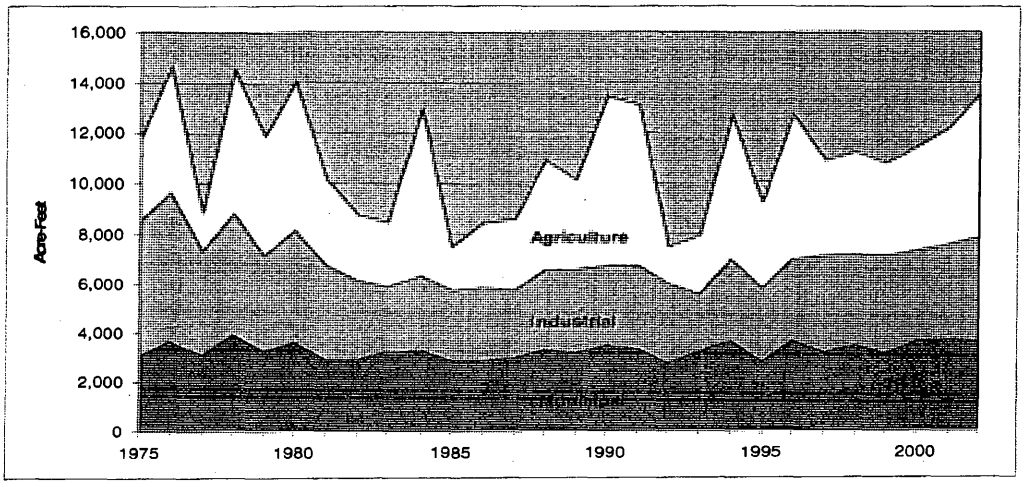


Figure 2: Historical pumping levels in the McPherson Intensive Groundwater Use Control Area (IGUCA)

Water Demands and Population

Water demands for the McPherson area through the year 2040 were developed using projected population growth based on historical growth and use trends.

Table 1 presents the population and water use projections prepared by the KWO through the year 2040 for McPherson. Because of the high municipal and industrial demand in McPherson, a constant per capita use rate of 230 gallons per capita per day (gpcd) through the year 2040 was used for this appraisal-level report. The 230 gpcd used in this study was the average water provided by McPherson between 1990 and 2002. This per capita use rate includes city-delivered industrial water but does not include supplemental-industrial water provided by company-owned wells.

Table 1—McPherson population and water use estimates. Population projections and water use projections were obtained from a demographic report prepared by the KWO.

Item	1990	2000	2010	2020	2030	2040
Population	12,422	13,279	14,193	15,108	16,022	16,937
Water use (thousands of gallons)	—	1,012,989	1,082,713	1,152,514	1,222,238	1,292,039
Water use (acre-feet)	—	3,109	3,323	3,537	3,751	3,965
Water use (average 1990-2002) (gpcd)	—	239	230	230	230	230
Adjusted water use (acre-feet)[1]	3,421	3,557	3,657	3,893	4,128	4,364

[1] The adjusted water use includes industrial/commercial uses, which are supplied by McPherson. The per capita use rate, including industrial/commercial use with water supplied by the city, used for future water needs projections, is 230 gpcd.

Table 2 summarizes the estimated total groundwater demands for future years projected to be pumped from the Aquifer in the IGUCA.

Table 2—Estimated groundwater demands from the IGUCA for future years. **This table does not include Individual domestic wells from household development outside the city of McPherson water delivery system.**

	Demand in acre-feet per year			
Year	Municipal & Industrial	Supplemental Industrial provide by company owned wells	Agricultural	Total
2000	3,557	3,694	4,114	11,365
2010	3,657	4,000	4,000	11,657
2020	3,893	4,000	4,000	11,893
2030	4,128	4,000	4,000	12,128
2040	4,364	4,000	4,000	12,364

McPherson County has generally experienced low levels of unemployment, and a solid industrial base. Several large industrial plants are located in the county, which help to attract and support industries and infrastructure. This growth may be reflected through population growth, income growth, and increasing employment prospects. The population and economy of McPherson County have grown over the last 30 years. Between 1970 and 2000, the population of the county grew by slightly more than 19 percent.

Water Resources

McPherson Intensive Groundwater Use Control Area (IGUCA)

The IGUCA was established March 28, 1980, by the Chief Engineer-Director, Division of Water Resources, at the request of the District, because of declining water levels in areas of the unconfined Aquifer. Groundwater withdrawals had exceeded recharge, creating a groundwater mining condition. By 1980, the water table in portions of the Aquifer had dropped as much as 30 feet from the 1940's The IGUCA encompasses a 56-square-mile area located in the extreme northern portion of the district, as shown in Figure 1.

The management provisions established in 1980 in the control area, when the IGUCA was established, include:

- Closing the area to further groundwater development, except for domestic use
- Dismissing all applications to appropriate water filed after the establishment of the control area
- Installing water meters on all non-domestic water wells in the control area
- Submitting an annual status report and management recommendations to the chief engineer

The Kansas Geological Survey has estimated the average annual recharge to the IGUCA is approximately 10,000 acre-feet. The annual groundwater usage in the IGUCA has varied from an estimated minimum of 4,916 acre-feet in 1974 to a maximum of 14,497 acre-feet in 1978. The average annual between 1981 when the IGUCA was established

and 2002 was 10,547 acre-feet. The average annual municipal, industrial, and agricultural uses are about 30 percent, 33 percent, and 37 percent, respectively, of the total average annual groundwater use from the IGUCA. The volume of dewatered aquifer was determined to be about 758,270 acre-feet for the 1940 to 2002 time period and 688,190 acre-feet for the 1940 to 1986 time period. The difference in the volumes of the dewatered aquifer for these time periods gives about 70,080 acre-feet, which represents the volume of aquifer dewatered since 1986. By multiplying the volume of dewatered aquifer for each time period by a representative specific yield for the Aquifer of 0.15, the groundwater deficits for these time periods in IGUCA can be estimated. Table 3 summarizes these groundwater deficits:

Table 3—Groundwater Deficits in IGUCA

Time period	Years	Volume of dewatered aquifer (acre-feet)	Total deficit 15%(specific yield) of dewatered Volume (acre-feet)	Average annual deficit (acre-feet/year)
1940-2002	62	758,270	113,740	1,835
1940-1986	46	688,190	103,230	2,245
1987-2002	16	70,080	10,510	657

The total deficit of 113,740 acre-feet for the 1940-2002 time periods represents the volume of groundwater that, if replaced in the Aquifer, would raise the water level to the pre-1940 levels. As shown in Table 3, the Aquifer continues to be dewatered, as indicated by the 1987-2002 groundwater deficits. Recharging the Aquifer would reduce further drawdown and depletion, reduce future pumping cost, and increase the hydrostatic barrier to halt salt water intrusion of the Aquifer.

For report purposes, the approach used to determine the average annual volume of water needed to supplement the 10,000 acre-feet sustainable yield from the Aquifer was to add the projected 2040 demand water deficit (2,365 acre-feet) to the amount needed to restore the Aquifer to the 1940's level in a reasonable time period. Since the Aquifer depletion occurred over approximately 60 years, and given the variability of annual aquifer recharge over time, a 60-year recovery period is considered reasonable in this report. Table 4 illustrates the total supplemental water requirements for several recovery periods. Based on the 60-year recovery time period, the average annual diversion rate, which includes the year 2040 water supply deficit, is 4,260 acre-feet as shown in Table 4.

Table 4—Average Annual Little Arkansas River diversion needs—various aquifer recovery time periods

Recovery period (years)	Deficit* (acre-feet)	Annual aquifer recovery (acre-feet)	Rate for total capacity (acre-feet)
10	2,365	11,370	13,735
30	2,365	3,790	6,155
40	2,365	2,845	5,210
60	2,365	1,895	4,260

*Deficit = 2040 demand(12,365 ac-ft) – Sustainable yield (10,000 ac-ft)

Saline groundwater intrusion occurring east of the refinery has been briefly addressed elsewhere in this report. The problem is such that in the last two years the refinery has discontinued using their own wells because of saline conditions and has been purchasing

water from the city. Aquifer recharge in the area east of the refinery would create a groundwater barrier that could limit further saline water intrusion into the area. This may allow the refinery to again use their existing wells to meet their water supply needs.

Surface Water

The Little Arkansas River is the primary surface water resource in the general study area. The watershed drains an area of approximately 1,342 square miles surrounding the confluence with the Arkansas River near Wichita. Land surface ranges from a high of elevation 1738 feet average mean sea level (AMSL) to a low of elevation 1295 feet AMSL. The Aquifer area is part of this watershed and is drained by the Little Arkansas River and its tributaries. The portion of the Little Arkansas River above the gauging station at Alta Mills is the area of interest in this study. The contributing drainage area is 736 square miles for the gauging station at Alta Mills. The average discharge for the period of 1974 to 2002 is about 216 cubic feet per second (cfs) or about 156,700 acre-feet per year. The stream flow extremes ranged from a maximum of more than 30,100 cfs in October 1973 to no flow occurring in August and October, 1991.

Water quality data for the Little Arkansas River has indicated that the above-base flows that can be used for recharge varies with flow and is generally of good quality [above-base flows are defined as flows generated from rainfall runoff above the base river flow as established by Kansas Division of Water Resources]. The surface water in the Little Arkansas River is generally of better quality than the water in the Aquifer, with the exception of turbidity. The quality of the water from bank storage recovery is similar to the quality of the water in the river. Therefore, water can be used from the river in recharging the Aquifer with minimal treatment and minimal effect on water quality. It has been demonstrated (District, 1995) that the river turbidity and suspended solids are drastically reduced as the river water flows through the sands, gravels, silts, and clay in the river alluvium.

CHAPTER 3

Alternatives

The overall purpose of this study is to find supplemental water sources to meet the 2040 demand for municipal, industrial, and agricultural water in the McPherson area and, to restore the Aquifer to the pre-1940's level. In order to meet this purpose the following assumptions have been made:

1. The average annual sustainable yield of the IGUCA is 10,000 acre-feet.
2. The total 2040 demand in the area is 12,365 acre-feet.
3. In order to restore the IGUCA over a 60-year period, either by injection or naturally, an average of 1,895 acre-feet of supplemental water is needed each year.

All supplemental water sources identified in this report have a number of common features:

a. All sources could provide supplemental water either by diversion (withdrawal) wells or by diversion dams, with the exception of the Burrton source where water could only be acquired by the diversion wells.
b. All sources would require the use of a water supply delivery pipeline.
c. The supplemental water from all sources could either be injected into the Aquifer and then pumped out or delivered as a direct supply.
d. The Aquifer could be recharged naturally or by injection under each of the supplemental water resources alternatives.
e. All supplemental water source alternatives would likely require some variable amount of water treatment.

In addition to variable water treatment requirements, there are a number of other variables for each source of supplemental water including location, maximum amount of supplemental water available, initial capital costs, and long-term O&M costs. Based on the common feature options cited above, there are many combinations of alternatives that could be formulated for each water source. If a feasibility study is conducted, more detailed information would be developed and the alternatives that appear to be the most cost effective with the least environmental impacts would be evaluated in greater depth. This report focuses primarily on describing each water source, location, and associated issues without actually determining which combination of features appears to be the most feasible.

ALTERNATIVE 1: **Little Arkansas River**

Using Little Arkansas River water to supply additional recharge water for the Aquifer to augment the raw water supply for Wichita is an alternative that has been under study for a number of years. The results of past investigations of Aquifer Storage and Recovery (ASR) of the Equus Beds well field, extending from the Wichita area to the Halstead area, have proven the viability of recharging the Aquifer with water from the Little Arkansas River. The recharging well field area near Wichita is meant to replenish the

Aquifer and ensure future water availability, particularly during dry weather periods, and to reduce future deterioration of the Aquifer water quality by slowing migrating high chloride water into the well field from nearby plume sources. A similar alternative for the McPherson area could provide relief to the Aquifer.
This option for the IGUCA includes the major components listed below:

- Divert water from the Little Arkansas River to the injection wells near McPherson for recharge.
- Recover stored water in the Aquifer for all users in the IGUCA, as needed to meet the water supply requirements.

The projected water withdrawal rate for the IGUCA in the year 2040 has been estimated at 12,365 acre-feet per year. The sustainable yield of the Aquifer in the IGUCA is an average of about 10,000 acre-feet per year, as determined by the U.S. Geological Survey (USGS). Thus, the net deficit in the year 2040 is an average of about 2,365 acre-feet per year. The annual volume of water to be diverted from the Little Arkansas River for aquifer recharge should meet this anticipated deficit, and provide an additional 1,895 acre-feet that could restore aquifer water levels to the pre-1940s time period. Based on the 60-year recovery time period, the average annual diversion rate, including the year 2040 water supply deficit, is 4,260 acre-feet.

The number of estimated wells necessary to divert an average of 4,260 acre-feet per year depends upon the number of days per year that the diversion wells could operate, given the flow of the Little Arkansas River and minimum stream-flow requirements in the river. Based on preliminary injection results from the ASR Demonstration Project, each well could inject 450-500 gpm (1.1 cfs) back into the Aquifer on average. A preliminary review of the historical record and in consideration of minimum flow rates required in the Little Arkansas River, it is estimated that each diversion well could operate 200 days each year and inject about 430 acre-feet per year. To meet the desired goal of 4,260 acre-feet per year would take a minimum of 10 injection wells. During extended periods of drought, the number of days where diversion and injection could occur would be greatly reduced. For the purposes of this report, a base flow was estimated at 15 cfs to account for minimum desirable flows, and any senior water rights below McPherson that may require higher flows.

The preliminary location of the diversion wells would be along the Little Arkansas River in the vicinity of the confluence with Blaze Fork Creek, about 3 to 4 miles west of Alta Mills. The diversion wells would typically be located a minimum of 50 feet from the normal streambed and spaced about 600 to 800 feet apart along the river. A direct surface water diversion may also be implemented. A pipeline from the diversion wells to the point of use would be necessary for this alternative.

The location of the recharge wells would be in the vicinity of the IGUCA most affected by depletions and would be most effective in recharging the Aquifer contained by the IGUCA. The refinery located south of McPherson has water supply wells. In 2005, the refinery has discontinued using the wells because of brine water migration in the Aquifer from the east. Instead, the refinery has opted to purchase water from McPherson. To correct the brine migration situation, this report proposes one or two injection wells be located along the road east of the refinery. By injecting water into the Aquifer, a groundwater barrier can be established that could impede the movement of higher saline groundwater into the production well area.

ALTERNATIVE 2: **Sharps Creek**

Sharps Creek is a tributary to the Smoky Hill River and is located about 8.5 miles northwest of McPherson. The concept of using water from Sharps Creek to recharge the Aquifer is the same as for using water from the Little Arkansas River. This option provides for diversion wells located in the Sharps Creek alluvium that would be pumped whenever the flow in Sharps Creek is higher than the base flow, with allowance for minimum acceptable instream flow. Sharps Creek does not have a stream gauge, nor has it had a stream gauge in the past; therefore, the quantity of a dependable water supply that would be available is unknown.

For this water supply alternative, it is projected that the recharge wells in the McPherson area would be in the same locations as in the Little Arkansas River option. A pipeline from the Sharps Creek diversion wells would also be necessary and could be located along existing roads. The average annual yield available from Sharps Creek is estimated at about 1,000 acre-feet in this report. While this alternative by itself will not meet the entire needs of McPherson, it could provide support to other alternatives, specifically during periods of extended drought when flows in the Little Arkansas River are at a minimum.

ALTERNATIVE 3: **Smoky Hill River**

The likely diversion point on the Smoky Hill River is located about 16 miles directly north of McPherson. The general concept of diverting water from the Smoky Hill River to recharge the Aquifer is generally the same as diverting water from the Little Arkansas River. The Smoky Hill River is part of the Smoky Hill-Saline River Basin. It will be necessary to work closely with Kansas to determine conditions for any proposed transfers and to obtain appropriate approvals.

(a.) This option provides for diversion wells in the Smoky Hill River alluvium that would be pumped whenever the flows in the river are above an agreed upon minimum. The rate would correspond to the release of an annual volume of water purchased from the KWO and released from Kanopolis Reservoir. For this water supply alternative, it is assumed that the recharge wells in the McPherson area would be located in the same places as with the Little Arkansas River option. A pipeline from the Smoky Hill River diversion wells to the point of use would also be necessary and could be located along existing roads.

(b) A second option of this Smoky Hill alternative would include the construction of a diversion dam in the river to divert surface water purchased from the KWO and released from Kanopolis Reservoir for transport to the McPherson area. The Smoky Hill River carries considerable sediment and is high in dissolved constituents which would dictate the water treatment processes necessary to bring the water supply into compliance with current drinking water standards. The main parameters of concern include TDS (total dissolved solids), sulfate, and chloride. Reverse osmosis treatment would most likely be required in addition to typical surface water treatment to removed suspended solids.

(c) A different option considered is the possible blending of Smoky Hill River water with water pumped from the Aquifer before use by McPherson and the industrial users including the refinery. The concept assumes that Smoky Hill River water quality could be improved through blending with Equus Beds groundwater, which is of higher quality, such that the blended water might be acceptable for domestic and industrial use. Blending assumes that the withdrawal of groundwater from the Equus Beds would be reduced by the amount of the proposed diversion from the Smoky Hill River, 4,260 acre-feet per year as stated in this report, thus allowing for a natural recovery of the Aquifer without direct recharge. Given the TDS of about 445 milligrams per Liter (mg/L) for the aquifer and a high TDS of Smoky Hill water of about 950 mg/L, the blended water would require 90 percent aquifer water with 10 percent Smoky Hill water in order to meet the Secondary Maximum Contaminant Level of 500 mg/L. For the annual demand of 7,251 acre-feet per year, approximately 725 acre-feet could be diverted from the Smoky Hill River annually without additional treatment.

ALTERNATIVE 4: **Wastewater Reuse**

Recycled wastewater from the McPherson wastewater treatment plant could be used to recharge the Aquifer. The wastewater may require additional treatment before injection into the Aquifer. The quantity of wastewater that could be reused annually would be considerably less than the total to meet the future water supply needs and for aquifer recharge. Additional water supplies would still be necessary to meet the future needs in the McPherson area.

ALTERNATIVE 5: **Purchasing Available Water from KWO**

The KWO continues to strive for coordinated management of state-owned or controlled storage space in Federal reservoirs in order to satisfy water rights within each basin. This is managed through the state's long-term Water Assurance Program and the annual-term Water Marketing Program. Each of these programs strives to meet municipal and industrial demands in a coordinated effort in the best interest of the state. Obtaining water from existing storage reservoirs may be a possible alternative to meet the water supply needs in the McPherson area. Two reservoirs in the program are within a reasonable distance from the McPherson area and are included as possible alternatives—Kanopolis Lake on the Smoky Hill River and Marion Lake on the Cottonwood River.

5a. Water Supply from Kanopolis Lake

Kanopolis Lake is located on the Smoky Hill River, about 24 miles northwest of the McPherson. Kansas recently purchased water stored in Kanopolis Lake from the U. S. Army Corps of Engineers (USACE) and has made this available for purchase. This alternative would involve purchasing and diverting surface water from Kanopolis Lake to the McPherson area. Since the water supply needs of the McPherson area are estimated at 4,260 acre-feet per year, sufficient water appears to be available for diversion to McPherson. This water supply could be used to recharge the Aquifer or as the domestic water supply for McPherson, offsetting groundwater use. New facilities required for this alternative would depend on the intended use. Diversion wells on the Smoky Hill River below Kanopolis reservoir could pump water directly from the river to injection wells

around McPherson. If the water were to be used by McPherson directly, a diversion dam and pumping plant along the Smoky Hill River, a transmission pipeline to the McPherson area (about 16 miles long), and water treatment facilities would be needed to make the water a suitable drinking supply.

The potential costs for this alternative would include:

- Purchasing raw water under the Water Marketing Program at an annual cost set each year by KWO. KWO has set an annual cost for 2004 of $123.77 per million gallons or about $40.33 per acre-foot. Under the KWO Water Marketing Program, the costs are set each year and are valid for one year, typically under a long-term contract running 30 to 40 years. Given this unit cost, the cost of the 4,260 acre-feet (1,388 million gallons) that would be needed in the McPherson area in 2004 dollars would be about $171,800. If this alternative were used to meet the entire annual demand, acquisition costs would be around $200,000 per year for the entire supply with a minimum "take or pay" schedule that would be negotiated at the time of purchase.

- In order to participate in the Water Marketing Program, water users would be required to sign a long-term (up to 40 years) contract agreeing to: repay the state for the costs of providing the water; pay for at least 50 percent of the contracted water each year, regardless of actual use; and pay for water lost in transit from the dam to the purchaser's intake if the water delivery system is below the dam.

- The length of pipeline from the Smoky Hill River below Kanopolis reservoir would be about 16 miles compared to 20 miles from the Little Arkansas River.

- Initial water treatment plant cost plus annual O&M costs would be needed to remove suspended and dissolved solids.

5b. Water Supply from Marion Lake

Marion Lake is on the Cottonwood River, about 30 miles east of McPherson. This alternative would involve the purchase of Marion Lake water from the allocation Kansas purchased from the USACE. This water may require water treatment prior to being used as a source for drinking water or before injection into the Aquifer. While this may not fully meet the McPherson demand, it could be viable in conjunction with other alternatives.

ALTERNATIVE 6: **Groundwater near Burrton**

This alternative would generally consist of pumping groundwater from the Aquifer contaminated by oil field brine plumes near Burrton (see Figure 1), treating this water to remove salts (primarily chloride), and transporting the treated groundwater 27 miles to the McPherson area for groundwater recharge. In the Burrton area, the groundwater has been adversely affected by disposal of brine wastes from past oil drilling activities in the 1900s, resulting in a groundwater plume that has been moving toward the water supply wells owned by Wichita. The chloride level in the saltwater plume is about 1,000 mg/L.

Wichita, the State of Kansas, and others have been investigating various alternatives to correct this potential saltwater intrusion problem and protect local water supply wells, primarily Wichita, from further contamination and aquifer degradation. One of the more prominent alternatives being investigated is to remove, by pumping, the salt contaminated groundwater and treat the water by reverse osmosis to remove the salts. Subsequently, the product water could be beneficially used. Wichita has shown interest in buying the product water from the groundwater treatment operations.

Likewise, treated groundwater could also be bought and used as a supplemental water supply for the McPherson area. For the McPherson area, this alternative would consist of transporting the desalinated groundwater to the McPherson area to be used either directly as the municipal and refining water supply, or to inject into the Aquifer. Based on past studies of the Burrton Salt Plume problem, the yield from the groundwater basin for treatment, and as a water supply, has been determined to be about 4,000 gpm by continuous pumping from the Aquifer. Therefore, the annual volume of water pumped from the Burrton Salt Plume would be about 6,450 acre-feet. This compares with the estimated long-term need of a water supply for the McPherson area of 4,260 acre-feet per year. Using the water directly as the McPherson water supply would reduce the need to pump a like volume of water from the Aquifer, allowing for natural recharge over and above the projected 2040 withdrawals.

This alternative would include a 27 mile pipeline, plus treatment costs. Reclamation's recent studies on the feasibility of desalinating the salt water plume has indicated a unit treatment cost, including brine disposal, of about $2.00 per thousand gallons of product water or $650 per acre-foot. This alternative does have the potential to recharge at or above the desired rate of 4,260 acre-feet per year or provide a portion of the annual recharge if feasible. Since this alternative is not dependent on surface water runoff it could prove more reliable during extended drought periods.

Water Treatment Plant in Conjunction with River Diversions

All of the alternatives have the potential to reduce withdrawals from the Aquifer through the diversion or importation of water from other sources. This reduction would have a net effect of recharging the Aquifer without the costs of pumping the water out for municipal use and then injecting the replacement water back into the Aquifer.

Alternatives are based on the assumption that 12,365 acre-feet of water is needed to meet 2040 demand, there is a sustainable aquifer yield of 10,000 acre-feet per year, and 4,260 acre-feet of the supplemental water would be needed; 1,895 acre-feet to be injected for "aquifer recovery" and 2,365 acre-feet for city, either via aquifer injection or as a direct supply with water treatment. The recovery portion of each alternative could be accomplished by "in-situ" (natural) recovery rather than by injection. Instead of pumping the 10,000 acre-feet sustainable yield from the Aquifer and then injecting 1,895 acre-feet back into the Aquifer for a net withdrawal of 8,105 acre-feet, it would be less expensive to simply limit aquifer pumping to 8,105 acre-feet per year and allocate the entire 4,260 acre-feet of supplemental water for direct use by the city. The net result is the same either way: 12,365 acre feet of water available for use by the city and a gain of 1,895 acre-feet in the Aquifer each year. During higher runoff years, diversions could be used as available to further reduce pumping from the Aquifer and result in a greater recharge

rate to the Aquifer. The initial short-term construction costs of each option, along with the long-term O&M costs, would be evaluated for each alternative if a feasibility study is conducted.

The first three alternatives which divert water from the river could be able to provide the annual target recharge level when combined with the adequate water treatment capability. McPherson would need to acquire the ability to treat approximately 6 million gallons per day (MGD) to meet the combined municipal and industrial demands. The addition of a water treatment plant could provide the opportunity to meet a portion of the demands with river water and reduce groundwater pumping.

The number of days that the river is above normal flow whereby diversions from the river could occur was estimated at 200 days per year or 55 percent of the time. The average annual demand for municipal, industrial and agriculture combined was determined to be 10,547 acre-feet. Agricultural demand was assumed to be 50 percent of the maximum available diversion since this demand is tied to growing seasons and precipitation.

As shown in Figure 2 and summarized in Table 4, groundwater pumping could be reduced by 45 percent with the addition of river diversions while meeting the target recharge rate of 4,260 acre-feet per year, and provide an additional 450 acre-feet of recharge per year to the Aquifer.

The city has also experienced National Pollution Discharge Elimination System (NPDES) problems with discharges into Turkey Creek from the wastewater treatment plant. The water quality of the plant effluent has seen a steady increase in dissolved solids and salinity in recent years, such that the NPDES permit conditions are being exceeded. The blending of water from the Smoky Hill River with Equus Beds groundwater would result in further increases in the salinity and TDS in the wastewater discharges into Turkey Creek. This problem would probably result in requirements for additional wastewater treatment to remove dissolved solids by reverse osmosis before discharge or, as an alternate, water treatment to remove dissolved solids by reverse osmosis in the water supply before municipal and industrial use in the McPherson area.

Based on appraisal-level estimates based on available information, construction costs could range between $25 and $48 million dollars, while annual O&M costs could range between $1.8 and $3 million dollars per year. Actual construction costs of each option, along with the long-term O&M costs, would be determined for each alternative as part of the feasibility study if one is conducted.

Table 5 Summary of projected 2040 Pumping levels combined with River Diversions

					Projected 2040 Annual Demand in Acre-Feet		12,364	1
Type of Use		Percent of Average Annual Demand	Acre-Feet per Year	Acre-Feet per Day	Million Gallons per Day (MGD)	River Diversion percentage	River Diversions (Acre-Feet)	Row Number
Municipal		30%	3,709	10.1	3.3	55%	2,039	3
Industrial		33%	4,080	11.2	3.6	55%	2,244	4
				Water treatment capacity required for M&I (MGD)	6.0			
Agriculture		37%	4,575	12.5	4.1	27%*	1,235	6
						Total Contribution per 200 days of pumping (Acre-Feet)(sum rows(3+4+6))	5,518	7
						Target recharge amount per year (Acre-Feet)	4,260	8
						Additional Annual recharge based on 200 river diversion days (Acre-Feet)(row 7 minus row 8)	1,258	9
						Pumping reduction as a result of River Diversions (%)(row7/row1)	45%	10
						Annual Groundwater pumping required in 2040 (Acre-Feet)(row 1 – row7)	6,846	11

*River Diversion contribution to Agriculture was reduced by 50% as demand is tied to growing seasons and precipitation.

Table 6—Summary comparison of the options and alternatives features

	Alternatives							
Feature	Little Arkansas River	Sharps Creek Water Supply	Smoky Hill River	Wastewater reuse	Purchase from Kanopolis Reservoir	Combination of Alternatives such as Sharps Creek and Wastewater Reuse	Purchase from Marion Lake	Groundwater near Burrton
Water supply available	Sufficient	Unknown; insufficient	Probably sufficient	Insufficient	Sufficient	Sufficient	Insufficient	Insufficient
Estimated water supply ac-ft/year	4,260	Est. 1,000	4,260	Est. 1,000	4,260	4,260	0	Est. 2,000
Water Cost (KWO)	None	None	$200,000 annually + O&M	None	$200,000 annually + O&M	None	$200,000 annually + O&M	None
RO Treatment	None	Unknown	Yes	Yes	Yes	Yes	Yes	Yes
Treatment Facilities	None	None	Yes	Yes	Yes	Yes	Yes	None
Pipeline, Miles	20 miles	15 miles	17 miles	Local system	30 miles	15	>35 miles	27 miles
Pumping Plants	None	None	Yes	None	Yes	None	Yes	Yes
Recharge wells	7	7	7	3	4	7	4	7
Diversion Wells	10	10	10	6	8		8	10

CHAPTER 4

Potential Effects of Alternatives

Water Resources

The potential effects of these alternatives would be limited to the areas of each alternative. Since there is the possibility that a single alternative would not be able to meet the projected demand on a sustainable level, it will be necessary to formulate a plan for meeting the demand and then evaluate the effects of the alternatives chosen.

Potentially, diverting above-base flow water from the Little Arkansas River would slightly reduce the average annual runoff of the river by about 3 percent. Diversions could be limited to periods when the flow rate is above the base flow plus any minimum instream flow requirements or senior water rights downstream.

The water quality impacts of recharging the Aquifer in the McPherson area depend on the quality of the groundwater and the water that is used to recharge the Aquifer.

Threatened and Endangered Species and Species of Concern

In addition to the Federally listed species, the Kansas list of threatened or endangered species include several fish, birds, and the eastern spotted skunk. A reduction in flows from the Little Arkansas River Basin could impact species in the area.

Table 7—Summary of Federally listed species likely found in the study area

Species	Status	County where found
Arkansas darter	Candidate	Reno, Sedgwick
Arkansas River shiner[2]	Threatened	Sedgwick
Bald eagle	Threatened	McPherson, Reno, Sedgwick
Interior least tern	Endangered	Reno, Sedgwick
Whooping crane	Endangered	McPherson, Reno, Sedgwick

While other neotropical migratory songbirds, waterfowl, and raptors migrate through the proposed study area, a complete list of impacted species has not been compiled for this report.

Cultural Resources

Ground disturbance would occur from all alternatives, most would include wells for water production and injection along with associated pipelines for water transportation. Where possible the pipelines and recharge wells would both be within existing road rights-of-way. Access roads or additional leveling or site preparation for the well pads might also be included. Any of the proposed alternatives included in this report would require a qualified archeologist to perform a Class III, on-the-ground, survey of all areas of ground disturbance to identify and record any cultural resources or areas of historic

[2] FWS 1993 letter notes the Arkansas River shiner "may in all likelihood already have been extirpated from the Arkansas River."

interest that might be affected by the action. The survey level required could take from 6 to 9 months to complete.

Environmental Impacts Associated with Project Implementation

Impacts to the existing environment would be determined by the number and location of bank storage wells installed. Vegetation impacts are expected to be minimal if road rights-of way are used to install and construct pipelines from diversion wells to the injection well sites. Impacts that cannot be avoided may require mitigation. Disturbed areas would be re-seeded with native, non-invasive plant species to control erosion

Impacts to aquatic resources and species would depend on the volume and timing of water diverted. Diversions would occur when flows exceed a certain minimum designated stream flow.

Environmental Clearances Necessary at Feasibility-Level Study

Construction in riparian areas could require a Clean Water Act Section 404 Dredge and Fill Permit from the USACE and, a 401 Water Quality Certificate from the State of Kansas. The U.S. Fish and Wildlife Service (USFWS) and the Kansas Department of Wildlife and Parks would need to be formally contacted, and consultation with USFWS regarding impacts to listed species is required. Impacts of alternatives would be determined in a National Environmental Policy Act (NEPA) document if a feasibility study is completed.

The following is a list of the environmental clearances that may be necessary:

- Appropriate permits from the USACE for Section 404 of the Clean Water Act
- Water Quality Certificate from Kansas under Section 401 of the Clean Water Act
- Concurrence from the USFWS on listed species in the study area
- Indian trust assets and/or Indian sacred sites identification
- Consult with the Chief Engineer, on proposed project to determine water withdrawals are in compliance with state statutes and appropriations (K.S.A. 82a-703(b)).

CHAPTER 5

Findings

Reclamation performed this study for Kansas, local water purveyors, and water users in addressing public water supply problems and needs in the McPherson area. If any of the water supply alternatives are authorized for additional feasibility study and implementation, additional planning and design analyses and NEPA compliance documents would need to be prepared to facilitate a Federal decision about implementation.

This chapter summarizes the findings of this appraisal-level study. The water supply estimated to equal annual deficits for recharge of the Aquifer has been determined to be 2,365 acre-feet per year, based upon future 2040 demands in the McPherson area. An additional annual amount of 1,895 acre-feet has been identified as necessary for aquifer recovery, assuming a 60-year recovery period. Therefore, the total additional water supply need for demand and aquifer recharge is estimated to be 4,260 acre-feet per year.

The river diversion alternatives coupled with an adequately sized water treatment plant could provide the target amount of 4,260 acre-feet per year. These alternatives assume the river would be above-base flow conditions 200 days every year, and river diversions could be treated and used to partially meet the municipal and industrial demands. Annual pumping for McPherson and the surrounding area could be reduced to about 5,800 acre-feet which is well under the sustainable yield of 10,000 acre-feet and the current average of over 10,547 acre-feet.

Purchasing water from Kanopolis Reservoir by taking water from the lake would require water treatment and transporting 10 miles farther than some of the other alternatives, such as the Little Arkansas River, Sharps Creek, and Smoky Hill River diversion alternatives. Transporting water out of a watershed, in the volumes required at a distance in excess of 35 miles and more than 2,000 acre-feet per year, may require a state hearing under the Kansas Water Transfer Act to address concerns and seek required approvals.

Placing wells in the shallow alluvium of the Smoky-Hill River where I-35 crosses north of McPherson would decrease the transportation distance to about 17 miles. A small diversion dam could be placed in the river to pond water to pump surface water purchased and released from Kanopolis Reservoir.

Pumping and treating oil field brine contaminated plumes in groundwater near Burrton, would also require water treatment to remove contaminants and transporting the water.

Although some of the alternatives supply sufficient quantities of water from an individual source, it should be noted that in the future, multiple alternatives may become more viable

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Memorandum

BURNS McDONNELL

Date: June 14th 2017

To: Tim Maier

From: Daniel Clement

Subject: South Wellfield Permit Conditions – Permit Nos. 47955, 47956, 47957

Tim,

After reviewing the last round of recommended permit conditions from DWR for the South Wellfield groundwater rights, we would recommend consideration of the following recommendations and revisions in order of relative importance:

Permit Condition No. 26

The approved applications are further limited to an initial aggregate quantity of 5,283 acre-feet per year when combined with Vested Right, File No. MP 005, Water Right, File Nos. 1,311, 23,310, 28,151 and 28,735, through the year 2040

- Discuss how a longer municipal planning and funding horizon relates to this initial quantity, and discuss how an additional outlook could be developed that still falls within the limits of maximum beneficial use and the perfection period.

Permit Condition No. 28

Following the second 10-year report after the diversion works are completed, and each 10 years thereafter, the Chief Engineer, after opportunity for review by GMD No. 2, will modify the aggregate quantity limitation by findings and order to meet the applicant indicated projected water use for another 10 years based on the current and projected population, industry water use, and treatment needs consistent with the methods used with the original applications (memo of March 14, 2016), not to exceed the total time allowed to perfect Nos. 47955, 47956, and 47957 or a combined quantify of 7,213 acre-feet.

- Given the amount of the investment for a project of this magnitude the process for modification of the aggregate quantity limitation needs to be a specific process such that future modifications are guaranteed to be a function of the originally designated factors that define reasonable need.
- We recommend striking "after opportunity for review by GMD No. 2" or adding additional language to ensure that the aggregate quantity simply a pre-established methodology.

Permit Condition No. 25
The permits shall be subject to GMD No. 2 Board review if the groundwater monitoring plan indicates, as determined by GMD No. 2 District staff, that the operation of the authorized wells are impacting the Hollow Nikkel chloride plume.

- This is very close to the last round of language that was developed, we would recommend the language below.
- *The permits shall be subject to review if the groundwater monitoring plan indicates, as determined by GMD No. 2 and the Chief Engineer that the operation of the authorized wells are significantly impacting the Hollow Nikkel chloride plume leading to a deterioration of the fresh and usable quality of the area's groundwater supply.*

Permit Condition No. 30
Any change in place of use application, shall be subject to GMD No. 2 Board review.

- We recommend modifying this language as follows: "Any change in place of use application shall be subject to review."
- The original applications were not approved under any restrictions, known issues, nor findings that detailed why future changes in place of use should be automatically required to go through a GMD No. 2 Board review.

Permit Condition No. 3
That the authorized source from which the appropriation shall be made is groundwater from the Little Arkansas Equus Beds aquifer, to be withdrawn by means of one(1) well located near the center of the East Half of the East Half of the Southeast Quarter (E½E½SE¼) of Section 32, more particularly described as being near a point 1,320 feet North and 363 feet West of the Southeast corner of said section, in Township 22 South, Range 3 West, Harvey County, Kansas, located substantially as shown on the topographic map accompanying the application.

- It looks like there is a typo on the aquifer description, I believe it should read Little Arkansas River Basin, Equus Beds Aquifer.

DWC/dwc

Turney, Brent

From: Letourneau, Lane
Sent: Thursday, September 7, 2017 8:19 AM
To: Barfield, David; Lanterman, Jeff; Turney, Brent
Cc: Beightel, Chris
Subject: RE: Water Permit No. 47957 Draft

I talked with Brian Meier and explained that we did not think material was necessary. I told him we would be willing to explain it again to Tim Maier. I told Brian that we did give this a lot of thought. We understand Tim Maier's concern with GMD 2's board and Steve Flarety(sp). Maier has no problem with Boese. Just the board and Steve. I told Brian the condition is non regulatory and "shall not impair" should take care of Time Maier's concerns. Brian will take with Time Maier and we might schedule a conference call.

From: Barfield, David
Sent: Wednesday, September 6, 2017 10:17 AM
To: Lanterman, Jeff <Jeff.Lanterman@ks.gov>; Letourneau, Lane <Lane.Letourneau@ks.gov>; Turney, Brent <Brent.Turney@ks.gov>
Cc: Beightel, Chris <Chris.Beightel@ks.gov>
Subject: RE: Water Permit No. 47957 Draft

Here is my recollection on the discussion of this. First, B&M's technical review, confirmed by their modeling work, says that the hydrologic setting (hydrologic gradients, boundary conditions) is such that the plume's migration will not altered in any significant way by the pumping authorized under the new applications.

Second, I recall a discussion with Tim on the condition. He said that, in the unlikely case that there is a southerly migration of the plume, that a review of the matter by GMD might result in recommendations for additional monitoring or other recommendations on operation of the well field to avoid problems.

I assert that the construct of the condition is non-regulatory ("The permits shall be subject to GMD No. 2 Board review if ...staff...determine.."). I did a bit of looking at our rules for GMD 2 to confirm this. The rules provide for a process to allow GMD 2 to review applications and provide recommendations for the CE to consider in application processing under 5-22-12. I don't see that the CE is bound by these recommendations, other than to consider them. So what can come from their review unless some material effect is produced that requires us to regulate the use, e.g. if impairment is found. And if impairment is found, we can act in any case. Am I missing something in our rules on the regulatory effect of a Board review? Do we need to have Legal confirm this?

Note: there is an interesting rule on non-compliance, 5-22-6, that allows them to consider violations of various types including permit conditions, and could results in an order by the district to remedy the non-compliance. Again, I don't see this coming unto play unless there is some real evidence of a problem.

One could ask, if the condition is non-regulatory, why have it as a permit condition? It think the answer is, to get GMD's support for the longer perfection period.

David

From: Lanterman, Jeff
Sent: Wednesday, September 6, 2017 9:19 AM
To: Letourneau, Lane <Lane.Letourneau@ks.gov>; Barfield, David <David.Barfield@ks.gov>; Turney, Brent <Brent.Turney@ks.gov>

Cc: Beightel, Chris <Chris.Beightel@ks.gov>
Subject: RE: Water Permit No. 47957 Draft

Is this all covered with "shall not impair"?

I would have trouble doing anything with this condition. Or proving anything. So before I call them out of compliance it would have to be compelling evidence for DWR. But not necessarily for the GMD.

From: Letourneau, Lane
Sent: Wednesday, September 6, 2017 9:03 AM
To: Lanterman, Jeff <Jeff.Lanterman@ks.gov>; Barfield, David <David.Barfield@ks.gov>; Turney, Brent <Brent.Turney@ks.gov>
Cc: Beightel, Chris <Chris.Beightel@ks.gov>
Subject: RE: Water Permit No. 47957 Draft

Tim Maier is trying to protect the BPU from the GMD board because of what Jeff is describing.

For the GMD a tiny change in chlorides could mean a deterioration of the fresh water.

"Significant" is not a good work because what is the level of significant? We are in the same boat with the word "material". What is material?

I don't mind a descriptor if it moves us along.

I can go with what the team wants to go with.

From: Lanterman, Jeff
Sent: Wednesday, September 6, 2017 8:58 AM
To: Barfield, David <David.Barfield@ks.gov>; Letourneau, Lane <Lane.Letourneau@ks.gov>; Turney, Brent <Brent.Turney@ks.gov>
Cc: Beightel, Chris <Chris.Beightel@ks.gov>
Subject: RE: Water Permit No. 47957 Draft

I don't like the condition either and I don't know what it means really. I guess GMD will tell me when material deterioration occurs so I know when it becomes out of compliance. For them it may be what we would consider a tiny change in chlorides.

From: Barfield, David
Sent: Tuesday, September 5, 2017 4:18 PM
To: Letourneau, Lane <Lane.Letourneau@ks.gov>; Lanterman, Jeff <Jeff.Lanterman@ks.gov>; Turney, Brent <Brent.Turney@ks.gov>
Cc: Beightel, Chris <Chris.Beightel@ks.gov>
Subject: RE: Water Permit No. 47957 Draft

I don't really like the condition but we did agreed to it. I am getting a bit tired of what seems a constant series of one more suggestions. The condition is just saying when the GMD will look at it. Their review has no regulatory effect. Action could only occur if they can demonstrate a material problem. We don't do impairment actions for immaterial impairments. I would rather get this done.

David

The permits shall be subject to GMD No. 2 Board review if the groundwater monitoring plan indicates, as determined by GMD No. 2 District staff, that the operation of the authorized wells are impacting the Hollow Nikkel

chloride plume leading to a **material** deterioration of the fresh and usable quality of the area's groundwater supply.

From: Letourneau, Lane
Sent: Monday, August 28, 2017 9:52 AM
To: Lanterman, Jeff <Jeff.Lanterman@ks.gov>; Barfield, David <David.Barfield@ks.gov>; Turney, Brent <Brent.Turney@ks.gov>
Subject: FW: Water Permit No. 47957 Draft

I have no issue with "material being added".

I do think we should let Tim Boese know that is being added if we add it.

From: Meier, Brian [mailto:bmeier@burnsmcd.com]
Sent: Monday, August 28, 2017 9:05 AM
To: Barfield, David <David.Barfield@ks.gov>; Letourneau, Lane <Lane.Letourneau@ks.gov>
Subject: FW: Water Permit No. 47957 Draft

Lane and David,

In addition to your proposed changes regarding the perfection period for the McPherson SWF water rights Tim had the one final suggestion in regard to the language in item 25. He would like to add the word "material" in front of the impairment (see attached).

There also appears to be a word missing in item 23.

Please call with any questions and let me know if you think we need to have additional discussion with Tim Boese.

Thanks for all of your help and have a terrific week!

Brian J. Meier
Managing Associate
Burns & McDonnell
Direct: 316-941-3921
Mobile: 316-554-6996
Fax: 316-941-4730
www.burnsmcd.com

Proud to be one of FORTUNE's 100 Best Companies To Work For

Brian/Daniel,

Attached is a copy of the permit with a proposed change in item 25. Also, there appears to be a typo in item 23.

Tim

Timothy S. Maier
General Manager
Board of Public Utilities
McPherson, KS 67460

Ph 620-245-2532
timm@mcphersonpower.com

Memorandum

BURNS McDONNELL

Date: March 14, 2016

To: Tim Maier

From: Daniel Clement

Subject: Historic Water Use and Projected Water Demand

The McPherson Board of Public Utilities (BPU) recently filed three new applications to appropriate groundwater in northern Harvey County, Kansas (Application Nos. 47955, 47956, and 47957). As part of filing for this additional water supply, the State of Kansas Division of Water Resources (DWR) requires that a municipal water supplier qualify the requested quantity based on a reasonable need and anticipated future demands.

For BPU this means projecting growth based on increases in population, additional industrial development, and anticipated water treatment changes. The Groundwater Management District No. 2 (GMD2) currently defines the methodology for projecting a reasonable annual quantity for municipal use under K.A.R. 5-22-14(f):

K.A.R. 5-22-14(f):

(f) Unless the applicant demonstrates a projected deviation from actual population trends, a reasonable annual quantity of water for municipal use shall not exceed the lesser of the following:

(1) 200 gallons per capita per day; or

(2) 110 percent of the last three years' average per capita per day usage, excluding industries that use over 200,000 gallons per year, times 365 days per year, times the projected population for the twentieth year after the application is filed, plus reasonable projected water use for industries that use over 200,000 gallons per year. Population projections shall be made using one of the following:

(A) Accepted statistical methods using historic population trends for the applicant; or

(B) Data from the U.S. census bureau, Kansas water office population projections, or the Kansas census bureau. Projected deviations from historic population trends shall be justified by the applicant.

Population Growth & Gallons Per Capita Per Day

Historic and projected population data for the City was gathered from the US Census Bureau (Census) and Kansas Water Office (KWO). In 1999 the KWO completed a study that utilized the relationship between water use and census data as a methodology to project future population. The procedure and findings developed by the KWO were later endorsed as the official Kansas population projections by the Kansas Division of the Budget.

Attachment 1

District and Chief Engineer that additional water is needed due to the population projections and industry water use projections being consistent with the information provided with the original applications, the Chief Engineer will modify the initial aggregate quantity limitation to meet the projected water use for another 20 years or longer, not to exceed the total time allowed to perfect #47955, #47956, and #47957. Additionally, upon demonstration by the applicant satisfactory to the District and Chief Engineer that additional water is needed due to required water treatment, the Chief Engineer will modify the aggregate quantity limitation to meet the increased projected water use.

The KWO population projections for the City are summarized in Table 1 below. In 2015 the population of the City was estimated to be approximately 13,200. In addition to supplying the City of McPherson, BPU also supplies water to several surrounding Rural Water Districts and the City of Windom.

Table 1 - Kansas Water Office Projected Population

Year	Projected Years From 2015	KWO Projected Population
2020	5	15,108
2030	15	16,022
2035	20	16,473
2040	25	16,937
2045	30	17,379
2055	40	18,285
2065	50	19,191

Water use reports submitted to the State of Kansas by BPU were analyzed for the years 2010 through 2015 to calculate the average gallons per capita per day (GPCD) within the City. Based on the last three years of available data, the average is 151 GPCD (see Table 2 below).

Table 2 - DWR Reported Residential Water Use & Calculated GPCD

Water Use Report Year	2010	2011	2012	2013	2014	2015
Residential Use (Acre-Feet)	2105	2566	2124	2282	2017	1964
Avg. Residential Use (MGD)	1.88	2.29	1.89	2.03	1.80	1.75
GPCD	154	183	157	150	154	149

Industrial & Commercial Growth

The BPU currently supplies treated water to several critical industrial and commercial customers. This includes large regional and area employers such as: Hospira Inc, CHS McPherson Refinery, Johns Manville, Viega LLC, Chemstar Products Company, Central States MFG, and North American Specialty Products.

Attachment 1

As the BPU service area continues to experience industrial and commercial growth, raw water supply needs will continue to increase. An annual industrial development rate of 2% was selected to represent a reasonable anticipated projection of maximum future industrial and commercial water demand. The results of this projection are listed below in Table 3.

Table 3 - Projected Growth in Large Water Users (Industrial & Commercial)

Year	Projected Years From 2015	2% Growth Large Water Users (AF)	2% Growth Large Water Users MGD)	Increase From 2014 Water Use AVG (GPM)
2020	5	1,436	0.14	100
2030	15	1,750	0.42	295
2035	20	1,932	0.59	408
2040	25	2,134	0.77	532
2045	30	2,355	0.96	670
2055	40	2,872	1.43	990
2065	50	3,500	1.98	1380

Water Treatment Changes

The treatment standards and regulations for potable water continue to exhibit a movement toward stringent contaminant removal criteria. As water treatment standards become more restrictive, additional water treatment technologies will need to be implemented. Currently BPU utilizes a blending facility to normalize groundwater of varying quality from the well field to meet existing primary and secondary drinking water standards.

Water treatment technologies such as Reverse Osmosis (RO) may require implementation in the near future in order to achieve regulated removal of contaminants and to continue to provide an optimum treated water quality from new water resources. The RO process produces both a fresh highly treated water supply, and a smaller concentrated contaminant stream. Recovery rates of RO facilities vary based on influent water quality, but typically approach 75 to 80 percent of the total input quantity. The remaining portion of concentrate is then put to a beneficial use, sent to evaporation, or commonly injected into a deep disposal well. Given the percentage of raw water accounted for in the RO concentrate stream, future water treatment systems must be considered when planning for future raw water supply.

Future Water Supply Projections

Utilizing the developed data for projected population, industrial development, and anticipated water treatment changes a future water demand can be calculated utilizing the prescribed GMD2 method for calculating described under K.A.R 5-22-14(f)(2) (see Table 4).

Table 4 - Projected BPU Water Demand through 2065 (50 Years)

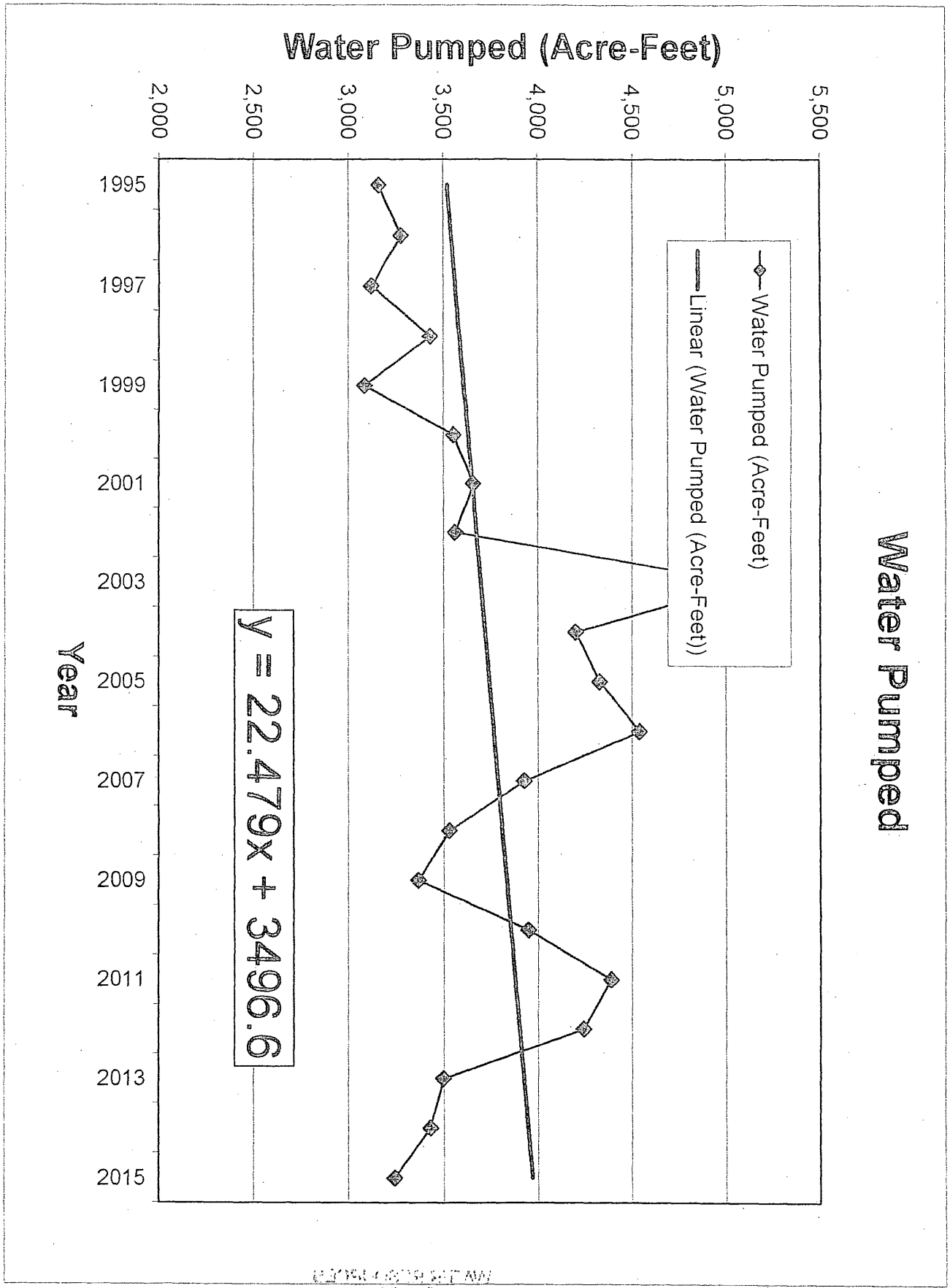
Year	Projected Years From 2015	KWO Projected Population	Last 5 Years Average x 110% (GPCD)	2% Growth Large Water Users (AF)	Total Raw Water Demand (AF)	Total Raw Water Demand With 15% RO (AF)
2020	5	15,108	166	1,436	4,245	4,882
2030	15	16,022	166	1,750	4,729	5,439
2035	20	16,473	166	1,932	4,995	5,744
2040	25	16,937	166	2,134	5,283	6,076
2045	30	17,379	166	2,355	5,587	6,424
2055	40	18,285	166	2,872	6,272	7,213
2065	50	19,191	166	3,500	7,068	8,129

BPU currently has Water Rights totaling 4,605 acre-feet per year (AF/Year) sourced from their existing well field in McPherson County. The existing BPU wellfield is currently over appropriated and has experienced historic declines during periods of normal withdrawal. Based on the fact that existing groundwater resources in McPherson County are declining, BPU is currently in direct need of an alternative source to augment supply from a decreasing resource.

