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UNITED NUCLEAR-HOMESTAKE PARTNERS
P. O. BOX 98
GRANTS, NEW MEXICO
87020

RECEIVED
APR 17 1981
RADIATION PROTECTION SECTION

April 16, 1981

Bill Fleming
Radiation Protection Bureau
New Mexico Environmental Improvement Division
P.O. Box 968
Santa Fe, New Mexico 87503

Re: Letter to State Engineer

Dear Bill:

Attached, for your information and files, is a copy of a letter submitted by Homestake Mining Company to the State Engineers Office concerning that agency's question of going to 100 feet of beach at the tailings facility. It is Homestake's feeling that the material presented justifies the 50 feet of beach requirement currently existing in their operating license, and request approval to remain at 50 feet.

If you have any questions concerning this material, please don't hesitate to contact me.

Very truly yours,

HOMESTAKE MINING COMPANY

Edward E. Kennedy

Edward E. Kennedy
Direct of Environmental Aff rs

EEK/jel

Attachment

cc: J. M. Parker (w/o attachment)

Denmedy

HOMESTAKE MINING COMPANY
P.O. BOX 98
GRANTS, NEW MEXICO 87020

April 14, 1981

Mr. S. E. Reynolds, State Engineer
Bataan Memorial Building
Santa Fe, New Mexico 87503

Dear Mr. Reynolds:

Attached please find a copy of a letter from D'Appolonia to me dated April 10, 1981 and entitled "Results of Phreatic Level Study for Resolution of Beach width Question". I believe that this report will resolve the 100 foot beach question and would ask that you approve the 50 foot beach as required in our license. If you feel that a meeting would be helpful please let me know.

Yours truly,

HOMESTAKE MINING COMPANY

J.M. Parker

J. M. Parker, P.E.
General Manager

JMP:jg

Attachment

D'APPOLONIA

CONSULTING ENGINEERS, INC.

Alan K. Kuhn, Ph.D., P.E.
PROJECT SUPERVISOR

April 10, 1981

Project No. RM80-311

Mr. John Parker
General Manager
Homestake Mining Company
P.O. Box 98
Grants, New Mexico 87020

Results of Phreatic Level Study
for Resolution of Beach Width Question

Dear Mr. Parker:

On December 30, 1980, the State Engineer's office provided written comments on the Engineer's Report, Stability Assessment, Uranium Mill Tailings Pond, United Nuclear-Homestake Partners submitted in November, 1980, by D'Appolonia Consulting Engineers (D'Appolonia). In that letter the State Engineer postulated that the slope stability safety factors reported in the above report were based on the maintenance of a 100 feet beach. The State Engineer also requested an additional study using Casagrande or diaphragm type piezometers to verify the low phreatic levels monitored in the embankment by 0.01 inch slotted PVC piezometer screens. The need for a 100 feet beach was postulated by the State Engineer to be directly tied to the need for a low phreatic level within the embankment.

In order to address the State Engineer's concern about the accuracy of piezometric measurements, D'Appolonia agreed to perform a comparitive study of piezometers. On February 18, 1981, D'Appolonia submitted a proposed plan for installing six Casagrande-type open standpipe piezometers at one section of the Homestake Mining Company (Homestake) embankment. These piezometers were to be located near existing slotted screen piezometers on the beach, crest and downstream slope portions of the embankment. The Casagrande piezometers were to be placed at depths above the measured phreatic levels in the slotted screen piezometers but below the State Engineer's postulated phreatic level.

The Casagrande piezometers were installed by Homestake personel under the direction of a D'Appolonia engineer during the period March 18-20, 1981. The Casagrande piezometers are two-feet long, 60 micron porous stones, 1 inch I.D. and 1.5 inch O.D. The stones were attached to 1/2 inch diameter PVC riser pipe.

