What's the Big Secret?
Observations and Comments on the San Andrés Mine
and Mining Regulation in Honduras

Report prepared by:
Robert E. Moran, Ph.D.
May 2002

Report commissioned by:
Development Commission of the Department of Copán (CODECOPAN),
through the Association of Non-Governmental Organizations (ASONOG).

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Cover photos:  Open pit of the San Andrés Mine.  This is the old site of the
community of San Andrés, which was relocated in 1998.  (Photo: Anna Cody,
CESR)
Inset photo:  Lixiviacion pool in the San Andrés Mine. (Photo: ASONOG)
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FOREWORD

The problems surrounding the San Andrés Mine are demonstrative of the precarious mining situation in Honduras, a country in which the power and influence of the mining industry on the Government is made more than evident. Great expanses of the national territory have been granted in concessions to mining companies. Several municipalities and thousands of Hondurans are being affected by the activities of these companies. Local inhabitants and municipalities are afforded no participation in the granting of mining concessions; from the beginning, the interests and concerns of municipal governments and the population are regularly neglected by the Central Government.

The General Mining Law, approved six weeks after Hurricane Mitch in 1998, allows for the exclusion of local stakeholders from decisions that will affect their lands and every-day lives. According to this law, all the subsurface of the national territory belongs to the State of Honduras, and is theirs to grant in concessions for exploration and exploitation to mining companies. Furthermore, this law contains provisions for the forceful expropriation of lands belonging to third parties if they obstruct mining exploitation within the concession.

Since the late 1990s, the Association of Non-Governmental Organizations (ASONOG) has been working directly with the three village communities that have been most affected by the activities at the San Andrés Mine, located within the Municipality of La Unión, Copán, in the western region of Honduras. In early 2001, in response to the concerns of citizens that local waters and lands were possibly being contaminated by mining operations, ASONOG was commissioned to seek the assistance of an expert such as Dr. Robert Moran. Dr. Moran is an internationally respected hydrogeologist and geochemist with over 30 years of experience in water quality and mining-related issues. He was contracted to perform an independent technical study on the mining-environmental matters in the area.

Complying with all the legal transactions required, ASONOG, together with the Development Commission of the Department of Copán (CODECOPAN), was granted permission to form part of a government-ordered environmental evaluation on the San Andrés Mine and its operating company, Minerales de
Occidente (MINOSA). (The San Andrés Mine was formerly operated by the Canadian company, Greenstone Resources, Ltd., until 1999, when it declared bankruptcy.) According to Honduran regulation, no study performed independently of the approval of the Central Government, or the mining company, is allowed.

The government-ordered study, scheduled for the second week of December 2001, was interrupted by MINOSA when they illegally denied ASONOG (which is a member of CODECOPAN) and Dr. Moran entrance to their facilities. The report that follows recounts the events surrounding that study, and discusses the inadequate nature of the mining oversight provided by the Honduran authorities. Dr. Moran also discusses other very important issues, such as potential dangers to other communities in the region, problems commonly experienced at mine sites, and he gives several recommendations to improve the current mining situation in Honduras. Among his conclusions are that the mining industry clearly has great control over mining regulation (in legislation and actual enforcement), and that no new mining concessions should be granted until oversight procedures are dramatically improved.

It is our wish that this report will contribute to the discussions and processes that will improve the protections of human rights and the environment for the Honduran public. There currently exists a climate of mistrust among some of the affected communities towards government regulatory agencies; they believe these agencies are not always looking out for their best interests or well being, and they often feel somewhat powerless to improve their situation. This is quite understandable when one considers that ASONOG, after months of coordination, and at considerable cost to obtain the independent technical-scientific opinion of an expert, was not allowed to perform any environmental evaluation. Are we to believe that the local campesino will have the resources, or will even be allowed to get any further? It is our hope that this report will serve as constructive criticism towards the development of a well-founded trust in government agencies on the part of the public, once dramatic changes are realized in the functions, policies, and practices of the pertinent government oversight agencies.

Finally, let us not forget the words of his Venerable Eminence Cardinal Oscar Andrés Rodríguez M. (S.D.B.): “We cannot exploit our natural resources and then wait for the deluge to come. We must deliver an earth better than the one we received; we must deliver forests better than those we received;
we must give our future generations reasons for hope, reasons to live with dignity as children of God.

Association of Non-Governmental Organizations (ASONOG)
May 2002

For more information on the mining situation in Honduras, and the subsequent violation of human rights, please see ASONOG’s publication, “Cráteres, Venenos, Derechos Humanos” (“Craters, Poisons, Human Rights”), currently available only in Spanish. Soon available on the web at www.asongoghn.
Executive Summary

After many months of joint effort between the Development Commission of the Department of Copán (CODECOPAN) and the Association of Non-Governmental Organizations (ASONOG), these organizations succeeded in being allowed to be part of a government-sanctioned study to evaluate the environmental conditions at the San Andrés Mine. ASONOG paid to bring expert assistance to Honduras for the study. Ultimately, the mine operators, Minerales de Occidente, refused to allow the study to be conducted. The Honduran government representatives involved did not override this unlawful action.

The report that follows clearly indicates that there is no effective government oversight of mining activities at the San Andrés Mine, and that the company actually determines the extent to which it wishes to comply with environmental regulations. It further shows that the environmental monitoring conducted by the Honduran mining authority, DEFOMIN, is largely inadequate for revealing the presence of possible mining chemical contamination in the soils, waters and environment of the area.

Importantly, the report demonstrates that little transparency exists within the present legal and regulatory system, thus the general public is not allowed to adequately evaluate what activities and impacts are actually occurring at Mina San Andrés. Aside from the poor-quality studies produced by DEFOMIN, the only other sources of environmental information are those paid for by the mining company, which are several years out of date, and which are often based on inadequate and biased “science”. Even these studies are often not truly available to the public, and there is no access to company monitoring data. Clearly, there is a drastic need for environmental studies made by sources independent of both the mining company and government influence.

This truncated, yet revealing visit also showed the following:
• Mining activities are obviously contributing to contamination of local water resources, and may generate long-term impacts. This contamination may negatively impact the new water treatment program of the Municipality of Santa Rosa de Copán.
• The main role of the Honduran mining regulatory agency is to promote mining, which presents an obvious conflict of interest when it comes to
actual environmental oversight. There is lax enforcement of government directives and regulations, plus a lax provision for any kind of financial assurance or “guarantee fund” demanded from mining companies. Hence, the economic, social and health “costs” of these impacts are being borne by the affected citizens, not by the companies.

• At present, the Honduran government lacks the ability to adequately oversee environmental and social impacts that result from mining activities. As a result, no new mining concessions should be granted, nor should the commencement of any new exploitation be allowed, until these oversight capabilities are greatly upgraded.
INTRODUCTION

“The Story”

So, you fear that your local river and possibly your drinking water are being contaminated by the less-than-public activities of a mining company that uses cyanide to remove gold from native rock. What do you do? In Canada, the USA, or western Europe you might contact one of the regional or national regulatory agencies to provide information and assistance. However, if you are a citizen in Honduras, it is much more complicated. Here, there are also environmental and mining regulatory agencies, but among the public there exists a deep mistrust of the competence and independence of their staffs, and it is obvious that their first loyalty is to the industry that they are supposed to regulate—and promote.

Such is the situation for citizens that live near the San Andrés Mine in the municipality of La Unión, in the highlands of western Honduras. The residents of three villages, San Andrés, San Miguel and Azacualpa, have reasonable concerns about possible negative impacts to public health, safety and the local, largely-subsistence economy as a result of activities at this mine.

Given the prevailing mistrust of the company and the national authorities, the citizens enlisted the aid of a network of Honduran non-profit organizations, the Association of Non-Governmental Organizations (ASONOG), and the Development Commission of the Department of Copán (CODECOPAN) to help them examine and understand these impacts, and attempt to negotiate improvements. As part of these efforts, ASONOG wanted to conduct an independent evaluation of the impacts to local water resources as a result of the mining activities. They contacted me and I agreed to perform such a study during the late summer, 2001.

