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SPECIMENS FROM NAVAJO COPPER COMPANY'S SHIPPING STATION.

<u>No.</u>		<u>% Cu.</u>	<u>CaO</u>	<u>Insol.</u>
92	Green stained sandstone	13.32	1.8	74.4
93	Green sandstone with purplish spots	18.68	0.9	66.0
94	Dark Gray sandstone	31.12	1.2	52.2

CONSOLIDATED ARIZONA SMELTING CO.

ASSAY CERTIFICATE

HUMBOLDT, ARIZ., 9/28/17

I HAVE ASSAYED THE FOLLOWING SAMPLES AND FIND THEY CONTAIN:

DESCRIPTION		ASSAY			ANALYSIS; PERCENT					
Lot	Name	Au. Ozs.	Ag. Ozs.	Cu. %	Insol.	Fe.	CaO.	S.	Zn.	MgO.
	Navajo #1			0.35						
	" 2			0.70						
	" 3			0.63						
	" 4			1.12						
	" 5			0.53						
	" 6			0.72						
	" 7			1.25						
	" 8			3.20						
	" 9			3.08						
	" 10			1.84						

Aslett

ASSAYER AND CHEMIST

CONSOLIDATED ARIZONA SMELTING CO.

ASSAY CERTIFICATE

HUMBOLDT, ARIZ., 9/28/17

I HAVE ASSAYED THE FOLLOWING SAMPLES AND FIND THEY CONTAIN:

DESCRIPTION		ASSAY			ANALYSIS; PERCENT					
Lot	Name	Au. Ozs.	Ag. Ozs.	Cu. %	Insol.	Fe.	CaO.	S.	Zn.	MgO.
	Navajo #11			2.65						
	" 12			1.88						
	" 13			3.00						
	" 14			6.74						
	" 15			0.65						
	" 16			0.83						
	" 17			1.07						
	" 18			1.88						
	" 19			1.01						
	" 20			1.03						

Albert

ASSAYER AND CHEMIST

1123 missing

CONSOLIDATED ARIZONA SMELTING CO.

ASSAY CERTIFICATE

HUMBOLDT, ARIZ., 9/28/17

I HAVE ASSAYED THE FOLLOWING SAMPLES AND FIND THEY CONTAIN:

DESCRIPTION		ASSAY			ANALYSIS; PERCENT						
Lot	Name	Au. Ozs.	Ag. Ozs.	Cu. %	Insol.	Fe.	CaO.	S.	Zn.	MgO.	
	Navajo #21			0.37							
	" 22			0.39							
	" 24			0.63							
	" 25			2.47							
	" 26			0.67							
	" 27			2.47							
	" 28 <i>23</i>			1.10							
	" 28			2.73							
	" 29			0.47							
	" 30			0.47							

a. Scott

ASSAYER AND CHEMIST

CONSOLIDATED ARIZONA SMELTING CO.

ASSAY CERTIFICATE

HUMBOLDT, ARIZ., 9/29/17.

I HAVE ASSAYED THE FOLLOWING SAMPLES AND FIND THEY CONTAIN:

DESCRIPTION		ASSAY			ANALYSIS; PERCENT					
Lot	Name	Au. Ozs.	Ag. Ozs.	Cu. %	Insol.	Fe.	CaO.	S.	Zn.	MgO.
	Navajo #31			4.83						
	" 32			1.78						
	" 33			3.60						
	" 34			"0.65						
	" 35			3.70						
	" 36			4.34						
	" 37			1.07						
	" 38			0.59						
	" 39			0.49						
	" 40			4.06						

Albert

ASSAYER AND CHEMIST

CONSOLIDATED ARIZONA SMELTING CO.

ASSAY CERTIFICATE

HUMBOLDT, ARIZ., 9/29/17.

