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Via Electronic and First Class Mail - bhg@azdeq.gov

Benjamin H. Grumbles
Director
Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, Arizona 85007

Subject: West Van Buren WQARF Site
Roosevelt Irrigation District Well Investigation Work Plan

Dear Director Grumbles:

On behalf of Honeywell International Inc., CH2M HILL appreciates this opportunity to comment on the Roosevelt Irrigation District Well Investigation Work Plan (WP) prepared by Montgomery & Associates on behalf of the Roosevelt Irrigation District (RID), dated August 9, 2010. The WP was submitted to the Arizona Department of Environmental Quality (ADEQ) in response to the conditional approval of RID's February 3, 2010 Early Response Action (ERA) Work Plan. According to ADEQ, specific conditions, tasks, and outcomes must be achieved as a condition of the approval. After a thorough technical review of the WP, we provide the comments below.

General Comments on the WP

1. ADEQ required Task 2 (RID Wells Investigation) as part of its conditional approval because:

"Due to the proposed increased pumping rate at RID wells to be used for remediation, RID must conduct well testing and modeling to insure that changes in pumping will not adversely affect groundwater quality and levels within the WVBA beyond what would be expected with the current pumping conditions. Water levels must be maintained at or near current levels taking into account natural variations. The investigation must determine how ERA workplan implementation will affect both the aquifer and wells in the area of the plume."

Therefore, ADEQ required RID to submit, within 45 days of ERA approval, "a well investigation work plan for the investigation of RID wells within the plume boundary" that will include "at a minimum, water levels, screen intervals, spinner log testing, depth specific analytical testing and video logging." This requires that ALL RID wells within the plume boundary must be comprehensively and thoroughly evaluated as necessary to determine their suitability for use in a strategically planned remediation effort, to evaluate their current effect on the aquifer and surrounding wells in the West

Van Buren Area (WVBA), and to determine how implementation of the ERA will alter that effect.

However, the WP submitted by RID only describes a limited investigation of 13 of its impacted wells, and only proposes to do the required detailed investigation on four of its wells. In fact, RID specifically states that the scope is "limited to a phased approach to assess wells within the existing plume and wells proposed for use in the ERA." RID provides no justification for excluding the other RID wells within the plume boundary that will continue to affect the groundwater conditions as time progresses. RID has not shown that they understand the past or current impact their wells have on groundwater conditions in the WVBA, and therefore, their limited approach will not meet ADEQ's mandate that RID understand how implementation of the ERA will "affect both the aquifer and wells in the area of the plume."

By limiting the well investigation to only the RID extraction wells for the ERA and not fully investigating, as ADEQ says, "RID wells within the [WVBA] plume boundary," RID is not in compliance with ADEQ's mandate. In addition, by limiting the spinner log testing and depth specific analytical testing to only four of its wells, the work proposed is not in compliance with ADEQ's requirements. The RID WP is not consistent with ADEQ direction and, therefore, does not satisfy the second specific condition of ADEQ's approval, and cannot result in a demonstration that the ERA will not negatively affect the aquifer and surrounding wells. Furthermore, by limiting this investigation, RID cannot provide a reasonable evaluation of how the proposed ERA improves plume control or mass removal over the existing pumping program.

2. RID presents their own goal of determining whether any wells should be modified to reduce the flow of "clean" groundwater into the wells. If RID intends to modify their wells, then it seems more logical and appropriate to modify them to seal off the contaminated zones and reduce the production of contaminated water, thereby avoiding the need for an ERA and allowing a full feasibility study to be conducted. This would ensure that the final remedy for the site addresses all remedial goals, not just RID's goal of producing early remediated water for sale.
3. Overall, RID's WP does not meet the requirements of ADEQ's conditional approval. As stated in the conditional approval letter, the RID Wells Investigation must 1) Insure that changes in pumping will not adversely affect groundwater quality and levels within the WVBA beyond what would be expected with the current pumping conditions, 2) Maintain water levels at or near current levels taking into account natural variations, and 3) Determine how ERA workplan implementation will affect both the aquifer and wells in the area of the plume.

However, the WP provides no discussion on how the data collected during the Wells Investigation task will meet these specific goals or will be used to evaluate these goals.

4. The key section entitled "Well Investigations" (Section 4.0) is seriously deficient. This is the area of the WP where it would be expected there would be a higher level of specific technical detail for each of the tasks, and information on how the data would be used to

address ADEQ's requirements. This section is vague and provides limited technical details.

