

# ANNUAL SUMMARY OF GROUND WATER CONDITIONS IN THE SOUTHEAST BOISE GROUND WATER MANAGEMENT AREA CALENDAR YEAR 2023

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This report describes the ground water conditions in and around the Southeast Boise Ground Water Management Area (GWMA) based on the ground water level observation network established in the spring of 2000 under the guidance of the Southeast Boise Ground Water Advisory Committee (Advisory Committee). The network is a cooperative effort among Micron Technology, Inc., Suez Water Idaho Inc., and the Idaho Department of Water Resources (IDWR). The cooperators submit water level data to IDWR and/or provide support and access to wells for monitoring. The data is maintained in the IDWR ground water database and published on the public IDWR website. The J.R. Simplot Co., City of Boise, Idaho Transportation Department, Idaho Department of Lands, Boise Gun Club, and other landowners provide access to wells within the monitoring network.

## Status of Monitoring Network

The network currently consists of 34 active monitoring sites (**Table A1**), with one site (03N 02E 14ABC) containing a set of five nested wells for a total of 38 active wells (**Figure B1**). Although the core monitoring network has remained relatively unchanged over time, one change occurred in 2023: the SunRoc Well is no longer an active monitoring well due to access issues.

Twenty-five wells are equipped with In-Situ™ pressure transducers and are programmed to collect water level and water temperature observations at a minimum of two times per day (**Figure B1**). IDWR downloaded the transducer data from all 25 wells during seasonal manual measurement visits. Suez Water Idaho Inc. measured the remaining seven wells bi-monthly.

## Ground Water Level Trends

Ground water level hydrographs showing the complete period of record through December 31, 2023, for active wells in the monitoring network are shown in **Appendix C**. Several wells are subject to significant seasonal trends and/or pumping effects, which can make it difficult to draw meaningful conclusions from the hydrographs. Similarly, nearby pumping and/or management changes may impact apparent water level trends. Periodic manual data collection in wells without continuous pressure transducers make it difficult to conclude trends due to the uncertainty regarding the seasonal peaks and troughs of the hydrographs relative to the instantaneous manual measurements. The magnitude of the observed water level changes can also be such that determining trends independent of factors such as systematic and random errors can be challenging. All qualitative and quantitative analyses should recognize the limitations of the data as well as the associated uncertainties. Qualitative trends have been completed for each well in the network, and Mann-Kendall trend analyses have been completed for each well with at least four years of fall measurements.

Qualitative trends were determined by subtracting the minimum depth to water for a given calendar year from the minimum depth to water for calendar year 2023, and by subtracting the maximum depth

to water for a given calendar year from the maximum depth to water for calendar year 2023 (**Table A2**). If the calculated difference for the minimum depth to water and the maximum depth to water values are both negative, the water level trend is said to be increasing (measured water levels are becoming shallower). If the calculated difference for the minimum depth to water and the maximum depth to water values are both positive, the water level trend is said to be decreasing (measured water levels are becoming deeper). If the calculated difference for the minimum depth to water and the maximum depth to water values have different arithmetic signs, the water level trend is said to be undetermined.

Qualitative trends for 5-, 10-, and 15-year intervals were developed for the active monitoring network (**Table A2**). Of the 38 active wells, 36 wells had sufficient data to evaluate trends. In the last five years (2018 to 2023), there have been apparent decreasing water level trends in 7 of the 36 active wells. In that same time period, there have been apparent increasing water level trends in 13 of the 36 active wells. Water level trends for the remaining 16 wells were said to be undetermined due to water level ambiguity, and/or insufficient data.

The Southeast Boise Monitoring Network fall water level measurements were used to test ground water level trends using the Mann-Kendall computer program described by Helsel et al., 2006 (**Table A3**). The Mann-Kendall test describes trend over time while providing a measure of the trend's statistical significance (Helsel & Hirsch, 2002). High quality hand measurements from the fall time period, with no pumping or recovering ground water conditions, were used in the trend analysis, and wells with at least four years of measurements were selected for the analysis. Results were considered statistically significant if the p-value was < 0.05. Mann-Kendall trend results show a statistically significant decreasing water level trend in 7 of the 36 qualifying wells, and a statistically significant increasing water level trend in 18 wells. It should be noted that in some of the wells with increasing trends, the oldest measurements were excluded from the analysis as those measurements did not sit within the fall timeframe or did not qualify for another reason, e.g., the well was pumping/recovering during the measurement. An example of such a well is 02N 02E 02BBC2, where the oldest measurement, in 1989, was not recorded within the fall timeframe. In 11 of the 36 qualifying wells, the results were not statistically significant.

## **Recommendations**

In May of 2023, the Advisory Committee made the following requests to IDWR:

- 1) Add new wells to the monitoring network, if possible (specifically near the Sunroc Well and the City of Boise injection/test wells).
- 2) Develop improved elevation data for the wells that currently utilize data based on topographic map data.
- 3) Analyze water level data utilizing a statistical trend-test methodology.
- 4) Produce hydrographs in the annual report using consistent scales whenever possible.
- 5) Upgrade transducer deployment to improve data collection.

This annual report details the progress made in the previous year towards these requests. IDWR will continue to look for opportunities to improve the Southeast Boise Monitoring Network and further pursue Advisory Committee requests.

## **Bibliography**

Helsel, D. R., & Hirsch, R. M. (2002). *Statistical Methods in Water Resources*. United States Geological Survey.

Helsel, D. R., Mueller, D. K., & Slack, J. R. (2006). Computer program for the Kendall family of trend tests.

# Appendix A

## **Tables**

**Table A1.** Summary of the ground water monitoring network for the Southeast Boise GWMA.

<b>Map ID</b>	<b>Well Number</b>	<b>Well Name</b>	<b>Period of Water Level Record</b>	<b>Status of Well</b>	<b>Comments</b>
1	01N 01E 34AAA1	City of Boise Farm	2018 - 2023	Active	Transducer installed January 2018
2	01N 03E 04BBD1	Prigge	1994 - 2023	Active	Transducer installed October 2014, vented transducer installed April 2019
3	01N 04E 28CAC1	Ken Agenbroad	1979 - 2023	Active	
4	02N 01E 36BBB1	Harris South Cole	1969 - 2023	Active	Transducer installed May 2018
5	02N 02E 02BBC2	JR Flat	1989 – 2023	Active	
6	02N 02E 04CBB1	IDL House	1973 - 2023	Active	Transducer installed March 2017
7	02N 02E 07CBC1	Hollilynn	1993 - 2023	Active	Transducer installed May 2018
8	02N 02E 17ABD1	Ten Mile	1996 – 2023	Active	
9	02N 02E 22BBB1	Pioneer	1998 - 2023	Active	
10	02N 02E 34CCD1	Boise Gun Club	1976 - 2023	Active	Transducer installed November 2016
11	02N 03E 06DCA1	Micron Test #1	1986 - 2023	Active	Transducer installed October 2019
12	02N 03E 07BAC1	Micron Test #2	1983 - 2023	Active	Transducer installed October 2019
13	02N 03E 07CDA1	Pettibone	1997 - 2023	Active	Transducer installed October 2019
14	02N 03E 07DBB1	Micron Shallow Obs	1998 - 2023	Active	Transducer installed October 2019
15	02N 03E 07DBB2	Micron Deep Obs	1998 - 2023	Active	Transducer installed October 2019
16	02N 03E 09BAA2	Christensen	1993 - 2023	Active	Transducer installed October 2019
17	02N 03E 19DBB1	Micron South	2017 - 2023	Active	Vented transducer installed April 2019
18	02N 03E 28CAA1	Blacks Creek Rest Area Westbound	2007 - 2023	Active	Transducer installed May 2018

Appendix A

Map ID	Well Number	Well Name	Period of Water Level Record	Status of Well	Comments
19	02N 03E 34ACC1	Blacks Creek Exit ITD	2012 - 2023	Active	Transducer installed October 2014, vented transducer installed April 2019
20	03N 02E 11DDD1	TV Lenzi	1977 - 2023	Active	Transducer installed June 2016
21	03N 02E 14ABC	TVHP 4-1 through 4-5	2002 - 2023	Active	Transducers installed August 2016
22	03N 02E 25ACBC1	Helen Lowder Park	1992 - 2023	Active	
23	03N 02E 25CAA1	Centennial	1976 - 2023	Active	
24	03N 02E 26DBA1	Bergeson	1990 - 2023	Active	
25	03N 02E 35BAB1	Market	1991 - 2023	Active	
26	03N 02E 36ABC1	Terteling	1972 - 2023	Active	
27	03N 03E 30BCBD1	Hurok	1969 - 2023	Active	
28	03N 03E 30DDAA1	E Boise Ave	1987 - 2023	Active	Lost access to site in Summer of 2019, Regained access 7/26/2022
29	03N 03E 31ADD1	Simplot Golden Development	1993 – 2023	Active	
30	03N 03E 32BBA1	Whitney Fire	1975 – 2023	Active	
31	03N 03E 32CDD1	Micron Columbia	1990 – 2023	Active	Transducer installed October 2019, Removed January 2020 due to malfunction. Reinstalled October 2020.
32	03N 03E 33DAA1	Hammer Flats	1969 – 2023	Active	
33	02N 02E 03DDC1	Boise Airport	2019 – 2023	Active	Drilled June 2019, Transducer installed July 2019
34	03N 03E 33CDB1	Surprise Valley	2021-2023	Active	Transducer installed January 2022. Transducer became stuck and was then removed summer 2022
N/A	02N 02E 04CAA1	SEB IDL Field	2000 - 2009	Inactive	Discontinued in 2010

Appendix A

<b>Map ID</b>	<b>Well Number</b>	<b>Well Name</b>	<b>Period of Water Level Record</b>	<b>Status of Well</b>	<b>Comments</b>
N/A	02N 03E 09BCA2	Vern Guyer	1993 - 2007	Inactive	Discontinued in 2007
N/A	03N 02E 25CBCA1	Motive Power 41A	1997 - 2015	Inactive	Discontinued in 2015
N/A	03N 03E 31BDD1 - DESTROYED	Oregon Trail - Destroyed	1977 - 2012	Inactive	Discontinued in 2013
N/A	03N 02E 36CDA1	Cromon	1991-2018	Inactive	Homeowner requested an end to monitoring activity. Discontinued in 2020
N/A	02N 02E 21CBB1	SunRoc	2018 - 2023	Inactive	Transducer installed April 2018. Discontinued in Spring of 2023.

**Table A2.** Qualitative trend results for the 38 active monitoring wells.

Well Number	Well Name	5 Year Trend (2023-2018)	10 Year Trend (2023-2013)	15 Year Trend (2023-2008)
01N 01E 34AAA1	City of Boise Farm	Decreasing	N/A	N/A
01N 03E 04BBD1	Prigge	Increasing	Increasing	Increasing
01N 04E 28CAC1	Ken Agenbroad	Decreasing	Undetermined	Undetermined
02N 01E 36BBB1	Harris South Cole	Decreasing	Decreasing	Decreasing
02N 02E 02BBC2	JR Flat	Undetermined	Undetermined	Undetermined
02N 02E 04CBB1	IDL House	Decreasing	Decreasing	Decreasing
02N 02E 07CBC1	Hollilynn	Undetermined	Undetermined	Undetermined
02N 02E 22BBB1	Pioneer	Decreasing	Decreasing	Undetermined
02N 02E 34CCD1	Boise Gun Club	Decreasing	Decreasing	Decreasing
02N 03E 06DCA1	Micron Test #1	Increasing	Increasing	Increasing
02N 03E 07CDA1	Pettibone	Undetermined	Undetermined	Undetermined
02N 03E 07DBB1	Micron Shallow Obs	Undetermined	Undetermined	Undetermined
02N 03E 07DBB2	Micron Deep Obs	Undetermined	Undetermined	Undetermined
02N 03E 09BAA2	Christensen	Increasing	Increasing	Increasing
02N 03E 28CAA1	Blacks Creek Rest Area Westbound	Undetermined	Undetermined	Undetermined
02N 03E 34ACC1	Blacks Creek Exit ITD	Increasing	Undetermined	N/A
03N 02E 11DDD1	TV Lenzi	Undetermined	Undetermined	Undetermined
03N 02E 14ABC1	TVHP 4-1	Undetermined	Undetermined	Undetermined
03N 02E 14ABC2	TVHP 4-2	Undetermined	Undetermined	Undetermined
03N 02E 14ABC3	TVHP 4-3	Undetermined	Undetermined	Undetermined
03N 02E 14ABC4	TVHP 4-4	Undetermined	Undetermined	Undetermined
03N 02E 14ABC5	TVHP 4-5	Undetermined	Undetermined	Undetermined
03N 02E 25CAA1	Centennial	Increasing	Increasing	Increasing
03N 02E 26DBA1	Bergeson	Increasing	Increasing	Increasing
03N 02E 35BAB1	Market	Increasing	Increasing	Undetermined
03N 02E 36ABC1	Terteling	Increasing	Increasing	Increasing
03N 03E 30BCBD1	Hurok	Undetermined	Undetermined	Undetermined
03N 03E 30DDAA1	E Boise Ave	Increasing	Increasing	Increasing
03N 03E 32BBA1	Whitney Fire	Increasing	Increasing	Increasing
03N 03E 31ADD1	Simplot Golden Development	Increasing	Increasing	Increasing
03N 03E 32CDD1	Micron Columbia	Increasing	Increasing	Increasing
03N 03E 33DAA1	Hammer Flats	Decreasing	Undetermined	Undetermined
02N 03E 07BAC1	Micron Test #2	Increasing	Increasing	Increasing
02N 02E 17ABD1	Ten Mile	Undetermined	Undetermined	Undetermined
02N 03E 19DBB1	Micron South	Undetermined	N/A	N/A
03N 02E 25ACBC1	Helen Lowder Park	Undetermined	Undetermined	Undetermined
02N 02E 03DDC1	Boise Airport Well	N/A	N/A	N/A
03N 03E 33CDB1	Surprise Valley	N/A	N/A	N/A



**Table A3.** Mann-Kendall trend results for fall depth to water measurements in 36 active monitoring wells. Wells with sufficient data, at least 4 years of fall measurements, were included in the analysis. Shaded results represent a statistically significant slope trend,  $p < 0.05$ . A negative slope value indicates a rising water trend.