Subsequently, ASONOG was informed that conducting such an independent study was not allowed by Honduran environmental legislation. Any and all environmental studies must be performed in accordance with the Code of the National Environmental Impact Evaluation System (SINEIA). According to this Code, environmental studies may only be performed by the mining company itself, the General Office of Environmental Control and Impact Evaluation (DECA), or by consultants or firms listed on a Register maintained by the Secretariat for the Dispatch of Natural Resources and Environment (SERNA). (Note: The DECA is an office within SERNA. See appendix.)
Thus, not allowed to perform their own independent study, ASONOG, in coordination with CODECOPAN, petitioned the SERNA for permission to take part in an environmental study of the mine site and pertinent areas. ASONOG also raised funds from international sources necessary to hire expert assistance regarding water issues. After some months, the SERNA conceded, allowing CODECOPAN, ASONOG and their consultant to be part of an investigative team gathered to evaluate whether Minerales de Occidente was adequately complying with their required mitigation measures, and to inspect the status of present environmental impacts. This team was convened by the National Government (through SERNA) in accordance with the SINEIA Code, and was composed of staffs from the National Government (DECA, and the Executive Office for the Promotion of Mining [DEFOMIN], which is also under the SERNA), and numerous regional agencies (such as the Intermunicipal Technical Unit [UTIM] and the Municipal Environmental Units [UMAs] of Santa Rosa de Copán and La Unión). SINEIA studies can legally be conducted without giving the mining company prior notice. In this case, however, the Vice Minister of the SERNA announced the dates of the study at a public meeting in the municipality of La Unión (within which the mine is located) on November 8, 2001. Representatives of Minerales de Occidente (MINOSA) were present at this meeting.

The evaluation and monitoring were to be conducted during the week of December 10, 2001. Preliminary meetings were held by the evaluation team members in the office of the municipal mayor of La Unión on December 10 and 11, attempting to work out the details of the program. However, on December 12, Minerales de Occidente formally refused admittance to ASONOG and their representatives, because, they said, a former ASONOG staff member had previously written an anti-mining article. (I have read this article, and it was clearly not flattering to MINOSA, but it was hardly anti-mining.) The obvious message was that MINOSA was not willing to allow entrance to an organization they knew would bring a critical eye to the study. Thus, they would allow entry of the government representatives, but not ASONOG and their consultant. At this point, the other team members voted to cancel the evaluation. One of the DECA staff (Mauro Suazo) noted that if one member of the SINEIA study was not allowed to participate, the study was not complete, and could not proceed. The team then went to San Miguel, and composed a legal document censuring the company.

Thus, MINOSA unlawfully prevented the evaluation from taking place, demonstrating that they and the mining industry are in control of actual mining environmental activities, not the Honduran authorities.
What do they have to hide?
This network of NGOs attempted to rectify their grievances by following the government-prescribed procedures for obtaining an independent evaluation, but they were thwarted by a combination of difficult and inept regulations and agencies. What other means of response are left to them?

Purpose and Scope
The purpose of this report is to summarize my conclusions regarding the environmental situation at the San Andrés Mine, focusing on water-related aspects. This report also discusses some observations regarding the present Mining Law, mining environmental oversight in Honduras, and the expansion to the water supply for Santa Rosa de Copán. The review is intended to provide a perspective that is independent of the mining company, their consultants, and the governmental regulators.

As summarized above, I was prevented from participating in the planned independent site review and, thus, gathered relatively little direct information; however, considerable indirect information was obtained. The opinions of this report are based on the following:

• travel in Honduras between December 6 and 19, 2001. During this time, I made visits to the publicly-accessed portions of the San Andrés Mine and environs, including the villages of San Andrés, San Miguel, and Azacualpa accompanied by staff of ASONOG on December 7, and again on December 11 and 12 with the other SINEIA study team members.
• interviews and talks with numerous villagers and officials of the affected towns, representatives of local and regional NGOs, governmental officials and politicians from Santa Rosa de Copán and surrounding areas, representatives of national regulatory agencies (DECA, DEFOMIN), and one interview with a representative of the Public Prosecutor for the Environment.
• review of the publicly-available environmental information for the San Andrés project, including volumes 1 and 3 of the Environmental Impact Study (EIA) produced by Steffen Robertson and Kirsten, Inc., [U.S.], (SRK). Unfortunately, no publicly available copies of volume 2 could be found, after numerous requests by various sources, including the mayors of La Unión and Santa Rosa. Allegedly this volume contains the baseline data for the site.
• review of various environmental monitoring reports from DEFOMIN (as well as those from the former national mining authority) for the San Andrés Mine, from December 1997 through May 2001.
• More than 30 years of applied hydrogeology and geochemistry experience, much of it at mining sites throughout the world.

This report is not intended to tell the citizens and regulators what to do. It is intended to provide independent technical support to the local stakeholders and NGOs, and to assist them in determining their own choices regarding the environment and development. Furthermore, the report is intended to present opinions that may constructively influence the oversight practices of the Honduran government. Hopefully this effort will help to minimize the inevitable project impacts, and will improve the chances that future negative impacts are adequately mitigated and are actually paid for by Minerales de Occidente, not the public or various international donors.

Neither ASONOG, CODECOPAN, nor Dr. Moran are philosophically anti-mining, but here focus on making irresponsible practices publicly known, in order to change them where possible.

All activities leading to the preparation of this report have been supported by funds from Dan Church AID (Danish government and Danish NGOs) and Christian AID (English NGO), with logistical assistance from the Association of Non-Governmental Organizations (ASONOG) and CODECOPAN. The findings and opinions are, however, my own.

Background
According to Humphrey (2000, pg. 30), the Aztecs of México told Cortés that they received their gold from the mountains of Honduras, thus expeditions south and eastward began early, around 1524-1525. The San Andrés ore body was reportedly first worked by Spaniards in the 16th century (Engineering & Mining Journal, Feb. 1992, p. 7), and was the source of the first reported gold discovery in Honduras (EIA, Vol. 1, pg.1-3).

Open pit, cyanide leach operations at San Andrés began in 1983 and continued until 1997, under the name Cia. Minerales de Copán (EIA, pg.5). Doan (1997) reports that this Honduran company was actually 99% owned by Greenstone Resources Ltd., of Canada. Between 1996 or 1997
(depending on information from either the mining authority [1997] or the EIA [1998]) and 1999, the official operating name was Greenstone Minera de Honduras, S.A., at which time the company went bankrupt and ownership was acquired by one of its creditors, Banco Atlántida. It now operates under the name of Minerales de Occidente, S.A. de C.V.

Under Greenstone ownership, the open-pit operations were expanded, forcing relocation of the former village of San Andrés to a location several kilometers away. After expansion of the leach facilities, some of the homes in San Miguel were as close as 42 meters from the edges of the cyanide leach pads (where ground-up rock is piled for irrigation with cyanide solution). The open pit has been expanded such that it sits immediately below the village of Azacualpa, with some homes sitting as close as 150 to 200m from the pit margin.

The expanded facilities have been constructed on lands legally purchased from large landholders. However, these lands were formerly rented by local
campesinos to grow subsistence crops. These mountainous highlands contain very little truly usable agricultural land. The expansion of mining operations has changed the former subsistence economy, endangering food security for many.

Local villagers have made numerous complaints about the noise and vibration from nearby blasting, and various socio-economic grievances related to unfulfilled expectations about job creation. They also allege that they suffer various health impacts due to the establishment of leaching facilities so close to where they live, that they must breathe dusts laced with cyanide compounds, metals and other chemicals. This report, however, focuses on alleged releases of contaminants into the local ground and surface waters, and the related environmental and health impacts.