The projections in Table 4 show that with normal growth, BPU will need additional water rights by 2035 to meet potential demand utilizing existing water treatment facilities. This is the purpose of new appropriation application nos. 47955, 47956, and 47957, referred to as the South Well Field. The South Well Field (SWF) is located nearly 20 miles away from the City of McPherson, but has been shown to be a viable and sustainable source of the requested 2,909 AF/Year.

Given the cost and investment associated with running 20 miles of pipeline, and the required well field infrastructure, the SWF must be viewed with a longer planning and investment horizon than the 20 years granted by K.A.R 5-22-14(f). Water supply planning is a continuous process for a water utility, and recent history shows that a vision for water development 50 years into the future is more practical, increases reliability, and reduces long-term costs. The SWF project appears to fulfill a critical need to augment currently over appropriated resources, and provide a long term sustainable water supply.

DWC/wc

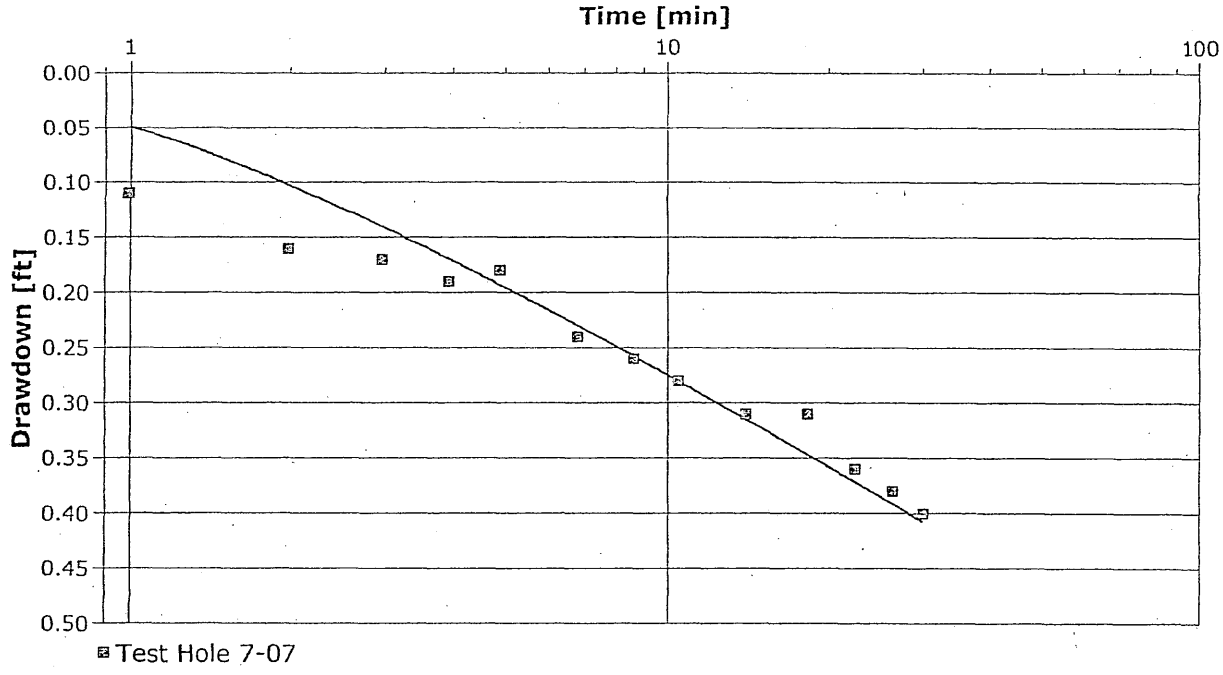


MAR 1 8 2016

Attachment 1

Ground Water Associates 1999 N. Amidon, STE. 218 Wichita, Ks 67203	Pumping Test Analysis Report
	Project: Jeff Foster
	Number: TW 1-08 Pumping Test
	Client:

Location: NW NW SE Sec 32, T22S, R3W	Pumping Test: 3.5 Hr Pumping Test	Pumping well: Test Well 1-08
Test conducted by: Peterson Irrigation		Test date: 2/19/2008
Analysis performed by: Brad Vincent	Agarwal- Recovery	Date: 2/21/2008
Aquifer Thickness: 211.66 ft	Discharge: variable, average rate 86.996 [U.S. gal/min]	



Calculation after AGARWAL + Theis

Observation well	Transmissivity [U.S. gal/d-ft]	K [U.S. gal/d-ft²]	Storage coefficient	Radial distance to PW [ft]	
Test Hole 7-07	7.92×10^{4}	3.74×10^{2}	3.32×10^{-2}	24.45	

Attachment 2

BURNS McDONNELL

June 20, 2016

Mr. Tim Boese, Manager
Equus Beds
Groundwater Management District No.2
313 Spruce Street
Halstead, Kansas 67056

Re: Supplemental Figures for McPherson BPU South Well Field Groundwater Model

Dear Mr. Tim Boese:

Burns and McDonnell (BMcD) has developed two supplemental figures to address comments provided by the Equus Beds Groundwater Management District No. 2 (GMD2) on the South Well Field Groundwater Model (BMcD, 2016) modeling study. The GMD2 comments were transmitted via email to BMcD on April 11, 2016.

The attached Supplemental Figure 1 presents an interpretation of chloride concentrations in groundwater within the Hollow-Nikkel plume area. The data presented are chloride concentrations in groundwater from samples collected in June and August 2015. The water quality sample results shown on this figure are the deep "C" level Equus Beds (EB) monitoring wells and from the South Well Field (Foster Property) monitoring wells. These data are the most current chloride data for the Hollow-Nikkel chloride plume.

To provide clarifications related to the groundwater elevation contour maps presented in the South Well Field Groundwater Model (BMcD, 2016), the McPherson Board of Public Utilities (BPU) surveyed several monitoring wells to collect top of well casing and top of ground surface elevation data.

The results of the survey have been provided to GMD2 and revealed that varying vertical datums and sources were utilized to originally define elevations across the various sources of monitoring well data. These recently gathered survey elevations helped to refine and clarify the interpreted potentiometric surface within the groundwater model area. Supplemental Figure 2 illustrates the interpreted potentiometric surface from the within the model study area, using 2015 water level elevations.

Supplemental Figure 2 also illustrates the Hollow-Nikkel chloride plume (from Supplemental Figure 1) and the groundwater model predicted capture zone predicted with the South Well Field wells pumping at their maximum requested pumping rate (as defined in the model report). As shown, the Hollow-Nikkel chloride plume is hydraulically down gradient of the South Well Field and the model predicted capture zone does not intersect the interpreted extents of the plume.

9400 Ward Parkway \ Kansas City, MO 64114
O 816-333-9400 \ F 816-333-3690 \ burnsmcd.com

Attachment 3

BURNS McDONNELL

We hope these two supplemental figures address the comments you provided on the South Well Field Groundwater Model. Please contact me at 816-448-7591 if you have further questions or comments.

Sincerely,

Luca DeAngelis. P.E., P.G.
Associate Geological Engineer

Brian Meier
Project Manager

LD/ld

Enclosure Attachment
cc: Tim Maier

Attachment 3

BOARD OF PUBLIC UTILITIES
McPHERSON, KS

Supplemental Figure 2
Observed (April 2015) Water Level Elevations And Model Predicted Well Field Capture Zone South Well Field Groundwater Model Area

LEGEND:

EB27
1410.9
Monitoring Well with Measured Water Level Elevation (ft msl)

Contour of Measured Water Level Elevation CI = 10 ft (April 2015 data)

Deep Chloride Isocontours (mg/L) From Summer 2015. CI = 1000 mg/L See Supplemental Figure 1 for detail

Model Predicted Particle Tracking Results for 30 Year Time of Travel.

MODFLOW Drain Cell

MODFLOW River Cell

MODFLOW No Flow Cell

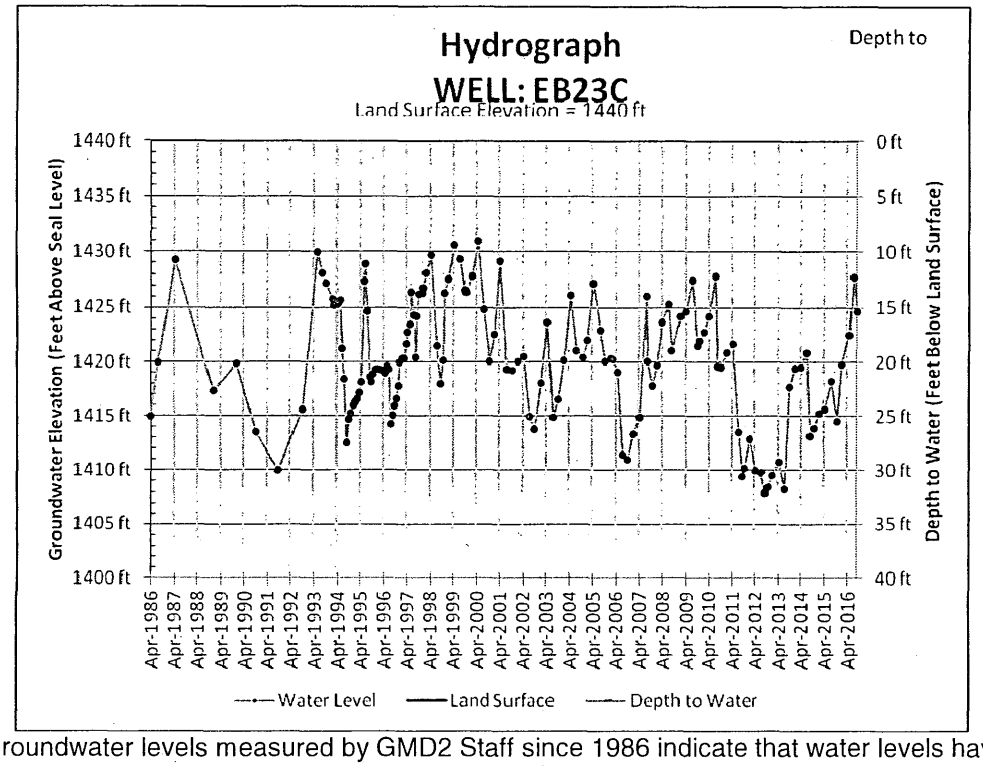
Note:
1)This figure presents observed water level elevations from April 2015, including data from the South Well Field monitoring wells.
2)The Hollow-Nikkel Chloride plume from Summer 2015 is also shown on this figure.
3)This figure shows the model particle tracking results from MODPATH. The total time of travel shown is 30 years.
4)The South Well Field wells were simulated as steady state boundaries,pumping at 600 gallons per minute.

N
W E
S

0 7000 14000
Map Scale: 1-inch = 7000 feet

BURNS McDONNELL

Attachment 3



Graph 1. Groundwater levels measured by GMD2 Staff since 1986 indicate that water levels have remained within a 20 foot range and have rovered over 15 feet since the 2011 and 2012 drought. See Figure 4 for location.

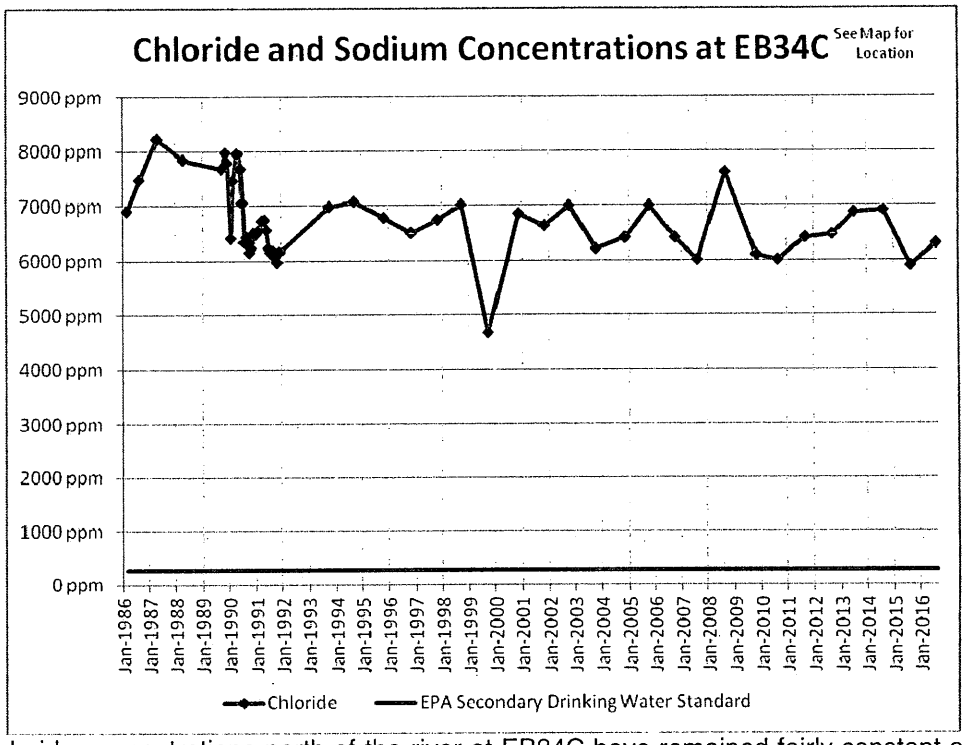
The southern edge of the Hollow-Nikkel Chloride plume is approximately 1.7 miles north of the proposed pumping wells. Chlorides have been found in excess of 6000 ppm at EB34C which is approximately 1.9 miles north of the proposed wells.

Burns and McDonnell (BMcD) submitted 2015 groundwater level contours of the area as well as contours of the chloride plume (Attachments 2-4).

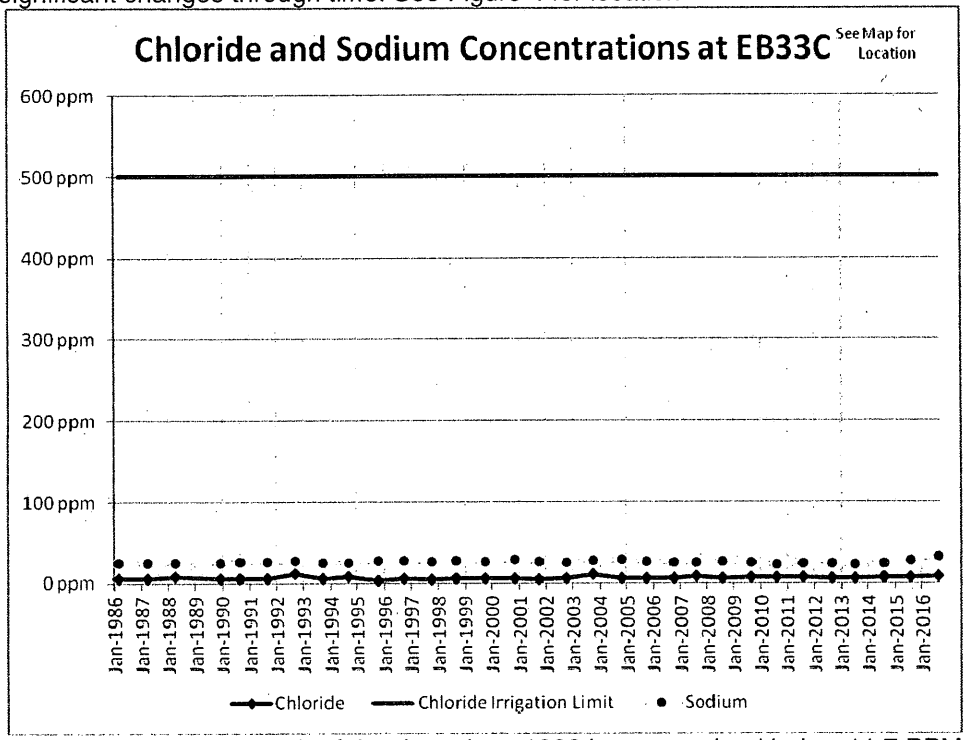
Groundwater samples collected in 2013 and 2015 indicate that Chloride concentrations at the BPU observation wells are below 10 PPM (Table 4).

	July 2013 Sample (PPM)	June 2015 Sample (PPM)
BPU 1	3.1	2.5
BPU 2	4.1	3.2
BPU 3	6.5	5.1
BPU 4	5.3	4.1
BPU 5	5.7	4.2
BPU 6	5.3	4.3
BPU 7	5.1	4.0

Table 4. Chloride concentrations at the BPU owned observations wells sampled by Continental Analytical Services. See Figure 4 for locations.



Graph 2. Chloride concentrations north of the river at EB34C have remained fairly constant and does not display any significant changes through time. See Figure 4 for location



Graph 3. Chloride concentration south of the river since 1982 have remained below 11.7 PPM. See Figure 4 for location

APPLICATION REVIEW INFORMATION

NAME McPherson BPU
ADDRESS 401 West Kansas Ave.
McPherson, KS 67460

APPLICATIONS. 47955, 47956, 47957
NEW APPL. 3 New Municipal Wells
COUNTY Harvey TRACT: South Half
WELL LOCATION S32 T22S R3W
WELL SPACING D>660', ND>1320'

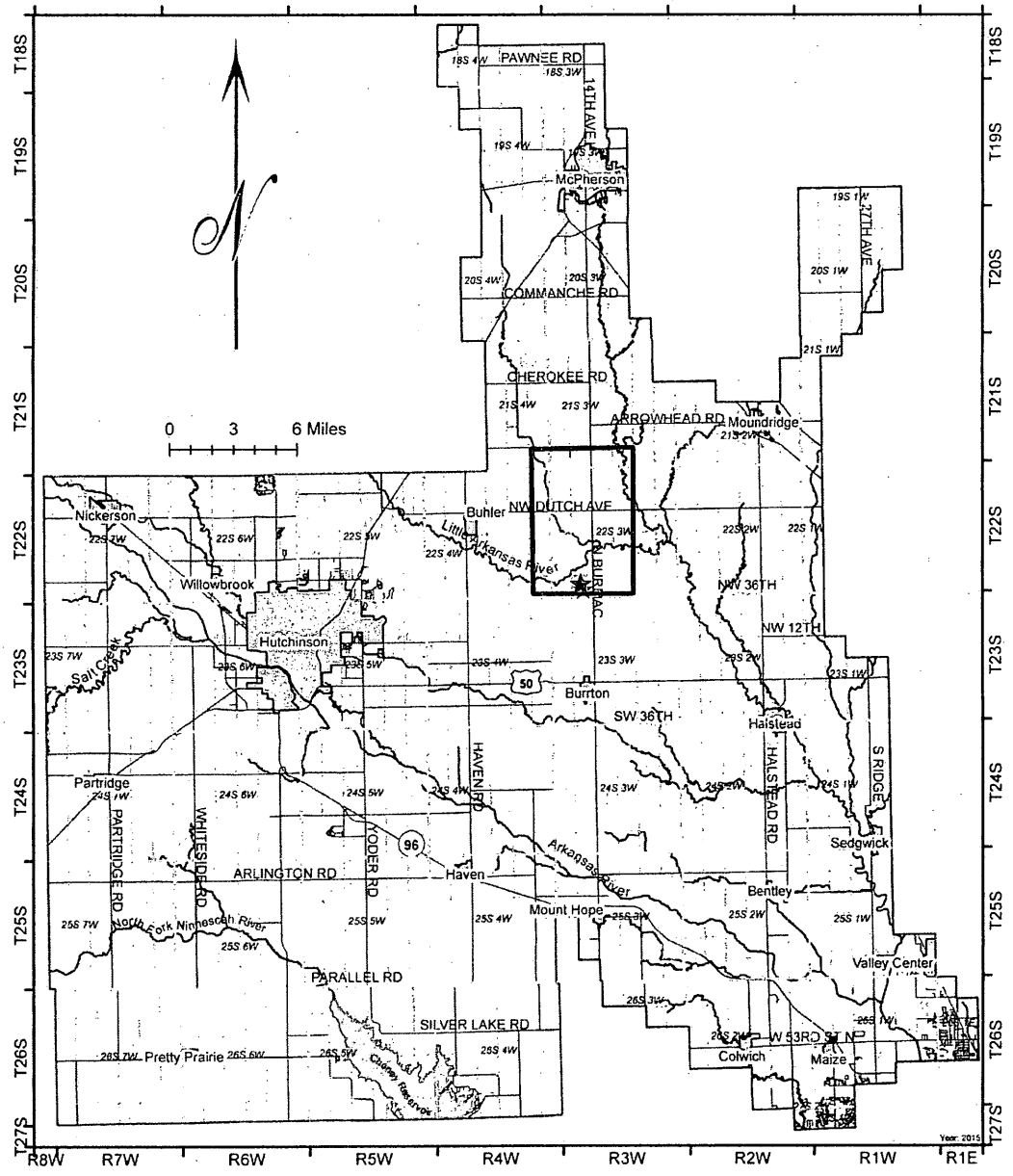


Figure 1. General location of application within the District indicated by the red star. Hollow-Nikkel Special Water Quality Use Area outlined in red.

ISSUE: Applications are within the boundaries of the Hollow-Nikkel SWQUA and do not comply with the maximum reasonable quantity outlined in 5-22-14(f).

TIMELINE OF EVENTS:

September 17, 1986 — The Hollow-Nikkel Special Water Quality Use Area was established largely as a result of oil field brine disposal in the 1930's and 1940's.

October 5, 2011 — The applicant filed 3 applications to appropriate groundwater for municipal use in Section 32 Township 22 South, Range 3 West.
Application #47955 proposes 2574 acre feet at 1750 GPM
Application #47956 proposes 2674 acre feet at 1750 GPM, with a limitation of 2674 acre feet when combined with # 47955.
Application # 47957 proposes 2909 acre feet at 2000 GPM, with a limitation of 2909 acre feet when combined with #47955 #47956.
The proposed points of diversion are located at the southern edge of the Hollow-Nikkel SWQUA (Figure 1)

February 13, 2013 to September 30, 2016 — The applicant's consultant (Burns and McDonnell) worked on and submitted documentation to support the proposal

October 3, 2016 — The applicant, the applicant's consultant, and the Division of Water Resources were notified that the appeal will be reviewed at the October 11th Board Meeting.

SUMMARY OF APPLICATION REVIEW:

The McPherson Board of Public Utilities currently obtains groundwater from wells in the McPherson IGUCA. Groundwater levels as recorded from 2000 to 2015 have declined an average of .75 feet per year (Figure 2). The applicant, McPherson Board of Public Utilities (BPU), seeks to divert water to reduce pumping from the McPherson IGUCA area and pump more water from an area where groundwater levels are not declining and where there is potential to supply water for the future population projections. The applicant seeks to pipe the water to McPherson for municipal use within the City of McPherson and immediate vicinity, City of Windom and immediate vicinity and within the areas served by Rural Water District No. 2, 3, 4, McPherson County, Kansas including customers along the pipeline which serves the City of Windom.

Change in Static Water Levels
1980-2015

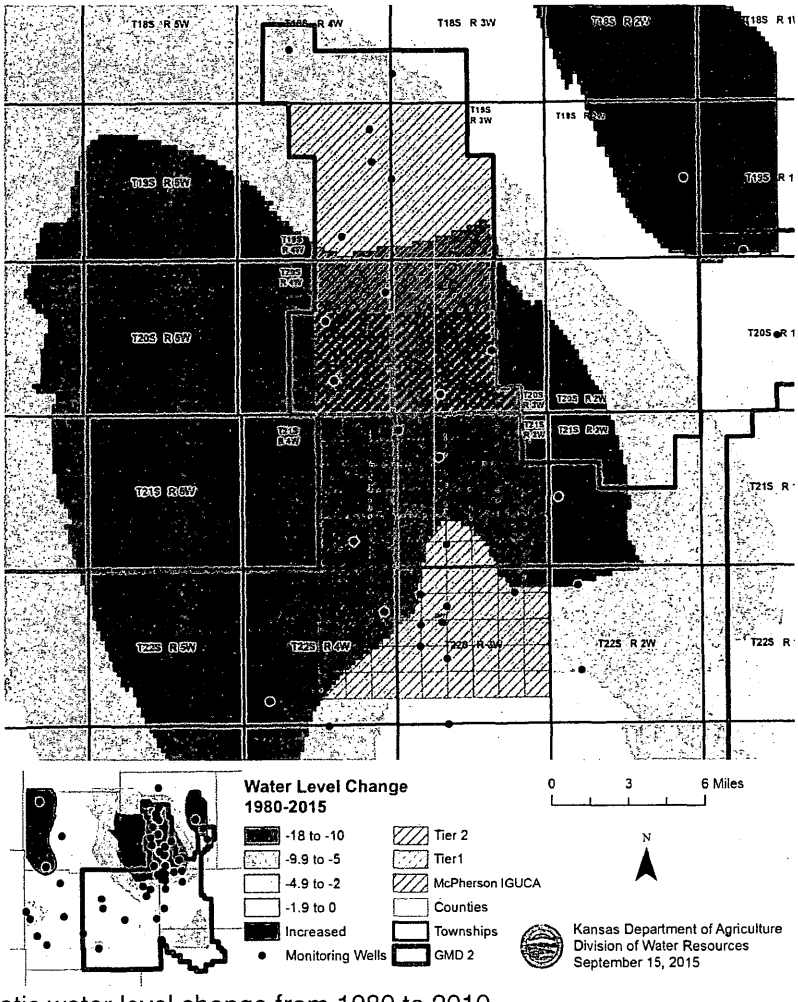


Figure 2. Map of static water level change from 1980 to 2010

The Division of Water Resources (DWR) received one call and no letters from nearby well owners.

Application #47955 proposes 2754 AF/Y at 1750 gallons per minute from a proposed well located 660'N & 4590'W;
Application #47956 proposes 2674 AF/Y at 1750 gallons per minute, with a limitation of 2674 AF/Y when combined with #47955 from a proposed well located 660'N & 2640'W;
Application #47957 proposes 2909 AF/Y at 2000 gallons per minute, with a limitation of 2909 AF/Y when combined with #47955 and #47956 from a proposed well located 1320'N & 363'W;
of the Southeast Corner of Section 32, Township 22 South, Range 3 West, Harvey County (Figure 1, 3).

The three applications comply with the Safe Yield Regulation 5-22-7(a). The existing and proposed consumptive appropriations total 4021 AF/Y in the application's area of consideration for each application (Tables 1-3). The maximum allowable appropriation for each area of consideration is 4021 AF/Y.

SAFEYIELD EVALUATION #47955							
LOCATION: SWSWSW (660'N & 4590'W) 32-22S-03W, Harvey County							
SPECIAL USE AREA: HOLLOW-NIKKEL SWQUA							
EVALUATION DATE:- 10/3/2016							
Total Areas: 8,042 acres; Area in 3 inch discharge zone: 0 acres; Area in 6 inch discharge zone: 8,042 acres							
FILE_ID	WELL_ID	TOWNSHIP	RANGE	SECTION	QUALIFIER	USE	AUTHQUANTITY
A01736300	1368	22S	03W	29	40532836	IRR	92
A02930900	1239	22S	03W	29	40532836	IRR	60
A03005000	1892	22S	03W	30	28000050	IRR	190
A03653500	1126	22S	03W	30	29403817	IRR	224
A03653600	1896	22S	03W	30	29403817	IRR	11
A03709000	423	22S	03W	29	40532836	IRR	30
A04213200	2261	22S	03W	29	40532836	IRR	140
A04795500	3868	22S	03W	32	6604590	MUN	2574
A04795600	3869	22S	03W	32	6602640	MUN	0
A04795700	3870	22S	03W	32	13200363	MUN	0
AM045	1949	22S	04W	36	46003950	BF	50
AM046	1950	22S	04W	36	47752600	BF	50
AM047	1951	22S	04W	36	40501400	BF	50
AM048	1952	22S	04W	36	35000200	BF	50
AM049	1953	22S	03W	31	29004050	BF	50
AM050	1954	22S	03W	31	40003250	BF	50
AM051	1955	22S	03W	31	45002000	BF	50
AM052	1956	22S	03W	31	51250850	BF	50
AM053	1957	22S	03W	30	9000175	BF	50
AM054	1958	22S	03W	29	14504225	BF	50
AM055	1959	22S	03W	29	20753000	BF	50
AM056	1960	22S	03W	29	25751750	BF	50
AM057	1961	22S	03W	29	39001600	BF	50
AM058	1962	22S	03W	29	51751650	BF	50
Allowable Appropriations		4,021.00		Total Existing Appropriation			4,021.00
Small User Quantity		0		Non Consumptive Appropriations			0
Remaining SUQ		45		Consumptive Appropriations			4,021.00
Note- Values are in acre-feet				Available Appropriations			0

Table 1. Safe yield results at proposed well site for permit # 47955. Sum of consumptive appropriations includes permit # 47955. See Figure 2 for Location

SAFEYIELD EVALUATION #47956							
LOCATION: SESESW (661'N & 2640'W) 32-22S-03W, Harvey County							
SPECIAL USE AREA: HOLLOW-NIKKEL SWQUA							
EVALUATION DATE:- 10/4/2016							
Total Areas: 8,042 acres; Area in 3 inch discharge zone: 0 acres; Area in 6 inch discharge zone: 8,042 acres							
FILE_ID	WELL_ID	TOWNSHIP	RANGE	SECTION	QUALIFIER	USE	AUTHQUANTITY
A01736300	1368	22S	03W	29	40532836	IRR	92
A02930900	1239	22S	03W	29	40532836	IRR	60
A03005000	1892	22S	03W	30	28000050	IRR	190
A03653500	1126	22S	03W	30	29403817	IRR	224
A03653600	1896	22S	03W	30	29403817	IRR	11
A03709000	423	22S	03W	29	40532836	IRR	30
A04213200	2261	22S	03W	29	40532836	IRR	140
A04795500	3868	22S	03W	32	6604590	MUN	2574
A04795600	3869	22S	03W	32	6602640	MUN	100
A04795700	3870	22S	03W	32	13200363	MUN	0
AM047	1951	22S	04W	36	40501400	BF	50
AM048	1952	22S	04W	36	35000200	BF	50
AM049	1953	22S	03W	31	29004050	BF	50
AM050	1954	22S	03W	31	40003250	BF	50
AM051	1955	22S	03W	31	45002000	BF	50
AM052	1956	22S	03W	31	51250850	BF	50
AM053	1957	22S	03W	30	9000175	BF	50
AM054	1958	22S	03W	29	14504225	BF	50
AM055	1959	22S	03W	29	20753000	BF	50
AM056	1960	22S	03W	29	25751750	BF	50
AM057	1961	22S	03W	29	39001600	BF	50
AM058	1962	22S	03W	29	51751650	BF	50
Allowable Appropriations		4,021.00		Total Existing Appropriation			4,021.00
Small User Quantity		0		Non Consumptive Appropriations			0
Remaining SUQ		45		Consumptive Appropriations			4,021.00
Note- Values are in acre-feet				Available Appropriations			0

Table 2. Safe yield results at proposed well site for permit # 47956. Sum of consumptive appropriations includes permit # 47955 and # 47956 and appropriate limitation clause. See Figure 2 for Location

SAFEYIELD EVALUATION #47957							
LOCATION: NESESE (1321'N & 363'W) 32-22S-03W, Harvey County							
SPECIAL USE AREA: HOLLOW-NIKKEL SWQUA							
EVALUATION DATE:- 10/4/2016							
Total Areas: 8,042 acres; Area in 3 inch discharge zone: 0 acres; Area in 6 inch discharge zone: 8,042 acres							
FILE_ID	WELL_ID	TOWNSHIP	RANGE	SECTION	QUALIFIER	USE	AUTHQUANTITY
A01736300	1368	22S	03W	29	40532836	IRR	92
A02930900	1239	22S	03W	29	40532836	IRR	60
A03005000	1892	22S	03W	30	28000050	IRR	190
A03709000	423	22S	03W	29	40532836	IRR	30
A04213200	2261	22S	03W	29	40532836	IRR	140
A04795500	3868	22S	03W	32	6604590	MUN	2574
A04795600	3869	22S	03W	32	6602640	MUN	100
A04795700	3870	22S	03W	32	13200363	MUN	235
AM048	1952	22S	04W	36	35000200	BF	50
AM049	1953	22S	03W	31	29004050	BF	50
AM050	1954	22S	03W	31	40003250	BF	50
AM051	1955	22S	03W	31	45002000	BF	50
AM052	1956	22S	03W	31	51250850	BF	50
AM053	1957	22S	03W	30	9000175	BF	50
AM054	1958	22S	03W	29	14504225	BF	50
AM055	1959	22S	03W	29	20753000	BF	50
AM056	1960	22S	03W	29	25751750	BF	50
AM057	1961	22S	03W	29	39001600	BF	50
AM058	1962	22S	03W	29	51751650	BF	50
AM059	1963	22S	03W	20	7750675	BF	50
Allowable Appropriations		4,021.00		Total Existing Appropriation			4,021.00
Small User Quantity		0		Non Consumptive Appropriations			0
Remaining SUQ		45		Consumptive Appropriations			4,021.00
Note- Values are in acre-feet				Available Appropriations			0

Table 3. Safe yield results at proposed well site for permit #47957. Sum of consumptive appropriations includes permit # 47955, #47956, and #47957 and appropriate limitation clauses. See Figure 2 for Location.

The proposed points of diversion meet spacing to nearby domestic and non-domestic wells (Figure 3).

Equus Beds Groundwater Management District No. 2

SPACING EVALUATION No. 47956

SESW (660'N & 2640'W) 32-22S-03W, Harvey County

Prepared By: Stephen Flaherty Date: 10/4/2016

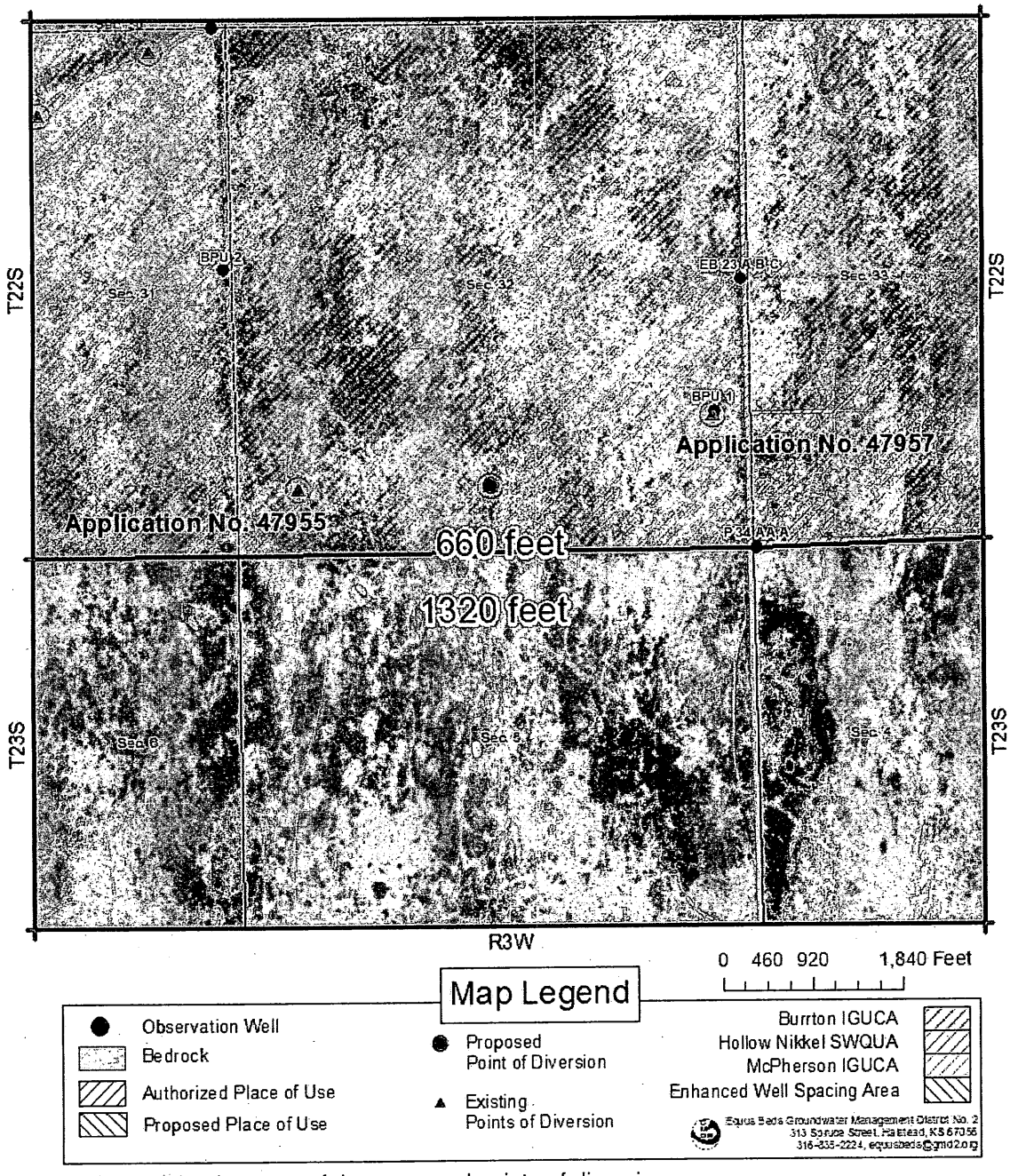


Figure 3 Spacing evaluation map of the proposed points of diversion.

The applications do not comply with the District's Maximum Reasonable Quantity for Beneficial Use Rule and Regulation 5-22-14(f). Pursuant to this regulation, unless the applicant can demonstrate a projected deviation from actual population trends, the annual quantity of water for municipal use shall not exceed the lesser of:

1. 200 gallons per capita per day; or
2. 110% of the last three year's average per capita per day usage times 365 days per year times the population projection 20 years after the application is filed, plus projected industrial use .

Given the City of McPherson's unique elevated number of water intensive usage industries, District staff recommends that method No. 2 be used to determine the maximum allowable quantity for the McPherson BPU.

McPherson BPU current existing water rights total 4,605 AF/Y. Application #47955, 47956, 47957 total 2,909 AF/Y. If approved without limitation, this would equal 7,514 AF/Y.

The applicant's consultant provided information regarding historic water use and demand projections (Attachment 1). The last three years (2013-2015) average per capita use for the McPherson BPU is 151 gallons per day and the projected population in 2035 is 16,473. Although the applications were filed in 2011, staff recommends using 2015 as the starting point for population projection, since the applications have been held for 5 years.

151 gallons per capita per day X 110% = 166 gallons per capita per day. 166 gallons per capita per day X 365 days X 16,473 = 3063 AF/Y. 2035 projected industrial use based on 2% industrial growth = 1932 AF/Y. Total water demand in 2035 = 4995 AF/Y. The applicant is also requesting an additional 15% of water due to possible water treatment requirements (such as Reverse Osmosis). However, there is not a specific current need identified by the applicant and appears to only represent a possible future requirement.

The applicant is requesting that a 50 year (through 2065) projected water use be used, instead of the 20 year projection outlined in K.A.R. 5-22-14(f). Due to the unique nature of the applications, including the investment in infrastructure (wells, pipeline, booster pumps, etc) that must be made for this project, staff recommends a longer water use projection period be allowed with an initial limitation clause of 4995 AF/Y through the year 2035. After the year 2035 and upon demonstration by the applicant satisfactory to the District and Chief Engineer that additional water is needed due to the population projections and industry water use projections being consistent with the information provided with the original applications, the Chief Engineer will modify the initial limitation to meet the projected water use for another 20 years or longer, not to exceed the total time allowed to perfect the water rights. Additionally, upon demonstration by the applicant satisfactory to the District and Chief Engineer that additional water is needed due to required water treatment, the Chief Engineer will modify the limitation to meet the increased projected water use.

REVIEW OF SUBMITTED REPORTS:

May 12, 2008 – Ground Water Associates (GWA) conducted a hydrogeologic study by drilling several test wells and installing one five-inch well near the center of Section 32 Township 22 South Range 3 West and performing a pumping test at 87 GPM for 210 minutes (Attachment 2). The study concluded that "There is a very significant volume of good quality water in storage under each section of land in the area of interest..." (GWA, Ground Water Investigation, 2008)

May 15, 2014 – Kansas Geological Survey (KGS) conducted a hydrogeologic study entitled "Characterization of the Chloride Contamination Plume in the Hollow-Nikkel Area of Equus Beds Groundwater Management District No. 2". Water quality data from at least 21 observation wells supported this study. The Chloride plume is located north of the Little Arkansas river and was modeled in three dimensions. The report concludes: that the plume is not migrating appreciably in a lateral direction; and that the plume concentration has not substantially changed within the last 10 years and is expected to remain at its current concentration for the near future (Whittemore, 2010).

February 2016 – Burns and McDonnell (BMcD) conducted a study entitled "South Well Field Groundwater Model" in which the structure of the USGS groundwater model was used to estimate the effects of pumping from the three proposed wells. The Hollow-Nikkel plume was also added into this model. Simulation results indicated that pumping would not affect the plume migration and that the rate and quantity of requested water is achievable at the proposed locations. As part of this study the McPherson BPU installed 7 observation wells identified as BPU 1-7 on Figure 4.
GMD2 Staff recommended that certain parts of the study be revisited including chloride contours, head measurements, and observation well data from 2008 to present.

May 2016 – The BMcD model was revisited and corrections were submitted to GMD2 Staff (Attachments 3).

HYDROGEOLOGIC REVIEW:

The proposed well locations are on the north flank of the sand hills (Figure 4). A well log was submitted with the application and identifies three significant clay units in excess of 34 feet in thickness with interbedded fine to coarse sands. Static water level was measured at 31.1 feet below land surface (Attachment 4). Depth to bedrock ranges from 244 to 258 feet below land surface. Saturated thickness is approximately 223 ft including clay intervals. Well logs and cross sections also indicate that a perched aquifer exists at this location (Attachment 4). Groundwater levels in the area of the application display an increasing trend since the first measurement began in 2012 (Graph 1).

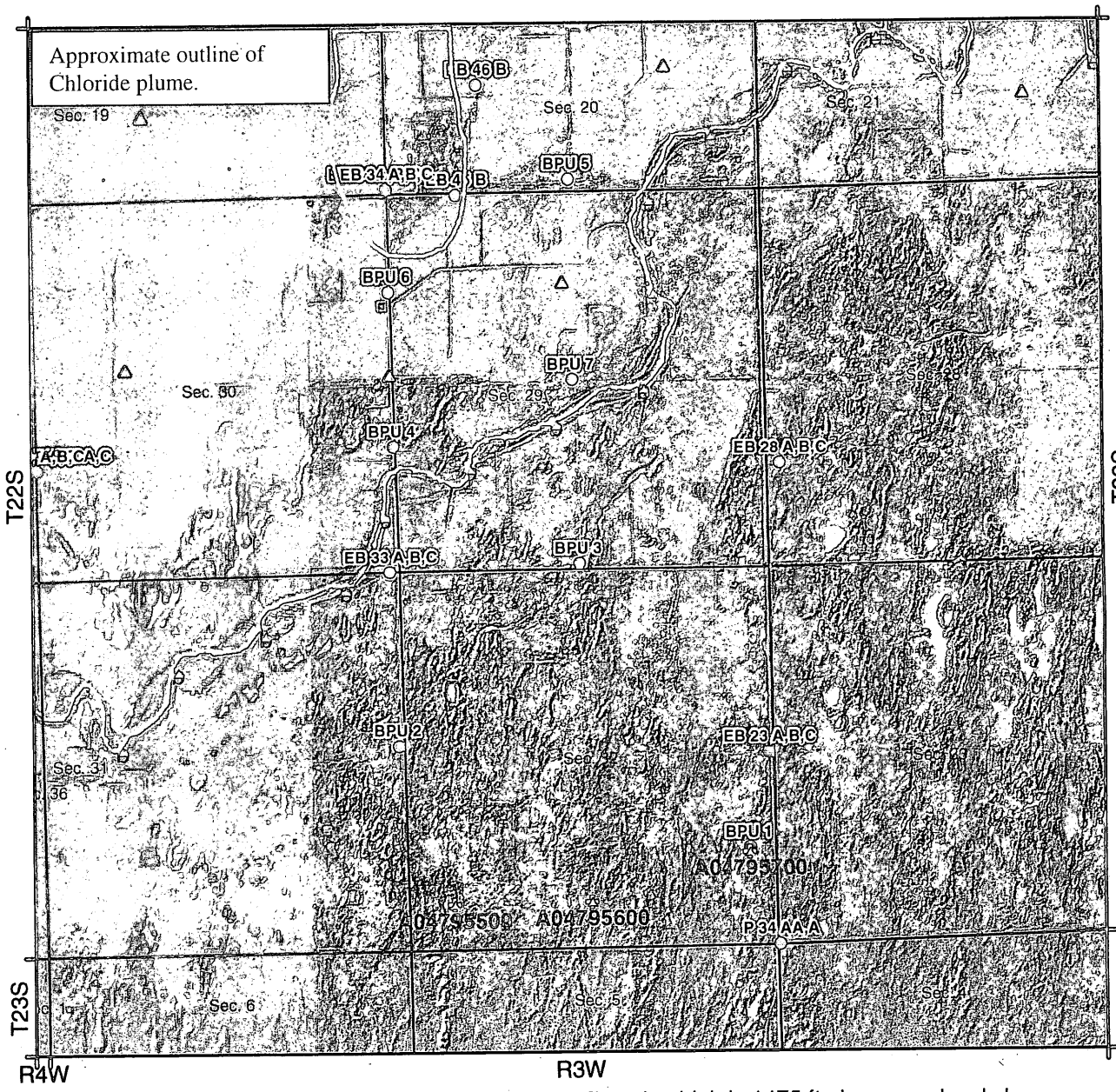


Figure 4. Land surface elevation and well locations map. Elevation high is 1475 ft above sea level shown in white and the low is 1425 feet shown in green. BPU owned observation wells labeled as BPU #. Three wells proposed by the application are labeled as A04795500, A04795600, and A04795700.

McPherson BPU conditions, DWR proposed changes, draft of 11/22/2016

1. The applicant will develop a groundwater monitoring plan, with input from GMD No. 2 including water-level and water quality monitoring, at the applicant's expense.
2. The existing monitoring well network of the seven existing monitoring previously installed by McPherson BPU be maintained and incorporated into the groundwater monitoring plan.
3. The constructed wells be equipped with a sample port or ports for water sample collection.
4. Water samples be collected from the points of diversion prior to initial operation, and analyzed by a State accredited water quality laboratory to include inorganic analysis comprised of metals and minerals and including chloride, sodium, and specific conductance and drinking water suitability interpretation.
5. The applicant will perform a rigorous pumping test simulating maximum authorized pumping rates indicating the maximum drawdowns at EB33A, B, or C. Details of the pumping test to be determined in consultation with GMD No. 2 staff. The test will be a minimum of 24 hours and shall continue until water levels have stabilized, but not more than 72 hours.
6. The permits shall be subject to Board review if the groundwater monitoring plan indicates, as determined by the District staff, that the operation of the proposed wells are impacting the chloride plume.
7. Application #47955 is authorized for 2574 acre feet per year at 1750 GPM
8. Application #47956 is authorized for 2674 acre feet per year at 1750 GPM, and further limited to 2674 acre feet per year when combined with #47955.
9. Application #47957 is authorized for 2909 acre feet per year at 2000 GPM, and further limited to 2909 acre feet per year when combined with #47955 #47956.
10. The approved applications are further limited to 5,283 acre-feet per year when combined with the McPherson BPU's existing water rights through the year 2040. That 10 years after the diversion works are completed, and every 10 years following until the perfection period expires, the applicant submit to GMD No .2 and the Chief Engineer water use data, including population/per capita data, industrial use data, and any demonstration that additional water is needed due to required water treatment. Following the second 10-year report and each 10 years thereafter, the Chief Engineer, after opportunity for review by GMD 2, will modify the aggregate quantity limitation by findings and order to meet the projected water use for another 10 years based on the population, industry water use, and treatment needs consistent with the methods used with the original applications (memo of March 14, 2016), not to exceed the total time allowed to perfect Nos. 47955, 47956, and 47957 or a combined quantify of 7213 acre-feet. Additionally, upon demonstration by the applicant satisfactory Chief Engineer, after review by GMD No. 2, that actual water demand exceeds the original projections, the Chief Engineer will modify the aggregate quantity limitation to meet the increased projected water use.
11. Any change in place of use application filed on Nos. 47955, 47956, and/or 47957, shall be subject to District Board review.

2550 563 MSH

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Turney, Brent

To:	Boese, Tim
Cc:	Barfield, David; Letourneau, Lane
Subject:	Application File Nos. 47,955, 47,956 and 47,957

Tim,
This email is a follow up to our earlier conversation regarding the Districts letter dated October 18, 2016. The letter states that " A District decision may be appealed to the District Board of Directors by submitting a written petition to the District office with 30 days from the date of this notification, pursuant to K.A.R. 5-22-12." While we are not appealing the recommendation of the Board of Directors, we do however, request additional time to review the conditions of approval as stated in your letter. The Chief Engineer and staff will be reviewing the conditions in depth and will be responding to you in the near future.
As always we appreciate working with you.
Thanks,
Brent

Brent A. Turney, P.G.
Kansas Department of Agriculture
Division of Water Resources
1320 Research Park Drive
Manhattan Kansas 66502
(785) 564-6645
Brent.Turney@ks.gov
www.agriculture.ks.gov

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Turney, Brent

From: Tim Boese <tboese@gmd2.org>
Sent: Sunday, November 20, 2016 11:40 AM
To: Turney, Brent
Cc: Barfield, David; Letourneau, Lane
Subject: RE: Application File Nos. 47,955, 47,956 and 47,957

Thanks Brent. If there are any substantial changes to the District's recommendation conditions, I will need to take it back to the Board. Since I had discussed the quantity limitation with both David and Lane and thought we had all agreed on the concept, I would be concerned if now DWR would want to make any major changes. I would certainly be open to any wordsmithing.
Additionally, if the applicant wants the limitation changed, then the applicant should be the party appealing to the Board, not DWR. It is important to remember that the Maximum Reasonable Quantity for Beneficial Use Regulation K.A.R. 5-22-14 is a District Regulation, and therefore to be granted an exception it must come from the Board as a recommendation to the Chief Engineer. The Board has made the exception recommendation based on the conditions outlined.

I would be glad to discuss this with you, David, and Lane.

Thanks and I look forward to continuing to work together on this and other issues.

