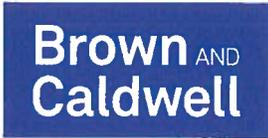


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September 7, 2010

Ms. Jennifer Edwards Thies  
WQARF Unit Manager  
Arizona Department of Environmental Quality  
1110 West Washington Street  
Mail Code 4415B-1  
Phoenix, Arizona 85007

15-129678

**Subject:** Comments on Montgomery & Associates Well Investigation Work Plan, Roosevelt Irrigation District Early Response Action, West Van Buren Area Water Quality Assurance Revolving Fund Site

Dear Ms. Thies:

On behalf of Dolphin, Inc., Brown and Caldwell (BC) reviewed the August 9, 2010 *Well Investigation Work Plan* (Work Plan) for the West Van Buren (WVB) Water Quality Assurance Revolving Fund (WQARF) Registry Site prepared by Montgomery & Associates on behalf of Roosevelt Irrigation District (RID). The Arizona Department of Environmental Quality's (ADEQ's) conditional approval of the proposed RID Early Response Action (ERA) Work Plan specified that RID must meet four conditions. The second of those conditions (i.e., tasks) was an investigation of RID wells within the plume boundary to determine how the proposed ERA will affect the aquifer and wells in the area of the plume. ADEQ required that RID submit a Work Plan for the well investigation which included at a minimum water levels, screen intervals, spinner log testing, depth specific analytical testing, and video logging.

The basic elements of any work plan are three-fold. First, specify the objectives (goals) of the investigative activities to be conducted. Second, provide a detailed description of the investigation activities being proposed to achieve the specified goals. Third, present detailed decision criteria against which the investigation activities will be evaluated to determine whether the goals have been met. Review of RID's *Well Investigation Work Plan* indicates that a comprehensive presentation of these elements is missing.

First, the overall goal of the investigation and a rationale for the goal are not presented to clearly frame the scope of the proposed well investigation activities. In addition, the Work Plan does not address the primary ADEQ concern specified in the conditional approval letter for the ERA Work Plan. In the condition approval letter, ADEQ specifies that the intent of the well investigation is to insure that proposed modifications to RID well pumping rates will not adversely affect groundwater quality and levels within the WVB Site. Groundwater levels must be maintained at current or near current levels taking natural variations into account. Rather than addressing that goal, the first paragraph of Section 2.0 states "This Well Investigation Work Plan describes the preliminary investigations required to evaluate the need and feasibility for potential modifications to existing extraction wells and to provide additional data to assess performance of the ERA". While determining the need and feasibility of potential modifications to existing extraction wells may address RID operational concerns during

ERA implementation so “there will be no net change in annual groundwater pumping volumes ....”, it does nothing to address the well investigation goal specified by ADEQ.

Second, the scope of work presented in Section 4.0 is very limited in most instances, and provides no rationale for progressively limiting the number of wells to be evaluated from 32 wells for compilation of well construction and operational data to 13 wells for video logging and finally to 4 wells for fluid-movement investigation and depth-specific sampling.

Finally, rather than presenting detailed criteria against which collected data will be assessed to help focus each successive step in the investigation, the Work Plan simply states that some unspecified evaluations will be performed and decisions will be made based on those unspecified evaluations. For example, the depth-specific water sampling description in Section 4.4.2 indicates that “Depths for sampling will be selected in the field based on results of geophysical logs obtained previously.” The Work Plan provides no indication of how the geophysical logs will be used to select sampling intervals. This type of information is lacking throughout the Work Plan sections describing the activities to be performed. As a result, it is impossible to determine whether the Work Plan will fulfill ADEQ’s intended purpose and whether the data collected will be of sufficient quantity and quality for use in determining the need and appropriateness of the ERA.

## Specific Comments

### 1.0 Introduction

The last sentence of this section on page 1 states “The scope of this Well Investigation Work Plan is limited to a phased approach to assess wells within the existing plume and wells proposed for use in the ERA.” Similar to the approach taken with the earlier Public Health Exposure Assessment and Mitigation Work Plan, the very limited scope of the Well Investigation Work Plan fails to meet the ADEQ requirements for this task. The conditional approval specifies that RID shall investigate the “wells within the plume boundary”, to include “at a minimum, water levels, screen intervals, spinner log testing, depth-specific analytical testing, and video logging.” Instead, the Work Plan progressively parses each aspect of the required investigation activities so that the proposed scope fully evaluates only 4 of the 32 wells within the WVB WQARF Site. As results of the well investigation are intended to provide data necessary for development of a groundwater model, 4 of 32 well locations is clearly an insufficient basis for model development.