Potential impacts from the San Andrés operation are not limited to those involving only local water resources. The largest city of the region, Santa Rosa de Copán, has begun construction of facilities to expand and upgrade their water supply. They plan to divert much of the additional water from the Río Higuito, which is fed by rivers passing through the mine area. During my visit, the mayor of the Municipality of Santa Rosa, Ing. Juan Carlos Elvir, expressed obvious concern about the possibility that mine contamination might impact this drinking water supply and increase treatment costs.
FINDINGS

Sampling Study
As described above, in December of 2001, Minerales de Occidente refused to allow myself, and staff of ASONOG to enter their facilities as part of a government-sanctioned study. This effort was intended to evaluate conditions at Mina San Andrés, and whether the terms of the Contract of Mitigation Measures signed by MINOSA with the State of Honduras were being fulfilled. Interestingly, MINOSA had previously allowed ASONOG staff access to the site, but none of these observers were experts regarding technical mining and water-related issues. MINOSA had also allowed DEFOMIN staff and selected Japanese advisors access to conduct routine sampling on numerous occasions. Clearly, in this case, MINOSA did not wish selected details of their operations and monitoring to be made public—certainly not to myself or to a potentially more critical international audience.

Nevertheless, it was possible to learn a great deal about the San Andrés operational and environmental procedures by simply viewing the facilities visible from the public roads (leach pads, waste rock, open pit, crusher facilities), which pass right through the center of the operations. In fact, the local villagers must walk through the operations to get home. These impressions were also augmented via discussions with local villagers, officials and representatives of the water users groups, and with the technical staffs of DEFOMIN, DECA, the UMAs (Municipal Environmental Units) of Santa Rosa and La Unión, the UTIM (Intermunicipal Technical Unit), ASONOG and CODECOPAN—many of whom have had several years experience with the operations at the mine. Such sources, together with review of the EIA (1998) and various DEFOMIN reports, provided a good insight into what has been happening at Mina San Andrés.

Sample Handling
For example, on the first evening of our truncated study I was told by various study team members that the previous water quality samples collected by DEFOMIN at the site had not been filtered or preserved in the field at the time of collection. (Preservation means addition of chemicals such as nitric acid to prevent the metals from settling to the bottom of the bottle. Sodium hydroxide is commonly added to prevent the “loss of” cyanide prior to analysis.) That is, the routine procedure for the DEFOMIN team had been
to collect samples at all the sampling locations during the day, drive all the way back to Santa Rosa de Copán, and then filter and preserve the samples in the evening while in their hotel. Such sample handling activities would not occur until many hours or even days after a sample had been collected.

This approach is totally contrary to internationally-accepted sampling procedures. For decades it has been standard practice to filter and then preserve in the field, at the time of sample collection. (Or simply add preservative to an unfiltered sample.) There are several very practical reasons for not waiting to treat the samples.

Firstly, in areas as remote as the San Andrés sites, it may actually be hours or even days before samples are returned to the hotel or laboratory for filtering and preservation. Also, mining-related waters, both surface and ground waters, are usually unstable chemically, with the dissolved contents tending to form solid particles that drop out of solution, falling to the bottom or attaching onto the sides of the sample bottle—if preservative is not added rapidly. The sampling bias is further aggravated by filtering these chemically-unstable samples which are now many hours or days “old.” This removes the solid
particles, which were previously dissolved, thus these contents are not available to be detected in the later laboratory analyses. Not surprisingly, this approach results in lower measured concentrations of most chemical constituents, especially metals.

Hence, there is considerable reason to question whether water quality samples collected during the DEFOMIN monitoring studies correctly represent the existing surface and ground water conditions.

Early on December 11, the DEFOMIN staff confirmed that these were the sampling procedures they had been taught by their Japanese advisors, and which had been used in past monitoring. (The Honduran mining authority had a technical cooperative agreement with the Japanese government under which they received environmental training.) I stated that such procedures were unacceptable and should not be used in the proposed sampling. As a compromise, I suggested that we collect duplicate samples, some handled by the DEFOMIN methods, and a second set preserved in the field, and either filtered later at the lab, or analyzed for “total” metals.

Until this point, the team members still assumed that the study was going forward. Furthermore, DEFOMIN had planned to conduct their own periodic environmental study of the mine (which would have included sampling) simultaneously with the SINEIA study. However, the sampling dispute caused disagreement and concern on the part of DEFOMIN, and delays began to occur, while they conferred with their laboratory team in Tegucigalpa, their superiors, and probably with MINOSA. Shortly afterward, it became clear that MINOSA was going to oppose the inclusion of myself and ASONOG in the study. The sample handling dispute seems to have contributed to MINOSA’s subsequent opposition.

Once it became clear the SINEIA study would not continue, DEFOMIN representatives said they would also suspend their routine environmental monitoring that week. Yet on Thursday the 13th, the day after the SINEIA study was closed, and once I was back in Santa Rosa de Copán, DEFOMIN took their samples anyway.

**Company Monitoring**

According to both the EIA and various team members, MINOSA routinely conducted their own water quality monitoring, and thus it should be possible to compare those data with the past DEFOMIN results. This might shed light
on some of the sampling issues. What procedures did MINOSA use and how comparable were the results? Unfortunately, the DEFOMIN and DECA staff reported that these company monitoring data had never been made public. The government was supposed to receive and review such company data, but for many years, they had never required that these data be provided.

**Impacts**

What impacts were visible from my “limited” view?

- During my first site visit on December 7, we observed an area where orange-yellow colored ground water seepage was entering the far bank of the Río Lara, opposite the main gate to the process facilities area. The discolored zone was about 30 meters wide, and had the characteristic appearance of waters that are acidic. Such waters are often seen at mining sites (referred to as acid rock drainage, ARD), and the color invariably results from a high iron content (often also high manganese and aluminum), usually accompanied by elevated concentrations of numerous other metals and metalloids. As a minimum, the ground water when upgradient, away from the river bank, had contacted some solid materials that caused it to become somewhat acidic, thereby dissolving other chemical constituents, which were carried towards the river. What were these solids? I do not know. They could have been old waste rock, or old ore that had previously been leached (spent ore), buried chemical reagents, or naturally-acidic soils that had been stockpiled. The area that this ground water flow seemed to be coming from had been obviously graded, recontoured, and possibly revegetated. Whatever this undefined material was, it had been buried there and was acting as a source of contamination to the river.

- The waste rock accumulations were being visibly eroded by rainfall, and are obviously reacting chemically with the rain to dissolve chemicals (metals, non-metals) out of the rock, which then flow into the surface and ground waters. These observations are corroborated by elevated specific conductance measurements made by DEFOMIN below the waste rock areas. Also, geochemical testing of waste rock samples described in the EIA (see later discussion) clearly demonstrates that these materials are generating acid leachates, and will in the future. In the EIA, pg. 4-18 to 4-20, it admits that some waste rock and processed ores will be acid generating and will release metals.
Part of an area discolored by orange-yellowish waters on the bank of the Río Lara; this is the characteristic appearance of acid rock drainage (ARD).

Photo: Anna Cody (CESR)

(Mining produces tremendous amounts of solid waste [waste rock, tailings] which contain process chemicals, waste metals, and other toxic components. The U.S. EPA states in its Toxics Release Inventory [TRI] for 2001 that the mining industry is the largest source of toxic pollutants in the USA [U.S. EPA, 2001]. In 1999, it released approximately 3.98 billion pounds of toxic materials, more than half of all the toxic pollution [7.8 billion pounds] released in the United States that year.)

- Some of the San Miguel homes are so close to the heap leach facilities that the occupants are obviously forced to breathe contaminant-laden dust, especially during windy periods. DEFOMIN reports that the closest homes are only 42 meters from the leach facility fence (Environmental Monitoring Report # 03-01, dated 09 March 2001). I have never seen houses this close to such a facility—after more than 30 years of experience at mining sites.)
• The local citizens claim that there have been at least 6 or 7 releases of contaminated leach waters into the local surface waters, and apparently the company and DEFOMIN have admitted that this is so (CESR, 2001).

• Field measurements of specific conductance at piezometer No. 2 by DEFOMIN indicate that leach fluids are likely leaking into the shallow ground water and possibly into the surface water (see later discussion details).

The mining industry often says that there will be no leakage from modern tailings facilities because they will be lined with synthetic membranes. Thus, they are often called “zero discharge facilities”—implying to the average citizen that there will be no leakage. Unfortunately, this is an obvious exaggeration; all liners leak to some extent. This leakage can be very significant if the liners were not installed correctly. Synthetic liners for such leach facilities are normally emplaced using heavy mechanical equipment that passes over the liners, creating holes in the synthetic materials. Even when correctly installed, small amounts of leakage can produce significant impacts if they occur over long periods of time. The management of potential leakage becomes even more difficult once the mine closes. It may require that some form of water management activities continue in perpetuity after mine closure.