Tim Boese, Manager
Equus Beds GMD2
313 Spruce, Halstead, Kansas 67056
316-835-2224
Fax: 316-835-2225
tboese@gmd2.org
www.gmd2.org

-----Original Message-----
From: Turney, Brent [mailto:Brent.Turney@ks.gov]
Sent: Thursday, November 17, 2016 5:18 PM
To: Boese, Tim
Cc: Barfield, David; Letourneau, Lane
Subject: Application File Nos. 47,955, 47,956 and 47,957

Tim,
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Consultation

1. The McPherson BPU shall develop and implement a groundwater monitoring plan acceptable to the Chief Engineer prior to the first use made of water. The plan shall monitor water-level and water quality and shall be completed at the owner's expense. The water collected under the monitoring plan shall be analyzed by a State accredited water quality laboratory and shall include inorganic analysis comprised of metals and minerals and including chloride, sodium and specific conductance and drinking water suitability interpretation. W/input from the CMP

2. The existing seven monitoring well network previously installed by McPherson BPU shall be maintained and incorporated in the groundwater monitoring plan.

3. The wells constructed under the authority of this permit shall be equipped with a sample port or ports for water sample collection.

4. The applicant shall conduct a minimum 24 hour pumping test simulating maximum authorized pumping rates until a stable water level is measured at the pumping well. The results of this test shall be made available the Chief Engineer.

5. The appropriation is further limited to 4,995 acre-feet per calendar year with the potential to increase the limitation to a total of 7213 acre-feet when combined with (list all of BPU's other water rights) to December 31, 2040, as outlined in the population table accompanying the application. That the permit holder shall submit a progress report to the office of the Chief Engineer by March 1, following the tenth full calendar year after the permit was issued. The progress report must be submitted on a form prescribed by the Chief Engineer, and shall compare annual water use projected in the original application with the actual annual water use for the prior 10 years. The progress report must document compliance with the approved conservation plan, contain sufficient details to determine the extent of perfection of the water right during the previous ten years, and demonstrate how the water right, in association with other water rights, meets the municipal use needs.

WATER DEMAND TABLE

McPherson BPU conditions, DWR proposed changes

Draft note to Tim,

Tim, associated with another meeting, I recently met with Tim .... and Brian Meier related to the GMD NO. 2 recommended conditions for these approvals.

The utility has a total annual operating budget of approx. $3.5 million per year and cannot take on this $20 million project without significant certainty that it will be both an alternate source and provide for the future growth. Otherwise, the project will not happen.

Their focus is on conditions which require either the GMD's or DWR's future approval outside of very clear terms. We went over your draft conditions and believe the following changes are needed to provide them with that certainty so they can move forward.

Condition 10 needs to be self-executed to the extent consistent with the demonstrated population growth, growth in industrial demand or treatment needs. This has been a big issue with the City of Hays as well. It cannot be subject to veto by either the GMD or Chief Engineer, outside of the growth not occurring.

As you know, in our permitting, we do not impose interim limits; they get what they get at the end of the perfection period. I think both DWR and BPU is concerned with having to take future action.

As I understand the process proposed, they will be provided a quantity that should be sufficient for 20 years. Thus there would be two action at the following times to review and modify the limitation:

- At year 20 to provide for growth through year 30.
- At year 30 to provide for growth through year 40.
- Then at year 40, there would be the final certificate.

Is that how you envision it?

As it is clear this project will not be built and in operation until closer to or after 2020, I would if we can change the initial amount to the 2040 projection?

....

We need to know if you can live with these changes so they can determine whether they need to appeal the conditions.

David

++++++++++++

It was the decision of the Board of Directors to recommend to the Chief Engineer that the applications be granted an exception to the Maximum Reasonable Quantity for Beneficial Use Rule and Regulation 5-22-14(f) and the applications be recommended for approval, subject to the following conditions:

1. The applicant will ~~implementation of a District~~ develop~~ed~~ a groundwater monitoring plan, with input from GMD No. 2 including water-level and water quality monitoring, at the applicant's expense.
2. The existing monitoring well network of the seven existing monitoring previously installed by McPherson BPU be maintained and incorporated into the groundwater monitoring plan.
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10. The approved applications are further limited to ~~4995~~ 5,283 acre-feet per year, or up to 15% more to the extent it is demonstrated by the applicant that the additional water is needed for water treatment, when combined with the McPherson BPU's existing water rights through the year 2035. That 10 years after the diversion works are completed, and every 10 years following until the perfection period expires, the applicant submit to ~~the District~~GMD No .2 -and the Chief ~~engineer~~ Engineer water use data, including population/per capita data and industrial use data. Following submitting each 10 year report and upon demonstration by the applicant satisfactory to ~~the District and~~ Chief Engineer, after opportunity for review by GMD 2, that additional water is needed due to the population and industry water use being consistent with the information provided with the original applications, the Chief Engineer will modify the initial aggregate quantity limitation to meet the projected water use for another 10 years, not to exceed the total time allowed to perfect Nos. 47955, 47956, and 47957. Additionally, upon demonstration by the applicant satisfactory to the District and Chief Engineer that additional water is needed due to required water treatment or actual water demand exceeding the original projections, the Chief Engineer will modify the aggregate quantity limitation to meet the increased projected water use.
11. Any change in place of use application filed on Nos. 47955, 47956, and/or 47957, shall be subject to District Board review.

McPherson BPU conditions, DWR proposed changes

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The utility has a total annual operating budget of approx. $3.5 million per year and cannot take on this $20 million project without significant certainty that it will be both an alternate source and provide for the future growth. Otherwise, the project will not happen.

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As you know, in our permitting, we do not impose interim limits; they get what they get at the end of the perfection period. I think both DWR and BPU is concerned with having to take future action.

As I understand the process proposed, they will be provided a quantity that should be sufficient for 20 years. Thus there would be two action at the following times to review and modify the limitation:

- At year 20 to provide for growth through year 30.
- At year 30 to provide for growth through year 40.
- Then at year 40, there would be the final certificate.

Is that how you envision it?

As it is clear this project will not be built and in operation until closer to or after 2020, I would if we can change the initial amount to the 2040 projection?

....

We need to know if you can live with these changes so they can determine whether they need to appeal the conditions.

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7. Application #47955 is authorized for 2574 acre feet per year at 1750 GPM
8. Application #47956 is authorized for 2674 acre feet per year at 1750 GPM, and further limited to 2674 acre feet per year when combined with #47955.
9. Application #47957 is authorized for 2909 acre feet per year at 2000 GPM, and further limited to 2909 acre feet per year when combined with #47955 #47956.
10. The approved applications are further limited to ~~4995~~ 5,283 acre-feet per year, or up to 15% more to the extent it is demonstrated by the applicant that the additional water is needed for water treatment, when combined with the McPherson BPU's existing water rights through the year 2035. That 10 years after the diversion works are completed, and every 10 years following until the perfection period expires, the applicant submit to ~~the District~~GMD No .2 -and the Chief ~~engineer~~ Engineer water use data, including population/per capita data and industrial use data. Following submitting each 10 year report and upon demonstration by the applicant satisfactory to ~~the District and~~ Chief Engineer, after opportunity for review by GMD 2, that additional water is needed due to the population and industry water use being consistent with the information provided with the original applications, the Chief Engineer will modify the initial aggregate quantity limitation to meet the projected water use for another 10 years, not to exceed the total time allowed to perfect Nos. 47955, 47956, and 47957. Additionally, upon demonstration by the applicant satisfactory to the District and Chief Engineer that additional water is needed due to required water treatment or actual water demand exceeding the original projections, the Chief Engineer will modify the aggregate quantity limitation to meet the increased projected water use.
11. Any change in place of use application filed on Nos. 47955, 47956, and/or 47957, shall be subject to District Board review.

McPherson BPU conditions, DWR proposed changes

Draft note to Tim,

Tim, associated with another meeting, I recently met with Tim .... and Brian Meier related to the GMD NO. 2 recommended conditions for these approvals.

The utility has a total annual operating budget of approx. $3.5 million per year and cannot take on this $20 million project without significant certainty that it will be both an alternate source and provide for the future growth. Otherwise, the project will not happen.

Their focus is on conditions which require either the GMD's or DWR's future approval outside of very clear terms. We went over your draft conditions and believe the following changes are needed to provide them with that certainty so they can move forward.

Condition 10 needs to be self-executed to the extent consistent with the demonstrated population growth, growth in industrial demand or treatment needs. This has been a big issue with the City of Hays as well. It cannot be subject to veto by either the GMD or Chief Engineer, outside of the growth not occurring.

As you know, in our permitting, we do not impose interim limits; they get what they get at the end of the perfection period. I think both DWR and BPU is concerned with having to take future action.

As I understand the process proposed, they will be provided a quantity that should be sufficient for 20 years. Thus there would be two action at the following times to review and modify the limitation:

- At year 20 to provide for growth through year 30.
- At year 30 to provide for growth through year 40.
- Then at year 40, there would be the final certificate.

Is that how you envision it?

As it is clear this project will not be built and in operation until closer to or after 2020, I would if we can change the initial amount to the 2040 projection?

....

We need to know if you can live with these changes so they can determine whether they need to appeal the conditions.

David

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It was the decision of the Board of Directors to recommend to the Chief Engineer that the applications be granted an exception to the Maximum Reasonable Quantity for Beneficial Use Rule and Regulation 5-22-14(f) and the applications be recommended for approval, subject to the following conditions:

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11. Any change in place of use application filed on Nos. 47955, 47956, and/or 47957, shall be subject to District Board review.

1. The McPherson BPU shall develop and implement a groundwater monitoring plan acceptable to the Chief Engineer prior to the first use made of water. The plan shall monitor water-level and water quality and shall be completed at the owner's expense. The water collected under the monitoring plan shall be analyzed by a State accredited water quality laboratory and shall include inorganic analysis comprised of metals and minerals and including chloride, sodium and specific conductance and drinking water suitability interpretation.

2. The existing seven monitoring well network previously installed by McPherson BPU shall be maintained and incorporated in the groundwater monitoring plan.

3. The wells constructed under the authority of this permit shall be equipped with a sample port or ports for water sample collection.

4. The applicant shall conduct a minimum 24 hour pumping test simulating maximum authorized pumping rates until a stable water level is measured at the pumping well. The results of this test shall be made available the Chief Engineer.

5. The appropriation is further limited to _____ acre-feet per calendar year with the potential to increase the limitation to a total of _____ acre-feet when combined with (list all of BPU's other water rights) to December 31, 2040, as outlined in the population table accompanying the application. That the permit holder shall submit a progress report to the office of the Chief Engineer by March 1, following the tenth full calendar year after the permit was issued. The progress report must be submitted on a form prescribed by the Chief Engineer, and shall compare annual water use projected in the original application with the actual annual water use for the prior 10 years. The progress report must document compliance with the approved conservation plan, contain sufficient details to determine the extent of perfection of the water right during the previous ten years, and demonstrate how the water right, in association with other water rights, meets the municipal use nee

1 Oct 2007

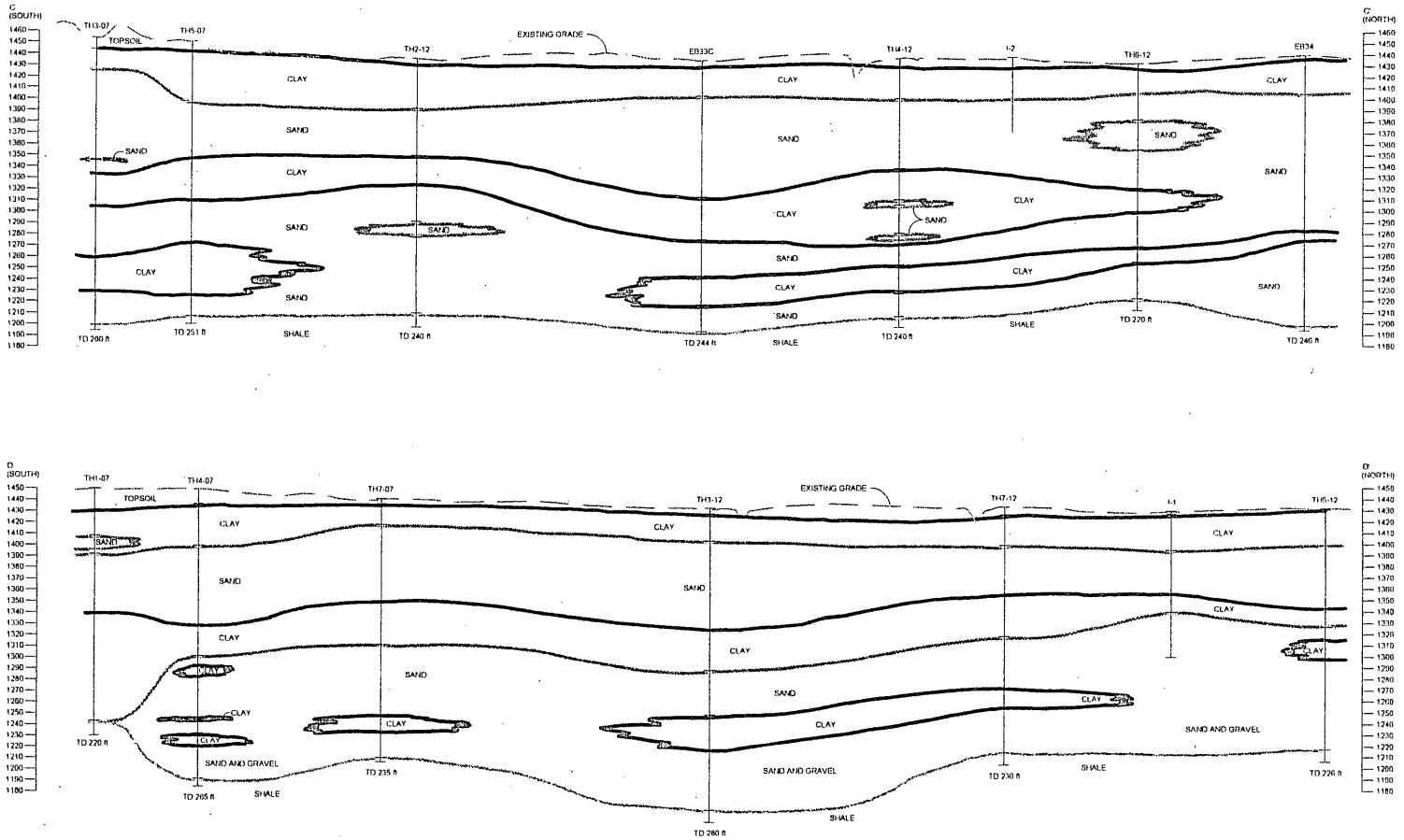
Jeff Foster
Test Hole 5-07

906' N & 215' E of SW cor. Section 32, T22S, R3W — Elev. 1452'
GPS N 38° 5.350' W 97° 40.986'
38.08916 - -97.6831 — SWL 31.10'

0 - 9'	Sand br, vf-f
9 – 21	Sand br, vf-f, so. clay gy, streaks
21 – 46	Clay lt br & lt gy, sandy
46 – 55	Clay lt br & tan &gy
55 – 75	Sand br, vf-f
75 – 104	Sand br, vf-c
104 – 110	Clay tan, sandy
110 – 117	Clay lt br & tan, sandy, cemented sand streaks, so. gravel br, f
117 – 130	Clay lt br, sandy, sand br, vf-f
130 – 137	Clay lt br & gy, silty, so. sand br, vf, streaks
137 – 140	Clay lt br & gy, silty, so. caliche layers
140 – 141	Clay lt br & gy, sandy, gravel in clay
141 – 160	Sand br, vf-f, so. clay br & lt br streaks, tight
160 – 178	Sand br, vf-c, so. clay rd-br streaks
178 - 190	Clay rd br & lt br, silty,
190 – 195	Clay rd br , sandy, so. gravel br, f
195 – 205	Clay rd br & gy, sandy, so. gravel br, f
205 – 210	Clay gy- gn, silty
210 – 215	Clay rd br & gy, sandy, so. gravel br, f
215 – 220	Clay rd br & gy, sand br, m-c
220 – 225	Clay rd br, silty
225 – 244	Sand br, f-c, clay rd-br &gy streaks
244 -250	Shale rd, hard
250 – 251	Shale dk gy

Set 2" PVC . Screen 244' – 224'.

Logged by Brad Vincent, P. G., Ground Water Associates
Hand held GPS. Conus 1927 datum



HORIZONTAL: 0 1000' 2000' SCALE IN FEET

VERTICAL: 0 100' 200' SCALE IN FEET V.E. = 10"

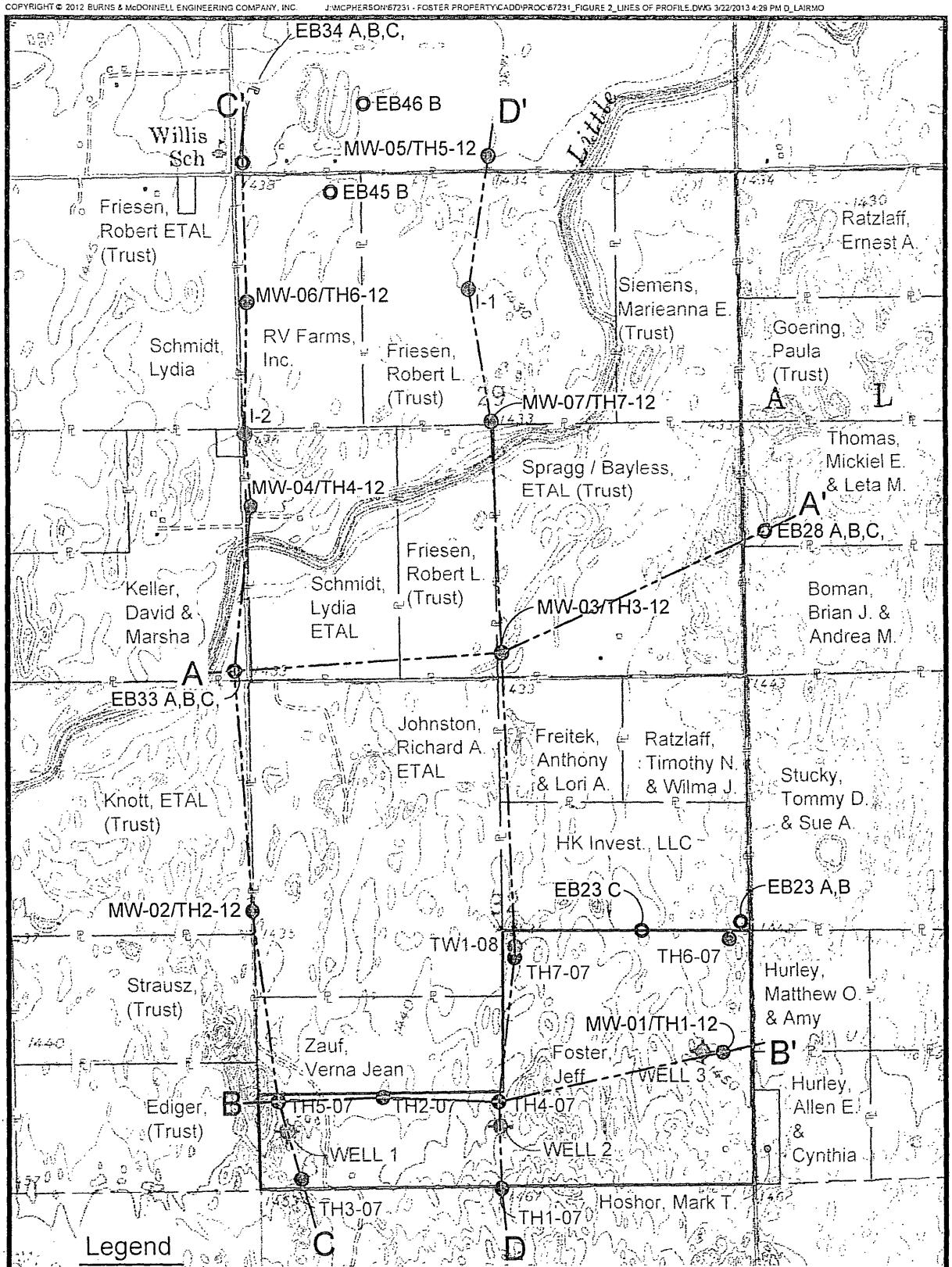
Figure 5

Foster Property Evaluation
Profiles C-C' and D-D'

J:\MCPHERSON\67231 - FOSTER PROPERTY\CADD\PROC\67231_FIGURE 5_PROFILE C-C' AND D-D' DWG 3/22/2013 4:34 PM D_LAIRMO

Attachment 4

 J:\MCPHERSON\67231 - FOSTER PROPERTY\CADD\PROC\67231_FIGURE 2_LINES OF PROFILE.DWG 3/22/2013 4:29 PM D_LAIRMO



Legend

- Lines of Profile
- 2007 Test Boring
- 2008 Test Well
- 2012 Monitoring Well/Test Boring
- Irrigation Well
- Proposed Well Location (Preliminary)
- GMD2 Monitoring Well

0 1000' 2000'
SCALE IN FEET

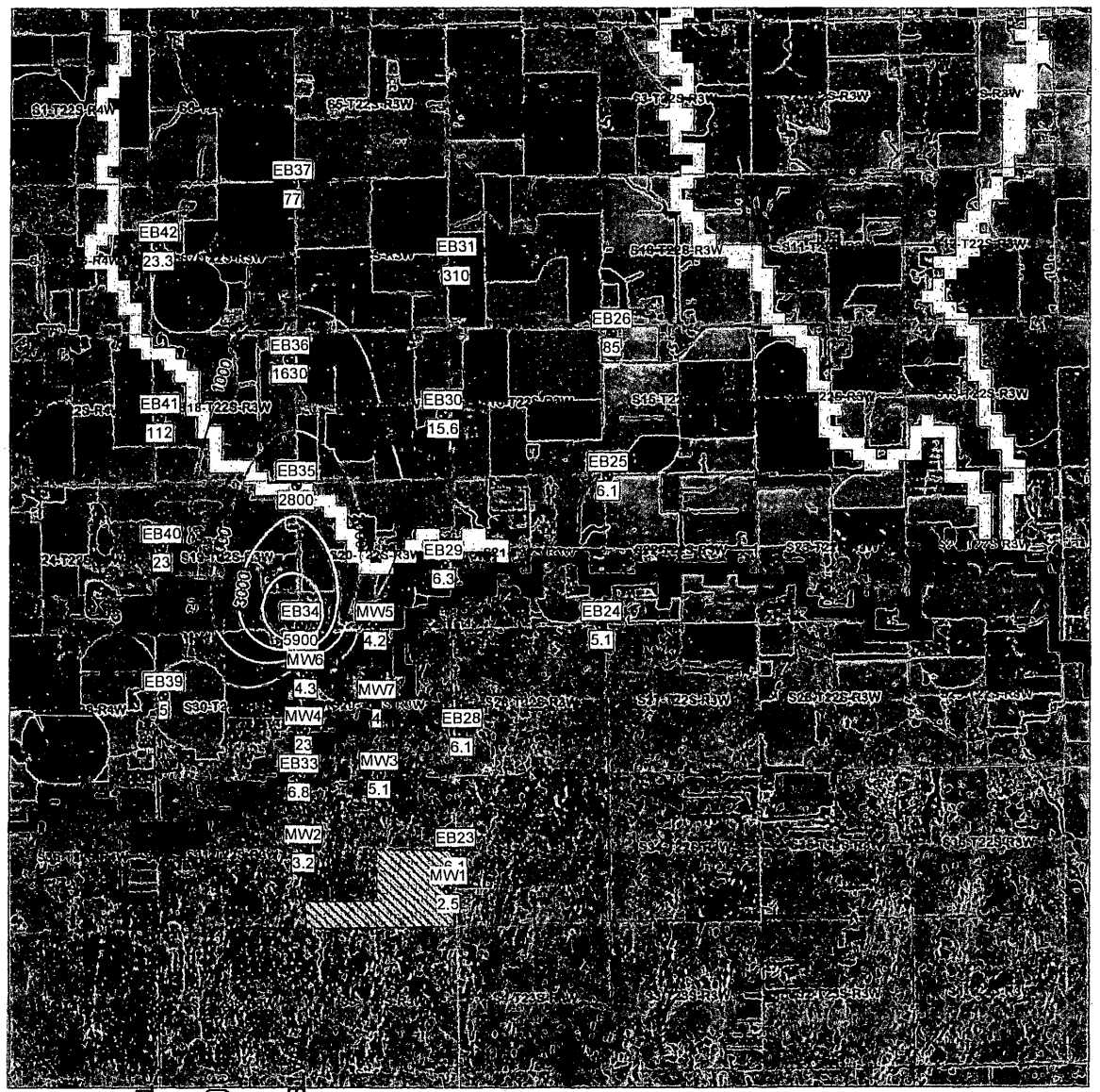
N

Burns & McDonnell since 1898

Figure 2

Foster Property Evaluation Lines of Profile

Attachment 4



BOARD OF PUBLIC UTILITIES
McPHERSON, KS

Supplemental Figure 1
Observed Chloride Concentrations Summer 2015
Hollow Nikkel and South Well Field Area

LEGEND:

EB27
2800
Monitoring Well with Measured Chloride Concentrations (mg/L)

Deep Chloride Isocontour (mg/L)
Cl = 1000 mg/L
Using EB "C" Wells

MODFLOW Drain Cell

MODFLOW River Cell

McBPU South Well Field

0 4000 8000
Map Scale: 1-inch = 4000 feet

Note:
1)This figure presents observed chloride concentrations from Summer 2015, including data from the EB monitoring wells and the South Well Field monitoring wells.
2)EB monitoring wells sampled in August 2015. South Well Field monitoring wells sampled in June 2015.

BURNS McDONNELL

EQUUS BEDS GROUNDWATER MANAGEMENT DISTRICT NO. 2

313 SPRUCE STREET • HALSTEAD, KANSAS 67056-1925 • PHONE (316) 835-2224 • FAX (316) 835-2225 • equusbeds@gmd2.org • www.gmd2.org

October 18, 2016

Chief Engineer, Division of Water Resources
Attn: Doug Schemm, Topeka Field Office
6531 SE Forbes Ave., Suite B
Topeka, KS 66619

Re: Application Nos. 47955, 47956, 47957 – McPherson BPU

Dear Mr. Schemm:

The referenced applications were reviewed by the Equus Beds Groundwater Management District No. 2, Board of Directors at the October 11, 2016, meeting. District staff, the applicant, and the applicant's consultant presented information regarding the application. A copy of the District's Application Review Information report is enclosed for your information.

Upon review of the information presented and discussed at the meeting, and based on findings that:

1. The municipal well locations proposed by Application #47955, #47956, and #47957 are located in the southern edge of the Hollow-Nikkel SWQUA.
2. Application #47955, #47956, and #47957 propose a total quantity of 2909 acre-feet per year.
3. The applications comply with the District's Safe Yield Regulation K.A.R. 5-22-7(a);
4. The applications comply with the District's Well Spacing Regulation K.A.R. 5-22-2(a).
5. The boundaries of the chloride plume in the Hollow-Nikkel SWQUA are well defined by the Kansas Geological Survey (KGS).
6. An aquifer test was conducted by Ground Water Associates.
7. Burns and McDonnell (BMcD) conducted a study to estimate the effects of pumping from the three proposed wells. Model simulation results indicated that pumping would not affect the plume migration and that the rate and quantity of requested water is achievable at the proposed locations.
8. Chloride concentrations have not exceeded 11.7 ppm at well EB33C or 5.3 ppm at BPU 6;
9. The chloride concentrations at EB33C has remained between 11.7 ppm and 3 ppm since 1986;
10. Groundwater modeling and hydrogeologic tests indicate that the zone of capture from the applications' proposed rates and quantities does not reach the plume.
11. The McPherson Board of Public Utilities has installed and maintains 7 observation wells located between the proposed municipal well locations and the chloride plume.
12. According to the KGS, the southern edge of the Hollow-Nikkel chloride contaminant plume is located approximately 1.75 – 2 miles north–northwest of the proposed wells.
13. The plume is not significantly moving in any lateral direction according to the KGS.
14. Groundwater levels in the vicinity of the applications have remained stable since 1986 as measured at monitoring well EB 23C.
15. The exact impacts of the proposed pumping are unknown without a full scale pumping test.
16. The applications do not comply with the District's Maximum Reasonable Quantity for Beneficial Use Rule and Regulation 5-22-14(f), as the applicant is requesting that a longer period than 20 years be used for projecting water use demand and justifying the quantity of water requested.
17. Due to the unique nature of the applications, including the significant investment in infrastructure required including well construction, pipeline installation, etc, a longer than 20 year water demand projection is reasonable.
18. The current McPherson BPU municipal wells are located in the McPherson IGUCA and are experiencing long-term groundwater declines.

19. If the proposed applications are approved, the 2909 acre-feet per year authorized by the applications could be used to reduce the amount of water pumped by the McPherson BPU's existing wells located in the McPherson IGUCA, thus assisting in stabilizing the groundwater levels in that portion of the McPherson IGUCA.

It was the decision of the Board of Directors to recommend to the Chief Engineer that the applications be granted an exception to the Maximum Reasonable Quantity for Beneficial Use Rule and Regulation 5-22-14(f) and the applications be recommended for approval, subject to the following conditions:

1. The implementation of a District developed groundwater monitoring plan, including water-level and water quality monitoring, at the applicant's expense.
2. The existing monitoring well network of the seven existing monitoring previously installed by McPherson BPU be maintained and incorporated into the groundwater monitoring plan.
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6. The permits shall be subject to Board review if the groundwater monitoring plan indicates, as determined by the District staff, that the operation of the proposed wells are impacting the chloride plume.
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A District decision may be appealed to the District Board of Directors by submitting a written petition to the District office within 30 days from the date of this notification, pursuant to K.A.R. 5-22-12.

Please contact the District if you have any questions regarding the District's findings or recommendation.

Sincerely,
EQUUS BEDS GROUNDWATER
MANAGEMENT DISTRICT NO. 2

T. Boese

Tim Boese
Manager

TDB/db

Enclosure

pc: McPherson Board of Public Utilities, Applicant
Brian Meier, Burns & McDonnell
Jeff Lanterman, Division of Water Resources, Staffordi

Burns and McDonnell submitted a Theis drawdown calculation which estimated less than 1 foot of drawdown at 9000 ft from the pumping well using the following parameters:
Q = 1800 GPM
S = .15
T = 50000 g/d/ft
T = 365 d

STAFF RECOMMENDATIONS:

Based on the following District findings that:

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2) Application #47955, #47956, and #47957 propose a total quantity of 2909 acre-feet per year.
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Staff recommends that the applications be granted an exception to the Maximum Reasonable Quantity for Beneficial Use Rule and Regulation 5-22-14(f) and the applications be recommended for approval, subject to the following conditions:

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EQUUS BEDS GROUNDWATER MANAGEMENT DISTRICT NO. 2

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April 20, 2017

Chief Engineer, Division of Water Resources
Attn: Leslie Ireland
1320 Research Park Dr.
Manhattan, KS 66502

Re: Vested Right, File No. MP 005
Water Right, File Nos. 1,311; 23,310; 28,151 & 28,735
McPherson Board of Public Utilities

Dear Ms. Ireland:

The Equus Beds Groundwater Management District No. 2 reviewed the referenced change in place of use applications on April 20, 2017, using the District's Revised Management Program (effective May 1, 1995) and Rules and Regulations K.A.R. 5-22-1 through 5-22-17.

The change applications propose to modify the places of use by adding the area known as the South Well Field, the immediate vicinity of the South Well Field pipeline, and 15 sections adjacent to the current city limits. The proposed change in place of use applications will create an identical overlapping place of use with application nos. 47,955, 47,956, and 47,957.

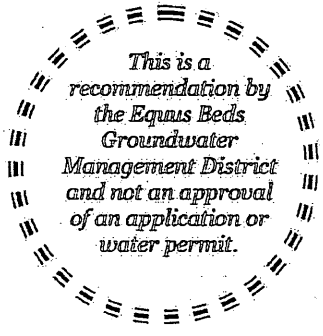
The referenced change applications comply with the District's Management Program and Rules and Regulations and the applications are recommended for approval by the Equus Beds Groundwater Management District No. 2.

A District decision may be appealed to the District Board of Directors by submitting a written petition to the District office within 30 days from date of this notification, pursuant to K.A.R. 5-22-12. Please contact the District should you have any questions regarding the review or recommendation.

Sincerely,
EQUUS BEDS GROUNDWATER
MANAGEMENT DISTRICT NO. 2

T. Boese

Tim Boese
Manager
TDB/STF



pc: Timothy S. Maier, McPherson Board of Public Utilities, Applicant
Jeff Lanterman, Division of Water Resources, Stafford

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EQUUS BEDS GROUNDWATER MANAGEMENT DISTRICT NO. 2

313 SPRUCE STREET • HALSTEAD, KANSAS 67056-1925 • PHONE (316) 835-2224 • FAX (316) 835-2225 • equusbeds@gmd2.org • www.gmd2.org

April 20, 2017

City of McPherson, Board of Public Utilities
Attn: Timothy S Maier, General Manager
401 W Kansas.
PO Box 768
McPherson, KS 67460

Re: Vested Right, File No. MP 005
Water Right, File Nos. 1,311; 23,310; 28,151 & 28,735

Dear Mr. Maier,

The Equus Beds Groundwater Management District No. 2 made a recommendation to the Division of Water Resources that the above referenced Change Applications be approved. Pursuant to K.A.R. 5-22-4a, all points of diversion described in the applications must be equipped with District approved water flowmeters:

The wells must be properly equipped with approved meters within 30 days after the approval of each change application and prior to operation of the point of diversion. If more time is needed to install meters or modify existing meter installations, you may request an extension of time. The request must be made to the Groundwater Management District before the end of the 30-day period.

Enclosed is once copy of a Flow Meter Installation form to be completed and returned to this office after completion of each meter installation or modification. Please copy the form as needed. A copy of the Division of Water Resources' meter installation notification form (Notice of Completion of Diversion Works) may be substituted for the District form. Upon receiving the completed forms, the District will inspect the installations.

Also enclosed is a copy of water meter and installation specifications. Water meters must meet these specifications and the list of certified water meters provided under K.A.R. 5-1-12, for District approval. The list of certified water meters can be obtained by contacting the District or at the following link: http://agriculture.ks.gov/divisions-programs/dwr/water-appropriation/water-flowmeters. If you have any questions about the District's metering program or the enclosed material, please contact the District for assistance.

Sincerely,
EQUUS BEDS GROUNDWATER
MANAGEMENT DISTRICT NO. 2

T Boese

Tim Boese
Manager
TDB/STF

Enclosures
pc: Jeff Lanterman, Division of Water Resources, Stafford

EQUUS BEDS GROUNDWATER MANAGEMENT DISTRICT NO. 2

313 SPRUCE STREET • HALSTEAD, KANSAS 67056-1925 • PHONE (316) 835-2224 • FAX (316) 835-2225 • equusbeds@gmd2.org • www.gmd2.org

October 18, 2016

Chief Engineer, Division of Water Resources
Attn: Doug Schemm, Topeka Field Office
6531 SE Forbes Ave., Suite B
Topeka, KS 66619

Re: Application Nos. 47955, 47956, 47957 – McPherson BPU

Dear Mr. Schemm:

The referenced applications were reviewed by the Equus Beds Groundwater Management District No. 2, Board of Directors at the October 11, 2016, meeting. District staff, the applicant, and the applicant's consultant presented information regarding the application. A copy of the District's Application Review Information report is enclosed for your information.

Upon review of the information presented and discussed at the meeting, and based on findings that:

1. The municipal well locations proposed by Application #47955, #47956, and #47957 are located in the southern edge of the Hollow-Nikkel SWQUA.
2. Application #47955, #47956, and #47957 propose a total quantity of 2909 acre-feet per year.
3. The applications comply with the District's Safe Yield Regulation K.A.R. 5-22-7(a);
4. The applications comply with the District's Well Spacing Regulation K.A.R. 5-22-2(a).
5. The boundaries of the chloride plume in the Hollow-Nikkel SWQUA are well defined by the Kansas Geological Survey (KGS).
6. An aquifer test was conducted by Ground Water Associates.
7. Burns and McDonnell (BMcD) conducted a study to estimate the effects of pumping from the three proposed wells. Model simulation results indicated that pumping would not affect the plume migration and that the rate and quantity of requested water is achievable at the proposed locations.
8. Chloride concentrations have not exceeded 11.7 ppm at well EB33C or 5.3 ppm at BPU 6;
9. The chloride concentrations at EB33C has remained between 11.7 ppm and 3 ppm since 1986;
10. Groundwater modeling and hydrogeologic tests indicate that the zone of capture from the applications' proposed rates and quantities does not reach the plume.
11. The McPherson Board of Public Utilities has installed and maintains 7 observation wells located between the proposed municipal well locations and the chloride plume.
12. According to the KGS, the southern edge of the Hollow-Nikkel chloride contaminant plume is located approximately 1.75 – 2 miles north–northwest of the proposed wells.
13. The plume is not significantly moving in any lateral direction according to the KGS.
14. Groundwater levels in the vicinity of the applications have remained stable since 1986 as measured at monitoring well EB 23C.
15. The exact impacts of the proposed pumping are unknown without a full scale pumping test.
16. The applications do not comply with the District's Maximum Reasonable Quantity for Beneficial Use Rule and Regulation 5-22-14(f), as the applicant is requesting that a longer period than 20 years be used for projecting water use demand and justifying the quantity of water requested.
17. Due to the unique nature of the applications, including the significant investment in infrastructure required including well construction, pipeline installation, etc, a longer than 20 year water demand projection is reasonable.
18. The current McPherson BPU municipal wells are located in the McPherson IGUCA and are experiencing long-term groundwater declines.

19. If the proposed applications are approved, the 2909 acre-feet per year authorized by the applications could be used to reduce the amount of water pumped by the McPherson BPU's existing wells located in the McPherson IGUCA, thus assisting in stabilizing the groundwater levels in that portion of the McPherson IGUCA.

It was the decision of the Board of Directors to recommend to the Chief Engineer that the applications be granted an exception to the Maximum Reasonable Quantity for Beneficial Use Rule and Regulation 5-22-14(f) and the applications be recommended for approval, subject to the following conditions:

1. The implementation of a District developed groundwater monitoring plan, including water-level and water quality monitoring, at the applicant's expense.
2. The existing monitoring well network of the seven existing monitoring previously installed by McPherson BPU be maintained and incorporated into the groundwater monitoring plan.
3. The constructed wells be equipped with a sample port or ports for water sample collection.
4. Water samples be collected from the points of diversion prior to initial operation, and analyzed by a State accredited water quality laboratory to include inorganic analysis comprised of metals and minerals and including chloride, sodium, and specific conductance and drinking water suitability interpretation.
5. The results of a rigorous 72 hour pumping test simulating maximum authorized pumping rates indicating that drawdown will not exceed 1 foot of drawdown at EB33A, B, or C. Details of the pumping test to be determined between District staff McPherson BPU, and the applicant's consultant.
6. The permits shall be subject to Board review if the groundwater monitoring plan indicates, as determined by the District staff, that the operation of the proposed wells are impacting the chloride plume.
7. Application #47955 is authorized for 2574 acre feet per year at 1750 GPM
8. Application #47956 is authorized for 2674 acre feet per year at 1750 GPM, and further limited to 2674 acre feet per year when combined with #47955.
9. Application #47957 is authorized for 2909 acre feet per year at 2000 GPM, and further limited to 2909 acre feet per year when combined with #47955 #47956.
10. The approved applications are further limited to 4995 acre-feet per year when combined with the McPherson BPU's existing water rights through the year 2035. That 10 years after the diversion works are completed, and every 10 years following until the perfection period expires, the applicant submit to the District and Chief engineer water use data, including population/per capita data and industrial use data. Following submitting each 10 year report and upon demonstration by the applicant satisfactory to the District and Chief Engineer that additional water is needed due to the population and industry water use being consistent with the information provided with the original applications, the Chief Engineer will modify the initial aggregate quantity limitation to meet the projected water use for another 10 years, not to exceed the total time allowed to perfect Nos. 47955, 47956, and 47957. Additionally, upon demonstration by the applicant satisfactory to the District and Chief Engineer that additional water is needed due to required water treatment or actual water demand exceeding the original projections, the Chief Engineer will modify the aggregate quantity limitation to meet the increased projected water use.
11. Any change in place of use application filed on Nos. 47955, 47956, and/or 47957, shall be subject to District Board review.

A District decision may be appealed to the District Board of Directors by submitting a written petition to the District office within 30 days from the date of this notification, pursuant to K.A.R. 5-22-12.

Please contact the District if you have any questions regarding the District's findings or recommendation.

Sincerely,
EQUUS BEDS GROUNDWATER
MANAGEMENT DISTRICT NO. 2

T. Boese

Tim Boese
Manager

TDB/db
Enclosure

pc: McPherson Board of Public Utilities, Applicant
Brian Meier, Burns & McDonnell
Jeff Lanterman, Division of Water Resources, Staffordi

APPLICATION REVIEW INFORMATION

NAME McPherson BPU
ADDRESS 401 West Kansas Ave.
McPherson, KS 67460

APPLICATIONS. 47955, 47956, 47957
NEW APPL. 3 New Municipal Wells
COUNTY Harvey TRACT: South Half
WELL LOCATION S32 T22S R3W
WELL SPACING D>660', ND>1320'

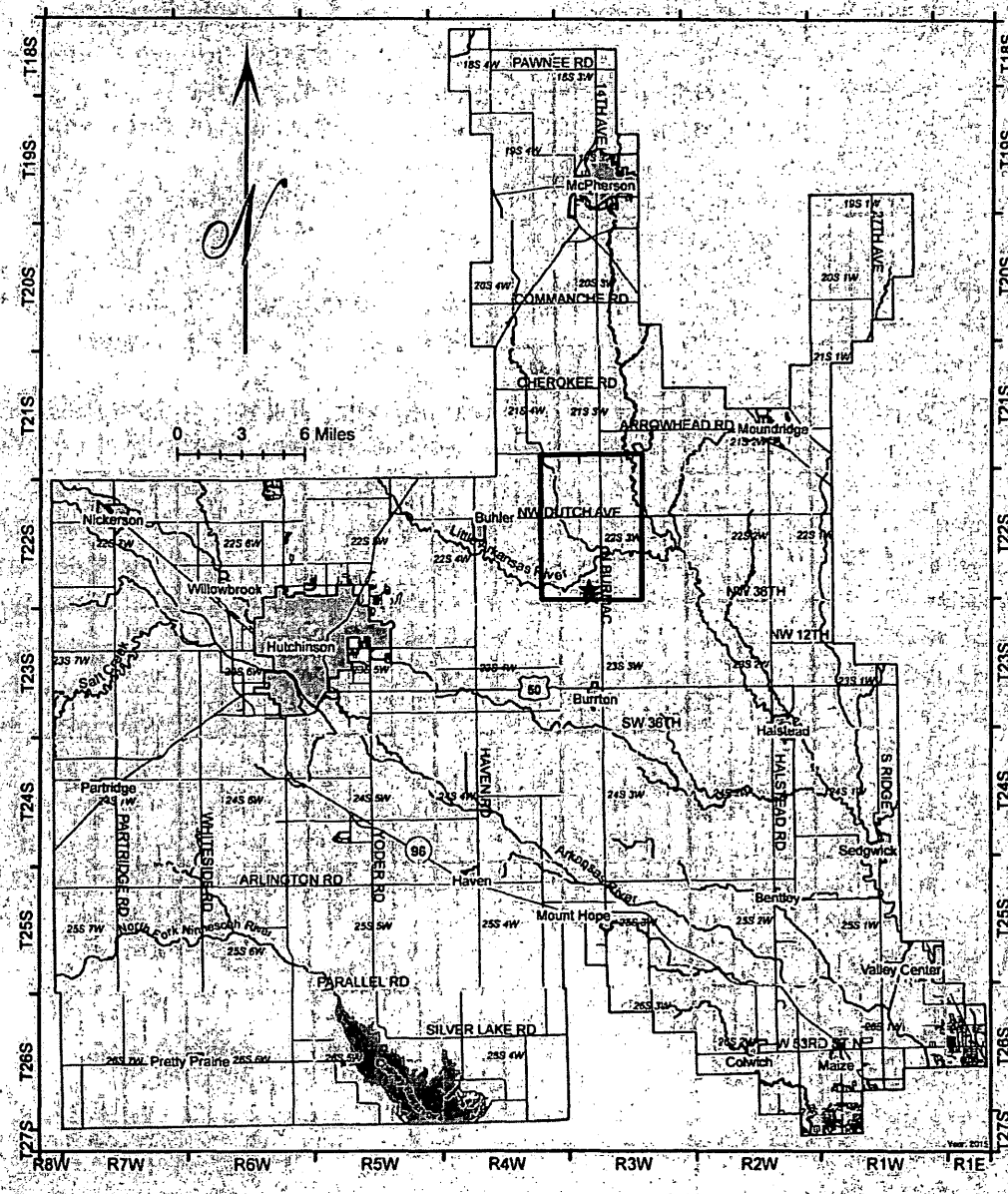


Figure 1. General location of application within the District indicated by the red star. Hollow-Nikkel Special Water Quality Use Area outlined in red.

ISSUE: Applications are within the boundaries of the Hollow-Nikkel SWQUA and do not comply with the maximum reasonable quantity outlined in 5-22-14(f).

TIMELINE OF EVENTS:

September 17, 1986 — The Hollow-Nikkel Special Water Quality Use Area was established largely as a result of oil field brine disposal in the 1930's and 1940's.

October 5, 2011 — The applicant filed 3 applications to appropriate groundwater for municipal use in Section 32 Township 22 South, Range 3 West.
Application #47955 proposes 2574 acre feet at 1750 GPM
Application #47956 proposes 2674 acre feet at 1750 GPM, with a limitation of 2674 acre feet when combined with # 47955.
Application # 47957 proposes 2909 acre feet at 2000 GPM, with a limitation of 2909 acre feet when combined with #47955 #47956.
The proposed points of diversion are located at the southern edge of the Hollow-Nikkel SWQUA (Figure 1)

February 13, 2013 to September 30, 2016 — The applicant's consultant (Burns and McDonnell) worked on and submitted documentation to support the proposal

October 3, 2016 — The applicant, the applicant's consultant, and the Division of Water Resources were notified that the appeal will be reviewed at the October 11th Board Meeting.

SUMMARY OF APPLICATION REVIEW:

The McPherson Board of Public Utilities currently obtains groundwater from wells in the McPherson IGUCA. Groundwater levels as recorded from 2000 to 2015 have declined an average of .75 feet per year (Figure 2). The applicant, McPherson Board of Public Utilities (BPU), seeks to divert water to reduce pumping from the McPherson IGUCA area and pump more water from an area where groundwater levels are not declining and where there is potential to supply water for the future population projections. The applicant seeks to pipe the water to McPherson for municipal use within the City of McPherson and immediate vicinity, City of Windom and immediate vicinity and within the areas served by Rural Water District No. 2, 3, 4, McPherson County, Kansas including customers along the pipeline which serves the City of Windom.

Change in Static Water Levels
1980-2015

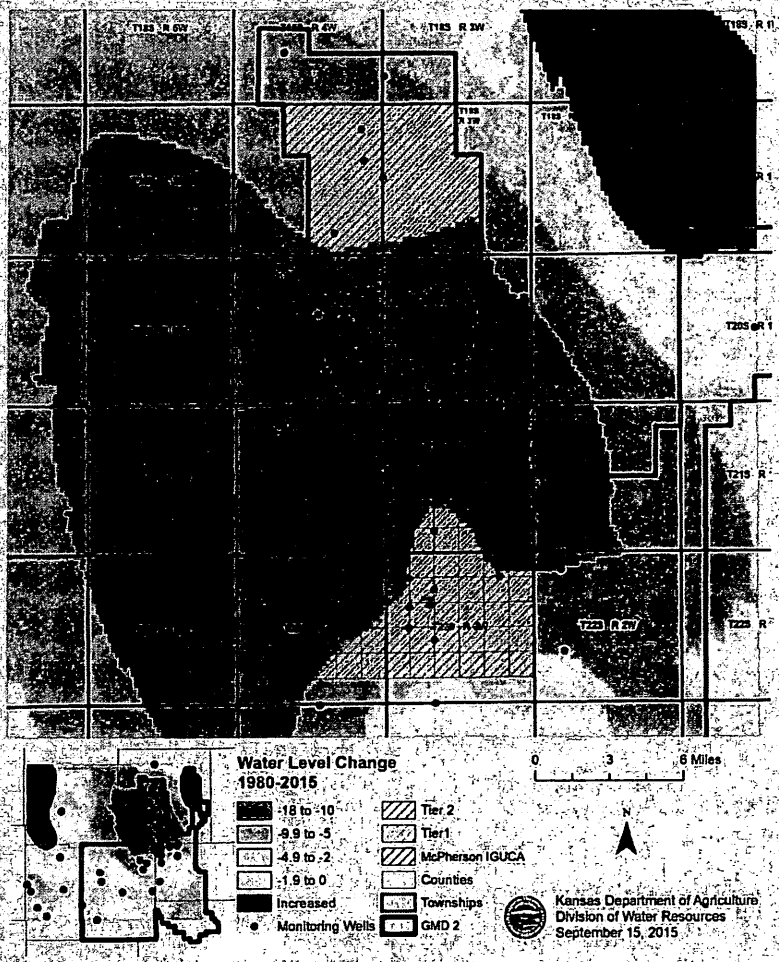


Figure 2. Map of static water level change from 1980 to 2010

The Division of Water Resources (DWR) received one call and no letters from nearby well owners.

Application #47955 proposes 2754 AF/Y at 1750 gallons per minute from a proposed well located 660'N & 4590'W;
Application #47956 proposes 2674 AF/Y at 1750 gallons per minute, with a limitation of 2674 AF/Y when combined with #47955 from a proposed well located 660'N & 2640'W;
Application #47957 proposes 2909 AF/Y at 2000 gallons per minute, with a limitation of 2909 AF/Y when combined with #47955 and #47956 from a proposed well located 1320'N & 363'W;
of the Southeast Corner of Section 32, Township 22 South, Range 3 West, Harvey County (Figure 1, 3).

The three applications comply with the Safe Yield Regulation 5-22-7(a). The existing and proposed consumptive appropriations total 4021 AF/Y in the application's area of consideration for each application (Tables 1-3). The maximum allowable appropriation for each area of consideration is 4021 AF/Y.

