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MEMORANDUM

May 16, 2013

To: Devin Galloway, Groundwater Specialist, WSFT, USGS

From: Jena Huntington, Hydrologist, Nevada WSC, USGS
Kip Allander, Groundwater Specialist, Nevada WSC, USGS

Subject: Nr HORSE CREEK RD WELL AQUIFER TEST—Analysis of a single-well aquifer recovery test in Dixie Valley, Nevada, HA 128

Introduction

A private company was contracted to install a pump and complete a constant rate pumping test on an isolated well in southern Dixie Valley, Nevada, HA128 (fig. 1). Recovery data was analyzed as a single-well aquifer test. The aquifer test was 48 hours in duration followed by a 24 hour recovery period. Testing ranged from July 5th to July 7th, 2012 and the 24 hour recovery ended on July 9th, 2012. Transmissivity of basin-fill sediments from approximately 400-500 ft below land surface were estimated. Estimated hydraulic properties of this well fill in hydrogeologic data gaps in the valley and will help constrain calibration of a future groundwater flow model of the valley.

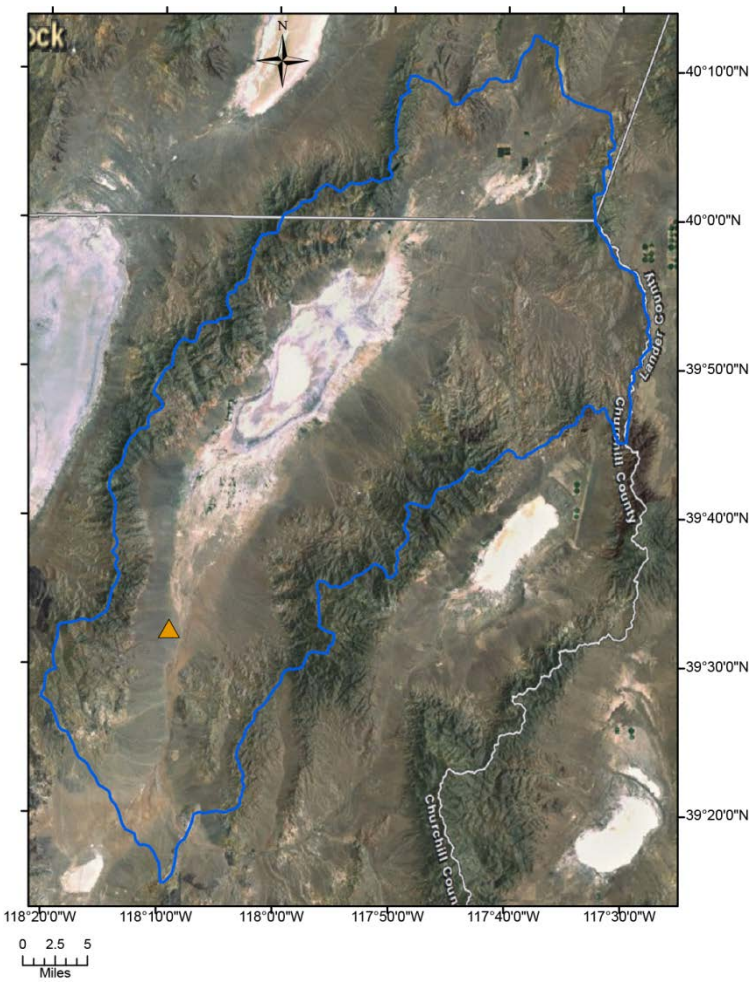

Figure 1. Location of well for aquifer testing in Dixie Valley, Nevada

Site and Geology

The single-well aquifer test occurred in southern Dixie Valley, Nevada (fig. 1) within alluvial basin-fill sediments on the valley floor. Well completion and aquifer material information were obtained from well driller's logs (table 1 and Appendix A). The alluvial fill was comprised of cobbles, gravel, sand and small amounts of clay intervals from about 3,814 to 3,314 feet above North American Vertical Datum of 1988 (0 to 500 feet below land surface). The screened interval (400-500 ft below land surface) was mostly in an area comprised of gravel and sand. The gravel pack (of large aquarium sand) extended from 100 ft above the screen interval to the total depth of the well.

