



CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
416 W. Congress St., Suite 100
Tucson, Arizona 85701
602-771-1601
<http://www.azgs.az.gov>
inquiries@azgs.az.gov

The following file is part of the JABA, Inc. Tombstone Mining Records

ACCESS STATEMENT

These digitized collections are accessible for purposes of education and research. We have indicated what we know about copyright and rights of privacy, publicity, or trademark. Due to the nature of archival collections, we are not always able to identify this information. We are eager to hear from any rights owners, so that we may obtain accurate information. Upon request, we will remove material from public view while we address a rights issue.

CONSTRAINTS STATEMENT

The Arizona Geological Survey does not claim to control all rights for all materials in its collection. These rights include, but are not limited to: copyright, privacy rights, and cultural protection rights. The User hereby assumes all responsibility for obtaining any rights to use the material in excess of "fair use."

The Survey makes no intellectual property claims to the products created by individual authors in the manuscript collections, except when the author deeded those rights to the Survey or when those authors were employed by the State of Arizona and created intellectual products as a function of their official duties. The Survey does maintain property rights to the physical and digital representations of the works.

QUALITY STATEMENT

The Arizona Geological Survey is not responsible for the accuracy of the records, information, or opinions that may be contained in the files. The Survey collects, catalogs, and archives data on mineral properties regardless of its views of the veracity or accuracy of those data.

Volume 8, Book 23

8144

TOMBSTONE

Mining District

Cochise County

Arizona

**Arizona Department of
Environmental Quality Files
T.E.I. to Present**

INDEX

Record #144 [8:23:298-303] <cyanide literature>
Unknown Authors. (00/00/00)
Literature on Cyanide.

Record #150 [8:23:315-316] <letter>
Curllett, James E. (07/23/87) Letter To: Lindroos, Gary A.
Need to retest wells for mercury content.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #117 [8:23:1-16] <sample plan>
DuBois, James F. (06/30/88)
Sample Plan for PBR Minerals, Inc. Site.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #127 [8:23:97-114] <geochemical report>
Unknown Author. (07/01/88)
Geochemical Evaluation of Clay-Subliner Material.
Geochemical Engineering Inc., Lakewood, CO.

Record #123 [8:23:89] <memo>
Thatcher, Bruce K. (09/14/88) Letter To: Larson, Rob.
PBR Minerals, Inc. Application for a Groundwater Quality Protection Permit (Revised).
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #119 [8:23:17-24,26-57] <hearing transcript>
Landsman, Paul H. (12/15/88)
Public Hearing on Groundwater Quality Protection Permit No. G-0019-02,
December 15, 1988, Tombstone, AZ - Reporter's Transcript of Proceeding.
McFate Reporting Service, Inc.

Record #120 [8:23:58-86] <groundwater permit>
Miller, Ronald L. (01/20/89)
State of Arizona Groundwater Quality Protection Permit No. G-0020-02.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #156 [8:23:338-370] <groundwater permit>
Miller, Ronald L. (01/20/89)
State of Arizona Groundwater Quality Protection Permit No. G-0020-02. [Notes Copy]
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #118 [8:23:25] <letter>
Kennett, Roger. (01/23/89) Letter To: Hearing Participants.
PBR Minerals, Incorporated - Grand Central Leaching Facility, Groundwater Quality
Protection Permit No. G-0020-02.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #131 [8:23:203-208] <pad neutralization log>
Lindroos, Gary A. (02/20/89)
Pad 4 Neutralization Log, 2/20/89 thru 4/4/89.
PBR Minerals, Inc., Tombstone, AZ.

Record #126 [8:23:94-96] <letter report>
Poshard, R. Howard. (03/13/89) Letter To: Lindroos, Gary.
In-Place Density Tests, Tailings Pad.
Cochise Testing Lab, Inc., Sierra Vista, AZ.

Record #125 [8:23:91-93] <letter report>
Poshard, R. Howard. (03/30/89) Letter To: Lindroos, Gary.
Field Density Tests, Waste Disposal Pad.
Cochise Testing Lab, Inc., Sierra Vista, AZ.

Record #143 [8:23:296] <letter>
Ashworth, J. Michael. (04/07/89) Letter To: ADEQ.
Groundwater Quality Protection Permit No. G-0020-02, corrective actions.
PBR Minerals, Inc., Tombstone, AZ.

Record #132 [8:23:209-212] <field summary report>
Lindroos, Gary A. (04/20/89) Letter To: ADEQ.
Field Summary for the months of January, February, and March 1989.
PBR Minerals, Inc., Tombstone, AZ.

Record #124 [8:23:90] <letter>
Ashworth, J. Michael. (04/20/89) Letter To: ADEQ.
Construction of the heap leaching facility is completed.
PBR Minerals, Inc., Tombstone, AZ.

Record #133 [8:23:213] <letter>
Lindroos, Gary A. (05/01/89) Letter To: ADEQ.
Results of pump test on TEI Well No. 2.
PBR Minerals, Inc., Tombstone, AZ.

Record #130 [8:23:141-201] <quarterly report>
Lindroos, Gary A. (05/01/89) Letter To: ADEQ.
Quarterly Interpretative Assessment Report for the period of January thru March, 1989.
PBR Minerals, Inc., Tombstone, AZ.

Record #135 [8:23:220-232] <self-monitoring report>
Hankins, S. (06/09/89)
Groundwater Quality Protection Permit Self-Monitoring Report Forms -
TEI, PBR, & City of Tombstone Wells, May, June, and July, 1989.
Arizona Testing Laboratories, Phoenix, AZ.

Record #145 [8:23:305] <memo>
Chen, Chiou-Lian. (07/07/89) Letter To: Woodruff, David.
Complaints For PBR Mineral Mine, Temporary Groundwater Permit G-0019-02T.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #146 [8:23:306] <phone notes>
Davis, Gordon. (07/13/89)
From William Brett / Complaint.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #147 [8:23:307] <newspaper article>
Bagwell, Keith. (07/15/89)
Mercury is tainting 1 of Tombstone's 2 water wells.
The Arizona Daily Star, Section B, Page 1.

Record #148 [8:23:308] <newspaper article>
Bagwell, Keith. (07/18/89)
Well might have had mercury for 7 months, officials tell Tombstone.
The Arizona Daily Star.

Record #149 [8:23:309-314] <memo>
Pulsifer, Doris. (07/19/89) Letter To: Mayor & Councilmembers.
Well #1 - Mercury re-sampling #1 results.
City Clerk, City of Tombstone, Tombstone, AZ.

Record #137 [8:23:234-241] <letter report>
Rouse, Jim V. (07/25/89) Letter To: Kennett, Roger.
Geohydrologic evaluation of the PBR Minerals site south of Tombstone.
Geochemical Engineering Inc., Lakewood, CO.

Record #134 [8:23:214-219] <field summary report>
Lindroos, Gary A. (07/26/89) Letter To: ADEQ.
Field Summary for the months of April, May, and June, 1989.
PBR Minerals, Inc., Tombstone, AZ.

Record #129 [8:23:121-140] <quarterly report>
Lindroos, Gary A. (07/26/89) Letter To: ADEQ.
Quarterly Interpretative Assessment Report for the period of April thru June, 1989.
PBR Minerals, Inc., Tombstone, AZ.

Record #151 [8:23:317] <phone notes>
Davis, Gordon. (07/27/89)
Phone call to William Brett to find out mercury and nitrate analysis of city water.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #152 [8:23:318] <memo>
Woodruff, David H. (07/28/89) Letter To: Maston, Jim.
PBR Minerals - Groundwater Quality Protection Permit #G-0020-02.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #153 [8:23:319] <memo>
Woodruff, David H. (07/28/89) Letter To: Daniel, Debra.
PBR Minerals - Groundwater Quality Protection Permit #G-0020-02.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #154 [8:23:320-323] <memo>
DuBois, James F. (08/01/89) Letter To: Wiley, Bill.
City of Tombstone Municipal Well #1 and Mining Impact on Aquifer at PBR Minerals.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #174 [8:23:255-281] <geohydrologic report>

Rouse, Jim V. (08/01/89)

Geohydrologic Assessment of Cyanide Contamination of PBR Minerals Well No. 2, Tombstone,
Cochise County, Arizona.

Geochemical Engineering Inc., Lakewood, CO.

Record #136 [8:23:233-241] <memo>

Kennett, Roger. (08/08/89) Letter To: Woodruff, Dave.

PBR Minerals, Inc. - Grand Central Leaching Facility, Groundwater
Quality Protection Permit No. G-0020-02. (with enclosure)

Arizona Department of Environmental Quality, Phoenix, AZ.

Record #138 [8:23:242-243] <memo>

Rendes, Andrew M. (08/16/89) Letter To: Woodruff, David.

PBR Minerals, Inc. - Permit G-0020-02.

Arizona Department of Environmental Quality, Phoenix, AZ.

Record #139 [8:23:244-254A] <letter report>

Rouse, Jim V. (08/21/89) Letter To: Kennett, Roger.

PBR Minerals Aquifer Characteristics Reports.

Geochemical Engineering Inc., Lakewood, CO.

Record #173 [8:23:254A] <land & water well map>

Rouse, Jim V. (08/21/89)

Facility Location Map, Land Ownership, and Registered Water Wells.

Geochemical Engineering Inc., Lakewood, CO, Plate II-1, scale 1:24,000.

Record #140 [8:23:283-285] <memo>

DuBois, James F. (10/02/89) Letter To: Woodruff, Dave.

PBR Minerals Groundwater Quality Protection Permit.

Arizona Department of Environmental Quality, Phoenix, AZ.

Record #122 [8:23:88] <phone notes>

Vandermark, Brad. (10/03/89)

Phone notes about mining operation being on low-key mode with cutbacks of staff.

Arizona Department of Environmental Quality, Phoenix, AZ.

Record #121 [8:23:87] <memo>

Vandermark, Brad. (10/05/89) Letter To: PBR Minerals.

PBR's need to report water level in storm water pond.

Arizona Department of Environmental Quality, Phoenix, AZ.

Record #155 [8:23:324-337] <letter>

DuBois, James F. (11/15/89) Letter To: Perotti, Joe.

Results of the sampling of City of Tombstone water supply sources.

Arizona Department of Environmental Quality, Phoenix, AZ.

Record #141 [8:23:286-289] <self-monitoring report>

American Analytical Lab. (01/17/90)

Groundwater Quality Protection Permit Self-Monitoring Report Forms - Wells #1, #2, & #4.

American Analytical Laboratories, Tucson, AZ.

Record #142 [8:23:290-295] <field summary report>
Lindroos, Gary A. (01/23/90) Letter To: ADEQ.
Field Summary for the months of October thru December, 1989.
PBR Minerals, Inc., Tombstone, AZ.

Record #128 [8:23:115-120] <quarterly report>
Lindroos, Gary A. (01/23/90) Letter To: ADEQ.
Quarterly Interpretative Assessment Report for the period of July thru September, 1989.
PBR Minerals, Inc., Tombstone, AZ.

Record #157 [8:23:371-376] <letter>
Smith, Russell A. (12/01/90) Letter To: Ashworth, J. Michael.
PBR Minerals, Inc.; Permit (#G-0020-02); Compliance Requirements and
Groundwater Remediation. [DRAFT]
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #158 [8:23:377] <notes>
Unknown Author. (03/01/91)
Notes on PBR Minerals compliance with ADEQ requirements.

Record #160 [8:23:379-382] <letter>
Smith, Russell A. (03/20/91) Letter To: Ashworth, J. Michael.
PBR Minerals, Inc.; Permit (#G-0020-02); Compliance Requirements and
Groundwater Remediation. [DRAFT]
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #159 [8:23:378] <memo>
Smith, Russell A. (03/20/91) Letter To: Azizi, Reza.
PBR Minerals, Inc.; Permit (#G-0020-02); Compliance Requirements and
Groundwater Remediation.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #161 [8:23:383-386] <letter>
Smith, Russell A. (04/01/91) Letter To: Ashworth, J. Michael.
PBR Minerals, Inc.; Permit (#G-0020-02); Compliance Requirements and
Groundwater Remediation. [DRAFT]
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #162 [8:23:387-390] <letter>
Smith, Russell A. (05/01/91) Letter To: Ashworth, J. Michael.
PBR Minerals, Inc.; Permit (#G-0020-02); Compliance Requirements and
Groundwater Remediation. [DRAFT]
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #163 [8:23:391-393] <letter>
Smith, Russell A. (06/01/91) Letter To: Ashworth, J. Michael.
PBR Minerals, Inc.; Permit (#G-0020-02); Compliance Requirements and
Groundwater Remediation. [DRAFT]
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #164 [8:23:394-398] <letter>
Smith, Russell A. (07/27/91) Letter To: Ashworth, J. Michael.
PBR Minerals, Inc.; Permit (#G-0020-02); Compliance Requirements and
Groundwater Remediation. [DRAFT]
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #167 [8:23:406-412] <letter>
Smith, Russell A. (07/29/91) Letter To: Ashworth, J. Michael.
PBR Minerals, Inc.; Permit (#G-0020-02); Compliance Requirements and
Groundwater Remediation. [DRAFT]
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #165 [8:23:399] <memo>
Engstrom, Bill. (07/09/92) Letter To: Kennett, Roger.
Phone conversation with Jim Briscoe.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #166 [8:23:400-405] <phone notes>
Engstrom, Bill. (07/09/92)
Phone conversation with Jim Briscoe.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #168 [8:23:413-415] <letter>
Bell, Donald. (08/05/92) Letter To: Niedfeldt, Jerry.
PBR Minerals, Inc.; Groundwater Protection Permit# G-0020-02); groundwater remediation
and monitor reports.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #169 [8:23:416-418] <letter>
Bell, Donald. (08/05/92) Letter To: Ashworth, J. Michael.
PBR Minerals, Inc.; Groundwater Protection Permit# G-0020-02); groundwater remediation
and monitor reports.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #171 [8:23:420] <memo>
Fox, Edward Z. (08/11/92) Letter To: Cunningham, Patrick.
Case Development Memorandum (CDM) for PBR Minerals, Inc.; Inventory Number 100334;
Groundwater Protection Permit (GWPP) #G-0020-02); Cochise County, Arizona.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #170 [8:23:419] <memo>
Munson, Brian. (08/11/92) Letter To: Cunningham, Patrick.
Case Development Memorandum (CDM) for PBR Minerals, Inc.; Inventory Number 100334;
Groundwater Protection Permit (GWPP) #G-0020-02); Cochise County, Arizona.
Arizona Department of Environmental Quality, Phoenix, AZ.

Record #172 [8:23:421-422] <phone notes>
Engstrom, Bill. (08/12/92)
Typed Phone conversation with Jim Briscoe 8/12/92, 10:30am.
[According to A+ notes, this conversation occurred on 7/9/92]
Arizona Department of Environmental Quality, Phoenix, AZ.

PRE-DEL. & MBS
ON MINIBUS PLAN

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

SAMPLE PLAN

Site Name: PBR Minerals, Inc. (Formerly Cochise Silver Mines, Inc.)

Site Location: T20S R22E Sec. 11, 12, 13, 14

Address: 950 Skyline Drive P.O. Box 370

City/State/Zip: Tombstone AZ 85638

County: Cochise

EPA SITE ID No: _____
(If Assigned)

DEQ ACID ID No: _____
(If Assigned)

Prepared By: JAMES F. DuBois Title: Hydrologist III

Office/Section/Unit: Water Quality/Hydrology/State Permits

Address: 2005 N. Central

City/State/Zip: Phoenix, AZ 85004

Telephone: 257-2364 Date Prepared: 6/30/88

APPROVALS

Program Review/Approval By: _____ Date: _____

Title: _____

Review/Approval By: _____ Date: _____

Title: Section QA/QC Officer

I. SUMMARY OF ANALYSES REQUESTED

TYPE OF SAMPLE (USE SEPARATE SHEET FOR EACH MEDIA): Water Soil Waste

Sample or Well ID	Sample or Well Name	Expected Concentration*	Analyses Requested**													Comments			
			Organics														Other		
1. 55-086448	TEI #1 (D-20-22) 11 DDB	L M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	CN (total + direct)
2. 55-505610	TEI #2 (D-20-22) 12 CCD	(L) M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	"
3. "	" " "	(L) M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	" Duplicate
4. 55-516482	TEI #3 (D-20-22) 12 CCA	(L) M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	"
5. _____	Heavy Leak Detection System	L M (H)	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	"
6. _____	Pond Leak Detection System	L M (H)	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	"
7. 55-616498	Municipal Well #1	(L) M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	"
8. "	Municipal Well #1	(L) M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	" Duplicate
9. _____	Municipal Well #2	L M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	"
10. _____	Municipal Well #3	L M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	"
11. _____	Miller Canyon Intake	L M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	
12. _____	Carr Canyon Intake	L M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	
13. _____	Miller Canyon (End of Line)	L M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	
14. _____		L M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	
15. _____		L M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	
16. _____		L M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	
17. _____		L M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	
18. _____		L M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	
19. _____		L M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	
20. _____		L M H	V	SV	P	BTX	DBCP	EDB	DWH	EPP	SC	MCA	DWM	EPM	PPM	N	C	I	

TOTALS

- *Key: L = Low expected concentration: Less than 10ppm (10,000ppb)
M = Medium expected concentration: Between 10ppm and 100ppm
H = High expected concentration: Greater than 100ppm

Note: Recommended concentration ranges may not apply to all constituents and may be effected by sample volume.

- ** See Reference Table in the Appendix for a list of constituents for each of the following parameter groups:
V = Volatile organics, 35 compounds. Includes Priority Pollutant volatile organics.
SV = Semi-volatile organics, 65 compounds. Includes Priority Pollutant Acid/Based-Neutral semi-volatile organics.
P = Priority Pollutant pesticides and PCB's, 26 compounds.
BTX = Benzene, toluene, xylene, ethylbenzene
DBCP = Dibromochloropropane
EDB = Ethylene dibromide
DWH = Safe Drinking Water pesticides and herbicides, 6 compounds
EPP = EP Toxicity pesticides, 6 compounds
SC = Solvent scan (qualitative or quantitative)
MCA = Major cations and anions
DWM = Safe Drinking Water metals, 8 Primary and 4 Secondary
EPM = EP Toxicity metals, 8 metals
PPM = Priority Pollutant metals, 20 metals including HSL and other commonly tested metals.
N = Nutrients C = Corrosivity I = Ignitability

000002

II. MAPS

1. Title of Area Location Map (Highway map, 1:250,000 scale map or similar):

Tombstone, Ariz (1:24,000) ←

2. Title of Topographic Map (1:62,500, 1:24,000, or similar):

Tombstone, Ariz. (1:24,000)

3. Title of Detailed Site or Facility Map (if applicable):

Location Map

Well Sampling Location Map

Titles of Other Maps:

4.

5.

6.

7.

8.

000003

ADDITIONAL WELL INFO

<u>Well #</u>	<u>LAT - LONG</u>		<u>TD</u>	<u>DIA</u>	<u>DTW</u>	<u>Approx Purge Volume</u>
TEI #1	31° 42' 20" N	110° 03' 25" W	800'	8"	440	2800 gal
TEI #2	31° 42' 18" N	110° 03' 24" W	620'	6"	400 (?)	970 gal
TEI #3	31° 42' 12" N	110° 03' 46" W	715	12"	380	5904 gal
Tombstone #1	31° 42' 40" N	110° 03' 48" W	612	4"	333	546 gal
Tombstone #2	31° 43' 20" N	110° 03' 11" W	600	6"	278	1419 gal
Tombstone #3	31° 43' 00" N	110° 02' 49" W	890	16"	333	17,211 gal

000004

17
009711

17-92



Cochise Silver Mines
 Tombstone Development
 Tombstone

by: Dustin Escapule
 Cochise Silver Mines

FIGURE 2 LOCATION MAP

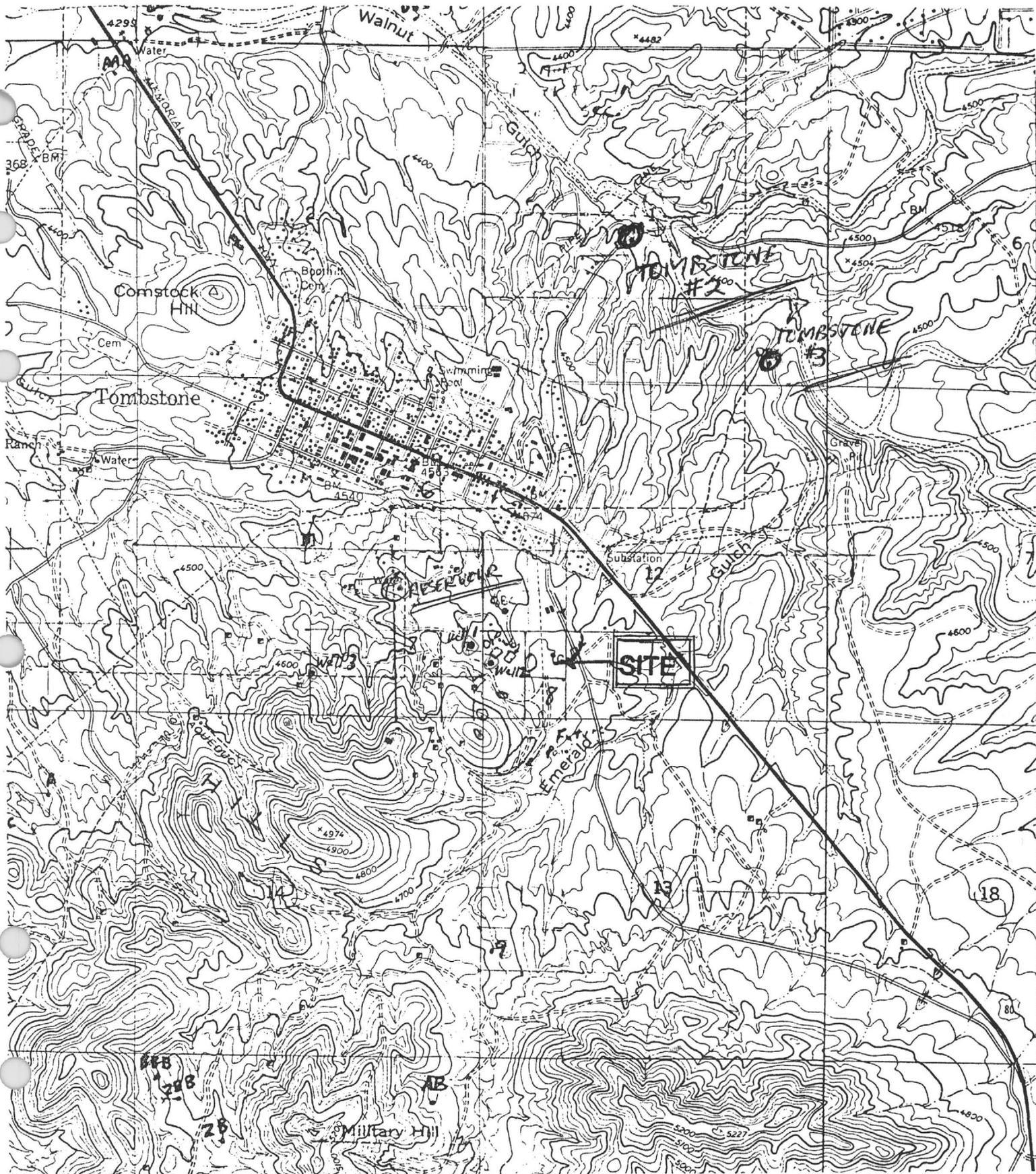


FIGURE # 1

Topographic/Location Map

000006

6579-85

7.11.600



by: Dustin Escapule
 Cochine Silver Mines

Cochise Silver Mine
 Tombstone Development Co's Property
 Tombstone, Ariz.