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BECKLEY, WV CHESTERTON, IN DENVER, CO HOUSTON, TX LAGUNA NIGUEL, CA
PITTSBURGH, PA WILMINGTON, NC BRUSSELS, BELGIUM SEOUL, KOREA

The installation of the Casagrande piezometers was made by drilling a four-inch diameter hole with compressed air. The drilling was performed by Homestake personnel using their trailer mounted rotary rig and a portable air compressor. When the boring reached the designated depth the drill rod was removed and a 3 inch steel pipe was placed into the hole to prevent caving during piezometer installation. The steel casing was held above the designated sensing zone by the use of the clamp and blocking configuration shown on the typical installation diagram, Figure 1. Compressed air was used to create a pocket below the steel casing for insertion of the Casagrande piezometer. The Casagrande piezometer was then mounted to 1/2 inch schedule 40 PVC pipe and placed with the tip at least two feet below the steel casing. Once the Casagrande piezometer was in place the annulus between the PVC riser pipe and the steel casing was backfilled with tailings sand and cemented with Portland cement around the top to prevent infiltration of surface water. The annulus around the outside of the steel casing was also backfilled with tailings sand and cemented with Portland cement at the ground surface to provide protective rigidity to the PVC riser pipe. Finally, the piezometer number was labeled on the protective steel casing and the piezometer cap.

The piezometers were labeled UNHP1 through UNHP6 and were installed on the West pond of the embankment on the section designated 2-2' in the November, 1980, Engineer's Report. UNHP1 and UNHP2 are located within a few feet of the D'Appolonia screen piezometer DB80-16 and have respective tip elevations of 6632.5 and 6618.9 feet. UNHP3 and UNHP4 are near the D'Appolonia screen piezometer DB80-17B with tip elevations of 6615.6 and 6596.9 feet, respectively. The last two Casagrande piezometers, UNHP5 and UNHP6, are near the D'Appolonia screen piezometer DB80-18 and have tip elevations of 6600.4 and 6590.9 feet, respectively. The relationship of the Casagrande piezometers to the D'Appolonia screened piezometers is shown on Figure 2.

In addition, Figure 2 shows the relation of the Casagrande piezometers to the soil stratification under the crest of Section 2-2'. This soil profile was previously reported in the November, 1980, Engineer's Report and has been updated to show the pond level and phreatic surface of April 3, 1981.

During installation of Casagrande piezometers, borings for UNHP1, UNHP2, UNHP5, and UNHP6 were dry, while UNHP3 and UNHP4 both had wet zones near the bottom of the piezometer borings. On March 20, 1981 the piezometers were flushed and sensitivity tested with all piezometers returning to their original measured depth within 30 minutes after discontinuation of flushing.

The piezometer readings taken for both the Casagrande piezometers and the PVC screen piezometers are summarized for the period March 20 through April 7, 1981 on Table 1. Of the six Casagrande piezometers two (UNHP5 and UNHP6) have been dry throughout the measuring period. One other piezometer (UNHP1) has been dry on two occasions, but on April 7 contained almost one foot of water. Casagrande piezometer UNHP2 has shown a slow rise in water level, measuring 0.4 foot higher on April 7th than on March 20th. Both piezometers UNHP3 and UNHP4 on the crest centerline have remained at a fairly consistent level throughout the measuring period.

On the downstream slope side of the embankment, the Casagrande piezometers (UNHP5 and UNHP6) show no saturation at their sensing levels, which indicates that the slotted screen piezometer DB80-18 is measuring the proper phreatic surface. This phreatic surface remained nearly constant throughout the measuring period and is only 3.5 feet below the tip of the lower Casagrande piezometer, UNHP6.