Table 1. Location and construction of wells used in Dixie Valley single-well aquifer tests

[Geographic coordinates are given in latitude and longitude referenced to North American Datum of 1983 and vertical altitude data is referenced to National Geodetic Vertical Datum of 1988]

Site ID	Well name	Latitude	Longitude	Land surface altitude, ft above sea level	Well depth, ft	Static water level, ft below land surface	Depth to Top of Screen, ft	Depth to Bottom of Screen, ft	Well Diameter, in
393224118091001	Nr Horse Creek Rd	39° 32' 24.0"	118° 09' 10.4"	3,813.74	500	294.3	400	500	8

Procedures and Analysis

The Nr Horse Creek Rd well was tested independently using the Cooper and Jacob (1946) recovery method. Prior to testing, the well was equipped with a submersible pump, discharge line, flow meter, and pressure transducer. The Nr Horse Creek Rd well was allowed to recover for 24 hours before the pressure transducer was disturbed and the pump was removed from the well. A less than ideal dataset resulted from the 48-hour pumping test, which is attributed to sensitive aquifer responses to small tweaks in the pumping rate (fig. 2). The 24-hour recovery dataset was deemed a more favorable dataset for analysis.

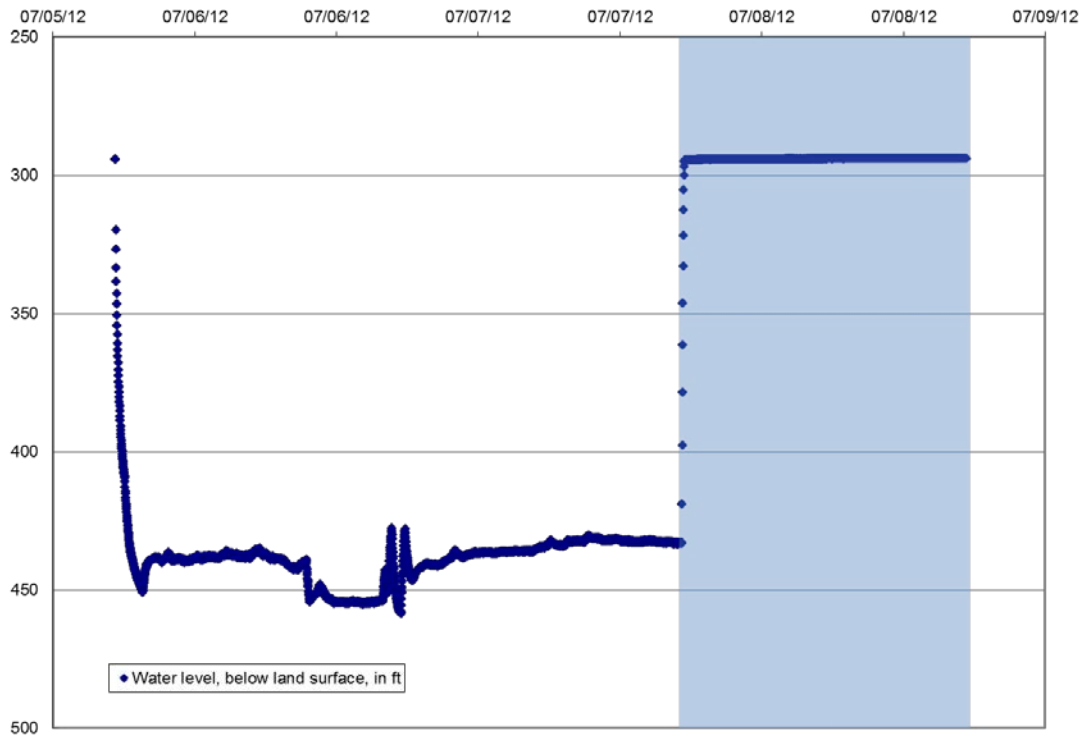

Figure 2. Graph of Nr Horse Creek Rd continuous water level measurements. Blue shaded region depicts the dataset used in analysis.