• Use of local waters by MINOSA aggravates the competition for these waters. Members of the local water users group believe that surface water levels have declined since mine expansion.

While not a water-related impact, it is hard not to notice the proximity of some homes in Azacualpa to the active open pit. This village is located on a hill immediately above the ever-expanding pit, with some homes as close as 150m from the pit margin. The residents complain of excessive noise and strong tremors during blasting, and given that the area is seismically active, the cliffs would appear to be in danger of failing (see EIA discussion). This risk would be especially high if an earthquake occurred during a period of prolonged rainfall.

Because we were prevented from participating in the actual water quality monitoring, we lack the actual “hard” data necessary to demonstrate additional impacts to water resources. However, my experience at hundreds of other mining sites allows some extrapolation.
The lixiviation pools of Minerales de Occidente (MINOSA), in the San Andrés Mine, containing cyanide solution.

Photo: Heine Pedersen (Dan Church Aid)

Firstly, it must be said that there are always impacts to water resources at mining sites. The simple fact that mining processes involve the blasting and/or breaking of rock into relatively small pieces causes a great increase in the rock surface area. This increases the rate at which these rocks react chemically with water or other chemicals—as compared to the reaction rates of the unfractured rock in its natural state. Thus, essentially all rock materials impacted by mining—waste rock, exposed ore, pit wall rock, tailings, and heap leach materials—are more likely to release contaminated leachates than similar, unbroken rock. For this reason, any mining and mineral processing-related activities started at a previously-unmined site always produce some degradation in the baseline water quality. The same invariably happens when a previously mined site is expanded.

Unfortunately, at the San Andrés mine, the operators have failed to compile an adequate baseline data set—for either water quality or water quantity (see EIA discussion). Hence the present impacts have been masked. Obviously the regulators have also not required that such an adequate baseline be provided.
Past Studies

EIA. Greenstone contracted with the U.S.-based consulting firm, Steffen, Robertson & Kirsten to prepare an Environmental Impact Assessment (EIA, 1998) when the operations were being expanded. The EIA reports that the “Baseline Studies” were included in Volume 2, however none of the citizens or local officials we interviewed had ever seen a copy of Volume 2—nor had the members of DECA. Apparently the DEFOMIN staff had seen this volume. Interestingly, documents from public meetings show that the local mayors and other official representatives had publicly requested that a copy of Volume 2 be provided since at least Feb. 13, 2001. Over a year later, a copy of this volume still has not been provided.

Thus, there are no reliable data (presented in the EIA) that allow one to determine whether impacts to water quality have occurred in the past, or are presently occurring. The reader needs to recall that open pit operations at this mine have been conducted since 1983 or 84!

The “disappeared” Volume 2 also contains the descriptions of the detailed operations history of the site, baselines for aquatic biology, and descriptions of the sources of water. Hence, none of the local stakeholders have been able to review any of this information.

EIA, pages 4-11 through 4-14 and Table 4.1.2 present data and discussions that make clear that much of the waste rock and leached ore will generate ARD and other toxic leachates. Many of the ore and processed ore samples had paste pHs ranging from 3.6 to 5.8. Numerous waste rock paste pHs ranged from 2.7 to 5.0. All of the samples in Table 4.1.2 had very low neutralizing potential (NP) values.

Like the waste rock and pit wall rock, much of the leached ore is also likely to become acidic in the long-term. The EIA fails to explain that the mineral processing procedures rely on CHEMICAL as well as physical steps. A dilute solution of sodium cyanide and lime is used to extract the gold and silver from the ore.

The leach fluids are maintained at a high pH (between about 10 and 12 initially), partly to allow the reuse of the cyanide, which is expensive, and to prevent the formation of cyanide gas, which is extremely toxic and often lethal to humans.
Leached (spent) ores usually have high pHs, initially, together with elevated concentrations of many toxic constituents such as: metals (aluminum, antimony, arsenic, barium, cadmium, copper, chromium, cobalt, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, zinc); non-metals (sulfate, nitrate, ammonia, boron); cyanide and related breakdown compounds (metal-cyanide complexes, cyanate, thiocyanate); and possibly radioactivity (uranium, gross alpha and beta).

Once the alkalinity in the leached ores reacts, the rock is capable of becoming acidic if sufficient sulfide material is present. This process may require many years to become visible. The high rainfall of this area (median is approximately 1600mm per yr.) ensures that the spent ores will generate leachates—either alkaline or acid—depending on the geochemistry of the wastes at the time. Either acidic or alkaline leachates from such wastes can be potentially toxic to plants and aquatic organisms.

EIA, page 4-13: These discussions of synthetic leaching procedures are largely useless for indicating the character of leachates that will be generated by these rocks. The synthetic leaching tests (the EPA 1311 / TCLP and EPA 1312 tests), have been used incorrectly. They were originally used by the U.S. EPA to give a very rough indication of the concentrations of selected constituents that could be easily mobilized from industrial wastes—without any chemical reactions occurring. These tests were never intended to be used to evaluate the reactivity of mining wastes.

Such tests are only suitable to give a rough indication of concentrations of constituents that can be leached rapidly (within about 18 hrs.) from geologic materials by rainwater-like liquids. Thus, they do not accurately represent leachates that may develop from chemical reactions between rock and water that require considerable periods of time to occur, such as almost all weathering reactions, depletion of alkalinity, and the formation of acid rock drainage (ARD). Most significant, ARD production and many other reactions require the presence of specialized bacteria to speed the rates of reaction. It takes significant time for the bacteria to grow and multiply, and the bacteria populations will not thrive unless the pH is less than about 4.5. An 18-hour test does not allow time for these changes to occur. Furthermore, synthetic leach test procedures do not call for test leachate samples to be acidified prior to analysis—a strange omission considering that most international regulatory agencies require that water samples intended for metals analysis be acidified prior to analysis. Failure to acidify leachate samples is likely to
allow metals to settle out of solution, resulting in unrealistically low measured concentrations (see Sample Handling discussion). Also, the pH range of the test makes it unlikely that the leachate samples will contain realistic concentrations of metal oxyanion compounds (such as forms of arsenic, uranium, nickel, selenium, etc.) that may be quite mobile at elevated alkaline pHs.

EIA, Table 4.1.5, entitled Analysis of Final Pregnant Solutions, certainly is not very revealing as to the actual chemical contents of these liquids. It contains no measurements of pH or specific conductance, and the analytical detection limits for many of the trace constituents are too high to be of any real environmental value. For example, note the detection limits for the following toxic constituents:

<table>
<thead>
<tr>
<th>Element</th>
<th>Detection Limit (mg/L)</th>
<th>Honduran Norm*(mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>selenium</td>
<td>less than 2.5</td>
<td>0.20</td>
</tr>
<tr>
<td>cadmium</td>
<td>less than 0.15</td>
<td>0.05</td>
</tr>
<tr>
<td>arsenic</td>
<td>less than 0.50</td>
<td>0.10</td>
</tr>
</tbody>
</table>

(* Quality norms for residual water discharges, listed in DEFOMIN reports.)

On these analyses, the selenium concentration, as an example, would be reported as less than 2.5 mg/L, unless it happened to be higher. Of course, any amount above 0.20 mg/L would exceed these Honduran norms, but would not be detectable using these analytical techniques unless it was more than ten times higher. (Laboratories only report concentrations when they are above a pre-determined limit—the detection limit. In order to quantitatively detect concentrations lower than this limit, the lab may be required to use different pre-analysis procedures, or even a more sensitive analytical technique.)

These are only three examples, but they clearly show that, using these detection limits, one would be unable to detect any Se, Cd, or As in a sample until concentrations were much higher than the legal norms—thus these data and methods are useless for environmental purposes. It should also be mentioned that the Honduran norms are much more lax than comparable international standards (see later standards discussion).

EIA, pages 4-35 and 4-36 state that the open pit may fill with water forming a lake, which may be impacted by acid rock drainage (ARD) formation. If such a pit lake did form, pit seepage could destabilize the adjacent waste rock
piles, causing erosion and landslides, and long-term water quality degradation.

