

Status Report for Pumping Test at Well R-42

INTRODUCTION

This status report summarizes the preliminary data collected during pumping and rebound from June 17, 2013, to September 1, 2013, related to the interim measures long-term pumping test conducted at regional monitoring well R-42, as requested by the New Mexico Environment Department (NMED) (2013, 522947). Well R-42 is located within the regional aquifer beneath Mortandad Canyon with the highest concentration in the chromium plume. The pumping test at well R-42 is being conducted to collect additional data to determine the next steps in the evaluation of the potential for active long-term removal of chromium from the regional aquifer, as proposed in the "Interim Measures Work Plan for the Evaluation of Chromium Mass Removal" (the Work Plan) (LANL 2013, 241096). This report provides preliminary data for well R-42, including pumping rates, water-level responses, geochemical trends in groundwater samples collected during pumping and rebound sampling, and chromium mass removal. The summary also provides information about water treatment and subsequent land application of treated water, as approved by the NMED–Ground Water Quality Bureau (GWQB). This status report includes data for both the entire active pumping phase and approximately 10 d of the rebound period following the test. Additional rebound data are being collected following the September 1, 2013, cutoff date for this report. Interpretation of the data provided with this status report will be presented in a report to NMED by March 31, 2014, on the 2013 pumping test activities conducted for the Work Plan (NMED 2013, 522947). Pump tests at regional well R-28 and perched-intermediate zone well SCI-2 will also be conducted as part of this work plan scope, the results of which will be reported in the March 2014 report.

PUMPING INFORMATION

Pumping at R-42 started on June 17, 2013, and ended on August 21, 2013. A pump failure caused an interruption in the test starting the evening of July 7 and ending the morning of July 11, 2013. After the first 2 d, the pumping rate during the test remained steady (± 0.3 gallons per minute [gpm]) and averaged just over 7 gpm. A total of 628,630 gal. of water was removed over the pumping period. Table 1-1 in Attachment 1 (on CD) provides detailed pumping rate information (gpm) and cumulative (total) gallons pumped from the regional aquifer over the duration of the test. These data were collected with a digital flow meter.

WATER-LEVEL DATA

Water-level data were measured with transducers at R-42 and other nearby regional aquifer monitoring wells located within the Chromium Investigation monitoring group. These data will be used in conjunction with water-level data from the same wells during extended pumping at R-28 to further refine the understanding of hydrology of the regional aquifer and to evaluate the location and design of a pilot pumping well. Water-level data for this project are being collected from the pumping well R-42 and nearby regional monitoring wells R-11, R-15, R-28, R-43 (both screens), R-44, R-45, R-50, and R-61. The data indicate regional water levels within this set of wells responded variably to pumping at R-42. Detailed interpretation of the water-level responses is not included in this summary report but will be included in the March 31, 2014, report described above.

Table 1-2 (on CD) provides the raw transducer data for the above-mentioned wells for the period from June 17, 2013, to September 1, 2013. The data are also corrected to account for barometric pressure effects to differentiate pumping effects from atmospheric effects. In addition, nearby pumping at Los Alamos County water-supply wells on the Pajarito Plateau (O-4, PM-2, PM-3, PM-4, and PM-5) locally affects regional water levels. (It has been previously established that PM-1 pumping does not

affect water levels at the monitored regional wells with the chromium plume.) O-4 was active throughout the entire pumping test; PM-2, PM-3 and PM-5 were pumped irregularly, and; PM-4 became active on June 27, 2013, and continued to pump during the field test at R-42. The information about the pumping regime of the wells is provided in Table 1-2 on the data CD. Figure 1 shows barometric pressure–corrected water-level data for R-42 and all the wells near the pumping well (R-11, R-15, R-28, R-43 [both screens], R-44, R-45, R-50, and R-61). Figure 1 shows periodic rises in the water level at R-42 during pumping, when the generator was turned off for refueling; periodic declines also occurred during rebound, when water samples were collected. Similar plots at different scales are included with Table 1-2 on the data CD. Note that some of the R-28 and R-42 data were collected using absolute transducers; these data do not need barometric pressure corrections (there may be barometric pressure effects in the absolute transducer data, but these effects are negligible). Detailed analyses of the drawdowns during the pumping test will be provided in the March 2014 report.