At the crest centerline of the embankment both Casagrande piezometers (UNHP3 and UNHP4) show measurable water levels. The soil stratigraphy under the crest of section 2-2', Figure 2, readily indicates the reason for the water in UNHP3. The position of UNHP3 directly above a five foot thick clay lense indicates that UNHP3 is monitoring a perched water table. The water in this zone builds up when the downward seeping pond water contacts the impermeable clay. The perched water is shallow and has very little potential lateral extent (see other embankment cross sections in the November, 1980 Engineer's Report). The potential effect of a small perched water table as measured on Section 2-2' on overall slope stability would be lost within the general uncertainity level inherent in limit equilibrium slope stability analysis. The water level in UNHP4 is on the average only 2.5 feet above the level indicated in DB80-17B. This difference may be due to the impedence caused by slight stratification of fine material combined with the different sensing zone locations for the two piezometers. The difference is not significant to the actual stability of the embankment.

The Casagrande piezometers UNHP1 and UNHP2 on the beach at section 2-2' both show water levels above the slotted screen piezometer DB80-16. This may result from one of the following two possible causes:

- Thin layers of fine material stratified within the silty sand mass might horizontally divert non-saturated downward flow from the pond, producing small saturated zones (perched water).

- The higher water levels measured in the successively higher sensing zones might indicate that downward saturated seepage flow is occurring below the pond surface. In this case, the pond would act as an elevated source, feeding into the the largely downward saturated vertical flow. The successively lower phreatic levels measured by UNHP1, UNHP2, and finally DB80-16 would indicate drops in head or potential along the nearly vertical flow path.

Neither of the above possibilities may be completely proved or disproved using the presently available data. Since precise soil characterization on the beach at section 2-2' was not the goal of the previous sampling program, exact location of small lenses (a few inches or less in thickness) of fine materials is not possible. Therefore, the potential for small perched zones may not be directly ascertained.

The most conservative assumption is the latter of the two possible causes. This assumption has been used to date when performing the slope stability analysis. The general saturated flow pattern from this assumption is shown on Figure 2 with a rough representation of the equipotential flow lines sketched on the drawing. It is obvious from this representation that the upper piezometers measuring head at their respective sensing zones would show higher water levels.

The present slope stability situation is not dependent on the strength of materials on the beach nor is it dependent on the saturation or lack thereof of the beach materials. In general, the downward seepage gradient increases the effective confining pressure above that experienced with horizontal flow conditions in an equally thick zone of saturation. This effect is generally disregarded in slope stability analysis, producing a conservative analysis.

The Casagrande piezometer program at section 2-2' on the West pond has definitely confirmed the measured phreatic levels under the embankment crest and downstream slope. The actual saturated flow phenomenon behind the embankment crest has not been definitely pinpointed with this program. The most conservative approach of assuming saturation under the pond surface water, used in all previous analyses, appears to depict the apparent flow condition in the beach area. This is similar to the estimated flow shown on Figure 28 of the November, 1980, Engineer's Report. The effect of saturated beach tailings is presently not a controlling factor on the stability of the Homestake embankment.

The Casagrande piezometers have indicated that pond water level has no major effect on the piezometric level under the main embankment. Consequently, there is no difference between a 100 feet beach and a 50 feet beach with respect to embankment stability. Acordingly, there is no technical reason to maintain a 100 feet beach. However, it still would be prudent engineering practice to continue to maintain a minimum 50 feet beach zone. This beach zone helps to reduce wind-driven wave erosion of the coarse tailings containment dike built around the outer embankment periphery. This dike is responsible for the freeboard on the tailings pond and must be protected against erosional infringement.

If you have any additional concerns over the measured piezometer responses or questions on the interpretations made herein, please contact us.