I HAVE ASSAYED THE FOLLOWING SAMPLES AND FIND THEY CONTAIN:

DESCRIPTION		ASSAY			ANALYSIS; PERCENT					
Lot	Name	Au. Ozs.	Ag. Ozs.	Cu. %	Insol.	Fe.	CaO.	S.	Zn.	MgO.
	Navajo #41			0.41						
	" 42			4.68						
	" 43			5.11						
	" 44			5.73						
	" 45			4.87						
	" 46			5.17						
	" 47			1.04						
	" 48			2.68						
	" 49			0.39						
	" 50			2.24						

" #14 Au trace
Ag 4.72 oz.

A. Scott

ASSAYER AND CHEMIST

February 11th, 1941

Mr. Donald F. Reed
Office of Indian Affairs
Ft. DeFiance, Arizona

Re: Navajo Copper

file

Dear Reed:

Your letter of January 25th arrived here during my absence in the east and since returning have had to take a short trip to California so you will excuse delay in replying.

While in the east and through correspondence with some friends on the Pacific coast I investigated to some extent the market for copper sulphate and results of this investigation were not at all encouraging. Apparently the general market for this material is very limited and prices uncertain and it might be difficult to market any large quantity of copper sulphate that came on the market from increased operations at the Navajo Copper or any other property. A certain amount of material is used by the insecticide manufacturers but they buy a low grade raw material at a cheap price. The so-called Bordeaux mixtures are made with copper sulphate and lime or copper sulphate with zinc sulphate and lime and for all the purposes mentioned above the manufacturers frequently buy scrap copper and crude sulphuric acid and make up a copper sulphate of their own.

I think that the operators of the Navajo Copper, if they obtain as high a price as you have been informed, must have access to some special market which probably only absorbs a very limited quantity of material and this will doubtless account for the limited scale on which they have been operating and which probably could not be increased with any advantage although I of course have no special information on this particular point.

Everything considered, it does not appear to me that the proposal to take over the Navajo Copper holdings would be likely to attract any substantial amount of capital unless the data which I secured should prove to be misleading and I don't think I would care to investigate further at present.

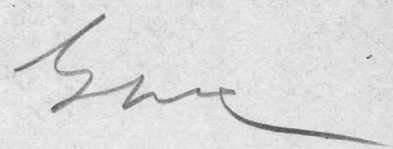
Mr. Donald F. Reed

#2

Feb. 11th, 1941

I was glad to learn that you had a pleasant trip down to your farm near Florence and certainly think that agriculture should do well during the coming year. Hope you will drop in again and see me sometime when you are in this vicinity. Meanwhile, best personal regards.

Sincerely,

A handwritten signature in dark ink, appearing to be 'G. M. C.', written in a cursive style.

GMC:at

4.55
4
18.20

Said that Cu sulfate sells @ 4.55¢

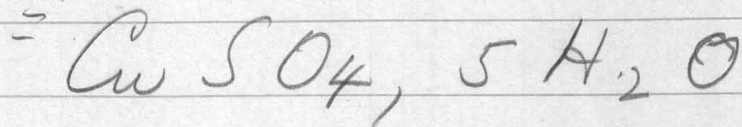
per lb. F.O.B. Flycatcher Shipped

in box to G. Co. (?)

This $V = 18.20$ ¢ per lb of Cu

contained, which seems very high

Copper Sulfate (blue stone)



& ∴, 25.1% of the sulfate is

pure Cu.

Usually sells in the East only the

value of the copper contained unless for

some special purpose.

See Iron and Hydrometallurgy of
p 426

December 4th, 1940

Mr. Donald F. Reed
Box 275
Ft. Defiance, Arizona

Re: Navajo Copper

Dear Reed:

Was glad to receive yours of November 25th and presume that this letter will be forwarded to you from Ft. Defiance if you are still working in that district or around Tuba City.

I was interested in the information which you gave me concerning the property and operations of the Coconino Copper and Chemical Company and I know their Flagstaff attorney, Mr. C. B. Wilson; also I have met Mr. Shattuck of Bisbee who owns adjoining property.

