phelps dodge Sierrita Inc.

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John D. Brack
General Manager

October 30, 2006

Via Certified Mail # 7002 1000 0005 6776 4616
Return Receipt Requested

Robert Casey, Manager
Water Quality Enforcement Unit
Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, Arizona 85007

Re: Work Plan Addendum and Phelps Dodge Sierrita, Inc. Response to ADEQ Work Plan Comments Mitigation Order on Consent, Docket No: P-500-06

Dear Mr. Casey:

This letter provides a second Addendum to the "Work Plan to Characterize and Mitigate Sulfate with Respect to Drinking Water Supplies in the Vicinity of the Phelps Dodge Sierrita Tailing Impoundment, Pima County, Arizona" (Work Plan). The first Addendum[1] was submitted to ADEQ on September 7, 2006 to clarify the proposed scope of the Feasibility Study (FS). The second Addendum contains Work Plan revisions and relates agreements made between Arizona Department of Environmental Quality (ADEQ) and Phelps Dodge Sierrita, Inc.'s (PDSI) based on a meeting to discuss ADEQ's comments[2] on the Work Plan. The second Addendum also provides PDSI's responses on ADEQ's Work Plan review comments. PDSI thanks ADEQ taking the time to meet to discuss the Work Plan and appreciates the opportunity to respond to ADEQ's comments.

On October 11, 2006 ADEQ and PDSI met to review ADEQ's comments on the Work Plan. The meeting was able to clarify and resolve certain matters contained in both the Work Plan and ADEQ's comments. It was agreed that PDSI could satisfy the ADEQ's requirement to modify and resubmit the Work Plan, as specified in Section III.B or the Mitigation Order on Consent, by preparing a second Addendum that documents meeting resolutions addressing ADEQ's comments and by incorporating the second Addendum into the Work Plan as an appendix. Additionally, the terms of a revised schedule were discussed at the meeting and in a subsequent discussion with ADEQ. The revised schedule was submitted to ADEQ on October 24, 2006.

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[1] Phelps Dodge Sierrita Inc. 2006. Correspondence from John Brack, PDSI, to Robert Casey, ADEQ, Regarding Amendment to Work Plan to Characterize and Mitigate Sulfate with Respect to Drinking Water Supplies in the Vicinity of the Phelps Dodge Sierrita Tailing Impoundment. September 7, 2006.

[2] ADEQ. 2006. Correspondence from Robert Casey, ADEQ, to John Brack, PDSI, Regarding: Mitigation Order on Consent, Docket No. P-50-06 – Work Plan Response. September 22, 2006.

PDSI's comments are provided as follows: Attachment A summarizes how each of ADEQ's comments was resolved during the meeting, Attachment B contains PDSI's written responses to ADEQ comments, and Attachment C is a list of wells for the groundwater monitoring program. The revised project schedule is provided in Attachment D. Please be advised that per our previous discussions, PDSI will submit a revised Work Plan cover page, table of contents, and introduction indicating that the first and second addenda are included as appendices to the Work Plan.

PDSI appreciates the opportunity to comment on ADEQ's review of the Work Plan. We believe the Work Plan scope and schedule are appropriate and protective of drinking water supplies in the vicinity of the sulfate plume. We look forward to working with ADEQ to gain approval of the Work Plan so that we can proceed with its implementation.

Please do not hesitate to contact me at (520) 648-8510 or Mr. Stuart Brown at (503) 675-5252 if you have any question regarding this submittal.

Sincerely,

John D. Brack

JDB:sb
Attachments

xc: Cynthia Campbell, Arizona Department of Environmental Quality
Chad Fretz, Phelps Dodge Sierrita, Inc.
Ray Lazuk, Phelps Dodge Corporation

ATTACHMENT A

Summary of Resolutions on ADEQ Comments Based on the October 11, 2006 Meeting between ADEQ and PDSI

COMMENT	RESOLUTION
GENERAL COMMENTS	
A. Well Inventory	
Well Inventory (1)	The Work Plan did not propose to solely rely on the Arizona Department of Water Resources Well Registry; it did propose to augment it with other sources of information. PDSI will use information from water providers and Pima County. PDSI will field check and locate wells.
Well Inventory (2)	Agreed. PDSI will sample drinking water supply wells identified by through the inventory and collect water level information, subject to receiving permission from well owners.
Well Inventory (3)	Agreed that the proposed well inventory approach is flexible. As described in the Addendum, there are several technical reasons why the well inventory area defined in the Mitigation Order is sufficient and, therefore, at this time it is not necessary to inventory all drinking water wells in the Green Valley as far east as the Santa Cruz River. Agreed that ADEQ would retract this comment.
Well Inventory (4)	Agreed. Well information will be stored in a database or spreadsheet.
B. Plume Characterization	
Plume Characterization (1)	Agreed that, if possible, PDSI will use existing wells to collect requested information.
Plume Characterization (2)	Agreed that, if possible, PDSI will use existing wells to collect requested information.
Plume Characterization (3)	Agreed that, if possible, PDSI will use existing and proposed new wells to collect requested information.
Plume Characterization (4)	Agreed that, if possible, PDSI will use existing wells to collect requested information.
C. Groundwater Monitoring	
Groundwater Monitoring (1)	Agreed. Groundwater data will be collected and verified in accordance with the QAPP.
Groundwater Monitoring (2)	Agreed. PDSI will collect groundwater samples on a quarterly basis to monitor the position of the plume as described in this Addendum.

D. Identification of Potential Interim Actions	Agreed. A process for identifying and implementing interim action plans (i.e., options) will be available by the end of the well inventory. Agreed that by "plans" ADEQ means options that may need to be refined based on site-specific conditions prior to implementation.
E. Mitigation Plan	Agreed. The FS will include identification and evaluation of alternatives for the mitigation of sulfate loadings to groundwater from the PDSTI.
F. Schedule	The revised schedule was submitted to ADEQ on October 24, 2006 (Attachment D).
G. Addendum	
Addendum (1)	ADEQ misinterpreted the first Addendum. The first Addendum stated that the FS will evaluate and consider measures that would ultimately reduce sulfate concentrations in the basin fill aquifer, including removal and containment measures. The limiting language identified in ADEQ's comment applied to the types of mitigation measures that would be evaluated to control sulfate migration from the Phelps Dodge Sierrita Tailing Impoundment (PDSTI). This limiting language is superseded by PDSI's agreement to expand the FS to include the identification and evaluation of alternatives for the mitigation of sulfate loadings to groundwater from the PDSTI.
Addendum (2)	Agreed. See resolution to Addendum (1).
Addendum (3)	Agreed. The FS will include identification and evaluation of alternatives for the mitigation of sulfate loadings to groundwater from the PDSTI.
SPECIFIC COMMENTS	
A. Section 2.1 – Summary of Existing Information	
Summary of Existing Information (1)	Agreed. The Work Plan text was revised.
Summary of Existing Information (2)	Agreed. The performance of the interceptor wellfield will be evaluated and reported in the task report for Task 3.
Summary of Existing Information (3)	Agreed. See discussion in this Addendum.
B. Section 2.3 – Geological Setting	
Geological Setting (1)	Agreed. A schematic cross section is provided in this Addendum.
Geological Setting (2)	Agreed. A map showing depth to bedrock will be developed and reported in the task report for Task 4.

Geological Setting (3)	Agreed. The significance of regional faulting and gypsiferous bedrock will be described in the task report for Task 4.
Geological Setting (4)	Agreed. Stratigraphic controls on sulfate will be evaluated and reported in the task report for Task 4.
C. Section 2.4 – Hydrogeology	
Hydrogeology (1)	Agreed.
Hydrogeology (2)	Agreed. See discussion in this Addendum.
Hydrogeology (3)	Agreed. See discussion in this Addendum.
D. Section 2.5 – Water Quality	
Water Quality (1)	Agreed. Groundwater monitoring proposed in Task 2.2 will include the collection of samples upgradient and outside the areas affected by the plume that can be used to evaluate background sulfate concentrations in groundwater.
Water Quality (2)	Agreed. Groundwater monitoring reports for Task 2.2 will present maps of sulfate using the requested contour intervals.
Water Quality (3)	Agreed. ESP-4 will be sampled for groundwater monitoring program for Work Plan Task 2.2. Evaluation of the western boundary of the plume will be conducted in Task 4 using data from existing wells.
Water Quality (4)	Agreed. See discussion in this Addendum regarding wells IW-1 and MH8, 9, and 10. PDSI will attempt use existing wells to delineate the distribution of sulfate in the vicinity of the Twin Buttes mine.
Water Quality (5)	Agreed. Potential correspondence between sulfate and hydrostratigraphic units will be evaluated and reported in the task report for Task 4.
Water Quality (6)	Agreed. Plume movements will be evaluated and reported in the task report for Task 4.
E. Section 2.6 – Conceptual Site Model	
Conceptual Site Model (1)	Agreed. The FS will include identification and evaluation of alternatives for the mitigation of sulfate loadings to groundwater from the PDSTI.
Conceptual Site Model (2)	Agreed. Fate and transport modeling for Task 4 will consider the various sources of sulfate, including bedrock as a potential source. The results will be reported in the task report for Task 4.
Conceptual Site Model (3)	Agreed. See discussion in this Addendum.

Conceptual Site Model (4)	Agreed. Fate and transport modeling for Task 4 will consider the vertical distribution of sulfate. Results will be reported in the task report for Task 4.
F. Appendix E – Quality Assurance Project Plan (QAPP)	
Quality Assurance Project Plan (1)	Agreed that expanding the range of parameters proposed for testing is not warranted for the reasons presented in this Addendum.
Quality Assurance Project Plan (2)	Agreed. Data validation protocols are described in this Addendum.