Respectfully submitted,

Alan K. Kuhn

ALAN K. KUHN
NEW MEXICO
6798
REGISTERED PROFESSIONAL ENGINEER

Alan K. Kuhn
Project Supervisor

T. J. Harrington

TIM J. HARRINGTON
NEW MEXICO
7301
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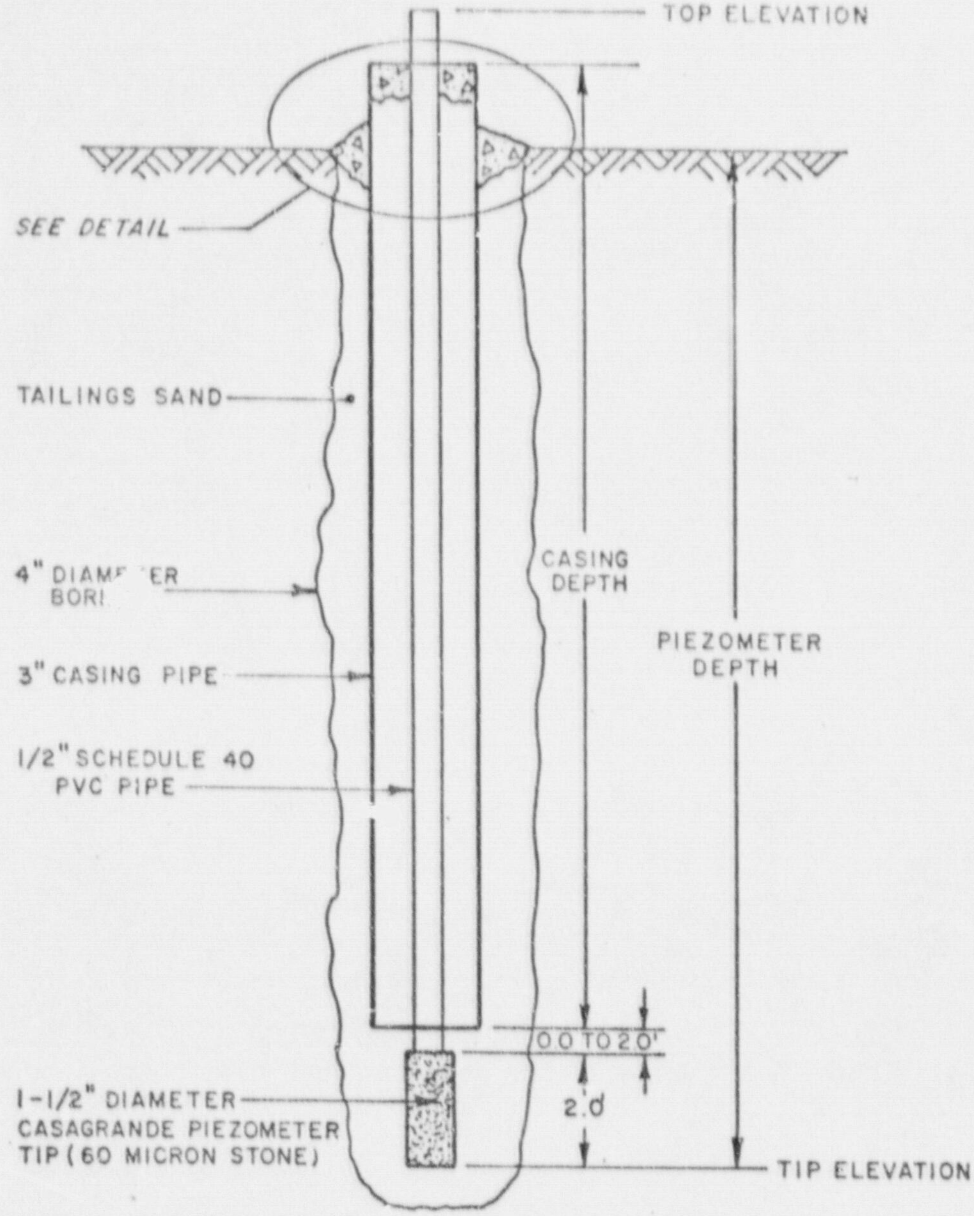
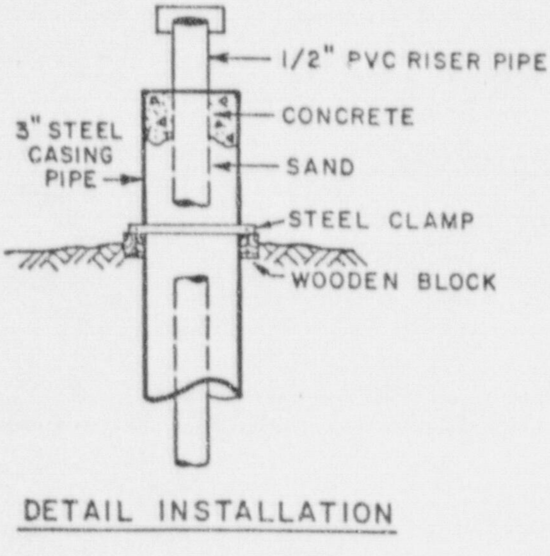
T. J. Harrington
Project Engineer

