

Don Pdx
Jan 13, Jan 4

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BORNITE PROJECT *TIMES*

Fall 1991

News about the Bornite Project, Marion County, Oregon

THE BORNITE PROJECT: So Far, So Good

"Plexus Inc.'s public meetings with towns near the Bornite Project have been friendly, informative, instructive and constructive," says Plexus technical services vice president Allen S. Gordon.

In recent years, public resistance to, and resentment of, mining projects have been as tough for mining ventures as complex geology and raising capital and financing.

"We just are not drawing any fire," says Plexus public relations counsel Chuck Bennett.

The meetings were in Salem, Mill City and Elkhorn, which is just 12 miles from the site.

Headlines on newspaper stories by reporter Dan Postrel in *The Statesman Journal*, Salem, indicated tone and direction of the meetings:

- Plexus Officials Lay Out Cascade Mining Plan.
- Valley Residents Urge Control On Canyon Mining.
- Mill City Greets Plan For Copper Mine, Jobs.

At the public meeting in Salem, Ellen Lindholm reflected environmental concerns, noting the devastation copper companies had left in Arizona.

"But much of that was the legacy of years past," says Mr. Gordon. "When the worst occurred, Arizona was still the wild and woolly West. Few understood environmental consequences. Few cared. Land, air and space were inexhaustible -- or so people thought."

"But today, Plexus aspires to operate with environmental soundness. And when all is done, the Company must reclaim and restore the Bornite Project site," says A.H. Ditto, Plexus president and chief executive officer.

The Company is now and will be under bond to perform as law and regulation require.

Mine reclamation became the law of the land in the 1970s. States have since passed laws that either
Continued-Page 2, Column 1



PLEXUS GEOLOGIST MARCI KALSCH LOGS CORE SAMPLES AT THE COMPANY'S MILL CITY OFFICE

Breccia Pipes

The target zone of the Bornite Project is a "breccia pipe."

The mine . . . and the pipe . . . will yield 137 million pounds of copper, 40,000 ounces of gold and 1 million ounces of silver over its eight-year life.

So, just what is this "breccia pipe?"

"Breccia pipe" is a geologic term, referring to a cylindrical-like underground structure that is filled with broken rock.

A pipe was formed this way:

Over several hundred thousand or millions of years, magma muscled its way toward the earth surface. Magma is the molten rock that pushes its way to the surface and forms volcanoes.

As a molten mass pushes upward, it may form several "fingers" at the top.

Think of blowing into a dish washing glove. The inflated sleeve and palm are the magma intrusion; the inflated fingers are five "pipes."

GEOLOGIC TIME

The magma intrusion began about 14 million years ago and took a couple of million years to form an arm a mile wide and five to six miles deep. The finger that forms the site of the Bornite "breccia pipe" is at least 2,000 feet deep and about 500 feet wide.

As, the molten magma in the finger began to cool, gases from the magma formed a super high pressure bubble at the tip of the finger.

Then, maybe 10 million years ago-- the bubble burst. Through cracks and fractures, the gas made an explosive escape. It could have happened in hours, or over several days. But it was a violent event.

With pressure gone, the gas chamber collapsed in on itself, filling
Continued-Page 2, Column 3

Continued from Page 1

SO FAR, SO GOOD

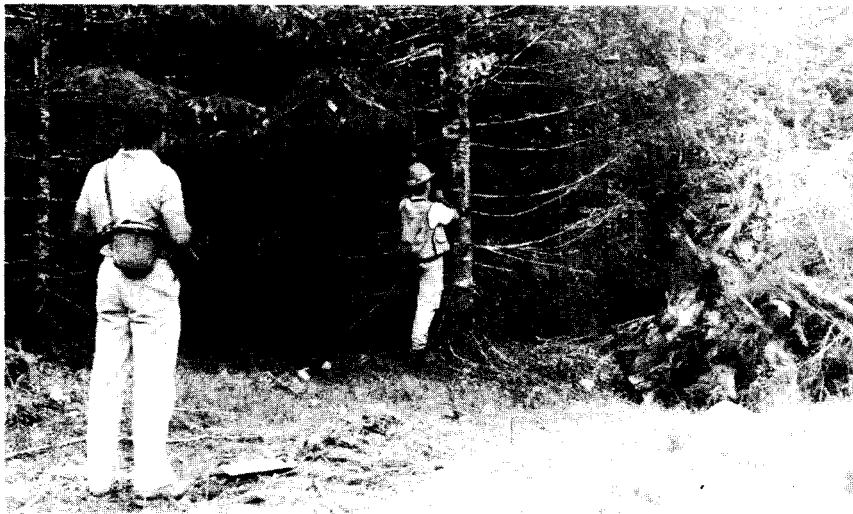
matched or exceeded the federal standards.

"The questions at the meetings were well thought out," says Mr. Gordon.

"What about noise and traffic congestion and conflict with recreation?" asked another attendee.

Five times during the 24-hour work operation, a truck with a 20- to 30-ton load of mill concentrate will pass on the way to its most likely destination, the port at Vancouver, Washington.

Mini-buses and vans hauling workers and supplies will be



ON-GOING ENVIRONMENTAL TESTING

making 15 to 20 round trips in the 24-hour work period.

The route is a two-lane paved road up to within six miles of the site. After that, it is a gravel-based Forest Service road which passes the site.

"The Forest Service might exercise traffic control on weekends," says Mr. Gordon. "But I suspect it is going to be a very lonely road."

Bornite Project senior geologist Bart Stone and Plexus financial vice president Mike Washington were on hand to talk about operation and funding of the project.

Tom Fencl, co-owner of a small logging company, was positive: "They've (Plexus) got it pretty

well thought out . . . It would be good for the community because logging is going to take a step down."

North Santiam Canyon's economy depends heavily on national forest timber harvests.

But as national forest policy shifts towards recreation and wild life protection, those harvest values are expected to decline.

There is a lot of transferability of job skills from forest to mining work. Equipment -- trucks and loaders -- are not that much different.

About 65 of the 80 or more mine employees will be hired locally, Company officers said.

Plexus still has not received the green light for the project, planned

to begin operation in 1993.

There are still many meetings ahead and many approvals to be gained. From the start, Plexus has kept an open-phone, open-door policy on all queries about the project.

"And that policy will not be changed," said Mr. Ditto. ●

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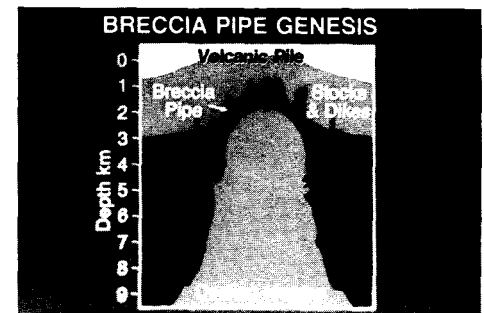
185 South State Street
Suite 400

Salt Lake City, Utah 84111

For additional information contact
Allen Gordon, Vice President
(801) 363-9152

Continued from Page 1

with broken rock, creating a "breccia pipe" about 2,000 feet from top to bottom and 450 feet wide.