Well Number	Well Name	slope (ft/yr)	p-value
01N 01E 34AAA1	City of Boise Farm	1.34	0.133
01N 03E 04BBD1	Prigge	<b>-0.23</b>	0.002
01N 04E 28CAC1	Ken Agenbroad	0.13	0.270
02N 01E 36BBB1	Harris South Cole	<b>0.40</b>	0.000
02N 02E 02BBC2	JR Flat	<b>-0.96</b>	<b>0.001</b>
02N 02E 04CBB1	IDL House	<b>0.76</b>	0.000
02N 02E 07CBC1	Hollilynn	<b>0.82</b>	0.000
02N 02E 17ABD1	Ten Mile	<b>0.93</b>	<b>0.006</b>
02N 02E 22BBB1	Pioneer	<b>0.65</b>	<b>0.023</b>
02N 02E 34CCD1	Boise Gun Club	<b>0.39</b>	0.000
02N 03E 06DCA1	Micron Test #1	-0.36	0.075
02N 03E 07BAC1	Micron Test #2	<b>-0.93</b>	0.000
02N 03E 07CDA1	Pettibone	<b>-1.29</b>	0.003
02N 03E 07DBB1	Micron Shallow Obs	<b>-1.50</b>	0.006
02N 03E 07DBB2	Micron Deep Obs	<b>-0.92</b>	0.029
02N 03E 09BAA2	Christensen	<b>-0.31</b>	0.002
02N 03E 19DBB1	Micron South	-0.07	1.00
02N 03E 28CAA1	Blacks Creek Rest Area WB	-0.03	0.788
02N 03E 34ACC1	Blacks Creek Exit ITD	-0.04	0.098
03N 02E 11DDD1	TV Lenzi	<b>-0.09</b>	0.000
03N 02E 14ABC1	TVHP 4-1	-0.003	0.804
03N 02E 14ABC2	TVHP 4-2	<b>-0.11</b>	0.003
03N 02E 14ABC3	TVHP 4-3	<b>-0.10</b>	0.002
03N 02E 14ABC4	TVHP 4-4	0.06	0.837
03N 02E 14ABC5	TVHP 4-5	0.06	0.837
03N 02E 25ACBC1	Helen Lowder Park	-0.11	0.080
03N 02E 25CAA1	Centennial	<b>-0.95</b>	<b>0.017</b>
03N 02E 26DBA1	Bergeson	<b>-1.76</b>	<b>0.000</b>
03N 02E 35BAB1	Market	<b>-1.05</b>	<b>0.000</b>
03N 02E 36ABC1	Terteling	<b>-1.46</b>	<b>0.001</b>
03N 03E 30BCBD1	Hurok	-0.02	0.362
03N 03E 30DDAA1	E Boise Ave	<b>-1.14</b>	0.000
03N 03E 31ADD1	Simplot Golden Development	<b>-0.88</b>	0.000
03N 03E 32BBA1	Whitney Fire	<b>-3.10</b>	0.000
03N 03E 32CDD1	Micron Columbia	<b>-0.34</b>	0.012
03N 03E 33DAA1	Hammer Flats	<b>0.41</b>	0.000

# Appendix B

## **Figures**

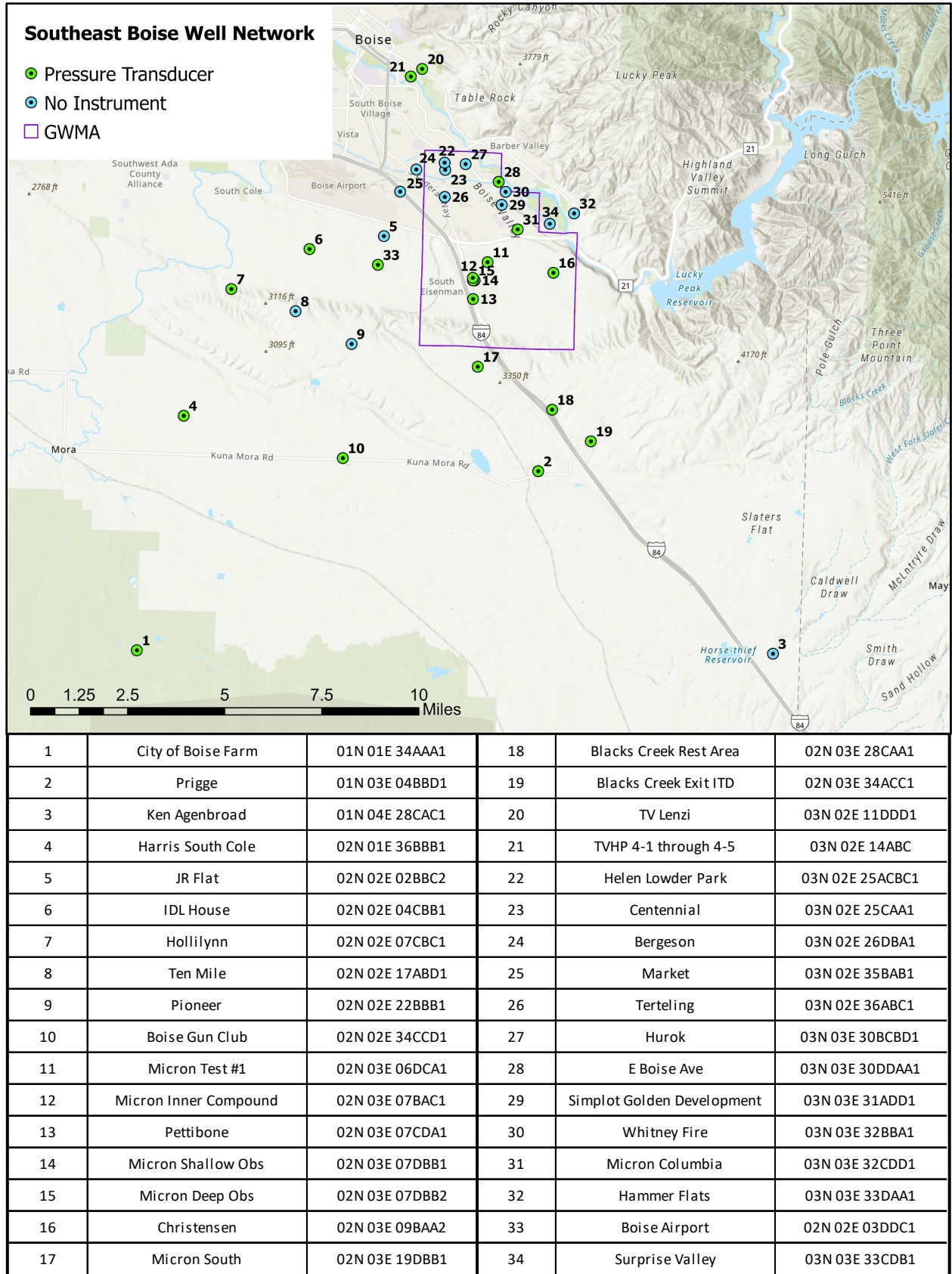
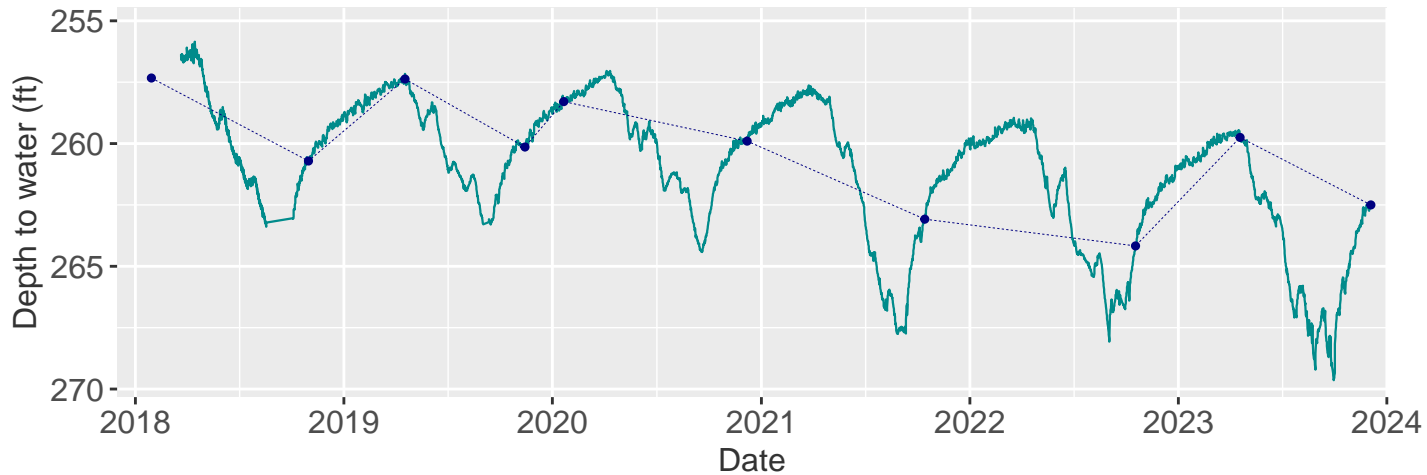


Figure B1. Current Southeast Boise GWMA monitoring network.

