Crandon: the quest and the questions. [1979]

Exxon Minerals Company
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Crandon

THE QUEST & THE QUESTIONS

THE Quest

The Quest for minerals is society's quest. When successful, it helps us to attain a higher standard of living. A mining company like Exxon is society's instrument in its quest for the resources we must have to manufacture needed commodities. ☐ Such a company weighs many factors when considering a new mine. The existence of a mineral reserve isn't the only requirement. Other questions arise: Is there a safe and practical way to mine it profitably? How can the ore be refined into metal? Can mining take place without injury to the environment? Is there sufficient market for the metal? Exxon includes one more factor in its decision-making process: Can we earn public confidence? ☐ Exxon believes that the way to build public confidence is to take the mystery out of the company's plans and intentions. People are more likely to approve of a project they understand, and more likely to respect a company that keeps them informed and responds frankly to their questions.

Exxon conducted an aerial survey in Forest County during 1974. Instruments in the airplane which detect anomalies* beneath the surface registered an anomaly near Crandon. In the summer of 1975 this discovery was confirmed by drilling to be a mineral resource.

*This and other terms in the vocabulary of mining are defined on page 22.

THE Questions

Exxon keeps saying "If we mine . . . ," yet it seems like you've already decided. When will we know?

Exploration and prospecting are costly, so we, too, are eager to know. Investigation of any mineral discovery is a long and deliberate process with many phases. Thousands of feet of core must be drilled and analyzed, and we must remove a bulk mineral sample from underground for testing. We must confirm our assumptions, prove that the mineral deposit can be mined and concentrated, and justify our financial risks. If our findings are favorable, our

Needle in a Haystack

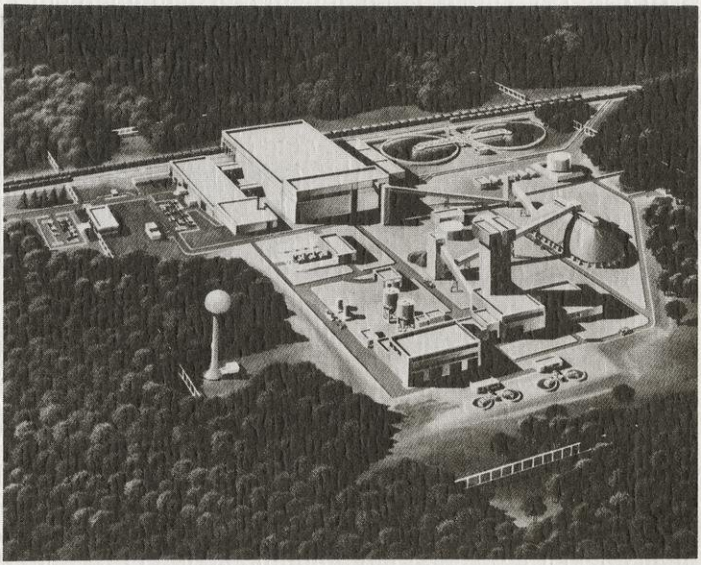
Today most mineral deposits are discovered by aerial exploration. Sensitive instruments detect "anomalies," which might be valuable minerals, but could also be a pipeline, steel building, or mineralization of no value. Here is a typical score card on 10,000 anomalies:

10,000	detected while flying
-9,000	rejected as due to man-made objects
1,000	judged to be due to geologic sources
-900	rejected as "not of ore body quality"
100	examined by instruments on the ground
-66	rejected as "not of ore body quality"
34	tested by drilling
-33	rejected as uneconomic pyrite or graphite deposit
1	contains minerals useful to people *and only one in ten of these anomalies contains potentially commercial quantities of minerals*