Note: See attached diagrams for
 further details on areas A, B, and C

III. BACKGROUND AND OBJECTIVES

Background: Wastewater and pregnant solution
water stored in the overflow, water spray and
pregnant solution ponds seeped beneath the ponds
and ultimately contaminated the soil and
groundwater beneath the ponds. A spill of cyanide
laden waters into Emerald Gulch occurred in 1985.
Cyanide contamination was discovered in water from
Tombstone Development, Inc. Well. No. 2 in
July, 1984, with a Free cyanide concentration of 93.9 mg/l.
Additional contaminants included Mercury and nitrates.
Cyanide in the ponds was neutralized while pumping
continued at well No. 2 in order to recover the contaminated
groundwater. Recently mercury was detected in the
Tombstone Municipal Well #1 at 0.004 mg/l with the
confirmation sample showing 0.001 mg/l

Mercury concentrations
 are at
 about 0.03 mg/l
 in
 well.

Objectives of Sampling: The objective of sampling is
twofold. First, we would like to audit
sample the existing monitor wells at PBR
Minerals. Second, sampling is necessary to
determine the significance of the high mercury
result for the city well. Also, Tombstone's
other sources will be sampled to determine
amounts of mercury in the entire municipal
supply system.

IV. RATIONALE FOR SAMPLING

A. Rationale for Sample Locations: Audit samples will be taken from locations specified in the groundwater permit. Municipal well locations are those that are routinely sampled by city personnel. Surface water will be sampled at the intakes in Miller and Carr Canyon. Also, if leak detection systems at the mine have fluid present, it will be sampled as specified in the groundwater permit.

B. Rationale for Analyses Requested: Total cyanide, Free cyanide, mercury and nitrates are the contaminants of concern that exceeded U.S. EPA MCL's and ADHS action levels in groundwater which is $\pm 500'$ below ground level. In addition, we will analyze for inorganics for cation - anion balance calculations.

C. Rationale for Number of Samples: One for each well of concern and a duplicate for TIEI #2 - the high cyanide well and for Municipal Well #1. Also, samples will be drawn from the origins of the two surface water sources.

V. QA/QC METHODS AND PROCEDURES

A. Sample Collection Process

1. Sampling procedures and quality assurance will be in accordance with the Quality Assurance Project Plan, Arizona Department of Environmental Quality, September 1987. Additional References are the NWWA/EPA publication Manual of Groundwater Sampling Procedures, EPA RCRA Groundwater Monitoring Technical Enforcement Guidance Document (TEGD) (OSWER-9950.0), and EPA Soil Sampling Quality Assurance Users Guide (EPA 600/4-84-043).

2. Brief description of collection procedures/equipment:

Equipment: bottles
gloves
Tape
bailer (stainless)

All wells have pumps and, thus, may be sampled at the wellhead tap. Wells will be purged approx. 3 well volumes. Field measurements below will be taken. 4 unfiltered samples to be taken from tap.

3. Brief description of field measurements:

pH, EC, Temp

4. Sample containers/preservation: (Reference Table in Appendix)

TEST	CONTAINERS	PRESERVATION
CN (total and Free)	1, 1 liter plastic	4°C, NaOH to pH > 12
Hg	1, 500 ml plastic	HNO ₃ to pH < 2
NO ₃ -NO ₂	1, 250 ml plastic	4°C, H ₂ SO ₄ to pH < 2
Inorganics	3, 1 liter plastic	4°C / HNO ₃ + H ₂ SO ₄ preserved and 1 unpreserved.

4 bottles total for each sample

5. Brief description of sample documentation (labels, etc):

Labels to be placed on sample containers should include the site name, sample #, analyses required, date, time and initials of sampler.

6. Brief description of chain-of-custody procedures:

All samples shall be transferred directly to the Arizona state laboratory and shall be accompanied by an original Chain-of-Custody Record. The record shall be filled out legibly in waterproof ink. All shipping containers shall be sealed. Upon transfer, a copy of the custody record shall be retained by the field sampler. Note custody procedures in field notebook.

7. Sample shipment (check with Health & Safety Officer about shipment of high-hazard samples): N/A

B. Equipment Decontamination (as it relates to prevention of cross-contamination in samples)

Most samples will be taken directly from tap so that no decon of sampling equipment will be necessary. If bailer is used for leak detection sump sampling, it will be decontaminated with tap water rinse, alconox wash, tap water rinse and DI rinse.

C. Samples Collected for Quality Assurance/Quality Control

1. Duplicate Samples: Typically, one duplicate sample per day, per matrix will be collected or 10% of the total samples per day, per matrix if more than 10 samples are collected. Care will be taken to insure that as true a duplicate as possible will be obtained. The duplicate sample will be collected, numbered, packaged and sealed in the same manner as the other samples so that it is unknown to laboratory personnel performing the analysis. Duplicates will be collected at the following sampling locations:

<u>Sample or Well ID</u>	<u>Sample or Well Name</u>	<u>Rational for Selection as Duplicate</u>
(1)	TEI #2	Most likely sample to show mercury above detection limit
(2)	Tombstone #1	
(3)		Well has shown mercury defect and wish to confirm.
(4)		
(5)		
(6)		

2. Background Samples: These samples are used to characterize ambient or upgradient conditions.

<u>Sample or Well ID</u>	<u>Sample or Well Name</u>	<u>Rational for Selection as Background</u>
(1)	N.A.	
(2)		
(3)		
(4)		
(5)		
(6)		

3. Blank Samples: Typically, when water samples are collected on a site, one "field blank" per day will be included in each shipment to each lab. Water samples which are being analyzed for volatile organic compounds will have a VOA "travel blank" in each shipping container (all VO vials will be kept in one ice box each day to avoid collecting more than one VOA-blank daily). The blanks will be numbered, packaged and sealed in the identical manner as the other water samples collected. The

VI. SITE SAFETY PLAN

Site Name: PBR Minerals, Inc. (Formerly Cochise Silver Mines, Inc.)

A. Health and Safety Considerations

<u>Area of Concern</u>	<u>Hazard Potential</u>			<u>Precautions</u>
	<u>Low</u>	<u>Med</u>	<u>High</u>	
Explosion:	<u>X</u>	—	—	
O2 Deficiency: (e.g. Confined Spaces)	<u>X</u>	—	—	
Radiation:	<u>X</u>	—	—	
Toxic Gases:				
a. General (HNU meter)	<u>X</u>	—	—	
b. Specific: (e.g. Sorbent or Detector Tube)	<u>X</u>	—	—	
Skin/Eye Contact:	<u>X</u>	—	—	Wear surgical gloves when sampling contaminated wells Take frequent breaks, bring two gallons of drinking water per day per person, gatorade, drink frequently.
Heat/Cold Stress:	—	<u>X</u>	—	
Falling Objects: (e.g. Stacked barrels, etc.)	<u>X</u>	—	—	
Falls: (e.g. pits, ponds, elevated work place, etc.)	<u>X</u>	—	—	
Confined Spaces: (e.g. manholes, vaults, closed rooms, trenches, etc.)	<u>X</u>	—	—	
Mechanical:	<u>X</u>	—	—	
Electrical:	<u>X</u>	—	—	

B. Acute Exposure Symptoms of Compounds Present or Suspected (See also Table 1. Atmospheric Hazard Guidelines. For specific compounds, reference material is available from the Health & Safety Officer).

Compound	Applicable Std. (STEL, TLV, etc.)	Symptoms	First Aid
HCN	TLV-TWA = 10 mg/m ³	weak, headache, confusion, nausea, vomiting, skin irritation, respiratory, asphyxia and death	Skin: water flush immediately breath: art. resp./amyl nitrate pearls Eye: irrigate immediately
CN	TLV-TWA = 5 mg/m ³	As above	Skin: soap wash immediately breath: artificial respiration Eye: irrigate immediately swallow: medical attn. immediately
Hg	TLV-TWA = 0.01 mg/m ³ STEL = 0.03 mg/m ³	Cough, dysp, bron, pneu, tremor, insomnia, irrity, indecision, head, fatigue, weak, stomatorsis, saliv, GI, anor, lo-wt, prot, irrit, eyes, skin	As above for CN

C. Overall Hazard Assessment (Toxicity, flammability, reactivity, stability, operational hazards with sampling, decontamination, etc.)

Heat stress will most likely be the most serious hazard. However, a potential does exist for skin/eye contact and inhalation of CN or Hg contaminated soil if windy conditions exist. Sampling to date indicates very low (< 10ppm) levels of cyanide remaining. Low potential for exposure to HCN exists.

Level of Protection Needed: A _____ B _____ C _____ D X

Note: For level "C" protection and higher, review and approval of this Site Safety Plan is required by the DEQ Health & Safety Officer.

D. Equipment and Procedures

1. Hazard Surveillance Equipment & Materials: None - site has previously been evaluated with HCN detector tubes.
Olfactory detection of cyanide - almond odor - abandon site.
Also - abandon site under dusty conditions.

2. Entry Procedures: No special requirements

3. Special Equipment, Materials, Procedures, (Note: Level "D" basic supplies are required as per DEQ "Personnel Safety Manual"):

1 box surgical gloves

4. Decontamination Equipment & Procedures: (as they relate to health & safety)

1 bucket
Distilled water
Alconox

5. Disposal Procedures (contaminated equipment, supplies, etc.):

Remove gloves and dispose between samples

E. Emergency Information

1. Nearest Hospital Emergency Room: Sierra Vista, AZ
Address: 300 El Camino Real Telephone: 458-4641
2. Emergency Telephone Numbers:
 - a. Fire 457-2244
 - b. Police 457-2244
 - c. Ambulance 457-2244
3. Poison Management Center, St. Lukes Hospital: 1-800-362-0101
4. Arizona Radiation Regulatory Agency: 1-255-4845

F. Approvals

1. Safety Plan Prepared by: James F. Dubs Date: 7-28-89
2. Supervisor/Title: _____ Date: _____
3. DEQ Health & Safety Officer: _____ Date: _____
(Not required for level D)

1 more than five minutes.

2 When I call your name, please come forward to the
3 microphone.

4 Gabe Brett.

5 MS. BRETT: I never thought back in 1983 that I
6 would be standing here six years almost later on the same
7 pollution problem; and I would like to say that I am glad to
8 see that you did mention mercury and nitrates, but they do
9 fluctuate.

10 In September -- I think the citizens of Tombstone
11 should know that a high nitrate and a high mercury level is
12 up there in that well, and how many more years do we have to
13 go before we can have that cleaned up? I don't care where it
14 comes from. It should be cleaned up.

15 In September, the nitrate which is normal 10 was
16 33.8 in Well No. 2. Nitrates were 29.4, and in September
17 nitrates were 37.3. Now that's high. Mercury which is 00.2,
18 was .018, .11, .19 and .25. Somehow, someplace, we must be
19 able to clean this mercury and this nitrate up. This cannot
20 be allowed to continue.

21 I used to think that the state and the DEQ was there
22 for the protection of the people, but I somehow in six years,
23 I don't think that any more. I think you just are a jeopardy
24 to us. You don't care.

25 And PBR Well No. 3 I believe it was in May -- no, in



1 February, was the last time that we had any kind of report
2 that I know of. And look at all this (indicating), this is
3 what they sent me, and I have read all this; I have read all
4 this. These are all well reports, and I will be glad to give
5 any reporter -- because I've got documents of what these
6 reports are. But PBR is no longer available for Well No. 3
7 to be tested. Well No. 3 was coming up in nitrates in
8 February. Well No. 3 belongs to the Santa Fe Mining Company
9 which I believe was Mr. Magini. I'm not sure.

10 And I think my five minutes is about up, and I'm
11 just a little tired. I don't like -- I could have had people
12 down from the state. I could have had people down from
13 Washington, D.C. on this pollution. But after being called
14 carpetbaggers and being told that they were better dressed
15 than most of the miners -- they weren't. They weren't better
16 dressed; they were just clean -- and I advised them not to
17 come because I think it's a total loss for them to come this
18 far and try to talk to the state of Arizona. Thank you.

19 THE HEARING OFFICER: Thank you, Miss Brett.

20 Bill Brett.

21 MR. BRETT: Good day. My wife covered most of the
22 comments, but what I feel, we have to have someone
23 responsible for cleaning up those wells. We have had
24 different mining operations in there and that's not getting
25 the job done.

1 There's one individual or one corporation that owns
2 that land, and I think that they should be made part of the
3 contract to get that well cleaned up. Not just on the
4 responsibility of the people coming in and mining up there,
5 but let's go to the landowners, make them post a bond if
6 necessary. Let's get this well cleaned up after six years.

7 Another thing we have got to worry about is City
8 Well No. 1. We are high on nitrates. The limit on nitrates
9 is 10. That's the norm. Now, in Tombstone we have been
10 fluctuating, different levels. We are up to 8 something now.
11 Now, 10 could be a norm for a standard healthy person.

12 Now, you start looking at the people in Tombstone.
13 We have youngsters, we have people that are pregnant, we have
14 older people. 8 may be too much for them. That's true. At
15 the standard it's just the norm. And I think ^{mining}mining (sic)
16 has to be done on our Well No. 2, and as soon as possible we
17 have to do some studies to protect that well to make sure
18 that we do not go over in nitrates and in mercury.

19 Thank you. That's all I have to say.

20 THE HEARING OFFICER: Thank you, Mr. Brett.

21 MR. KENNETT: Excuse me, Oleta.

22 THE HEARING OFFICER: Yes.

23 MR. KENNETT: I need to clarify something, Mr.
24 Brett. Did you mean the City of Tombstone Well No. 2?

25 MR. BRETT: City of Tombstone Well No. 1.

1 MR. KENNETT: So, the monitoring you were speaking
2 of is of City of Tombstone Well No. 1?

3 MR. BRETT: Yes, city well.

4 MR. KENNETT: Okay. Thank you.

5 THE HEARING OFFICER: Brian Chadwick.

6 MR. CHADWICK: Good evening. My name is Frank
7 Chadwick, and I'm the general manager of PBR Minerals. And I
8 have in my possession a petition which has been signed by
9 about 350 citizens of Tombstone supporting the issuance of a
10 groundwater quality protection permit to PBR Minerals.

11 Thank you.

12 THE HEARING OFFICER: Thank you, Mr. Chadwick.

13 Mr. Chadwick, did you wish to submit that?

14 MR. CHADWICK: The petition has been submitted. You
15 have copies of it.

16 THE HEARING OFFICER: Thank you.

17 Rodney Bell.

18 MR. BELL: I'm Rodney Bell and I'm just a citizen of
19 Tombstone. I have not heard really anything that would be
20 detrimental to PBR coming in here and providing a lot of us
21 with employment and work that we need very badly around this
22 area.

23 Now, if there's proof that there is some
24 contamination that is caused by this, I can understand it;
25 but as long as the mine is willing to comply with the

1 regulations set down by the state and all qualified people in
2 the authority to regulate this, I don't see why there is any
3 reason why they should be denied a permit, and we need the
4 employment around this area. Thank you.

5 THE HEARING OFFICER: Thank you, Mr. Bell.

6 Dick Peterson.

7 MR. PETERSON: As a private citizen of this
8 community, I would like to voice my wholehearted support for
9 this operation, and to give my support to you folks to issue
10 the permit for them to operate. We do need it and it's a
11 good thing for this town.

12 THE HEARING OFFICER: Thank you, Mr. Peterson.

13 Judy Heiser.

14 MS. HEISER: I would like to say to Mrs. Brett that,
15 Gabe, we are all tired. We are all really tired of you,
16 tired of the economy in town. We are tired of the constant
17 fighting for a buck; and most of the people who are concerned
18 about the permit being given to PBR are people who are
19 retired. They have little businesses to keep them going when
20 they aren't doing other things. And it sounds to me like the
21 state is monitoring PBR's workings and the construction thereof
22 to the point where if anything went wrong, the state would
23 certainly be on top of it, and I don't see how they can
24 possibly hurt our groundwaters.

25 The city wells also contain high levels of nitrates



1 and mercury as Mr. Brett who is on the city council just
2 stated in Well No. 1; and I'm sure if we were to go back in
3 the records, if we could do this over a period of many years,
4 we would find that all of the wells in Tombstone have had
5 these high levels for many, many years, and I don't see that
6 anyone is being -- their health is being jeopardized or their
7 mental capabilities or whatever. And I am very much in favor
8 as a business person in this town and a long time resident
9 with a lot of family here of having this permit granted.

10 Thank you very much.

11 THE HEARING OFFICER: Ken Hays.

12 MR. HAYS: I definitely second what Judy just had to
13 say. I would like to ask Dustin, he's the big representative
14 of PBR, are you willing to comply with all these things the
15 state's laid out?

16 MR. ESCAPULE: Yes, sir.

17 MR. HAYS: I think they laid it out very well; and
18 if he is willing to comply, I don't see why there's any
19 reason. And I take issue with both Mr. and Mrs. Brett both.
20 I mean, Mr. Brett is a retired lieutenant colonel. He's got
21 a big pension. They are business people, but they don't have
22 to worry about their income.

23 Now, some of us do. I'm in business here myself. I
24 have to worry about it. I don't have a big pension from the
25 government. I get Social Security, yes.



1 So, I think there's too much fighting amongst the
2 merchants around here, and I just wonder if some of this is
3 not a personal vendetta against the Escapule family, I mean
4 really. And I'm all for granting that petition, and I think
5 we need it. We need everything we can get here to make
6 Tombstone more viable.

7 Too many people around here fighting everything.
8 They want us to wither down and die on the ground. And if we
9 don't grow, we are going to die.

10 So, I'm all for it, and as long as Dustin says they
11 will comply, and I'm sure they will. The state has set up
12 pretty strong standards there, and why not let's go along
13 with it. Thank you.

14 THE HEARING OFFICER: Thank you, Mr. Hays.

15 Jay Moyes.

16 MR. MOYES: Madam Hearing Officer, my name is Jay
17 Moyes, and I'm an attorney with the firm of Meyer, Hendricks
18 in Phoenix and I represent PBR Minerals. And I will not take
19 time to go into any extensive comments at this point, but
20 would like to address just briefly a couple of things that
21 were touched upon by Mr. Kennett and Mr. Larson's opening
22 presentations and perhaps elaborate just a little bit on some
23 of the protections that are built into the system for which
24 this permit is being issued. And I would secondly add that
25 during the informal comment and question period that will

1 follow the formal record, we are more than happy to explain
2 in any detail that anyone would like to see every single
3 element of this facility as it is proposed and the
4 requirements that the state is imposing on us and which we
5 intend to and will fully comply with.

6 It needs to be understood that beneath all of this
7 series of repetitive protection features that are built into
8 this facility, there will also be created by the new well
9 that is going to be drilled in the next few days; in fact,
10 the rig is on site there now; there will be created by the
11 pumping of that new well what we call in hydrologic terms a
12 cone of depression.

13 The groundwater will be pumped from that well at
14 such a rate that any groundwater underlying this facility
15 will by natural hydraulic pressure move toward the site from
16 which that well is pumping and create a cone in the
17 hydrologic gradient underneath the facility. We have
18 compacted soils at the top of that. On top of that we have
19 100 percent compacted two foot clay liners. Then we have
20 leak detection systems; and on top of the leak detection
21 systems, two layers of 40-mil synthetic materials all
22 designed to be sure that nothing that is used in the way of
23 solutions in this process, and not just the cyanide laden
24 solutions but any solutions in this entire facility cannot
25 ever permeate into the soils and reach the groundwater.



ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Rose Mofford, Governor
Randolph Wood, Director

January 23, 1989

To Whom It May Concern:

RE: PBR MINERALS, INCORPORATED-GRAND CENTRAL LEACHING FACILITY
GROUNDWATER QUALITY PROTECTION PERMIT NO. G-0020-02

On January 20, 1989, the Director of the Arizona Department of Environmental Quality issued a Groundwater Quality Protection Permit for the above referenced facility.

Because you commented on the record at the public hearing on December 15, 1988 in Tombstone, we have attached the transcript of the hearing and a summary of responses to comments made during the hearing. We have paraphrased what we felt was the substance of your comments in the summary. Your complete comment may be found in the transcript.

If you have any questions concerning this matter, please feel free to call me at 257-2270.

Sincerely,



Roger Kennett
Supervisor
Existing Groundwater Facilities Team
Office of Water Quality

RK:jc

Attachments

000025

The Department of Environmental Quality is An Equal Opportunity Affirmative Action Employer

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

GROUNDWATER QUALITY PROTECTION PERMIT NO. G-0019-02
PBR MINERALS, INC.
P.O. BOX 370
TOMBSTONE, ARIZONA 85638

PUBLIC HEARING

December 15, 1988
Schieffelin Hall
315 Fremont Street
Tombstone, Arizona

REPORTER'S TRANSCRIPT

OF

PROCEEDINGS

PAUL H. LANDSMAN, RPR
Court Reporter

ORIGINAL

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

P R O C E E D I N G S

THE HEARING OFFICER: Good evening, ladies and gentlemen. Thank you for coming. Today is Thursday, December the 15th, 1988. The time is 7:04. The location is Schieffelin Hall, Tombstone, Arizona.

This is a public hearing being held in accordance with Arizona Administrative Code 9-20-2-23 and Arizona Revised Statute 49-208 conducted by the Arizona Department of Environmental Quality for the purpose of obtaining comments regarding the proposed operation of PBR Minerals' Grand Central Leaching facility. This hearing is for this facility only.

My name is Oleta Elliott. I am with the Arizona Department of Environmental Quality. I have been designated by the Department to act as a hearing officer during the course of this public hearing being held tonight in regards to this proposed groundwater quality protection permit. It is my responsibility to act as a hearing officer for the purpose of securing public comment both oral and written.

Representing the Department this evening is Rob Larson, environmental engineering specialist, Water Permits Unit, the office of water quality. On my far left is Roger Kennett, environmental program supervisor, also of the office of water permits. In the rear signing people in still is Skip Hellerud, the manager Water Permits Unit, also in the



1 office of water quality.

2 The agenda this evening will be as follows: We will
3 have an opening of the record, the statement by the
4 Department, formal comments, closing of the record followed
5 by an informal question and answer period. Any requests for
6 clarification on technical terms or statements will be made
7 at that time. Technical or policy questions will not be
8 addressed at this time.

9 If you wish to comment on this proposal, please fill
10 out a speaker slip. This will allow everyone an opportunity
11 to be heard and allow us to match the voice of the official
12 record with its source. I will call individuals to present
13 their oral statements only after having received a speaker
14 slip.