## Appendix C

# Hydrographs for Active Monitoring Wells

City of Boise Farm  
01N 01E 34AAA1  
Well depth: NA



• Hand Measurement

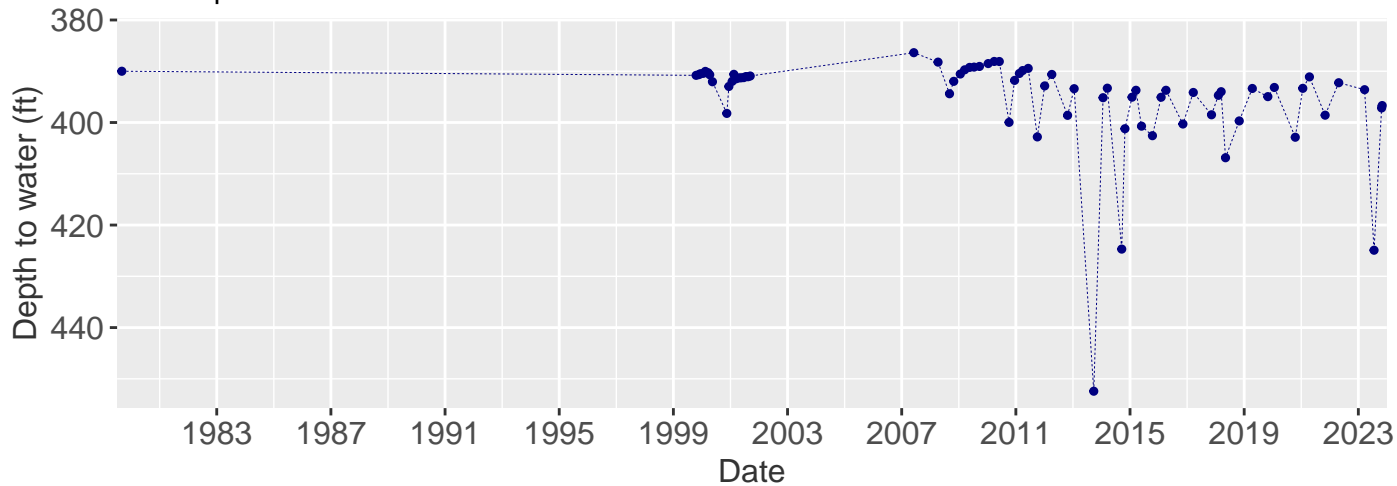
— Continuous Transducer Data

\*The dashed line is a visual guide for hand measurements



# Ken Agenbroad 01N 04E 28CAC1

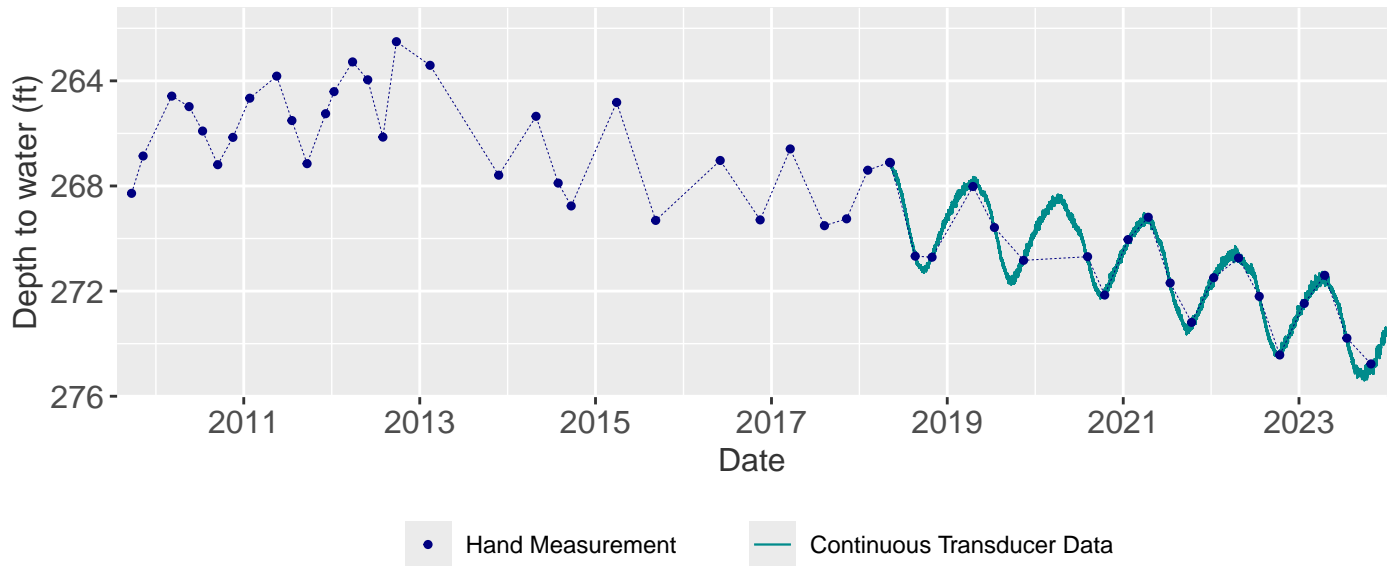
Well depth: 763 ft



• Hand Measurement

\*The dashed line is a visual guide for hand measurements

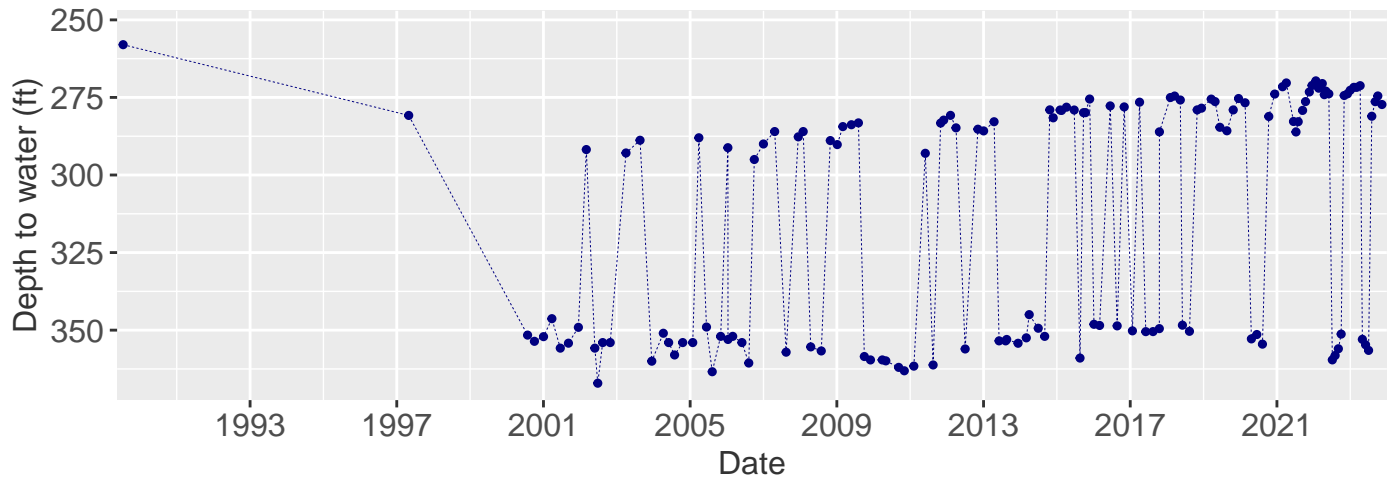
Harris South Cole  
02N 01E 36BBB1  
Well depth: 305 ft



\*The dashed line is a visual guide for hand measurements



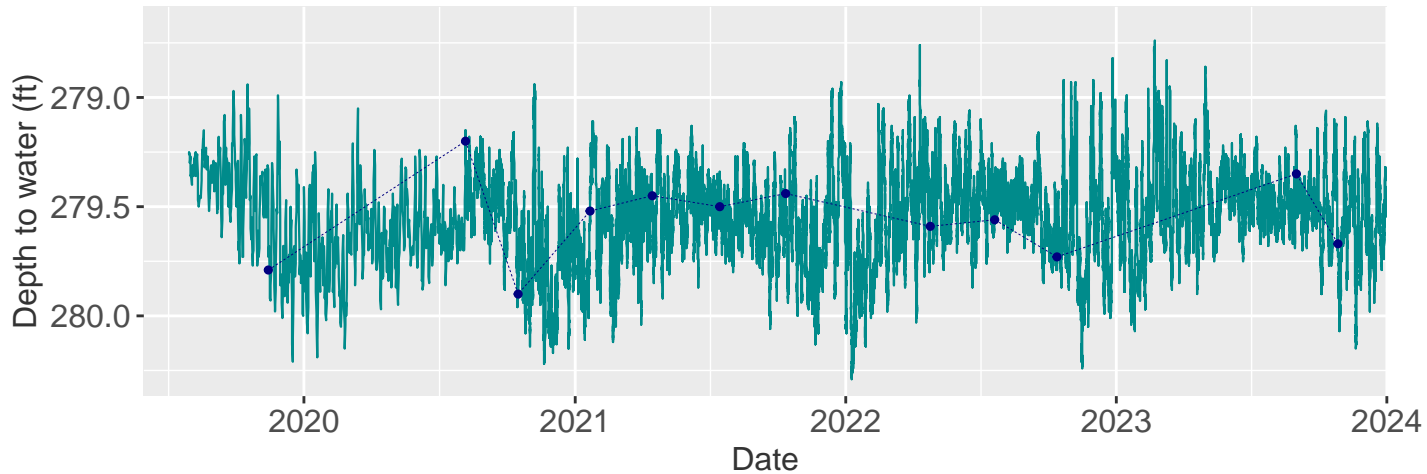
JR Flat  
02N 02E 02BBC2  
Well depth: 567 ft