GROUNDWATER CHEMISTRY AND CHROMIUM MASS REMOVAL

Groundwater samples from well R-42 were collected throughout the pumping and rebound phases. Table 1 presents the analyses performed on the groundwater samples and indicates the analytical results included with this report and in Tables 1-3 and 1-4 (on the data CD). Hach kit analyses were performed in the field to measure redox-sensitive constituents. Field parameters are collected to evaluate groundwater conditions and to provide early insights into any changes in groundwater quality or conditions in the well. Figure 2 shows field-measured Hach kit results, and Figure 3 shows field-parameter data as time-series plots. Laboratory analyses are conducted on-site at the Geochemistry and Geomaterials Research Laboratory (GGRL) to document transients in key constituents associated with long-term pumping. Chromium isotope analyses are used to check for variations in isotope fractionation during pumping and rebound. Polymerase chain reaction analyses are used to determine microbial activity. Additional rebound data, past September 1, 2013, are being collected from R-42 and will be included with the March 2014 report.

A key objective of the pumping test is to collect data on chromium concentration trends during pumping and rebound as part of the information that will be used to evaluate the viability of large-scale chromium mass removal from the regional aquifer as a remedial alternative. Figure 4 shows the chromium concentrations detected during the pumping test and the early rebound period, with vertical lines indicating the timing of the pump failure/restart and the end of the pump test. Over the 65-d pumping test at R-42, concentrations dropped from an initial value of 932 $\mu\text{g/L}$ to 675 $\mu\text{g/L}$, or an approximate 27% decline. For the 10-d rebound period through September 1, little to no rebound (rise) in chromium concentrations occurred. Figure 5 shows chromium mass removal as a function of the volume of groundwater pumped. A total of 1.9 kg of chromium was removed with approximately 616,000 gal. water. (The estimate of water removed differs slightly from the measured value because the calculation assumes a steady daily pumping rate equivalent to that measured near 10:00 a.m. each day.) Figure 6 shows the nitrate (as N) concentrations detected during the pumping and rebound periods.

TREATMENT SYSTEM

Groundwater removed during the pump test was treated using ion exchange resin for the removal of chromium and nitrate. Treated water was sampled to ensure concentrations were below the approved land-application limit of 45 $\mu\text{g/L}$ for chromium and 9 mg/L for nitrate. Treated water was then disposed via land application at six land-application zones within Mortandad Canyon (Figure 1-1 on the data CD), as approved by the NMED-GWQB temporary permission DP-1793. Table 1-5 (data CD) provides information about the water that was land applied through September 1, 2013, including: sample and batch numbers, date applied, volume applied, location of application, and chromium and nitrate concentrations.

ONGOING PUMPING TESTS

Pumping at R-28 began on August 28, 2013, and ran until the pump failed on August 30, 2013. Only 3 d of data were collected before September 1, 2013, and therefore are not reported herein. The pump was replaced and pumping resumed on September 7, 2013. The plan is to pump continuously at R-28 and treat and land apply the water, in accordance with DP-1793, until frozen ground within the six land-application zones prevents infiltration. Typical conditions in Mortandad Canyon suggest that land application will need to be terminated by late November 2013. At that time, pumping will cease at R-28, and rebound sampling will be conducted for a period to be determined by results of the rebound sampling.

Extended pumping is expected to begin at SCI-2 in early to mid-October 2013 and will continue for up to 30 d. Water produced from SCI-2 will be stored in small batches at the well site, transported to the R-28 treatment system for treatment, and land applied in Mortandad Canyon.

REFERENCES

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

LANL (Los Alamos National Laboratory), April 2013. "Interim Measures Work Plan for the Evaluation of Chromium Mass Removal," Los Alamos National Laboratory document LA-UR-13-22534, Los Alamos, New Mexico. (LANL 2013, 241096)

NMED (New Mexico Environment Department), June 26, 2013. "Approval with Modification, Interim Measures Work Plan for the Evaluation of Chromium Mass Removal," New Mexico Environment Department letter to P. Maggiore (DOE-LASO) and J.D. Mousseau (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2013, 522947)