ATTACHMENT B

PDSI RESPONSES TO ADEQ COMMENTS

For clarity and ease of review, our responses reference the page number and section heading of ADEQ's comments which are shown in bold text. Although we have tried to keep our responses brief, additional explanation of the Work Plan has been provided when a more complete discussion was merited.

Page 1 of 8, GENERAL COMMENTS, A. Well Inventory

ADEQ indicates that "PDSI's proposed well inventory depends solely on the Arizona Department of Water Resources (ADWR) Well Registry database for information." This statement is incorrect. Section 3.2 of the Work Plan states the following:

> *"To augment the well inventory, public and semipublic water systems on file with ADEQ will be checked against the well inventory to identify water systems. Also, the ADWR Water Providers database will be used to identify the service areas of municipal water providers in the area."*

We believe the cross-checking of ADEQ water systems and ADWR Water Providers against the well inventory results is a prudent way to ensure the well inventory is complete.

Page 1 of 8, GENERAL COMMENTS, A.(1)

As indicated above, the well inventory does use information from ADEQ and ADWR. Although we believe that checking with ADEQ and ADWR should be adequate for the well inventory, we will also contact local water providers and Pima County as recommended by ADEQ to obtain information on any potential water supply wells.

As requested by ADEQ, drinking water wells identified by the well inventory will be field checked and their locations determined with a hand-held Global Positioning System unit.

Page 1 of 8, GENERAL COMMENTS, A.(2)

PDSI will contact the owners of drinking water wells identified by the well inventory and offer water quality sampling free of charge. Following the well owner's approval of sampling and property access, PDSI will collect and analyzed a sample of well water. Water level information will be obtained if the well is equipped with a sounding tube.

Page 1 of 8, <u>GENERAL COMMENTS</u>, A.(3)

ADEQ's comment is that the area of the well inventory should be expanded to include all drinking water sources in the Green Valley as far east as the Santa Cruz River. The apparent basis for ADEQ's comment is that wells outside the one-mile radius may be "threatened" in 10 years.

Such an expansion would extend the boundary of the well inventory far beyond a one-mile radius. This would be inconsistent with Section III.A.4 of the Mitigation Order which stipulates that the well inventory identify drinking water supply wells "within a one (1) mile radius of the sulfate plume's down and cross-gradient outer edge".

There are multiple technical reasons that the one-mile radius is sufficiently protective and that the approach to the well inventory proposed in the Work Plan is flexible.

- The interim actions development and Mitigation Plan provisions of the Work Plan (Work Plan Sections 4 and 5) provide a short-term and near-term framework for identifying and mitigating any drinking water supply impacted by sulfate from the Phelps Dodge Sierrita Tailing Impoundment (PDSTI). Expanding the radius of the well inventory would include only wells at the extremity of the search radius, which are highly unlikely to be impacted prior to establishment of the Mitigation Plan even at maximum plume migration rates.
- The scope of the well inventory is proactive and flexible because it will be adapted as necessary to account for the results of the plume characterization and any changes in the spatial distribution of sulfate over time. As stated in Section 3.2 of the Work Plan, "The well inventory may be revised if the plume defined by the results of characterization work for Task 2 indicates a significantly different shape for the plume". Also, as indicated in the Work Plan, the actual radius of the well inventory search will exceed the one mile required by the Mitigation Order so that we account for uncertainty in well position due to the cadastral coordinates used by ADWR.
- The notion that the well inventory should be expanded eastward to the Santa Cruz River, presumably due to a perceived risk at wells such as ESP-5 and CW-5 is inconsistent with the hydrodynamics of the groundwater flow system. The plume is moving to the north-northeast as sulfate is transported by advection with the bulk groundwater flow determined by the water level configuration in the aquifer. The maximum sulfate migration rate identified in Work Plan only applies only in the north-northeast direction; along the long axis of the plume. Any eastward spreading of the plume, or spreading in a direction perpendicular to the direction of groundwater flow, would occur at a significantly slower rate due to transverse hydrodynamic dispersion or the influence of local groundwater pumping wells. Because ESP-5, CW-5, and other wells along the Santa Cruz River are more than a mile cross gradient (perpendicular to the direction of groundwater flow) to the plume, the risk of sulfate from the PDSTI impacting these wells under the current

groundwater level configuration is negligible, especially in the timeframe for development of interim actions and the Mitigation Plan.

Page 1 of 8, GENERAL COMMENTS, A.(4)

Well information collected by the well inventory will be stored in a database, spreadsheet, or other suitable electronic medium.

Page 1 of 8, GENERAL COMMENTS, B. Plume Characterization

We disagree that "additional monitor wells must be installed, not only to define the leading edge of the plume but also to understand its internal dynamics, such as the identification of hot spots within the plume". Existing wells, at the interceptor wellfield and at MH-13, MH-11, MH-12, MH-25, and MH-26 provide an exceptionally good record of the spatial distribution of aquifer materials and the spatial and temporal distribution of groundwater sulfate concentrations in the core of the plume. Note that MH-13, MH-25, and MH-26 are nested wells installed over the last three years for the specific purpose of characterizing the structure of the plume. Also, collection of depth-specific groundwater quality data at ESP-1, ESP-2, ESP-3, ESP-4, CW-7, CW-8, MH-11 and MH-12 pursuant to Section 3.3.3.2 of the Work Plan, will augment data from the existing wells and ongoing water quality monitoring program.

The notion that there might be "hot spots" within the plume is inconsistent with the currently available data. The Environmental Protection Agency (EPA) has traditionally defined hot spots as being 2 to 3 orders of magnitude above target cleanup levels, which in this case would be sulfate concentrations of 25,000 to 250,000 mg/L. Since there are limited source areas (such as the tailing area at PDSI), the notion of downgradient "hot spots" is not consistent with the conceptual site model.

To address ADEQ's comment, PDSI will identify existing wells in the areas of interest and seek access to those wells for sampling pursuant to the groundwater monitoring program for Work Plan Task 2.2.

Page 2 of 8, GENERAL COMMENTS, B. Plume Characterization (1)

Existing monitoring wells between the I-series wells and CW-7 will be identified and sampling, pending on land owner permission. Additionally, PDSI will attempt to access and sample the I- and M-series wells.

Page 2 of 8, GENERAL COMMENTS, B. Plume Characterization (2)

A well south of MH-7 and IW3A is not necessary at this time because there are existing wells south of the tailing impoundment that PDSI will attempt to access and sample for the groundwater monitoring program (Work Plan Task 2.2). Green Valley Domestic Water Improvement District (GVWID) has wells that are crossgradient and

upgradient of MH-7 and IW-3A that will be sampled for the groundwater monitoring program pending access from GVDWID.

Page 2 of 8, GENERAL COMMENTS, B. Plume Characterization (3)

A well between ESP-1 and ESP-5 is not necessary at this time because the eastern edge of the plume in this area will be monitored by ESP-2 and ESP-3 and proposed wells 3 and 4 (Figure 13 of Work Plan). In the event that these wells do not define the eastern edge of the plume, PDSI would install a well east of the area in question. As indicated in Section 3.3.4 of the Work Plan pertaining to installation of off-site wells, "If during this task, newly installed offsite wells are determined to be within the plume, a determination will be made as to whether additional wells need to be installed to meet the data quality objectives of defining the extent of the plume."

Page 2 of 8, GENERAL COMMENTS, B. Plume Characterization (4)

Existing upgradient wells will be identified and sampled pursuant to the groundwater monitoring program (Work Plan Task 2.2) to establish upgradient, background conditions. Upgradient, background conditions will be characterized because they are necessary data for development of the fate and transport model for Task 4.

Page 2 of 8, GENERAL COMMENTS, C. Groundwater Monitoring (1)

All groundwater data collected pursuant to the Work Plan is to be collected and verified in accordance with the Quality Assurance Project Plan (QAPP) submitted with the Work Plan for ADEQ review and approval.

Page 2 of 8, GENERAL COMMENTS, C. Groundwater Monitoring (2)

PDSI believes that groundwater monitoring frequency should be tied to the purpose of the monitoring. For example, wells that are used to monitor the position and concentration of the plume should be monitored more frequently than wells distant from the plume that would be monitored to characterize regional water level and water quality conditions for fate and transport modeling (Work Plan Task 4). To address ADEQ's request, PDSI recommends the following schedule for the collection of water level information and water quality data pursuant to Work Plan Task 2.2:

- quarterly sampling at monitoring and production wells that are used to monitor the position of the plume and that are under the control of PDSI (e.g. wells proposed for installation for the aquifer characterization, ESP-1, ESP-2, ESP-3, ESP-4, MH-11, MH-12, MH-13, MH-25, and MH-26),
- quarterly sampling at monitoring and production wells that are used to monitor the position of the plume but that not under PDSI control (e.g.,GV-1, GV-2, CW-3, CW-6, CW-7, CW-8, CW-9, and wells on Park Corporation property),

although access to these wells and data will be contingent on developing access agreements with other entities, and

- semiannual sampling at wells monitored to establish regional conditions for fate and transport modeling (These wells will be evaluated and sampled by Work Plan Task 2.2 based on a review of existing regional wells, determination of appropriate well construction, and negotiation of access).

Attachment C lists wells and sampling frequencies for groundwater monitoring (Work Plan Task 2.2) pursuant to the Mitigation Order. This list contains wells that PDSI will attempt to access for sampling. Wells were selected to provide geographic coverage for water level and water quality data. Should a well owner refuse access or should the well be inappropriate for sampling based on construction or other considerations, a nearby alternative well will be identified if one is available.

Water quality samples for tracking plume position and establishing regional conditions pursuant to Task 2.2 would be analyzed biannually for sulfate and major element ions and parameters as described in Section 3.3.2 of the Work Plan (the 'biannual suite of analytes'). Samples from wells used to track plume position would also be monitored for sulfate only in quarters between those in which the biannual suite of analytes is determined.