• Hand Measurement

\*The dashed line is a visual guide for hand measurements

Boise Airport  
02N 02E 03DDC1  
Well depth: 353 ft

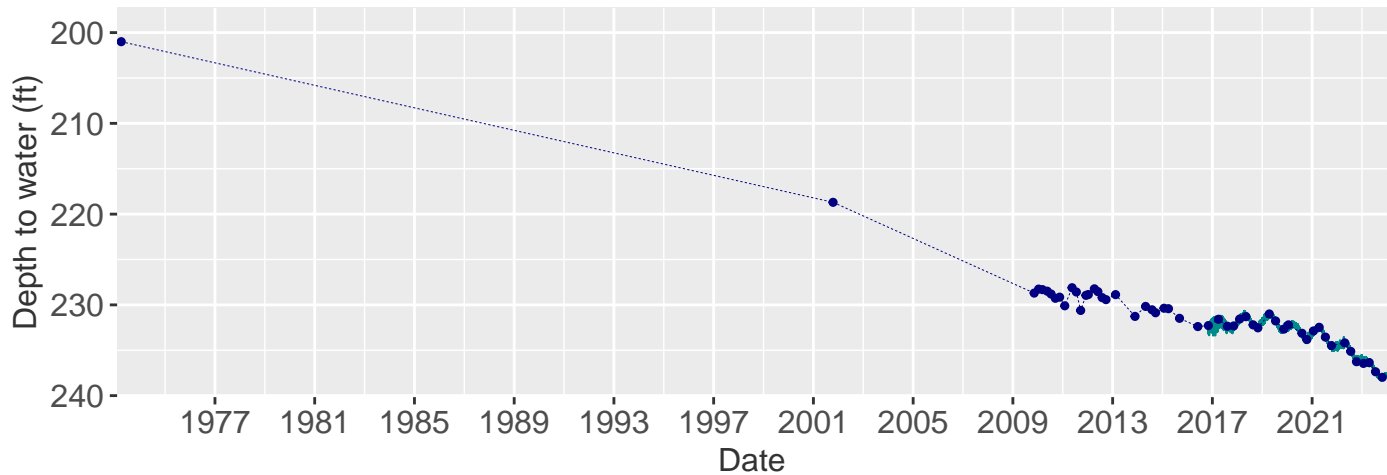


• Hand Measurement

— Continuous Transducer Data

\*The dashed line is a visual guide for hand measurements

IDL House  
02N 02E 04CBB1  
Well depth: 353 ft

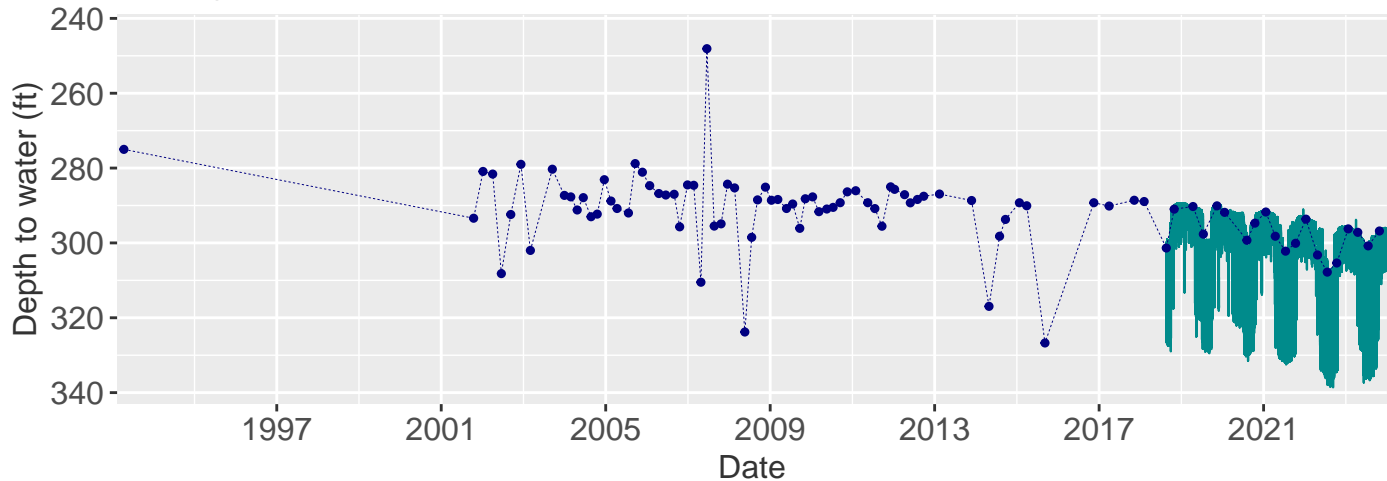


• Hand Measurement

— Continuous Transducer Data

\*The dashed line is a visual guide for hand measurements

Hollilynn  
02N 02E 07CBC1  
Well depth: 460 ft



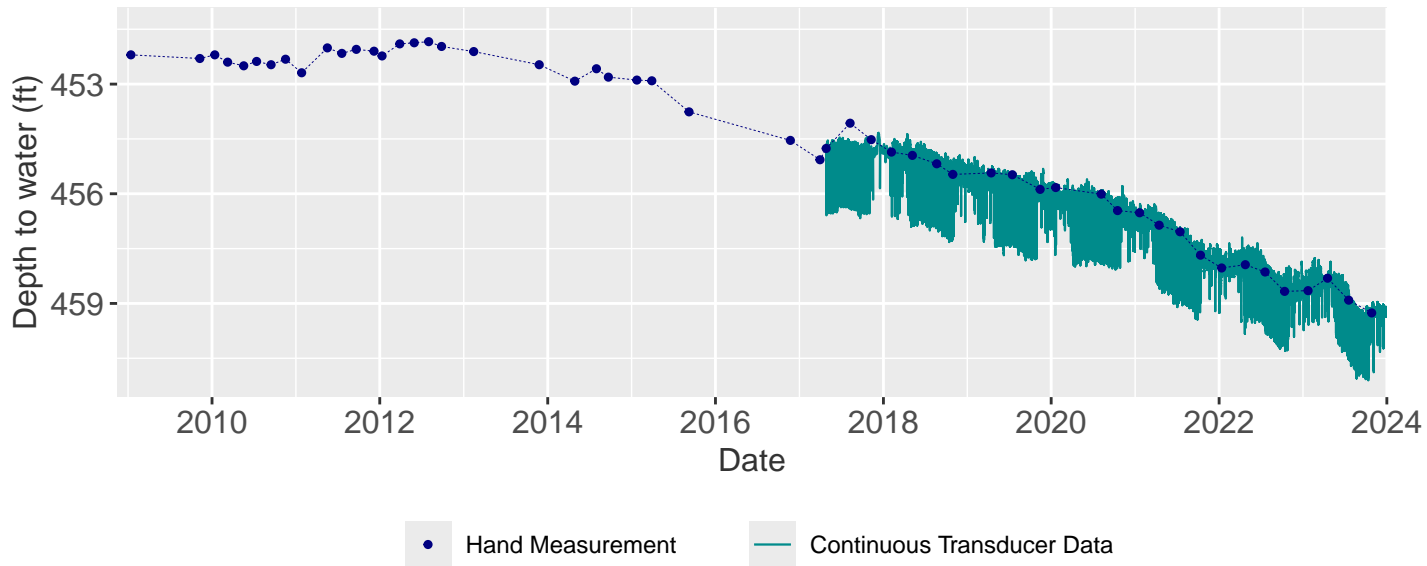
• Hand Measurement

— Continuous Transducer Data

\*The dashed line is a visual guide for hand measurements

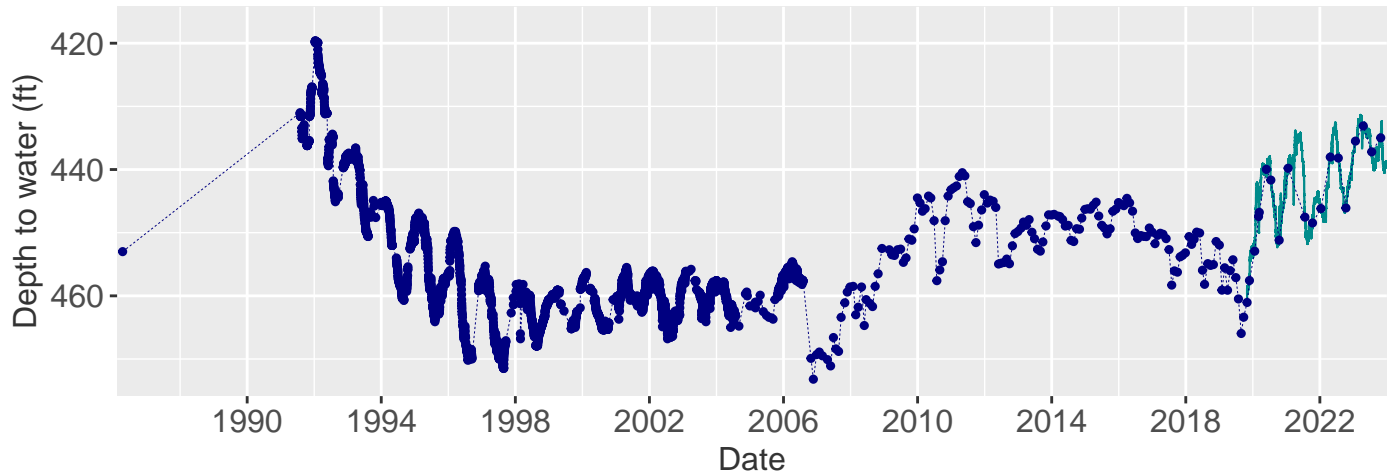


Boise Gun Club  
02N 02E 34CCD1  
Well depth: 504 ft



\*The dashed line is a visual guide for hand measurements

Micron Test #1  
02N 03E 06DCA1  
Well depth: 855 ft



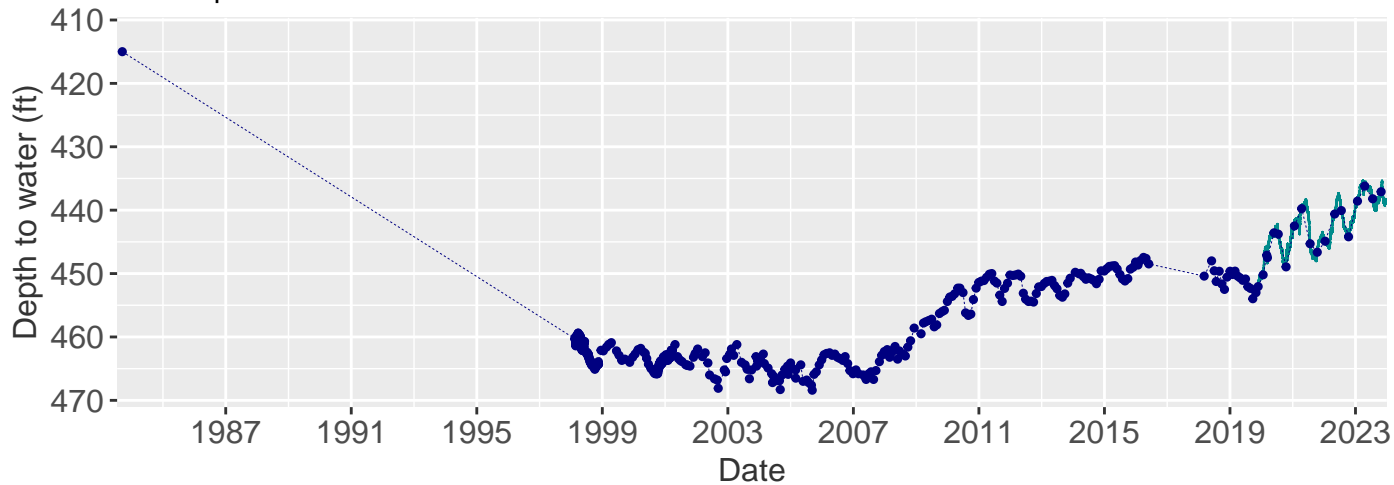
• Hand Measurement

— Continuous Transducer Data

\*The dashed line is a visual guide for hand measurements

# Micron Inner Compound 02N 03E 07BAC1

Well depth: 580 ft



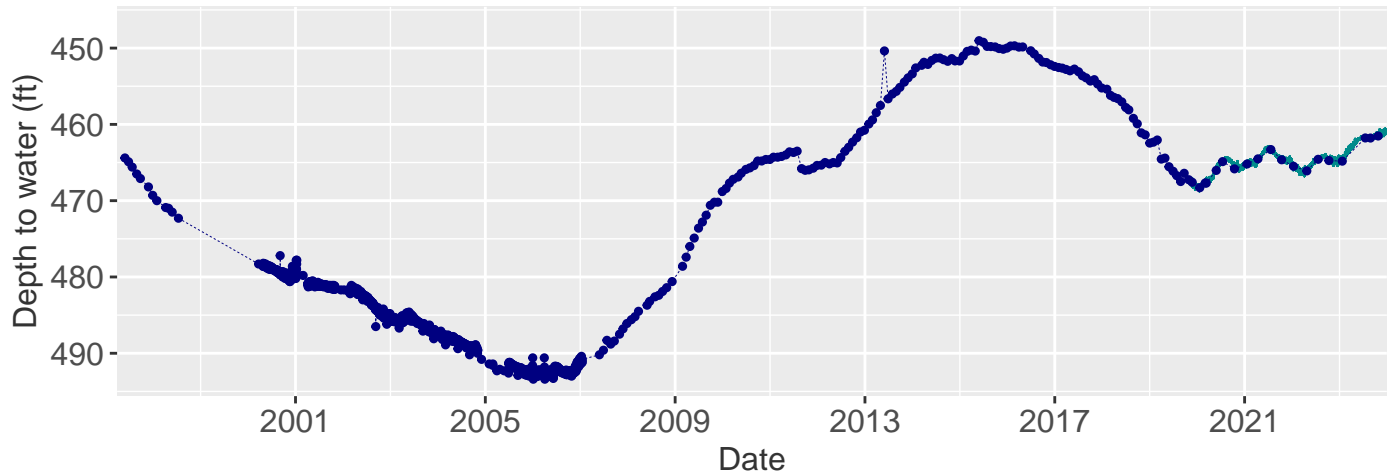
• Hand Measurement

— Continuous Transducer Data

\*The dashed line is a visual guide for hand measurements



Pettibone  
02N 03E 07CDA1  
Well depth: 478 ft

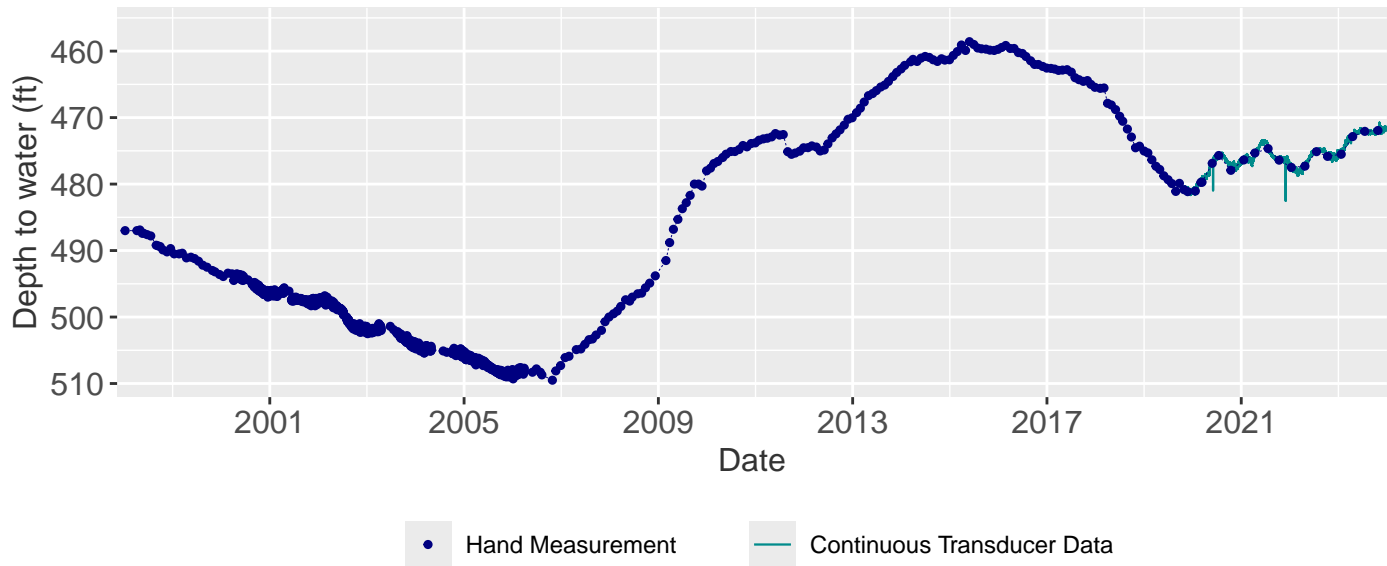


• Hand Measurement

— Continuous Transducer Data

\*The dashed line is a visual guide for hand measurements

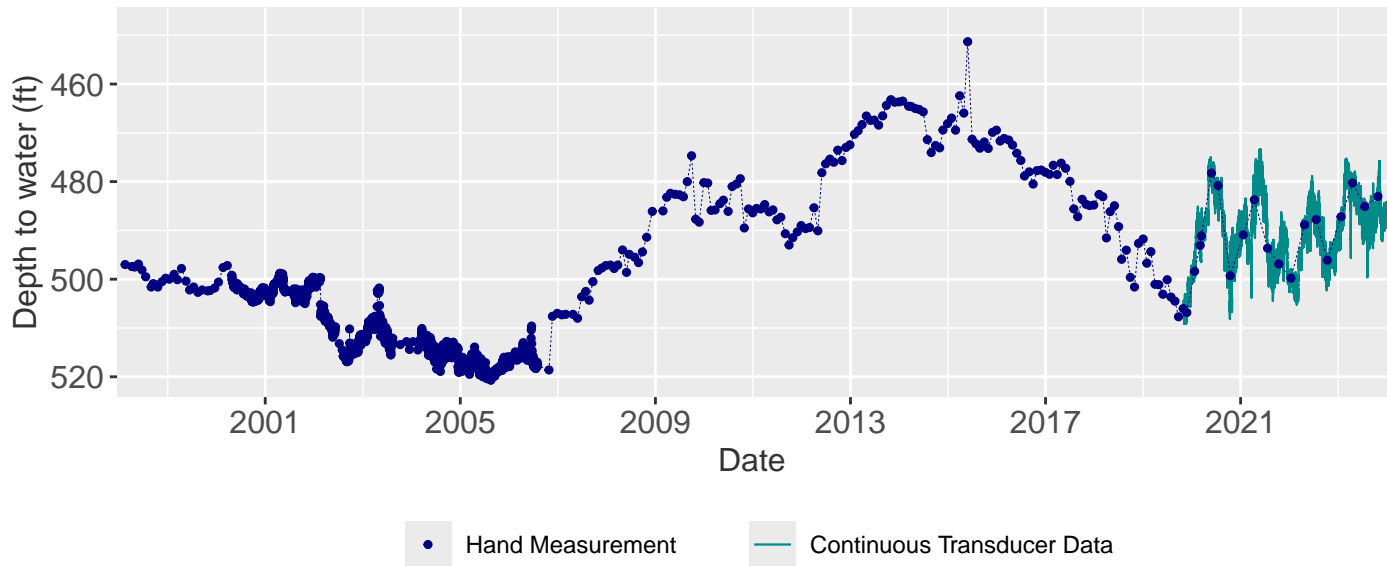
Micron Shallow Obs  
02N 03E 07DBB1  
Well depth: 561 ft