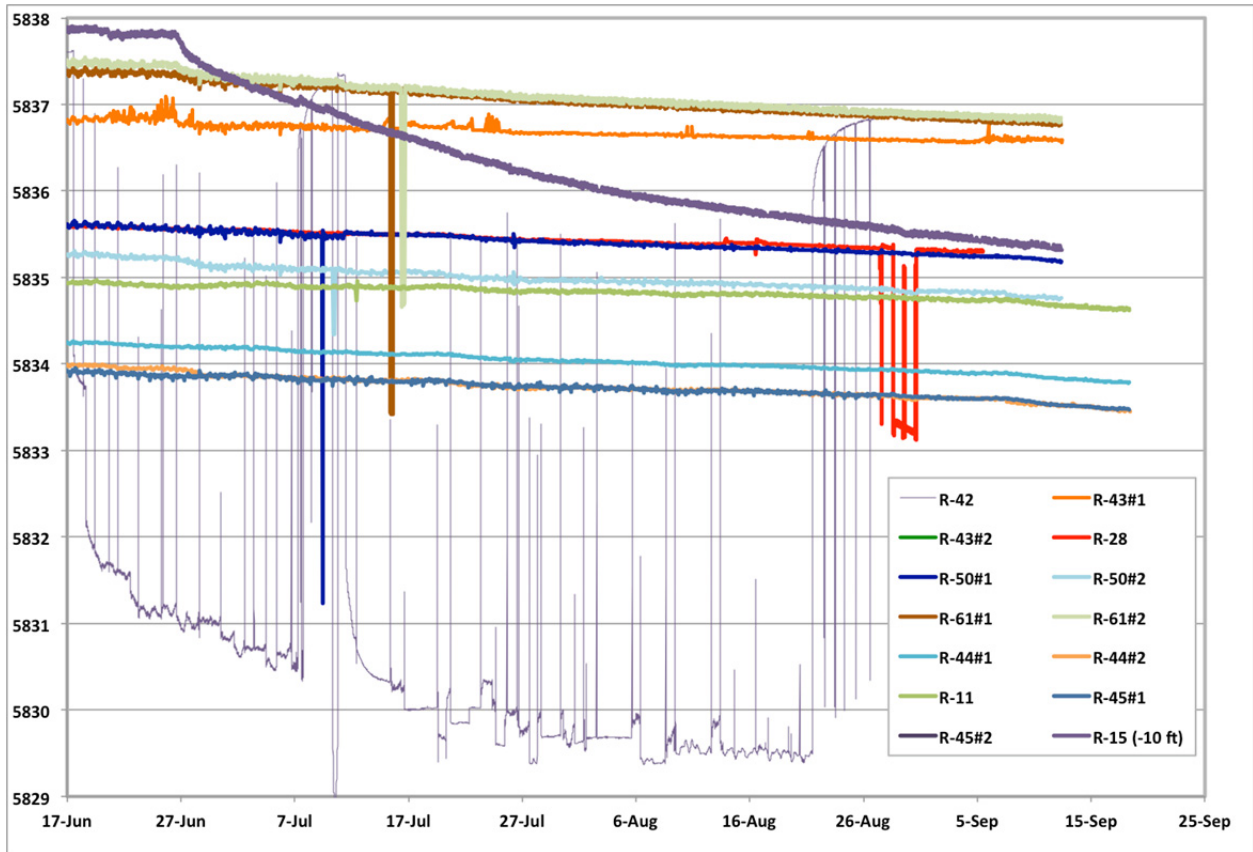


Figure 1 Water-level data with barometric pressure correction for all the regional monitoring wells near R-42