SAFEYIELD EVALUATION #47955							
LOCATION: SWSWSW (660'N & 4590'W) 32-22S-03W, Harvey County							
SPECIAL USE AREA: HOLLOW-NIKKEL SWQUA							
EVALUATION DATE:- 10/3/2016							
Total Areas: 8,042 acres; Area in 3 inch discharge zone: 0 acres; Area in 6 inch discharge zone: 8,042 acres							
FILE_ID	WELL_ID	TOWNSHIP	RANGE	SECTION	QUALIFIER	USE	AUTHQUANTITY
A01736300	1368	22S	03W	29	40532836	IRR	92
A02930900	1239	22S	03W	29	40532836	IRR	60
A03005000	1892	22S	03W	30	28000050	IRR	190
A03653500	1126	22S	03W	30	29403817	IRR	224
A03653600	1896	22S	03W	30	29403817	IRR	11
A03709000	423	22S	03W	29	40532836	IRR	30
A04213200	2261	22S	03W	29	40532836	IRR	140
A04795500	3868	22S	03W	32	6604590	MUN	2574
A04795600	3869	22S	03W	32	6602640	MUN	0
A04795700	3870	22S	03W	32	13200363	MUN	0
AM045	1949	22S	04W	36	46003950	BF	50
AM046	1950	22S	04W	36	47752600	BF	50
AM047	1951	22S	04W	36	40501400	BF	50
AM048	1952	22S	04W	36	35000200	BF	50
AM049	1953	22S	03W	31	29004050	BF	50
AM050	1954	22S	03W	31	40003250	BF	50
AM051	1955	22S	03W	31	45002000	BF	50
AM052	1956	22S	03W	31	51250850	BF	50
AM053	1957	22S	03W	30	9000175	BF	50
AM054	1958	22S	03W	29	14504225	BF	50
AM055	1959	22S	03W	29	20753000	BF	50
AM056	1960	22S	03W	29	25751750	BF	50
AM057	1961	22S	03W	29	39001600	BF	50
AM058	1962	22S	03W	29	51751650	BF	50
Allowable Appropriations	4,021.00		Total Existing Appropriation				4,021.00
Small User Quantity	0		Non Consumptive Appropriations				0
Remaining SUQ	45		Consumptive Appropriations				4,021.00
Note- Values are in acre-feet			Available Appropriations				0

Table 1. Safe yield results at proposed well site for permit # 47955. Sum of consumptive appropriations includes permit # 47955. See Figure 2 for Location

SAFEYIELD EVALUATION #47956							
LOCATION: SESESW (661'N & 2640'W) 32-22S-03W, Harvey County							
SPECIAL USE AREA: HOLLOW-NIKKEL SWQUA							
EVALUATION DATE:- 10/4/2016							
Total Areas: 8,042 acres; Area in 3 inch discharge zone: 0 acres; Area in 6 inch discharge zone: 8,042 acres							
FILE_ID	WELL_ID	TOWNSHIP	RANGE	SECTION	QUALIFIER	USE	AUTHQUANTITY
A01736300	1368	22S	03W	29	40532836	IRR	92
A02930900	1239	22S	03W	29	40532836	IRR	60
A03005000	1892	22S	03W	30	28000050	IRR	190
A03653500	1126	22S	03W	30	29403817	IRR	224
A03653600	1896	22S	03W	30	29403817	IRR	11
A03709000	423	22S	03W	29	40532836	IRR	30
A04213200	2261	22S	03W	29	40532836	IRR	140
A04795500	3868	22S	03W	32	6604590	MUN	2574
A04795600	3869	22S	03W	32	6602640	MUN	100
A04795700	3870	22S	03W	32	13200363	MUN	0
AM047	1951	22S	04W	36	40501400	BF	50
AM048	1952	22S	04W	36	35000200	BF	50
AM049	1953	22S	03W	31	29004050	BF	50
AM050	1954	22S	03W	31	40003250	BF	50
AM051	1955	22S	03W	31	45002000	BF	50
AM052	1956	22S	03W	31	51250850	BF	50
AM053	1957	22S	03W	30	9000175	BF	50
AM054	1958	22S	03W	29	14504225	BF	50
AM055	1959	22S	03W	29	20753000	BF	50
AM056	1960	22S	03W	29	25751750	BF	50
AM057	1961	22S	03W	29	39001600	BF	50
AM058	1962	22S	03W	29	51751650	BF	50
Allowable Appropriations	4,021.00		Total Existing Appropriation				4,021.00
Small User Quantity	0		Non Consumptive Appropriations				0
Remaining SUQ	45		Consumptive Appropriations				4,021.00
Note- Values are in acre-feet			Available Appropriations				0

Table 2. Safe yield results at proposed well site for permit # 47956. Sum of consumptive appropriations includes permit # 47955 and # 47956 and appropriate limitation clause. See Figure 2 for Location

SAFEYIELD EVALUATION #47957							
LOCATION: NESESE (1321'N & 363'W) 32-22S-03W, Harvey County							
SPECIAL USE AREA: HOLLOW-NIKKEL SWQUA							
EVALUATION DATE:- 10/4/2016							
Total Areas: 8,042 acres; Area in 3 inch discharge zone: 0 acres; Area in 6 inch discharge zone: 8,042 acres							
FILE_ID	WELL_ID	TOWNSHIP	RANGE	SECTION	QUALIFIER	USE	AUTHQUANTITY
A01736300	1368	22S	03W	29	40532836	IRR	92
A02930900	1239	22S	03W	29	40532836	IRR	60
A03005000	1892	22S	03W	30	28000050	IRR	190
A03709000	423	22S	03W	29	40532836	IRR	30
A04213200	2261	22S	03W	29	40532836	IRR	140
A04795500	3868	22S	03W	32	6604590	MUN	2574
A04795600	3869	22S	03W	32	6602640	MUN	100
A04795700	3870	22S	03W	32	13200363	MUN	235
AM048	1952	22S	04W	36	35000200	BF	50
AM049	1953	22S	03W	31	29004050	BF	50
AM050	1954	22S	03W	31	40003250	BF	50
AM051	1955	22S	03W	31	45002000	BF	50
AM052	1956	22S	03W	31	51250850	BF	50
AM053	1957	22S	03W	30	9000175	BF	50
AM054	1958	22S	03W	29	14504225	BF	50
AM055	1959	22S	03W	29	20753000	BF	50
AM056	1960	22S	03W	29	25751750	BF	50
AM057	1961	22S	03W	29	39001600	BF	50
AM058	1962	22S	03W	29	51751650	BF	50
AM059	1963	22S	03W	20	7750675	BF	50
Allowable Appropriations	4,021.00		Total Existing Appropriation				4,021.00
Small User Quantity	0		Non Consumptive Appropriations				0
Remaining SUQ	45		Consumptive Appropriations				4,021.00
Note- Values are in acre-feet			Available Appropriations				0

Table 3. Safe yield results at proposed well site for permit #47957. Sum of consumptive appropriations includes permit # 47955, #47956, and #47957 and appropriate limitation clauses. See Figure 2 for Location.

The proposed points of diversion meet spacing to nearby domestic and non-domestic wells (Figure 3).

Equus Beds Groundwater Management District No. 2

SPACING EVALUATION No. 47956

SESW (660'N & 2640'W) 32-22S-03W, Harvey County

Prepared By: Stephen Flaherty Date: 10/4/2016

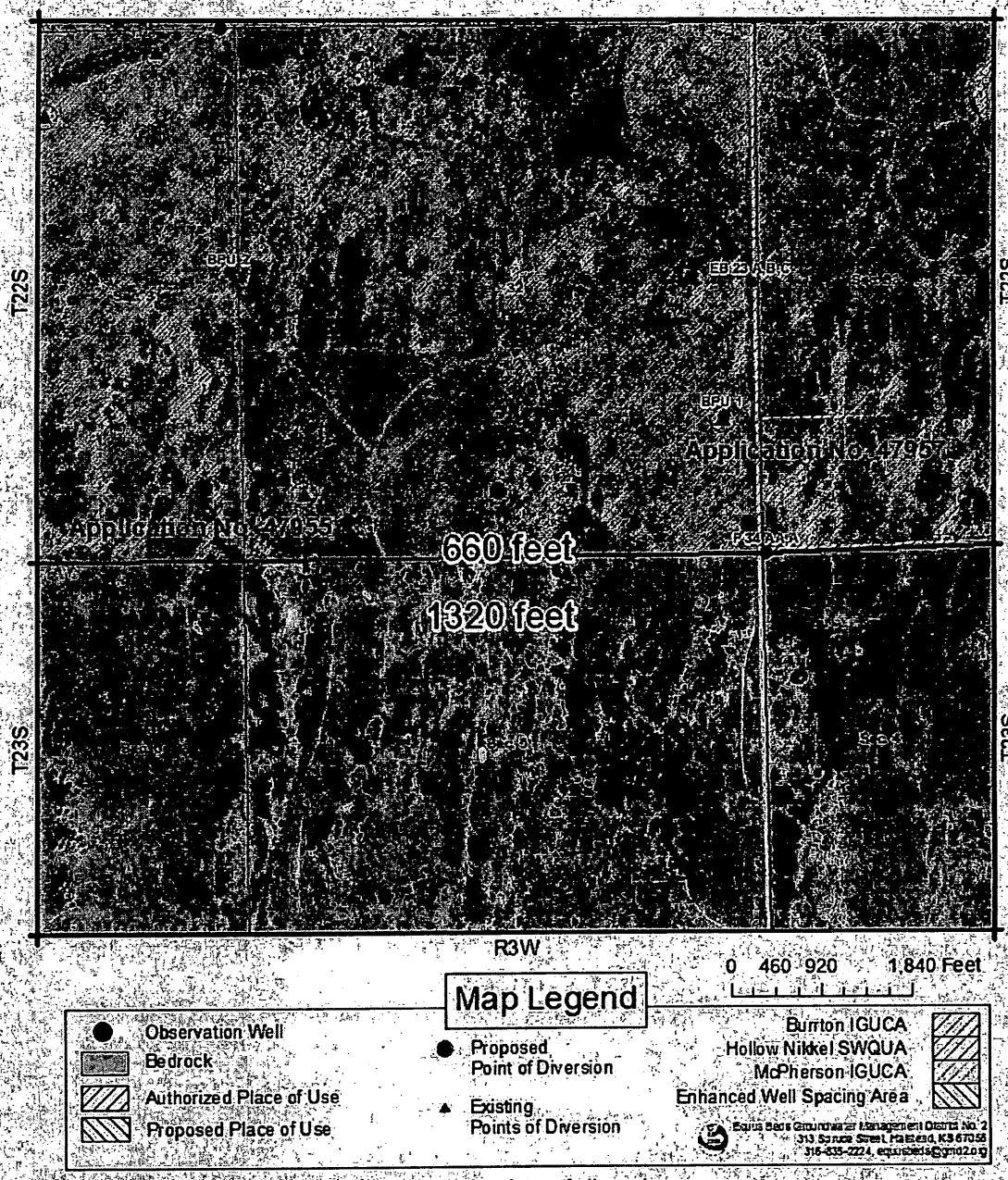


Figure 3 Spacing evaluation map of the proposed points of diversion.

The applications do not comply with the District's Maximum Reasonable Quantity for Beneficial Use Rule and Regulation 5-22-14(f). Pursuant to this regulation, unless the applicant can demonstrate a projected deviation from actual population trends, the annual quantity of water for municipal use shall not exceed the lesser of:

1. 200 gallons per capita per day; or
2. 110% of the last three year's average per capita per day usage times 365 days per year times the population projection 20 years after the application is filed, plus projected industrial use .

Given the City of McPherson's unique elevated number of water intensive usage industries, District staff recommends that method No. 2 be used to determine the maximum allowable quantity for the McPherson BPU.

McPherson BPU current existing water rights total 4,605 AF/Y. Application #47955, 47956, 47957 total 2,909 AF/Y. If approved without limitation, this would equal 7,514 AF/Y.

The applicant's consultant provided information regarding historic water use and demand projections (Attachment 1). The last three years (2013-2015) average per capita use for the McPherson BPU is 151 gallons per day and the projected population in 2035 is 16,473. Although the applications were filed in 2011, staff recommends using 2015 as the starting point for population projection, since the applications have been held for 5 years.

151 gallons per capita per day X 110% = 166 gallons per capita per day. 166 gallons per capita per day X 365 days X 16,473 = 3063 AF/Y. 2035 projected industrial use based on 2% industrial growth = 1932 AF/Y. Total water demand in 2035 = 4995 AF/Y. The applicant is also requesting an additional 15% of water due to possible water treatment requirements (such as Reverse Osmosis). However, there is not a specific current need identified by the applicant and appears to only represent a possible future requirement.

The applicant is requesting that a 50 year (through 2065) projected water use be used, instead of the 20 year projection outlined in K.A.R. 5-22-14(f). Due to the unique nature of the applications, including the investment in infrastructure (wells, pipeline, booster pumps, etc) that must be made for this project, staff recommends a longer water use projection period be allowed with an initial limitation clause of 4995 AF/Y through the year 2035. After the year 2035 and upon demonstration by the applicant satisfactory to the District and Chief Engineer that additional water is needed due to the population projections and industry water use projections being consistent with the information provided with the original applications, the Chief Engineer will modify the initial limitation to meet the projected water use for another 20 years or longer, not to exceed the total time allowed to perfect the water rights. Additionally, upon demonstration by the applicant satisfactory to the District and Chief Engineer that additional water is needed due to required water treatment, the Chief Engineer will modify the limitation to meet the increased projected water use.

REVIEW OF SUBMITTED REPORTS:

May 12, 2008 – Ground Water Associates (GWA) conducted a hydrogeologic study by drilling several test wells and installing one five-inch well near the center of Section 32 Township 22 South Range 3 West and performing a pumping test at 87 GPM for 210 minutes (Attachment 2). The study concluded that "There is a very significant volume of good quality water in storage under each section of land in the area of interest..." (GWA, Ground Water Investigation, 2008)

May 15, 2014 – Kansas Geological Survey (KGS) conducted a hydrogeologic study entitled "Characterization of the Chloride Contamination Plume in the Hollow-Nikkel Area of Equus Beds Groundwater Management District No. 2". Water quality data from at least 21 observation wells supported this study. The Chloride plume is located north of the Little Arkansas river and was modeled in three dimensions. The report concludes: that the plume is not migrating appreciably in a lateral direction; and that the plume concentration has not substantially changed within the last 10 years and is expected to remain at its current concentration for the near future (Whittemore, 2010).

February 2016 – Burns and McDonnell (BMcD) conducted a study entitled "South Well Field Groundwater Model" in which the structure of the USGS groundwater model was used to estimate the effects of pumping from the three proposed wells. The Hollow-Nikkel plume was also added into this model. Simulation results indicated that pumping would not affect the plume migration and that the rate and quantity of requested water is achievable at the proposed locations. As part of this study the McPherson BPU installed 7 observation wells identified as BPU 1-7 on Figure 4.
GMD2 Staff recommended that certain parts of the study be revisited including chloride contours, head measurements, and observation well data from 2008 to present.

May 2016 – The BMcD model was revisited and corrections were submitted to GMD2 Staff (Attachments 3).

HYDROGEOLOGIC REVIEW:

The proposed well locations are on the north flank of the sand hills (Figure 4). A well log was submitted with the application and identifies three significant clay units in excess of 34 feet in thickness with interbedded fine to coarse sands. Static water level was measured at 31.1 feet below land surface (Attachment 4). Depth to bedrock ranges from 244 to 258 feet below land surface. Saturated thickness is approximately 223 ft including clay intervals. Well logs and cross sections also indicate that a perched aquifer exists at this location (Attachment 4). Groundwater levels in the area of the application display an increasing trend since the first measurement began in 2012 (Graph 1).

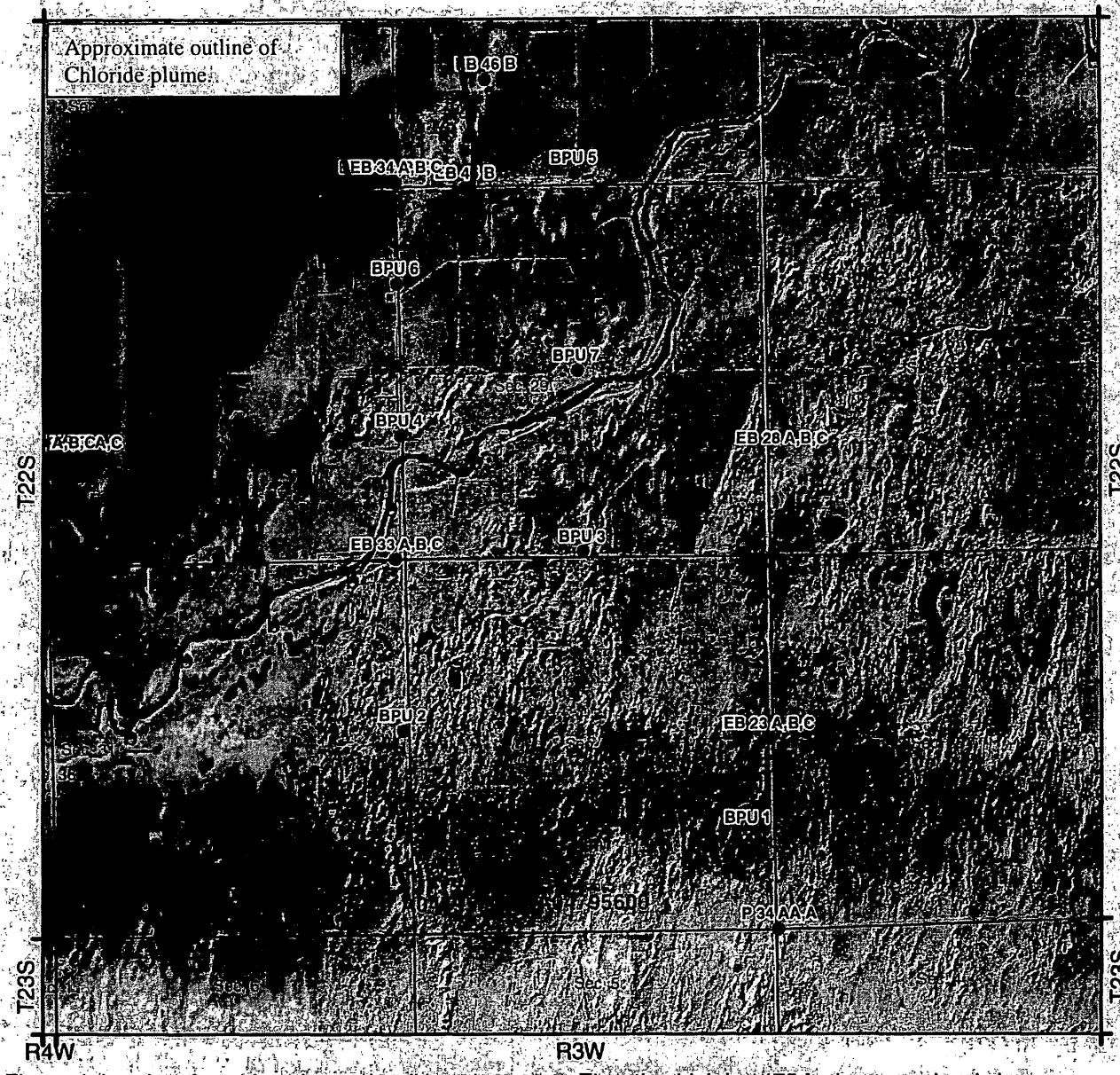
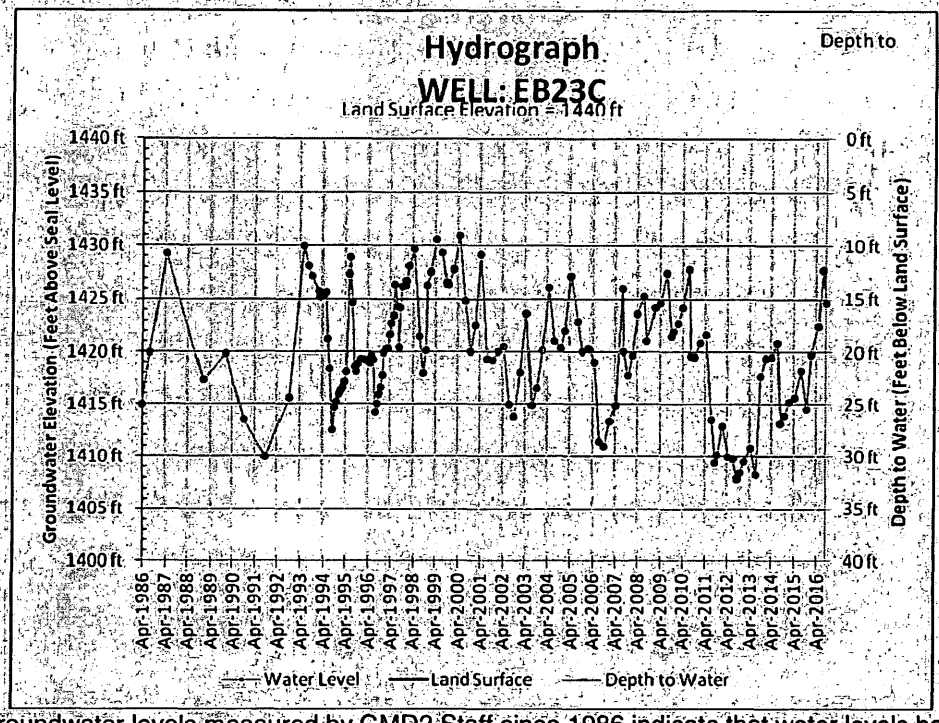


Figure 4. Land surface elevation and well locations map. Elevation high is 1475 ft above sea level shown in white and the low is 1425 feet shown in green. BPU owned observation wells labeled as BPU #. Three wells proposed by the application are labeled as A04795500, A04795600, and A04795700.



Graph 1. Groundwater levels measured by GMD2 Staff since 1986 indicate that water levels have remained within a 20 foot range and have rovered over 15 feet since the 2011 and 2012 drought. See Figure 4 for location.

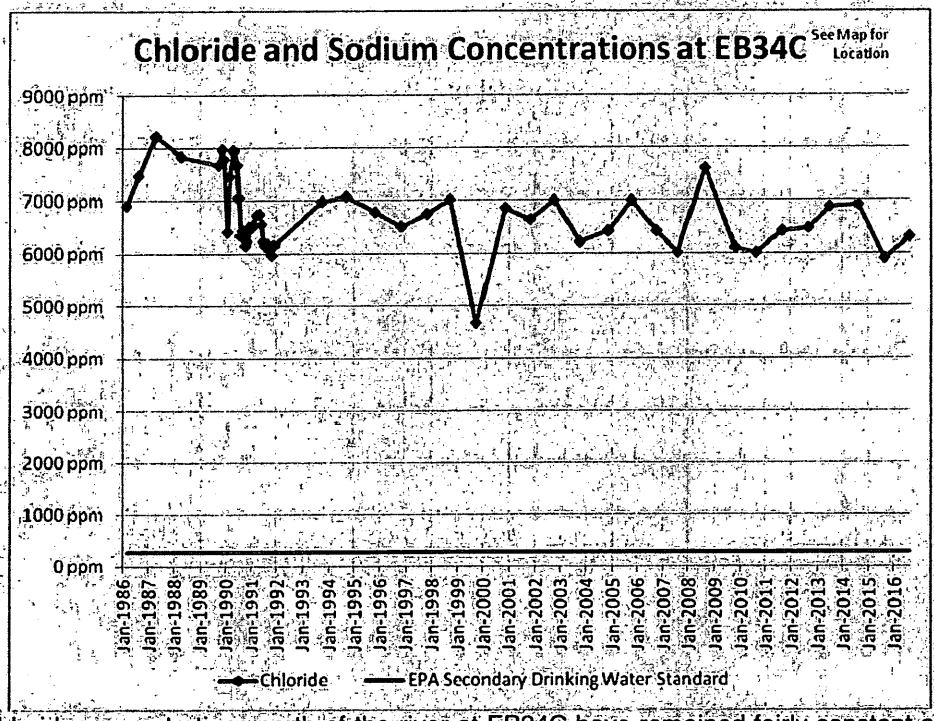
The southern edge of the Hollow-Nikkel Chloride plume is approximately 1.7 miles north of the proposed pumping wells. Chlorides have been found in excess of 6000 ppm at EB34C which is approximately 1.9 miles north of the proposed wells.

Burns and McDonnell (BMcD) submitted 2015 groundwater level contours of the area as well as contours of the chloride plume (Attachments 2-4).

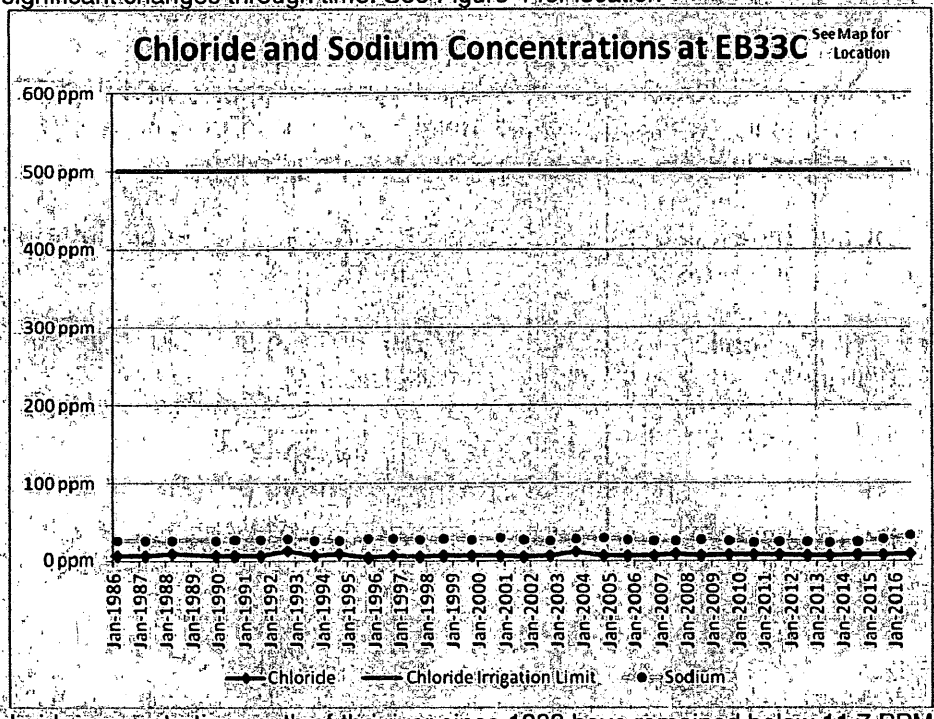
Groundwater samples collected in 2013 and 2015 indicate that Chloride concentrations at the BPU observation wells are below 10 PPM (Table 4).

	July 2013 Sample (PPM)	June 2015 Sample (PPM)
BPU 1	3.1	2.5
BPU 2	4.1	3.2
BPU 3	6.5	5.1
BPU 4	5.3	4.1
BPU 5	5.7	4.2
BPU 6	5.3	4.3
BPU 7	5.1	4.0

Table 4. Chloride concentrations at the BPU owned observations wells sampled by Continental Analytical Services. See Figure 4 for locations.



Graph 2. Chloride concentrations north of the river at EB34C have remained fairly constant and does not display any significant changes through time. See Figure 4 for location



Graph 3. Chloride concentration south of the river since 1982 have remained below 11.7 PPM. See Figure 4 for location

Burns and McDonnell submitted a Theis drawdown calculation which estimated less than 1 foot of drawdown at 9000 ft from the pumping well using the following parameters:
Q = 1800 GPM
S = .15
T = 50000 g/d/ft
T = 365 d

STAFF RECOMMENDATIONS:

Based on the following District findings that:

1) The municipal well locations proposed by Application #47955, #47956, and #47957 are located in the southern edge of the Hollow-Nikkel SWQUA.
2) Application #47955, #47956, and #47957 propose a total quantity of 2909 acre-feet per year.
3) The applications comply with the District's Safe Yield Regulation K.A.R. 5-22-7(a);
4) The applications comply with the District's Well Spacing Regulation K.A.R. 5-22-2(a).
5) The boundaries of the chloride plume in the Hollow-Nikkel SWQUA are well defined by the Kansas Geological Survey (KGS).
6) An aquifer test was conducted by Ground Water Associates.
7) Burns and McDonnell (BMcD) conducted a study to estimate the effects of pumping from the three proposed wells. Model simulation results indicated that pumping would not affect the plume migration and that the rate and quantity of requested water is achievable at the proposed locations.
8) Chloride concentrations have not exceeded 11.7 ppm at well EB33C or 5.3 ppm at BPU 6;
9) The chloride concentrations at EB33C has remained between 11.7 ppm and 3 ppm since 1986;
10) Groundwater modeling and hydrogeologic tests indicate that the zone of capture from the applications' proposed rates and quantities does not reach the plume.
11) The McPherson Board of Public Utilities has installed and maintains 7 observation wells located between the proposed municipal well locations and the chloride plume.
12) According to the KGS, the southern edge of the Hollow-Nikkel chloride contaminant plume is located approximately 1.75 – 2 miles north–northwest of the proposed wells.
13) The plume is not significantly moving in any lateral direction according to the KGS.
14) Groundwater levels in the vicinity of the applications have remained stable since 1986 as measured at monitoring well EB 23C.
15) The exact impacts of the proposed pumping are unknown without a full scale pumping test.

16) The applications do not comply with the District's Maximum Reasonable Quantity for Beneficial Use Rule and Regulation 5-22-14(f), as the applicant is requesting that a longer period than 20 years be used for projecting water use demand and justifying the quantity of water requested.

17) Due to the unique nature of the applications, including the significant investment in infrastructure required including well construction, pipeline installation, etc, a longer than 20 year water demand projection is reasonable.

18) The current McPherson BPU municipal wells are located in the McPherson IGUCA and are experiencing long-term groundwater declines.

19) If the proposed applications are approved, the 2909 acre-feet per year authorized by the applications could be used to reduce the amount of water pumped by the McPherson BPU's existing wells located in the McPherson IGUCA, thus assisting in stabilizing the groundwater levels in that portion of the McPherson IGUCA.

Staff recommends that the applications be granted an exception to the Maximum Reasonable Quantity for Beneficial Use Rule and Regulation 5-22-14(f) and the applications be recommended for approval, subject to the following conditions:

1) The implementation of a District developed groundwater monitoring plan, including water-level and water quality monitoring, at the applicant's expense.

2) The existing monitoring well network of the seven existing monitoring previously installed by McPherson BPU be maintained and incorporated into the groundwater monitoring plan.

3) The constructed wells be equipped with a sample port or ports for water sample collection.

4) Water samples be collected from the points of diversion prior to initial operation, and analyzed by a State accredited water quality laboratory to include inorganic analysis comprised of metals and minerals and including chloride, sodium, and specific conductance and drinking water suitability interpretation.

5) The results of a rigorous 72 hour pumping test simulating maximum authorized pumping rates indicating that drawdown will not exceed 1 foot of drawdown at EB33A, B, or C. Details of the pumping test to be determined between District staff McPherson BPU, and the applicant's consultant.

6) The permits shall be subject to Board review if the groundwater monitoring plan indicates, as determined by the District staff, that the operation of the proposed wells are impacting the chloride plume.

7) Application #47955 is authorized for 2574 acre feet per year at 1750 GPM.

8) Application #47956 is authorized for 2674 acre feet per year at 1750 GPM, and further limited to 2674 acre feet per year when combined with #47955.

9) Application #47957 is authorized for 2909 acre feet per year at 2000 GPM, and further limited to 2909 acre feet per year when combined with #47955 #47956.

10) The approved applications are further limited to 4995 acre-feet per year when combined with the McPherson BPU's existing water rights through the year 2035. After the year 2035, and upon demonstration by the applicant satisfactory to the

District and Chief Engineer that additional water is needed due to the population projections and industry water use projections being consistent with the information provided with the original applications, the Chief Engineer will modify the initial aggregate quantity limitation to meet the projected water use for another 20 years or longer, not to exceed the total time allowed to perfect #47955, #47956, and #47957. Additionally, upon demonstration by the applicant satisfactory to the District and Chief Engineer that additional water is needed due to required water treatment, the Chief Engineer will modify the aggregate quantity limitation to meet the increased projected water use.

Memorandum

BURNS McDONNELL

Date: March 14, 2016

To: Tim Maier

From: Daniel Clement

Subject: Historic Water Use and Projected Water Demand

The McPherson Board of Public Utilities (BPU) recently filed three new applications to appropriate groundwater in northern Harvey County, Kansas (Application Nos. 47955, 47956 and 47957). As part of filing for this additional water supply, the State of Kansas Division of Water Resources (DWR) requires that a municipal water supplier qualify the requested quantity based on a reasonable need and anticipated future demands.

For BPU this means projecting growth based on increases in population, additional industrial development, and anticipated water treatment changes. The Groundwater Management District No. 2 (GMD2) currently defines the methodology for projecting a reasonable annual quantity for municipal use under K.A.R. 5-22-14(f).

K.A.R. 5-22-14(f):

(f) Unless the applicant demonstrates a projected deviation from actual population trends, a reasonable annual quantity of water for municipal use shall not exceed the lesser of the following:

(1) 200 gallons per capita per day; or

(2) 110 percent of the last three years' average per capita per day usage, excluding industries that use over 200,000 gallons per year, times 365 days per year, times the projected population for the twentieth year after the application is filed, plus reasonable projected water use for industries that use over 200,000 gallons per year. Population projections shall be made using one of the following:

(A) Accepted statistical methods using historic population trends for the applicant; or

(B) Data from the U.S. census bureau, Kansas water office population projections, or the Kansas census bureau. Projected deviations from historic population trends shall be justified by the applicant.

Population Growth & Gallons Per Capita Per Day

Historic and projected population data for the City was gathered from the US Census Bureau (Census) and Kansas Water Office (KWO). In 1999 the KWO completed a study that utilized the relationship between water use and census data as a methodology to project future population. The procedure and findings developed by the KWO were later endorsed as the official Kansas population projections by the Kansas Division of the Budget.

Attachment 1

The KWO population projections for the City are summarized in Table 1 below. In 2015 the population of the City was estimated to be approximately 13,200. In addition to supplying the City of McPherson, BPU also supplies water to several surrounding Rural Water Districts and the City of Windom.

Table 1 - Kansas Water Office Projected Population

Year	Projected Years from 2015	KWO Projected Population
2020	5	15,108
2030	15	16,022
2035	20	16,473
2040	25	16,937
2045	30	17,379
2055	40	18,285
2065	50	19,191

Water use reports submitted to the State of Kansas by BPU were analyzed for the years 2010 through 2015 to calculate the average gallons per capita per day (GPCD) within the City. Based on the last three years of available data, the average is 151 GPCD (see Table 2 below).

Table 2 - DWR Reported Residential Water Use & Calculated GPCD

Water Use Report Year	2010	2011	2012	2013	2014	2015
Residential Use (Acre-Feet)	2105	2566	2124	2282	2017	1964
Avg. Residential Use (MGD)	1.88	2.29	1.89	2.03	1.80	1.75
GPCD	154	183	157	150	154	149

Industrial & Commercial Growth

The BPU currently supplies treated water to several critical industrial and commercial customers. This includes large regional and area employers such as: Hospira Inc, CHS McPherson Refinery, Johns Manville, Viega LLC, Chemstar Products Company, Central States MFG, and North American Specialty Products.

Attachment 1

As the BPU service area continues to experience industrial and commercial growth, raw water supply needs will continue to increase. An annual industrial development rate of 2% was selected to represent a reasonable anticipated projection of maximum future industrial and commercial water demand. The results of this projection are listed below in Table 3.

Table 3 - Projected Growth in Large Water Users (Industrial & Commercial)

Year	Projected Years From 2015	2% Growth Large Water Users (AF)	2% Growth Large Water Users MGD)	Increase From 2014 Water Use AVG (GPM)
2020	5	1,436	0.14	100
2030	15	1,750	0.42	295
2035	20	1,932	0.59	408
2040	25	2,134	0.77	532
2045	30	2,355	0.96	670
2055	40	2,872	1.43	990
2065	50	3,500	1.98	1380

Water Treatment Changes

The treatment standards and regulations for potable water continue to exhibit a movement toward stringent contaminant removal criteria. As water treatment standards become more restrictive, additional water treatment technologies will need to be implemented. Currently BPU utilizes a blending facility to normalize groundwater of varying quality from the well field to meet existing primary and secondary drinking water standards.

Water treatment technologies such as Reverse Osmosis (RO) may require implementation in the near future in order to achieve regulated removal of contaminants and to continue to provide an optimum treated water quality from new water resources. The RO process produces both a fresh highly treated water supply, and a smaller concentrated contaminant stream. Recovery rates of RO facilities vary based on influent water quality, but typically approach 75 to 80 percent of the total input quantity. The remaining portion of concentrate is then put to a beneficial use, sent to evaporation, or commonly injected into a deep disposal well. Given the percentage of raw water accounted for in the RO concentrate stream, future water treatment systems must be considered when planning for future raw water supply.

Future Water Supply Projections

Utilizing the developed data for projected population, industrial development, and anticipated water treatment changes a future water demand can be calculated utilizing the prescribed GMD2 method for calculating described under K.A.R 5-22-14(f)(2) (see Table 4).

Attachment 1

Table 4 - Projected BPU Water Demand through 2065 (50 Years)

Year	Projected Years From 2015	KWO Projected Population	Last 3 Years Average x 110% (GPCD)	2% Growth Large Water Users (AF)	Total Raw Water Demand (AF)	Total Raw Water Demand With 15% RO (AF)
2020	5	15,108	166	1,436	4,245	4,882
2030	15	16,022	166	1,750	4,729	5,439
2035	20	16,473	166	1,932	4,995	5,744
2040	25	16,937	166	2,134	5,283	6,076
2045	30	17,379	166	2,355	5,587	6,424
2055	40	18,285	166	2,872	6,272	7,213
2065	50	19,191	166	3,500	7,068	8,129

BPU currently has Water Rights totaling 4,605 acre-feet per year (AF/Year) sourced from their existing well field in McPherson County. The existing BPU wellfield is currently over appropriated and has experienced historic declines during periods of normal withdrawal. Based on the fact that existing groundwater resources in McPherson County are declining, BPU is currently in direct need of an alternative source to augment supply from a decreasing resource.

The projections in Table 4 show that with normal growth, BPU will need additional water rights by 2035 to meet potential demand utilizing existing water treatment facilities. This is the purpose of new appropriation application nos. 47955, 47956, and 47957, referred to as the South Well Field. The South Well Field (SWF) is located nearly 20 miles away from the City of McPherson, but has been shown to be a viable and sustainable source of the requested 2,909 AF/Year.

Given the cost and investment associated with running 20 miles of pipeline, and the required well field infrastructure, the SWF must be viewed with a longer planning and investment horizon than the 20 years granted by K.A.R 5-22-14(f). Water supply planning is a continuous process for a water utility, and recent history shows that a vision for water development 50 years into the future is more practical, increases reliability, and reduces long-term costs. The SWF project appears to fulfill a critical need to augment currently over appropriated resources, and provide a long term sustainable water supply.

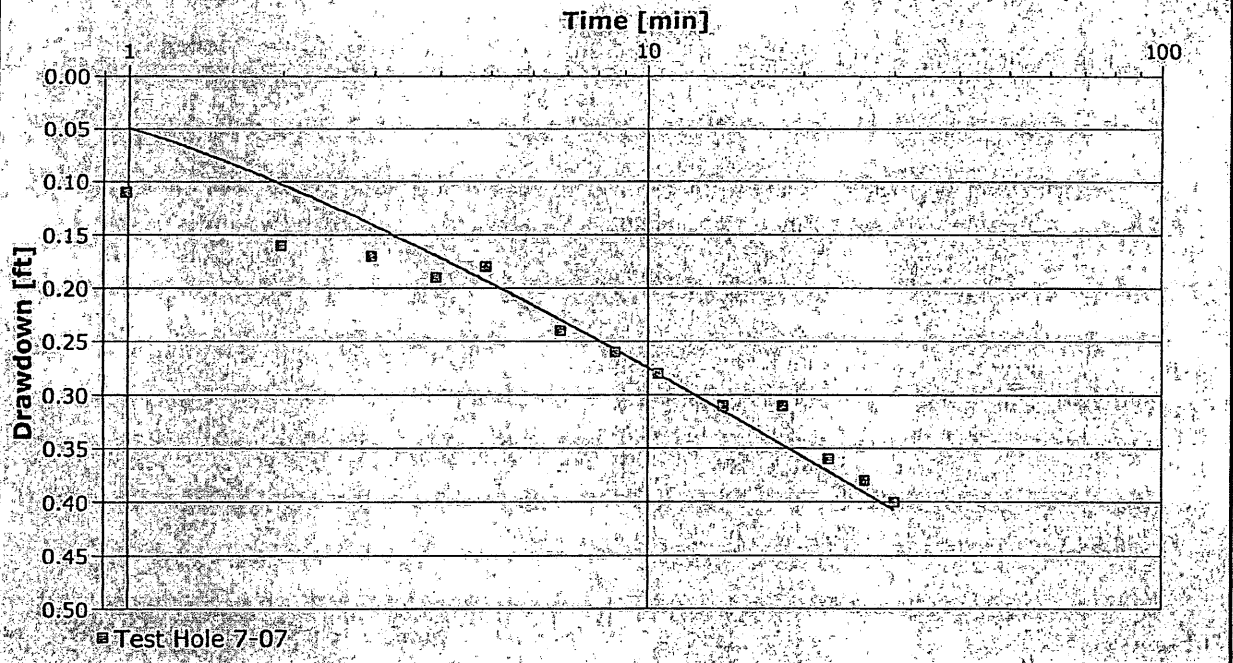
DWC/wc

Attachment 1

Attachment 1

Ground Water Associates 1999 N. Amidon, STE. 218 Wichita, Ks 67203	Pumping Test Analysis Report
	Project: Jeff Foster
	Number: TW 1-08 Pumping Test
	Client:

Location: NW NW SE Sec 32, T22S, R3W	Pumping Test: 3.5 Hr Pumping Test	Pumping well: Test Well 1-08
Test conducted by: Peterson Irrigation		Test date: 2/19/2008
Analysis performed by: Brad Vincent	Agarwal- Recovery	Date: 2/21/2008
Aquifer Thickness: 211.66 ft	Discharge: variable, average rate 86.996 [U.S. gal/min]	



Calculation after AGARWAL + Theis

Observation well	Transmissivity [U.S. gal/d-ft]	K [U.S. gal/d-ft²]	Storage coefficient	Radial distance to PW [ft]
Test Hole 7-07	7.92×10^4	3.74×10^2	3.32×10^{-2}	24.45

Attachment 2

BURNS McDONNELL

June 20, 2016

Mr. Tim Boese, Manager
Equus Beds
Groundwater Management District No.2
313 Spruce Street
Halstead, Kansas 67056

Re: Supplemental Figures for McPherson BPU South Well Field Groundwater Model

Dear Mr. Tim Boese:

Burns and McDonnell (BMcD) has developed two supplemental figures to address comments provided by the Equus Beds Groundwater Management District No. 2 (GMD2) on the South Well Field Groundwater Model (BMcD, 2016) modeling study. The GMD2 comments were transmitted via email to BMcD on April 11, 2016.

The attached Supplemental Figure 1 presents an interpretation of chloride concentrations in groundwater within the Hollow-Nikkel plume area. The data presented are chloride concentrations in groundwater from samples collected in June and August 2015. The water quality sample results shown on this figure are the deep "C" level Equus Beds (EB) monitoring wells and from the South Well Field (Foster Property) monitoring wells. These data are the most current chloride data for the Hollow-Nikkel chloride plume.

To provide clarifications related to the groundwater elevation contour maps presented in the South Well Field Groundwater Model (BMcD, 2016), the McPherson Board of Public Utilities (BPU) surveyed several monitoring wells to collect top of well casing and top of ground surface elevation data.

The results of the survey have been provided to GMD2 and revealed that varying vertical datums and sources were utilized to originally define elevations across the various sources of monitoring well data. These recently gathered survey elevations helped to refine and clarify the interpreted potentiometric surface within the groundwater model area. Supplemental Figure 2 illustrates the interpreted potentiometric surface from the within the model study area, using 2015 water level elevations.

Supplemental Figure 2 also illustrates the Hollow-Nikkel chloride plume (from Supplemental Figure 1) and the groundwater model predicted capture zone predicted with the South Well Field wells pumping at their maximum requested pumping rate (as defined in the model report). As shown, the Hollow-Nikkel chloride plume is hydraulically down gradient of the South Well Field and the model predicted capture zone does not intersect the interpreted extents of the plume.

9400 Ward Parkway \ Kansas City, MO 64114
O 816-333-9400 \ F 816-333-3690 \ burnsmcd.com

Attachment 3

BURNS McDONNELL

We hope these two supplemental figures address the comments you provided on the South Well Field Groundwater Model. Please contact me at 816-448-7591 if you have further questions or comments.

Sincerely,

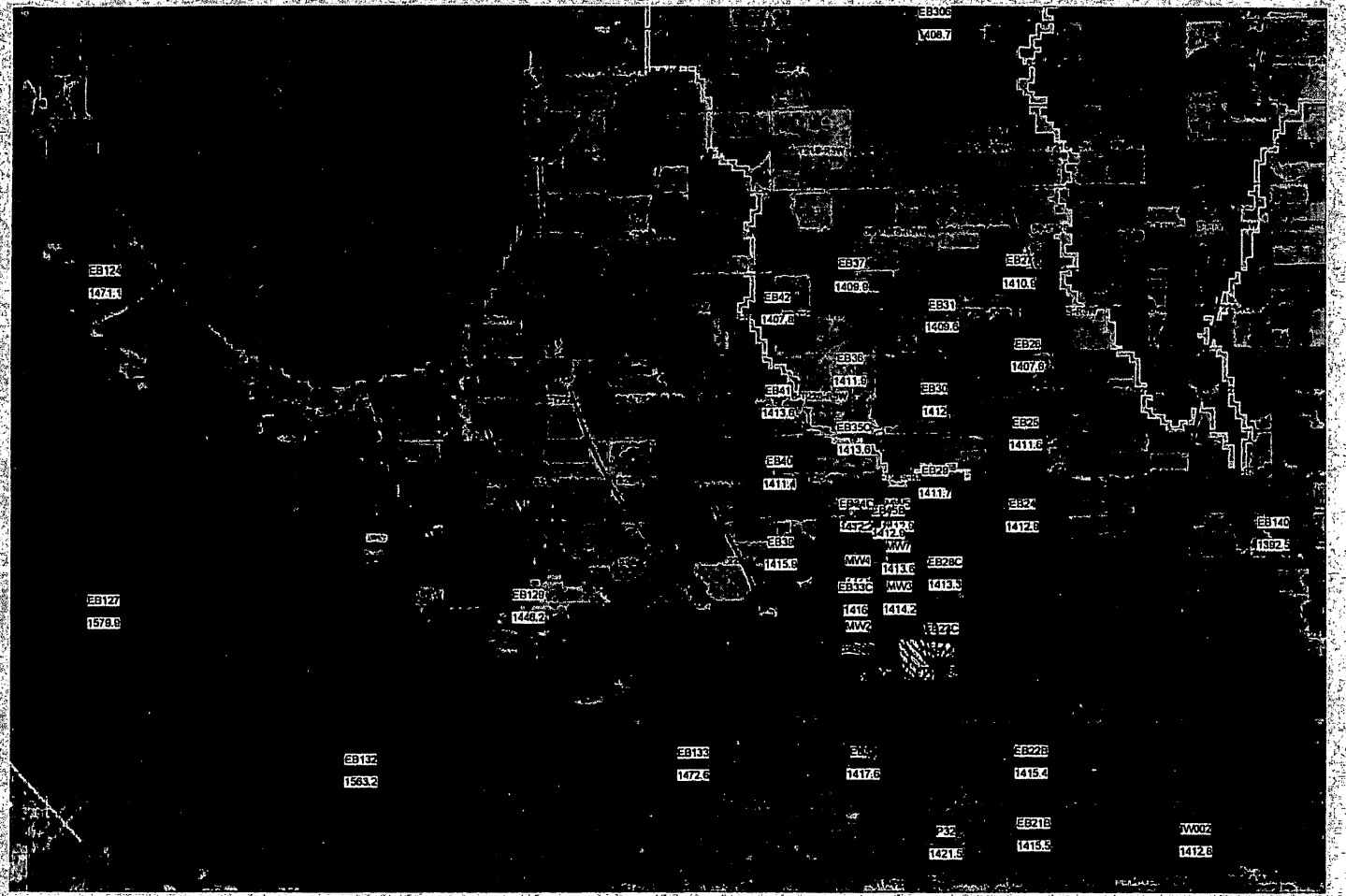
Luca DeAngelis, P.E., P.G.
Associate Geological Engineer

Brian Meier
Project Manager

LD/ld

Enclosure Attachment
cc: Tim Maier

Attachment 3



0 7000 14000

Map Scale: 1-inch = 7000 feet

BOARD OF PUBLIC UTILITIES
McPHERSON, KS

Supplemental Figure 2
Observed (April 2015) Water Level Elevations And Model Predicted Well Field Capture Zone South Well Field Groundwater Model Area

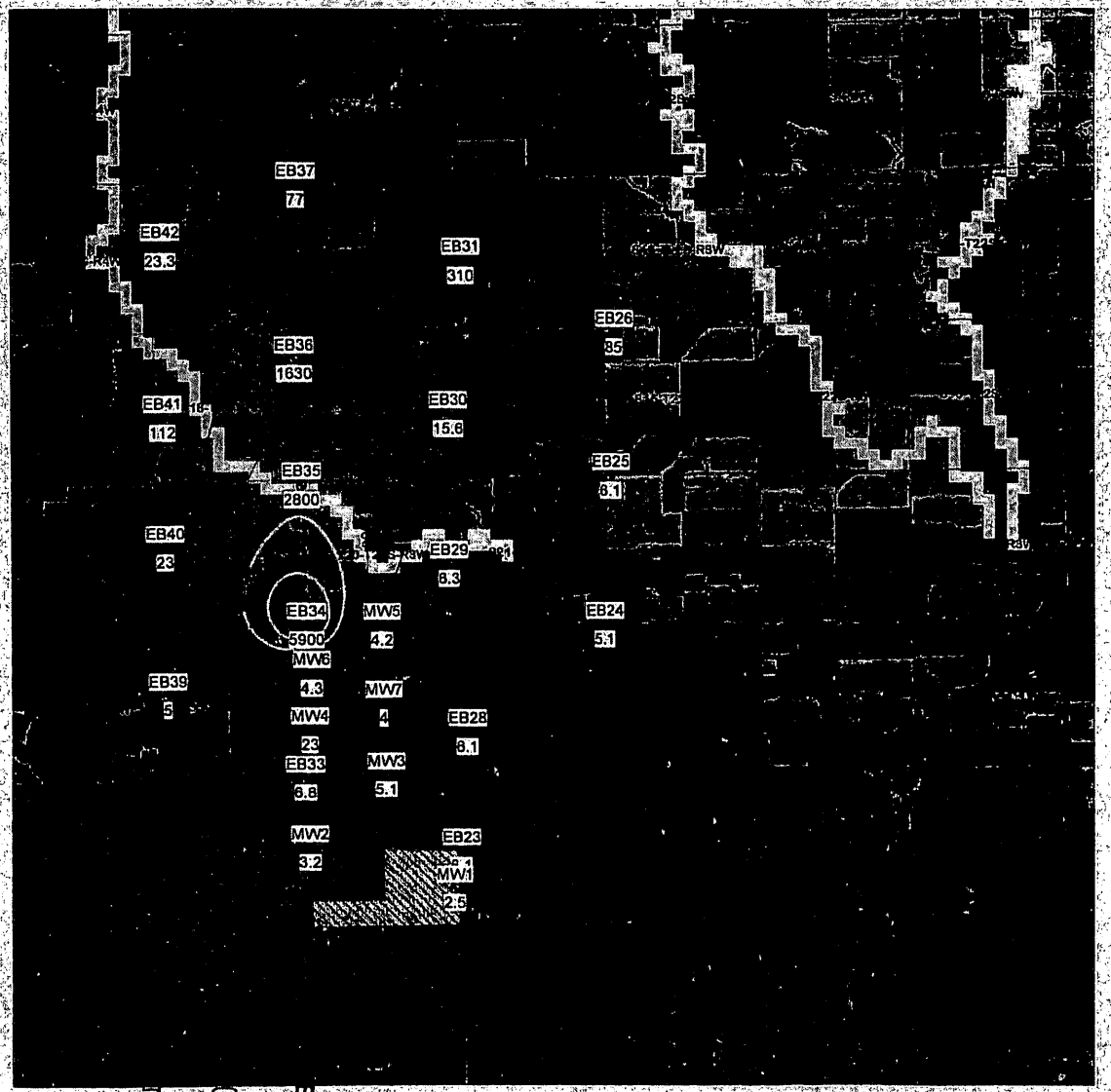
LEGEND:

- EB27 / 1410.9 — Monitoring Well with Measured Water Level Elevation (ft msl)
- Contour of Measured Water Level Elevation CI = 10 ft (April 2015 data)
- Deep Chloride Isocontours (mg/L) From Summer 2015. CI = 1000 mg/L See Supplemental Figure 1 for detail
- Model Predicted Particle Tracking Results for 30 Year Time of Travel.
- MODFLOW Drain Cell
- MODFLOW River Cell
- MODFLOW No Flow Cell

Note:
1)This figure presents observed water level elevations from April 2015, including data from the South Well Field monitoring wells.
2)The Hollow-Nikkel Chloride plume from Summer 2015 is also shown on this figure.
3)This figure shows the model particle tracking results from MODPATH. The total time of travel shown is 30 years.
4)The South Well Field wells were simulated as steady state boundaries,pumping at 600 gallons per minute.