5. The schedule presented within the WP completely disregards the direction and the intent of ADEQ's conditional approval with respect to the need for a detailed, committed plan for action.
6. The groundwater system needs to be considered holistically, as an integration of multiple aquifer systems and system components (e.g., wells). It is important to understand how each of those wells impacts the system as a whole, laterally, vertically, and temporally. To do this effectively, it is necessary to understand how each well operates and impacts the overall system. The WP does not provide the level of detail or confidence to show that the system is or will be understood appropriately.
7. The work efforts must not be focused on enhancing the physical infrastructure of RID's system to be compatible with a future business plan objective, but rather on meeting the objectives ADEQ stated in the conditional approval, consistent with the Arizona Department of Water Resources Groundwater Quality Management Program. The evaluation of the RID system should be designed to ensure a scientific plan for extraction and treatment of impacted groundwater that optimizes the remedial effectiveness of the system.

Specific Comments on the WP

2.0 Early Response Action

While this section explains that there will be no net change in annual groundwater pumping volumes, the key issue that RID fails to acknowledge (and that ADEQ required RID to address) is the effect on the plume and water levels when pumping rates are shifted around the WVBA, not whether the total volume of water changes.

1. Section 2.0, page 2, Despite RID's claim that there will be no net change in pumping volumes under the ERA, RID must still demonstrate that the ERA will maintain water levels at or near current levels (taking into account natural variations) in all areas of the plume, as well as not adversely affect other (RID and non-RID) wells in the plume area. Simply maintaining annual pumping volumes in the RID system will not automatically result in no changes to the water levels, especially in localized areas where RID has chosen to increase pumping of its production wells.
2. Section 2.0, page 2, The issue that RID fails to acknowledge and address in the WP is not whether the annual pumping volume will change, but rather what effect changing the location and rate of pumping will have on the WVBA plume, which ADEQ mandated them to evaluate.

3.0 West Van Buren Area

This section of the WP is lacking the detail necessary to show that RID has a sufficient understanding of the complexities of the geology and hydrogeology in the WVBA, and the effect their wells have historically had on the plume, to warrant the limited investigation

they are proposing. This section also includes statements for which RID has provided no support or evidence in any of their submittals.

3. Section 3.0, page 2, Overall, the physical setting, hydrogeologic conditions, groundwater conditions, and sources of contamination should be restated with clarity as to how they relate to the RID well investigation. There is no indication from RID that they understand the complexities both geologically and hydrogeologically in the WVBA and how their wells have historically impacted, and currently impact, the contamination and groundwater conditions within the plume. Detailed well construction information needs to be provided and described in relation to the specific hydrostratigraphy that exists at each well location.
4. Section 3.1, page 3, Detailed aquifer tests for ALL RID production wells, along with other site-specific information that should be gathered during the well investigation and prior to conducting a modeling effort, is missing from RID's evaluation. According to the WVBA Remedial Investigation Report, aquifer tests have only been conducted at two RID wells (RID-84 and RID-104), neither of which are wells to be used in RID's ERA. The results from these two tests show how variable the aquifer characteristics are across the WVBA plume. A complete understanding of these properties in the area associated with the ERA is necessary to formulate a proper conceptual site model that can then be used for the upcoming modeling effort.
5. Section 3.2, page 3, This section identifies that RID past operations have apparently had significant seasonal impacts on the local water levels. It is necessary to discuss this factor in much more detail to understand how this may have contributed to the introduction and dispersment of contamination within the local aquifer. This will assist in framing how future extraction operations can be modified to mitigate this problem and improve remediation efforts.
6. Section 3.2, page 3, Planned well investigations need to be completed on all wells within a range of dates with minimal hydrogeologic variation in the system (e.g., within one season). Understanding of how the system operates within that season can be extrapolated to other seasons assuming seasonal variation is understood. Seasonal variations in the aquifer system should be documented and discussed as an integral part of the well investigation program.
7. Section 3.2, page 4, Because it has been reported that RID pumping has affected the extent of the WVBA plume historically, and because ADEQ specifically required that this WP help show that changes in pumping will not adversely affect groundwater quality and levels within the WVBA, this section of the WP needs to be expanded. The WP should also provide a discussion on how the vertical hydraulic gradient changes over time with RID pumping, and more specifically in areas where there is currently limited UAU2 or MAU contamination. Overall, there is not a clear understanding of how each RID well affects the plume at each well location, or how the wells have previously exacerbated the WVBA plume, because the detailed hydrostratigraphy at each well location is not understood. To meet ADEQ's mandate, RID needs to conduct a more detailed well investigation than is proposed in this WP such that any future

modeling efforts can more accurately predict the effect changing the pumping scheme will have on groundwater contamination and water levels in the WVBA.