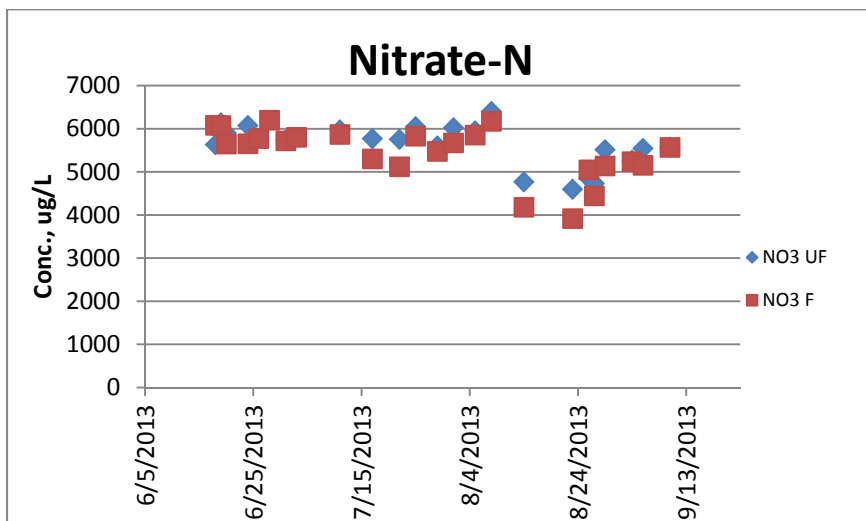
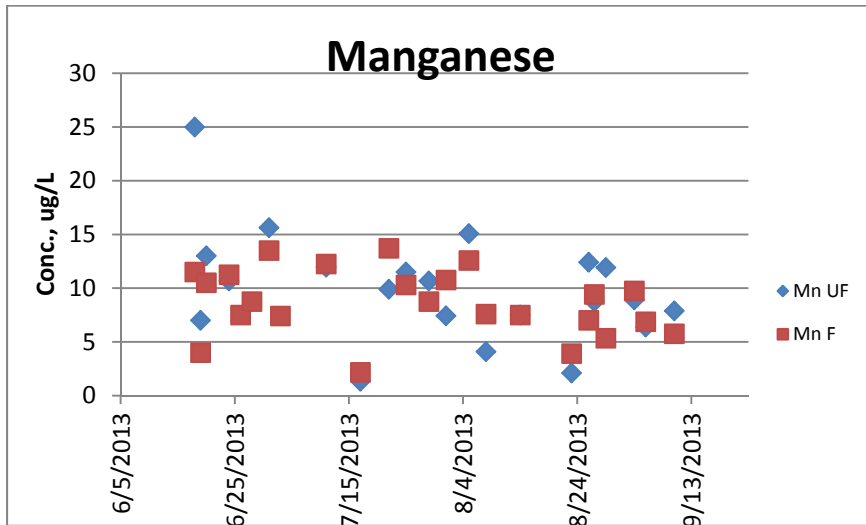
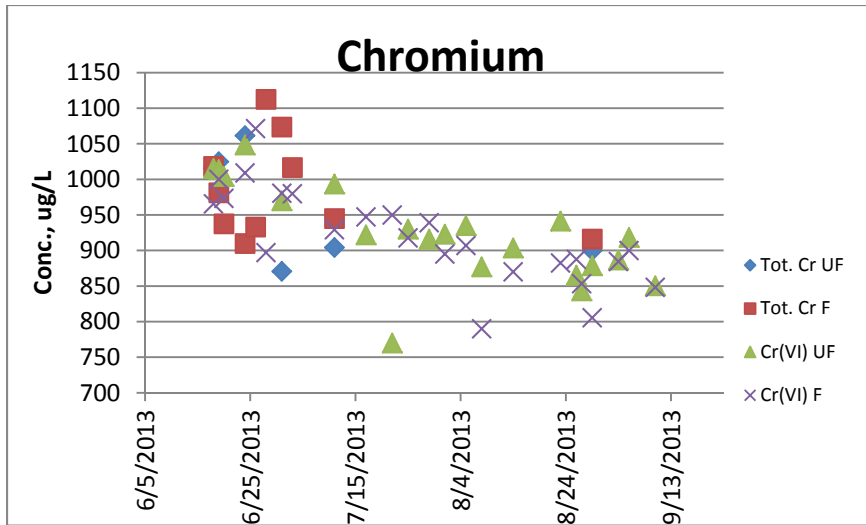