AKK:TJH:tac

Attachments

cc: M. J. Taylor





DETAIL INSTALLATION

FIGURE 1

TYPICAL CASAGRANDE PIEZOMETER INSTALLATION

PREPARED FOR

HOMESTAKE MINING COMPANY
GRANTS, NEW MEXICO

D'APPOLONIA

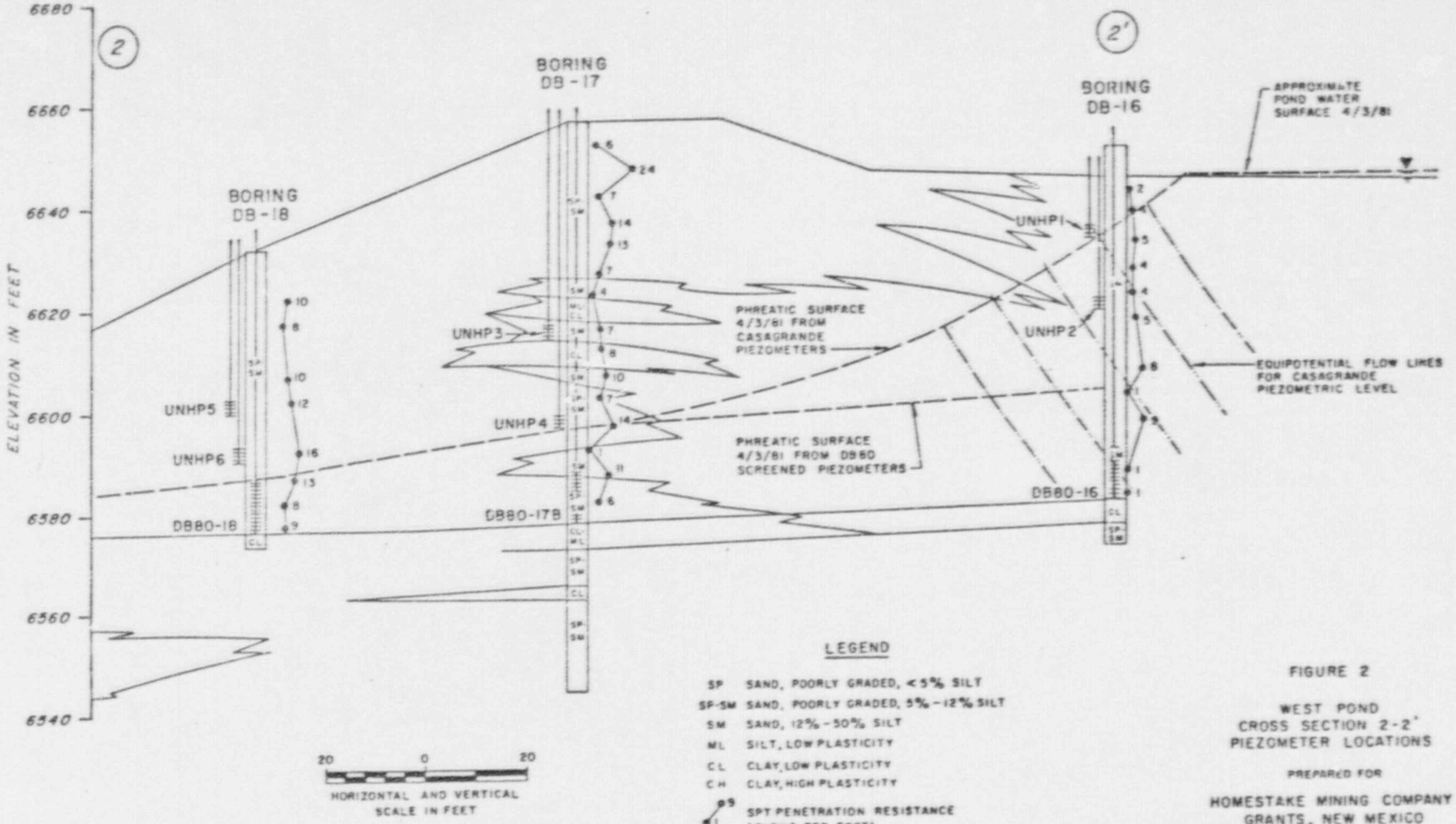
DRAWN BY	N.J.G.	CHECKED BY	TJH	DRAWING NUMBER	RM80-311-A17
	4/10/81	APPROVED BY			

TABLE 1
SECTION 2-2' PIEZOMETER READINGS
MARCH 20 - APRIL 7, 1981

PIEZOMETER		READINGS							
No.	Top/Bottom Elevation (ft.)						Cleaning with Compressed Air Before	Cleaning with Compressed Air After	
		3-20-81	3-23-81	3-27-81	4-2-81*	4-3-81	4-6-81	4-6-81	4-7-81
UNHP1	6655.46/6632.5	6637.7	6637.4/DRY	6633.6	6632.7	6632.3/DRY	6633.5	6633.9	6633.4
UNPH2	6654.56/6618.9	6620.4	6620.5	6620.8	6620.9	6621.3	6621.3	6621.5	6621.1
UNHP3	6661.59/6615.6	6618.2	6618.3	6618.4	6618.3	6618.7	6618.8	6618.8	6618.6
UNHP4	6661.89/6596.9	6599.0	6598.4	6598.6	6598.3	6597.4	6699.8	6600.8	6598.4
UNHP5	6638.38/6600.4	6601.4/DRY	6600.3/DRY	6601.6/DRY	6600.2/DRY	6600.1/DRY	/DRY	/DRY	