EIA, page 4-36 mentions elevated arsenic and mercury concentrations in surface water samples, and assumes they are the result of past mining activities, or natural hot spring sources. In the absence of an actual baseline data set, one can not determine the source of these constituents.

The EIA and some maps show “colas” (tails) deposited near the old pit. Apparently these are actually spent ores generated by Minerales de Copán which had been previously washed.

EIA, page 4-43 indicates that there were no piezometers or monitoring wells at the time the EIA was prepared, thus there was no actual ground water baseline—for either quantity or quality.

EIA, pages 4-58—4-60, states that the project is located in a very seismically active area, with frequent earthquakes of relatively high magnitude. The cited report by Bukovansky Assoc. states that: “...geologic conditions are not favorable regarding mine stability." This conclusion obviously has implications for the stability of the cliffs that support many Azacualpa homes. It also emphasizes the possibilities for various structures, such as retention dams, waste rock and heap leach piles, etc., to fail in the long term.

Strangely, on December 12, 2001, Ricardo Pineda, the manager of human resources and community relations for MINOSA announced to the study team that SRK had prepared a new EIA, which would be released soon. This may be in response to MINOSA’s intention to expand mining operations.

**DEFOMIN Monitoring Reports.** As mentioned previously, the sample handling procedures used by DEFOMIN guarantee that the measured concentrations of most chemical constituents in water samples will be lower than if generally-accepted procedures had been followed. *This means that most of the DEFOMIN laboratory monitoring data for San Andrés are not reliable for determining whether contaminants have been released by the mining activities.*

Of equal importance is the largely disorganized way in which these studies have been conducted. For example:
The list of chemical constituents monitored is severely inadequate to detect potential releases. While more extensive analyses are expensive, some of the least expensive and most useful indicators of mine leachates, such as sulfate, nitrate, ammonia, chloride, total alkalinity and iron are not performed. Also, numerous other potentially toxic constituents often found in gold leach wastes are not determined—such as selenium, molybdenum, uranium, etc.

There appear to be some analytical problems. In the majority of mining-related studies in which I have been involved, it is routine for the labs to be able to report **reliable, high confidence** results with much lower detection limits than those listed in the DEFOMIN reports. It is common to reliably report these metals to the nearest **microgram per liter** using atomic absorption techniques.

Analytical quality and reproducibility are certainly made more difficult by the fact that the rear of the DEFOMIN sampling vehicle was open to all the dust swept up from the dirt roads. This rear area is where all the sampling equipment was carried. It must be remembered that these analyses are routinely attempting to report results in the **part per billion** (microgram per liter) range. Thus, only one fragment of dust can completely alter the results.
• The organization of samples in the summary tables and on maps, and the labeling of sample bottles is confusing for the general reader. I have never before seen a program where the sample bottles were specifically numbered, but the monitoring stations were not! Also, sampling locations were not kept consistent from one study to the next. This makes comparison of the results from the periodic studies unreliable. It also makes computer analysis of the data extremely difficult. Was that the goal?
• No summaries of past monitoring data by station were presented in any of the reports reviewed.
• The same sampling stations are not sampled in every study period.
• As the monitoring fails to include any of the common anions, the most mobile constituents, it is largely impossible to truly interpret these data. It is the anions that are the best indicators of ARD production, the use of explosives, release of cyanide leach and cyanide breakdown-products and other reagents, presence of pesticides and fertilizers, etc. Some of these determinations can even be done in the field, at least semi-quantitatively.
• No attempt has been made by DEFOMIN to obtain the MINOSA monitoring data, and to compare those results to their own.
• DEFOMIN does not share their data with other agencies, such as DECA.

Several of these reports contain statements that seem a bit fantastic. For example, from Report No. 08-00; September 21, 2000: The report states that no detectable cyanide was found where a significant spill of leach solution had occurred. How is it possible to have had a release of 1800 gallons of cyanide-containing process fluids (CN concentration about 0.10 mg/L), and not be able to detect any Total CN in nearby soils? (I have collected similar soil samples that still contained tens of milligrams per kilogram of total CN, more than 40 years after the releases to the environment had ceased. [Moran, 2000]).

Is it possible that the impacted soils were treated with hypochlorite to break down the cyanide compounds? Once again, because the DEFOMIN data does not include anions, such as chloride, it is not possible to discern the answer. What do the MINOSA monitoring data show? They have not been made public. (A former mine employee told ASONOG that he had seen some discharges treated using some form of chlorine-containing compound.)
Various measurements that seem to provide evidence of mining contamination are often not discussed in these reports. For example: piezometer No. 2 routinely shows elevated specific conductance measurements, often in the range of 1100 to 1400 µS/cm, while the upgradient surface water sample shows a conductance of about 200 µS. There is no explanation for the great increase near the leaching facilities.

Report 07-01; 3 May 2001, states that two new piezometers were constructed, but in different locations than requested. Apparently DEFOMIN did not oversee the siting and construction procedures. What well completion and development procedures were used? Piezometers 4, 5, and 6 all had pHs near 6.0, which would be extremely unusual in newly-constructed wells. Normally such wells would have pHs that were slightly elevated, assuming that surface casing was emplaced using a cement-grout mixture. What would cause them to be acidic? The report contains no explanation!

**Role of Government**

During our attempted site evaluation activities, the mining company obviously controlled the process. In fact, **at no time did the staff of DECA or DEFOMIN ever attempt to overrule Minerales de Occidente’s unlawful refusal to allow us entrance to the site.**

It is clear that the various government agencies lack sufficient funds and trained staff to adequately oversee such activities. More importantly, they are primarily tasked with promoting mining rather than regulating it. This is especially true for DEFOMIN, as their title suggests. Likewise, it is clear that the citizens do not trust the environmental reports they produce, and do not feel these agencies represent their best interests when pitted against those of a mining company.

The DEFOMIN monitoring reports appear to be primarily designed to convince the public that there are no problems, and that the government is watching out for the safety of the citizens. Unfortunately, these studies are conducted in a way that prevents both the government and the public from discovering what is actually happening environmentally.

These agencies do not assist the public in seeing that the company monitoring data and reports are made public, nor do they actively enforce the stipulations presented in the Contract of Mitigation Measures. (In the present case it is referred to as the Contract of the Fulfillment of Mitigation Measures for
the Development of the Mining Project “San Andrés, Copán.”) For example, according to the terms of the “Contract,” MINOSA had been required to prepare and present numerous reports to DECA. These included: Plans for Waste Rock Disposal and Management, Plan for Erosion Control, Noise, Ground Water Study. Several of these documents either had not been written or delivered, as became obvious during our meetings with MINOSA during the period of December 11-12. Also, the San Andrés sewage system had not been working for several months, so MINOSA, which is responsible for providing this service, was told by DECA to propose a schedule for fixing it. No real action had been taken previously by the government or MINOSA in this respect.

Even though MINOSA had failed to comply with many of stipulations of the “Contract”, the company was still allowed to determine their own schedule as to when these overdue reports would be turned in. Clearly, these reports will serve only cosmetic purposes and will be useless unless outside, independent participants are involved in their preparation. More importantly, the terms of such programs must be enforced.

In this situation, DECA’s concept of “enforcement” consisted of reading the Contract Mitigation Measures to MINOSA, ONCE AGAIN, in front of us. There is little technical coordination between DECA and DEFOMIN, at least not in a manner that would assist the public in understanding and correcting mining environmental disputes. Discussions with DECA staff made it clear that they had never seen or reviewed any of the DEFOMIN monitoring reports for the San Andrés Mine. In fact, DECA reported that DEFOMIN reports were not routinely sent to their agency, or to the SERNA, the Secretariat they both are under.

The DECA and DEFOMIN representatives stated that the government had not adequately overseen the San Andrés activities in the past. It became clear during our meetings that Greenstone had not actually complied with the past mitigation measures, and that the enforcement situation had remained the same for MINOSA.

