APPENDIX D RESULTS OF MONITORING WELL INSTALLATION TASK 2.4 OF AQUIFER CHARACTERIZATION PLAN

APPENDIX D

RESULTS OF MONITORING WELL INSTALLATION

TASK 2.4 OF AQUIFER CHARACTERIZATION PLAN MITIGATION ORDER ON CONSENT DOCKET NO. P-50-06

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December 28, 2007

TABLE OF CONTENTS

1.	INTF	RODUCTION	1		
2.	DRII	LLING, CONSTRUCTION, AND WELL DEVELOPMENT	3		
	2.1	Drilling Methods	3		
	2.2	Well Construction			
	2.3	Well Development			
	2.4	Geologic Summary			
3.	DRII	LLING AND CONSTRUCTION OF INDIVIDUAL WELLS	11		
	3.1				
		3.1.1 Pilot Borehole MO-2007-1C			
		3.1.1.1 Geologic Summary of MO-2007-1C			
		3.1.2 Screened Intervals, Site MO-2007-1			
	3.2	Monitoring Well Site MO-2007-2			
		3.2.1 Pilot Borehole MO-2007-2			
		3.2.1.1 Geologic Summary of MO-2007-2			
		3.2.2 Screened Interval, MO-2007-2			
	3.3	Monitoring Well Site MO-2007-3			
	0.0	3.3.1 Pilot Borehole MO-2007-3C			
		3.3.1.1 Geologic Summary of MO-2007-3C			
		3.3.2 Screened Intervals, Site MO-2007-3			
	3.4	Monitoring Well Site MO-2007-4			
		3.4.1 Pilot Borehole MO-2007-4C			
		3.4.1.1 Geologic Summary of MO-2007-4C	19		
		3.4.2 Screened Intervals, Site MO-2007-4	20		
	3.5	Monitoring Well Site MO-2007-5			
	0.0	3.5.1 Pilot Borehole MO-2007-5C			
		3.5.1.1 Geologic Summary of MO-2007-5C			
		3.5.2 Screened Intervals, Site MO-2007-5			
	3.6	Monitoring Well Site MO-2007-6	24		
	3.0	3.6.1 Pilot Borehole MO-2007-6B			
		3.6.1.1 Geologic Summary of MO-2007-6B			
		3.6.2 Screened Intervals, Site MO-2007-6			
4.	WAT	TER QUALITY	29		
5.	KEF	ERENCES	31		

TABLES

- D.1 Well Construction Details
- D.2 Bedrock Data from MO-2007 Pilot Boreholes
- D.3 Results of Reconnaissance Water Sampling, MO-2007-1C
- D.4 Results of Reconnaissance Water Sampling, MO-2007-3C
- D.5 Results of Reconnaissance Water Sampling, MO-2007-4C
- D.6 Results of Reconnaissance Water Sampling, MO-2007-5C
- D.7 Results of Reconnaissance Water Sampling, MO-2007-6B

FIGURES

- D.1 New Mitigation Order Monitor Well Locations
- D.2 Well Construction Diagrams and Stratigraphy for Wells MO-2007-1A, MO-2007-1B, and MO-2007-1C
- D.3 Well Construction Diagram and Stratigraphy for Well MO-2007-2
- D.4 Well Construction Diagrams and Stratigraphy for Wells NP-2, MO-2007-3B, and MO-2007-3C
- D.5 Well Construction Diagrams and Stratigraphy for Wells MO-2007-4A, MO-2007-4B and MO-2007-4C
- D.6 Well Construction Diagrams and Stratigraphy for Wells CW-3, MO-2007-5B, and MO-2007-5C
- D.7 Well Construction Diagram and Stratigraphy for Wells MO-2007-6A and MO-2007-6B

APPENDICES

- D.1 Lithologic Logs of Pilot Boreholes MO-2007-1C, MO-2007-2, MO-2007-3C, MO-2007-4C, MO-2007-5C, and MO-2007-6B
- D.2 Drilling Penetration Rates
- D.3 Well Construction Summary Forms
- D.4 Well Construction Diagrams of Individual Mitigation Order Wells
- D.5 Well Construction Data for NP-2 and CW-3
- D.6 Water Quality Analyses

LIST OF ACRONYMS

ADEQ Arizona Department of Environmental Quality

ADWR Arizona Department of Water Resources

bls below land surface

ft feet

GEFCO George E. Failing Company HGC Hydro Geo Chem, Inc. PDSI Phelps Dodge Sierrita, Inc.

PDSTI Phelps Dodge Sierrita Tailing Impoundment

PVC poly vinyl chloride MO Mitigation Order mg/L milligrams per liter

WDC WDC Exploration and Wells, Inc.

1. INTRODUCTION

In June 2006, Arizona Department of Environmental Quality (ADEQ) and Phelps Dodge

Sierrita Inc. (PDSI) entered into a Mitigation Order on Consent (Docket P-50-06) (MO)

requiring PDSI to characterize the extent of sulfate in groundwater and to develop a Mitigation

Plan for any impacted drinking water supplies attributable to the Phelps Dodge Sierrita Tailing

Impoundment (PDSTI). Section III.A of the MO required a work plan designed to characterize

the vertical and horizontal extent of the sulfate plume downgradient of the PDSTI. Hydro Geo

Chem, Inc. (HGC) prepared 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) on behalf of PDSI (HGC, 2006).

Pursuant to Task 2.4 of the Work Plan, HGC has conducted drilling, construction and

testing of thirteen water quality monitoring wells in areas east and northeast of the PDSTI in and

near the community of Green Valley, Arizona. Drilling, sampling, well construction, well

development, and pump testing were conducted in accordance with the drilling specifications

prepared for the project. Results of these activities are presented in this report.

The MO-2007 series of monitor wells were installed for the following purposes:

• Define the lateral extent of the sulfate plume.

• Define the vertical zoning of sulfate.

Provide installations for long term monitoring of water levels and water quality.

• Characterize the aquifer materials and hydraulic properties in the basin fill aquifer.

• Determine depth to bedrock and thickness of the basin fill at each location.

Appendix D: Drilling Report

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Monitoring wells were installed at six locations (sites), MO-2007-1 through MO-2007-6,

located east and northeast of the PDSTI (Figure D.1). The location of the sulfate plume as

defined by the 250 milligrams per liter (mg/L) concentration contour is also shown on

Figure D.1. The sites were selected to provide additional definition of the plume limits at their

respective locations.

Monitor well installation was focused at the northern and eastern portions of the plume

because groundwater flow downgradient from the PDSTI is to the east and then north, and

because these areas have the greatest uncertainty regarding the distribution of sulfate and are of

concern with respect to future plume migration. Some of the well sites were selected so that the

monitoring wells will serve as sentinel wells for water supply wells near the current plume

margin.

Nests of two to three wells were installed at all sites with the exception of MO-2007-2 to

assess vertical differences in hydraulic properties and sulfate distribution in the basin fill aquifer.

Only one well with one screened interval was installed at MO-2007-2 because the saturated

thickness of the basin fill is insufficient to warrant multiple wells or multiple well screens. The

well nests allow sampling and hydrologic testing of specific vertical intervals within the basin

fill. Selection of screened intervals for the monitor well nests was based on two primary criteria.

First, the screened intervals were positioned to monitor the top, middle, and bottom of the basin

fill with the shallow ("A" well), middle ("B" well), and deep ("C" well), respectively, to follow

the pattern that had been established for some of the MH-series wells. Second, the lithological

and water quality information provided by the pilot borehole were used to select specific

hydrostratigraphic units to include or avoid in the screened intervals in a particular well.

Appendix D: Drilling Report

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December 28, 2007

DRILLING, CONSTRUCTION, AND WELL DEVELOPMENT

Drilling, construction and development of thirteen monitor wells were conducted during

the period March 14, 2007 through October 13, 2007. A total of 12,663 feet (ft) was drilled for

the offsite well installation and testing program. Table D.1 lists the monitor well name, Arizona

Department of Water Resources (ADWR) registration number, location, completion date, ground

surface elevation, drilled depth, casing depth and diameter, depths to top and bottom of the

screens, screened length(s), and water level for each well. The monitoring wells were drilled,

installed, and developed by WDC Exploration and Wells, Inc. (WDC), with onsite oversight

monitoring, documentation, and logging of lithologic materials by HGC personnel.

2.1 **Drilling Methods**

Monitoring wells were drilled with George E. Failing Company (GEFCO) Speedstar

50K-CH rotary drill rigs. An initial 18-inch borehole was drilled to a depth of 20 ft and 10-inch

conductor casing installed. The annulus between the borehole wall and conductor casing was

cemented to provide a surface seal. At some locations a bucket auger rig was used to drill and

set the surface casing prior to the arrival of the drill rig. Drilling activities for each well

including drilling progress, changes in drilling conditions, setbacks, and milestones were

recorded in a notebook by HGC personnel.

The first boring drilled at each site was a pilot borehole drilled for the purpose of

determining basin fill material and thickness, bedrock lithology, and reconnaissance water

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

December 28, 2007

sampling during drilling. The pilot borehole was drilled as deeply as possible by

reverse-circulation air with a down-hole hammer, followed by reverse-circulation air-rotary

when feasible. Reverse-circulation air methods were utilized to provide high-quality lithologic

samples and to allow reconnaissance groundwater sampling during drilling. Procedures and

results of water sampling during drilling are discussed in Section 4. When penetration by

reverse-circulation air was no longer possible due to excessive groundwater inflow or borehole

stability problems, the rig was converted to mud-rotary and water sampling was discontinued.

The pilot borehole was then reamed and advanced to bedrock by conventional mud-rotary

methods.

During drilling of the pilot boreholes, drill cuttings were sampled at 10-foot intervals and

placed in labeled zip-seal plastic bags. Representative splits from each sample were placed in

chip trays for reference purposes. HGC personnel prepared lithologic logs that include a

description of each sample. Basin fill material was logged according to the specifications of

American Society of Testing of Materials D2488-00. Lithologic logs of the pilot boreholes are

provided in Appendix D.1.

Drilling penetration rates were monitored and recorded in a field notebook by HGC

personnel during drilling of the pilot boreholes. Graphs depicting the drilling rates for the pilot

boreholes are included as Appendix D.2. During drilling, cuttings and excess drilling fluids were

collected in a hopper and then placed in roll-off bins and allowed to dry, and transported to a

local landfill.

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

December 28, 2007

After pilot borehole drilling and construction of the deep monitoring well were completed

on each site, intermediate- and shallow-depth wells were drilled as needed using conventional

mud-rotary methods. No water samples were collected nor cuttings logged from the intermediate

or shallow-depth wells. No downhole geophysical surveys of the wells were conducted.

2.2 **Well Construction**

The approach to monitor well installation and construction was based on aquifer

thickness, aquifer material characteristics, and results of water quality sampling. At sites where

three wells were installed, the deep monitor well at each site was constructed in the reamed pilot

borehole drilled to bedrock and designated as the "C" well. One or two additional wells were

installed subsequently to monitor the middle and upper portions of the aquifer as needed. Wells

monitoring the middle of the aquifer are designated as "B" wells, and wells monitoring the upper

portion of the aguifer are designated "A" wells. At site MO-2007-6, where two wells were

installed, the deeper well is designated the "B" well and the shallower the "A" well. At site

MO-2007-2, where only one well was installed, no letter designation is used.

Installation of a shallow monitoring well was contingent on the proximity and availability

of pre-existing wells suitable for monitoring of the upper portion of the aquifer at or near the site.

For example, at sites MO-2007-3 and MO-2007-5, access was obtained to pre-existing shallow

wells NP-2 and CW-3, respectively, which are sufficiently close to the sites that it was not

necessary to drill an additional shallow well.

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

December 28, 2007

Wells were constructed in accordance with the general well construction guidelines

described in the Work Plan, with the exception that in order to minimize potential incursion of

No. 60 sand into the gravel pack, an intermediate layer of at least 5 ft of No. 8-12 choke sand

was placed on top of the gravel filter pack rather than 10 ft of No. 60 sand directly on top of the

gravel pack as originally planned.

The length of screened interval(s) for each well was chosen based on aquifer thickness,

lithologic characteristics of the aquifer material, and at site MO-2007-1 on water quality

sampling results. Details of water quality sampling and results are included in Section 4. Casing

and screen are welded 5-inch diameter, Schedule 40 mild steel in the deep and middle aquifer

monitoring wells, and 5-inch diameter, Schedule 80 flush-threaded poly vinyl chloride (PVC) in

the shallow monitoring wells. Factory cut slots are 0.05-inch wide in the steel screens and

0.04-inch wide in the PVC screens. A sump of 5-10 ft of blank casing with a bottom cap extends

below the screen (or the bottommost screen in well MO-20070-6A) in all wells. In pilot

boreholes penetrating more than 20 ft of bedrock (e.g., MO-2007-2 and MO-2007-6B), which

penetrated 53 and 100 ft of bedrock, respectively), bentonite pellets were used to seal the

uncased bottom of the borehole to prevent groundwater penetration of the bedrock from the basin

fill aquifer.

Following casing installation, No. 8 Tacna gravel filter pack was installed from the

bottom of the well (or from the top of the bentonite pellet seal in MO-2007-2 and MO-2007-6B)

to at least 10 ft above the well screen using a tremie pipe. Surging was conducted inside the well

screen to agitate the annular materials and promote settling of the filter pack. The top of the

filter pack was measured periodically to confirm the height of filter pack in the annulus and

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

December 28, 2007

5, 2007

check for bridging of filter packing materials. Approximately 5 ft of No. 8-12 sand was placed

on top of the gravel pack, followed by 5 ft of No. 60 silica sand. At least 10 ft of time-release

bentonite pellets were placed on top of the No. 60 sand. The remainder of the annular space

between the boring and casing was filled with high solids bentonite slurry.

At each well site, HGC personnel recorded well construction progress in a field notebook

and on a well construction summary form, and created a diagram of the construction as the well

was built. Copies of well construction summary forms, which include construction times,

materials, quantities, installed, and development procedures for each well are presented in

Appendix D.3. Construction diagrams for individual wells with static water levels as well as

water quality and stratigraphy for the pilot borehole wells are presented in Appendix D.4.

Composite diagrams showing data from all wells comprising the well nest at each site are

presented in Figures D.2 through D.6.

2.3 **Well Development**

Well development activities including bailing, swabbing, airlifting, and pumping were

conducted by WDC with oversight by HGC personnel. Airlifting and swabbing were performed

either by the drilling rig following well construction or by a WDC development rig. Airlifting or

pumping typically continued until the discharge water was clear and free of sediment. Details of

development activities for each well are included in the well construction summaries in

Appendix D.3. Field parameters including pH, electric conductivity, and temperature were

recorded in a field notebook during development operations, but are not included in this report.

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

December 28, 2007

De Minimus General Permits were obtained for the release of development water into

nearby washes for each site with the exception of MO-2007-4C, where water was stored in a

20,000-gallon tank and later hauled away for disposal. At sites with discharge permits, the first

4,000 gallons of development water was trucked to the mine site to prevent drilling mud from

being discharged into local washes.

Pursuant to the Work Plan, aquifer testing and collection of an initial water sample were

conducted at each site following well development. Aquifer testing typically consisted of step

tests at 1/3 and 2/3 of the pump capacity for one hour each followed by a constant rate test at full

capacity for approximately 8 hours. Details of the pumping tests and initial water sampling are

presented in separate reports.

After well development, testing, and sampling, surface completions of the monitoring

wells were built. Each surface completion includes the installation of a temporary compression

well plug in preparation for installation of a dedicated pump and sanitary well seal. The north

side of the sounding tube installed with the pump and well seal is marked and establishes a

permanent measurement datum for water levels. An Arizona Registered Land Surveyor

contracted by PDSI surveyed this measuring point elevation to +/-0.01 ft. A painted steel box

was installed around the well casing on a concrete pad to protect the wellhead. The ADWR well

registry number was stamped into the top of the well casing and the well name written on the

concrete pad and well cover lid. After well completion, the depth-to-water was measured and

recorded.

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

December 28, 2007

2.4 Geologic Summary

Pilot boreholes drilled at the MO-2007 sites intercepted Quaternary- to Tertiary-aged

basin fill deposits overlying Cretaceous clastic sedimentary and volcanic bedrock. The basin fill

is composed of unconsolidated to moderately consolidated gravel, sand, silt, and clay. Basin fill

thicknesses encountered in the pilot boreholes drilled to bedrock ranged from a minimum of

687 ft in MO-2007-2 to a maximum of 1,442 ft in MO-2007-3C.

The gravel fraction of the basin fill ranges from fine- to coarse-grained, but actual sizing

of the gravels is obscured by the grinding action of the drill bit. Most gravel clasts are

subangular to subrounded. In places, the presence of cobbles was inferred based on drill rig

performance in conjunction with the presence of angular fragments which were interpreted to

represent larger gravel or cobbles reduced in size by the drilling process. Clast composition of

the gravel clasts in the basin fill sequence is polymictic, including varying ratios of igneous and

sedimentary clasts, and rarely metamorphic rocks. Igneous clasts observed include various

granitoids, felsic porphyries, and aphanitic to porphyritic volcanics. Sedimentary clasts observed

include quartzose sandstone, arkose, siltstone, and rarely limestone. Varying clast lithologies

and their ratios to one another define compositional horizons within the basin fill. Pre-erosional

hydrothermal alteration was observed commonly in both igneous and sedimentary clasts,

represented by (in the order of abundance) epidote as feldspar replacements, veinlets, and as

matrix or groundmass material; oxidized sulfides, occurring as limonite and hematite; chlorite, as

groundmass material and replacing biotite; vein quartz; sericite; calcite veinlets; and

D-9

silicification.

Appendix D: Drilling Report

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The sand fraction of the basin fill encountered in the MO-2007 monitoring wells is

coarse- to fine-grained, and typically well-graded, commonly all the way to silt. The sand is

composed primarily of quartz, with lesser feldspar and epidote grains; igneous and clastic

sedimentary lithic grains (generally as part of the coarser fraction of the sand); and up to one

percent fine-grained, crystalline magnetite.

The fine fraction (silt and clay) of the basin fill was visually estimated during logging of

the drill cuttings. No geotechnical testing of the material was conducted. Silt and clay occur

primarily intermixed with variable amounts of sand and occasionally gravel, as clay and/or silt

with sand, sandy clay, or sandy silt. Occasionally the presence of silt and clay interbedded with

coarser material was inferred based upon intermittent discharge of clay and silt balls from the

drill cyclone in conjunction with corresponding changes in drill penetration rates.

Depth to bedrock and bedrock lithology encountered in the pilot boreholes are

summarized in Table D.2. Bedrock units encountered in the pilot boreholes at sites MO-2007-1,

MO-2007-2, MO-2007-3, MO-2007-4, and MO-2007-5 are quartzose sandstone and arkose,

interpreted to be units of the lower Cretaceous Angelica Arkose. Bedrock material intercepted at

site MO-2007-6 is felsic volcanics, interpreted to be part of the lower rhyolite tuff member of the

upper Cretaceous Demetrie Volcanics.

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

December 28, 2007

3. DRILLING AND CONSTRUCTION OF INDIVIDUAL WELLS

This section depicts the geology at each site and summarizes the drilling and construction of wells. A generalized stratigraphy for each site is presented based on interpretation of the geologic logs.

3.1 Monitoring Well Site MO-2007-1

Monitor well site MO-2007-1 is located at the Green Valley American Legion Hall on West Duval Mine Road, Green Valley, Arizona (Figure D.1). Three wells, MO-2007-1C, MO-2007-1B, and MO-2007-1A were installed at the site to monitor the lower, middle and upper portions of the aquifer, respectively. Figure D.2 depicts well constructions of the three wells, stratigraphy, depth to water, and water quality parameters from formation water samples collected during drilling at the site. Drilling and well construction dates of the wells are presented below:

Well	Drilling Dates	Construction Dates
MO-2007-1C	May 24 through June 13, 2007	June 14 through 17, 2007
MO-2007-1B	June 20 through 26, 2007	June 26 through 28, 2007
MO-2007-1A	June 28 through July 2, 2007	July 2 through 3, 2007

3.1.1 Pilot Borehole MO-2007-1C

MO-2007-1C was drilled to total depth of 1,260 ft bls using a reverse-circulation down-hole air hammer to 820 ft below land surface (bls), followed by reaming and advancement into bedrock by conventional mud-rotary methods with a tricone bit. Bedrock was intercepted at

Appendix D: Drilling Report

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December 28, 2007

1,243 ft bls. Ground water was first noted during drilling at 460 ft bls, and reconnaissance water samples were collected at 20-ft intervals from 460 to 820 ft bls.

3.1.1.1 Geologic Summary of MO-2007-1C

The geologic log for MO-2007-1C is in Appendix D.1. Basin fill at MO-2007-1 can be summarized as follows:

• 0-50 ft: Well-graded sand with silt

50-70 ft: Sand with gravel
70-150 ft: Silty to clayey sand
150-180 ft: Silt and clay with sand

• 180-380 ft: Silty to clayey sand with trace gravel; sandy clay at

320-340 ft

380-420 ft: Well-graded sand with silt, clay, and gravel
420-510 ft: Well-graded sand with gravel, local silt beds
510-600 ft: Well-graded sand with trace to 20 percent gravel
600-660 ft: Well-graded sand with 15-35 percent gravel

• 660-750 ft: Well-graded sand, locally with gravel

• 750-810 ft: Well-graded sand with 20-25 percent gravel

• 810-920 ft: Well-graded sand with local gravels at 830 and 900 ft

• 920-1,010 ft: Well-graded sand with silt

• 1,010-1,210 ft: Silty sand with local clayey fines

• 1,210-1,243 ft: Silty sand with few gravels

The gravel fraction of the basin fill material at site MO-2007-1 is polymictic, composed of variable ratios of granite and related intrusives, porphyries, gray aphanitic volcanics, arkose, quartzose sandstone, siltstone and occasional limestone clasts. The gravel fraction is primarily granitic and volcanic with few clasts of sedimentary rock in the upper portion of the basin fill from the surface to 480 ft bls; polymictic (granitic, volcanic, arkose, and quartzose sandstone) from 480-1,130 ft bls; and dominantly clastic sedimentary (arkose, quartzose sandstone, and siltstone in approximately equal proportions) from 1,130 ft bls to bedrock. Bedrock in

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December 28, 2007

MO-2007-1C is fine-grained arkosic sandstone and siltstone and is interpreted to be part of the

lower Cretaceous Angelica Arkose.

3.1.2 Screened Intervals, Site MO-2007-1

Screened intervals for the MO-2007-1 wells were selected to evaluate multiple depth

intervals in three stratigraphic horizons the basin fill aquifer. Approximately 820 ft of saturated

thickness of basin fill encountered in the pilot hole extends from the water table to bedrock

(Figure D.2). Deep well MO-2007-1C installed in the pilot borehole is screened from 1,020 to

1,180 ft bls to sample a silty sand layer present from 1,010 to 1,210 ft bls. The upper 500 ft of

the basin fill aguifer consists of sands and gravels with minor silty interbeds. This zone is

sampled in the upper portion by MO-2007-1A from 460 to 600 ft bls. The lower portion of this

zone has less silt and more gravel and is sampled by MO-2007-1B, which is screened from

740 to 900 ft bls (Figure D.2).

In selecting the screened intervals for wells MO-2007-1A and MO-2007-1B, the results

of water quality sampling during drilling were also taken into consideration. Within the upper

and intermediate portions of the aquifer where water quality samples were collected, lower

concentrations of sulfate were encountered below 620 ft bls than above 620 ft bls (Figure D.2).

MO-2007-1B is designed to sample the higher sulfate zone separately from the lower sulfate

zone sampled by MO-2007-1B.

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

December 28, 2007

3.2 Monitoring Well Site MO-2007-2

Site MO-2007-2 is located on West Duval Mine Road near its intersection with View

Point Road (Figure D.1). Initially two nested monitoring wells were proposed for the

MO 2007-2 site. Because the saturated thickness of the basin fill was found to be only 112 ft at

the MO-2007-2 site, only a single monitoring well was installed. Well construction, depth to

water, and stratigraphy of MO-2007-2 are shown in Figure D.3. Well drilling and construction

dates are presented below:

Well Drilling Dates Construction Dates

MO-2007-2 March 14 through April 11, 2007 April 13 through 15, 2007

3.2.1 <u>Pilot Borehole MO-2007-2</u>

Two attempts were made to drill to bedrock at the MO-2007-2 site. The first attempt

used reverse-circulation air-rotary with a tricone bit to a depth of 590 ft bls. The first boring was

abandoned when lost tools could not be recovered from the hole, preventing further penetration.

The second attempt was drilled to 590 ft bls using reverse-circulation air-rotary followed by

reaming and mud-rotary to a total depth of 740 ft bls.

3.2.1.1 Geologic Summary of MO-2007-2

The geologic log for MO-2007-2 is included in Appendix D.1. Basin fill at MO-2007-2

can be summarized as follows:

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

• 0-30 ft: Silty sand and sandy silt with gravel

• 30-324 ft: Well-graded sand with gravel and locally silt; clay layers at

112 and 208 ft

• 324-410 ft: Sand with up to 10 percent gravel

• 410-460 ft: Well-graded sand with silt and silty sand

• 460-540 ft: Well-graded sand with gravel

• 540-690 ft: Well-graded sand with silt and gravel interbedded with gravels

From the surface to 540 ft bls, the gravel fraction is composed primarily of granitic,

porphyritic, and aphanitic volcanic clasts with lesser arkose and quartzose sandstone clasts.

From 540 to 610 ft bls, the gravel fraction is dominantly arkose and quartzose sandstone, with

lesser amounts of igneous clasts. From 610 through 640 ft bls, the gravel fraction contains

abundant soft gray rhyolite fragments, which may represent a volcanic interbed within the early

basin fill sequence at this location. Granite and arkose clasts are the primary components of the

gravel fraction from 660 ft bls to bedrock at 687 ft bls.

Bedrock in MO-2007-2 is fine-grained arkosic sandstone and siltstone with weak

hydrothermal alteration represented by fine disseminated and fracture controlled oxidized pyrite,

chloritic laminae, sericite, and epidote replacing feldspars and some of the groundmass in sandy

layers. The bedrock is interpreted to be part of the lower Cretaceous Angelica Arkose.

3.2.2 Screened Interval, MO-2007-2

The small saturated thickness of only 112 ft encountered by MO-2007-2 made it

impractical to install more than one well, as originally planned. Bedrock was encountered at

approximately 693 ft bls and the static water level is 574.82 ft bls, recorded on August 9, 2007.

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

December 28, 2007

MO-2007-2 is screened from 520 to 680 ft bls to include the entire saturated thickness with a 10-ft sump of blank casing from 680 to 690 ft bls (Figure D.3).

3.3 Monitoring Well Site MO-2007-3

Site MO-2007-3 is located on the northeast corner of the intersection of La Canada Drive and West San Ignacio (Figure D.1). Two wells, MO-2007-3C and MO-2007-3B, were installed at the site to monitor the lower and middle portions of the aquifer, respectively. NP-2, a pre-existing well located approximately 200 ft east-northeast of the MO-2007-3 site, has been converted to a monitoring well and serves as the shallow well monitoring the upper portion of the aquifer at this location. Figure D.4 shows the construction of NP-2, MO-2007-3B, and MO-2007-3C, static water levels, and the stratigraphy and water quality encountered in MO-2007-3C. Drilling and well construction dates of MO-2007-3C and MO-2007-3B are summarized below:

Well	Drilling Dates	Construction Dates
MO-2007-3C	April 25 through May 13, 2007	May 14 through 23, 2007
MO-2007-3B	August 11 through 25, 2007	August 28 through 30, 2007

NP-2 was drilled and constructed to a total depth of 515 ft bls in 1974. A video survey and test pumping of NP-2 were conducted prior to initial sampling of the well. A summary of the video findings and data pertaining to the construction of NP-2 available from the ADWR well registry (ADWR, 2007a) are presented in Appendix D.5.

D-16

Appendix D: Drilling Report

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3.3.1 Pilot Borehole MO-2007-3C

MO-2007-3C was drilled to a total depth of 1,430 ft bls using reverse-circulation air with

a downhole hammer to 870 ft, followed by reaming and advancement by reverse-circulation

air-rotary from 870 to 980 ft, and finally advanced into bedrock by conventional mud-rotary

methods. Bedrock was intercepted at 1,422 ft bls. Formation water was reconnaissance sampled

from 470 to 980 ft bls at 20-foot intervals. The presence of flowing sand from 1,010 to 1,030 ft

bls was reported by the driller.

3.3.1.1 Geologic Summary of MO-2007-3C

The geologic log for MO-2007-3C is included in Appendix D.1. The basin fill can be

summarized as follows:

0-40 ft: Well-graded sand with gravel

Silty sand 40-80 ft:

• 80-120 ft: Silt

120-200 ft: Silt with sand and sandy silt

200-280 ft: Clay and silt with sand

280-480 ft: Clay and silt with sand interbedded with silty sand

480-540 ft: Well-graded sand with silt and silty sand, locally with gravel

Well-graded sand, locally with gravel 540-600 ft:

600-680 ft: Well-graded sand with gravel

680-810 ft: Well-graded sand, locally with gravel

• 810-880 ft: Well-graded sand with gravel

880-990 ft: Well-graded sand, locally with gravel

990-1,422 ft: Well-graded sand, few silty fines

The gravel fraction of the basin fill sequence is polymictic, composed varying ratios of

granitic, volcanic, quartzose sandstone, arkose, and rare limestone clasts. No vertical

compositional zoning based on gravel clast lithology was seen in MO-2007-3C.

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

Bedrock in MO-2007-3C is fine-grained arkosic sandstone composed mostly of fine

quartz sand with few feldspar grains in a calcareous matrix, with up to 1 percent disseminated

and fracture-controlled oxidized pyrite and other non-magnetic, fine-grained gray metallics. The

bedrock is interpreted to be part of the Angelica Arkose.

3.3.2 Screened Intervals, Site MO-2007-3

Groundwater is encountered at about 350 ft bls in existing well NP-2, resulting in over

1,000 ft of saturated thickness in the basin fill at site MO-2007-3. Based on the video log of the

well, NP-2 has open screen from 331 to 486 ft bls, and is used to monitor the upper aquifer zone

of sandy silt and silty sand. Gravelly sands that predominate from 530 to 990 ft bls are

monitored by MO-2007-3B, which is screened from 740 to 940 ft bls. The lower zone in the

aquifer that consists of a fairly uniform sand with 5 percent silt from 990 to 1,422 ft bls is

monitored by MO-2007-3C, screened from 1,160 to 1,320 ft bls (Figure D.4).

3.4 **Monitoring Well Site MO-2007-4**

Site MO-2007-4 is located in the median of La Canada Drive approximately 100 ft south

of West Camino Penasco (Figure D.1). Three wells, MO-2007-4C, MO-2007-4B, and

MO-2007-4A were installed to monitor the lower, middle, and upper portions of the basin fill

aquifer, respectively. Well construction diagrams and static water levels of the three wells and

water quality parameters of samples collected during drilling and the stratigraphy encountered in

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

December 28, 2007

MO-2007-4C are presented in Figure D.5. Well drilling and construction dates of the three wells are presented below:

Well	Drilling Dates	Construction Dates
MO-2007-4C	June 19 through July 11, 2007	July 13 through 15, 2007
MO-2007-4B	September 4 through 11, 2007	September 12 through 18, 2007
MO-2007-4A	September 19 through 23, 2007	September 24 through 26, 2007

<u>3.4.1</u> <u>Pilot Borehole MO-2007-4C</u>

MO-2007-4C was drilled to a total depth of 1,153 ft bls and is the deepest of three wells installed at site MO-2007-4. MO-2007-4C was drilled using a reverse-circulation downhole air hammer to 560 ft bls, followed by reaming and advancement to total depth by conventional mud-rotary methods with a tricone bit. MO-2007-4C intercepted bedrock at 1,140 ft bls. Formation water was sampled at 40-foot intervals from 380 to 540 ft bls. Flowing sand at 560 ft bls was reported by the driller.

3.4.1.1 Geologic Summary of MO-2007-4C

The geologic log of MO-2007-4C is included in Appendix D.1. The basin fill can be summarized as follows:

0-40 ft: Well-graded sand with silt, locally with gravel
40-90 ft: Sandy silt to silty sand, locally with gravel
90-120 ft: Well-graded gravel with sand; locally little silt
120-150 ft: Well-graded sand with gravel grading to silty said

• 120-150 ft: Well-graded sand with gravel, grading to silty sand

150-240 ft: Sandy silt with interbeds of silty sand
 240-330 ft: Clayey silt, few fine-grained sands

330-400 ft: Silt with sand, trace to 10 percent gravel
400-420 ft: Well-graded gravel with silt and sand

Appendix D: Drilling Report
H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

• 420-460 ft: Silt with sand, some clay, trace gravel

• 460-510 ft: Well-graded gravel with silt and sand

• 510-560 ft: Silty sand, with gravel from 530-560 ft

• 560-600 ft: Silty sand and well-graded sand with silt

• 600-690 ft: Well-graded sand and sand with silt, trace gravel locally

690-1,050 ft: Well-graded sand, trace silt and gravel locally, silty from

860-910 and 960-980 ft

• 1,050-1,140 ft: Well-graded sand, trace silt

The gravel fraction of the basin fill sequence is polymictic, composed of granitic,

porphyritic to aphanitic volcanic, arkose, quartzose sandstone, and rare limestone clasts. Epidote

was commonly noted in addition to occasional oxidized sulfides and quartz veinlets. Three

gravel compositional horizons defined by the relative abundance of various clast lithologies were

observed in the basin fill: from the surface to 70 ft bls gravel clasts were primarily granitic,

porphyritic, and volcanic; from 70 to 730 ft bls clasts were granitic, porphyritic, and volcanic

with lesser amounts of arkose and quartzose sandstone; and from 730 to 1,140 ft bls clasts were

dominantly arkose and quartzose sandstone with lesser amounts of igneous clasts.

Bedrock in MO-2007-4C was intercepted at 1,140 ft bls and is fine-grained arkosic

sandstone composed mostly of fine quartz sand with few feldspar grains in a calcareous, or

locally epidote, matrix, with up to 1 percent disseminated limonite and fine-grained magnetite.

The bedrock is interpreted to be part of the Angelica Arkose.

3.4.2 Screened Intervals, Site MO-2007-4

Approximately 790 ft of saturated alluvial aquifer is present at the location of

MO-2007-4C. The bottom portion of the basin fill aquifer from 1,050 to 1,140 ft bls is

Appendix D: Drilling Report

characterized by medium- to fine-grained sand with 5 percent silt and may be partially indurated, as indicated by its resistance to drill penetration. Well MO-2007-4C is screened from 1,090 to 1,130 ft bls to sample this horizon (Figure D.5). Above this horizon, the basin fill is dominated by sand with some silty interbeds and variable gravel content. The upper portion of this zone is monitored by MO-2007-4A, screened from 360 to 560 ft bls, and is characterized by a mixture of interbedded sand, silt, and gravel layers. The lower portion is predominantly sand and sand with

silt, locally with gravel, and is monitored by MO-2007-4B, screened from 700 to 940 ft bls

3.5 **Monitoring Well Site MO-2007-5**

(Figure D.5).

Site MO-2007-5 is located in the median of La Canada Drive approximately 400 ft south of West Paseo del Canto (Figure D.1). Two wells, MO-2007-5C and MO-2007-5B, were installed at the site for the purpose of monitoring the lower and middle portions of the aquifer, respectively. A pre-existing well, CW-3, located approximately 250 ft north-northeast of the site is used to monitor the upper portion of the aquifer. Figure D.6 shows the well constructions of CW-3, MO-2007-5B, and MO-2007-5C, static water levels, and the stratigraphy and water quality parameters of samples collected during drilling of MO-2007-5C. Well drilling and construction dates for MO-2007-5C and MO-2007-5B are presented below:

Well	Drilling Dates	Construction Dates
MO-2007-5C	July 16, through August 1, 2007	August 8 through 11, 2007
MO-2007-5B	September 21 through 27, 2007	October 3 through 5, 2007

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

December 28, 2007

CW-3 was drilled and constructed in 1964 with a total depth of 501.5 ft bls. A

down-hole video survey and test pumping of CW-3 were conducted prior to initial sampling of

CW-3. The survey showed that CW-3 is screened from 178 to at least 462 ft bls and filled with

sediment to 462 ft bls. A summary of the video findings and the ADWR well registry data

regarding construction of CW-3 (ADWR, 2007b) are included in Appendix D.5.

3.5.1 Pilot Borehole MO-2007-5C

MO-2007-5C was drilled to a total depth of 1,370 ft bls using reverse-circulation air with

a downhole hammer to 440 ft bls, followed by reaming and advancement into bedrock by

conventional mud-rotary methods with a tricone bit. Bedrock was intercepted at 1,363 ft bls.

Formation water was reconnaissance sampled from 320 to 440 ft bls. Flowing sand was

encountered at 450 ft bls.

3.5.1.1 Geologic Summary of MO-2007-5C

The geologic log of MO-2007-5C is included in Appendix D.1. The basin fill can be

summarized as follows:

• 0-30 ft: Silty sand with gravel

• 30-60 ft: Well-graded sand with trace silt grading to sand with silt and

gravel

• 60-100 ft: Gravel with sand

• 100-200 ft: Silty gravel with sand grading to silty sand with gravel

• 200-250 ft: Silty clay and clayey sand

• 250-300 ft: Sand with silt and gravel, grading to silty sand

• 300-440 ft: Well-graded sand with silt and gravel, with silty sand above basal

gravel unit

• 440-850 ft: Well-graded sand, trace silt, locally trace gravel

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

December 28, 2007

• 850-1,070 ft: Sand with silt, with silty sand from 990-1,040 ft

• 1,070-1,170 ft: Silty, clayey sand, (10-30 percent fines)

• 1,170-1,230 ft: Sandy silt and clay grading to silty clayey sand (40 percent) fines

• 1,230-1,363 ft: Silty sand (20-40 percent fines from 1,230-1,290 ft; 10-20 percent

fines from 1,290-1,363 ft)

The gravel fraction of the basin fill sequence is polymictic, composed primarily of

granitic, various volcanic, quartzose sandstone, siltstone, arkose and rare limestone clasts. Three

horizons characterized by different ratios of clast lithologies were recognized in the basin fill

penetrated by MO-2007-5C: from the surface to 400 ft bls volcanics are dominant with lesser

granitic clasts; from 400 to 1,000 ft bls volcanics are dominant with lesser quartzose sandstone

and arkose and few granitic clasts; and from 1,000 to 1,363 ft bls, volcanic and arkosic to

quartzose sandstone clasts are present in varying ratios.

Bedrock in MO-2007-5C was intercepted at 1,363 ft bls and is composed of fine-grained

gray, white, tan, and maroon quartzose sandstone, arkosic sandstone, and siltstone. The bedrock

is interpreted to be part of the Angelica Arkose.

3.5.2 Screened Intervals, Site MO-2007-5

Groundwater is encountered at approximately 265 ft bls in CW-3 with bedrock at 1,363 ft

bls, indicating approximately 1,100 ft of thickness in the basin fill aquifer. Pre-existing well

CW-3 has open screen from 178 to 462 ft bls, based on the video log of the well, and is used to

monitor the upper basin fill zone consisting of silty sand and sand with variable amounts of silt

and gravel. The bottom portion of the basin fill consists of silty to clayey sand with no gravel

from approximately 1,060 ft bls to bedrock at 1,363 ft bls and is monitored by MO-2007-5C,

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

December 28, 2007

screened from 1,150 to 1,350 ft bls (Figure D.6). The middle zone of the aquifer is comprised of well-graded sand with 5 percent silt and trace gravel from 440 to 850 ft bls increasing to 10 percent silt from 850 to 990 ft bls. The middle zone is monitored by MO-2007-5B, which is screened from 660 to 960 ft bls (Figure D.6).

3.6 Monitoring Well Site MO-2007-6

Site MO-2007-6 is located on the west side of Camino del Sol approximately 300 ft south of Placita Beldad Road. Two wells were installed at the MO-2007-6 site, MO-2007-6B and MO-2007-6A. MO-2007-6B was drilled to bedrock and is the deeper of the two wells, monitoring the lower portion of the basin fill aquifer. MO-2007-6A has two screened intervals in a single well, to monitor two zones in the upper portion of the basin fill aquifer. Well construction diagrams of MO-2007-6A and MO-2007-6B, static water levels, and the stratigraphy and water quality parameters of samples collected during drilling of MO-2007-6B are presented in Figure D.7. Well drilling and construction dates are presented below:

Well	Drilling Dates	Construction Dates
MO-2007-6B	August 14 through 28, 2007	September 6 through 10, 2007
MO-2007-6A	September 10 through 18, 2007	September 19 through 21, 2007

3.6.1 Pilot Borehole MO-2007-6B

MO-2007-6B was drilled using reverse-circulation air with a down-hole hammer to a depth of 370 ft bls, followed by reaming and advancement by conventional mud-rotary methods with a tricone bit to a total depth of 1,060 ft bls. Borehole stability problems during drilling due

Appendix D: Drilling Report

to caving in an unconsolidated gravel bed intercepted from 310 to 400 ft bls prevented advancement by reverse-circulation air hammer drilling beyond 370 ft bls. MO-2007-6B was intercepted at 960 ft bls (Figure D.7). Formation water was reconnaissance sampled at 20-foot intervals from 320 to 360 ft bls.

3.6.1.1 Geologic Summary of MO-2007-6B

The geologic log of MO-2007-6B is in Appendix D.1. The basin fill at MO-2007-6 can be summarized as follows:

0-30 ft: Clayey sand, 10 percent gravel 30-60 ft: Gravel with variable sand and clay

• 60-90 ft: Clay and silt

90-250 ft: Silt and clay with sand to clayey sand, locally with gravel;

clay from 140-170 ft and 230-250 ft

Gravel 250-260 ft:

• 260-310 ft: Clay with sand

• 310-400 ft: Clayey gravels and gravel with clay and sand

• 400-570 ft: Silty sand with gravel (10-30 percent) grading to sand with silt

and gravel

570-630 ft: Silty and clayey sands

630-710 ft: Clay with 10-25 percent sand

• 710-770 ft: Sandy silt and clay (40 percent sand)

• 770-870 ft: Silty sand, variable clay

• 870-960 ft: Sandy clay to silty, clayey sand

The gravel fraction of the basin fill sequence is polymictic, composed primarily of various volcanic, porphyritic, and granitic clasts with lesser amounts of sedimentary clasts of fine-grained quartzose sandstone, siltstone, and arkose. The gravel fraction encountered in MO-2007-6B has a larger percentage of volcanic clasts relative to other clast types compared to the basin fill gravels intercepted at other MO-2007 well sites. Varying ratios of igneous and

Appendix D: Drilling Report H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc sedimentary clasts defined five compositional horizons encountered in MO-2007-6C: from the

surface to 130 ft bls, primarily volcanic clasts; from 130 to 630 ft bls, volcanic with lesser

sandstone and granitic clasts; from 630 to 770 ft bls volcanic, quartzose sandstone and arkose in

varying ratios; from 770 to 900 ft bls, dominantly volcanic clasts; and from 900 to 960 ft bls,

volcanic approximately equal to quartzose sandstone and arkose clasts.

The sand fraction of the basin fill is comprised of mixed quartz, quartz-biotite, and

feldspar grains; volcanic, granitic and fine-grained quartzose sandstone, arkose and siltstone

lithic grains; few epidote grains, and small amounts of very fine-grained magnetite. The

majority of coarse-grained sand-sized particles in MO-2007-6B are lithic grains.

Bedrock in MO-2007-6B is represented by variable felsic volcanics, including gray to

brown aphanite, reddish rhyolite, fine-grained biotite-feldspar aphanitic-porphyry, fine volcanic

breccia, and rhyolitic volcaniclastic material. Based on drilling penetration rates, the volcanic

units are moderately soft from 960 to 1,050 ft bls and become hard below 1,050 ft bls. The

volcanic bedrock in MO-2007-6B is interpreted to be part of the lower rhyolite tuff member of

the upper Cretaceous Demetrie Volcanics.

3.6.2 Screened Intervals, Site MO-2007-6

The basin fill aquifer thins in the vicinity of the MO-2007-6, extending from 300 ft bls to

bedrock at approximately 960 ft bls. The lower zone of basin fill from 720 to 960 ft bls consists

of sandy clay and silty, clayey sand and is separated from the upper portion by a clay layer with

10 to 25 percent sand from 630 to 710 ft bls. The lower zone is monitored by MO-2007-6B,

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

December 28, 2007

which is screened from 780 to 940 ft bls (Figure D.7). The upper zone of the basin fill aquifer

consists of an upper unit of gravel with variable sand and clayey fines from 310 to 400 ft bls and

a lower unit consisting of sand with silt and gravel from 430 to 570 ft bls and silty, clayey sand

from 570 to 630 ft bls. The units are separated by silty sand with gravel from 400 to 430 ft bls.

Two screened intervals monitor the upper zone of the aquifer in MO-2007-6A, one from 310 to

390 ft bls to monitor the upper unit and another from 430 to 630 ft bls to monitor the lower unit

(Figure D.7). The screens are separated by 40 ft of blank casing with a 20-ft annular seal of

hydrated bentonite pellets. This configuration enables the two screens to be sampled separately

with the use of packers should the need arise in the future.

Appendix D: Drilling Report

December 28, 2007

4. WATER QUALITY

Reconnaissance grab samples of groundwater were collected from the reverse-circulation

air hammer and air-rotary return for estimation of sulfate concentration with depth. Sampling

using decontaminated containers commenced when the pilot borehole encountered groundwater

and continued at 20- to 40-foot intervals as long as it was possible to proceed with reverse-

circulation air drilling. Field parameters of pH and electrical conductivity were taken on the

samples as soon as possible after sample collection occurred. The field parameters were

recorded in a notebook along with the name of the boring, depth of drilling at the time of sample

collection, and the date and time of the measurements.

Collected water samples were passed through a 0.45 micron filter and delivered under

chain-of-custody to Turner Laboratories, Inc. in Tucson, Arizona, for sulfate analyses by ion

chromatography. All samples were labeled with the project number, borehole name, and sample

depth. The custody of the samples was documented using chain-of-custody forms from the time

of sample collection to completion of analyses. When water was excessively turbid, solids were

allowed to settle prior to filtration. Results of the analyses for sulfate are presented in Tables D.3

through D.7. Copies of laboratory reports and chain-of-custody documentation are included in

Appendix D.6.

The results of reconnaissance water samples are plotted on Figures D.2, D.4, D.5, D.6,

and D.7. Sulfate concentrations in reconnaissance water samples were well below the standard

of 250 mg/L established in the MO, ranging from 6.6 to 99 mg/L, with the exception of samples

Appendix D: Drilling Report

H:\78300\78306.4\Drilling Results\Drilling Report\Drilling rpt 123107.doc

December 28, 2007

from MO-2007-4C, which yielded concentrations ranging from 39 to 670 mg/L (Tables D.3 through D.7). No usable reconnaissance water samples were collected from MO-2007-2.

5. REFERENCES

- Arizona Department of Water Resources (ADWR), 2007a. Imaged Records 55 Database, well number 55-605898 (NP-2), downloaded May 13, 2007.
- ADWR, 2007b. Imaged Records 55 Database, well number 55-627483 (CW-3), downloaded May 13, 2007.
- Errol L. Montgomery and Associates, 2006. Results of Drilling, Construction, and Testing of Groundwater Monitoring Well Suites MH-25, MH-26, and MH-13, Phelps Dodge Sierrita, Inc., Pima County, Arizona.
- Hydro Geo Chem, Inc. (HGC), 2006. 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. August 11, 2006, revised October 31, 2006.

TABLES

TABLE D.1
Well Construction Details

WELL NAME	ADWR WELL REGISTRY NUMBER	UTM NORTHING (NAD 83, meters)	UTM EASTING (NAD 83, meters)	DRILLED DEPTH (ft bls)	CASING DEPTH (feet)	CASING DIAMETER (inch)	DEPTH TO TOP OF SCREEN (ft bis)	DEPTH TO BOTTOM OF SCREEN (ft bis)	SCREEN LENGTH (feet)	MEASURING POINT ELEVATION (NAVD 88, ft amsl)	DATE MEASURED	DEPTH TO WATER BELOW MEASURING POINT (feet)	STATIC WATER LEVEL ELEVATION (ft amsl)
MO-2007-1A	907342	3529331.380	500016.947	620	610	5	460	600	140	2967.15	07/30/07	425.87	2541.28
MO-2007-1B	907210	3529325.119	500021.574	920	910	5	740	900	160	2966.35	07/30/07	425.67	2540.68
MO-2007-1C	907209	3529328.959	500013.405	1260	1190	5	1020	1180	160	2964.34	07/30/07	423.87	2540.47
MO-2007-2	906765	3527621.102	497912.410	740	685	5	520	680	160	3153.61	08/09/07	575.30	2578.31
MO-2007-3B	906816	3528508.801	500522.491	960	950	5	740	940	200	2910.75	09/10/07	359.38	2551.37
MO-2007-3C	906817	3528508.743	500529.713	1430	1330	5	1160	1320	160	2910.09	07/05/07	356.30	2553.79
MO-2007-4A	907213	3525634.956	500383.682	580	570	5	360	560	200	2923.47	10/09/07	307.67	2615.80
MO-2007-4B	907212	3525613.952	500380.947	960	950	5	700	940	240	2923.22	10/11/07	308.72	2614.50
MO-2007-4C	907211	3525624.484	500382.217	1153	1140	5	1090	1130	40	2923.49	08/12/07	307.13	2616.36
MO-2007-5B	907456	3523743.376	500013.850	980	970	5	660	960	300	2943.42	10/12/07	268.27	2675.15
MO-2007-5C	907457	3523736.459	500014.152	1370	1360	5	1150	1350	200	2944.33	08/23/07	294.04	2650.29
MO 2007 CA	907607	3521842.050	498367.161	630	620	_	310	390	80	3042.49	10/02/07	202.00	2720.00
MO-2007-6A	907607	3521842.050	498367.161	630	620	5	430	610	180	3042.49	10/02/07	303.60	2738.89
MO-2007-6B	907606	3521849.495	498367.887	1060	950	5	780	940	160	3041.95	10/04/07	319.17	2722.78
	Existing Wells at MO-2007 Sites												
CW-3	627483	3523809.985	500047.663	501	500	16	182	500	318	2941.44	06/06/07	265.35	2676.09
NP-2	605898	3528517.116	500582.904	515	515	12	331	515 ¹	184 ¹	2907.05	06/04/07	351.50	2555.55

ADWR = Arizona Department of Water Resources UTM = Universal Transverse Mercator (Zone 12) NAD 83, meters = North American Datum of 1983 NAVD 88 = North American Vertical Datum of 1988 It amsl = feet above mean sea level It bis = feet below land surface

¹ depth to bottom of screen and screen length are not provided in the ADWR well registry and therefore estimated

TABLE D.2
Bedrock Data from MO-2007 Pilot Boreholes

WELL	ADWR 55 WELL REGISTRY NUMBER	GROUND SURFACE ELEVATION (ft amsl) GROUND DRILLED DEPTH (ft bls)		DEPTH TO BEDROCK (ft bls)	BEDROCK LITHOLOGY
MO-2007-1C	907209	2964.34	1260	1243	Arkosic Sandstone
MO-2007-2	906765	3153.12	740	687	Arkosic Sandstone
MO-2007-3C	906817	2910.09	1430	1422	Arkosic Sandstone
MO-2007-4C	907211	2923.49	1153	1140	Arkosic Sandstone
MO-2007-5C	907457	2941.34	1370	1363	Arkosic Sandstone
MO-2007-6B	907606	3041.93	1060	960	Felsic Volcanics

ft amsl = feet above mean sea level ft bls = feet below land surface

TABLE D.3
Results of Reconnaissance Water Sampling
MO-2007-1C

Depth (ft bls)	EC (µS)	рН	Sulfate (mg/L)
460	332	7.37	72
480	498	7.45	
500	387	7.64	90
520	550	7.68	
540	385	7.30	73
560	415	7.78	
580			52
600	373	8.01	
620	381	7.91	17
640	368	7.85	
660	347	7.63	8.3
680	325	7.84	
700	327	7.92	6.6
720	330	8.02	
740	354	7.75	14
760	342	8.12	14
780	330	7.40	15
800	305	7.58	16
820	319	7.49	14

ft bls = feet below land surface EC = electrical conductivity mg/L = milligrams per liter

 μ S = microsiemens

TABLE D.4
Results of Reconnaissance Water Sampling
MO-2007-3C

Depth (ft bls)	EC (μS)	рН	Sulfate (mg/L)
470	428	7.72	52
480	720	1.12	52
490	370	7.93	42
500	417	7.94	43
510	717	7.54	70
520	437	7.90	41
530	407	7.50	71
540	433	7.77	44
550	100	7	
560	438	7.71	41
570	100	7	
580	427	7.93	39
600	448	7.84	
620	439	7.92	38
640	438	7.71	
660	416	7.64	14
680	425	7.91	
700	415	7.89	41
720	410	7.95	
740	370	7.44	43
760	350	7.62	
780	347	8.00	41
800	363	7.89	
820	335	8.06	34
840	324	7.69	
860	324	8.07	31
880	399	7.50	
900	413	7.60	38
920	381	7.73	
940	381	7.73	41
960	413	7.83	
980	357	7.57	39, 40 (duplicate)

ft bls = feet below land surface

EC = electrical conductivity

 $\mu S = microsiemens$

mg/L = milligrams per liter

TABLE D.5
Results of Reconnaissance Water Sampling
MO-2007-4C

Depth (ft bls)	EC (µS)	рН	Sulfate (mg/L)
380	480	7.50	110
400	1174	7.38	
420	1243	7.24	670
440	722	7.43	
460	1243	7.12	240
480	518	7.83	
500	722	7.68	39
520	544	7.73	
540	525	7.60	100

ft bls = feet below land surface EC = electrical conductivity mg/L = milligrams per liter

 μ S = microsiemens

TABLE D.6
Results of Reconnaissance Water Sampling
MO-2007-5C

Depth (ft bls)	рН	Sulfate (mg/L)
320	7.71	98
340	7.77	80
360	7.74	86
380	7.82	82
400	7.81	68
420	7.77	58
440	7.88	99

ft bls = feet below land surface mg/L = milligrams per liter

TABLE D.7
Results of Reconnaissance Water Sampling
MO-2007-6B

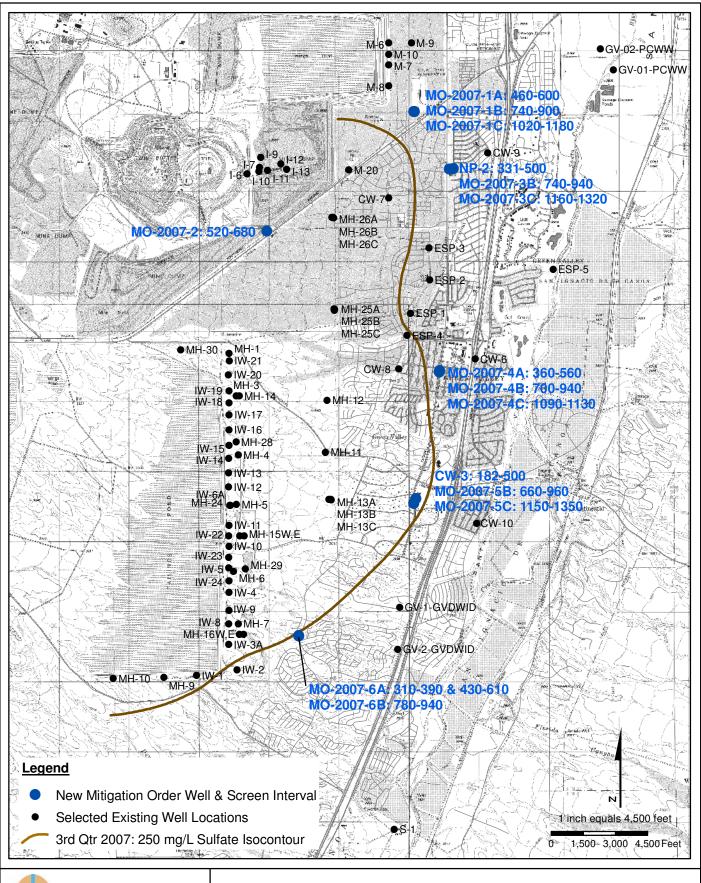
Depth (ft bls)	EC (µS)	рН	Sulfate (mg/L)
320	439	7.72	69
340	316	7.85	49
360	302	7.84	36