Figure 2 Field-measured Hach kit results for R-42

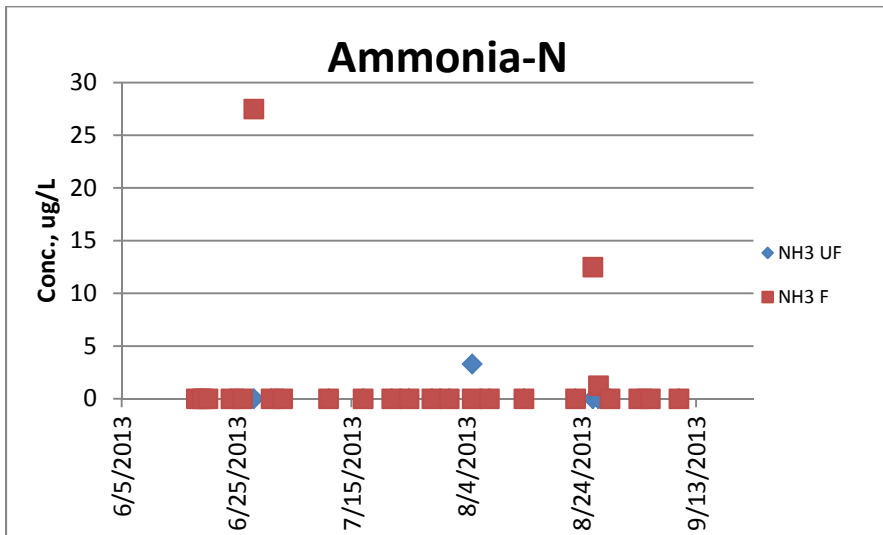
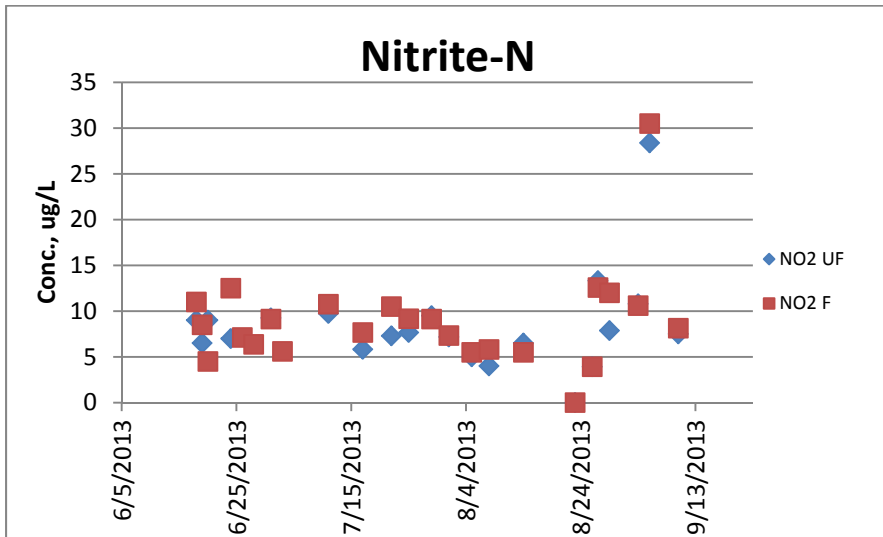