BURNS McDONNELL

Attachment 3



BOARD OF PUBLIC UTILITIES
McPHERSON, KS

Supplemental Figure 1
Observed Chloride Concentrations Summer 2015
Hollow Nikkel and South Well Field Area

LEGEND:

EB27
2800
Monitoring Well with Measured Chloride Concentrations (mg/L)

Deep Chloride Isocontour (mg/L)
Cl = 1000 mg/L
Using EB "C" Wells

MODFLOW Drain Cell

MODFLOW River Cell

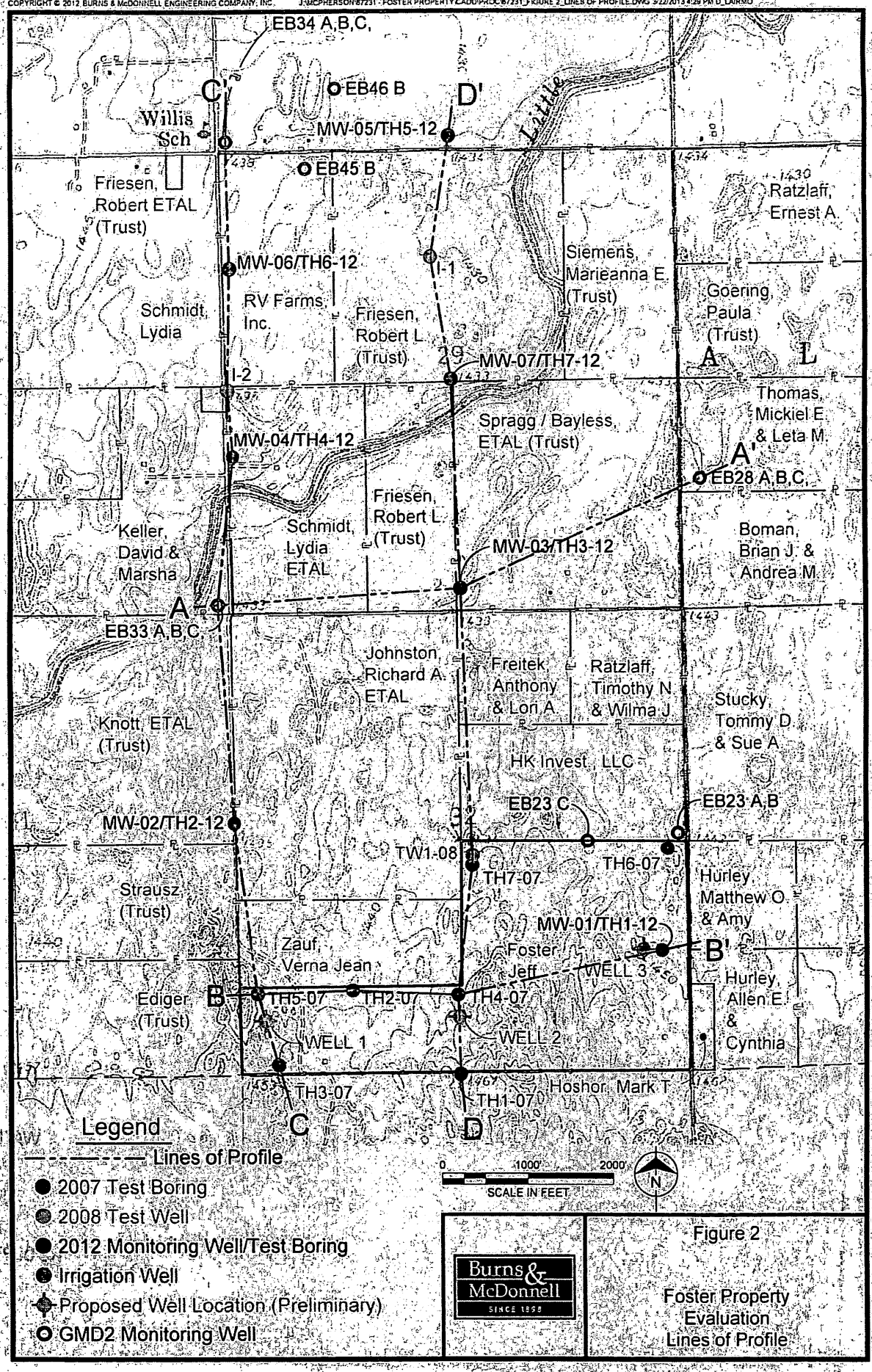
McBPU South Well Field

0 4000 8000
Map Scale: 1-inch = 4000 feet

Note:
1)This figure presents observed chloride concentrations from Summer 2015; including data from the EB monitoring wells and the South Well Field monitoring wells.
2)EB monitoring wells sampled in August 2015. South Well Field monitoring wells sampled in June 2015.

BURNS McDONNELL

Attachment 3



Burns & McDonnell SINCE 1898

Figure 2

Foster Property Evaluation Lines of Profile

Attachment 4

1 Oct 2007

Jeff Foster
Test Hole 5-07

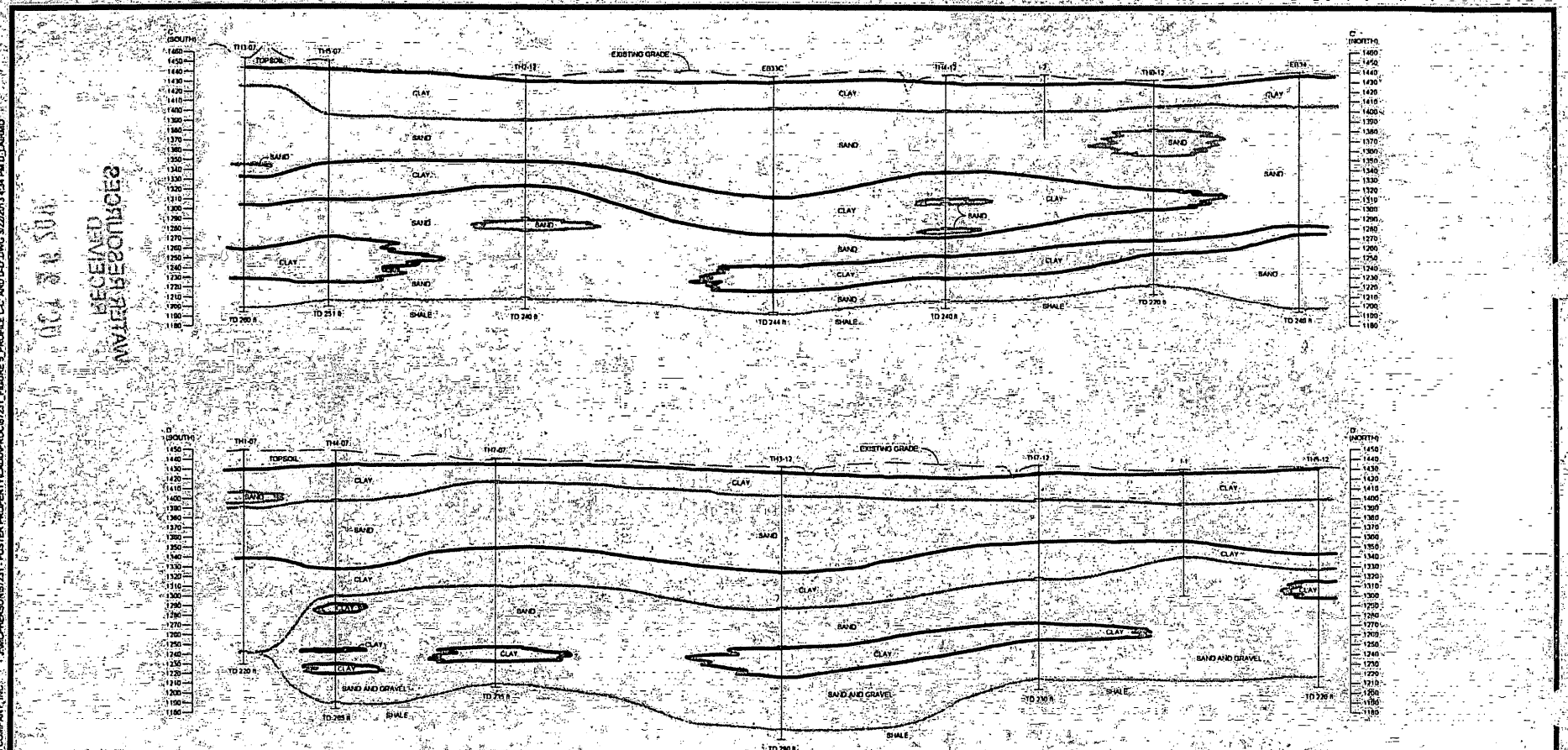
906' N & 215' E of SW cor. Section 32, T22S, R3W. Elev. 1452'
GPS N 38° 5.350' W 97° 40.986'
38.08916 -97.6831 SWL 31.10'

0 - 9'	Sand br, vf-f
9 – 21	Sand br, vf-f, so. clay gy, streaks
21 – 46	Clay lt br & lt gy, sandy
46 – 55	Clay lt br & tan &gy
55 – 75	Sand br, vf-f
75 – 104	Sand br, vf-c
104 – 110	Clay tan, sandy
110 – 117	Clay lt br & tan, sandy, cemented sand streaks, so. gravel br, f
117 – 130	Clay lt br, sandy, sand br, vf-f
130 – 137	Clay lt br & gy, silty, so. sand br, vf, streaks
137 – 140	Clay lt br & gy, silty, so. caliche layers
140 – 141	Clay lt br & gy, sandy, gravel in clay
141 – 160	Sand br, vf-f, so. clay br & lt br streaks, tight
160 – 178	Sand br, vf-c, so. clay rd-br streaks
178 - 190	Clay rd br & lt br, silty
190 – 195	Clay rd br , sandy, so. gravel br, f
195 – 205	Clay rd br & gy, sandy, so. gravel br, f
205 – 210	Clay gy- gn, silty
210 – 215	Clay rd br & gy, sandy, so. gravel br, f
215 – 220	Clay rd br & gy, sand br, m-c
220 – 225	Clay rd br, silty
225 – 244	Sand br, f-c, clay rd-br &gy streaks
244 -250	Shale rd, hard
250 – 251	Shale dk gy

Set 2" PVC . Screen 244' – 224'.

Logged by Brad Vincent, P. G., Ground Water Associates
Hand held GPS. Conus 1927 datum

Attachment 4



HORIZONTAL: 0 1000' 2000' SCALE IN FEET

VERTICAL: 0 100' 200' SCALE IN FEET V.E. = 10'

Burns & McDonnell SINCE 1898

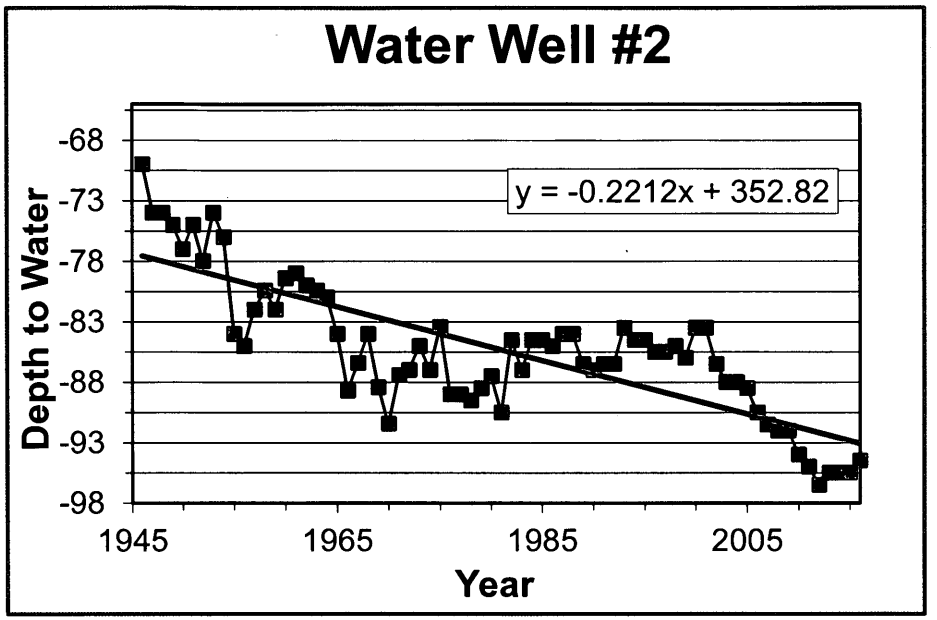
Figure 5

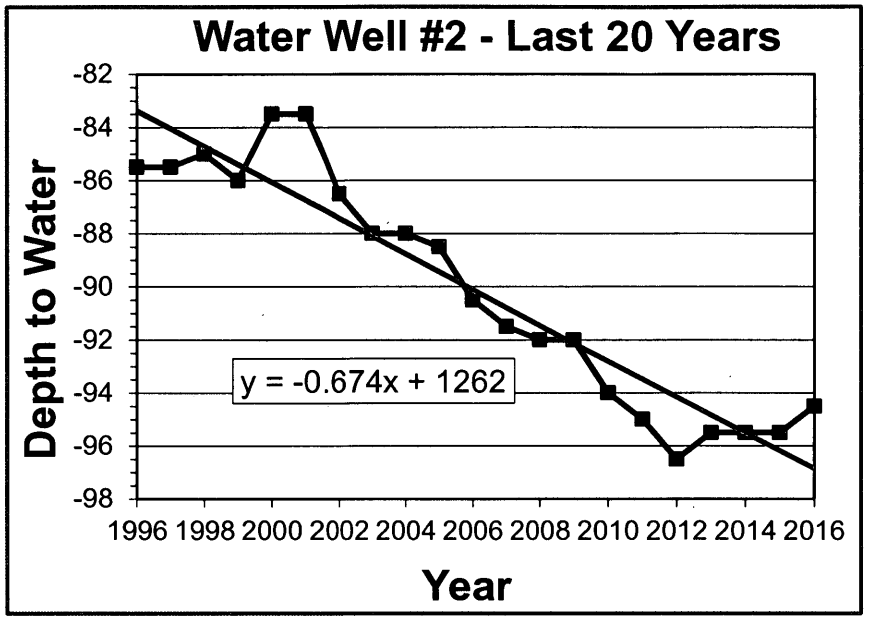
Foster Property
Evaluation
Profiles C-C' and D-D'

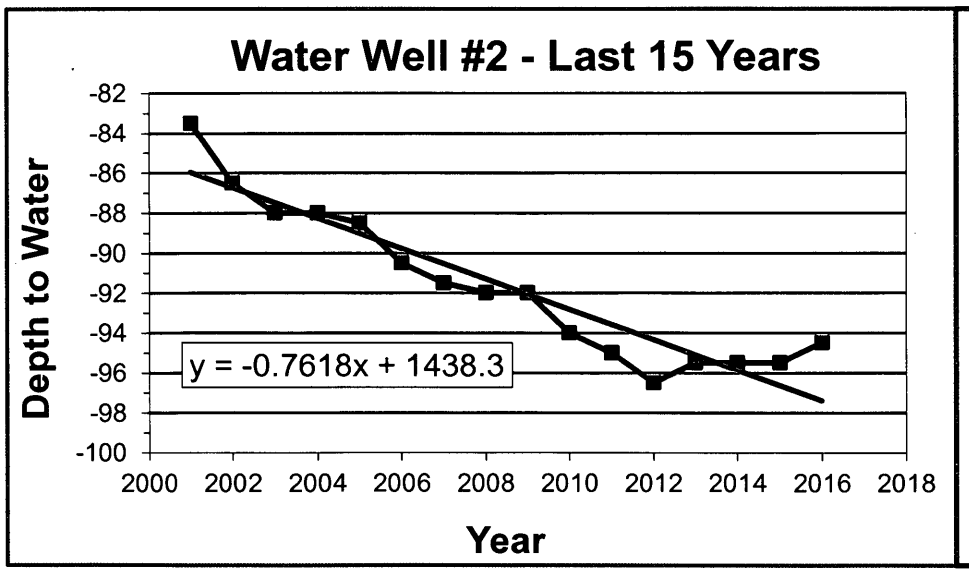
RECEIVED
WATER RESOURCES
OCT 31 2012
KANSAS DEPARTMENT OF AGRICULTURE

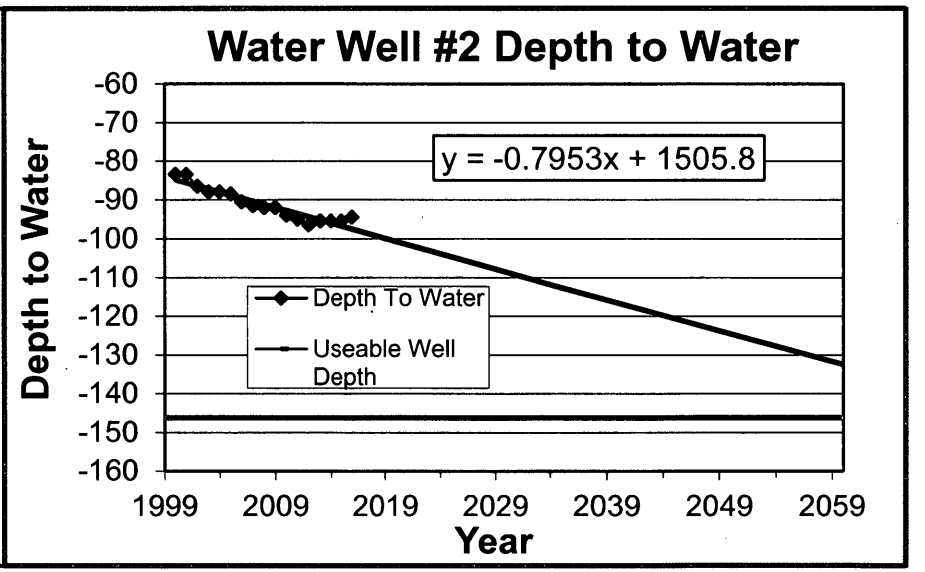
Attachment 4

Water Well #2

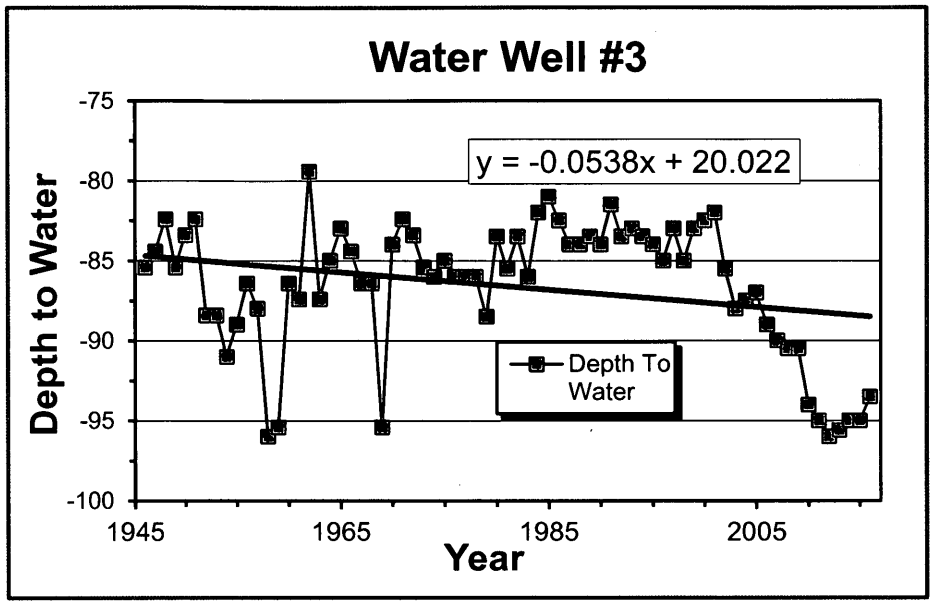

Water Well #2
y = -0.2212x + 352.82
Depth to Water
-68
-73
-78
-83
-88
-93
-98
1945
1965
1985
2005
Year

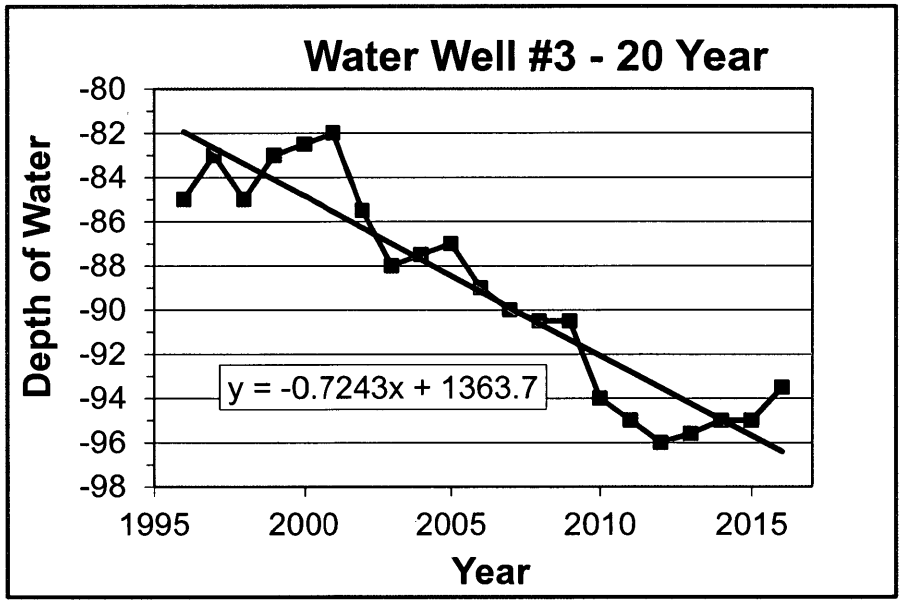

Water Well #2 - Last 20 Years
y = -0.674x + 1262
Depth to Water
-82
-84
-86
-88
-90
-92
-94
-96
-98
1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016
Year

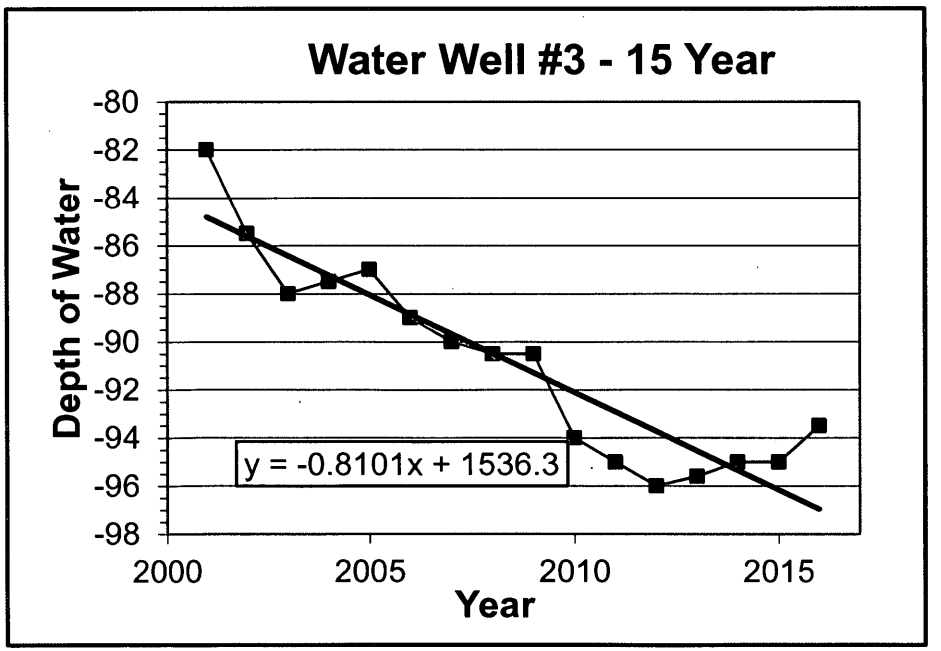

Water Well #2 - Last 15 Years
y = -0.7618x + 1438.3
Depth to Water
-82
-84
-86
-88
-90
-92
-94
-96
-98
-100
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018
Year

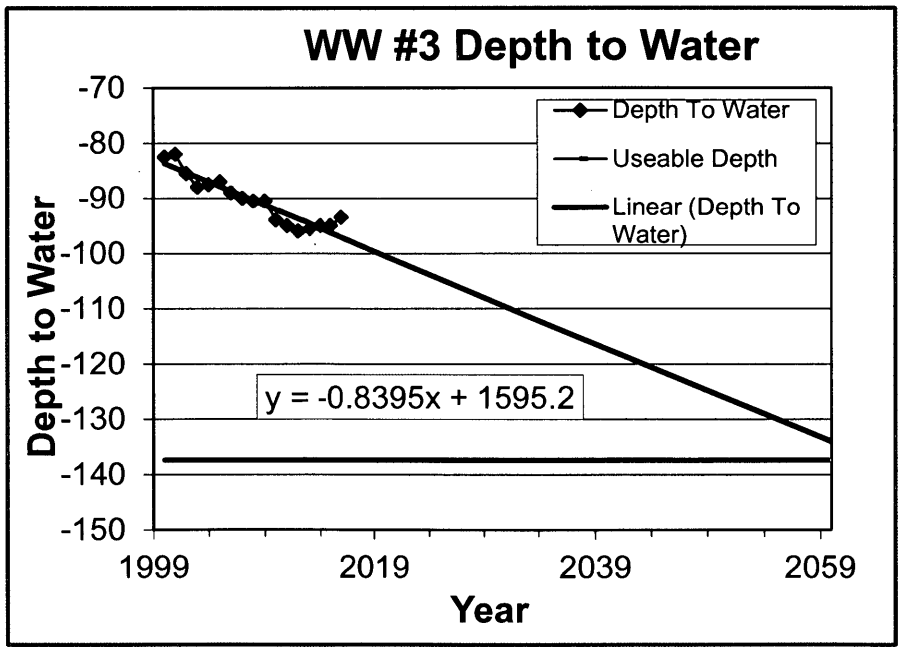

Water Well #2 Depth to Water
y = -0.7953x + 1505.8
Depth To Water
Useable Well Depth
Depth to Water
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
1999 2009 2019 2029 2039 2049 2059
Year

Water Well #3

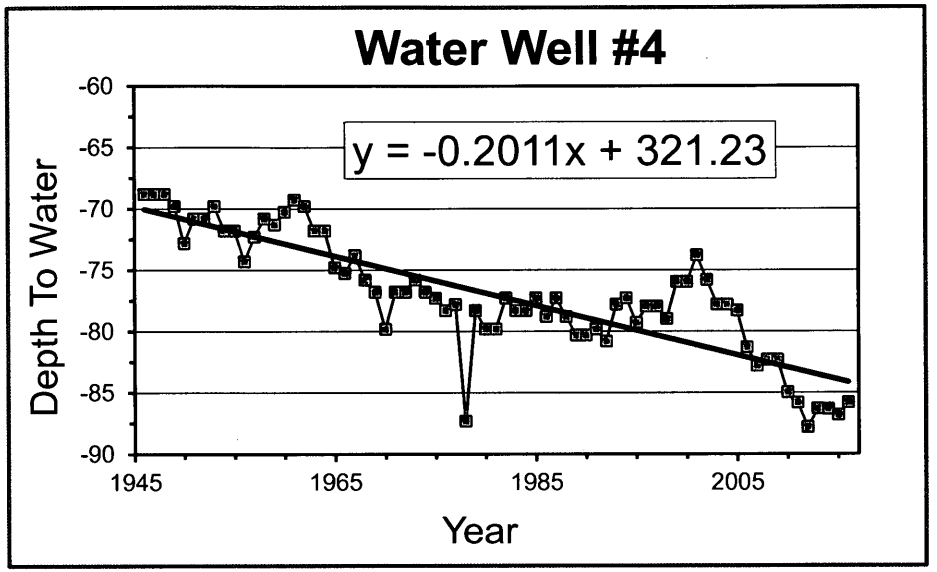

Water Well #3
y = -0.0538x + 20.022
Depth To Water
Depth to Water
Year
-75
-80
-85
-90
-95
-100
1945
1965
1985
2005

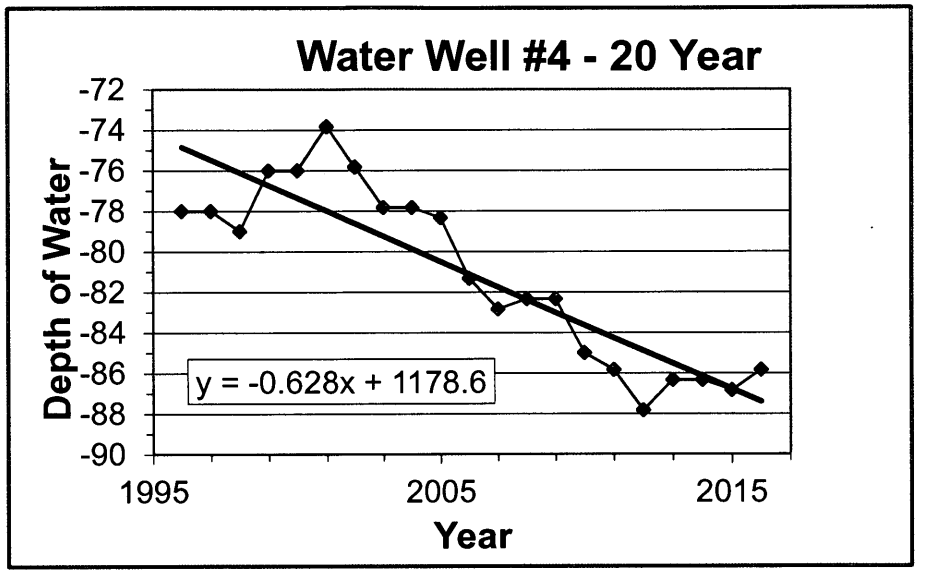

Water Well #3 - 20 Year
y = -0.7243x + 1363.7
Depth of Water
Year
-80
-82
-84
-86
-88
-90
-92
-94
-96
-98
1995
2000
2005
2010
2015

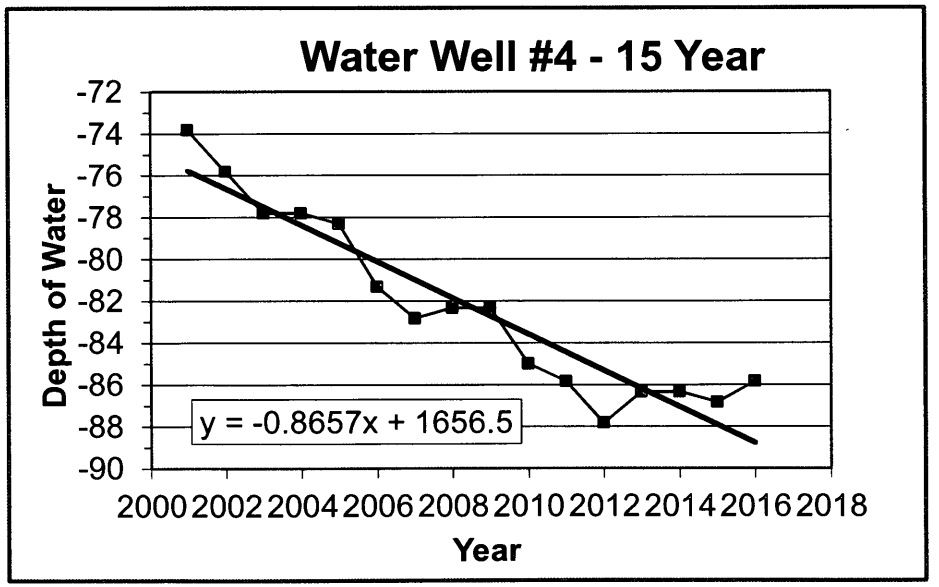

Water Well #3 - 15 Year
y = -0.8101x + 1536.3
Depth of Water
Year
-80
-82
-84
-86
-88
-90
-92
-94
-96
-98
2000
2005
2010
2015

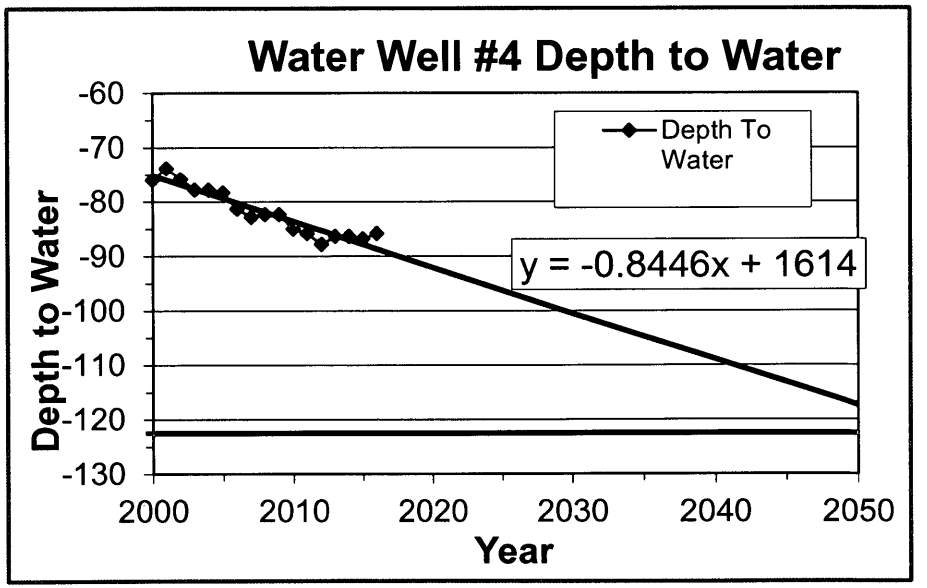

WW #3 Depth to Water
Depth To Water
Useable Depth
Linear (Depth To Water)
y = -0.8395x + 1595.2
Depth to Water
Year
-70
-80
-90
-100
-110
-120
-130
-140
-150
1999
2019
2039
2059

Water Well #4

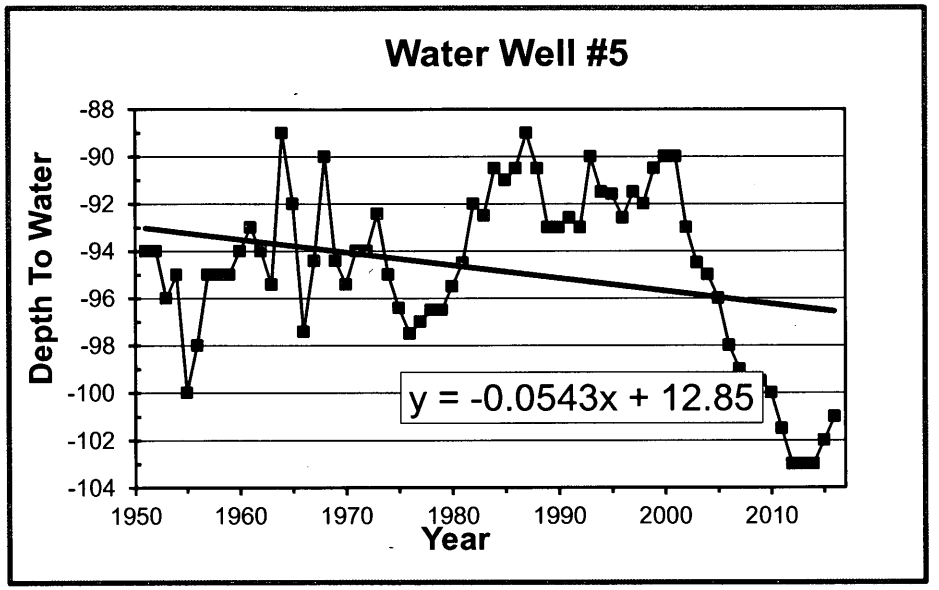

Water Well #4
y = -0.2011x + 321.23
Depth To Water
-60
-65
-70
-75
-80
-85
-90
1945
1965
1985
2005
Year

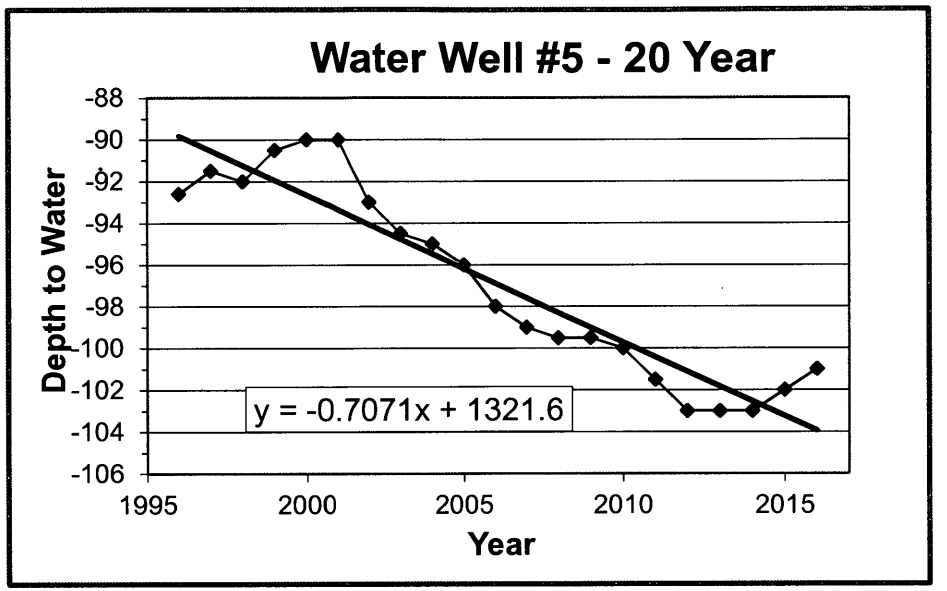

Water Well #4 - 20 Year
y = -0.628x + 1178.6
Depth of Water
-72
-74
-76
-78
-80
-82
-84
-86
-88
-90
1995
2005
2015
Year

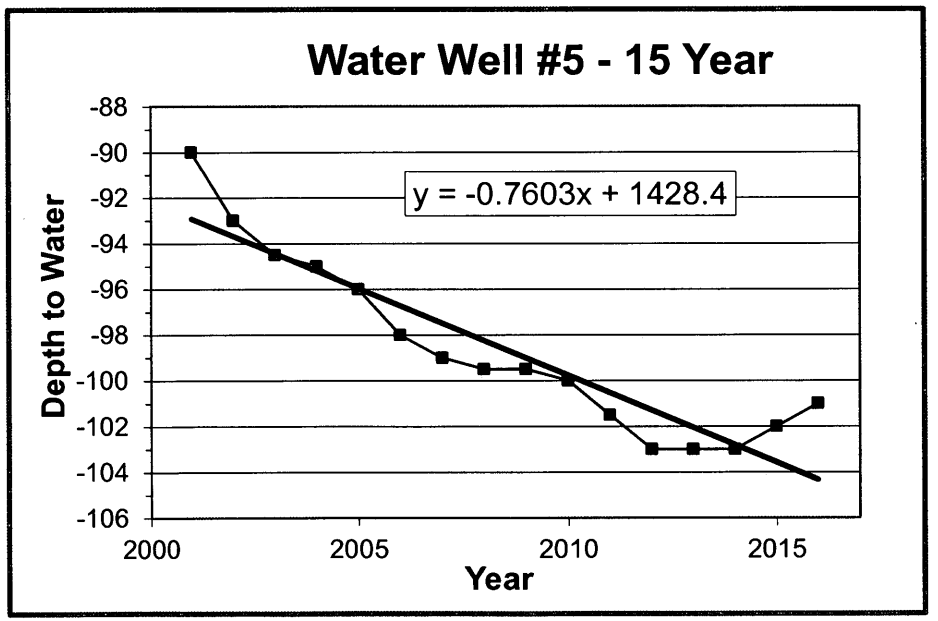

Water Well #4 - 15 Year
y = -0.8657x + 1656.5
Depth of Water
-72
-74
-76
-78
-80
-82
-84
-86
-88
-90
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018
Year

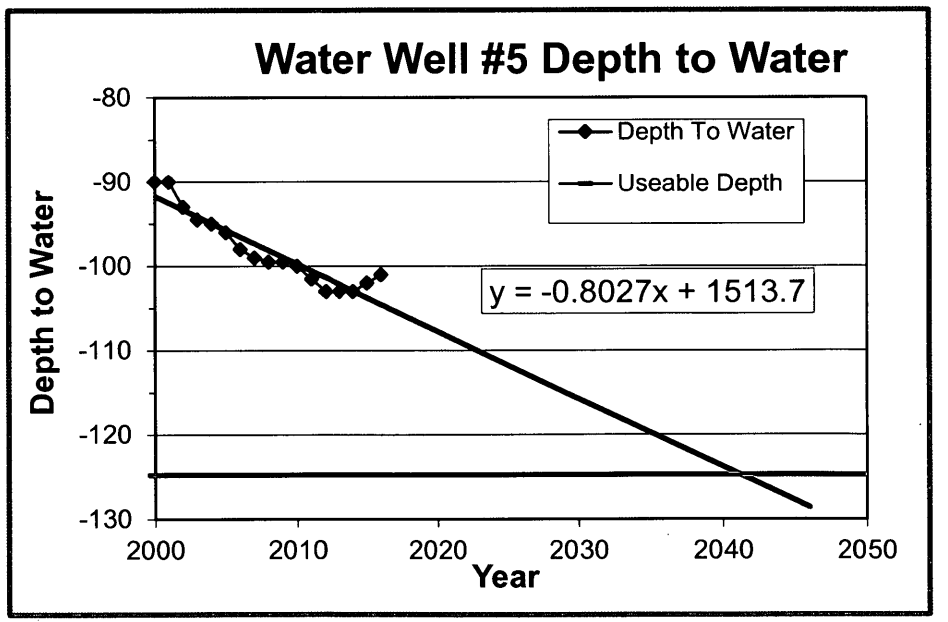

Water Well #4 Depth to Water
Depth To Water
y = -0.8446x + 1614
Depth to Water
-60
-70
-80
-90
-100
-110
-120
-130
2000
2010
2020
2030
2040
2050
Year

Water Well #5

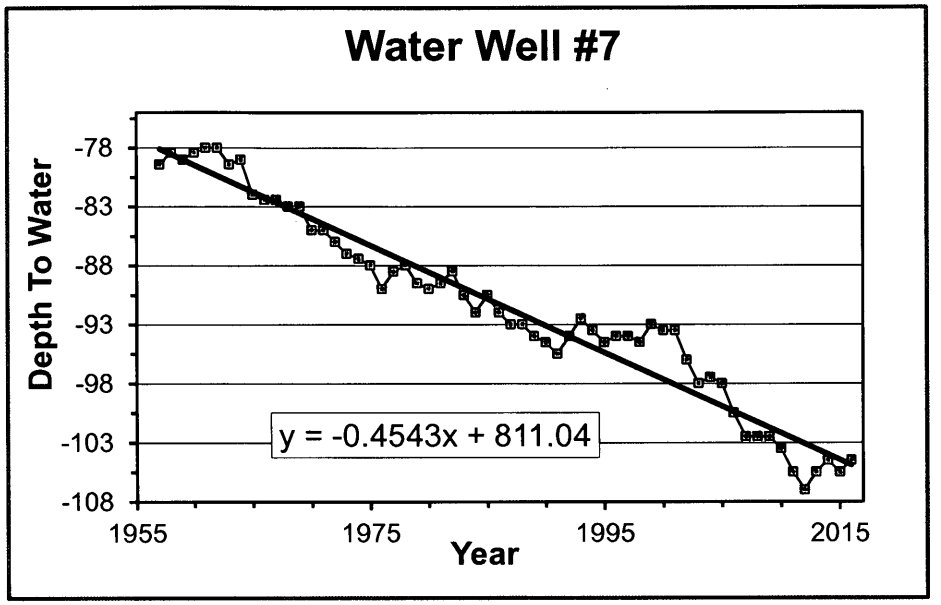

Water Well #5
Depth To Water
-88
-90
-92
-94
-96
-98
-100
-102
-104
1950
1960
1970
1980
1990
2000
2010
Year
y = -0.0543x + 12.85

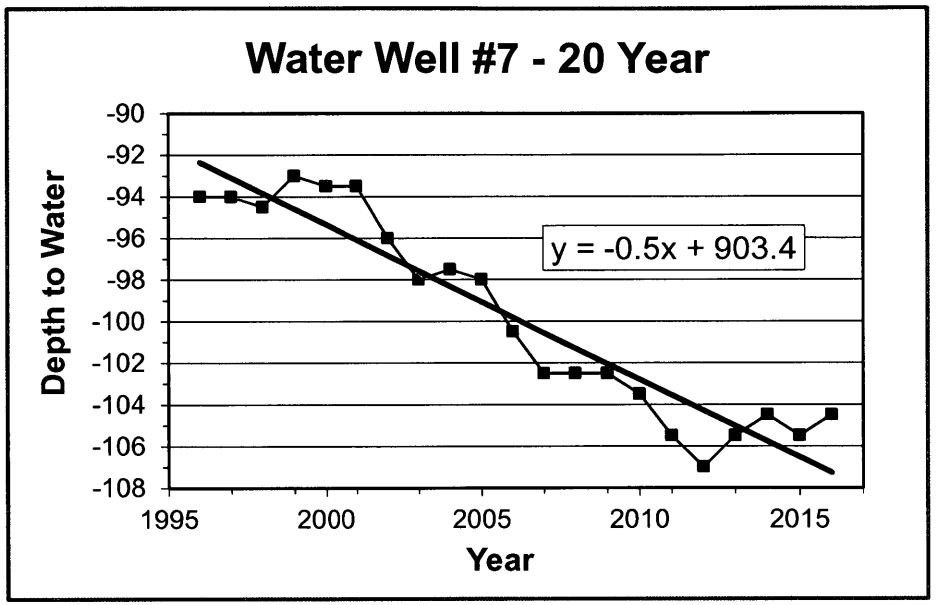

Water Well #5 - 20 Year
Depth to Water
-88
-90
-92
-94
-96
-98
-100
-102
-104
-106
1995
2000
2005
2010
2015
Year
y = -0.7071x + 1321.6

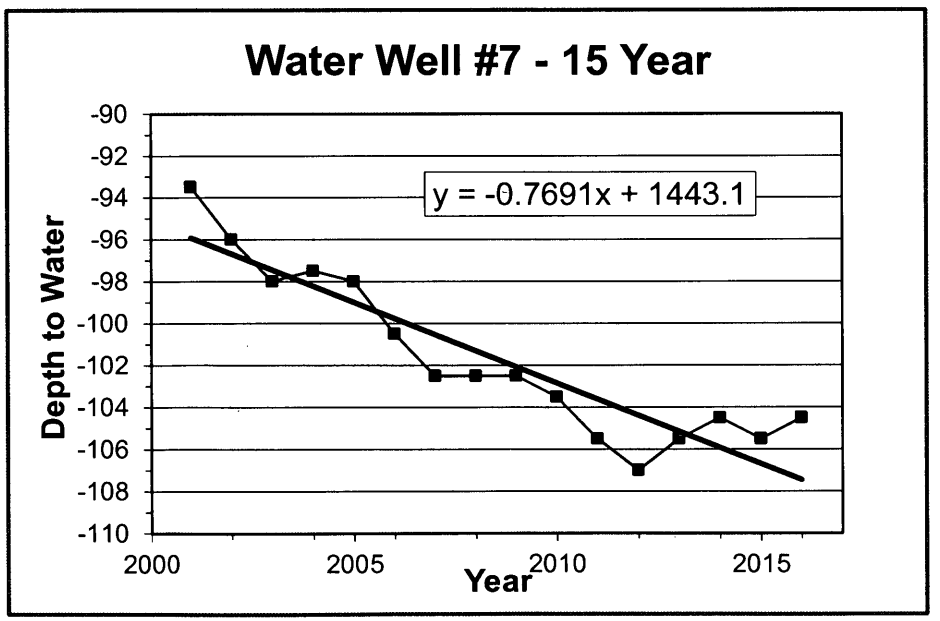

Water Well #5 - 15 Year
Depth to Water
-88
-90
-92
-94
-96
-98
-100
-102
-104
-106
2000
2005
2010
2015
Year
y = -0.7603x + 1428.4

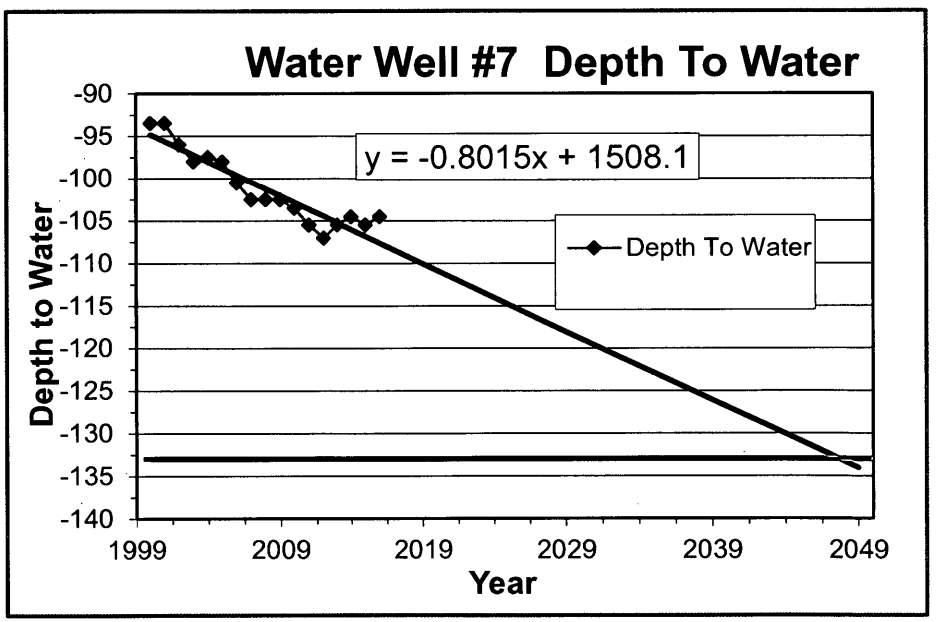

Water Well #5 Depth to Water
Depth to Water
-80
-90
-100
-110
-120
-130
2000
2010
2020
2030
2040
2050
Year
Depth To Water
Useable Depth
y = -0.8027x + 1513.7

Water Well #7

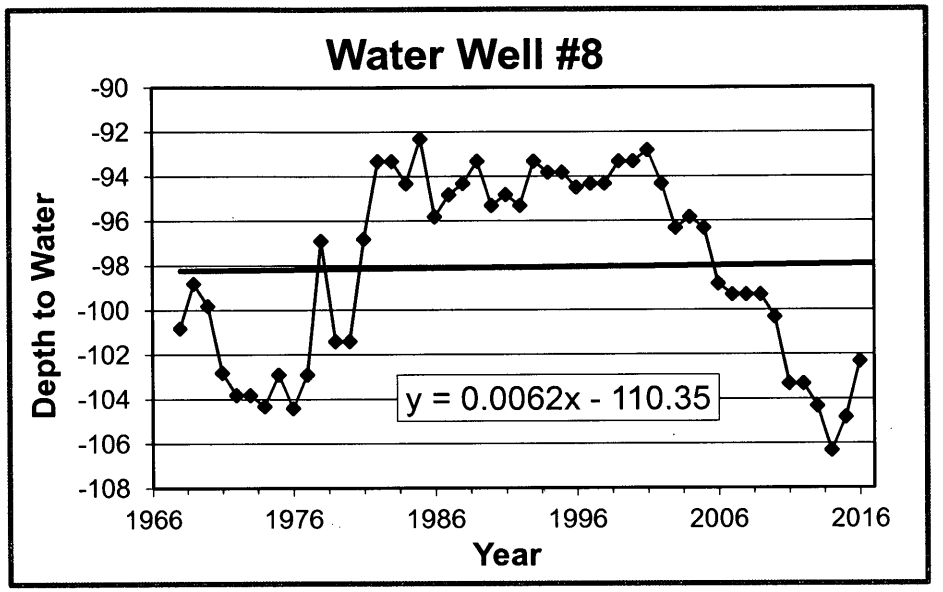

Water Well #7
Depth To Water
-78
-83
-88
-93
-98
-103
-108
1955
1975
1995
2015
Year
y = -0.4543x + 811.04

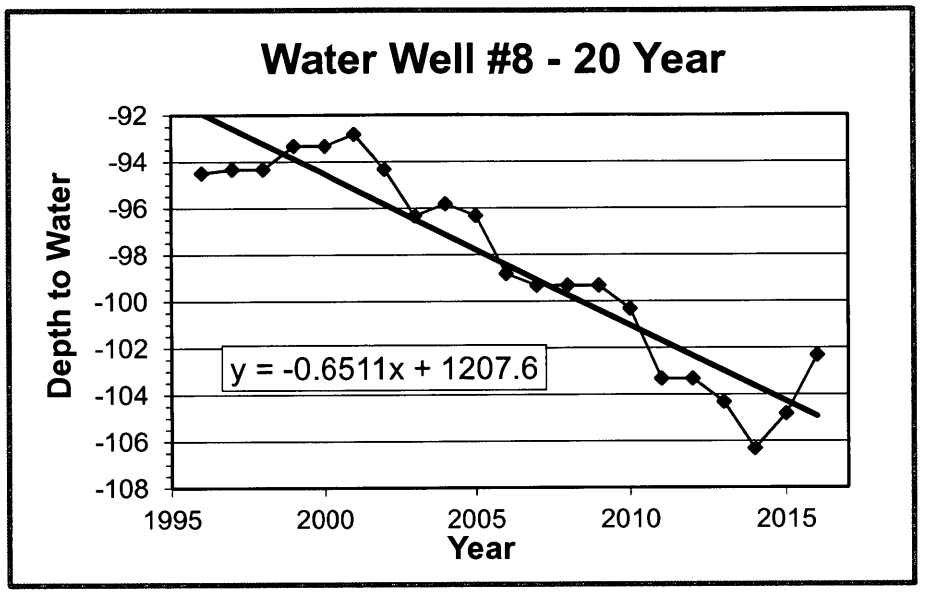

Water Well #7 - 20 Year
Depth to Water
-90
-92
-94
-96
-98
-100
-102
-104
-106
-108
1995
2000
2005
2010
2015
Year
y = -0.5x + 903.4