15 Members of the public may also submit written
16 statements today or at a later time, but in no case later
17 than December the 22nd, 1988, at 5:00 p.m. Written
18 statements may be mailed or hand-delivered to Roger Kennett,
19 Department of Environmental Quality, Water Permits Unit, 2005
20 North Central, Suite 202, Phoenix 85004.

21 Please be sure to sign in on the attendance sheets.
22 The final decision will be made by January 21, 1989.

23 There is also an agenda on the table as you entered.
24 On the agenda is the address where written comments may be
25 submitted.



1 I will now have the representatives make their
2 presentations.

3 Roger.

4 MR. KENNETT: Good evening everybody. Thanks for
5 coming. Rob is going to discuss the permit, the draft permit,
6 which we are really here to get your comments on tonight,
7 but I felt it would be helpful if I gave sort of a status of
8 the preceding activities that occurred before this draft
9 permit.

10 Back in 1984 the Department which was then the
11 Department of Health Services became aware of high levels of
12 cyanide in the onsite well at the mine site commonly called
13 TEI Well No. 2, and we developed or I should say regulations
14 were certified for the program that we are all involved with
15 here tonight in July of that same year.

16 So, we were in our infancy, and we requested a
17 permit application of the then operator, Tombstone
18 Exploration, Incorporated; and we were in the process of
19 guiding them and hopefully getting that, and that company
20 went bankrupt. And in the intervening years we were trying
21 to get a handle on what we could do to get that well cleaned
22 up.

23 Then a company known as Cochise Silver Mines
24 requested to operate at the site, and the Department stuck
25 with their original plan of cleaning up that well and the

1 source of the contamination of the well.

2 We wrote a permit in 1987 which involved removal of
3 soils underneath a pond which was discovered to have leaked
4 very close to TEI Well No. 2. The permit required excavation
5 of those soils and treatment so that there was no remaining
6 cyanide in the materials. At the same time, the well was
7 pumped as continuously as it could be to contain the
8 contamination in the groundwater.

9 The excavation was not quite completed by the time
10 that permit expired. It was expressed to us that it wouldn't
11 be very much longer for that to be accomplished, so we issued
12 a temporary permit for the same purpose in January of this
13 year.

14 I should say at this time that that permit required
15 at the tail end of the cleanup a site assessment of the
16 situation which would assure that the groundwater quality
17 standards would not be violated at the property boundary.

18 At this time, the excavation is very nearly complete
19 if not totally complete. Any remaining materials there that
20 need to be removed will be placed on the new pad discussed in
21 the new permit that we are here about tonight.

22 The permits that we have written in the past
23 required monitoring of various wells including TEI Well No. 2.
24 Currently the data show that the cyanide level is below the
25 drinking water standard. There are high nitrates in the well,



1 however, and the well has always shown an elevated
2 concentration of mercury which has never varied up or down
3 during the period of our involvement.

4 The source of this mercury is still under
5 investigation, and it's surmised that it may be naturally
6 occurring in the area or remanent from the old days of mining
7 in this town when mercury amalgamation was a common practice.

8 Therefore, what is left to do? We have requested
9 the permittee, PBR Minerals, to complete a site assessment
10 and develop a closure report for this site; and as I stated
11 before, this should address whether groundwater quality
12 standards will be maintained at the downgrade and property
13 boundary.

14 The tasks of the site assessment, and I will go over
15 those briefly, a new pumping well which will serve also as a
16 monitor well is to be installed in association with the new
17 facility; and when that is drilled, a pump test of this TEI
18 Well No. 2, an aquifer test if you will, will be performed to
19 ascertain localized aquifer characteristics.

20 Also, a groundwater water table map is to be
21 developed which hopefully will indicate the local direction
22 of groundwater movement. Up till this point it's been
23 generally assumed that groundwater is moving towards the town,
24 but there is not a lot of data available. Hopefully with
25 some new data points up in that area we can pin this down.

1 Water quality will continue to be monitored in the
2 current wells, the current existing wells, the new well that
3 I just mentioned, and PBR is also going to propose locations
4 for additional monitoring wells. We have agreed upon two at
5 this point, thought that would be necessary to provide the
6 ultimate answer to the situation.

7 This temporary permit that we are under currently
8 expires on January 9th, so the Department felt that to
9 continue with a consistent attitude at this facility that we
10 should tie in some of what I have just explained to you in
11 the new draft permit.

12 Based on internal comments, we propose to include a
13 compliance schedule at the end of the draft permit, and Rob
14 will discuss that permit in more detail here shortly.

15 We do have some copies of the permit with us here
16 today and the draft compliance schedule that I mentioned, and
17 we would be glad to provide those to you if we could later on
18 tonight. We do have limited copies, however; so, we
19 appreciate it if you could share if possible.

20 I think that's all I have to say for now. Turn it
21 over to Rob.

22 MR. LARSON: Good evening, ladies and gentlemen. I
23 am Rob Larson, environmental engineer specialist for the
24 Water Permits Unit, and my responsibilities with this project
25 have been in doing the technical review for the new facility

1 going in and drafting the permit for the groundwater
2 requirements and so forth for this new facility.

3 I would like to use my time tonight to explain the
4 requirements the Department has for cyanide leaching
5 operations, and also to go through this draft permit and
6 explain some of the requirements that PBR will have to meet
7 to stay in compliance with the state regulations.

8 Currently the state is developing BADCT documents
9 for the mining industry, and BADCT is another acronym for
10 best available demonstrated control technology. We are
11 having BADCT guidelines manuals for lab fields, for mining
12 operations, industrial facilities and wastewater treatment
13 facilities, and hopefully these will all be adopted within
14 about another year.

15 And we will be having copies of the mining BADCTs
16 out shortly, probably in February, and if anybody would like
17 to have copies or get on these BADCT mailing lists, you can
18 contact me after this meeting.

19 So, briefly to go through the draft permit and allow
20 everybody to make their comments tonight, the main
21 requirement: This facility shall be constructed and
22 maintained in such a manner as to prevent discharge of any
23 pollutants to the land surface or subsurface which may have
24 an adverse impact on groundwater.

25 That kind of wraps up in a nutshell what the whole

1 permit is going to be about.

2 Basically the facility is going to excavate ore on
3 site and mine it with the heap leaching process. They are
4 anticipating to produce about 350,000 tons of ore a year
5 which will be stacked on their heap leach pads.

6 The leach pad will cover approximately about four
7 and-a-half acres, and the leach pad will be divided into four
8 equal segments. The segment berms will also help in
9 assisting to drain the leach fluid off of the leach pad when
10 they are leaching the ore.

11 The leach pad will be lined with a flexible
12 synthetic membrane liner. Right now in our BADCT document we
13 are requiring a minimum of 30-mil liners for all heap
14 leaching facilities. They are looking at a 40-mil liner, and
15 plus I will go a little bit further into the liner
16 description here in a little bit.

17 When they are putting their liner down, they will
18 have to have a lining contractor there to assist and
19 supervise in installing the liner, and this lining installer
20 contractor shall have a minimum of five million square feet
21 of successfully installed flexible membrane lining.
22 Practices in the past, probably the main problem we have had
23 with them is having faulty liner systems installed, and this
24 is one requirement that we are putting into our BADCT
25 documents to hopefully make sure that these liners are

1 installed and used properly.

2 The PVC pipe which will be transporting any leach
3 solution on or off the pad will also be required to be in
4 synthetic lined ditches. So, if any pipeline breaks or so
5 forth, they will have to have containment for it. So,
6 basically the whole facility is going to have to have total
7 containment anywhere where the cyanide leach solution will be
8 used.

9 The solution ponds which are commonly called the
10 pregnant and the barren pond will be double lined. So, they
11 will have two synthetic liners with a leak detection system
12 in between the two liner systems. Then a 12-inch pipe will
13 come down the side of the ponds, booted through the crest
14 elevation of the pond down to a sump at the bottom, and so
15 they will be able to access in between these two liners to
16 monitor to see if that liner is leaking.

17 And the waste product that will be generated at this
18 facility, they are going to load the ore on to a pad, leach
19 it depending on their recovery times anywhere from a week to
20 several months. Once they have recovered all the precious
21 metal from the ore, then they are going to neutralize it
22 using probably the standard hydrochloride neutralization
23 method. And then they will have to test this ore before they
24 can take it off the pad to make sure it doesn't still contain
25 any cyanide. If it contains cyanide, then they have to keep



1 their neutralization process up until their tests come back
2 showing that there is no cyanide left in the ore before it
3 can be unloaded.

4 The spent ore which has been neutralized to show
5 that there is no cyanide in it will be then stacked on top of
6 a compacted clay liner spent ore disposal area, and this clay
7 liner will be a minimum of two feet thick.

8 The entire facility shall be protected from a 100
9 year/24 hour storm water event by a series of surface water
10 diversion devices constructed to prevent any runoff from
11 entering the processing site, and all the lined areas within
12 the facility shall be capable of containing a 100 year/24
13 hour storm water event. In case anybody wants to know,
14 that's about three and a quarter inches in this area.

15 All the employees that will be working at the site
16 shall be required to attend a cyanide safety and first-aid
17 seminar offered by the state mine inspector's office.

18 As far as monitoring for the facility, the facility
19 will be required to do daily leach solution monitoring which
20 is mainly a water balance record which is going to show how
21 much water they add to the system and how much chemicals and
22 so forth they are adding to the system. Then they will be
23 required to do weekly monitoring on their leak detection
24 devices for the ponds, and also as I mentioned earlier, they
25 will have a leak detection system underneath the leach pad

1 itself.

2 They will also be required to continuously monitor
3 their neutralized tailings before they can be unloaded off of
4 the pad into the spent ore disposal area.

5 Groundwater quality monitoring shall be required as
6 Roger mentioned by the one new well they are putting in as
7 well as two additional passive monitoring wells which will be
8 required to be installed within the first year of operation.

9 So, as far as what they will have to submit to the
10 Department so we can keep up with their monitoring, they will
11 have to submit all construction testing results. They are
12 required to do compaction/density testing for all their clay
13 liners. They have to do field seaming tests when they
14 install the liners. They have to go along with the air lance
15 and test every inch of the seam as well as they have to do
16 destructive testing every 700 feet where they actually go in
17 and cut a piece of the seam out and use these ASTM standard
18 test methods to see if the seams are being adequately sealed.
19 And they will also have to on a quarterly basis give us the
20 construction status of the facility operations.

21 They will have to do their daily leak solution
22 monitoring, their weekly leak detection monitoring on the
23 ponds and on the pad, their continuous neutralized tailings
24 monitoring and their quarterly groundwater monitoring. And
25 all of their reports will be due on a quarterly basis and

1 submitted to the Department.

2 Going to the post-closure plan, once they do finish
3 up with their leaching operation, they will be required to
4 submit a post-closure plan to the Department a minimum of 180
5 days prior to abandonment of the facility. Also in this
6 post-closure plan, we have some minimum requirements that
7 they will have to address in their post-closure plan.

8 And that's about all I have tonight. Thank you.

9 THE HEARING OFFICER: I have received the following
10 speaker slips. Gabe Brett, Bill Brett, Frank Chadwick,
11 Rodney Bell, Dick Peterson, Judy Heiser, Ken Hays, Jay Moyes
12 and John Bronson.

13 Are there any others?

14 (Short pause.)

15 THE HEARING OFFICER: And Mike Gregory. *ok Reasonable Q+A*

16 Everyone who wishes to speak will be allowed to do
17 so. Although everyone may speak, please try to avoid
18 repetition. Never hesitate to express your support or
19 opposition to earlier statements. All we ask is that you not
20 reiterate entire statements made by the preceding speakers.
21 Please confine your comments to this permit only.

22 We may interrupt you with questions while you are
23 talking. Do not interpret an interruption as a criticism of
24 your comments. It is the only way we have to clarify your
25 position for the record. Please limit your comments to no

1 The fail-safe systems that are built into this are
2 much much more expensive than they were at the time that the
3 problems many of you have complained about historically here
4 were created. And we don't deny that were problems created
5 in the past, and they were created by our predecessors. And
6 the Department and the state did not have the level of
7 standards at that time that perhaps they should have had; but
8 they have been on us like flees on a dog with their new
9 standards and they are going to continue to be that way with
10 us. And we don't complain about that; that's the way it
11 should be. You need to be protected and you will be
12 protected under this new facility, and the insinuations that
13 somehow we ought to be responsible for what has been an
14 historical problem here simply aren't correct.

15 It takes a lot of money. There have been over \$2
16 million spent at that site since I stood here two years ago
17 in a hearing to talk about the first permit. That's a lot of
18 money that the state didn't have to put into it, the citizens
19 of this town didn't have to put into it, and some of that
20 money at least went to employ some of you assisting in that,
21 and a significant expenditure and the best available
22 technology has been used to accomplish what has been
23 accomplished there.

24 We have excavated 90,000 yards and treated and
25 cleaned up 90,000 yards of material. Other testing indicates



1 that that excavation was complete and satisfactory and that
2 there remains no cyanide laden materials in those old pond
3 sites.

4 The state as Mr. Kennett points out had some
5 question about two or three plots in that entire grid of
6 ponds, and we intend to continue testing those and continue
7 excavating if it has to be done to properly be sure that that
8 is completely cleaned up.

9 The wells have had high nitrate levels here forever,
10 since they were drilled. Mr. Brett mentioned the high
11 nitrates in the city well. Those were there when the well
12 was first drilled. The city of Tombstone used to put raw
13 sewage down into mining shafts. It doesn't do that any more.
14 We have learned a lot over the last 30 years, but we are all
15 enduring some of the consequences of what was done a long,
16 long time ago. It's not fair or even sensible to assume that
17 new operations are going to do the same things. We have come
18 a long ways.

19 Mr. Larson mentioned BADCT technologies. Even
20 though the law is not official yet that requires BADCT
21 technology, BADCT technology is used in the proposed
22 operation, in the proposed design of it and it will be
23 followed and it will be required; and any questions that you
24 might have about the technical aspects of any element of this
25 facility or how it will be operated, we are open. We are



1 open to review, discussion. We hide nothing from anybody
2 about either this operation or what we have done in the past;
3 and I stand here two years after the first time I was down
4 here proud of what has been accomplished. It's taken one
5 company under, and we have got some more folks now that are
6 willing to put some more money into this thing because they
7 believe in it and they are going to make it work. And we now
8 have a program to do it.

9 I congratulate the state for the effort it has made.
10 And I have to work with them on a daily basis and they make
11 life miserable for me once in a while doing their job. They
12 don't have all the answers all the time and neither do we,
13 but they do the best they can do; and that's what we have
14 them for, and I am glad that they are there. They are trying
15 to protect you.

16 This permit should be granted. It is
17 technologically sound. It makes good economic sense. It
18 makes good environmental sense. And I can guarantee you that
19 when this operation is in operation and the revenues are
20 coming from it, what you will see up there at the old site is
21 something that you can be proud of as a city and not the
22 situation that existed there three or four years ago.

23 Thank you.

24 THE HEARING OFFICER: Thank you, Mr. Moyes.

25 John Bronson.



1 FROM THE FLOOR: He left.

2 THE HEARING OFFICER: Okay. Michael Gregory.

3 MR. GREGORY: My name is Michael Gregory, and I
4 don't have any particular problem with the parts of the plan
5 that have been written into the permit now. There are some
6 things that I think should be added to adequately protect the
7 environment and especially protect the people in town from
8 accidents that might happen.

9 It seems to me that we are dealing with some
10 hazardous materials here, and under several laws that are not
11 truly effective in the state of Arizona could be monitored
12 and dealt with a little more adequately than they are in this
13 permit. And I think the permit ought to anticipate the law
14 and the regulations that are coming down the line and write
15 them into the permit at this point.

16 I won't try to get into all of these right now. I
17 will submit some written comments later. Hopefully, I will
18 have time to do that. Let me just mention a couple of them
19 now, though.

20 First of all, on the first page of the permit and
21 later on when it says that the life of the permit will be for
22 the life of the facility, I think that that is not quite
23 right. I think that no facility should be permitted
24 automatically for life, but that a permit ought to be
25 reviewed periodically; and I would strongly recommend that



1 this permit especially not be allowed a life of more than
2 five years at which time it ought to be reviewed and ought to
3 be reviewed under the new regulations of the aquifer
4 protection permit that will be coming on-line next year.
5 That will give the facility a full four years to adapt to the
6 new regulations; and since the facility is already planning
7 to institute BADCT and some of the other aquifer protection
8 permit requirements, that should not be a hardship of any
9 kind.

10 So, I think we ought to require that five year
11 aquifer permit renewal rather than automatically extending
12 the groundwater permit for the life of the facility.

13 Second, under the monitoring, the way the permit is
14 written now, and I understand this is part of the underground
15 water protection permit system, we are not really concerned
16 with doing anything in the way of response to a problem until
17 the problem has already happened. Under the groundwater
18 protection permit system you really have to pollute the water
19 first and then you react to that.

20 Well, that seems a little silly. Under the new
21 regulations under the environmental ^{Quality} ~~hauling~~ act that was
22 passed a few years ago, under the new permit system that will
23 go into line next year we try to prevent those kinds of
24 things through certain kinds of actions, and I think that
25 ought to be within this permit, too. We ought to be doing

1 monitoring in other words not just on the groundwater and on
2 the leachate materials themselves, but we have to be doing
3 some subsoil monitoring both for baseline and on a periodic
4 basis.

5 I would recommend that you put that kind of monthly
6 assessment and quarterly reporting in for soils just as you
7 do for water, leachate solution and so forth.

8 My main concern is with the contingency plan and
9 closure plans as written into the permit. The contingency
10 plan it seems to me should include not only spills and water
11 contamination, that is groundwater contamination, but should
12 also include soils as I was mentioning; and the contingency
13 plan should be written as part of this permit, not depend
14 upon an accident to happen first. The way the permit is
15 written now, there is no contingency plan required until an
16 accident has already occurred, at which point the contingency
17 would have to be written within 30 days as I read the permit.
18 If I'm wrong, I stand corrected if you can correct me, but I
19 think that's what the permit says. If that is so, I think it
20 should be corrected. A contingency plan should be in place
21 as part of this permit written into it before the permit is
22 granted.

23 And as part of that contingency plan I would suggest
24 that we include several kinds of responses that would be
25 required if this were another kind of facility besides a mine.

1 Any other facility in the county except mining and one or two
2 others is required under the community right to know the law
3 which passed the state last year to do certain kinds of
4 reporting and certain kinds of contingency response for
5 hazardous materials accidents, and I think that we ought to
6 include that as part of this permit.

7 For instance, we will be transporting raw materials
8 that are hazardous as well as certain kinds of ore bodies and
9 so forth that contain hazardous materials. The
10 transportation routes which those materials will be going
11 over should be identified and the possible danger zones or
12 what they call vulnerability zones along those routes should
13 also be identified, and a plan for evacuating people if
14 necessary should be in place as part of this permit.

15 Cyanide, of course, can spread quite far in the air
16 with some pretty nasty effects on the people who have to
17 breath it or end up getting in touch with it in other ways.

18 The amounts of materials being transported and the
19 frequencies with they which they are being transported should
20 be identified. Also, potential entry points into the
21 drinking water supply should be identified and protection
22 response techniques or methods identified in the permit.

23 Also, there should be written into the permit a plan
24 for warning people of an accident. How are we going to let
25 people know that they have to get out of there real quick.

1 That's not in the permit right now. There are no standard
2 procedures in place for that. The county is now working on
3 writing procedures of that sort but they are not in place yet.
4 They ought to be in place in this permit, including things
5 like who do you notify in the Fire Department, in the
6 Marshal's Department. Do you call DPS and get their
7 hazardous materials team down here and so forth. All those
8 numbers should be in the permit, and essentially a safety
9 plan is what I'm talking about should be in place as part of
10 the contingency. There are other points in the contingency
11 plan that I will submit in writing later.

12 Just a couple more points before I close. The way
13 the permit is written right now, recordkeeping is to be kept
14 only for three years. The life of the permit is for the life
15 of the facility according to the permit and recordkeeping is
16 only three years. I think that the recordkeeping also should
17 be for the life of the facility and possibly the permit
18 should only be three years.

19 The permit talks about a closure plan. It doesn't
20 require that the closure plan be written. Several
21 regulations are under way on the federal level that will
22 require closure plans to be part of the permitting system.
23 Those are, again, not in place yet. We expect them in place
24 in the next couple of years; but I would recommend that we
25 put a closure plan into this permit, not wait until 180 days



1 before the company may want to leave town to tell us what's
2 going to happen with all those hazardous materials out there
3 after they are gone.

4 Also I think the permit should identify the
5 difference between permanent closure and temporary closure.
6 It doesn't have any such definition at the present time.

7 And the last point I would like to make is about
8 transfers. The permit allows transfer of the title of the
9 permit and that's fine; but if there is a transfer, it seems
10 to me that would also be an appropriate time to require that
11 the aquifer protection permit come into play and that the
12 groundwater protection permit be dropped. Thank you.

13 THE HEARING OFFICER: Thank you, Mr. Gregory.

14 Has Mr. Bronson returned?

15 FROM THE FLOOR: No.

16 THE HEARING OFFICER: All right. Thank you.

17 I have received one more speaker slip. I cannot
18 pronounce the last name, I'm sorry. Ernie?

19 MR. ESCAPULE: Escapule.

20 THE HEARING OFFICER: I'm sorry, again?

21 MR. ESCAPULE: Ernie Escapule.

22 THE HEARING OFFICER: All right. Can I have you
23 come to the microphone, sir?

24 MR. ESCAPULE: I am Ernie Escapule. I have
25 followed this line of work for all my life, and particularly

1 in recovery of precious metals from the earth to even to
2 refining them by chemicals.

3 The one thing that I do recall is that all of these
4 things are constantly monitored, are constantly worked with
5 particular divisions of the departments that have these laws
6 to protect us all. And my latest work in this line was with
7 the Maricopa County Landfill Department in doing the
8 metallurgy on liquids coming into the landfill, and they were
9 monitored, they were checked closely. But in my travels I
10 have learned that we the people are mainly responsible for
11 these actions. The finger gets pointed at he who is trying
12 to do something, but we who are washing our car, we are throw
13 these chemicals out from a wash pale or we who wash parts of
14 anything that is greasy or dirty, we throw it on the ground.

15 These things, these liquids evaporate. The
16 chemicals are laying there yet, and they will lay there until
17 the rain comes; and when the rain comes, the water takes it
18 down a water course to our water tables that is getting a
19 concentration of number one is oil. You're taking a lot of
20 oil into the ground from natural plants, from automobiles,
21 from batteries, cars washed off, washing the battery area off.
22 There are just all these good things that are concentrating
23 that each and every one of us individuals do, throwing stuff
24 into a garbage disposal. There's many things that we are all
25 contributing to our water problems.



1 So, I don't think that it should all be pointed at
2 one individual or one outstanding action of the area that is
3 trying to progress and help everybody that should be packing
4 the brunt of it. I think we should all be looking at the
5 laws and rules and regulations and clean up our own act.

6 I want to thank you very much.

7 THE HEARING OFFICER: Thank you, Mr. Escapule.

8 Are there any other speaker slips at this time?

9 (No response.)