Figure 2 (continued) Field-measured Hach kit results for R-42

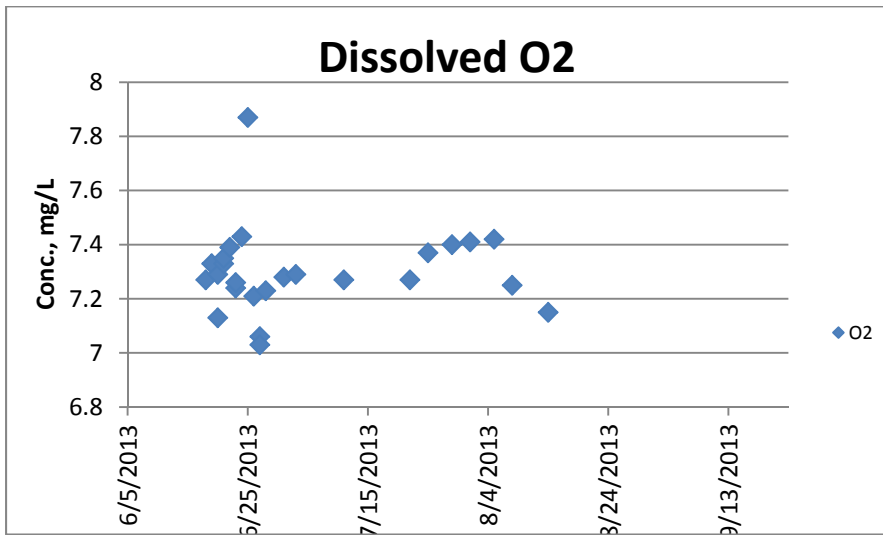
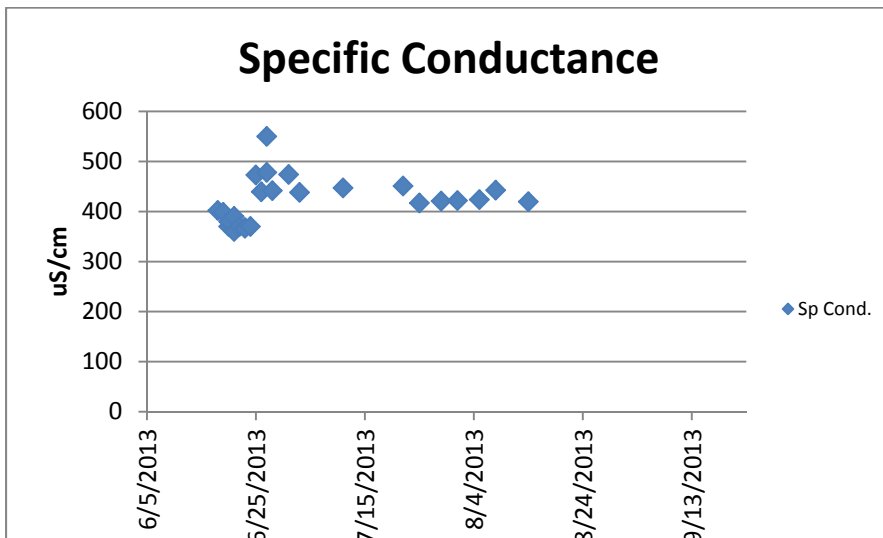
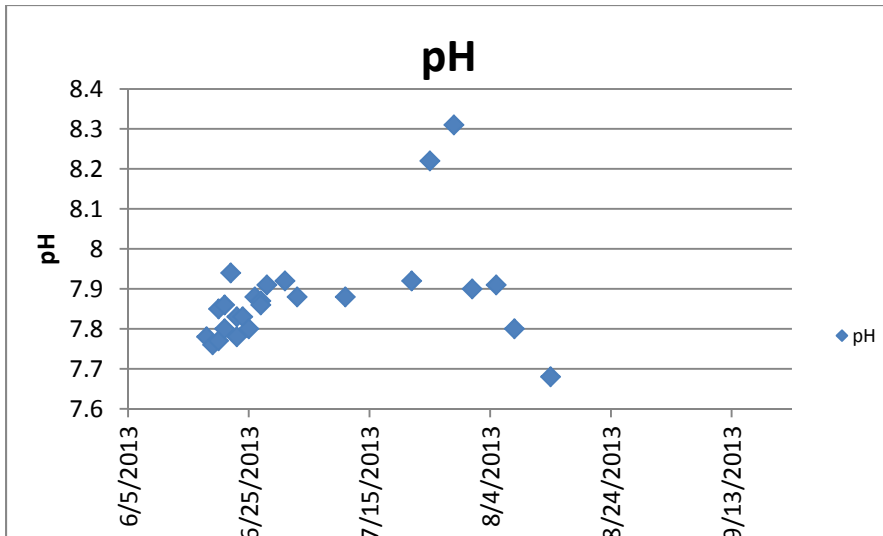