The “Contract” mechanism assumes that the mining company will act as the force that provides socio-economic benefits to the impacted communities. However, these companies normally do not know how to carry out development work, and besides, it does not make them money—so it is seldom done effectively.
After watching these agencies in action, one is tempted to ask: Has the Honduran government ever collected a fine for mining environmental violations or closed a mine for any environmental reason?

**Transparency**

The Mina San Andrés situation is a classic example of how the lack of openness or transparency leads to tremendous mistrust on the part of the general public, towards both the mining company and the mining regulators. By refusing to allow myself and the other SINEIA team members to conduct our study, Minerales de Occidente revealed a great deal about how little openness is tolerated. The largely impotent response by the Honduran regulators also reveals a great deal about their interest in supporting the right of the public to be informed about the issues.

For example, DEFOMIN reported that they are presently elaborating and reviewing the contents of a mining manual (Manual on Mining Environmental Policies) and the Mining Code, but that none of the public stakeholders, such as the affected communities or environmental protection organizations, had been allowed to be part of this process. The following disdainful remarks made by a DEFOMIN technical advisor show clearly that DEFOMIN does not consider participation of the public in the EIA process to be important or relevant. “If we submit the decision to peasants there will be anarchy. It is unreasonable to ask illiterate people what should happen. These decisions belong to experts, doing the job properly.” (CESR, 2001, P.24).

It is obvious that these regulatory agencies make little or no attempt to assist the general public in obtaining the necessary company monitoring information; it has never been collected. Secondly, the environmental information that these regulatory agencies produce is, to say it politely, of dubious quality. It would seem that revealing environmental problems is not one of their main functions.

It is difficult for average citizens to locate copies of most of the technical environmental documents produced by the companies. In this case some of the most important documents have never been made public. More importantly, aside from the DEFOMIN reports which are of questionable value, the Mina San Andrés technical and environmental information are paid for and prepared by representatives of, or consultants to the mining company. These environmental documents prepared by the consultants to the mining com-
pany normally fail to consider potential impacts from the viewpoints of those most likely to be impacted—the local citizens.

Mining consultant’s reports frequently fail to realistically discuss the unpleasant impacts; it is not good for their future employment prospects, and it is easier for the politicians to approve projects when no negative impacts are “foreseen.” Less-than-candid consultant’s reports are the norm in both developed and less-developed countries, when mining environmental issues are concerned.

In the present situation, it is unlikely that the stakeholders would trust studies performed by the mining regulatory agencies. The Honduran regulators have an inherent conflict of interest. In the case of DEFOMIN, as their name implies, their primary responsibility is to promote mining; actively enforcing environmental regulations thus can appear to hamper economic progress.

In such situations it is imperative that environmental studies be performed by parties that are independent of the mining company being regulated. By raising international funds and contracting independent expert assistance, ASONOG attempted to provide that “outside” viewpoint. Even though these efforts at increasing transparency were largely thwarted by Minerales de Occidente, several interesting glimpses have been obtained—at considerable cost to ASONOG. One can only imagine how little the average campesino can discover about the actual environmental situation at Mina San Andrés, given the prevailing climate of secrecy.

**NOTE:** Over 4 months after the interrupted SINEIA study was closed in December 2001, no SINEIA report has been submitted by DECA to the Municipalities of La Unión or Santa Rosa, or CODECOPAN. Another SINEIA study was conducted in early January 2002, without the participation of ASONOG, or myself. The report by DECA for the January study has not been presented either. This demonstrates the lack of seriousness shown by the regulatory agencies on this issue.
RELATED ISSUES

Water Supply Project—Santa Rosa de Copán
Santa Rosa de Copán has grown tremendously in recent years placing great pressure on the infrastructure—especially the water supply and sewage system. At present, this community of about 28,000 inhabitants (within the urban area) uses ground water for their source. However, about 79 percent of the homes receive water only twice per week. About 30 to 40% drink untreated water. Approximately 56% of homes are connected to some form of sewage system that discharges directly to the local stream (Ing. Juan Carlos Elvir, Mayor of Santa Rosa de Copán, 13-14 Dec. 2001).

To deal with some of these needs, the municipality has designed a program that will expand the treated water supply by diverting additional water from the Río Higuito. However, some of the flow in the Río Higuito is contributed by tributaries that drain the San Andrés concession area. Thus, the mayor of Santa Rosa de Copán has been concerned with the possibility that contamination from this mine operation may cause problems and increase treatment and operation costs for the municipality. Answering these concerns in detail is obviously beyond the scope of this report, and would require a separate study. However, because the mayor approached me with these questions, it seems appropriate to comment on these issues.

According to Ing. Elvir, water from the Río Higuito will actually be extracted via wells constructed in the river alluvium, which will then be piped to the expanded water treatment plant. This program involves construction of the diversion facilities and gallery system, expansion of the old plant and remodeling of the laboratory, and development of a mobile laboratory. The first phase construction (diversion and galleries) is estimated to cost L 40M (40,000,000 lempiras, around $US2,500,000); the second, about L 24M ($US1.5M). Funding has been provided by the U.S. Agency for International Development (AID)—with L30 M being donated, and L 10-15M provided in the form of long-term loans.

In preparation for initiating the water expansion program, USAID conducted an evaluation of the existing regional water quality. Unfortunately, the information presented in that study—Santa Rosa Water Quality report—does not contain adequately detailed water quality sampling to truly define the past
conditions, especially for the site on the Río Lara near the mining area. Only one sample was collected per site. Also, many of the possible mine contaminants were not determined in this one sample. Furthermore, some of the analytical detection limits were unsuitable for such purposes, such as: As < 0.1 mg/L. Thus, the report does not provide a thorough picture of the worst water quality that this new plant will encounter.

If contamination from the mining can be demonstrated—either chronic or from acute events—it is possible that the municipality would be required to expend additional funds in treating these contaminated waters. It is not possible to say, at present, what the additional costs might be; this would require a detailed evaluation, including the collection of considerably more complete water quality data.

Thus, it seems only prudent that a much more thorough set of analyses be performed on both the actual water to be treated and the final treated waters. These analyses should include all of the constituents noted in the section on international standards, with suitable analytical detection limits. In addition, some of these samples should be analyzed for Total cyanide, thiocyanate, and cyanate.

It is well known that if cyanide compounds are present in the Río Higuito intake waters, they could convert to numerous other compounds during water treatment (Wild, et. al. 1994). Many of these compounds are not detected in normal cyanide analyses (Moran 2000).

In the past, neither the mining company nor the national regulators have made adequate water quality monitoring data available to the public. Thus, if any form of contaminant spill or release occurred upstream from the water project, the Municipality of Santa Rosa would not know about it, unless they had their own capabilities to detect such events. Hence, the mayor mentioned his desire to have a mobile laboratory that would allow the Municipality to rapidly detect signs of serious contamination—such as mine spills. This could easily be done by having the capability to provide in situ measurements of pH, specific conductance, dissolved oxygen, nitrate, ammonia, sulfate and chloride. If such parameters were routinely monitored (together with other laboratory determinations), an adequate baseline would be available such that the presence of spills could be rapidly detected.
Given these circumstances, it is not surprising that Ing. Elvir further stated the need for an autonomous system, one not dependent on support from the central government.

If it becomes obvious that contamination from mining is increasing the costs of the expanded water treatment system, some of these additional costs should be paid by the mining operators. The existing data are inadequate to answer these questions, and given the weaknesses in the past study, it would appear that such was the intent.

In most developing countries, there are often glaring legal loopholes that allow mining companies to use water at little or no cost. While I have not been able to adequately research the Honduran details, one of the DEFOMIN participants to our SINEIA study described some related issues in Honduran water law. He stated that Honduran water prices were set by the Water Law of 1929, sometimes referred to as the “Canon”, and that it stipulated that the cost of water, to anyone, was and is $0.02 / m3. If this is true, it may explain much of the careless use of water practiced by mining companies.

**Norms and Standards**

The DEFOMIN monitoring studies discussed previously cite Honduran water quality guidelines that are extremely lax when compared to many other international standards and criteria, as is made clear in the following table.