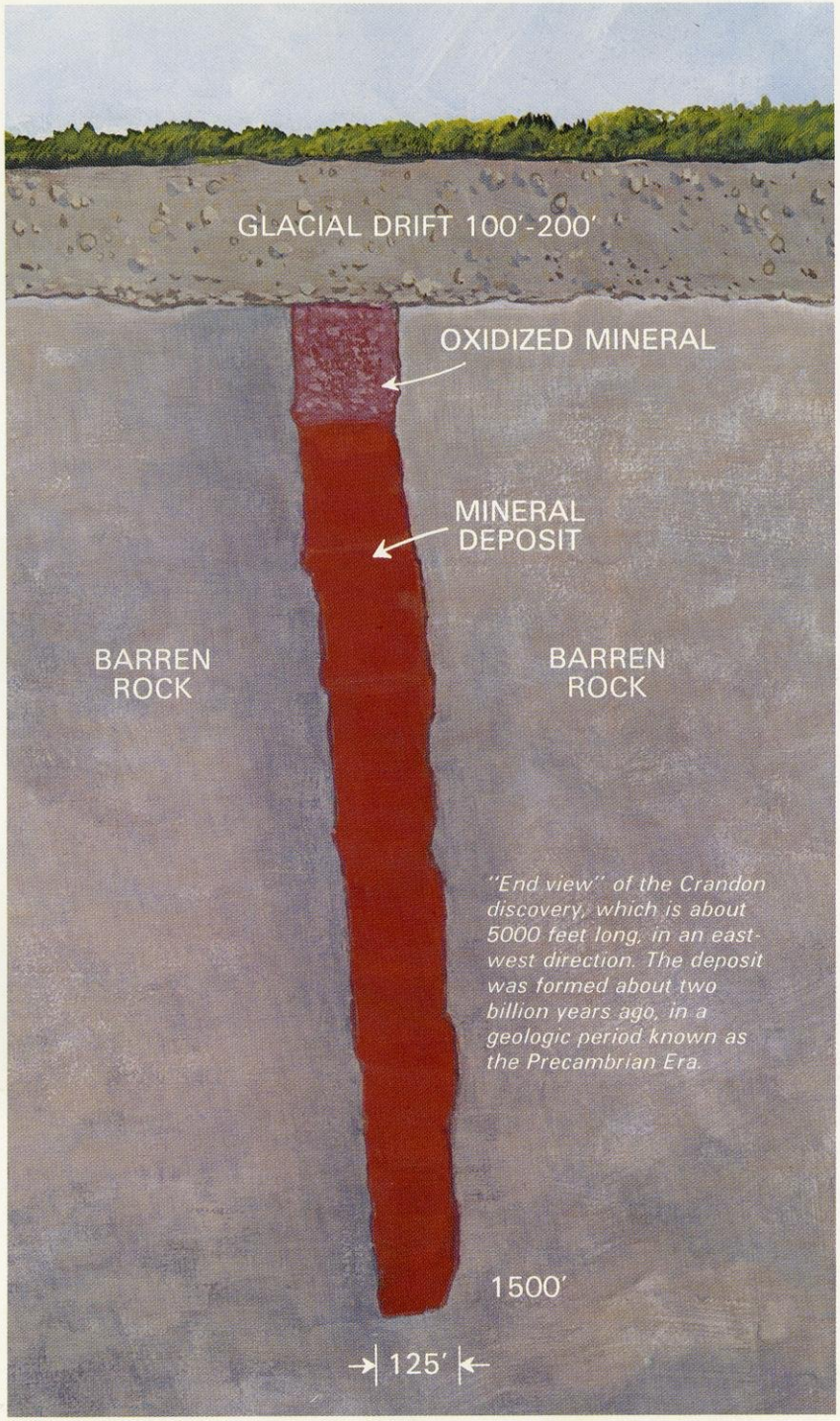
Environmental Impact Report (EIR) must be reviewed by the Wisconsin Department of Natural Resources. We must be granted many government permits to develop a mine. In short, we're hoping for four things:

- Positive results from our technical and environmental evaluation
- Community and state support for our program
- A business climate that encourages mining
- A favorable market forecast for zinc and copper

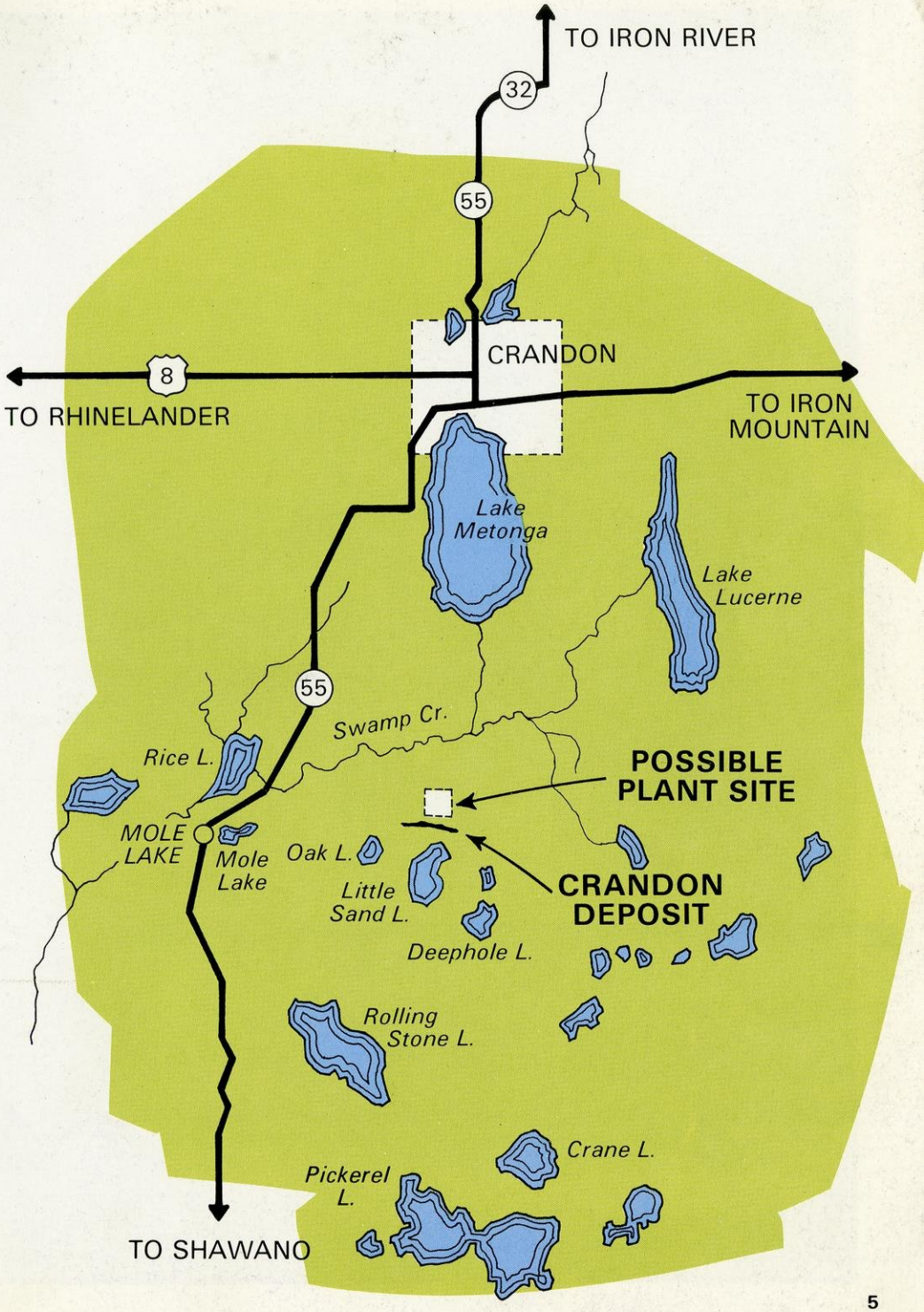
If these factors come together, we could foresee construction beginning in 1983 and dedication of a new mine 3-4 years later.