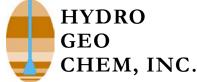
ft bls = feet below land surface EC = electrical conductivity

mg/L = milligrams per liter

 μ S = microsiemens

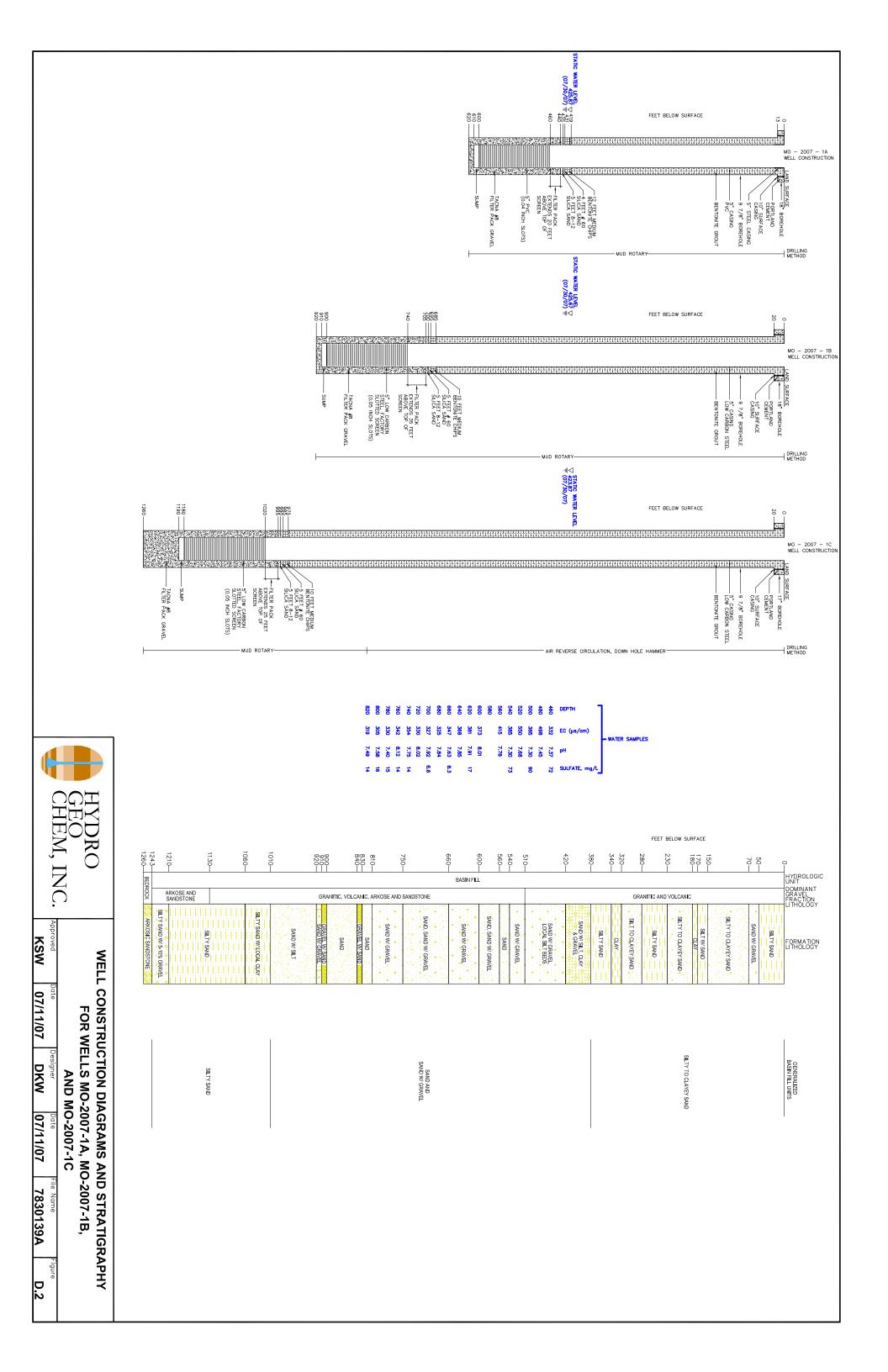
FIGURES

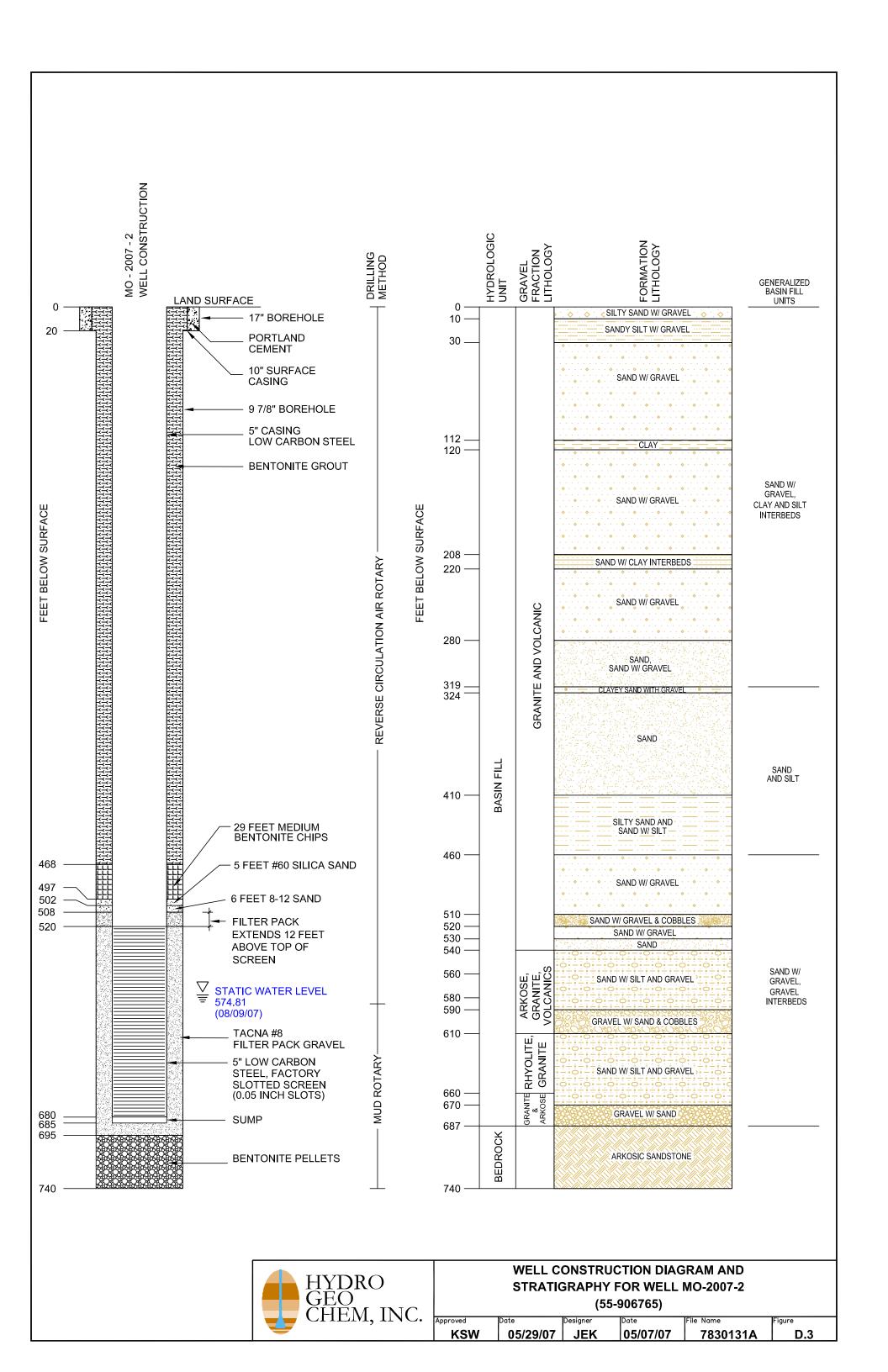


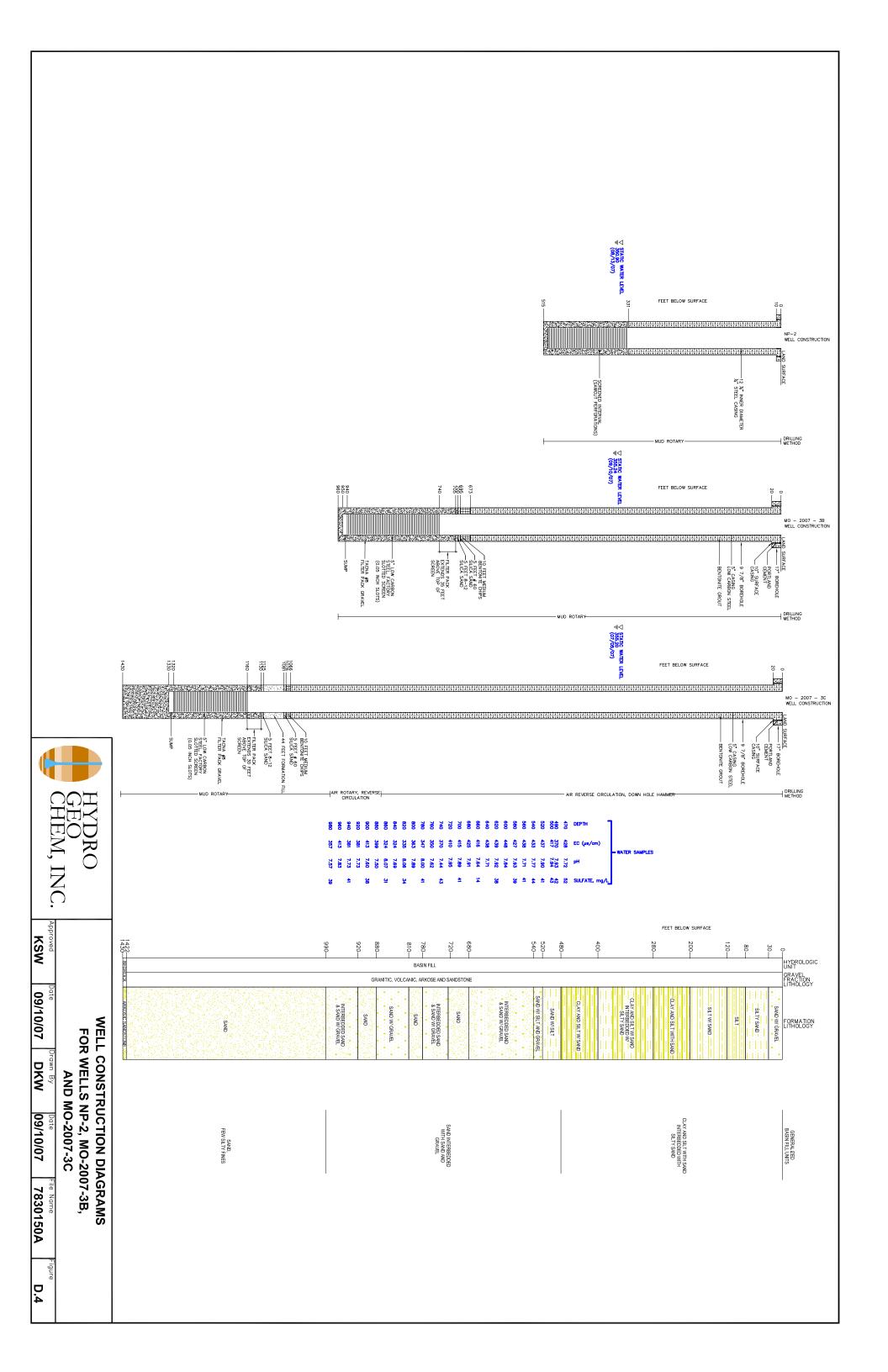


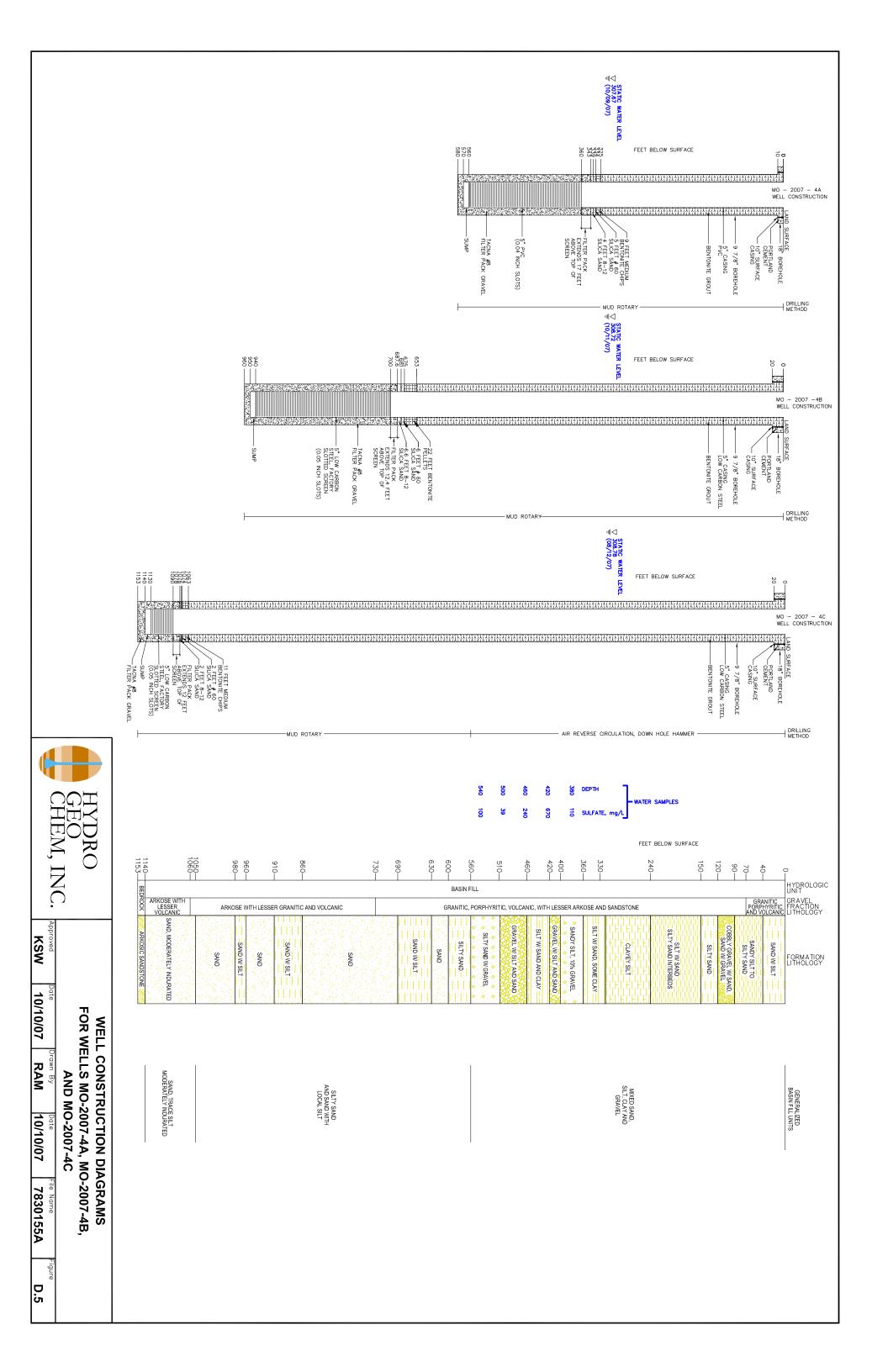
NEW MITIGATION ORDER MONITORING WELL LOCATIONS

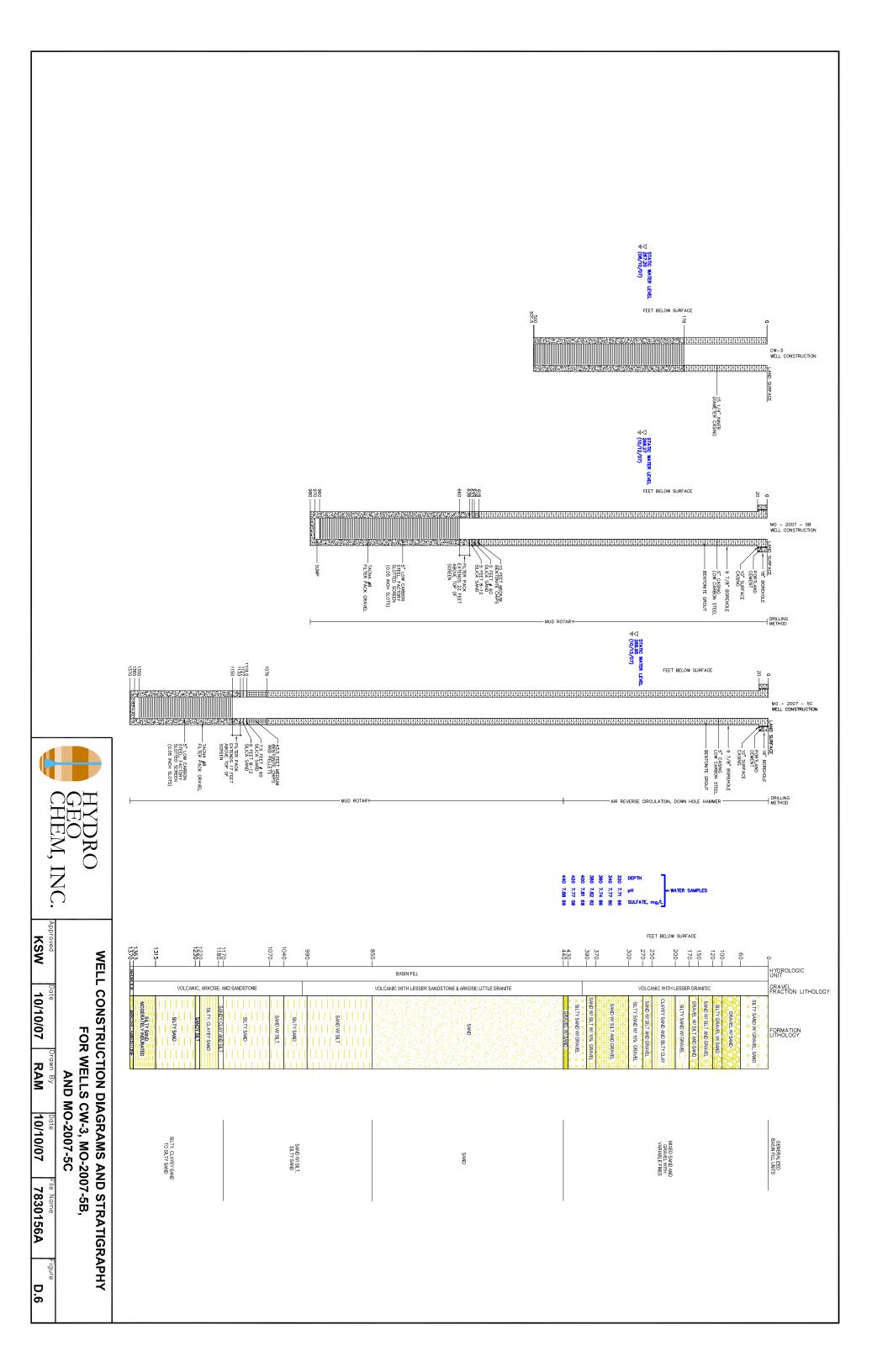
Approved	Date	Author	Date	File Name	Figure
JRN	10/12/07	RAM	10/12/07	7830008G	D.1

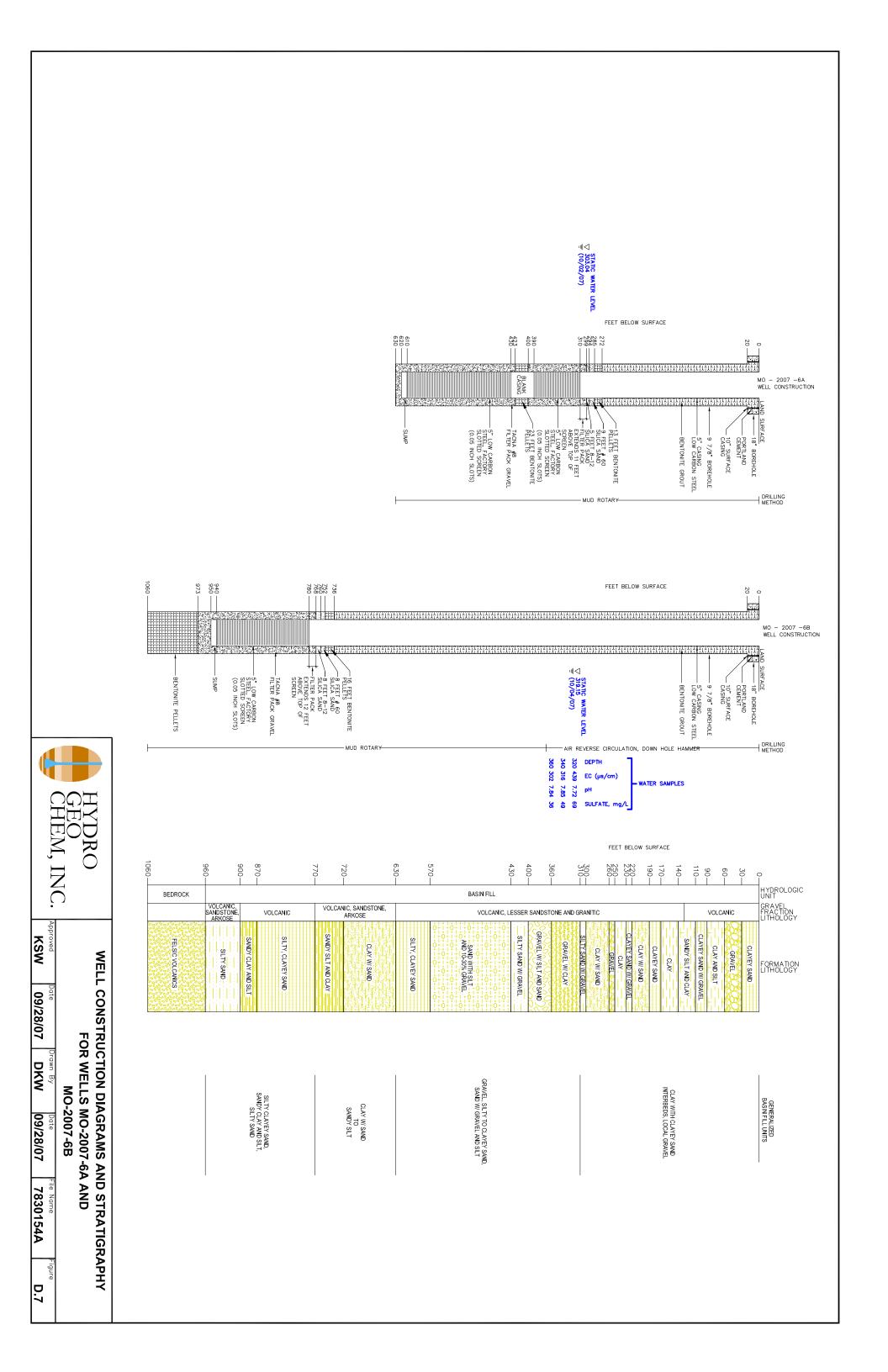












APPENDIX D.1

LITHOLOGIC LOGS OF PILOT BOREHOLES MO-2007-1C, MO-2007-2, MO-2007-3C, MO-2007-4C, MO-2007-5C, AND MO-2007-6B

HYDRO GEO CHEM, INC.

Geologic Boring Log

	D 1 11		D : :			88141	<u> </u>	Boring No.: MO-2007-1C
Project Name: Phelps Dodge Sierrita Mitigation Order Drilling Company: WDC Exploration and Wells Drille								
					ration and	Wells		Driller: Arnold Lamon
Site Pl	an at Bori	ng Lo	cation	:				ADWR Registration No.: 55-907209
								Drilling Equipment: GEFCO Speedstar 50K
								Drilling Method: RC Air and Mud Rotary
								Bit Type/Size: Tricone, 9 7/8 inch
								Total Borehole Depth: 1260 feet
								Casing Depth: 1190 feet
								Screened Interval: 1020-1180 feet
								Depth to Water/Date: 423.87 feet 7/30/07
								Screen slot size: 0.05 inches
								Filter pack type: No. 8 Tacna Gravel
								Top of Casing Elevation:
								Ground surface Elevation: 2964.34 feet amsl
								Date/Time Started: 5/24/07 8:30
	Foundhin	Dona	- C-	otion	T470 D40	NE 04454		Date/Time Completed: 6/13/07 11:32
	ı ownsnıp <u>,</u> ₋attitude:				T17S, R13	110 59 59.49		Logged by: K.Wilson/ W.Thompson
							LICI	Checked by: Kim Wilson
eptn (Ft)	Graphic Log	GR	SA	ed %	USCS Symbol	Munsell Color	HCI Rxn	Sample Description
0		5	85	10	SW-SM	10YR6/2	S	Alluvium, light brownish gray sand with silt.
30		5	85	10	SW-SM	10YR6/2	S	Light brownish gray sand with silt. Gravel fraction is
								polymictic, composed of granitoids with epidote and limonite,
								sandstone and arkose with disseminated oxidized pyrite,
								and dark gray aphanitic volcanics. Sand fraction is mostly
								quartz with lesser feldspar, few volcanic grains, and < 1%
								fine grained magnetite.
40		5	65	30	SM	10YR6/3	W	Pale brown silty sand. Gravel fraction is granite and diorite
								with oxidized sulfides and disseminated epidote.; clasts are
								subrounded to angular, up to 2 cm diameter. Sand fraction
								is moderately well graded, fine to coarse grained, but
								mostly fine of medium grained; mostly quartz with lesser
								feldspar, < 1% fine magnetite, trace epidote and mica flakes.
50		15	83	2	SW	7.5YR6/3	М	Light brown well graded sand with gravel. Gravel fraction
								is primarily granitoids (Ruby Star granodiorite and Pre-
								cambrian granite), with lesser arkose and schist; some
								clasts show epidote and limonite alteration; clasts sub-
								angular. Sand is subangular to subrounded, fine to coarse
								grained, mostly fine to medium grained, moderately well
								graded; mostly quartz with lesser feldspar, epidote,
								magnetite, and hematite.
		25	75	trace	SW	7.5YR6/3	М	Light brown sand with gravel. Gravel is fine, subangular
60				uace	O V V	1.01110/3	IVI	
60		20						Idranite and teleic nornhyries with rare arkees. Sand
60		20						granite and felsic porphyries with rare arkose. Sand
60		20						fraction is mostly coarse grained comprised of quartz,
60								

Projec	t Name:	Phelps Dodge Sierrita Mitigation Order					Boring No.: MO-2007-1C			
Depth	Graphic	Es	timat	ed %	USCS	Munsell	HCI	Sample Description		
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description		
70			70	30	SM	7.5YR6/3	S	Light brown silty sand. Sand is mostly fine to very fine		
								grained, primarily quartz with little feldspar, =1% gray</td		
								metallics including some magn 55-907209		
				4.5	21.4	\ / D 0 / 0				
80			85	15	SM	7.5YR6/3	S	Light brown silty sand, as above. Sand is mostly fine to		
								very fine grained, primarily quartz with little feldspar, up to		
								1% fine grained crystalline magnetite.		
90			65	35	SC	7.5YR6/3	S	Light brown clayey sand. Composition as above, with clay.		
30			00	55	50	7.511(0/5	-	Light brown dayey sand. Composition as above, with day.		
100		5	75	20	T17S, R13	7.5YR6/3	S	Light brown clayey sand. Sand is very fine through medium		
					,			but mostly fine grained; primarily quartz with little feldspar		
								and = 1%very fine grained magnetite. Gravel is angular</td		
								to subangular, up to 2 cm clasts of granite, diorite, and		
								rhyolite containing variable amounts of epidote and		
								oxidized sulfides.		
110		trace	70	30	SM	7.5YR6/3	S	Light brown silty sand. Sand is fine to coarse grained,		
								mostly fine through medium grained, subrounded; primarily		
								quartz, quartz-feldspar lithic grains, with lesser feldspar		
								grains, =1% magnetite. Some limonite stain on sand</td		
								grains. Small gravel fraction is granite with oxidized pyrite		
								and silicified arkose.		
120			65	35	SC	7 EVD6/2	S	Light hypurg alovery conductith some silt. Cond is mostly		
120			00	33	30	7.5YR6/3	3	Light brown clayey sand; with some silt. Sand is mostly subrounded quartz with little feldspar and trace very fine		
								grained magnetite.		
								gramed magnetite.		
130			60	40	SC	7.5YR6/3	S	As above.		
	•									
	<u>'</u>									
140			60	40	SC	7.5YR6/3	S	As above.		
		$\vdash \vdash$								
						7 5 / 5 - / 2	_	Direction of the control of the cont		
150	l		20	80	ML	7.5YR6/3	S	Silt with sand; with some clay also present. Sand fraction		
	ļ	$\vdash \vdash \vdash$					-	is subangular to subrounded, primarily quartz with little		
	l							feldspar and trace magnetite.		
	l						-			
160	l	\vdash	40	60	ML	7 5VD6/2	S	As above. Sand fraction is fine to madium around awart-		
160		\vdash	40	00	IVI∟	7.5YR6/3	<u></u>	As above. Sand fraction is fine to medium grained, quartz		
								with trace feldspar and fine magnetite, sun angular to subrounded, moderately well graded.		
<u> </u>	l	$\vdash \vdash \vdash$						Subrounded, moderatery well graded.		
	l									
L							<u> </u>			

Depth Graphic Estimated % USCS Munsell HCl Sample Description GR SA Ft Symbol Color Name Symbol	Project	t Name:	Phelps Dodge Sierrita Mitigat			gation Order	tion Order Boring No.: MO-2007-1C					
Log CR SA F Symbol Color Rxn	Depth	Graphic	Es	timat	ed %	USCS	Munsell	HCI	Sample Description			
coarse but mostly fine to medium grained, primarily quartz with little feldspar, rine grained magnetite and trace epidote. 180	(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Cample Description			
with little feldspar, fine grained magnetite and trace epidote. 180	170	i		45	55	CL	7.5YR6/3	S				
epidote. 180 65 35 SC 7.5YR6/3 S Light brown clayer sand. Sand composition as above, subrounded, fine to coarse grained, well graded. 190 70 30 SM 7.5YR6/3 S Light brown silty sand. Sand fraction as above. 200 65 35 SC 7.5YR6/3 S Light brown clayer sand. Sand fraction composition as as above, mostly fine to medium with some coarse grained. 210 170 180 180 281 281 281 282 283 283 284 285 285 285 286 287 287 286 385 386 387 387 387 386 386 387 387 387 387 387 387 387 388 388 388		i.							, , , , , , , , , , , , , , , , , , ,			
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fine, mostly medium to fine grained, composed of small granitoid grains, quartz, feldspar and very fine grained	260			70	30	SM	7.5YR6/3	S	As above.			
fine, mostly medium to fine grained, composed of small granitoid grains, quartz, feldspar and very fine grained												
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fine, mostly medium to fine grained, composed of small granitoid grains, quartz, feldspar and very fine grained			-									
fine, mostly medium to fine grained, composed of small granitoid grains, quartz, feldspar and very fine grained	270		trace	70	30	SM	7.5YR6/3	S	Light brown silty sand; some clay. Sand is coarse through			
granitoid grains, quartz, feldspar and very fine grained	210	l,	adob	, 0	30	JIVI	7.01110/0	<u> </u>				
		i.										
		,										

Project	Name:	Phelp	s Do	dge S	ierrita Miti	gation Orde	•	Boring No.: MO-2007-1C
	Graphic			ed %		Munsell	HCI	
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
280			70	30	SC	7.5YR6/3	S	Light brown clayey sand; some silt. As above with a bit
								more clay. Sand fraction as above.
	ı							
290	,		65	35	SC	7.5YR6/3	S	Light brown clayey sand; some silt. Sand is fine to medium
	Ī							well graded thru silt. Rare coarse grains are granitic lithic
	,							fragments. Sand is mostly subrounded.
-	ī							
300		trace	85	15	SM	7.5YR6/3	S	Light brown silty sand. <5% gravel is granitoids. Sand is
300	,	tracc	00	10	Olvi	7.511(0/5		fine to coarse grained, subangular to subrounded, mostly
								quartz, with quartz-biotite, quartz feldspar, trace epidote
	,							and very fine magnetite grains.
310		5	80	15	SM	7.5YR6/3	S	Light brown silty sand. Gravel fraction is granitoids and
								andesite with epidote alteration. Sand composition is as
								above, fine to coarse grained, well graded.
	ī							
320			35	65	CL	7.5YR6/3	S	Light brown sandy clay; some silt also present. Sand
	·							fraction is as above.
	,							
330	,		35	65	CL	7.5YR6/3	S	Light brown sandy clay as above. Sand is mostly fine to
330	ı		33	03	CL	7.511(0/3	3	medium grained quartz with little feldspar and trace very
	i							fine grained magnetite.
								into gramou magnotito.
340	,		70	30	SM	7.5YR6/3	S	Light brown silty sand. Sand is fine to coarse grained,
	i.							subangular to subrounded, well graded, composed of quartz
	1							and quartz-feldspar grains with lesser feldspar and trace
								amounts of epidote and magnetite.
350	ī	5	80	15	SM	7.5YR6/3	S	Light brown silty sand. Small gravel fraction is composed
								of granitoids and gray volcanics. Sand fraction is mostly
	·							quartz with lesser feldspar, often fine biotite specks and/or
								iron oxides intergrown with quartz grains; sand is fine to
360		trace	85	15	SM	7.5YR6/3	S	coarse grained, subangular to subrounded. Light brown silty sand, with 5% clay. Sand is subrounded,
300		uace	00	13	OIVI	7.011\0/0		fine to medium grained, mostly fine grained; primarily
								quartz with little feldspar and trace magnetite. Gravel is
								angular to subangular granitic clasts.
	•							
370		trace	75	25	SC	7.5YR7/3	W	Light pinkish brown clayey sand. Sand is subrounded, fine
								to coarse grained, mostly quartz with lesser feldspar and
								trace epidote and fine grained magnetite. Weak limonite
								surface stain on grains. Trace fine gravel is granitic.
	·							
380		trace	90	10	SW-SM	10YR7/2	S	Very pale brown sand with silt. Gravel is granite with
	•							epidote and oxidized pyrite. Sand fraction is subrounded,
	,							fine to coarse, but mostly fine to medium grained;
								composition as above.
390		5	85	10	SW-SC	10YR7/3	M	Vary nale brown eand with along Craval fraction is grapitic
390		5	65	10	300-30	1011/3	IVI	Very pale brown sand with clay. Gravel fraction is granitic with epidote and iron oxides and quartz fragments; clasts
								are angular to subangular. Sand is angular to subangular,
							-	coarse through fine grained, composition as above.
								ooarse through time grained, composition as above.

Project	: Name:	Phelp	s Do	dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-1C
	Graphic			ed %		Munsell	HCI	· · · · · · · · · · · · · · · · · · ·
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
400		15	80	5	SW	10YR7/3	S	Very pale brown sand with gravel. Gravel fraction is composed
								of limonitic granitoids and gray aphanitic porphyry with fine
								feldspar. Sand is subrounded, fine to coarse grained, but
								mostly medium to coarse.
					0111 0 0	(2) (5-10	.	
410		15	75	10	SW-SC	10YR7/3	M	Very pale brown sand with clay and gravel. Gravel fraction
	i							is comprised of granitoids with limonite and epidote and
								lesser gray aphanitic volcanics. Sand fraction is sub-
								rounded, fine to coarse grained, mostly medium to coarse
	ı							grained.
420		5	85	10	SW-SM	10YR7/2	S	Light gray sand with silt. Gravel clasts are granitoids and
120	i			-10	OVV OIVI	1011172	<u> </u>	feldspar porphyry. Sand fraction is primarily quartz with
	•							fine grained granitoid grains, feldspar with oxidized pyrite.
	'							Sand sized grains are angular to subrounded, fine through
	1							coarse grained.
	'							Ü
430		10	75	15	SM	10YR7/2	S	Light gray silty sand. Granite fraction is angular to
								subangular silicified volcanics and granitoids. Sand
								fraction is subangular to subrounded, fine to coarse
								grained, well graded through to silt; composition as above.
440		4.5	00		0)4/	10)/D7/0		
440		15	80	5	SW	10YR7/2	S	Light gray sand with gravel. Gravel fraction is subangular
								granitoids with epidote and oxidized pyrite and angular
								silicified volcanics. Sand is subrounded with some
	ı							subangular grains, fine to coarse grained, mostly medium grained, composed mostly of quartz and granitic grains,
								with few feldspars, trace epidote and magnetite.
	ı							with few feldopard, trade opidate and magnetic.
450	1	30	60	10	SW-SM	10YR7/2	S	Light gray well graded sand with silt and gravel. Gravel is
	'							angular to subangular granitoids with lesser volcanics.
								Sand fraction is subangular, fine to coarse grained,
								composition as above with a few dark gray volcanic grains.
460	ı	5	90	5	SW	10YR7/2	S	Light gray sand with composition and texture as above.
								First water.
470		0.5	70	_	CVA	40\/D7/0		Name and a brasis of a constant of the constan
470	,	25	70	5	SW	10YR7/3	S	Very pale brown sand with gravel. Gravel fraction is mostly
\vdash								granitic with few volcanic clasts. Sand is fine to coarse,
								mostly coarse grained, with texture and composition as above.
								abovo.
480	•	10	80	10	SW-SM	10YR7/3	М	Pale brown sand with silt, with about 5% clay. Gravel
.00	•				Jiii		1	fraction is composed of granitoids with epidote, sandstone,
	•							arkose, and rare volcanics. Sand is subrounded with some
	'							subangular grains; well-graded coarse grained through to
	•							to silt. Sand grains are mostly quartz and other granitic
	<u>'</u>							minerals with a few lithic grains of grey aphanitic volcanics
								and fine grained sandstone.
490		20	75	5	SW	10YR7/2	М	Light gray sand with gravel. Gravel is angular to sub-
								angular granitoids with lesser fine grained sandstone and
								volcanics. Sand fraction composition and texture as above,
							<u> </u>	with abundant coarse grains.

Project	Name:	Phelp	s Do	dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-1C
Depth	Graphic	Es	timat	ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR		FI	Symbol	Color	Rxn	Cample Description
500	•	15	80	5	SW	10YR7/3	S	Very pale brown sand with gravel. Gravel fraction is
	i							angular to subangular granite with epidote and fine grained
								sandstone. Sand fraction is subrounded, fine to coarse
								grained, mostly medium grained, composed of quartz with
								lesser feldspar, fine magnetite, trace epidote.
510	•	15	80	5	SW	10YR7/3	S	Very pale brown sand with gravel. Sand fraction as above.
	i							Gravel is fine except for a few 1-2 cm clasts, comprised of
	•							granite, arkose and volcanics. Well is making a lot of water,
								making estimation of % fines difficult from here on in.
	ı							
520	i	20	75	5	SW	10YR7/3	S	Very pale brown sand with gravel. Sand fraction as above.
								Gravel fraction is angular to subangular volcanics,
	•							granitoids with epidote, and few sandstone clasts.
							-	
530		15	80	5	SW	10YR7/3	М	Very pale brown sand with gravel. Sand fraction as above
530		15	δU	5	SVV	1011/3	IVI	Very pale brown sand with gravel. Sand fraction as above. Gravel as above, up to 1 cm volcanics, granitoids, and
								arkose.
	i							arroot.
540	i	trace	95	5	SW	10YR7/3	М	Very pale brown well graded sand. Sand is subangular to
	•							subrounded, fine to coarse grained, mostly quartz with
								lesser feldspar, <1% very fine grained magnetite, trace
	•							epidote, with few grains of gray volcanics, granitoids,
	i							and sandstone. Trace gravel is siltstone with limonitic
								fracture filling.
550	•	_		_	0)4/	40)/D7/0	N 4	N/
550	i	5	90	5	SW	10YR7/3	М	Very pale brown well graded sand. Fine to coarse grained
								with abundant medium sized grains. Composition and grain shape as above. Gravel fraction is granitoids and
	•							volcanics.
	•							voicanos.
560	•	20	80		SW	10YR7/3	М	Very pale brown sand with gravel. Gravel fraction is
	i							mostly subangular to subrounded granitoids with few
	•							volcanics, and arkose with epidote. Sand fraction is as
								above.
	ı							
570	•	10	90		SW	10YR7/3	М	Very pale brown sand. As above, with smaller gravel
								fraction.
580	•	1 =	Q.E		SW	10VD7/2	N /	Voru note brown cand with around. Cond fraction as about
560		15	85		344	10YR7/3	М	Very pale brown sand with gravel. Sand fraction as above. Sand fraction is as above. Gravel fraction is granitoids,
	i							volcanics and little arkose.
	•							Tologinoo ana mao amooo.
	•							
590		5	95		SW	10YR7/3	М	Very pale brown sand. Sand is fine to coarse, mostly
	•							medium to coarse grained, subangular to subrounded;
								composed of primarily quartz with lesser quartz-feldspar,
								quartz-biotite, and feldspar grains, trace epidote and very
								fine grained magnetite. Gravel fraction is granite, schist,
	•							and few volcanics.

Project	Name:	Phelps Dodge S Estimated %		ierrita Miti	gation Orde	r	Boring No.: MO-2007-1C	
	Graphic	Es	timat	ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR		FI	Symbol	Color	Rxn	Cample Description
600	ī	15	85		SW	10YR7/2	М	Very pale brown sand with gravel. Sand fraction as above.
	,							Gravel fraction is subangular granitoids, volcanics and
-	,							metasediments.
	1							
610	,	25	70	5	SW	10YR7/1	М	Light gray sand with gravel. Gravel fraction is subangular
010	i	23	70		377	1011(1/1	IVI	up to 2 cm clasts of granitoids, volcanics, trace arkose.
	·							Sand fraction is subangular to subrounded, fine to coarse
								grained quartz, feldspar, granitic grains, trace epidote and
								fine magnetite.
620		30	70		SW	10YR7/1	М	Light gray sand with gravel. Sand fraction as above.
	,							Gravel is subangular granitoids, angular silicic volcanics
	i							and fine grained sandstone with oxidized fine grained
	,							pyrite.
630	,	15	85		SW	10YR7/3	М	Very pale brown sand with gravel. Gravel fraction as above.
030		10	υü		311	1011/3	IVI	Sand fraction is subrounded, fine to coarse grained with
								abundant medium sized grains; composition as above with
								a few dark gray volcanic lithic grains.
640	•	25	75		SW	10YR7/3	М	As above, with larger gravel fraction.
	ı							
CEO.	,	25	60	F	CVV	40VD7/2	N 4	Name and a branch and with sound Crossel frontiers in
650	ī	35	60	5	SW	10YR7/2	М	Very pale brown sand with gravel. Gravel fraction is composed of granitoids, volcanics, fine grained sandstone,
	Ī							Sand fraction is fine to coarse, mostly medium to coarse
								grained, subangular to subrounded, composed of lithic
	,							fragments, quartz, quart-feldspar, and feldspar grains and
	i							trace fine grained magnetite.
660		10	85	5	SW	10YR7/2	М	Very pale brown well graded sand. Composition and
								textures as above, with smaller gravel fraction.
	,							
	i							
670		15	90		SW	10YR7/2	N 4	Vorundo brown and with ground. Conditionation in well
670		15	80	5	311	101K//2	М	Very pale brown sand with gravel. Sand fraction is well graded, coarse through fine grained, as above. Gravel is
								angular to subangular dark gray volcanics, gray feldspar
								porphyry and granitoids.
								1 · 1 / / G
680		5	90	5	SW	10YR6/2	М	Light brownish gray sand. Composition and textures as
								above, with smaller gravel fraction. Gravel is fine grained with
								occasional 2 cm clasts, angular to subangular, comprised
								of dark gray aphanitic volcanics, crystal rich porphyry,
								chert and granitoids.
000	,	0.5	70		0\44	40\/D0/0	R 4	Versionals become and all the control of the contro
690		25	70	5	SW	10YR6/2	М	Very pale brown sand with gravel. Sand is fine to coarse
								grained, mostly medium to coarse grained, subangular to subrounded, primarily quartz and quartz with fine biotite,
								with lesser feldspar, trace epidote and fine magnetite.
								mar 100001 toldopal, traco opidoto and fille magnetite.
							1	

Project	Name:	Phelps Dodge S			ierrita Miti	gation Orde	r	Boring No.: MO-2007-1C
Depth	Graphic	Es	timat	ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Gample Description
700		trace	95	5	SW	10YR7/2	S	Very pale brown sand. Sand is fine to coarse grained,
								mostly medium through coarse grained, subangular,
	ı							composed of quartz, quartz-feldspar, quartz-biotite and
	,							lithic grains. Gravel fraction is polymictic comprised of
								granitoid, volcanic, and fine grained limonite-epidote
	Ī							altered fine grained sandstone clasts up to 1 cm.
740	,	40	00	0	CVA	40VDC/0	MC	Light the consists are consisted to the constant of the consta
710	,	10	88	2	SW	10YR6/2	IVI-S	Light brownish gray sand. Sand fraction is fine to coarse,
	ī							mostly medium through coarse grained, subangular
	,							quartz, quartz-feldspar, quartz-biotite, feldspar and lithic
	,							grains. Gravel fraction is polymictic comprised of volcanic, grantoid, and fine grained limonitic sandstone clasts up to
	ī							1 cm diameter.
	ī							i dii diameter.
720	,	15	85		SW	10YR6/3	М	Pale brown sand with gravel. As above, with a larger gravel
720		10	00			101110/0	171	fraction.
								industri.
	ı							
730	,	10	85	5	SW	10YR6/2	М	Light brownish gray sand. Gravel and sand fractions as
								above.
	ı							
740	i	5	95	trace	SW	10YR6/2	М	Light brownish gray sand. Gravel fraction as above. Sand
	į.							as above, but mostly fine to medium grain. 5% dark gray
	,							sand-size angular volcanic fragments, probably ground up
	1							gravel fraction during drilling.
	1							
750		20	70	10	SW	10YR7/1	W	Light gray sand with gravel. Gravel fraction angular to
								subrounded arkose, granitoids and volcanics. Sand is well
								graded, coarse grained through silt; angular to subrounded,
								and composed of quartz and lithic grains.
760	i	35	50	15	SW	10YR7/1	W	Light gray sand with gravel. Composition as above, with
	ī							larger gravel fraction and more fines. Small amounts of
	,							epidote and fine grained oxidized pyrite are present in a few
								arkose and grainitc clasts. HCl reaction restricted to fines.
		0.7	70		0)47	10)/5=/6	.	
770		25	70	5	SW	10YR7/2	M	Very pale brown sand with gravel. Gravel fraction is angular
								to subrounded, dark to light gray aphanitic volcanics,
							<u> </u>	granitoids, and a few fine grain sandstone clasts. Sand fraction
								is coarse through fine grained, well graded, primarily quartz
								and some feldspar, rust colored iron oxide stain, fairly
\vdash	ı.							clean.
780		10	80	10	SW-SM	10YR6/3	М	Pale brown well-graded sand with silt. Gravel fraction is
760		10	30	10	0 V V - O IVI	101110/3	IVI	angular to subrounded, dark through light gray aphanitic
								volcanics, few granitoids, few light pink quartz clasts.
							-	Sand fraction is coarse through fine grained, fairly well-
								graded through to silt.
								g. saca 1110agri 10 0mi
790		20	75	5	SW	10YR6/3	М	Pale brown sand with gravel. Gravel fraction as above.
						12111070		Sand fraction is coarse through fine, but has larger
								amount of coarse grained material compared to above,
								fairly well-graded, clean.
								, , , , , , , , , , , , , , , , , , , ,

Depth Graphic Estimated % USCS Symbol Color Rxn Sample Description	is angular to with few e grained,
Record R	is angular to with few e grained,
810 10 85 5 SW 10YR6/3 M Pale brown well-graded sand. Gravel fraction is subrounded, dark through light gray aphanites of granitoids. Sand fraction is coarse through fine primarily quartz, few feldspars, fairly well graded saturated.	is angular to with few e grained,
810 10 85 5 SW 10YR6/3 M Pale brown well-graded sand. Gravel fraction is subrounded, dark through light gray aphanites of granitoids. Sand fraction is coarse through fine primarily quartz, few feldspars, fairly well graded saturated.	with few e grained,
subrounded, dark through light gray aphanites of granitoids. Sand fraction is coarse through fine primarily quartz, few feldspars, fairly well graded saturated.	with few e grained,
subrounded, dark through light gray aphanites of granitoids. Sand fraction is coarse through fine primarily quartz, few feldspars, fairly well graded saturated.	with few e grained,
subrounded, dark through light gray aphanites of granitoids. Sand fraction is coarse through fine primarily quartz, few feldspars, fairly well graded saturated.	with few e grained,
subrounded, dark through light gray aphanites of granitoids. Sand fraction is coarse through fine primarily quartz, few feldspars, fairly well graded saturated.	with few e grained,
granitoids. Sand fraction is coarse through fine primarily quartz, few feldspars, fairly well graded saturated.	e grained,
saturated.	
	d, clean,
40 05 5 000 40000 14	
820 10 85 5 SW 10YR6/3 M As above.	
830 70 25 5 GW 10YR6/3 M Pale brown and mottled gravel with sand. Grav	vel fraction
broken up due to drilling, composed of angular	to subrounded
dark gray volcanics, granitoids, arkose, and whi	ite translucent
limestone, and numerous quartz clasts. Sand f	fraction is coarse
through fine grained, fairly clean, saturated.	
10 05 5 0W 10VD0/0 M D + + 0 11 + 1	
838 10 85 5 SW 10YR6/3 M Pale brown sand. Coarse through very fine gra	
well graded, primarily quartz with some dark grallithic grains, white limestone; rust colored iron of	
on some grains; clean. Gravel is polymictic, co	
above.	inposition as
850 10 85 5 SW 10YR6/3 M As above.	
860 15 80 5 SW 10YR6/3 M Pale brown sand with gravel. As above, with m	
860 15 80 5 SW 10YR6/3 M Pale brown sand with gravel. As above, with m	
grained sand and a slightly larger graver fraction	11.
870 95 5 SW 10YR6/3 M Pale brown well-graded sand, coarse through fi	ine grained,
well-graded through to minor silt fraction; prima	
dark gray volcanics, some epidote, and numero	ous grains of
white translucent limestone; clean.	
880 95 5 SW 10YR6/3 M As above.	
880 95 5 SW 10YR6/3 M As above.	
890 95 5 SW 10YR6/3 M As above.	
900 70 25 5 GW 10YR6/3 M Pale brown gravel with sand. Gravel fraction is	ongular.
900 70 25 5 GW 10YR6/3 M Pale brown gravel with sand. Gravel fraction is due to breakage during drilling. Primarily quarts	
aphanitic volcanics, and granitoids with few lime	
clasts. Sand fraction is coarse through fine gra	
quartz-biotite, quartz-feldspar grains; clean.	

Project	t Name:	Phelps Dodge S Estimated %		dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-1C
Depth	Graphic	Es	timat	ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
910		20	75	5	SW	10YR6/3	М	Pale brown sand with gravel. Gravel fraction angular to
								subrounded, composition as above. Sand fraction is coarse
	ı							though fine grained, fairly well graded, clean, saturated.
200	i	40	0.5		0)4/	10)/D0/0		
920	,	10	85	5	SW	10YR6/3	S	Pale brown sand. Gravel fraction as above. Sand fraction
	i							is coarse through very fine grained, primarily quartz, with
								dark gray aphanitic volcanic lithic grains. Fairly well- graded, clean.
	i							graded, dean.
930			90	10	SW-SM	10YR6/3	S	Pale brown well graded sand, coarse through fine grained,
	i				011 0	10111070		composed primarily of quartz with lesser dark gray volcanic
	i							and limestone lithic grains, few feldspar and green epidote
	i							grains; well-graded through to silt fraction.
940		5	85	10	SW-SM	10YR6/3	S	As above.
	i.							
	,							
950	ı	5	85	10	SW-SM	10YR6/3	S	As above.
	i							
060	i		00	10	CIVI CIVI	10VD6/2	S	Dolo bysum wall graded cond coarse through fine grained
960	ı		90	10	SW-SM	10YR6/3	3	Pale brown well-graded sand, coarse through fine grained, primarily quartz with lesser dark gray volcanics, and few
	i.							arkose, granitoid, limestone, epidote and feldspar grains;
								fairly clean.
	i							lany doan.
970			90	10	SW-SM	10YR6/3	S	As above.
	i							
	ı							
980	i		90	10	SW-SM	10YR6/3	S	As above.
	i							
4000	,				0144 611	10\1000		
1000		10	80	10	SW-SM	10YR6/3	S	Pale brown well-graded sand with silt. Gravel fraction broken by
								drilling, angular to subrounded, primarily quartz with dark
								gray aphanitic volcanics, few granitoid and arkose clasts.
\vdash		-						Sand is coarse through fine grained, primarily quartz with lesser limestone and dark volcanic lithic grains, and few
								feldspar grains. About 50% of clasts are granitoid derived,
	i.							10% volcanic, and 40% arkose, sandstone, and siltstone.
	ļ							1070 volumilo, and 4070 andose, samusione, and sinsione.
1010			75	20	SM	10YR6/3	S	Pale brown clayey, silty sand. Sand fraction is medium to
.5.5	l,		. 0		2		Ť	very fine grained, primarily quartz with dark colored
	•							volcanics, few feldspar, epidote and calcite grains; rust
	li I							colored iron oxide stain on surface of some grains. Clay
								fraction sticky, cohesive, possibly occurring as thin
								interbeds.
1020			85	15	SM	10YR6/3	S	Pale brown silty sand. As above without clay; sand is
								more coarse grained, ranging form very coarse to fine
							<u> </u>	grained; fairly well-graded.

Project	Name:	Phelps Dodge S Estimated %		ierrita Miti	gation Orde	r	Boring No.: MO-2007-1C	
	Graphic	Es		ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR		FI	Symbol	Color	Rxn	Gumple Description
1030	į.		85	15	SM	10YR6/3	S	As above, with several clay balls.
	ı							
	,							
1040	,		85	15	SM	10YR6/3	S	As above. Sand is about 30% arkose, sandstone, and sea
1010	ī		- 00		Olvi	101110/0		green siltstone particles as coarse angular fragments, 25%
								angular fine to coarse volcanic grains, and 50% subangular
								to subrounded quartz, quartz-biotite, and quartz-feldspar
								grains.
	ī							
1050			85	15	SM	10YR6/3	S	Pale brown silty sand. Sand fraction is coarse through fine
	Ī							grained, primarily quartz with dark colored aphanitic
	,							volcanic lithic grains, white translucent calcite, few grains
	į							of arkose, epidote, and brick red colored aphanite. Several small balls of soft plastic clay. Fairly well graded through
	Ī							to silt.
1060			85	15	SM	10YR6/3	S	As above, with no clay.
1000	į				0	10111070	<u> </u>	no above, marrie day.
1070	ı		85	15	SM	10YR6/3	S	As above.
	,							
	i							
1000	,		85	15	SM	10YR6/3	-	As also a Also to FOO/ of the according wants and area its
1080	,		00	15	SIVI	10110/3	S	As above. About 50% of the sand is quartz and granitic- derived grains, 40% arkose, sandstone and siltstone, and
								15% gray volcanic grains.
	,							1070 gray voicamo gramo.
1090			80	20	SM	10YR6/3	S	As above.
	ī							
	,							
4400	,		00	20	CNA	40VDC/2		Analous
1100	ī		80	20	SM	10YR6/3	S	As above.
	Ī							
1110			80	20	SM	10YR6/3	S	As above.
4100					011	40)/50/6		
1120			80	20	SM	10YR6/3	S	As above.
1130			80	20	SM	10YR6/3	S	As above. Material is very consistent. Sand particles are 80%
								arkose, sandstone and few sea green siltstone lithic grains;
								15% quartz and quartz-biotite grains; and 5% volcanic grains.
								Coarsest grains are angular sandstone, siltstone, with trace
								amounts of fine oxidized pyrite.

Project	Name:	Phelps Dodge S Estimated %			ierrita Miti	gation Orde	•	Boring No.: MO-2007-1C
Depth	Graphic	Es	timat	ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
1140			80	20	SM	10YR6/3	S	As above.
	ī							
1150	,		80	20	SM	10YR6/3	S	As above.
	ı							
	·							
1100	,		90	20	CM	40VDC/2	-	As above. Condita 400/ avents and avents histita 400/
1160			80	20	SM	10YR6/3	S	As above. Sand is 10% quartz and quartz-biotite, 10% gray volcanic grains, 80% sedimentary particles including
	i							arkose, sandstone with oxidized pyrite, greenish siltstone,
								and limestone.
	,							
1170	i.		75	25	SM	10YR6/3	S	Pale brown silty sand. Sand fraction is medium to very
	1							fine grained with abundant quartz grains, lesser calcite, and
								dark colored volcanic lithic grains; fairly well-graded through
								to silt fraction.
1180	ı		75	25	SM	10YR6/3	S	As above. About 5% granitic and free quartz grains, 15%
	,							gray volcanics, 80% arkose and related sediment grains, and
	ı							trace chert.
1100	,		75	25	CNA	40VDC/2	_	As all and
1190			75	25	SM	10YR6/3	S	As above.
	ı							
1200	,		75	25	SM	10YR6/3	S	As above. Coarse and some medium sand size particles
1200	·		- ' -		Oivi	101110/0	_	are angular to subangular, 85% arkose, siltstone and
	ı							sandstone, 10% dark gray aphanite, and 5% quartz with
	1							very fine biotite.
1210		10	65	25	SM	10YR6/3	S	Pale brown silty sand with 10% gravel. Gravel fraction is
	ı							angular to subrounded, broken up in the process of drilling.
								Mostly fine quartz sandstone, arkose, sea green siltstone,
	Ī							with lesser aphanitic gray volcanic, and granitoids. Sand
	,							fraction is comprised of about 5% quartz grains, many
	į							with intergrown biotite specks, 15% dark gray aphanitic
								volcanics, and 80% sedimentary lithic grains including arkose and siltstone with rare epidote and fine oxidized pyrite, and
								clean fine grained sandstone. Quartz +/- biotite grains are
								generally finer and sub-rounded compared to the coarser
								angular to subangular lithic particles. Few thin calcite
	•							veinlet chips.
	•							·
1215		10	65	25	SM	10YR6/3	S	As above, but with a higher percentage (15%) of quartz
								and quartz-biotite grains.
1220		10	65	25	SM	10YR6/3	S	As above. Sample is dominantly sedimentary lithic
								particles with rare feldspar porphyry and granite in the gravel
	•							fraction. Sand fraction is about 75% arkose, siltstone and
								fine sandstone, 10% quartz and quartz-biotite fine biotite grains,
								10% dark gray aphanitic volcanic grains. Sand grains are angular
								to subrounded. Angular grains are mostly sedimentary and volcanic lithic fragments and the quartz +/- biotite subangular to
								subrounded.
								Drilling has slowed to about one foot per hour.
								Straining flad diomod to about one root per flour.