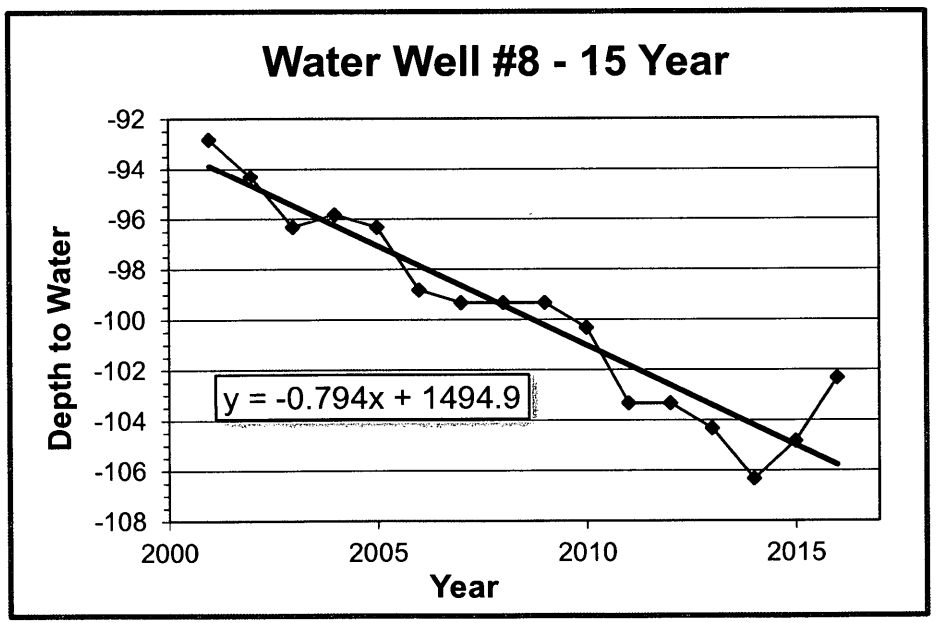

Water Well #7 - 15 Year
Depth to Water
-90
-92
-94
-96
-98
-100
-102
-104
-106
-108
-110
2000
2005
2010
2015
Year
y = -0.7691x + 1443.1

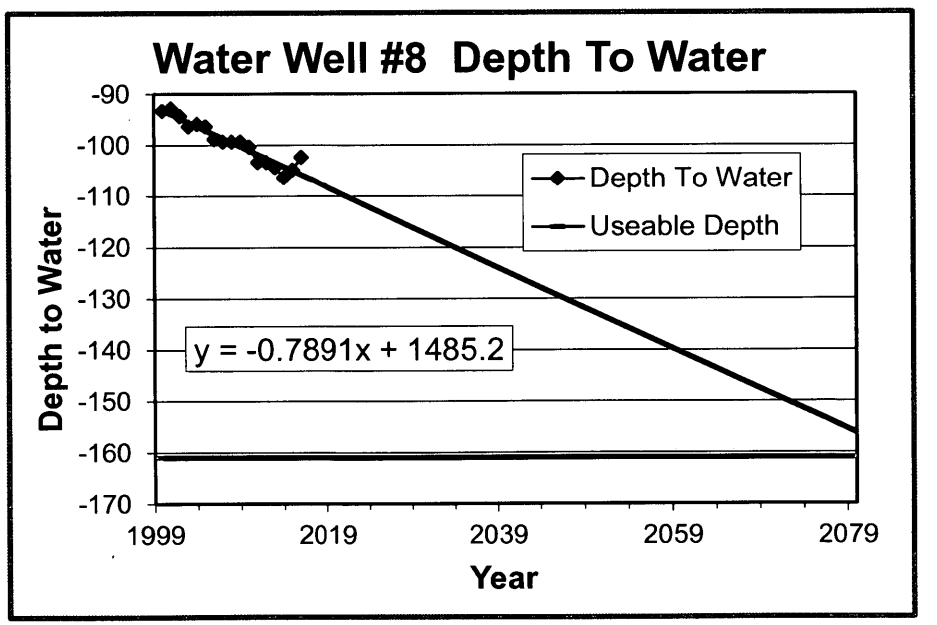

Water Well #7 Depth To Water
Depth to Water
-90
-95
-100
-105
-110
-115
-120
-125
-130
-135
-140
1999
2009
2019
2029
2039
2049
Year
y = -0.8015x + 1508.1
Depth To Water

Water Well #8

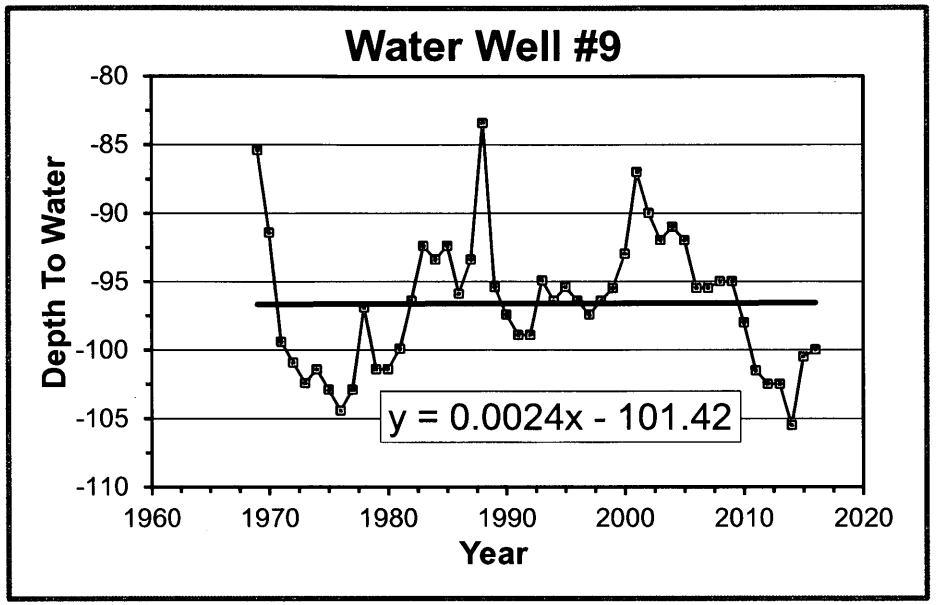

Water Well #8
Depth to Water
-90
-92
-94
-96
-98
-100
-102
-104
-106
-108
1966
1976
1986
1996
2006
2016
Year
y = 0.0062x - 110.35

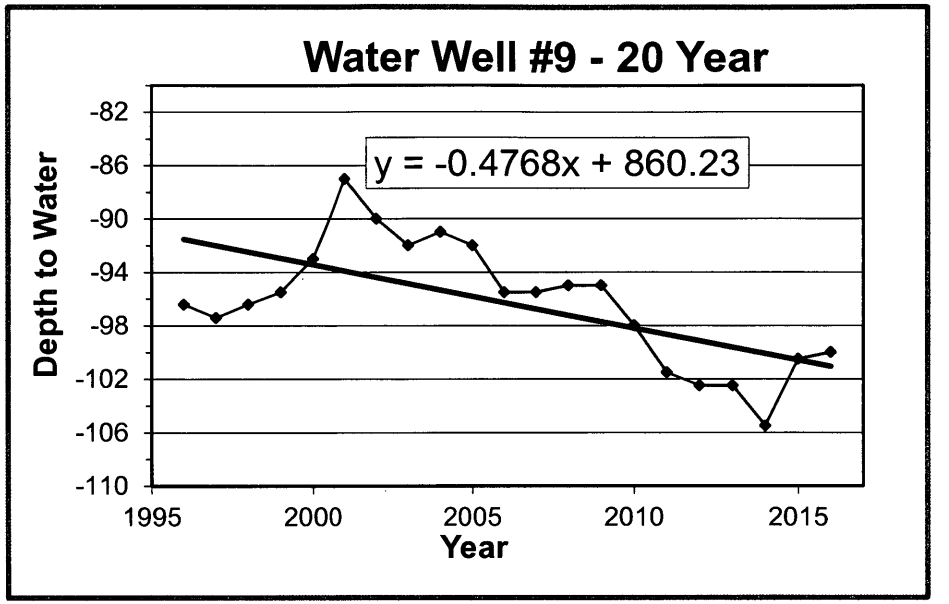

Water Well #8 - 20 Year
Depth to Water
-92
-94
-96
-98
-100
-102
-104
-106
-108
1995
2000
2005
2010
2015
Year
y = -0.6511x + 1207.6

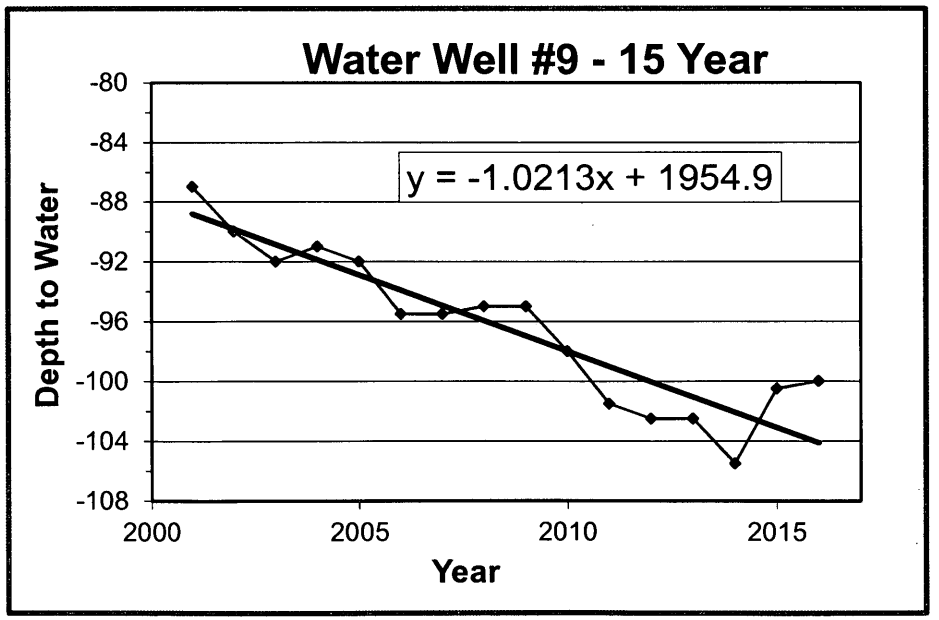

Water Well #8 - 15 Year
Depth to Water
-92
-94
-96
-98
-100
-102
-104
-106
-108
2000
2005
2010
2015
Year
y = -0.794x + 1494.9

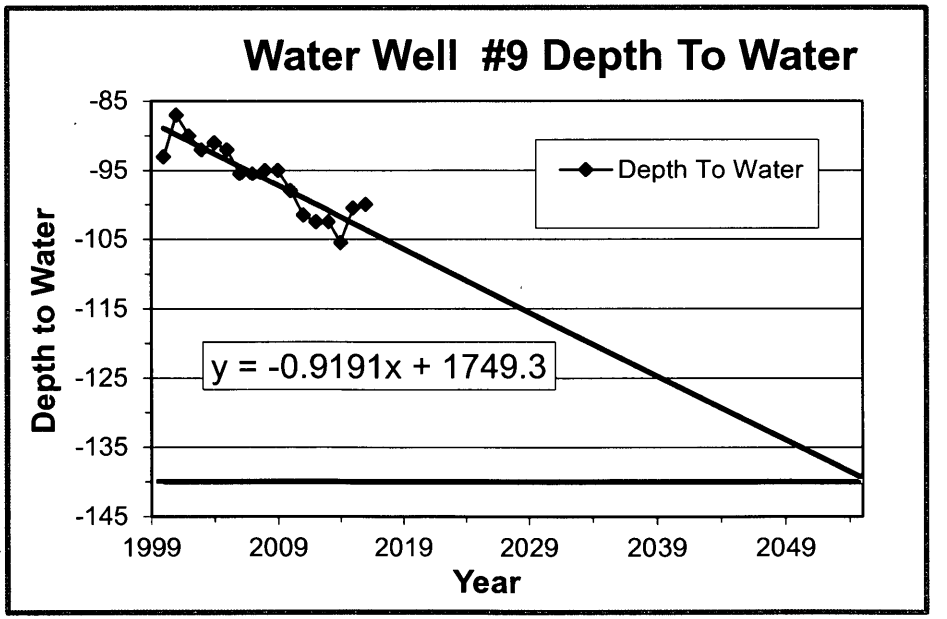

Water Well #8 Depth To Water
Depth to Water
-90
-100
-110
-120
-130
-140
-150
-160
-170
1999
2019
2039
2059
2079
Year
Depth To Water
Useable Depth
y = -0.7891x + 1485.2

Water Well #9

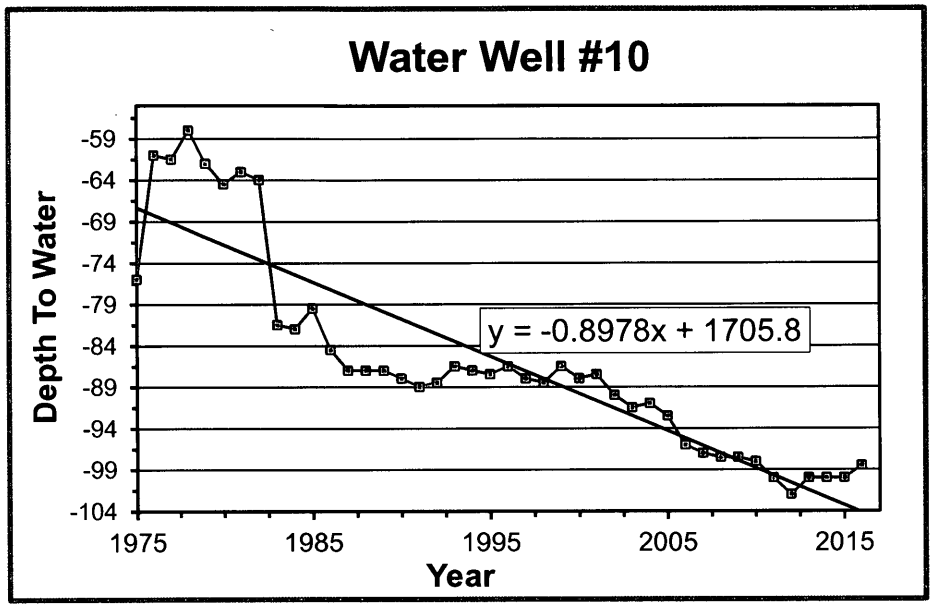

Water Well #9
Depth To Water
-80
-85
-90
-95
-100
-105
-110
1960
1970
1980
1990
2000
2010
2020
Year
y = 0.0024x - 101.42

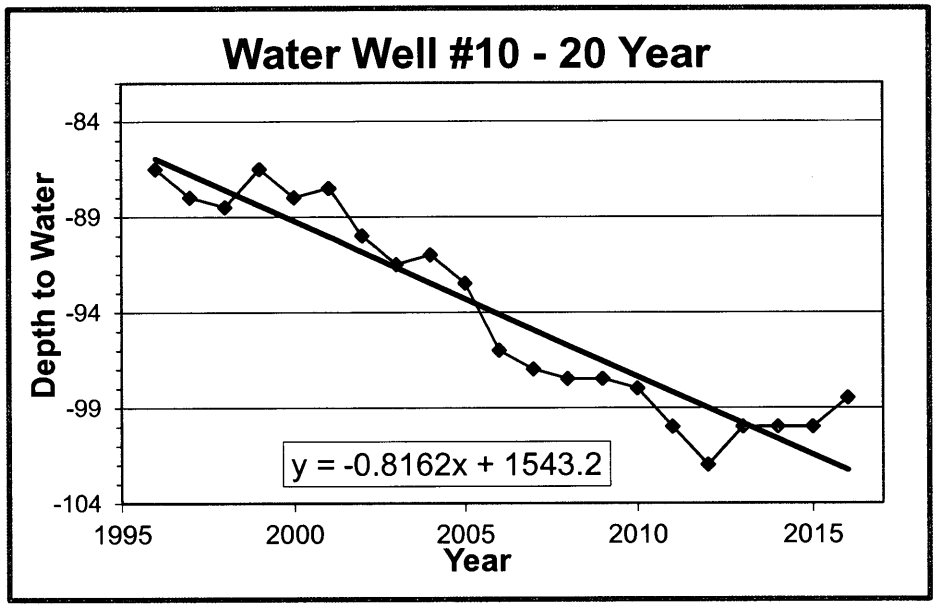

Water Well #9 - 20 Year
Depth to Water
-82
-86
-90
-94
-98
-102
-106
-110
1995
2000
2005
2010
2015
Year
y = -0.4768x + 860.23

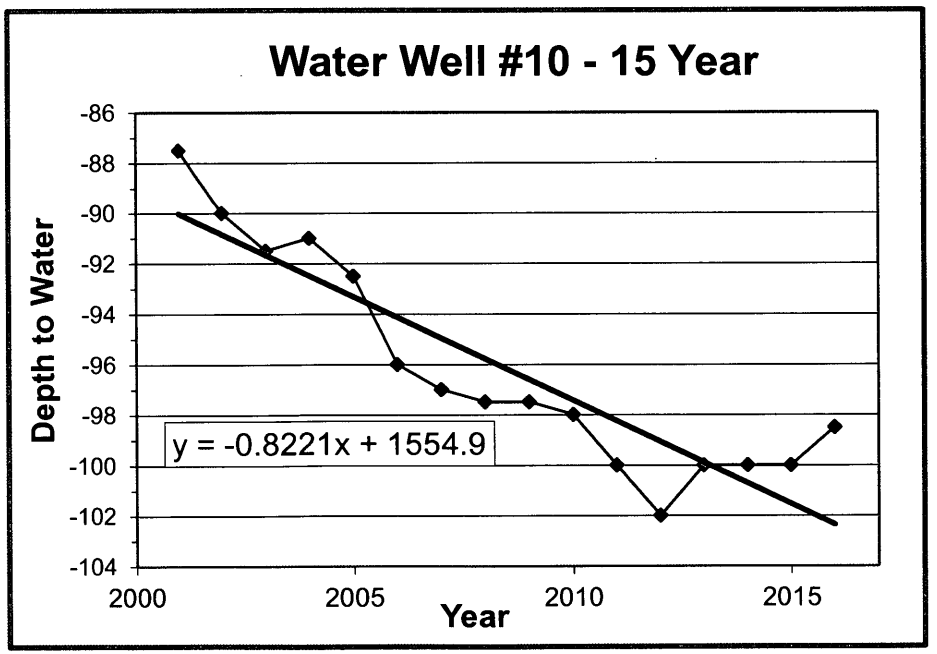

Water Well #9 - 15 Year
Depth to Water
-80
-84
-88
-92
-96
-100
-104
-108
2000
2005
2010
2015
Year
y = -1.0213x + 1954.9

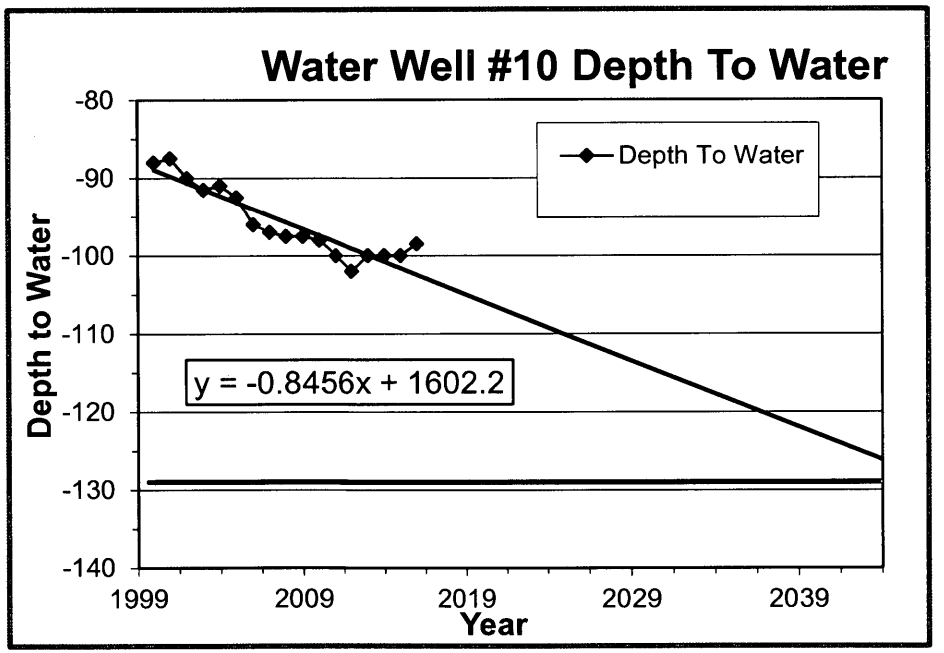

Water Well #9 Depth To Water
Depth to Water
-85
-95
-105
-115
-125
-135
-145
1999
2009
2019
2029
2039
2049
Year
Depth To Water
y = -0.9191x + 1749.3