Looking over our file I find a report on the property of the Navajo Copper Company and I believe that the claims which they then held are now a part of the property being worked by the Coconino Copper although I am not sure on this point but you can judge for yourself after reading over the copy of Holland's report which I am herewith enclosing. I do not have a copy of the report by English which appears to have been lost but enclose copy of his telegram as well as the telegram from Holland and, as I recall, English and Holland were in pretty good agreement concerning the main features of the ore deposit.

This property was brought to my attention at Humboldt by the New York officials of the Consolidated Arizona Smelting Company in September of 1917 and as I remember they were in a great hurry to receive the reports from the Field Engineers as some brokerage firm in New York had asked our Company to join with them in financing the equipment and operation of the mining claims on a much more extensive scale. At that time the price of copper was $23\frac{1}{2}$ ¢ a pound and we were taking on anything that looked really promising but the showings at the Navajo Copper did not appear attractive and the terms asked by the owners were unreasonable.

Reading over your letter and noting the present situation, it does not appear likely that Fleming would be disposed to do business unless he received a substantial amount of cash to reimburse him for his investment and evidently Ingraham will hold on as long as he can if this operation is a meal-ticket for him. I very much doubt if any large amount of ore

Mr. Donald F. Reed

-2-

December 4th, 1940

has actually been developed and presume that the present operators have merely continued to gouge out the higher grade stringers and pockets from near the surface and it seems to me that no one would want to take over the mine excepting on the basis of a lease with option to purchase and the option would have to run for a sufficient length of time to permit extensive development and the obtaining of definite information concerning the positive and probable ore reserves.

Under present conditions and for a long time past it has been extremely difficult to secure any money for the exploration or development of copper deposits and it hardly seems likely that this showing would appear sufficiently attractive to intrigue any conservative investors.

However, I am writing all of the above as merely a tentative expression of opinion and this might change entirely if my premises are incorrect.

I am sorry that just at present I cannot plan to visit that section of the state as I have no other reason for going any further north than Prescott but I hope that we can have a personal discussion of the matter when you next pass through Phoenix and by that time you may have obtained considerable additional information.

With personal regards.

Sincerely,

GMC:MF
Enc. 2

Tuba City, Ariz.
Nov. 25 1940.

Mr. G. M. Colvocoresses
1102 Lumber Tower
Phoenix Ariz.

A ¹²/₄
40

Dear Mr. Colvo:

Just received your reply to my letter as I was leaving Ft. Defiance for Tuba City this morning. Expect to be here until next Friday on governmental road business. While here I will try to pick up all possible information in regard to the property.

Here is all that I have been able to learn so far. Most of my information came from Mr. John O'Farrell, Indian trader at the Gap, which is the nearest point on US 89 to the property.

It lies 25 miles from US 89 (the Gap) straight north over a fair but unimproved desert road.

I was unable to discover the names of the owners but they are represented by a Vernon Cruikshank (not sure of the spelling of the last name) who is attorney in charge and whose address is Continental Bldg., Los Angeles, Calif.

The claims (do not know how many) are all patented, and therefore while on the reservation, are not part of it.

The property is being worked under a ten year lease which has six years to go, by an outfit calling themselves the "Cochino Copper and Chemical Co."

The company consists of three men.

Mr. Dana Duncan

Mr. Fleming, who put up all of the money
and Mr. S. H. Ingraham who is the active member
and manages the operation.

+ C. B. Wilson of Flagstaff is the attorney
for the lessors.

My information is that Fleming financed
the whole thing but that when some \$80,000
had been spent and no production forth-
coming, he talked and informed the other
partners that he would put up no more
money. Mr. O'Farrell told me that he was
sure that if Mr. Fleming could get back the
money he had put in, he would give the
lease away. Never comes out to property.

Ingraham then scraped up the haywire
outfit and did start to producing Cu & S.
I was told that he gets \$10 for each ton produced.
As he is producing about 50 tons a month, he
is making good wages. I suspect that no
one else is making anything.