Project	Name:	Phelp	s Do	dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-1C
Depth	Graphic	Es	timat	ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Cample Description
1230		5	75	20	SM	10YR6/3	S	Pale brown silty sand. Sand fraction is coarse throught fine
								grained, well graded, primarily quartz lith some calcite,
								dark gray volcanics, light green fine grained arkose, few
								granitoids.
1240		5	75	20	SM	10YR6/3	S	As above.
1243								Bedrock. Fine grained arkose, interpreted to be part of the
								Angelica Arkose.
	,							
1250						10YR5/4	S	Bedrock. Sample is largely chips of gray fine grained
								arkose.
1260						10YR5/4	S	As above. TD = 1260' bls.

HYDRO GEO CHEM, INC.

Geologic Boring Log

			ig Lo	<i>'</i> '				Boring No.: MO-2007-2
	Project N	ame.	Pholo	s Dod	ne Sierrita	Mitigation (Order	Project No.: 78300
					ation and \		Ji uci	Driller: Jeff Burris
	an at Bori				anon and v	, , , , , , , , , , , , , , , , , , , 		ADWR Registration No.: 55-906765
	a at D0111	y _0(Janoi I.					Drilling Equipment: GEFCO Speedstar 50K
								Drilling Method: RC Air and Mud Rotary
								Bit Type/Size: Tricone, 9-7/8 inch
								Total Borehole Depth: 740 feet
								Casing Depth: 685 feet
								Screened Interval: 520-680 feet
								Screen slot size: 0.050 inch
								Filter pack type: Tacna No. 8
								Top of Casing Elevation:
								Land surface Elevation:
								Date/Time Started: 3/14/07 8:30
								Date/Time Completed: 3/29/07 11:32
					T18S, R13			Logged by: Warren Thompson
	_attitude:					111 01 19.47	1	Checked by: Kim Wilson
	Graphic		stimate		USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	·
0		20	50	30	SM	7.5YR5/4	M	Brown silty sand with gravel, few cobbles up to 6" in
								diameter. Gravel fraction is subangular to rounded. Sand fraction is coarse to very fine grained, well graded through
								to silt fraction. Alluvial mix, dry. Moderate reaction to HCL.
								To sill fraction. Alluvial filix, dry. Moderate reaction to HCL.
5		20	30	50	SM	7.5YR5/4	М	As above, with greater clay content. Sample exhibits
								slight plasticity when wet; cohesive when dry. Gravel
								fraction composed of granitic fragments, quartz, trace
								volcanics. Sand fraction is mostly quartz with some
								feldspar, quartz-biotite, trace epidote, and up to 0.5%
								fine to extremely fine grained magnetite crystals.
								Moderate reaction to HCL.
10		20	30	50	ML	7.5YR5/3	S	Brown sandy silt with gravel and clay. Sample material
								very ground up; gravel fraction partially inferred based
								on drill performance. Gravel fraction granitic. Sand
								fraction is coarse to very fine grained, mostly quartz
								with lesser feldspar, fine to extremely fine magnetite
-								crystals, trace epidote. Slight to moderate plasticity when wet; cohesive when dry.
								Strong reaction to HCL.
								onong reaction to FIGE.
20		20	30	50	ML	7.5YR6/4	S	As above. Gravel fraction ground up due to drilling.
					2			Sample is a slurry due to much water injected down
								hole. Sand fraction is very coarse to very fine, fairly
								well graded through to silt fraction.

Projec	ct Name:	Phelp	s Do	dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-2
	Graphic		timat		USCS	Munsell	HCI	
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
30		45	45	10	SW-SM	7.5YR6/3	М	Light brown sand with silt and gravel. Gravel fraction is
								angular to subrounded, ground up in drilling process, few
								cobbles present in formation, composed of granitoids,
								abundant sandstone and arkosic sandstone with little
								epidote and common oxidized disseminated pyrite. Sand
								fraction is coarse to fine grained, well graded through to
								silt fraction, mostly quartz and quartz-feldspar grains, with
								magnetite. Caliche coatings, moderate reaction to HCL.
40		45		_	CVA	7.5VD0/0	14/	Links have a green all a good with many all years little alls
40		45	50	5	SW	7.5YR6/3	W	Light brown gravelly sand with gravel, very little silt. Gravel fraction includes feldspar porphyry with silicified
								groundmass and oxidized disseminated pyrite, sericitized
-								granite, granite with chlorite, epidote, oxidized pyrite.
								Sand is quartz, quartz -feldspar, quartz-magnetite, and fine
								magnetite. Weak reaction to HCL.
								magnetite. Weak reaction to HoL.
50		30	50	20	SM	7.5YR6/3	S	Light brown silty sand with gravel, as above, with greater
30			- 50		CIVI	7.01110/0	۲	silt content. Gravel fraction ground up due to drilling,
							H	mixed granitoids with hydrothermal alteration, sandstone,
								chert, and limestones. Sand fraction is very coarse
								through fine grained, well graded through to
								silt. Very strong reaction to HCL
60		30	65	5	SW	7.5YR7/2	W	Pinkish-gray sand with gravel. Gravel fraction ground up,
								comprised of volcanics, granite, rare arkose. Sand fraction
								is mostly quartz with lesser pink and white feldspars,
								and small amounts of magnetite; coarse through very fine
								grained, well graded. Very weak reaction to HCL.
70		30	65	5	SW	7.5YR7/2	W	As above; gravel fraction includes medium to dark gray
								aphanitic volcanic, small fragments of dark limestone,
								light colored sandstone, quartz, chert, and granitoids.
								Weak reaction to HCL.
80		30	60	10	SW-SM	7 EVD7/2	0	Cond with ailt and grovel. As above, but with higher ailt
80		30	60	10	200-2101	7.5YR7/2	S	Sand with silt and gravel. As above, but with higher silt content and greater reactivity to HCL. Strong reaction to
								HCL.
								HOL.
90		30	55	10	SW-SM	7.5YR6/4	S	Light brown sand with silt and gravel. Gravel fraction has
							Ť	abundant light colored granite with very fine grained
								biotite, and granite with chlorite and disseminated fine
								pyrite. Some limonite staining on surface of sand grains.
								Strong reaction to HCL.
100		5	90	5	SW	7.5YR6/4	М	Light brown sand, coarse to very fine grained, well
								graded, with moderately strong limonite stain, little silt.
								Moderate reaction to HCL.
110						no sample		Driller reports intercepting clay layer; but difficult to
								distinguish from drilling mud.
							-	

Depth Graphic (F) Log (R SA F1 Symbol Color National Color Nationa	Projec	ct Name:	Phelp	s Do	dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-2
120 25 66 10 SW-SM 7.5VR6/3 N Light brown gravelly sand with silt. Gravel fraction broken up from drilling action; angular to subrounded, mix of grantic clasts with silica-epidete-pytrie alteration and medium to dark gray aphanites. Sand fraction is coarse to fine grained, well graded, with moderately strong limonite stain on grain surfaces. No reaction to HCL. 130	Depth	Graphic	Es	timat	ed %	USCS	Munsell	HCI	Samula Deceription
broken up from drilling action; angular to subrounded, mix of grantic class with silica-epidote-pyrite identition and medium to dark gray aphanites. Sand fraction is coarse to fine griende, will graded, with moderately strong limonite stain on grain surfaces. No reaction to HCL. 130 15 85 5 SW 7.5YR6/2 M Pinkish gray sand with gravel. Less gravel and slit than previous interval. Gravel includes granitic clasts with sericle alteration and oxidized pyrite, and dark gray imastones. Moderate reaction to HCL. 140 15 75 10 SW-SM 7.5YR6/3 M Sand with silt and gravel. Less gravel and slit than previous interval. Gravel includes granitic clasts with sericle alteration and oxidized pyrite, and dark gray imastones. Moderate reaction to HCL. 140 15 75 10 SW-SM 7.5YR6/3 M Sand with silt and gravel. Class with gravel imastones. Moderate reaction with HCL. 150 30 65 5 SW 7.5YR6/4 N Light brown sand with gravel. Gravel fraction broken by diffilling, primarily light colored granite and sandstone, with some light to dark gray aphanitic clasts. Silica-epidote-with colored sandstone/bleached arkose clasts. No reaction to HCL. 160 26 65 10 SW-SM 7.5YR6/4 W Light brown sand with silt and gravel. As above, with a slight increase in silt content and very weak reaction to HCL. 27 75 5 SW 7.5YR6/4 N Light brown sand with gravel. Gravel fraction broken due to drilling, composed of granite containing fresh disseminated pyrite. Sand fraction consists of light colored silicate grains, granitic fragments, dark aphanites; is consistent smooth drilling indicates homogeneous formation. Granite with silica-pyrite-series of light colored silicate grains, granitic fragments, dark aphanites, is consistent smooth drilling indicates homogeneous formation. Granite with silica-pyrite-series choiced alteration in gravel fraction. No reaction to HCL. 20 75 5 SW 7.5YR6/4 N As above. Consistent smooth drilling indicates homogeneous formation in gravel fraction. No reaction to HCL. 20 75 5 SW 7.5YR6/4 N As above. Consistent smooth drilling indi	(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
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and medium to dark gray aphanites. Sand fraction is coarse to fine grained, well graded, with moderately strong limonite stain on grain surfaces. No reaction to HCL. 130 15 85 5 SW 7.5YR6/2 M Pinkish gray sand with gravel. Less gravel and slit than previous interval. Gravel includes granitic classrs with senciel alteration and oxidized pyrite, and dark gray limestones. Moderate reaction to HCL. 140 15 75 10 SW-SM 7.5YR6/3 M Sand with silt and gravel. Lest provide stain surfaces. No reaction to HCL. 150 30 65 5 SW 7.5YR6/4 N Light brown sand with minor gravel and slit, as above with slightly higher slit fraction. Moderate reaction with HCL. 150 30 65 5 SW 7.5YR6/4 N Light brown sand with gravel. Gravel fraction broken by drilling, grmarily light colored granite and sandstone, with some light to dark gray aphanitic clasts. Silica-epidote-chilorite-oxidized pyrite larget action in granite primers; fine oxidized pyrite in light colored sandstone/bleached arkose clasts. No reaction to HCL. 160 25 65 10 SW-SM 7.5YR6/4 W Light brown sand with gravel. As above, with a slight increase in silt content and very weak reaction to HCL. 170 20 75 5 SW 7.5YR6/4 N Light brown sand with gravel. Gravel fraction broken due to drilling, composed of granite containing fresh disseminated pyrite. Sand fraction consists of light colored silicate grains, granitic tragments, dark aphanites: is coarse to fine grained, well graded, clean. No reaction to HCL. 180 20 75 5 SW 7.5YR6/4 N As above. Consistent smooth drilling indicates homogeneous formation. Granite with silica-pyrite-sericle-chlorite alteration in gravel fraction. No reaction to HCL. 20 75 5 SW 7.5YR6/4 N As above. Gravel fraction includes granite with pervasive silicitication and dark gray aphanitic volcanic clasts. No reaction to HCL. 20 75 5 SW 7.5YR6/4 N As above. Gravel fraction includes granite with pervasive silicitication and dark gray aphanitic volcanic clasts. No reaction to HCL. 20 76 5 SW 7.5YR6/4 Silty sand, with clay intebeds from 208-212, and sma									
Coarse to fine grained, well graded, with moderately storog limonite stain on grain surfaces. No reaction to HCL.									
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previous interval. Gravel includes princin clasts with serticise alteration and oxidized pyrite, and dark gray limestones. Moderate reaction to HCL. 15 75 10 SW-SM 7.5YR6/3 M Sand with silt and gravel. Light brown sand with minor gravel and silt, as above with slightly higher silt fraction. Moderate reaction with HCL. 150 HCL. 150 30 65 5 SW 7.5YR6/4 N Light brown sand with gravel. Gravel fraction broken by drilling, primarily light colored granite and sandstone, with some light to dark gray aphanitic clasts. Silica-epidote-chlorite-doxidized pyrite in light colored granite and sandstone, with some light to dark gray aphanitic clasts. Silica-epidote-chlorite-doxidized pyrite in light colored sandstone/bleached arkose clasts. No reaction to HCL. 160 25 65 10 SW-SM 7.5YR6/4 W Light brown sand with gravel. As above, with a slight increase in silt content and very weak reaction to HCL. 170 20 75 5 SW 7.5YR6/4 N Light brown sand with gravel. Gravel fraction broken due to drilling, composed of granite containing fresh disseminated pyrite. Sand fraction consists of light colored silicate grains, granitic fragments, dark aphanites; is coarse to fine grained, well graded, clean. No reaction to HCL. 180 20 75 5 SW 7.5YR6/4 N Same as above. No reaction to HCL. 190 20 75 5 SW 7.5YR6/4 N As above. Consistent smooth drilling indicates homogeneous formation. Granite with silica-pyrite-sericite-chlorite alteration in gravel fraction. No reaction to HCL. 200 20 75 5 SW 7.5YR6/4 N As above. Cravel fraction includes granite with pervasive silicitication and dark gray aphanitic volcanic clasts. No reaction to HCL. 201 30 SM 7.5YR6/4 Silty sand, with clay intebeds from 208-212, and small amount of gravel., as indicated by drill performance. Sand is similar to above consisting of well-graded fine to coarse grained light colored silicates. Gravel fraction									
sericite alteration and oxidized pyrite, and dark gray limestones. Moderate reaction to HCL. 15 75 10 SW-SM 7.5YR6/3 M Sand with silt and gravel. Light brown sand with minor gravel and silt, as above with slightly higher silt fraction. Moderate reaction with HCL. 30 65 5 SW 7.5YR6/4 N Light brown sand with gravel. Gravel fraction broken by drilling, primarily light colored granite and sandstone, with some light to dark gray aphanitic clasts. Silica-epidote-chlorite-oxidized pyrite alteration in granite fragments; fine oxidized pyrite in light colored sandstone/bleached arkose clasts. No reaction to HCL. 25 65 10 SW-SM 7.5YR6/4 W Light brown sand with gravel. As above, with a slight increase in silt content and very weak reaction to HCL. 170 20 75 5 SW 7.5YR6/4 N Light brown sand with gravel. Gravel fraction broken due to drilling, composed of granite containing fresh disseminated pyrite. Sand fraction consists of light colored silicate grains, granitic fragments, dark aphanites; is coarse to fine grained, well graded, clean. No reaction to HCL. 180 20 75 5 SW 7.5YR6/4 N Same as above. No reaction to HCL. 20 75 5 SW 7.5YR6/4 N Same as above. No reaction to HCL. 20 75 5 SW 7.5YR6/4 N Same as above. No reaction includes granite with silica-pyrite-sericite-chlorite alteration in gravel fraction. No reaction to HCL. 20 75 5 SW 7.5YR6/4 N As above. Consistent smooth drilling indicates homogeneous formation. Granite with silica-pyrite-sericite-chlorite alteration in gravel fraction. No reaction to HCL. 20 75 5 SW 7.5YR6/4 N As above. Consistent smooth drilling indicates homogeneous formation. Granite with silica-pyrite-sericite-chlorite alteration in gravel fraction. No reaction to HCL. 20 75 5 SW 7.5YR6/4 N Samoev. Gravel fraction includes granite with pervasive silicification and dark gray aphanitic volcanic clasts. No reaction to HCL. 20 75 5 SW 7.5YR6/4 Sity sand, with clay intebeds from 208-212, and small amount of gravel, as indicated by drill performance. Sand is similar to above consisting of well-g	130		15	85	5	SW	7.5YR6/2	M	
Imestones. Moderate reaction to HCL.									·
140 15 75 10 SW-SM 7.5YR6/3 M Sand with silt and gravel. Light brown sand with minor gravel and silt, as above with slightly higher silt fraction. Moderate reaction with HCL. 30 65 5 SW 7.5YR6/4 N Light brown sand with gravel. Gravel fraction broken by drilling, primarily light colored granite and sandstone, with some light to dark gray aphanitic clasts. Silica-epidote-chilorite-oxidized pyrite in light colored sandstone/bleached arkose clasts. No reaction to HCL. 25 65 10 SW-SM 7.5YR6/4 W Light brown sand with silt and gravel. As above, with a slight increase in silt content and very weak reaction to HCL. 170 20 75 5 SW 7.5YR6/4 W Light brown sand with gravel. Gravel fraction broken due to drilling, composed of granite containing fresh disseminated pyrite. Sand fraction consists of light colored silicate grains, granitic fragments, dark aphanites; is coarse to fine grained, well graded, clean. No reaction to HCL. 180 20 75 5 SW 7.5YR6/4 N Same as above. No reaction to HCL. 20 75 5 SW 7.5YR6/4 N Same as above. No reaction to HCL. 180 20 75 5 SW 7.5YR6/4 N As above. Consistent smooth drilling indicates homogeneous formation. Grante with silica-pyrite-sericlorist alteration in Grante with silica-pyrite-sericlorist alteration in Grante with silica-pyrite-sericlorist alteration in Grante with spready silicification and dark gray aphanitic volcanic clasts. No reaction to HCL. 20 75 5 SW 7.5YR6/4 N As above. Gravel fraction includes granite with pervasive silicification and dark gray aphanitic volcanic clasts. No reaction to HCL. 20 75 5 SW 7.5YR6/4 Silty sand, with clay intebeds from 208-212, and small amount of gravel, as indicated by drill performance. Sand is similar to above consisting of well-graded fine to coarse grained light colored silicates on coars									
Light brown sand with minor gravel and silt, as above with slightly higher silt fraction. Moderate reaction with HCL. 30 65 5 SW 7.5YR6/4 N Light brown sand with gravel. Gravel fraction broken by drilling, primarily light colored granite and sandstone, with some light to dark gray aphanitic clasts. Silica-epidote-chlorite-oxidized pyrite alteration in granite fragments; fine oxidized pyrite in light colored sandstone/bleached arkose clasts. No reaction to HCL. 160 25 65 10 SW-SM 7.5YR6/4 W Light brown sand with silt and gravel. As above, with a slight increase in silt content and very weak reaction to HCL. 170 20 75 5 SW 7.5YR6/4 N Light brown sand with gravel. Gravel fraction broken due to drilling, composed of granite containing fresh disseminated pyrite. Sand fraction consists of light colored silicate grains, granitic fragments, dark aphanites; is coarse to fine grained, well graded, clean. No reaction to HCL. 180 20 75 5 SW 7.5YR6/4 N Same as above. No reaction to HCL. 180 20 75 5 SW 7.5YR6/4 N Same as above. No reaction to HCL. 20 75 5 SW 7.5YR6/4 N As above. Consistent smooth drilling indicates residue-cholorite alteration in gravel fraction. No reaction to HCL. 20 75 5 SW 7.5YR6/4 N As above. Gravel fraction includes granite with pervasive slitication and dark gray aphanitic volcanic clasts. No reaction to HCL. 20 75 5 SW 7.5YR6/4 N As above. Gravel fraction includes granite with pervasive slitication and dark gray aphanitic volcanic clasts. No reaction to HCL.									limestones. Moderate reaction to HCL.
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200 75 5 SW 7.5YR6/4 N As above. Gravel fraction includes granite with pervasive silicification and dark gray aphanitic volcanic clasts. No reaction to HCL. 208 10 70 20 SM 7.5YR6/4 Silty sand, with clay intebeds from 208-212, and small amount of gravel., as indicated by drill performance. Sand is similar to above consisting of well-graded fine to coarse grained light colored silicates. Gravel fraction									
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208 10 70 20 SM 7.5YR6/4 Silty sand, with clay intebeds from 208-212, and small amount of gravel., as indicated by drill performance. Sand is similar to above consisting of well-graded fine to coarse grained light colored silicates. Gravel fraction				, 5		211	7.101110/7	T	
208 10 70 20 SM 7.5YR6/4 Silty sand, with clay intebeds from 208-212, and small amount of gravel., as indicated by drill performance. Sand is similar to above consisting of well-graded fine to coarse grained light colored silicates. Gravel fraction									
small amount of gravel., as indicated by drill performance. Sand is similar to above consisting of well-graded fine to coarse grained light colored silicates. Gravel fraction									
small amount of gravel., as indicated by drill performance. Sand is similar to above consisting of well-graded fine to coarse grained light colored silicates. Gravel fraction									
small amount of gravel., as indicated by drill performance. Sand is similar to above consisting of well-graded fine to coarse grained light colored silicates. Gravel fraction	208		10	70	20	SM	7.5YR6/4		Silty sand, with clay intebeds from 208-212, and
Sand is similar to above consisting of well-graded fine to coarse grained light colored silicates. Gravel fraction									
coarse grained light colored silicates. Gravel fraction									
									<u> </u>

Projec	ct Name:	Phelp	s Do	dge S	ierrita Miti	gation Order	•	Boring No.: MO-2007-2
Depth	Graphic	Es	timat	ed %		Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	
220		20	75	5	SW	7.5YR5/3	М	Brown sand with gravel. Gravel fraction broken up due to
								drilling; primarily comprised of light colored granitic
								material with silica-biotite-oxidized pyrite alteration and
								dark gray limestones. Sand fraction is coarse through fine
								grained, mostly white to translucent silicates with limonite
								surface stain. Fairly clean, moderate reaction to HCL.
230		20	75	5	SW	7.5YR5/3	М	As above. Consistent drilling suggests homogenous
								lithology. Gravel fraction consists of granitic clasts with
								locally strong silicification and weak oxidized pyrite.
								Moderate reaction to HCL.
240		20	75	F	CW	7.EVDC/2	N /	As above alight color above to light brown Crovel
240		20	75	5	SW	7.5YR6/3		As above, slight color change to light brown. Gravel fraction is hydrothermally altered granite clasts showing
								silicification, secondary biotite, and epidote after feldspar.
								ισιασμαι.
250		20	75	5	SW	7.5YR6/3	N	Light brown sand with gravel. Gravel fraction is dominantly
200			, 5	0	5**	7.0110/0	1.4	granitic with fine biotite, chlorite, epidote alteration with
								rare andesite, arkose and limestone. Sand fraction is well
								graded, coarse to fine grained, primarily quartz and
								feldspar with minor limonite stain, and rare dark gray
								aphanite. No reaction to HCL.
260		20	75	5	SW	7.5YR6/3	W	As above, except for very weak reaction to HCL.
								,
270		20	75	5	SW	7.5YR6/3	W	As above, epidote, fine grained oxidized pyrite in granitic
								clasts.
280		10	85	5	SW	7.5YR6/3	W	Cond. As shows with decreased ground fraction
200		10	65	5	SVV	7.51K0/5	VV	Sand. As above, with decreased gravel fraction
290		10	85	5	SW	7.5YR6/3	W	As above, except sand fraction is coarse through medium
								grained with very little fine grained material.
300								As above.
240		4.5	00		CIAI	7.5//00/0	N A	Light happy a pool with group Climbth and the manner
310		15	80	5	SW	7.5YR6/3		Light brown sand with gravel. Slightly greater gravel
<u> </u>								fraction, comprised largely of granite and porphyritic
-								volcanics, both with silicification. Moderate reaction to HCL.
								I IOL.

Projec	ct Name:	Phelp	s Do	dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-2
	Graphic		timat			Munsell	HCI	Commis Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
319		20	60	20	SC	7.5YR5/3	М	Brown clayey sand with gravel. Gravel fraction broken up
								due to drilling. Gravel fraction is primarily light colored
								andesite and arkose, with lesser dark colored limestones,
								granite, quartz and feldspar with weak to moderate
								limonite stain. Sand fraction is mostly quartz and feldspar,
								coarse through medium grained with little fines. Clay
								fraction is as interbedded material in layers up to 6 " thick
								based on drill rig response. Moderate reaction to HCL.
004		40	0.5	-	0)4/	7.5\/D5/0		D 1 0 1 11 11 11 11 11 11 11 11 11 11 11
324		10	85	5	SW	7.5YR5/3	М	Brown sand. Sand with little gravel and very little fines.
								fairly clean; composition as above. Moderate reaction to HCL.
								nol.
330		10	85	5	SW	7.5YR5/3	М	As above.
330		10	00	J	344	7.511(3/3	IVI	A3 above.
340		10	85	5	SW	7.5YR5/3	М	As above; gravel fraction is largely granitic with lesser
0.10		-10	-00		OVV	7.01110/0	101	gray quartz and arkose.
								gray quarte and antooo.
350		10	85	5	SW		М	As above; dominantly granitic clasts with variable epidote
								and weak potassium feldspar alteration; with lesser
								volcanic and rare arkose clasts. Sand fraction is quartz and
								feldspar, with small amounts of mafic grains.
360		10	85	5	SW	7.5YR5/3	W-M	Dark brown sand. Sand fraction primarily light
								colored silicates including translucent and opaque
								quartz often with fine biotite intergrowths, feldspar, and
								little epidote; medium to coarse grained, moderately well
								graded. Gravel is primarily granitic with rare chert and
								metasediments. Weak to moderate reaction to HCL.
		4.0			0147	\	10/ 10	
370		10	85	5	SW	7.5YR5/3	VV-IVI	As above.
380		10	85	5	SW	7.5YR5/3	\A/_ N /I	As above.
300		10	00	5	344	7.5113/5	V V - IVI	AS above.
390		10	85	5	SW	7.5YR5/3	W-M	As above; gravel fraction is granitic with lesser silicified
- 000						7.01710/0	**	volcanic clasts. Weak to moderate reaction to HCL.
								Trouble transfer to the desired to t
400		10	85	5	SW	7.5YR6/3	W	Light brown sand. Gravel fraction small, broken up
								in drilling, consists of variably hydrothermally altered
								granitic, volcanic and metasedimentary material. Sand
								fraction is well graded, coarse to medium grained, mostly
								quartz, quartz-feldspar intergrowths with little fine grained
								magnetite. Weak reaction to HCL.
410		10	65	25	SM	10YR6/2	S	Light brownish gray silty sand. Gravel and sand fraction
								compositions as above. Silt fraction reacts strongly to
								HCL.

Projec	ct Name:	Phelp	s Do	dge S	ierrita Miti	gation Orde	•	Boring No.: MO-2007-2
Depth	Graphic	Es	timat	ed %	USCS	Munsell	HCI	Samula Deceription
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
420		20	65	15	SM	10YR6/2	S	Light brownish gray gravelly silty sand. As above but
								with larger gravel fraction and less silt.
430		10	80	10	SW	7.5YR6/3	W	Light brown sand. Minor amount of gravel and silt. Sand
								fraction is fine to coarse grained, well graded, composed
								of abundant quartz, small granite fragments, and few dark
								gray aphanitic grains. Gravel fraction is silicified
								granitoids.
440		40	00	40	0)4/	7. F)/D.F./0		December 1 Minus and 1 and 1 to Occupit the Control
440		10	80	10	SW	7.5YR5/3	S	Brown sand. Minor gravel and silt. Gravel fraction is
								andesite, arkose, and coarse feldspar.
								Sand fraction is quartz and feldspar,
								with little dark aphanitic material, well graded, very fine to coarse grained with moderate limonite stain. Strong
								reaction to HCL
								TEACHOIT TO LITTLE
450		15	75	10	SW-SM	10YR7/2	S	Light gray sand with gravel. Little silt. Gravel fraction
400		10	70	10	OVV OIVI	1011(7/2		comprised of hydrothermally altered granite, volcanics
								and arkose. Sand is quartz and feldspar with few dark
								aphanitic grains, coarse to very fine grained, well graded.
								Strong reaction to HCL
460		30	65	5	SW	10YR7/2	М	Light gray sand with gravel. Little silt. As above with
								increase in gravel fraction. Moderate reaction to HCL.
								-
470		30	65	5	SW	10YR7/2	М	As above. Little return from cyclone discharge.
480		20	CE	F	CM	10YR7/2	N /	Light gray sand with gravel. Gravel fraction is granitoids.
400		30	65	5	SW	10117/2	IVI	quartz, feldspar and few dark gray limestone clasts. Sand
								fraction is coarse to fine grained but primarily medium
								through fine grained; moderately well graded throughout
								size range. Moderate reaction to HCL.
								Sizo rango. Modorato rodottori to FIOL.
490		30	65	5	SW	7.5YR6/3	W	As above, except sand is mostly coarse through medium
				-				grained. Sand is primarily quartz. Weak reaction to HCL.
								, , ,
500		30	65	5	SW	7.5YR6/3	W	As above, with an increase in the amount of black
								volcanic material. Sand is quartz, quartz-feldspar, quartz-
								epidote, and small arkose particles, trace magnetite.
								Weak reaction to HCL.
F40		40		_	OD.	40\/D0/0	14/	Dolo bysour good with agreed with benefit as a destillar
510		40	55	5	SP	10YR6/3	W	Pale brown sand with gravel, with boulders and cobbles.
								Sand is primarily coarse grained, angular to rounded,
-								comprised primarily of quartz and granitoids with some epidote and black aphanite. Very weak reaction to HCL.
								epidole and black aphanile. Very weak reaction to not.
							l .	

Projec	ct Name:	Phelp	s Do	dge S	ierrita Miti	gation Order		Boring No.: MO-2007-2
	Graphic		timat			Munsell	HCI	
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
520		20	70	5	SW	10YR6/3	W	Sand with gravel, as above. Sand is medium to fine
								grained, moderately well graded. Weak reaction to HCL
530		10	85	5	SW	10YR6/3	S	Pale brown sand. Sand fraction is medium
								through fine grained, angular to well-rounded, moderately
								well graded; comprised primarily of quartz, some
								granitoids and dark aphanites. Moderate limonite stain.
								Strong reaction to HCL.
								First water at 535'.
F40		20	60	40	CVA/ CNA	40VDC/E	-	Dala harawa aand with ailt and arawal
540		30	60	10	SW-SM	10YR6/5	S	Pale brown sand with silt and gravel.
								Gravel fraction very broken up due to drilling; angular to subrounded granitoids, quartz, arkose,
								dark to medium gray volcanic clasts. Moderate limonite
								stain. Oxidized pyrite and epidote in arkose clasts.
								Sand fraction is very coarse through fine grained, fairly
								well graded, angular to subrounded. Silt fraction reacts
								strongly to HCL. Saturated.
								on ongry to From Outdivided.
550		30	60	10	SW-SM	10YR6/3	S	As above. Gravel fraction composed of mostly arkose
- 555					011 0111	101110,0		with lesser amount of granitoids; arkose contains oxidized
								oxidized pyrite and epidote.
								Strong reaction to HCL.
								<u> </u>
560		30	60	10	SW-SM	10YR6/3	М	Pale brown sand with silt and gravel. Little silt, as above.
								Moderate reaction to HCL.
570		00	70	4.0	0)4/ 014	10)/50/0		
570		20	70	10	SW-SM	10YR6/2		Light brownish gray sand with silt and gravel. Gravel
								fraction broken up in drilling, angular to subrounded.
								Sand fraction is coarse through fine grained, moderately well graded, primarily quartz with medium to dark gray
								aphanitic volcanics, few granitoids, moderate iron oxide
								stain, saturated. Silt fraction reacts moderately with HCL.
								Gravel is arkose and granitoids with epidote and limonite
								alteration.
								anoranorn.
580		20	70	10	SW-SM	10YR6/2	М	As above.
590		60	30	10	GM	mottled	W	Gravel with silt and sand.
								Sandy, cobbly gravel with 10% silt and clay. Mottled
								coloration. Cobbles are inferred by drill response. Cobble
								and gravel fraction is angular to subrounded, primarily
								arkose, granitoids and volcanics, with chlorite, epidote,
								alteration and limonite stain. Sand fraction is subangular
								to rounded, primarily quartz, little feldspar and epidote,
								some iron oxide staining, clean. Few small interbeds of
								soft sticky silt and clay. Weak reaction to HCL. Saturated.

Projec	ct Name:	Phelp	s Do	dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-2
Depth	Graphic	Es	timat	ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
600		60	30	10	GM	mottled	W	As above.
610		40	50	10	SW-SM	mottled	W	Sand with silt and gravel, mottled coloration. Gravel has
								abundant arkose clasts and light gray soft rhyolite
								fragments (quartz phenocrysts in aphanitic groundmass)
								which might reflect presence of volcanic tuff layer within
								the basin fill sequence.
					0111			
620		30	60	10	SW-SM	10YR6/3	W	Light yellowish brown sand with silt and gravel. Gravel
								fraction broken up in drilling, primarily arkose, granitoids
								dark gray volcanics and medium gray soft rhyolite.
								Sand fraction is mostly quartz, with few dark gray
								aphanitic volcanics, epidote, scarce dark gray limestone grains, angular to subrounded, limonite stained, fairly well
								grains, angular to subrounded, innonite stained, rainly well graded from very coarse through medium grained,
								saturated. Weak reaction to HCL.
								Saturated. Weak reaction to FIGE.
630		20	70	10	SW-SM	mottled	W	As above, without rhyolite component and less iron oxide
- 555					011 0	motiou		stain.
640		30	60	10	SW-SM	10YR6/3	W	Pale brown sand with silt and gravel. Gravel fraction is soft
								gray rhyolite with lesser arkose and granite clasts. Sand
								fraction is primarily quartz with some dark volcanic and
								few dark gray limestone grains, coarse through fine
								grained, fairly well graded, saturated. Very weak reaction
								to HCL.
					0111			
650		20	70	10	SW-SM	mottled	W	As above.
660		20	70	10	SW-SM	10YR6/3	М	As above except for absence of gray rhyolite in gravel
							<u> </u>	fraction. Moderately strong limonite stain, saturated.
								Moderate reaction to HCL. Granitic content greater than
								arkose in gravel fraction.
670		70	25	5	GW	mottled	М	Dark to light gray mottled gravel with sand. Gravel clasts
								angular to subrounded, abundant arkose fragments
								showing silicification, epidote, chlorite, and
								oxidized pyrite alteration; dark gray volcanic and few
								limestone clasts also present in gravel fraction. Sand
							<u> </u>	fraction is mostly coarse grained. Saturated.
								Moderate reaction to HCL
690		60	20	10	CIAL CIA	mottlad	۱۸/	Crovel with alove and cond. Crovel angular to subarraular
680		60	30	10	GW-GM	mottled	W	Gravel with clay and sand. Gravel angular to subangular,
							-	gray aphanites, quartz, and abundant flat angular arkose chips with epidote and oxidized pyrite. Arkose
								bedrock estimated at 687' based on drilling characteristics.
								Sand fraction is very coarse through fine grained fairly
								well graded. Saturated. Weak reaction to HCL.
								g.adod. Odtaratod. Would roudifor to HOL.
					I .		l	

Projec	t Name:	Phelp	s Do	dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-2
Depth	Graphic	Es		ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Cample Description
690	bedrock					mottled	W	Angular arkose chips, grayish brown, greenish brown.
								Clay fraction moderately plastic, sticky, cohesive.
								Weak reaction to HCL overall; clay moderately reactive.
								Angelica Arkose bedrock.
	,							
700	ļ					2.5Y5/2	W	Grayish brown arkose, fine-grained sandstone, greenish
								gray siltstone weakly metamorphosed. Disseminated fine-
	ļ							grained oxidized pyrite, occasional chloritic laminae,
								epidote matrix in some sandy layers.
	,							Very weak reaction to HCL.
740	ļ					0.5\/5/0	10/	A section of
710	•					2.5Y5/2	W	As above.
720	•					2.5Y5/2	W	As above, fine sandstone, arkose, siltstone chips.
								Small amount of black aphanitic material.
	•							
700						0.5\/5/0	101	
730						2.5Y5/2	W	As above, with more fine grained arkosic sandstone and
	•							fewer siltstone chip. Oxidized fine grain disseminated
	ŀ							pyrite, epidote, little sericite alteration.
740	ŀ					2.5Y5/2	W	As above, grayish brown angular chips of arkose.
7 70	ŀ					2.010/2	V V	Few dark gray volcanic and granite fragments with
								epidote-sericite alteration, probably representing a pebbly
								layer in the arkose as observed in surface outcrops of the
								formation.

HYDRO GEO CHEM, INC.

Geologic Boring Log

Jeu	ogic B	.J. 111	<i>y </i>	<u>y</u>				Boring No.: MO-2007-3C	
	Project N	ame:	Phelp	s Dod	lge Sierrita	Mitigation C	Order	Project No.: 78300	
Dri					ation and V			Driller: Arnold Lamon	
	an at Borir			•				ADWR Registration No.: 55-906817	
		5						Drilling Equipment: GEFCO Speedstar 50K	
								Drilling Method: RC Air and Mud Rotary	
								Bit Type/Size: Tricone, 9-7/8 in.	
								Total Borehole Depth: 1430 feet	
								Casing Depth: 1130 feet	
								Screened Interval: 1160 - 1320 feet	
								Depth to Water/Date: 355.20 feet 7/5/07	
								Screen slot size: 0.05 inches	
								Filter pack type: No. 8 Tacna	
								Top of Casing Elevation:	
								Ground surface Elevation: 2910.09 feet amsl	
								Date/Time Started: 4/25/07 10:52	
								Date/Time Completed: 5/13/07 15:36	
	Township	, Rang	ge, Sed	ction:	T18S, R13	E, 2bcc		Logged by: Warren Thompson	
	_attitude:		_			110 59 39.83		Checked by: Kim Wilson	
	Graphic		stimate			Munsell	HCI	·	
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description	
1		30	70	0	SW	2.5YR4/3	W	Reddish brown, sand with gravel. Gravel is fine, sub-	
								rounded to subangular, composed of chloritic diorite,	
								and arkose and granite with variable silicification,	
								epidote and chlorite alteration. Sand fraction is primarily	
								with lesser feldspar and minor chlorite, well-graded.	
								Weak reaction to HCL. (0'-870' drilled with 6"button bit)	
			70	_	0)4/	7. EVDE/4	14/	Description of the second with second Operation is	
5		30	70	0	SW	7.5YR5/4	W	Brown well-graded sand with gravel. Gravel fraction is	
								subrounded to subangular, comprised if arkose and	
								granite. Sand fraction is mostly quartz with lesser	
								feldspar and various mica flakes. Fine biotite commonly attached to quartz grains.	
								attached to quartz grains.	
10		30	70	0	SW	7.5YR5/4	W	Brown subrounded well-graded sand with gravel.	
								Gravel fraction is limonite stained granite and arkose.	
								Sand fraction as above.	
								Weak reaction to HCL.	
15		20	90	0	SW	7.5YR5/4	W	Brown subrounded to subangular well-graded sand with	
10			50	0	011	7.011(0)-	**	gravel. Gravel is limonitic granite. Sand is quartz, feldspa	ır
								small granitic particles, fine magnetite. Strong limonite	α,
								stain. Weak reaction to HCL.	
20		50	50	0	GW	10YR6/4	W	Light yellowish brown subrounded to subangular	,
								well-graded sand with gravel. Gravel fraction comprised of	
								limonitic granite and arkose with weak epidote-silica alter-	
							<u> </u>	ation. Sand fraction is primarily quartz with lesser feldspa	r
								and very fine biotite and chlorite grains.	
30		5	90	5	SW	7.5YR5/4	М	Brown sand. Gravel fraction is	
30			90		344	7.0110/4	IVI	minor, clasts to 1/2" maximum diameter, angular to	
								subrounded. Sand fraction is coarse through medium	
								grained with 5% fines; composed primarily of quartz with	
							<u> </u>	moderate limonite stain with few dark colored mafic	
								volcanic grains. Loose, dry. Slight to moderate reaction	
								with HCL.	
		l					1	WILLIOE.	

Project	Name:	Phelps Dodge Si		errita Mitig	ation Order		Boring No.: MO-2007-3C		
Depth	Graphic		timate	_	USCS	Munsell	HCI	Sample Description	
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	·	
40			10	90	ML	10YR6/2	W	Light brownish gray silt. Sand fraction is very	
								fine grained, loose, powdery, dry. Sand is composed of	
								quartz, little feldspar, and traces of biotite.	
								Weak reaction to HCL.	
50			85	15	SM	10YR5/2	М	Grayish brown silty sand. Sand fraction is coarse through	
30			00	10	OIVI	101113/2	IVI	fine grained, moderately well-graded, primarily quartz with	
								few pink granite fragments, arkose and fine grained	
								volcanic aphanites, traces of epidote, oxidized pyrite and	
								chlorite. Moderately strong iron oxide stain on quartz	
								grains. Dry. Moderate reaction with HCL.	
60		trace	60	40	SM	10YR6/4	S	Light yellowish brown silty sand. Sand fraction is fine to	
								very fine grained, powdery, dry; composed primarily of	
								quartz with traces of specular hematite and octahedral	
								magnetite. Gravel fraction is granite with epidote, chlorite	
							-	and iron oxides. Strong reaction to HCL.	
70		troca	75	20	CM	10\/D0/4	-	Light vallouish brown silts and Conditrostics is seems	
70		trace	75	20	SM	10YR6/4	S	Light yellowish brown silty sand. Sand fraction is coarse through fine grained, moderately well-graded, primarily	
								quartz and quartz-fine chlorite, with lesser feldspar, little	
-								little epidote and magnetite. Strong reaction to HCL.	
								intile epidote and magnetite. Strong reaction to FIGE.	
80		trace	30	70	ML	10YR6/3	S	Pale brown sandy silt. Sand fraction is coarse through	
			- 00	. 0			Ť	very fine grained. <5% gravel clasts, composed of granite	
								and arkose. Sand is quartz with lesser feldspar, trace	
								epidote and iron oxide grains.	
								Strong reaction to HCL.	
90		trace	10	90	ML	10YR6/3	S	Pale brown clayey silt with sand. Sand fraction is very	
								grained, powdery. Sand is primarily quartz and grains of	
								decomposed granite, feldspar and trace magnetite.	
								Strong reaction to HCL.	
100			10	00	N/I	10YR6/3	-	As above	
100			10	90	ML	10186/3	S	As above.	
110			10	90	ML	10YR6/3	S	As above. Drillers are injecting a considerable amount of	
								water to lift material from hole.	
120			15	85	ML	10YR6/3	S	Pale brown clayey silt with sand. Sand fraction is coarse	
								through fine grained but is primarily coarse through	
							1	medium grained, composed mostly of quartz with small	
		\vdash					-	amounts of gray aphanitic material. Fine fraction contains a few clumps of very soft clay. Drillers injecting a lot of	
								water to keep hole clear. Strong reaction to HCL.	
								mater to hoop hole clear. Offering reaction to Hot.	
130			15	85	ML	10YR6/3	S	As above, except that the sand fraction is finer grained,	
100							Ť	ranging from medium to very fine grained.	
								, ,	
140			15	85	ML	10YR6/3	S	As above.	
							1		

	Name:	Phelps Dodge Sierrita Mitigation Order					Boring No.: MO-2007-3C				
	Graphic		timate		USCS	Munsell	HCI	Sample Description			
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn				
150			20	80	ML	10YR6/3	S	As above, slightly higher sand content.			
160			20	80	ML	10YR6/3	S	As above.			
170			20	80	ML	10YR63	S	As above.			
180			30	70	ML	10YR6/3	S	Pale brown sandy clayey silt, as above with increased			
								sand content, sand is coarse to very fine grained. Small			
								lumps of very soft plastic clay. Cuttings in a slurry due to			
								injection of water while drilling. Sand is mostly quartz with minor feldspar, trace epidote and			
								and magnetite. Strong reaction to HCL.			
190			30	70	ML	10YR6/3		As above.			
200			25	75	ML-CL	10YR6/3	S	Pale brown clay and silt with sand. Sand fraction is			
								medium through very fine grained. Clay fraction is as very			
								soft small balls. Sand is quartz, quartz-biotite, quartz-			
								chlorite, lithic arkose grains, mica flakes, trace epidote and magnetite grains.			
								Strong reaction to HCL.			
								5.101.1g 10401101110 110 <u>1</u> 1			
210			25	75	ML-CL	10YR6/3	S	As above, except that sand fraction is slightly less and			
								fine grained.			
220			20	80	ML-CL	10YR6/3	S	Pale brown clay and silt with sand. Sand fraction is coarse			
								through fine grained. Fines are a mix of clays and silt,			
<u> </u>							ļ	primarily very soft, plastic, sticky clay. Strong reaction to			
							-	HCL.			
230			25	75	CL	10YR6/3	S	As above.			
240		trace	25	75	CL-ML	10YR6/3	S	As above. Rare small gravel fragments are arkose and			
								granitic fragments with fine epidote and oxidized pyrite.			
							1				
250			25	75	CL-ML	10YR6/3	S	As above.			

Project	Name:	Phelps Dodge Si			errita Mitig	ation Order		Boring No.: MO-2007-3C
Depth	Graphic		timate	_	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
260			15	85	CL-ML	10YR6/3	S	Pale brown silty clay with sand. Sand fraction is fine
								grained. Clay is soft, plastic, sticky. Strong reaction to
								HCL.
270			10	90	CL-ML	10YR6/3	S	As above, except for slightly less sand.
					022	101110,0		The discret, except for engine) feet earner
280		5	75	20	SM	10YR6/3	S	Pale brown silty sand; little gravel. Sand and gravel
								fractions are mostly quartz with lesser arkose and dark
								gray limestone. Sand fraction is coarse through fine
								grained, moderately well graded through to silty fraction.
								Strong reaction to HCL.
200			20	00	CL MI	10VDC/2	-	Dolo brown clay and ailt mix with cond. Cond fraction is
290			20	80	CL-ML	10YR6/3	S	Pale brown clay and silt mix with sand. Sand fraction is coarse through fine grained. Strong reaction to HCL.
								coarse through line grained. Strong reaction to FIGE.
300			20	80	CL-ML	10YR6/3	S	Pale brown sandy clay and silt. Sand fraction is fine to
								very fine grained. Material is as a slurry due to injection
								of water down hole. Strong reaction to HCL.
310			20	80	CL-ML	10YR6/3	S	As above.
320		5	75	20	SM	10YR6/3	S	Dala brown ailtu aandi traaa grayal Crayal fraction is
320		3	73	20	SIVI	10110/3	3	Pale brown silty sand; trace gravel. Gravel fraction is angular to subrounded arkose, black aphanitic volcanics,
								and pieces of limestone. Sand fraction contains abundant
								quartz with some iron oxide stain on grains, coarse to fine
								grained, moderately well graded. Strong reaction to HCL.
								, , , , , , , , , , , , , , , , , , ,
330		10	70	20	SM	10YR6/3	S	As above, slight increase in gravel fraction.
				-				
0.10			00	00	OL M	40\/D0/0		Dala harry all and alay sale with and O. 14 C.
340			20	80	CL-ML	10YR6/3	S	Pale brown silt and clay mix with sand. Sand fraction is
\vdash								medium to very fine grained. Clay-silt fraction is plastic, sticky and soft. Strong reaction to HCL.
		<u> </u>						Shorty and Soft. Shorty reaction to FIGE.
350			20	80	CL-ML	10YR6/3	S	As above.
360			40	60	CL-ML	10YR6/3	S	As above, except for increase in sand fraction. Sand is
								primarily quartz with lesser amounts of feldspar and little
								epidote, magnetite and chlorite grains. Strong reaction to
								HCL.
		<u> </u>					<u> </u>	

Project	Name:	Phelps Dodge Si		errita Mitig	ation Order		Boring No.: MO-2007-3C	
	Graphic		timate		USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	·
370		10	80	10	SW-SM	10YR6/3	S	Pale brown sand with silt. Gravel fraction is angular to subrounded clasts of diorite and granite with
								silicification and oxidized pyrite. Sand fraction is very
								coarse through fine grained, composed of primarily quartz
								with arkose and lesser gray volcanic and fine grained
								limestone clasts. Strong reaction to HCL
								· ·
380		trace	70	30	SM	10YR6/3	S	Pale brown clayey silty sand. Sand fraction is coarse
								through fine grained, moderately well graded; few (<5%)
								gravel clasts; cohesive, sticky. Strong reaction to HCL.
200		40	75	4.5	CNA	40VDC/2	-	Dala hyayya alayay aility aanad Canadiiyaatian is aaayaa
390		10	75	15	SM	10YR6/3	S	Pale brown clayey silty sand. Sand fraction is coarse through fine grained, moderately well graded through to
								silt. Gravel fraction is angular to subrounded, composed
							1	of arkose with epidote and granite with chlorite and iron
							1	oxides. Sand fraction is quartz and feldspar.
							1	Strong reaction to HCL.
400		trace	30	70	CL-ML	10YR6/3	S	Pale brown sandy silt and clay mix. Sand fraction is fine
								grained. Sample is a slurry due to water injection down
								hole. Gravel is epidotized granite. Sand is largely quartz
								with few epidote, hematite and magnetite grains.
								Strong reaction to HCL.
110					01.141	10) (50)		
410			30	70	CL-ML	10YR6/3	S	As above.
420			30	70	CL-ML	10YR6/3	S	As Above.
430		trace	50	50	SM/CL	10YR6/3	S	Pale brown sand, silt and clay mix with few gravel clasts.
430		liace	50	30	SIVI/CL	10110/3	3	Sand fraction is coarse through fine grained. Cohesive,
								sticky. Strong reaction to HCL.
								oneny. Oneng reasons to rice.
440			30	70	CL-ML	10YR6/3	S	Pale brown sandy silt and clay mix. Sand fraction is fine
								grained.
								Strong reaction to HCL.
450			20	70	CL-ML	10YR6/3	S	As above, except the condification is seems through fine
450			30	70	CL-IVIL	101100/3	3	As above, except the sand fraction is coarse through fine grained Strong reaction to HCL.
							 	First water @ 450'
							1	1 100 1100
							1	
460			40	60	CL-ML	10YR6/3	S	Pale brown sandy clay and silt. Sand fraction is coarse
						•		through fine grained. Strong reaction to HCL.
							1	
470			40	60	CI MI	10YR6/3	-	As above
4/0			40	60	CL-ML	10110/3	S	As above.
							1	

Project	Name:	Phelps Dodge S			errita Mitig	ation Order		Boring No.: MO-2007-3C
	Graphic		timate	ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	
480		5	85	10	SW-SM	10YR6/3	М	Pale brown sand with silt. Sand fraction is very coarse
								through fine grained, moderately well graded. Gravel fraction is angular to subrounded.
								Moderate reaction to HCL.
								Moderate reaction to FIGE.
490		trace	80	20	SM	10YR6/3	M-S	Pale brown silty sand. Sand fraction is coarse to fine
								grained, moderately well graded to silt fraction. Primarily
								quartz with few gray aphanites and limestone grains.
								Rare gravel clasts are altered granite with a little arkose.
								Moderate to strong reaction to HCL.
500			90	10	SM-SW	10YR6/3	М	Sand with silt. As above, except for decrease in silt content.
300			30	10	OIVI-OVV	101110/3	IVI	Odna With Silt. As above, except for decrease in Silt content.
510			90	10	SM-SW	10YR6/3	М	As above.
520		15	75	10	SW-SM	10YR6/3	W	Pale brown sand with silt and gravel. Gravel fraction is
525								angular to subrounded, primarily a mix of quartz, dark to
								light gray aphanitic volcanics, few granitoids, arkose,
								and small amount of limestone. Sand fraction is coarse
								through fine grained, moderately well graded, fairly clean.
								Weak reaction to HCL.
500		45	7.5	40	0)4/ 014	40\/D0/0	14/	As above
530		15	75	10	SW-SM	10YR6/3	W	As above.
540		10	85	5	SW	7.5YR5/3	М	Mottled brown, gray and white sand; minor gravel.
								Sand fraction is primarily coarse grained but ranges from
								very coarse through fine grained, mainly quartz with some
								gray aphanitic volcanics, and a few limestone grains.
								Moderate reaction to HCL.
550		10	85	5	SW	7.5YR5/3	М	As above, but sand much better graded from coarse to
330		10	00	J	- O V V	7.011\0/0	IVI	fine grained.
								Moderate reaction to HCL.
560		20	75	5	SW	mottled	М	Mottled white to black sand with gravel. Gravel fraction is
								angular to subrounded granite and dark aphanitic volcanics.
								Sand fraction is coarse through fine grained, fairly well
								graded, primarily quartz with some fine grained dark gray volcanics. Moderate reaction to HCL.
								VOICATHOS. IVIOUETALE TEACHIOH TO MOL.
570		20	75	5	SW	mottled	М	As above.
1.5							<u> </u>	-

Project	Name:	Phelp	s Doc	lge Si	errita Mitig	ation Order		Boring No.: MO-2007-3C
	Graphic		timate	_	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	
580		10	85	5	SW	10YR5/3	M	As above, except for decrease in gravel fraction.
590		10	85	5	SW	10YR5/3	M	Brown sand. Gravel fraction clasts are up to 2
								inches diameter dark gray aphanitic volcanics and light .
								colored granitoids. Sand fraction is primarily quartz and gray aphanitic grains; moderately strong limonite stain on
								quartz grains. Fairly well graded from very coarse to
								fine grained; clean. Moderate reaction to HCL.
600		25	70	5	SW-SM	10YR5/3	М	Brown sand with gravel. Gravel fraction clasts are a mix of
							-	angular to subrounded quartz, granitoids, volcanic
								aphanites, epidote. Sand is fairly well graded, very coarse through fine grained.
								Moderate to strong reaction to HCL.
								moderate to ottong rousiness to FTOE.
610		25	70	5	SW-SM	10YR5/3	М	As above.
620		25	70	5	SW-SM	10YR5/3	М	As above. Sand fraction is almost entirely quartz with few
020		20	70		OVV OIVI	101110/0	IVI	light through dark gray aphanites.
								3 3 3
		4.0	0.		0)4/	40) (D = /0		
630		10	85	5	SW	10YR5/3	M	Sand. As above, except for decrease in gravel fraction.
640		20	75	5	SW	10YR5/3	М	Brown sand with gravel. Gravel fraction is angular to sub-
								rounded dark gray aphanitic volcanics, some granitoids
								and arkose with a small amount of epidote. Sand fraction
								is coarse through fine grained, fairly well graded, primarily quartz with moderately strong limonitic stain.
								Moderate reaction to HCL.
650		20	75	5	SW	10YR5/3	М	As above.
660		10	85	5	SW	10YR5/3	М	As above except for a decrease in gravel fraction; material
								is finer grained overall.
670		20	75	5	SW	7.5YR5/2	W	Mottled brown sand with gravel. Gravel fraction is angular
670		20	13	J	344	1.01100/2	VV	to subrounded, abundant dark gray to black aphanitic
								volcanics, biotite speckled granitoids, arkose and quartz.
							1	Sand fraction is coarse through fine grained, moderately
								well graded, primarily quartz with some epidote, moderate
						-		to strong limonitic stain, fairly clean. Weak
								reaction to HCL.

