

Norman, Yolande

From: Guo, Lifeng
Sent: Wednesday, September 02, 2009 7:35 AM
To: Norman, Yolande
Subject: FW: Zone 3 injection test description

Hi Yolande:

The conference call last Friday with the licensee and its consultants was primarily focused on the proposal of an injection test that was technically already concurred with the State of New Mexico and understood by US EPA. Due to its experimental nature of the test, we went through the test procedures, potential problems that may arise and benefits that the test might provide in term of potential site future remedial actions. This call was mainly for clarification purpose.

Thanks

Lifeng

From: Mark Jancin [mailto:mjancin@chesterengineers.com]
Sent: Tuesday, August 25, 2009 4:51 PM
To: Guo, Lifeng
Cc: Roy Blickwedel; James Ewart
Subject: Zone 3 injection test description

Below is a description of the Zone 3 injection test. We can discuss related issues during our conference call on Friday.

UNC proposes to conduct an injection test in monitoring well NBL-2 in the northern part of Zone 3. The test will occur after mid-September at a specific date to be determined. The primary objective is to empirically assess the amount of water a well in the non-impacted, northern part of Zone 3 can accommodate by injection. A secondary objective is to determine a new estimate of the hydraulic conductivity in this area. However, the average hydraulic conductivity in this area has previously been determined to be 2.95×10^{-4} cm/s or 0.84 ft/day (N.A. Water Systems, April 25, 2008, Recommendations and Summary of Hydrogeologic Analysis – Evaluation of Groundwater Flow in Zone 3 for the Design of a Pumping System to Intercept and Recover Impacted Groundwater; in reference to northern section line NBL; see p. 8 and Figure 7).

The context of this test is to evaluate the potential for creating a hydraulic (and possibly an alkalinity) barrier, using multiple injection wells, to limit further northward advance of the seepage-impacted groundwater in the northern part of Section 36. This potential remedial option was retained in the Revised Submittal, Site-Wide Supplemental Feasibility Study Part II (Chester Engineers, July 10, 2009) with a caveat that the formation may not accept sufficient quantities of fluid to be practicable, as occurred in the Zone 3 in-situ alkalinity stabilization test (Arcadis, June 2007). Secondary permeability restrictions have developed in portions of Zone 3 where the arkosic sandstones have been altered to clays by reaction with the acidic tailings seepage. The proposed injection test is located outside of the influence of tailings seepage where such secondary permeability restrictions are less likely.

UNC proposes to inject 800 gallons of water obtained from the site's old mill well, which taps the Westwater Canyon Formation. This is the same water source that was used for the previous in-situ alkalinity stabilization pilot test. It is UNC's understanding that NMED approves its use for this injection test.

Monthly chemical field parameter measurements indicate that the groundwater is non-impacted in well NBL-2. Based on the pumping rates of the new NW-series of wells in the northern part of Zone 3, it is expected that

injection rates may prove to be approximately 1 to 1.5 gpm. However, for a variety of reasons there are inherent differences between injection and withdrawal such that injection rates are typically less than withdrawal rates.

The injection water will be piped below the water table in order to minimize the potential for air bubbles to clog the pore spaces around the well. The active injection will be of relatively short duration via gravity flow until the water level rises to the top of the well riser pipe, at which time the flow will be shut-off. Frequent water-level measurements be made, starting before any water is injected. UNC will use a pressure transducer and data logger (provisionally the In-Situ Level Troll) to collect these measurements, using a log-time measurement frequency. Manual measurements will be made when the transducer is installed prior to the test and at convenient times during the test, in order to verify the initial depth and later accuracy of the transducer measurements. Another reason for the pre-test manual measurement is to determine the position of the water table relative to the top of the Zone 3 hydrostratigraphic unit. This distance, and the saturated thickness, are factors used in estimating hydraulic conductivity from the test data (the injection test can be viewed as a single-well falling-head slug test). It is likely that the test would be repeated over several days to analyze reproducibility. UNC is also considering closing-in the well head to determine the time required to inject all 800 gallons without running the risk of overtopping the well riser pipe (i.e. more akin to a constant head test).