\*The dashed line is a visual guide for hand measurements

# Micron Deep Obs 02N 03E 07DBB2

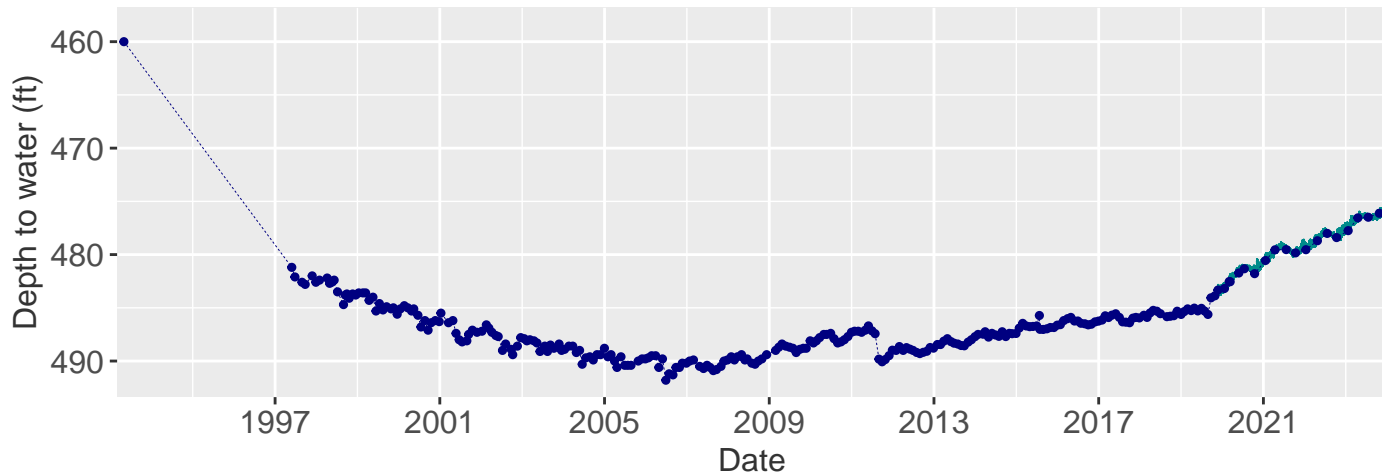
Well depth: 811 ft



• Hand Measurement      — Continuous Transducer Data

\*The dashed line is a visual guide for hand measurements

Christensen  
02N 03E 09BAA2  
Well depth: 522 ft

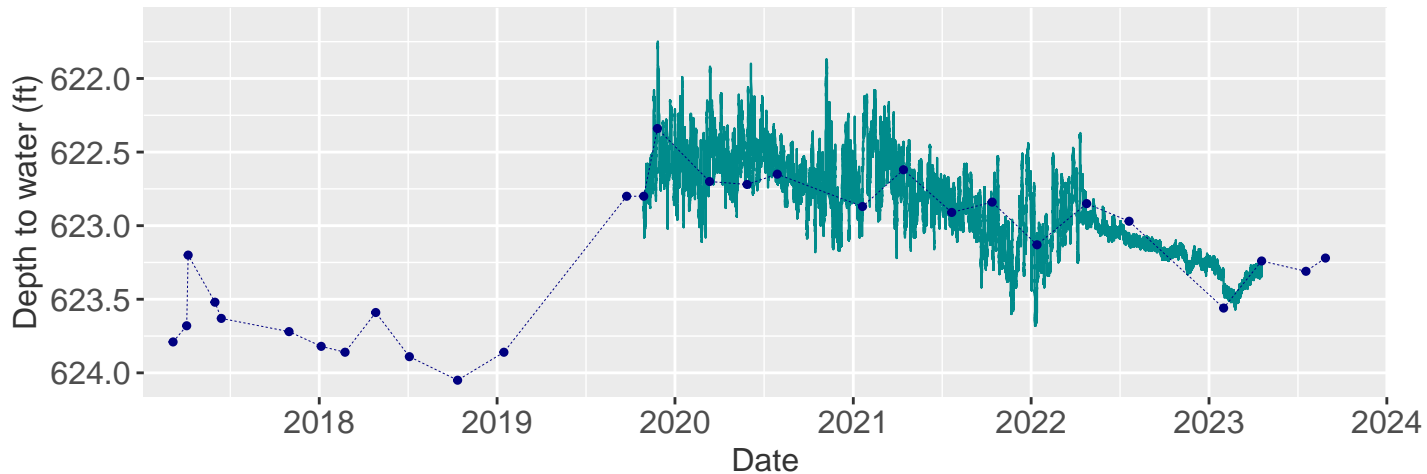


• Hand Measurement

— Continuous Transducer Data

\*The dashed line is a visual guide for hand measurements

Micron South  
02N 03E 19DBB1  
Well depth: 760 ft

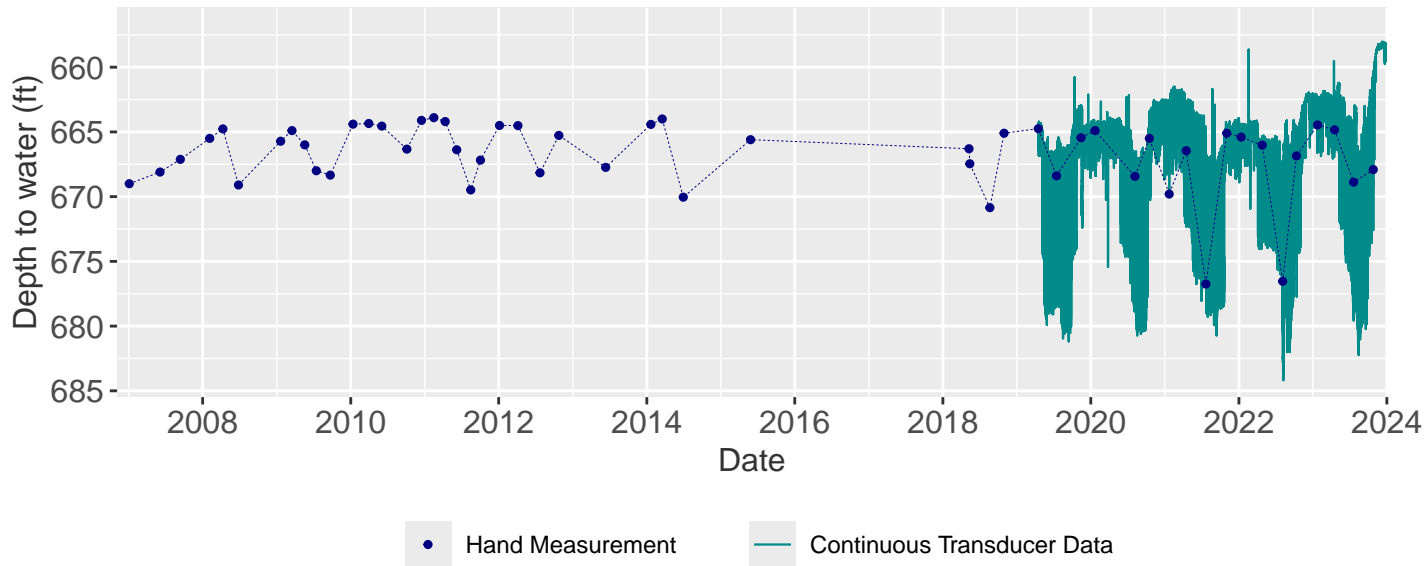


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\*The dashed line is a visual guide for hand measurements

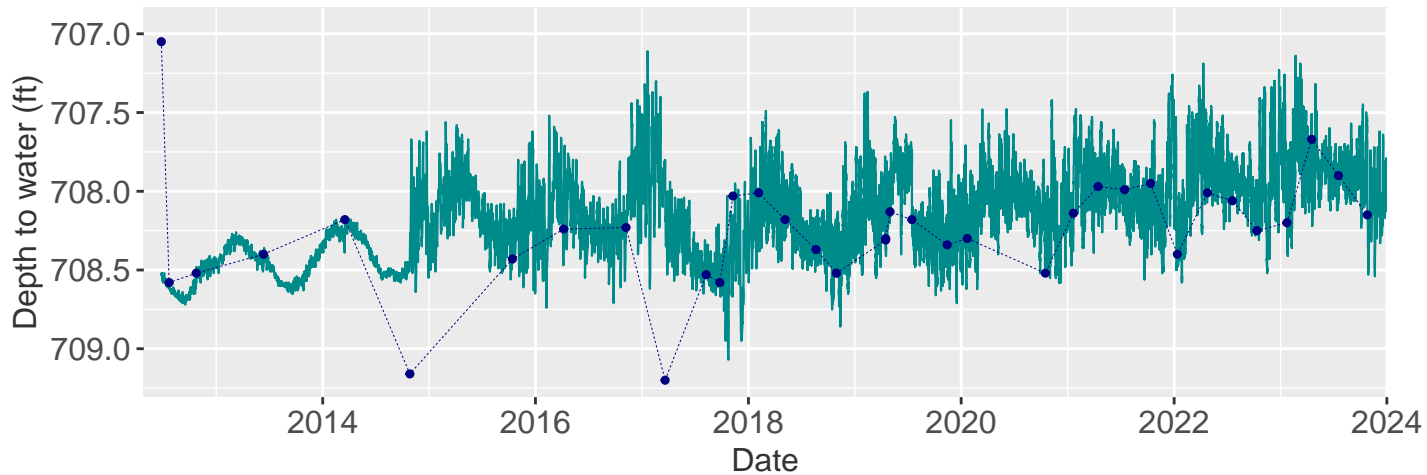
# Blacks Creek Rest Area Westbound 02N 03E 28CAA1

Well depth: 1010 ft



\*The dashed line is a visual guide for hand measurements

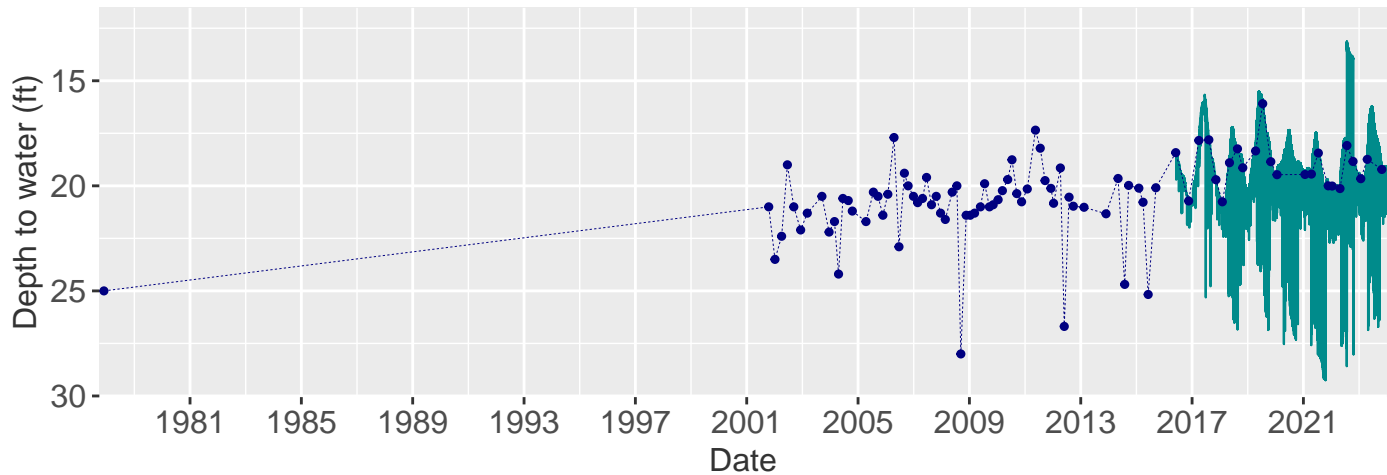
# Blacks Creek Exit ITD 02N 03E 34ACC1 Well depth: 861 ft