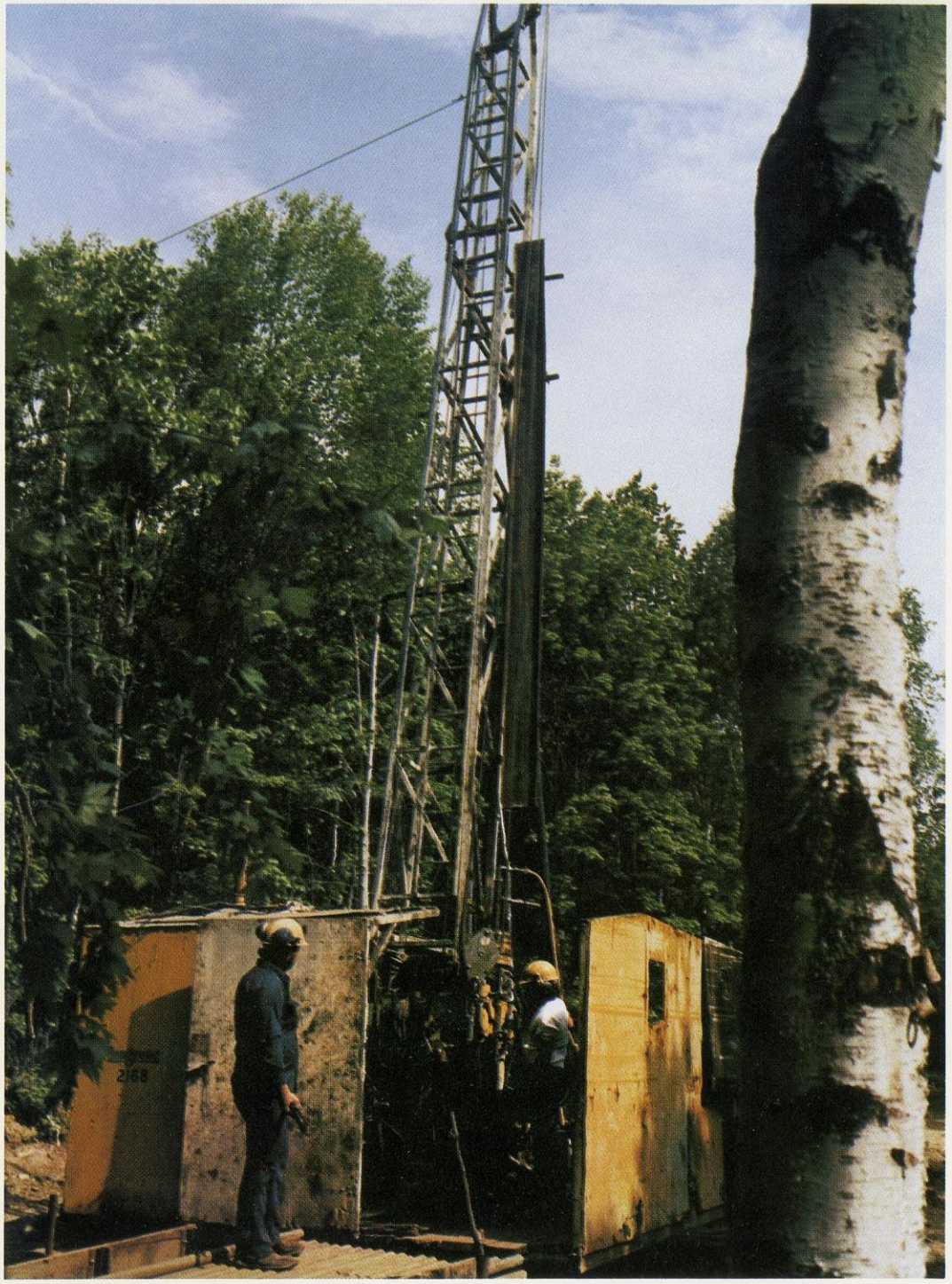


If the Crandon Mine were to be developed, surface facilities would resemble this artist's drawing. Machinery in these buildings would lift the ore from the mine, and upgrade it. Although milling is just one step in mineral processing, a complex like this is often loosely referred to as a "mill."