8. Section 3.3, page 4, The text refers to the ERA consisting of pumping and treating the 10 most highly contaminated RID wells, whereas Table 1 and Figure 2 (and the ERA) indicate that 13 wells will be pumped. This needs to be clarified.
9. Section 3.3, page 5, The potential for exacerbating the vertical extent of contamination through operation of MAU and LAU wells is present. Testing of well hydraulics with spinner logging alone will help describe flow conditions in the well. However, only a properly designed and executed aquifer test in these wells, coupled with monitoring in nearby observation wells, followed by modeling will enable a complete understanding of how the system components, when operated simultaneously, will effect groundwater conditions.
10. Section 3.4, page 5, "Groundwater pumped from the impacted wells...is currently conveyed to the RID Main Canal..." This statement fails to acknowledge that only four out of the 10 most highly contaminated wells are conveyed to the RID Main Canal and that six out of the 10 are conveyed to the RID Salt Canal.
11. Section 3.4, page 5, The WP states that the contaminated groundwater "impairs RID's wells..." The WP should state how the wells are impaired by the contaminated groundwater, and how the well investigation will help evaluate the impact on RID wells and wells in the surrounding area.
12. Section 3.4, page 5, The WP states that the contaminated groundwater "restricts the use of this water supply." The contaminated groundwater does not restrict the current use of RID's water supply. Nowhere has RID provided technical evidence providing support for this statement; statements such as this need to be supported or removed from the document. The WP should be clarified that the current use of water is not restricted. RID has not changed or altered its production of irrigation water to its customers based on the groundwater contamination.

4.0 Well Investigations

This section of the WP, the core of the entire document, is seriously deficient and provides limited technical details. This section describes RID's limited well investigation that not only fails to meet ADEQ's mandate for conditional approval of the ERA, but changes the goals of the work required. ADEQ directed RID to conduct a detailed well investigation for "RID wells within the plume boundary" and required "at a minimum, water levels, screen intervals, spinner log testing, depth specific analytical testing, and video logging." But RID chose to limit the detailed investigation to only four of its wells. In addition, this section of the WP does not provide the necessary information to meet ADEQ's mandate that RID understand how implementation of the ERA will "affect both the aquifer and wells in the area of the plume." Furthermore, RID's plan to conduct the groundwater modeling concurrently with the well investigation goes against standard protocol of collecting and compiling ALL data prior to conducting any modeling efforts.

13. Section 4.0, page 6, As stipulated in ADEQ's conditional approval letter, groundwater modeling cannot be conducted concurrently with the well investigation effort; the modeling must be conducted sequentially. Groundwater models are only as good as the quality and thoroughness of the data input into the model. Basically, the model needs the data to run, and if the data input into the model are incomplete or poorly compiled, the results of the model will be equally poor, biased, and unreliable. The well investigation required by ADEQ will form the basis for the model and therefore it is critical that it is conducted completely and appropriately for the model to have any credibility. Developing a numerical model in parallel with conducting data gathering could introduce bias or end up "guiding" the investigation.
14. Section 4.0, page 6, The WP states that technical work will include "detailed investigation of selected key wells." This does not comply with ADEQ's direction to investigate and conduct spinner logging, depth specific analytical testing, and video logging in all RID wells within the plume boundary, not just at all impacted wells or ERA wells. All RID wells in the WVBA are potentially a hydrologic "sink" that could impact plume behavior, particularly since well performance is unique to each well. Understanding how pumping a well at a certain rate or rates, and how that sink propagates out and impacts the system overall is very important.
15. Section 4.0, page 6, "Information gathered from investigation of these key wells will be used: ...to determine if modification of any well(s) is warranted to enhance capture..." The ERA states, "...RID wells 89, 92, 95, 106, 107, 112, and 113 will be evaluated to determine whether sealing the bottom portion of these wells is needed to isolate the pumping to the upper contaminated groundwater zones." How is the information going to be used to determine whether sealing the well will enhance capture when the ERA states it is to isolate the pumping, and why are the goals of the WP different than those of the ERA? Nowhere has RID presented an analysis of capture based on the current pumping scheme, nor an evaluation of capture under the proposed ERA conditions, so how is RID going to compare the two pumping regimes to determine if modifications will "enhance capture"?
16. Section 4.0, page 6, Although not consistent with ADEQ's direction, RID's contingency measure for additional detailed investigation is only to do four more wells (screened in the UAU and MAU). There is no plan to do any detailed well investigations (spinner logging and depth specific analytical testing) in five of the 13 ERA wells.
17. Section 4.0, page 7, There is no reason to provide recommendations for subsequent well investigations in a future task. ADEQ's direction explains that the Wells Investigation task is for all RID wells within the plume boundary.
18. Section 4.0, page 7, It should be clearly stated by RID that field activities, sampling methods, laboratory analyses, and quality assurance procedures **will** adhere to protocols previously developed by ADEQ; they should not adhere only "to the extent possible."
19. Section 4.0, page 7, The detailed well investigations describe obtaining "groundwater samples at selected depths, including depths where the flow regime changes noticeably during pumping operation..." After pumping these wells for such a long time