Figure 3 Field parameters for R-42

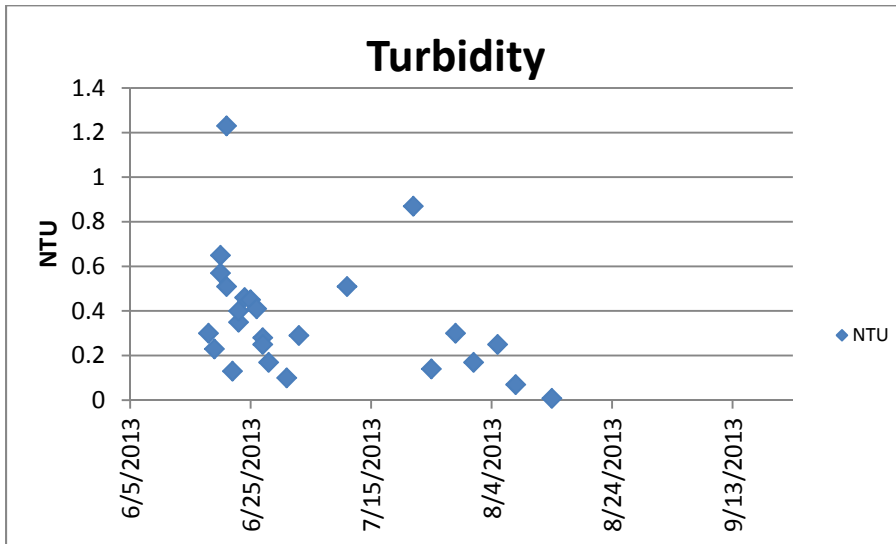


Figure 3 (continued) Field parameters for R-42

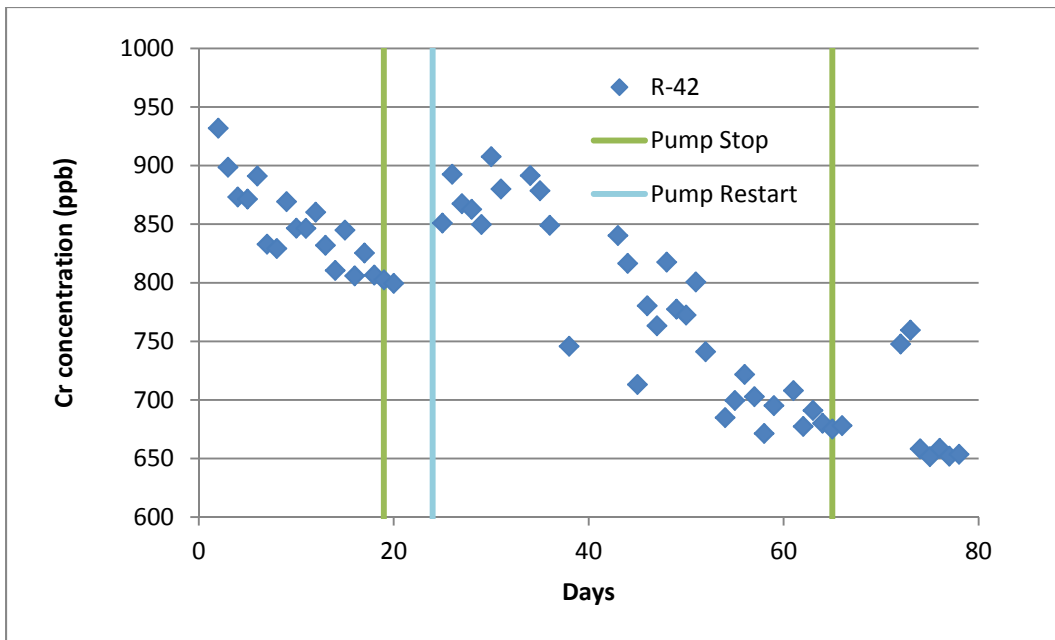


Figure 4 Chromium concentration (ppb) at R-42 during the R-42 pump test and early rebound phase, June 18 through September 1, 2013. Analytical data are from an on-site laboratory (GGRL).