Under pressure and heat, the rock rubble began to bond and a super-heated brew of mineral-saturated water passed through it. Those dissolved minerals are the copper, gold, and silver.

As the mass bonded and cooled, minerals precipitated to the tip and sides of the finger.

When formed, the tip was more than one mile below Oregon's surface. Natural erosion, and abrasion by glaciers, took the surface down to barely expose the top of the pipe.

HOW WILL PLEXUS MINE THE "BRECCIA PIPE?"

Miners will get to the ore zone by a "decline," in this case a 16-foot wide, 15-foot high tunnel spiraling down the outside of the pipe.

It will reach the best grade of ore early, about 200 feet below the top of the pipe, or a quarter-mile drive down the spiraling tunnel.

Miners will blast the ore out of what is called a working face. They will scoop the broken ore up with a front-end loader, put it in a low profile, 40-ton-capacity diesel truck for haul back to the surface mill.

The mill will grind the ore into a fine powder, which will then go into a concentrator to produce a "concentrate." The concentrate will be sold and shipped elsewhere for smelting and refining.

By the end of the mine life, Plexus miners will be taking the last ore out at about 900 to 1,000 feet below the top of the pipe.

By then, the distance from the surface entry to the working face will be two and one-half miles.

After mining, half of the mill tailings and earth removed during construction can be buried in the then-abandoned tunnel and mine workings. ●

THE BORNITE PROJECT:

Questions and Answers

HOW BIG IS THE SITE?

The Bornite Project will disturb 32 acres of second growth forest.

WHAT WILL BE LEFT BEHIND WHEN PLEXUS IS FINISHED MINING?

The project includes a detailed reclamation plan that calls for more than half of the tailings (the leftovers after the copper concentrate is milled from the ore) to be put back into the underground workings. The remainder will be spread over existing contours of the site. It will then be covered with the top soil that has been saved and replanted with native plant species which may include alder and Douglas fir.

HOW MANY JOBS WILL THIS CREATE AND WHO WILL GET THEM?

Throughout the life of the project, including initial construction activity, there will be about 100 people employed by Plexus. During most of the mining period of at least eight years, the project will employ 80 workers. Most of the employees will be hired locally and are expected to come from among timber industry workers who already have many of the skills needed for both mining and milling. Some of the more technical jobs involving special skills in geology and engineering may come from out of the area, and these employees will be asked to live in the Santiam Canyon community. The project is expected to generate about \$2.5 million in payroll and spend \$1.3 million for materials needed by the project and its crew each year.

WHERE DID THE NAME BORNITE COME FROM?

Bornite is the name of the copper-rich ore discovered at the site. It is an ore body contained in a so-called "breccia pipe," a rock formation that is cylindrical and extends down from the surface

about 1,000 feet. The formation to be mined has been dated at about 10.1 million years old.

WILL THIS HURT THE OLD GROWTH FORESTS NEARBY?

No old growth timber will be disturbed and access to the site is along existing Forest Service roads.

WILL THIS AFFECT WATER QUALITY IN THE SANTIAM CANYON OR IN SALEM?

No. Water management plans for the project include recycling water used in milling. No toxic chemicals will be used in the process. The water ultimately returned to the environment will be of drinking water quality. This is an unusually good project from a water quality and water quality protection standpoint.

IS CYANIDE OR ANY OTHER DANGEROUS CHEMICAL USED IN THE MILLING PROCESS, LIKE THE ONES WE HAVE READ ABOUT IN HEAP LEACH MINING IN EASTERN OREGON AND OTHER STATES?

No. The process used by Plexus at the Bornite site is called "flotation" and extracts concentrates from the ore much like you remove dirt from clothes in a washing machine. No minerals are placed in solution and no caustic chemicals are used in the process.

WILL THERE BE ANY ACID MINE DRAINAGE?

No. Mineral constituents that contribute to acid drainage are not present in the quantity required to form the acid. Plus, the rock contains other mineral constituents that inhibit the formation of acid in much the same way as antacids are used to control an upset stomach.

Meet Bart Stone Senior Project Geologist



Plexus' senior project geologist for the Bornite Project has the perfect name for someone in his profession: Bart Stone. He also has a wealth of experience in the mining business and a great appreciation for the land on which mines are found.

Stone, 44, has worked world-wide in mining prospects and projects -- from Australia to Canada to Kenya. Through different jobs in different parts of the world, he knows first-hand how an underground mine in a near pristine area can -- and should -- be operated.

After graduating in geology from Dalhousie University in Halifax, Nova Scotia, he went to work for the Geologic Survey of the then newly independent African nation of Kenya. As one of only six geologists in a country of 12 million people, he was called upon to do much more than his degree had prepared him for -- including testifying in court as an expert witness and negotiating tribal disputes.

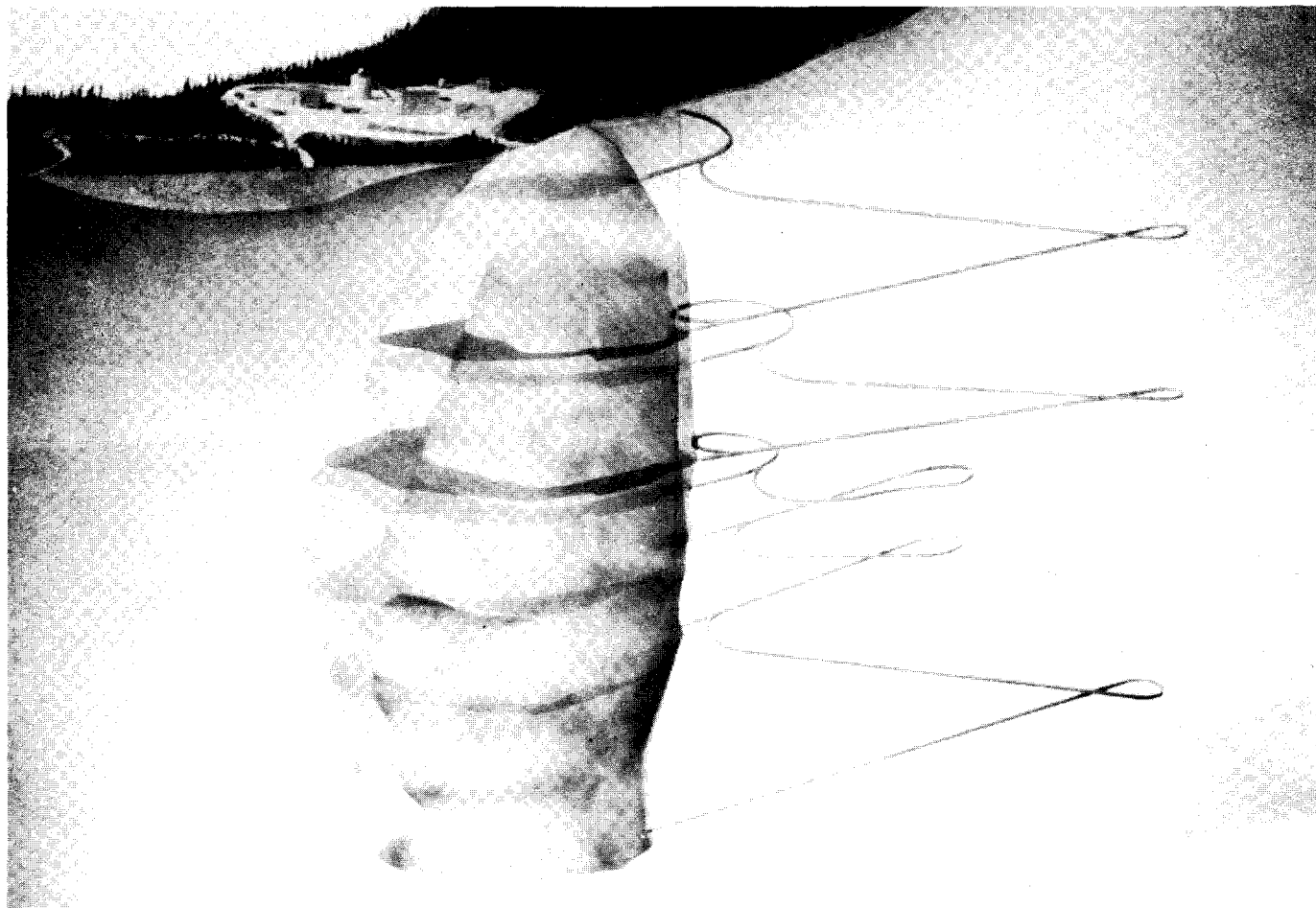
He then joined the Anaconda Company and worked on copper projects in Canada and Utah, as well as serving as Anaconda's mining relations liaison out of the Company's Denver headquarters.