Part	Project	Name:	Phelps Dodge Sierrita Mitigation Orde		ation Order	r Boring No.: MO-2007-3C				
10 85 5 SW	Depth	Graphic						HCI	Sample Description	
reaction to HCL has increased. 10	(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description	
10 85 5 SW 7.5YR5/2 W/M As above.	680		10	85	5	SW	7.5YR5/2	W/M		
700 95 5 SW 10YR6/4 W Light yellowish brown sand. Primarily quartz with few gray volcanic aphanites, coarse through fine grained, well graded, clean. Weak reaction to HCL: 10 85 5 SW 10YR6/4 W Sand. As above, but with minor gravel fraction which is comprised of angular to subrounded dark through medium gray volcanics and light granitoids. 720 15 80 5 SW 10YR6/4 W Light yellowish brown sand with gravel. As above, with slight increase in gravel fraction. 730 15 80 5 SW 10YR6/4 W Light yellowish brown sand with gravel. As above, with slight increase in gravel fraction. 740 95 5 SW 10YR6/4 W Light yellowish brown sand, coarse through fine grained, moderately well graded, primarily quartz with some iron oxide stain, clean. Weak reaction to HCL: 750 10 90 SW Mottled W Sand, mottled whites, grays, blacks with a few rust colored clasts. Gravel fraction is angular to sub-rounded granitoids, dark through medium gray volcanic aphanites. Sand fraction is coarse through fine grained, well graded, abundant quartz. Weak reaction to HCL. 760 100 SW 10YR6/3 W Pale brown sand, medium to fine grained, primarily quartz. Some limonitic stain, well graded. Very weak reaction to HCL. 770 15 85 SW Mottled W Sand with gravel, mottled coloration of whites, browns and grays. Gravel fraction is angular to subrounded of granitoids and dark through fine grained, primarily quartz. Some limonitic stain, well graded. Very weak reaction to HCL. 770 18 85 SW Mottled W Sand with gravel, mottled coloration of whites, browns and grays. Gravel fraction is angular to subrounded of granitoids and dark through fine grained, fairly well graded, clean, saturated. Weak reaction to HCL.									reaction to HCL has increased.	
700 95 5 SW 10YR6/4 W Light yellowish brown sand. Primarily quartz with few gray volcanic aphanites, coarse through fine grained, well graded, clean. Weak reaction to HCL: 10 85 5 SW 10YR6/4 W Sand. As above, but with minor gravel fraction which is comprised of angular to subrounded dark through medium gray volcanics and light granitoids. 720 15 80 5 SW 10YR6/4 W Light yellowish brown sand with gravel. As above, with slight increase in gravel fraction. 730 15 80 5 SW 10YR6/4 W Light yellowish brown sand with gravel. As above, with slight increase in gravel fraction. 740 95 5 SW 10YR6/4 W Light yellowish brown sand, coarse through fine grained, moderately well graded, primarily quartz with some iron oxide stain, clean. Weak reaction to HCL: 750 10 90 SW Mottled W Sand, mottled whites, grays, blacks with a few rust colored clasts. Gravel fraction is angular to sub-rounded granitoids, dark through medium gray volcanic aphanites. Sand fraction is coarse through fine grained, well graded, abundant quartz. Weak reaction to HCL. 760 100 SW 10YR6/3 W Pale brown sand, medium to fine grained, primarily quartz. Some limonitic stain, well graded. Very weak reaction to HCL. 770 15 85 SW Mottled W Sand with gravel, mottled coloration of whites, browns and grays. Gravel fraction is angular to subrounded of granitoids and dark through fine grained, primarily quartz. Some limonitic stain, well graded. Very weak reaction to HCL. 770 18 85 SW Mottled W Sand with gravel, mottled coloration of whites, browns and grays. Gravel fraction is angular to subrounded of granitoids and dark through fine grained, fairly well graded, clean, saturated. Weak reaction to HCL.										
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gray volcanic aphanites; coarse through fine grained, well graded, clean. 10 85 5 SW 10YR6/4 W Sand. As above, but with minor gravel fraction which is comprised of angular to subrounded dark through medium gray volcanics and light grantioids. 720 15 80 5 SW 10YR6/4 W Light yellowish brown sand with gravel. As above, with slight increase in gravel fraction. 730 15 80 5 SW 10YR6/4 W Light yellowish brown sand with gravel. As above, with slight increase in gravel fraction. 740 95 S SW 10YR6/4 W Light yellowish brown sand, coarse through fine grained, moderately well graded, primarily quartz with some iron ovide stain, clean. Weak reaction to HCL. 750 10 90 SW Mottled W Sand, mottled whites, grays, blacks with a few rust colored clasts. Gravel fraction is angular to sub-rounded granticids, dark through medium gray volcanics aphanites. Sand fraction is coarse through fine grained, well graded, abundant quartz. Weak reaction to HCL. 760 100 SW 10YR6/3 W Pale brown sand, medium to fine grained, primarily quartz. Very weak reaction to HCL. 770 15 85 SW Mottled W Sand with gravel, mottled coloration of whites, browns and grays. Gravel fraction is angular to sub-rounded of granitoids and dark through medium gray volcanics. Sand fraction is coarse through fine grained, feirly well graded, clean, saturated. Weak reaction to HCL.	030		10	00		344	7.511(3/2	V V / IVI	As above.	
gray volcanic aphanites; coarse through fine grained, well graded, clean. 10 85 5 SW 10YR6/4 W Sand. As above, but with minor gravel fraction which is comprised of angular to subrounded dark through medium gray volcanics and light grantioids. 720 15 80 5 SW 10YR6/4 W Light yellowish brown sand with gravel. As above, with slight increase in gravel fraction. 730 15 80 5 SW 10YR6/4 W Light yellowish brown sand with gravel. As above, with slight increase in gravel fraction. 740 95 S SW 10YR6/4 W Light yellowish brown sand, coarse through fine grained, moderately well graded, primarily quartz with some iron ovide stain, clean. Weak reaction to HCL. 750 10 90 SW Mottled W Sand, mottled whites, grays, blacks with a few rust colored clasts. Gravel fraction is angular to sub-rounded granticids, dark through medium gray volcanics aphanites. Sand fraction is coarse through fine grained, well graded, abundant quartz. Weak reaction to HCL. 760 100 SW 10YR6/3 W Pale brown sand, medium to fine grained, primarily quartz. Very weak reaction to HCL. 770 15 85 SW Mottled W Sand with gravel, mottled coloration of whites, browns and grays. Gravel fraction is angular to sub-rounded of granitoids and dark through medium gray volcanics. Sand fraction is coarse through fine grained, feirly well graded, clean, saturated. Weak reaction to HCL.										
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Weak reaction to HCL.	700			95	5	SW	10YR6/4	W		
Weak reaction to HCL.									· ·	
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Part Circle Cir	Project	Name:	Phelp	os Doo	dge Si	errita Mitig	ation Order		Boring No.: MO-2007-3C
10 90 SW 10YR6/3 W As above except gravel fraction has increased and includes light colored granitoids. Weak reaction to HCL.					_			HCI	
Book	(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
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coarse through fine grained, well graded, fairly clean,	-								primarily quartz, rainy clean. Very weak reaction to HCL.
coarse through fine grained, well graded, fairly clean,			<u> </u>					+	
coarse through fine grained, well graded, fairly clean,									
coarse through fine grained, well graded, fairly clean,	890		5	90	5	SW	10YR6/3	W	Pale brown sand; very little gravel. Sand fraction is
	333							1	
								L	

Project	Name:	Phelp	s Do	dge Si	errita Mitig	ation Order		Boring No.: MO-2007-3C
	Graphic		timate	_	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
900		5	90	5	SW	10YR6/3	W	As above.
910		10	90		SW	10YR6/3	W	Pale brown sand. Gravel fraction is primarily
								fine grained volcanics, limonitic arkose, and quartz.
								Sand fraction is very coarse through fine grained, moderately
								graded, clean.
								Very weak reaction to HCL.
920		25	75		SW	Mottled	W	Sand with gravel, mottled coloration, whites, grays, and
920		23	73		344	Mottled	VV	browns. Gravel fraction is dark through medium gray
								aphanitic volcanics with few granitoids. Sand fraction is
								primarily very coarse through medium grained, moderately
								well graded, clean. Very weak reaction to HCL.
								J .,
930		10	90		SW	10YR6/3	W	Pale brown sand; as above, with smaller gravel
								fraction.
					-		<u> </u>	
940		15	85		SP	10RY6/3	W	Pale brown poorly graded sand with gravel. As above,
								but coarser grained overall. Gravel fraction contains a few
								clasts of brick red fine grained sandstone as well as
								granitic clasts.
950		10	90		SW	10YR6/3	W	Pale brown sand. Gravel is arkose and granite.
930		10	90		344	101110/3	VV	Sand fraction is coarse through fine grained, primarily
								quartz with limonite stain, moderately well graded, clean.
								Weak reaction to HCL.
960		10	90		SW	10YR6/3	W	As above.
 								
070			0.5		0147	40\/D0/0	147	Dele hystyre and access through the second to the second t
970		5	95		SW	10YR6/3	W	Pale brown sand, coarse through fine grained, well graded,
							-	clean. Very weak reaction to HCL.
\vdash								
							1	
980		25	75		SW	Mottled	W	Sand with gravel, mottled whites, medium to dark grays,
							T	browns. Gravel fraction is angular to subrounded, granite,
								medium through dark gray aphanitic volcanics and little
								arkose, abundant quartz and little epidote. Sand fraction
						-		coarse through fine grained, but primarily coarse grained,
								primarily quartz with minor feldspar and trace epidote and
								magnetite; clean. Very weak reaction to HCL.
					<u> </u>	400 (= - 1-	<u> </u>	
990			95	5	SW	10YR6/3	M	Pale brown sand, medium to very fine grained, well graded,
								mostly quartz, little feldspar, with small arkose and few
								volcanic grains, calcite flakes, very fine magnetite grains.
								Loose, clean. Moderate reaction to HCL.
\vdash								
					<u> </u>		I	

Project	Name:	Phelps Dodge Sierrita Mitigation Order				ation Order	Boring No.: MO-2007-3C				
	Graphic		timate		USCS	Munsell	HCI	Sample Description			
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	• •			
1000			95	5	SW	10YR6/3	M	As above, slightly finer grained.			
1010			95	5	SW	10YR6/3	М	As above. Driller reports flowing sand.			
1020			90	10	SW	10YR6/3	М	Pale brown sand, medium to very fine grained, small			
								amount of silt, flowing. Moderate reaction to HCl.			
1030			95	5	SW	10YR6/3	М	As above. Very consistent.			
,,,,,											
1040			O.F.		CW	10VDC/2	N #	As above			
1040			95	5	SW	10YR6/3	M	As above.			
1050			95	5	SW	10YR6/3	М	Pale brown sand, coarse through fine grained, primarily			
								quartz with numerous dark gray aphanitic volcanics, few			
								granitoids, some limonitic staining on grain surfaces. Well graded, fairly clean, loose.			
								Moderate reaction to HCL.			
								moderate reaction to the L.			
1060			90	10	SW	10YR6/3	М	Pale brown sand as above, coarse through very fine			
								grained, primarily medium through very fine grained,			
								loose, clean.			
								Weak to moderate reaction to HCL.			
1070			95	5	SW	10YR6/3	М	Pale brown sand, coarse through fine grained, primarily			
7010								quartz, some dark magnetite-bearing grains, and aphanitic			
								volcanics. Well graded, loose.			
								Moderate reaction to HCL.			
1080			95	5	SW	10YR6/3	М	Pale brown sand as above, with less coarse grained			
1000			30	J	SVV	1011/0/3	IVI	material.			
1090			95	5	SW	10YR6/3	M	Sand as above.			
\vdash											
1100			95	5	SW	10YR6/3	М	Sand as above.			
1110			95	5	SW	10YR6/3	M	Sand as above.			
1110			33	<u> </u>	SVV	101110/3	IVI	Jana as above.			

	Project		Phelps Dodge Sierrita Mitigation Order					·				
1120	Depth								Sample Description			
1130		Log	GR						·			
1140	1120			95	5	SW	10YR6/3	M	Sand as above.			
1140												
1140												
1140												
grained, primarily quartz with lesser dark through light gray aphanitic volcanics, few light green epidote and brick red grains, some surficial limonite stain, well graded, clean. Weak to moderate reaction to HCL.	1130			95	5	SW	10YR6/3	М	Sand as above.			
grained, primarily quartz with lesser dark through light gray aphanitic volcanics, few light green epidote and brick red grains, some surficial limonite stain, well graded, clean. Weak to moderate reaction to HCL.												
grained, primarily quartz with lesser dark through light gray aphanitic volcanics, few light green epidote and brick red grains, some surficial limonite stain, well graded, clean. Weak to moderate reaction to HCL.												
grained, primarily quartz with lesser dark through light gray aphanitic volcanics, few light green epidote and brick red grains, some surficial limonite stain, well graded, clean. Weak to moderate reaction to HCL.												
aphantitic volcanics, few light green epidote and brick red grains, some sufficial limonite stain, well graded, clean. Weak to moderate reaction to HCL.	1140			95	5	SW	10YR6/3	М	Sand as above, continuing pale brown, coarse through fine			
1150									aphanitic volcanics, few light green epidote and brick red			
1150 95 5 SW 10YR6/3 M Sand as above. 1160 95 5 SW 10YR6/3 M Sand as above. 1170 95 5 SW 10YR6/3 M Sand as above. 1180 96 5 SW 10YR6/3 M Sand as above. 1190 97 5 SW 10YR6/3 M Sand as above. 1190 98 5 SW 10YR6/3 M Sand as above. 1200 99 5 5 SW 10YR6/3 M Sand as above.												
1160 95 5 SW 10YR6/3 M Sand as above. 1170 95 5 SW 10YR6/3 M Sand as above. 1180 95 5 SW 10YR6/3 M Sand as above. 1190 95 5 SW 10YR6/3 M Sand as above. 1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above.									clean. Weak to moderate reaction to HCL.			
1160 95 5 SW 10YR6/3 M Sand as above. 1170 95 5 SW 10YR6/3 M Sand as above. 1180 95 5 SW 10YR6/3 M Sand as above. 1190 95 5 SW 10YR6/3 M Sand as above. 1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above.												
1160 95 5 SW 10YR6/3 M Sand as above. 1170 95 5 SW 10YR6/3 M Sand as above. 1180 95 5 SW 10YR6/3 M Sand as above. 1190 95 5 SW 10YR6/3 M Sand as above. 1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above.												
1170 95 5 SW 10YR6/3 M Sand as above. 1180 95 5 SW 10YR6/3 M Sand as above. 1190 95 5 SW 10YR6/3 M Sand as above. 1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above.	1150			95	5	SW	10YR6/3	М	Sand as above.			
1170 95 5 SW 10YR6/3 M Sand as above. 1180 95 5 SW 10YR6/3 M Sand as above. 1190 95 5 SW 10YR6/3 M Sand as above. 1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above.												
1170 95 5 SW 10YR6/3 M Sand as above. 1180 95 5 SW 10YR6/3 M Sand as above. 1190 95 5 SW 10YR6/3 M Sand as above. 1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above.												
1170 95 5 SW 10YR6/3 M Sand as above. 1180 95 5 SW 10YR6/3 M Sand as above. 1190 95 5 SW 10YR6/3 M Sand as above. 1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above.												
1170 95 5 SW 10YR6/3 M Sand as above. 1180 95 5 SW 10YR6/3 M Sand as above. 1190 95 5 SW 10YR6/3 M Sand as above. 1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above.	1160			95	5	SW	10YR6/3	М	Sand as above.			
1180 95 5 SW 10YR6/3 M Sand as above. 1190 95 5 SW 10YR6/3 M Sand as above. 1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above, very consistent. 1220 95 5 SW 10YR6/3 M Sand as above, very consistent.	1100			- 00	Ū	0	101110/0		Suita do aboro.			
1180 95 5 SW 10YR6/3 M Sand as above. 1190 95 5 SW 10YR6/3 M Sand as above. 1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above, very consistent. 1220 95 5 SW 10YR6/3 M Sand as above, very consistent.												
1180 95 5 SW 10YR6/3 M Sand as above. 1190 95 5 SW 10YR6/3 M Sand as above. 1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above, very consistent. 1220 95 5 SW 10YR6/3 M Sand as above, very consistent.												
1180 95 5 SW 10YR6/3 M Sand as above. 1190 95 5 SW 10YR6/3 M Sand as above. 1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above, very consistent. 1220 95 5 SW 10YR6/3 M Sand as above, very consistent.	4470			0.5	_	0)4/	40\/D0/0		One day above			
1190 95 5 SW 10YR6/3 M Sand as above. 1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above, very consistent. 1220 95 5 SW 10YR6/3 M Sand as above, very consistent.	1170			95	5	SW	10YR6/3	IVI	Sand as above.			
1190 95 5 SW 10YR6/3 M Sand as above. 1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above, very consistent. 1220 95 5 SW 10YR6/3 M Sand as above, very consistent.												
1190 95 5 SW 10YR6/3 M Sand as above. 1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above, very consistent. 1220 95 5 SW 10YR6/3 M Sand as above, very consistent.												
1190 95 5 SW 10YR6/3 M Sand as above. 1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above, very consistent. 1220 95 5 SW 10YR6/3 M Sand as above, very consistent.												
1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above, very consistent. 1220 95 5 SW 10YR6/3 M Sand as above.	1180			95	5	SW	10YR6/3	М	Sand as above.			
1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above, very consistent. 1220 95 5 SW 10YR6/3 M Sand as above.												
1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above, very consistent. 1220 95 5 SW 10YR6/3 M Sand as above.												
1200 95 5 SW 10YR6/3 M Sand as above. 1210 95 5 SW 10YR6/3 M Sand as above, very consistent. 1220 95 5 SW 10YR6/3 M Sand as above.												
1210 95 5 SW 10YR6/3 M Sand as above, very consistent. 1220 95 5 SW 10YR6/3 M Sand as above.	1190			95	5	SW	10YR6/3	М	Sand as above.			
1210 95 5 SW 10YR6/3 M Sand as above, very consistent. 1220 95 5 SW 10YR6/3 M Sand as above.												
1210 95 5 SW 10YR6/3 M Sand as above, very consistent. 1220 95 5 SW 10YR6/3 M Sand as above.												
1210 95 5 SW 10YR6/3 M Sand as above, very consistent. 1220 95 5 SW 10YR6/3 M Sand as above.	1200			0.E	5	C/V/	10/DE/2	N A	Sand as above			
1220 95 5 SW 10YR6/3 M Sand as above.	1200			30	J	311	10110/3	IVI	Janu as abuve.			
1220 95 5 SW 10YR6/3 M Sand as above.												
1220 95 5 SW 10YR6/3 M Sand as above.												
1220 95 5 SW 10YR6/3 M Sand as above.							1.51.45 - 1-	<u> </u>				
	1210			95	5	SW	10YR6/3	M	Sand as above, very consistent.			
	1220			95	5	SW	10YR6/3	М	Sand as above.			
1230 95 5 SW 10YR6/3 M Sand as above.												
1230 95 5 SW 10YR6/3 M Sand as above.							·					
1230 95 5 SW 10YR6/3 M Sand as above.												
	1220			0.E	5	C/V/	10/DE/2	N A	Sand as above			
	1230			30	ິບ	SVV	10110/3	IVI	Janu as abuve.			
								L				

Project	Name:			errita Mitigation Order			Boring No.: MO-2007-3C	
	Graphic	Es	timate	ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	<u>FI</u>	Symbol	Color	Rxn	·
1240			95	5	SW	10YR6/3	М	Sand as above.
					_			
1250			95	5	SW	10YR6/3	M	Sand as above.
1260			95	5	SW	10YR6/3	М	Sand as above.
1270			95	5	SW	10YR6/3	М	Sand as above.
							-	
1280			95	5	SW	10YR6/3	М	Sand as above.
1290			95	5	SW	10YR6/3	M	Sand as above.
1290			95	5	SVV	10110/3	IVI	Sand as above.
					2111			
1300			95	5	SW	10YR6/3	M	Sand as above. Continuing polymictic sand with primarily
								quartz grains, with feldspar, quartz-biotite, magnetite, trace epidote; sand sized particles of fine grained sandstone,
								dark gray volcanic with epidote-replaced feldspar
								phenocrysts. Occasional caliche cement.
1010			0.5		014/	10) (D 0 (0	L.	
1310			95	5	SW	10YR6/3	М	Sand as above.
1320			95	5	SW	10YR6/3	M	Sand as above.
							-	
							 	
1330			95	5	SW	10YR6/3	М	Sand as above.
							1	
1340			95	5	SW	10YR6/3	М	Sand as above.
1350			95	5	SW	10YR6/3	М	Sand as above.
		l	l l				I.	

Project		Phelp	os Doc	dge Si	errita Mitig	ation Order		Boring No.: MO-2007-3C
	Graphic		timate		USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	
1360			95	5	SW	10YR6/3	М	Sand as above.
1370			95	5	SW	10YR6/3	М	Sand as above.
1380			95	5	SW	10YR6/3	М	Sand as above.
1390			95	5	SW	10YR6/3	М	Sand as above.
4.400			0.5	-	0)4/	40\/D0/0		One day above
1400			95	5	SW	10YR6/3	М	Sand as above.
1410			95	5	SW	10YR6/3	М	Sand as above.
1420			95	5	SW	10YR6/3	М	Sand as above.
1420			33	3	344	101110/3	IVI	Cana as above.
1422	bedrock					10YR6/3	S	Bedrock; Pale brown fine grained calcite-cemented arkosic
								sandstone, composed of fine grained quartz with little
								feldspar, oxidized and trace fresh fine grained disseminated pyrite, non-magnetic gray metallic, limonitic microfractures,
								traces of epidote.
1430								As above.
		-						
		-						
		-						
		l		<u> </u>			<u> </u>	

HYDRO GEO CHEM, INC.

Geologic Boring Log

Geor	ogic B	UIIII	y LO	<u>y</u>					
ļ	B					B # 1 - =		Boring No.:	MO-2007-4C
						Mitigation C	rder		Project No.: 78300
				Explor	ation and W	Vells			Jeff Burris
Site Pla	an at Borir	ng Loc	ation:					ADWR Registration No.:	55-906765
									GEFCO Speedstar 50K
									RC Air and Mud Rotary
									Tricone, 9-7/8 in.
								Total Borehole Depth:	
								Casing Depth:	
								Screened Interval:	
								Depth to Water/Date:	
								Screen slot size:	
									No. 8 Tacna Gravel
								Top of Casing Elevation: Ground surface Elevation:	2022 40 feet emel
								Date/Time Started:	
								Date/Time Completed:	
	Townshir	Pan	70 S0	ction:	T18S, R13	E 1500d			
<u> </u>	_attitude:					110 59 45.45		Logged by/Date: Checked by/Date:	
	Graphic		stimate		USCS	Munsell	HCI	j	
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample	e Description
(Ft) 0	Log	20	70	10	SW-SM	2.5YR5/4	S	Brown well-graded sand with	s cilt and graval
	•	20	70	10	344-3141	2.5113/4	3	Brown well-graded sand will	i siit ahu giavei.
20								As above.	
	•							/ G above.	
	•								
	•								
	•								
	•								
30	•	trace	90	10	SW-SM	7.5YR5/4	S	Brown well-graded sand with	n silt. Sand is medium through
	•								d through to silt fraction, loose,
	•							dry. Gravel clasts are subro	
	•							volcanics.	<u> </u>
	•								
40	•		30	70	ML	7.5YR5/4	М	Brown sandy silt. Sand fract	ion is very fine grained.
	•							Material is loose, dry.	
	•							Drillers began water injection	n to stabilize hole at 40'.
50		trace	40	60	ML	7.5YR3/6	М	Brown sandy silt. As above,	
								fraction and sand is coarser	
								subangular sericite-altered g	ranitics and gray feldspar
								porphyry.	
	•						ļ <u></u>		
60		trace	60	40	SM	10YR6/4	M	Light brown silty sand, mediu	
								moderately well-graded throu	
	•							Gravel clasts are gray feldsp	ar porphyry.
	•								
70			20	70	N A I	7 EVD0/4	P 4	Light brown accedes all Commit	liquom, fina arained lases
70	•		30	70	ML	7.5YR6/4	М	Light brown sandy silt. Sand	ı is very iine grained, ioose.
	•								
	•								
-	•								
							1		

Project	Name:	Phelp	s Do	dge Si	errita Mitig	gation Order		Boring No.: MO-2007-4C
Depth	-			ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	
80		25	50	25	SM	10YR6/4	M	Light brown silty sand with gravel. Gravel fraction is mixed,
								angular to subrounded, composed of quartz, granitoids, reddish brown to dark gray feldspar porphyry volcanics, and
								fine grained arkosic sandstone with epidote alteration.
								Sand fraction is coarse through fine grained, fairly well-
								graded through to silt fraction.
		70	00	40	014/ 014	44. 1		
90		70	20	10	GW-GM	mottled	М	Gravel with silt and sand; cobbly. Mottled coloration, clasts are feldspar porphyry volcanics, fine grained dark and light
								gray and green epidotized arkose, Loose. Sand fraction is
								as above. Moderate reaction to HCL is confined to sand and
								silt fraction.
					0111			
100		70	25	5	GW	mottled	S	Gravel with sand, mottled reds, grays, and whites; mix of angular
								to rounded clasts of quartz, abundant feldspar porphyry, granitoids, volcanics, fine grained sandstone, limestone;
								epidote in some clasts. Sand fraction is very coarse to fine
								grained, well-graded.
110		70	25	5	SW	mottled	S	As above.
120		35	60	5	GW	7.5YR5/4	М	Brown sand with gravel. Gravel as above, sand fraction
								is coarse through very fine grained, moderately well graded,
								loose.
130		10	80	10	SW-SM	7.5YR5/4	W	Brown sand with silt. As above, with less gravel and
130		10	00	10	344-3141	7.511(3/4	VV	increased sand and silt fractions.
								The sacra can a ca
140		trace	80	20	SM	7.5YR5/4	W	Brown silty sand. Sand fraction is medium through very
								fine grained, fairly well-graded through to silt fraction. Gravel is red-brown feldspar porphyry and fine grained
								arkosic sandstone.
								arrosio sariastorio.
150			20	80	ML	7.5YR5/4	W	Brown silt with sand, very soft. Sand fraction is fine
								grained.
							-	
160			20	80	ML	7.5YR5/4	W	As above.
100			20	50	IVIL	7.011\0/4	V V	, 10 db0v0.
170		-	20	80	ML	7.5YR5/4	W	As above,
\vdash								
\vdash								
180			20	80	ML	7.5YR5/4	W	As above.

Project	Name:	Phelps Dodge Sierrita Miti				gation Order		Boring No.: MO-2007-4C
Depth				ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	
190			20	80	ML	7.5YR5/4	W	As above.
200			00	70		7.5\/D5/4		
200		trace	30	70	ML	7.5YR5/4	S	Brown sandy silt. Sand fraction is coarse to very fine grained. Gravel fraction is angular to subrounded granitic
								clasts with limonite and little epidote, and fine grained
								quartz sandstone.
210			70	30	SM	7.5YR5/4	S	Brown silty sand. Gravel fraction and coarse sand is
								angular to subrounded, mostly granitic with lesser fine grained sandstone and reddish volcanic with feldspar
								phenocrysts. Sand is quartz, granitic grains, and very
								fine grained magnetite.
220			50	50	SM/ML	7.5YR5/4	M/S	Brown sandy silt. Mixed sand and silt, sand fraction is
								medium to very fine grained but primarily fine to very fine
							-	grained; soft.
230			30	70	ML	7.5YR5/4	М	Brown sandy silt, with small amount of clay. As above,
								with clay and less sand.
240			10	90	ML	7.5YR5/4	М	Brown silt with clay. Sand is fine to very fine grained.
				- 00				Samples are sticky, cohesive, very soft. Driller is adding a
								lot of water to keep the hole open.
250			10	90	ML-CL	7.5YR5/4	M	As above, with slightly more clay.
260			10	90	ML-CL	7.5YR5/4	М	As above.
270			10	90	ML-CL	7.5YR5/4	М	As above.
\vdash								
280			10	90	ML-CL	7.5YR5/4	М	As above.
						-		_
290			10	90	ML-CL	7.5YR5/4	М	As above.
230			10	30	IVIL-OL	1.011\0/4	IVI	no abovo.
000			4.0	00	M' C'	7.575574		
300			10	90	ML-CL	7.5YR5/4	M	As above.

Project	Name:	Phelps Dodge Sierrita			errita Mitig	gation Order		Boring No.: MO-2007-4C
	Graphic			ed %	USCS	Munsell	HCI	
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
310		trace	10	90	ML-CL	7.5YR5/4	М	As above. Trace gravel fraction is granitic.
320			10	90	ML-CL	7.5YR5/4	M	As above.
330		trace	15	85	ML	7.5YR5/4	M/S	Brown silt with sand and clay. Sand fraction is minor,
330		liace	13	00	IVIL	7.511(3/4	IVI/O	coarse through very fine grained. Sticky, cohesive.
								Trace gravel fraction is granitic.
								Trace graver fraction is grantice.
340			15	85	ML	7.5YR5/4	M/S	As above.
350								missed sample
360		10	30	60	ML	7.5YR5/4	M/S	Sandy silt. Gravel fraction is fine, up to 1/2" diameter clasts,
								comprised of gray feldspar porphyry, epidote-altered
								granitoid, and fine grained arkosic sandstone with
								quartz veinlet.
370		10	30	60	ML	7.5YR5/4	M/S	Proug conducilt on above. Crovel is medium grained
370		10	30	00	IVIL	7.5185/4	IVI/3	Brown sandy silt, as above. Gravel is medium grained granitic intrusive and arkose. One gravel size chunk of
								caliche-cemented sand.
								canonic comonica sana.
380	first water	10	25	65	ML	7.5YR5/4	M/S	Brown sandy silt. As above, slight decrease in sand fraction.
								Gravel clasts are epidote-hematite altered porphyry.
								First water at 380' below surface.
390		10	30	60	ML	7.5YR5/4	W	Brown sandy silt. Some clay, sticky, cohesive, very soft.
								Gravel is granitic with epidote replacing feldspar; trace
								caliche-cemented sand. Sand is mostly quartz with lesser
								felspar and little fine grained magnetite.
400		7.	00	4.0	0144 011	7 5 / 5 - / 4		
400		70	20	10	GW-GM	7.5YR5/4	М	Gravel with silt and sand, brown. Gravel fraction is angular
								to subrounded, primarily light colored granitic clasts with
							-	some sandstone, arkose, and limestone clasts. Sand
							-	fraction is coarse through fine grained, loose.
410		70	20	10	GW-GM	7.5YR5/4	М	As above.
+10		70	20	10	O 4 4 - G 141	7.01110/4	IVI	no above.
420		20	40	40	SM	7.5YR5/4	М	Brown silty sand with gravel; some clay. Gravel fraction is
						2.1120.	T	angular to subrounded, primarily granitic with some fine
								grained arkosic sandstone with epidote, and volcanics.
								Sand fraction is coarse through fine grained, quartz and
								granitic-derived grains, trace very fine grained magnetite.
								, , ,
<u>-</u>				•			•	

Project	Name:	Phelps Dodge Sier			errita Mitig	gation Order		Boring No.: MO-2007-4C
Depth	-		timat		USCS	Munsell	HCI	Sample Description
(Ft) 430	Log	GR 5	SA 25	FI 70	Symbol ML	Color 7.5YR5/4	Rxn M	·
430		5	23	70	IVIL	7.3113/4	IVI	Brown sandy silt and clay. As above, except only trace gravel. Sticky, cohesive; sand fraction is medium through
								fine grained.
440		5	25	70	ML	7.5YR5/4	М	As above.
110			20	70	IVIL	7.011(0/1	141	710 db0v0.
450		5	25	70	ML	7.5YR5/4	N /	As above
450		5	23	70	IVIL	7.0110/4	М	As above.
460		40	30	30	GM	7.5YR5/4	М	Brown silty gravel with sand. Gravel fraction is fine grained,
								angular to subrounded, primarily granitic and fine grained volcanics, limonite stain on some surfaces. Sand fraction
								is coarse through fine grained, but primarily coarse grained.
470		50	40	10	GW-GM	7.5YR5/4	M	Brown gravel with silt and sand. As above, but with
								increased sand and gravel relative to fines.
480		50	40	10	GW-GM	7.5YR5/4	М	As above.
490		30	60	10	SM	7.5YR5/4	М	Brown sand with silt and gravel. Gravel fraction as above;
								sand fraction is coarse through fine grained, primarily
								coarse grained.
500		50	40	10	GM	10YR6/4	М	Light yellowish brown gravel with silt and sand. Gravel
- 555					· · · ·	101110/1		fraction is angular to subrounded, granitic, dark gray fine
								grained limestone, volcanics, and arkose. Sand fraction is
								coarse through fine grained, primarily coarse grained.
							-	
510		10	50	40	SM	10YR6/4	W	Light yellowish brown silty sand, with 10% gravel. Gravel
								is primarily angular to subrounded volcanic clasts; sand
						-		fraction is coarse through fine grained.
520		10	70	20	SM	10YR6/3	W	Pale brown silty sand. Small gravel fraction as above; sand
320		10	70	20	JIVI	101110/3	٧٧	fraction is coarse through very fine grained, fairly well-
								graded through to silt fraction.
530		20	60	20	SM	10YR6/3	W	Pale brown silty sand with gravel as above
330		20	- 50	20	JIVI	101110/3	٧٧	Pale brown silty sand with gravel, as above.
		<u> </u>					<u> </u>	

Project	Name:	Phelp	s Do	dge Si	errita Mitig	ation Order		Boring No.: MO-2007-4C
Depth				ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	·
540		20	60	20	SM	10YR6/3	W	As above.
550		20	00	20	CM	40\/DC/0	N 4	Data have a discount of the second of the second for affective in figure
550		20	60	20	SM	10YR6/3	М	Pale brown silty sand with gravel. Gravel fraction is fine, angular to rounded, primarily granitic and volcanic, with
								some fine grained limestone. Sand fraction is coarse through
								fine grained.
500			0.5	4.5	014	40\/D0/0		
560			85	15	SM	10YR6/3	М	Pale brown silty sand. Sand is coarse through fine grained, well-graded through to silt fraction; primarily quartz with
								some dark through light gray volcanic grains; loose.
								Driller reports flowing sand rapidly coming into the borehole.
570			85	15	SM	10YR6/3	M	As above.
580			90	10	SW-SM	10YR6/3	М	Sand with silt, as above with slightly less silt.
590			90	10	SW-SM	10YR6/3	W	As above.
600		trace	95	5	SW	10YR6/3	W	Pale brown sand. Trace gravel, 1/2" maximum diameter,
								angular to subrounded, aphanitic volcanics. Sand fraction
								is coarse through fine grained, primarily quartz with some granitic lithic grains, some limonites surface stain, well-
								graded, fairly clean.
								5 · · · · · · · · · · · · · · · · · · ·
610		trace	95	5	SW	10YR6/1	W	As above.
620		trace	95	5	SW	10YR6/3	W	As above.
630			90	10	SW-SM	10YR6/3	W	Pale brown sand with silt. Sand fraction is coarse through
								fine grained, well-graded, primarily quartz with some
						·		volcanic lithic grains.
640			90	10	SW-SM	10YR6/3	W	As above.
040			50	10	C V V GIVI	101110/0	V V	, 10 00010.
650			90	10	SW-SM	10YR6/3	W	As above
650			90	10	300-3101	10110/3	VV	As above.

Project	Name:				errita Mitigation Order			Boring No.: MO-2007-4C
Depth	-		stimat		USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	
660		5	85	10	SW-SM	10YR6/3	W	Pale brown sand with silt. Trace gravel fraction is angular
								to subrounded, dark to medium gray aphanitic volcanics. Sand is coarse through fine grained, moderately well-graded
								through to silt fraction; composed primarily of quartz and
								volcanic grains with few granitic and epidote grains.
								3
670		5	85	10	SW-SM	10YR6/3	W	As above. Sand is mostly quartz with some lithic granitic grains,
								trace volcanic and arkose grains.
680		5	85	10	SW-SM	10YR6/3	W	As above.
000			00	10	OVV-OIVI	1011(0/3	VV	AS above.
690		trace	95	5	SW	10YR6/3	W	Pale brown sand. Trace gravel as above. Sand fraction is
								coarse through fine grained, primarily quartz with aphanitic
								volcanic and few epidote grains, well-graded, fairly
								clean.
700			00	-	CVV	40VDC/2	14/	As also as 10 distributions and association of Grant's Constitution
700		5	90	5	SW	10YR6/3	W	As above, with slightly increased gravel fraction. Granitic lithic
								grains more common than volcanic plus arkose grains.
710			95	5	SW	10YR6/3	W	As above, except for absence of gravel fraction. Granitic and
								arkose lithic grains present in equal proportions.
700			00	-	CVV	40VDC/2	14/	Data have and traver of several and all Consultantian in
720		5	90	5	SW	10YR6/3	W	Pale brown sand; traces of gravel and silt. Gravel fraction is
								angular to subrounded, granitic and volcanic clasts. Sand fraction is coarse through very fine grained, well-graded
								through to silt fraction, primarily quartz with dark to light
								gray aphanitic volcanic lithic grains, fairly clean.
								gray apriamile voicame inine grame, ramy steam
730		5	90	5	SW	10YR6/3	W	As above, slightly less gravel fraction. Gravel and coarser lithic
								sand size particles are granitic and arkose.
740			00	-	0)4/	40\/D0/0	10/	
740		5	90	5	SW	10YR6/3	W	As above. Sand is quartz rich with few quartz-feldspar grains,
								few arkose-sandstone lithic grains. Coarsest grains are angular
								to subangular arkose fragments.
750		5	90	5	SW	10YR6/3	W	As above. Coarsest sand-size paraticles are flat, angular arkose
					-			fragments. Very fine grain free magnetite grains.
760		5	90	5	SW	10YR6/3	W	As above.
		-						
		-					1	
		1	<u>I</u>	l			J	1

Project	Name:	Phelps Dodge Sierri			errita Mitig	ation Order		Boring No.: MO-2007-4C
Depth		Es		ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	odnipie bescription
770		5	90	5	SW	10YR6/3	W	As above. Increased arkose chips; arkose lithic grains more
								abundant that volcanic and granitic lithic grains.
780		5	90	5	SW	10YR6/3	W	As above.
790		5	90	5	CW	10YR6/3	W	As above
790		5	90	5	SW	10110/3	VV	As above.
800		trace	95	5	SW	10YR6/3	W	Pale brown sand, as above, with only a trace of gravel. Sand
								fraction is coarse through very fine grained, well-graded
								through to silt fraction, mostly quartz with some epidote
								and aphanitic volcanic lithic grains, fairly clean.
810		trace	95	5	SW	10YR6/3	W	As above. Arkese lithic grains a bit more common than granitic
610		liace	90	5	SVV	10110/3	VV	As above. Arkose lithic grains a bit more common than granitic, trace volcanic grains in coarse sand fraction; about 1% fine
								magnetite in the fine grain sand portion of the sample.
								principle in the first grain can a portion of the campion
820		trace	95	5	SW	10YR6/3	W	As above.
830		5	90	5	SW	10YR6/3	W	As above, with a slight increase in gravel fraction. Gravel
000			- 00	Ŭ		101110/0		is angular to subrounded, dark through medium gray fine
								grained volcanics, arkose, few granitic and quartz clasts. Arkose
								lithis grains more abundant than granitic. Hematite, limonite,
								epidote, magnetite in groundmass of arkose grains.
0.40				_	0)4/	40\/D0/0	147	
840		5	90	5	SW	10YR6/3	W	Pale brown sand, Traces of silt and gravel. Gravel fraction is angular to subrounded, primarily dark to medium gray
								volcanics and arkose. Sand fraction is coarse through fine
								grained, well-graded, primarily quartz with gray volcanic lithic and
								few epidote grains, fairly clean.
850		5	90	5	SW	10YR6/3	W	As above, coarsest material is angular arkose fragments.
860		5	85	10	SW-SM	10YR6/3	W	Pale brown sand with silt. As above with slightly greater
								gravel and silt fractions.
						·		
					0)4/ 6::	10) (5 - (-	14.	
870		3	87	10	SW-SM	10YR6/3	W	As above, with scarce gravel and larger amount of fine
		\vdash					-	grained sand. Sand is primarily quartz with little epidote and magnetite. Coaser sand grains are sandstone and arkose lithic
		\vdash						grains.
								B. 20.1.2.
880		3	87	10	SW-SM	10YR6/3	W	As above.

Project	Name:	Phelps Dodge Sierrita Mit				ation Order		Boring No.: MO-2007-4C
Depth			timat		USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	
890		3	87	10	SW-SM	10YR6/3	W	As above.
200			07	40	0)4/ 014	40\/D0/0	107	
900		3	87	10	SW-SM	10YR6/3	W	As above.
					_			
910		3	92	5	SW	10YR6/3	W	Pale brown sand; trace fine angular to subrounded gravel.
								Sand fraction is coarse through very fine grained, fairly well-graded, primarily quartz with lesser dark gray aphanitic
								lithic grains, fine sandstone grains, some epidote grains.
								Moderate limonite stain on grain surfaces.
			0.5		0)	10) (5 5 /5	,	
920		3	92	5	SW	10YR6/3	W	As above.
930			95	5	SW	10YR6/3	W	Pale brown sand, coarse through very fine grained, well-
								graded, mixed quartz and dark to light gray aphanitic
								volcanic lithic grains, sandstone lithic grains, and few epidote
								and limonite grains; fairly clean.
940			95	5	SW	10YR6/3	W	As above.
					_			
950			95	5	SW	10YR6/3	W	As above, except sand is finer grained overall.
930			33	3	344	101110/3	VV	As above, except same is liner grained overall.
222				4.0	014/ 014	4 0) (D 0 (0	100	
960			90	10	SW-SM	10YR6/3	W	Pale brown sand with silt. As above, with slightly greater silt fraction.
								Sil Haction.
970			90	10	SW-SM	10YR6/3	W	Pale brown sand, coarse through very fine grained, well-
								graded, mostly quartz with lesser dark to light gray volcanic
								and multi-colored arkose and sandstone lithic grains, some epidote, feldspar, and limonite grains.
								episoto, iotopai, and innonito grano.
980			95	5	SW	10YR6/3	W	As above, consistent composition and texture. Coarser sand
								sized partcles are mostly sandstone and arkose lithic grains.
990			95	5	SW	10RY6/3	W	As above. Coarser sand size particles are sandstone, arkose,
								and gray volcanic lithic grains.
							•	

Project		Phelps Dodge Sierrita Mitigation Order						Boring No.: MO-2007-4C
Depth			timat		USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	·
1000			95	5	SW	10RY6/3	W	As above.
1010			95	5	SW	10RY6/3	W	As above.
1010					0	10111070	•••	710 db010.
1020			95	5	SW	10RY6/3	W	As above.
1020			95	5	SW	10RY6/3	W	As shows
1030			95	3	SVV	10K10/3	VV	As above.
1040			95	5	SW	10RY6/3	W	As above.
1050			95	5	SW	10RY6/3	W	As above. Drilling penetration rate slowed.
1000			95	5	CM	10DV6/2	W	As above but finan avairant avairal Counting assertions of at
1060			95	5	SW	10RY6/3	VV	As above, but finer grained overall. Sand is comprised of primarily quartz with lesser feldspar, epidote, fine sandstone
								and arkose lithic grains, and very fine grained magnetite.
								Oxidized pyrite and epidote in matrix of arkose.
								Oxidized pyrite and opidate in matrix of amode.
1070			95	5	SW	10YR6/3	M/S	Pale brown sand; medium to very fine grained, a mix
								of primarily quartz with lesser arkose and volcanic lithic grains,
								few epidote and limonite grains.
1080			95	5	SW	10YR6/3	M	Pale brown sand. Sand fraction is medium through very fine
								grained, but primarily fine grained; mostly quartz with little
								aphanitic volcanics and arkose lithic grains. Drilling has slowed
								to 5 feet per hour; formation may be cemented.
1090			95	5	SW	10YR6/3	М	As above, coarser sand sized grains are arkose and sandstone
1080			90	J	344	10110/3	IVI	As above, coarser sand sized grains are arkose and sandstone lithic grains.
								9
1100			95	5	SW	10YR6/3	М	As above, except the sand fraction is coarse through very fine
								grained; well-graded.

	Name:					gation Order		Boring No.: MO-2007-4C
Depth (Ft)	Graphic Log	GR	SA	ed %	USCS Symbol	Munsell Color	HCI Rxn	Sample Description
1110			95	5	SW	10YR6/3	М	Pale brown silty sand. Sand fraction is primarily fine to very fine
								grained, with approximately 20% coarse through medium
								grained material; composed primarily of quartz, with lesser lithic
								grains including abundant arkose, lesser volcanic and few
								granitic grains.
1120			95	5	SW	10YR6/3	М	As above, coarser sand grains are primarily arkose.
1130			95	5	SW	10YR6/3	М	As above.
1110	bedrock					10YR6/3	М	Advance headrends - Drilling has aloused to 2 feet/hour - Comple
1140	bedrock					10110/3	IVI	Arkose bedrock. Drilling has slowed to 3 feet/hour. Sample
								consists of ground up arkose. Coarser material angular arkose
								chips; finer portion free quartz sand grains. Arkose is white
								tan, reddish, greenish to gray, fine grained quartz in calcareous
								with local epidote matrix, with up to 1% disseminated limonite
								and fine grained magnetite.
1150	bedrock					10YR6/3	М	Arkose bedrock, as above.
4450						10)/D0/0	ļ.,	
1153	bedrock					10YR6/3	M	Arkose bedrock, as above.
	TD							
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HYDRO GEO CHEM, INC.

Geologic Boring Log

								Boring No.:	MO-2007-5C
						Mitigation C	Order	*	Project No.: 78300
					ation and \	Vells		Driller:	Arnold Lamon
Site Pla	an at Bori	ng Loc	cation:					ADWR Registration No.:	55-907457
									GEFCO Speedstar 50K
									RC Air and Mud Rotary
									Tricone, 9-7/8 inch
								Total Borehole Depth:	
								Casing Depth:	1360 feet
								Screened Interval:	
								Depth to Water/Date:	
								Screen slot size:	0.05 inches
								Filter pack type:	No. 8 Tacna
								Top of Casing Elevation:	
								Ground surface Elevation:	
								Date/Time Started:	
								Date/Time Completed:	
					T13S, R13			Logged by/Date:	Warren Thompson
	_attitude:				ongitude:	110 59 59.46		Checked by/Date:	Kim Wilson
Depth	Graphic	Es	stimate	ed %	USCS	Munsell	HCI	Samr	ole Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	-	•
0		20	60	20	SM	10YR6/4	S	Light yellowish brown silty sa	
								fraction is subangular to well-	
								granitics, light to dark gray vo	
								sandstone. Sand fraction is	coarse through very fine
								grained, well-graded through	to silt fraction, loose, dry.
10		20	60	20	SM	10YR6/4	S	As above.	
20		20	60	20	SM	10YR6/4	M	As above, less reactive to HC	CI.
30			95	5	SW	7.5YR5/4	W	Brown well-graded sand; coa	rse through very fine grained
								sand to minor silt fraction; loc	ose, dry. Sand is mostly
								quartz and quartz-feldspar, w	
								granitic and rhyolite lithic gra	ins, trace fine crystalline
								magnetite grains.	
40			95	5	SW	7.5YR5/4	W		cting water. Gravel is andesite
								with epidote alteration, rhyoli	te, quartz-feldspar porphyry
								and granite.	
50		15	75	10	SW-SM	7.5YR5/4	S	Brown sand with silt and grav	· · · · · · · · · · · · · · · · · · ·
								diameter, subangular to subr	
								and volcanics including gray	
								porphyry and trace rhyolite.	Sand fraction is very coarse
								through fine grained, loose.	
60		70	20	10	GW-GM	7.5YR5/4	S		nd. Gravel fraction is angular
								to subrounded, ground up ch	
								reddish, white, and gray igne	<u> </u>
								altered quartz-feldspar porph	
								clasts. Sand is coarse through	
								Strong reaction to HCl is con	fined to the silt fraction.

Project	Name:	Phelp	os Do	dge S	ierrita Mitig	gation Order		Boring No.: MO-2007-5C
Depth			stimat		USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	·
70		75	20	10	GW	mottled	N	Gravel with sand, mottled coloration with light to dark
-								grays, whites, reds. Gravel is angular to rounded
								volcanics, mostly andesite porphyry with some rhyolite, with lesser quartz and granitic clasts; clean, loose.
								with lesser quartz and granitic clasts, clean, loose.
80		85	15		GW	mottled	N	As above, with less sand and no silt. Sand is very coarse
					<u> </u>			to coarse grained. Gravel is rhyolite and andesite clasts.
								·
90		70	25	5	GW	7.5YR5/4	N	Brown gravel with sand. Gravel as above; sand fraction is
								coarse through fine grained, loose.
100		40	40	20	GM/SM	7.5YR5/4	N	Brown silty gravel and sand. Gravel fraction is angular to
								rounded, various colors including pink, red, purple, white
								and grays; mostly andesite, some rhyolite porphyry, and
					_			lesser amounts of granitic and arkose clasts. Sand is
								coarse through fine grained, loose, many lithic grains.
					011/011			
110		40	40	20	GM/SM	7.5YR5/4	N	As above. Gravel is mostly andesite and rhyolite porphyry.
-								
120		40	50	10	SW-SM	7.5YR5/4	N	Brown sand with silt and gravel. Gravel fraction as above
					011 0111	1101110/1		but with more dark gray aphanitic volcanic rock. Sand
								fraction is coarse through fine grained, well graded, loose,
								contains abundant andesite and rhyolite lithic grains.
130		40	50	10	SW-SM	7.5YR5/4	N	As above.
140		40	50	10	SW-SM	7.5YR5/4	N	As above, abundant andesite clasts.
					0111 011			
150		50	40	10	GW-GM	7.5YR5/4	N	Brown gravel with silt and sand. As above, except with
								increased gravel fraction.
160		50	40	10	GW-GM	7.5YR5/4	N	As above. Dominantly andesite clasts with little granitic
					-			and trace sandstone.
					0.1		<u> </u>	
170		30	50	20	SM	7.5YR5/4	N	Brown silty sand with gravel. Gravel clasts are mostly
								angular to rounded andesite and rhyolite. Sand fraction is
				 			-	coarse through fine grained, mostly quartz and granitic grains, some arkose, sandstone and few gray volcanic
		-						lithic grains.
								mano granio.
							1	
180		30	50	20	SM	7.5YR5/4	N	As above, except that the coarse sand material is more
								granitic with abundant quartz and quartz-feldspar grains
								and fewer volcanic lithic grains.
	_			_		_		

Project	Name:	Phelps Dod		dge Si	ierrita Miti	gation Order	•	Boring No.: MO-2007-5C
Depth	Graphic	Es	stimat	ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Gample Description
190		10	70	20	SM	7.5YR5/4	М	Brown silty sand. Gravel fraction is granitic
130		-10	70	20	Olvi	7.011(0/4	IVI	with gray volcanics. Sand is coarse through fine grained,
								moderately well-graded, loose, primarily quartz and quartz-
								feldspar grains.
200			10	90	CL/ML	10YR6/3	W/M	Pale brown silty clay with 10% sand. Very soft, sticky,
								cohesive. Sand is mostly fine grained.
210		10	65	25	SM/SC	7.5YR6/4	М	Light brown silty clayey sand. Minor gravel fraction is
			- 00		0111/00	7.011(0)		angular to rounded granitics and volcanics. Sand is
								coarse through fine grained, mostly quartz with some
								fine grained sandstone lithic grains. Clay is as clay balls,
								soft plastic, cohesive.
220		5	25	70	CL	7.5YR6/4	М	Light brown sandy clay with silt. Clay is very soft,
								plastic, and cohesive. Sand and gravel as above.
230		10	65	25	SC	7.5YR6/4	М	Light brown clayey sand. Small gravel fraction is primarily
			- 00			1101110,1		dark gray volcanics with light colored granitics. Sand
								fraction is coarse through fine grained. Clay is cohesive
								and soft, occurring as clay balls.
240		10	75	15	SC	7.5YR6/4	M	Light brown clayey sand. As above, with less clay and
								silt. Gravel is rhyolite; sand is quartz and volcanic lithic
								grains. Clay is as few clay balls.
250		15	75	10	SW-SM	7.5YR6/4	М	Light brown sand with silt and gravel. Gravel is angular
								to rounded, abundant light colored granitics, with lesser
								dark to light gray volcanics. Sand fraction is coarse to
								fine but primarily coarse grained quartz, quartz-feldspar,
								feldspar, and granitic grains. Silt fraction reacts with HCl.
000		45	7.5	40	0)4/ 014	7 FVDC/4		As also as a second for ation and air a should not an electric
260		15	75	10	SW-SM	7.5YR6/4		As above; gravel fraction contains abundant andesite porphyry, little rhyolite, trace arkose. Sand is quartz, plus
								granitic and andesite porphyry lithic grains.
								First water at 265'.
270		10	70	20	SM	7.5YR6/4	М	Light brown silty sand. 10% gravel fraction is angular to
								subrounded dark gray volcanics, granitics, and quartz.
								Sand fraction is coarse through fine grained, mostly coarse
								through medium grained, composed of abundant quartz
								with lesser volcanic and some epidote grains; fairly well-
								graded.
280		10	70	20	SM	7.5YR6/4	М	As above. Gravel is rhyolite with quartz and epidote
			. 0		CIVI	7.011(0/1		micro-veinlets.
290		10	65	25	SM	7.5YR6/4	М	Light brown clayey silty sand. Gravel and sand fractions
								as above. Clay fraction is soft, cohesive, plastic.
							ļ	
200		10	90	10	CIVI CIVI	7 EVD6/4	N 4	Light brown agnd with ailt. Croval fraction as above
300		10	80	10	SW-SM	7.5YR6/4	M	Light brown sand with silt. Gravel fraction as above.

Project	Name:	Phelps Dodge Sierrita Mitigation Order						Boring No.: MO-2007-5C		
	Graphic	GR GR	SA	ed %		Munsell	HCI	Sample Description		
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sand fraction is coarse through fine grained, but primarily		
								coarse grained. Abundant quartz, granitic and arkose		
								lithic grains, some epidote. Trace calcite cement.		
210		15	75	10	CVA/ CMA	7 EVDC/4	N 4	Light brown and with ailt and groval. As above with a		
310		15	75	10	SW-SM	7.5YR6/4	М	Light brown sand with silt and gravel. As above, with a larger gravel fraction.		
								larger graver receion.		
220		45	75	40	CVA/ CNA	7.FVDC/4	N 4	A a chave		
320		15	75	10	SW-SM	7.5YR6/4	M	As above.		
330		15	75	10	SW-SM	7.5YR6/4	N/I	As above. Little return from the cyclone.		
330		15	75	10	3VV-3IVI	7.51R0/4	М	As above. Little return from the cyclone.		
340		10	75	15	SM	7.5YR6/4	M	As above, with increase in silt fraction. Rhyolite gravel clasts have epidote-replaced feldspar. Sand is mostly		
								quartz, quartz-biotite, and quartz-feldspar.		
350		15	75	10	SW-SM	7.5YR6/4	M	Light brown sand with silt and gravel. Little return from		
								the cyclone. Abundant rounded sand sized lithic grains of andesite, rhyolite, and granite.		
								or andoore, myoreo, and granico.		
360		20	70	10	SW-SM	10YR6/4	M	Light brown sand with silt and gravel. Gravel fraction is		
								angular to subrounded, primarily light to dark gray rhyolite and aphanitic volcanics, granite, and quartz.		
070		- 10		4.0	0)4/ 014	10\/D0/4				
370		10	80	10	SW-SM	10YR6/4	M	Light brown sand with silt. Gravel fraction as above. Sand fraction is coarse through fine grained, moderately		
								well-graded, primarily quartz. Trace calcite cement.		
								<u> </u>		
200		40	00	40	0)4/ 014	40\/D0/4	N 4	As above Consulfaction is small in about the and		
380		10	80	10	SW-SM	10YR6/4	M	As above. Gravel fraction is granitic, rhyolite, and arkose with an epidote groundmass.		
								arkose with an epidote groundmass.		
200		0.5		200	CNA	40\\D0/4	NA/O	Light brown oils, oppd with ground. As above but with		
390		25	55	20	SM	10YR6/4	IVI/S	Light brown silty sand with gravel. As above but with increased amounts of gravel and silt.		
400		25	55	20	SM	10YR6/4	M/S	As above. Gravel is feldspar porphyry and light to dark		
								gray aphanitic volcanics, granitic and arkose with epidote alteration; coarser sand grains are lithics of same		
								composition. Calcite cement coatings on few clasts.		
410		25	55	20	SM	10YR6/4	M	As above.		
420		25	55	20	SM	10YR6/4	M	As above.		
430		80	15	5	GW	mottled	М	Gravel with sand, mottled coloration. Gravel clasts include		

Project	Name:				errita Miti	gation Order		Boring No.: MO-2007-5C
Depth (Ft)	Graphic Log	Es GR		ed %	USCS Symbol	Munsell Color	HCI Rxn	Sample Description
(1.6)	Log	OIX	OA.	•	Cymbol	00101	IXAII	gray fine grained volcanics, silicified feldspar porphyry,
								volcaniclastic, granitic porphyry, and minor arkose.
440			95	5	SW	10YR6/4	W	Light vallowish brown and Drimarily quartz fine grained
440			90	3	SVV	10110/4	VV	Light yellowish brown sand. Primarily quartz, fine grained, well-graded through to silt fraction. Coarser sand grains
								are gray volcanics, porphyritic granite, silicified arkose,
								and sericitized pink feldspar porphyry.
					0111	10) (50/1		
450			95	5	SW	10YR6/4	W	As above, flowing. Fine grained, well sorted, poorly graded. Clogged down hole hammer; very difficult to pull
								out of hole. Flowing sand.
								out of fiolo. Trowning out a.
460		5	90	5	SW	10YR6/4	W/M	Light yellowish brown sand. Sand fraction is primarily
								quartz with some dark gray volcanic and few arkose lithic
								grains, few epidote grains. Moderately well graded, clean.
470		5	90	5	SW	10YR6/4	М	As above. Coarse sand sized particles are angular to
								subrounded arkose, volcanic and granitic lithic grains;
								trace fine grained crystalline magnetite grains.
480			95	5	SW	10YR6/4	N	Light yellowish brown sand. Sand is coarse through fine
400			55			101110/4	- 11	grained, but primarily coarse through medium grained.
								Composed mostly of quartz with lesser dark to light gray
								volcanic lithic grains, few arkose, epidote and fine grains.
								magnetite grains. Well graded, clean.
490			95	5	SW	10YR6/4	N	As above.
430			90	3	344	101110/4	IN	As above.
500			0.5	_	0144	40\/D0/0		
500		trace	95	5	SW	10YR6/3	N	Pale brown sand. Trace broken up gravel is primarily angular to subrounded gray aphanitic volcanics with few
								granitics. Coarse to medium grained sand fraction
								contains abundant arkose, sandstone and few volcanic
								lithic grains
540			0.5	_	0144	40\/D0/0	147	
510		trace	95	5	SW	10YR6/3	W	As above, sand fraction also contains few lithic grains of limestone.
								illinestone.
520		5	95	5	SW	10YR6/3	W	As above, with slight increase in gravel fraction and fewer
								fines; material coarser grained overall.
530			100	trace	SW	10YR6/3	W	Pale brown sand. Coarse through fine grained, primarily
								coarse through medium grained. Mostly quartz with some
								volcanic grains, few arkose, epidote, feldspar and
								limestone grains; moderately well-graded.
540		5	90	5	SW	10YR6/3	W	Pale brown sand, as above. Gravel and coarse sand
340			90	3	344	101100/3	V V	fraction is arkose, aphanitic gray volcanic, and
								granitic porphyry.
550		5	90	5	SW	10YR6/3	W	Pale brown sand, as above. Gravel and coarse sand
								fraction is dominantly arkose and fine grained sandstone

Project	Name:	Phelps Dodge S			ierrita Miti	gation Order		Boring No.: MO-2007-5C
Depth			timat			Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	with epidote-limonite alteration.
								with epidote innomic diteration.
500		_	00		0)4/	40\/D0/0	١٨/	Dela harring and Transport harbon and distinct
560		5	90	5	SW	10YR6/3	W	Pale brown sand. Trace gravel, broken up during drilling is angular to subrounded fine grained volcanics. Sand
								fraction is coarse through fine grained, but primarily coarse
								grained; abundant quartz and dark to light gray fine
								grained to aphanitic volcanics, few epidote and arkose
								grains.
570			95	5	SW	10YR6/3	W	As above, with no gravel.
580			95	5	SW	10YR6/3	W	As above. Coarse sand fraction composed of arkose with
								lesser volcanic angular to subangular lithic grains.
590			95	5	SW	10YR6/3	W	As above, very consistent texture and composition.
600		5	90	5	SW	10YR6/3	W	As above, with a small amount of broken gravel, primarily
								volcanics with lesser granitics and arkose.
610		trace	95	5	SW	10YR6/3	W	As above, few gravel clasts.
620		trace	95	5	SW	10YR6/3	W	As above.
630			95	5	SW	10YR6/3	W	Pale brown sand. Coarse through fine grained, primarily
								quartz with light to dark gray grains of fine grained volcanic, few epidote, arkose and limestone grains;
								moderately well-graded.
640			95	5	SW	10YR6/3	W	As above.
040			30	5	344	10110/3	V V	ητο αμύντο.
650			95	5	SW	10YR6/3	W	As above.
030			33	J	344	101110/0	V V	, 10 400 40.
660			95	5	SW	10YR6/3	W	As above.
300			55	<u> </u>	O V V	101110/0	v v	7 to above.