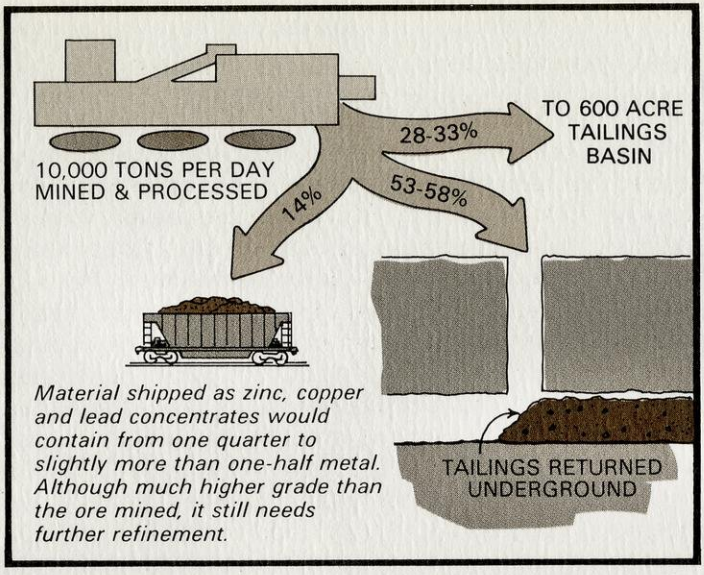


"End view" of the Crandon discovery, which is about 5000 feet long, in an east-west direction. The deposit was formed about two billion years ago, in a geologic period known as the Precambrian Era.





After aerial detection of an electromagnetic anomaly, and confirmation by instruments on the ground, drill crews move in to take core samples of the area of interest. Core is cut by a cylindrical bit rimmed with industrial diamonds. The Crandon anomaly was drilled in 1975-1978. This was the 25th prospect Exxon had studied in Wisconsin.



Material shipped as zinc, copper and lead concentrates would contain from one quarter to slightly more than one-half metal. Although much higher grade than the ore mined, it still needs further refinement.

Once the ore is finely-ground, "concentrate" and "tailings" may be separated. What happens to the tailings? As the drawing shows, most could be used as backfill in mined-out sections. The remainder would be confined in a basin of some 600 acres, which would later be revegetated. (We can't return 100% of the tailings underground because grinding almost doubles the volume of the rock.)

How valuable is the Crandon deposit?

If we can answer a question with a question, we'd say: "How much will Crandon's recoverable zinc and copper concentrates sell for over about a thirty year period starting in the 1980's?" Nobody knows, yet hoped-for dividends for our shareholders warrant risking many millions of dollars in exploration. Inflation also distorts any projection we try to make. What's more important than the total value is where the dollars go. Exxon shareholders would receive a small percentage for the use of their money. Most of the dollars would remain in Wisconsin, to be spent on construction, equipment, supplies and services, employee salaries, and taxes. In any mine development the greatest economic benefit is to the people in the area where the mine is located.

New payrolls and tax revenues are positive factors. What about the negatives?

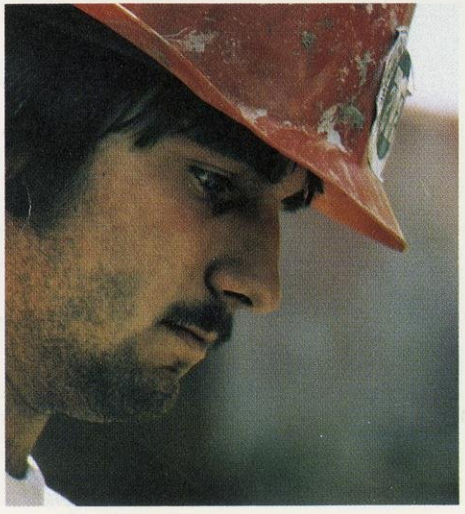
Ok, let's list some "problems" that will arise if we go ahead, but remember that problems are often dependent on your point-of-view. What some people see as problems, others view as challenges, or opportunities. Construction of a mining complex requires a corps of workers; although many local people would be employed, those from outside the Crandon area would need lodging and other accommodations. Later, these construction jobs would be replaced by about 800 permanent skilled workers. Since these basic jobs generate employment in public and private support services, a total of about 1500 new jobs would result in the region. Again, many jobs would be filled by residents; however, new families would require housing, utilities, stores, recreation, education, churches, safety and fire protection, health care. One of the reasons for organized society is to handle "problems" like these to the advantage of all. In studying the past we find examples of disorder and waste in social development. Today we have an opportunity to benefit by yesterday's mistakes and develop better communities. A nearby natural resource is one of the soundest footings for financing community development that you can have—an asset, not liability.