In addition to his geology degree, Stone has an MBA from Regent University, Virginia Beach, Virginia.

At Plexus, he will act as Bornite Project manager. If you have questions or comments about the project, Stone is the person to talk to. And he'll be accessible. Plexus will maintain an open-door policy throughout the project's life.

The Stone family will reside in the Mill City/Gates area. ●

BORNITE: AN UNDERGROUND MINE - LIMITED SURFACE DISTURBANCE



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Plexus Inc.
185 South State Street
Suite 400
Salt Lake City, Utah 84111



PLEXUS RESOURCES CORPORATION • 185 South State Street • Suite 400 • Salt Lake City, Utah 84111 • (801) 363-9152 • FAX (801) 363-8747

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FOR IMMEDIATE RELEASE

Contact: Allen Gordon
(801) 363-9152
Chuck Bennett
(503) 362-6617

PLEXUS' BORNITE MINE CROSSES MAJOR HURDLE

Salt Lake City, Utah: Plexus Bornite project took an important step toward development with the release late last month of the U.S. Forest Service Draft Environmental Impact Statement (DEIS) on the proposed underground copper mine in Oregon's Willamette National Forest. The announcement of the DEIS release was published in The Federal Register, November 27, 1992. This starts a 45-day public comment period that will end January 10, 1993.

In its DEIS, the Forest Service says, "There would be no anticipated, significant, long-term adverse impacts due to the proposed Bornite Project with implementation of the proposed mitigation measures and monitoring plans." The Forest Service pointed out that most of the project's impacts would be short-term during the construction and operation of the mine. Long-term impacts would be both few and negligible.

"We've said from the start that Bornite would be earth-friendly," said Plexus Vice President Allen Gordon. "The Draft Environmental Impact Statement backs that up. There is still a lot to do, but the DEIS moves us much closer to going into production."

The DEIS looks at any potential environmental problems associated with the mine and establishes mitigation and monitoring programs to minimize any impact. Many of these programs were contained in the Plexus Plan of Operations for the Bornite project.

The Bornite underground mine will limit surface disturbance to a small area of new-growth forest located some 50 miles east of Salem, Oregon. The mine will be a producer of gold, silver, and copper, and is expected to significantly contribute to corporate earnings.

Construction could begin as early as mid-1993 and would employ up to 80 individuals, most from the local community, Mr. Gordon said.

Plexus Resources Corporation is a North American minerals development company. Its common shares trade on the Toronto Stock Exchange (PXS) and the NASDAQ system (PLUSF).

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QUESTIONS AND ANSWERS

THE BORNITE PROJECT

Plexus Inc., based in Salt Lake City, Utah, is in the formal process of acquiring permits to develop the Bornite Project underground copper mine 50 miles east of Salem in the Cedar Creek Valley.

Here are some commonly asked questions about the project and the answers.

Question: *How big is the site?*

Answer: The Bornite Project will disturb 32 acres of second growth forest.

Question: *What will be left behind when Plexus is done mining?*

Answer: The project includes a detailed reclamation plan that calls for over half of the tailings (the leftovers after the copper concentrate is milled from the ore) to be put back into the underground workings. The remainder will be spread over existing contours of the site. It will then be covered with the top soil that has been saved and then replanted with native plant species which may include alder and douglas fir.

Question: *How many jobs will this create and who will get them?*

Answer: Throughout the life of the project, including initial construction activity, there will be about 100 people employed by Plexus. During most of the mining period of at least eight years, the project will employ 80 workers. Most of the employees will be hired locally and are expected to come from among timber industry workers who already have many of the skills needed for both mining and milling. Some of the more technical jobs involving special skills in geology and engineering may come from out of the area but these employees will be asked to live in the Santiam Canyon community. The project is expected to generate about a \$2.5 million payroll and spend \$1.3 million for materials needed by the project and its crew each year.

Question: *Where did the name bornite come from?*

Answer: Bornite is the name of the copper-rich ore discovered at the site. It is an ore body contained in a so-called "breccia pipe", a rock formation that is cylindrical and extends down from the surface about 1,000 feet. The formation to be mined has been dated to be 10.1 million years old.

QUESTIONS AND ANSWERS

THE BORNITE PROJECT

Question: *Will this hurt the old growth forests nearby?*

Answer: No old growth timber will be disturbed and access to the site is along existing Forest Service roads.

Question: *Will this affect water quality in the Santiam Canyon or in Salem?*

Answer: No. Water management plans for the project include recycling water used in milling. At the same time tests show that no toxic chemicals will be released into the water during the process and that water ultimately returned to the environment will be of drinking water quality. This is an unusually good project from a water quality and water quality protection standpoint.

Question: *Is cyanide or any other dangerous chemical used in the milling process like the ones we have read about in heap leach mining in Eastern Oregon and other states?*

Answers: No. The process used by Plexus at the Bornite site is called "flotation" and extracts concentrates from the ore much like you remove dirt from clothes in a washing machine. No minerals are placed in solution so no highly caustic chemicals are used in the process.

Question: *Will there be a chance for the public to get more direct information from both Plexus and the Forest Service on the project and to comment on the project before it gets the permits?*

Answers: Yes. Plexus is planning a series of information meetings on the project in September. These meetings will be followed by a series of "scoping" hearings conducted by the Forest Service to determine public concerns about the project. There also will be a host of other public hearings on other permits required by state and federal government agencies. Interested persons should contact both Plexus and the Forest Service for information on the meetings and to be notified of them. Watch for local newspapers for additional information.