	Name:					gation Order	•	Boring No.: MO-2007-5C
Depth (Ft)	Graphic Log	GR		ed %	USCS Symbol	Munsell Color	HCI Rxn	Sample Description
670	Log	GK	95	5	SW	10YR6/3	W	As above, very consistent texture and composition.
680		5	95	5	SW	10YR6/3	W	Pale brown sand with trace gravel. Gravel broken up from
								drilling, angular to subrounded quartz, fine grained volcanics, arkose and granitics. Sand fraction is coarse
								through fine grained, but primarily coarse through medium
								grained; mostly quartz with fine grained and aphanitic
								volcanics, few granitic, epidote, feldspar and limestone grains, moderately well-graded, fairly clean.
								grains, moderatery well-graded, rainy clean.
690		5	95	5	SW	10YR6/3	W	As above.
700		5	95	5	SW	10YR6/3	W	As above,
710		5	95	5	SW	10YR6/3	W	As above
720		5	95	5	SW	10YR6/3	W	Sand with trace gravel. Gray volcanic lithic grains have
								increased, comprising about 50% of the sand. Material appears to be cemented based on drilling; bit is chattering
								and binding. May be a cobbly or bouldery zone.
700			0.5		0)4/	40)/[0.0/0) A / / B A	
730		5	95	5	SW	10YR6/3	VV/IVI	As above. Gravel is mostly dark gray volcanics, some with silica- and carbonate-filled microfractures. Sand is coarse
								through fine grained, mostly quartz and dark gray fine
								grained volcanic lithic grains; fairly well-graded.
740		5	95	5	SW	10YR6/3	W/M	As above.
750		5	95	5	SW	10YR6/3	W	As above.
		-						
760		5	95	5	SW	10YR6/3	W/M	As above.
					01	10) (7.5)	,	
770			95	5	SW	10YR6/3	W	Pale brown sand. Sand is medium through fine grained, mostly quartz with lesser dark gray fine grained volcanic
								grains; fairly well-graded and clean. Appear to be out of
								the volcanic-rich cobbly material.
700			05		CVV	10VDC/0	14/	As above
780			95	5	SW	10YR6/3	W	As above.

Denth		Phelps Dodge S Estimated %			Sierrita Mitigation Order			Boring No.: MO-2007-5C
(Ft)	Graphic Log	GR		ed %	USCS Symbol	Munsell Color	HCI Rxn	Sample Description
(Ft)	Log	GK	SA		Syllibol	COIOI	KAII	
790			95	5	SW	10YR6/3	W	As above, except sand is coarse through fine grained.
800			95	5	SW	10YR6/3	W	As above. Driller said based on drilling characteristics there have been several one-foot thick clay interbeds
								between 770-800', but no evidence seen in the cuttings.
810			95	5	SW	10YR6/3	W	Pale brown sand. Coarse through fine grained, primarily
010			90	J	300	101110/3	VV	quartz with lesser dark gray volcanics, few epidote and
								and feldspar grains; moderately well graded, fairly clean.
820			95	5	SW	10YR6/3	W	As above.
830			95	5	SW	10YR6/3	W	As above.
840			95	5	SW	10YR6/3	W	As above.
850			90	10	SW-SM	10YR6/2	W	Light brownish gray sand with silt. Sand is medium to fine
- 000			00	10	OVV OIVI	101110/2	•	grained, primarily quartz and dark gray volcanic grains
								with few epidote, feldspar and arkose grains; moderately
								well-graded.
860			90	10	SW-SM	10YR6/2	W	As above.
870			90	10	SW-SM	10YR6/2	W	As above, but slightly finer grained overall.
880			90	10	SW-SM	10YR6/2	W	As above.
890			90	10	SW-SM	10YR6/2	W	As above.
000			00	40	CM CM	10\/DC/0	۱۸/	As above
900			90	10	SW-SM	10YR6/2	W	As above.
910			90	10	SW-SM	10YR6/2	W	As above, continuing light brownish gray sand with silt.
			33	. 5	0 OIVI			Sand fraction is coarse through fine grained, primarily

Project	Name:	Phelp	os Do	dge S	ierrita Mitig	gation Order		Boring No.: MO-2007-5C
Depth (Ft)		GR	stimat SA	ed %	USCS Symbol	Munsell Color	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	quartz and aphanitic gray volcanics, few epidote and
								granitic grains; moderately well-graded. Silt fraction reacts
								weakly with HCl.
920			90	10	SW-SM	10YR6/2	W	As above.
920			30	10	377-3171	101110/2	VV	As above.
930			90	10	SW-SM	10YR6/2	W	As above.
940			90	10	SW-SM	10YR6/2	W	As above.
950			90	10	SW-SM	10YR6/2	W	As above.
960			90	10	SW-SM	10YR6/2	W	As above.
970			90	10	SW-SM	10YR6/2	W	As above.
980			90	10	SW-SM	10YR6/2	W	As above.
990			85	15	SM	10YR6/2	W	Light brownish gray silty sand. Sand fraction is coarse
								through fine grained, primarily quartz and gray volcanics,
								few granitic and epidote grains; moderately well-graded through to silt fraction. Silt fraction reacts weakly to HCl.
								amought to our macron. Our macron roads would to rio.
1000			85	15	SM	10YR6/2	W	As above.
							_	
1010			80	20	SM	10YR6/2	М	Light brownish grayish brown silty sand. Silt fraction
								more reactive to HCl than above. Some clay, possibly occurring as thin interbeds. Coarse sand size particles are
								angular to subangular, abundant volcanic with lesser
								arkose and sandstone lithic grains
1020			80	20	SM	10YR6/2	M	As above.
1020			00	20	SIVI	10110/2	IVI	no above.
1030			80	20	SM	10YR6/2	M	As above.
1000					Olvi	101110/2	171	, 10 00000

Project	Name:	Phelp	os Doc	dge Si	ierrita Mitiç	gation Order		Boring No.: MO-2007-5C
Depth	Graphic	Es	stimat	ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Guilipie Description
1040			90	10	SW-SM	10YR6/2	М	Light brownigh gray good with ailt. Cond is coorse
1040			90	10	377-3171	10110/2	IVI	Light brownish gray sand with silt. Sand is coarse- through fine-grained, moderately well-graded through to
								silt; primarily quartz, dark gray volcanics, arkose with
								variable epidote, specularite, magnetite; yellowish to white
								sandstone, and granitic grains. Coarse to medium sand
								sized particles are mostly lithic fragments.
1050			90	10	SW-SM	10YR6/2	М	As above. Clastic>volcanic>granitic grains among coarse
								to medium sized grains.
1060			00	10	CVA/ CNA	40VDC/2	N 4	As above were experient restarial. Above don't too to
1060			90	10	SW-SM	10YR6/2	M	As above, very consistent material. Abundant tan to white arkose and sandstone, lesser gray volcanic and red
								porphyry and well as quartz sand-sized particles.
								porpriyry and wen as quartz sand-sized particles.
1070			80	20	SM/SC	10YR6/2	М	Light yellowish brown silty clayey sand. Sand fraction as
						<u> </u>		described above. Sticky clay in cuttings may indicate
								presence of thin clay interbeds.
1080			80	20	SM/SC	10YR6/2	M	As above.
1090			90	10	SW-SM	10YR6/2	М	Light grayish brown sand with silt. Sand is medium to
1000			50	10	OVV OIVI	101110/2	101	fine grained, primarily quartz and gray aphanitic volcanics,
								with lesser white opaque limestone, reddish aphanites,
								few epidote and granitic grains; moderately well-graded.
								, , , , ,
1100			80	20	SM/SC	10YR6/2	М	Light grayish brown silty clayey sand. Sand as described
								above. Small clay fraction probably as thin interbeds,
								very soft, plastic, sticky.
1110			75	25	CM/CC	40VDC/2	N 4	As above with increase in fine freetien. Lithic and evalua-
1110			75	25	SM/SC	10YR6/2	M	As above, with increase in fine fraction. Lithic sand grains include reddish feldspar porphyry, andesite with chlorite
								and epidote, sandstone with epidote matrix, and few
								quartz-biotite grains.
								Table Signature
1120			70	30	SM/SC	10YR6/2	М	As above, with increase in fine fraction. Coarsest sand-
								sized particles are angular volcanic and arkose/sandstone
								chips.
1130			70	30	SM/SC	10YR6/3	M	As above.
1140			70	30	SM/SC	10YR6/3	М	As above, but sand fraction has increased lithic grains of
1140			70	30	SIVI/SC	10110/3	IVI	reddish brown volcanic grains, abundant gray volcanic
								grains, variably-colored fine sandstone, quartz, and few
								epidote grains. Clay probably is as thin interbeds
								opiacio gianio. Giay probably io do tini interbodo
1150			90	10	SW-SM	10YR6/3	М	Light grayish brown sand with silt. Sand fraction as

Project	Name:				ierrita Miti	gation Order		Boring No.: MO-2007-5C
Depth (Ft)	Graphic Log	GR	stimat SA		USCS Symbol	Munsell Color	HCI Rxn	Sample Description
	<u> </u>				•			described above, medium to very fine grained, moderately
								well-graded through to silt fraction; no clay.
1160			85	15	SM	10YR6/2	М	Light brownish gray silty clayey sand. Sand fraction as
								is quartz, quartz-biotite, arkose, red porphyritic and gray
								aphanitic volcanic grains. Coarser sand size particles are
		-						about 40% fine sandstone and arkose, 30% subrounded quartz and few quartz-biotite grains, and 30% volcanic
								grains. Clay is present as small soft, cohesive, sticky
								balls.
1170			40	60	CL /MI	10VD6/2	N 4	Light gravish brown conductory and silt. Cond fraction is
1170			40	60	CL/ML	10YR6/2	М	Light grayish brown sandy clay and silt. Sand fraction is medium to very fine grained, but mostly fine to very fine
								grained. Clay fraction is very soft, plastic and sticky.
4400			00	40	014/00	40\/D0/0		Light granifal bassage site 1
1180			60	40	SM/SC	10YR6/2	М	Light grayish brown silty clayey sand. Sand fraction is medium to very fine grained, but primarily fine to very fine
		-						grained; sticky, cohesive.
								gramou, onony, comocive.
1190			60	40	SM/SC	10YR6/2	М	As above, with weaker reaction to HCI. More than 50%
								of coarse sand-sized particles are lithic grains, dominantly green, white and yellow sandstone and arkose with lesser
								porphyritic volcanics.
								porpriy.mo versumos.
1200			60	40	SM/SC	10YR6/2	W	As above.
1210			60	40	SM/SC	10YR6/2	W	As above.
1220			50	50	SM/ML	10YR6/2	W	Light grayish brown sandy silt. Sand is primarily fine to
								very fine grained, mostly quartz and volcanics with some
								epidote, granitic and limestone/calcite grains. Sticky,
		-						cohesive
1230			70	30	SM	10YR6/2	W	Light grayish brown silty sand with trace clay. Sand
								fraction is coarse through very fine grained, primarily
						-		quartz and gray to reddish volcanics, few epidote, granitic,
								arkose and limestone grains; moderately well-graded
								through to silt fraction; sticky.
			-				<u> </u>	
1240			60	40	SM	10YR6/2	W	As above, with increased silt. Drilling speed has
							-	increased; soft zone is present 1240-1280'.
1250			60	40	SM	10YR6/2	W	As above, but sand is primarily fine grained with about
							-	10-15% medium sized grains. Abundant multi-colored coarse sand size particles of sandstone and arkose.
							1	podrse sand size particles of sandstone and arkose.
1260			60	40	SM	10YR6/2	W	As above. Very weak reaction to HCl.

Depth Graphic Estimated % USCS Munsell HCI (Ft) Log GR SA FI Symbol Color Rxn	
(Ft) Log GR SA FI Symbol Color Rxn	Sample Description
	Campio 2000. pilon
1270 60 40 SM 10YR6/2 W As above.	
1270 00 40 0W 1011072 W 7/3 db0VC.	
	h less silt and medium sized sand fraction
is about 25%.	
4000	1 0 16 11
	brown silty sand. Sand fraction is coarse
	grained, well-graded, composed of quartz, andstone, arkose, quartz, quartz-biotite,
	andstone, arkose, quartz, quartz-biotite, ar, gray to reddish volcanic and trace chert
	d magnetite grains. Coarse to medium sized
	ostly angular to subangular lithic particles.
grains are mo	ostry arrigular to subarrigular intrio particles.
1300 90 10 SW-SM 10YR5/2 W Grayish brown	n sand with silt. Sand is coarse through fine
	arily dark gray with some reddish volcanics,
	lined sandstone, arkose, and quartz grains.
	dium sized grains are primarily angular to
subangular litl	
	n silty sand. As above with slightly higher
silt content an	nd sand is finer grained overall.
1015	
1315 Very hard drill	ling beginning at 1315'.
1320 90 10 SW-SM 10YR5/4 W Grayish brown	n sand with silt. Sand is coarse through fine
	tly medium through fine grained, well-graded;
	to dark gray aphanitic and red to brown fine
	nitic-porphyritic volcanics with lesser arkose,
	ee quartz, and few epidote grains.
	granter
	s above, slight increase in silt fraction. Most
	arse sand-sized particles are lithic grains of
	epidote altered fine grained volcanic, reddish
	andstone, magnetite-quartz-sericite grains,
and arkose, w	vith lesser free clear quartz.
1240	set coorse condicined eveling and and to be
	ost coarse sand sized grains appear to be
epidote and si	e and sandstone with chlorite, magnetite,
l lepidote and si	CHOILE.
1350 80 20 SM 10YR5/4 W As above.	
33 20 3M 10110/7 W 7/3 db0Ve.	
1360 80 20 SM 10YR5/4 W As above. Ab	oundant multi-colored arkosic and sandstone
	articles, some with epidote-chlorite-magnetite
	ay aphanitic volcanic grains, quartz, quartz-
feldspar grain	IS.

Project	Name:	Phelp	s Do	dge Si	errita Miti	gation Order		Boring No.: MO-2007-5C
Depth (Ft)	Graphic Log		stimate SA		USCS Symbol	Munsell Color	HCI Rxn	Sample Description
1363	BEDROCK				SW-SM	10YR5/4	W	Very hard drilling. Sample is mixed gray volcanic grains
1000	DEDITOOR					101110/1		and clastic (arkose and sandstone) grains in about equal
								proportions, with some free quartz grains. Coarse to medium sized particles are angular to subangular.
1370	TD=1370'					10YR5/4	W	Sample is mostly clastic material including fine quartz
								sand, fine grained gray, tan white, and maroon sandstone and siltstone chips; with some gray aphanitic volcanic
								grains. Few chips are limonite stained and/or have traces
								of oxidized pyrite.

Geologic Boring Log

	logic L	<i>-</i>	· y -	~ _				Paring No : MO 2007 CP
	Droiget M	ama:	Dhol	os De	lao Ciorrit	o Mitigation	Ordo	Boring No.: MO-2007-6B
					ration and	a Mitigation	Orael	Project No.: 78300 Driller: Arnold Lamon
					ration and	vveiis		
Site Pi	an at Bori	ng Lo	cation:					ADWR Registration No.: 55-907606
								Drilling Equipment: GEFCO Speedstar 50K
								Drilling Method: RC Air and Mud Rotary
								Bit Type/Size: Tricone, 9 7/8 inch
								Total Borehole Depth: 1060 feet
								Casing Depth: 950 feet
								Screened Interval: 780-940 feet
								Depth to Water/Date: 319.15 feet 10/04/07
								Screen slot size: 0.05 inches
								Filter pack type: No. 8 Tacna Top of Casing Elevation:
								Ground surface Elevation: 3041.93 feet amsl
								Date/Time Started: 8/14/07 12:45
								Date/Time Started: 6/14/07 12:43 Date/Time Completed: 8/29/07 15:36
T	ownshin	Rang	e. Sec	ction:	T18S, R13	RF 28dhd		Logged by: K.Wilson/W.Thompson
	attitude:				ongitude:	111 01 02.10		Checked by: Kim Wilson
	Graphic		timat		USCS	Munsell	HCI	
υ е ριπ (Ft)	Log	GR		FI	Symbol	Color	Rxn	Sample Description
10	Log	10	70	20	SC	7.5YR4/4	S	Prown alayay ailty aand. Mix of lagge aand and ailty
10		10	70	20	30	7.51K4/4	3	Brown clayey, silty sand. Mix of loose sand and silty
								to+J87 sandy clay balls. Gravel is angular to subrounded,
	•							comprised of gray feldspar-rich porphyry with some
								epidote replacement of feldspars, gray volcanic with few
	i							feldspar phenocrysts with variable epidote alteration,
	i							biotite schist, quartzite, rhyolite, and vein quartz. Sand
								fraction is coarse to fine grained, moderately well-graded,
	ı							coarse to medium grains are about 50% quartz, 50% lithic
	i							grains; fine fraction is mostly quartz with trace fine
	ı							crystalline magnetite.
00	i	40	70	45	00	7 FVD 4/4		As all as a with favor along halls Open alice against and
20	i	10	70	15	SC	7.5YR4/4	S	As above, with fewer clay balls. Gravel is primarily
	i							volcanic porphyry and phenocryst-rich porphyry with
	i							lesser metamorphic and sedimentary clastic clasts.
00	i	00		45	00	7 FVD 4/4		Description of the second of t
30	•	80	5	15	GC	7.5YR4/4	М	Brown clayey gravel. Gravel is angular to subrounded
								gray feldspar porphyry, brownish gray volcanic with few
	,						-	feldspars, and soft gray ashy aphanitic volcanic clasts.
40	·	75	00		C\\\\	7 EVD 4/4	۱۸/	Drown grovel with and Crown in an arrive to extract the
40	i	75	20	5	GW	7.5YR4/4	W	Brown gravel with sand. Gravel is angular to subrounded,
	•							abundant gray aphanitic to feldspar porphyritic volcanics,
	•							with few arkose clasts. Sand fraction is mostly coarse
	•							grained, angular to subrounded quartz and lithic grains.
	i	0.5	10		CM	40\\DE/4	D 4	Vollouriah hyayya ayayal. Fayy ayaall alay halla ayad alay
50	•	85	10	5	GW	10YR5/4	М	Yellowish brown gravel. Few small clay balls and clay
	·						-	coatings on gravel clasts. Clasts are up to 3 cm diameter,
	•						-	angular to subrounded, light gray ashy tuff, medium to
	·							dark gray aphanitic to feldspar porphyritic volcanics
	i						-	(possibly andesite from Demetrie Volcanics), feldspar
	·							porphyry, with little rhyolite and gray quartz vein material.
60		10	10	80	CL	10VDE/4	N A	Vollowich brown alove Little city and and group! Croup!
60		10	10	00	OL	10YR5/4	М	Yellowish brown clay. Little silt, sand and gravel. Gravel
-								clasts are gray feldspar porphyry with or without epidote,
								and quartz-feldspar porphyry with quartz-hematite veining.
							-	Sand is coarse to fine grained; mostly quartz, but coarse
							<u> </u>	grained sand is 50% quartz/50% lithic grains.

Project	Name:	Phelp	os Do	dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-6B
Depth	Graphic	Es	timat	ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR		FI	Symbol	Color	Rxn	Sample Description
70		10	25	65	ML/CL	10YR5/4	S	Yellowish brown sandy silt and clay. Some sufficiently
	1							indurated to survive drilling, showing finely banded silt
	1							and clay with matrix supported angular to subrounded
	,							fine to medium quartz sand grains. Sand throughout entire
	,							sample is fine to coarse grained. Gravel and coarse sand
								fraction is gray andesitic volcanics, feldspar porphyry,
	i							and quartz vein material.
	i	4.0	0.5	0.5	N. 401	10)/5=/4		
80	•	10	25	65	ML/CL	10YR5/4	S	As above.
	•							
	•							
	ı							
90	,	30	40	20	SC	10VD4/4	N /	Dark vallowish brown slavey and with gravel. Crovel is
90	,	30	40	30	SC .	10YR4/4	М	Dark yellowish brown clayey sand with gravel. Gravel is
	,							angular to subrounded clasts of gray aphanitic to porphy- ritic volcanics with epidote-altered feldspar, epidotized
	,							granitic, crystal-rich quartz-feldspar porphyry in reddish
\vdash								grantic, crystal-neri quartz-leidspar porpriyry in reddish groundmass, and fine grained sandstone. Sand is fine
	ı							through coarse grained, quartz and lithic grains. Clay dries
	,							whitish and crusty.
	1							whitish and crusty.
100	,	25	35	40	SC	10YR5/4	S	As above. Gravel fraction is multi-colored due to varying
100		20	55	70	- 00	101113/4		red and tan iron oxide stain, some bleaching, and green
								epidote alteration.
								opidate diteration.
	ı							
110		5	40	55	ML/CL	10YR5/4	М	Dark yellowish brown sandy clay and silt. Rare gravel is
	1							fine grained dark gray volcanic (andesite) with epidote
	ı							alteration and quartz-Kfeldspar vein material.
	,							,
	'							
120	1	15	20	65	ML/CL	7.5YR5/4	S	Brown sandy silt and clay with gravel. Gravel is angular
								to subangular gray volcanics and feldspar porphyry with
								epidote alteration.
130		10	50	40	SM-SC	7.5YR4/3	М	Brown silty and clayey sand. Gravel fraction and coarse
								sand grains are angular to subrounded gray fine grained
	,							volcanics and feldspar porphyry, crystal-rich quartz-
								feldspar porphyry, rhyolite, fine grained sandstone, and
<u> </u>								chert. Sand is poorly graded, fine to coarse grained. Fine
								grained sand is quartz with little magnetite; medium to
 	1							coarse sand is lithic grains with abundant sandstone and
 							 	arkose particles.
4.40		_	_	00	01	7.5\\D.5\\0	B 4	Drawn day Vary little and and any Co. 11 "
140		5	5	90	CL	7.5YR5/3	M	Brown clay. Very little sand and gravel. Gravel is fine
-								grained gray andesitic volcanic with epidote alteration
\vdash	,						-	and quartz- feldspar rich porphyry clasts.
\vdash	,						-	
\vdash								
150		tracc	5	95	CL	7.5YR4/3	М	Brown clay Rare gravel clasts are gray and critic velocate
150		trace	ن ن	90	OL	1.01R4/3	IVI	Brown clay. Rare gravel clasts are gray andesitic volcanic porphyry with epidote and fine grained sandstone. Clay
\vdash								is very sticky, plastic and cohesive
\vdash								is very sucky, piasuc and conesive
							<u> </u>	

Project	t Name:	Phelp	s Do	dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-6B
	Graphic			ed %		Munsell	HCI	
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
160			5	95	CL	7.5YR4/3	S	Brown clay. Sticky, cohesive, plastic; little sand.
	i							
170	,	20	50	30	SC	7.5YR5/3	M	Brown clayey sand with gravel. Gravel is angular to
	i							rounded clasts of gray andesitic volcanic with epidote,
								fine grained brecciated gray volcanic (probably eroded
	i							Demetrie Volcanics), brownish gray aphanitic volcanic,
	,							red rhyolite porphyry, arkose, and reddish siltstone. Sand fraction is quartz, volcanic lithic grains, and few sandstone
								with epidote grains, little magnetite.
	,							with opidote grains, little magnetice.
180	ı	10	50	35	SC	7.5YR5/4	W	Brown clayey sand. As above with greater clay content
100	i							and less gravel. Gravel clasts are primarily assorted
	•							volcanics as described above with lesser amount of
								sandstone. Clay fraction is sticky, cohesive and plastic.
190		trace	20	80	CL	7.5YR6/3	S	Brown clay with sand. Small gravel fraction is aphanitic to
								fine grained porphyritic andesite with epidote alteration
	i.							(probably Demetrie Volcanics) and quartz sandstone.
	ı							Sand is very fine to coarse grained, well-graded, mostly
	ı							quartz, some lithic grains, and little magnetite. Clay is
	,							sticky, cohesive, plastic.
200	ı.	+ro o o	15	0.E	CI	7. EVDC/4		Drown clay with good on chays. Croyal and accres and
200		trace	15	85	CL	7.5YR6/4	S	Brown clay with sand, as above. Gravel and coarse sand are primarily assorted volcanics with lesser arkose.
	i							are primarily assorted volcanics with lesser arkose.
	,							
	i							
210	i	5	20	75	CL	7.5YR6/4	М	Light brown clay with sand. Gravel is mostly epidotized
	,							andesite with lesser aphanitic brownish gray volcanic and
								quartzite clasts. Sand is mostly fine grained but ranges
								from fine to coarse grained, poorly graded; fine grained
								sand is mostly quartz with <1% fine crystalline magnetite;
	ı							coarse sand size particles are mostly lithic grains. Clay
	,							is sticky, cohesive.
	1	4.5	0.5	00	00	7.5\/0.0/0		Light Changer along your and 1991
220		15	65	20	SC	7.5YR6/3	М	Light brown clayey sand with gravel. Gravel is angular to
	1							subrounded clasts of brownish gray aphanitic volcanics,
\vdash								gray fine grained volcanics, arkose with epidote and limonite, chert, and siltstone. Sand is white, gray, red, tan
\vdash								and green quartz and lithic grains.
	ı						1	jana green quartz ana nune granis.
230	i	5	15	80	CL	7.5YR6/3	S	Light brown clay with sand. Very sticky, cohesive, plastic.
	•					3 1 1 10, 0	Ť	Gravel fraction as above.
	n							
240	i		5	95	CL	7.5YR6/4	М	Light brown clay; sticky, cohesive, plastic. Some silt and
								and fine-grained sand.
-	i.							

Project	Name:	Phelp	s Do	dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-6B
Depth	Graphic	Es	timat	ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Cample Description
250	ī	80	10	10	GW-GC	7.5YR 5/3	S	Brown gravel with clay. Gravel is angular to subrounded
	,							clasts of limonitic crystal rich quartz-feldspar porphyry,
	,							andesitic volcanics, red to pale gray rhyolite, and very fine
	1							grained white siliceous rock. Few clay balls. HCl reaction
								is in clay fraction.
260		trace	15	85	CL	7.5YR5/4	S	Brown clay with sand; some silt. Very sticky, plastic,
	ı							cohesive. Rare gravel is andesitic volcanic. Sand is
	•							mostly fine grained quartz, with 1-2% very fine grained
								magnetite.
	·							
270	i	20	15	65	CL	7.5YR5/4	M	Brown gravelly clay with sand. Poorly sorted.
	,							Gravel is mostly andesitic with epidote alteration
	į							with lesser brownish gray aphanitic volcanic, quartz sandstone, and quartz-feldspar intrusive clasts. Clay is
	Ī							sticky plastic and cohesive.
								Sticky plastic and conesive.
280		5	15	80	CL	7.5YR6/4	М	Brown clay with sand. Gravel as above.
								,
	·							
	i				141.701	7.57.000		
290	,	trace	25	75	ML/CL	7.5YR6/3	S	Brown clay and silt with sand. Rare gravel, as above.
	ī							One 3 cm diameter gravel clast; others = 1 cm diameter.
	,							
300	,	15	55	30	SM	7.5YR6/3	W	Brown silty sand with gravel. Gravel is angular to sub-
	i.							rounded clasts of andesitic volcanics, brown aphanitic
								volcanic with few quartz and feldspar phenocrysts, and
								quartz sandstone. Sand is coarse through fine grained;
	ı							abundant volcanic lithic grains and few epidotized sand-
	,							stone lithic grains in coarse sand fraction.
240	,	00	40	40	OD 00	7. FVD. F/0	N 4	Drawn are religible along Created in an endow to subgroup and
310		80	10	10	GP-GC	7.5YR 5/2	М	Brown gravel with clay. Gravel is angular to subangular clasts up to 2.5 cm diameter. Clasts are primarily andesitic
	ı							with some epidote alteration of feldspar; volcanic breccia
								textures visible in few clasts; lesser amounts of rhyolite,
	,							brown aphanitic volcanic, gray feldspar porphyry, crystal
	1							rich quartz-feldspar intrusive, and trace sandstone with
								epidote matrix. HCl reaction is in fine fraction.
320	r	75	10	15	GC	7.5YR5/2	М	Brown clayey gravel. As above, with a slightly greater
								fine fraction. Color of washed gravel is more gray at
								10YR5/2. HCl reaction restricted to fine fraction. First
								water. Water sample.
330		80	10	10	GP-GC	7.5YR5/2	S	Brown gravel with clay. As above with a little less fines.
330		50	10	10	J1 -GC	1.01110/2		Majority of gravel clasts are volcanics, with andesitic most
							<u> </u>	abundant, probably derived from Demetrie Volcanics.
							İ	
340		80	10	10	GP-GC	7.5YR5/2	М	As above. Water sample.
	,							

Project	: Name:	Phelp	s Do	dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-6B
	Graphic			ed %		Munsell	HCI	
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
350		80	10	10	GP-GC	7.5YR5/2	М	As above. Clast size up to 2.5 cm, dominantly andesite.
	'							•
360	i	60	20	20	GM	7.5YR5/2	S	Brown silty gravel with sand. Increased sand, silt, and
								clay content. Gravel is finer than above 50 feet. Volcanic
								clasts continue to be predominate, but sandstone, arkose,
	ı							and crystal rich quartz-feldspar intrusive clasts have
								increased. Sand is fine to coarse grained, mix of quartz,
								volcanic and sandstone lithic grains, few feldspars and 1%
	ı							very fine magnetite.
270	•	75	15	10	GP-GM	7.5YR5/2	N 4	Drown group with ailt and good. Crouplin angular to out
370		75	15	10	GP-GIVI	7.51R5/Z	М	Brown gravel with silt and sand. Gravel is angular to sub-
\vdash								rounded clasts up to 4 cm on long axis. Clasts dominantly andesitic with epidote alteration, with sandstone clasts
								increased to about 10% and crystal rich intrusive to about
	,							15%. Sand is fine to coarse grained, composed of quartz,
	,							lithic grains, and little magnetite. Gravel is loose and
								caving. Rig got stuck one hour and has not been able to
	·							get past 370' depth without gravel caving behind the bit.
	,							got pactors depart material graver saving perima are plan
380	'	70	20	10	GW-GM	10YR5/3	W	Brown gravel with silt and sand. Gravel is angular to
	ı							subrounded dark gray volcanics (some chloritic alteration),
	•							granitic, and gray sandstone clasts with few feldspar and
	'							epidote fragments. Sand fraction is coarse through fine
	'							grained, but primarily coarse grained, fairly clean.
390		85	10	5	GW	10YR5/3	W	Brown gravel. Gravel clasts are angular to rounded,
								primarily dark gray fine grained volcanic, granitic, and
								sandstone clasts, with some chlorite and epidote alteration.
	i							Sand fraction is coarse through medium grained, clean.
400		40	50	10	SW-SM	10YR5/3	W	Brown sand with silt and gravel. Gravel fraction as above
								but finer grained overall; sand fraction is coarse through
	i							fine grained, well-graded through to silt fraction.
440		45	0.5	00	014	40\/D5/0	N 4	Description and with several Occupation of the section of the sect
410	•	15	65	20	SM	10YR5/3	М	Brown silty sand with gravel. Gravel fraction as above.
								Sand fraction is primarily quartz and dark to light gray volcanic and sandstone lithic grains; fairly well-graded.
								voicanie and sandsione illine grains, ially well-graded.
	,							
420		20	65	15	SM	10YR5/3	М	As above, slightly more gravel.
120	·		55		Olvi	101110/0		
	•							
	'							
	'							
	•							
430	'	25	65	10	SW-SM	10YR5/3	М	Brown sand with silt and gravel. Gravel fraction is fine
	'							grained, angular to subrounded fine grained volcanic and
								granitic with some feldspar and epidote clasts. Sand
	•				_			fraction is coarse through fine grained, but primarily
								coarse grained; fairly clean.

Project	t Name:	Phelp	os Do	dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-6B
-	Graphic			ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	oumple Description
440		10	80	10	SW-SM	10YR5/3	W	Brown sand with silt. Gravel fraction is fine grained with
								maximum clast diameter of 1/4 inch, angular to subrounded
								dark to light gray fine grained and aphanitic volcanics.
								Sand is coarse through fine grained volcanic, quartz, few
								epidote and limestone grains; some iron oxide staining,
								fairly well-graded.
450		10	80	10	SW-SM	10YR5/3	W	As above.
430		10	00	10	OVV-OIVI	1011(3/3	VV	As above.
	•							
	•							
460		10	80	10	SW-SM	10YR5/3	W	As above, except sand fraction is coarser, primarily coarse
								through medium grained.
470		25	65	10	SW-SM	10YR5/3	W	Brown sand with silt and gravel. As above, with greater
								gravel fraction.
480		25	65	10	SW-SM	10YR5/3	W	As above.
400		20	00	10	OVV-OIVI	1011(3/3	VV	As above.
490	<u>'</u>	30	60	10	SW-SM	10YR5/3	М	Brown sand with silt and gravel. Gravel is fine grained up
								to 1/2 inch maximum diameter, angular to subrounded;
								angular clasts may represent larger clasts crushed during
								drilling. Clasts are primarily fine grained and aphanitic
								volcanics, with few granitic and quartz clasts. Chlorite
								and epidote alteration and limonite surface stain present
								on some clasts.
500		25	65	10	SW-SM	10YR5/3	М	As above.
300		20	00	10	OVV-OIVI	101113/3	IVI	As above.
	l							
	1							
510		25	65	10	SW-SM	10YR6/2	W	Light grayish brown sand with silt and gravel. Gravel
								fraction is fine grained chips up to 3/8 inch diameter,
								angular to subrounded, mostly dark to light gray volcanics
								with little quartz and granitic clasts. Sand fraction is coarse
								through medium grained, fairly well-graded.
					0144.55	10) (5 - 1-		
520		25	65	10	SW-SM	10YR6/3	W	As above.
	ļ						-	
	l						-	
530		25	65	10	SW-SM	10YR6/3	W	As above.
330	l	20	00	10	OVV-OIVI	101110/3	V V	no above.
	ŀ							
							<u> </u>	

Project	t Name:	Phelp	os Do	dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-6B
-	Graphic			ed %	4	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	·
540		25	65	10	SW-SM	10YR6/3	W	As above, with small amount of friable sandstone.
550		25	65	10	SW-SM	10YR6/3	W	As above.
560		10	85	10	SW-SM	10YR6/3	W	Light grayish brown sand with silt. Gravel as above.
			- 00		011 0111	101110/0		Sand is coarse through fine grained, but primarily coarse
								through medium grained quartz, volcanic, some epidote,
								and small amount of sandstone lithic grains.
				-	014/00	10) (5 = 15	14.	
570		5	70	25	SM/SC	10YR5/3	W	Brown clayey, silty sand. Gravel as above. Sand
							-	fraction is coarse through very fine grained quartz and volcanic lithic grains. Clay fraction is as small balls of soft
								moderately plastic material.
								moderately place material.
580		5	70	25	SM/SC	10YR5/3	W	As above. Sandstone gravel fragments are carbonate
								cemented, reacting strongly to HCI; overall cuttings react
								weakly to HCl.
590		5	80	15	SM	10YR5/3	W	Brown silty clayey sand. As above with decreased clay
330		- 5	00	10	Olvi	1011(3/3	VV	and silt fraction.
600			55	45	SM/SC	10YR5/3	W	Brown clayey silty sand. Sand primarily medium through
								very fine grained with some coarse grains; material is sticky and cohesive.
								Sticky and conesive.
610			55	45	SM/SC	10YR5/3	W	As above.
620			55	45	SM/SC	10YR5/3	W	As above, except that the sand fraction is well-graded
020			33	43	SIVI/SC	101113/3	VV	from very coarse through very fine grained, with more
							İ	coarse grained material than above.
	,							
630			10	90	CL	7.5YR6/3	N	Light brown clay, 10% sand. Sand fraction is medium
								to fine grained. Clay is very soft, plastic and sticky. No reaction to HCl.
							1	reaction to Hot.
640	•		25	75	CL	7.5YR6/3	N	Light brown clay with sand. Sand fraction is coarse through
								fine grained, primarily quartz and dark gray volcanic and
								small amount of reddish sandstone lithic grains; some iron
								oxide stain on grain surfaces; very soft, sticky, cohesive.
							-	
				<u> </u>				

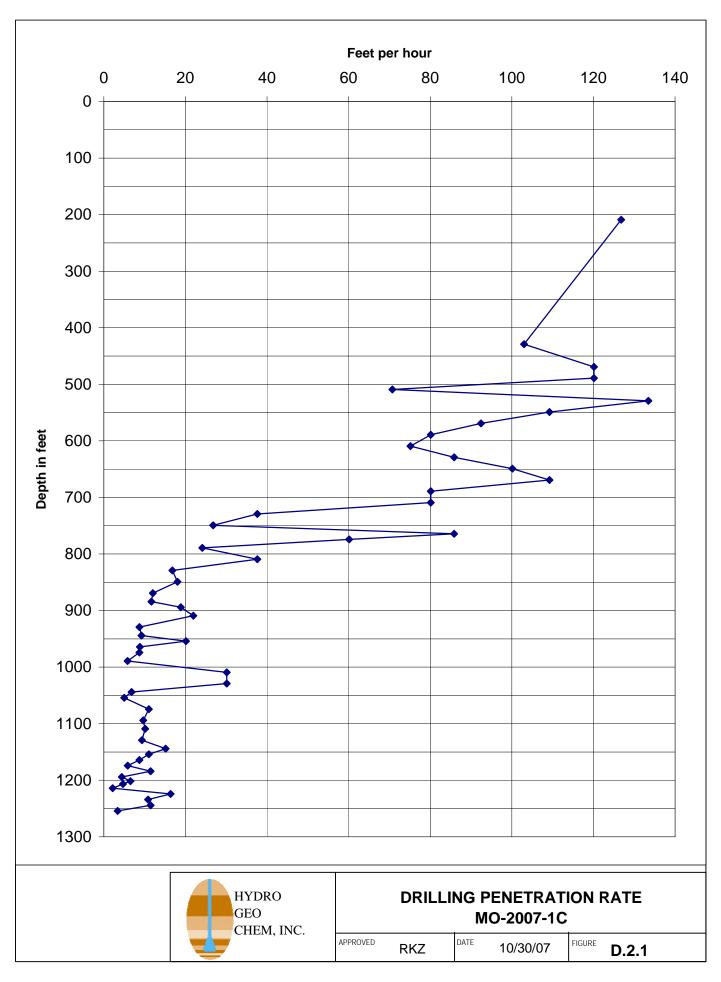
Project	Name:	Phelp	os Do	dge S	ierrita Miti	gation Order	r	Boring No.: MO-2007-6B
	Graphic		timat			Munsell	HCI	Samble Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	
650	·		10	90	CL	7.5YR6/3	N	Brown clay. As above with less sand.
	·							
660			20	80	CL	7.5YR6/3	N	Brown clay with sand. As above, with increased sand.
	ŗ							
	•							
670			20	80	CL	7.5YR6/3	N	As above.
680			20	80	CL	7.5YR6/3	N	As above.
							<u> </u>	
690			20	80	CL	7.5YR6/3	N	As above.
700			25	75	CL	7.5YR6/3	N	As above, with slightly increased sand fraction. Very
	·							soft, drilling rate has increased between 690' and 700'.
	1							
	·							
710			25	75	CL	7.5YR6/3	N	As above.
	·							
720	•		40	60	ML/CL	10YR6/2	W	Light brownish gray sandy silt and clay. Sand fraction
								is coarse through fine grained, primarily quartz and
								aphanitic volcanic lithic grains. Very soft material.
730			40	60	ML/CL	10YR6/2	W	As above.
740			40	60	ML/CL	10YR6/2	W	As above.
	,							
750			40	60	ML/CL	10YR6/2	W	As above.
760			40	60	MI /CI	10VD6/0	۱۸/	As above
760			40	60	ML/CL	10YR6/2	W	As above.

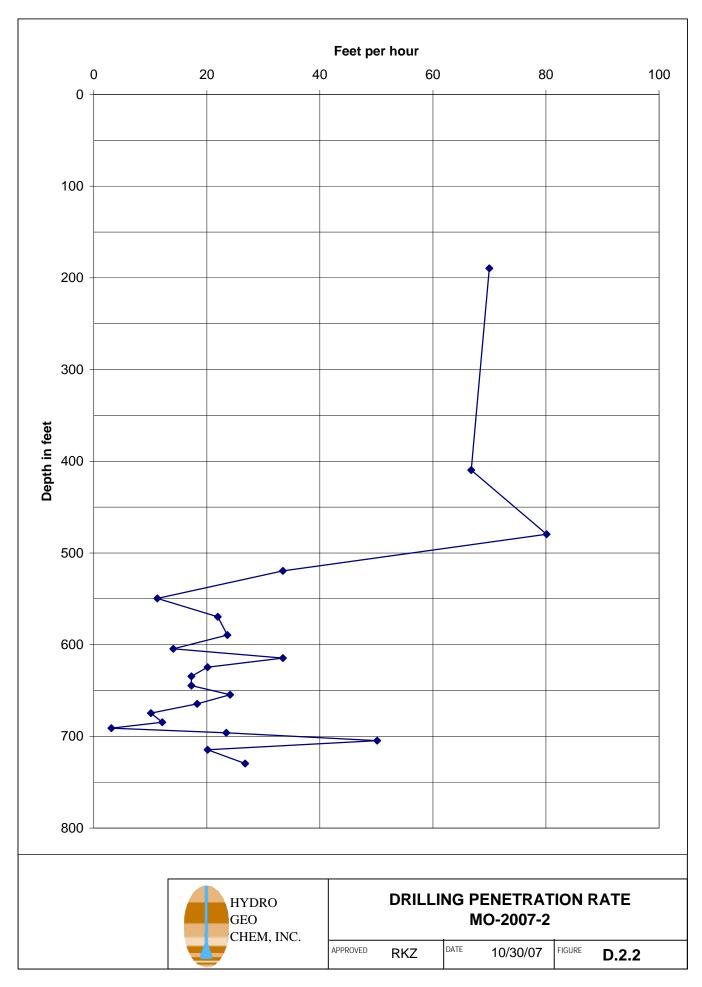
Project	t Name:	Phelp	os Do	dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-6B
Depth	Graphic	Es	timat	ed %	USCS	Munsell	HCI	Sample Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
770			70	30	SM/SC	10YR6/2	W	Light brownish gray silty, clayey sand. Sand is coarse
								through fine grained, primarily composed of dark to light
								gray aphanitic volcanic and quartz grains, with small
								amounts of granitic and sandstone lithic grains; well-
	i.							graded through to silt. Washed sample is very dark gray
	i.							due to high percentage of volcanic grains.
780			70	30	SM/SC	10YR6/2	W	As above.
	i							
	•							
700	ı		70	20	CNA/CC	40VDC/0	١٨/	A a shave
790	i		70	30	SM/SC	10YR6/2	W	As above.
	i							
							-	
							1	
800	i.		80	20	SM	10YR6/2	N	Light brownish gray silty sand. Sand fraction is coarse
300	ı		30	20	JIVI	101110/2	IN	to fine grained, well -graded through to silt. Sand is
	ļ							primarily volcanic grains with abundant quartz, some
								granitic, feldspar, and epidote grains.
	ı							gramile, relaspar, and epidote grame.
810	i		55	45	SM/SC	10YR6/2	N	Light brownish gray silty, clayey sand. Sand as above,
0.0	ı		- 00		0.11.700	101110/2	.,	very soft, sticky, cohesive material.
	ı							voly cont, analy, concerve material
	i							
820	i		55	45	SM/SC	10YR6/2	N	As above.
	•							
	U							
830	i		75	25	SM	10YR6/2	N	Light brownish gray silty sand. Sand fraction is coarse to
	i							very fine grained, well-graded through to silt fraction;
								primarily dark to light gray and reddish brown volcanic
	i.							grains with abundant quartz and few feldspar grains.
840			70	30	SM/SC	10YR6/2	N	As above except for small amounts of clay as small soft,
	i							plastic, cohesive balls.
	,						-	
850			70	30	SM/SC	10VD6/2	۱۸/	As above, except weakly reactive to HCI
650			70	30	SM/SC	10YR6/2	W	As above, except weakly reactive to HCl.
	ı						 	
	ļ							
	ļ							
860	l		70	30	SM/SC	10YR6/2	W	As above.
500			, 0	50	C.VI, CO	101110/2	- * *	, 10 000101
	i.							
	ı							
	ı							
870	ı		40	60	CL/ML	10YR6/3	W	Pale brown sandy clay and silt. Sand fraction is coarse
5.5			.,		,	12111070		to fine grained, primarily dark gray volcanic and quartz
	•							grains with some reddish brown aphanitic volcanic grains.
	•							Soft, sticky.
	b							. ,

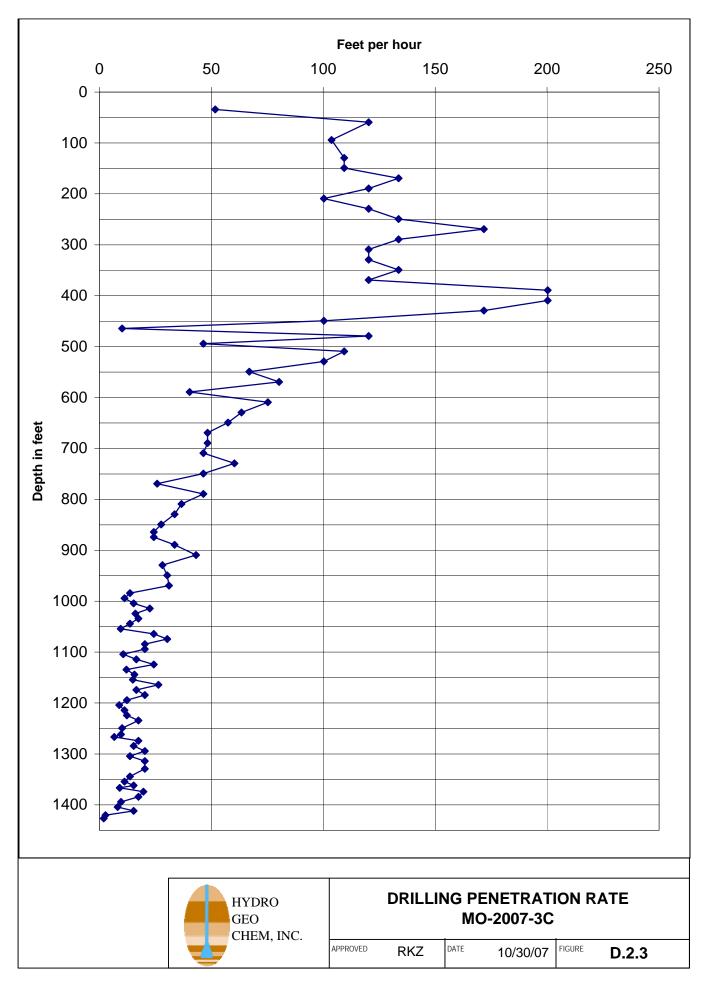
Project	t Name:	Phelps Dodge Sierrita N		ierrita Miti	gation Orde	r	Boring No.: MO-2007-6B	
	Graphic					Munsell	HCI	Comple Description
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
880			40	60	CL/ML	10YR6/3	W	As above.
	,							
								
890	ı		40	60	CL/ML	10YR6/3	W	As above, except that sand is finer, ranging from medium
	,							to very fine grained.
	ı							
900	,	5	75	20	SM	10YR6/3	W	Pale brown silty sand. Gravel is up to 1/2 " diameter.
000	i		-,0		Olvi	101110/0		Sand is coarse through fine grained, well-graded to silt.
	i							Sand grains are primarily fine grained to aphanitic dark
								volcanics and quartz, with some sandstone grains.
910		5	75	20	SM	10YR6/2	W	As above.
000		_	00	4.5	014	10)/D0/0	107	
920	,	5	80	15	SM	10YR6/3	W	Pale brown silty sand; trace gravel. As above, except with
								less silt and the sand and gravel fraction contain numerous lithic grains and clasts of reddish sandstone.
	,							innic grains and clasts of reddistrisandstone.
930	,		70	30	SM	10YR6/3	W	Pale brown silty, clayey sand. Sand fraction is coarse
- 000	,			- 00	0	101110/0		through fine grained, but mostly fine grained quartz,
	i							aphanitic volcanic and reddish sandstone grains.
	1							
940	ı		70	30	SM	10YR6/3	W	As above.
	ı							
	,							
950		10	70	20	SM	10YR6/2	W	Light brownish gray silty sand. Gravel fraction is fine
930	ı	10	70	20	SIVI	10110/2	VV	grained to 1/2 inch maximum diameter, angular to sub-
								rounded, primarily dark colored volcanic, granitic, quartz,
								sandstone and trace shaley clasts. Volcanic clasts include
								gray andesite with epidote-replaced feldspars, gray
								aphanitic siliceous chips with few diffuse feldspars, brown
								rhyolite, reddish brown aphanitic with feldspar and biotite
								phenocrysts, gray tuff, and small amount of finely
								brecciated volcanic with silica matrix. Some sandstone
								grains have pre-erosional epidote, sericite, oxidized pyrite
<u> </u>							<u> </u>	alteration.
				0.0	61.6	40\ /D = /=		
960	bedrock		70	30	SM	10YR6/2	N	Light brownish gray silty sand. Sand is coarse through
								fine grained, fairly well-graded, mostly dark gray volcanic
								and quartz grains. Sample lacks variety of lithologies described above, consisting of only the biotite-feldspar,
								diffuse feldspar, brownish gray aphanitic volcanics and
								few silica-breccia volcanics. Interpreted to be top of
								volcanic bedrock.
								TOTAL TO DOUT OUT.