The data to be collected during the test are: units of time; volume of mill water down the well (gallons in); and water-level elevations or depths to water in the injection well. The data logger operation will continue for 48 hours after the start of injection, in order to record the change in water level during and after the test. In addition, manual water-level measurements will be made in monitoring well NW-5, which is the closest available non-pumping well to NBL-2 (separated by 488 ft). The objective of these measurements is to check on fluctuations in barometric pressure and the possibility that there might be a slight rise in water-level elevation from the injection water. However, the water level in NW-5 is not static, since it is apparently influenced by the combined pumping in wells NW-1, NW-2, NW-3, and PB-2. The distance between NBL-2 and NW-5 is large enough that UNC does not expect to see an effect in the latter from the injection.

The data and analysis of the injection test will presented in a short letter report within approximately 4 weeks of the completion of the test. Three possible outcomes are envisioned with the fundamental goal being to evaluate whether the SWSFS should retain the hydraulic (or alkalinity) barrier alternative for Zone 3. One possible outcome is that the water flows much more readily than during the in-situ alkalinity stabilization test; in this case, the alternative should continue to be developed. Another outcome might be that the injection rate is not appreciably different than it was during the in-situ alkalinity stabilization test; in this case, the alternative will be screened-out. A third possibility is that the results are somewhere in-between. In this latter case, UNC will consider more rigorous testing procedures to be conducted at possibly more than a single well.

From: Mark Jancin
Sent: Monday, August 24, 2009 2:07 PM
To: 'Guo, Lifeng'
Cc: Roy Blickwedel; James Ewart
Subject: Church Rock conf call Friday @ 10:30 am

Hi Lifeng – we are set for our conference call on Friday, August 28, at 10:30 am. The main objective is to discuss NRC comments and questions about the pending hydraulic injection test in the northern part of Zone 3. We will send you a short, informal writeup of the test workplan before the call.

The call-in number is 877-985-4279

Access number is 469764#

Mark

From: Guo, Lifeng [mailto:Lifeng.Guo@nrc.gov]
Sent: Friday, August 21, 2009 2:19 PM
To: Mark Jancin
Subject: RE: Church Rock Zone 3 injectability testing (NRC's comments)

Hi Mark: I'm available next Friday. Just let me know the time and I'll join the call. Thanks and have a good weekend. _Lifeng

From: Mark Jancin [mailto:mjancin@chesterengineers.com]
Sent: Thursday, August 20, 2009 1:39 PM
To: Guo, Lifeng
Subject: FW: Church Rock Zone 3 injectability testing (NRC's comments)

Hi Lifeng – in consideration of the email below, will you be available for a related conference call next week on either Monday (August 24) or Friday (August 28)? If not, please advise as to which days or weeks may be most suitable for you.

Mark Jancin
Chester Engineers

From: Norman, Yolande [mailto:Yolande.Norman@nrc.gov]
Sent: Friday, July 10, 2009 10:54 AM
To: Blickwedel, Roy (GE, Corporate)
Cc: Bush, Larry (GE Infra, Aviation, US); Mark Jancin; e.esplain@yahoo.com; Bahar, Dana, NMENV; Jetter, Steve, NMENV; Guo, Lifeng; Tadesse, Rebecca; Dixon, Earle, NMENV; Purcell.Mark@epamail.epa.gov; Norman, Yolande
Subject: RE: Church Rock Zone 3 injectability testing (NRC's comments)

Hi Roy,

The NRC understands that the overall objective of this injection test (i.e. either a falling head or a constant head) is to show whether there is a significant difference in the hydraulic conductivity between the altered and unaltered Zone 3 water-bearing zone.

Zone 3 is a water-bearing zone/aquifer which may naturally exhibit spatial variability. For example, the saturated hydraulic conductivity of the altered Zone 3 could be within the range of the variability of the unaltered aquifer and *vice versa*. In addition, the values for hydraulic conductivity may also be scale dependent (e.g., slug test data versus pumping test data).

The NRC does not object to the implementation of this injection tests as proposed and does not require a formal work plan for this tests. However, UNC/GE is cautioned that given the results which will be obtained from this one well in the unaltered Zone 3, it may be difficult to prove a difference statistically between the altered and unaltered portions of Zone 3, due to the limited amount of available field measurements.

Moreover, it would be prudent to examine the existing well logs for Zone 3 (e.g. relict structural features/lithology that could affect the variation in hydraulic properties) and hydraulic conductivity measurements previously generated for Zone 3 to make a crude judgment of the spatial variability of aquifer characteristics before proceeding to the field test to achieve the objective.

Please call to discuss with our hydrogeologist Lifeng Guo (310-415-7962) or via e-mail Lifeng.Guo@nrc.gov. Lifeng will be available on 07/10, 07/13 and the week of 07/20 – 07/24.