Question: *Will there be any acid mine drainage?*

Answer: No. Mineral constituents that contribute to acid drainage are not present in the quantity required to form the acid. Plus, the rock contains other mineral constituents that inhibit the formation of acid in much the same way as antacids are used to control an upset stomach.

Plexus Adequacy Review

February 12, 1993

- PAGE COMMENT
- i 1.3 - Soil Resources [7]8
- v Plate 5 - Post Mining Contours. This plate exists but is not listed here.
- 1 The executive summary states that concurrent reclamation will be undertaken. This is not possible with the current dam design.

General comment on maps - Hard to move from map to map. Example:

<u>Designation</u>	<u>Project Type</u>	<u>Grid</u>	<u>Scale</u>	<u>Perimeter</u>	<u>North Arrow</u>
Fig. 2	Plant Com.	#1	1"=480.8'	Yes	Y
Fig. 3	Soils	#1	1"=480.8'	Yes	Y
Fig. 7	Claim	No	1"=1851.8'	No	Y
Fig. 16	Crown Pillar	#2	1"=79.4'	No	N
Plate 1	Aquatic Feat.	No	1"=138.9'	Yes	Y
Plates 2-5	Surf. Facil.	#1	1"=151.5	No	Y

There is a map that shows Bornite Brook before and after relocation. A map of the facilities showing the pre-mine location would make a graphic presentation of why the relocation is needed.

A suggestion is to produce figures 2, 3, and 16 at one scale and on one grid or, better yet, incorporate 16 into Plates 2-5. Add the project perimeter and the pre- and post-mine location of the creeks to Fig. 16 and/or Plates 2-5. All plates should be at one scale. By standardizing scales, maps can be overlaid for comparison even if direct measurements of distances using common scales cannot be used.

- 1 Although road construction is not required to reach the site, Road 2207 must be relocated so road construction is part of the project and, therefore, the relocated road must be incorporated into the project area. A major issue to be addressed is measures to be taken to prevent turbid water discharges from the road relocation from reaching Cedar Creek.
- 3 Para 6 - "Bornite Brook" Putting Bornite Brook in quotes the first time it is used, as you have already done with Vanishing Creek, will indicate that this is also an informal name.

<u>PAGE</u>	<u>COMMENT</u>
3	<p>Appropriate soil profile descriptions and soil analyses must be presented here or the baseline data incorporated by specific reference.</p> <p>Para 3 - Map Unit 12 is not within the disturbance limit.</p> <p>Para 7 - This groundwater summary is not consistent with the interpretation of WRD and DEQ. This paragraph must be revised to be consistent with the ground water model accepted by WRD and DEQ that is used for groundwater monitoring. For example, more characterization wells need to be completed as previously stated by WRD and DEQ. The baseline groundwater characterization has not been accepted as complete.</p>
6	1.2.4 - ...by red alder and has [and] an understory of...
9	Para 1 - ...As a result, [a]A horizon topsoil...
11	<p>1.4 - What is the expected 100 year/24 hour storm event and how was this estimated?</p> <p>1.4.2 - Snow fall/melt - How were these calculated?</p>
13	Para 1 - Only portions of Cedar Creek upstream of the 2207 bridge flow subsurface. That area should be shown on Plate 1. This reference should be more specific as is done on Page 18.
12 & 13	Detailed studies of the riparian habitat and aquatic invertebrate communities have been completed. Those studies must be incorporated as part of the application and referenced by specific reference.
13	1.5.3 - The electrofishing study must be detailed here or incorporated by specific reference.
17	<p>1.7.1 - The results of 12 months of water quality data must be supplied. What chemicals/potential contaminants (e.q. grout, ANFO, and diesel fuel) will be used in the mine which have the potential to adversely affect water quality discharges?</p> <p>1.7.2 - The results of 12 months of surface water quantity and quality data must be supplied.</p>
18	1.8.1 - The results of 12 months of ground water quantity and quality data must be supplied. As stated previously, the baseline data collection plan has not yet been approved.

PAGE	COMMENT
18	<p>The comments on Sections 1.8 mimic those of Page 3, Paragraph 7. No details are included in this section so no evaluation is possible. If this section is to stand alone, data supporting the conclusions made must be submitted.</p> <p>All parties seem to agree that the permeability of the bedrock less than that of the alluvium and that flow in the bedrock is via joints and fractures. The data collected from bedrock is from relatively shallow wells from near the tailings impoundment. There is no controlled water quality or quantity data from the area of the ore body. (The source of the water from the one drill hole is unknown.) The possibility of high water flows through an as yet unidentified fracture or fracture system must be addressed. If encountered, we understand that it could be pumped and discharged once it meets DEQ standards. If this is the procedure envisioned, that procedure must be stated.</p> <p>Para 4 - ...nearly parallel <u>to</u> Bornite Brook.</p> <p>1.9.1 - The stream-side vegetation plus the stream floodplain shape must be described to use as a guide in stream relocation.</p>
24	<p>1.9.4 - ...because [the] <u>they</u> meet...</p>
26	<p>1.10.1 - ...of stream valley to [one] <u>an</u> elevation of...</p> <p>1.10.2 - ...extends downward from surface [from] <u>for</u> over...</p>
27	<p>NOTE TO REVIEWERS: This statement has been sent to Matthew Mabey, DOGAMI seismic engineer, for review.</p> <p>1.10.3 - The Klohn Leonoff July 1992 report (section 2.6 Seismicity) contains the best baseline data submitted yet and should be incorporated into this section. Some further refinement is needed.</p> <p>A probability must be attached to the 0.22g acceleration value. Assessment of hazard to determine risk is not possible without the probability. The design criteria or assumptions documenting that the dam and foundation will not lose strength during shaking, we assume will be included in the final design.</p> <p>The earlier requirement for an analysis of the affects of a subduction zone earthquake must still be met. Even though the accelerations of a subduction zone earthquake are not expected to exceed what is now being proposed, an interface earthquake or</p>

PAGE	COMMENT
27	intraplate earthquake of long duration could greatly affect the liquifaction potential of the tailings impoundment. Since the structure will last "in perpetuity," and the risk of liquifaction and the attendant probability must be addressed.
31	1.12.2 - See 1.12.1 comments. Page 32 and 33, Table 6 and 7. The rock type must be specified.
43	<p data-bbox="261 531 1481 558">3.1, Para 3 - ...a typical plan section [are] <u>is</u> illustrated...</p> <p data-bbox="261 604 1594 825">3.2, Para 2 - Woody material - After logging of the site, slash and root wads will be handled according to FS best management practices. This may mean burning the slash. Root wads may be broken up and saved for spreading over the reclaimed areas. Roots smaller than 3' long and 3" in diameter may incorporated into the topsoil stockpiles. Large woody debris will be salvaged and stockpiled, if determined practical by the FS, for later spreading over the reclaimed areas.</p> <p data-bbox="261 856 1465 951">A commitment is needed to locate and appropriately seal all exploration drill holes within the area to be affected by this project.</p> <p data-bbox="261 982 1594 1108">3.2 - Site Clearing and Construction - The relocate 2207 road is considered part of this permit. The 150' buffer specified in 4.5.7 must be maintained between the edge of the disturbance and the break in slope to Cedar Creek.</p>
44	Para 1 - A visual barrier of at least 100 feet shall be maintained between the tailings pond and road 2207. If the tailings dam is built within 100 feet of the road, the visual screen will be reestablished as soon as possible. A leave strip of 150 feet wide must be maintained between road 2207 and Cedar Creek.
47	<p data-bbox="261 1329 1528 1392">3.4.3 - ...Increased knowledge of the ore body [in wake of] after development...</p> <p data-bbox="261 1423 1433 1455">3.4.4 - Where will the crown pillar colluvium be stockpiled?</p>
50	<p data-bbox="261 1486 1544 1581">Para 1 - As a suggestion for clarification, an explanation in this paragraph would help explain why the crown pillar removal does not increase the area of surface disturbance.</p> <p data-bbox="261 1612 1513 1677">Para 2 - For clarification, Figures 13 and 14 could be redone to emphasize the crown pillar and not the entire orebody.</p>