• Hand Measurement      — Continuous Transducer Data

\*The dashed line is a visual guide for hand measurements

TV Lenzi  
03N 02E 11DDD1  
Well depth: 68 ft



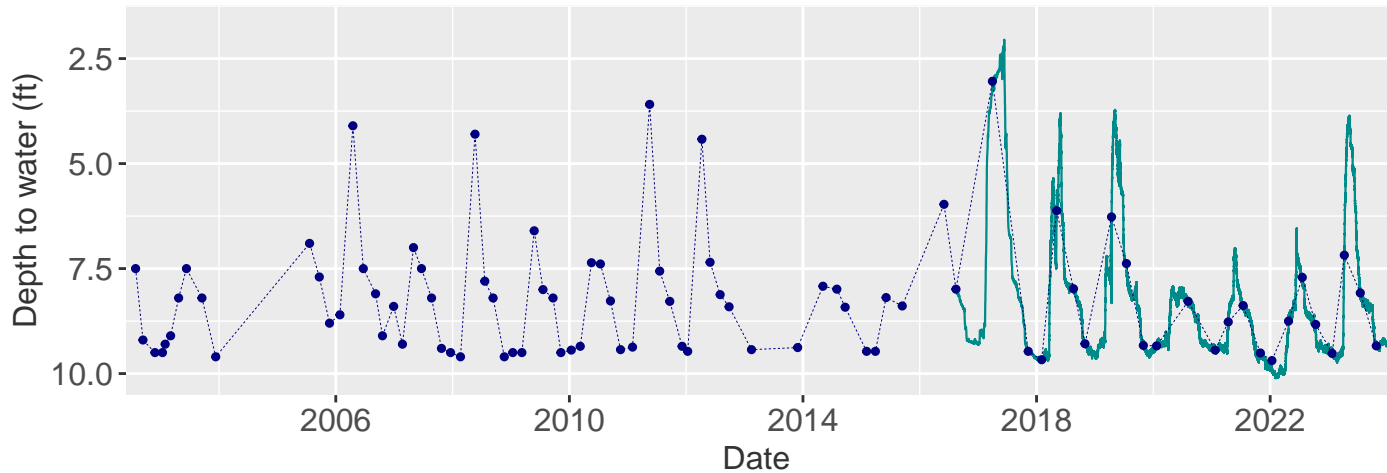
• Hand Measurement

— Continuous Transducer Data

\*The dashed line is a visual guide for hand measurements



TVHP 4-1  
03N 02E 14ABC1  
Well depth: 800 ft

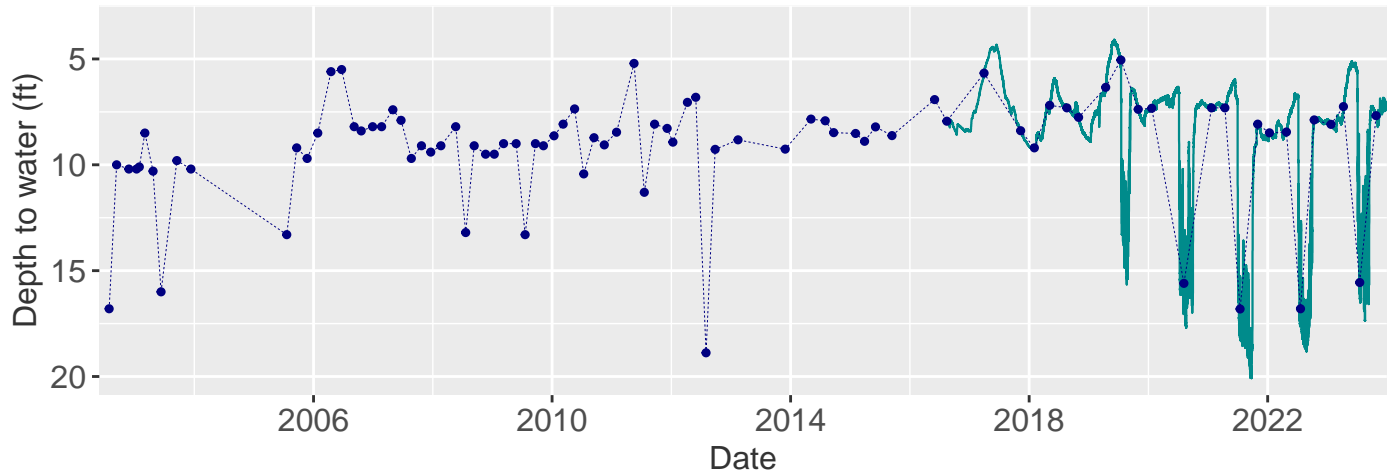


• Hand Measurement

— Continuous Transducer Data

\*The dashed line is a visual guide for hand measurements

TVHP 4-2  
03N 02E 14ABC2  
Well depth: 800 ft



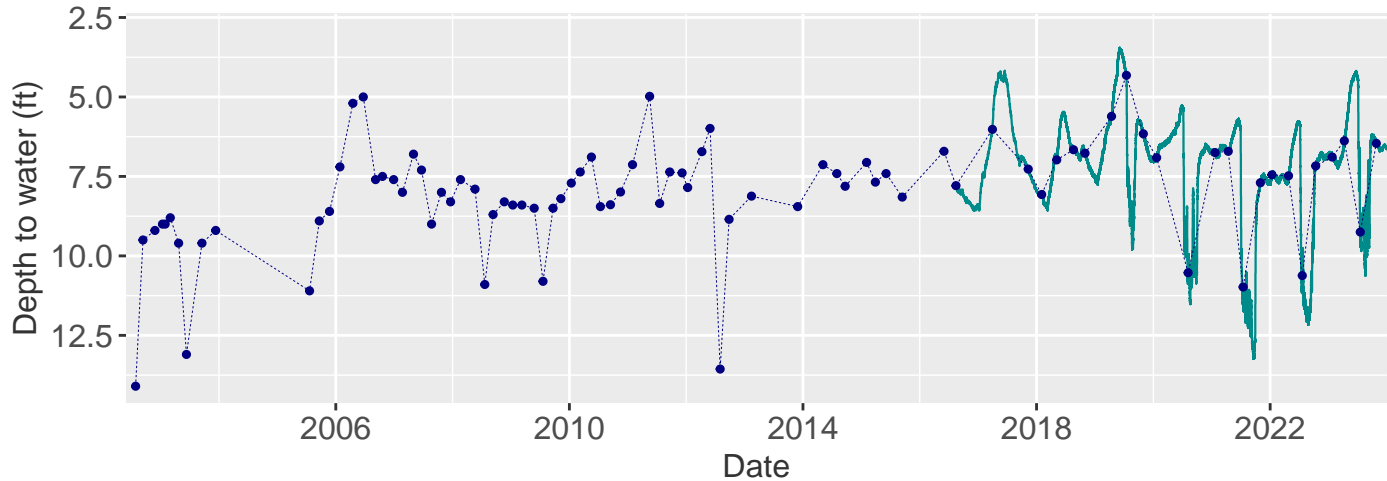
• Hand Measurement

— Continuous Transducer Data

\*The dashed line is a visual guide for hand measurements

TVHP 4-3  
03N 02E 14ABC3

Well depth: 800 ft

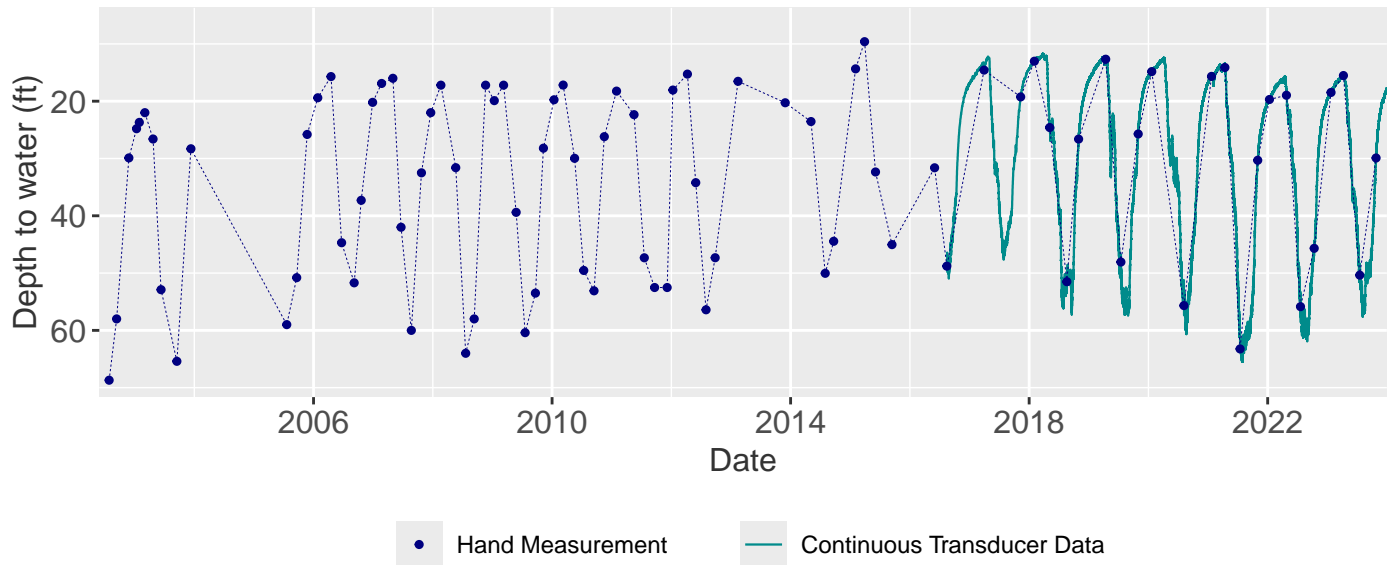


• Hand Measurement

— Continuous Transducer Data

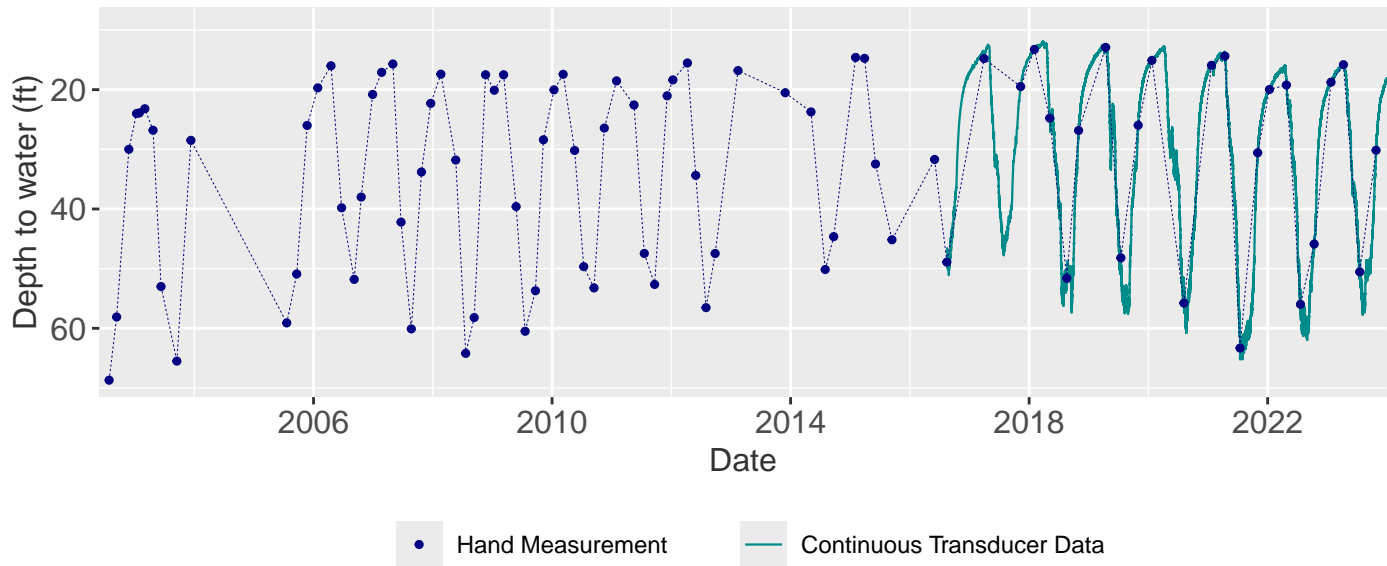
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TVHP 4-4  
03N 02E 14ABC4  
Well depth: 800 ft



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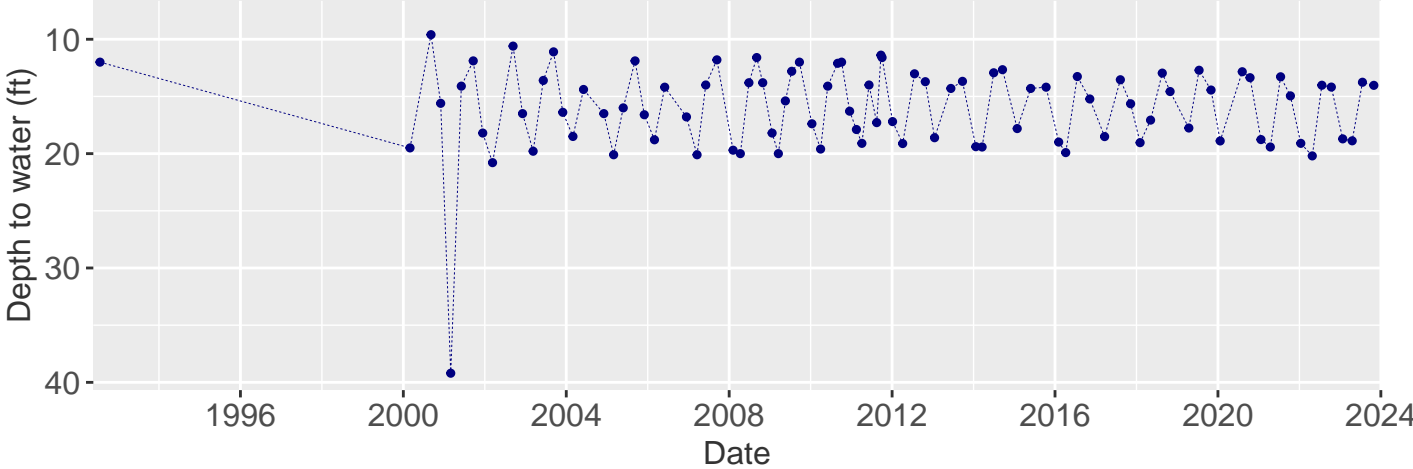
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03N 02E 14ABC5  
Well depth: 800 ft