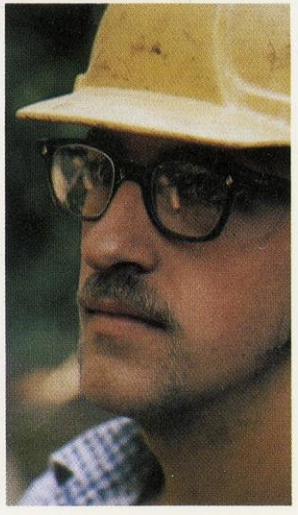
You're talking only about socio-economic impacts. How about the environment?

Have you ever wondered what became of the campus environmental activists of the 1960's? Many of them are working for government or for natural resource developers such as mining companies. That's "where the action is" in the applied science of environmental protection. They're engineers, biologists, chemists, hydrologists, and ecologists. Without their skills mining *could* unknowingly injure the environment. With their skills it need not. Northern Wisconsin is a beautiful place, and if the Crandon discovery is mined, the air and water and scenic resources of Forest County will not be degraded. Exxon would mine

Thousands of feet of drill core from the Crandon deposit have been examined, catalogued and placed in storage. Samples have also been used for "bench tests" to learn how the metallic minerals might best be liberated from the rock.

Left, diamond driller probing the Crandon discovery. About 200 holes, some as deep as 2500 feet, help us to understand the mineral deposit's physical limits and quality. Information revealed by drilling brought conclusion that the deposit could be mined by underground methods.