This table is presented for comparison purposes only, and is not intended to imply that one set of guidelines is more pertinent to the situation at Mina San Andrés than another. Furthermore, the original sources for this table contained technical details, often in the form of complicated footnotes, which may not have been included here. Nevertheless, the table is useful to gain an approximate understanding for some international standards as applied to various water uses—drinking water, agricultural uses, aquatic life protection, and industrial discharges. Note that the table does not include any of the numerous organic compounds that might be found at a mining site.

Firstly, this table demonstrates that many of the constituents of international importance are not mentioned in the San Andrés reports—either the EIA or the DEFOMIN reports. Secondly, many of the Honduran norms allow discharge concentrations much higher than those acceptable for many water uses, according to international standards.
**SELECTED WATER QUALITY GUIDELINES**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (units)</td>
<td>6.5–9.0</td>
<td>6.5–8.5</td>
<td>6.5–8.5</td>
<td>6.5</td>
<td>5.0</td>
<td>6.5–9.0</td>
</tr>
<tr>
<td>Total dissolved solids</td>
<td>100</td>
<td>500</td>
<td>500</td>
<td>500.3500</td>
<td>3000</td>
<td>100.009</td>
</tr>
<tr>
<td>Total suspended solids</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil and Grease (mg/L)</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Phosphorus (mg/L)</td>
<td>2.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulphate (mg/L)</td>
<td>250</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulphide (mg/L)</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloride (mg/L)</td>
<td>250</td>
<td>0.062</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlorine, total residual (mg/L)</td>
<td>0.2</td>
<td>0.019</td>
<td>0.011</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluoride (mg/L)</td>
<td>20.0</td>
<td>4.0 (2.0)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ammonia (mg/L N)</td>
<td>0.16 ±0.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrate (mg/L NO₃)</td>
<td>50</td>
<td>10 (as N)</td>
<td></td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Arsenic (total) (µg/L)</td>
<td>0.1</td>
<td>0.01</td>
<td></td>
<td></td>
<td>0.10</td>
<td>0.025</td>
</tr>
<tr>
<td>Fluoride (diss.) (µg/L)</td>
<td>0.05 ±0.01</td>
<td></td>
<td></td>
<td></td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Cadmium (µg/L)</td>
<td>0.05 ±0.02</td>
<td></td>
<td></td>
<td></td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Chromium (hexavalent) (µg/L)</td>
<td>0.05 ±0.05</td>
<td></td>
<td></td>
<td></td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Copper (µg/L)</td>
<td>1.5</td>
<td>2.0</td>
<td>1.0 (1.0)</td>
<td>1.0</td>
<td>0.63</td>
<td>10.0</td>
</tr>
<tr>
<td>Lead (µg/L)</td>
<td>3.5</td>
<td>0.05</td>
<td>1.0 (0.5)</td>
<td>1.0</td>
<td>0.63</td>
<td>10.0</td>
</tr>
<tr>
<td>Manganese (µg/L)</td>
<td>0.06 ±0.01</td>
<td></td>
<td></td>
<td></td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Mercury (µg/L)</td>
<td>0.01 ±0.001</td>
<td></td>
<td></td>
<td></td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Molybdenum (µg/L)</td>
<td>10.0</td>
<td>5.0</td>
<td>10.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nickel (µg/L)</td>
<td>0.05 ±0.02</td>
<td></td>
<td></td>
<td></td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Selenium (µg/L)</td>
<td>0.05 ±0.001</td>
<td></td>
<td></td>
<td></td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Silver (µg/L)</td>
<td>0.5</td>
<td>0.10</td>
<td>1.0 (1.0)</td>
<td></td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Thallium (µg/L)</td>
<td>0.062</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uranium (µg/L)</td>
<td>20.0 (20.06)</td>
<td></td>
<td></td>
<td></td>
<td>0.01</td>
<td>0.2</td>
</tr>
<tr>
<td>Zinc (µg/L)</td>
<td>2.0</td>
<td>3.0</td>
<td>5.0</td>
<td>1.0</td>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Alpha, Grays (picoCi/L)</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radium226+228 (picoCi/L)</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyanide (total) (µg/L)</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.50</td>
</tr>
<tr>
<td>Cyanide (free) (µg/L)</td>
<td>1.0</td>
<td>0.07</td>
<td>0.2</td>
<td></td>
<td>0.062</td>
<td></td>
</tr>
<tr>
<td>Cyanide WAD (µg/L)</td>
<td>0.5</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>


4. US EPA Water Quality Criteria for Aquatic Life—acute(Ac) and chronic(Chr): http://www.epa.gov/OST/standards/index.html#criteria. Due to space limitations, A=acute, and C=chronic.
Honduran Mining Law

A detailed discussion of the Honduran Mining Law is beyond my expertise and the scope of this report. Nevertheless, it is clear that many of the environmental shortcomings noted above are partly encouraged by the Honduran Mining Law, the main goal of which was obviously to promote mining. The details of this law were clearly composed by representatives of the mining industry.

The public has little real access to the necessary detailed environmental documents and data. When documents are made available, they are of unacceptably poor quality, and are clearly composed with a pro-industry bias. More concerning, if a citizen’s group wishes to dispute aspects of a concession (see Article 60), they have only 15 calendar days after public notice of the solicitation for the granting of a mining concession, in which to file opposition. During these 15 days, they must also have organized all of their technical arguments. Such a stipulation is clearly intended to prevent any meaningful opposition.

The Law makes no provisions for truly independent environmental studies. At present, all studies are controlled by the mining interests—as is well substantiated by the farcical events of our attempted SINEIA study at Mina San Andrés. Also, the laws regulating the procedures for environmental studies do not allow for such studies outside of government or company approval.

A layman’s reading of the Law indicates that it allows forced expropriation of land for mining purposes, and even encourages relocation of communities—without requiring the consent of the affected citizens—if ores are located beneath the communities. The Law even contains “servidumbre” provisions that allow mining companies, through the government, to forcibly condemn additional private lands that the company claims are necessary to allow them “to realize the benefits of the concession.” While the owners of such condemned lands must be compensated financially, it seems ludicrous to believe that the process provides provisions to assure that they would receive fair market value for their lands.
The overwhelmingly pro-industry character of this Law and the apparently lax enforcement of environmental regulations leave the citizens few, if any, meaningful ways to legally impact the “process”. Thus, this onerous Law indirectly encourages the citizens not to comply with the various government directives, and discourages cooperation with the mining companies.

Interestingly, this modern Honduran law, adopted in 1999, has many aspects that are quite similar to those in the mining law of the United States, the General Mining Law, or the Hardrock Act of 1872—but the U. S. Law was composed more 125 years earlier. The U.S. Law of 1872, was also extremely unbalanced and pro-mining, but it was passed largely as a means to encourage citizens to settle in the sparsely-populated western lands. The parallel situation does not exist in Honduras. In the intervening 125 years, numerous additional protections (laws and regulatory agencies) for the rights of citizens and the environment have evolved in the U.S. These protections have helped to correct many, but not all, of the original imbalances in that Law. The Honduran “situation” provides the general public with few of those protections. As such, it encourages poor environmental practices on the part of mining companies—many of which are based outside Honduras. Clearly, they would not be allowed to operate in a similar manner in Canada, the U.S.A., or western Europe.

**Financial Assurance**

It is clear that mining activities often produce *short-term* financial benefits to communities and workers (jobs, general business spending) and frequently improve portions of the local infrastructure, such as roads, electrical and water delivery systems, etc. However, these same activities also produce *long-term* environmental and health impacts for which the mining companies often avoid paying (Moran, R.E., 2001c).

Mining has always been a “globalized” industry where international companies operate in developing countries, usually as separate subsidiaries of parent companies. If a company develops financial problems, possibly as a result of declining metals prices, or because of business mistakes, or even outright fraud, the subsidiary may be forced to close unexpectedly and might declare bankruptcy. These companies have often caused serious environmental problems, but until recently in most countries, regulators failed to require mining companies to pay costs associated with many of the post-operational impacts. Either the contamination remained unremediated, serving as a “hidden cost” to the impacted public, or the government / citizens had to pay for the cleanup.
The Mineral Policy Center (Da Rosa, 1999) estimates that there are more than 500,000 abandoned mines in the USA, which could cost the government between $US32 billion and $US72 billion to remediate.