Page 2 of 8, GENERAL COMMENTS, D. Identification of Potential Interim Actions

ADEQ's comment is in accord with the work and the revised schedule. The Identification of Potential Interim Actions proposed in Section 4 of the Work Plan is not a Mitigation Order requirement, it is a task identified by PDSI to ensure that exposure management options are available if needed before the Mitigation Plan is completed. The Identification of Interim Actions is already in progress to address PDSI's intent to identify interim actions available for rapid implementation should the average sulfate concentration at the point of use in a drinking water supply exceed, or is projected to exceed, 250 milligrams per liter (mg/L) prior to implementation of the Mitigation Plan. In accordance with the revised project schedule, the interim action evaluation will be completed by December 31, 2006.

Page 2 of 8, GENERAL COMMENTS, D. Mitigation Plan

The Feasibility Study to identify and evaluate mitigation alternatives to be considered as part of a Mitigation Plan will be expanded to include alternatives that could potentially reduce sulfate loadings to groundwater from the PDSTI.

Page 3 of 8, GENERAL COMMENTS, F. Schedule

A revised project schedule was submitted to ADEQ on October 24, 2006. Because PDSI intends to identify and evaluate interim action options early in the project, we agree strongly with ADEQ that this alleviates the need to expedite the investigation process. The interim action evaluation process will include monitoring drinking water

systems identified by the well inventory and provide mitigation actions for any drinking water system found to exceed 250 mg/L at the point of use due to sulfate from the PDSTI or that could exceed 250 mg/L at the point of use before the Mitigation Plan is completed.

Although PDSI agreed to the revised schedule, it is important for ADEQ to understand that both the groundwater monitoring task and the offsite well installation task have potential lead time issues for negotiation of access to private property, whereas well installation also requires permitting lead time – especially if Arizona State Land Department property is used. The uncertainties associated with scheduling these tasks may limit the progress of the fate and transport modeling which depends on the results of groundwater monitoring and well testing. PDSI will make all efforts to expedite access and permits including seeking assistance from interested parties and agencies, but we cannot make guarantees on matters that are out of our hands. In addition, the second round of groundwater monitoring needs to be conducted during the summer to obtain regional water level and water quality data during the high pumping season. We cannot obtain this information any other time. Thus, even if we are able to complete the offsite well installation task earlier, the groundwater monitoring task will become the critical path to determining the overall project schedule. Data obtained during the second round of regional groundwater monitoring will need to be incorporated into the fate and transport model which will need to be calibrated and tested before it can be used to evaluation potential mitigation alternatives in the FS.

ADEQ is well aware of PDSI's concerns regarding the timeliness of obtaining site access and permitting. During Mitigation Order negotiations, both parties identified the use of Force Majeure in these instances so that PDSI is not subjected to stipulated penalties for delays beyond its control.

Page 3 of 8, <u>GENERAL COMMENTS</u>, G. <u>Addendum</u>

This portion of ADEQ's comments refer to the first addendum or amendment[3] to the Work Plan submitted to ADEQ to clarify Section 5.1.2 pertaining to Mitigation Actions. ADEQ's citation is taken from the amendment which is included in the Work Plan as Appendix F. The full text of the sentence cited by ADEQ is "The FS also will evaluate and consider mitigation measures that would: 1) control sulfate migration from the PDSTI through mitigation actions such as groundwater pumping, but not removal or physical containment, and 2) ultimately reduce sulfate concentrations in the basin fill aquifer to meet the numeric mitigation objective through mitigation actions such as groundwater pumping and natural attenuation, individually or in combination." Although we thought the cover letter and addendum were self-explanatory, the sentence must have been unclear because it was not meant to limit the range of plume mitigation measures that will be evaluated in the FS as interpreted by ADEQ.

[3] PDSI. 2006. Correspondence from John Brack, PDSI, to Robert Casey, ADEQ, Regarding: Amendment to Work Plan to Characterize and Mitigate Sulfate with Respect to Drinking Water Supplies in the Vicinity of the Phelps Dodge Sierrita Tailing Impoundment. September 7, 2006.

Clause 1) in the sentence pertains to mitigation actions that would be evaluated in the FS for tailing impoundment source control, and indicates that actions such as groundwater pumping (e.g., enhancement of the interceptor wellfield or similar actions) would be considered for mitigation, but not removal or physical containment of the tailing pile. Clause 2) pertains to mitigation actions that would be evaluated in the FS for the sulfate plume, and indicates that the FS will consider actions capable of meeting the 250 mg/L numeric mitigation objective in the basin fill aquifer. Such options would include containment and removal by hydraulic methods potentially using various configurations of groundwater withdrawal and, possibly, recharge.

Additionally, as previously stated, to address ADEQ's comments PDSI agreed to expand the range of mitigation actions that would be evaluated in the FS for the tailing impoundment. See the response to **Page 2 of 8, GENERAL COMMENTS, D. Mitigation Plan** above**.**

Page 3 of 8, GENERAL COMMENTS, G. Addendum (1)

As discussed above and indicated in the amendment (Work Plan Appendix F), the FS will evaluate mitigation measures to contain and remove sulfate for the purpose of meeting the 250 mg/L numeric mitigation objective in the basin fill aquifer downgradient of the PDSITI.

Page 3 of 8, GENERAL COMMENTS, G. Addendum (2)

As discussed above and indicated in the amendment (Work Plan Appendix F), the FS will evaluate mitigation measures to contain and remove sulfate for the purpose of meeting the 250 mg/L numeric mitigation objective in the basin fill aquifer downgradient of the PDSITI.

Page 3 of 8, GENERAL COMMENTS, G. Addendum (3)

The interceptor wellfield is a key mitigation facility that must be included in any mitigation alternative developed because of it obvious effectiveness in removing sulfate from the source area of the plume. Measures to increase the effectiveness of the interceptor wellfield are to be considered in Work Plan Task 4 (Work Plan Section 3.4) which will evaluate the existing sulfate control system.

Additionally, PDSI has agreed to expand the FS to address ADEQ's comments regarding mitigation actions capable of reducing sulfate loadings to groundwater from the PDSTI.

Page 4 of 8, SPECIFIC COMMENTS, A. Section 2.1 – Summary of Existing Information (1) Page 9, Paragraph 1

ADEQ misquoted the sentence in this paragraph which actually reads "In April 2006, concentrations of sulfate in wells *near the eastern edge of the tailing*

impoundment (italics added to distinguish text omitted by ADEQ) ranged from 100 to 1,750 mg/L. On further review, the sentence in the Work Plan should have stated "From January thorough April 2006, concentrations of sulfate in wells near the eastern edge of the tailing impoundment ranged from 100 to 1,810 mg/L." This statement is based on the sulfate concentrations measured in 26 groundwater samples from the IW and MH wells in the interceptor wellfield on the east edge of the tailing impoundment. We suspect the data cited by ADEQ do not pertain to the east edge of the tailing impoundment.

Page 4 of 8, SPECIFIC COMMENTS, A. Section 2.1 – Summary of Existing Information (2) Page 10, Paragraph 3

The work requested in this comment will be completed during Task 3 of the Work Plan (Work Plan Section 3.4) which will evaluate the existing sulfate control system. The results will be reported in the task report for Task 3.

Page 4 of 8, SPECIFIC COMMENTS, A. Section 2.1 – Summary of Existing Information (2) Page 12, Paragraph 12

The thickness of basin fill in the vicinity of the PDSTI is illustrated in six geologic cross sections in Appendix A of the Work Plan. As shown on the cross sections, the basin fill is approximately 500 thick in the north half of the interceptor wellfield and, as discussed in Appendix A, thickens to the south. In the southern half of the interceptor wellfield the basin fill is up to approximately 1,000 feet thick (Work Plan Figures A.4a and A.4b, Appendix A). Along the north-south cross section containing wells MH-13, MH-11, MH-12, MH-25, and MH-26 approximately one mile east of the tailing impoundment, the basin fill ranges approximately 800 feet to 1,300 feet thick (Work Plan Figure A.5, Appendix A). The basin fill is thicker at MH-13 on the south side of the cross section . On the east side of the sulfate plume, basin fill is greater than 1,200 feet thick and few wells penetrate bedrock (Work Plan Figures A.6, A.7, A.8, and A.9, Appendix A). Additional evaluation of the basin fill thickness and definition of the bedrock configuration in the area is the purpose of Work Plan Task 2.1 (Work Plan Section 3.3.1). The results will be reported in the Data Compilation and Evaluation Report prepared during Task 2.1.

Page 4 of 8, SPECIFIC COMMENTS, B. Section 2.3 – Geologic Setting (1)

Appendix A provides cross-sections showing geologic relationships in the vicinity of the sulfate plume. Geologic cross sections showing interpreted regional geologic relationships pertinent to the Tucson basin are provided in United States Geologic Survey Water-Supply Paper 1939-E by E.S. Davidson. Figure 1 is a schematic cross section based on Davidson's stratigraphy of the Tucson Basin. As discussed in Appendix A of the Work Plan, however, Davidson's Fort Lowell Formation and the Tinaja Beds are not differentiated in the vicinity of the PDSTI.

Page 4 of 8, SPECIFIC COMMENTS, B. Section 2.3 – Geologic Setting (2)

The purpose of Work Plan Task 2.1 (Work Plan Section 3.3.1) is to compile and evaluate information on bedrock depth in the area. This information is crucial for constructing the numerical model. One of the results of Task 2.1 will be a map of bedrock depth downgradient of the plume. The results will be reported in the Data Compilation and Evaluation Report prepared during Task 2.1.