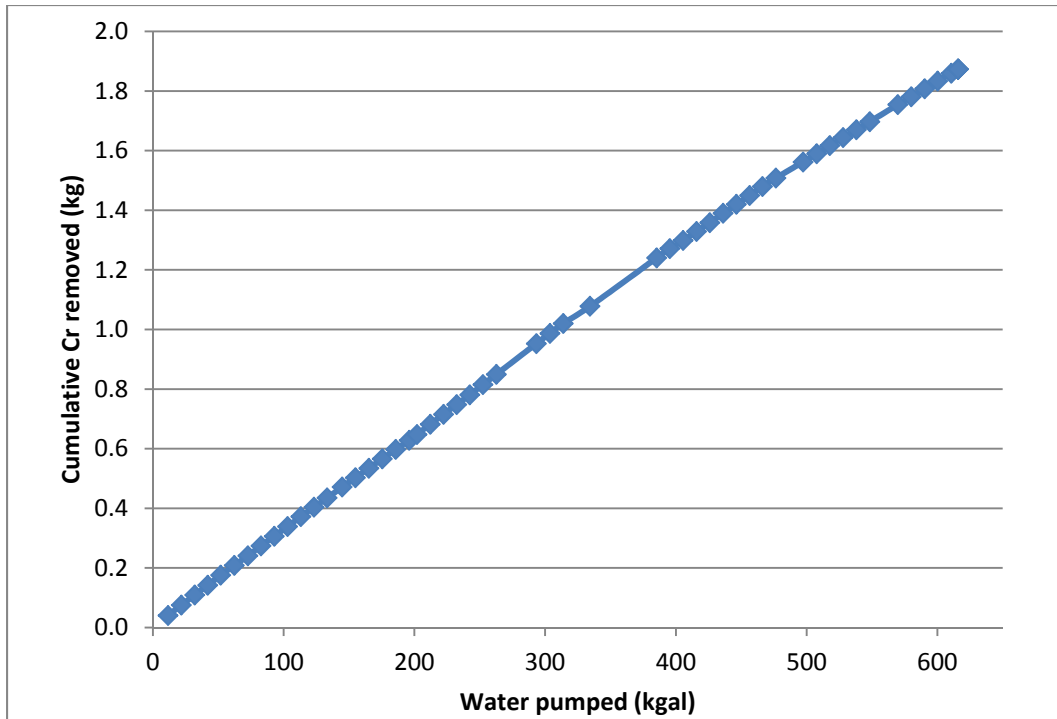


Figure 5 Cumulative chromium removed (kg) as a function of water pumped (kgal) during the R-42 pump test, June 17 through August 21, 2013

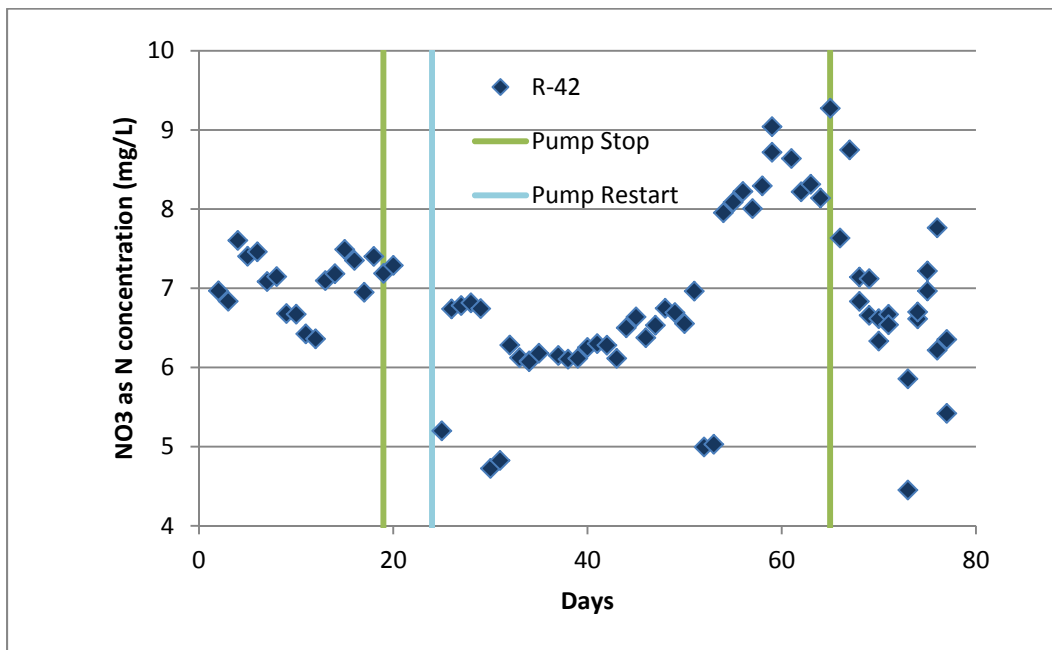


Figure 6 Nitrate (as N, mg/L) concentration at R-42 during the R-42 pump test and early rebound phase, June 18 through September 1, 2013. Analytical data are from an on-site laboratory (GGRL).

Table 1
Analytes Sampled during R-42 Pumping and Rebound Phases
and Analytical Results Included in Attachment 1

Analysis	Included in Attachment 1 (on CD)
Field Analyses	
Hach Kit: Total Cr, Cr(VI), NO ₃ , NO ₂ , NH ₃ , Total Fe, Fe(II), Mn	Yes, Table 1-3
Field Parameters: pH, Temperature, Conductivity, Dissolved Oxygen, Turbidity, Oxidation-Reduction Potential	Yes, Table 1-3
Laboratory Analyses	
Metals	Yes, Table 1-4
Dissolved Organic Carbon	Yes, Table 1-4
Anions	Yes, Table 1-4
Alkalinity/pH	Yes, Table 1-4
Total Organic Carbon	Yes, Table 1-4
Tritium (GGRL)	Yes, Table 1-3
Cr Isotopes	No
Polymerase Chain Reaction	No
Tritium (EPA:906)	Yes, Table 1-4

Attachment 1
Data for Pumping Test at Well R-42
(on CD)