historically, RID should already have some information in its possession to identify in the WP the anticipated specific depths, or ranges of anticipated specific depths, from which the groundwater samples will be collected. In addition, the number of anticipated samples should be estimated such that proper quality control measures can also be identified.

20. Section 4.1, page 8, The sources of data referenced in this section do not represent acceptable references for obtaining the characterization of existing facility conditions. More extensive field evaluations are necessary to physically examine the operating facilities.
21. Section 4.3, page 9, Video surveys should be conducted on "...RID wells within the plume boundary" and not limited to only the 13 wells selected by RID.
22. Section 4.3, page 9, The WP should state the contingencies for addressing problems with plugged or heavily scaled well casings as identified during the video logging. Will those wells be cleaned and video logged a second time to determine if the cleaning was adequate and if the well casing is still intact?
23. Section 4.4, page 9, RID wells within the plume boundary are required by ADEQ to include the spinner logging as part of the well investigation. The requirement is not limited to only four wells with the potential to do others.
24. Section 4.4.1, page 10, The WP states that following all tasks "...existing or replacement permanent pumping equipment will be reinstalled." The WP should provide information explaining what will determine if replacement pumping equipment will be needed and how replacement of that specific equipment is necessary. RID should provide contingencies and other alternatives if equipment proves to be faulty, other than the expense of complete replacement.
25. Section 4.4.2, page 11, The WP states that, "Depths for sampling will be selected in the field based on the results of geophysical logs obtained previously." At what point will ADEQ or other parties be provided the information such that a technical review of the selected sampling depths can be performed?

5.0 Well Modifications

26. Section 5.0, page 12, Modifications to RID wells would be implemented where there is a contribution of "substantial volumes of 'clean' groundwater to the wells..." If RID intends to modify their wells, then it seems more logical and appropriate to modify them to seal off the contaminated zones and reduce the production of contaminated water, thereby avoiding the need to jump ahead of the normal remedy selection process and run the risk that once the feasibility study is conducted, it will be determined that the ERA was not reasonable or necessary.

6.0 Schedule

27. Section 6.0, page 13, The paragraph describing the schedule is confusing in that it implies (more directly than the rest of the WP) that the data review, preliminary testing, and the fluid-movement investigations will only occur at the four wells completed in the

LAU, when ADEQ's direction clearly states these tasks are to be performed on all RID wells within the plume boundary.

28. Section 6.0, page 13, Providing a detailed schedule to ADEQ "...within 30 days *following* project initiation" is unacceptable and, again, does not demonstrate commitment to a coherent process.

Tables

29. Table 3, All wells within the plume boundary are required to be video logged in accordance with ADEQ's conditional approval requirements. There are seven RID wells where video logging is "contingent" on the "technical specifications and bidding process task." Again, this is not consistent with ADEQ direction and, therefore, is not responsive to meeting the specific conditions, tasks, and outcomes that must be achieved to maintain the conditional approval.

If you have any questions or require discussion, please contact me at 480-295-3927 or Troy Kennedy at 973-455-4279. For your convenience, my e-mail address is Robert.Frank@ch2m.com and Troy's is troy.j.meyer@honeywell.com.

Sincerely,

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