Hydraulic Property Estimates

The estimated transmissivity value of the Nr Horse Creek Rd well is about 6,000 ft^2/d (table 2). This is a reasonable transmissivity estimate for mostly coarse basin-fill sediments, although given the estimated value it is curious why a higher pumping rate could not be sustained. The pumping water level was drawn down within the screened interval within 35 minutes from the start of the test and recovered to within 1 foot of static water level in 10 minutes during recovery. One can hypothesize that as the drawdown occurred within the screened interval, a cone of depression was not forming in the aquifer. Water in the well was more easily removed than water from the aquifer that probably contains more fine silt and clay than the driller's log suggests. Groundwater could then continue to seep into the well from the still saturated aquifer above the lower water level in the well. When the pumping ceased, the seeping water aided in the rapid recovery of the well (fig. 3).

Table 2. Aquifer test length, pumping rate and estimated transmissivity values for wells used in Dixie Valley single-well aquifer tests.

Site ID	Well name	Length of recovery test, hrs	Pumping rate, gpm	Water Level Change, ft	Transmissivity, ft^2/d
393224118091001	Nr Horse Creek Rd	24	~55	-103.89	6,000

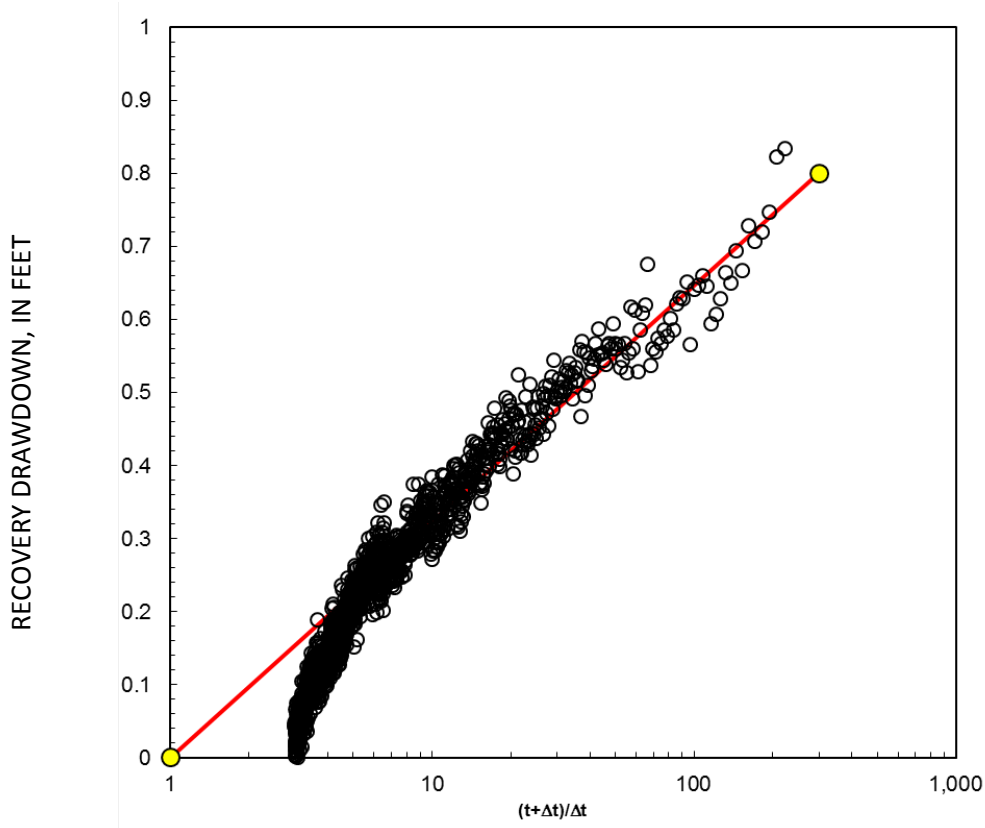

Figure 3. Cooper-Jacob recovery analysis of Nr Horse Creek Rd well in Dixie Valley, NV.

References

Cooper, H.H. and Jacob, C.E., 1946, A generalized graphical method for evaluating formation constants and summarizing well field history, American Geophysical Union Transactions, v. 27, No. 4, 526–534.

Halford, K.J. and Kuniansky, E.L., 2002, Documentation of spreadsheets for analysis of aquifer-test and slug-test data, U.S. Geological Survey Open-File Report 02-197, 51 p.