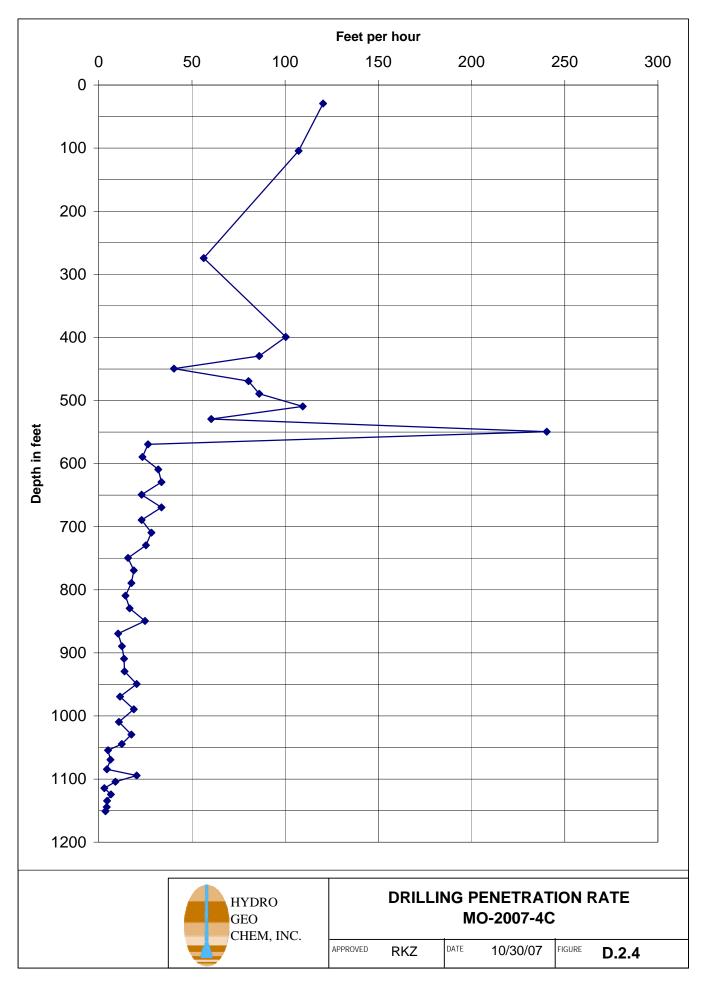
Project	Name:	Phelp	s Do	dge S	ierrita Miti	gation Orde	r	Boring No.: MO-2007-6B
	Graphic			ed %		Munsell	HCI	, and the second
(Ft)	Log	GR	SA	FI	Symbol	Color	Rxn	Sample Description
970			80	20	SM	10YR6/2	N	Light brownish gray silty sand. Grains are very angular,
								primarily dark to light gray and reddish brown volcanics
								with biotite and feldspar phenocrysts, and few fine
								volcanic breccia chips.
	,							
980	ı		70	30	SM	10YR6/2	N	Light brownish gray clayey, silty sand. As above, with
								clay. Clay is soft, cohesive, sticky. Sand sized particles
	į.							are about 90% brown volcanic with feldspar, biotite and rare quartz phenocrysts, 5% free quartz, and 5% fine
	,							volcanic breccia.
	,							Voicariic breccia.
990			40	60	CL/ML	10YR6/2	N	Light brownish gray sandy clay and silt. Sand as above;
- 000	,			- 00	OL/WL	101110/2		clay is very soft, sticky, cohesive.
	1							only confidence of the confide
	'							
1000			40	60	CL/ML	10YR6/2	W	As above.
								Drilling has slowed down to 10 feet per hour.
								From 950 to present depth, seem to be passing through
	ı							interbeds of volcanics and clay-silt. Volcanic layers slow
								drilling penetration rate; clayey layers drill more quickly.
1010	,			40	CNA	40VDC/0	147	Light hyguniah avan alaman aiku agad. Candinastian is
1010	i.		60	40	SM	10YR6/2	W	Light brownish gray clayey, silty sand. Sand fraction is primarily medium to fine grained, fairly well-graded
	,							through to silt fraction.
	,							unough to siit naction.
1020	•		60	40	SM	10YR6/2	W	As above, except that sand fraction is coarse through
	•				<u> </u>			fine grained.
	,							
1030			20	80	CL	10YR5/2	W	Grayish brown clay with sand. Sand fraction is coarse
	,							through fine grained volcanic, quartz and feldspar grains.
	ı							Clay is cohesive, sticky, very soft.
1040			0.5	1 =	CM	10VDe/0	N.I	Light brownish grow silty sand, ground up valencies. Mix
1040			85	15	SM	10YR6/2	N	Light brownish gray silty sand, ground up volcanics. Mix of gray to brown aphanitic and fine fragmental textured
								volcanics.
								voicanios.
1050			85	15	SM	10YR5/2	W	Grayish brown silty sand, interpreted as ground up
								volcanic bedrock. Drilling very slow. Sand sized particles
								mostly angular with little subrounded material. Sample is
								about 50% gray to brown aphanitic volcanic with feldspar
								and few biotite phenocrysts and 50% small angular
	,							volcanic fragments and individual biotite, feldspar and
								grains, densely packed, and cemented with light pinkish
	,							tan siliceous material. Some epidote replacement of
								feldspars in both the volcanic porphyritic and fragmental
								material.
1060			95	5	SW	10YR5/2	N	As above, 75% fine fragmental volcaniclastic textures.
1060			90	ن ن	300	1011072	IN	As above, 15% line fragmental volcaniciastic textures.
							I	

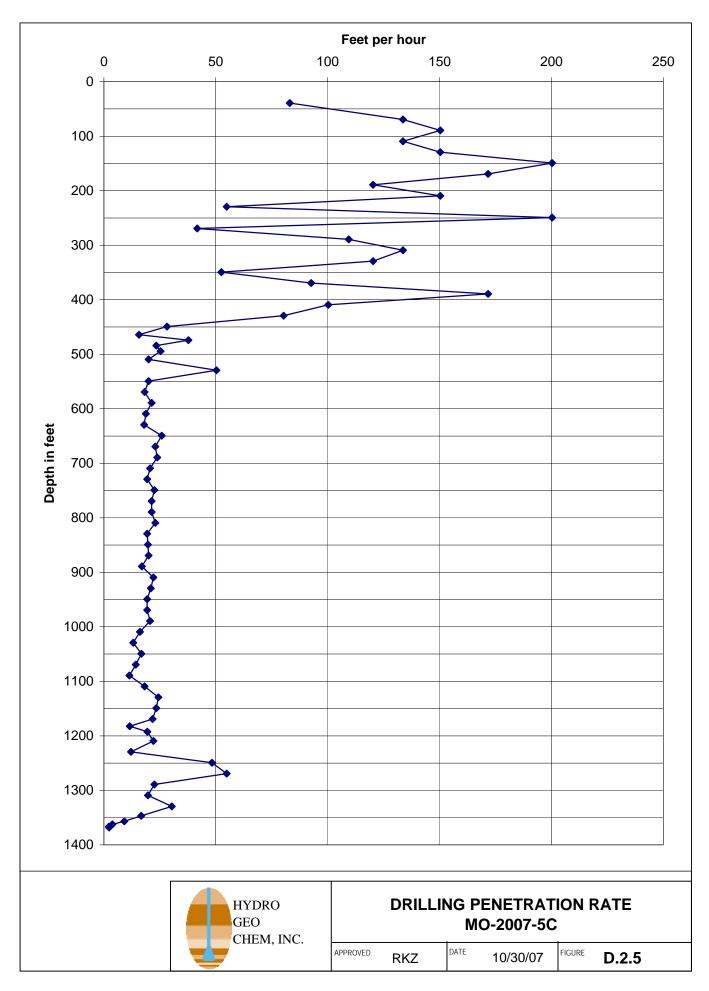
APPENDIX D.2 DRILLING PENETRATION RATES

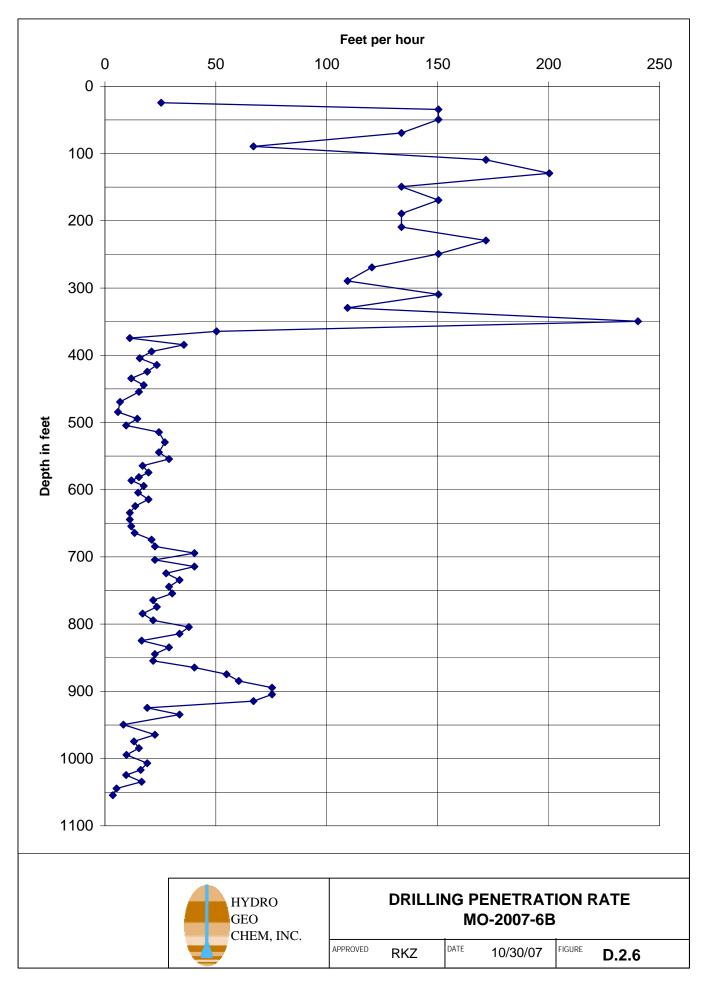












APPENDIX D.3 WELL CONSTRUCTION SUMMARY FORMS

Project Nar	me: Phelps Dodge	Sierrita Inc	Sulfate Inves	tigation			Boring No ·	MO-2007-1A
	mpany: WDC	Ciorrita irio.	Sunato invoc		teve Huston		Project No.:	
	Il Registration No.:	55-907342					Geologist: N	
	American Legion H							
	Range, Section: 1							
,	3-,		_					
AS-BU	IILT DIAGRAM			DRIL	LING SUMM	IARY		
Depth (Ft)		Total Depth:	620 feet	Hole Dia	meter: 9 7/8"	1	Method: mu	d rotary
	LAND SURFACE		efco Speedsta				Bit Type: tri	
	→ 18" BOREHOLE	J	•					
žŏ —	PORTLAND							
N N	CEMENT			1	NELL DATA	1		
	10" SURFACE CASING		De	epth Interva	al (Ft)		Diameter, M	laterial,
	5" STEEL CASING	Ca	sing		Screen			t Size
	9 7/8" BOREHOLE	0 - 13'					10" steel	
	K	0-20'					5" steel, sch	
图	5" CASING PVC	+1-20'					5" sch 80 P'	
	8			460'-600				/C 0.04" Slots
图	BENTONITE GROUT							C w/ bottom cap
X			/laterial: #8		⁄el		Interval: 44	
	民		/laterial: #8-1				Interval: 43	
N C	图		/laterial: #60				Interval: 43	
ALE E			ips: time rele				Interval: 41	
80 80 80	R		onite grout sl	urry			Interval: 10	
OP 전		Cement:					Interval: 0'	- 10'
FEET BELOW SURFAC (NOT TO SCALE) YYYXYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYY	R		npletion: abo		steel box			
			oint: to be e					
		Centralizer L	ocations: eve	ery 50 ft ald	ong screened	d interval		
점								
图								
	图			0011075				
				CONSTR	RUCTION TII	ME LOG	i T	
图	图	Task		Data and	Ctart Time		Data and Fig	ink Time
数		Task			Start Time		Date and Fir	
<u> </u>	∕─ 12 FEET MEDIUM	Drilling		6/28/07 1			7/2/07 10:30	
N. C.	BENTONITE CHIPS	Casing		7/2/07 14			7/2/07 16:46	
	4 FEET #60 SILICA SAND	Filter Pack		7/2/07 16			7/2/07 19:30	
419	_ 5 FEET 8-12	Bentonite Cl	· .	7/2/07 19			7/2/07 19:59	
431 435 440	SILICA SAND	Bentonite G		7/2/07 20			7/2/07 22:00	
440	FILTER PACK	Bentonite G	out	7/3/07 12	2.00		7/3/07 15:00)
460	EXTENDS 20 FEET	Cement Surface Con	oplotion	8/21/07 8/21/07			8/21/07 8/21/07	
	ABOVE TOP OF	Surface Cor	npietion	0/21/07			0/21/07	
	SCREEN							
	5" PVC	1		\ \ /⊏! !	DEVEL OR	MENT		
	(0.04 INCH SLOTS)	Tack	Time (hre)	Gallons	DEVELOPI Star		End	
		Task	Time (hrs)		Star			11.15
		Bailing	3.5	240	07/14/07 8	:15	07/14/07	11:45
	TACNA #8	Airlifting						
	FILTER PACK GRAVEL	Swabbing Development						
			13.25		07/10/07 4	1.10	07/40/07	16:30
600	SUMP	Pumping Pump Testing	10.75		07/18/07 1	3:40	07/19/07 08/08/07	19:27
620		Total	27.5		00/00/07	J. 4 U	00/00/07	13.41
Remarks:		i Otal	£1.J					
romans.		1						

		Summary		
		Sierrita Inc. Sulfate Invest		Boring No.: MO-2007-1B
	mpany: WDC	EE 007040	Driller: Ryan Reynolds	Project No.: 78300
	ell Registration No.:			Geologist: M. Arneson
	American Legion H			
Township,	, Range, Section: 1	7S 13E 34dcd		
AS-BI	UILT DIAGRAM		DRILLING SUMMARY	
Depth (Ft)		Total Depth: 920 feet	Hole Diameter: 9 7/8"	Method: mud rotary
	LAND SURFACE	Drill Rig: Gefco Speedsta		Bit Type: tricone
	■ 18" BOREHOLE	Zim ring. Golde Speeded		Dit Type: theorie
20	PORTLAND			
\$	CEMENT		WELL DATA	
8	10" SURFACE	De	oth Interval (Ft)	Diameter, Material,
E	CASING	Casing	Screen	Slot Size
Ħ	B	0 - 20'	00.00	10" steel
A	9 7/8" BOREHOLE	+1-740'		5" steel, sch 40
B	5" CASING		740' - 900'	5" steel, .05" vertical slot
	LOW CARBON STEEL	900' - 910' (sump)	7-10 300	5" steel w/bottom cap
	BENTONITE GROUT		Lacna gravel	Interval: 705' - 920'
<u> </u>		Filter Pack Material: #8-1		Interval: 700' - 705'
K	K.	Filter Pack Material: #60		Interval: 700 - 700'
w V	V	Bentonite chips: time rele		Interval: 685' - 695'
TO SCALE)	A	Grout: bentonite grout slu		Interval: 20' - 685'
			шу	Interval: 0' - 20'
M M		Cement: Surface Completion: abo	vo ground stool hov	interval. 0 - 20
10	7.5	Measuring Point: to be es		
(NOT		<u> </u>		-1
16	4-6	Centralizer Locations: eve	ery 50' along screened interv	aı
	3			
	10 FFFT NFDIUM		CONSTRUCTION TIME I	20
5	BENTONITE CHIPS		CONSTRUCTION TIME LO	-
	5 FFET # 60 SILICA SAND	Tools	Data and Start Time	Data and Finish Time
13	-5 FFFFT 8-12	Task	Date and Start Time	Date and Finish Time
695	SILICA SAND	Drilling	6/20/07 8:30	6/26/07 9:30
685 695 700		Casing	6/26/07 15:00	6/27/07 10:30
8	→ FILTER PACK	Filter Pack	6/27/07 14:15	6/27/07 15:25
85.7	EXTENDS 35 FEET	Bentonite Chips	6/27/07 15:30	6/27/07 15:35
740	ABOVE TOP OF	Bentonite Grout	6/27/07 16:00	6/28/07 9:15
	SCREEN	Cement	6/28/07 9:30	6/28/07 10:30
33		Surface Completion	8/21/07	8/21/07
	5" LOW CARBON			
	STEEL, FACTORY SLOTTED SCREEN			
(1)	(0.05 INCH SLOTS)		WELL DEVELOPMENT	
		Task Time (hrs)	Gallons Start	End
		Bailing 9.2	240 7/27/07 9:20	7/28/07 14:15
	TACNA#8	Airlifting 3.0	7/30/07 9:55	7/30/07 15:50
\$#	FILTER PACK GRAVEL	Swabbing 1.5	7/28/07 10:30	7/28/07 12:00
	10	Development		
		Pumping		
900	SUMP	Pump Testing 5.9	8/2/07 8:03	8/2/07 15:55
920	1000	Total 19.6		
Remarks:		-		

	Sonstruction							
	ame: Phelps Dodge	Sierrita Inc. S	Sulfate Investi					No.: MO-2007-1C
	ompany: WDC			Driller: A	rnold Lar	non		No.: 78300
	/ell Registration No.:						Geolog	ist: W. Thompson
	American Legion H							
Township	o, Range, Section: D	-17-13-34dcd						
AS-B	UILT DIAGRAM			DRIL	LING SU	MMARY		
Depth (Ft		Total Depth:	1260 feet	Hole Dia	meter: 9	7/8"	Method	l: mud rotary
0 — 1983	LAND SURFACE	Drill Rig: Get	fco Speedsta	r 50K			Bit Typ	e: tricone
20	17" BOREHOLE							
8	PORTLAND CEMENT							
	덬 \				WELL DA	TA		
8	10" SURFACE CASING			oth Interva	al (Ft)		Diamet	er, Material,
E	쥑		sing	_	Screen	1		Slot Size
8	9 7/8" BOREHOLE						10" ste	
8	5" CASING	+1 -1020'						l, sch 40
83	LOW CARBON STEEL			1020' - 1	180'			l, .05" vertical slot
크	BENTONITE GROUT	1180' - 1190'						w/bottom cap
24	No.	Filter Pack M			vel			: 995' -1260'
용 점	3	Filter Pack M						: 990' - 995'
		Filter Pack M						l: 985' - 990'
SURFACE SCALE)	Kil	Bentonite chi			3			: 975' - 985'
	, A	Grout: bento	nite grout slu	rry				l: 20' - 975'
FEET BELOW	A	Cement:					Interva	l: 0' - 20'
mo E	[3]	Surface Com			steel box	<u> </u>		
	3	Measuring Po						
4 2	3	Centralizer Lo	ocations: eve	ry 50° aloi	ng screer	ied intervai		
5	BENTONITE CHPS							
3	183 7							
3	SUCA SAND			CONSTR	HICTION	TIME LOG	2	
FEET BELL (NOT T	5 FEET 8-12 SILICA SAND					TIME LOC	<u>, </u>	
975 975 985 993	*	Task		Date and	Start Tim	10	Date an	d Finish Time
550	FILTER PACK	Drilling		5/24/07		16	6/13/07	
1020	EXTENDS 25 FEET	Casing		6/15/07			6/15/07	
<u> </u>	ABOVE TOP OF SCREEN	Filter Pack		6/16/07			6/16/07	
		Bentonite Ch	ins	6/16/07			6/16/07	
	5" LOW CARBON STEEL, FACTORY SLOTTED SCREEN	Bentonite Gro		6/16/07			6/17/07	
4	SLOTTED SCREEN	Cement	Jul	6/17/07			6/17/07	
	(0.05 INCH SLOTS)	Surface Com	pletion	9/11/07			9/11/07	
7		24.1450 00111	F.00011	13, 1, 1, 0, 1			3, 1, 1, 01	
ß								
				WELL	DEVELO	OPMENT		
	=	Task T	ime (hrs)	Gallons	Sta		End	
		Bailing	6.67	450	7/11/07		7/12/07	15:26
1180 1190	SUMP	Airlift pumping	6.83	2643	7/13/07		7/14/07	11:45
	1953 1933	Zonal airlifting					,	
	TACNA #8 FILTER PACK GRAVEL	and swabbing	9.08	4598	7/15/07	11:10	7/16/07	15:20
		Development					3, 5 .	
10.00 kg		pumping	18.13		7/26/07	9:07	7/27/07	17:05
1260 —	ELECTION OF THE PARTY OF THE PA	Pump testing	11.7			8:20	7/31/07	20:02
Remarks:	•	Total	52.41				,	
		1						

Darie ()	Dhal D !	Olamita Ina Olf ()	and the m	Danis - Na - MO 0007 0
_		Sierrita Inc. Sulfate Investi		Boring No.: MO-2007-2
	ompany: WDC	FF 00070F	Driller: Jeff Burris	Project No.: 78300
	ell Registration No.:			Geologist: W. Thompson
	,	north side) and View Point I	Road (east side)	
Lownship	, Range, Section: D	-18-13-9baa		
	= 514.65.44			
	UILT DIAGRAM	T	DRILLING SUMMARY	
Depth (Ft)	,	Total Depth: 740 feet	Hole Diameter: 9 7/8"	Method: mud rotary
0 - 121222	LAND SURFACE	Drill Rig: Gefco Speedsta	r 50K	Bit Type: tricone
1	→ 17" BOREHOLE			
20 —	PORTLAND		WELL DATA	
園	CEMENT		oth Interval (Ft)	Diameter, Material,
	10" SURFACE	Casing	Screen	Slot Size
	CASING	0-10'		10" steel
IT BELOW SURFACE (NOT TO SCALE)		1'-520'		5" steel, sch 40
× =	◆ 9 7/8" BOREHOLE		520' to 680'	5" steel, .05" vertical slot
(NOT TO SCALE)	5'CASING	680' - 685' (sump)		5" steel w/ bottom cap
#9 E	LOW CARBON STEEL	Filter Pack Material: #8 T		Interval: 695' - 508'
30 E		Filter Pack Material: #3 sa		Interval: 508' - 502'
	BENTONITE GROUT	Filter Pack Material: #60		Interval: 502' - 497'
19 周	周	Grout: time release bento	onite	Interval: 740' - 695'
5 7	Α.	Bentonite chips: medium		Interval: 497 - 468'
自自	₿/	Grout: bentonite grout/slu	ırry	Interval: 468' - 20'
	/- 29 FEET MEDIUM	Cement:		Interval: 20 - 0'
	BENTONITE CHIPS	Surface Completion: above		
	₩ /	Measuring Point: to be es		
468	∰ / _ 5 FEET #60 SILICA SAND	Centralizer Locations: eve	ry 50' along screened interva	d
ANT III	7			
502	6 FEET 8-12 SAND			
508	+		CONSTRUCTION TIME LO	G
520	FILTER PACK			
	EXTENDS 12 FEET ABOVE TOP OF	Task	Date and Start Time	Date and Finish Time
	SCREEN	Drilling	3/14/07 8:40	4/11/07 12:00
	SONEIN	Casing	4/13/07 9:06	4/13/07 16:00
	TACNA #8	Filter Pack	4/13/07 17:30	4/13/07 19:30
	FILTER PACK GRAVEL	Bentonite Slurry	4/13/07 17:30	4/13/07 20:00
		Cement	4/15/07 11:00	4/15/07 12:00
	FILOUI CARROLL	Surface Completion	4/19/07	4/19/07
	5" LOW CARBON STEEL, FACTORY	•	•	
	SLOTTED SCREEN		WELL DEVELOPMENT	
	(0.05 INCH SLOTS)	Task Time (hrs)	Gallons Start	End
		Bailing	06/02/07 10:30	06/04/07 17:00
		Airlifting		
680 685	SUMP	Swabbing		
695	9.A.A.A.	Development		
		Pumping	06/05/07 8:20	06/06/07
	BENTONITE PELLETS	Pump Testing	06/14/07 7:30	06/14/2007
		Total	33,1-707 1.30	55,11,2501
740	3 44444			
Remarks:		1		
Nomains.	•			

Well Construction Summary

Project N	lame: Phelps Dodge	Sierrita Inc. S	Sulfate Invest	igation		Boring No.: MO-2007-3B
Drilling C	Company: WDC			Driller: A	rt Cortez	Project No.: 78300
ADWR W	Vell Registration No.:	55-906816				Geologist: W. Thompson
Location:	: NE corner of La Ca	nada and Sai	n Ignacio on r	north side (of wash	
Township	o, Range, Section: D	-18-13-2bcc				
AS-E	BUILT DIAGRAM			DRIL	LING SUMMAR	Υ
Depth (F	t)	Total Depth:	960 feet	Hole Dia	meter: 9 7/8"	Method: mud rotary
0 100	LAND SURFACE 18° BOREHOLE		efco Speedsta	ar 50K		Bit Type: tricone
20	PORTLAND		•			
	CBMENT 10' SURFINCE					
3	GASING				WELL DATA	
	9 7/8" BOREHOLE		De	pth Interva	l (Ft)	Diameter, Material,
	5" GASING LOW CARBON STEEL	Ca	asing		Screen	Slot Size
	BENTONITE GROUT	0 - 20'	<u>g</u>			10" steel
		+1 -740'				5" steel, sch 40
# E				740' - 94	·O'	5" steel, .05" slot, sch 40
NOT TO SCALE		940' - 950' ((sump)	1.15 5	-	5" steel, sch 40 w/bottom cap
TO TO	日		Material: #8	Tacna grav	/el	Interval: 705' -960'
NON ETER			Material: #8-1			Interval: 700' - 705'
THE STATE OF	園		Material: #60			Interval: 695' - 700'
翻			nips: time rele			Interval: 673' - 695'
	237		onite grout/slu			Interval: 20' - 673'
		Cement:	ornic groupsii	ипу		Interval: 0' - 20'
222	E		npletion: abo	ve-around	steel hov	Interval. 0 20
			Point: to be e		Steel box	
37			ocations: 94		0' 700' 740'	
		Certifalizer	_00ations. 94	0,030,04	0,730,740	
				CONST	RUCTION TIME	LOG
				1	COCTION TIME	
		Task		Date and	Start Time	Date and Finish Time
	甚	Drilling		8/11/07		8/25/07 16:30
日				8/28/07		8/28/07 17:39
PRET DESCRIPTOS STATES INOT TO STATES INOT TO		Casing Filter Pack		8/29/07		8/29/07 15:40
		Bentonite Cl	hine	8/29/07		8/29/07 15:40
NAME:	E	Bentonite G		8/29/07		8/30/07 14:25
	10 FEET MEDIUM BENTONITE CHIPS		iout	9/18/07	J. 13	9/18/07
073	SLICA SAND	Cement Surface Cor	nnletion	9/18/07		9/18/07
595 705	SFEET 8-12 SLICA SAND	Surface Cor	прівноп	9/10/07		9/16/07
706	FLITER PAGE					
740	ABOVE TOP OF			WELL	_ DEVELOPMEN	ıT
	SOREEN	Task	Time (hrs)	Gallons	Start	End
	■ä	Bailing	3.5	500	8/12/07 7:45	8/12/07 17:00
			2.45	500	9/6/07 12:35	9/6/07 15:10
	FI LOW CARBON	Airlifting Swabbing	۷.40		3/0/0/ 12.33	9/0/07 13.10
	STEEL, FACTORY SLOTTED SCREEN	Swabbing				
W.	(0.06 INCH SLOTS)	Development				
	TAGNA #6 FILTER PACK GRAVEL	Pumping	0.0		0/40/07 0 00	0/40/07 47 00
8		Pump Testing	9.0		9/10/07 8:00	9/10/07 17:00
940 950	SLMP	Total	14.95			
980	. Discount					
Remarks) <u>;</u>					
⊔ .\702∩∩\7						

12/12/2007

	ame: Phelps Dodge	Sierrita Inc. Sulfate Inve	estigation	Boring No.: MO-2007-3C
Drilling Co	ompany: WDC		Driller: Arnold Lamon	Project No.: 78300
ADWR W	ell Registration No.:	55-906817		Geologist: W. Thompson
		nada and San Ignacio o	n north side of wash	
Township	, Range, Section: D	-18-13-2bcc		
AS-B	UILT DIAGRAM		DRILLING SUMMARY	
Depth (Ft))	Total Depth: 1430 feet		Method: mud rotary
0	LAND SURFACE	Drill Rig: Gefco Speed	star 50K	Bit Type: tricone
20	17' BOREHOLE PORTLAND			
器	CEMENT			
	I I I SURFACE CASING		WELL DATA	
	→ 9.718° BOREHOLE		Depth Interval (Ft)	Diameter, Material,
	D' CABIND LOW CARBON STEEL	Casing	Screen	Slot Size
22	BENTONITE GROUT	0 - 20'		10" steel
둺		+1 -1160'	11001 10001	5"mild steel, sch 40
20 E	員	40001 40001	1160' - 1320'	5" mild steel, .05" slot, sch 40
AND THE	菌	1320' - 1330'	0. To an a series of	5" mild steel, sch 40
CONTRACTOR	萬	Filter Pack Material: #		Interval: 1130' -1430'
TON TON	E	Filter Pack Material: # 8	3-1∠ cnoke sand	Interval: 1125' - 1130'
		Filter Pack Material:	20	formation fill 1081' - 1125'
日		Filter Pack Material: #6		Interval: 1076' - 1081'
T.	' ₽	Bentonite chips: time re		Interval: 1066' - 1076'
9	A .	Grout: bentonite grout. Cement:	rsiurry	Interval: 20' - 1066' Interval: 0' - 20'
Br.	Êu	Surface Completion: a	have ground stool hav	interval. 0 - 20
商		Measuring Point: to be		+
	魯			/al
SHEET.	1 1 1 1 1 1 1 1 1 1		every 50' along screened interv	val
TENTANT				val
HERETERETE			every 50' along screened interv	
	TOPPET NEDAM DENTONITE CHIPS		every 50' along screened interv	
	50NTONITE CHRS 5FEET \$80 SELICA SAND	Centralizer Locations:	construction time Lo	OG
	BENTONITE CHIPS	Centralizer Locations: 6	CONSTRUCTION TIME Lo	OG Date and Finish Time
1088	50NTONITE CHRS 5FEET \$80 SELICA SAND	Centralizer Locations: 6 Task Drilling	CONSTRUCTION TIME Lo Date and Start Time 4/25/07 10:52 5/15/07 8:30 5/17/07 7:40	Date and Finish Time 5/13/07 15:36 5/16/07 12:00 5/17/07 17:16
	SELFA SAND 44 FEET FORMATION FILL SPEET B 12 SULCA SAND	Task Drilling Casing Filter Pack Bentonite Chips	CONSTRUCTION TIME Lo Date and Start Time 4/25/07 10:52 5/15/07 8:30 5/17/07 7:40 5/22/07 9:55	Date and Finish Time 5/13/07 15:36 5/16/07 12:00 5/17/07 17:16 4/13/07 20:00
1195	SELTA SAND 44 FEET FORMATION FILL SIPERT 6/12 SELTA SAND FILTER PRICK ENTENDS SO FEET	Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout	CONSTRUCTION TIME Long Screened intervention of the construction o	Date and Finish Time 5/13/07 15:36 5/16/07 12:00 5/17/07 17:16 4/13/07 20:00 5/22/07 15:20
1185	SPECIA SAND SPECIA SAND SPECIA SAND SPECIA SAND SPECIA SAND SPECIA SAND FILTER PACK	Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement	CONSTRUCTION TIME Lo Date and Start Time 4/25/07 10:52 5/15/07 8:30 5/17/07 7:40 5/22/07 9:55 5/22/07 10:45 5/23/07 7:00	Date and Finish Time 5/13/07 15:36 5/16/07 12:00 5/17/07 17:16 4/13/07 20:00 5/22/07 15:20 5/23/07 9:45
1185	SPECT SAND SPECT SAND SPECT SAND SPECT SAND SPECT SAND FILTERPACK ENTRODOS SPECT ABOVE TOP OF SCREIN	Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout	CONSTRUCTION TIME Long Screened intervention of the construction o	Date and Finish Time 5/13/07 15:36 5/16/07 12:00 5/17/07 17:16 4/13/07 20:00 5/22/07 15:20
1195	SPEET BYO SELEC AS AND 44 FEET FORMATION FILL SPEET BYO SELEC AS AND FILTER PACK EATENCE SO FEET ABOVE TOP OF	Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement	CONSTRUCTION TIME Lo Date and Start Time 4/25/07 10:52 5/15/07 8:30 5/17/07 7:40 5/22/07 9:55 5/22/07 10:45 5/23/07 7:00	Date and Finish Time 5/13/07 15:36 5/16/07 12:00 5/17/07 17:16 4/13/07 20:00 5/22/07 15:20 5/23/07 9:45
1195	SPECT BS/ SPECT	Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement	CONSTRUCTION TIME Long Screened intervention of the construction o	Date and Finish Time 5/13/07 15:36 5/16/07 12:00 5/17/07 17:16 4/13/07 20:00 5/22/07 15:20 5/23/07 9:45 9/18/07
1195	SPECT SAND SPECT SAND SPECT SAND SPECT SAND SPECT SAND SPECT SAND FILTERPROX ENTENDES SPECT ABOVE TOP OF SCREEN TAGNARE FILTER PROX GRAVID. SPECT SAND STEEL FACTORY SCREEN SCR	Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion	Date and Start Time 4/25/07 10:52 5/15/07 8:30 5/17/07 7:40 5/22/07 9:55 5/22/07 10:45 5/23/07 7:00 9/18/07 WELL DEVELOPMENT	Date and Finish Time 5/13/07 15:36 5/16/07 12:00 5/17/07 17:16 4/13/07 20:00 5/22/07 15:20 5/23/07 9:45 9/18/07
1195	SETE SAND SELE AS AND 44 FEET FORMATION FILL SIPERT BAD SELE AS AND FILTER PRICK EATONOS SO FEET AS OVE TOP OF SCREEN TAGINA 46 FILTER PRICK GRAYD. 5° LOW CARBON STEEL FACTORY	Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs)	CONSTRUCTION TIME LO Date and Start Time 4/25/07 10:52 5/15/07 8:30 5/17/07 7:40 5/22/07 9:55 5/22/07 10:45 5/23/07 7:00 9/18/07 WELL DEVELOPMENT Gallons Start	Date and Finish Time 5/13/07 15:36 5/16/07 12:00 5/17/07 17:16 4/13/07 20:00 5/22/07 15:20 5/23/07 9:45 9/18/07
1160	SPECIASIS SELEA SAND 44 FEET FORMATION FILL SPECIA SAND 44 FEET FORMATION FILL SPECIA SAND FILTER PRICK ENTRUGS SOFEET ASOVE TOP OF SCREEN TAGNA #6 FILTER PRICK GRAND. FILTER PRICK GRAND. FILTER PRICK GRAND. 17 CON CURBON STEEL FACTORY SCITTED SCREEN (0.05 MOHS.0TS)	Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing 5.0	CONSTRUCTION TIME LO Date and Start Time 4/25/07 10:52 5/15/07 8:30 5/17/07 7:40 5/22/07 9:55 5/22/07 10:45 5/23/07 7:00 9/18/07 WELL DEVELOPMENT Gallons Start 6/4/07 12:30	Date and Finish Time 5/13/07 15:36 5/16/07 12:00 5/17/07 17:16 4/13/07 20:00 5/22/07 15:20 5/23/07 9:45 9/18/07 End 6/6/2007 13:00
1160	SPECT SAND SPECT SAND SPECT SAND SPECT SAND SPECT SAND SPECT SAND FILTERPROX ENTENDES SPECT ABOVE TOP OF SCREEN TAGNARE FILTER PROX GRAVID. SPECT SAND STEEL FACTORY SCREEN SCR	Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing 5.0 Airlift Pumping 10.0	CONSTRUCTION TIME LO Date and Start Time 4/25/07 10:52 5/15/07 8:30 5/17/07 7:40 5/22/07 9:55 5/22/07 10:45 5/23/07 7:00 9/18/07 WELL DEVELOPMENT Gallons Start	Date and Finish Time 5/13/07 15:36 5/16/07 12:00 5/17/07 17:16 4/13/07 20:00 5/22/07 15:20 5/23/07 9:45 9/18/07
1160	SPECIASIS SELEA SAND 44 FEET FORMATION FILL SPECIA SAND 44 FEET FORMATION FILL SPECIA SAND FILTER PRICK ENTRUGS SOFEET ASOVE TOP OF SCREEN TAGNA #6 FILTER PRICK GRAND. FILTER PRICK GRAND. FILTER PRICK GRAND. 17 CON CURBON STEEL FACTORY SCITTED SCREEN (0.05 MOHS.0TS)	Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing 5.0 Airlift Pumping 10.0 Zonal airlifting	CONSTRUCTION TIME Long Screened intervention of the construction o	Date and Finish Time 5/13/07 15:36 5/16/07 12:00 5/17/07 17:16 4/13/07 20:00 5/22/07 15:20 5/23/07 9:45 9/18/07 End 6/6/2007 13:00 6/15/2007 13:30
1160	SPECIASION CHIPS SPECIASION SPECIASION 44 FEET FORMATION FILL SPECIASION FILTER PRICK ENTRUGE SOFFEET ABOVE TOP OF SOFFEET TAGINA 46 FILTER PRICK GRAND. FY LOW CURBON STEEL FACTORY SCITTED SORGEN (0.05 MOHS.0TS)	Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing 5.0 Airlift Pumping 10.0 Zonal airlifting and swabbing 10.25	CONSTRUCTION TIME LO Date and Start Time 4/25/07 10:52 5/15/07 8:30 5/17/07 7:40 5/22/07 9:55 5/22/07 10:45 5/23/07 7:00 9/18/07 WELL DEVELOPMENT Gallons Start 6/4/07 12:30	Date and Finish Time 5/13/07 15:36 5/16/07 12:00 5/17/07 17:16 4/13/07 20:00 5/22/07 15:20 5/23/07 9:45 9/18/07 End 6/6/2007 13:00
1160	SPECIASION CHIPS SPECIASION SPECIASION 44 FEET FORMATION FILL SPECIASION FILTER PRICK ENTRUGE SOFFEET ABOVE TOP OF SOFFEET TAGINA 46 FILTER PRICK GRAND. FY LOW CURBON STEEL FACTORY SCITTED SORGEN (0.05 MOHS.0TS)	Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing 5.0 Airlift Pumping 10.0 Zonal airlifting and swabbing 10.25 Development	Date and Start Time 4/25/07 10:52 5/15/07 8:30 5/17/07 7:40 5/22/07 9:55 5/22/07 10:45 5/23/07 7:00 9/18/07 WELL DEVELOPMENT Gallons Start 6/4/07 12:30 6/14/07 10:00	Date and Finish Time 5/13/07 15:36 5/16/07 12:00 5/17/07 17:16 4/13/07 20:00 5/22/07 15:20 5/23/07 9:45 9/18/07 End 6/6/2007 13:00 6/15/2007 13:30
1160	SPECIASION CHIPS SPECIASION SPECIASION 44 FEET FORMATION FILL SPECIASION FILTER PRICK ENTRUGE SOFFEET ABOVE TOP OF SOFFEET TAGINA 46 FILTER PRICK GRAND. FY LOW CURBON STEEL FACTORY SCITTED SORGEN (0.05 MOHS.0TS)	Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing 5.0 Airlift Pumping 10.0 Zonal airlifting and swabbing 10.25 Development Pumping 11.0	CONSTRUCTION TIME LO Date and Start Time 4/25/07 10:52 5/15/07 8:30 5/17/07 7:40 5/22/07 9:55 5/22/07 10:45 5/23/07 7:00 9/18/07 WELL DEVELOPMENT Gallons Start 6/4/07 12:30 6/14/07 10:00 6/16/07 15:45 6/21/07 8:00	Date and Finish Time 5/13/07 15:36 5/16/07 12:00 5/17/07 17:16 4/13/07 20:00 5/22/07 15:20 5/23/07 9:45 9/18/07 End 6/6/2007 13:00 6/15/2007 13:30 6/17/2007 18:30
1160	SPECIASIO SPECIASIO SPECIASIO 44 FEET FORMATION FILL SPECIASION FILTER PRICK ENTRUG SO FEET ABOVE TOP OF SCREEN TACHA 46 FILTER PRICK GRAVID. 9° LOW CARBON STEEL FACTORY SLOTTED SCREEN (0.05 NOTHS.OTS) SLAP	Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing 5.0 Airlift Pumping 10.0 Zonal airlifting and swabbing 10.25 Development	Date and Start Time 4/25/07 10:52 5/15/07 8:30 5/17/07 7:40 5/22/07 9:55 5/22/07 10:45 5/23/07 7:00 9/18/07 WELL DEVELOPMENT Gallons Start 6/4/07 12:30 6/14/07 10:00	Date and Finish Time 5/13/07 15:36 5/16/07 12:00 5/17/07 17:16 4/13/07 20:00 5/22/07 15:20 5/23/07 9:45 9/18/07 End 6/6/2007 13:00 6/15/2007 13:30

Well Construction Summary

Drilling Company: WDC	Project Name	: Phelps Dodge	Sierrita Inc. Sulfate Investig	gation	Boring No.: MO-2007-4A
ADWR Well Registration No.: 55-907213 Geologist: W. Thompson Location: La Canada median approximately 100' south of Penasco, Green Valley, Arizona	Drilling Company: WDC Driller: Art Cortez Project No.: 7830				
Depth (Ft)			55-907213		
AS-BUILT DIAGRAM				f Penasco, Green Valley, Ariz	
Total Depth (Ft)				,	
Total Depth: 580 feet	' '	<u> </u>			
Drill Rig: Gefco Speedstar 50K Bit Type: tricone	AS-BUIL	T DIAGRAM		DRILLING SUMMARY	
Drill Rig: Gefco Speedstar 50K Bit Type: tricone	Depth (Ft)		Total Depth: 580 feet	Hole Diameter: 9 7/8"	Method: mud rotary
### BRENDLE PARK AND CASHING CASING C		AND CUDEACE			
Melican Meli		T			
Casing Depth Interval (Ft) Diameter, Material, Slot Size		PORTI AND			
Casing Screen Slot Size				WELL DATA	
Casing Screen 10" steel			Dep	th Interval (Ft)	Diameter, Material,
## 1 - 360' 5" sch 80 PVC		CASING			Slot Size
# 1 - 360 360' - 560' 5" sch 80 PVC, .04" slot 560' - 570' 5" sch 80 PVC, .04" slot 560' - 570' 5" sch 80 PVC, .04" slot 560' - 570' 5" sch 80 PVC, .04" slot 560' - 570' 5" sch 80 PVC, .04" slot 560' - 570' 5" sch 80 PVC 330' - 343' 339' - 343' 11ter Pack Material: #8 Tacna gravel 1nterval: 334' - 339' 343' 339' - 343' 339' - 343' 339' - 343' 339' - 343' 339' - 343' 339' 343' - 339' 343' - 339' 343' - 339' 343' - 339' 343' - 339' 343' - 339' 343' - 339' 341' - 325' 325			0 - 20'		10" steel
September Sept		9 7/8" BOREHOLE	+1 - 360'		5" sch 80 PVC
September Sept				360' - 560'	5" sch 80 PVC, .04" slot
Filter Pack Material: #8-12 choke sand		7	560' - 570'		5" sch 80 PVC
Filter Pack Material: #8-12 choke sand		BENTONITE GROUT	Filter Pack Material: #8 T	acna gravel	Interval: 343' - 580'
Bentonite chips: time release pellets					
Grout: bentonite grout/slurry		<u> </u>	Filter Pack Material: #60 c	choke sand	Interval: 334' - 339'
SECTION SAMP		<	Bentonite chips: time relea	se pellets	Interval: 325' - 334'
SECTION SAMP		(Grout: bentonite grout/slui	rry	Interval: 20' - 325'
SECTION SAMP		<	Cement:		Interval: 0' - 20'
STATE PAGE	[06 E	(Surface Completion: above	e-ground steel box	
STATE PAGE	9 T	<			
STATE PAGE		(Centralizer Locations: 560	', 510', 460', 410', 360'	
SENTONITE CIPS FIEL #80 SILEA SAND S		<			
CONSTRUCTION TIME LOG SILICA SAND					
Task Date and Start Time Date and Start Time Date and Start Time Drilling 9/19/07 14:05 9/23/07 12:25 Casing 9/24/07 10:30 9/24/07 13:03 Filter Pack Pilter Pack 9/24/07 14:00 9/25/07 8:40 Bentonite Chips 9/25/07 8:50 9/25/07 9:00 Bentonite Grout 9/25/07 9:25 9/25/07 11:36 Cement 9/26/07 10:00 9/26/07 10:30 Surface Completion 10/24/07 10/24/07 10/24/07		/ /- 5 FEET #60		CONSTRUCTION TIME LO	G
Task Date and Start Time Date and Start Time		1. 1 P			
Casing 9/24/07 10:30 9/24/07 13:03			Task	Date and Start Time	Date and Start Time
Casing 9/24/07 10:30 9/24/07 13:03		*			9/23/07 12:25
Filter Pack SOREEN Filter Pack Bentonite Chips Bentonite Grout Bentonite Grou	5648 800	2 4		9/24/07 10:30	9/24/07 13:03
Bentonite Chips 9/25/07 8:50 9/25/07 9:00					
Cement 9/26/07 10:00 9/26/07 10:30 Surface Completion 10/24/07 10/24/07			Bentonite Chips		
Surface Completion 10/24/07 10/24/07 10/24/07			Bentonite Grout		
WELL DEVELOPMENT Task Time (hrs) Gallons Start End					
Task Time (hrs) Gallons Start End		And the Market	Surface Completion	10/24/07	10/24/07
Task Time (hrs) Gallons Start End					
Task Time (hrs) Gallons Start End		ַל טומ יגי			
Bailing Airlifting Swabbing Development Pumping 11.75 10/05/07 15:00 10/06/07 17:45 Pump Testing 9.0 10/08/07 10:00 10/08/07 19:00 Total 20.75	1 1	(0.04 INCH SLOTS)		WELL DEVELOPMENT	
Airlifting Swabbing Development Pumping 11.75 10/05/07 15:00 10/06/07 17:45 Pump Testing 9.0 10/08/07 10:00 10/08/07 19:00 Total 20.75			Task Time (hrs)	Gallons Start	End
Swabbing Development Pumping 11.75 10/05/07 15:00 10/06/07 17:45 Pump Testing 9.0 10/08/07 10:00 10/08/07 19:00 Total 20.75			Bailing		
FILTER PACK GRAVEL Development Development Pumping 11.75 10/05/07 15:00 10/06/07 17:45 Pump Testing 9.0 10/08/07 10:00 10/08/07 19:00 Total 20.75		**************************************	Airlifting		
Pumping 11.75 10/05/07 15:00 10/06/07 17:45 Pump Testing 9.0 10/08/07 10:00 10/08/07 19:00 Total 20.75			Swabbing		
Pump Testing 9.0 10/08/07 10:00 10/08/07 19:00 Total 20.75			Development		
Total 20.75	580	→ SUMP	Pumping 11.75	10/05/07 15:00	10/06/07 17:45
		j.	<u> </u>	10/08/07 10:00	10/08/07 19:00
Remarks:			Total 20.75		
	Remarks:				

12/12/2007

Well Construction Summary Project Name: Phelps Dodge Sierrita Inc. Sulfate Investigation

molect iva	ame. Pheins Dodde	Sierrita Inc. Sulfate Invest	rigation	Boring No.: MO-2007-4E
	ompany: WDC		Driller: Art Cortez	Project No.: 78300
	ell Registration No.:	55-907212		Geologist: W. Thompsor
	<u> </u>		of Penasco, Green Valley, Ari	
	, Range, Section: D		•	
-	-			
AS-B	UILT DIAGRAM		DRILLING SUMMARY	
Depth (Ft)		Total Depth: 960 feet	Hole Diameter: 9 7/8"	Method: mud rotary
0	AND SURFACE 18" SOREHOLE	Drill Rig: Gefco Speedsta	ar 50K	Bit Type: tricone
20	PORTLAND			
	10" SURFACE CASING			
	PT/W BOPEHOLE	_	WELL DATA	
B	9" GASING LOW GARBON STEEL		pth Interval (Ft)	Diameter, Material,
	BENTOMTE GROUT	Casing	Screen	Slot Size
園	141	0 to 20'		10" steel
	2000 2000 2000 2000 2000 2000 2000 200	+1' - 700'	70014 0401	5" steel
INOT TO SCALE	193	0.4014 - 0.501	700' to 940'	5"steel, .05" slot
100 M	<u>11917</u>	940' to 950'	<u> </u>	5" steel with bottom cap
N I	222	Filter Pack Material: #8		Interval: 687.6' - 960'
	E	Filter Pack Material: #8-1		Interval: 681' - 687.6'
	PER	Filter Pack Material: #60		Interval: 675' - 681'
		Bentonite chips: time rele	•	Interval: 653' - 675'
		Grout: bentonite grout/sli	urry	Interval: 20' - 653'
	H	Cement:	and the state of t	Interval: 0' - 20'
E3	E	Surface Completion: abo	ove-arouna steel box	
	14144441	Measuring Point: to be e Centralizer Locations: 94	stablished	
	HHHHH	Measuring Point: to be e	stablished 0', 890', 840', 790', 740'	
		Measuring Point: to be e	stablished	G
		Measuring Point: to be e Centralizer Locations: 94	stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO	
		Measuring Point: to be e Centralizer Locations: 94	stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time	Date and Finish Time
		Measuring Point: to be e Centralizer Locations: 94 Task Drilling	stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time 9/4/07 8:00	Date and Finish Time 9/11/07 10:25
		Measuring Point: to be e Centralizer Locations: 94 Task Drilling Casing	stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time 9/4/07 8:00 9/12/07 7:30	Date and Finish Time 9/11/07 10:25 9/12/07 13:45
	22 FEET BENIONIE	Measuring Point: to be e Centralizer Locations: 94 Task Drilling Casing Filter Pack	stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time 9/4/07 8:00 9/12/07 7:30 9/13/07 7:30	Date and Finish Time 9/11/07 10:25 9/12/07 13:45 9/13/07 14:00
	2) FEET SENTONITE PELETS SILENS WID	Measuring Point: to be e Centralizer Locations: 94 Task Drilling Casing	stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time 9/4/07 8:00 9/12/07 7:30	Date and Finish Time 9/11/07 10:25 9/12/07 13:45
111	B FEET #80 BLICA SAND B FEET 612 SLICA SAND	Measuring Point: to be e Centralizer Locations: 94 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout	stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time 9/4/07 8:00 9/12/07 7:30 9/13/07 7:30 9/13/07 14:15	Date and Finish Time 9/11/07 10:25 9/12/07 13:45 9/13/07 14:00 9/13/07 14:30
	SFEET #50 SLICA SAND SSFEET 6-12 SLICA SAND FILTER PRICK EXTENDS 12-4 FEET	Measuring Point: to be e Centralizer Locations: 94 Task Drilling Casing Filter Pack Bentonite Chips	stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time 9/4/07 8:00 9/12/07 7:30 9/13/07 7:30 9/13/07 14:15 9/18/07 11:30	Date and Finish Time 9/11/07 10:25 9/12/07 13:45 9/13/07 14:00 9/13/07 14:30 9/18/07 13:20
	BFEET #80 BLICA 9AND BLICA 9AND BLICA 9AND FILTER PACK	Measuring Point: to be e Centralizer Locations: 94 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement	stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time 9/4/07 8:00 9/12/07 7:30 9/13/07 14:15 9/18/07 11:30 9/26/07 10:30	Date and Finish Time 9/11/07 10:25 9/12/07 13:45 9/13/07 14:00 9/13/07 14:30 9/18/07 13:20 9/26/07 11:00
5 5	BFEET #80 SLIGA SAND #8 FEET #12 SLIGA SAND FILTER PRICK EXTENS 124 FEET ABOVE TOP OF	Measuring Point: to be e Centralizer Locations: 94 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement	stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time 9/4/07 8:00 9/12/07 7:30 9/13/07 7:30 9/13/07 14:15 9/18/07 11:30 9/26/07 10:30 10/24/2007	Date and Finish Time 9/11/07 10:25 9/12/07 13:45 9/13/07 14:00 9/13/07 14:30 9/18/07 13:20 9/26/07 11:00
	FEET 380 SLICA SAND SI FEET 612 SLICA SAND FILTER PROX EXTENDS 124 FEET ABOVE TOP OF SOMEON TAXNA 48 FILTER PROX GRAVEL	Measuring Point: to be e Centralizer Locations: 94 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion	stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time 9/4/07 8:00 9/12/07 7:30 9/13/07 14:15 9/18/07 11:30 9/26/07 10:30 10/24/2007 WELL DEVELOPMENT	Date and Finish Time 9/11/07 10:25 9/12/07 13:45 9/13/07 14:00 9/13/07 14:30 9/18/07 13:20 9/26/07 11:00 10/24/07
5 5	BEET 380 BLICA SAND BA FEET 612 BLICA SAND BA FEET 612 BLICA SAND FILTER PRICK EXTENDS 124 FEET ABOVE TOP OF BOREEN TACKA 48 FILTER PRICK GRAVEL D'LOW CARBON STEEL, FACTORY BLOTTED BORKEN	Measuring Point: to be e Centralizer Locations: 94 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs)	stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time 9/4/07 8:00 9/12/07 7:30 9/13/07 7:30 9/13/07 14:15 9/18/07 11:30 9/26/07 10:30 10/24/2007	Date and Finish Time 9/11/07 10:25 9/12/07 13:45 9/13/07 14:00 9/13/07 14:30 9/18/07 13:20 9/26/07 11:00
5	FEET 380 SLICA SAND ES FEET 612 SLICA SAND FLITER PROX EXTENS 124 FEET ABOVE TOP OF SCREEN TACNA 48 FLITER MOX GRAVEL FLOW CARBON STEEL, FACTORY	Measuring Point: to be e Centralizer Locations: 94 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing	Stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time 9/4/07 8:00 9/12/07 7:30 9/13/07 7:30 9/13/07 14:15 9/18/07 11:30 9/26/07 10:30 10/24/2007 WELL DEVELOPMENT Gallons Start	Date and Finish Time 9/11/07 10:25 9/12/07 13:45 9/13/07 14:00 9/13/07 14:30 9/18/07 13:20 9/26/07 11:00 10/24/07 End
5 5	BEET 380 BLICA SAND BA FEET 612 BLICA SAND BA FEET 612 BLICA SAND FILTER PRICK EXTENDS 124 FEET ABOVE TOP OF BOREEN TACKA 48 FILTER PRICK GRAVEL D'LOW CARBON STEEL, FACTORY BLOTTED BORKEN	Measuring Point: to be e Centralizer Locations: 94 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing Airlifting 5.0	stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time 9/4/07 8:00 9/12/07 7:30 9/13/07 14:15 9/18/07 11:30 9/26/07 10:30 10/24/2007 WELL DEVELOPMENT	Date and Finish Time 9/11/07 10:25 9/12/07 13:45 9/13/07 14:00 9/13/07 14:30 9/18/07 13:20 9/26/07 11:00 10/24/07
5	BEET 380 BLICA SAND BA FEET 612 BLICA SAND BA FEET 612 BLICA SAND FILTER PRICK EXTENDS 124 FEET ABOVE TOP OF BOREEN TACKA 48 FILTER PRICK GRAVEL D'LOW CARBON STEEL, FACTORY BLOTTED BORKEN	Measuring Point: to be e Centralizer Locations: 94 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing Airlifting 5.0 Swabbing	Stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time 9/4/07 8:00 9/12/07 7:30 9/13/07 7:30 9/13/07 14:15 9/18/07 11:30 9/26/07 10:30 10/24/2007 WELL DEVELOPMENT Gallons Start	Date and Finish Time 9/11/07 10:25 9/12/07 13:45 9/13/07 14:00 9/13/07 14:30 9/18/07 13:20 9/26/07 11:00 10/24/07 End
	BEET 380 BLICA SAND BA FEET 612 BLICA SAND BA FEET 612 BLICA SAND FILTER PRICK EXTENDS 124 FEET ABOVE TOP OF BOREEN TACKA 48 FILTER PRICK GRAVEL D'LOW CARBON STEEL, FACTORY BLOTTED BORKEN	Measuring Point: to be e Centralizer Locations: 94 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing Airlifting 5.0 Swabbing Development	Stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time 9/4/07 8:00 9/12/07 7:30 9/13/07 7:30 9/13/07 14:15 9/18/07 11:30 9/26/07 10:30 10/24/2007 WELL DEVELOPMENT Gallons Start	Date and Finish Time 9/11/07 10:25 9/12/07 13:45 9/13/07 14:00 9/13/07 14:30 9/18/07 13:20 9/26/07 11:00 10/24/07 End
33 75 80 80 80 80 80 80 80 80 80 80 80 80 80	BEET 380 BLICA SAND BS FEET 612 SLICA SAND FLITER PRICK EXTENDS 124 FEET ABONE TOP OF SCREEN TACHA 48 FILTER PACK GRAVEL PLOY CARBON STEEL, FACTORY BLOTTED SCREEN 10.05 INCH SLOTS)	Measuring Point: to be e Centralizer Locations: 94 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing Airlifting 5.0 Swabbing Development Pumping	stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time 9/4/07 8:00 9/12/07 7:30 9/13/07 7:30 9/18/07 11:30 9/26/07 10:30 10/24/2007 WELL DEVELOPMENT Gallons Start 09/25/07 10:00	Date and Finish Time 9/11/07 10:25 9/12/07 13:45 9/13/07 14:00 9/13/07 14:30 9/18/07 13:20 9/26/07 11:00 10/24/07 End 09/25/07 14:30
5 0 0	BEET 380 BLICA SAND BA FEET 612 BLICA SAND BA FEET 612 BLICA SAND FILTER PRICK EXTENDS 124 FEET ABOVE TOP OF BOREEN TACKA 48 FILTER PRICK GRAVEL D'LOW CARBON STEEL, FACTORY BLOTTED BORKEN	Measuring Point: to be e Centralizer Locations: 94 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing Airlifting 5.0 Swabbing Development	Stablished 0', 890', 840', 790', 740' CONSTRUCTION TIME LO Date and Start Time 9/4/07 8:00 9/12/07 7:30 9/13/07 7:30 9/13/07 14:15 9/18/07 11:30 9/26/07 10:30 10/24/2007 WELL DEVELOPMENT Gallons Start	Date and Finish Time 9/11/07 10:25 9/12/07 13:45 9/13/07 14:00 9/13/07 14:30 9/18/07 13:20 9/26/07 11:00 10/24/07 End

Project Name: Ph	elps Dodge	Sierrita Inc. Sulfate In	vestig	ation			Boring No.: N	MO-2007-4C
Drilling Company:					nold Lamor	n	Project No.:	
ADWR Well Regis		55-907211					Geologist: W	
Location: La Cana	ada median	approximately 100' so	uth of	West Car	nino de Pe	nasco, C		
Township, Range,						, -		=-
, , , , , ,								
AS-BUILT DIA	AGRAM			DRILL	ING SUMN	IARY		
Depth (Ft)		Total Depth: 1153 fe	et	Hole Dian	neter: 9 7/8	3"	Method: mud	d rotary
		Drill Rig: Gefco Spee	edstar	50K			Bit Type: tric	cone
	-18" BOREHOLE							
20 — 13	PORTLAND							
	CEMENT				ELL DATA	١		
일 점 /	10" SURFACE		Dept	h Interval	, ,		Diameter, Ma	
B B '	CASING	Casing			Screen			Size
점 얼		0 - 20'					10" steel	
	9 7/8" BOREHOLE	+1 -1090'					5" steel	
e e	Et CACINO			1090' - 11	30'		5" steel, .05	" slot
	_5" CASING LOW CARBON STEEL	1130' - 1140'					5" mild steel	
E E	- a to a constitution to	Filter Pack Material:					Interval: 107	
	BENTONITE GROUT	Filter Pack Material:					Interval: 107	
		Filter Pack Material:			1		Interval: 107	
M M		Bentonite chips: time					Interval: 106	
H A A		Grout: bentonite grou	ut/sluri	ry			Interval: 20'	
Yo de de		Cement:	-1				Interval: 0' -	20'
F B		Surface Completion:			steel box			
		Measuring Point: to be established Centralizer Locations: 1090', 1120', 1135'						
80 B		Centralizer Locations	: 1090), 1120, 1	135			
				CONSTRI	JCTION TI	MELOG	<u>.</u>	
FEET BELOW SURF				001101111	3011014 111	IIIL LOC	, 	
		Task		Date and	Start Time		Date and Sta	rt Time
E E		Drilling		6/19/07 1			7/11/07 11:1	
표 점		Casing		7/13/07 9			7/13/07 16:1	
日 日	11 FEET MEDIUM	Filter Pack		7/13/07 1			7/14/07 11:5	
田田田/	BENTONITE CHIPS	Bentonite Chips		7/14/07 1			7/14/07 13:3	
	2 FEET #60	Bentonite Grout		7/14/07 1			7/14/07 16:4	
	SILICA SAND	Cement		7/15/07 1			7/15/07 17:0	
图 图//,	2 FEET 8-12	Surface Completion		10/24/200			10/24/07	
直 3//	SILICA SAND	- p	J					
1063	FILTER PACK EXTENDS 12 FEET							
1063 1074 1076 1078	ABOVE TOP OF			WELL I	DEVELOPI	MENT		
1080	SCREEN	Task Time (hr	s)	Gallons	Sta	rt	End	d
	5" LOW CARBON	Bailing 3.5	-	500	8/12/07 7	:45	8/12/07 1	7:00
	STEEL, FACTORY SLOTTED SCREEN	Airlifting 4.67				9:45		14:25
1130	(0.05 INCH SLOTS)	Swabbing 2.5			8/12/07 1	13:00	8/12/07	15:30
1140	_SUMP	Development						
1153		Pumping 5.08			8/15//07	9:45	8/15/07	14:50
1	TACNA #8	Pump Testing 11.28			8/16/07 7	7:48	8/16/07	19:05
	FILTER PACK GRAVEL	Total 27.03						
Remarks:								
					-	_	_	

Sierrita Inc. Sulfate Invest	tigation	Boring No.: MO-2007-5B
Oicinia inc. Sunate invest		Project No.: 78300
55-907456	Dimon / Miloid Edition	Geologist: W.Thompson
	400' south of West Paseo de 0	i
	100 004.1.0. 1100.1.4000 40	54.110
	DRILLING SUMMARY	
Total Depth: 980'	Hole Diameter: 9 7/8"	Method: mud rotary
		Bit Type: tricone
	WELL DATA	
De	pth Interval (Ft)	Diameter, Material,
	Screen	Slot Size
0 - 20'		10" steel
+1 - 660'		5" steel
	660' - 960'	5" steel, .05" slot
960' - 970' (sump)		5" steel, with bottom cap
Filter Pack Material: #8	Tacna gravel	Interval: 638' -980'
		Interval: 633' - 638'
Filter Pack Material: #60	choke sand	Interval: 628' - 633'
Bentonite chips: time rele	ease pellets	Interval: 618' - 628'
	•	Interval: 20' - 618'
Cement:	•	Interval: 0' - 20'
Surface Completion: abo	ove-ground steel box	
·		960'
	CONSTRUCTION TIME LO	3
Task	Date and Start Time	Date and Finish Time
		Date and Finish Time
Drilling	9/21/07 10:54	9/27/07 17:35
Drilling Casing	9/21/07 10:54 10/3/0711:05	
		9/27/07 17:35
Casing	10/3/0711:05	9/27/07 17:35 10/3/07 16:38
Casing Filter Pack	10/3/0711:05 10/4/07 7:30	9/27/07 17:35 10/3/07 16:38 10/4/07 10:06
Casing Filter Pack Bentonite Chips	10/3/0711:05 10/4/07 7:30 10/4/07 10:55	9/27/07 17:35 10/3/07 16:38 10/4/07 10:06 10/4/07 11:15
Casing Filter Pack Bentonite Chips Bentonite Grout	10/3/0711:05 10/4/07 7:30 10/4/07 10:55 10/4/07 13:40	9/27/07 17:35 10/3/07 16:38 10/4/07 10:06 10/4/07 11:15 10/4/07 15:15
Casing Filter Pack Bentonite Chips Bentonite Grout Cement	10/3/0711:05 10/4/07 7:30 10/4/07 10:55 10/4/07 13:40 10/5/07 15:50	9/27/07 17:35 10/3/07 16:38 10/4/07 10:06 10/4/07 11:15 10/4/07 15:15 10/5/07 16:22
Casing Filter Pack Bentonite Chips Bentonite Grout Cement	10/3/0711:05 10/4/07 7:30 10/4/07 10:55 10/4/07 13:40 10/5/07 15:50	9/27/07 17:35 10/3/07 16:38 10/4/07 10:06 10/4/07 11:15 10/4/07 15:15 10/5/07 16:22
Casing Filter Pack Bentonite Chips Bentonite Grout Cement	10/3/0711:05 10/4/07 7:30 10/4/07 10:55 10/4/07 13:40 10/5/07 15:50	9/27/07 17:35 10/3/07 16:38 10/4/07 10:06 10/4/07 11:15 10/4/07 15:15 10/5/07 16:22
Casing Filter Pack Bentonite Chips Bentonite Grout Cement	10/3/0711:05 10/4/07 7:30 10/4/07 10:55 10/4/07 13:40 10/5/07 15:50 10/23/07	9/27/07 17:35 10/3/07 16:38 10/4/07 10:06 10/4/07 11:15 10/4/07 15:15 10/5/07 16:22
Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion	10/3/0711:05 10/4/07 7:30 10/4/07 10:55 10/4/07 13:40 10/5/07 15:50 10/23/07	9/27/07 17:35 10/3/07 16:38 10/4/07 10:06 10/4/07 11:15 10/4/07 15:15 10/5/07 16:22 10/23/07
Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs)	10/3/0711:05 10/4/07 7:30 10/4/07 10:55 10/4/07 13:40 10/5/07 15:50 10/23/07 WELL DEVELOPMENT Gallons Start	9/27/07 17:35 10/3/07 16:38 10/4/07 10:06 10/4/07 11:15 10/4/07 15:15 10/5/07 16:22 10/23/07
Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing 2*	10/3/0711:05 10/4/07 7:30 10/4/07 10:55 10/4/07 13:40 10/5/07 15:50 10/23/07 WELL DEVELOPMENT Gallons Start 55 10/10/07 15:30*	9/27/07 17:35 10/3/07 16:38 10/4/07 10:06 10/4/07 11:15 10/4/07 15:15 10/5/07 16:22 10/23/07 End
Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing 2 * Airlifting 1.9	10/3/0711:05 10/4/07 7:30 10/4/07 10:55 10/4/07 13:40 10/5/07 15:50 10/23/07 WELL DEVELOPMENT Gallons Start 55 10/10/07 15:30*	9/27/07 17:35 10/3/07 16:38 10/4/07 10:06 10/4/07 11:15 10/4/07 15:15 10/5/07 16:22 10/23/07 End
Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing 2* Airlifting 1.9 Swabbing	10/3/0711:05 10/4/07 7:30 10/4/07 10:55 10/4/07 13:40 10/5/07 15:50 10/23/07 WELL DEVELOPMENT Gallons Start 55 10/10/07 15:30*	9/27/07 17:35 10/3/07 16:38 10/4/07 10:06 10/4/07 11:15 10/4/07 15:15 10/5/07 16:22 10/23/07 End
Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing 2 * Airlifting 1.9 Swabbing Development	10/3/0711:05 10/4/07 7:30 10/4/07 10:55 10/4/07 13:40 10/5/07 15:50 10/23/07 WELL DEVELOPMENT Gallons Start 55 10/10/07 15:30* 10/5/07 12:04	9/27/07 17:35 10/3/07 16:38 10/4/07 10:06 10/4/07 11:15 10/4/07 15:15 10/5/07 16:22 10/23/07 End 10/10/07 17:30 10/05/07 13:58
Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing 2 * Airlifting 1.9 Swabbing Development Pumping 1.5	10/3/0711:05 10/4/07 7:30 10/4/07 10:55 10/4/07 13:40 10/5/07 15:50 10/23/07 WELL DEVELOPMENT Gallons Start 55 10/10/07 15:30* 10/5/07 12:04	9/27/07 17:35 10/3/07 16:38 10/4/07 10:06 10/4/07 11:15 10/4/07 15:15 10/5/07 16:22 10/23/07 End 10/10/07 17:30 10/05/07 13:58
Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing 2 * Airlifting 1.9 Swabbing Development Pumping 1.5 Pump Testing 9.0	10/3/0711:05 10/4/07 7:30 10/4/07 10:55 10/4/07 13:40 10/5/07 15:50 10/23/07 WELL DEVELOPMENT Gallons Start 55 10/10/07 15:30* 10/5/07 12:04	9/27/07 17:35 10/3/07 16:38 10/4/07 10:06 10/4/07 11:15 10/4/07 15:15 10/5/07 16:22 10/23/07 End 10/10/07 17:30 10/05/07 13:58
	Task	DRILLING SUMMARY Total Depth: 980' Hole Diameter: 9 7/8" Drill Rig: Gefco Speedstar 50K WELL DATA Depth Interval (Ft) Casing Screen 0 - 20'

HYDRO GEO CHEM, INC.