Mr. O'Farrell stated that he was always
a month, or even two, behind with his payroll
and does not pay his bills. O'Farrell
himself loaned him \$35 to get a repair
part which had come in on the stage C.O.D.
with the assurance that this would be
repaid the next day. That was about a
year ago and he has never paid this
loan.

Another group of claims adjoining this property, same formation; equally good showings, are owned by a Mr. Shattuck, a banker and member of the Arizona Highway Commission, from Bisbee. These are undeveloped. No doubt you know some of these men and perhaps can obtain more information than I was able to gather locally.

I will be working around Tuba City for some time as we have several road and bridge jobs in this district. Perhaps you can find time to run up this way and look the thing over on one of your trips to the northern part of the state. I feel that properly handled and financed there is an opportunity here.

I have not talked to Ingraham and can not state whether anything can be done or what terms would be asked. As I told you Fleming would probably be very glad to get out from under. It is likely that Duncan would also.

Will surely attempt to see you when I come to Phoenix and will advise you as soon as I know when that will be.

Sincerely
Donald F. Reed

NAVAJO INDIAN RESERVATION COCONINO COUNTY, ARIZONA

NAVAJO COPPER COMPANY, and NAVAJO PACIFIC COPPER COMPANY, which owns 70% of the Navajo Copper Company's stock. Robert Mitchell, Flagstaff, Manager; W. D. O'Brien, Superintendent.

Inspected September 20-25 by L. F. S. Holland, Field Engineer, Consolidated Arizona Smelting Company. (Norris English, who made a joint examination, reported independently.)

LOCATION AND TRANSPORTATION: The claims, originally located in 1882 by Thomas V. Keams and associates, before the segregation of the District as Indian Lands, are on the Kaibito Plateau in the White Mesa or Keam's Mining District. The Navajo Copper Company now holds 30 claims, of which five are patented and the Navajo Pacific Copper Company holds eight claims, of which four are patented. The mean annual rainfall at Tuba, the nearest station (altitude 4700 feet) is 5.30 inches. Owing to the porosity of the sandstone country, one cubic foot of which may hold a quart of water, artificial tanks are impracticable, unless entirely lined with cement, and in any event heavy showers would probably soon fill such tanks with sand. Two such tanks, however, are now being developed by the Companies. Two wells of very small yield are located five miles from the mines, but water for domestic purposes is hauled long distances. A survey for a pipe line from the Colorado River is said to show a distance of 16 miles and a lift of 3000 feet. Small Juniper and Pinon, suitable for firewood, is found on the claims. Cheap lumber, chiefly yellow pine, is obtainable in Flagstaff.

The properties are reached by fair automobile road, 112 miles north of Flagstaff, crossing the Little Colorado River by Government Bridge, 54 miles from Flagstaff. Ore and supplies are hauled by means of "Holt Caterpillar" and "C. L. Best" tractors, (except over the Bridge where Jeffrey Quad tracks transfer the wagons) to and from a loading station on a standard gauge logging railroad, 15 miles from Flagstaff. The Companies have twelve tractors and fifty seven heavy type ore wagons, the latter purchased from the City of Los Angeles and the

Troy Wagon Works. The tractors haul 30 tons of ore, have a speed of about two miles per hour, consume two gallons of distillate per hour, and are making the round trip in about ten days. Mitchell estimated that the present cost of hauling to the loading station is about \$20.00 per ton, but with repairs, etc., it may be much more. Freight from Flagstaff to El Paso or Tacoma Smelter is \$7.00 per ton. Ninety tons of ore were shipped in the past nine days and between 1800 and 1900 tons since May, 1916.

ORE DEPOSITS - The claims are located on a divide running East and West at an elevation of 6000 to 6300 feet. The country rock is fine grained sandstone, composed of white and reddish grains of sand, cemented by calcareous and ferruginous material, and occasionally siliceous cement. The formation may be described as solidified sand dunes. Cross bedding is universal and joints are everywhere well developed. The formation exactly corresponds to the upper La Plata Sandstone of the Jurassic system found in Southwestern Colorado. In Arizona and New Mexico the United States Geological survey has given the name of "Navajo Sandstone" to this upper stratum of the La Plata formation. The normal bedding is horizontal, but owing to the universal cross bedding, very varied local dips and strikes may be observed.