<u>PAGE</u>	<u>COMMENT</u>
50	<p>Para 3 - The ore stockpiles are not located on a map.</p> <p>3.4.5 - Where will the recycle process water tank be located?</p>
51	<p>Para 2 - The following comment should be addressed in a revised water balance: Based on rock porosity, the estimated 100 gpm flow seems high. Overestimation may affect process water availability. This issue is complex and is anticipated to be addressed in WRD's water rights permits. However, the flow rate is inconsistent with the baseline characterization.</p> <p>Para 3 - Grouting is suitable for accessible sites. What would be done for water flows encountered in a stope? What will be the affect of the grout chemicals on water quality?</p> <p>3.4.6 - What areas will be left open for "post-mining access?" This is inconsistent with Section 4.5 that calls for sealing of the portal.</p>
52 & 54	Legends and grid numbers must be legible.
55	This map is not acceptable. The crown pillar must be shown in relation to other mine facilities. See the general map comments.
59	3.5.1 - Run-of-mine underground are [from] will be...
64	Para 2 - No details of the toxicology study have been submitted. Please submit and incorporate by specific reference.
65	Para 3 - 6' high fence is required for deer exclusion.
68	<p>Para 1 - No details of the tailings impoundment construction are included or referenced. The details needed by DEQ and WRD will be sufficient for DOGAMI.</p> <p>No breakdown is given as to the ratio of coarse tails to slimes, only that 40 percent of the tails will be stored on the surface. A system must be in place to monitor all material going to the tailings to determine if the 3:1 ANP:AGP is maintained. Facilities must be on site to treat the tails if the ratio is not met.</p> <p>Figures 22 and 23 have no scale so no estimate of capacity can be made. The inference in the plan is that backfill is continuous and that optimum sulfide removal is always achieved. Actual experience shows that this rarely happens. Will the tanks have sufficient</p>

<u>PAGE</u>	<u>COMMENT</u>
70	<p>3.9 - An acceptable screening method to identify and segregate rocks with ARD potential must be agreed to by Plexus, DEQ, and DOGAMI.</p> <p>Details of the liner and water collection system are needed.</p> <p>Where will the colluvium removed during crown pillar mining be stockpiled? The volume should be re-stated here.</p>
	<p>3.10 - The adequacy of the pond cannot be determined without knowledge of the size of the 100 year/24 hour storm event and maximum snow melt. See Page 11 comments.</p> <p>Upslope diversion ditches are needed for the area east of the mine portal and above the cutslope for the tailings impoundment on Plates 2 to 4.</p>
	<p>Will the sediment pond be excavated or have constructed fill banks? If fill, how will it be constructed? How will the overflow spillway go through the fill? How will water be channeled to Bornite Brook?</p>
73	<p>3.11.3 - The water balance needs to be detailed enough to conform with WRD and DEQ requirements.</p>
74	<p>3.11.5 - What will be used to maintain the ANP/AGP ratio of the tails? Where will the neutralizing material be stored and added?</p>
78	<p>3.11.9 - ...will accommodate the following: [In addition to individual offices, the building will contain a:]</p>
79	<p>3.11.11 - a 6 foot wildlife fence is required.</p> <p>3.12 - See comments for Page 44, Para 1.</p>
88	<p>4.2 - Must conform to the attached reclamation objectives.</p>
89	<p>4.3.2 - See comments on Page 43, 3.2.</p>
90	<p>4.3.3, Para 3 - The topsoil storage piles will...</p> <p>Stockpiles with a maximum slope of 3:1 are preferred. Additional erosion control is required for steeper slopes. See reclamation specifications.</p>
91	<p>Table 13 - Revise using the reclamation specification.</p>

<u>PAGE</u>	<u>COMMENT</u>
91	<p>Soil Volume - Once the final dam design is approved, the actual area to be topsoiled can be calculated. By combining the area with the required depth of soil needed on different facilities, a soil volume must be calculated and submitted. The agreed upon volume of soil must then be stockpiled.</p> <p>4.4, Para 1 - Where, on the surface, are the mine water ponds?</p> <p>4.4, Para 2 - All compacted areas, not just the roads, if not on bedrock, must be ripped. This commitment is already made in Section 4.5.2. See separate reclamation specifications. The fence will remain until revegetation is successfully established.</p>
92	<p>4.4.1 - Will the decline be backfilled with tails or waste rock? The ventilation shaft must be covered with a concrete cap meeting OSM standards. Blasting or cementing would be acceptable for the decline. Both sites must be topsoiled and revegetated.</p> <p>4.4.3 - Details on how the surface will be treated to allow final reclamation are needed. Will the colluvial material be used as backfill here? What will be the hydrology of the reclaimed crown pillar?</p>
93	<p>4.4.5 - See comments on 3.9.</p> <p>4.4.6 - Power line removal requirements will be set by the Forest Service.</p> <p>A section must be added to address roads.</p> <p>4.5.1 - A final grading plan with a contour interval of 10 feet or less must be approved prior to start up or two years before reclamation of the facility in question is regraded. A map showing post-mining topography and the post-mine ground water surface is required.</p>
94	<p>Facilities - All concrete foundations must be broken up and buried.</p> <p>Mine Portal - How will the portal be sealed?</p> <p>Ponds - What will be done with the pond liners? From Fig. 21, it is impossible to tell if the pond is excavated or above ground. Closure will depend upon construction method.</p>

PAGE

COMMENT

94 Tailings Impoundment - More details must be supplied on how or if the tails will be drained, the pond decommissioned, and the long-term integrity of the structure guaranteed. What will be the water content of the tails after closure? How will water runoff be handled? How will topsoil be respread? Discuss revegetation with Forest Service. Since the exact elevation of the final tailings surface will not be known until closure, a detailed conceptual plan is acceptable at this time.

Tailings Impoundment Dam - See previous heading for general comments. The outslope angle as constructed is 2:1; the statement that final grading will be to 2:1 makes no sense. Please explain in detail how the structure will be left to insure long-term stability.

94 Crown Pillar Area - The first statement is not a sentence. Is the 65,000 yards of material referred to the same material Sentence 4? The paragraph is unclear.