10 THE HEARING OFFICER: I would like to remind you all
11 to please sign the sign-in sheet as you came in. I urge you
12 again to submit written comments. We will accept comments
13 received by 5:00 p.m. December the 22nd, 1988. You may mail
14 or hand-deliver them to Roger Kennett, Department of
15 Environmental Quality, Water Permits Unit, 2005 North Central,
16 Suite 202, Phoenix 85004. Any telephone inquiries may be
17 directed to Mr. Kennett at 257-2270.

18 Thank you for attending the hearing this evening.
19 Your interest is greatly appreciated.

20 The time is 7:59, 15th day of December, 1988. This
21 public hearing is now adjourned.

22 We will now open the floor for any questions that
23 you may have that concern technical issues only.

24 Do you have any questions?

25 (No response.)

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

THE HEARING OFFICER: Okay. Thank you for coming.
(The hearing was concluded at 8:00 p.m this date,
December 15, 1988.)

1 STATE OF ARIZONA)
2) SS:
3 COUNTY OF MARICOPA)
4

5 I HEREBY CERTIFY that the foregoing hearing was
6 taken before me, PAUL H. LANDSMAN, RPR, a Notary Public in
7 and for the County of Maricopa, State of Arizona; that all
8 proceedings had upon the taking of said hearing were taken
9 down by me in shorthand and thereafter reduced to writing
10 under my direction; and that the foregoing Pages 1 through
11 33, inclusive, contain a full, true and correct transcript of
12 said shorthand record, all done to the best of my skill and
13 ability.

14 WITNESS my hand and seal of office this 30th day of
15 December, 1988.

16
17
18 *Paul H. Landsman*
19 PAUL H. LANDSMAN, RPR
Notary Public

20 My Commission Expires:
21 February 25, 1991.
22
23
24
25



COMMENTATOR A: MS. GABE BRETT (ORAL COMMENT)

Comment 1: There are high nitrate and mercury levels in well #2, and how many more years do we have to go before we can have that cleaned up? I don't care where it comes from.

Response: The steps ADEQ has required up to this point have resulted in the removal of the source of cyanide contamination (contaminated soil), of well #2 and continued pumping so that the present level of cyanide is below the groundwater quality standard.

This permit contains a compliance schedule section which requires the permittee to perform a hydrogeologic assessment of the groundwater and assure ADEQ that nitrate and mercury contamination will be contained and/or reduced on site. Additional monitor wells will be drilled to establish that compliance with Aquifer Water Quality Standards will be maintained at the property boundary. The permit shall require continued pumping of well #2 which will contain the contamination.

If the presence of mercury is a natural occurrence, state law prohibits ADEQ from requiring an entity to clean it up. However, no further degradation is allowed. *

Comment 2: Well #3 was coming up in nitrates in February, but well #3 is no longer available for PBR to test since it is now based to Santa Fe Mining.

Response: ADEQ has been assured by the landowner that PBR will be allowed access to well #3. Furthermore, well #3 will be included in the overall hydrogeologic assessment.

COMMENTATOR B: MR. BILL BRETT (ORAL COMMENT)

Comment 1: There's one individual or one corporation that owns that land, and I think that they should be made part of the contract to get that well cleaned up; make them post a bond if necessary. Let's get this well cleaned up after six years.

Response: Under environmental law, the landowner is automatically responsible for compliance with water quality standards and requirements of any permits issued to his lessees. *

Currently, ADEQ has no authority to require bonding in the groundwater quality permits program.

One of the early lab reports (1984), of contamination of well #2 indicated around 94 mg/l of cyanide. Today, the cyanide level is less than 0.20 mg/l, largely due to ADEQ's efforts and requirements. The level of nitrate has increased in this well, and elevated mercury levels have been consistently present since the earliest data for well #2. As stated in the response to comment A.1, this permit will require a hydrogeologic assessment which will address the nitrate and mercury situation.

Comment 2: Another thing we have got to worry about is City well No. 1. We are high on nitrates. The limit on nitrates is 10. That's the norm. Now, in Tombstone we have been fluctuating, different levels. We are up to 8 something now. Now, 10 could be a norm for a standard healthy person.

Response: The history of high nitrate in City well #1 predates the contamination of TEI well #2 and is related to sewage disposal practices within the City. Even during the 1970's, concentrations of nitrate were in excess of 11 mg/l. EPA has set the maximum contaminant level at 10 mg/l which has been determined safe for the total population.

COMMENTATOR C: MR. BRIAN CHADWICK (ORAL COMMENT)

Comment: I have in my possession a petition which has been signed by about 350 citizens of Tombstone supporting the issuance of a groundwater quality protection permit to PBR Minerals.

Response: The Department has received the petition and it has been documented in the facility file.

COMMENTATOR D: MR. RODNEY BELL (ORAL COMMENT)

Comment: I have not heard really anything that would be detrimental to PBR coming in here and providing a lot of us with employment and work that we need very badly around this area.

Now, if there's proof that there is some contamination that is caused by this, I can understand it; but as long as the mine is willing to comply with the regulations set down by the state and all qualified people in the authority to regulate this, I don't see why there is any reason why they should be denied a permit, and we need the employment around this area. Thank you.

Response: The Department has reviewed the design of the leaching system and gives its approval by issuance of this permit. The permittee must comply with the permit requirements. Failure to do so could result in various enforcement actions or penalties.

COMMENTATOR E: MR. DICK PETERSON (ORAL COMMENT)

Comment: I would like to voice my wholehearted support for this operation, and to give my support to you folks to issue the permit for them to operate.

Response: Your comment is noted.

COMMENTATOR F: MS. JUDY HEISER (ORAL COMMENT)

Comment: It sounds to me like the state is monitoring PBR's workings and the construction thereof to the point where if anything went wrong, the state would certainly be on top of it, and I don't see how they can possibly hurt our groundwaters.

Response: Refer to the response to comment D.

COMMENTATOR G: MR. KEN HAYS (ORAL COMMENT)

Comment: So, I'm all for it, and as long as Dustin says they will comply, and I'm sure they will. The state has set up pretty strong standards there, and why not let's go along with it.

Response: Your comment is noted.

COMMENTATOR H: MR. JAY MOYES (ORAL COMMENT)

Comment: (Mr. Moyes summarizes the fail-safe systems in the design and briefly discusses history of contamination in Tombstone area.)

This permit should be granted. It is technologically sound. It makes good economic sense. It makes good environmental sense. And I can guarantee you that when this operation is in operation and the revenues are coming from it, what you will see up there at the old site is something that you can be proud of as a city and not the situation that existed there three or four years ago.

Response: Your comment is noted.

COMMENTATOR I: MR. MICHAEL GREGORY (ORAL & WRITTEN COMMENTS)

Comment 1: It seems to me that we are dealing with some hazardous materials here, and under several laws that are not truly effective in the state of Arizona could be monitored and dealt with a little more adequately than they are in this permit. And I think the permit ought to anticipate the law and the regulations that are coming down the line and write them into the permit at this point.

Response: This permit was reviewed and developed pursuant to A.A.C. Title 9, Chapter 20, Article 2: "Requirements for Facilities Affecting Groundwater Quality". However, guidance was given the applicant and the Department's review was conducted with the proposed Aquifer Protection Permits regulations in mind. It is nearly impossible and very probably illegal to fully anticipate laws and regulations not effective in this state or at this time.

Comment 2: I think that no facility should be permitted automatically for life, but that a permit ought to be reviewed periodically; and I would strongly recommend that this permit especially not be allowed a life of more than five years at which time it ought to be reviewed and ought to be reviewed under the new regulations of the aquifer protection permit that will be coming on-line next year.

Response: First, compliance with permit conditions will be reviewed on a quarterly basis in conjunction with the quarterly interpretative report.

Second, we feel that based on the monitoring reports and their frequency and the design of the facility, that permit duration for the life of the facility is adequate. In addition, R9-20-210.C, states that an owner/operator must request a shorter permit duration.

Finally, this permit will be reviewed for compliance with the new Aquifer Protection Permits regulations after their certification.

Comment 3: Under the groundwater protection permit system you really have to pollute the water first and then you react to that. I would recommend that you put that kind of monthly assessment and quarterly reporting in for soils just as you do for water, leachate solution and so forth.

Response: The idea of leak detection systems is to maintain a first line defense to detect any failures in the system prior to groundwater pollution. If the leak detection system indicates a problem during routine weekly monitoring, steps may be taken to evaluate the extent of the problem. Those steps may include subsurface soils investigations.

Comment 4: The way their permit is written now, there is no contingency plan required until an accident has already occurred, at which point the contingency would have to be written within 30 days as I read the permit. A contingency plan should be in place as part of this permit written into it before the permit is granted.

Response: There are some specific contingency requirements in the permit, but it would be difficult to anticipate every possible occurrence and draft contingency plans for each. We have attempted to address foreseeable emergency situations and allow the permittee to contact the Department to determine corrective actions for other, less critical occurrences.

Comment 5: We will be transporting raw materials that are hazardous. The transportation routes which those materials will be going over should be identified, and a plan for evacuating people if necessary, should be in place as part of this permit. The amounts being transported and the frequencies with which they are being transported should be identified. Also, potential entry points into the drinking water supply should be identified in the permit. Essentially a safety plan is what I'm talking about should be in place as part of the contingency.

Response: The items discussed here are outside the purview of this permitting program, and are controlled by other agencies and programs.

Comment 6: The way the permit is written right now, recordkeeping is to be kept only for three years. I think that the recordkeeping also should be for the life of the facility and possibly the permit should only be three years.

Response: R9-20-215.B, requires record retention for a period of at least three years from the date of a given sample. The Department will keep monitor reports beyond the lifetime of the facility, or at least until post-closure requirements have been fulfilled to the Department's satisfaction.

Comment 7: The permit doesn't require that the closure plan be written. I would recommend that we put a closure plan into this permit, not wait until 180 days before the company may want to leave town.

Response: The permit contains the current industry standard for closure of a cyanide leaching operation. In addition the permit requires submission of a detailed post-closure plan to the Director for approval as per R9-20-216.C.

Comment 8: Also I think the permit should identify the difference between permanent closure and temporary closure. It doesn't have any such definition at the present time.

Response: There is currently no regulatory provision governing temporary closure. If a facility temporarily closes, all permit conditions must be adhered to. The proposed Aquifer Protection Permit regulations addresses the concept of temporary closure.

Comment 9: And the last point I would like to make is about transfers. The permit allows transfer of the title of the permit and that's fine; but if there is a transfer, it seems to me that would also be an appropriate time to require that the Aquifer Protection Permit come into play and that the Groundwater Protection Permit be dropped.

Response: This is a good idea and the regulation allow for this. It is likely that the Department will do this with all transfers of Groundwater Protection Permits after the APP rules are certified.

Comment 10: A.1. Containment - I presume that the term pollutants as used here refers to statutory definitions of pollution, but since the term is unclear here, it might be best to put the definition or the reference in the list of definitions.

It would also be helpful to have included in the plan a list of hazardous materials that may be on-site. I would suggest that the permit adopt certain features from the Emergency Planning and Community Right-to-know process, and require listing of maximum potential amounts of all hazardous materials to be used, stored, processed, etc.

Response: We feel the statutory definition of pollutant is sufficient, and is not necessary to repeat in permits.

The features you mention are part of the RCRA regulatory program, not the Groundwater Protection program.

Comment 11: d. Neutralized Tailing Disposal - Suggest that the weak language at the top of page 5 (shall be exercised with care) be strengthened to add specific statements of what careful handling is meant to accomplish.

Response: The phrase: "to avoid spillage" has been added for clarification.

Comment 12: Suggest quantifying amount of neutralizing material in terms of amount of cyanide on-site.

Response: We feel the proposed language in the draft permit is adequate to accomplish enforcement.

Comment 13: 6. Modification - Insert proposed before the term modification. It should not be automatically assumed (or automatic in fact) that modifications will be acceptable to the Department.

Response: The nature of the phrase "advanced written notice" indicates a proposal to modify. The current language is adequate.

Comment 14: Suggest monthly monitoring for primary constituents.

Response: Constituents to be monitored monthly are used as indicator parameters. These would indicate changes first, and as such provide adequately for prompt responses.

Comment 15: A monitoring plan should be put in place for the disposal area as well as other areas used in the process.

Response: Neutralized tailings shall be monitored on the leach pad prior to removal to the disposal area.

Comment 16: Air monitoring should be included since airborne contaminants have potential for entering wells.

Response: Aside from the limitations of placing air quality requirements in a water quality permit, we do not agree that these occurrences are valid threats.

COMMENTATOR J: MR. ERNIE ESCAPULE (ORAL COMMENT)

Comment 1: The one thing that I do recall is that all of these things are constantly monitored, are constantly worked with particular divisions of the Departments that have these laws to protect us all. But in my travels I have learned that we the people are mainly responsible for these actions. The finger gets pointed at he who is trying to do something, but there are many things that we are all contributing to our water problems. I think we should all be looking at the laws and rules and regulations and clean up our own act.

Response: Your comment is noted.

EW19 PP-6-0020-02

RECEIVED

JAN 26 1989

STATE OF ARIZONA

ADEQ-OWQ
COMPLIANCE SECTION

GROUNDWATER QUALITY PROTECTION PERMIT

PART I. AUTHORIZATION FOR FACILITY OPERATION SUCH THAT GROUNDWATER QUALITY OF THE STATE OF ARIZONA IS NOT ADVERSELY IMPACTED.

In compliance with the provisions of A.R.S. 36-1851 et seq; A.A.C. Title 9, Chapter 20, Article 2; A.A.C. Title 9, Chapter 21, Article 4; and conditions set forth in this permit:

Facility Name:

Land Owner:

Grand Central Leaching

Tombstone Development Co.

Lessee/Operator:

PBR Minerals, Inc.
950 Skyline Drive
P. O. Box 370
Tombstone, Arizona 85638

is authorized to operate the Grand Central Leaching facility located approximately one (1) mile south of Tombstone, Arizona, in Cochise County over groundwater of the Upper San Pedro Basin in Township 20 South; Range 22 East; Section 11, 12, 13, 14 - Gila and Salt River Base Line and Meridian.

This permit shall become effective on the date of the Director's signature and shall be valid for the operational life of the facility provided that the facility is operated and maintained in compliance with the specific conditions, general conditions, information documented or referenced in PART I, II, III and IV of this Permit, and the Groundwater Quality Standards and Aquifer Water Quality Standards are not violated (PART V).



J. Michael Ashworth
President
PBR Minerals, Inc.

Signed this 20th day of

January 19 89



Ronald L. Miller, Ph.D.
Assistant Director
Arizona Department of Environmental Quality

Signed this 20th day of

January 19 89

PART II. SPECIFIC CONDITIONS (R9-20-208.C.)

A. Containment/Disposal Requirements

1. Containment

The permittee is authorized to operate a hydrometallurgical precious metal recovery facility utilizing the cyanide heap leach process. Components of the facility's operation shall include an impervious lined leach pad, impervious lined leach solution containment ponds, a final recovery circuit, a lined neutralized tailings disposal area, an impervious lined cyanide mixing and container rinsing area and a storm water diversion system. The facility shall be constructed and maintained in such a manner as to prevent discharge of pollutants to the land surface or subsurface which may have an adverse impact on groundwater.

a. Heap Leach Process

Material (ore) to be processed at the facility shall be from on-site mining activities. It is anticipated that the mining will produce 350,000 tons of ore per year which will be processed by the heap leaching method. Crushed ore shall be loaded on an impervious lined pad and leached with a dilute solution of sodium cyanide with an expected 600 gpm circulation rate. "Pregnant" leach solution is treated for recovery of precious metals then returned to the leaching circuit. There shall be no surface or subsurface disposal of leach solution. All leach solution shall be contained in impervious devices and recycled within the process.

b. Leach Pad Design with Leak Detection/Collection

The leach pad shall cover an area of approximately 200,000 square feet (4.5 acres). The leach pad will be divided into four (4) equally sized segments by the installation of two (2)-foot high berms which run north to south across the leach pad. The segment berms will be installed to assist in drainage and removal of leach solution by placing a six (6)-inch perforated HDPE pipe running along the toe of the berms. The entire pad will be graded from southeast to the northwest.

The leach pad shall be lined with a flexible synthetic membrane which will be placed over a compacted clay subliner. The compacted clay subliner shall have a minimum thickness of two (2)-feet and shall be compacted to a minimum of 95 percent of maximum density as determined by ASTM D698 Method. The frequency of the field density test shall be not less than one (1) test for each 500 cubic yards of placed subliner material. There shall be at least one (1) field density test for

each lift of subliner material placed and compacted. Written records shall be maintained for each construction day, covering the subject construction activities. The written records and reports shall be in accordance with the respective Quality Control (QC) Procedures Plan as submitted and documented in the Notice of Disposal file and shall include results of all tests conducted. The original records of all daily construction testing shall be kept on-site and available for Departmental review.

The leach pad leak detection/collection system shall consist of four (4) perforated two (2)-inch HDPE pipes bedded in sand and gravel filled trenches running beneath the toe of the segment berms on the south side of the berms. The HDPE collection and conveyance pipes shall be plumbed to the leak detection manholes located on the north edge of the leach pad. All sand and gravel utilized in the leak detection system shall be approved by the liner contractor.

The 40-mil flexible membrane (FM) leach pad liner shall meet or exceed the National Sanitation Foundation minimum material properties (NSF Standard 54). Prior to installation of the FM liner, the lining contractor shall inspect and verify the subgrade to be a continuous smooth surface free of rock protrusions, nested gravels or other abrupt irregularities and that proper compaction has been achieved. Field seaming shall require a minimum overlap of six (6) inches for adjoining FM sheets and shall be seamed using industry standards. All field seams shall be tested by the Air Lance Method. Destructive shear and peel test (ASTM D4545 6.1.2. and 6.1.1.) shall be performed by an independent testing laboratory on field seaming every 500 lineal feet of seaming. The authorized installation contractor or the field service representative shall provide written certification that states installation of the liner system was performed in accordance with the manufacturer's recommendations and industry standards. Liner installation shall be supervised by a lining contractor or field service representative which has more than five (5)-million square feet of successfully installed flexible membrane lining.

c. Solution Storage Ponds with Leak Detection/Collection

The PVC pipe which shall be used to transport the leach solution from the leach pad to the pregnant pond shall be located in a flexible membrane lined trench capable of containing and draining leach solution to the pregnant pond in the event of pipe failure. The PVC pipe shall be protected from the sunlight. The PVC pipe which shall be used to transport the neutralizing solution from the leach pad to the neutralization pond shall require the

000060

same protection as required for leach solution piping. All pipes transporting leach solution from lined containment areas shall require the same protection as stated above.

The solution ponds, pregnant, barren and neutralization shall each consist of double liners of a flexible membrane material which is sunlight resistant. The solution ponds shall have a total capacity of 1.3 million gallons with maintaining one (1) foot of freeboard. The solution ponds shall have a liner system consisting of four (4) layers; first, a primary flexible membrane liner with a minimum thickness of 30-mil; underneath the primary liner shall be a geotextile drainage net for the leak detection system. The underliner shall be a flexible membrane liner with a minimum thickness of 30-mil. Underneath the flexible membrane underliner shall be a two (2)-foot thick clay subgrade which shall serve as further protection against solution leakage.

The bottom of both ponds shall be sloped to a gravel-filled leak detection/collection sump which shall be placed in between the primary flexible membrane liner and the flexible membrane underliner. A 12-inch HDPE pipe shall be plumbed to the leak detection/collection sump and shall extend to above the crest elevation of each pond to provide access for the detection and sampling of any fluid in the sump. Geomembrane liner installation and field seaming tests as described for the heap pad liner installation shall be required for pond liner installations.

d. Product Recovery and Spill Containment

Precious metals contained in the leach solution shall be recovered in the extraction plant. Leach solution in the pregnant solution pond shall be pumped to the extraction plant and then into the barren solution storage pond. The extraction plant area shall be sloped to drain to the barren solution storage pond. The concrete floor of the extraction plant shall be designed to drain to a cement sump piped to conduct flow to the barren solution pond. The cement floor structure and sump drainage shall be capable of draining all solutions being processed within the extraction plant.

e. Neutralized Tailings Disposal

The waste product (leached tailings) generated by the heap leach processing shall be rinsed and neutralized in place on the heap leach pad. Tailings shall not be removed from the heap leach pad until neutralized to contain less than 0.45 mg/Kg cyanide as per the weak-acid dissociable (ASTM Method C) analytical test method.

Transferring of neutralized tailings from the heap leach pad to the spent ore disposal area shall be exercised with care to avoid spillage and shall be supervised by PBR, Inc. management. The neutralized tailings shall not be removed from the clay-lined spent ore disposal area and shall be stacked to prevent slumping and shall not allow discharge of any material or fluids to the land surface or subsurface.

The spent ore disposal area shall be lined with a compacted clay liner with a minimum thickness of two (2)-feet and shall be compacted to a minimum of 95 percent of maximum density as determined by ASTM D698 Method. The frequency of the field density test shall not be less than one test for each 500 cubic yards of placed liner material. Written records shall be maintained for the liner construction activities. The written records and reports shall be in accordance with the respective Quality Control (QC) Procedures Plan as submitted and documented in the Notice of Disposal file. The original records of all construction testing shall be kept on-site and available for Departmental review.

f. Storm Water Protection

The entire facility site shall be protected from storm water runoff associated from a 100-year/24-hour storm water event (3.75 inches) by a series of surface water diversion devices constructed to prevent any runoff from entering the processing site or spent ore disposal area. All lined areas shall be capable of containing a 100-year/24-hour storm water event which will land on the lined areas. The pregnant and barren solution ponds shall have a normal operating capacity while maintaining a one (1)-foot freeboard. Only during precipitation events can the one (1)-foot freeboard be exceeded and at such time the storm water back-up pond shall be used to store excess solution. The storm water back-up pond shall require an impervious liner of a flexible membrane material with a minimum thickness of 30-mil with a two (2)-foot clay subgrade. Liner installation procedures, testing and record keeping shall be the same as required for the construction of the heap leach pad. The storm water back-up pond shall not be used during normal operations; it shall only be used during or after precipitation events which cause solution levels in the solution ponds to exceed the one (1)-foot freeboard operating level. Solution collected in the storm water back-up pond shall be introduced back into the leaching circuit. In the event solution in the storm water back-up pond cannot be reintroduced back into the leaching circuit within ten (10) days, it shall be neutralized to contain less than 0.20 free cyanide and transferred to the neutralization pond. A written log shall be kept

000062

daily available for Departmental review of solution entering and leaving the storm water back-up pond.

g. Chemical Storage

Sodium cyanide used in the leaching process shall be stored in "air-tight" drums in the cyanide storage area which shall have a concrete slab with six (6)-inch curbing and shall have a drainage system with an outlet to the barren solution pond and a canopy to protect the drums from sunlight and weather. A fresh water rinse pad shall be installed for washdown of the chemical containers and shall consist of a concrete slab with a six (6)-inch curbing which has a drainage system with an outlet to the barren solution pond. Empty chemical containers which have been triple rinsed shall be stored on-site until either returned to vendor or an approved landfill or recycling center. A sufficient stock of hypochlorite shall be maintained on-site for the purpose of neutralizing any cyanide in the event a spill occurs outside the areas of lined containment.

h. Domestic Sewage Disposal

Only nonresidential structures shall be built on-site to serve as an analytical laboratory, offices and storage. Domestic sewage disposal shall be by means of Cochise County approved septic tank systems. All analytical samples shall be returned to the leaching circuit so that no discard of analytical samples are to the land surface or subsurface.