\*The dashed line is a visual guide for hand measurements

Helen Lowder Park  
03N 02E 25ACBC1

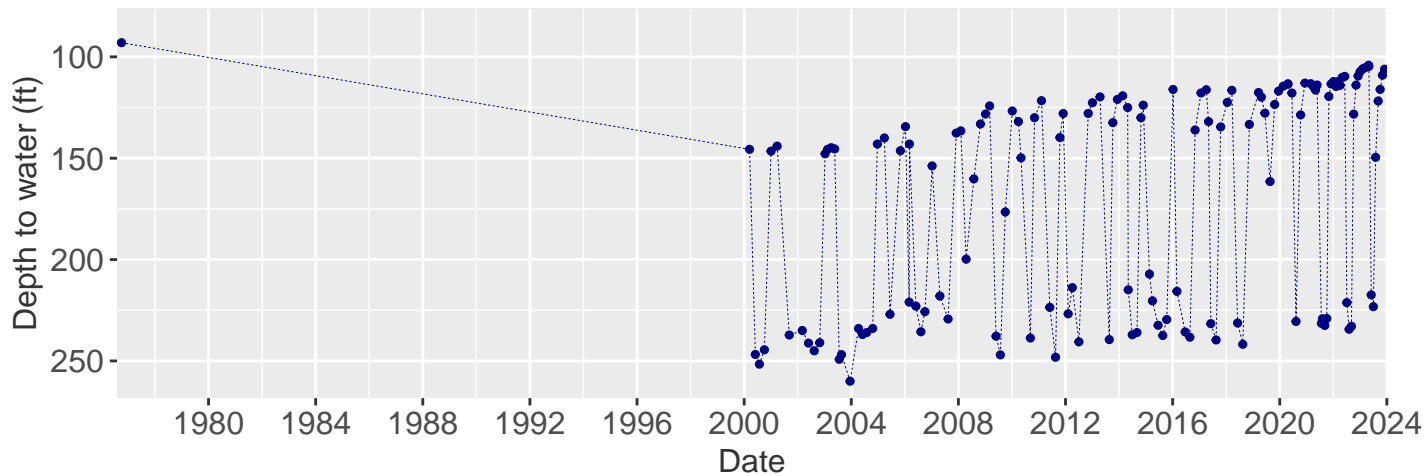
Well depth: 75 ft



• Hand Measurement

\*The dashed line is a visual guide for hand measurements

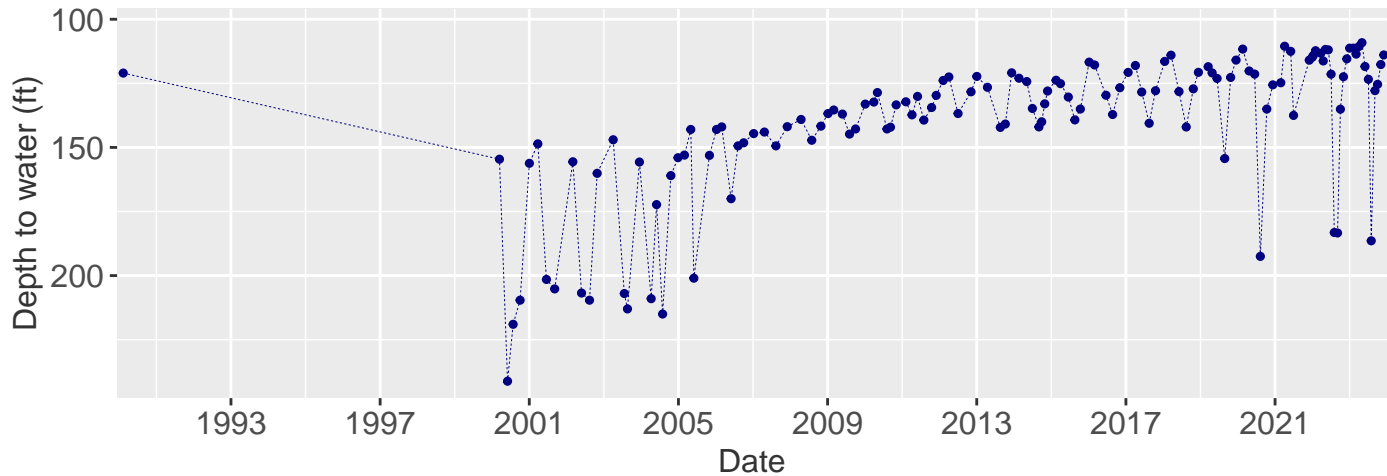
Centennial  
03N 02E 25CAA1  
Well depth: 416 ft



• Hand Measurement

\*The dashed line is a visual guide for hand measurements

Bergeson  
03N 02E 26DBA1  
Well depth: 663 ft

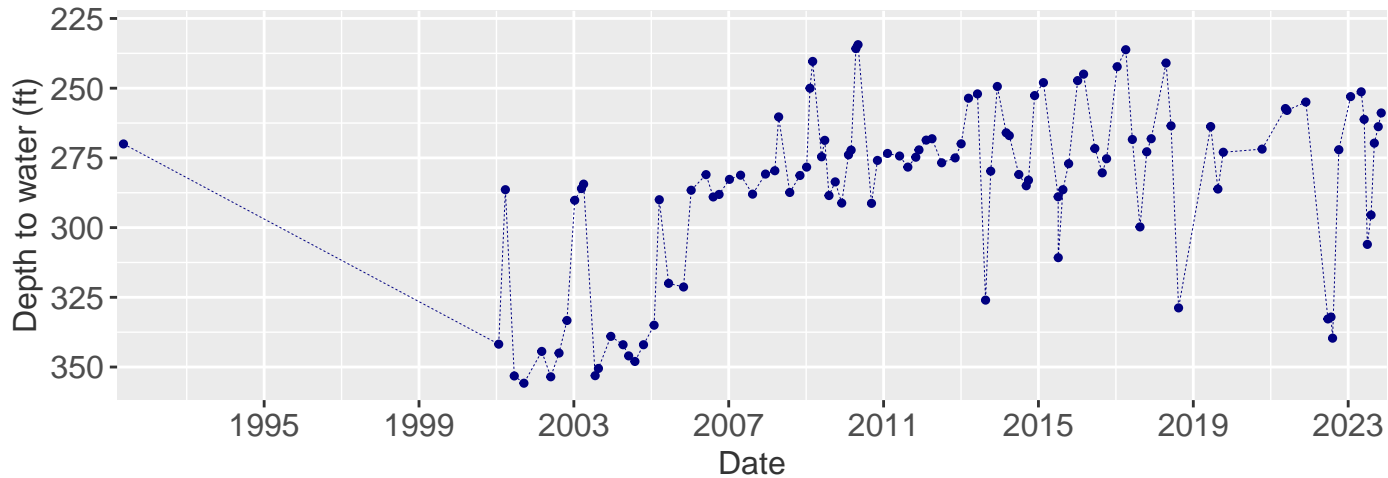


• Hand Measurement

\*The dashed line is a visual guide for hand measurements



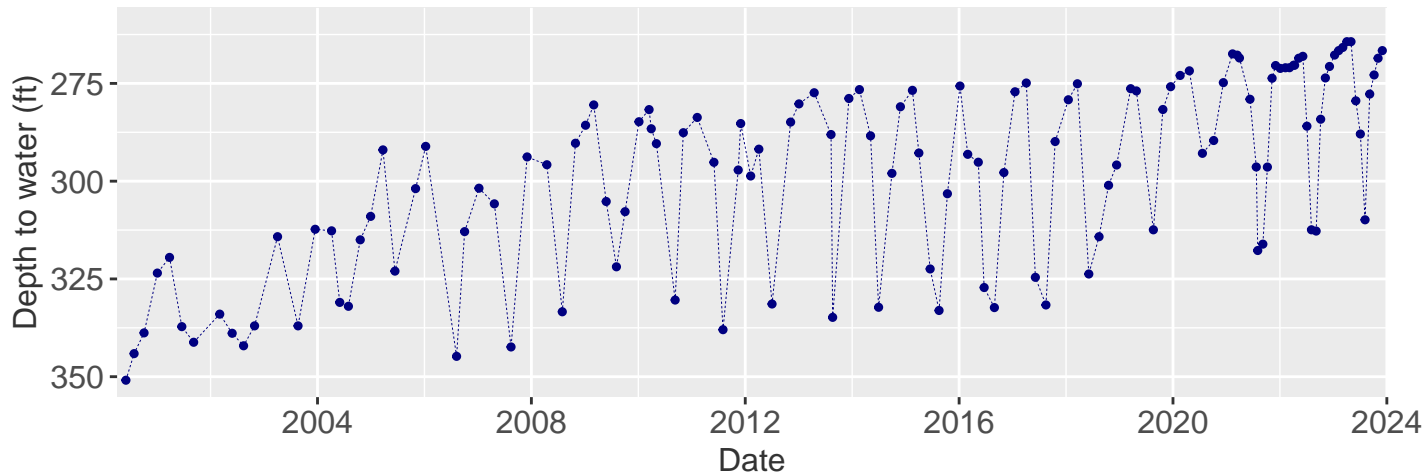
Market  
03N 02E 35BAB1  
Well depth: 944 ft



• Hand Measurement

\*The dashed line is a visual guide for hand measurements

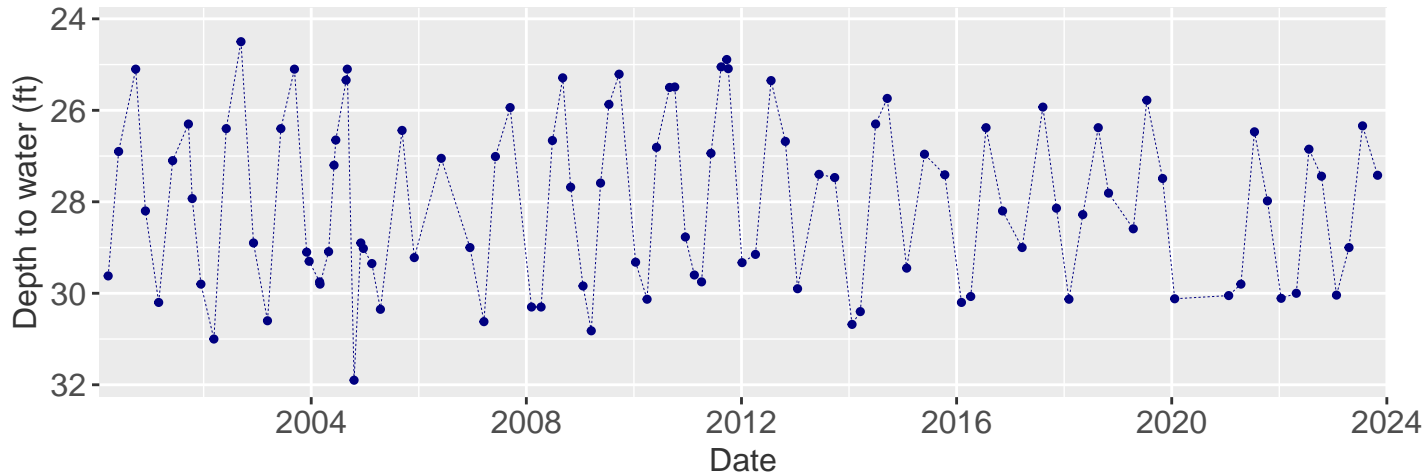
Terteling  
03N 02E 36ABC1  
Well depth: 642 ft



• Hand Measurement

\*The dashed line is a visual guide for hand measurements

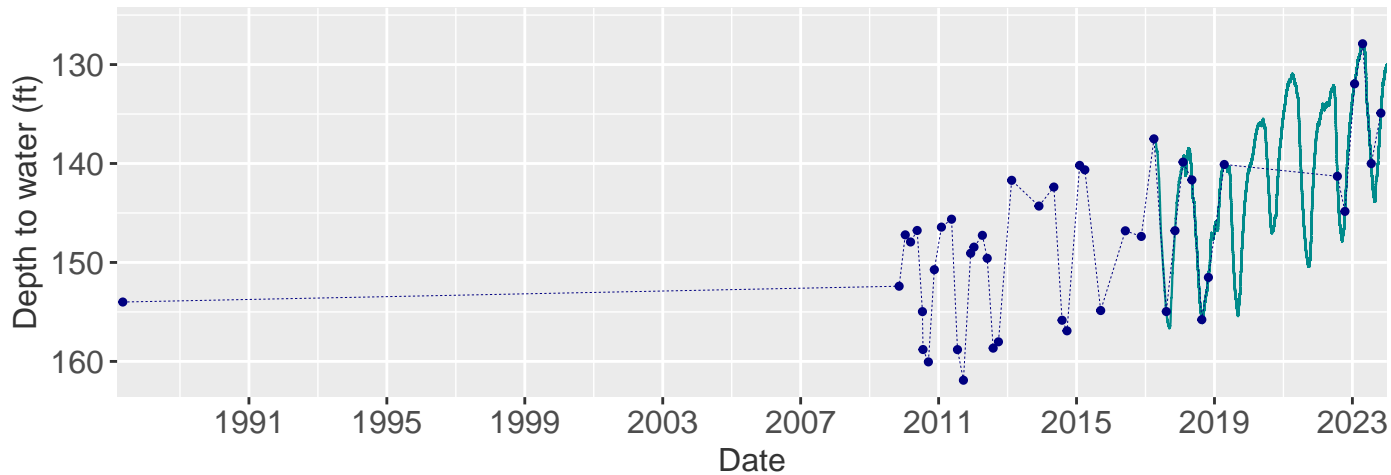
Hurok  
03N 03E 30BCBD1  
Well depth: 48 ft