Sentence 4 should refer not to Figures 19 and 20, but Figures 13 and 16, respectively. If the paragraph is trying to say that the crown pillar stopes and the planned dilution areas will be backfilled with cemented tailings and that the colluvial material will then be replaced, that proposal is acceptable. The paragraph must be reworded to make the procedure clearer.

95 4.5.2 - Surface Preparation - Refer to 4.4. Ripping of tails must be addressed in the conceptual plan for reclamation of this facility.

4.5.3 - A minimum of 2 feet of topsoil is required over areas underlain by a glacial till that has been ripped. Topsoil requirements on the tailings pond must reflect the needs of what will be planted. Topsoil on the 2:1 side slopes of the dam shall be at least one foot thick. See reclamation specification.

The methods to replace and retain topsoil on 2:1 slopes must be addressed in detail. Scrapers or trucks are not capable of achieving even distribution on such slopes. Reclamation of the 2:1 cut banks up hill from the tailings pond are not adequately described. What will be their maximum final height?.

4.5.4 - Revegetation - This section must be revised to conform with the reclamation specifications.

<u>PAGE</u>	<u>COMMENT</u>
98	<p>4.5.5 - Wetlands Restoration - The acceptable DSL stream relocation permit may be substituted for this section. Otherwise, considerable more detail is needed.</p> <p>The wetlands documentation must address removal of the two bridges over Bornite Brook.</p>
99	<p>4.5.7 - Erosion Control - Para 2, Editorial comment: There are two ponds; not "numerous" ponds.</p> <p>Further information is needed to explain how the water diversion on the north side of the diverted Bornite Brook gets between the brook and the pond through what is presumably the parking area for the lab, admin. building, and concentrator (Plates 2-4).</p> <p>A 150-foot wide forested buffer between the permit area and Cedar Creek should be adequate to minimize turbid water runoff into the creek. Plates 2-4 must be revised to incorporate the buffer.</p> <p>4.5.7, Para 4 - Ditches must be designed for the 100 year/24 hour flood or snowmelt event. What size will the ditches be? What is their gradient? What is the justification for such a size?</p> <p>Para 5 - What construction design will be utilized to meet the stability objectives of the stockpiles?</p> <p>Long slopes must be broken with rounded terraces to reduce erosion potential. Contour ditching may also be appropriate.</p>
100	<p>4.5.8 - We agree that a permanent stream relocation is the preferable alternative. Again, details must be included in this document or in other documents by specific reference.</p>
101	<p>4.6 - Monitoring and Management - Erosion monitoring must be on-going and related to storm events. Two typos exist in Paragraph 1 ...in the [1994]year following construction..., ...[Perent]Percent ground cover... The monitoring comments in the reclamation specifications must be incorporated here.</p> <p>4.6.1 - Para 2 and 3 would be more appropriate under 4.6.</p>
102	<p>4.6.2 - Surface Water - Para 2, Quarterly samples [will be] have been taken.</p> <p>Operational and post operational water monitoring must be according to DEQ requirements.</p>

<u>PAGE</u>	<u>COMMENT</u>
103	Table 16 - Sample site SPD is omitted. TL should be TC. DEQ will review and approve these sites.
105	<p>Ground Water Sampling - The location of the eight ground water monitoring sites is not shown. The ground water characterization has never been accepted as complete by the state agencies. A critical path item to permitting is installation of an acceptable array of wells for a sufficient length of time to allow characterization of the ground water before construction can begin. Prompt agreement by the agencies of the location and depth of the proposed holes is critical for Plexus.</p> <p>Para 3 - Monitoring wells cannot be used as production wells.</p> <p>Para 4 - Data collected in the second half of 1992 must be submitted as part of the baseline information.</p> <p>Para 5 - [DWR]WRD - This transposition occurs twice in this paragraph.</p> <p>Table 8 - The location of wells M7-M11 is not known.</p>
108	<p>Cement Storage - How will tails destined for the tailings pond be treated to have a neutralization ration of > 3:1 if it is lower than that when produced?</p> <p>Stockpiles, Para 1 - How will this stockpile area be lined?</p> <p>Para 2 - The topsoil stockpile will drain into the process water pond, not the sediment pond.</p> <p>Development Rock - The screening process for ARD rock must be approved prior to start-up.</p>
110	Bonding - This section is inadequate. A detailed bond review is not possible until all items in the reclamation plan have been resolved.

AHT/dm:review

RECLAMATION SPECIFICATIONS FOR THE BORNITE PROJECT

February 12, 1993

- - - DRAFT - - -

1. Define reclamation objectives

The objective of the Bornite Reclamation Plan is to produce a geologically and erosionally stable post-mining topography capable of supporting productive vegetative cover with a high value for use by wildlife. Specific objectives are to:

- stabilize the site to prevent erosion and sedimentation on both a short and long term basis,
- reestablish productive vegetation with an emphasis on native species,
- remove potential hazards to protect public health and safety,
- restore and create wildlife habitat,
- reestablish an esthetic environment with consideration of visual quality and recreational opportunities.
- restore public access to the project area,
- protect surface and ground water quantity and quality on a short-term and long-term basis.

Plexus will accomplish these objectives by stabilizing disturbed areas during and following operations. Specific plans will be developed and periodically updated for each disturbed area. These areas are grouped on the basis of type of vegetative cover desired for interim and final reclamation and are listed below. Two years prior to the commencement of final reclamation the Forest Service will evaluate the desirability of using any or all parts of the project area for other purposes. Starting immediately after disturbance begins and continuing until bond release, monitoring of all reclaimed areas will identify the need for further restoration efforts. Monitoring will be frequent immediately after completion of an action and will decrease in frequency as the objective is reached. The compliance frequency will depend upon what is being evaluated. e.g. erosion control evaluation could be after each storm event, water quality monitoring may be on a quarterly basis, and revegetation success would be evaluated once a year.

Specific areas will be reclaimed as follows:

<i>Facilities</i>	(plant site, ponds, ditches, stockpile areas) - returned to a coniferous forest, the Forest Service will evaluate the desirability of using the plant site for other purposes at least 2 years before reclamation starts.
<i>Tailings impoundment</i>	(dam face) open grassy meadow
<i>Tailings surface</i>	(within the impoundment) - meadow and/or wetland species.
<i>Roads</i>	All roads having no post mining use will be blended in with the surrounding area.
<i>Road out slopes and cutbanks</i>	Cutbanks and out slopes will be seeded for erosion control and allowed to permanently revegetate with volunteer vegetation.
<i>Transmission line and corridor</i>	Transmission line and corridor will be blended in with the adjacent vegetation type.
<i>Riparian areas</i>	(Wetlands) An amount of riparian and wetland area will be created when Bornite Brook is relocated to match the area lost by the relocation.

2. Revegetation requirements

Specific areas will be revegetated as follows to meet the reclamation objectives:

Facilities will be reforested - The area will be planted with Douglas fir and western white pine, trees will be planted on 8 ft. spacings with a ratio of 60 fir to 40 pine and 680 trees per acre. Additional final reclamation species may also be required by the Forest Service and/or DOGAMI.