2. Unauthorized Materials

- a. Materials authorized to be disposed of in all septic tanks shall be typical household sewage and shall not include laboratory materials, motor oil, gasoline, paints, varnishes, solvents, pesticides, fertilizers or other materials not generally associated with toilet flushing, food preparation, laundry facilities and personal hygiene.
- b. No commercial operations utilizing hazardous materials or creating hazardous wastes shall dispose of such materials into these systems.

3. Operational Practices

- a. TEI Well #2 shall be pumped as continuously as is practicable. Any mechanical down-time shall be minimized by expeditious repairs. This well shall be utilized as the main source for the facility's water supply to encourage continual pumping.

000063

- b. Adequate supervision and operation shall be performed to ensure that all employees of the facility are aware of and understand the containment/disposal requirements of PART II.A.
- c. All employees shall be required to attend a cyanide safety and first-aid seminar offered on-site by the chemical supplier or the Arizona State Mine Inspector.

4. Discharge Source Limits

- a. There shall be no discharge of pollutants that violate the State of Arizona Groundwater Quality Standards (A.R.S. R9-21-401, et seq.).
- b. Analytical sampling aliquots shall be returned to the heap leach solution circuit and shall not be disposed of on the land surface or subsurface.

5. Leak Detection Limits

Any fluid collected at the leak detection/collection sampling points shall not exceed a pH of 8.5 or show the presence of free cyanide in excess of 0.20 mg/l.

6. Modification

This permit is issued contingent upon the above conditions. The permittee shall give 90-days advance, written notice to the Department of any modification to the above facility.

7. Other Laws and Rules

The issuance of this permit does not waive any federal, state, county or local government rules, regulations or permits for which this facility may have to comply.

B. Monitoring Requirements, Record Keeping (R9-20-215)

1. Monitoring Type and Conditions

a. Leach Solution Monitoring

The leaching solution used in the hydrometallurgical heap leach process shall be closely monitored at least daily in the form of a water balance record. The daily water balance record shall include: The amount of fresh water added to the leaching circuit, the amount of chemicals (cyanide, lime, NaOH) added to the leaching circuit, and a daily solution level in the pregnant pond, barren pond, neutralization pond and storm water back-up pond (if any).

II. B. 1. b. Leak Detection and Collection Monitoring

The leak collection sampling points specified in PART II.A.1.b. and c. shall be monitored weekly for the presence of fluid. Any fluid collected shall be analyzed by standard field methods for pH and free cyanide. Refer to contingency requirements (PART II.C.) for action to be taken if free cyanide is detected in excess of 0.20 mg/l.

II. B. 1. c. Neutralized Tailing Disposal Monitoring

Prior to transferring neutralized spent ore from the heap leach pad to the spent ore disposal pad, the spent ore shall be sampled and assayed to assure that the material contains less than 0.45 mg/Kg of weak-acid dissociable (ASTM D4374 Method C) cyanide. Sampling shall be conducted at three (3) randomly-selected sites across the pad segment surface which has received the neutralization procedure. Samples shall be recovered by means of a bucket hand auger or a backhoe. All equipment used in recovery samples shall be cleaned before sampling and between digging each sample hole. After sampling the entire depth of the tailings, the samples will be mixed and quartered. One quarter sample from each hole will be subsequently composited with the samples from the other two (2) holes. The composite sample will then be analyzed for soluble weak-acid dissociable (WAD) cyanide in accord with ASTM D4374 Method C. The remaining three quarters of each sample will be retained pending receipt of sample results.

In the event the composite sample contains less than 0.45 mg/Kg WAD cyanide, the remaining samples can be disposed and the spent ore can be removed from the leach pad and placed on the spent ore disposal pad. If the level in the composite sample is greater than 0.45 mg/Kg WAD cyanide, all three (3) individual samples shall be assayed for WAD cyanide. Neutralization efforts shall be continued on the portion of the pad represented by the elevated level(s). Additional composite samples and neutralization efforts shall continue until the level in the pad segment to be unloaded contains less than 0.45 mg/kg WAD cyanide.

Submitted

*

Written records of all neutralized spent ore sampling locations and analytical results shall be kept by the permittee and shall be tabularized and submitted to the Department on a quarterly basis.

II. B. 1. d. Groundwater Monitoring

Groundwater quality conditions shall be monitored by one (1) down-gradient on-site pumped monitor well and two (2) (up-gradient and down-gradient) on-site passive

000065

groundwater monitoring wells. The permittee shall complete at least three (3) rounds of ambient groundwater monitoring. Enforceable Maximum Groundwater Limits (MGL) and Alert Levels shall be based on ambient groundwater quality. MGLs are equal to MCLs except in cases where ambient groundwater quality exceeds a MCL. In such a case the highest ambient groundwater quality observed for the constituent during ambient groundwater quality monitoring shall become the MGL.

Alert Levels for each groundwater monitoring constituent shall be based on the arithmetic mean for the constituent from the first three (3) rounds of ambient groundwater sampling. In calculating the mean, values reported to be below detection limit shall be regarded as one-half the detection limit. Alert Levels shall be set at the mean plus two (2) standard deviations. If Alert Levels calculated in this manner are below detection limit (analysis detection level), the Alert Level shall be set at the detection limit. If Alert Levels calculated in this manner exceed the MGL's, the Alert Level shall be set at the MGL.

Verification of an exceeded MGL or verification of an exceeded Alert Level shall require the initiation of a contingency plan.

e. Groundwater Monitoring Limits and Schedule

The following wells shall be sampled and analyzed in accordance with the constituents and frequencies listed below:

<u>Well ID</u>	<u>DWR Registration</u>	<u>DWR Location</u>
#1 Pumping Well	55-523032-C	D(20-22)14aaa
#2 Down Gradient Passive	xxxxxxx-C	x,xxx,xxx,xxx,xxx
#3 Up Gradient Passive	xxxxxxx-C	x,xxx,xxx,xxx,xxx

<u>Constituent</u>	<u>Frequency</u>	<u>Alert Level</u>	<u>MGL</u>
Cyanide (total)	Quarterly	Detection Level	0.20 mg/l
Mercury	Quarterly	Detection Level	0.002 mg/l
Arsenic	Quarterly	Detection Level	0.05 mg/l
Lead	Quarterly	Detection Level	0.05 mg/l
Silver	Quarterly	Detection Level	0.05 mg/l
Nitrate (as N)	Quarterly	Reserved	10.0 mg/l
pH	Monthly	Reserved	N/A
Calcium	Monthly	Reserved	N/A
Chloride	Monthly	Reserved	N/A
Magnesium	Monthly	Reserved	N/A

(Continued)

<u>Constituent</u>	<u>Frequency</u>	<u>Alert Level</u>	<u>MGL</u>
Potassium	Monthly	Reserved	N/A
Sodium	Monthly	Reserved	N/A
Sulfate	Monthly	Reserved	N/A
Total Dissolved Solids	Monthly	Reserved	N/A
Zinc	Monthly	Reserved	N/A

The following parameters shall be recorded immediately before each groundwater monitoring sample round:

Well ID#, Date, Time, Name of Technician
Volume of water extracted
Temperature of groundwater
pH
Specific Conductance

f. Groundwater Monitoring Protocol

Static water level shall be measured in each of the three (3) monitor wells prior to pumping and purging for a sample round. Immediately before a sampling round each well shall be purged. Purging shall consist of removing at least three (3) casing volumes of water (as measured using the static water level) or until indicator parameters are stable (Conductivity, pH and Temperature), whichever represents the greater volume. If the well recharges slowly or is pumped dry, the well shall be allowed to recover to 80% of the static water level before sampling.

The ADEQ Quality Assurance Operation Plan procedures must be followed while sampling and transporting the samples to the designated lab. Travel blanks, equipment blanks and duplicates must be obtained as stated in the Department's QA/QC document. Chain of custody protocol must be followed. Analysis for all groundwater sampling shall be performed only by laboratories certified by the State of Arizona, using USEPA approved methods. To ensure proper preservation of the samples, the receiving laboratory shall be contacted prior to sampling to ensure that all required preservatives have been added to the sample containers and to ensure that all samples shall be delivered within the maximum allowable holding times. For results to be considered accurate and valid, all analytical work shall meet all quality control standards specified by the Arizona Department of Health Services, Office of Laboratory Licensure Certification (phone number in PART III of permit). Groundwater sample results shall be submitted on the forms supplied by the Department or on a form approved by the Department prior to submittal.

000067

2. Reporting Requirements

The permittee/operator shall prepare a quarterly interpretative assessment report for the entire facility and shall include all records of all construction testing and all monitoring as required by this permit. The quarterly report submitted to the Department shall include:

a. Construction Testing Results

- (1) Compaction/Density Testing Results *OK*
- (2) Flexible Membrane Field Seaming Testing Results *NO*
- (3) Construction Status of Facility Operations *OK*

b. Leach Solution Monitoring

- (1) Daily amounts of fresh water and chemicals added to the leaching circuit. *OK*
- (2) Daily solution levels in the pregnant pond, barren pond, neutralization pond and storm water back-up pond (if any). *OK*

c. Leak Detection Monitoring

- (1) Weekly testing for the presence of fluid and if fluid is present, testing for pH and free cyanide in the four (4) leak detection manholes located in the heap leach pad.
- (2) Weekly testing for the presence of fluid and if fluid is present, testing for pH and free cyanide in the leak detection sump located in the pregnant and barren solution ponds.

d. Tailings Neutralization Monitoring

- (1) Neutralized tailings sample locations and analytical results.
- (2) The amount of neutralized tailings removed from the leach pad and placed on the spent ore disposal area.

e. Groundwater Monitoring

- (1) Quarterly analytical results for constituents with MGLs.
- (2) Monthly analytical results for constituents without MGLs.

000068

f. Corrective Actions

- (1) If exceeding any permit limit during operational monitoring, describe the actions taken.
- (2) Type and volume of any spill not contained within the leaching circuit and actions taken.

g. Reporting Frequency

Quarterly reports shall be submitted to the Department in accordance with the following schedule:

<u>Interpretative Assessment Report for:</u>	<u>Due Date</u>
Oct, Nov, Dec	Feb 1
Jan, Feb, Mar	May 1
Apr, May, Jun	Aug 1
Jul, Aug, Sep	Nov 1

If, for any reason, the permittee is unable to comply with the schedule for report submittal, the permittee shall provide the Director in writing with the following information within five (5) days of becoming aware of such a condition or five (5) days prior to due date:

- (1) A description of the cause for non-compliance with the due date; and,
- (2) The period, including exact dates of the period of non-compliance and steps that are being taken to correct the condition.

The interpretative assessment report including all monitoring forms and analytical results shall be submitted in duplicate to the following location:

Arizona Department of Environmental Quality
Office of Water Quality
Water Pollution Control Compliance Unit
2005 N. Central Avenue
Phoenix, Arizona 85004

C. Contingency Requirements (R9-20-206.D.2.)

1. Should any fluid be collected in any of the leak detection sampling points which exceed the permit limits (Part II.A.4.) or should any groundwater sample exceed the permit limits (MGLs or Alert Levels, PART II.B.1.e.), the permittee shall contact the Department's Water Pollution Control Compliance Unit (PART III) within 72 hours of being aware exceeding a permit limit. When any permit limit has been exceeded and the

000069

Department has been notified as required above, the permittee shall within 48 hours initiate a re-sampling program to verify that a permit limit has been exceeded. Upon verification, a scope of work which addresses corrective and remedial actions shall be submitted to the Department for review and comment within 30 days of a verified sample exceeding a permit limit. Upon approval by the Department, the contingency plan shall be incorporated into the permit.

2. In the event of a leach solution spill onto the land surface, it shall be neutralized immediately with a five (5) percent hypochlorite solution with a pH of greater than 10.0. A sufficient amount of hypochlorite shall be stored on-site to accommodate such or any other type of unforeseen situation. Any leach solution or chemical spill shall be reported to the Department's Water Pollution Compliance Unit and the Cochise County Health Department within 72 hours of the spill and any spill or clean-up activities (corrective actions) shall be documented in the quarterly submittal of the interpretative assessment report.

D. Post-Closure Plan (R9-20-206.D.3. and R9-20-216.C.2.)

1. The permittee shall notify the Department at least 180 days prior to abandonment of the facility. The permittee shall be required to submit a detailed post-closure plan to the Department for approval and shall be incorporated into this permit.
2. Before permanent abandonment of the facility site, the permittee shall adhere to the following procedures for closure when utilizing cyanide.
 - a. Operate the leach solution circuit for a minimum of 96 hours without the addition of cyanide, adding only fresh water and caustic soda to maintain water levels and a pH of 10 to 11. Test the leach solution for any residual free cyanide. If free cyanide is detected in concentrations of greater than 0.2 mg/l, continue with next steps ("b." and "c." hypochlorite neutralization). If free cyanide is not detected in concentrations of greater than 0.2 mg/l, go to step "e."
 - b. Run a 1% hypochlorite solution through the pregnant pond and barren pond for a minimum of 24 hours.
 - c. Run a 1% hypochlorite solution through the entire heap leaching system for a minimum of 48 hours.
 - d. Test the rinseate for free cyanide as described in PART II.B.1.a. If free cyanide is detected in concentrations of greater than 0.2 mg/l, repeat steps "a." "b." and "c." above and test for cyanide again.

Doesn't ring

- e. Allow solutions to evaporate from the ponds. Any remaining residues or sludges shall be analyzed by EPA approved test methods (Test Methods for Evaluating Solid Waste, SW-846, 2nd Edition) for the following constituents, and the results reported to the Department:

<u>Constituent</u>	<u>Limits</u>
Cyanide (Total and Free)	10 mg/l
Arsenic	5 mg/l
Barium	100 mg/l
Cadmium	1 mg/l
Chromium	5 mg/l
Lead	5 mg/l
Selenium	1 mg/l
Silver	5 mg/l

If any constituent exceeds its associated limit, the residual sludge shall be removed and disposed of at a landfill approved for handling hazardous waste.

2. The permittee shall file a report with the Department's Water Permits Unit following closure describing the results of each step of the closure plan within 60 days after closure.

E. Compliance Schedule (R9-20-219)

The permittee shall complete a site assessment and develop a closure report for the remediation of TEI Well #2 addressing whether groundwater quality standards will be maintained at the downgradient property boundary. Monthly monitoring of TEI #1, #2, and #3 groundwater wells shall be for the following constituents: NO₃-N, CN (total and free) and Hg until the Director deems necessary based on review and approval of the site assessment and closure report.

The tasks of the site assessment and submittal of the closure report shall be performed in accordance with the following schedule of compliance:

The permittee shall submit reports of compliance or noncompliance with the interim requirements of the compliance schedule within 14 days following each interim date.

1. Prior to Leaching Operations

Install the downgradient pumping monitor well and collect three (3) rounds of ambient groundwater samples for analysis of constituents listed in PART II.B.1.e. so that MGL's and Alert Levels can be established prior to initiation of the facility's leaching operation.

#1? (PBR??)

2. Three (3) Months from Permit Issuance

Complete aquifer testing (pump test) of TEI Well #2. Submit historical pumping records for TEI Well #2.

3. Six (6) Months from Permit Issuance

Submit to the Department an interpretative aquifer characteristics report including:

a. Water Table map showing groundwater flow directions with groundwater contour elevations;

b. aquifer testing results for TEI Well #2;

c. water quality data for all on-site groundwater wells since the issuance of this permit; and

d. proposed locations for additional groundwater monitoring wells (minimum of two (2)). *Passive wells?*

4. Nine (9) Months from Permit Issuance

The installations of additional monitor wells shall be completed. Submit to the Department the driller's logs for each of the wells completed and groundwater quality data for each of these wells.

5. Twelve (12) Months from Permit Issuance

Submit a closure report addressing all remedial activities and any further actions needed to establish compliance with this permit. *TEI 2 P*

PART III. REFERENCES: PERTINENT INFORMATION

A. References

The terms and conditions set forth in this permit have been developed based upon the information contained in the following:

1. Groundwater Field Inspection Form(s) dated _____

2. Notice of Disposal dated 7-22-88
3. Groundwater Impact Review (re above No. 2) dated _____
4. Plan Review File Number N/A
5. Permit Application dated 8-3-88
6. Groundwater Impact Review (re above No. 5) dated _____
7. Amendments to above Nos. 2, 4 and 5 dated _____

8. Public Notice dated 11-14-88
9. Public Hearing comments, correspondence and any additional supplemental information contained in the facility permit file.
10. Other ADEQ Water Pollution Control Compliance Unit
Phone No. (602) 257-6818
ADHS Office of Laboratory Licensure Certification
Phone No. (602) 255-1188

000073

B. Facility Information

1. Facility Contact Person Gary A. Lindroos
2. Address 950 Skyline Drive
P. O. Box 370
Tombstone, Arizona 85638
3. Emergency Telephone Number: Business (602) 457-2282
Home ()

The Department shall be notified within 30 days of a change in the facility contact person.

4. Landowner of Facility Site Tombstone Development Co.

000074

C. Definitions

1. "Abandoned" means permanent cessation of facility operation, as determined by the facility owner. Facilities which are temporarily shut down are not considered abandoned within the context of these regulations.
2. "Activity" means any human activity including institutional, commercial, manufacturing, extraction, agricultural or residential land use which may involve disposal of wastes or pollutants which may result in pollution of groundwaters of the State.
3. "Adverse impact upon groundwater quality" has the meaning ascribed to it in A.A.C. Title 9, Chapter 20, Article 2, Section R9-20-203.3, R9-20-206.A.7, R9-20-208.A, R9-20-216.B.4 and R9-20-220.A.
4. "Approved" or "approval" means approved in writing by the Director.
5. "Aquifer" means a geologic unit that contains saturated permeable material to yield usable (drinking water, agriculture, industry, etc.) quantities of water to a well or spring.
6. "Aquifer Water Quality Standards" means the standards as defined by A.R.S. 49.223.
7. "Areal composite sample" means a set of samples collected from an area and combined into a single sample. The number and spacing shall be representative of the quality of the accumulated material.
8. "Compliance Schedule" or "Schedule of Compliance" means a written document issued by the Director which identifies requirements and times for compliance with either or both the water quality standards in A.A.C. Title 9, Chapter 21 or the permit regulations in A.A.C. Title 9, Chapter 20.
9. "Composite sample" means a combination of four (4) individual portions obtained at equal time intervals for one (1) hour. The volume of each individual portion shall be directly proportional to the discharge flow rate at the time of sampling. The sampling period shall coincide with the period of maximum discharge flow.
10. "Department" means the Arizona Department of Environmental Quality (ADEQ).
11. "Director" means the Director of the Arizona Department of Environmental Quality or his duly authorized representative.

000075

12. "Discharge" means the addition, spilling, leaking, pumping, pouring, emitting or dumping of any pollutant into waters of the State from any point source.
13. "Discharge Impact Area" means the potential area extent of waste or pollutant migration as projected on the land surface as a result of a discharge or disposal from a facility.
14. "Discrete sample" means any individual sample collected in less than 15 minutes.
15. "Disposal" means the discharge, deposit, well injection, dumping, spilling, leaking, or placing of any wastes or pollutants into or on any land or water such that groundwater is or may be affected. For the purposes of this Article, irrigation with effluent from a wastewater treatment facility is disposal if the application rate exceeds that amount necessary to satisfy the consumptive use and leaching requirements of the crop or landscaping being irrigated.
16. "Disposal system" means a system for disposing of wastes either by surface or underground methods and includes sewerage systems, treatment works, disposal wells and other systems.
17. "Facility" means any system or activity in which or by which disposal occurs or has occurred on either a continuous or intermittent basis.
18. "Flow rate" means the volume per unit time given to the flow of fluids.
19. "Geologic unit" means a geologic formation, group formations or part of a formation.
20. "Groundwater" means water under the surface of the earth regardless of the geologic structure in which it is standing or moving. Groundwater does not include water flowing in underground streams with ascertainable beds and banks.
21. "Groundwater Quality Standards" means the standards in A.A.C. R9-21-403.
22. "Hazardous waste" means a waste as defined by the Federal Resource Conservation and Recovery Act (P.L. 94-580).
23. "Hydraulic conductivity" means a measure of the capability of a geologic unit to transmit a fluid.
24. "Individual disposal system" means a device or system for the treatment or disposal of sewage from a single housing unit or equivalent.

25. "Maximum Disposal Limit (MDL)" means the maximum permissible concentration for a contaminant in an effluent stream.
26. "Maximum Groundwater Limit (MGL)" means the maximum permissible concentration for a contaminant in water.
27. "Modification" means a change in the location, volume, constituent(s) or constituent concentration(s) of a disposal, which is described in the permit issued pursuant to R9-20-208.
28. "Operator" means any person who makes management decisions regarding facility operations.
29. "Owner" means any person holding legal or equitable title in any real property subject to these regulations.
30. "Permit" means a rule, certificate, letter or any other document issued by the Director authorizing and conditioning the discharge of any pollutant to groundwater from any point source or disposal of wastes from any disposal system identified in A.R.S. Sec. 36-136.G.8.
31. "Pollute" means to cause pollution.
32. "Regulations" means A.A.C. Title 9, Chapter 20, Article 2, requirements for facilities affecting groundwater quality.
33. "Sewage" means wastes from toilets, baths, sinks, lavatories, laundries and other plumbing fixtures in residences, and wastes from institutions, commercial buildings, mobile homes and other places of human habitation, employment or recreation which are similar in content to residential wastes.
34. "Site" means the area where any facility is physically located or an activity is conducted, including adjacent land used in connection with the facility.
35. "Treatment works" means any plant or other works used for the purpose of treating, stabilizing or holding wastes.
36. "Vadose zone" means the zone between the land surface and the principal zone of saturation.

000077

PART IV. GENERAL CONDITIONS: RESPONSIBILITIES

A. Permit Duration (R9-20-210)

1. Permits shall be valid for the expected operational life of the facility under the ownership as set forth in the permit unless otherwise limited by Federal or State statute or transferred pursuant to R9-20-221.C.
2. A permit may be modified or terminated pursuant to R9-20-221.
3. The owner or operator of the facility may request that a permit be issued for a duration that is less than the full allowable term.

B. Permit Rights (R9-20-214)

1. A permit does not convey any property or water right of any sort or any exclusive privilege.
2. A permit does not authorize any injury to persons or property or invasion of other private rights, or any infringement of federal, state or local laws or regulations.