Appendix A. Nr Horse Creek Rd driller's log

STATE OF NEVADA
DIVISION OF WATER RESOURCES
WELL DRILLER'S REPORT

OFFICE USE ONLY
Log No. 113028
Permit No.
Basin 128

PRINT OR TYPE ONLY
DO NOT WRITE ON BACK

Please complete this form in its entirety in accordance with NRS 534.170 and NAC 534.340

NOTICE OF INTENT NO. 66563

1. OWNER U.S. Geological Survey
MAILING ADDRESS 2730 N Deer Run Road
Carson City, Nv., 89701

ADDRESS AT WELL LOCATION Dixie Valley Hwy near Horse Creek Road
Subdivision Name: County: Churchill

2. LOCATION NE ¼ SE ¼ Sec 4 T 19N N/S R 34 E
PERMIT/WAIVER No. MO-1641 Issued by Water Resources Parcel No.

Latitude 39.5400 Longitude 118.1528
UTM E N
☐ NAD 27 ☒ NAD 83/WGS 84

3. WORKED PERFORMED
☒ New Well ☐ Replace ☐ Recondition ☐ Deepen ☐ Other

4. PROPOSED USE
☐ Domestic ☐ Irrigation ☐ Test ☐ Municipal/Industrial ☒ Monitor ☐ Stock

5. WELL TYPE
☐ Cable ☒ Rotary ☐ RVC ☐ Air ☐ Other Mud

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thickness
large gravel to 1 1/2"		0	90	90
Medium gravels grading to medium sands with small sections of approx 5% clay	x	90	392	302
Very clean gravels and sands with almost no clay	x	392	500	108

RECEIVED 2011 FEB 15 PM 2:55 STATE ENGINEER'S OFFICE

Date started: 12-Jan , 20 11
Date completed: 23-Jan , 20 11

7. *Water Level*
Static water level: 295.15 feet below land surface
Artesian Flow: G.P.M. P.S.I.
Water Temperature: 95 °F
Quality: unknown

8. WELL TEST DATA
TEST METHOD: ☐ Bailer ☐ Pump ☒ Air Lift

G.P.M.	Draw Down (Feet Below Static)	Time (Hours)
150-200	unknown	6

9. *WELL CONSTRUCTION*
Depth Drilled 500 Feet Depth Cased 500 Feet

HOLE DIAMETER (BIT SIZE)

		From		To	
13	Inches	0	Feet	500	Feet
	Inches		Feet		Feet
	Inches		Feet		Feet

CASING SCHEDULE

Size O.D. (Inches)	Weight/Ft. (Pounds)	Wall Thickness (Inches)	From (Feet)	To (Feet)
8.625	16.96	0.188	0	500

Perforations:
Type of perforation Machine slot
Size of perforation .03"
From 400 feet to 500 feet
From feet to feet
From feet to feet
From feet to feet
From feet to feet

Annular Seal: ☒ Yes ☐ No

☒ Neat Cement	0 to 1	☐ Pumped	☒ Poured
☐ Cement Grout	to	☐ Pumped	☐ Poured
☐ Concrete Grout	to	☐ Pumped	☐ Poured
☒ ≥80% Bentonite Grout	1 to 299	☒ Pumped	☐ Poured

Gravel Pack: ☒ Yes ☐ No 300 to 500 ☐ Pumped ☒ Poured
Type: large aquarium gravel
Bentonite Chips: ☒ Yes ☐ No 299 to 300 ☐ Pumped ☒ Poured
Type: Cetco 1/4" coated tablets

10. DRILLER'S CERTIFICATION
This well was drilled under my supervision and the report is true to the best of my knowledge.
Name James L. Wood (Contractor)
Address 2730 N Deer Run Road (Contractor)
Carson City, NV, 89701
Nevada contractor's license number
Issued by the *State Contractor's Board*
Nevada driller's license number issued by the Division of Water Resources, the *on-site driller* FP-2178
Signed (By driller performing actual drilling on site or contractor)
Date 1/25/2011

(Rev. 06/08)

USE ADDITIONAL SHEETS IF NECESSARY

39.540081°N
118.151835°W
NAD 27 TR