The ore is of various shades of green and blue, due to the replacement of the cementing material, probably originally a clay, in the sandstone, by chrysocolla, malachite and occasionally chalcocite. In mining, chalcocite is taken as the indicator of ore of shipping grade, which is sorted to eleven to fifteen per cent copper. A little silver is associated with the copper, but not necessarily with the chalcocite. There are no volcanic intrusions, nor are the deposits associated with fissures, but the joint planes have influenced the deposition of copper from solutions, perhaps very weak, leaching through the sandstone. The copper has probably been separated from the solutions by the action of the clayey cementing material by the process called "adsorption", a process

which has been tested in the U. S. Geological Survey Laboratory. Minute quantities of carbonaceous matter may have influenced the deposition of the occasional bunches of chalcocite, as described by Lindgren, in his study of the "Red Beds" of Colorado, where the primary ore is chalcocite, and chalcocite has been found replacing coal.

The ore bodies are always irregular in form and distribution, and generally quite small, depending on the degree of replacement by copper solutions in the sandstone. At the highest elevations, the sandstone is apt to have a reddish color, due to a little iron on the surface of the rock, but this also is generally found to be white, when freshly broken. Nodules of hard malachite, weathered out, or still in place, are a distinctive feature of this reddish stained upper layer, especially on the contact with the lower, lighter colored sandstone. The lower sandstone is colored with chrysocolla and malachite in various forms. The greenish and bluish tints may be deepest on joint planes, becoming fainter away from the joints; or in bunches a few inches to a few feet in size, with a darker center than circumference; or in bands or leaves in the bedding planes of the sandstone. A pit 30' 6" deep, on the isolated Spencer claim showed good ore still in the bottom of the pit, but the ore appeared to be limited to a cross section 4' x 5' associated with joint planes. This was the deepest ore observed in place on the properties.

DEVELOPMENT: All the known workings were examined and their characteristics noted, but individual descriptions of the large number of scattered shallow pits and cuts, of which the development chiefly consists, would probably serve no useful purpose here. The pits and trenches are often in groups of four to six around a spot on which there may have been a surface exposure. The cuts may disclose bunches of ore, generally low grade, from a few pounds to a few tons in size, rarely as much as twenty tons, and very often nothing but barren sandstone.

The largest exposure is on the Little Dick, one of the Navajo

Pacific Company's claims. Here open cuts show more or less mineralized sandstone for a length 230' North and South, and, including a short tunnel, 107' East and West, crossing at a point 170' from the North end. The average height of the mineralized bedding sampled was 6.2 feet and the average assay value (geometric mean) 3.0 % Copper.

Joining the extremities of these exposures and calculating 12.3 cubic feet to the ton, (the specific gravity being 2.61), it may be estimated that the block of ground contains 6000 tons of probable, but not positive, ore assaying 3.0 % Copper, based on twenty-two samples taken at intervals of twenty feet, for an average height of 6.2 ft.

The only other workings of considerable size are on the Mollie T., also one of the Navajo Pacific Claims. Here are two open cuts, one immediately below the other. The upper cut shows copper in patches in fractured cross bedded sandstone for a length of 260 feet. The lower cut shows practically no ore, so that no estimate can be made for ore deeper than the upper cut. Allowing a width of ten feet of ore on either side of the upper cut, the block would contain 4000 tons of probable, not positive, ore assaying 2.1% copper, based on fourteen samples taken at twenty foot intervals, for an average height of 9.2 feet.

Six samples were taken at the best exposures on the Nannie E., which averaged 1% copper for a height of 3.6 feet. On the Warrior claim, which has a 70' tunnel and various pits, is light colored sandstone dipping N. E. at a small angle, showing malachite and chrysocolla in small nodules and in knife blade streaks in the bedding. The eight samples assayed 1.28% copper for a height of 5.1 feet.