Page 4 of 8, SPECIFIC COMMENTS, B. Section 2.3 – Geologic Setting (3)

As discussed in Section 2.6.1 of the Work Plan, gypsiferous sediment has been identified as a potential source of elevated sulfate in groundwater in the vicinity of the Santa Cruz River. Any potential influence of regional faulting on migration of the sulfate plume will be investigated and reported in the task report for Task 4 which will complete a fate and transport evaluation (Work Plan Section 3.5).

Page 4 of 8, SPECIFIC COMMENTS, B. Section 2.3 – Geologic Setting (4)

The geologic sections in Appendix A of the Work Plan are based on an extensive review of geologic logs for wells in the vicinity of the plume. The purpose of developing the cross sections was to evaluate the presence of hydrostratigraphic units that might exert a strong control on the migration of sulfate from the PDSTI. As illustrated by the geologic cross sections (Work Plan Figures A.4a through A.9, Appendix A), saturated basin fill above the Pantano Formation is primarily sand and gravel that lacks distinct plume-scale marker horizons that can be used to differentiate the hydrostratigraphy with greater resolution. For this reason, Section 2.6.2 of the work plan indicates "Although existing information indicates some variations in the hydraulic conductivity of the basin fill aquifer with depth (e.g., low permeability Pantano Formation at depth in MH-13 and higher flows at depth in ESP-4), large-scale features that would cause preferential flow paths, such as laterally extensive aquitards or high permeability units within the basin fill, have not been identified." Additional investigation of the potential presence of hydrostratigraphic control of sulfate migration will be conducted by Work Plan Tasks 2.3 (depth-specific sampling), 2.4 (offsite well installation and testing) and 4 (sulfate fate and transport evaluation). The results will be reported in the task reports for Tasks 2.3, 2.4, and 4.

Page 5 of 8, SPECIFIC COMMENTS, C. Section 2.4 – Hydrogeology (1)

No comment.

Page 5 of 8, SPECIFIC COMMENTS, C. Section 2.4 – Hydrogeology (2)

The change in the magnitude of the hydraulic gradient is likely due to increases in basin fill transmissivity due to increases in saturated thickness as groundwater flows eastward from the tailing impoundment area. Although at a basin-scale the grain size of basin fill sediments diminishes from the margins to the center of the basin, drilling results

show no evidence of a significant eastward fining of grain size in the vicinity of the PDSTI.

Page 5 of 8, SPECIFIC COMMENTS, C. Section 2.4 – Hydrogeology (3)

Depth to groundwater is illustrated on the geologic and water quality cross sections in Appendices A and D of the Work Plan. As a general characterization between January and April 2006, the depth to groundwater in the vicinity of the ESP wells was approximately 350 to 400 feet below land surface (bls) while the depth to water in the vicinity of the interceptor wellfield and wells MH-11, MH-12, MH-25, and MH-26 ranged from ranged from approximately 350 to 500 feet bls.

Page 5 of 8, SPECIFIC COMMENTS, D. Section 2.5 – Water Quality (1) Background Water Quality

Figure 8 of the Work Plan is a map showing sulfate concentrations in groundwater samples in the vicinity of the plume including samples from wells that are upgradient, crossgradient, and downgradient of the plume. The upgradient and crossgradient, and downgradient concentrations in areas distant from the plume represent contemporary background, or ambient, concentrations of sulfate. Additionally, Section 2.5.2 discusses the major element chemistry for water samples from wells in the vicinity of the plume. Figure 12 of the Work Plan illustrates the major element chemistry, showing that water samples from upgradient and downgradient wells have a distinctly different water quality type than do wells in the sulfate plume. These data illustrate the differences between plume and background water types. Groundwater monitoring for Task 2.2 of the Work Plan (Work Plan Section 3.3.2) will further delineate the distribution of sulfate in the vicinity of the plume and describe background concentrations. The results will be reported in the Groundwater Monitoring Data Reports for the sampling events under Task 2.2.

Page 5 of 8, SPECIFIC COMMENTS, D. Section 2.5 – Water Quality (2) Spatial Distribution of Sulfate

Groundwater monitoring for Task 2.2 of the Work Plan (Work Plan Section 3.3.2) will report sulfate concentration maps showing isoconcentration contours at the intervals requested by ADEQ. The results will be reported in the Groundwater Monitoring Data Reports for the sampling events under Task 2.2.

Page 5 of 8, SPECIFIC COMMENTS, D. Section 2.5 – Water Quality (3) Lateral Distribution

In the first part of this comment ADEQ asks whether ESP-4 should be sampled. ESP-4 is proposed for depth-sampling for Work Plan Task 2.3 and will be sampled for groundwater monitoring under Task 2.2.

The second part of this comment refers to definition of the western boundary of the plume west of well MH-30. Groundwater monitoring for Task 2.2 will use data from existing wells west of MH-30 to further define the western boundary of the plume.

Page 6 of 8, SPECIFIC COMMENTS, D. Section 2.5 – Water Quality (4) Longitudinal Distribution

The first part of ADEQ's comment refers to sulfate concentrations west of IW-2. As shown by Work Plan Figure 8, the concentrations of sulfate west of IW-2 in IW-1, MH-9, and MH-10 were 500, 420, and 1360 mg/L, respectively. Well MH-8 was last sampled for sulfate in 1986 and is longer part of the monitoring network because of an obstruction at approximately the 200-foot depth.

The second part of ADEQ's comment suggests that an additional well is needed along Duval Mine Road to define the extent of sulfate in the vicinity of the Twin Buttes mine. As discussed above for ADEQ comment **Page 2 of 8, GENERAL COMMENTS, B. Plume Characterization (1),** PDSI will attempt to gain access and sample to existing borings and wells in that area pursuant to the groundwater monitoring program (Work Plan Task 2.2).

Page 6 of 8, SPECIFIC COMMENTS, D. Section 2.5 – Water Quality (5) Vertical Distribution

As described above in our response to ADEQ comment **Page 4 of 8, SPECIFIC COMMENTS, B. Section 2.3 – Geologic Setting (4),** Section 2.6.2 of the work plan indicates "Although existing information indicates some variations in the hydraulic conductivity of the basin fill aquifer with depth (e.g., low permeability Pantano Formation at depth in MH-13 and higher flows at depth in ESP-4), large-scale features that would cause preferential flow paths, such as laterally extensive aquitards or high permeability units within the basin fill, have not been identified." Additional investigation of the potential presence of hydrostratigraphic control of sulfate migration will be conducted by Work Plan Tasks 2.3 (depth-specific sampling), 2.4 (offsite well installation and testing) and 4 (sulfate fate and transport evaluation). The results will be reported in the task reports for Tasks 2.3, 2.4, and 4.

Page 6 of 8, SPECIFIC COMMENTS, D. Section 2.5 – Water Quality (6) Temporal Distribution

As described above with regard to ADEQ comment **Page 1 of 8, GENERAL COMMENTS, A.(3)** the plume is moving to the north-northeast as sulfate is transported by advection with the bulk groundwater flow determined by the water level configuration in the aquifer. The maximum sulfate migration rate identified in Work Plan only applies only in the north-northeast direction; along the long axis of the plume. Any eastward spreading of the plume, or spreading in a direction perpendicular to the direction of groundwater flow, would occur at a significantly slower rate due to transverse hydrodynamic dispersion or the influence of local groundwater pumping wells. We

believe that increasing sulfate concentration at wells ESP-4 and ESP-1 are partly related to groundwater pumping that pulls the plume eastward. Fate and transport modeling for Work Plan Task 4 will evaluate the rate of eastward movement of the plume particularly under projected future pumping scenarios.

Page 6 of 8, SPECIFIC COMMENTS, E. Section 2.6 – Conceptual Site Model (1) Page 39, Paragraph 2

We disagree with ADEQ's statement that "seepage from the PDSTI will continue indefinitely to degrade a drinking water source aquifer." The very point of the sentence ADEQ paraphrases is that the source of sulfate is finite and that rates of residual seepage will diminish once tailing deposition ceases and impoundment is closed. We agree that "a robust well interception system" is needed to prevent future sulfate impacted groundwater from affecting the basin fill aquifer downgradient of the tailing impoundment. Work Plan Task 3 has as one of its objectives development of recommendations for enhancing the effectiveness of the interceptor wellfield. Additionally, one of the objectives of the Feasibility Study for the sulfate Mitigation Plan is to evaluate mitigation actions capable of meeting the numeric mitigation objective in the basin fill aquifer downgradient of the tailing impoundment.

Page 7 of 8, SPECIFIC COMMENTS, E. Section 2.6 – Conceptual Site Model (2) Page 39, Paragraph 2

ADEQ's comment pertains to sulfate concentrations in bedrock upgradient of the tailing impoundment. Groundwater in bedrock upgradient of the tailing impoundment does contain elevated sulfate concentrations in some wells, however, as stated in fourth paragraph of Work Plan Section 2.6.1, "the contribution of sulfate by bedrock recharge is likely to be minor compared to the tailing because the low permeability of bedrock (Section 2.4.2) would limit the sulfate mass flux from the upgradient area."

Groundwater in bedrock west of the tailing impoundment flows easterly into basin fill beneath the tailing impoundment. Because bedrock is highly indurated material, it does not possess significant intrinsic permeability. Thus, groundwater movement is through secondary structures such as fractures in shallow portions of the bedrock. Bedrock lithologies west of the tailing impoundment are intrusive igneous rocks and Cretaceous Demetrie Volcanics. As listed in Table 1 and Appendix B of the Work Plan, the mean hydraulic conductivity estimates for intrusive rocks and the Demetrie Volcanics are estimated 0.0312 feet/day and 0.0047 feet/day, respectively. The mean hydraulic conductivity of basin fill is 15.05 feet/day, or more than two orders of magnitude higher than intrusive rock and more than three orders of magnitude higher than Demetrie Volcanics. The low hydraulic conductivities of bedrock limit the magnitude of groundwater flow and sulfate mass flux from the bedrock to basin fill compared to seepage from the tailing impoundment.