Water Well #10

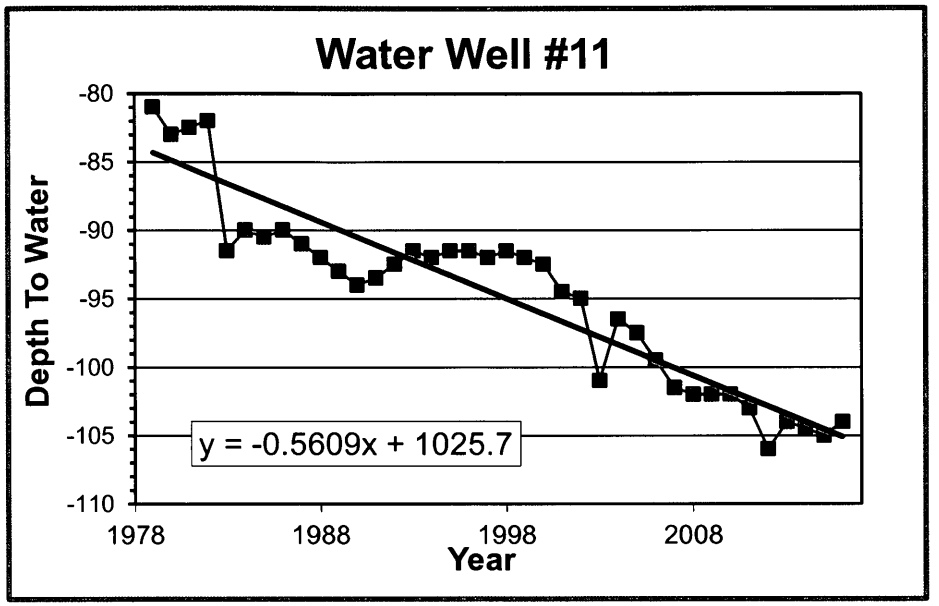


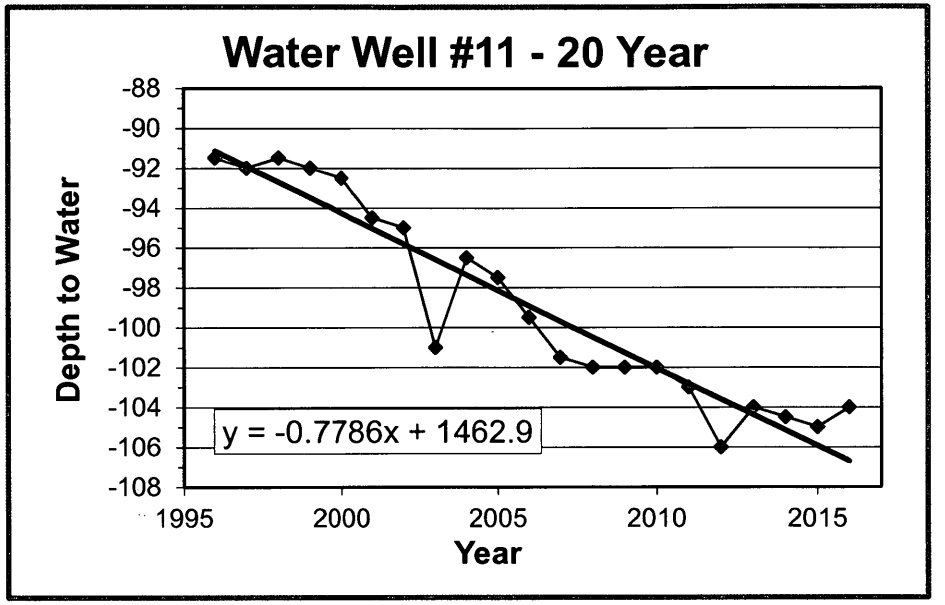


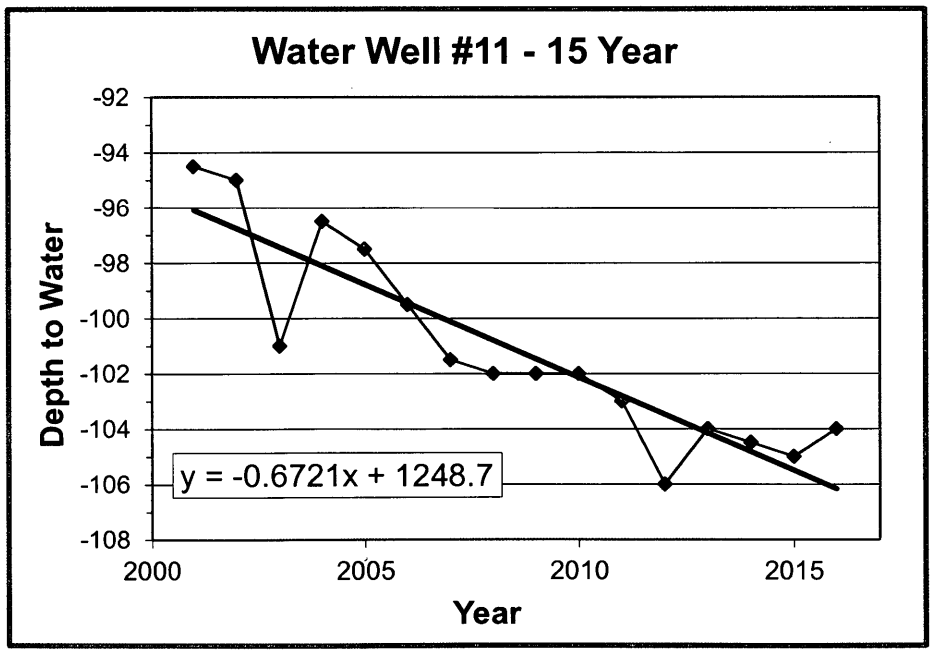


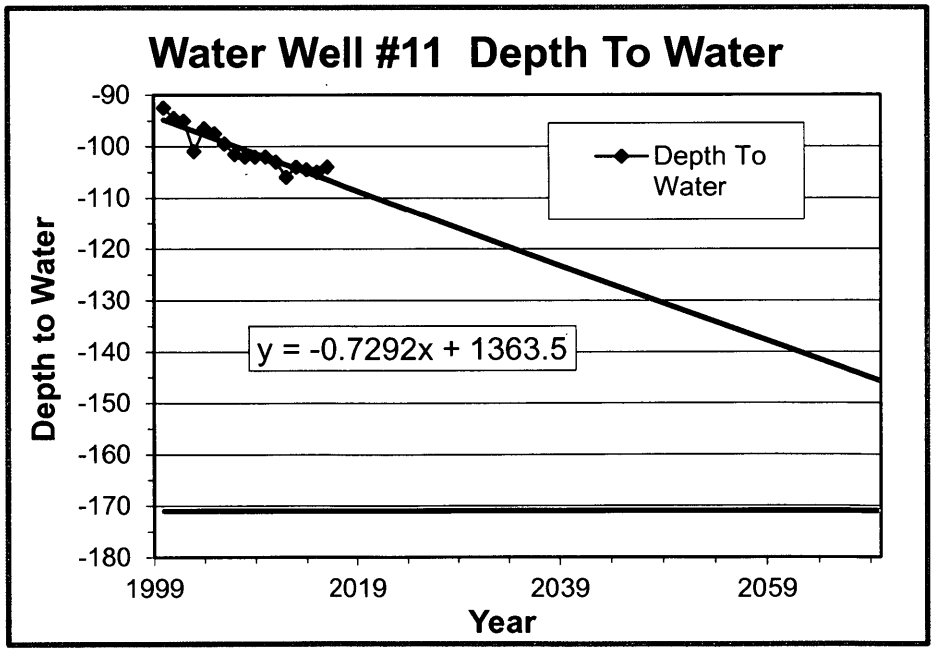


Water Well #11

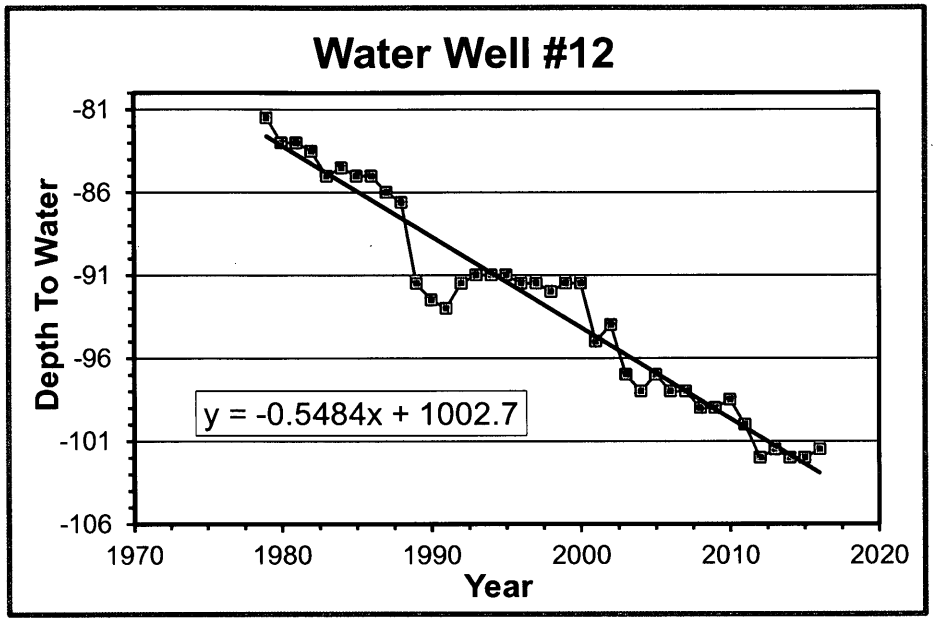


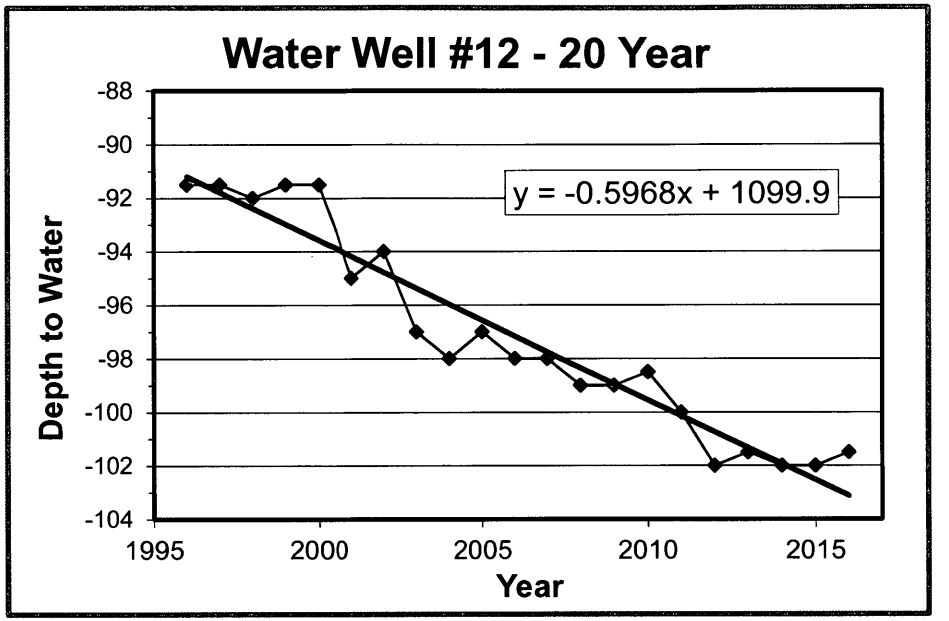


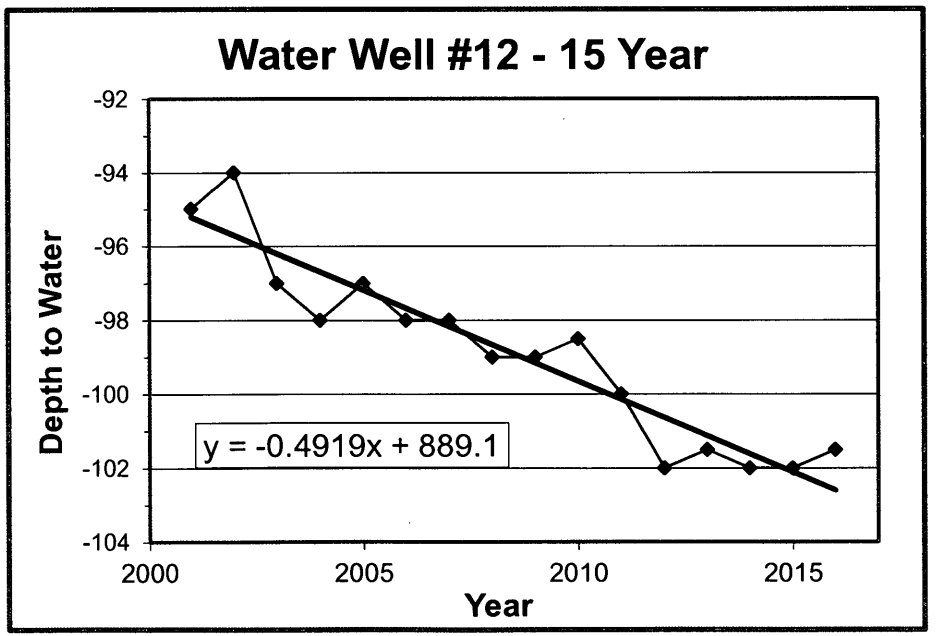


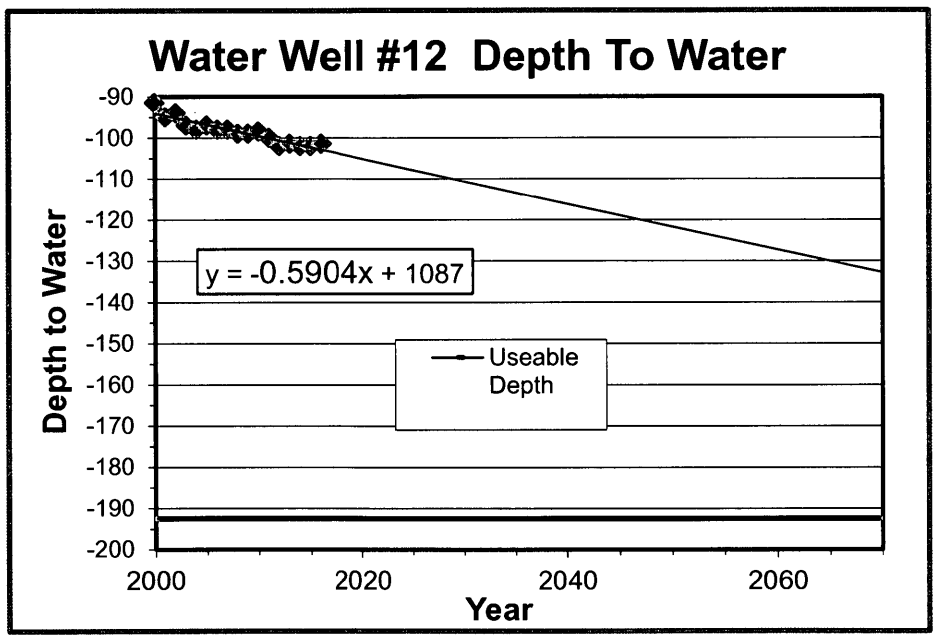


Water Well #12

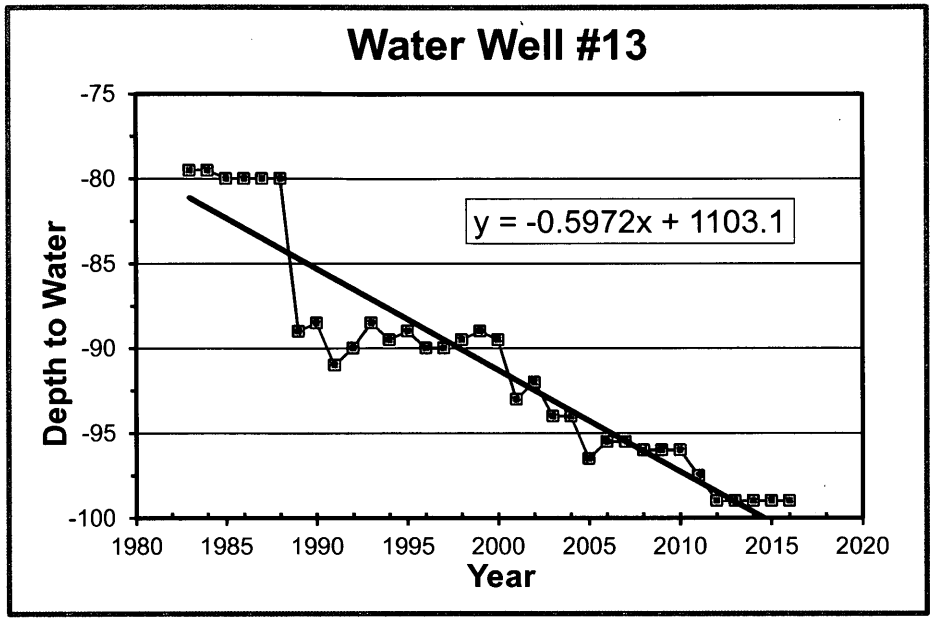


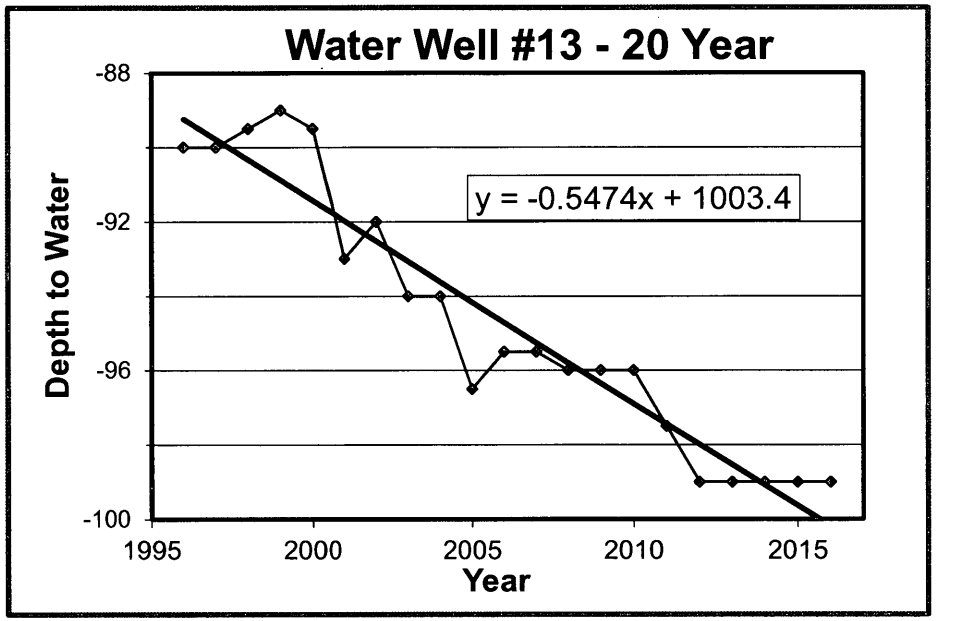


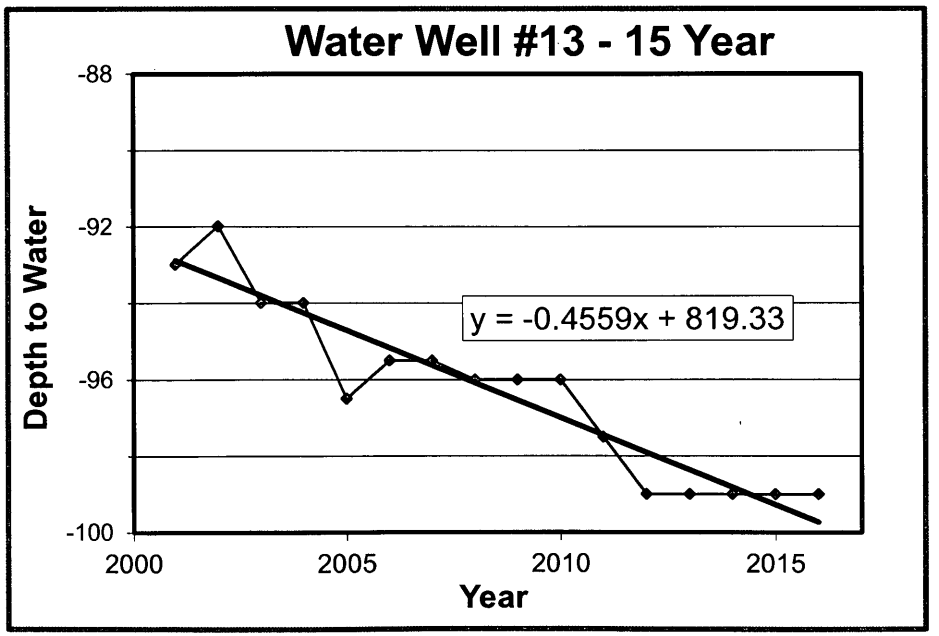


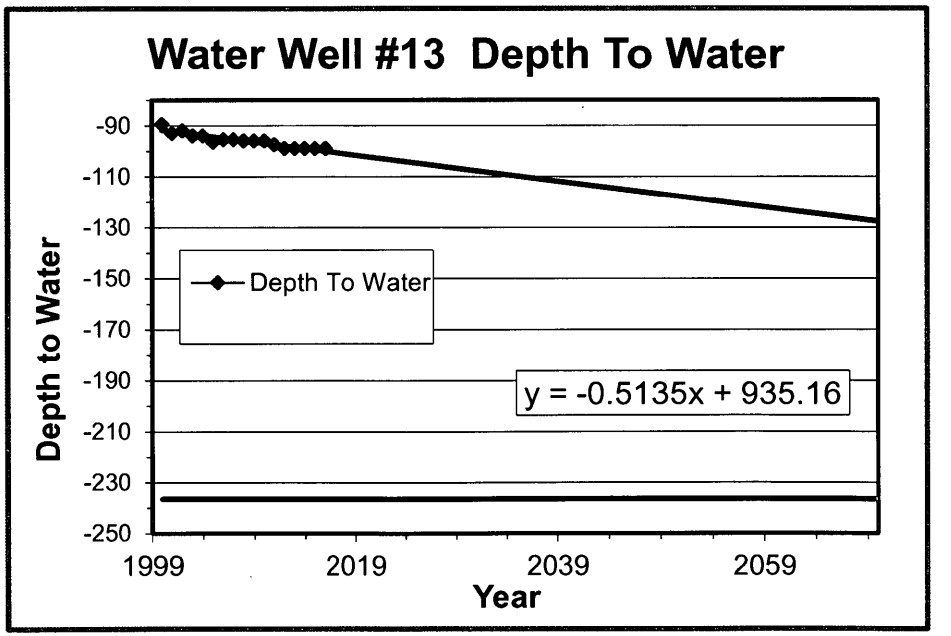


Water Well #13

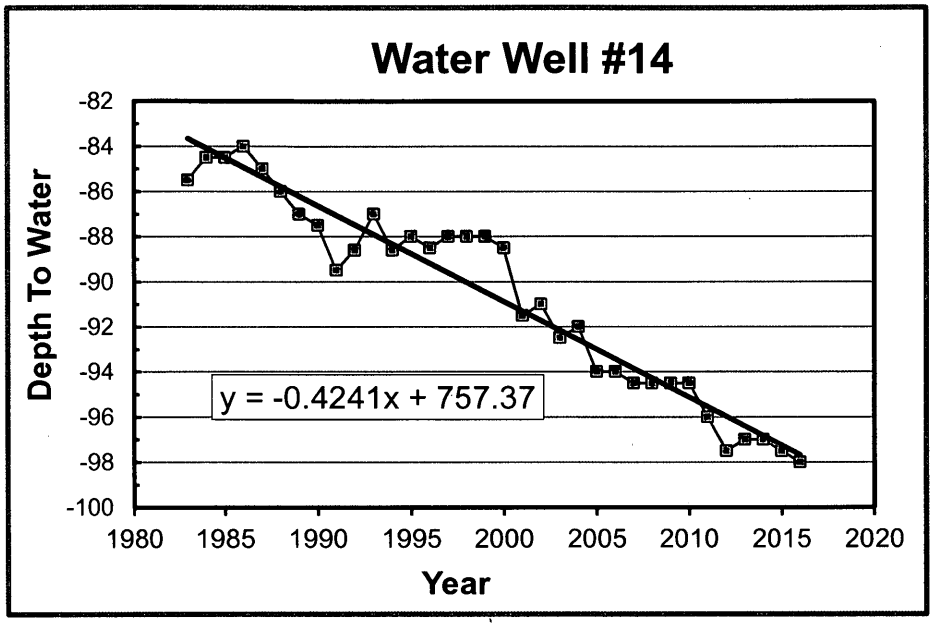


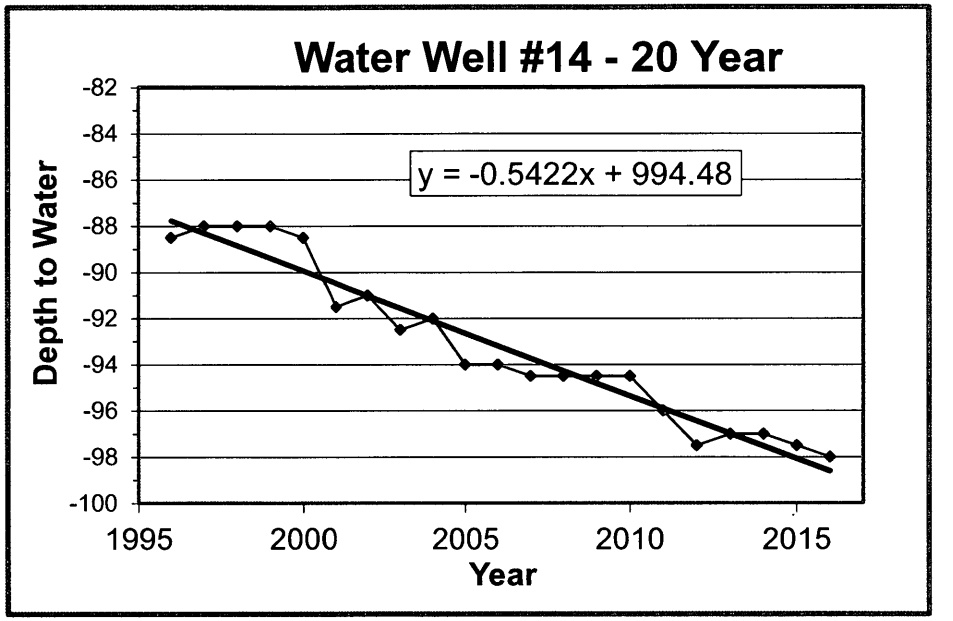


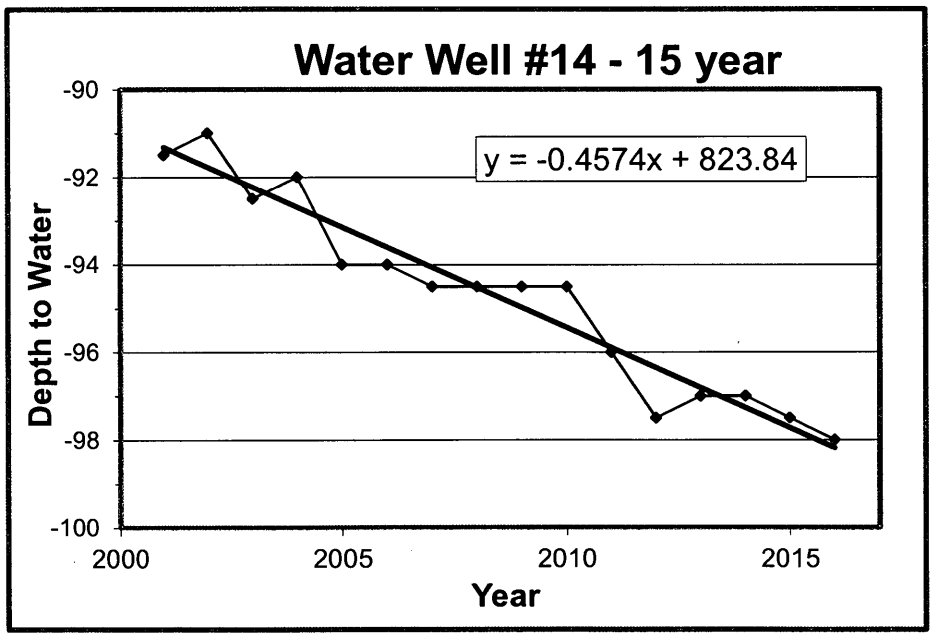


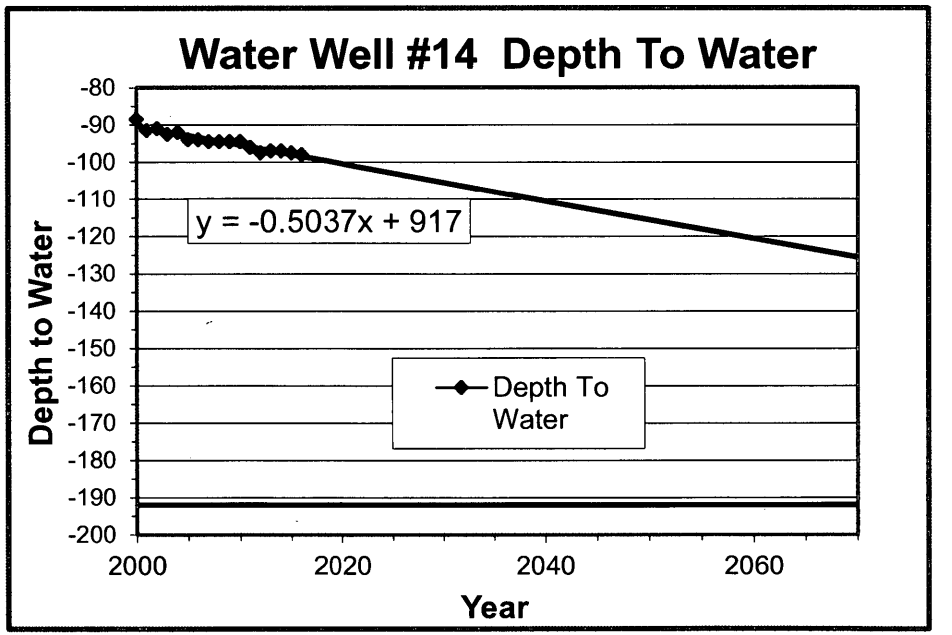


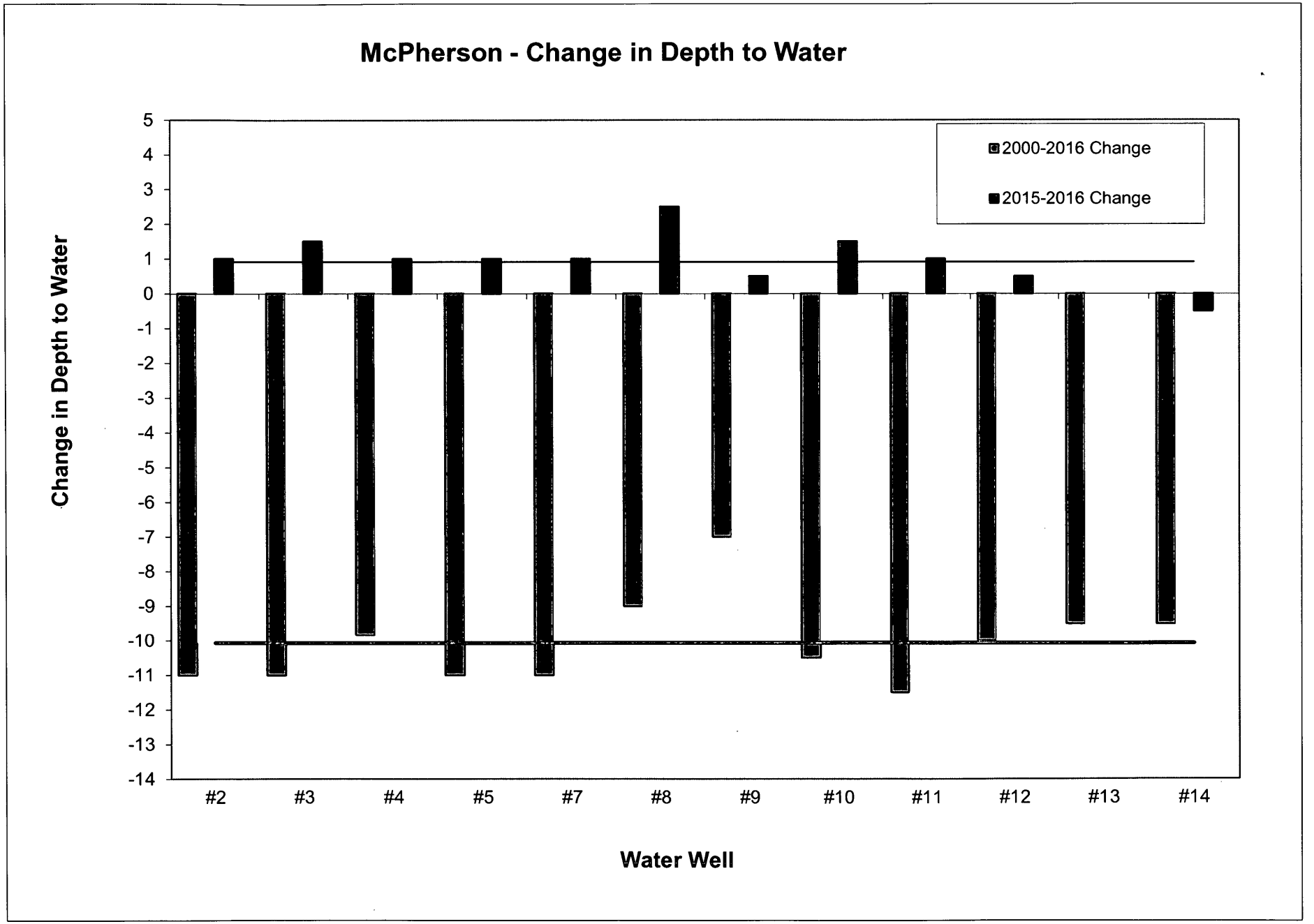
Water Well #14

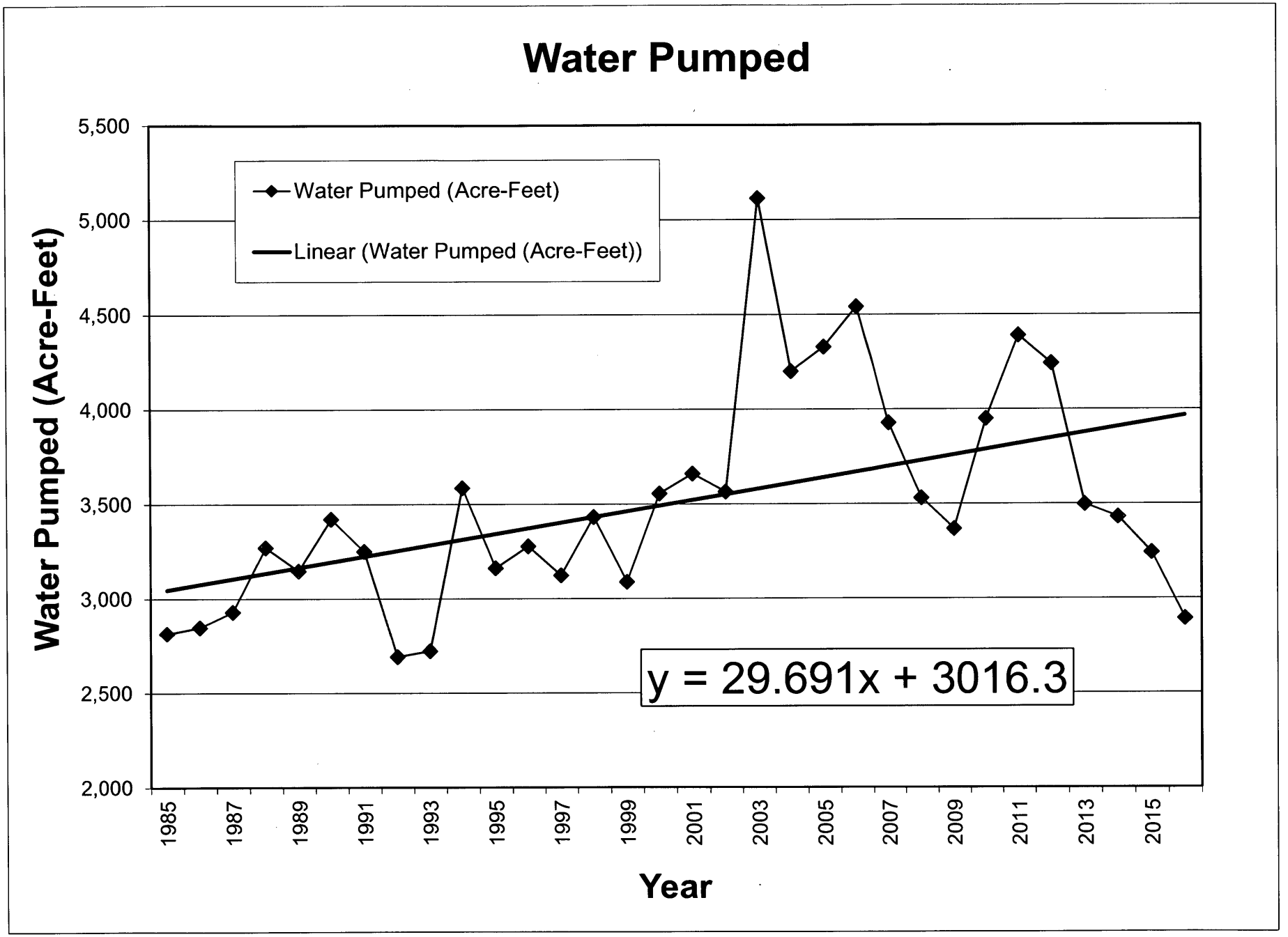


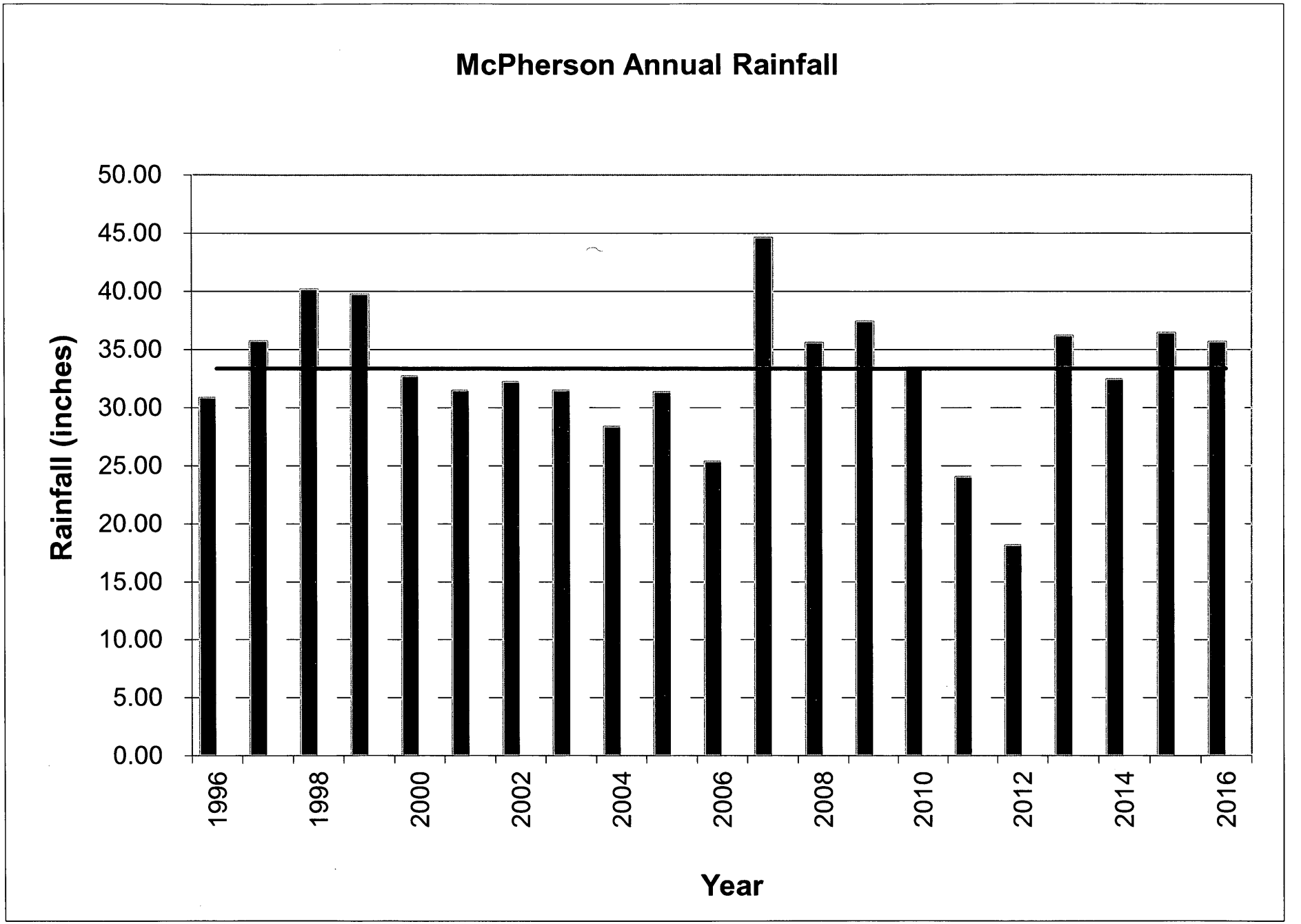


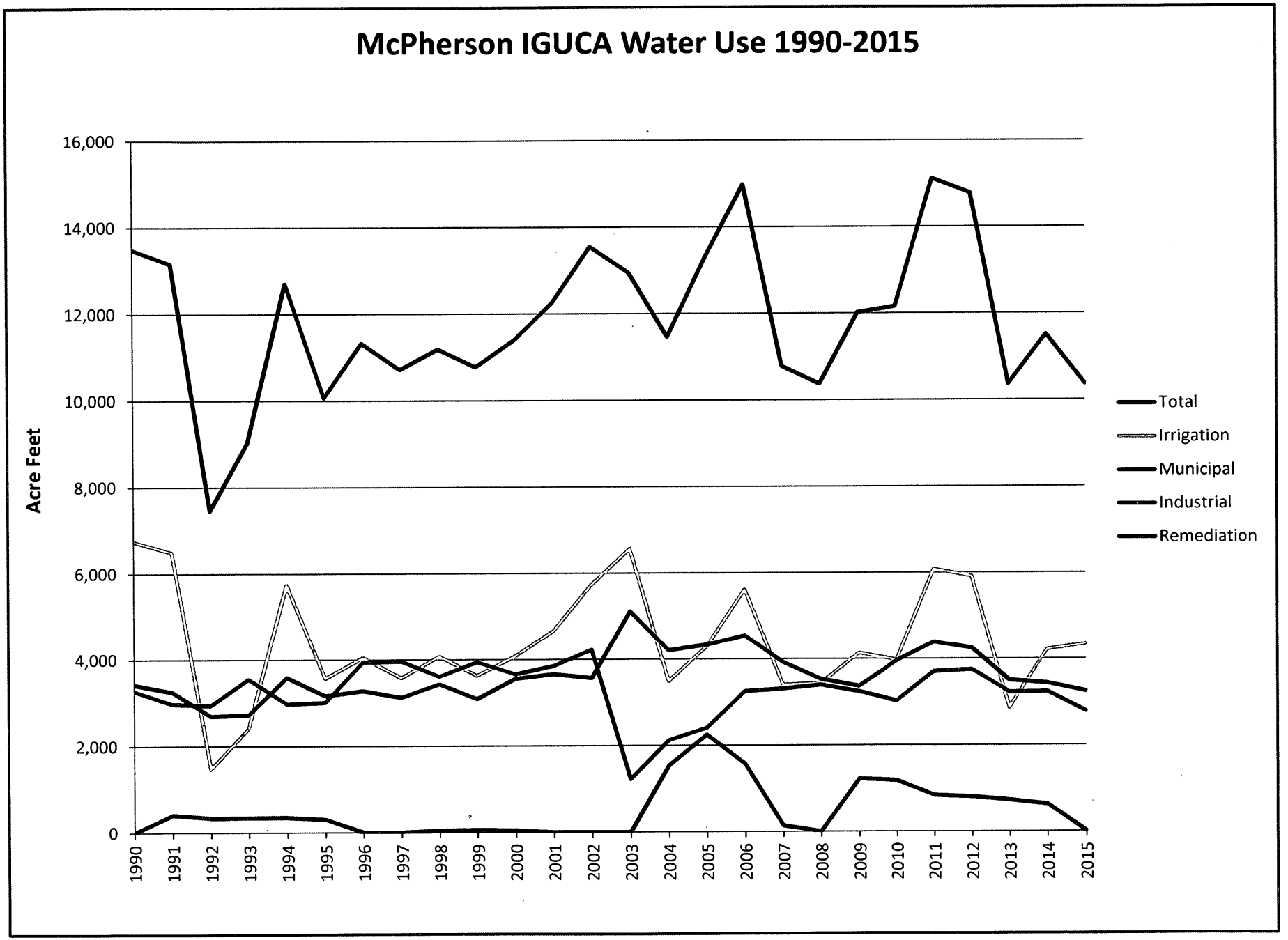




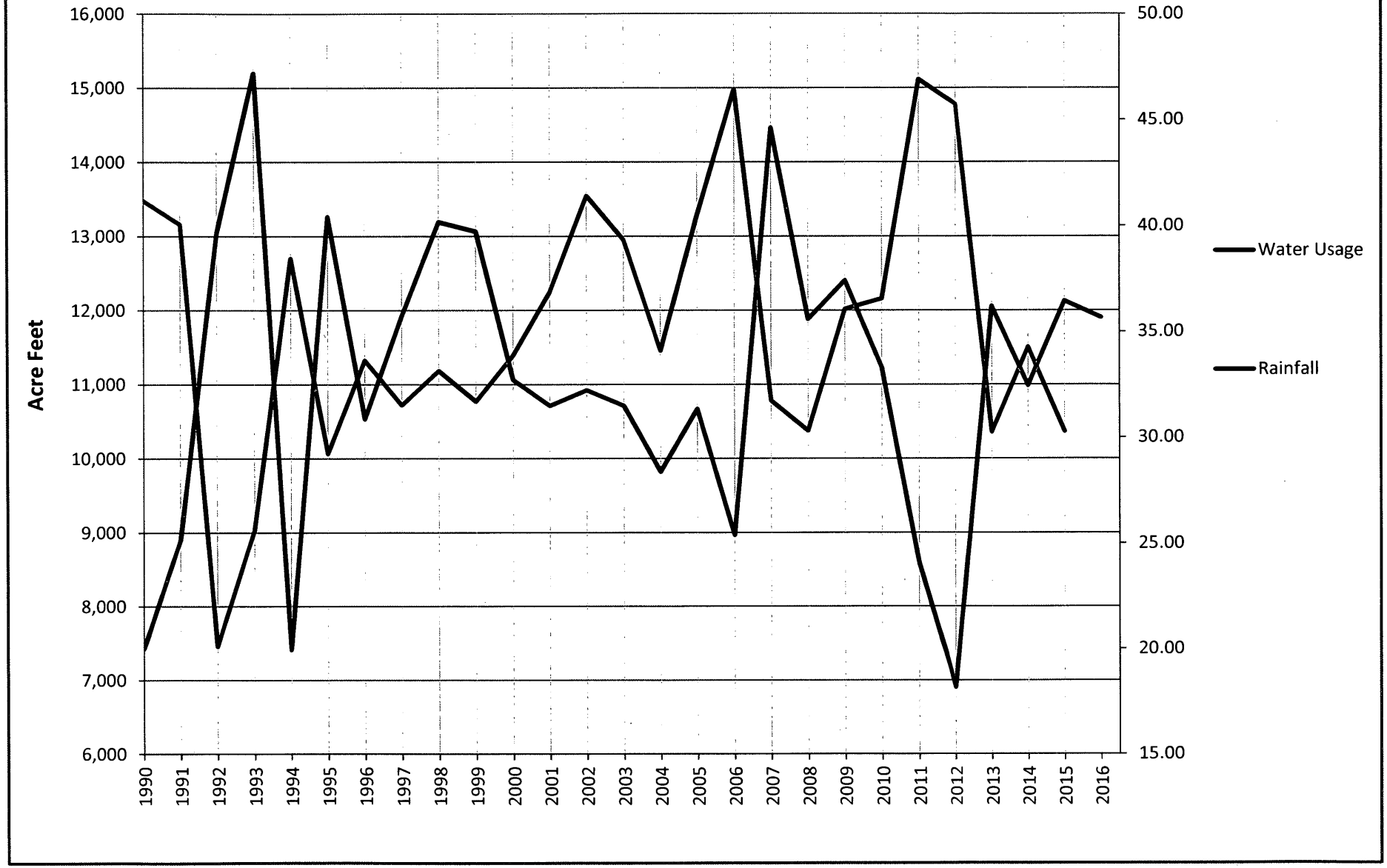

McPherson - Change in Depth to Water
Change in Depth to Water
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
2000-2016 Change
2015-2016 Change
#2
#3
#4
#5
#7
#8
#9
#10
#11
#12
#13
#14
Water Well


Water Pumped
Water Pumped (Acre-Feet)
Linear (Water Pumped (Acre-Feet))
y = 29.691x + 3016.3
Water Pumped (Acre-Feet)
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
Year

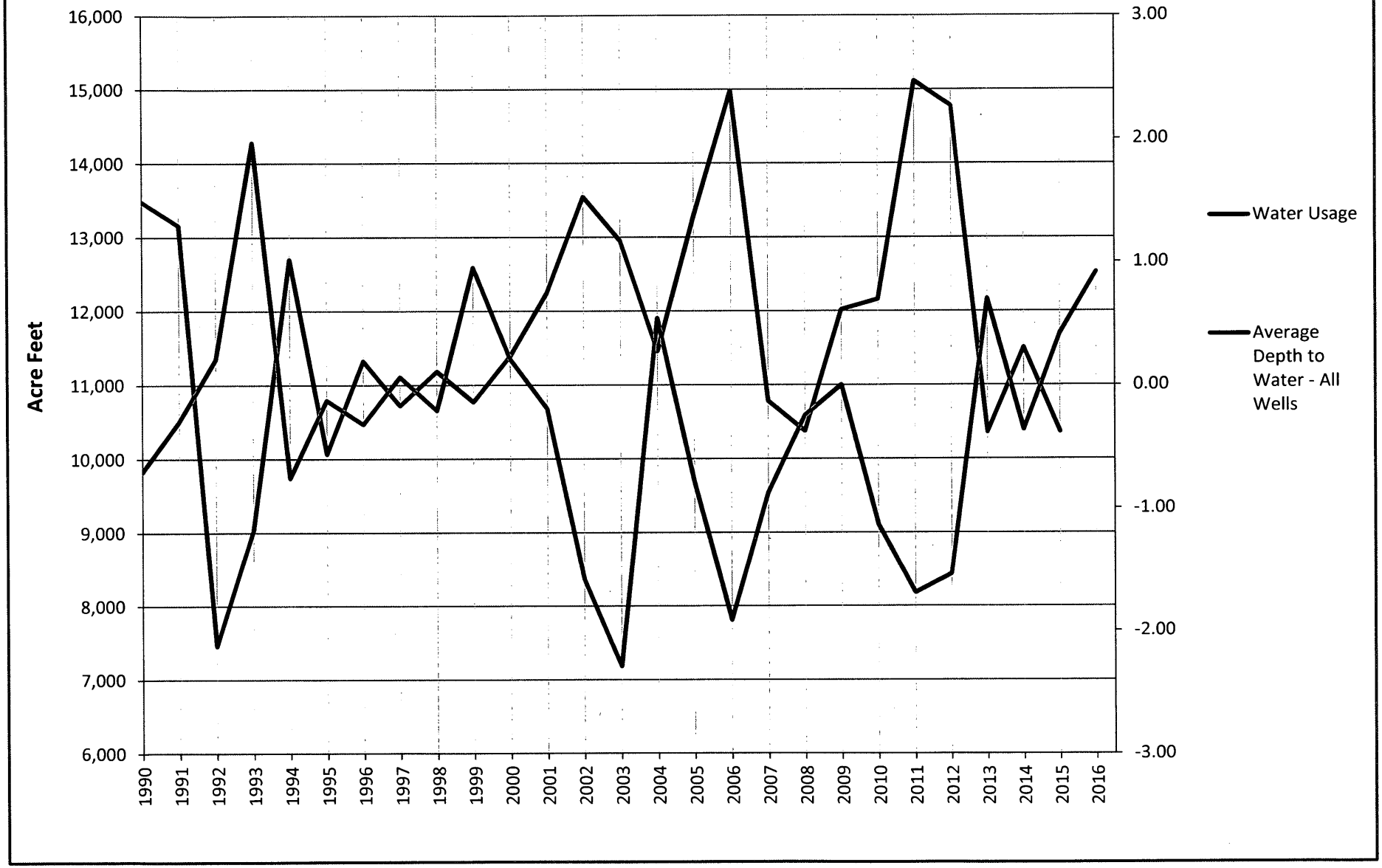

McPherson Annual Rainfall
Rainfall (inches)
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Year


McPherson IGUCA Water Use 1990-2015
Acre Feet
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Total
Irrigation
Municipal
Industrial
Remediation

McPherson IGUCA Water Use and Rainfall



McPherson IGUCA Water Use/ Ave Depth to Water



47,955

From: Jeff Foster [mailto:JFoster@Stewart.com]
Sent: Thursday, September 29, 2011 11:23 AM
To: Jeff Houston
Cc: 'Peck, John'
Subject: McPherson BPU

Jeff,

The purpose of this letter is to grant legal right of access to the points of diversion situated upon the following described real estate, located in Harvey County, Kansas, to-wit:

The South three-fourths (3/4) of the South Half (S/2) of the Southwest Quarter (SW/4) of Section Thirty-two
(32), Township Twenty-two (22) South, Range Three (3) West of the 6th P.M.:

And

The Southeast Quarter (SE/4) of Section Thirty-two (32), Township Twenty-two (22) South, Range Three (3)
West of the Sixth P.M.;

Said access being granted from the owner of the above described real property to the applicant, City of McPherson, Kansas, Board of Public Utilities.

Sincerely,

The Jeff W. Foster and Dayna S. Foster Family Trust dated Sept. 20, 2004

Jeff W. Foster, Trustee

Jeff W. Foster
President
McPherson County Abstract & Title Co., Inc.
(620) 241-1317 ph
(620) 241-3637 fx
jfoster@stewart.com

#47,955

Change in Depth to Water for All Wells

Water Well	~~Depth to Water~~ Total Depth (ft.)	1990-1999	2000-2011 Change	2010-2011 Change
#2	151.167	-2.16	-11.5	-1
#3	158.4167	0.77	-12.5	-1
#4	146	-2.17	-9.83	-0.83
#5	151.75	1.55	-11.5	-1.5
#7	153	1.5	-12	-2
#8	181.5	2	-10	-3
#9	169	1.92	-8.5	-3.5
#10	165	1.5	-12	-2
#11	190.5	2	-10.5	-1
#12	210	1	-8.5	-1.5
#13	253	-0.5	-8	-1.5
#14	207	-0.5	-7.5	-1.5
Average		**0.576**	**-10.194**	**-1.694**

Kansas
Department of Agriculture
Division of Water Resources

109 SW 9th Street, 2nd Floor
Topeka, Kansas 66612-1283

phone: (785) 296-3717
fax: (785) 296-1176
www.ksda.gov/dwr

Dale A. Rodman, Secretary
David W. Barfield, Chief Engineer

Sam Brownback, Governor

October 6, 2011

BOARD OF PUBLIC UTILITIES
401 W KANSAS AVE
MCPHERSON KS 67460

RE: Application
File No. 47955

Dear Sir or Madam:

Your application for permit to appropriate water in 32-22S-3W, in Harvey County, was received and has been assigned the file number noted above.

In order to be fair to all concerned, it is our policy to process applications in the order they are received. Once review of your application has begun, we will contact you, if additional information is required.

In accordance with the provisions of the Kansas Water Appropriation Act, a portion of which is included below, the use of water as proposed prior to approval of the application is unlawful. Once approved, compliance with the terms, conditions and limitations of the permit is necessary. Conservation of the water resources of Kansas is required.

Section 82a-728 of the Kansas Water Appropriation Act, provides (a) except for the appropriation of water for the purpose of domestic use, . . . it shall be unlawful for any person to appropriate or threaten to appropriate water from any source without first applying for and obtaining a permit to appropriate water in accordance with the provisions of the Water Appropriation Act or for any person to violate any condition of a vested right, appropriation right or an approved application for a permit to appropriate water for beneficial use.

(b) (1) The violation of any provision of this section by any person is a class C misdemeanor . . . A class C misdemeanor is punishable by a fine not to exceed $500 and/or a term of confinement not to exceed one month in the county jail. Each day that the violation occurs constitutes a separate offense.

If you have any questions, please contact our office. If you wish to discuss a specific file, please have the file number ready so that we may help you more efficiently.

Sincerely,

Brent A. Turney

Brent A Turney, L.G.
Change Applications Unit Supervisor
Water Appropriation Program

BAT:arh
pc: STAFFORD Field Office
Groundwater Management District No. 2

RECLAMATION

Managing Water in the West

Water Supply Augmentation Investigation for McPherson, Kansas

Appraisal Report

U.S. Department of the Interior
Bureau of Reclamation
Great Plains Region
Oklahoma-Texas Area Office

December 2005

TABLE OF CONTENTS

List of Figures

Acronyms and Abbreviations

AMSL	average mean sea level
ASR	Aquifer Storage and Recovery
Aquifer	Equus Beds Aquifer
BPU	Kansas Board of Public Utilities
Board	Equus Beds Groundwater Management District Board of Directors
cfs	cubic feet per second
District	Equus Beds Groundwater Management District No.2
gpcd	gallons per capita per day
gpm	gallons per minute
IGUCA	Intensive Groundwater Use Control Area
KWO	Kansas Water Office
mgd	million gallons per day
mg/L	milligrams per liter
NEPA	National Environmental Policy Act
NPDES	National Pollution Discharge Elimination System
O&M	operation and maintenance
SMCL	secondary maximum contaminate level
TDS	total dissolved solids
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service

EXECUTIVE
Summary

This document presents the appraisal-level findings of a water supply augmentation investigation in and around the city of McPherson located in south-central Kansas. Groundwater from the Equus Beds Aquifer (Aquifer), that currently supplies all the existing needs in the study area, has been adversely affected by depletion and an inadequate recharge rates sufficient to replace withdrawals, especially during periods of drought. The purpose of this investigation is to assist the State of Kansas, local water suppliers, and water users in addressing public water supply problems and needs for the McPherson area through the year 2040.

Need for Action

The McPherson area communities currently use groundwater from the Aquifer as the only water supply source for agricultural, rural, domestic, municipal and industrial needs. It is critical that potential methods to enhance water supplies for future growth and development be identified. Additional objectives of the investigation are to ensure a safe, reliable, and sustainable source of water to meet
the 2040 demands.

In response to the serious depletion problem, the McPherson Intensive Groundwater Use Control Area (IGUCA) was established in 1980 as the first IGUCA in the state. In addition, conservation measures and careful management of the area water resources were implemented. Groundwater levels have stabilized in some areas of the Aquifer in recent years since water use controls were implemented within the IGUCA. The water levels still remain as much as 20-30 feet from the 1940's levels at certain locations in this portion of the Aquifer. If action is not taken to augment the water supplies in the study area, water shortages could restrict the growth of existing and new industries and businesses in the McPherson economic development area.

Resources, Opportunities, and Constraints

Opportunities exist in this Kansas area to reduce the impacts on the Aquifer water levels by reducing or eliminating the Aquifer overdraft. This could be accomplished by using water from Federal reservoirs, water from the Little Arkansas River, water from the Smoky-Hill River, recycled water, water from treatment of oil field brine pollution plumes, or a combination of the alternatives identified. Development of new surface storage, recharge of the Aquifer, and irrigated land retirement also appear to be viable alternatives. Conservation and recycling, where appropriate, will help to sustain supplies and lessen groundwater depletion.

Alternatives

Alternative water supplies are required to meet local user needs, to stem the decline of the Aquifer, to provide additional recharge, and to stem the movement of high saline groundwater from the east to the Equus Beds in the McPherson area. The use of surface

water to augment the total water supply would allow the Aquifer levels to recover to near pre-1940 levels through recharge and reduced pumping.

For this appraisal-level report, Reclamation has investigated several alternatives which alone or in combination, could meet the projected water demands in the McPherson area. The alternatives include:

- Little Arkansas River Diversion
- Sharps Creek Diversion
- Wastewater recharge of the Aquifer.
- Transport of water from the Smoky Hill River via pipeline.
- Purchase water from Kanopolis Reservoir and transport to McPherson Area via pipeline.
- Groundwater near Burrton

Non-Injection Options

All alternatives are based on the assumption that 12,365 acre-feet of water is needed to meet 2040 demand, that there is a sustainable aquifer yield of 10,000 acre-feet per year, and that 4,260 acre-feet of supplemental water is needed; 2,365 acre-feet to meet the demand beyond the sustainable yield and 1,895 acre-feet to be injected for "aquifer recovery" which will aid in restoring the aquifer to pre-1940 levels.

The recovery portion of each alternative could be accomplished by "in-situ" (natural) recovery rather than by injection. For example, instead of pumping the 10,000 acre-feet sustainable yield from the Aquifer followed by injecting 1,895 acre-feet for net withdrawal of 8,105 acre-feet, simply limit aquifer pumping to 8,105 acre-feet per year and allocate the entire 4,260 acre-feet of supplemental water for the city's direct use. The net result is the same either way: 12,365 acre-feet of water available for city use and a gain of 1,895 acre-feet in the Aquifer each year.

Based on appraisal-level estimates and on available information, construction costs could range between $25 and $48 million dollars, while annual operation and maintenance (O&M) costs could range between $1.8 and $3 million dollars per year. Actual construction costs, along with the long-term O&M costs, would be determined for each alternative as part of the feasibility study if one is conducted.

Potential Environmental Impacts

The potential environmental impacts of each of the alternatives would be specific and every effort to minimize adverse environmental impacts would be made. In some cases, mitigation may be required. If a feasibility study is conducted, the alternatives and their impacts would be fully evaluated.

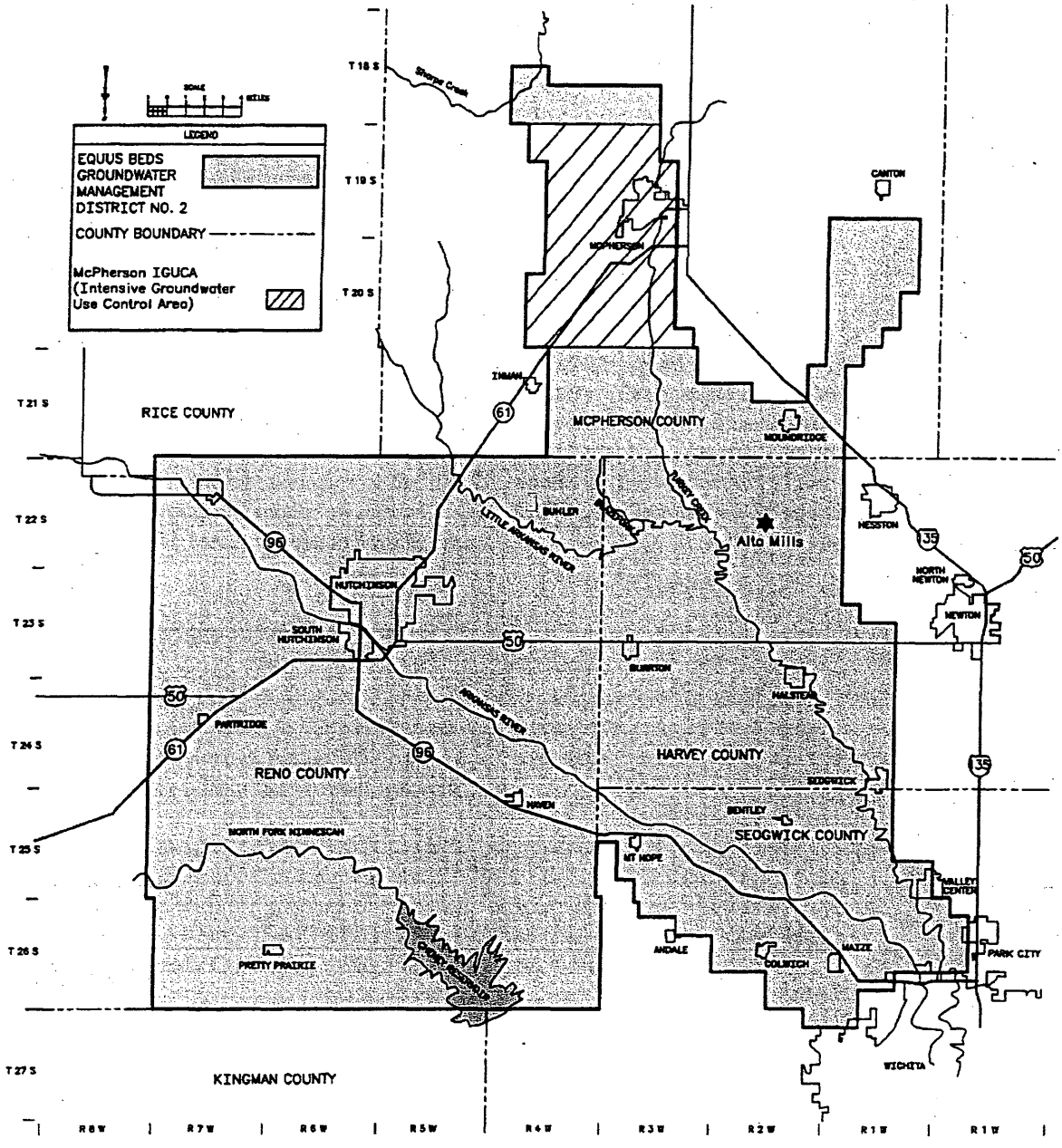


Figure 1 Location Map

CHAPTER 1

Purpose and Need

This appraisal report documents the appraisal-level findings of a water supply augmentation investigation which would serve McPherson, Kansas. Groundwater from the Aquifer that currently supplies all the existing needs in the study area has been affected by withdrawals and inadequate recharge rates during prolonged drought periods.

Study Area

The primary study area of this appraisal report is the McPherson Intensive Groundwater Use Control Area (IGUCA), located in McPherson County. The overall study area includes the Little Arkansas River Basin and parts of several other river basins near McPherson. The boundaries of the Equus Beds Groundwater Management District No. 2 (District), as well as the boundaries of the IGUCA, in the northernmost part of the management district, are shown on Figure 1. The IGUCA encompasses a 56-square-mile area, including the area adjacent to McPherson.

Study Purpose and Scope

The purpose of this study is to assist Kansas in comprehensively addressing public water supply problems and needs in the McPherson area through the year 2040. Kansas is represented by the Kansas Water Office (KWO), the District, basin advisory committees, and citizens living within the McPherson area.

The McPherson Board of Public Utilities (BPU) has undertaken several steps to ensure a water supply for customers during the past 30 years. The city has developed a water conservation plan with the primary objectives to develop long-term water conservation plans (Long-Term Water Use Efficiency Section) and short-term emergency plans (Drought/Emergency Contingency Section). Efficient water use is a priority of McPherson.

The Kansas Geological Survey estimates the current average recharge rate for the McPherson IGUCA is approximately 10,000 acre-feet per year, which is slightly less than the current demand. The McPherson area currently utilizes groundwater as the only water supply source for domestic, rural, agricultural, municipal, and industrial needs. This report identifies alternatives which would provide recharge for the Aquifer in the McPherson area, allow a sustainable pumping level, and in some cases combine multiple available water sources in order to meet projected demands through the year 2040. The recharge of the Aquifer is also important to the overall area water supply. Storing additional water in the Aquifer would provide a more reliable water supply during the critical drought periods, increase the hydraulic barrier between the fresh and salt water, and reduce future pumping costs.

Study Authority

This study is authorized under the Reclamation Act of June 17, 1902 (32 Stat. 388, 43 U.S.C. 391), and acts amendatory thereof and supplementary thereto, including the Reclamation Project Act of 1939, approved February 25, 1956, (Ch. 71, 70 Stat.28)

Need for Action

The IGUCA was established in 1980 by the Kansas, Division of Water Resources, at the request of the District's Board of Directors (Board). Action was requested as a result of declining groundwater levels in and around McPherson. Since the 1940s, water well withdrawals have exceeded the natural recharge rate of the Aquifer, resulting in a decline of the water level. Groundwater levels have stabilized but the Aquifer has been lowered 20-30 feet. One of the management controls enacted in the 56-square-mile IGUCA was to restrict new groundwater usage to domestic use only and excluded any new wells for agriculture.

Action is needed to recharge the Aquifer, and determine a sustainable yield which will support the projected population growth and existing and new industries in the McPherson economic development area through the year 2040.

Previous Studies in the Area

Reconnaissance Report and Environmental Assessment, Water Supply Storage Reallocation for Wilson Lake, Kansas, September 1997, Corps of Engineers.

Equus Beds Groundwater and Bank Storage Recharge Project Studies, various years of the 1990s, Burns and McDonnell.

Reallocation and Environmental Assessment Report for Kanopolis Reservoir, U.S. Army Corps of Engineers, Kansas City District, June 2002.

Water Resources Study, Round Mound Dam and Reservoir, Smoky Hill River Basin, November 1963, U.S. Department of Health, Education and Welfare for Bureau of Reclamation.

Special Report, Smoky Hill Division, December 1960, Bureau of Reclamation.

CHAPTER 2

Resources, Opportunities, and Constraints

Opportunities exist to manage groundwater aquifer water levels and develop a sustainable water supply through the year 2040 for McPherson. Additional supplies could include water from existing Federal reservoirs (Kanopolis or Marion), water from the Little Arkansas River or the Smoky Hill River, adjacent streams (Sharps Creek), or other sources such as recycled wastewater, reclaimed salt water in the Burton area, water rights retirement, or any combination of these.

As shown in Figure 1, the Aquifer is the principal source of fresh, usable water in south-central Kansas. The Aquifer underlies portions of a four-county area totaling approximately 900,000 acres. Depth to water in the northern portion of the Aquifer in the McPherson area ranges from about 40 to 110 feet. The saturated thickness of the Aquifer ranges from about 50 to 300 feet. Areas of greatest thickness correspond to the McPherson and Ancestral Arkansas River bedrock channels. Areas of least thickness are associated with highs or ridges in the bedrock surface. The water quality of the Aquifer is slowly deteriorating because some high chloride water is slowly migrating into the well field from an old oilfield near Wichita, Kansas and the Arkansas River in the southern end of the study area. Additional background information and details on the Aquifer are available in a report titled *Equus Beds Groundwater Management District No. 2, Management Program*, released by the Board on May 1, 1995. The report includes contour maps of the entire district, depicting depth of water below land surface, water table configuration, saturated thickness, and configuration of the bedrock surface. The soil in the IGUCA is generally impermeable, thus reducing recharge to the Aquifer. In a normal year, approximately 3 inches of rainfall recharges the Aquifer; the remaining 27 inches is used by plants, drains to rivers or streams, or evaporates.

Current Water Uses

Industrial, municipal, and agricultural groundwater use reported in 2002 in the IGUCA water use study area totaled 13,521 acre-feet, a 25 percent increase over the average use of 10,547 acre-feet.

In past years, groundwater use in the study area has typically been divided evenly among municipal, industrial, and agricultural uses. Historical pumping for each use is displayed in Figure 2. Agricultural use can be seen to vary and is closely tied to precipitation during the growing season in any particular year. The historic municipal use is the total water supplied by McPherson and includes the domestic use and the commercial/ industrial use by businesses that obtain their water supply from the city. There are private domestic wells in use which are estimated to account for about 1 percent of the annual demand.

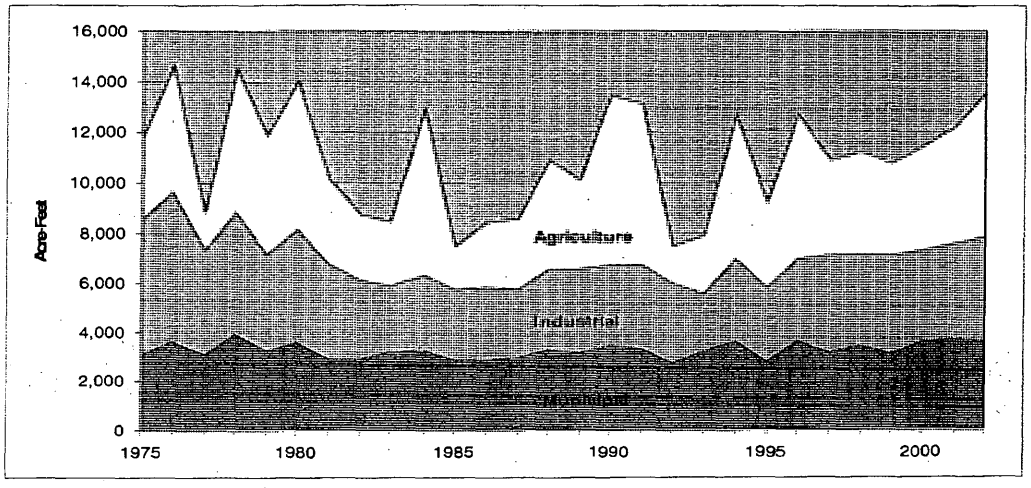


Figure 2: Historical pumping levels in the McPherson Intensive Groundwater Use Control Area (IGUCA)

Water Demands and Population

Water demands for the McPherson area through the year 2040 were developed using projected population growth based on historical growth and use trends.

Table 1 presents the population and water use projections prepared by the KWO through the year 2040 for McPherson. Because of the high municipal and industrial demand in McPherson, a constant per capita use rate of 230 gallons per capita per day (gpcd) through the year 2040 was used for this appraisal-level report. The 230 gpcd used in this study was the average water provided by McPherson between 1990 and 2002. This per capita use rate includes city-delivered industrial water but does not include supplemental-industrial water provided by company-owned wells.

Table 1—McPherson population and water use estimates. Population projections and water use projections were obtained from a demographic report prepared by the KWO.

Item	1990	2000	2010	2020	2030	2040
Population	12,422	13,279	14,193	15,108	16,022	16,937
Water use (thousands of gallons)	—	1,012,989	1,082,713	1,152,514	1,222,238	1,292,039
Water use (acre-feet)	—	3,109	3,323	3,537	3,751	3,965
Water use (average 1990-2002) (gpcd)	—	239	230	230	230	230
Adjusted water use (acre-feet)[1]	3,421	3,557	3,657	3,893	4,128	4,364

[1] The adjusted water use includes industrial/commercial uses, which are supplied by McPherson. The per capita use rate, including industrial/commercial use with water supplied by the city, used for future water needs projections, is 230 gpcd.

Table 2 summarizes the estimated total groundwater demands for future years projected to be pumped from the Aquifer in the IGUCA.

Table 2—Estimated groundwater demands from the IGUCA for future years. **This table does not include Individual domestic wells from household development outside the city of McPherson water delivery system.**

	Demand in acre-feet per year			
Year	Municipal & Industrial	Supplemental Industrial provide by company owned wells	Agricultural	Total
2000	3,557	3,694	4,114	11,365
2010	3,657	4,000	4,000	11,657
2020	3,893	4,000	4,000	11,893
2030	4,128	4,000	4,000	12,128
2040	4,364	4,000	4,000	12,364

McPherson County has generally experienced low levels of unemployment, and a solid industrial base. Several large industrial plants are located in the county, which help to attract and support industries and infrastructure. This growth may be reflected through population growth, income growth, and increasing employment prospects. The population and economy of McPherson County have grown over the last 30 years. Between 1970 and 2000, the population of the county grew by slightly more than 19 percent.

Water Resources

McPherson Intensive Groundwater Use Control Area (IGUCA)

The IGUCA was established March 28, 1980, by the Chief Engineer-Director, Division of Water Resources, at the request of the District, because of declining water levels in areas of the unconfined Aquifer. Groundwater withdrawals had exceeded recharge, creating a groundwater mining condition. By 1980, the water table in portions of the Aquifer had dropped as much as 30 feet from the 1940's The IGUCA encompasses a 56-square-mile area located in the extreme northern portion of the district, as shown in Figure 1.

The management provisions established in 1980 in the control area, when the IGUCA was established, include:

- Closing the area to further groundwater development, except for domestic use
- Dismissing all applications to appropriate water filed after the establishment of the control area
- Installing water meters on all non-domestic water wells in the control area
- Submitting an annual status report and management recommendations to the chief engineer

The Kansas Geological Survey has estimated the average annual recharge to the IGUCA is approximately 10,000 acre-feet. The annual groundwater usage in the IGUCA has varied from an estimated minimum of 4,916 acre-feet in 1974 to a maximum of 14,497 acre-feet in 1978. The average annual between 1981 when the IGUCA was established

and 2002 was 10,547 acre-feet. The average annual municipal, industrial, and agricultural uses are about 30 percent, 33 percent, and 37 percent, respectively, of the total average annual groundwater use from the IGUCA. The volume of dewatered aquifer was determined to be about 758,270 acre-feet for the 1940 to 2002 time period and 688,190 acre-feet for the 1940 to 1986 time period. The difference in the volumes of the dewatered aquifer for these time periods gives about 70,080 acre-feet, which represents the volume of aquifer dewatered since 1986. By multiplying the volume of dewatered aquifer for each time period by a representative specific yield for the Aquifer of 0.15, the groundwater deficits for these time periods in IGUCA can be estimated. Table 3 summarizes these groundwater deficits:

Table 3—Groundwater Deficits in IGUCA

Time period	Years	Volume of dewatered aquifer (acre-feet)	Total deficit 15%(specific yield) of dewatered Volume (acre-feet)	Average annual deficit (acre-feet/year)
1940-2002	62	758,270	113,740	1,835
1940-1986	46	688,190	103,230	2,245
1987-2002	16	70,080	10,510	657

The total deficit of 113,740 acre-feet for the 1940-2002 time periods represents the volume of groundwater that, if replaced in the Aquifer, would raise the water level to the pre-1940 levels. As shown in Table 3, the Aquifer continues to be dewatered, as indicated by the 1987-2002 groundwater deficits. Recharging the Aquifer would reduce further drawdown and depletion, reduce future pumping cost, and increase the hydrostatic barrier to halt salt water intrusion of the Aquifer.

For report purposes, the approach used to determine the average annual volume of water needed to supplement the 10,000 acre-feet sustainable yield from the Aquifer was to add the projected 2040 demand water deficit (2,365 acre-feet) to the amount needed to restore the Aquifer to the 1940's level in a reasonable time period. Since the Aquifer depletion occurred over approximately 60 years, and given the variability of annual aquifer recharge over time, a 60-year recovery period is considered reasonable in this report. Table 4 illustrates the total supplemental water requirements for several recovery periods. Based on the 60-year recovery time period, the average annual diversion rate, which includes the year 2040 water supply deficit, is 4,260 acre-feet as shown in Table 4.

Table 4—Average Annual Little Arkansas River diversion needs—various aquifer recovery time periods

Recovery period (years)	Deficit* (acre-feet)	Annual aquifer recovery (acre-feet)	Rate for total capacity (acre-feet)
10	2,365	11,370	13,735
30	2,365	3,790	6,155
40	2,365	2,845	5,210
60	2,365	1,895	4,260

*Deficit = 2040 demand(12,365 ac-ft) – Sustainable yield (10,000 ac-ft)

Saline groundwater intrusion occurring east of the refinery has been briefly addressed elsewhere in this report. The problem is such that in the last two years the refinery has discontinued using their own wells because of saline conditions and has been purchasing

water from the city. Aquifer recharge in the area east of the refinery would create a groundwater barrier that could limit further saline water intrusion into the area. This may allow the refinery to again use their existing wells to meet their water supply needs.

Surface Water

The Little Arkansas River is the primary surface water resource in the general study area. The watershed drains an area of approximately 1,342 square miles surrounding the confluence with the Arkansas River near Wichita. Land surface ranges from a high of elevation 1738 feet average mean sea level (AMSL) to a low of elevation 1295 feet AMSL. The Aquifer area is part of this watershed and is drained by the Little Arkansas River and its tributaries. The portion of the Little Arkansas River above the gauging station at Alta Mills is the area of interest in this study. The contributing drainage area is 736 square miles for the gauging station at Alta Mills. The average discharge for the period of 1974 to 2002 is about 216 cubic feet per second (cfs) or about 156,700 acre-feet per year. The stream flow extremes ranged from a maximum of more than 30,100 cfs in October 1973 to no flow occurring in August and October, 1991.

Water quality data for the Little Arkansas River has indicated that the above-base flows that can be used for recharge varies with flow and is generally of good quality [above-base flows are defined as flows generated from rainfall runoff above the base river flow as established by Kansas Division of Water Resources]. The surface water in the Little Arkansas River is generally of better quality than the water in the Aquifer, with the exception of turbidity. The quality of the water from bank storage recovery is similar to the quality of the water in the river. Therefore, water can be used from the river in recharging the Aquifer with minimal treatment and minimal effect on water quality. It has been demonstrated (District, 1995) that the river turbidity and suspended solids are drastically reduced as the river water flows through the sands, gravels, silts, and clay in the river alluvium.

CHAPTER 3

Alternatives

The overall purpose of this study is to find supplemental water sources to meet the 2040 demand for municipal, industrial, and agricultural water in the McPherson area and, to restore the Aquifer to the pre-1940's level. In order to meet this purpose the following assumptions have been made:

1. The average annual sustainable yield of the IGUCA is 10,000 acre-feet.
2. The total 2040 demand in the area is 12,365 acre-feet.
3. In order to restore the IGUCA over a 60-year period, either by injection or naturally, an average of 1,895 acre-feet of supplemental water is needed each year.

All supplemental water sources identified in this report have a number of common features:

a. All sources could provide supplemental water either by diversion (withdrawal) wells or by diversion dams, with the exception of the Burrton source where water could only be acquired by the diversion wells.
b. All sources would require the use of a water supply delivery pipeline.
c. The supplemental water from all sources could either be injected into the Aquifer and then pumped out or delivered as a direct supply.
d. The Aquifer could be recharged naturally or by injection under each of the supplemental water resources alternatives.
e. All supplemental water source alternatives would likely require some variable amount of water treatment.

In addition to variable water treatment requirements, there are a number of other variables for each source of supplemental water including location, maximum amount of supplemental water available, initial capital costs, and long-term O&M costs. Based on the common feature options cited above, there are many combinations of alternatives that could be formulated for each water source. If a feasibility study is conducted, more detailed information would be developed and the alternatives that appear to be the most cost effective with the least environmental impacts would be evaluated in greater depth. This report focuses primarily on describing each water source, location, and associated issues without actually determining which combination of features appears to be the most feasible.