The average of all fifty samples taken was 2.3 % copper, 6.8 feet height.

Ore treatment problems are not to be considered here, but it may be mentioned that a favorable report on the leaching of the ores by sulphuric acid has been made by W. L. Austin of Riverside, California, and on dry concentration by Carr W. Pritchett of Steamboat Springs, Colorado. A mill building is now being erected and some of the equipment is on the ground and in transit. This includes a Hardinge Mill; a Sutton Steele & Steele dry concentrating table; a Sutton Steele & Steele "Deduster", and a No. 12 Morse Rarefied Dust Collector. Two small artificial "Tanks" are being prepared to collect rain water, as already mentioned, but it is obvious that without great expense, sufficient water for a large leaching plant cannot be made available on the ground, even though the volume of ore to be treated may be successfully reduced three into one by preliminary dry concentration.

CONCLUSIONS: The claim that a million tons of five percent copper ore is even partially developed at the present time, cannot be maintained, and it is practically impossible that any such tonnage of five percent copper ore ever can be developed on both properties combined. Although exact figures are not available, it is very doubtful if the ore being shipped, which is only suitable for converter flux, is meeting the expense of setting it out, hauling, shipping and treatment. Local conditions as to transportation, the lack of water, the irregular distribution and size of the ore bodies and their low average tenor, combine to make the operation of the property with any method of ore treatment, a very doubtful venture. With the present demand for such equipment, the tractors, trucks and wagons might be salvaged for a substantial sum, but without this equipment, I could not recommend the purchase of both properties outright for the twenty five thousand dollars asked for a part interest in them.

L. F. Holland
Field Engineer

Consolidated Arizona Smelting Company.

NAVAJO COPPER

Ashfork, Ariz. Sept. '17.

(Copy of telegram from L.F. S.Holland to G. M. Colvocoresses)

Small circular ore bodies are replacements or concentrations of malachite chrysocolla and chalcocite influenced by joint planes in La Plata cross bedded sandstone. Chalcocite in small proportion indicates of shipping ore lately ten tons per day, eleven to fifteen percent copper. Scattered Development usually limited to shallow cuts showing few pounds to few tons low grade ore often nothing, average fifty samples one nine tenth percent height six eight tenths feet; only one assayed five percent. Conditions do not admit estimating positive ore only considerable sized blocks probable ore six tenths percent Little Dick, six thousand tons two seven tenths percent. By no reasonable stretch of imagination is there remotest possibility ever developing one million tons five percent. Without tractors and trucks which might be salvaged I would not give twenty five thousand dollars for all thirty eight claims.

(Copy of telegram from Norris English to G. M. Colvocoresses)

1917
Sept. 26, 1929.

Number one property of little value. Ore bodies are gash veins in sandstone and badly scattered. Are short narrow and generally largest and richest within ten feet surface. Most of them will not produce one hundred tons five percent ore. Largest ore bodies on Mollie T and little Dick claims exhausted of Best ore. Fourteen samples from first assayed one point six for nine feet width. Twenty two from second two point eight over six feet. No positive ore except on dumps. Very little probable, possible ore does not exceed fifty thousand tons five percent.

Navajo Navajo Copper Co. file
Box 275

Ft. Defiance, Ariz.
February 16, 1941

Mr. G. M. Colvocoresses
1102 Luhrs Tower
Phoenix, Arizona.

Dear Mr. Colvo:

Since last talking to you have been picking up a little more information here and there and had come to the same conclusion as yourself, namely, that the Navajo Copper proposition was not worth any more consideration. The property closed down shortly after I saw you and I very much doubt that it will reopen operations. Apparently they had some small special market which pooped out on them.

Sorry to have taken up your time with the matter but it did seem to warrant looking into.

With many thanks for your trouble and best regards,

Truly yours

Donald F. Reed
Donald F. Reed

Harage Copper & Iron
of New Mexico