• Hand Measurement

\*The dashed line is a visual guide for hand measurements

E Boise Ave  
03N 03E 30DDAA1  
Well depth: 940 ft



• Hand Measurement

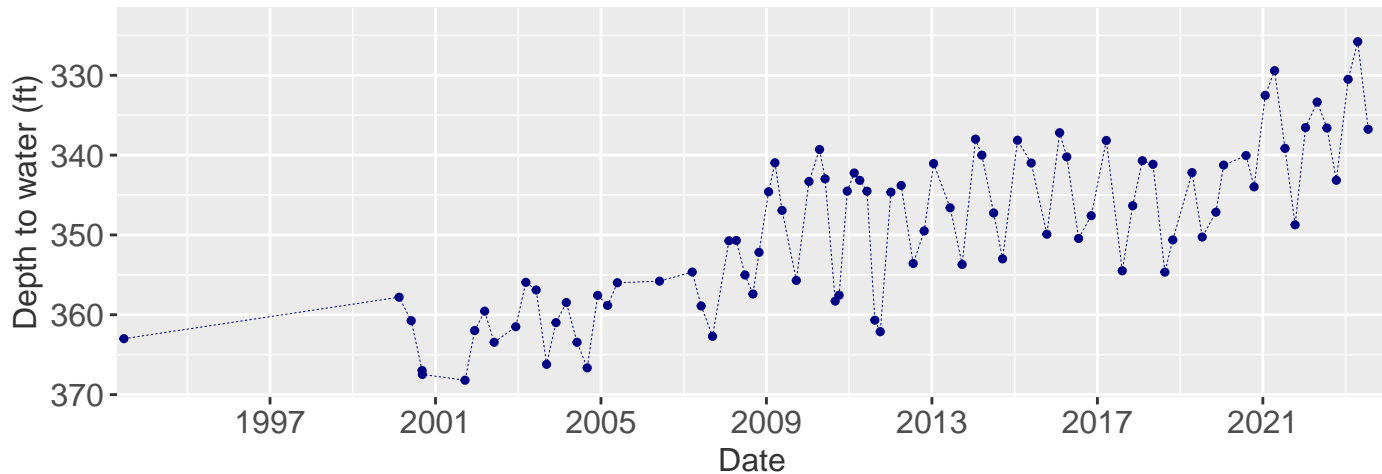
— Continuous Transducer Data

\*The dashed line is a visual guide for hand measurements

# Simplot Golden Development

03N 03E 31ADD1

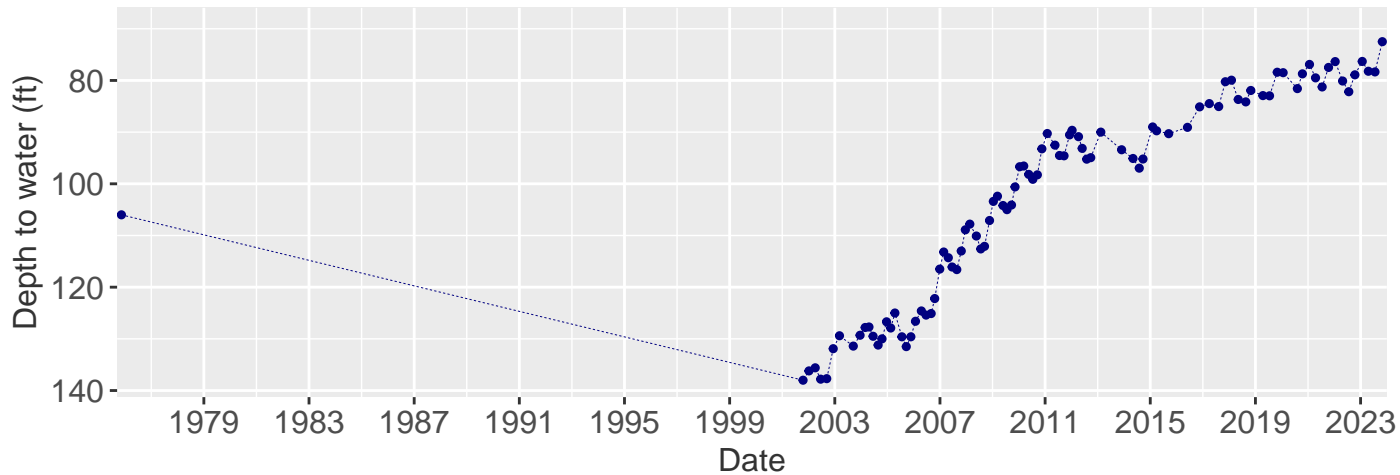
Well depth: 1180 ft



• Hand Measurement

\*The dashed line is a visual guide for hand measurements

Whitney Fire  
03N 03E 32BBA1  
Well depth: 280 ft

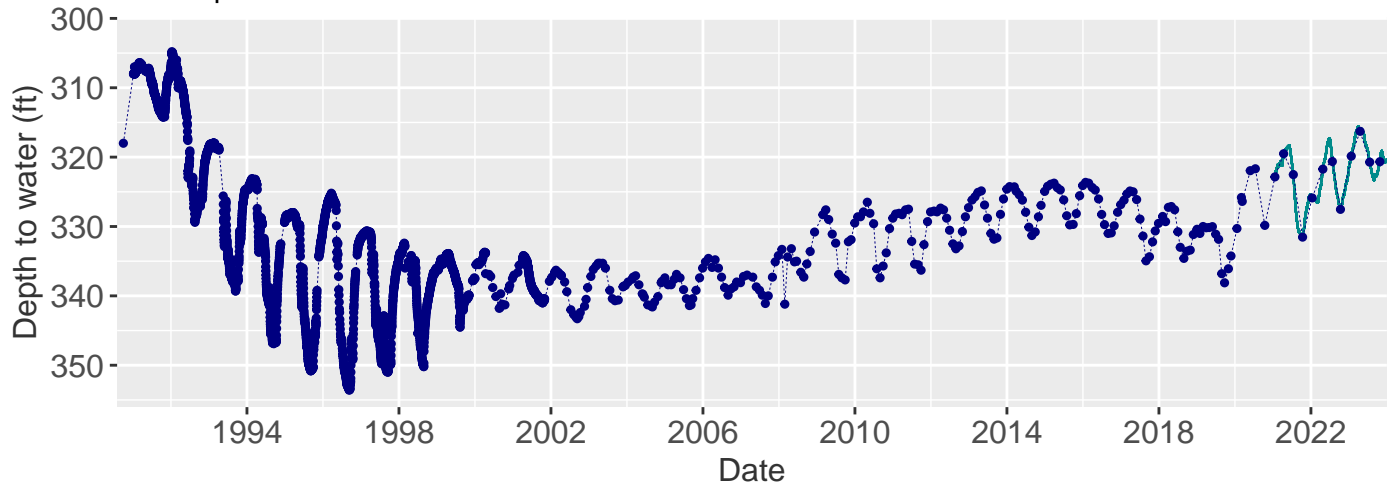


• Hand Measurement

\*The dashed line is a visual guide for hand measurements

# Micron Columbia 03N 03E 32CDD1

Well depth: 802 ft



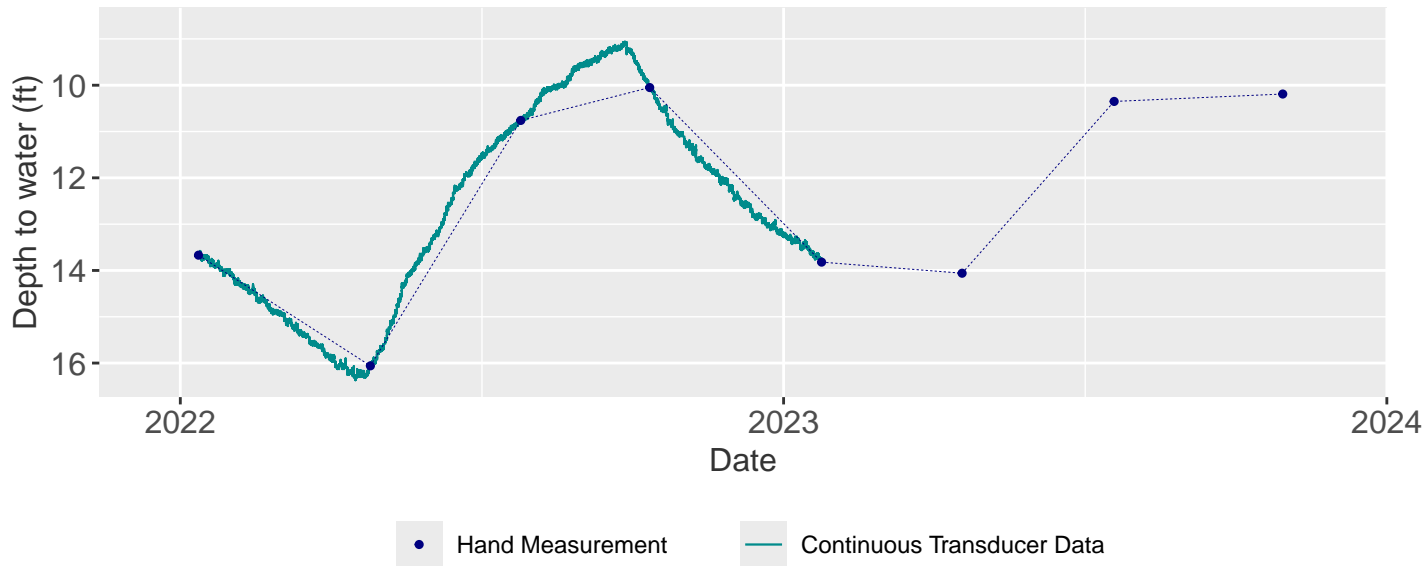
• Hand Measurement

— Continuous Transducer Data

\*The dashed line is a visual guide for hand measurements

# Surprise Valley 03N 03E 33CDB1

Well depth: 283 ft

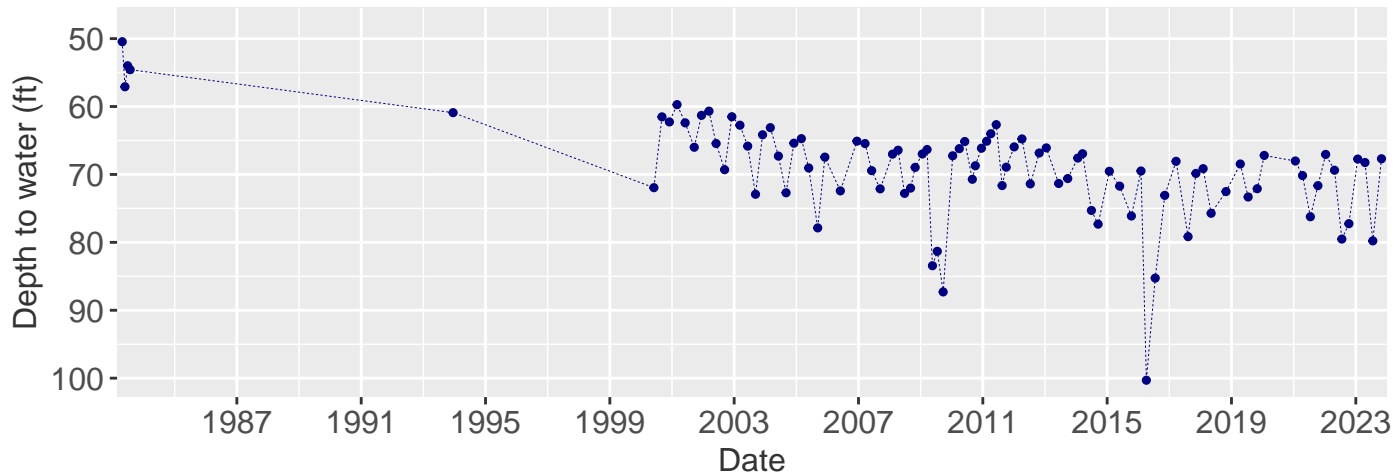


\*The dashed line is a visual guide for hand measurements



# Hammer Flats 03N 03E 33DAA1

Well depth: 127 ft



• Hand Measurement

\*The dashed line is a visual guide for hand measurements