### 2.0 Early Response Action

The second paragraph of this section on page 2 of the Work Plan states “Under the ERA, there will be no net change in annual groundwater pumping volumes by RID in the WVBA Site. Consequently, any impacts on overall RID water production capacity due to well modifications must be offset by pumping adjustments in other existing or new wells.” Neither of these statements addresses the issue of concern to ADEQ, which is that any changes in pumping rates proposed by RID must not adversely affect groundwater quality and levels within the WVB Site. Collection of data addressing this concern should be one of the primary goals of the well investigation, but is not specifically identified or addressed in the Work Plan. The Work Plan appears to be focused on whether modifications to production well operations are necessary rather than on what impacts operational changes may have on groundwater levels and flow directions.

### 3.0 West Van Buren Area

A work plan is intended to be a stand alone document that incorporates all the data necessary to clearly define the problem(s) being addressed and the rationale justifying the proposed scope of work to be performed. Instead, as stated in the Section 3.0 introductory text on pages 2 and 3, this Work Plan

references other documents, specifically the Draft Remedial Investigation (RI) Report and the ERA Work Plan and provides very abbreviated descriptions of WVB WQARF Site conditions in Sections 3.1 through 3.4. These abbreviated discussions provide no clear indication that RID has a thorough understanding of the geologic and hydrogeologic conditions within the WVB Site or how operation of the RID wells impacts groundwater conditions and migration of the volatile organic compound (VOC) plume. The lack of such detailed information, as well as discussion of the rationale for each aspect of the proposed investigation activities, makes it impossible to determine the overall appropriateness of the Work Plan.

### **3.2 Groundwater Conditions**

The first paragraph of this section on page 3 makes a general statement that groundwater levels in the WVB Site vary seasonally due primarily to variations in pumping from RID wells. However, no specific details regarding the magnitude of seasonal fluctuations within the various hydrogeologic units are provided; if or how much such fluctuations impact horizontal gradients within each unit or vertical gradients between units; and how conditions vary with pumping of individual wells. Understanding of variations in these conditions is critical to understanding both historical and potential future contaminant migration within and between the hydrogeologic units. This is particularly important if production rates of individual wells are modified in the future as RID suggests in the second paragraph of Section 2.0 on page 2. Whether or not “there will be no net change in annual groundwater pumping volumes by RID in the WVBA Site” is far less important than the fact that “any impacts on overall RID water production capacity due to well modifications must be offset by pumping adjustments in other existing or new wells.” Because such modifications to the pumping rate of individual wells can influence both lateral and vertical plume migration, comprehensive understanding of conditions associated with all RID wells within the WVB Site is necessary to determine where and how modifications can be implemented without producing unintended and unanticipated negative consequences.

### **3.4 Impact of Groundwater Contamination on RID Operations**

The second paragraph of this section on page 5 states “The contaminated groundwater in the WVBA Site ....restricts the use of this water supply.” RID does not provide any data or other factual evidence in the Work Plan supporting this claim. Further, RID operation of wells within the WVB Site has not changed as a result of groundwater contamination in this area and it continues to provide this water to its customers. Therefore, the Work Plan should be revised to eliminate any statement indicating that groundwater contamination has restricted use of the water supply.

### **4.0 Well Investigations**

The last sentence in the first paragraph on page 6 states that groundwater modeling will be conducted concurrently with the well investigations. This statement clearly contradicts one of the four conditions (Task 3) that must be met as part of ADEQ’s conditional approval of the ERA Work Plan. The well investigation needs to be completed prior to commencing the groundwater modeling effort so that data generated during the well investigation is incorporated in the groundwater model.