C. Monitoring Requirements; Record Keeping (R9-20-215)

1. The permittee shall implement and maintain an approved monitoring system if required as a condition of a permit.
 - a. The permittee shall install, use and maintain all monitoring equipment in acceptable condition or provide alternate methods approved by the Department.
 - b. The permittee is required to conduct monitoring of a type and frequency sufficient to yield data which are representative of the monitored activity.
2. The permittee shall retain records or have access to all monitoring information for a period of at least three (3) years from the date of the sample or measurement. This period may be extended by written request of the Department at any time. Copies of records shall be furnished to the Department upon written request.
 - a. Records of monitoring information shall include but are not limited to the following:
 - (1) The date, time, exact place and name of individual(s) who performed the sampling or measuring;
 - (2) the date(s) of, and name(s) of the individual(s) who performed the analyses; and

- (3) the analytical techniques or methods used to perform the analyses.
- b. Monitoring results shall be reported at intervals specified in the permit.
- c. Calculations which require the averaging of measurements shall utilize an arithmetic mean unless it can be demonstrated by the permittee that another method would more accurately describe or be representative of the monitored activity.
3. Information submitted as a result of any well boring shall include a complete driller's log and drawings showing details of the well's construction. If information must be submitted more than once for the same well, then subsequent submittals shall note that the driller's log and construction drawings have already been submitted and the date of the initial submittal shall be documented.

D. Reporting Requirements (R9-20-216)

1. The permittee shall give 90-days advance, written notice to the Department of any modification to the facility which is not described in the approved Notice of Disposal or permit application.
2. The permittee shall notify the Department within 72 hours of becoming aware of any permit violation. The Department may require the permittee to submit a written report within 30 days documenting the following:
 - a. A description of the noncompliance and its cause;
 - b. the period of noncompliance, including exact date(s) and time(s), and the anticipated time period during which the noncompliance is expected to continue if it has not been completely corrected;
 - c. action taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance. If applicable, such action shall be in accordance with an approved contingency plan;
 - d. monitoring or other information which indicates that any waste or pollutant may cause an endangerment to an aquifer; and
 - e. noncompliance with a permit condition or malfunction of the disposal system which may cause fluid migration into or between aquifers.

3. The Department shall be notified in writing at least 180 days prior to abandonment of the facility.
 - a. The permittee may be required to submit a detailed post-closure plan to the Department for approval which shall describe what the physical condition of the facility will be on the date operations are terminated.
 - b. The Department may require the post-closure plan to include any or all of the following:
 - (1) A description of monitoring procedures to be implemented by the permittee including monitoring frequency, type and location which will be implemented to ensure post-closure activities will not violate groundwater quality standards;
 - (2) a description of procedures for maintaining existing groundwater quality protection systems;
 - (3) a schedule and description of physical inspections to be conducted at the facility following abandonment;
 - (4) a description of future land or water uses or both which may be precluded as a result of facility abandonment; and
 - (5) identification of responsibilities for post-closure cleanup or remedial action in the event of pollution of waters of the State.

E. Site Examination (R9-20-217)

1. The Department may routinely inspect the facility or an activity used for the generation, storage, treatment, collection or disposal of any waste or pollutant, and where records are kept for the purpose of determining compliance with these regulations or water quality standards, or verifying information submitted in a Notice of Disposal or permit application, or documented in a permit including any permit conditions.
2. The Department may:
 - a. Obtain samples of wastes or pollutants;
 - b. analyze or cause to be analyzed any samples either on site or at another location;
 - c. take photographs of waste and equipment processes and conditions at the site; or

000080

- d. inspect and copy any pertinent records, reports, information and test results.
3. Any pertinent information required by the permit to be maintained by the permittee shall be available for on-site inspection during normal business hours. Split samples and copies of photographs will be provided to the facility owner or operator if the owner or operator requests them at the time the sample(s) is obtained or the photograph(s) is taken as the case may be.
4. Inspections shall be conducted pursuant to the appropriate provisions of the Arizona Revised Statutes and policies established by the Department.

F. Proper Operation and Maintenance (R9-20-218)

The permittee shall at all times maintain in good working order and operate properly all treatment works installed or used for water pollution control and abatement to achieve compliance with the terms and conditions of the permit and water quality standards. If required by Article 5 of A.A.C. Title 9, Chapter 20, the permittee shall retain the services of an operator certified by the Department at the level appropriate to the permitted facility.

G. Permit Conditions (R9-20-220)

1. Duty to Mitigate

The permittee shall take all steps to minimize and correct any adverse impact on groundwater quality as defined in A.A.C. Title 9, Chapters 20 and 21 resulting from noncompliance with the permit.

2. Duty to Reapply

If a permittee has not been issued a permit for the life of the facility, a renewal application in the form of an amended Notice of Disposal or permit application shall be submitted to the Department no less than 180 days prior to expiration of the existing permit.

3. Duty to Comply

The permittee shall comply with all terms and conditions of the permit and take such action as is necessary to ensure compliance.

H. Permit Actions (R9-20-221)

1. This permit may be modified, transferred, renewed or revoked for cause. The filing of a request by the permittee for a permit action does not stay any existing permit condition.

2. Permit Modification

- a. Request for modification of a permit may be made by the permittee, the Department, or any affected person and shall identify the specific item(s) to be considered for modification.
- b. Public requests for modification of a permit shall be in writing to the Department and shall contain technical facts or reasons which justify the requested changes. The Department upon receipt of the request will notify the permittee and evaluate and determine whether any request for modification shall be granted.
- c. The permittee may be required to submit additional information, including an updated Notice of Disposal or permit application.
- d. Only those items considered for modification may be changed, and all other conditions of the existing permit will remain in effect.
- e. The following circumstances and occurrences shall require modification of a permit:
 - (1) Modification to the facility which justify application of permit conditions that are different from or absent in the existing permit;
 - (2) other information that was not available when the existing permit was issued and which justifies application of different permit conditions;
 - (3) changes in the regulations or standards upon which the permit was based which have been made after the permit was issued;
 - (4) good cause exists for changes in a compliance schedule because of conditions over which the permittee has little or no control and a change to the permit by modification is a reasonable remedy;
 - (5) reason(s) exists for revocation of the permit, and the Department determines that modification is an appropriate method for change; and
 - (6) amendment to an approved abandonment plan or contingency plan or any other portion of an approved Notice of Disposal or permit application.
- f. The suitability of the location of the facility will not be reconsidered during the process of changing the permit

000082

unless new information or change to regulations indicate that a violation of adopted groundwater quality standards exist and no other action is possible to mitigate the violation and comply with groundwater quality standards.

- g. The Department will publish a notice of intent pursuant to R9-20-223 to modify a permit before any final action is taken.
- h. With the concurrence of the permittee, the Department may make minor modifications to a permit for any of the following reasons:
 - (1) To correct typographical errors;
 - (2) to require more or less frequent monitoring or reporting by the permittee;
 - (3) to change an interim compliance date in a schedule of compliance provided the new date is not more than 60 days after the date specified in the existing permit and does not interfere with attainment of the final compliance date requirement;
 - (4) to change quantities or types of fluids discharged which are within the capacity of the facility as permitted, and in the judgment of the Department would not interfere with the operation of the facility or its ability to meet conditions prescribed in the permit, and would not change its classification if the facility is an injection well; or
 - (5) to change construction requirements approved by the Department, provided that any such alteration shall comply with the requirements of these regulations.

3. Permit Transfer

- a. This permit is transferrable to any person after 30-days advance, written notice to the Department. The Department may require modification of the permit to change the name of the permittee and incorporate any requirements which may be necessary to ensure compliance with State statutes and regulations.
- b. The permittee shall notify by registered letter a new owner or operator of a permitted facility of the existence of the permit 30 days prior to transfer of responsibility. The notice shall include a copy of the permit. A copy of the letter shall be transmitted to the Department.

000083

- c. The new owner or operator shall be responsible for compliance with the permit upon transfer of ownership or operation without regard to whether said owner or operator has in fact received the notice required by R9-20-221.C.2.
- d. Permit transfer does not absolve the previous permittee of any liability existing at or before the time the permit was transferred.

4. Permit Revocation

- a. Request for revocation of a permit may be made by the permittee, Department or any affected person.
- b. Public requests for permit revocation shall be in writing to the Department and shall contain technical facts or reasons which justify the requested action. The Department upon receipt of the request will notify the permittee and evaluate the request and determine whether any request for revocation should be granted.
- c. Revocation of a permit is initiated when the Department issues a notice of intent to revoke a permit pursuant to R9-20-223 to the permittee and may be initiated for the following reasons:
 - (1) Noncompliance by the permittee with any permit condition;
 - (2) deliberate failure by the permittee to fully disclose all relevant facts when applying for a permit;
 - (3) intentional or deliberate misrepresentation of any relevant fact at any time by the permittee; or
 - (4) if it is determined by ADEQ that the permitted activity is causing a violation of groundwater quality standards and such violation can only be regulated to acceptable levels by revoking the permit.
- d. If disposal to an aquifer causes a clear, present and immediate danger to the health or welfare of persons, the Department may immediately suspend a permit. Within 14 days of the suspension, the Department shall issue a notice of intent to revoke the permit. The permit shall be considered revoked 30 days after the notice of intent is issued by the Department unless and until a hearing is requested by the permittee pursuant to R9-20-222.

000084

I. Confidentiality of Information (R9-20-224)

1. Any information submitted to or obtained by the Department pursuant to these regulations may be claimed as confidential by the facility owner or operator. Any such claim shall be asserted at the time the information is submitted or obtained. If no claim is made at that time, the Department may make the information available to the public without further notice.
2. Claims of confidentiality for the following information shall be denied:
 - a. The name and address of any permit applicant or permittee; or
 - b. information which deals with the present or future existence, absence or level of waste(s) or pollutant(s) in water.
3. Criteria for determining confidentiality are:
 - a. A confidentiality claim has been made at the time the information was submitted or obtained;
 - b. the facility owner or operator has shown that reasonable measures have been taken to protect the confidentiality of the information and intends to continue to take such measures;
 - c. the information is not, and has not been, reasonably obtainable without the facility owner or operator's consent;
 - d. no statute specifically requires disclosure of the information; and
 - e. the facility owner or operator has shown that disclosure of the information is likely to cause harm to its competitive position; or, the information is voluntarily submitted and disclosure would be likely to impair the State's ability to obtain necessary information in the future.

J. Enforcement and Penalties (R9-20-225)

Any person who constructs, operates or maintains a facility, disposal system, or introduces wastes or pollutants to waters of the State contrary to the provisions of this permit, falsifies data or information submitted to the Department as a result of the requirements of this permit, or otherwise violates the provisions of this permit, shall be subject to enforcement and penalties pursuant but not limited to A.R.S. 36-1864.01.

000085

PART V. GROUNDWATER QUALITY STANDARDS

A. General Standards Applicable to all Groundwaters (R9-21-403)

1. Discharges of any pollutants and disposal of any wastes shall not impair the uses which have been made, are being made or will be made of groundwater for every purpose.
2. Discharges of any pollutants and disposal of any wastes to groundwaters of the State shall not cause a public health hazard.
3. Disposal of any hazardous waste, radioactive waste or other waste shall not cause toxic substances to be present in groundwaters of the State in concentrations which are or may be hazardous to public health or which interfere with present and future uses of the groundwater.
4. Discharges of any pollutants and disposal of any wastes to groundwaters of the State shall not directly or indirectly cause violation of surface water quality standards established pursuant to Article 2 of this chapter.

000086

REPORTING AREA
CONSTRUCTION

10/5/89

10 AM

PBR Minerals # 6-0020-02

During Oct. 4 and Oct 5, the Tombstone area received rainfall from Hurricane weather patterns in Mexico. I telephoned U.S. Weather Bureau (602) 261-4000, and they told me "no gauge" in Tombstone. However, Tucson received 1.25 inches and Sierra Vista received 2.12 inches of rainfall since 5 AM on October 4, 1989 (Wednesday). Lull, Nogales, AZ received 3.5 inches of rain.

PBR needs to report "water levels" in storm water pond --- this likely will be high value on Quarterly Interpretive Report.

Brad Vandermark

000087

10/3/89

PBR Minerals, Inc.

Bradley Vandermant - wpcu

11:10 AM.

Gary A. Lindross
(602) 457-2282

J. Michael Ashworth, Pres.
PBR Minerals, Inc.

(Facility) Unit: Grand Central Leaching Facility
Mr. Dusty Escapule

Dusty ~~Escapule~~ Escapule. - V.P. & Gen. Manager

- ① On on low-key ^{mode} mode. Drilling and exploration in the pit required
Major cut backs of mining staff.
- ② Facility is at 30% capacity; may go down to 20% ^{capacity} ~~over~~.
- ③ ~~By~~ Back up to > 30% capacity within "eight weeks."
- ④ State mine inspector came by on Oct 2, 1989 (Monday)
- ⑤ I left him my name and number.

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Inter-Office Memorandum

DATE: September 14, 1988

TO: Rob Larson
Water Permits Unit

THRU: Debra Daniel, Manager *DD*
State Permits Hydrology Unit

FROM: Bruce K. Thatcher, Jr., Hydrologist *BKT*
State Permits Hydrology Unit

RE: PBR Minerals, Inc. Application for a Groundwater Quality Protection Permit (Revised)

Regarding response two in the August 26, 1988 letter from Jim Rouse; the two passive monitoring wells are preferred, while the "active" monitoring well is strictly optional. I have no problem with a water supply well located down-gradient of the passive downgradient monitor well. In the revised Groundwater Quality Protection Permit application see page 3-3, paragraph 6; page 7-1, paragraph 3; and page 7-1, paragraph 5.

In the event of groundwater contamination, I recommend that a pump test be performed at the "pumping" well (if installed) downgradient of the facility. The passive monitor wells could be used as observation wells. This test will enable the determination of aquifer parameters used to define the pumping well's capture zone. See page 8-1, paragraph 2.

Post-closure monitoring of the passive monitor wells should be conducted for five years and include major ions (including NO_3), total cyanide, free cyanide and mercury. See page 9-1, paragraph 4.

The revision has not addressed the hydraulic conductivity of the clay liner beneath the heap leach piles which should be a maximum of 1×10^{-7} cm/sec. Laboratory data and/or field data should be submitted to ADEQ which verifies that the above conductivity value will not be exceeded. In addition, the revision has not addressed collecting samples of the barren and pregnant solutions for analysis. Parameters should be identical to the monitoring wells. The sampling frequency should be annual. This data will be of value when evaluating the groundwater monitoring well analytical data for potential contamination.

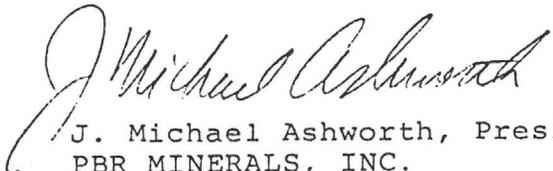
BT:d1

000089

PBR MINERALS, INC.
P.O. Box 370
Tombstone, Arizona 85638
(602) 457-2282

April 20, 1989

As of this date, PBR Minerals has completed the construction of its heap leaching facility in Tombstone, Arizona, in accordance with and in compliance to the plans and specifications as set forth in the State of Arizona Groundwater Quality Protection Permit No.G-0020-02.


J. Michael Ashworth, President
PBR MINERALS, INC.

RECEIVED

MAY 2 - 1989

**ADEQ - OWQ
COMPLIANCE SECTION**

000090

COCHISE TESTING LAB, INC.

Civil Engineering
and Surveying
Construction Surveys/Design
Construction Management
Environmental

Hydrology/Hydraulic Studies
Construction Materials Testing
Concrete/Soils/Asphalt
Percolation Testing
Inspection/Quality Control
Structural Engineering

FULL ENGINEERING SERVICES Local, Statewide & International

March 30, 1989
Job #89-12

GR-0000-02

PBR Minerals, Inc.
P O Box 370
Tombstone, AZ 85638

Attention: Gary Lindroos

Subject: Field Density Tests
Waste Disposal Pad

Gentlemen:

At the request of Gary Lindroos, personnel of our firm performed tests at the subject property on March 30, 1989.

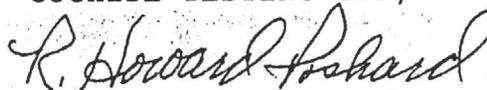
A total of 3 tests were taken by the nuclear probe test method. The results of the field tests are attached. Curve used has been previously reported.

Tests were taken at random locations selected by Gary on subbase fill.

If you have any questions regarding this report, please contact us.

Respectfully Submitted,

COCHISE TESTING LAB, INC.



R. Howard Poshard
Lab Manager

RECEIVED

MAY 2 - 1989

ADEQ - OWQ
COMPLIANCE SECTION

FRED HEWITT, PE, LS
Vice President

(602) 459-7369

Locally Owned and Operated

316 Bartow Drive
Sierra Vista, AZ 85635

R. HOWARD POSHARD, A.E.T.
Laboratory Manager

(602) 458-6654
000091

SUMMARY (FIELD DENSITY TEST RESULT.
WASTE DISPOSAL PAD

TEST NO.	DATE	TEST LOCATION	ELEVATION OF TEST	MOISTURE % DRY WT.	DRY DENSITY PCF	LAB COMP. CURVE	RELATIVE COMP.	SPECIFIED RELATIVE COMP.
EAST WASTE DISPOSAL AREA								
3-30-89		65' N & 50' E of SW Corner of Pad	100.0	7.7	100.8	100.2	100	95
3-30-89		110' N & 35' E of SW Corner of Pad	100.0	9.4	100.5	100.2	100	95
3-30-89		120' S & 40' E of NW Corner of Pad	100.0	9.7	100.3	100.2	100	95

FINISH PAD ELEVATION = 100.0 Feet

NOTE: Accepted testing procedures were used for these tests. The above data is presented for information purposes only. In the absence of continuous observations of our personnel at the site, we cannot express an opinion as to the adequacy of site preparation or overall fill compaction. We do not undertake the guarantee of construction, nor do we relieve the contractor of his primary responsibility to produce a completed project conforming to the project plans and specifications.

000092

F-3 FILL OBSERVATION & TESTING

Project No. 89-12

Technician H. P. SHAW

Date 3-30-89

Approved By _____

Daily Report No. 2

TEST NO	LOCATION	DEPTH OR ELEVATION (FEET)	LABORATORY		FIELD		PERCENT COMPACTION	SOIL TYPE
			MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)		
1	EAST WASTE DISPOSAL AREA 65' N & 50' E OF SW CORNER OF PAD	100.0'	100.8	20.0	100.8	7.7	100	IMPERT SILTY SANDY GRAVEL
2	110' N & 35' E OF SW CORNER OF PAD	100.0'	100.8	20.0	100.5	9.4	100	IMPERT " " "
3	120' S & 40' E OF NW CORNER OF PAD	100.0'	100.7	20.0	100.3	9.7	100	IMPERT " " "

FINISH PAD ELEVATION = 100.0 FT

SPECIFICATION COMPACTION & MATERIAL

TYPE AND NUMBER OF EARTH MOVING UNITS

TYPE AND NUMBER OF COMPACTION UNITS

NUMBER OF PASSES

THICKNESS OF LIFT

METHOD OF ADDING MOISTURE

FILL TESTED MEETS SPECIFICATIONS.
 FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S) AND SHOULD BE REMOVED OR REWORKED
 CONTRACTOR ADVISED

OBSERVATIONS
 Texture of material and moisture content appear to be uniform

000093

COCHISE TESTING LAB, INC.

Civil Engineering
and Surveying
Construction Surveys/Design
Construction Management
Environmental

FULL ENGINEERING SERVICES
Local, Statewide & International

Hydrology/Hydraulic Studies
Construction Materials Testing
Concrete/Soils/Asphalt
Percolation Testing
Inspection/Quality Control
Structural Engineering

254N

March 13, 1989
Job #89-12

G-0020-02

PBR Minerals, Inc.
P O Box 370
Tombstone, AZ 85638

**Subject: In-Place Density Tests
Tailings Pad**

Gentlemen:

Personnel of our firm performed tests at the subject project on March 13, 1989.

A total of 4 tests were taken by nuclear probe test method. A sample of the material was returned to the laboratory for a moisture density relations. The results of the laboratory and field tests are attached.

Tests were taken at random locations selected by our personnel on a waste disposal pad.

If you have any questions regarding this report, please contact us.

Respectfully submitted,

COCHISE TESTING LAB, INC.



R. Howard Poshard
Lab Manager

FRED HEWITT, PE, LS
Vice President

Locally Owned and Operated

R. HOWARD POSHARD, A.E.T.
Laboratory Manager

(602) 459-7369

316 Bartow Drive
Sierra Vista, AZ 85635

(602) 458-6654

000094

SUMMARY OF FIELD DENSITY TEST RESULTS
WASTE DISPOSAL PAD

TEST NO.	DATE	TEST LOCATION	ELEVATION OF TEST	MOISTURE % DRY WT	WET/DRY DENSITY PCF	LAB. COMP. CURVE PCF	RELATIVE COMP. %	SPECIFIED RELATIVE COMP. %
1	3-13-89	70' SOUTH & 20' EAST OF NW CORNER OF PAD	98.0	8.2	104.7	100.2	100+	95
2	3-13-89	90' SOUTH & 45' EAST OF NW CORNER OF PAD	100.0	10.8	105.9	100.2	100+	95
3	3-13-89	110' NORTH & 48' EAST OF SW CORNER OF PAD	98.0	13.2	107.0	100.2	100+	95
4	3-13-89	60' WEST & 82' NORTH OF SE CORNER OF PAD	100.0	12.1	106.3	100.2	100+	95

*FINISH BACKFILL ELEVATION = 100.0'

MOISTURE DENSITY RELATIONS PER ASTM D698-A
SOIL DESCRIPTION: SANDY SILT - STOCKPILE EAST OF SITE
MAXIMUM DRY DENSITY, PCF: 100.2
OPTIMUM MOISTURE CONTENT, %: 20.0

NOTE: Accepted testing procedures were used for these tests. The above data is presented for information purposes only. In the absence of continuous observations of our personnel at the site, we cannot express an opinion as to the adequacy of site preparation or overall fill compaction. We do not undertake the guarantee of construction, nor do we relieve the contractor of his primary responsibility to produce a completed project conforming to the project plans and specifications.



F-3 FILL OBSERVATION & TESTING

Project No. WASTE DISPOSAL PAD

Technician D. POSENER

Date 3-13-89

Approved By _____

Daily Report No. 1

TEST NO	LOCATION	DEPTH OR ELEVATION (FEET)	LABORATORY		FIELD		PERCENT COMPACTION	SOIL TYPE
			MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)		
	<u>Waste Disposal Pad</u>							
<u>1</u>	<u>70'S & 20'E OF NW CORNER OF PAD</u>	<u>98.0'</u>	<u>100.2</u>	<u>20.0</u>	<u>104.7</u>	<u>8.2</u>	<u>100+</u>	<u>IMPART SAND SILT</u>
<u>2</u>	<u>90'S & 45'E OF NW CORNER OF PAD</u>	<u>100.0'</u>	<u>100.2</u>	<u>20.0</u>	<u>105.9</u>	<u>10.8</u>	<u>100+</u>	<u>" " "</u>
<u>3</u>	<u>110'N & 48'E OF SW CORNER OF PAD</u>	<u>98.0'</u>	<u>100.2</u>	<u>20.0</u>	<u>107.0</u>	<u>13.2</u>	<u>100+</u>	<u>" " "</u>
<u>4</u>	<u>60'W & 82'N OF SE CORNER OF PAD</u>	<u>100.0'</u>	<u>100.2</u>	<u>20.0</u>	<u>106.3</u>	<u>12.1</u>	<u>100+</u>	<u>" " "</u>

SPECIFICATION COMPACTION & MATERIAL FINISH PAD ELEVATION = 100.0 FT

TYPE AND NUMBER OF EARTH MOVING UNITS

TYPE AND NUMBER OF COMPACTION UNITS

NUMBER OF PASSES THICKNESS OF LIFT
METHOD OF ADDING MOISTURE

FILL TESTED MEETS SPECIFICATIONS.
 FILL TESTED DOES NOT MEET SPECIFICATIONS AS INDICATED BY TEST NO.(S) AND SHOULD BE REMOVED OR REWORKED
 CONTRACTOR ADVISED

OBSERVATIONS
Moisture and texture of soil appear to be uniform in consistency.