UNHP6	6638.94/6590.9	6591.9/DRY	6590.7/DRY	6592.1/DRY	6590.6/DRY	6591.9/DRY	/DRY	/DRY	
DB80-16	6651.8/6582.8	6601.9		6602.0		6602.2			
DB80-17B	6661.2/6576.7	6595.9	6595.8	6596.0		6596.2			
DB80-18	6637.9/6577.3	6587.3		6587.2		6587.3			

*Measured with D'Appolonia water level indicator, other readings taken with Homestake water level indicator

NOTE: UNHP Piezometers are two-feet Casagrande Tips, 1 inch I.D.
DB80 Piezometers are 0.01 inch slotted screens, 1.5 inch I.D.



LEGEND

SP	SAND, POORLY GRADED, <5% SILT
SP-SM	SAND, POORLY GRADED, 5%-12% SILT
SM	SAND, 12%-50% SILT
ML	SILT, LOW PLASTICITY
CL	CLAY, LOW PLASTICITY
CH	CLAY, HIGH PLASTICITY
	SPT PENETRATION RESISTANCE (BLOWS PER FOOT)
	PIEZOMETER SENSING ZONE

FIGURE 2

WEST POND
CROSS SECTION 2-2'
PIEZOMETER LOCATIONS

PREPARED FOR

HOMESTAKE MINING COMPANY
GRANTS, NEW MEXICO

D'APPOLONIA

DRAWN BY	EF	4/10/81	CHECKED BY		4-10-81	DRAWING NUMBER	HM80-311-B25
			APPROVED BY				