A more detailed analysis of the relative sulfate flux of various potential sources will be provided in the task report for Task 4.fate and transport modeling.

Page 7 of 8, SPECIFIC COMMENTS, E. Section 2.6 – Conceptual Site Model (3) Page 40, Paragraph 1

ADEQ's comment asks two questions "What statistical or geochemical methods will be used to determine the source of sulfate?" and "How about sulfur isotopes?" In most cases hydrogeologic analysis and hydrochemical characterization based on major element chemistry will be the primary methods used to evaluate the source of sulfate. Hydrogeologic analysis will include evaluation of groundwater flow paths based on potentiometric conditions. Hydrochemical analysis would consist of evaluation of the major element chemistry of groundwater using methods such as trilinear diagrams or diagnostic constituents such as chloride, nitrate/nitrite, or fluoride to determine whether the water quality is suggestive of the plume or mixing with the plume. In the event that the source of sulfate in a well cannot be discerned by hydrogeologic analysis or the major element chemistry, and it is necessary to identify a source, more advanced geochemical methods such as analysis of sulfur, oxygen, and hydrogen isotopes or other environmental tracers are potential lines of research.

Page 7 of 8, SPECIFIC COMMENTS, E. Section 2.6 – Conceptual Site Model (4) Page 40, Paragraph 2

As requested by ADEQ, the fate and transport model to be developed for Work Plan Task 4 will account for the observed distribution of sulfate concentrations in the basin fill aquifer.

Page 7 of 8, SPECIFIC COMMENTS, F. Appendix E- Quality Assurance Project Plan (QAPP)

We are unclear of ADEQ's meaning of "preliminary" with regard to the Quality Assurance Project Plan (QAPP) in Appendix E of the Work Plan. The Work Plan QAPP addresses the required elements in ADEQ's Quality Assurance Project Plan Review checklist and reflects the requirements described in ADEQ's Superfund Program Section Quality Assurance Program Plan of May 22, 2000. Both of these ADEQ guides are based on EPA guidance documents including the October 1998 document "EPA Requirements for Quality Assurance Project Plans" (EPA QA/R-5). Based on our review of QAPPs prepared on behalf of the ADEQ Remedial Projects Unit, we find that the Work Plan QAPP is consistent in format and content with these ADEQ-approved QAPPs.

ADEQ's comment requests that the QAPP include a Field Sampling and Analysis Plan (FSP) with monitoring well designs and a Health and Safety Plan (HASP). Neither ADEQ nor EPA QAPP guidance include a Field Sampling and Analysis Plan or a HASP in the QAPP. At the October 11, 2006 meeting ADEQ agreed that it would be acceptable to prepare a project HASP and submit it to ADEQ in accordance with the revised schedule.

Regarding an FSP, the Work Plan QAPP contains sufficient information on sampling and analytical methods to be comparable to a FSP. However, there is certain

information, such as groundwater monitoring locations and well construction designs that cannot be specified in advance of the Work Plan implementation because of uncertainties in site access, and geologic and water quality conditions.

In the October 11, 2006 meeting, ADEQ identified three items as gaps in the QAPP: a list of wells to be sampled for the groundwater monitoring program (Task 2.2), a well construction diagram, and a response to ADEQ's comments regarding data review, verification and validation. These issues are addressed below to complete the QAPP.

Groundwater Monitoring Locations

Specific sampling locations for groundwater monitoring for Work Plan Task 2.2 cannot be determined at the Work Plan preparation phase due to uncertainties regarding our ability to access or gain data from private properties, and uncertainty in accessibility of individual wells for the purpose of water level measurement (i.e., does the well possess a sounding tube for measuring water levels?). Property access, data availability, and well construction specifics will be determine during the preliminary course of Task 2.2. At the October 11, 2006 meeting ADEQ agreed:

- it would be acceptable for PDSI to develop a list of wells that it will attempt to gain access to for sampling pursuant to Task 2.2 understanding that not all wells may ultimately be accessed or appropriate for monitoring, and
- groundwater monitoring could be implemented using the wells that can be accessed during the first quarter; during subsequent quarters, other wells will be added to the monitoring program once access is gained to additional wells.

Attachment C is a list of wells and sampling frequencies for groundwater monitoring (Work Plan Task 2.2) pursuant to the Mitigation Order. This list contains wells that PDSI will attempt to access for sampling. Wells were selected to provide geographic coverage for collection of water level and water quality data for determination of regional Potentiometric conditions and background water quality. Should a well owner refuse access or should the well be inappropriate for sampling based on construction or other considerations, a nearby alternative well will be accessed if one is available.

Well Construction Diagrams

The Work Plan and QAPP describe only general well construction methods and strategies because exact materials will be finalized based on discussion with drilling contractors, and the specifics of well depth and screened intervals will be determined in the field by the site geologist based on geologic and water quality conditions encountered during drilling. Figures 2 and 3 provide generic well construction diagrams for the two types of monitoring well constructions, single screen completions and dual screen completions, described in the Work Plan.

Data Review, Verification, and Validation

Data review, verification, and validation are discussed in the comments for **Page 7 of 8, SPECIFIC COMMENTS, F. Appendix E- Quality Assurance Project Plan (QAPP) (1) Section 6.2 – Data Review, Verification, and Validation.**

Page 7 of 8, SPECIFIC COMMENTS, F. Appendix E- Quality Assurance Project Plan (QAPP) (1) Section 5.3 – Analytical Methods

ADEQ requests that groundwater samples be analyzed for total and dissolved concentrations of some metals. At the October 11, 2006 meeting ADEQ agreed to retract this request because (1) the Mitigation Order is specific to sulfate and does not include metals, and (2) a review of data in Section 2.5.3 of the Work Plan indicates that metals are not associated with the sulfate plume as determined by an analysis of groundwater sample data from the interceptor wellfield. Additionally, based on the site conceptual model in which the source of sulfate is alkaline slurry water from the PDSTI rather than acidic drainage, metals would not be expected in the sulfate plume. Considering these factors, analysis of metals, other than those identified in the Work Plan, has no technical value for delineation of the sulfate plume characterization as required by the Mitigation Order.

Page 7 of 8, SPECIFIC COMMENTS, F. Appendix E- Quality Assurance Project Plan (QAPP) (1) Section 6.2 – Data Review, Verification, and Validation

ADEQ's comment states that the data collected by the project require validation. The problem is one of semantics. The definitions of "verification" and "validation" as used in the Work Plan QAPP are slightly different than those given in *EPA Guidance on Environmental Verification and Validation* (EPA QA/G-8). The intent of the Work Plan is that the elements of data validation be included in the data verification step and be integral to the data quality assessment of Work Plan activities. For this reason, the verification step described in the Work Plan QAPP includes those elements defined as validation in the EPA guidance document. For example, verification pursuant to the Work Plan QAPP specifies the following activities considered validation by EPA QA/G-8:

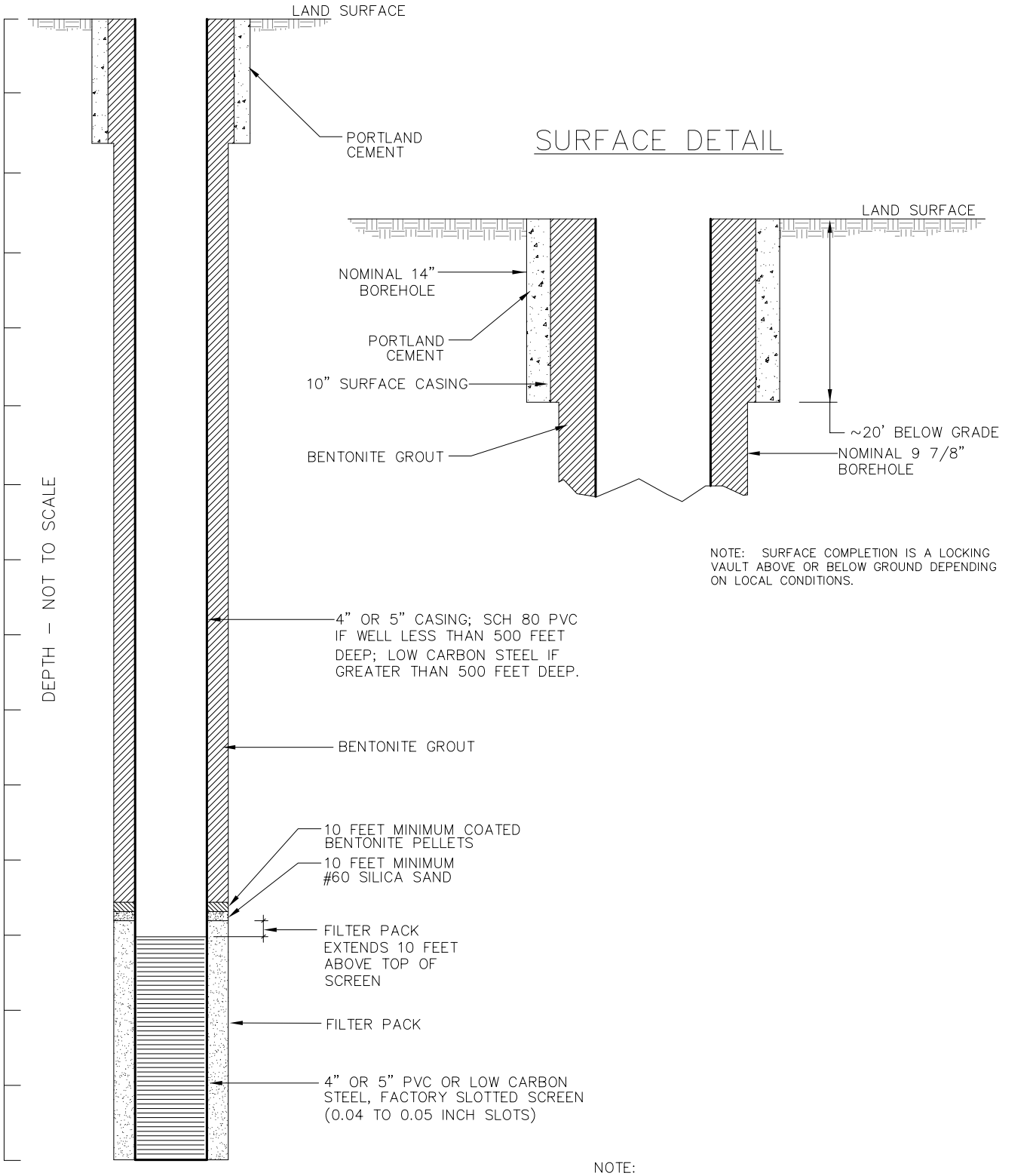
- Evaluation of completeness of field data and records (Work Plan Appendix E, Section 6.2.1)
- Evaluation of field data against data quality indicators (Work Plan Appendix E, Section 6.2.1)
- Checking that field equipment was properly calibrated (Work Plan Appendix E, Table E.2)
- Checking that field parameters had stabilized before sampling (Work Plan Appendix E, Table E.2)
- Checking that lithologic logging followed ASTM standards (Work Plan Appendix E, Table E.2)