9600096

JULY, 1988

REPORT

GEOCHEMICAL EVALUATION OF CLAY-SUBLINER MATERIAL

Prepared For:

PBR Minerals Inc.
Tombstone, Arizona



GEOCHEMICAL ENGINEERING
INCORPORATED

000097

TABLE OF CONTENTS

Page

1.0	Purpose and Scope	
2.0	Introduction	
3.0	Geochemical Program	
3.1	Preparation of Heap-Leach Solution	
3.2	Geochemical Characterization of Clay - Subliner Material	
3.2.1	Mineralogical Results	
3.2.2	Geochemical Properties	
3.2.3	Geochemical Evaluation	
3.3	Sequential Batch Testwork	
3.3.1	Testwork Procedures	
3.3.2	Discussion of Results	
4.0	Conclusions	



GEOCHEMICAL ENGINEERING
INCORPORATED

000098

1.0 PURPOSE AND SCOPE

This Geochemical Report was prepared in support of PBR Minerals' "Application for a Ground-Water Quality Protection Permit" for a gold mining and heap-leaching facility to be located south of the town of Tombstone, Cochise County, Arizona. The report summarizes the results and conclusions from laboratory testwork conducted to evaluate the geochemical attenuation ability of locally available clay-bearing material which is to be used in the construction of clay-subliners for process water impoundments and leach pads.

The principal objectives of the laboratory program were twofold:

- (1) determine the mineralogical and geochemical properties of the clay-subliner material; and
- (2) confirm through laboratory testwork whether the clay-subliner material can retard or attenuate the movement of chemical constituents that may be present in seepage.



GEOCHEMICAL ENGINEERING
INCORPORATED

000099

2.0 INTRODUCTION

PBR Minerals, Inc. is submitting a permit application to operate a gold mining and heap-leaching facility in Cochise County, Arizona. The facility will include a conventional heap-leaching circuit. Where crushed ore will be loaded on a low-permeability pad and leached with a dilute solution of sodium cyanide. Gold-bearing solutions collected from the heap leach will be treated to recover precious metals and then recycled. Spent ore will be neutralized and left in place.

The leach pad and process water ponds will be lined with synthetic membranes which will be placed over compacted clay subliners. The clay subliners can serve two purposes. In addition to acting as a geotechnical barrier to seepage movement, the clay subliners can function as a geochemical barrier to contaminant migration. If the clay-subliner material has the right geochemical properties, the clay can interact with chemical constituents which may be present in seepage. Under the right conditions such interactions can lead to geochemical reactions that fix and immobilize constituents and remove them from solution. Examples of such geochemical mechanisms include cation- and anion-exchange, sorption, precipitation and coprecipitation. Performing in this way, a clay subliner can introduce one additional safeguard against contaminant migration.



GEOCHEMICAL ENGINEERING
INCORPORATED

000100

3.0 GEOCHEMICAL PROGRAM

The geochemical program that was implemented for PBR Minerals was designed to complement geotechnical and geohydrological investigations at the site. The program consisted of laboratory analyses and testwork on clay-bearing material that was targeted for use in the construction of impoundment and leach pad subliners.

Specific objectives of the laboratory program included the following:

- (1) prepare a synthetic heap-leach solution that resembled possible seepage solutions;
- (2) determine the mineralogical and geochemical properties of the clay-subliner material; and
- (3) evaluate in sequential batch tests the ability of the clay-subliner material to act as a geotechnical trap and retard the migration of chemical constituents present in seepage.

3.1 Preparation of Heap-Leach Solution

The synthetic cyanide solution which was utilized in the clay subliner evaluation studies was prepared at Core Laboratories, Aurora, Colorado, from samples of ore and well water provided by Mr. Gary Lindroos, Technical Superintendent, PBR Minerals, Inc. Care was taken to assure that the heap-leach solution would be representative of the heap-leaching practices



GEOCHEMICAL ENGINEERING
INCORPORATED

000101

TABLE 3-1

CHEMICAL ANALYSIS OF SYNTHETIC HEAP-LEACH SOLUTION

PARAMETER	CONCENTRATION, in mg/l
pH (units)	11.6
Arsenic	0.07
Barium	0.06
Cadmium	0.09
Chromium	<0.01
Lead	<0.01
Mercury	0.0474
Selenium	0.04
Silver	2.03
Total Cyanide	115.
Free Cyanide	120.
Weak-Acid-Dissociable Cyanide	138.



GEOCHEMICAL ENGINEERING
INCORPORATED

000102

anticipated at PBR Minerals. The solution was synthesized from actual ore that will be processed in the PBR Minerals heap-leach circuit and by using water from the No. 2 well at the site. Cyanide and lime were added in proportions that would duplicate leaching conditions in the heap. The matrix that PBR Minerals anticipates using is 1 pound NaCN and 4 pounds lime per ton of ore.

Duplicating this matrix, the heap-leach solution was prepared by agitating a mixture of 10 pounds of ore composite, 9 grams of lime, 2.5 grams of NaCN in 10 liters of water, for about 24 hours. The procedure is described in more detail in the testwork protocols included with the analytical report from Core Laboratories that is appended to this report. At the conclusion of the procedure, the mixture was settled and the cyanide solution was decanted. Chemical analysis of this synthetic heap-leach solution is presented in Table 3-1.

The solution that is profiled in Table 3-1 resembles the heap-leach fluids that would come into contact with clay-subliner material in the unlikely event of liner leakage. The solution is alkaline (pH 11.6), enriched in cyanide concentrations, and contains traces of arsenic, cadmium, and mercury. The synthetic cyanide solution contains silver at a concentration of 2.03 mg/l. This concentration of silver reflects the fact that no attempt was made to recover the precious metal from solution. Silver and gold will be recovered during commercial plant operations.

3.2 Geochemical Characterizations of Clay-Subliner Materials

A sample of the clay-subliner material was analyzed for mineralogical and geochemical properties at Core Laboratories, Aurora, Colorado. Mineralogical identification consisted of quantitative x-ray diffraction analysis to determine bulk mineralogy and relative clay abundances. Geochemical evaluation



GEOCHEMICAL ENGINEERING
INCORPORATED

000103

involved laboratory analyses of the sample for geochemical properties to include the following:

- cation-exchange capacity and exchangeable cations
- acid-soluble iron and manganese
- organic carbon content
- soil pH
- base neutralizing potential

3.2.1 Mineralogical Properties

The x-ray diffraction analyses completed on the bulk sample and on the clay-size fraction are summarized in Table 3-2. The analysis indicates that the subliner material is calcereous and contains various clay minerals. The mineral calcite (CaCO_3) constitutes the major percentage (46% by weight) of the bulk material. Clay minerals constitute a smaller but significant fraction (24% by weight). The principal clay-forming minerals in this fraction are the mixed-layer smectite or montmorillonite type of clay minerals. Kaolinite and illite make up a minor percentage of the total clay-mineral phase.

3.2.2 Geochemical Properties

The results of geochemical analyses completed on the clay-subliner sample are presented in Table 3-3. The size of the clay-size fraction was determined by qualitative clay separation techniques. Cation-exchange capacity was measured by using the sodium acetate extraction procedure; exchangeable bases were



GEOCHEMICAL ENGINEERING
INCORPORATED

000104

TABLE 3-2

MINERALOGICAL PROPERTIES OF CLAY-SUBLINER SAMPLE

CONSTITUENT	BULK MINERALOGY
	(wt %)
Quartz	24
Feldspar	06
Plagioclase	02
K-Feldspar	04
Calcite	46
Clay Minerals	<u>24</u>
	100%
CONSTITUENT	RELATIVE CLAY ABUNDANCES
	(wt %)
Kaolinite	09
Chlorite	---
Illite	16
Mixed-layer, Illite/Smectite	<u>75</u>
	100%



GEOCHEMICAL ENGINEERING
INCORPORATED

000105

TABLE 3-3

GEOCHEMICAL PROPERTIES OF CLAY-SUBLINER SAMPLE

PARAMETER	UNITS	VALUE
Moisture (Air-Dry)	%	4.13
Clay Content	%	35.0
Cation-Exchange Capacity	meq/100g	14.7
Exchangeable Cations:		
Calcium	meq/100g	39.3
Magnesium	meq/100g	3.64
Sodium	meq/100g	1.07
Potassium	meq/100g	0.23
Acid-Soluble Iron	%	0.61
Acid-Soluble Manganese	%	0.02
Total Organic Carbon	%	0.11
Soil pH	pH units	7.58
Base Neutralizing Potential		



GEOCHEMICAL ENGINEERING
INCORPORATED

000106

determined by using a soluble cation extraction procedure in combination with an ammonium acetate extraction procedure. Organic carbon was analyzed using a modified Walkley-Black acid-digestion method, and the amount of iron and manganese hydrous oxides present was estimated by soaking the sample in dilute hydrochloric acid and measuring the iron and manganese that were solubilized in the process.

The clay-subliner sample contains about 35 percent clay-size material and shows a moderate cation-exchange capacity (14.7 meq/100 g). Calcium is the predominant exchangeable cation, suggesting that any smectite or montmorillonite clay is calcium saturated. The discrepancy between the reported exchangeable calcium and the total cation-exchange capacity of the sample is related to the presence of CaCO_3 in the material. Calcium-bearing minerals such as calcite are slightly soluble in the ammonium acetate solution that is used in the exchangeable cation procedure. Dissolution of the calcite interferes in the exchangeable calcium analyses.

As expected, the clay-subliner sample is low in organic carbon content (0.11% by weight). The results of iron analyses suggest that traces of iron hydrous oxides may be present in the material. The soil pH of the clay-subliner sample is near-neutral. However, the sample shows an ability to neutralize the pH of alkaline solutions.

3.2.3 Geochemical Evaluation

Overall, the clay-subliner sample shows very favorable mineralogical and geochemical properties. The properties suggest that the clay-subliner material can geochemically interact with seepage solutions and immobilize potential ground-water contaminants.



GEOCHEMICAL ENGINEERING
INCORPORATED

000107

The material is enriched in clay minerals, especially in mixed-layer type clays such as montmorillonite. Montmorillonite-type clays are well known for their ability to undergo cation-and anion-exchange reactions with chemical constituents and to immobilize potential ground-water contaminants. Likewise, the material contains traces of organic carbon and iron hydrous-oxide impurities which can be beneficial. Organic carbon can act as a chemical reducing agent and the iron hydrous oxides can scavenge and sorb chemical constituents from ground water.

Although the soil pH of the clay-subliner sample is slightly alkaline, the material has the ability and capacity to neutralize the alkaline pH of potential cyanide seepage solutions. By neutralizing the alkaline pH, conditions are established that promote degradation or attenuation of cyanide. Cyanide volatilization becomes significant when the pH of seepage solution is reduced below approximately 9.4; sorption of cyanide by natural clay-bearing materials is more efficient at less alkaline pH.

3.3 Sequential Batch Testwork

Sequential batch testwork is a laboratory procedure that is commonly used to evaluate the attenuation ability of clay-liner materials. Sequential batch testwork is described in more detail by Houle and Long (1980). The procedures simulate continuously leached columns wherein successive seepage solution comes in contact with fresh clay-subliner material that can effect attenuation of potential contaminants. The procedure can simulate years of potential field seepage through a clay subliner in a few days of laboratory testwork.



GEOCHEMICAL ENGINEERING
INCORPORATED

000108

3.3.1 Testwork Procedures

A schematic of the sequential batch test that was designed for the PBR Mineral's geochemical program is illustrated in Figure 3-1. The procedures consisted of mixing measured portions of clay-subliner material and the synthetic heap-leach solution discussed in section 3.1 and gently agitating the slurry in rolling bottles for a period of 24 hours. At the conclusion of each test in the series, the solution was sampled for chemical analysis and, after filtering, the liquid and solid portions were advanced in sequence according to the matrix illustrated in Figure 3-1.

3.3.2 Discussion of Results

Table 3-4 summarizes the results of chemical analyses completed on leachate samples from each batch test. The results are reported on a dissolved basis since leachate samples were filtered through 0.45 μm prior to analysis. For comparison purposes, the chemical profile of the synthetic heap-leach solution used in the testwork is included in Table 3-4.

The pH measurements presented in Table 3-4 clearly show the pH buffering capacity of the clay-subliner material. Contact of the heap-leach solution with the clay material in each test neutralized the alkalinity of the solution from pH 11.6 to pH of about 8-9. As expected, the greatest amount of neutralization was observed in batch tests A1, A2, and A3, where the solution to solids ratio was 1:1. However, the alkalinity (pH 11.6) of the heap-leach solution was reduced significantly even in batch test C1 (pH 9.31), where the solution to solids ratio was 3.1. By neutralizing the alkalinity of



SEQUENTIAL BATCH TESTWORK - PBR MINERALS, INC.

CLAY - SUBLINER SAMPLE

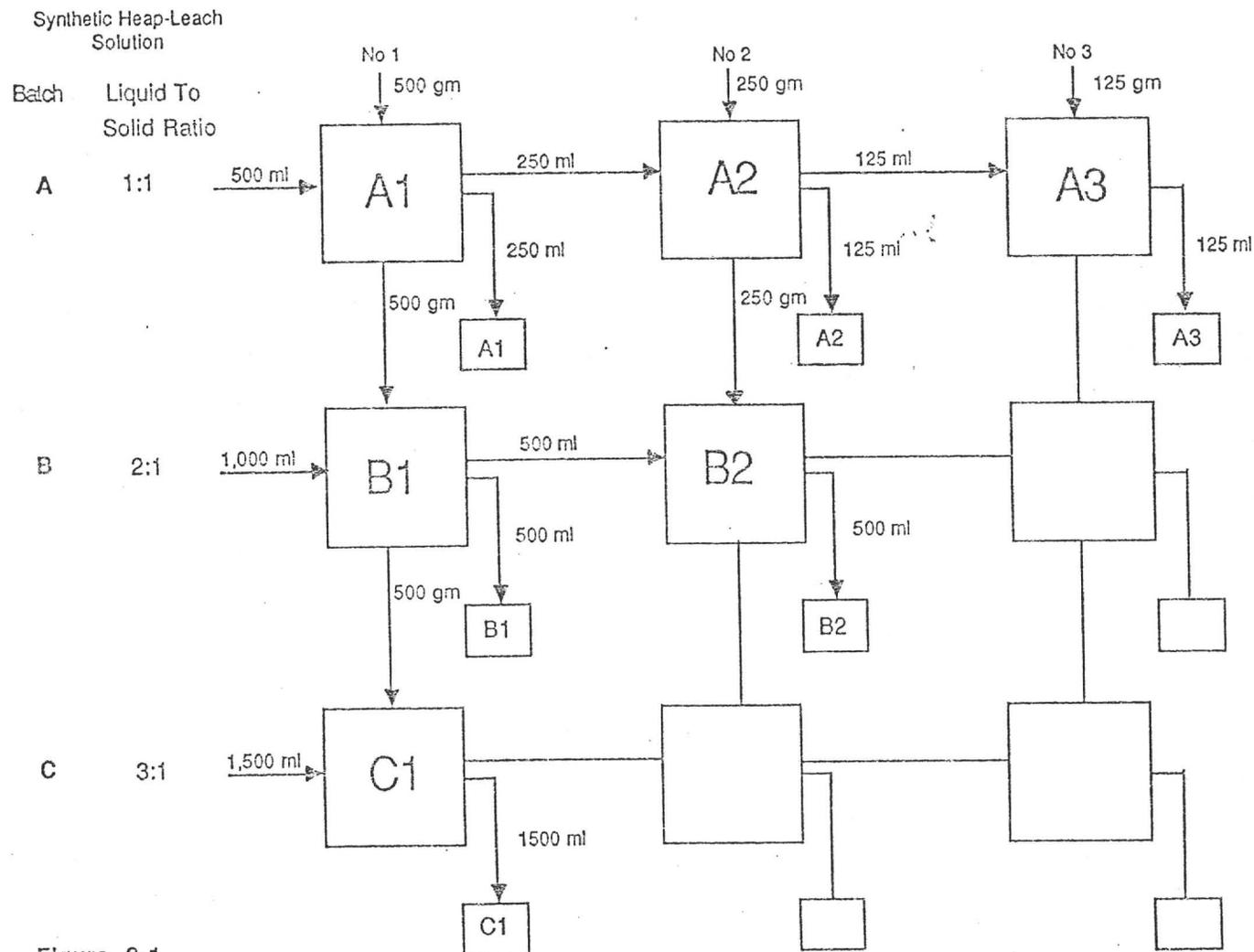


Figure 3-1

000110



TABLE 3-4

CHEMICAL ANALYSES OF SOLUTIONS FROM SEQUENTIAL BATCH TESTS

PARAMETER	SYNTHETIC HEAP-LEACH SOLUTION	CONCENTRATION, in mg/l					
		A1	A2	A3	B1	B2	C1
pH (pH units)	11.6	7.90	7.31	7.51	9.03	8.28	9.31
Arsenic	0.07	0.01	<0.05	<0.05	<0.01	0.01	<0.01
Cadmium	0.09	0.02	0.01	<0.01	0.05	0.03	0.07
Mercury	0.0474	0.001	<0.0025	0.0005	0.0008	0.0006	0.0042
Total Cyanide	115.	72.8	41.6	15.8	98.8	55.2	87.6
Free Cyanide	120.	92.4	37.2	16.6	95.6	62.8	100.
Weak-Acid Dissociable Cyanide	138.	83.6	33.2	4.2	81.6	50.0	83.6



GEOCHEMICAL ENGINEERING
INCORPORATED

000111

the heap-leach solution, pH conditions are established that promote the functioning of geochemical mechanisms which remove potential ground-water containments from solution.

The arsenic, cadmium, and mercury analyses summarized in Table 3-4 confirm that the clay-liner material is capable of scavenging heavy metals and removing chemical constituents from solution. Arsenic, for example, which was present in the heap-leach solution at a concentration of 0.07 mg/l was not detected in most of the samples from the batch tests. The solutions from batch test A1 and B2 did report 0.01 mg/l arsenic. Arsenic will be immobilized from solution by any number of geochemical mechanisms. Under neutral to slightly acid pH conditions, arsenic in the form of the monovalent arsenate (H_2AsO_4^-) anion will undergo exchange with montmorillonite-type clays. In addition to anion exchange with clay minerals, arsenic is likely to undergo adsorption and precipitation reactions with common clay impurities. For example, arsenic may be adsorbed on hydrous oxides of iron or may be precipitated as an insoluble arsenate by metals such as iron, copper, or zinc.

Similar geochemical mechanisms (cation-exchange, adsorption, and precipitation) are probably responsible for removing cadmium and mercury from the heap-leach solution during the batch testwork. The effectiveness of these reactions are illustrated in samples A1, A2, and A3.

Neutralizing the alkaline pH of the heap-leach solution had a pronounced effect on the cyanide concentrations reported in the batch test solutions. Prior to contact with clay-subliner material, the synthetic heap-leach solution used in the sequential batch testwork contained over 100 mg/l cyanide. With each contact, the concentrations of cyanide were reduced. The solution sample



GEOCHEMICAL ENGINEERING
INCORPORATED

000112

from batch test A3 reported about 16 mg/l total cyanide and about 4 mg/l WAD cyanide. These concentrations represent a decrease of 86 and 97 percent in the total and WAD cyanide levels, respectively, from the start of the batch tests.

Volatilization is a major physiochemical mechanism that will degrade and retard the movement of cyanide through the clay subliner. Neutralizing the alkaline pH of the heap-leach solution reduces the pH into a range where significant cyanide volatilization can occur. Cyanide volatilization becomes significant when the pH is reduced below 9.4.



GEOCHEMICAL ENGINEERING
INCORPORATED

000113

4.0 CONCLUSIONS

The results of the geochemical analyses and the sequential batch testwork lead to the following conclusions:

1. The mineralogical and geochemical properties of the clay-subliner sample are typical of natural materials which retard or attenuate the movement of chemical constituents.
2. The principal clay-forming minerals in the clay-subliner sample are smectite or montmorillonite-type clays. Trace amounts of organic carbon and iron hydrous-oxides are present in the material. Most importantly, the clay-subliner material is capable of neutralizing the alkaline pH of heap-leach solutions.
3. By neutralizing alkalinity, favorable pH conditions are established which promote the functioning of geochemical mechanisms which immobilize heavy metals such as arsenic, cadmium, and mercury, and degrade or volatilize cyanide.
4. Sequential batch testwork confirms that the clay-subliner material will interact with any unlikely seepage and is able attenuate potential ground-water contaminants such as arsenic, cadmium, mercury, and cyanide.



GEOCHEMICAL ENGINEERING
INCORPORATED

000114

REBORING 24413
LEIGH SCOURTON

3/2/90

File this as
if it is dated
Sept 30, 1989

BKV (ADEQ)

PBR MINERALS, INC.
P.O. BOX 370
TOMBSTONE, ARIZONA 85638
(602) 457-2282

RECEIVED
JAN 30 1990
ADEQ - OWQ
COMPLIANCE SECTION

January 23, 1990

← FILED LATE
PAST DUE DATE

RECEIVED

JAN 30 1990

ADEQ - OWQ
COMPLIANCE SECTION

Arizona Department of Environmental Quality
Office of Waste and Water Quality Management
Water Pollution Control Compliance Unit
2005 N. Central Avenue
Phoenix, Arizona 85004

Dear Sirs:

Please find enclosed our Quarterly Interpretative Assessment Report for the period of July thru September, 1989.

Should you have any questions concerning this report, please feel free to contact me at the number listed above.

Sincerely,

PBR MINERALS, INC.