Dam face - The upper area will be a steep hillside meadow. A seed mix will be selected from results of test plots and seed availability. The emphasis will be on erosion control through establishing a dense grass cover or a mosaic of grasses, forbs and shrubs, dependant on the outcome of soil stockpile test plots. Native species will be used where appropriate and available.

Parts of the toe will be a visual screen to limit visibility of the tailings structure from road 2207. All disturbances within 100 feet of the edge of road 2207 shall be planted with trees as soon as possible after the disturbance is made. Species planted, time of planting, and spacings will be specified by the Forest Service and DOGAMI.

Tailings surface - The pond surface will become a meadow or wetland. The exact plant mix will be decided after final design of the impoundment is established, when the final elevation of the tailings is known and when the post-mine hydrology of the tailings impoundment is understood.

Roads - If unwanted after mining, the gravel surface shall be removed and disposed of at the direction of the Forest Service and the site will be seeded to blend in with the adjacent vegetation types.

Road out slopes and all cut banks - These areas will be stabilized with grass using the basic seed mix until natural revegetation takes over. Should noxious and/or weedy species volunteer on these areas, removal may be necessary.

Wetlands - The existing wetlands will be replaced under the guidance of the DSL permit and the Forest Service.

Transmission line - Site specific revegetation will be selected to blend in with adjacent vegetation

SEED BED PREPARATION

Facilities - Upon removal of all structures and foundations, the ponds will be smoothed over after folding in any pond liners that have no contaminants. All gravel or asphalt pavement will be removed or buried as directed by the Forest Service and DOGAMI. The site will then be regraded to approximately the original contours. Any areas that are not covered or loosened during the regrading will be ripped to eliminate compaction. Ripping depth will be based on compaction depth and percentage of boulders in the compacted area. Where possible, ripping to a depth of 3 foot on 3 foot centers will be accomplished. Soil will be respread to a depth of 3 feet.

Dam face - Scarification of the face if necessary. One foot of soil will be spread. A thicker amount of soil will be required if the dam face, as constructed, is rough with few fines.

Tailings surface - Two feet of soil will be spread over the parts that are dried after ripping.

Cut or fill banks - The Forest Service and DOGAMI will specify soil needs on a case by case basis.

Other - sites from which the soil has been removed will have 2' of soil respread.

NOTE: fertilizer will be added as required and at appropriate rates based on soil tests of the stockpiled soil.

Two seed mixes will be used. The basic mix will consist of certified annual rye and fall barley. Application rates will be 8 lbs/acre and 25 lbs/acre respectively, these amounts may be reduced by half if drill seeded.

This mix may be modified as experience dictates. Modification will be approved by the Forest Service and DOGAMI.

The purpose of the basic seed mix is provide erosion control in the short term to allow the gradual encroachment of native species. As the planted species die out.

The second mix is the final reclamation mix. The species mix may will vary depending on habitat type objectives. The emphasis will be on a composition of native species found in similar local habitat types, but where appropriate native species are not available, non-native species may be substituted. Forbs and shrubs (from seeds, rooted stock, or cuttings) may be required where appropriate.

Dam mix - On the dam face, a thick permanent grass meadow or mosaic of grasses, forbs and shrubs is desired for maximum stabilization and erosion control.

Test plots on the soil stockpiles will be used to test various grass mixes. The emphasis will be on native species.

Tailings surface - The surface will be a mixture of wetlands and meadows. The final mix may include wetland species, grasses, forbs, and shrubs.

The seed mixtures, planting rates, etc will be reviewed at least every two years with an emphasis on selecting the proper:

- species
- availability of seeds, cuttings, and rooted stock
- application rates

Seed mixtures, application methods and application rates may be modified due to limited species availability, poor seed quality, site differences, poor initial performance or changes in reclamation technology and philosophy. The Forest Service and DOGAMI will specify seeding method and time of year based on the final seed mix chosen. Early to mid autumn is generally the preferred time of year for seeding.

Reclamation standards

Reforested areas will be conducted after the first and third growing seasons. A minimum total of 250 to 415 live trees per acre will be required.

The upper dam face, dry tailings surface and road prisms will be revegetated with a self sustaining population of grass species that have established an absolute aerial cover of 50% (absolute aerial cover to be determined by a modified Daubenmire polygon approach). Eighty percent of the cover must be composed of species in the original seed mix, volunteer natives or volunteer, non-native, desirable species. All reclaimed areas must be free of noxious weeds.

MEMO

TO: Don Hull - DOGAMI DATE: February 12, 1993
John Beaulieu - DOGAMI
Barbara Sellars - DEQ
Raj Kapur - DEQ
Janine Clayton - USFS
Dave Halemeier - USFS
Doug Shank - USFS
Kathy Willis - City of Salem
Marc Norton - WRD
E. Frank Schnitzer - DOGAMI
Gary Lynch - DOGAMI

FROM: Allen Throop

SUBJECT: Waste Rock Monitoring for ARD at the
Bornite Mine (24-0076)

I propose that, for monitoring purposes, we require Plexus to have their mine geologist examine the face of each mine heading in waste rock before it is blasted and determine the percentage of visible sulfides. Those with over 1 percent total visible sulfides will be handled as if they contain ARD potential. The agencies need to decide if the 1 percent level of pyrite is acceptable, or if another screen should be used. We should review the core from the project to reach that determination. Please get any comments to me about this proposal by February 20. We can then set a date to review the core for those interested.

My reasoning is as follows:

From the data submitted to date, very little waste material is expected to fall into the ARD generating category.

Pyrite is a minor mineral in most of the volcanic rocks of the Western Cascades due to propylitic alteration. The regional pyrite is fine grained and disseminated throughout the rock. Weathering of that pyrite has had no adverse effect on the water quality of the surface. Therefore we can expect some sulfide minerals in much of the rock that Plexus removes. On the other hand, the pyrite related to the Bornite deposit is often on fractures rather than disseminated. A few fractures with pyrite would quickly exceed the 1% limit.

Pyrite, at 53% S, is the most sulfur rich of the sulfide minerals expected at the site. One percent pyrite translates into 0.5% S.

The attached Figure 1 shows a plot of the waste rock data submitted by Plexus (from DOGAMI Application, Table 6, samples with anp/agn > 30 omitted). There are two samples with greater than 0.6% pyrite and an anp/agn < 3. These rock would need to be segregated and eventually used as backfill.