- Reviewing that laboratory QA/QC requirements were met (Work Plan Appendix E, Section 6.2.2)
- Checking that field and laboratory samples were in compliance (Work Plan Appendix E, Table E.2)
- Evaluating if field and laboratory data met quantitative and qualitative data quality objectives (Work Plan Appendix E, Section 6.4)
- Applying data quality flags to data not meeting quality assurance requirements to indicate that data are anomalous, estimated, or rejected (Work Plan Appendix E, Section 6.2.2)
- Generating a quality assessment report to describe data quality, identify QA/QC problems, and notify of any needed corrective actions (Work Plan Appendix E, Section 6.4).

What is described as "validation" in the Work Plan QAPP is strictly defined as the examination of raw laboratory data consistent with EPA Level IV data packages. This differentiation between verification and validation is not unusual. For example, ADEQ's Superfund Program Section Quality Assurance Program Plan laboratory report goals for verification and validation (ADEQ, 2000, Tables 19-2 and 19-3) are identical except that the latter includes raw laboratory data comparable to an EPA Level IV data package. As stated by ADEQ (2000), "The differentiation between the data verification and data validation procedures is the inclusion of the review of raw data during the data validation procedures. This level of scrutiny is not anticipated for Work Plan activities for several reasons:

- The analytes of interest for the Work Plan are sulfate and other major element ions that have well established standard analytical procedures and that occur in concentrations (10s to 1000s of milligrams per liter) that present no special challenges with respect to analytical method detection limits,
- Work Plan sampling and analysis is not an isolated, one-time event. Data quality will also be evaluated in the context of time series results so that anomalies or outliers can be identified for data quality review.

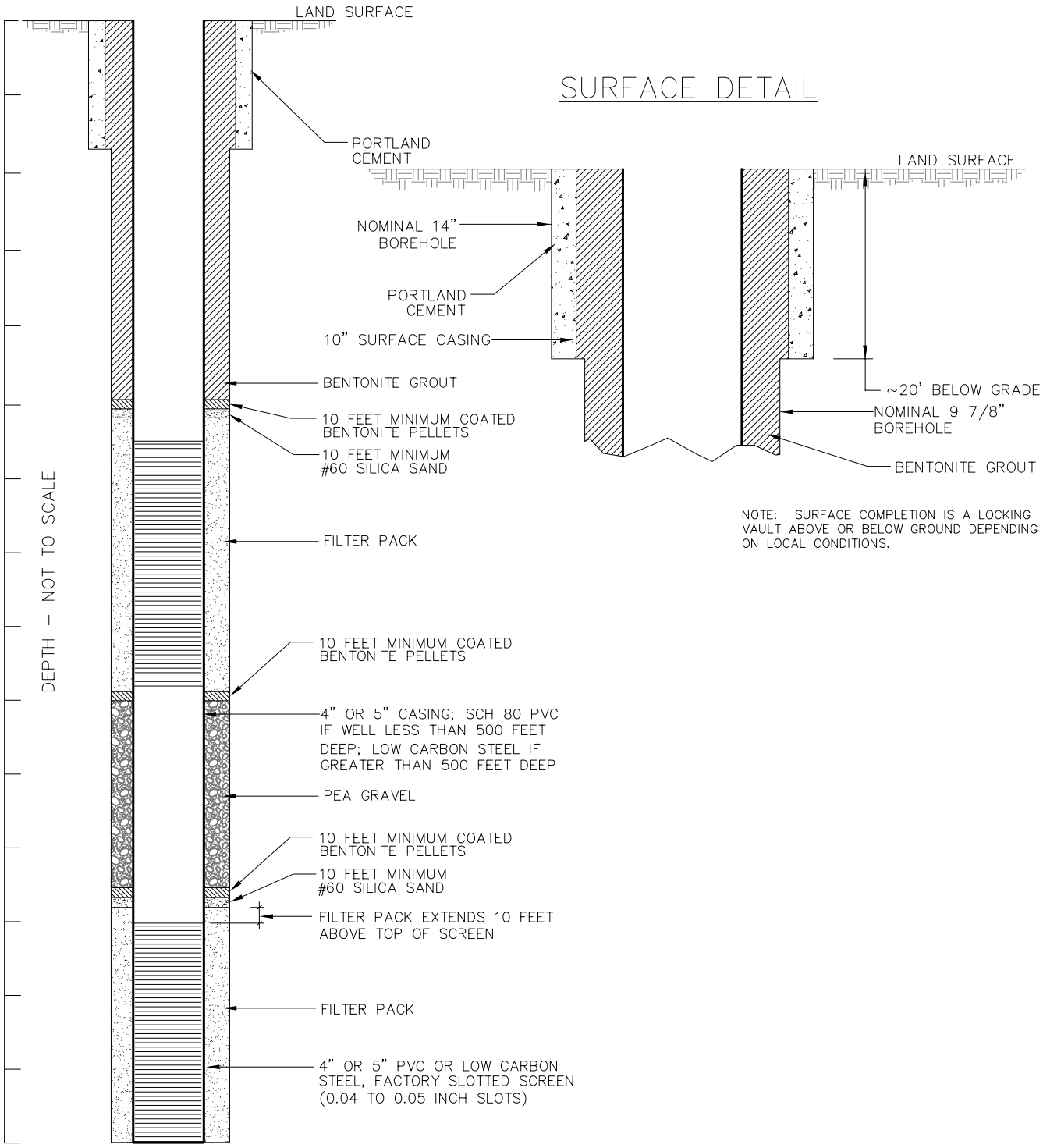
Although examination of raw data is not expected to be needed, the Work Plan makes provisions to call for EPA Level IV if persistent data problems arise (Work Plan Appendix E, Section 6.2).



HYDRO GEO CHEM, INC.

GENERALIZED WELL CONSTRUCTION DIAGRAM FOR WELLS WITH SINGLE SCREENED INTERVALS

Approved	Date	Revised	Date	Reference:	FIG.
AE	10/24/06			7830064A	1

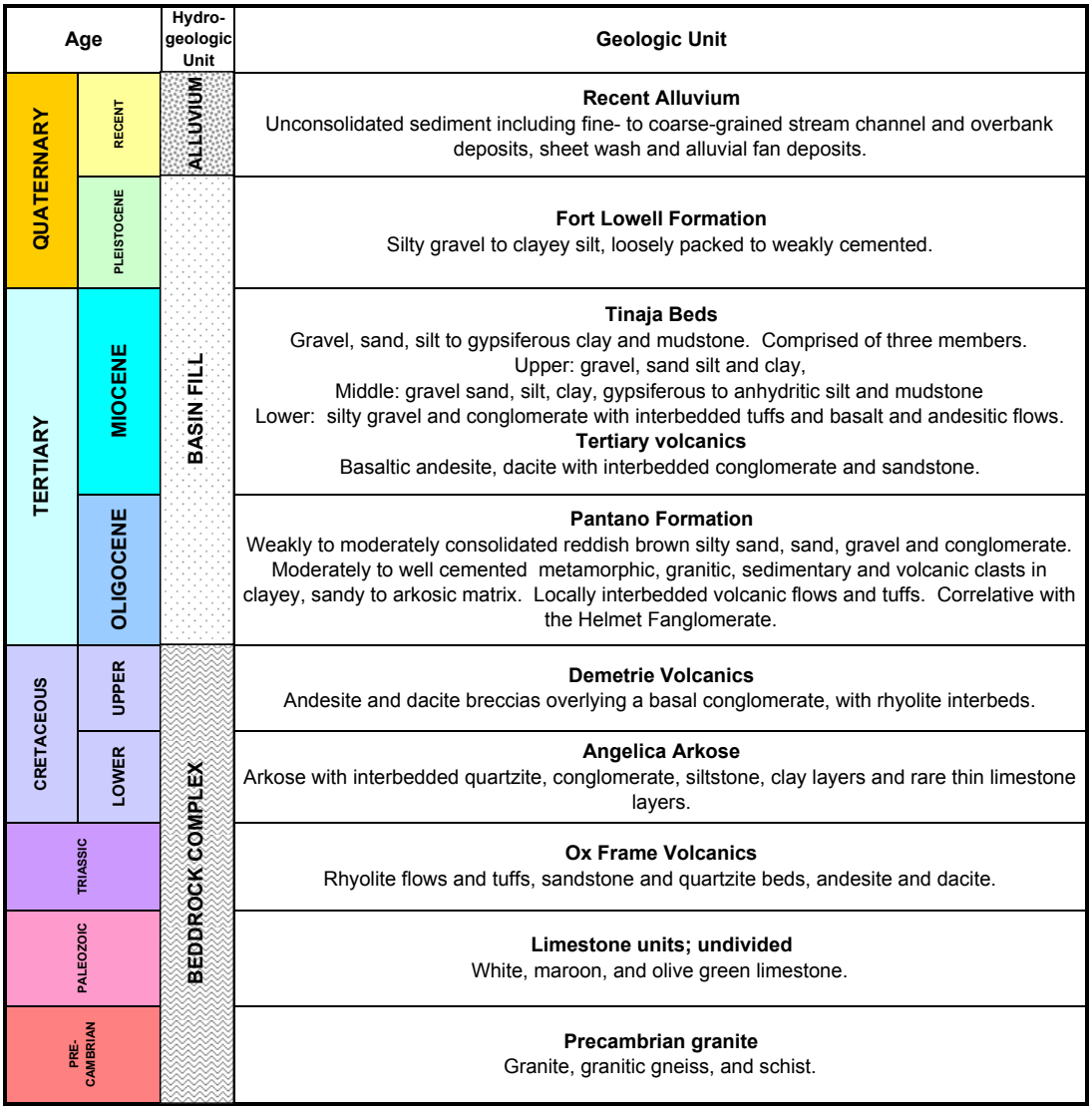


HYDRO GEO CHEM, INC.