The first sentence in the second paragraph on page 6 states that one of the technical tasks proposed in the Work Plan is “detailed investigation of selected key wells”. However, the Work Plan does not specify which wells are “key wells” or the criteria upon which a “key well” determination was made. As such there is no basis for even evaluating the selection of these unspecified wells. Further, the ADEQ scope of Task 2 in the conditional approval letter for the ERA Work Plan makes no mention of performing detailed investigations on “selected key wells”. Rather, it specifies investigation of all RID wells within the plume boundary.

The second sentence in the second paragraph on page 6 indicates that information gathered from investigation of key wells will be used “1) to determine if additional well investigations are needed”. The description for Task 2 in the ADEQ conditional approval letter specifies a single well investigation task, not initial and additional well investigation tasks. The well investigation scope presented in this Work Plan should represent a complete and comprehensive approach intended to generate all of the information necessary for subsequent decision making and groundwater modeling. If the scope of work presented here does not satisfy that requirement, it should be revised as necessary.

The A to C lettered descriptions of the well investigation scope of work indicate that specific investigation activities will be conducted only at selected RID wells within the WVB Site, although ADEQ’s conditional approval letter includes no such provisions. Further, the Work Plan provides no clear rationale for limiting the scope of work to 13 wells for video logging and 4 wells for spinner logging and sampling. The Work Plan provides no data suggesting that conditions within the 32 RID wells are consistent and therefore only those wells proposed for extraction need be evaluated, or that other wells might not be considered for extraction once results of the well investigation and the groundwater modeling activities are complete. The restricted scope of work as presented in this Work Plan is largely hardwired before work begins and offers little if any flexibility to adapt to changing conditions or new information generated as the investigation progresses. Instead, the scope of work should address all RID wells within the West Van Buren Site so that results of the well investigation provide the opportunity to reliably and realistically model the entire RID system and its impacts on groundwater flow and contaminant transport.

The last paragraph on page 7 states that the various investigation activities will be conducted “to the extent possible” in accordance with protocols developed by ADEQ. Rather than “to the extent possible”, all of the well investigation activities should be conducted in accordance with ADEQ protocols unless those protocols don’t address the specific activities proposed by RID. Because many of the activities proposed in this Work Plan are different than previous investigations conducted by ADEQ, RID should prepare project-specific planning documents (Sampling and Analysis Plan, Quality Assurance Project Plan, Site-Specific Health and Safety Plan, Data Management Plan, etc.) that fully address all aspects of the work to be performed during the well investigation.

#### **4.1 Task 1 – Data Compilation and Evaluation**

The text of this section states that existing conditions for all RID wells within the WVB Site will be compiled from various sources, but only identifies these sources as the Draft RI Report for the West Van Buren Site, unspecified Arizona Department of Water Resources (ADWR) information, and unspecified RID information. Considering the scope of the proposed ERA, evaluation of a far more extensive list of data sources would seem to be appropriate.

Also, the purpose of the data evaluation is not clear. It would seem appropriate that evaluation of all available data would be used as the basis for decision making in regard to subsequent investigation tasks. However, instead of that approach, the Work Plan as written appears to suggest just the opposite. The last sentence of Section 4.1 on page 8 states “the proposed well investigation tasks will be confirmed” by the data evaluation.

#### **4.3 Task 3 – Video Surveys**

The scope of this task, as proposed, is limited to 13 RID wells proposed as extraction wells. However, the Work Plan provides no justification for this decision. As presented, this decision presupposes that some or all of these 13 wells and only these 13 wells would be included in the ERA and ignores the fact that all operating RID wells within the WVB Site are producing groundwater, impacting conditions within one or more of the hydrogeologic units, and may require modifications to their current operating

conditions when the ERA is implemented. Because geologic and hydrogeologic conditions are heterogeneous and conditions associated with completion and operation of each well are unique, video logs should be generated for all of the RID wells.