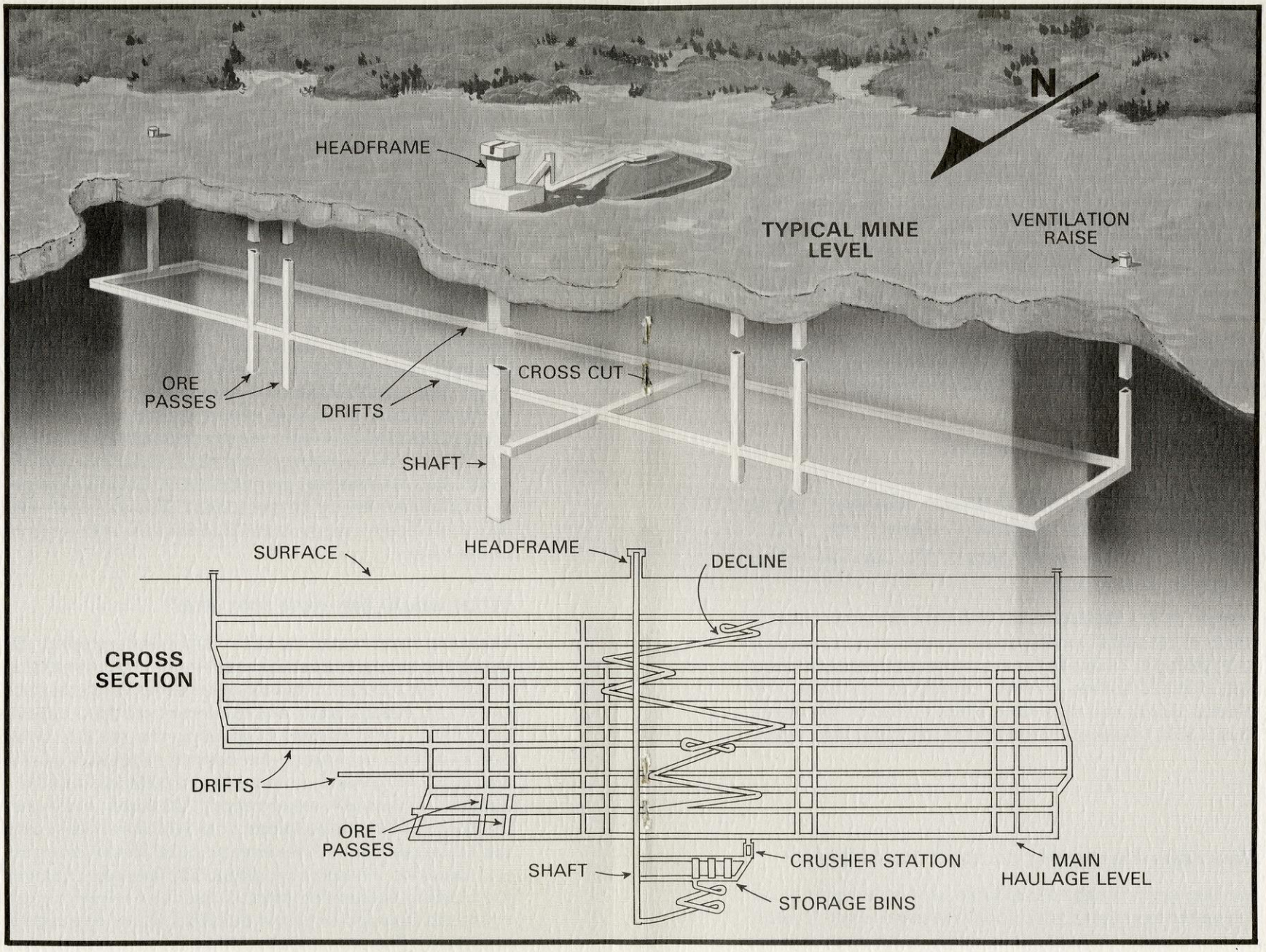




the Crandon deposit completely as an underground mine. This would greatly reduce physical change to the environment. Over half of the tailings (ground-up rock not containing recoverable minerals of value) would be returned to the underground cavities created by mining. The remainder would be impounded in an area covering about 600 acres. At the completion of mining, the area covered by tailings would be revegetated. Before mining, Exxon's studies of the ecosystems and physical environment include monitoring of the quantity and quality of surface water and ground water, detailed census of aquatic and terrestrial biology, a soils and geologic survey, a climatological study, and measurements of air quality. Such information is called *baseline data*. Exxon and state agencies will have volumes of information in hand before any operations begin. This would enable us to detect those changes which might be caused by mining, and take prompt measures to correct those which might cause undesirable impacts. Pre-operational environmental knowledge, as well as plans for continuous monitoring, are required in Exxon's Environmental Impact Report on the project. This document also describes Exxon's reclamation program to be implemented in the future.

What would the mine look like?

The mine itself would be out of sight underground. So would the primary crushing machinery which breaks up the ore, but a cluster of buildings is needed on the surface for offices, maintenance, and to concentrate the ore. (Concentrating is the process of grinding the ore into small particles, then separating the desired minerals from the lean or barren ground-up rock which is called tailings.) The surface facilities will require about 100 acres, about one-third occupied by the buildings. They will be of a design and profile compatible with the environment. The tallest structure would be a headframe, about 200 feet high, housing the hoisting equipment. Most of the noise would be confined underground or by the buildings which enclose the machinery. The exact location of the surface facilities has not been selected; the ore body, however, is 1400 feet or more from Little Sand Lake, so the surface buildings would be at least that far from the lake.



How a deposit such as the Crandon discovery could be mined. At the top of the page, a simplified version of underground mining technique, showing key components of a mine and their relationship to surface facilities. Below, a scheme showing the maze of mine openings called drifts, raises, and shafts that would be required to mine the Crandon deposit.

What are the risks of affecting the lake or Swamp Creek?

That part of the mine shaft which goes through the glacial gravels would be encased in concrete to prevent any impact on ground water. Water used in processing the ore would be continuously recovered and recirculated; if it were necessary to discharge any water, it would be clean water, treated in full compliance with all applicable standards and regulations. The quality and supply of water on neighboring property would not be adversely affected. Commitments such as these are based on knowledge and experience well established by mining professionals. For example, a number of mines are operated *beneath* lakes, without adverse effects. (The Crandon deposit, however, does not extend beneath any lake or stream.)

You've described the Crandon discovery as a "massive sulfide deposit." Does the word "massive" relate to the size of the deposit or the richness of the ore?

Neither. It is a geological term which, like other special words in technical vocabularies, is often misunderstood. To a geologist "massive" means that the host rock has a high metallic sulfide content, usually in the form of a mineral which you may have encountered by the name "fool's gold." Geologists call this *pyrite.* It has little value.

How does the deposit compare with others?

The discovery is considered large, and is believed to be among the top 10 deposits of the "massive sulfide" type in North America. It is about average in mineral content when compared with other known deposits of its kind: about 5% zinc, 1% copper, with substantially lesser values of lead, silver, and gold.

Aerial view of the discovery site. Mineral deposit lies 1400 feet north of Little Sand Lake, is about 5000 feet long and runs in a near east-west direction.

Right. Technicians sampling water at a nearby lake. Analysis of samples provides baseline data. This detailed knowledge and understanding of environment before mining enables ecologists to detect change by comparison with future data, then take corrective measures if needed.

Near right. Stream flow volume being monitored. Streams are also checked for sediments, aquatic life, presence of various elements measured in parts per billion. Far right, member of Beloit College archaeological team under Exxon contract. Shovel probes of soil taken at 15 meter intervals seek evidence of cultural activity that might have archaeological importance. When the brush isn't too thick, they cover 10 acres per day per person.

Why can't Exxon develop a discovery some place else?

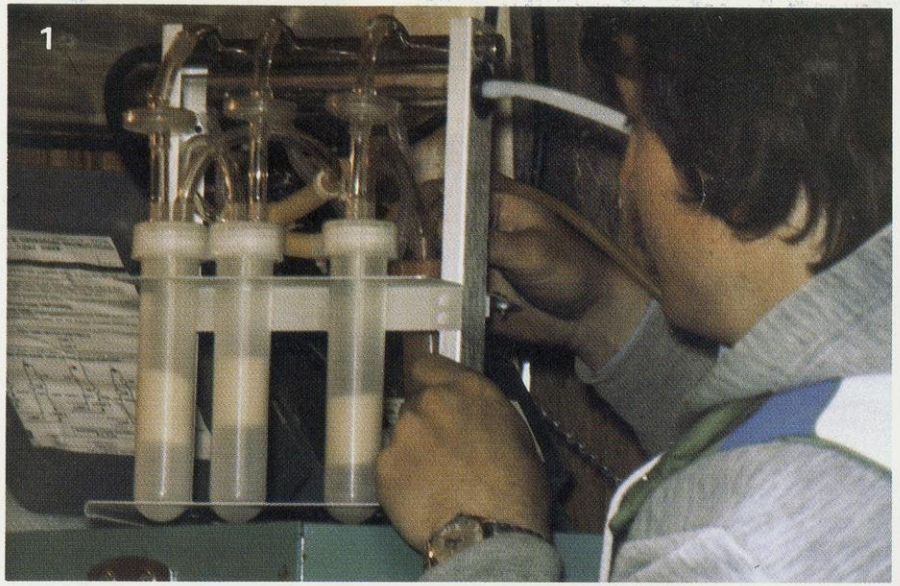
It's natural for people to worry about something that is unfamiliar, and the prospect of change disturbs many people. Mines, of course, must be where nature left the resources. If everybody felt there should be no mining, we would not have the materials on which to base improvements in our civilization. We would lack not only metals, but also fuels and fertilizers. Our challenge is to remove useful minerals from the earth, where they occur, with respect for the natural environment. Yes, there are impacts from mining. Our job is to mine with the least disturbance of the earth, and with the greatest possible benefit to our community and society. People are interdependent. Forest County can furnish forest products, recreational opportunity, and now, possibly, metals, to other people. They, in turn, provide things which benefit us, things such as energy, food, and manufacturing services.