I will be on vacation from 07/13 to 07/17.

Yolande J.C. Norman,
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From: Dixon, Earle, NMENV [<mailto:Earle.Dixon@state.nm.us>]
Sent: Tuesday, June 30, 2009 7:25 PM
To: Purcell.Mark@epamail.epa.gov; Blickwedel, Roy (GE, Corporate)
Cc: Bush, Larry (GE Infra, Aviation, US); mjancin@chesterengineers.com; Norman, Yolande; e.esplain@yahoo.com; Bahar, Dana, NMENV; Jetter, Steve, NMENV
Subject: RE: Church Rock Zone 3 injectability testing

Mark and All,

I talked with Larry Bush today about the new wells that were drilled in Zone 3 last fall and the gravity injection test proposed-described by Roy in his latest email. I look at the proposed test as similar to a falling head or constant head test to get a rough value for the saturated hydraulic conductivity at the Zone 3 well location(s) of choice. I think this test is more experimental at this initial stage just to see if there is a significant difference between the altered and unaltered material. Maybe it will show the two media to be at least an order of magnitude or more different in their respective hydraulic conductivities. Since this proposed work is not to be a highly sophisticated operation and it would provide a general idea about the potential difference in recharge between the two types of material, I'm of the opinion that our comments and concurrence do not need to be overly rigorous. I don't think a formal plan is necessary.

I support the proposed injection test. Please let me know if I need to inform-explain to NMED management and get their support-approval.

Thanks, Earle Dixon

From: Purcell.Mark@epamail.epa.gov [<mailto:Purcell.Mark@epamail.epa.gov>]
Sent: Tuesday, June 30, 2009 12:19 PM
To: Blickwedel, Roy (GE, Corporate)
Cc: Dixon, Earle, NMENV; Bush, Larry (GE Infra, Aviation, US); mjancin@chesterengineers.com; Norman, Yolande; e.esplain@yahoo.com
Subject: Re: Church Rock Zone 3 injectability testing

Hi Roy,

I am going to be out of the office for the next 3 weeks, returning on July 22nd. I will be checking e-mails.

I saw the comments from Earle and Yolande informed me that they are looking at it also.

I'll continue to follow the discussions and provide any other comments I might have via e-mail.

Mark

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From: "Blickwedel, Roy (GE, Corporate)" <Roy.Blickwedel@ge.com>
To: "Norman, Yolande" <Yolande.Norman@nrc.gov>, Mark Purcell/R6/USEPA/US@EPA, <earle.dixon@state.nm.us>
Cc: "Bush, Larry (GE Infra, Aviation, US)" <larry1.bush@ge.com>, <mjancin@chesterengineers.com>
Date: 06/29/2009 03:05 PM
Subject: Church Rock Zone 3 injectability testing

Folks,

We wanted to run an idea by you that Larry had. You may recall that we experienced poor injection rates during the insitu alkalinity stabilization pilot, and that we did some X-ray and SEM work to verify the cause. It was confirmed that feldspars were altering to clays in the presence of acidic tailings seepage water.

It was also determined that the arkose was essentially unaltered when not exposed to the tailings fluids. Therefore, UNC proposes to conduct a mini-injectability test in Zone 3 out in front of the seepage impacts to gain information on potential injection rates in the unaltered arkosic sandstones of Zone 3 in the Gallup Fm. This information will be of use to the SWSFS.

We would like your input and approval to conduct the test. We would plan to inject about 800 gallons of the same water that was used for the alkalinity stabilization pilot (minus the added alkalinity), and we would allow it to flow by gravity into one of the northernmost, unimpacted Zone 3 wells. This is intentionally not very fancy, but the information may be of much value in evaluating potential future remedies for Zone 3. We will monitor groundwater levels nearby as well as the injection rates. We want to know if the recharge rates for the altered and unaltered arkosic Gallup Fm. are different and to get an idea by about how much. We plan to do this via a truck-mounted water tank. You may recall that water for the Zone 3 alkalinity stabilization pilot test was pumped via a temporary pipeline from the mill well. We are planning to keep this much simpler so that we might get a general idea about the efficacy of injection technologies in the unimpacted part of the formation.

Please let me know your thoughts. We would be happy to convene a call to discuss. I'd like to avoid spending the time and money to put together a formal plan if at all possible.

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