Well Construction Summary

Project Name: Phelps	S Dodge Sierrita Inc. Sulfate	Investigation	Boring No.: MO-2007-5C
Drilling Company: WI		Driller: Arnold Lan	
ADWR Well Registrat	ion No.: 55-907457		Geologist: Wilson/Thompson
	Drive median strip, approxin	nately 400' south of West	Paseo de Canto
	ction: D-18-13-22acd, San I		
		-	
AS-BUILT DIAGE	RAM	DRILLING SUI	MARY
Depth (Ft)	Total Depth: 1370	feet Hole Diameter: 9	7/8" Method: mud rotary
0 LAND SURFACE	Drill Rig: Gefco Sp	eedstar 50K	Bit Type: tricone
20 PO	RTLAND		
	MENT SURFACE		
	SING	WELL DA	
	8° BOREHOLE	Depth Interval (Ft)	Diameter, Material,
	ASING CARBON STEEL Casing	Screen	
Ĕ Ĕ BE	ITONITE GROUT 0 - 20'		10" steel
	+1 -1150'		5" steel, sch 40
FAGE		1150' - 1350'	5" steel, .05" slot, sch 40
FEET BELOW SURFACE	1350' - 1360'		5" steel, sch 40
ELOW STATE	Filter Pack Material		Interval: 1133' -1370'
	Filter Pack Material	: #8-12 choke sand	Interval: 1127' - 1133'
		#60 choke sand	Interval: 1119.5' - 1127'
		ne release pellets and chip	
	Grout: bentonite gr	out/slurry	Interval: 20' - 1076'
-1/3N4-	Cement:		Interval: 0' - 20'
· Ar · Ar		n: above-ground steel box	
	Measuring Point: to	o be established ns: 1150', 1200', 1250', 13	00' 1350'
	Centralizer Location	15. 1150, 1200, 1250, 13	00, 1330
8 8			
		CONSTRUCTION	TIME LOG
	Task	Date and Start Tim	e Date and Finish Time
	Drilling	7/16/07 16:21	8/1/07 15:17
	Casing	8/8/07 9:45	8/8/07 18:45
43.5 F	Filter Dook	8/9/07 10:08	8/10/07 12:30
1076 AND P	Bentonite Chips	8/10/07 12:32	8/10/07/ 13:35
SILIGA	Bentonite Grout	8/11/07 9:15	8/11/07 12:45
1119.5 SILICA 1127 1133	8-12		
12.24 ESS 2.4 CF (PE)		n 10/23/07	10/23/07
ABOVE	DS 17 FEET TOP OF	•	-
SCREF	14		
TACNA		WELL DEVELO	PMENT
FILTER	Task Time (hrs) Gallons	Start End
	GARBON Bailing 0.5	55 8/22/	07 11:15 8/22/07 11:42
SL077	Airlifting 7.82	8/12	2/07 9:13 8/12/07 17:02
	Swabbing		
	Development		
1350	Pumping		
1360	D T : 50	8/23	/07 13:00 8/23/07 18:00
1370	Pump Testing 5.0		
	Total 13.32		

HYDRO GEO CHEM, INC.

Well Construction Summary

	ma: Pholas Dodgo		tigation	Paring No : MO 2007 CA
		Sierrita Inc. Sulfate Inves	tigation Driller: Arnold Lamon	Boring No.: MO-2007-6A
	mpany: WDC	<i>EE</i> 007607	Diller: Arnold Lamon	Project No.: 78300
	ell Registration No.:		Name of Diagram and Da	Geologist: W. Thompson
			' south of Placita Beldad Ro	ad, Green Valley, Arizona
l ownship,	Range, Section: 18	8S - 13E 28dbd		
AS-BU	JILT DIAGRAM		DRILLING SUMMARY	
Depth (Ft)		Total Depth: 630'	Hole Diameter: 9 7/8"	Method: mud rotary
	LAND SURFACE	Drill Rig: Gefco Speedsta		Bit Type: tricone
• - 183	■ 18" BOREHOLE	<u> </u>		1 21
20	PORTLAND			
	CEMENT		WELL DATA	
և	10" SURFACE	De	pth Interval (Ft)	Diameter, Material,
B	CASING	Casing	Screen	Slot Size
R	9 7/8" BOREHOLE	0 - 20'	30.00	10" steel
ح	Ħ	+1 - 310'		5" steel
8	5" CASING LOW CARBON STEEL		310' - 390'	5" steel, .05" slot
됩	8	390 - 430	2.0 000	5" steel
	BENTONITE GROUT		430' - 610'	5" steel, .05" slot
4	差	610' - 620' (sump)	100 010	5" steel, bottom cap
w 2	3	Filter Pack Material: #8	Tacna gravol	Intervals: 299' - 400', 423' - 630
Ž 🔡	R	Filter Pack Material: #8-1		Interval: 294' - 299'
	뒄			Interval: 285' - 294'
800	Ą	Filter Pack Material: #60 choke sand Bentonite chips: time release pellets		
80	7	Grout: bentonite grout/sl	Intervals: 272' - 285', 400' - 423	
T BELOW SURFACE (NOT TO SCALE)	Ä	Cement:	uity	Interval: 20 - 272
18	13 FEET BENTONITE PELLETS		we ground stool box	Interval. 0 - 20
272	-9 FEET#50	Surface Completion: abo Measuring Point: to be e		
0.11	SL:CA SAND	Centralizer Locations: 61		
285	SLCA SAND	Centralizer Locations, 61	0,560,510,460,560	
310	FILTER PACK			
	EXTENDS 11 FEET ABOVE TOP OF		CONSTRUCTION TIME LO	06
\$ E	SCREEN		- CONSTRUCTION TIME EX	
9=	5" LOW CARBON STEEL, FACTORY	Took	Date and Start Time	Date and Finish Time
M=	SLOTTED SCREEN	Task	Date and Start Time	Date and Finish Time
	(0.05 INCH SLOTS)	Drilling	9/10/07 9:10	9/18/07 13:10
390 400	23 FEET BENTONITE PELLETS	Casing	9/19/07 11:55	9/19/07 15:58
₩ B	BLANK IDE	Filter Pack	9/20/07 9:58	9/20/07 15:58
423 430	ASING HE TACNA#8	Bentonite Chips	9/20/07 16:15	9/20/07 16:53
***	FILTER PACK GRAVEL	Bentonite Grout	9/21/07 7:00	9/21/07 8:25
		Cement	10/04/07	1.2/2./25
	5" LOW CARBON	Surface Completion	10/24/07	10/24/07 0:00
	STEFL, FACTORY SLOTTED SCREEN			
	(0.05 INCH SLOTS)			
			WELL DEVELOPMENT	
		Task Time (hrs)	Gallons Start	End
		Bailing 5.0	9/26/07 11:15	9/26/07 16:15
		Airlifting		
		Swabbing		
		Development		
	<u></u>	Pumping 3.8	18,562 9/28/07 12:32	9/27/07 17:00
610	SUMP	Pump Testing 9.92	10/02/07 9:00	10/02/07 19:55
620	NO.	Total 18.72		
630		<i>,,,,</i>		
Remarks:				
		L		

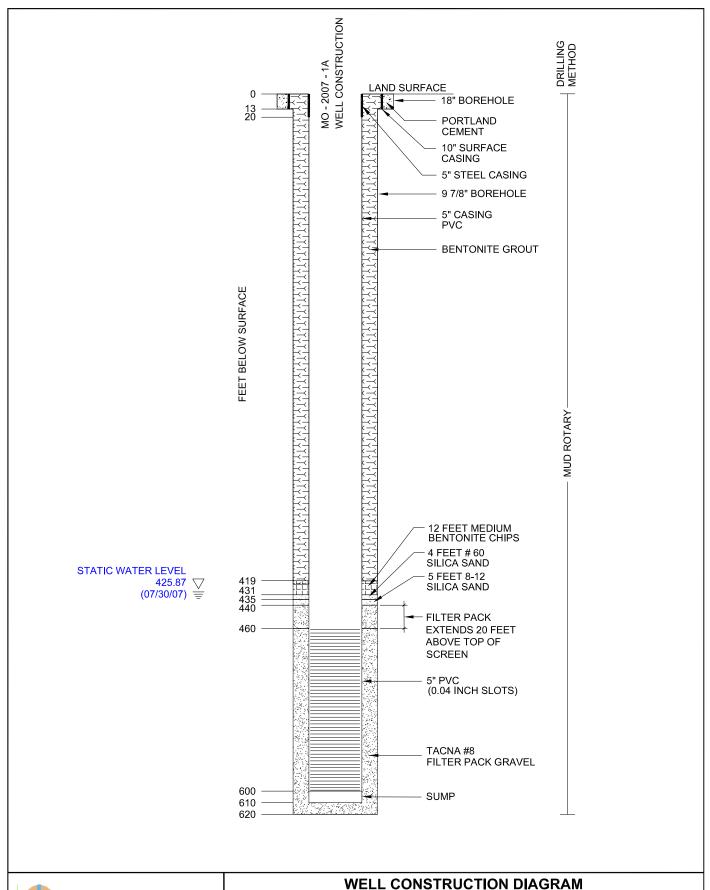
HYDRO GEO CHEM, INC.

Well Construction Summary

roject in	ame: Phelps Dodge	Sierrita Inc. Sulfate Inves	stigation	Boring No.: MO-2007-6
	ompany: WDC		Driller: Arnold Lamon	Project No.: 78300
	ell Registration No.:	55-907606		Geologist: W.Thompsor
			0' south of Placita Beldad Re	
	, Range Section: 18			,,,
	,			
AS-B	UILT DIAGRAM		DRILLING SUMMARY	1
epth (Ft))	Total Depth: 1060'	Hole Diameter: 9 7/8"	Method: mud rotary
1 Tage	LAND SURFACE 10" BORGHOUS	Drill Rig: Gefco Speeds	tar 50K	Bit Type: tricone
·	PORTLAND			
	OEMENT 10" BURFACE			
	CASING		WELL DATA	
超	9 X9' 6 OREHOLE	D	epth Interval (Ft)	Diameter, Material,
莒	LOW CARBON STEEL	Casing	Screen	Slot Size
	BENTONTE GROUT	0 - 20'		10" steel
日	图	+1 -780'		5" steel
	臺		780' - 940'	5" steel, .05"slot
日	ES .	940' - 950' (sump)		5" steel, with bottom cap
園		Grout: bentonite chips (bottom seal)	Interval: 973' - 1060'
	<u> </u>	Filter Pack Material: #8		Interval: 768' -973'
日		Filter Pack Material: #8		Interval: 760' - 768'
目		Filter Pack Material: #6		Interval: 752' - 760'
莒	<u> </u>	Bentonite chips: time rel		Interval: 736' - 752'
超	塔	Grout: bentonite grout/s	•	Interval: 20' - 736'
	茵	Cement: Portland	лату	Interval: 0' - 20'
53		Ocinicit. I ortiana		initerval. 0 20
国		Surface Completion: ab	ove-ground steel hox	
	Min	Surface Completion: ab	·	
	Mansam	Measuring Point: to be	established	
	माराज्यसम्बद्धस्य		established	
	प्रभागक्षणसम्प्रद्वा <u>त्र</u>	Measuring Point: to be	established	
	वन्त्रक्षमाध्यभवसम्बद्धाः	Measuring Point: to be	established 80', 830', 880', 930'	_OG
	भवस्यस्य	Measuring Point: to be	established	_OG
	स्त्रात्त्रात्त्रात्त्रात्त्रात्त्रात्त्रात्त्रात्त्रात्त्रात्त्रात्त्रात्त्रात्त्रात्त्रात्त्रात्त्रात्त्रात् 	Measuring Point: to be	established 80', 830', 880', 930'	OG Date and Start Time
	ભ્યામ મામ લાક તાલુકા મામ મામ મામ મામ મામ મામ મામ મામ મામ મ	Measuring Point: to be Centralizer Locations: 7	established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time	Date and Start Time
	તારાકાતાકારામાં લાકાલ સ્વાલ સ્થાપકારામાં સાથાતા	Measuring Point: to be Centralizer Locations: 7 Task Drilling	established 80', 830', 880', 930' CONSTRUCTION TIME I	
	क्षत् सम्बद्धानम् वस्त वस्तरम् तम् वस्त सम्बद्धानम् वस्त सम्बद्धानम् वस्त सम्बद्धानम् वस्त सम्बद्धानम् तम् तम्	Measuring Point: to be Centralizer Locations: 7	established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time 8/15/07 10:55	Date and Start Time 8/29/07 15:36
		Measuring Point: to be Centralizer Locations: 7 Task Drilling Casing Filter Pack	established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time 8/15/07 10:55 9/6/07 14:26	Date and Start Time 8/29/07 15:36 9/7/07 15:09
	16 FEET MEDIUM BERTONTE DIPE	Measuring Point: to be Centralizer Locations: 7 Task Drilling Casing Filter Pack Bentonite Chips	established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time 8/15/07 10:55 9/6/07 14:26 9/8/07 9:56	Date and Start Time 8/29/07 15:36 9/7/07 15:09 9/8/07 16:10 9/8/07 17:05
	10 FEET MEDIUM EDITION TO DAPS AND PELLETS A FEET WO SILIDA SAAD	Measuring Point: to be Centralizer Locations: 7 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout	established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time 8/15/07 10:55 9/6/07 14:26 9/8/07 9:56 9/8/07 16:25 9/9/07 9:00	Date and Start Time 8/29/07 15:36 9/7/07 15:09 9/8/07 16:10 9/8/07 17:05 9/9/0711:29
	10 FEET MEDIUM DEDITION TO CHAPS AND PELLETS A TEET WED SILIA SAMD 8 FEET A12 SILIA SAMD FETTER PACK	Measuring Point: to be Centralizer Locations: 7 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement	established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time 8/15/07 10:55 9/6/07 14:26 9/8/07 9:56 9/8/07 16:25 9/9/07 9:00 9/10/07 12:30	Date and Start Time 8/29/07 15:36 9/7/07 15:09 9/8/07 16:10 9/8/07 17:05 9/9/0711:29 9/10/07 13:00
	10 FEET MEDILAR DESTROYNE LAPPS AND PELLETS A FEET WO SILDA MAND B FEET B 422 SILDA WAND	Measuring Point: to be Centralizer Locations: 7 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout	established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time 8/15/07 10:55 9/6/07 14:26 9/8/07 9:56 9/8/07 16:25 9/9/07 9:00	Date and Start Time 8/29/07 15:36 9/7/07 15:09 9/8/07 16:10 9/8/07 17:05 9/9/0711:29
	10 FEET MEDILAR DESTRUCTIVE SAMPS AND PELLETS A FEET WO SILIA MANU B FEET SAL'S SILIA MANU FEET SAL'S EXTENSE 12 FEET ARONE TOP CS SCREEN	Measuring Point: to be Centralizer Locations: 7 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement	established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time 8/15/07 10:55 9/6/07 14:26 9/8/07 9:56 9/8/07 16:25 9/9/07 9:00 9/10/07 12:30	Date and Start Time 8/29/07 15:36 9/7/07 15:09 9/8/07 16:10 9/8/07 17:05 9/9/0711:29 9/10/07 13:00
	10 FEET MEDIUM DEDITION TO CHAPS AND PELLETS SUIDA SAND SIEDA SAND FILTER YACK ENTENNS 12 FEET ADDAY TO POOL	Measuring Point: to be Centralizer Locations: 7 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement	established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time 8/15/07 10:55 9/6/07 14:26 9/8/07 9:56 9/8/07 16:25 9/9/07 9:00 9/10/07 12:30	Date and Start Time 8/29/07 15:36 9/7/07 15:09 9/8/07 16:10 9/8/07 17:05 9/9/0711:29 9/10/07 13:00 10/24/07 0:00
	16 FEET MEDILAN DEPTON OF PROPERTY OF PROP	Measuring Point: to be Centralizer Locations: 7 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion	established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time 8/15/07 10:55 9/6/07 14:26 9/8/07 9:56 9/8/07 16:25 9/9/07 9:00 9/10/07 12:30 10/24/07 WELL DEVELOPMEN	Date and Start Time 8/29/07 15:36 9/7/07 15:09 9/8/07 16:10 9/8/07 17:05 9/9/0711:29 9/10/07 13:00 10/24/07 0:00
	16 FEST MEDILAN DEPONITE DIRECT SELIDA MAND STEET NO SELIDA MAND FILTER PACK ENTENDS 12 FEET AND/S TUP OF SCREEN TACKA WE FILTER PACK GRAVEL 9*LOW CAFBON STEEL FACTORY SIGNITURE SCREEN	Measuring Point: to be Centralizer Locations: 75 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs)	established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time 8/15/07 10:55 9/6/07 14:26 9/8/07 9:56 9/8/07 16:25 9/9/07 9:00 9/10/07 12:30 10/24/07	Date and Start Time 8/29/07 15:36 9/7/07 15:09 9/8/07 16:10 9/8/07 17:05 9/9/0711:29 9/10/07 13:00 10/24/07 0:00
	10 FEET MEDILAN DEPROVATE DATE AND VELLETS A PEET WO SILIA MAND STEET AND SILIA MAND FILTER PACK EXTENDS 12 FEET ANDAY TOPICS SCREEN TACAR WE FILTER PACK CIRAVEL 3"LOW CAFBOH STEEL RACTOW SIGNIFIC DATE IDES NICHT SLITES	Measuring Point: to be Centralizer Locations: 75 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing	Established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time 8/15/07 10:55 9/6/07 14:26 9/8/07 9:56 9/8/07 16:25 9/9/07 9:00 9/10/07 12:30 10/24/07 WELL DEVELOPMEN Gallons Start	Date and Start Time 8/29/07 15:36 9/7/07 15:09 9/8/07 16:10 9/8/07 17:05 9/9/0711:29 9/10/07 13:00 10/24/07 0:00 T End
	16 FEST MEDILAN DEPONITE DIRECT SELIDA MAND STEET NO SELIDA MAND FILTER PACK ENTENDS 12 FEET AND/S TUP OF SCREEN TACKA WE FILTER PACK GRAVEL 9*LOW CAFBON STEEL FACTORY SIGNITURE SCREEN	Measuring Point: to be Centralizer Locations: 7 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing Airlifting 5.5	established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time 8/15/07 10:55 9/6/07 14:26 9/8/07 9:56 9/8/07 16:25 9/9/07 9:00 9/10/07 12:30 10/24/07 WELL DEVELOPMEN	Date and Start Time 8/29/07 15:36 9/7/07 15:09 9/8/07 16:10 9/8/07 17:05 9/9/0711:29 9/10/07 13:00 10/24/07 0:00 T End
	10 FEET MEDILAN DEPROVATE DATE AND VELLETS A PEET WO SILIA MAND STEET AND SILIA MAND FILTER PACK EXTENDS 12 FEET ANDAY TOPICS SCREEN TACAR WE FILTER PACK CIRAVEL 3"LOW CAFBOH STEEL RACTOW SIGNIFIC DATE IDES NICHT SLITES	Measuring Point: to be Centralizer Locations: 7s Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing Airlifting 5.5 Swabbing	Established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time 8/15/07 10:55 9/6/07 14:26 9/8/07 9:56 9/8/07 16:25 9/9/07 9:00 9/10/07 12:30 10/24/07 WELL DEVELOPMEN Gallons Start	Date and Start Time 8/29/07 15:36 9/7/07 15:09 9/8/07 16:10 9/8/07 17:05 9/9/0711:29 9/10/07 13:00 10/24/07 0:00 T End
	TO FEET MEDILAN DEPTONITE OF SENT AND THE CAPE AND THE CAPE AND THE CAPE SELLA MAND SELLA MAND FEET HIZ SELICA MAND FEET MIZ SELICA MAND STEEL FACTOR SIGNED SERIEN LOSS NICH SELICA SUMP	Measuring Point: to be Centralizer Locations: 75 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing Airlifting 5.5 Swabbing Development	Established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time 8/15/07 10:55 9/6/07 14:26 9/8/07 9:56 9/8/07 16:25 9/9/07 9:00 9/10/07 12:30 10/24/07 WELL DEVELOPMEN Gallons Start	Date and Start Time 8/29/07 15:36 9/7/07 15:09 9/8/07 16:10 9/8/07 17:05 9/9/0711:29 9/10/07 13:00 10/24/07 0:00 T End
	10 FEET MEDILAN DEPROVATE DATE AND VELLETS A PEET WO SILIA MAND STEET AND SILIA MAND FILTER PACK EXTENDS 12 FEET ANDAY TOPICS SCREEN TACAR WE FILTER PACK CIRAVEL 3"LOW CAFBOH STEEL RACTOW SIGNIFIC DATE IDES NICHT SLITES	Measuring Point: to be Centralizer Locations: 75 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing Airlifting 5.5 Swabbing Development Pumping	established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time 8/15/07 10:55 9/6/07 14:26 9/8/07 9:56 9/8/07 9:56 9/9/07 9:00 9/10/07 12:30 10/24/07 WELL DEVELOPMEN Gallons Start 4000 10/01/07 10	Date and Start Time 8/29/07 15:36 9/7/07 15:09 9/8/07 16:10 9/8/07 17:05 9/9/0711:29 9/10/07 13:00 10/24/07 0:00 T End :30 10/01/07 16:00
38 39 39 39 39 39 39 39 39 39 39 39 39 39	TO FEET MEDILAN DEPTONITE OF SENT AND THE CAPE AND THE CAPE AND THE CAPE SELLA MAND SELLA MAND FEET HIZ SELICA MAND FEET MIZ SELICA MAND STEEL FACTOR SIGNED SERIEN LOSS NICH SELICA SUMP	Measuring Point: to be Centralizer Locations: 75 Task Drilling Casing Filter Pack Bentonite Chips Bentonite Grout Cement Surface Completion Task Time (hrs) Bailing Airlifting 5.5 Swabbing Development	Established 80', 830', 880', 930' CONSTRUCTION TIME I Date and Start Time 8/15/07 10:55 9/6/07 14:26 9/8/07 9:56 9/8/07 16:25 9/9/07 9:00 9/10/07 12:30 10/24/07 WELL DEVELOPMEN Gallons Start	Date and Start Time 8/29/07 15:36 9/7/07 15:09 9/8/07 16:10 9/8/07 17:05 9/9/0711:29 9/10/07 13:00 10/24/07 0:00 T End :30 10/01/07 16:00

APPENDIX D.4

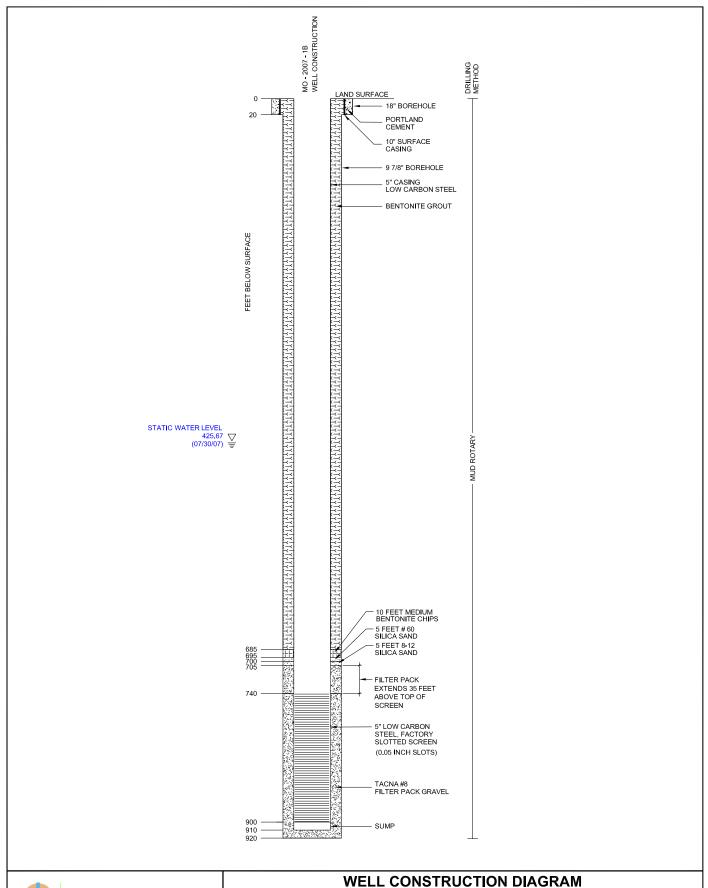
WELL CONSTRUCTION DIAGRAMS OF INDIVIDUAL MITIGATION ORDER WELLS





FOR WELL MO-2007-1A (55-907342)

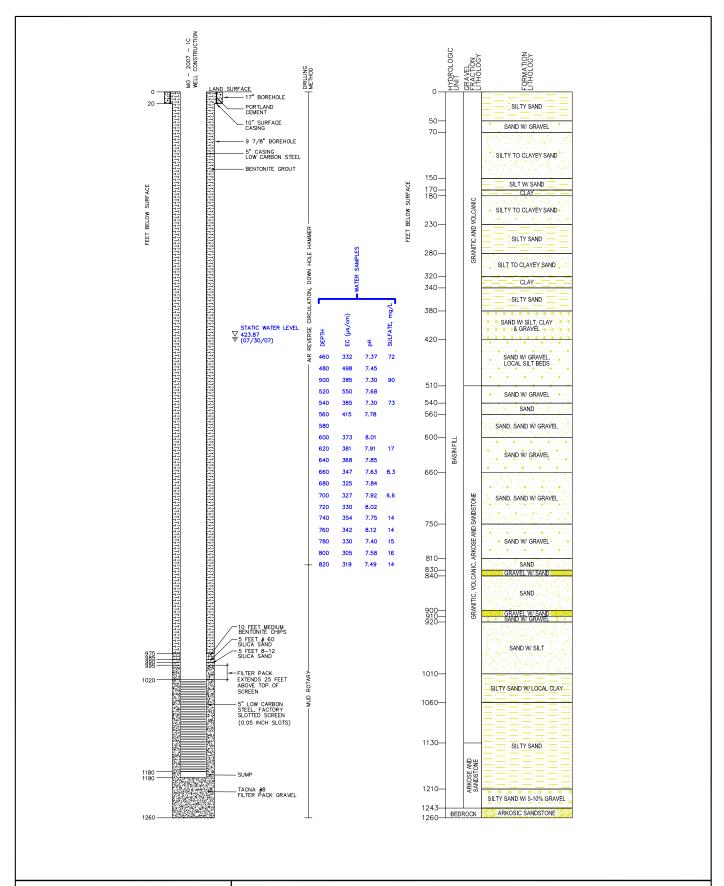
Approved	Date	Drawn By	Date	File Name	Figure
KSW	07/05/07	DKW	07/05/07	7830138A	D.4.1





WELL CONSTRUCTION DIAGRAM FOR WELL MO-2007-1B (55-907210)

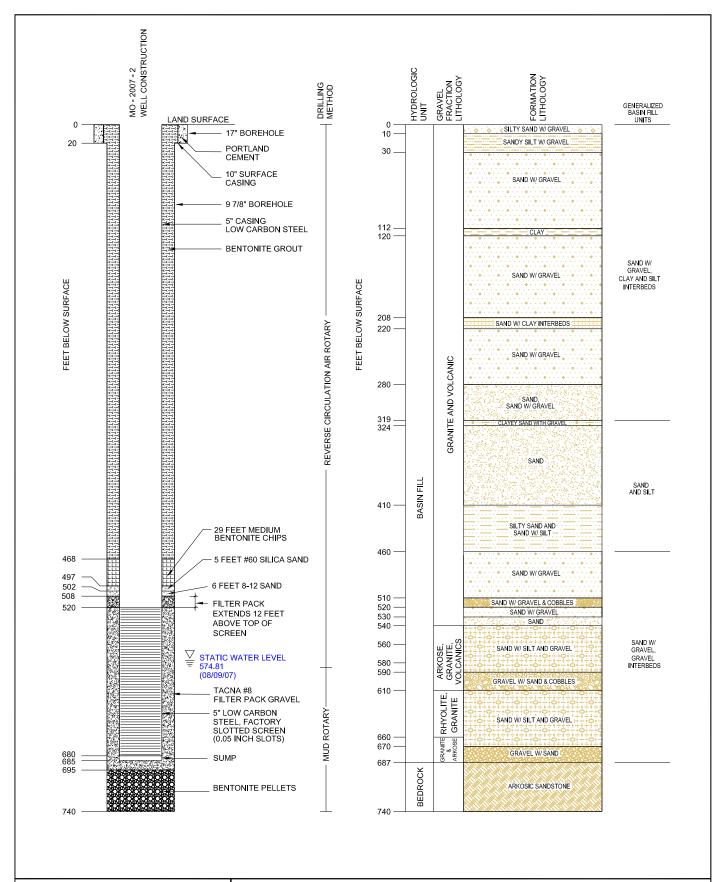
Approved	Date	Drawn By	Date	File Name	Figure
KSW	07/03/07	DKW	07/03/07	7830137A	D.4.2





WELL CONSTRUCTION DIAGRAM AND STRATIGRAPHY FOR WELL MO-2007-1C (55-907209)

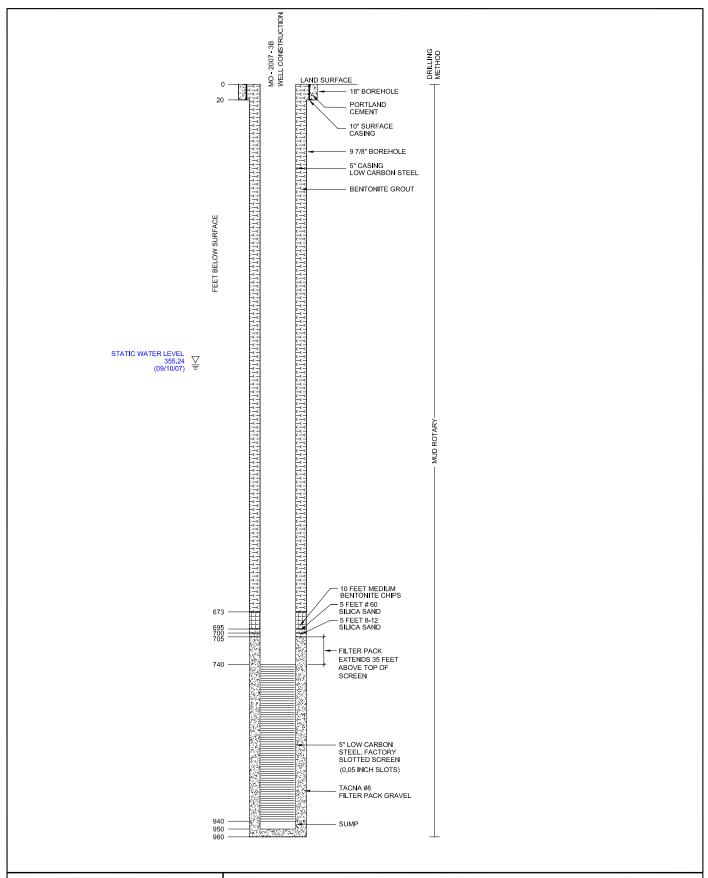
١	Approved	Date		Date	File Name	Figure
	KSW	06/19/07	DKW	06/19/07	7830134A	D.4.3





WELL CONSTRUCTION DIAGRAM AND STRATIGRAPHY FOR WELL MO-2007-2 (55-906765)

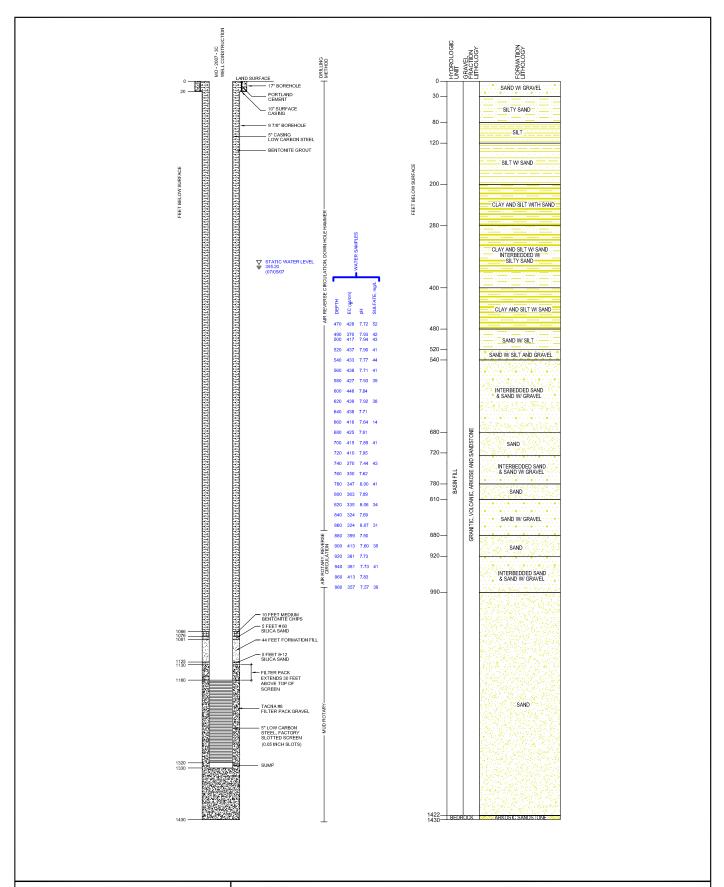
ł	Approved	Date	Drawn By	Date	File Name	Figure
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WELL CONSTRUCTION DIAGRAM FOR WELL MO-2007-3B (55-906816)

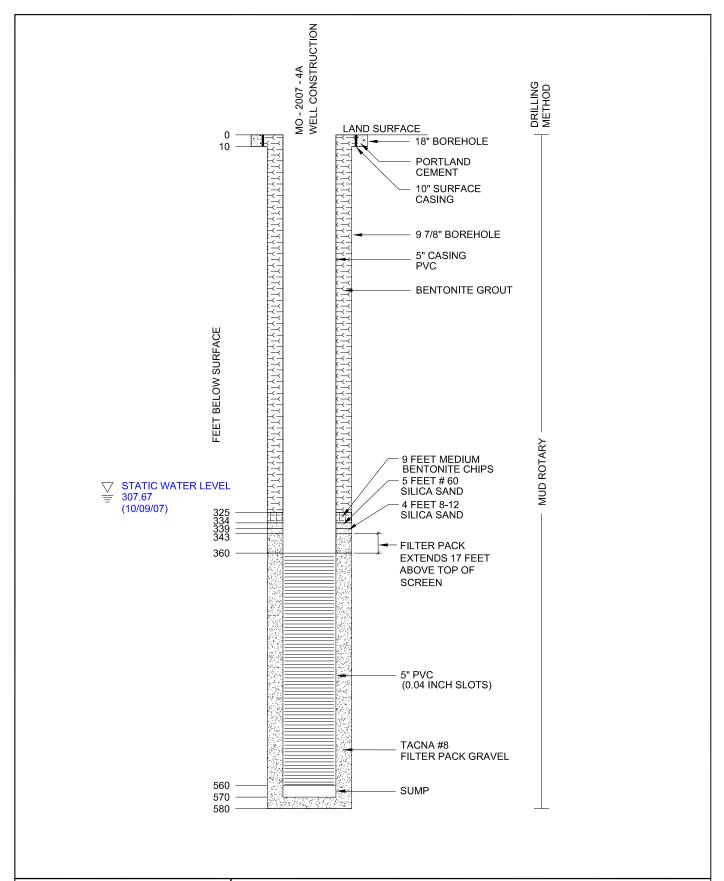
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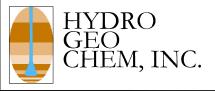




WELL CONSTRUCTION DIAGRAM AND STRATIGRAPHY FOR WELL MO-2007-3C (55-906817)

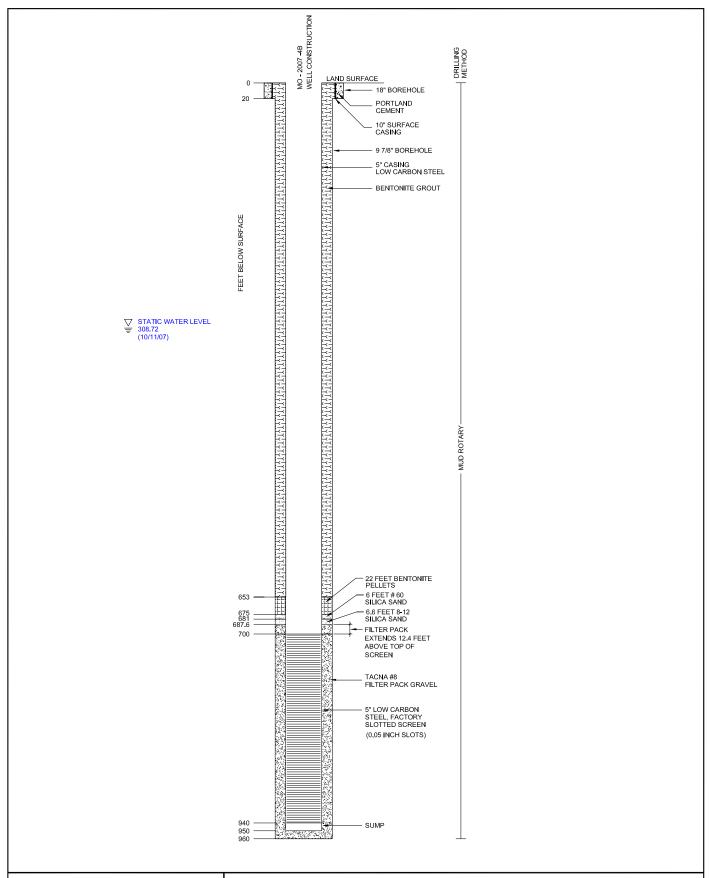
			•			
Α	pproved	Date	Drawn By	Date	File Name	Figure
	KSW	06/18/07	DKW	06/18/07	7830133A	D.4.6





WELL CONSTRUCTION DIAGRAM FOR WELL MO-2007-4A (55-907213)

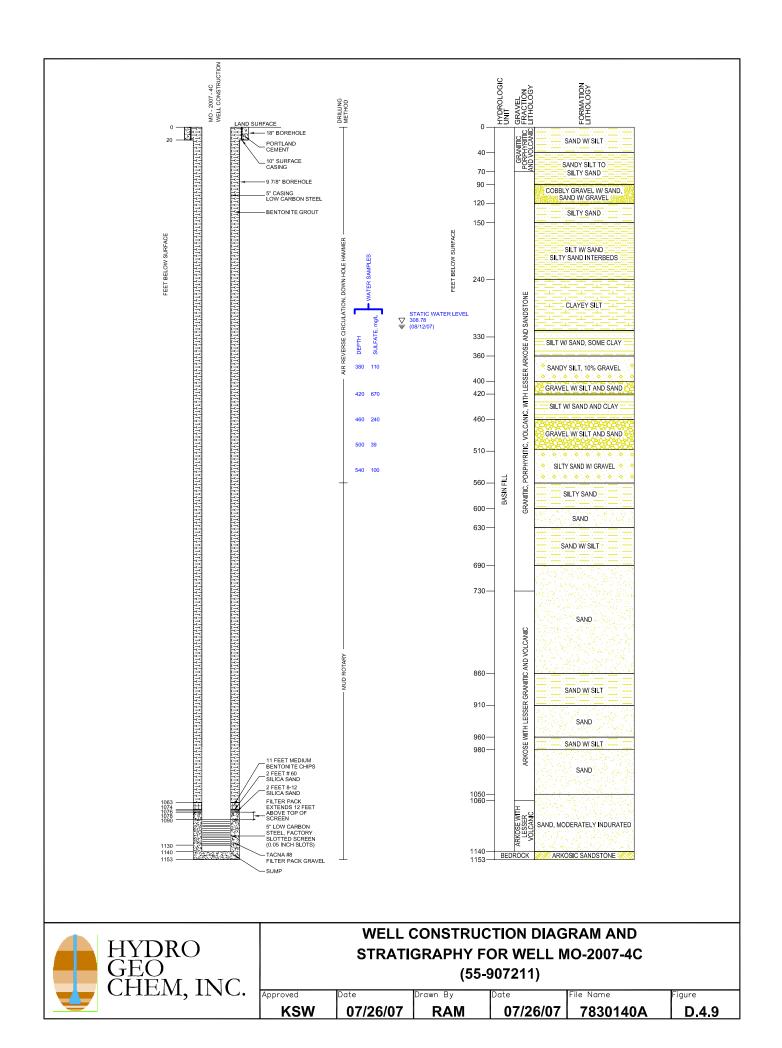
Approved	Date	Drawn By	Date	File Name	Figure
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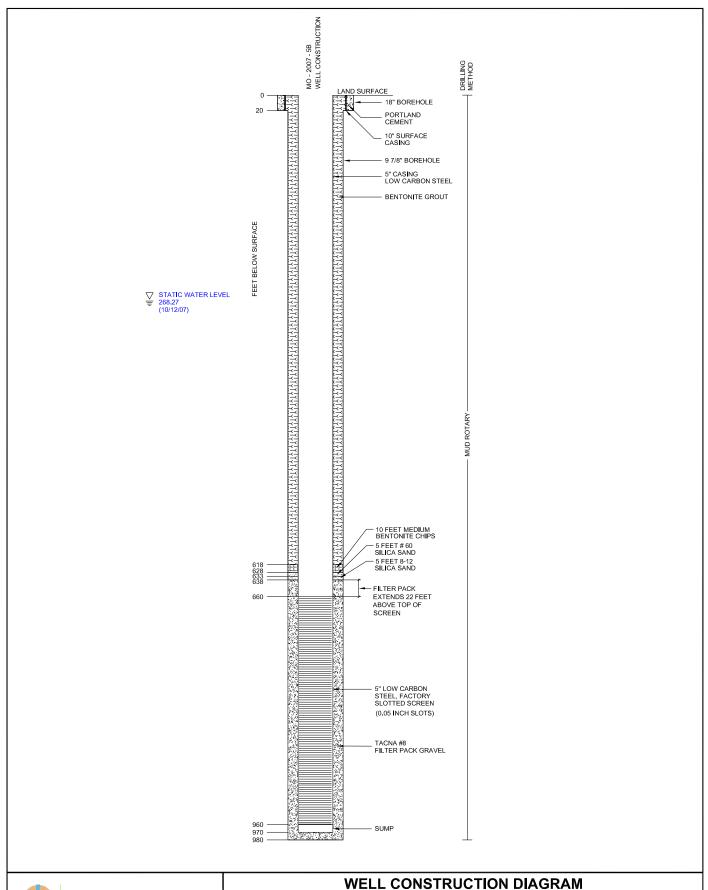




WELL CONSTRUCTION DIAGRAM FOR WELL MO-2007-4B (55-907212)

ı	Approved	Date	Drawn By	Date	File Name	Figure
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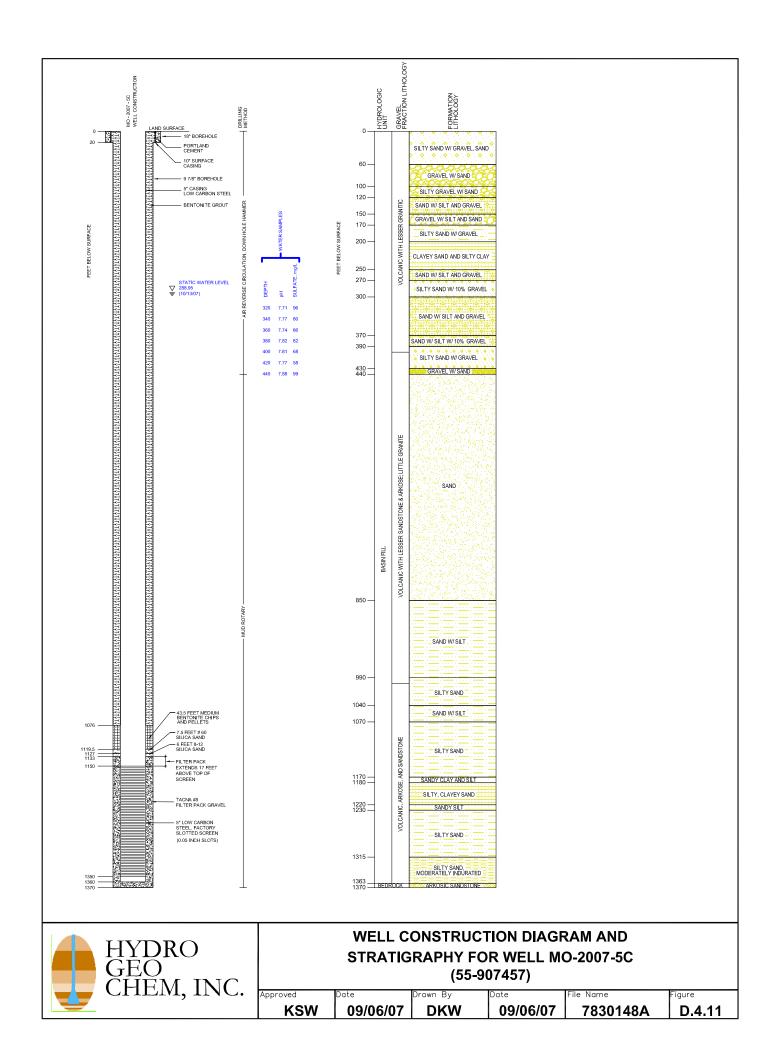


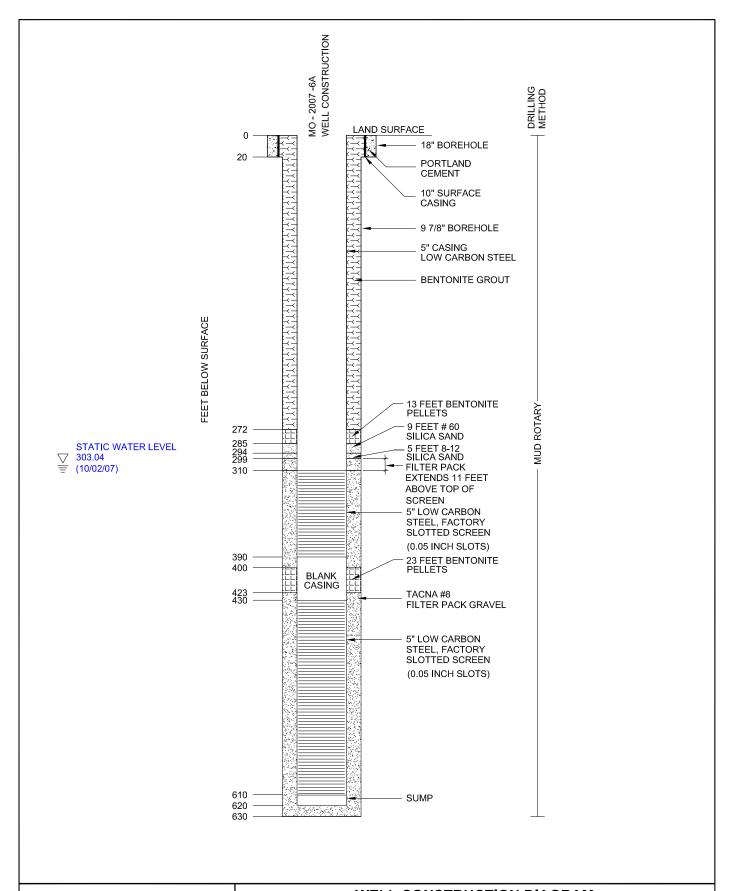




FOR WELL MO-2007-5B (55-907456)

Approved	Date	Drawn By	Date	File Name	Figure
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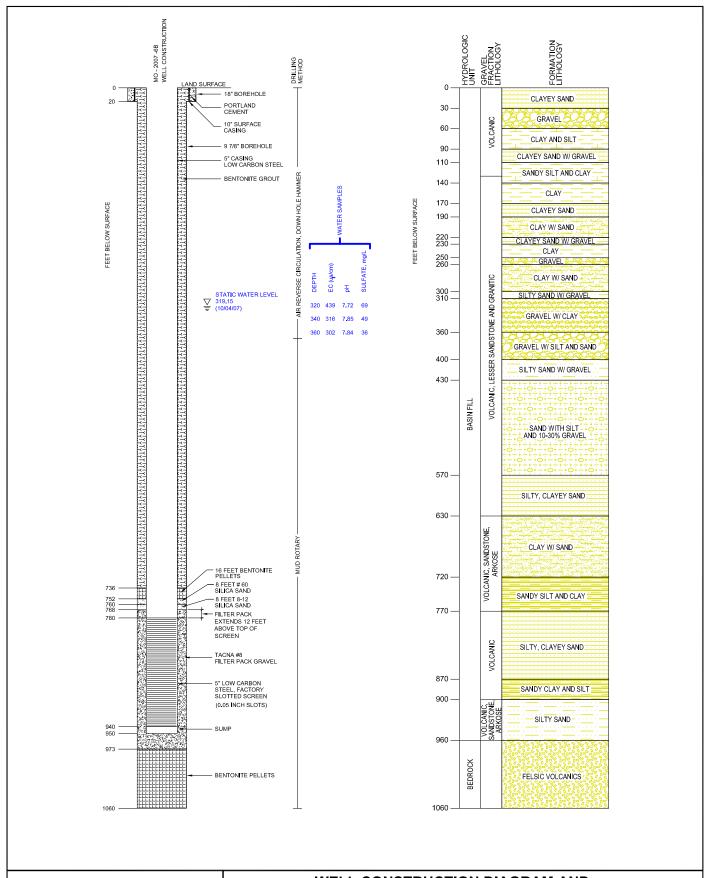






WELL CONSTRUCTION DIAGRAM FOR WELL MO-2007-6A (55-907607)

Approved	Date	Drawn By	Date	File Name	Figure
KSW	9/25/07	DKW	9/25/07	7830153A	D.4.12





WELL CONSTRUCTION DIAGRAM AND STRATIGRAPHY FOR WELL MO-2007-6B (55-907606)

Approved	Date	Drawn By	Date	File Name	Figure
KSW	9/11/07	DKW	9/11/07	7830151A	D.4.13

APPENDIX D.5 WELL CONSTRUCTION DATA FOR NP-2 AND CW-3

DEPARTMENT OF WATER RESOURCES 98 EAST VIRGINIA AVENUE PHOENIX, ARIZONA 85004

REGISTRATION OF EXISTING WELLS

READ INSTRUCTIONS ON BACK OF THIS FORM BEFORE COMPLE PRINT OR TYPE - FILE IN DUPLICATE

			09
		1	ICE USE ONLY
		REGISTRATION NO. 55	605898
REGISTRATION FEE (CHECK ONE)		FILE NO. D(18-1	312 600
EXEMPT WELL (NO CHARGE)		FILE NO. 1/1/8	AT 2
NON-EXEMPT WELL - \$10.00		FILED 7/3/0	AT (TIME)
14011-17 Livil 1 44 L L 410,00		INA -	
		AMA TUCSON	
. Name of Registrant:			(C. 1888) (C. 1884)
New Pueblo Constructors, Inc.			
• •	Tuggen		05706
P.O. Box 27566 (Address)	(City)		
. File and/or Control Number under previous gro	unduntar la		
(Junuwater la	w:	
	rol Number)		-
. a. The well is located within the <u>SW</u> ¼			
of Township <u>18 N/S</u> , R	_	13 E/W, (3 & SRB & M, in th
County of Pima		*	
b. If in a subdivision: Name of subdivision	-		
Lot No, Address <u>341 West R</u>	osa Drive.	Green Valley, Az	7
Franchised water system serving domes	igation - sto	ockwater - domestic ers and some comm	- municipal - industria
Franchised water system serving domes If for irrigation use, number of acres irrigated	igation - sto tic custom	ockwater - domestic ers and some comm	- municipal - industria mercial customers
Franchised water system serving domes If for irrigation use, number of acres irrigated	igation - sto tic custom	ockwater - domestic ers and some comm	- municipal - industria mercial customers
Franchised water system serving domes If for irrigation use, number of acres irrigated	igation - sto tic custom	ockwater - domestic ers and some comment. . 1, check this box [- municipal - industria mercial customers
Franchised water system serving domes If for irrigation use, number of acres irrigated Owner of land on which well is located. If sal	igation - sto tic custom from well _ me as Item	ockwater - domestic ers and some comment. . 1, check this box [- municipal - industria mercial customers
Franchised water system serving domes If for irrigation use, number of acres irrigated Owner of land on which well is located. If sa (Address) Well data (If data not available, write N/A)	igation - sto tic custom from well me as Item	ockwater - domestic ers and some comment. 1, check this box (State)	- municipal - industria mercial customers
Franchised water system serving domes If for irrigation use, number of acres irrigated Owner of land on which well is located. If sal (Address) Well data (If data not available, write N/A) a. Depth of Well	igation - sto tic custom from well _ me as Item (City)	ckwater - domestic ers and some comment. 1, check this box (State)	- municipal - industria mercial customers
Franchised water system serving domes If for irrigation use, number of acres irrigated Owner of land on which well is located. If sale (Address) Well data (If data not available, write N/A) a. Depth of Well b. Diameter of casing	igation - sto tic custom from well _ me as Item (City)	ckwater - domestic ers and some comment . 1, check this box [(State) 5 feet inches /	- municipal - industria mercial customers
Franchised water system serving domes If for irrigation use, number of acres irrigated Owner of land on which well is located. If sale (Address) Well data (If data not available, write N/A) a. Depth of Well b. Diameter of casing c. Depth of casing	igation - sto tic custom from well _ me as Item (City) 51 12	tockwater - domestic ters and some commerce. 1, check this box (State) 5 feet inches 5 feet	- municipal - industria mercial customers
Eranchised water system serving domes If for irrigation use, number of acres irrigated Owner of land on which well is located. If said (Address) Well data (If data not available, write N/A) a. Depth of Well b. Diameter of casing c. Depth of casing d. Type of casing	igation - sto tic custom from well _ me as Item (City) 51 12 51 ½" steel	ckwater - domestic lers and some commerce. 1, check this box (State) 5 feet	- municipal - industria
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Eranchised water system serving domes If for irrigation use, number of acres irrigated Owner of land on which well is located. If sale land land land land land land land land	igation - sto tic custom from well _ me as Item (City) 51 12 51 18 314	1, check this box (State) 5 feet inches 5 feet	- municipal - industria mercial customers (Zip)
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Franchised water system serving domes If for irrigation use, number of acres irrigated Owner of land on which well is located. If sale (Address) Well data (If data not available, write N/A) a. Depth of Well b. Diameter of casing c. Depth of casing d. Type of casing e. Maximum pump capacity f. Depth to water g. Date well completed November 12 (Month) (Date of the case of water. If same as Item ———————————————————————————————————	igation - sto tic custom from well	5 feet inches feet below lar (74 year)	- municipal - industria mercial customers X (Zip)
Eranchised water system serving domes If for irrigation use, number of acres irrigated Owner of land on which well is located. If sale (Address) Well data (If data not available, write N/A) a. Depth of Well b. Diameter of casing c. Depth of casing d. Type of casing e. Maximum pump capacity f. Depth to water g. Date well completed November 12 (Month) The place(s) of use of water. If same as Item 4 4 4 4 4, Section 7	igation - sto tic custom from well _ me as Item (City) 51 12 51 13 14" steel 18 314 20 31, check the ownship	5 feet inches feet below lar (74 year)	- municipal - industria mercial customers X (Zip)
Eranchised water system serving domes If for irrigation use, number of acres irrigated Owner of land on which well is located. If sale (Address) Well data (If data not available, write N/A) a. Depth of Well b. Diameter of casing c. Depth of casing d. Type of casing e. Maximum pump capacity f. Depth to water g. Date well completed November 12 (Month) The place(s) of use of water. If same as Item 14 14 14 14, Section 17	igation - sto tic custom from well _ me as Item (City) 51 12 51 13 14" steel 18 314 20 31, check the ownship	5 feet inches feet below lar (74 year)	- municipal - industria mercial customers (Zip)

Tours	12030 E. Riggs Road
(Adhe)	Chandler, AZ 85249 Telephone: 480/895-9404

T.V. CAMERA SURVEY

Date	5-	31	- 2007

)	11.) /1			
Customer //	RICITATION	co Chem Well Number	# NP. 2	2-1	
Job Number <u></u>	2-1/25	Well Numbe	0 (1/1	_ S.W.L <u>\$</u>	
LOCATION: Col	inty	City _	Green Villey	_ State /7//2001	
Sec		Twp		_ Rge	
		No Tape F			
Brief Well Descr	iption	124"	ID casing		
	DEPTH		DESCRIPTION	l	
	-	AT Ton	of Casin		12" casing
	18	AT Top ' Rust Buildy	as Cash		
		pus, purery			
	73,	21 R 1)	2		
		o' Builip on Os	-3149		
	27	Perforations	(8412)		4
	33/	REITOIPI (ON)	LOAN CUI)	115,	
	->	11 -1 1	12 1 1 1	1 01	
		1' STATIC M		- Cloudy)	
	36	2' Piece of 1	Motie		
the state of the s			0		
	37	Heavy Build	ep on Casing		
	410	Sacra Pices	e of Plastic		
			*	0 1	
-	45	D' Herry Buildy	au Casing & Por	hors hor's	
KV MARKATAN TANAN	480	11 Tag of 1			
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1					

Technician

acres =)

LAND DEPARTMENT WATER DIVISION STATE OF ARIZONA

REPORT OF WELL DRILLER

IMPORTANT

PLEASE COMPLETE AND REPURA

This report should be prepared by the driller in all detail and filed with the State Land Commissioner following completion of the well.