Modern hardrock mining employs technologies that allow the exploitation of low-grade ores (open-pit mining / chemical leaching), but result in massive operations that can produce impacts much more damaging than those of older technologies. These new technologies, together with reasonably stringent environmental requirements have greatly increased costs to restore lands and waters damaged by mining. Higher remediation costs together with several globalization factors, such as more flexible capital markets and drastic commodity price fluctuations have contributed to a recent increase in the number of unexpected mine closings and bankruptcies. Thus, the amount of public environmental liability resulting from mining activities has exploded.

Governments or citizen’s groups have sometimes litigated against these companies in an attempt to recover some costs, but often the bankrupt operating company has few if any remaining assets.

An instructive example is the Summitville mine which caused extensive aquatic contamination in Colorado, USA. Environmental permits for this mine were approved with little oversight during the national economic recession of the early 1980’s. Local officials and citizens wanted jobs. Subsequently the company went bankrupt costing the taxpayers between $US150 million and $US200 million (cleanup and litigation costs), and the environmental problems are not yet remediated. The bond provided by the operating company to the State of Colorado (in the mid-1980’s) was only about $US1 million, and most of this was not convertible to cash. The U.S. government brought litigation against the financially-sound parent company, but because it was Canadian-based, with most of its assets outside the U.S. A., this attempt was cumbersome and initially unsuccessful. Frequently, international and bankruptcy laws shield parent companies from liability—especially environmental liability.

Now, most new hardrock mines in the USA and Canada are required to guarantee that future environmental costs will be paid for (both during operation and after mine closure), even if the company goes bankrupt. All of the western U.S. states now require mining companies to provide some form of “reclamation bonding”—guaranteed funds intended to ensure that operations are conducted responsibly and which limit public liability in the event that mining companies fail to remediate adequately. However, the bonding requirements of these states vary greatly in effectiveness.
This process most often requires the mining company to purchase a bond from an insurance company, which is then held by an independent trustee. It is presently common in the USA and Canada for bonds to cover all anticipated costs of post-closure earth moving and revegetation. However, programs requiring mining companies to post bonds covering long-term water quality problems are in an early stage of development and application. Regulators have usually required companies to supply adequate financial assurance only for impacts they can reasonably predict will occur. The predictions have usually been developed by consultants paid by the mining companies, and results have often been too optimistic. As a result, post-operational impacts, especially the very expensive impacts involving long-term water quality problems, were often unforeseen, leaving the governments with inadequate funds to complete (or even begin) a clean-up.

A recent study by Kuipers (2000) summarizes the bonding programs of the various agencies of the western USA, provides case studies, and summarizes the potential unfunded reclamation liabilities for each state. The authors claim the total, potentially unfunded reclamation liability for all the western states is more than one billion dollars (US). High-quality, independent predictions of future liability would obviously provide more reasonable bond estimates and reduce the unfunded liability.

Costs associated with the operation of a water treatment plant often represent the most significant long-term remediation costs (examples: Summitville, Colorado; Zortman-Landusky, Montana; Golden Sunlight, Montana). Thus, bonding for anticipated, post-closure water quality problems is becoming quite common in the USA and Canada. For example, the State of New Mexico (USA) recently conducted bonding evaluation studies that will require two mining companies to provide bonds greater than $100 million for mine remediation and operation of water treatment facilities (Moran and McLaughlin Water Engineers, 2001).

Insurance is another form of financial assurance that is being evaluated by regulators. They are considering requiring operators of new mines to purchase enhanced forms of environmental liability insurance prior to permit approval. It is important to note that insurance companies normally set insurance coverage charges on the basis of the risks associated with accidents occurring at a population of similar sites—not on predictions for the future at any one site.
Financial assurance is usually inadequate or lacking in developing countries, thus citizens and governments subsidize environmental impact costs. For example, after the tailings spill at a gold processing site in Baia Mare, Romania (February-March 2000), it was discovered that the Romanian government, being a partner in the operation, did not require the company to post any financial bond or other financial assurance. Following the spill, the company was required to pay a fine equivalent to $US170! The company is presently being sued in Australian courts by the Hungarian government to recover damages of more than $US150 million.

Neither the San Andrés EIA nor the General Mining Law make any mention of Financial Assurance issues. There exists a lax provision for the requirement of a “Guarantee Fund” in the SINEIA legislation. However, the decision to create such a fund is left exclusively to SERNA. MINOSA is presently operating without any form of financial assurance.

**Long Term Impacts**

Some mining impacts do not become visible for many years. For example, acidic discharges from mining wastes may not produce obvious negative impacts for many years, or even decades. As a result, some modern mining situations may appear to be without impacts, when in fact it may simply be too early to judge. Once such impacts do develop, however, they may continue for centuries if not adequately and continuously managed.

One of the greatest shortcomings in most mining studies involves underestimating the length of time the public should consider when attempting to evaluate future impacts. For example, acid drainage has continued for hundreds and even thousands of years at sites originally mined in ancient Scandinavia, Spain, and Greece. Also, it is an unproven assumption that buried wastes will remain “contained” even a hundred years in the future. As evidence of these concerns, the State of New Mexico (USA) recently recommended that mining companies provide financial bonds adequate to pay for treatment of contaminated waters for a period of 100 years following mine closure (*Moran, R.E. and McLaughlin Engineers, 2001*).
CONCLUSIONS AND RECOMMENDATIONS

The totally unacceptable outcome from the aborted Mina San Andrés SINEIA study points out numerous glaring weaknesses in the present mining regulatory system that must be changed. Below are some recommendations to address the most significant problems:

• **Fund truly independent studies.** Local citizens would be much more likely to trust statements about present and future impacts if an “independent” study of the Mina San Andrés data and information was performed. Thus, it is recommended that Minerales de Occidente be required to provide community leaders and stakeholders with funds to conduct their own, independent assessment of environmental conditions at the mine. Such an independent study would involve collection and analysis of independent samples.

• **Revise procedures within the SERNA such that an independent environmental group is formed, tasked with monitoring and oversight of specific mining activities.** This group should have actual enforcement capabilities, and should have no role in promoting mining. One of the main roles of this group would be to promote transparency in the process, with the general aim of clearly assisting the general public in gaining access to detailed information/data, from both company and government-generated sources. This group should promote, wherever possible, involvement of the stakeholders in the environmental decision-making and monitoring activities. Funds for the operation of this group should come predominantly from the mining industry.

• **Monitoring procedures (sample collection, handling, laboratory analyses) utilized by both the government regulators and the mining companies must fit internationally-accepted protocols.** Based on studies by the U.S. Geological Survey (Johnson, and others, 2002) and several other sources, mining operators utilizing cyanide extraction processes should be required to monitor for cyanate, thiocyanate, and total cyanide, together with the routinely-monitored metals and non-metals.

• **The mining companies must be required to collect, summarize and submit to the environmental regulatory agency, all monitoring data**
at least quarterly. These data would then be made available to all interested parties. The regulators should also be required to compare the company monitoring data with data collected by their own agencies. Obviously, government monitoring programs should be designed such that the data are easily compared to company data.

- At present, the government (SERNA, DEFOMIN, DECA) is clearly incapable of or unwilling to perform these monitoring and oversight tasks in an acceptable and unbiased manner. Given this reality, it seems only responsible that the process of granting additional mining concessions be stopped until the monitoring and oversight capabilities are drastically improved.

- Members of civil society should play an integral role in helping to improve these monitoring and oversight capabilities. Informed citizen consent is now considered fundamental to the approval of large projects by the World Commission on Dams (2000). (This entire World Bank-commissioned report can be found at www.dams.org. However, the portion most relevant to citizen involvement is Chapter 7: Enhancing Human Development: Rights, Risks and Negotiated Outcomes, which can be found at: http://www.damsreport.org/docs/report/wcdch7.pdf).

- Revise the General Mining Law, such that it provides some balance of specific environmental and social protections for the affected communities and the Honduran public in general. These revisions should include provisions requiring mining companies to provide financial assurance adequate to pay for long-term environmental and other impacts. The terms of such a program could easily be modeled on the more progressive examples presently employed in Canada and the United States.
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