Plexus Static Test Results

Waste and Ore

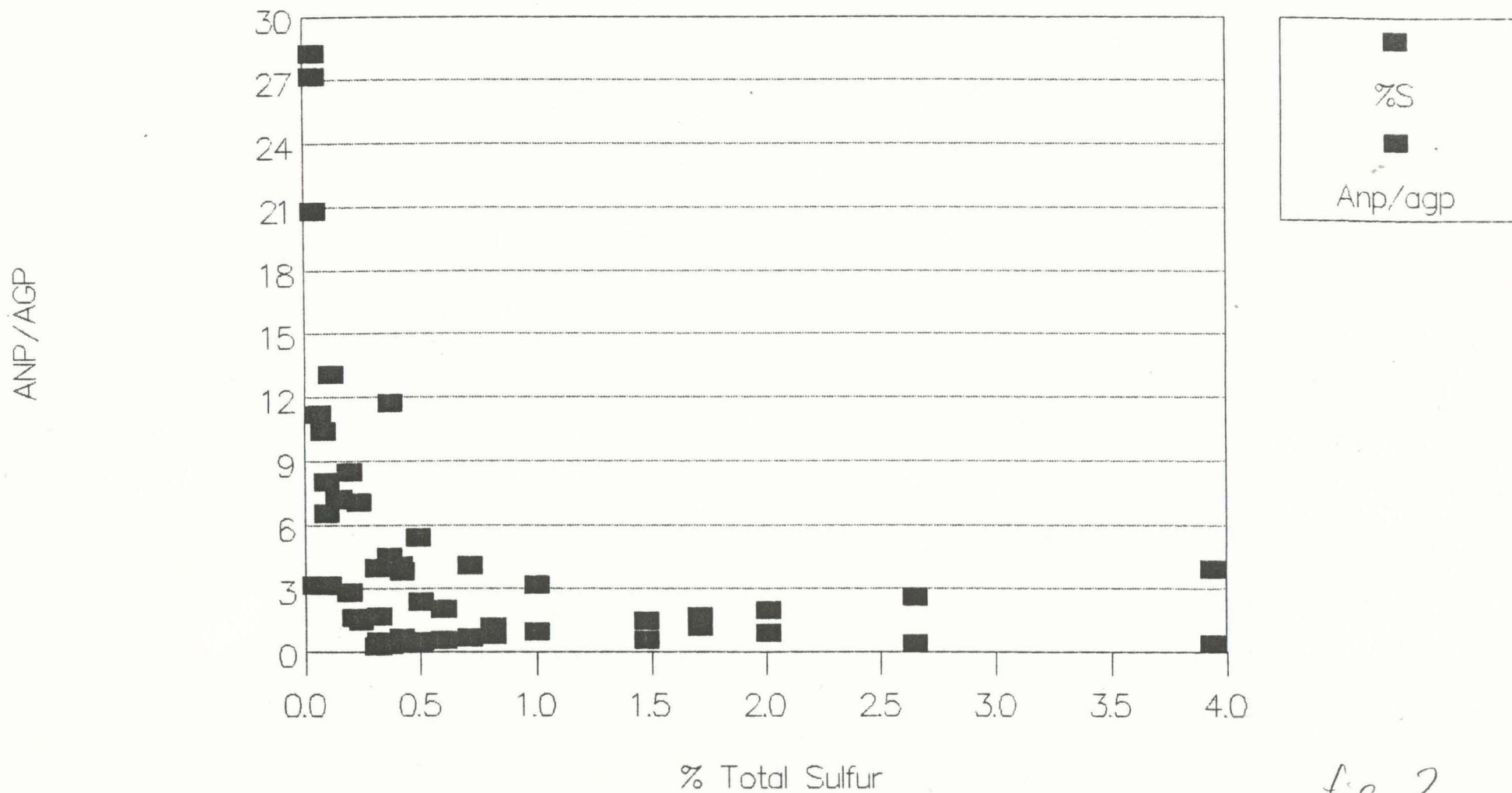


fig 2

Plexus Static Test Results Waste Rock

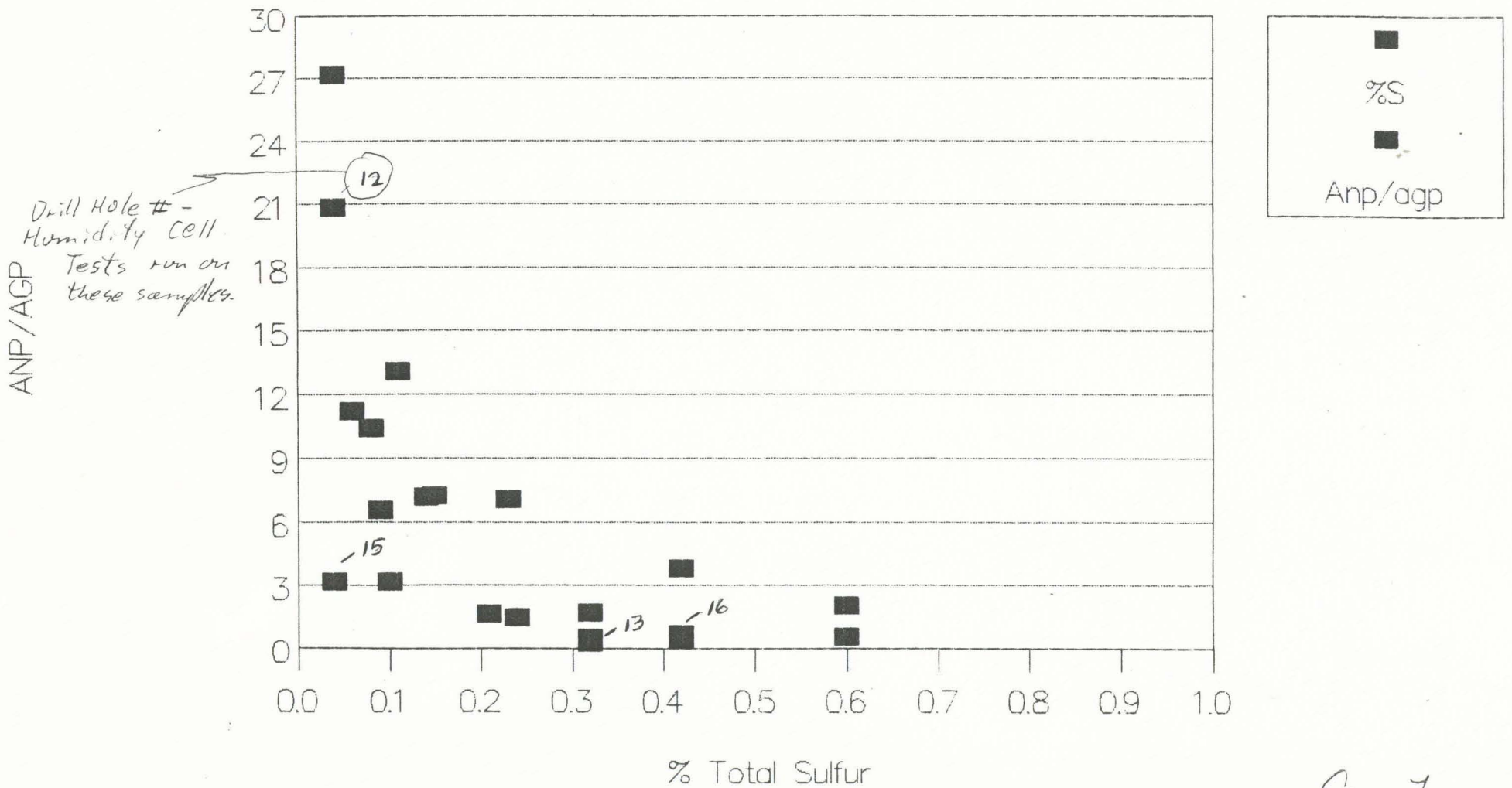


Fig 1