1.	OWNER TUCSON GREEN VALLEY
	c/o A. A. McDaniel Well & Machine Co., 2838 Ruthrauff Rd., Tucson, Arizona
	PALICA COS
21.	Lessee or Operator
3.	DRILLER A.A. McDANIEL WELL & MACHINE CO. Name
	Tucson, Arizona
	Address
	10-acre sudivision
ő.	Intention to Drill File No. D(18-13)22 aca Permit No.
	DESCRIPTION OF WELL
6.	Total depth of hole 501' 5" ft.
7.	Type of casing Linepipe
8.	Diameter and length of casing 16 in from 0 to 500 in from to in from to
	Method of sealing at reduction points
10.	Perforated from 182 to 500, from to from to from to
11.	Size of cuts 3/8# X1.11 Number of cuts per foot. 8
12.	If screen was installed: Lengthft. Diamin. Type
13.	Method of construction. Drilled cable tools
14.	Date started
15.	Date completed. March 16, 1961
16.	Depth of water 193 If flowing well, so state. ft.
17.	Describe point from which depth measurements were made, and give sea-level elevation if available
18.	If flowing well, state method of flow regulation.
19.	REMARKS: DO NOT WRITE IN THIS SPACE
	OFFICE RECORD
	OFFICE RECORD
*****	Received 3-19-L5 by R
	Filed 3-72-65 by
••	File No. D(18-13)22 aca
	File No. 1/10-1)/22 aca

(Lgyne)	12030 E. Riggs Road Chandler, AZ 85249
	Telephone: 480/895-9404

T.V. CAMERA SURVEY

Data	5	31-	2007
11210		ACTION NO.	

/)		Date
Oustomer	Tydi	ro (Well Number # CW-3 City Green Valley	2 22
Job Number	01-	4/25	Well Number Well Number	S.W.L. 200
LOCATION: Co	unty		City O'rean Valley	State Aricova
Sec			Twp	Rge
Tape Made:	Yes L	No	Tape File Number	
Brief Well Descr	ription		15 4" ID C	Asing
	DE	PTH	DESCRIF	PTION ADWR
	9		At The of Cash	
			AT Top of Casing	
		1781	Perforation's (Mills Kn	1/e) 182-500
		110	121 JOIN 1000 C 111113 110	176
		ر سدره	STatic Water level	1 260 (914
		270	Buildup on Ossing	
			11 0 10	
		300	Heavy Bully	
The state of the s				
	3987	399'	Split in Casing	
			,	
		4/9'	Herry Buildy on Casin	7
				,
		4/2'	Ty of Soft Fill	TD 501.5 19
			<u>, , , , , , , , , , , , , , , , , , , </u>	
				, !

Technician

DEPARTMENT OF WATER RESOURCES

REGISTRAT	ION OF	EXISTING	WELLS

READ INSTRUCTIONS ON BACK OF THIS FORM BEFORE COMPLETING PRINT OR TYPE - FILE IN DUPLICATE

NOV 15 1982 DEPT. OF

#3

miay 2 ~ 2930 WATER RESOURCES REGISTRATION NO. 55-REGISTRATION FEE (CHECK ONE) EXEMPT WELL (NO CHARGE) NON-EXEMPT WELL - \$10.00 $\square X$ Name of Registrant: 1 COMMUNITY WATER COMPANY OF GREEN VALLEY P.O. Box 1078, Green Valley, Arizona 85614 (Address) (State) (Zip) File and/or Control Number under previous groundwater law: (D-18-13) - 22-1(File Number) NE The well is located within the 3. 1/4 A-3 __¼, Section __22 of Township _ N/S, Range E/W, G & SRB & M, in the County of ____Pima If in a subdivision: Name of subdivision _____Green Valley Acres Lot No. 23 Blk., 1Address 1501 S. LA Canada, Green Valley, AZ 85614 The principal use(s) of water (Examples: irrigation - stockwater - domestic - municipal - industrial) Domestic If for irrigation use, number of acres irrigated from well ---Owner of land on which well is located. If same as Item 1, check this box 🔀 (Address) (City) (Zip) Well data (If data not available, write N/A) 501.5 Depth of Well a. Diameter of casing 16- 250 h. Depth of casing ____501.5 c. Type of casing <u>domestic steel line pipe</u> . d. Maximum pump capacity 500 e. gallons per minute. 260 f. Depth to water feet below land surface. Date well completed. _ March 16 a. The place(s) of use of water. If same as Item 3, check this box . See attached CC & N Map. __¼ ____¼ _____ X, Section _____ Township _____ Range __¼ ____¼ ____¼, Section _____ Township _____ Range

MICROFILMED

Attach additional sheet if necessary.

DATE 3-22-82 SIGNATURE OF REGISTRANT

LOG OF WELL

Indicate depth at which water was first encountered, and the depth and thickness of water bearing beds. If water is artesian, indicate depth at which encountered, and depth to which it rose in well.

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	2lı	Sandy topsoil and boulders
24	61	Soft conglomerate
61	105	Dry sand and gravel
105	116	Dry sand and boulders
116	180	Dry sand and gravel
180	181	Gravel and wate r
181	203	Sandy caky with streaks of gravel and water
203	299	Congomerate, possible water
299	331	Sticky brown clay
331	372	Hard conglomerate & clay streaks
372	378	Sand , gravel & water
378	390	Sticky brown clay
390	411	Hard conglomerate
411	429	Sandy clay
429	445_	Cemented sand
445	450	Randy clay
450	456	Clean gravel & water
1,56	1,71	Hard conglomerate
474	1479	Soft conglomerate
1,79	500	Hard conglomerate

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein contained are true to the best of my knowledge and belief.



Driller A. A. McDaniel Well & Machine Co.
Name

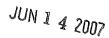
2838 Ruthrauff Rd. Tucson. Arizona

Date March 16 , 1964

M. 201

APPENDIX D.6 WATER QUALITY ANALYSES

Order No.: 0705848





June 12, 2007

Rick Zimmerman Hydro Geo Chem, Inc. 51 W. Wetmore Rd. Suite 101 Tucson, AZ 857051678 TEL: (520) 293-1500

FAX (520) 293-1550

RE: PDSI 78306.4

Dear Rick Zimmerman,

Turner Laboratories, Inc. received 3 samples on 5/31/2007 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc. ADHS License AZ0066

Shari Baumas

Shari Bauman

Laboratory Director

CLIENT:

Hydro Geo Chem, Inc.

0705848

Lab Order: Project:

Lab ID:

PDSI 78306.4

0705848-01A

Date: 12-Jun-07

Client Sample ID: MO-2007-1B-780

Collection Date: 5/29/2007 12:45:00 PM

Analyses	Result		PQL	_	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		E300					Analyst: JM
Sulfate	15	5	5.0		mg/L	1	5/31/2007 4:34:00 PM

R - RPD outside accepted recovery limits

CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0705848

Project:

PDSI 78306.4

Lab ID:

0705848-02A

Date: 12-Jun-07

Client Sample ID: MO-2007-1B-800

Collection Date: 5/29/2007 1:35:00 PM

Analyses	Result	PQL Q	ual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E30	00			Analyst: JM
Sulfate	16	5.0	mg/L	. 1	5/31/2007 4:52:00 PM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

CLIENT: Hydro Geo Chem, Inc.

Lab Order: 0705848

Project: PDSI 78306.4

Lab ID: 0705848-03A

Date: 12-Jun-07

Client Sample ID: MO-2007-1B-820

Collection Date: 5/29/2007 2:07:00 PM

Analyses	Result	PQL	Qual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E300				Analyst: JM
Sulfate	14	5.0	mg/L	1 ,	5/31/2007 5:11:00 PM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

TURNER LABORATORIES, INC.

SAMPLE CONTROL RECEIPT CHECKLIST

Tu	urner Laboratories W.O. #: 0705848			TURNE
Re	eceived By: RD			LABORATORIES I
Re	eceived Date/Time: 5/31/07 15:00			
De	elivered by: <u>Clien+</u>			
		,		
1.	Shipping container/cooler in good condition?	Z Yes	□No	☐ Not Present
2.	Custody seals intact on sample bottles?	☐ Yes	□ No	Not Present
3.	Chain of custody present?	Yes	□No	
4.	COC signed when relinquished and received?	Yes	□ No	
5.	COC agrees with sample labels?	☑ Yes		
6.	Samples in proper container/bottle?	Yes	□ No	
7.	Sample container intact?	☑ Yes		
8.	Sufficient sample volume for requested tests?	Yes	□ No	
9.	Samples received within holding times?	Yes	□No	
10.	VOA vials received with no headspace?	□ Yes	□ No	☑ No Vials
11.	Bacti bottles received with appropriate headspace?	☐ Yes		☐ Above 100ml
		☑ Not Appl	licable	□ Below 100ml
12.	Temperature upon receipt?3°C			
13.	Number of sample containers received?3			

Additional Comments:

2445 N. Coyote Drive, Suite 104 Tucson, Arizona 85745

Fax: (520) 882-9788 (520) 882-5880

www.turnerlabs.com

PROJECT NAME

ADDRESS,

しもりの名の言 TURNER WORK ORDER #_

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

PAGE_

Blue Ice SAMPLE RECEIPT CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX Wet Ice 000 D SSI **(**) aoo O'D Colilen DHd INVOICE INFORMATION: Coliforn SECONDARY D NdW PRIMARY SDWA-INORCANICS Amen. Cyanide [] lelol D sinsivilod vinoing P.O.# Diesol Bill to: Dissolved 2 O slet9M SPECIAL INSTRUCTIONS/COMMENTS: Dd701 Pest/Herb. D YON-IMAS Report (includes DUP, MS, TCLP Analysis MSD, as required, may be REPORT REQUIREMENTS: 7es Yes DYON (Includes All Raw Data) Date Validation Report charged as samples) CIBN. 1664A Oll and Grease Routine Report DV+991 Total Petroleum Hydrocarbons Compliance Analysis: Mail ADEQ Forms: ADEQ Forms: $D^{s_{i}g_{i}J_{d}}$ ij Desticides [] DEANH DSWHLL 0978/27475/8760 5 Day* TURNAROUND REQUIREMENTS: Volatile Organics DRINKING WATER = GROUNDWATER Standard (approx. 10 days)* D spiny = STORMWATER WASTEWATER 075/8270 Base Neutrals 2 Day Fax Preliminary Results * LEGEND SLUDGE Requested Report Date_ = SOLID SOIL NUMBER OF CONTAINERS Next Day * Working Days WW = 1 A A S S S S SAMPLE MATRIX* 8306, TURNER LABORATORIES, INC. EAX LPB RECEIVED BY: とるな 25 735 5/25/07 1407 TIME Printed Name $\overline{\kappa}$ Shafez 15/22/3 Date/Time Signature DATE 7 TUPSOUT mo-2007-1B-870 mo-2007-18-790 mo-2007-113-400 RELINOUISHED BY: CONTACT NAME KEK SAMPLER'S SIGNATURE SAMPLE I.D. COMPANY NAME.

DISTRIBUTION: WHITE - return to originator

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PINK - retained by originator

See back of pink copy for general terms and conditions/limits of liability

JUN I 4 2007

T U R N E R

June 12, 2007

Rick Zimmerman Hydro Geo Chem, Inc. 51 W. Wetmore Rd. Suite 101 Tucson, AZ 857051678 TEL: (520) 293-1500

RE: PDSI 78306.4

FAX (520) 293-1550

Dear Rick Zimmerman,

Order No.: 0705728

Turner Laboratories, Inc. received 10 samples on 5/25/2007 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc. ADHS License AZ0066

Shan Bauman

Shari Bauman

Laboratory Director

CLIENT: Hydro Geo Chem, Inc.

Lab Order: 0705728

Project: PDSI 78306.4

Lab ID: 0705728-01A

Date: 12-Jun-07

Client Sample ID: MO-2007-1B-700

Collection Date: 5/24/2007 3:18:00 PM

Analyses	Result	PQL Q	ual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E3	300			Analyst: JM
Sulfate	6.6	5.0	mg/L	. 1	5/30/2007 2:14:00 PM

CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0705728

Project:

PDSI 78306.4

Lab ID:

0705728-02A

Date: 12-Jun-07

Client Sample ID: MO-2007-1B-500

Collection Date: 5/24/2007 12:25:00 PM

Analyses	Result	PQL Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E300				Analyst: JM
Sulfate	90	50	mg/L	10	5/29/2007

Date: 12-Jun-07

CLIENT: Lab Order: Hydro Geo Chem, Inc.

0705728

Project:

PDSI 78306.4

Lab ID:

0705728-03A

Client Sample ID: MO-2007-1B-580

Collection Date: 5/24/2007 1:58:00 PM

Analyses	Result	PQL	Qual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E300)			Analyst: JM
Sulfate	52	50	mg/L	10	5/29/2007

R - RPD outside accepted recovery limits

Date: 12-Jun-07

CLIENT:

Hydro Geo Chem, Inc.

Client Sample ID: MO-2007-1B-620

Lab Order:

0705728

Project:

PDSI 78306.4

Collection Date: 5/24/2007 2:26:00 PM

Lab ID:

0705728-04A

Matrix: GROUNDWATER

Analyses	Result	P	QĹ Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		E300				Analyst: JM
Sulfate	1	7	5.0	mg/L	1	5/30/2007 3:09:00 PM

* - Value exceeds Maximum Contaminant Level

- R RPD outside accepted recovery limits
- E Value above quantitation range

CLIENT: Hydro Geo Chem, Inc.

Lab Order:

0705728

Project:

PDSI 78306.4

Lab ID:

0705728-05A

Date: 12-Jun-07

Client Sample ID: MO-2007-1B-660

Collection Date: 5/24/2007 2:52:00 PM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY Sulfate	8.3	3 00 5.0	ı .	mg/L	1	Analyst: JM 5/30/2007 3:27:00 PM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

Date: 12-Jun-07

CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0705728

Project:

PDSI 78306.4

Lab ID:

0705728-06A

Client Sample ID: MO-2007-1B-460

Collection Date: 5/24/2007 12:05:00 PM

Analyses	Result	PQI	Qual	Units	DF	Date Analyzo	ed
ANIONS BY ION CHROMATOGRAPHY	E	300				Analyst	: JM
Sulfate	72	50)	mg/L	10	5/29/2007	

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

CLIENT: Hydro Geo Chem, Inc.

Lab Order: 0705728

Project: PDSI 78306.4

Lab ID: 0705728-07A

Date: 12-Jun-07

Client Sample ID: MO-2007-1B-760

Collection Date: 5/25/2007 11:15:00 AM

Analyses	Result	PQL Q	ual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E	300			Analyst: JM
Sulfate	14	5.0	mg/L	1	5/30/2007 3:45:00 PM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

Date: 12-Jun-07

CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0705728

Project:

PDSI 78306.4

Lab ID:

0705728-08A

Client Sample ID: MO-2007-1B-740

Collection Date: 5/25/2007 4:40:00 PM

Matrix: GROUNDWATER

Analyses	Result	PQL Q	ual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E30	0			Analyst: JM
Sulfate	14	5.0	mg/L	1	5/30/2007 4:04:00 PM

* - Value exceeds Maximum Contaminant Level

- S Spike Recovery outside accepted recovery limits
- R RPD outside accepted recovery limits
- E Value above quantitation range

CLIENT: Hydro Geo Chem, Inc.

Lab Order: 0705728

Project: PDSI 78306.4

Lab ID: 0705728-09A

Date: 12-Jun-07

Client Sample ID: MO-2007-1B-540

Collection Date: 5/24/2007 1:31:00 PM

Analyses	Result	PQL Qu	al Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E300	<u>.</u>			Analyst: JM
Sulfate	73	25	mg/L	5	5/30/2007 4:22:00 PM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

CLIENT:

Hydro Geo Chem, Inc.

Client Sample ID: MO-2007-1B-760-OG

 Project:
 PDSI 78306.4

 Lab ID:
 0705728-10A
 Matrix: GROUNDWATER

Analyses	Result	PQL Q	ual Units	DF	Date Analyzed
EPA 1664A-OIL & GREASE	E	1664A			Analyst: PSL
Oil & Grease	ND	5.0	mg/L	1	6/4/2007 5:35:00 PM

Date: 12-Jun-07

TURNER LABORATORIES, INC.

SAMPLE CONTROL RECEIPT CHECKLIST

Tı	irner Laboratories W.O. #: 0 +05 +28			TURNE
Re	eceived By:R			LABORATORIES IN
Re	eceived Date/Time: 5/25/07			
	elivered by: 11 ent			
1.	Shipping container/cooler in good condition?	✓ Yes		☐ Not Present
2.	Custody seals intact on sample bottles?	☐ Yes	□ No	Not Present
3.	Chain of custody present?	∕ Yes		
4.	COC signed when relinquished and received?	Z Yes	□No	
5.	COC agrees with sample labels?	Yes	□ No	
6.	Samples in proper container/bottle?	Yes	□ No	
7.	Sample container intact?	Yes	□ No	
8.	Sufficient sample volume for requested tests?	Yes	□ No	
9.	Samples received within holding times?	Yes	□ No	
10.	VOA vials received with no headspace?	☐ Yes	□No	No Vials
11.	Bacti bottles received with appropriate headspace?	□ Yes		☐ Above 100ml
		Not App	licable	□ Below 100ml
12.	Temperature upon receipt?			
13.	Number of sample containers received?)		

Additional Comments:

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM 2445 N. Coyote Drive, Suite 104 fucson, Arizona 85745

Fax: (520) 882-9788 (520) 882-5880

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TURNER WORK ORDER #

DATE

PAGE

Blue Ice SAMPLE RECEIPT CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX Wet ice $\Box q_{08}$ >X > \prec D_{QQQ} 00 DHd Colilent INVOICE INFORMATION Z Coliform SECONDARY DNdW PRIMARY SDWA-INORGANICS Account Cyanide U stribillo^q Ylhoh^c Bill to: Total [ž O SPECIAL INSTRUCTIONS/COMMENTS: J.CLP [] Pest/Herb. JCLP Analysis II. Report (includes DUP, MS, MSD, as required, may be REPORT REQUIREMENTS: Yes Ves DYON (Includes All Raw Data) Date Validation Report charged as samples) Add 10% to invoice Oil and Grease Routine Report 1 Vt991 Compliance Analysis: Total Petroleum Hydrocarbons Mail ADEQ Forms: IR(8015AZ) ADEQ Forms: Ds,BJd Ħ Desticides [] DSAAH DSWHLL 5 Day* **TURNAROUND REQUIREMENTS:** Volatile Organics DRINKING WATER GW = GROUNDWATER DW = DRINKING WATER SD = SOLID SG = SLUDGE WW = WASTEWATER Standard (approx. 10 days)* D spiny = STORMWATER 022/8520 D sleutual asea Fax Preliminary Results * LEGEND Requested Report Date = SOIL NUMBER OF CONTAINERS Next Day __ * Working Days 3 3 8 SAMPLE MATRIX* 6 3 ه 35 3 3 74306.4 13:48 TURNER LABORATORIÉS, INC. FAX IAB ID f. D.C. RECEIVED BY 40 5/24/6× 1220 5/24/07 1358 5/24/02 1452 B/24/07 1518 3241 Colh2/5 5/24/67 12005 mo-000-18-760-06-5/25/11/5 CONTACT NAME RICK ZIMMERMON 0/19/0/25/2 TIME 5111 19245 5/4/by 133/ Printed Name U. Yetmore Signature DATE COMPANY NAME MY LO (JEO (PHONE -irm 042-81-1002-0M MO-2007-1B-580 MO-7007-18-740 MO-2007-1B-460 mo-2007-18-620 Mo-2007-1B-760 RELINQUISHED BY: MO-2007-18-660 Arneson 293-1500x131 MO-2007-113-500 RELINQUISHED BY MO-3007-113-700 SAMPLER'S SIGNATURE SAMPLE I.D. ADDRESS **S**[PROJECT NAME. しのが Printed Name

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Order No.: 0704810



May 10, 2007

Rick Zimmerman Hydro Geo Chem, Inc. 51 W. Wetmore Rd. Suite 101 Tucson, AZ 857051678 TEL: (520) 293-1500 FAX (520) 293-1550

RE: Groundwater PDSI 78300

Dear Rick Zimmerman,

Turner Laboratories, Inc. received 9 samples on 4/30/2007 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc. ADHS License AZ0066

Shari Bauman

Shari Bauman

Laboratory Director



CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0704810

Project:

Groundwater PDSI 78300

Lab ID:

0704810-01A

Date: 10-May-07

Client Sample ID: MO-2007-SC-3C-940

Collection Date: 4/28/2007 2:21:00 PM

Analyses	Result	PQL (Qual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E3	00			Analyst: JM
Sulfate	41	. 10	mg/L	2	4/30/2007 5:32:00 PM
TOTAL DISSOLVED SOLIDS	M	2540 C			Analyst: PSL
Total Dissolved Solids (Residue, Filterable)	. 170	20	mg/L	1	5/2/2007 3:00:00 PM

R - RPD outside accepted recovery limits



CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0704810

Project:

Groundwater PDSI 78300

Lab ID:

0704810-02A

Date: 10-May-07

Client Sample ID: MO-2007-SC-3C-980

Collection Date: 4/28/2007 5:29:00 PM

Analyses	Result	PQL Q	ual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E	300			Analyst: JM
Sulfate	39	10	mg/L	. 2	4/30/2007 5:50:00 PM
TOTAL DISSOLVED SOLIDS	М	2540 C			Analyst: PSL
Total Dissolved Solids (Residue, Filterable)	200	20	mg/L	. 1	5/4/2007 10:45:00 AM

R - RPD outside accepted recovery limits



CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0704810

Project:

Groundwater PDSI 78300

Lab ID:

0704810-03A

Date: 10-May-07

Client Sample ID: MO-2007-SC-3C-DUP-1

Collection Date: 4/28/2007 12:01:00 PM

Analyses	Result	PQL Q	ual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E	300			Analyst: JM
Sulfate	40	10	mg/L	2	4/30/2007 6:08:00 PM
TOTAL DISSOLVED SOLIDS	М	2540 C			Analyst: PSL
Total Dissolved Solids (Residue, Filterable)	210	20	mg/L	1	5/3/2007 2:20:00 PM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits



CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0704810

Project:

Groundwater PDSI 78300

Lab ID:

0704810-04A

Date: 10-May-07

Client Sample ID: MO-2007-SC-3C-900

Collection Date: 4/28/2007 11:16:00 AM

Analyses	Result	PQL (Qual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E	300			Analyst: JM
Sulfate	38	10	mg/L	2	4/30/2007 6:26:00 PM
TOTAL DISSOLVED SOLIDS	M	2540 C			Analyst: PSL
Total Dissolved Solids (Residue, Filterable)	200	20	mg/L	. 1	5/4/2007 10:45:00 AM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits



ories, Inc. Date: 10-May-07

CLIENT: Hydro Geo Chem, Inc. Lab Order: 0704810

Project: Groundwater PDSI 78300

Lab ID: 0704810-05A

Matrix: DRINKING WATER

Client Sample ID: MO-2007-SC-3C-740

Collection Date: 4/26/2007 4:36:00 PM

Analyses	Result	PQL (Qual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E	300			Analyst: JM
Sulfate	43	10	mg/L	2	4/30/2007 6:45:00 PM
TOTAL DISSOLVED SOLIDS	M	2540 C			Analyst: PSL
Total Dissolved Solids (Residue, Filterable)	210	. 20	mg/L	1	5/2/2007 3:00:00 PM



CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0704810

Project:

Groundwater PDSI 78300

Lab ID:

0704810-06A

Date: 10-May-07

Client Sample ID: MO-2007-SC-3C-820

Collection Date: 4/27/2007 2:55:00 PM

Analyses	Result	PQL Q	ual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	. Е	E300			Analyst: JM
Sulfate	34	10	mg/L	2	4/30/2007 7:03:00 PM
TOTAL DISSOLVED SOLIDS	M	M2540 C			Analyst: PSL
Total Dissolved Solids (Residue, Filterable)	190	20	mg/L	1	5/2/2007 3:00:00 PM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits



CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0704810

Project:

Groundwater PDSI 78300

Lab ID:

0704810-07A

Date: 10-May-07

Client Sample ID: MO-2007-SC-3C-780

Collection Date: 4/27/2007 1:56:00 PM

Analyses	Result	PQL Q	ual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E:	E300			Analyst: JM
Sulfate	41	10	mg/L	2	4/30/2007 7:21:00 PM
TOTAL DISSOLVED SOLIDS	M	M2540 C			Analyst: PSL
Total Dissolved Solids (Residue, Filterable)	210	20	mg/L	1	5/3/2007 2:20:00 PM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits



CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0704810

Project:

Groundwater PDSI 78300

Lab ID:

0704810-08A

Date: 10-May-07

Client Sample ID: MO-2007-SC-3C-540

Collection Date: 4/26/2007 9:25:00 AM

Analyses	Result	PQL	Qual Unit	s DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E300			Analyst: JM	
Sulfate	44	10	mg/L	2	4/30/2007 7:39:00 PM
TOTAL DISSOLVED SOLIDS	N	12540 C			Analyst: PSL
Total Dissolved Solids (Residue, Filterable)	200	20	mg/L	1	5/3/2007 10:40:00 AM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits



CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0704810

Project:

Groundwater PDSI 78300

Lab ID:

0704810-09A

Date: 10-May-07

Client Sample ID: MO-2007-SC-3C-860

Collection Date: 4/27/2007 4:15:00 PM

Analyses	Result	PQL Q	ıal Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	Ε:	300			Analyst: JM
Sulfate	31	25	mg/L	5	4/30/2007 7:58:00 PM
TOTAL DISSOLVED SOLIDS	М	M2540 C			Analyst: PSL
Total Dissolved Solids (Residue, Filterable)	170	20	mg/L	1	5/2/2007 3:00:00 PM

R - RPD outside accepted recovery limits

TURNER LABORATORIES, INC. SAMPLE CONTROL RECEIPT CHECKLIST



Tı	urner Laboratories W.O. #: <u>0904 810</u>			TURNE
Re	eceived By:			LABORATORIES I
R	eceived Date/Time: 4/30/07 //:004			
D	elivered by:			
1.	Shipping container/cooler in good condition?	XYes	□No	☐ Not Present
2.	Custody seals intact on sample bottles?	☐ Yes	□No	Not Present
3.	Chain of custody present?	Yes	□No	
4.	COC signed when relinquished and received?	Yes	□No	
5.	COC agrees with sample labels?	S=Yes	□No	
6.	Samples in proper container/bottle?	XYes	□No	
7.	Sample container intact?	Yes	□No	
8.	Sufficient sample volume for requested tests?	De Yes	□No	
9.	Samples received within holding times?		□No	
10.	VOA vials received with no headspace?	☐ Yes	□No	No Vials
11.	Bacti bottles received with appropriate headspace?	☐ Yes		☐ Above 100ml
		Not Applic	able	□ Below 100ml
12	Temperature upon receipt?			

Additional Comments:

13. Number of sample containers received?_

2445 N. Coyote Drive, Suite 104 Fucson, Arizona 85745 Fax: (520) 882-9788 (520)882-5880

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CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER#

DATE

PAGE

Blue Ice CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX 405 Wet Ice **D** aos X X X X Dss1 D_{QO} Db Duəliloo DHa NVOICE INFORMATION Coliforin SECONDARY DNdW PRIMARY SDWA-INORGANICS D vauv Cyanide U smetullo^{q vittoliq} D1610T P.O. # Bill to: $\bigcap p_{\Theta A loss i_{Cl}}$ $s_{le_{l} \ni \mathcal{W}}$ SPECIAL INSTRUCTIONS/COMMENTS: Dan Dest/Herb. [] D VONJUIOS TCLP Analysis Report (includes DUP, MS, MSD, as required, may be Ves REPORT REQUIREMENTS: O Yes DVON (Includes All Raw Data) Date Validation Report charged as samples) Add 10% to invoice Grav. 1664A Oll and Crease Routine Report DV+991 Total Petroleum Hydrocarbons J 646061 [(SAE 108)Al Compliance Analysis: Mail ADEQ Forms: ADEQ Forms: Ds.Book DEANH DSWHLL 0978/27475/8760 TURNAROUND REQUIREMENTS: 5 Day* DRINKING WATER GW = GROUNDWATER DW = DRINKING WATER ST = STORMWATER
SI = SOIL
SD = SOLID
SG = SLUDGE
WW = WASTEWATER Standard (approx. 10 days)* D spipy STORMWATER 075/8270 D sleutuoN osed Fax Preliminary Results * LEGEND Requested Report Date, **NUMBER OF CONTAINERS** * Working Days 293-1500FAX 293-1550 SAMPLE MATRIX* 3 S S とと 5 3 S S E 5 TURNĘR LABORATORIES, INC. P P MMECMAN RECEIVED BY RECEIVED By Vermore 100 ma-2007-5-5-5-6 4/26/07 0925 7541 folsolt 1052- 25-25- 1005-001 1351 Kolor/4 1025-25-25-005-011 1636 MO-56-24-740 1/26/01/1636 1257 | 70 both 02P-28-28-1005-0M 1/16 (o/se/) TIME 7457 mo-2007-56-36-DUP-1/48/07/1201 Printed Non-5000 Printed Name mo-2007-56-36-860 4/21/07 Date/Time DATE ci Secretary Chen 0 MO-2007-54-32-900 Freson RELINQUISHED BY: RELINQUISHED BY: Sampler's signature T SAMPLE I.D. CONTACT NAME COMPANY NAME PROJECT NAME 120/05 ADDRESS C Printed Name 12/K Date/Time Signature Firm

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78306A MO-3C



May 10, 2007

Rick Zimmerman Hydro Geo Chem, Inc. 51 W. Wetmore Rd. Suite 101 Tucson, AZ 857051678 TEL: (520) 293-1500 FAX (520) 293-1550

RE: PDSI-MO # 783000 Order No.: 0704800

Dear Rick Zimmerman,

Turner Laboratories, Inc. received 9 samples on 4/27/2007 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

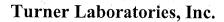
Respectfully submitted,

Turner Laboratories, Inc. ADHS License AZ0066

Snau Bauman

Shari Bauman

Laboratory Director



Date: 10-May-07

CLIENT:

Hydro Geo Chem, Inc.

Project:

PDSI-MO # 783000

Lab Order:

0704800

Date Received: 4/27/2007

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Tag Number	Collection Date
0704800-01A	MO-2007-SC-3C-700		4/26/2007 3:50:00 PM
0704800-02A	MO-2007-SC-3C-520		4/25/2007 5:13:00 PM
0704800-03A	MO-2007-SC-3C-560		4/26/2007 9:43:00 AM
0704800-04A	MO-2007-SC-3C-490		4/25/2007 4:46:00 PM
0704800-05A	MO-2007-SC-3C-500		4/25/2007 4:59:00 PM
0704800-06A	MO-2007-SC-3C-470		4/25/2007 4:36:00 PM
0704800-07A	MO-2007-SC-3C-580		4/26/2007 10:00:00 AM
0704800-08A	MO-2007-SC-3C-620		4/26/2007 1:34:00 PM
0704800-09A	MO-2007-SC-3C-660		4/26/2007 2:12:00 PM

CLIENT: Hydro Geo Chem, Inc.

Lab Order: 0704800

Project:

PDSI-MO # 783000

Lab ID:

0704800-01A

Date: 10-May-07

Client Sample ID: MO-2007-SC-3C-700

Collection Date: 4/26/2007 3:50:00 PM

Analyses	Result	PQL	Qual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E	300			Analyst: JM
Sulfate	41	10	mg/L	2	4/30/2007 1:34:00 PM

R - RPD outside accepted recovery limits

CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0704800

PDSI-MO # 783000

Project: Lab ID:

0704800-02A

Date: 10-May-07

Client Sample ID: MO-2007-SC-3C-520

Collection Date: 4/25/2007 5:13:00 PM

Analyses	Result	PQL Q	Qual Units	DF	Date Analyzed	
ANIONS BY ION CHROMATOGRAPHY Sulfate	E3 0)0 10	mg/L	2	Analyst: JM 4/30/2007 1:53:00 PM	

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0704800

Project:

PDSI-MO # 783000

Lab ID:

0704800-03A

Date: 10-May-07

Client Sample ID: MO-2007-SC-3C-560

Collection Date: 4/26/2007 9:43:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY Sulfate	E 3	300 10		mg/L	2	Analyst: JM 4/30/2007 2:11:00 PM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0704800

Project:

PDSI-MO # 783000

Lab ID:

0704800-04A

Date: 10-May-07

Client Sample ID: MO-2007-SC-3C-490

Collection Date: 4/25/2007 4:46:00 PM

Matrix: GROUNDWATER

Analyses	Result	PQL (Qual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E:	E300			Analyst: JM
Sulfate	42	10	mg/L	2	4/30/2007 2:29:00 PM

ND - Not Detected at or above the PQL

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Maximum Contaminant Level

PQL - Practical Quantitation Limit

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0704800

Project:

PDSI-MO # 783000

Lab ID:

0704800-05A

Date: 10-May-07

Client Sample ID: MO-2007-SC-3C-500

Collection Date: 4/25/2007 4:59:00 PM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E	E300				Analyst: JM
Sulfate	43	10		mg/L	2	4/30/2007 2:47:00 PM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

CLIENT: Hydro Geo Chem, Inc.

Lab Order: 0704800

Project: PDSI-MO # 783000

Lab ID: 0704800-06A

Date: 10-May-07

Client Sample ID: MO-2007-SC-3C-470

Collection Date: 4/25/2007 4:36:00 PM

Analyses	Result	PQL Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E300				Analyst: JM
Sulfate	52	25	mg/L	5	5/1/2007 11:12:00 AM

CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0704800

PDSI-MO # 783000

Project: Lab ID:

0704800-07A

Date: 10-May-07

Client Sample ID: MO-2007-SC-3C-580

Collection Date: 4/26/2007 10:00:00 AM

Analyses	Result	PQL Q	ual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E3(00			Analyst: JM
Sulfate	39	10	mg/L	2	4/30/2007 3:24:00 PM



CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0704800

PDSI-MO # 783000

Project: Lab ID:

0704800-08A

Date: 10-May-07

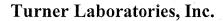
Client Sample ID: MO-2007-SC-3C-620

Collection Date: 4/26/2007 1:34:00 PM

Analyses	Result	PQL Q	ual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E3	00			Analyst: JM
Sulfate	38	10	mg/L	2	4/30/2007 3:42:00 PM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits



CLIENT: Hydro Geo Chem, Inc.

Lab Order:

0704800

PDSI-MO # 783000

Project: Lab ID:

0704800-09A

Date: 10-May-07

Client Sample ID: MO-2007-SC-3C-660

Collection Date: 4/26/2007 2:12:00 PM

Analyses	Result	PQL Q	ual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E3				Analyst: JM
Sulfate	14	10	mg/L	2	4/30/2007 4:00:00 PM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

TURNER LABORATORIES, INC.

SAMPLE CONTROL RECEIPT CHECKLIST

Tu	rner Laboratories W.Q. #: 0704800			TURNE
	ceived By:			LABORATORIES IN
	ceived Date/Time: 427/07 11:44			
	elivered by: <u>Client</u>			
1.	Shipping container/cooler in good condition?	Yes	□ No	☐ Not Present
2.	Custody seals intact on sample bottles?	☐ Yes	□No	Not Present
3.	Chain of custody present?	⊠Yes	□No	
4.	COC signed when relinquished and received?	☑ Yes	□No	
5.	COC agrees with sample labels?	⊠Yes	□ No	
6.	Samples in proper container/bottle?	Yes	□No	
7.	Sample container intact?	Yes	□ No	
8.	Sufficient sample volume for requested tests?	Yes	□No	
9.	Samples received within holding times?	□ Yes	□No	
10.	VOA vials received with no headspace?	☐ Yes	□No	☑ No Vials
11.	Bacti bottles received with appropriate headspace?	☐ Yes		☐ Above 100ml
	en er en stere en en en en en en en en en en en en en	Not Applic	able	□ Below 100ml
12.	Temperature upon receipt?			
13.	Number of sample containers received?			

Additional Comments:

2445 N. Coyote Drive, Suite 104 Tucson, Arizona 85745 (520) 882-5880 Fax: (520) 882-9788 www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER #

DATE Haylor

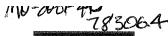
PAGE

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX	Verse Cyanide Netals D AOV D 412T D 6415t D 1616T	х.	~	*	×	x	×	*	*	火		REPORT REQUIREMENTS: INVOICE INFORMATION: SAMPLE RECEIPT:	I. Routine Report	P, MS, ay be			ONS/COMMENTS:	Compliance Analysis:	ırms: 🔲 Yes			
S	NBER OF CONTAINER		7	35	35	39	640	3	3	35	6W		TURNAROUND REQUIREMENTS:	Standard (approx. 10 days)*	Next Day X 3 ay 5 Day*	Fax Preliminary Results	Requested Report Date	* LEGEND	н п	11 11	WW = WASTEWATER GW = GROUNDWATER	
PROJECT NAME POST-MO # 783 CCO	hen hen hen hen hen hen hen hen hen hen	SAMPLER'S SIGNATURE LAB SA I.D. DATE TIME I.D. M.	10-2007-52-32-700 Halos 1550	mo-2007-52-520 4/25/01/17/3	9 Et 80 Copel 1025-25-7001-011	9 94.91 6/50/1 04-75-20-04		mo-2007-56-36-470 4/2561 1636 6		25. 15/2/ 015-75-750-0m		water control and function	RELINQUISHED BY: 2. RECEIVED BY:	Men	Mark Hrneson Mark O'Boyler Printed Name	Hof Im. Hydro Geo Chen Bo	1 26/07 4/21/07 11:42	UISINED BY: 4.		Printed Name Printed Name Tripled Name Tripled Name Tripled Name Tripled Name Tripled Name	25.3	The same of the sa

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July 11, 2007

Rick Zimmerman Hydro Geo Chem, Inc. 51 W. Wetmore Rd. Suite 101 Tucson, AZ 857051678 TEL: (520) 293-1500 FAX (520) 293-1550

RE: PDSI 78306.4

Dear Rick Zimmerman,

Turner Laboratories, Inc. received 5 samples on 6/22/2007 for the analyses presented in the following report.

Order No.: 0706671

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

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Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc. ADHS License AZ0066

Snaubaumai_

Shari Bauman

Laboratory Director

CC:

Date: 11-Jul-07

CLIENT:

Hydro Geo Chem, Inc.

Project:

PDSI 78306.4

Lab Order:

0706671

Date Received: 6/22/2007

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Tag Number	Collection Date
0706671-01A	MO-2007-4C-380		6/19/2007 4:56:00 PM
0706671-02A	MO-2007-4C-420		6/20/2007 8:55:00 AM
0706671-03A	MO-2007-4C-460		6/19/2007 10:00:00 AM
0706671-04A	MO-2007-4C-500		6/20/2007 10:29:00 AM
0706671-05A	MO-2007-46-540		6/20/2007 11:00:00 AM

CLIENT: Hydro Geo Chem, Inc.

Lab Order: 0706671

Project: PDSI 78306.4

Lab ID: 0706671-01A

S1 /8306.4

Collection Date: 6/19/2007 4:56:00 PM

Client Sample ID: MO-2007-4C-380

Date: 11-Jul-07

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		E300				Analyst: JM
Sulfate	110	50		mg/L	10	6/25/2007 3:16:00 PM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0706671

Project:

PDSI 78306.4

Lab ID:

0706671-02A

Date: 11-Jul-07

Client Sample ID: MO-2007-4C-420

Collection Date: 6/20/2007 8:55:00 AM

Analyses	Result	PQL Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY Sulfate	670	E300 250	mg/L	50	Analyst: JM 6/25/2007 3:34:00 PM

CLIENT: Lab Order: Hydro Geo Chem, Inc.

0706671

Project:

PDSI 78306.4

Lab ID:

0706671-03A

Date: 11-Jul-07

Client Sample ID: MO-2007-4C-460

Collection Date: 6/19/2007 10:00:00 AM

Analyses	Result	PQL Qu	al Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY Sulfate	E3 240	100	mg/L	20	Analyst: JM 6/25/2007 3:53:00 PM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0706671

Project:

PDSI 78306.4

Lab ID:

0706671-04A

Date: 11-Jul-07

Client Sample ID: MO-2007-4C-500

Collection Date: 6/20/2007 10:29:00 AM

Matrix: GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	ı	E300			 	Analyst: PSL
Sulfate	39	10		mg/L	2	6/23/2007 6:43:00 AM

ND - Not Detected at or above the PQL

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Maximum Contaminant Level

PQL - Practical Quantitation Limit

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

CLIENT: Lab Order: Hydro Geo Chem, Inc.

0706671

Project:

PDSI 78306.4

Lab ID:

0706671-05A

Date: 11-Jul-07

Client Sample ID: MO-2007-46-540

Collection Date: 6/20/2007 11:00:00 AM

Analyses	Result	PQL Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY Sulfate	E3	00	ma/L	10	Analyst: JM 6/25/2007 4:11:00 PM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

TURNER LABORATORIES, INC.

SAMPLE CONTROL RECEIPT CHECKLIST



Tı	urner Laboratories W.O. #: 070667			TURN
Re	eceived By: NH			LABORATORIES
R	eceived Date/Time: 6/22/07 12:11			
	elivered by: Client			
1.	Shipping container/cooler in good condition?	Z Yes	□ No	□ Not Present
2.	Custody seals intact on sample bottles?	☐ Yes	□No	Not Present
3.	Chain of custody present?	Yes	□ No	
4.	COC signed when relinquished and received?	Yes	□No	
5.	COC agrees with sample labels?	✓ Yes	□ No	
6.	Samples in proper container/bottle?	ZYes	□ No	
7.	Sample container intact?	□/Yes	□ No	
8.	Sufficient sample volume for requested tests?	Yes	□ No	
9.	Samples received within holding times?	Yes	□No	
10.	VOA vials received with no headspace?	☐ Yes	□No	No Vials
11.	Bacti bottles received with appropriate headspace?	□ Yes		☐ Above 100ml
	- DO	☑Not Ap	plicable	☐ Below 100ml
12.	Temperature upon receipt? O°C			
13.	Number of sample containers received?			

Additional Comments:

2445 N. Coyote Urive, Suite 11)4 Tucson, Arizona 85745 (520) 882-5880

Fax: (520) 882-9788 www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 0704 67

OLOGO 11 DATE

AGE____

OF

Blue Ice Kush Kesulta CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX Total Containers Wet Ice D_{QOg} X D SSI Daos 05 Colillen DHd INVOICE INFORMATION Coliform SECONDARY DNdW SDWA-INORGANICS DOWN Cyanide 🛘 sandullo^{q v}ahoh^q P.O. # D_{letoI} Bill to: ŝ ž sle^{19M} D_{dDL} SPECIAL INSTRUCTIONS/COMMENTS: Pest/Herb. JCLP Analysis II. Report (includes DUP, MS, MSD, as required, may be REPORT REQUIREMENTS: Ves Ves DVON (Includes All Raw Data) Date Validation Report charged as samples) Clear, 1664AD Routine Report oral Petroleum Hydrosarbang | A4A1 Add 10% to in 1 V+991 Compliance Analysis: Mail ADEQ Forms: ADEQ Forms: DSB2 1808 D səpiəiqsəd DSWH DSWHLL 5 Day* TURNAROUND REQUIREMENTS: DW = DRINKING WATER GW = GROUNDWATER Standard (approx. 10 days)* D sbioA = STORMWATER WW = WASTEWATER 022/8520 D sleduol osed Fax Preliminary Results * LEGEND SD = SOUD SG = SLUDGE Requested Report Date = SOIL **NOMBER OF CONTAINERS** * Working Days PHONE 43-1500 FAX 273-1550 30 SAMPLE MATRIX* 35 3 TURNER LABORATORIES, INC. LAB LD. RECEIVED BY. RECEIVED BY Ĉ) I'M METMAN PCO1/10/2/202-04-1025-04 0855 0001 70/14/0/4-74-7005-0M 1100-1007-76-54016/20/07/1100 1656 TIME Wetmore Printed Name COMPANY NAME HYDRO GEO (Stolo) 1/4/0) DATE ELL ELL 7 4 mo-2007-46-420 CONTACT NAME KICK 3. RELINQUISHED BY: Mo-2007-46-380 / RELIMOUISHED BY: PROJECT NAME PDS Meson SAMPLER'S SIGNATURE SAMPLE LD. ADDRESS_S7 Printed Name Date/Time

DISTRIBUTION: WHITE - return to originator

PINK - retained by originator

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MO-2007-SC



August 01, 2007

Rick Zimmerman
Hydro Geo Chem, Inc.
51 W. Wetmore Rd.
Suite 101
Tucson, AZ 857051678
TEL: (520) 293-1500
FAX (520) 293-1550

RE: PDSI 783000

Dear Rick Zimmerman,

Order No.: 0707652

Turner Laboratories, Inc. received 7 samples on 7/20/2007 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc.
ADHS License AZ0066

Amacyul Muner Yar Shari Baumaa

Shari Bauman

Laboratory Director

CC:

Date: 01-Aug-07

CLIENT:

Hydro Geo Chem, Inc.

Project:

PDSI 783000

Lab Order:

0707652

Date Received:

7/20/2007

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Tag Number	Collection Date
0707652-01A	MO-2007 5C-320		7/17/2007 11:00:00 AM
0707652-02A	MO-2007 5C-340		7/17/2007 11:15:00 AM
0707652-03A	MO-2007 5C-360		7/17/2007 1:04:00 PM
0707652-04A	MO-2007 5C-380		7/17/2007 1:19:00 PM
0707652-05A	MO-2007 5C-400		7/17/2007 1:26:00 PM
0707652-06A	MO-2007 5C-420		7/17/2007 3:28:00 PM
0707652-07A	MO-2007 5C-440		7/17/2007 3:58:00 PM



CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0707652

Project:

Lab ID:

PDSI 783000 0707652-01A Date: 01-Aug-07

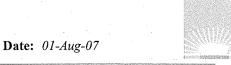
Client Sample ID: MO-2007 5C-320

Collection Date: 7/17/2007 11:00:00 AM

Analyses	Result	PQL	Qual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY Sulfate	98	E300	mg/L	5	Analyst: JM 7/20/2007 5:37:00 PM

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits



CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0707652

Project:

PDSI 783000

Lab ID:

0707652-02A

Client Sample ID: MO-2007 5C-340

Collection Date: 7/17/2007 11:15:00 AM

Analyses	Result	PQL Q	ıal Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	E3	00			Analyst: JM
Sulfate	80	25	mg/L	5	7/20/2007 8:22:00 PM

R - RPD outside accepted recovery limits

Date: 01-Aug-07

CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0707652

Project:

PDSI 783000

Lab ID:

0707652-03A

Client Sample ID: MO-2007 5C-360

Collection Date: 7/17/2007 1:04:00 PM

Analyses	Result		PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		E300					Analyst: JM
Sulfate	86		25		mg/L	5	7/20/2007 8:40:00 PM

R - RPD outside accepted recovery limits

CLIENT: Hydro Geo Chem, Inc.

Lab Order: 0707652

Project:

PDSI 783000

Lab ID: 0707652-04A

Date: 01-Aug-07

Client Sample ID: MO-2007 5C-380

Collection Date: 7/17/2007 1:19:00 PM

Analyses	Result	PQL	Qual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY Sulfate	82	E300 25	mg/L	5	Analyst: JM 7/20/2007 8:58:00 PM

R - RPD outside accepted recovery limits

CLIENT: Hy

Hydro Geo Chem, Inc.

0707652

Project:

Lab Order:

PDSI 783000

Lab ID:

0707652-05A

Date: 01-Aug-07

Client Sample ID: MO-2007 5C-400

Collection Date: 7/17/2007 1:26:00 PM

Analyses	Result	PQL	Qual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		E300			Analyst: JM
Sulfate	68	25	mg/L	5	7/20/2007 9:16:00 PM

R - RPD outside accepted recovery limits

Date: 01-Aug-07

CLIENT:

Hydro Geo Chem, Inc.

Client Sample ID: MO-2007 5C-420

Lab Order:

0707652

Collection Date: 7/17/2007 3:28:00 PM

Project:

PDSI 783000

Matrix: GROUNDWATER

Lab ID:	0707652-0
····	

Analyses	Result	PQL	Qual Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY Sulfate	E 58	300 25	mg/L	5	Analyst: JM 7/20/2007 9:35:00 PM

ND - Not Detected at or above the PQL

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Maximum Contaminant Level

PQL - Practical Quantitation Limit

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0707652

Project:

PDSI 783000

Lab ID:

0707652-07A

Date: 01-Aug-07

Client Sample ID: MO-2007 5C-440

Collection Date: 7/17/2007 3:58:00 PM

Matrix: GROUNDWATER

Analyses	Result	PQL	Qual U	Jnits	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		E300				Analyst: JM
Sulfate	99	25	. m	ng/L	5	7/20/2007 9:53:00 PM

ND - Not Detected at or above the PQL

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Maximum Contaminant Level

PQL - Practical Quantitation Limit

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

TURNER LABORATORIES, INC.

SAMPLE CONTROL RECEIPT CHECKLIST

Tu	mer Laboratories W.O. #: 0707652	•		
	ceived By:			T U R N E
Re	ceived Date/Time: 7/20/07 (4: 45 divered by: Chient			
1.	Shipping container/cooler in good condition?	✓ Yes	□ No	□ Not Present
2.	Custody seals intact on sample bottles?	☐ Yes	□No	Not Present
3.	Chain of custody present?	DY es	□ No	
4.	COC signed when relinquished and received?	D Yes	□ No	
5.	COC agrees with sample labels?	Yes	□No	
6.	Samples in proper container/bottle?	□\Yes	□ No	
7.	Sample container intact?	Yes	□No	
8.	Sufficient sample volume for requested tests?	Yes	□No	
9.	Samples received within holding times?	☑ Yes	□No	•
10.	VOA vials received with no headspace?	☐ Yes	□No	□ No Vials
11.	Bacti bottles received with appropriate headspace?	☐ Yes		☐ Above 100ml
12.	Temperature upon receipt? −3°C	Not Ap	plicable	☐ Below 100ml
13.	Number of sample containers received? — — — — — — — — — — — — — — — — — — —			

Additional Comments:

2445 N. Coyote Drive, Suite 104 Tucson, Arizona 85745 (520) 882-5880 Fax: (520) 882-9788 www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 0707 652 DATE 7/18/07

PAGE_

PROJECT NAME P DST #	783000	S	CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX	OPRIATE BOX
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3. RELINQUISHED BY: 4. RECEIVED BY		* LEGEND	SPECIAL INSTRUCTIONS/COMMENTS:	
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id Name	SG	SLUDGE W/astem/ater	Mail ADEQ Forms: Yes No	T. B. Grand Price Constitution (Constitution Constitution
Firm Firm Page 1	9:1	GROUNDWATER		n de en en en en en en en en en en en en en
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See back of pink copy for general terms and conditions/limits of liability.

Order No.: 0708746



August 28, 2007

Rick Zimmerman Hydro Geo Chem, Inc. 51 W. Wetmore Rd. Suite 101 Tucson, AZ 857051678 TEL: (520) 293-1500 FAX (520) 293-1550

RE: PDSI #78306.4

Dear Rick Zimmerman,

Turner Laboratories, Inc. received 3 samples on 8/17/2007 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc. ADHS License AZ0066

Shan'Baumar

Shari Bauman

Laboratory Director

CC:

CLIENT:

Hydro Geo Chem, Inc.

0708746

Lab Order: Project:

PDSI #78306.4

Lab ID:

0708746-01A

Date: 28-Aug-07

Client Sample ID: MO-2007-6B-320

Collection Date: 8/15/2007 2:57:00 PM

Analyses	Result	PQL Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY Sulfate	69	E300 25	mg/L	5	Analyst: JM 8/20/2007 5:43:00 PM

- B Analyte detected in the associated Method Blank
- * Value exceeds Maximum Contaminant Level

- S Spike Recovery outside accepted recovery limits
- R RPD outside accepted recovery limits
- E Value above quantitation range



Date: 28-Aug-07

CLIENT:

Hydro Geo Chem, Inc.

Lab Order:

0708746

PDSI #78306.4

Project: Lab ID:

0708746-02A

Client Sample ID: MO-2007-6B-340

Collection Date: 8/15/2007 3:08:00 PM

Analyses	Result	PQL Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY Sulfate	E:	3 00 10	mg/L	2	Analyst: JM 8/20/2007 1:28:00 PM

R - RPD outside accepted recovery limits

Date: 28-Aug-07

CLIENT:

Hydro Geo Chem, Inc.

Client Sample ID: MO-2007-6B-360

Lab Order:

0708746

Project:

PDSI #78306.4

Collection Date: 8/15/2007 3:13:00 PM

Lab ID:

0708746-03A

Analyses	Result	PQL Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY Sulfate	E3	3 00 10	mg/L	2	Analyst: JM 8/20/2007 1:46:00 PM

- S Spike Recovery outside accepted recovery limits
- B Analyte detected in the associated Method Blank
- R RPD outside accepted recovery limits
- * Value exceeds Maximum Contaminant Level
- E Value above quantitation range



2445 N. Coyote Drive, Suite 104 Tucson, Arizona 85745 (520) 882-5880

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

		# 2
3. RELINQUISHED BY: Signature Printed Name Firm Date/Time	RELINOPISHERES. White House's 1245 White Hou	PROJECT NAME PICK 2, MARCONPANY NAME NY STATE PHONE 2 SAMPLER'S SIGNATURE SAMPLE SA
A. RECEIVED BY: ADDIN BULLMAN Printed Name TURNER LABORATORIES, INC. FIRE HAD 1542 Dail/Time	RECEIVED BY: RECEIVED BY:	# 28 Elipson 1 Mare Rd 15/3 1457 1458 1458 1458 1458
* LEGEND ST = STORMWATER SL = SOIL SD = SOLID SG = SLUDGE WW = WASTEWATER GW = GROUNDWATER DW = DRINKING WATER	TURNAROUND REQUIREMENTS: Standard (approx. 10 days)* Next Day2 Day5 Day* Fax Preliminary Results Requested Report Date * Working Days	NUMBER OF CONTAINERS Base Neutrals Acids Volatile Organics 624/524.2/8350
SPECIAL INSTRUCTIONS/COMMENTS: Compliance Analysis: Yes ADEQ Forms: Yes Mail ADEQ Forms: Yes		
One Rush Results	INVOICE INFORMATION: Account y N P.O. # Bill to: Total Containers	Pesticitles D Pesticitles D PCB's D BOB2 Total Petroleum Hydrocarbons Oil and Grease Grav. 1664A D VOA D Sceni-VOA D Pest/Alerth. D TCLP Metals Dissolved D Priority Pollulants D SDWA-INORGANICS PRIMARY D SECONDARY D AMPN D Colliform DH D COD D TSS D BOD D PAGE OFF
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