Gary A. Lindroos
Technical Superintendent

GAL:cr

3rd Quarter 1989

000115

09/08/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	4.46	359,000	H2O	20,000 Gallons
	Barren	8.26	843,000	NaCN	500 Kg's
	Neutral	4.46	359,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	12.5 Tons

09/09/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	3.99	311,000	H2O	15,000 Gallons
	Barren	8.58	892,000	NaCN	1,000 Kg's
	Neutral	4.62	375,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	12.5 Tons

09/10/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	4.15	327,000	H2O	10,000 Gallons
	Barren	7.15	682,000	NaCN	500 Kg's
	Neutral	4.94	409,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	12.5 Tons

09/11/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	4.94	409,000	H2O	60,000 Gallons
	Barren	6.68	618,000	NaCN	500 Kg's
	Neutral	5.09	427,000	Lime	None Pounds
	Storm	5.57	53,000	Cement	12.5 Tons

09/12/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	4.46	359,000	H2O	5,000 Gallons
	Barren	7.63	749,000	NaCN	500 Kg's
	Neutral	4.46	359,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	12.5 Tons

08/31/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	6.68	618,000	H2O	30,000 Gallons
	Barren	3.51	266,000	NaCN	1,000 Kg's
	Neutral	0.66	42,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	25 Tons

09/01/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	7.15	682,000	H2O	50,000 Gallons
	Barren	3.83	296,000	NaCN	1,000 Kg's
	Neutral	0.66	42,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	25 Tons

09/02/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	6.84	639,000	H2O	40,000 Gallons
	Barren	4.15	327,000	NaCN	Kg's
	Neutral	0.51	31,000	Lime	Pounds
	Storm	0.35	1,000	Cement	Tons

09/03/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	6.20	557,000	H2O	30,000 Gallons
	Barren	4.62	375,000	NaCN	Kg's
	Neutral	0.82	52,000	Lime	Pounds
	Storm	0.82	2,000	Cement	Tons

09/04/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	6.52	597,000	H2O	40,000 Gallons
	Barren	4.94	409,000	NaCN	1,000 Kg's
	Neutral	1.30	85,000	Lime	None Pounds
	Storm	0.19	500	Cement	25 Tons

09/05/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	5.89	518,000	H2O	40,000 Gallons
	Barren	5.41	462,000	NaCN	1,000 Kg's
	Neutral	1.46	96,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	25 Tons

09/06/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	4.15	327,000	H2O	40,000 Gallons
	Barren	6.52	597,000	NaCN	500 Kg's
	Neutral	2.56	182,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	12.5 Tons

09/07/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	4.15	327,000	H2O	10,000 Gallons
	Barren	8.73	917,000	NaCN	500 Kg's
	Neutral	3.99	311,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	12.5 Tons

000117

08/23/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	5.89	518,000	H2O	20,000 Gallons
	Barren	3.83	296,000	NaCN	1,000 Kg's
	Neutral	1.14	74,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	25 Tons

08/24/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	5.25	444,000	H2O	20,000 Gallons
	Barren	4.46	359,000	NaCN	500 Kg's
	Neutral	1.30	85,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	12.5 Tons

08/25/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	4.94	409,000	H2O	10,000 Gallons
	Barren	5.25	444,000	NaCN	500 Kg's
	Neutral	1.30	85,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	12.5 Tons

08/26/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	3.99	311,000	H2O	10,000 Gallons
	Barren	5.73	499,000	NaCN	Kg's
	Neutral	0.82	52,000	Lime	Pounds
	Storm	0.35	1,000	Cement	Tons

08/27/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	4.15	327,000	H2O	Gallons
	Barren	5.73	499,000	NaCN	Kg's
	Neutral	0.98	63,000	Lime	Pounds
	Storm	0.35	1,000	Cement	Tons

08/28/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	4.94	409,000	H2O	20,000 Gallons
	Barren	5.25	444,000	NaCN	1,000 Kg's
	Neutral	0.82	52,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	25 Tons

08/29/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	5.41	462,000	H2O	10,000 Gallons
	Barren	4.78	392,000	NaCN	500 Kg's
	Neutral	0.98	63,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	25 Tons

08/30/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	5.73	499,000	H2O	20,000 Gallons
	Barren	4.62	375,000	NaCN	1,000 Kg's
	Neutral	0.98	63,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	25 Tons

08/15/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	4.78	392,000	H2O	30,000 Gallons
	Barren	3.99	311,000	NaCN	500 Kg's
	Neutral	0.98	63,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	25 Tons

08/16/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	5.25	444,000	H2O	30,000 Gallons
	Barren	4.46	359,000	NaCN	500 Kg's
	Neutral	0.82	52,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	25 Tons

08/17/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	4.78	392,000	H2O	40,000 Gallons
	Barren	4.94	409,000	NaCN	None Kg's
	Neutral	0.82	52,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	12.5 Tons

08/18/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	5.57	481,000	H2O	40,000 Gallons
	Barren	4.15	327,000	NaCN	1,000 Kg's
	Neutral	0.98	63,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	25 Tons

08/19/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	6.04	538,000	H2O	20,000 Gallons
	Barren	3.67	280,000	NaCN	Kg's
	Neutral	0.82	52,000	Lime	Pounds
	Storm	0.35	1,000	Cement	Tons

08/20/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	6.36	577,000	H2O	20,000 Gallons
	Barren	3.20	237,000	NaCN	Kg's
	Neutral	0.98	63,000	Lime	Pounds
	Storm	0.19	500	Cement	Tons

08/21/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	6.68	618,000	H2O	30,000 Gallons
	Barren	3.51	266,000	NaCN	1,000 Kg's
	Neutral	0.98	63,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	25 Tons

08/22/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	7.15	682,000	H2O	30,000 Gallons
	Barren	2.88	209,000	NaCN	500 Kg's
	Neutral	1.14	74,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	12.5 Tons

000119

08/07/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	1.46	96,000	H2O	70,000 Gallons
	Barren	4.78	392,000	NaCN	None Kg's
	Neutral	0.35	21,000	Lime	None Pounds
	Storm	0.66	1,000	Cement	None Tons

08/08/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	1.61	100,000	H2O	65,000 Gallons
	Barren	5.25	444,000	NaCN	1,000 Kg's
	Neutral	0.51	31,000	Lime	None Pounds
	Storm	0.66	1,000	Cement	25 Tons

08/09/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	3.99	311,000	H2O	30,000 Gallons
	Barren	5.41	462,000	NaCN	500 Kg's
	Neutral	0.82	52,000	Lime	None Pounds
	Storm	0.66	1,000	Cement	25 Tons

RECEIVED
 JAN 30 1990
 ADEQ - OWQ
 COMPLIANCE SECTION

08/10/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	4.15	327,000	H2O	30,000 Gallons
	Barren	5.25	444,000	NaCN	1,000 Kg's
	Neutral	0.98	63,000	Lime	None Pounds
	Storm	0.66	1,000	Cement	25 Tons

08/11/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	4.46	359,000	H2O	40,000 Gallons
	Barren	4.94	409,000	NaCN	1,000 Kg's
	Neutral	0.98	63,000	Lime	None Pounds
	Storm	0.66	1,000	Cement	25 Tons

08/12/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	4.78	392,000	H2O	Gallons
	Barren	4.78	392,000	NaCN	Kg's
	Neutral	1.14	74,000	Lime	Pounds
	Storm	0.51	1,500	Cement	Tons

08/13/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	5.09	427,000	H2O	Gallons
	Barren	4.30	343,000	NaCN	Kg's
	Neutral	1.14	74,000	Lime	Pounds
	Storm	0.35	1,000	Cement	Tons

08/14/89	PONDS...			SYSTEM...	
		Sol.Lvl.	Gallons		Added:
	Preg	5.57	481,000	H2O	20,000 Gallons
	Barren	3.67	280,000	NaCN	1,000 Kg's
	Neutral	0.98	63,000	Lime	None Pounds
	Storm	0.35	1,000	Cement	25 Tons

000120

G-0020-02

RECEIVED

JUL 27 1989

ADEQ - OWQ
COMPLIANCE SECTION

PBR MINERALS, INC.
P.O. BOX 370
TOMBSTONE, ARIZONA 85638
(602) 457-2282

July 26, 1989

Arizona Department of Environmental Quality
Office of Waste and Water Quality Management
Water Pollution Control Compliance Unit
2005 N. Central Avenue
Phoenix, Arizona 85004

Dear Sirs:

Please find enclosed our Quarterly Interpretative
Assessment Report for the period of April thru June, 1989.

Should you have any questions concerning this report,
please feel free to contact me at the number listed above.

Sincerely,

PBR MINERALS, INC.



Gary A. Lindroos
Technical Superintendent

GAL:cr

000121

LEACH SOLUTION MONITORING DAILY REPORT

DATE: 4-18-85

TIME SAMPLED	WATER ADDED	NaCN ADDED	LIME ADDED	OTHER ADDED	SOLUTION LEVEL	GALLONS
					0	0
					5.41	462,000
					7.94	775,000
					3.57	20,000

RECEIVED
 JUL 2
 ADEQ - OWG
 COMPLIANCE SECTION

LEACH SOLUTION MONITORING DAILY REPORT

DATE: 4-19-89

TIME SAMPLED	WATER ADDED	NaCN ADDED	LIME ADDED	OTHER ADDED	SOLUTION LEVEL	GALLONS
					0	0
REC					5.89	518,000
ARREN					6.99	660,000
EUTRAL.					6.04	64,000
TORM H2O			50 NaOH	400 H ₂ O		

RECEIVED
 JUL 27 1000
 ADEQ - OWQ
 COMPLIANCE SECTION

LEACH SOLUTION MONITORING DAILY REPORT

DATE: 4-20-89

TIME SAMPLED	WATER ADDED	NaCN ADDED	LIME ADDED	OTHER ADDED	SOLUTION LEVEL	GALLONS
					0	0
					5.09	457,000
					7.31	704,000
					6.36	72,000

REC
ARREN
EUTRAL.
FORM H20

RECEIVED
JUL 27 1989
ADEQ - OWQ
COMPLIANCE SECTION

LEACH SOLUTION MONITORING DAILY REPORT

DATE: 4-21-89

TIME SAMPLED	WATER ADDED	NaCN ADDED	LIME ADDED	OTHER ADDED	SOLUTION LEVEL	GALLONS
					0	0
					4.78	392,000
					7.47	720,000
			50# NaOH	400 Hypo	6.68	70,000

RECEIVED
 JUL 27 1989
 ADEQ - OWQ
 COMPLIANCE SECTION

IB.1.a

PBR MINERALS, INC.
P.O. BOX 370
TOMBSTONE, ARIZONA 85638
(602) 457-2282

May 1, 1989

G-0019-02
20

Arizona Department of Environmental Quality
Office of Water Quality
Water Pollution Control Compliance Unit
2005 N. Central Avenue
Phoenix, Arizona 85004

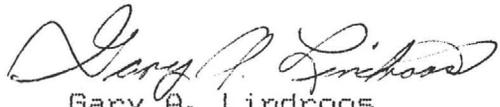
Dear Sirs:

Please find enclosed our Quarterly Interpretative
Assessment Report for the period of January thru March, 1989.

Should you have any questions concerning this report,
please feel free to contact me at the number listed above.

Sincerely,

PBR MINERALS, INC.



Gary A. Lindroos
Technical Superintendent
and Vice President

GAL:cr

RECEIVED

MAY 2 - 1989

ADEQ - OWQ
COMPLIANCE SECTION

000141

G-0020-02

Date	Time	Pond	Water Depth	Gallons	PH	GM (lb/70)	Soiled Inch Water At
1-23-89	0700	SPRAY	5.25'	444,456.58	10.30	0	-
-	2230	SPRAY	5.89'	518,49.62	10.30	0.9	73,963.01
-	2430	SPRAY	-	-	10.50	1.8	-
1-24-89	0130	SPRAY	-	-	10.60	1.9	-
-	0230	SPRAY	-	-	10.40	1.8	-
-	0400	SPRAY	-	-	10.60	2.0	-
-	0500	SPRAY	-	-	10.60	1.8	-
-	0600	SPRAY	-	-	10.60	1.8	-
-	1030	SPRAY	6.20'	557,295.65	10.60	1.7	38,876.03
1-25-89	1000	SPRAY	5.57'	480,815.04	10.48	1.3	-
-	1000	PREG	1.30'	84,788.15	10.35	1.1	-
1-26-89	1000	SPRAY	4.46'	358,845.99	10.40	1.4	-
-		PREG	2.25'	156,359.04	10.31	0.9	-
-		Neutralization	0.08'	9,200	-	-	-
1-27-89	0930	PREG	4.46'	358,845.99	0.9	10.26	-
	0935	BARREN	5.09'	426,736.73	1.4	10.55	-
	0925	Neutralization	0.08'	9,200	0.9	<0.01	34,280
1-28-89	1000	PREG	5.41	462,481			
	1002	BARREN	3.99	310,971			
	1005	Neutralization	0.08	9,200			
	1007	Storm Water	1.93	7,000			
1-29-89	0930	PREG	5.89	518,000			
	0932	BARREN	6.36	571,000			321,542
	0935	Neutralization	0.08	9,200			
	0938	Storm Water Pond	1.93	7,000			
1-30-89	0910	PREG	6.20 6.68	557,000 618,000			
	0913	BARREN	6.68	618,000			89,000
	0915	Neutralization	0.08	9,200			
	0920	Storm Water	1.93	7,000			

000142

REPORTING PART C
LEAK PROTECTION

LEAK DETECTION SEE
REPORTS BY PBR
GROUNDWATER MONITORING

000202

REPORTING - PART D.
TAILS NEUTRALIZATION

RECEIVED

MAY 2 - 1991

ADEQ - OWQ
COMPLIANCE SECTION

ad 4 Neutralization

G-0020-02

Pad 1 Weak Acid Dissociable
L site Total CN 0.18 mg/k

Time	Sample ID	mg/L Free Cl	mg/L Free CN	Remarks
2-20-89 0835	Pad 4 Return	0.50	0.50	Spray started at
- 1000	" 4 "	1.45	0.05	0500 hrs 2-19-89
- 1400	" 4 "	1.20	<0.01	
- 1600	" 4 "	1.30	<0.01	
- 1800	" 4 "	1.25	<0.01	
2-21-89 0800	" 4 "	0.90	<0.01	Sprays off
2-23-89	Pad 4 Composite	Total CN 0.21 mg/k		Weak Acid Dissociable
		Free Cl	Free CN	
2-21-89 0800	Pad 3 Return	0.95	<0.01	Sprays started 1400
1200	Pad 3 Return	0.30 0.30 ^{0.30}	<0.01	Hours 2-20-89
1600	Pad 3 Return	0.40	<0.01	
2-24-89	Pad 3 Composite	Total CN 0.30 mg/k		Weak Acid Dissociable
2-22-89 1900	Pad 2 Return	1.05	0.04	Spray started 1300 hrs
2-23-89 0100	✓	2.20	<0.01	
0700	-	1.85	<0.01	
1000	-	1.40	<0.01	
1400	✓	0.90	<0.01	
2-24-89	Weak Acid Dissociable Pad 2 Composite		Total CN 0.22 mg/k	
		Free Cl	Free CN mg/k	
2-24-89 1700	Pad 1 Return	0.45	0.80	Start Sprays 1200
2400	✓	1.20	0.30	
2-26-89 0600	✓	1.75	0.03	
1000	✓	2.10	<0.01	
1600	✓	2.00	<0.01	Sprays off
	Weak Acid Dissociable Pad 1 Composite		Total CN 0.24 mg/k	

000203

302

Date & Time	Pnd No.	Spray Info	Mg/L		Weak Acid Disinfectant
			Free Chlorine	Free CU	Total CU Mg/K
2-27-89 1400	4	Start Sprays	-	-	-
2400	4	Return Solution	0.95	0.15	
2-28-89 0600	4	" "	3.10	< 0.01	
0800	4	" "	2.95	< 0.01	
2-28-89	4	Tails	-	-	0.18
2-28-89 1100	3	Start	-	-	
1500	3	Return	0.65	0.20	
3-1-89 2400	3	Return	4.80	< 0.01	
0700	3	Return	2.15	< 0.01	
3-1-89	3	Tails			< 0.01
3-1-89 1200	2	Start Sprays			
3-1-89 1600	2	Return	0.40	0.65	
3-2-89 1300	2	Return	2.10	< 0.01	
3-2-89	2	Tails	-	-	0.36
3-2-89 1700	1	Start Sprays	-	-	
✓ 2300	1	Return	6.40	< 0.01	
3-3-89 0700	1	Return	5.20	< 0.01	
3-3-89	1	Tails	-	-	0.025
3-3-89 0900	4	Start Sprays	-	-	
3-4-89 0700	4	Return	4.60	< 0.01	
3-4-89	4	Tails			0.18

000204

Date	Time	Pad No.	mg/L free Cl	mg/L free CN	Total CN Weak Acid Dis.
3-4-89	1030	start 3	-	-	-
-	1500	3	1.20	0.02	
3-5-89	0730	3 Pad 3 Tails	3.90	<0.01	0.32
3- 5 ⁵ -89	0950	start 2	-	-	
-	1630	2	7.20	<0.01	
3-6-89	0630	2 Pad 2 Tails	5.40	<0.01	0.18
3-7-89	1100	start 4	-	-	
-	1400	4	6.05	0.08	
3-8-89	0715	4 Pad 4 Tails	6.40	<0.01	0.26
3-8-89	0930	start 1	-	-	
-	1530	Return 1	10.10	<0.01	
3-9-89	0715	Return 1 Pad 1 Tails	7.50	<0.01	0.04
3-9-89	1500	start 3	-	-	
3-10-89	0700	Return 3 Pad 3 Tails	51.10	<0.01	<0.01
3-10-89	1630	start 3	-	-	
3-11-89	0715	Return 3 Pad 2 Tails	7.60	<0.01	0.12
3-11-89	1400	start 1	-	-	
3-12-89	0815	Return Pad 1	1.20	0.15	
3-12-89	1500	"	4.60	0.06	
3-13-89	0800	"	40.60	<0.01	
3-14-89		Pad 1			0.30

000205

Date	Sample ID	Prod No	free chlorine Mg/L total	free Cu Mg/L	Total Cu weak Acid Dissociable
3-14-89	Start 0800	3	-	-	-
3-14-89	Return 1530	3	7.40	0.08	-
3-15-89	Return 0700	3	78.60	<0.01	-
3-15-89	Tails Comp.	3	-	-	0.26
3-14-89	Start 1400	2	-	-	-
3-15-89	Return 0700	2	64.30	<0.01	-
	Tails Comp.	2	-	-	0.18
3-16-89	Start 0800	0800	-	-	-
✓	Return 2300	2300	50.70	<0.01	-
-	Tails Comp				0.06
3-16-89	Start 1100	3	-	-	-
3-16-89	2300 Return	3		0.14	-
3-17-89	0700 Return	3	140	<0.01	-
3-17-89	Tails Comp	3	-	-	<0.01
3-17-89	Start 1400	4	-	-	-
3-18-89	Return 0730	4	60	<0.01	-
✓	Return 1030	4	55	<0.01	-
✓	Tails Comp	4			0.18
3-19-89	Start 0700	1	-	-	-
✓	Return 1500	1	70	0.14	-
3-20-89	Return 0700	1	40	<0.01	-
✓	Tails Comp	1	-	-	0.26
3-21-89	Start 1100	3	-	-	-
-	Return 1530	3	85	0.08	-
3-22-89	Return 0715	3	60	<0.01	-
-	Tails Comp	3	-	-	<0.01

000206

Date	Sample I.D.	Time	Pat No	mg/L free chlorine	mg/L free CN	Weak Acid Dissociable Total CN
3-22-89	Start	1100	2	-	-	-
3-23-89	Return	0200	2	125	<0.01	
-	Return	0730	2	80	<0.01	
-	Tails Comp		2	-	-	<0.01
3-23-89	start	1000	4	-	-	
-	Return	1800	4	65	<0.01	
3-24-89	Return	0700	4	40	<0.01	
-	Tails Comp		4	-	-	0.12
3-24-89	start	0930	1	-	-	
3-25-89	Return	0700	1	90	<0.01	
3-25-89	Tails Comp		1	-	-	0.26
3-25-89	start	1100	3	-	-	
-	Return	1600	3	35	0.02	
3-25-89	Return	0630	3	80	<0.01	
-	Tails Comp		3	-	-	0.12
3-26-89	start	1400	2	-	-	
3-27-89	Return	0715	2	95	<0.01	
-	Tails Comp		2	-	-	<0.01
3-27-89	start	0930	4	-	-	
-	Return	1530	4	40	0.18	
3-28-89	Return	0700	4	55	<0.01	
-	Tails Comp		4	-	-	0.06
3-28-89	start	0900	1	-	-	
-	Return	1400	1	125	0.02	
3-29-89	Return	0715	1	80	<0.01	
-	Tails Comp		1	-	-	0.22

000207

Date	Sample ID.	Pad No	Mg/L Free Chlorine	Mg/L Free Cu	Total CN Weak Acid Dissociable
3-29-89	Start 0930	3	-	-	
-	Return 1430	3	55	<0.01	
3-30-89	Return 0645	3	70	<0.01	
	Tails Comp	3	-	-	<0.01
3-30-89	Start 1100	2	-	-	
3-31-89	Return 0645	2	85	<0.01	
-	Tails Comp	2	-	-	0.12
3-31-89	Start 0930	4	-	-	
	Return 1500	4	105	0.08	
4-1-89	Return 0700	4	60	<0.01	
-	Tails Comp.	4	-	-	<0.01
4-1-89	Start 1145	2	80	2	
-	Return 8200	2	80	<0.01	0
✓	Tails Comp	2	-	-	0.06
4-1-89	Start 1900	1	-	-	
✓	Return 0630	1	105	<0.01	
4-2-89	Tails Comp	1			<0.01
4-2-89	Start 0930	4	75		
✓	Return 1700	4	75	<0.01	
4-2-89	Tails Comp	4	-	-	0.18
4-3-89	Start 0700	3	-	-	
✓	Return 1500	3	50	<0.01	
✓	Tails Comp.	3			<0.01
4-3-89	Start 1700	2	-	-	
4-4-89	Return 0700	2	105	<0.01	
	-				000208

REPORTING PART 15
GROUNDWATER MONITORING

PBR MINERALS, INC.
P.O. BOX 370
TOMBSTONE, ARIZONA 85638
(602) 457-2282

April 20, 1989

Arizona Department of Environmental Quality
Office of Waste and Water Quality Management
Compliance Section
2005 North Central Avenue
Phoenix, Arizona 85004

Re: Permit No. G-0020-02

Dear Sirs:

The following is the field summary for the months of
January, February, and March, 1989.

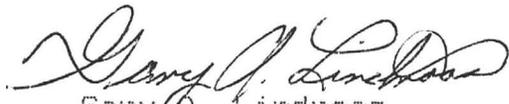
<u>LOCATION</u>	<u>FREE CYANIDE</u>	<u>LAB ANALYSIS</u>
TEI Well No. 1	Mg/L	< 0.01
TEI Well No. 2	Mg/L	< 0.01
Leak Detection Systems	--No Moisture Detected--	

Please be advised that the Method of Analysis for all
samples was HACH DR 1/A Colorimeter. As you know, TEI Well
No. 3 is obsolete, therefore no testing was performed.

Should you have any questions pertaining to this report,
please feel free to contact me at the number listed above.

Sincerely,

PBR MINERALS, INC.


Gary A. Lindroos
Vice President and
Technical Superintendent

RECEIVED

APR 24 1989

ADEQ - OWQ
COMPLIANCE SECTION

GAL:cr

Enclosures (3)

000209