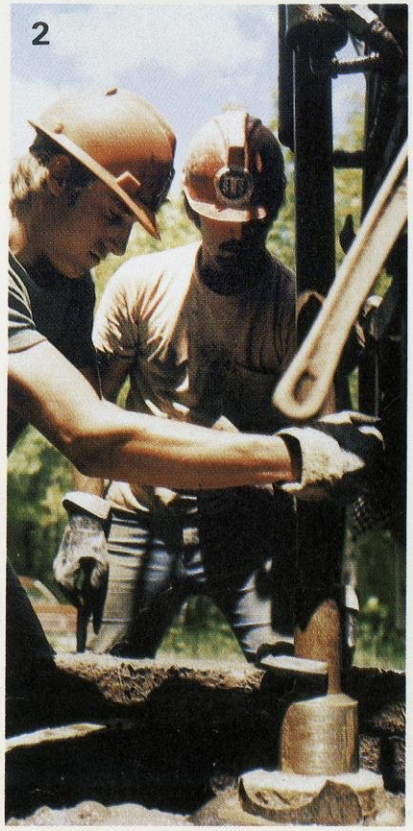
Won't mining harm our tourist industry?

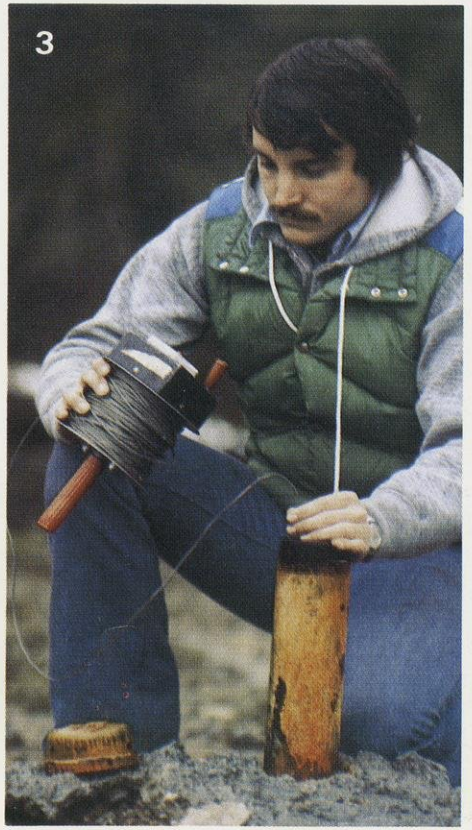
Since it would not harm our air, water, or forest land, mining should in no way reduce Forest County's attractiveness for recreation. Mining and tourism co-exist in harmony in Michigan, Minnesota, Missouri, and the western states. Tours of mining facilities are often interesting and educational experiences for travelers.

If Exxon develops a mine at Crandon, where will the ore be refined into metal?

Exxon's study of potential sites for a zinc refinery is incomplete, and its ultimate conclusions can wait until we reach a decision on a mine. However, the Northwoods of Wisconsin has been eliminated from consideration. It is not practical due to transportation economics. Sites being evaluated are scattered over five mid-western states, including Wisconsin.







(1) Air sampler gathers baseline data on air quality: instrument is SO_2 bubbler that draws air through chemical bath for analysis.

(2) Conventional well-drilling machine sinks holes in glacial materials to sample soils, and monitor ground water.

(3) Measuring water beneath the surface detects any change in water table.

(4) Technician checks instruments on meteorological station. Baseline data includes information on local winds, precipitation, temperatures.

Harvesting wild rice at nearby Rice Lake

Exxon is a petroleum company. Why is Exxon interested in mining metals?

Mineral development is a natural way for an oil company to diversify. Exxon's first mining experience came in the area of energy minerals: coal and uranium. There are many similarities between petroleum development and mining, which give us skills and the confidence to apply them to a project like Crandon. We are familiar with the management of resources. We understand resource development's high financial risks, long lead times, large up-front costs, and the capital-intensive character of mining. Many talents, particularly in geology and engineering, serve in the exploration and development of either an energy resource or a metal resource. Exxon Minerals is interested in zinc because there should be a good market for it; the U.S. currently imports more than 60 per cent of its zinc requirement.