GENERALIZED WELL CONSTRUCTION DIAGRAM FOR WELLS WITH MULTIPLE SCREENED INTERVALS

Approved	Date	Revised	Date	Reference:	FIG.
AE	10/25/06			7830066A	2

FIGURE 3
Generalized Geologic Column in Vicinity of the PDSTI



Notes:
PDSTI = Phelps Dodge Sierrita Tailings Impoundment
Geologic units based on Davidson (1973).

ATTACHMENT C

Wells for Evaluation by the Groundwater Monitoring Program

TARGET WELLS FOR GROUNDWATER MONITORING PROGRAM (TASK 2.2)

WELLS FOR QUARTERLY MONITORING CONTROLLED BY PDSI

WELL NAME	ADWR 55 Registry Number	CASING or WELL DEPTH (feet)	WATER LEVEL MEASUREMENT	WATER QUALITY SAMPLING
MH-1	803629	520	Q	
MH-3	803630	535	Q	
MH-4	803631	540	Q	
MH-5	803632	640	Q	
MH-6	803633	960	Q	
MH-7	803634	1100	Q	
MH-9	803635	1400	Q	
MH-10	803636	600	Q	Q
MH-11	803637	820	Q	
MH-12	803638	800	Q	
MH-13A	904071	660	Q	Q
MH-13B	904072	960	Q	Q
MH-13C	904073	1360	Q	Q
MH-14	528098	561	Q	
MH-15E	528094	467	Q	
MH-15W	528093	466	Q	
MH-16E	528100	460	Q	
MH-16W	528099	460	Q	
MH-24	563799	468	Q	
MH-25A	201528	530	Q	Q
MH-25B	208429	680	Q	Q
MH-25C	208426	1101	Q	Q
MH-26A	201527	538	Q	Q
MH-26B	208427	735	Q	Q
MH-26C	208428	900	Q	Q
MH-28	903648	490	Q	Q
MH-29	903649	475	Q	Q
MH-30	903884	920	Q	Q
PZ-7	561870	155	Q	Q
PZ-8	561866	280	Q	Q
PZ-9	561859	230	Q	Q
IW-1	623129	855		Q
IW-2	623130	1035	Q	Q
IW-3A	623131	1047		Q
IW-4	623132	946		Q
IW-5	623133	956		Q
IW-6A	545565	492		Q
IW-7	623135	1050		Q
IW-8	508236	783		Q
IW-9	508238	853		Q
IW-10	508237	831		Q
IW-11	508235	605		Q
IW-12	545555	625		Q
IW-14	545557	550		Q
IW-15	545558	548		Q
IW-16	545559	470		Q
IW-17	545560	502		Q
IW-18	545561	508		Q
IW-19	545562	544		Q
IW-20	545563	506		Q
IW-21	545564	620		Q
IW-22	200554	590		Q
IW-23	200555	964		Q
IW-24	200556	880		Q

WELLS FOR QUARTERLY MONITORING NOT CONTROLLED BY PDSI

ADWR 55 Registry Number	CASING or WELL DEPTH (feet)	WATER LEVEL MEASUREMENT	WATER QUALITY SAMPLING
627483	501	Q	Q
804995	600	Q	Q
603428	645	Q	Q
603429	560	Q	Q
605898	515	Q	Q
616156	500	Q	Q
543600	1200	Q	Q
588121	1000	Q	Q
208825	650	Q	Q
627485	840	Q	Q
623102	1020	Q	Q
623103	1044	Q	Q
623104	1043	Q	Q
623105	1045	Q	Q
515867	500	Q	Q
611220	495	Q	Q
502546	1065	Q	Q
207982	1140	Q	Q
Well 1350	Not Available	Q	Q
87388	660	Q	Q
87390	660	Q	Q
501653	1050	Q	Q
608526	900	Q	Q
608525	932	Q	Q

WELLS FOR SEMIANNUAL MONITORING

ADWR 55 Registry Number	CASING or WELL DEPTH (feet)	WATER LEVEL MEASUREMENT	WATER QUALITY SAMPLING
623111	783	S	S
623112	793	S	S
623113	811	S	S
623114	900	S	S
623115	800	S	S
623116	900	S	S
634394	650	S	S
608518	2516	S	S
634393	650	S	S
85304	647	S	S
501654	635	S	S
504722	402	S	S
608531	533	S	S
509604	230	S	S
608519	2064	S	S
524178	603	S	S
531807	490	S	
562962	500	S	
566940	922	S	S
574700	Not Available	S	S
577707	400	S	
608521	1800	S	S
608530	837	S	S
608604	217	S	
621717	365	S	S
624008	395	S	S
624010	1200	S	S
624024	1175	S	S
623982	2280	S	S
623996	1615	S	S
624005	1504	S	
624006	398	S	S
624012	520	S	S
624015	800	S	S
624025	1186	S	S
624027	300	S	S
640358	350	S	S
802661	400	S	S
532595	296	S	S
540451	500	S	S
550534	Not Available	S	
599357	655	S	S
608597	502	S	S
608591	253	S	S
616212	350	S	S
635387	248	S	S
624020	1100	S	S
639055	262	S	
634037	380	S	
800354	340	S	S
800925	686	S	S

NOTES:
1. Q = Quarterly, S = Semiannual
2. All wells in this table are subject to potential access restrictions related to ownership and the physical condition of the well.
3. Wells found to be more suitable for monitoring pending review of well construction data may be substituted for those proposed.

Range 12E
Range 13E
Range 13E
Range 14E
Township 16S
Township 17S
Township 17S
Township 18S
Township 18S
Township 19S
SAN IGNACIO DE LA CANOA RIVER VALLEY
GREEN VALLEY
Sahuarita
Sahuarita Heights
MINE DUMP
TAILINGS POND

562962
531807
550534
608604
624005
599357
524178
800925
85304
504722
623996
623982
608531
634393
608530
501654
566940
608518
624006
634394
501653
87388
616156
509604
87390
804995
608521
608526
608525
1350
605898
588121
608519
502546
208427
608591
201527
623104
608597
623103
561870
201528
623102
515867
624015
803629
623105
545564
545563
545562
624020
561859
543600
627485
624010
545561
803638
545560
545558
803631
616212
903648
624012
561866
803637
624024
563799
803632
627483
200554
528094
207982
200555
200556
803633
540451
623132
623133
603428
624008
28099
623131
803635623130
603429
803636
624027
623135623129
635387
624025
640358
208825
623111
577707
802661
623112
532595
639055
623113
621717
623114
800354
634037
574700
623115
623116
N
5,100 2,550 0 5,100 10,200
Feet