ALTERNATIVE 1: **Little Arkansas River**

Using Little Arkansas River water to supply additional recharge water for the Aquifer to augment the raw water supply for Wichita is an alternative that has been under study for a number of years. The results of past investigations of Aquifer Storage and Recovery (ASR) of the Equus Beds well field, extending from the Wichita area to the Halstead area, have proven the viability of recharging the Aquifer with water from the Little Arkansas River. The recharging well field area near Wichita is meant to replenish the

Aquifer and ensure future water availability, particularly during dry weather periods, and to reduce future deterioration of the Aquifer water quality by slowing migrating high chloride water into the well field from nearby plume sources. A similar alternative for the McPherson area could provide relief to the Aquifer.
This option for the IGUCA includes the major components listed below:

- Divert water from the Little Arkansas River to the injection wells near McPherson for recharge.
- Recover stored water in the Aquifer for all users in the IGUCA, as needed to meet the water supply requirements.

The projected water withdrawal rate for the IGUCA in the year 2040 has been estimated at 12,365 acre-feet per year. The sustainable yield of the Aquifer in the IGUCA is an average of about 10,000 acre-feet per year, as determined by the U.S. Geological Survey (USGS). Thus, the net deficit in the year 2040 is an average of about 2,365 acre-feet per year. The annual volume of water to be diverted from the Little Arkansas River for aquifer recharge should meet this anticipated deficit, and provide an additional 1,895 acre-feet that could restore aquifer water levels to the pre-1940s time period. Based on the 60-year recovery time period, the average annual diversion rate, including the year 2040 water supply deficit, is 4,260 acre-feet.

The number of estimated wells necessary to divert an average of 4,260 acre-feet per year depends upon the number of days per year that the diversion wells could operate, given the flow of the Little Arkansas River and minimum stream-flow requirements in the river. Based on preliminary injection results from the ASR Demonstration Project, each well could inject 450-500 gpm (1.1 cfs) back into the Aquifer on average. A preliminary review of the historical record and in consideration of minimum flow rates required in the Little Arkansas River, it is estimated that each diversion well could operate 200 days each year and inject about 430 acre-feet per year. To meet the desired goal of 4,260 acre-feet per year would take a minimum of 10 injection wells. During extended periods of drought, the number of days where diversion and injection could occur would be greatly reduced. For the purposes of this report, a base flow was estimated at 15 cfs to account for minimum desirable flows, and any senior water rights below McPherson that may require higher flows.

The preliminary location of the diversion wells would be along the Little Arkansas River in the vicinity of the confluence with Blaze Fork Creek, about 3 to 4 miles west of Alta Mills. The diversion wells would typically be located a minimum of 50 feet from the normal streambed and spaced about 600 to 800 feet apart along the river. A direct surface water diversion may also be implemented. A pipeline from the diversion wells to the point of use would be necessary for this alternative.

The location of the recharge wells would be in the vicinity of the IGUCA most affected by depletions and would be most effective in recharging the Aquifer contained by the IGUCA. The refinery located south of McPherson has water supply wells. In 2005, the refinery has discontinued using the wells because of brine water migration in the Aquifer from the east. Instead, the refinery has opted to purchase water from McPherson. To correct the brine migration situation, this report proposes one or two injection wells be located along the road east of the refinery. By injecting water into the Aquifer, a groundwater barrier can be established that could impede the movement of higher saline groundwater into the production well area.

ALTERNATIVE 2: **Sharps Creek**

Sharps Creek is a tributary to the Smoky Hill River and is located about 8.5 miles northwest of McPherson. The concept of using water from Sharps Creek to recharge the Aquifer is the same as for using water from the Little Arkansas River. This option provides for diversion wells located in the Sharps Creek alluvium that would be pumped whenever the flow in Sharps Creek is higher than the base flow, with allowance for minimum acceptable instream flow. Sharps Creek does not have a stream gauge, nor has it had a stream gauge in the past; therefore, the quantity of a dependable water supply that would be available is unknown.

For this water supply alternative, it is projected that the recharge wells in the McPherson area would be in the same locations as in the Little Arkansas River option. A pipeline from the Sharps Creek diversion wells would also be necessary and could be located along existing roads. The average annual yield available from Sharps Creek is estimated at about 1,000 acre-feet in this report. While this alternative by itself will not meet the entire needs of McPherson, it could provide support to other alternatives, specifically during periods of extended drought when flows in the Little Arkansas River are at a minimum.

ALTERNATIVE 3: **Smoky Hill River**

The likely diversion point on the Smoky Hill River is located about 16 miles directly north of McPherson. The general concept of diverting water from the Smoky Hill River to recharge the Aquifer is generally the same as diverting water from the Little Arkansas River. The Smoky Hill River is part of the Smoky Hill-Saline River Basin. It will be necessary to work closely with Kansas to determine conditions for any proposed transfers and to obtain appropriate approvals.

(a.) This option provides for diversion wells in the Smoky Hill River alluvium that would be pumped whenever the flows in the river are above an agreed upon minimum. The rate would correspond to the release of an annual volume of water purchased from the KWO and released from Kanopolis Reservoir. For this water supply alternative, it is assumed that the recharge wells in the McPherson area would be located in the same places as with the Little Arkansas River option. A pipeline from the Smoky Hill River diversion wells to the point of use would also be necessary and could be located along existing roads.

(b) A second option of this Smoky Hill alternative would include the construction of a diversion dam in the river to divert surface water purchased from the KWO and released from Kanopolis Reservoir for transport to the McPherson area. The Smoky Hill River carries considerable sediment and is high in dissolved constituents which would dictate the water treatment processes necessary to bring the water supply into compliance with current drinking water standards. The main parameters of concern include TDS (total dissolved solids), sulfate, and chloride. Reverse osmosis treatment would most likely be required in addition to typical surface water treatment to removed suspended solids.

(c) A different option considered is the possible blending of Smoky Hill River water with water pumped from the Aquifer before use by McPherson and the industrial users including the refinery. The concept assumes that Smoky Hill River water quality could be improved through blending with Equus Beds groundwater, which is of higher quality, such that the blended water might be acceptable for domestic and industrial use. Blending assumes that the withdrawal of groundwater from the Equus Beds would be reduced by the amount of the proposed diversion from the Smoky Hill River, 4,260 acre-feet per year as stated in this report, thus allowing for a natural recovery of the Aquifer without direct recharge. Given the TDS of about 445 milligrams per Liter (mg/L) for the aquifer and a high TDS of Smoky Hill water of about 950 mg/L, the blended water would require 90 percent aquifer water with 10 percent Smoky Hill water in order to meet the Secondary Maximum Contaminant Level of 500 mg/L. For the annual demand of 7,251 acre-feet per year, approximately 725 acre-feet could be diverted from the Smoky Hill River annually without additional treatment.

ALTERNATIVE 4: **Wastewater Reuse**

Recycled wastewater from the McPherson wastewater treatment plant could be used to recharge the Aquifer. The wastewater may require additional treatment before injection into the Aquifer. The quantity of wastewater that could be reused annually would be considerably less than the total to meet the future water supply needs and for aquifer recharge. Additional water supplies would still be necessary to meet the future needs in the McPherson area.

ALTERNATIVE 5: **Purchasing Available Water from KWO**

The KWO continues to strive for coordinated management of state-owned or controlled storage space in Federal reservoirs in order to satisfy water rights within each basin. This is managed through the state's long-term Water Assurance Program and the annual-term Water Marketing Program. Each of these programs strives to meet municipal and industrial demands in a coordinated effort in the best interest of the state. Obtaining water from existing storage reservoirs may be a possible alternative to meet the water supply needs in the McPherson area. Two reservoirs in the program are within a reasonable distance from the McPherson area and are included as possible alternatives—Kanopolis Lake on the Smoky Hill River and Marion Lake on the Cottonwood River.

5a. Water Supply from Kanopolis Lake

Kanopolis Lake is located on the Smoky Hill River, about 24 miles northwest of the McPherson. Kansas recently purchased water stored in Kanopolis Lake from the U. S. Army Corps of Engineers (USACE) and has made this available for purchase. This alternative would involve purchasing and diverting surface water from Kanopolis Lake to the McPherson area. Since the water supply needs of the McPherson area are estimated at 4,260 acre-feet per year, sufficient water appears to be available for diversion to McPherson. This water supply could be used to recharge the Aquifer or as the domestic water supply for McPherson, offsetting groundwater use. New facilities required for this alternative would depend on the intended use. Diversion wells on the Smoky Hill River below Kanopolis reservoir could pump water directly from the river to injection wells

around McPherson. If the water were to be used by McPherson directly, a diversion dam and pumping plant along the Smoky Hill River, a transmission pipeline to the McPherson area (about 16 miles long), and water treatment facilities would be needed to make the water a suitable drinking supply.

The potential costs for this alternative would include:

- Purchasing raw water under the Water Marketing Program at an annual cost set each year by KWO. KWO has set an annual cost for 2004 of $123.77 per million gallons or about $40.33 per acre-foot. Under the KWO Water Marketing Program, the costs are set each year and are valid for one year, typically under a long-term contract running 30 to 40 years. Given this unit cost, the cost of the 4,260 acre-feet (1,388 million gallons) that would be needed in the McPherson area in 2004 dollars would be about $171,800. If this alternative were used to meet the entire annual demand, acquisition costs would be around $200,000 per year for the entire supply with a minimum "take or pay" schedule that would be negotiated at the time of purchase.

- In order to participate in the Water Marketing Program, water users would be required to sign a long-term (up to 40 years) contract agreeing to: repay the state for the costs of providing the water; pay for at least 50 percent of the contracted water each year, regardless of actual use; and pay for water lost in transit from the dam to the purchaser's intake if the water delivery system is below the dam.

- The length of pipeline from the Smoky Hill River below Kanopolis reservoir would be about 16 miles compared to 20 miles from the Little Arkansas River.

- Initial water treatment plant cost plus annual O&M costs would be needed to remove suspended and dissolved solids.

5b. Water Supply from Marion Lake

Marion Lake is on the Cottonwood River, about 30 miles east of McPherson. This alternative would involve the purchase of Marion Lake water from the allocation Kansas purchased from the USACE. This water may require water treatment prior to being used as a source for drinking water or before injection into the Aquifer. While this may not fully meet the McPherson demand, it could be viable in conjunction with other alternatives.

ALTERNATIVE 6: **Groundwater near Burrton**

This alternative would generally consist of pumping groundwater from the Aquifer contaminated by oil field brine plumes near Burrton (see Figure 1), treating this water to remove salts (primarily chloride), and transporting the treated groundwater 27 miles to the McPherson area for groundwater recharge. In the Burrton area, the groundwater has been adversely affected by disposal of brine wastes from past oil drilling activities in the 1900s, resulting in a groundwater plume that has been moving toward the water supply wells owned by Wichita. The chloride level in the saltwater plume is about 1,000 mg/L.

Wichita, the State of Kansas, and others have been investigating various alternatives to correct this potential saltwater intrusion problem and protect local water supply wells, primarily Wichita, from further contamination and aquifer degradation. One of the more prominent alternatives being investigated is to remove, by pumping, the salt contaminated groundwater and treat the water by reverse osmosis to remove the salts. Subsequently, the product water could be beneficially used. Wichita has shown interest in buying the product water from the groundwater treatment operations.

Likewise, treated groundwater could also be bought and used as a supplemental water supply for the McPherson area. For the McPherson area, this alternative would consist of transporting the desalinated groundwater to the McPherson area to be used either directly as the municipal and refining water supply, or to inject into the Aquifer. Based on past studies of the Burrton Salt Plume problem, the yield from the groundwater basin for treatment, and as a water supply, has been determined to be about 4,000 gpm by continuous pumping from the Aquifer. Therefore, the annual volume of water pumped from the Burrton Salt Plume would be about 6,450 acre-feet. This compares with the estimated long-term need of a water supply for the McPherson area of 4,260 acre-feet per year. Using the water directly as the McPherson water supply would reduce the need to pump a like volume of water from the Aquifer, allowing for natural recharge over and above the projected 2040 withdrawals.

This alternative would include a 27 mile pipeline, plus treatment costs. Reclamation's recent studies on the feasibility of desalinating the salt water plume has indicated a unit treatment cost, including brine disposal, of about $2.00 per thousand gallons of product water or $650 per acre-foot. This alternative does have the potential to recharge at or above the desired rate of 4,260 acre-feet per year or provide a portion of the annual recharge if feasible. Since this alternative is not dependent on surface water runoff it could prove more reliable during extended drought periods.

Water Treatment Plant in Conjunction with River Diversions

All of the alternatives have the potential to reduce withdrawals from the Aquifer through the diversion or importation of water from other sources. This reduction would have a net effect of recharging the Aquifer without the costs of pumping the water out for municipal use and then injecting the replacement water back into the Aquifer.

Alternatives are based on the assumption that 12,365 acre-feet of water is needed to meet 2040 demand, there is a sustainable aquifer yield of 10,000 acre-feet per year, and 4,260 acre-feet of the supplemental water would be needed; 1,895 acre-feet to be injected for "aquifer recovery" and 2,365 acre-feet for city, either via aquifer injection or as a direct supply with water treatment. The recovery portion of each alternative could be accomplished by "in-situ" (natural) recovery rather than by injection. Instead of pumping the 10,000 acre-feet sustainable yield from the Aquifer and then injecting 1,895 acre-feet back into the Aquifer for a net withdrawal of 8,105 acre-feet, it would be less expensive to simply limit aquifer pumping to 8,105 acre-feet per year and allocate the entire 4,260 acre-feet of supplemental water for direct use by the city. The net result is the same either way: 12,365 acre feet of water available for use by the city and a gain of 1,895 acre-feet in the Aquifer each year. During higher runoff years, diversions could be used as available to further reduce pumping from the Aquifer and result in a greater recharge

rate to the Aquifer. The initial short-term construction costs of each option, along with the long-term O&M costs, would be evaluated for each alternative if a feasibility study is conducted.

The first three alternatives which divert water from the river could be able to provide the annual target recharge level when combined with the adequate water treatment capability. McPherson would need to acquire the ability to treat approximately 6 million gallons per day (MGD) to meet the combined municipal and industrial demands. The addition of a water treatment plant could provide the opportunity to meet a portion of the demands with river water and reduce groundwater pumping.

The number of days that the river is above normal flow whereby diversions from the river could occur was estimated at 200 days per year or 55 percent of the time. The average annual demand for municipal, industrial and agriculture combined was determined to be 10,547 acre-feet. Agricultural demand was assumed to be 50 percent of the maximum available diversion since this demand is tied to growing seasons and precipitation.

As shown in Figure 2 and summarized in Table 4, groundwater pumping could be reduced by 45 percent with the addition of river diversions while meeting the target recharge rate of 4,260 acre-feet per year, and provide an additional 450 acre-feet of recharge per year to the Aquifer.

The city has also experienced National Pollution Discharge Elimination System (NPDES) problems with discharges into Turkey Creek from the wastewater treatment plant. The water quality of the plant effluent has seen a steady increase in dissolved solids and salinity in recent years, such that the NPDES permit conditions are being exceeded. The blending of water from the Smoky Hill River with Equus Beds groundwater would result in further increases in the salinity and TDS in the wastewater discharges into Turkey Creek. This problem would probably result in requirements for additional wastewater treatment to remove dissolved solids by reverse osmosis before discharge or, as an alternate, water treatment to remove dissolved solids by reverse osmosis in the water supply before municipal and industrial use in the McPherson area.

Based on appraisal-level estimates based on available information, construction costs could range between $25 and $48 million dollars, while annual O&M costs could range between $1.8 and $3 million dollars per year. Actual construction costs of each option, along with the long-term O&M costs, would be determined for each alternative as part of the feasibility study if one is conducted.

Table 5 Summary of projected 2040 Pumping levels combined with River Diversions

					Projected 2040 Annual Demand in Acre-Feet		**12,364**	**1**
Type of Use		Percent of Average Annual Demand	Acre-Feet per Year	Acre-Feet per Day	Million Gallons per Day (MGD)	River Diversion percentage	River Diversions (Acre-Feet)	**Row Number**
Municipal		30%	3,709	10.1	3.3	55%	2,039	**3**
Industrial		33%	4,080	11.2	3.6	55%	2,244	**4**
					Water treatment capacity required for M&I (MGD)	6.0		
Agriculture		37%	4,575	12.5	4.1	27%*	1,235	**6**
						Total Contribution per 200 days of pumping (Acre-Feet)(sum rows(3+4+6))	5,518	**7**
						Target recharge amount per year (Acre-Feet)	4,260	**8**
						Additional Annual recharge based on 200 river diversion days (Acre-Feet)(row 7 minus row 8)	1,258	**9**
						Pumping reduction as a result of River Diversions (%)(row7/row1)	45%	**10**
						Annual Groundwater pumping required in 2040 (Acre-Feet)(row 1 – row7)	6,846	**11**

*River Diversion contribution to Agriculture was reduced by 50% as demand is tied to growing seasons and precipitation.

Table 6—Summary comparison of the options and alternatives features

	Alternatives							
Feature	Little Arkansas River	Sharps Creek Water Supply	Smoky Hill River	Wastewater reuse	Purchase from Kanopolis Reservoir	Combination of Alternatives such as Sharps Creek and Wastewater Reuse	Purchase from Marion Lake	Groundwater near Burrton
Water supply available	Sufficient	Unknown; insufficient	Probably sufficient	Insufficient	Sufficient	Sufficient	Insufficient	Insufficient
Estimated water supply ac-ft/year	4,260	Est. 1,000	4,260	Est. 1,000	4,260	4,260	0	Est. 2,000
Water Cost (KWO)	None	None	$200,000 annually + O&M	None	$200,000 annually + O&M	None	$200,000 annually + O&M	None
RO Treatment	None	Unknown	Yes	Yes	Yes	Yes	Yes	Yes
Treatment Facilities	None	None	Yes	Yes	Yes	Yes	Yes	None
Pipeline, Miles	20 miles	15 miles	17 miles	Local system	30 miles	15	>35 miles	27 miles
Pumping Plants	None	None	Yes	None	Yes	None	Yes	Yes
Recharge wells	7	7	7	3	4	7	4	7
Diversion Wells	10	10	10	6	8		8	10

CHAPTER 4

Potential Effects of Alternatives

Water Resources

The potential effects of these alternatives would be limited to the areas of each alternative. Since there is the possibility that a single alternative would not be able to meet the projected demand on a sustainable level, it will be necessary to formulate a plan for meeting the demand and then evaluate the effects of the alternatives chosen.

Potentially, diverting above-base flow water from the Little Arkansas River would slightly reduce the average annual runoff of the river by about 3 percent. Diversions could be limited to periods when the flow rate is above the base flow plus any minimum instream flow requirements or senior water rights downstream.

The water quality impacts of recharging the Aquifer in the McPherson area depend on the quality of the groundwater and the water that is used to recharge the Aquifer.

Threatened and Endangered Species and Species of Concern

In addition to the Federally listed species, the Kansas list of threatened or endangered species include several fish, birds, and the eastern spotted skunk. A reduction in flows from the Little Arkansas River Basin could impact species in the area.

Table 7—Summary of Federally listed species likely found in the study area

Species	Status	County where found
Arkansas darter	Candidate	Reno, Sedgwick
Arkansas River shiner[2]	Threatened	Sedgwick
Bald eagle	Threatened	McPherson, Reno, Sedgwick
Interior least tern	Endangered	Reno, Sedgwick
Whooping crane	Endangered	McPherson, Reno, Sedgwick

While other neotropical migratory songbirds, waterfowl, and raptors migrate through the proposed study area, a complete list of impacted species has not been compiled for this report.

Cultural Resources

Ground disturbance would occur from all alternatives, most would include wells for water production and injection along with associated pipelines for water transportation. Where possible the pipelines and recharge wells would both be within existing road rights-of-way. Access roads or additional leveling or site preparation for the well pads might also be included. Any of the proposed alternatives included in this report would require a qualified archeologist to perform a Class III, on-the-ground, survey of all areas of ground disturbance to identify and record any cultural resources or areas of historic

[2] FWS 1993 letter notes the Arkansas River shiner "may in all likelihood already have been extirpated from the Arkansas River."

interest that might be affected by the action. The survey level required could take from 6 to 9 months to complete.

Environmental Impacts Associated with Project Implementation

Impacts to the existing environment would be determined by the number and location of bank storage wells installed. Vegetation impacts are expected to be minimal if road rights-of way are used to install and construct pipelines from diversion wells to the injection well sites. Impacts that cannot be avoided may require mitigation. Disturbed areas would be re-seeded with native, non-invasive plant species to control erosion

Impacts to aquatic resources and species would depend on the volume and timing of water diverted. Diversions would occur when flows exceed a certain minimum designated stream flow.

Environmental Clearances Necessary at Feasibility-Level Study

Construction in riparian areas could require a Clean Water Act Section 404 Dredge and Fill Permit from the USACE and, a 401 Water Quality Certificate from the State of Kansas. The U.S. Fish and Wildlife Service (USFWS) and the Kansas Department of Wildlife and Parks would need to be formally contacted, and consultation with USFWS regarding impacts to listed species is required. Impacts of alternatives would be determined in a National Environmental Policy Act (NEPA) document if a feasibility study is completed.

The following is a list of the environmental clearances that may be necessary:

- Appropriate permits from the USACE for Section 404 of the Clean Water Act
- Water Quality Certificate from Kansas under Section 401 of the Clean Water Act
- Concurrence from the USFWS on listed species in the study area
- Indian trust assets and/or Indian sacred sites identification
- Consult with the Chief Engineer, on proposed project to determine water withdrawals are in compliance with state statutes and appropriations (K.S.A. 82a-703(b)).

CHAPTER 5

Findings

Reclamation performed this study for Kansas, local water purveyors, and water users in addressing public water supply problems and needs in the McPherson area. If any of the water supply alternatives are authorized for additional feasibility study and implementation, additional planning and design analyses and NEPA compliance documents would need to be prepared to facilitate a Federal decision about implementation.

This chapter summarizes the findings of this appraisal-level study. The water supply estimated to equal annual deficits for recharge of the Aquifer has been determined to be 2,365 acre-feet per year, based upon future 2040 demands in the McPherson area. An additional annual amount of 1,895 acre-feet has been identified as necessary for aquifer recovery, assuming a 60-year recovery period. Therefore, the total additional water supply need for demand and aquifer recharge is estimated to be 4,260 acre-feet per year.

The river diversion alternatives coupled with an adequately sized water treatment plant could provide the target amount of 4,260 acre-feet per year. These alternatives assume the river would be above-base flow conditions 200 days every year, and river diversions could be treated and used to partially meet the municipal and industrial demands. Annual pumping for McPherson and the surrounding area could be reduced to about 5,800 acre-feet which is well under the sustainable yield of 10,000 acre-feet and the current average of over 10,547 acre-feet.

Purchasing water from Kanopolis Reservoir by taking water from the lake would require water treatment and transporting 10 miles farther than some of the other alternatives, such as the Little Arkansas River, Sharps Creek, and Smoky Hill River diversion alternatives. Transporting water out of a watershed, in the volumes required at a distance in excess of 35 miles and more than 2,000 acre-feet per year, may require a state hearing under the Kansas Water Transfer Act to address concerns and seek required approvals.

Placing wells in the shallow alluvium of the Smoky-Hill River where I-35 crosses north of McPherson would decrease the transportation distance to about 17 miles. A small diversion dam could be placed in the river to pond water to pump surface water purchased and released from Kanopolis Reservoir.

Pumping and treating oil field brine contaminated plumes in groundwater near Burrton, would also require water treatment to remove contaminants and transporting the water.

Although some of the alternatives supply sufficient quantities of water from an individual source, it should be noted that in the future, multiple alternatives may become more viable

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1320 Research Park Drive
Manhattan, Kansas 66502
(785) 564-6700

Kansas
Department of Agriculture
agriculture.ks.gov

900 SW Jackson, Room 456
Topeka, Kansas 66612
(785) 296-3556

Jackie McClaskey, Secretary

Governor Sam Brownback

September 29, 2015

TIM BOESE
GROUNDWATER MANAGEMENT DISTRICT NO 2
313 SPRUCE ST
HALSTEAD KS 67056-1925

Re: Application
File Nos. 47,955, 47,956 and 47,957

Dear Mr. Boese:

In response to your written request dated September 18, 2015, the Chief Engineer is allowing additional time to submit recommendations regarding the above referenced applications. With this extension of time the revised deadline is **March 18, 2016**. Please submit your recommendations within the allotted time or any authorized extension of time thereof.

If you have any questions, please contact me at (785) 574-6640. If you wish to discuss a specific file, please have the file number ready so that I may help you more efficiently.

Sincerely,

Kenneth A. Kopp, P.G.
New Application Unit Supervisor
Water Appropriation Program

pc: Stafford Field Office

EQUUS BEDS GROUNDWATER MANAGEMENT DISTRICT NO. 2

313 SPRUCE STREET • HALSTEAD, KANSAS 67056-1925 • PHONE (316) 835-2224 • FAX (316) 835-2225 • equusbeds@gmd2.org • www.gmd2.org

September 18, 2015

Chief Engineer, Division of Water Resources
c/o Kenneth A. Kopp
1320 Research Park Drive
Manhattan, KS 66502

Re: Application Nos. 47955, 47956, 47957 – McPherson BPU

Dear Mr. Kopp:

The Equus Beds Groundwater Management District No. 2 requests an extension of time to review and make recommendations on the referenced applications.

The applications are located in the Equus Beds Special Water Quality Use Area (SWQUA), which was established by order of the Chief Engineer on September 17, 1986.

The District requests that the time be extended for an additional period of 180 days. The extension will allow the applicant and the applicant's consultant to provide additional information, including computer modeling to determine any impacts the applications could have on the Hollow-Nikkel or Burrton chloride plumes and existing senior water rights in the area. The applicant's consultant has provided the District with a scope of services for the modeling effort and has started work on the modeling project. Once the information is provided to the District, the applications will be scheduled to be reviewed by the District Board of Directors at the next available Board meeting.

Sincerely,
EQUUS BEDS GROUNDWATER
MANAGEMENT DISTRICT NO. 2

T. Boese

Tim Boese
Manager
TDB/db
pc: Timothy S. Maier, McPherson Board of Public Utilities
Brian Meier, Burns & McDonnell

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Kopp, Kenneth

From: Schemm, Doug
Sent: Tuesday, September 29, 2015 7:54 AM
To: Kopp, Kenneth
Subject: RE: File Nos. 47955. 47956. 47957 - McPherson BPU

Hello Ken,
Sure no problem. This is a long term MUN search for water, and Tim is assisting, so OK by me.
Thanks, Doug

From: Kopp, Kenneth
Sent: Tuesday, September 29, 2015 7:51 AM
To: Schemm, Doug
Subject: File Nos. 47955. 47956. 47957 - McPherson BPU

Hi Doug,

Tim is requesting more time on the McPherson BPU files, which I think are still assigned to you. His request is scanned into DocuWare. It is dated Sep. 18, but wasn't received until Sep. 28. I just wanted to make sure you are OK with another extension before I proceed. I can mail the letter from here.

Thanks,
Ken

1320 Research Park Drive
Manhattan, Kansas 66502
(785) 564-6700

Kansas
Department of Agriculture
agriculture.ks.gov

900 SW Jackson, Room 456
Topeka, Kansas 66612
(785) 296-3556

Jackie McClaskey, Secretary

Governor Sam Brownback

March 17, 2015

TIM BOESE
GROUNDWATER MANAGEMENT DISTRICT NO 2
313 SPRUCE ST
HALSTEAD KS 67056-1925

Re: Application
File Nos. 47,955, 47,956 and 47,957

Dear Mr. Boese:

In response to your written request received in this office on September 22, 2014, and your recent request by electronic mail received in our office on March 16, 2015, the Chief Engineer is allowing additional time to submit recommendations regarding the above referenced applications. With this extension of time the revised deadline is **September 18, 2015**. Please submit your recommendations within the allotted time, or any authorized extension of time thereof.

If you have any questions, please contact me at (785) 574-6640. If you wish to discuss a specific file, please have the file number ready so that I may help you more efficiently.

Sincerely,

Kenneth A. Kopp, P.G.
Water Appropriation Program
Division of Water Resources

pc: Stafford Field Office

EQUUS BEDS GROUNDWATER MANAGEMENT DISTRICT NO. 2

313 SPRUCE STREET • HALSTEAD, KANSAS 67056-1925 • PHONE (316) 835-2224 • FAX (316) 835-2225 • equusbeds@gmd2.org • www.gmd2.org

September 18, 2014

Chief Engineer, Division of Water Resources
c/o Richard Rockel
1320 Research Park Drive
Manhattan, KS 66502

Re: Application Nos. 47955, 47956, 47957 – McPherson BPU

Dear Mr. Rockel:

The Equus Beds Groundwater Management District No. 2 requests an extension of time to review and make recommendations on the referenced applications.

The applications are located in the Equus Beds Special Water Quality Use Area (SWQUA), which was established by order of the Chief Engineer on September 17, 1986.

The District requests that the time be extended for an additional period of 180 days. The extension will allow the applicant and the applicant's consultant to provide additional information, including computer modeling to determine any impacts the applications could have on the Hollow-Nikkel or Burrton chloride plumes and existing senior water rights in the area. Once the information is provided to the District, the applications will be scheduled to be reviewed by the District Board of Directors at the next available Board meeting.

Sincerely,
EQUUS BEDS GROUNDWATER
MANAGEMENT DISTRICT NO. 2

Tim Boese
Manager

TDB/db

pc: Timothy S. Maier, McPherson Board of Public Utilities
Brian Meier, Burns & McDonnell

EQUUS BEDS GROUNDWATER MANAGEMENT DISTRICT NO. 2

313 SPRUCE STREET • HALSTEAD, KANSAS 67056-1925 • PHONE (316) 835-2224 • FAX (316) 835-2225 • equusbeds@gmd2.org • www.gmd2.org

March 18, 2014

Chief Engineer, Division of Water Resources
c/o Douglas Schemm
109 SW 9th Street, 2nd Floor
Topeka, Kansas 66612-1283

Re: Application Nos. 47955, 47956, 47957 – McPherson BPU

Dear Mr. Schemm:

The Equus Beds Groundwater Management District No. 2 requests an extension of time to review and make recommendations on the referenced applications.

The applications are located in the Equus Beds Special Water Quality Use Area (SWQUA), which was established by order of the Chief Engineer on September 17, 1986.

The District requests that the time be extended for an additional period of 180 days. The extension will allow the applicant and the applicant's consultant to provide additional information, including computer modeling to determine any impacts the applications could have on the Hollow-Nikkel or Burrton chloride plumes and existing senior water rights in the area. Once the information is provided to the District, the applications will be scheduled to be reviewed by the District Board of Directors at the next available Board meeting.

Sincerely,
EQUUS BEDS GROUNDWATER
MANAGEMENT DISTRICT NO. 2

Tim Boese

Tim Boese
Manager
TDB/db

pc: Timothy S. Maier, McPherson Board of Public Utilities
Brian Meier, Burns & McDonnell

Kansas
Department of Agriculture
Division of Water Resources

109 SW 9th Street, 2nd Floor
Topeka, Kansas 66612-1283

phone: (785) 296-3717
fax: (785) 296-1176
www.ksda.gov/dwr

Dale A. Rodman, Secretary
David W. Barfield, Chief Engineer

Sam Brownback, Governor

March 24, 2014

GROUNDWATER MANAGEMENT DISTRICT NO 2
% TIM BOESE
313 SPRUCE ST
HALSTEAD KS 67056-1925

Re: Pending Applications, File Nos. 47,955; 47,956; and 47,957

Dear Mr. Boese:

In response to your written request received by electronic mail in our office on March 18, 2014, the Chief Engineer is allowing an additional extension of time for 180 days. Your previous date to respond was March 18, 2014. With this extension of time the revised response date is **September 18, 2014**. This extension of time appears reasonable based on the uniqueness and complexity of this significant project.

We are delaying any further action to allow you time to submit recommendations concerning these files. Please submit your recommendations within the allotted time, or any authorized extension of time thereof.

If you have any questions, please contact me at (785) 296-3495. If you wish to discuss a specific file, please have the file number ready so that I may help you more efficiently.

Sincerely,

Doug Schemm

Douglas Schemm
New Application Unit Supervisor
Water Appropriation Program

pc: Stafford Field Office

Schemm, Doug

From: Tim Boese <tboese@gmd2.org>
Sent: Tuesday, March 18, 2014 3:50 PM
To: Schemm, Doug
Subject: Nos. 47955, 47956, 47957 - McPherson BPU
Attachments: 47955_47956_47957_ext.pdf

Doug – The consultant for the applicant of Nos. 47955, 47956, 47957 is still working on the study/report and computer modeling in support of the referenced applications. Therefore, the District is requesting an additional 180-day extension of time to review and provide recommendations on the applications.

Please see the attached letter. The original is being mailed to you today.

Thanks.

Tim Boese, Manager
Equus Beds GMD2
313 Spruce, Halstead, Kansas 67056
316-835-2224
Fax: 316-835-2225
tboese@gmd2.org
www.gmd2.org

EQUUS BEDS GROUNDWATER MANAGEMENT DISTRICT NO. 2

313 SPRUCE STREET • HALSTEAD, KANSAS 67056-1925 • PHONE (316) 835-2224 • FAX (316) 835-2225 • equusbeds@gmd2.org • www.gmd2.org

March 18, 2014

Chief Engineer, Division of Water Resources
c/o Douglas Schemm
109 SW 9th Street, 2nd Floor
Topeka, Kansas 66612-1283

Re: Application Nos. 47955, 47956, 47957 – McPherson BPU

Dear Mr. Schemm:

The Equus Beds Groundwater Management District No. 2 requests an extension of time to review and make recommendations on the referenced applications.

The applications are located in the Equus Beds Special Water Quality Use Area (SWQUA), which was established by order of the Chief Engineer on September 17, 1986.

The District requests that the time be extended for an additional period of 180 days. The extension will allow the applicant and the applicant's consultant to provide additional information, including computer modeling to determine any impacts the applications could have on the Hollow-Nikkel or Burrton chloride plumes and existing senior water rights in the area. Once the information is provided to the District, the applications will be scheduled to be reviewed by the District Board of Directors at the next available Board meeting.

Sincerely,
EQUUS BEDS GROUNDWATER
MANAGEMENT DISTRICT NO. 2

Tim Boese

Tim Boese
Manager
TDB/db
pc: Timothy S. Maier, McPherson Board of Public Utilities
Brian Meier, Burns & McDonnell

Kansas
Department of Agriculture
Division of Water Resources

109 SW 9th Street, 2nd Floor
Topeka, Kansas 66612-1283

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Dale A. Rodman, Secretary
David W. Barfield, Chief Engineer

Sam Brownback, Governor

September 25, 2013

GROUNDWATER MANAGEMENT DISTRICT NO 2
% TIM BOESE
313 SPRUCE ST
HALSTEAD KS 67056-1925

Re: Pending Applications, File Nos. 47,955; 47,956; and 47,957

Dear Mr. Boese:

In response to your written request received in our office on September 20, 2013, the Chief Engineer is allowing an extension of time for 180 days. Your previous date to respond was September 18, 2013. With this extension of time the revised response date is **March 18, 2014**. This extension of time appears reasonable based on the uniqueness and complexity of this significant project.

We are delaying any further action to allow you time to submit recommendations concerning these files. Please submit your recommendations within the allotted time, or any authorized extension of time thereof.

If you have any questions, please contact me at (785) 296-3495. If you wish to discuss a specific file, please have the file number ready so that I may help you more efficiently.

Sincerely,

Doug Schemm

Douglas Schemm
New Application Unit Supervisor
Water Appropriation Program

pc: Stafford Field Office

EQUUS BEDS GROUNDWATER MANAGEMENT DISTRICT NO. 2

313 SPRUCE STREET • HALSTEAD, KANSAS 67056-1925 • PHONE (316) 835-2224 • FAX (316) 835-2225 • equusbeds@gmd2.org • www.gmd2.org

September 17, 2013

Chief Engineer, Division of Water Resources
c/o Douglas Schemm
109 SW 9th Street, 2nd Floor
Topeka, Kansas 66612-1283

Re: Application Nos. 47955, 47956, 47957 – McPherson BPU

Dear Mr. Schemm:

The Equus Beds Groundwater Management District No. 2 requests an extension of time to review and make recommendations on the referenced applications.

The applications are located in the Equus Beds Special Water Quality Use Area (SWQUA), which was established by order of the Chief Engineer on September 17, 1986.

The District requests that the time be extended for an additional period of ~~90~~ 180* days. The extension will allow the applicant and the applicant's consultant to provide additional information, including computer modeling to determine any impacts the applications could have on the Hollow-Nikkel or Burrton chloride plumes and existing senior water rights in the area. Once the information is provided to the District, the applications will be scheduled to be reviewed by the District Board of Directors at the next available Board meeting.

Sincerely,
EQUUS BEDS GROUNDWATER
MANAGEMENT DISTRICT NO. 2

Tim Boese

Tim Boese
Manager
TDB/db

pc: Timothy S. Maier, McPherson Board of Public Utilities
Jeff & Dana Foster Trust
Brian Meier, Burns & McDonnell

* Per Discussion with Tim Boese, model will take longer to develop. Requested additional time. DWS DWR 9/24/2013.

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Kansas
Department of Agriculture
Division of Water Resources

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Topeka, Kansas 66612-1283

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Dale A. Rodman, Secretary
David W. Barfield, Chief Engineer

Sam Brownback, Governor

March 25, 2013

GROUNDWATER MANAGEMENT DISTRICT NO 2
% TIM BOESE
313 SPRUCE ST
HALSTEAD KS 67056-1925

Re: Pending Applications, File Nos. 47,955; 47,956; and 47,957

Dear Mr. Boese:

In response to your written request received in our office on March 18, 2013, the Chief Engineer has allowed an extension of time for 180 days, until **September 18, 2013**, the time in which to review and provide recommendations concerning the above referenced files. This appears reasonable based on the uniqueness and complexity of this significant project.

We are delaying any further action to allow you time to submit recommendations concerning these files. Please submit your recommendations within the allotted time, or any authorized extension of time thereof.

If you have any questions, please contact me at (785) 296-3495. If you wish to discuss a specific file, please have the file number ready so that I may help you more efficiently.

Sincerely,

Douglas Schemm
New Application Unit Supervisor
Water Appropriation Program

pc: Stafford Field Office

FILE COPY

SCANNED

EQUUS BEDS GROUNDWATER MANAGEMENT DISTRICT NO. 2

313 SPRUCE STREET • HALSTEAD, KANSAS 67056-1925 • PHONE (316) 835-2224 • FAX (316) 835-2225 • equusbeds@gmd2.org • www.gmd2.org

March 13, 2013

Chief Engineer, Division of Water Resources
c/o Douglas Schemm
109 SW 9th Street, 2nd Floor
Topeka, Kansas 66612-1283

Re: Application Nos. 47955, 47956, 47957 – McPherson BPU

Dear Mr. Schemm:

The Equus Beds Groundwater Management District No. 2 requests an extension of time to review and make recommendations on the referenced applications.

The applications are located in the Equus Beds Special Water Quality Use Area (SWQUA), which was established by order of the Chief Engineer on September 17, 1986.

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Sincerely,
EQUUS BEDS GROUNDWATER
MANAGEMENT DISTRICT NO. 2

T. Boese

Tim Boese
Manager
TDB/db

pc: Timothy S. Maier, McPherson Board of Public Utilities
Jeff & Dana Foster Trust
Brian Meier, Burns & McDonnell

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Kansas
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Dale A. Rodman, Secretary
David W. Barfield, Chief Engineer

Sam Brownback, Governor

February 13, 2013

GROUNDWATER MANAGEMENT DISTRICT NO 2
% TIM BOESE
313 SPRUCE ST
HALSTEAD KS 67056-1925

Re: Pending Applications, File Nos. 47,955; 47,956; and 47,957

Dear Mr. Boese:

We are enclosing a copy of the applications referred to above which appear to be in proper form. Nearby well owner notification letters were sent out on December 10, 2012. The Division of Water Resources received a telephone call from one of the nearby domestic well owners, but no written response of any kind was received.

We are delaying any further action for a period of **30 days** from the date of this letter to allow you time to submit your recommendations concerning this application. Please submit your recommendations within the allotted time, or any authorized extension of time thereof.

If you have any questions, please contact me at (785) 296-3495. If you wish to discuss a specific file, please have the file number ready so that I may help you more efficiently.

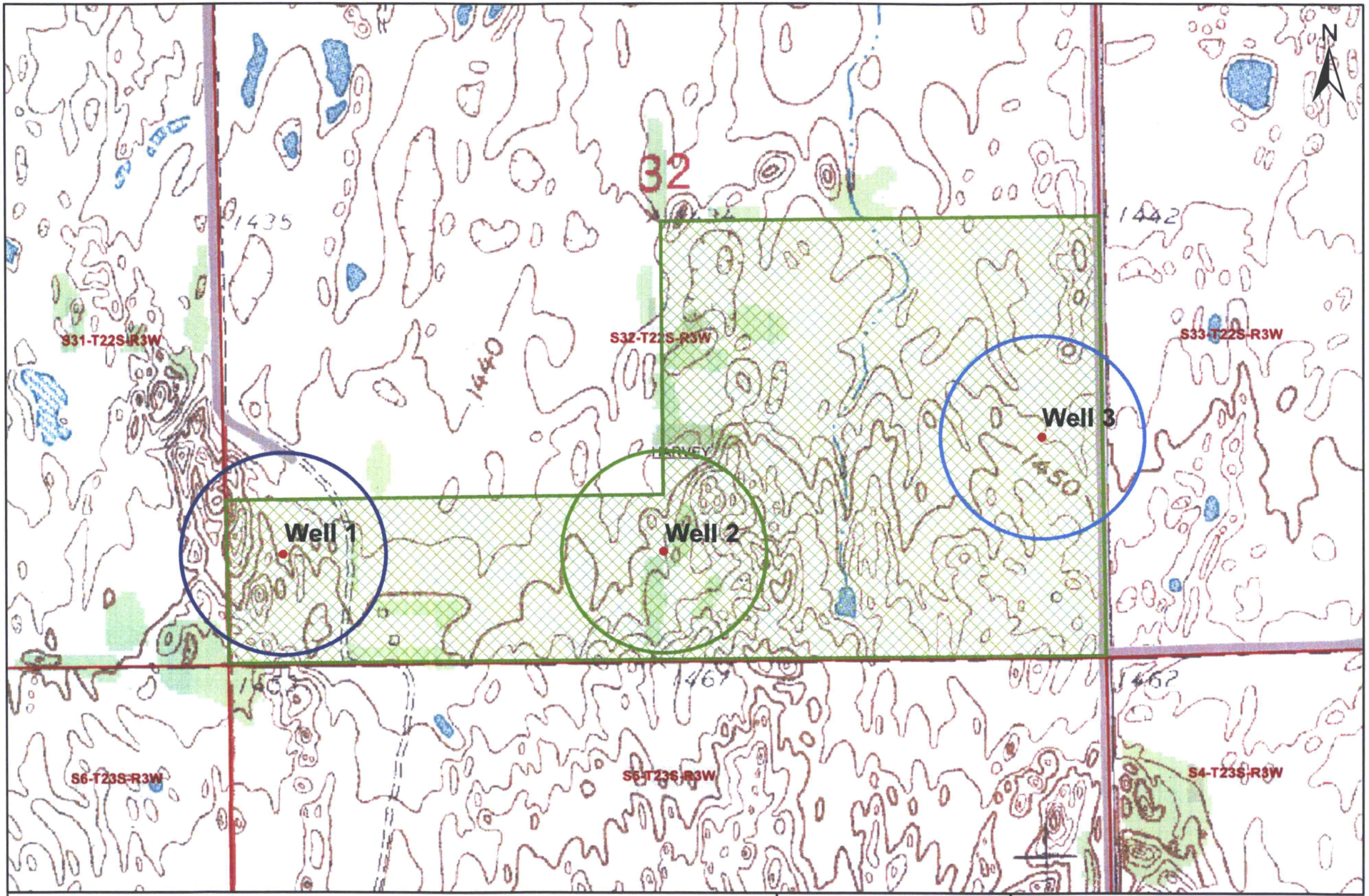
Sincerely,

Douglas Schemm
New Application Unit Supervisor
Water Appropriation Program

Enclosure

pc: Stafford Field Office

47,955



SCANNED

Burns & McDonnell
SINCE 1898

Figure 4
Jeff Foster Property
660 Foot Radius
Water Rights Search

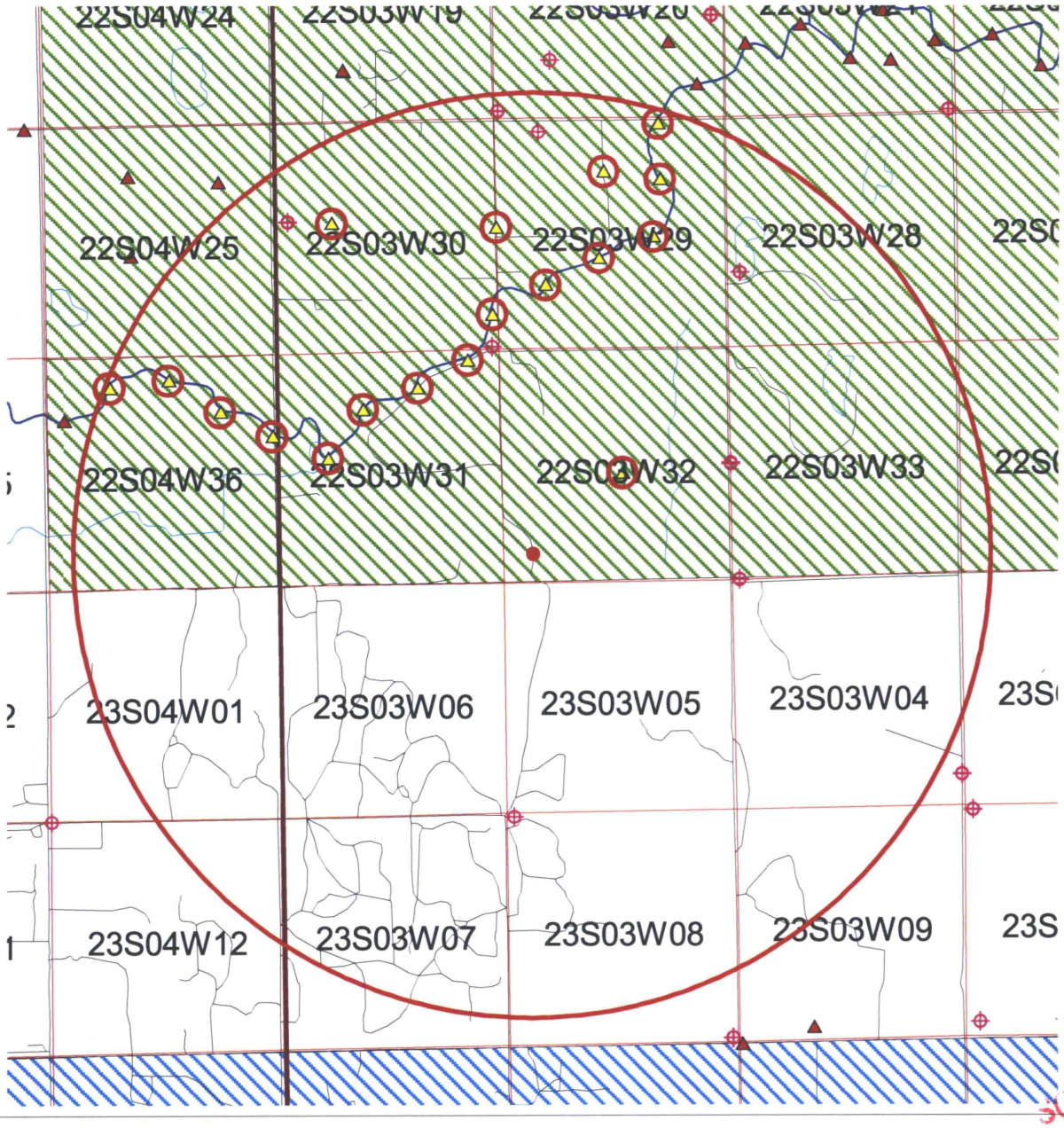
47,955

Equus Beds Groundwater Management District

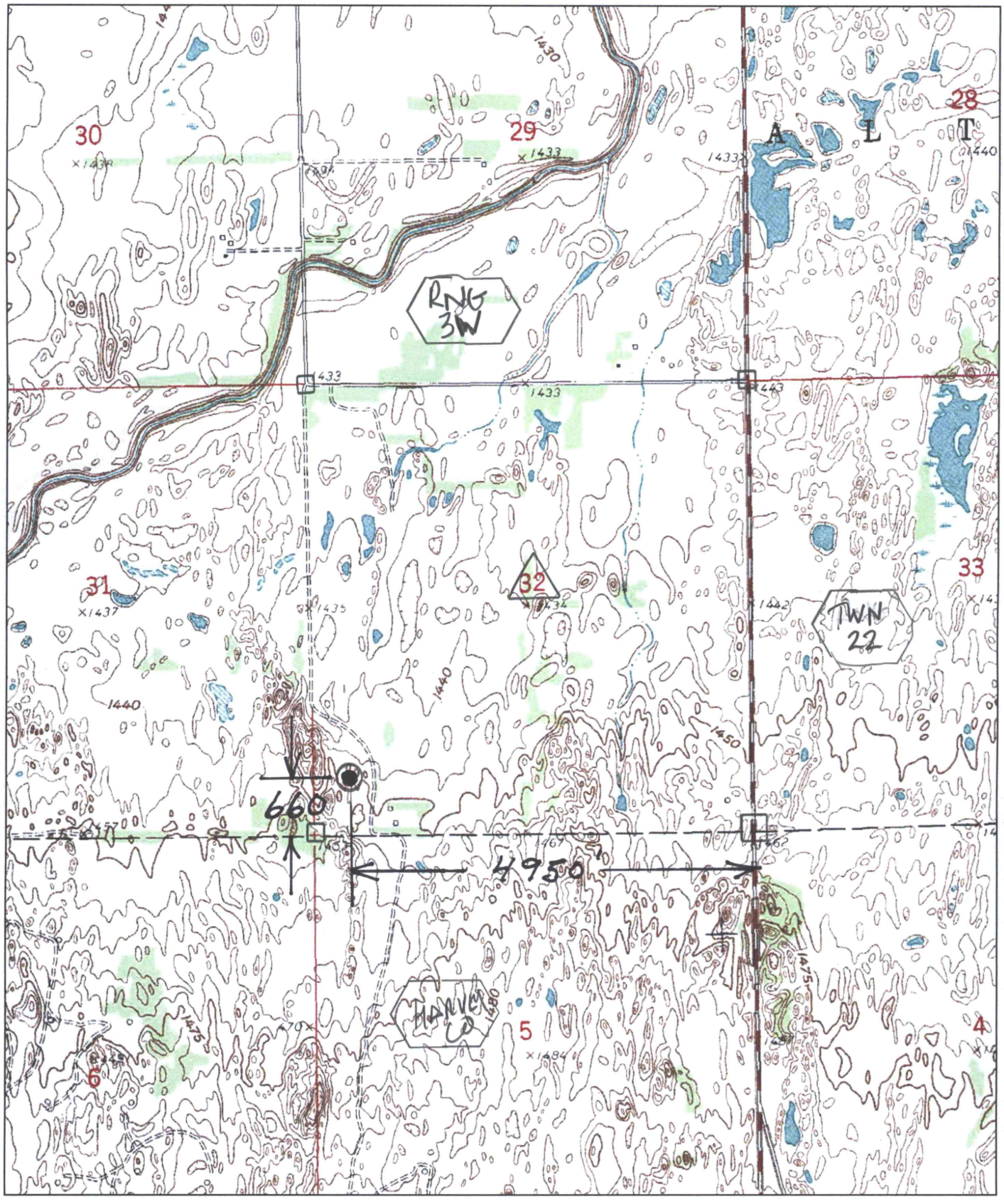
Preliminary Safe Yield Evaluation - Tim Maier, McPherson BPU

NC-SW-SW (660' N & 4590' W) Section 32, T22S, R3W, Harvey Co. #1

Prepared By: D. Clement **Date: 9/29/2011**



47,955



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Map provided by MyTopo.com

SCANNED

T 22S, R3W, Harvey Co.

* ⊙ PROPOSED WELL