GLOSSARY

Anomaly To mineral explorers, this term describes any increase in electromagnetic conductivity detected by instruments while flying over an area in search of minerals. All but a few anomalies are false alarms, but occasionally further exploration turns up a promising deposit such as the Crandon discovery.

Concentrate The desired product of the mine and milling process. Concentrates are shipped to a smelter or refinery for further processing. The Crandon mine/mill complex would probably produce zinc concentrate at about 55% zinc, and copper concentrate at about 25% copper. Also a verb: to concentrate.

Flotation A processing step in which the metal-bearing ore particles are made to float to the surface of a chemical bath so they can be skimmed off as a concentrate.

Massive Sulfide A geological term describing high sulfide content. Does not relate to grade of ore or size of deposit.

Tailings The by-product of the mining and milling process, the sandy material which is returned to the mine or impounded on the surface.

Photos by David Boe, Jack Lind, Olive Glasgow

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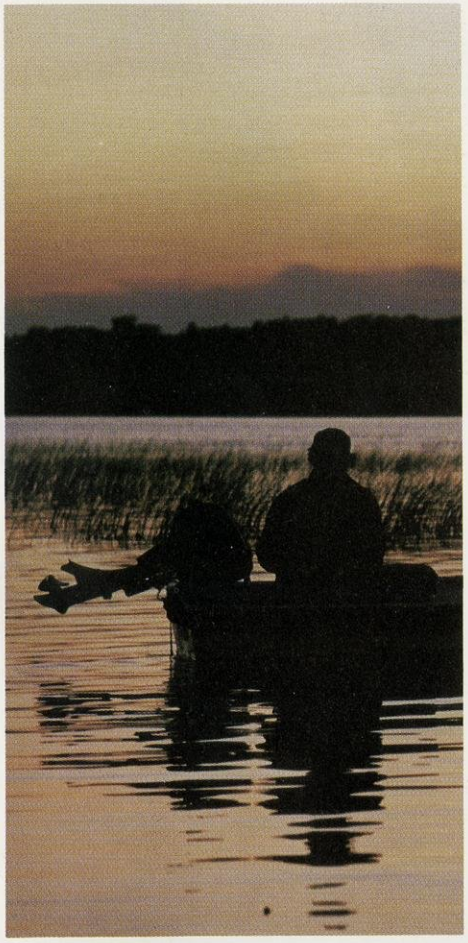

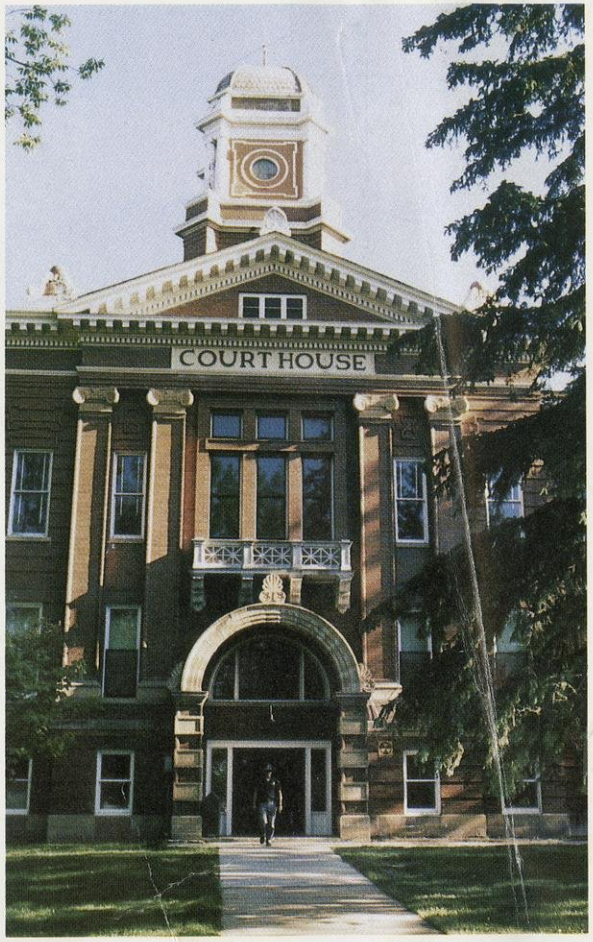
COURT HOUSE

The Quest for minerals has brought a discovery at Crandon. The explorer's success becomes the developer's challenge. Now the quest is for information. How much is there? How deep does it go? How can it be mined? How can the metal be liberated from the rock? How much will it cost? How long will it take? □ And how can we mine safely, without harming the natural environment, or offending people and their values? Will we be welcome here? Will the people like to work in a mine? Are they proud of this discovery or annoyed by it? □ As the quest for minerals succeeds, the quest for knowledge begins. All the questions aren't yours. Exxon has many questions, too. All the answers aren't Exxon's. Many of the answers are in the hearts and minds of the people of Crandon, Forest County, and Wisconsin. The Quest . . . and the Questions. We all benefit by sharing knowledge, just as we all benefit by sharing the bounty of the earth.

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