#### 4.4 Task 4 – Fluid-Movement Investigations

The third sentence of this section at the bottom of page 9 states that “The protocol for selecting wells for fluid-movement investigations is described above.” The “protocol” appears to consist of bullets B and C at the bottom of page 6. However, the Work Plan provides no rationale for limiting fluid-movement investigations to the four specified wells that are completed in the Upper Alluvial Unit (UAU), Middle Alluvial Unit (MAU), and Lower Alluvial Unit (LAU), or for adding four additional wells only if “substantial flow is entering any wells from the MAU”. This scope of work as presented implies that groundwater flow conditions observed in the four wells completed in all three hydrogeologic units are representative of conditions throughout the WVB Site. That suggests a degree of homogeneity that is not supported by existing data. Similarly, incorporating an additional four wells into the investigation would be based on indications of substantial flow from the MAU observed in the initial four wells. Again, the Work Plan provides no basis for a determination that substantial flow from the MAU at these wells would be indicative of flow from the MAU in other RID wells completed in this unit. Finally, the Work Plan provides no indication of what “substantial” represents (e.g., 100 gallons per minute [gpm], 500 gpm, 1,000 gpm). As with most other well investigation tasks, the fluid-measurement investigations should address all RID wells within the WVB Site as specified in the ADEQ conditional approval letter for the ERA Work Plan. Documenting the current conditions of all RID wells is important since the wells are anticipated to continue operating in the future, in some cases under potentially modified operating conditions. Because groundwater conditions and the extent of the contaminant plume within WVB site are a reflection of all operating RID wells, limiting investigation to 4 or possibly 8 of the 32 RID wells would result in a significant and inappropriate data gap.

##### 4.4.2 Testing Operations

While this section of the Work Plan identifies the various logs that will be performed, it provides no discussion of why specific logs were chosen (beyond those mandated by ADEQ), or how data collected during logging will be evaluated and integrated into the decision making process.

As noted previously, the discussion of depth-specific sampling under bullet No. 3 in Section 4.4.2 provides no indication of the criteria that will be used to select the sample intervals in each well, whether samples will be collected from all intervals that contribute groundwater to the well, or even an estimate of how many samples will be collected. Further, since the Work Plan states that sampling decisions will be made in the field and provides no indication of potential sample depths or quantities, it would appear these decisions will be made without input or concurrence from ADEQ.

It also appears that samples will only be collected from the four wells proposed for fluid-movement investigations, although the Work Plan provided no data to suggest that groundwater at the four specified well locations is indicative of groundwater conditions in all of the hydrogeologic units throughout the WVB Site. Instead, depth-specific samples should be collected from all RID wells within the WVB Site to gain a more comprehensive indication of how contaminant concentrations vary with depth in each well and where vertical migration to the deeper units is occurring as a result of groundwater withdrawals from the RID wells.

#### 5.0 Well Modifications

This section of the Work Plan focuses on potential modifications to pumping rates and screened intervals contributing groundwater to each well, but does not address well rehabilitation issues (plugged slots, scale formation, casing corrosion, or pump replacement) that could have potential impacts on the operating capacity of individual wells. If video logging and fluid-measurement investigations suggest

that well rehabilitation could improve the operational characteristics of selected wells proposed for inclusion in the ERA, such rehabilitation should be addressed before groundwater modeling and ERA implementation proceed.

## 6.0 Schedule

The schedule discussed in this section on page 13 of the Work Plan appears to be based on an assumption that implementing only the minimum scope of work will be necessary. Since the Work Plan includes provisions for potential additional activities, the schedule should also reflect the potential additional work for consistency.

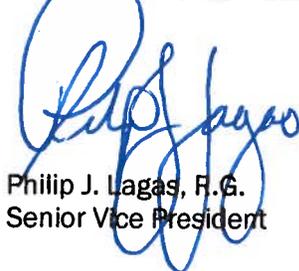
### Table 3

The Video Survey and Fluid-Movement Investigations columns of this table include references to "contingent - 1" and "contingent - 2", but neither the footnotes for this table nor the Work Plan text identify what the two contingencies represent. Explanations for both of these contingent actions should be provided the table and Work Plan text.

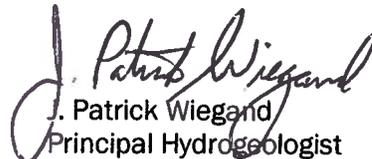
Brown and Caldwell appreciates the opportunity to submit comments on the Well Investigation Work Plan. If you have any questions or would like to discuss our comments further, please don't hesitate to contact me us at (602) 567-4000.

Very truly yours,

BROWN AND CALDWELL, INC.



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PJL:ld