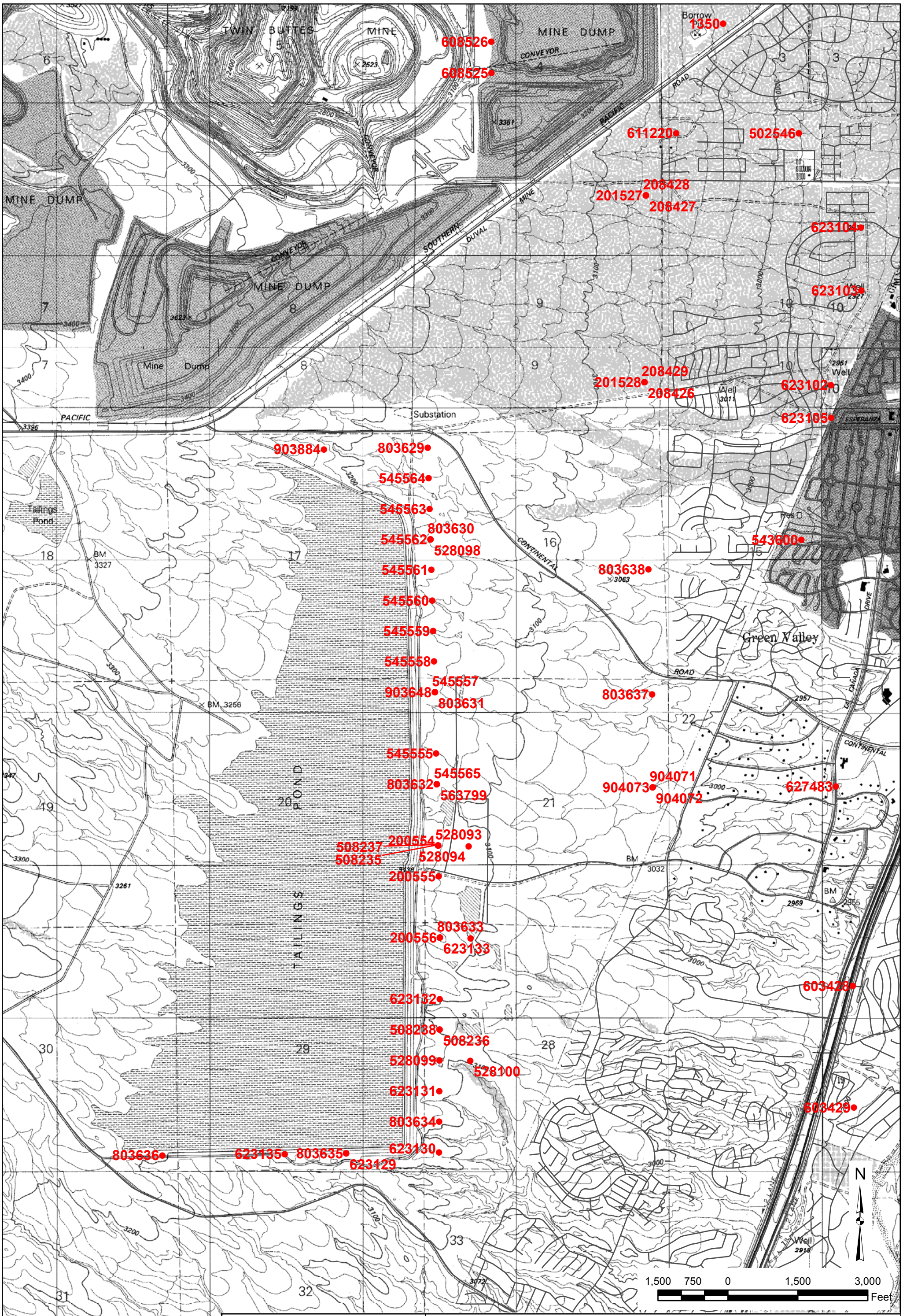
EXPLANATION

- QUARTERLY MONITORING
- SEMIANNUAL MONITORING

HYDRO GEO CHEM, INC.

WELL LOCATIONS FOR GROUNDWATER MONITORING (TASK 2.2)

Approved	Date	Revised	Date	Reference:	FIG.
JRN	10/27/06			7830011G	C.1



EXPLANATION

- QUARTERLY MONITORING

HYDRO GEO CHEM, INC.

WELL LOCATIONS FOR GROUNDWATER MONITORING (TASK 2.2) (PDSTI DETAIL)

Approved	Date	Revised	Date	Reference:	FIG.
JRN	10/30/06			7830012G	C.2

ATTACHMENT D

Revised Schedule

phelps dodge Sierrita Inc.

6200 W. Duval Mine Road • P. O. Box 527 • Green Valley, AZ 85622-0527
(520) 648-8500

John D. Brack
General Manager

October 24, 2006

Via Certified Mail # 7004 1350 0001 1197 3419
Return Receipt Requested

Cynthia Campbell
Section Manager, Water Quality Compliance Section
Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, Arizona 85007

Re: Revised Schedule for Mitigation Order on Consent, Docket No. P-50-06

Dear Ms. Campbell:

This letter provides a revised schedule for the "Work Plan to Characterize and Mitigate Sulfate with Respect to Drinking Water Supplies in the Vicinity of the Phelps Dodge Sierrita Tailing Impoundment, Pima County, Arizona" (Work Plan) dated August 11, 2006. The schedule was revised based on Arizona Department of Environmental Quality (ADEQ) comments[1] on the Work Plan and subsequent discussions between ADEQ and Phelps Dodge Sierrita, Inc. (PDSI) during which options for expediting certain aspects of the project and schedule constraints were discussed. We thank ADEQ for taking the time for meetings and telephone discussions with PDSI.

The revised schedule provided in Attachment A supersedes the original schedule in the Work Plan and follows the format used in ADEQ's comments. Please note that the revised schedule assumes ADEQ approval of the Work Plan and Quality Assurance Project Plan (QAPP) by November 15, 2006. Any delay in approval past that date would require adjustment of the schedule accordingly by adding the delay to the deliverable due dates.

Important aspects of the revised schedule are that it delivers the Well Inventory and Interim Action Evaluation by December 31, 2006, as proposed by ADEQ in their comments. This is important because the Well Inventory and Interim Action Evaluation will provide the methods for identifying and mitigating any wells impacted prior to development of the Mitigation Plan. Consistent with ADEQ's General Comment F, Schedule, completion of the interim action evaluation early in the project alleviates the need to expedite the investigation process.

[1] ADEQ. 2006. Correspondence from Robert Casey, ADEQ, to John Brack, PDSI, Regarding: Mitigation Order on Consent, Docket No. P-50-06 – Work Plan Response. September 22, 2006.

Another important aspect is that we plan to submit a list of wells proposed for monitoring, a generic monitoring well construction diagram, and a response to ADEQ's QAPP comment regarding data review, verification and validation [Specific Comment F(2)] by October 31, 2006 when we submit our responses to ADEQ's comments and Work Plan addendum. These three items were identified by ADEQ as specific gaps in the current QAPP. The submittal of these items a month earlier than proposed by ADEQ will hopefully make it possible for ADEQ to review and approve the QAPP by November 15, 2006 and for PDSI to complete the first round of quarterly groundwater monitoring by December 31, 2006 under the approved QAPP.

The revised schedule is constrained by the need to conduct groundwater monitoring during the summer 2007 period of high seasonal pumping in order to provide calibration data for the numerical fate and transport model.[2] Monitoring data for the summer season is critical for evaluating how the high summer pumping rates affect regional groundwater flow conditions. The fate and transport model will use the summer data to complete calibration activities and to evaluate the response of the groundwater flow system to seasonal pumping demands. The summer monitoring is proposed to be completed by September 2007.

Once the summer monitoring results are obtained, calibration, refinement and documentation of the numerical model will be completed and incorporated into the Aquifer Characterization Report (ACR) by December 31, 2007. Included in this process will be review of the calibrated model with ADEQ so that the agency is comfortable with the model and its operation. The ACR will also document the installation of the new monitoring wells. In light of discussions with ADEQ, we propose that the ACR consist of the following: results of the summer 2007 groundwater monitoring, results of installation and testing of offsite monitoring wells, a revised site conceptual model based on and summarizing the results of previously reported plume characterization tasks, and results of construction and calibration of the fate and transport model.

Because the summer 2007 groundwater monitoring is the critical path activity which cannot be expedited, well installation can also be completed by September 30, 2007 without impeding progress on the ACR. Establishing a completion date of September 30, 2007 for well installation will reduce the potential for triggering the Force Majeure provision in Section VII.A of the Mitigation Order if PDSI is unable to obtain timely access to one or more of the new well locations or obtain necessary permits in a timely manner.

Following the submittal of the ACR, four months are needed to complete simulations of various mitigation actions for control of the sulfate plume and reduction of groundwater sulfate concentrations for the feasibility study (FS). The FS will use the simulation results to evaluate the long-term effectiveness and cost of the mitigation alternatives. A draft FS report will be completed by April 30, 2008 assuming ADEQ approves the ACR by January 31, 2008. In discussions with ADEQ, PDSI agreed to meet with ADEQ to review FS progress after completion of the following tasks: Identification and Screening of Mitigation Actions and

[2] Note that the winter groundwater monitoring would be performed between December 2006 and February 2007.

Technologies, Development and Screening of Mitigation Actions, and Detailed Analysis of Mitigation Actions. These meetings will allow ADEQ to monitor the progress of the FS and provide feedback to the alternatives development process. The Mitigation Plan will be finalized and submitted to ADEQ by June 30, 2008, two months after the FS.

PDSI considers the revised schedule to be aggressive, particularly in light of the access/permitting issues that must be negotiated and the scope of the FS which has been expanded to include evaluation of potential mitigation actions for reducing sulfate loadings to groundwater from the tailing impoundment. ADEQ is well aware of PDSI's concerns regarding the timeliness of obtaining site access and permitting. During Mitigation Order negotiations, both parties identified the use of Force Majeure in these instances so that PDSI is not subjected to stipulated penalties for delays beyond its control.

Please do not hesitate to contact me at (520) 648-8510 or Mr. Stuart Brown at (503) 675-5252 if you have any question regarding this submittal.

Sincerely,

John D. Brack

JDB:sb
Attachment

xc: Robert Casey, ADEQ Water Quality Enforcement Unit
Chad Fretz, Phelps Dodge Sierrita, Inc.
Ray Lazuk, Phelps Dodge Corporation

ATTACHMENT A

ACTIVITY or TASK	DELIVERABLE DUE DATE
PDSI Response to ADEQ Comments, Work Plan Addendum, and Supplemental QAPP Information	October 31, 2006
Health and Safety Plan	November 30, 2006
Well Inventory	December 31, 2006
Interim Action Evaluation	December 31, 2006
Groundwater Monitoring (including depth-specific sampling) 1st Round 2nd Round 3rd Round 4th Round	 December 31, 2006 March 31, 2007 June 30, 2007 September 30, 2007
Evaluation of Interceptor System	February 28, 2007
Installation of New Wells	September 30, 2007
Final Aquifer Characterization Report	December 31, 2007
Feasibility Study	April 30, 2008
Mitigation Plan	June 30, 2008
Treatability Studies (if needed)	September 30, 2008

Note: Schedule assumes ADEQ approves the Work Plan and Quality Assurance Project Plan by November 15, 2006, and the Aquifer Characterization Report by January 31, 2008. Any delay in receiving these approvals will result in an extension of the schedule by the number of days by which ADEQ's approval occurs after the assumed dates.