Prueba de Pescaros,

UNIVERSITY OF MINNESOTA
TWIN CITIES

Mineral Resources Research Center
Minneapolis, Minnesota 55455

September 5, 1974

Mr. Benjamin Alvarado
Calle 64 #7-18, Apt. 1002
Bogota, D. E., Colombia, S. A.

Dear Mr. Alvarado:

Re: Paz del Rio Iron Ore, MRRC 1885-C62

We sincerely regret that, in reading our report of July 18, you had many difficulties in understanding the exact procedures followed in our laboratory and the meaning of several of the terms used. As you suggest, we sometimes wrongly assume that procedures and language used every day by us in our narrow field are also familiar to people in other occupations.

Here are answers to your four specific questions:

a. Scrubbing is a term used in mineral dressing to imply a disintegration effected by forces that are relatively light, but that are sufficient to break down soft, unconsolidated material or to sever a weak bonding between grains. Scrubbing normally precedes washing with water, but the two actions may proceed simultaneously. The bench-scale scrubbing that we employed attempted to simulate on a very small sample the action that would be obtained in a large, commercial apparatus. The scrubbing tests were made on unsized samples of Lots 1 and 2 that had been crushed through 10 mesh. Table 2 of the report shows the distribution of the sizes in the two samples before they had been scrubbed in the Waring Blendor and Table 3 shows the distribution of the sizes in the two samples after they had been scrubbed in the Blendor. The tests were <u>not</u> "run on pulps of the different fractions obtained from the screen analyses of the original samples."

b. The Waring Blendor that we used is a high-speed stirrer that is very popular for mingling or mixing a wide variety of materials to form fine suspensions, emulsions, and solutions. The ore pulp to be scrubbed is placed in a glass container (1000-ml total capacity, 500-ml working capacity) and agitated for a few minutes by a small propeller driven by a 1/4-hp motor at 16,000 rpm.

c. The purpose of the scrubbing tests was to see if a fine fraction could be removed without an excessive decrease in iron recovery. Although it is true that the iron contents of the 200/325-mesh fraction is slightly lower than the iron content of the minus 325-mesh fraction, it would be possible to beneficiate the

200-325-mesh fraction (assuming that the iron minerals were liberated) by gravity methods or by high-intensity magnetic separation. Scrubbing is a relatively inexpensive way of getting rid of the fine material (here arbitrarily designated as minus 325-mesh) which always reduces the efficiency of gravity or high-intensity magnetic separation processes.

d. In Table 5 of the report, the notations "conc at 0.4 a" and "conc at 0.5 a" mean "concentrated with a magnetic separator current of 0.4 ampere" and "concentrated with a magnetic separator current of 0.5 ampere." Lot 1 was subjected to a current of 0.4 ampere because it was mostly siderite and hematite and thus had a somewhat higher magnetic susceptibility than Lot 2 which was mostly goethite and thus had a somewhat lower magnetic susceptibility.

You are correct in disagreeing with our statement in the last paragraph of page 1 of the July 18 report:

> "In Lot 1, the main minerals are siderite, hematite, and goethite; the ratio of iron carbonate to iron oxides is about 3 to 1."

The statement should read:

> "--; the ratio of the peak intensity of iron carbonate to the peak intensity of the iron oxides is about 3 to 1."

An x-ray diffraction pattern obtained from a one-gram sample of Lot 1 showed that the intensity of the main peak for siderite at a d-value of 2.80 Angstroms (hkl $10\bar{1}4$) was about three times the intensity of the strongest peak for hematite at a d-value of 2.69 Angstroms (hkl $10\bar{1}4$). This did not mean that the siderite was three times more abundant than the hematite. Quantitative analyses by x-ray diffraction are difficult because preferred orientation and microabsorption vary with crystalline substances and do not allow for a direct correlation of the ratio of the amounts of the substances present and the ratio of the observed intensities of the substances.

From the chemical analyses we can see that the ratio of Fe^{++}:Fe^{+++} is 0.51. Assuming that all the Fe^{++} is tied up in the iron carbonate, we can infer that the amount of iron present as iron oxides is a little less than twice the amount of iron present as iron carbonate. However, chlorite (probably chamosite), which contains both Fe^{++} and Fe^{+++}, is also present. Microscopic observations as well as chemical analyses seem to indicate that the iron oxides and the iron carbonate are present in the ore in about equal amounts.

The gravity concentration tests and the magnetic roasting tests that we promised to carry out are nearly complete and will be reported to you in a few days.

It does not appear advisable to list the Paz del Rio ore among the reserves for the Belencito steel plant. The concentrate that can be prepared from it is too low in iron and too high in silica. The extremely fine grinding required to eliminate the silica from the siderite and to reduce the phosphorus below 0.2 percent precludes the economic exploitation of this deposit in the foreseeable future unless there are some extraordinary economic circumstances unknown to us.

Very truly yours,

E. Lawver
Professor and Director

JEL:mp

cc - W. D. Trethewey