

Witness Statement of Dr. Robert E. Moran

1. My name is Robert E. Moran. I have a Ph.D. in Geological Sciences from the University of Texas, Austin (1974). My Ph.D. dissertation dealt with the hydrogeology and geochemistry of a metal-mining region in Colorado and this work was completed during the 6 years (1972—1978) I was employed as a hydrogeologist and geochemist by the U.S. Geological Survey, Water Resources Division. I have more than 42 years of domestic and international experience in conducting and managing water quality, geochemical and hydrogeologic work for private investors, industrial clients, tribal and citizens groups, NGO's, law firms, and governmental agencies at all levels. Much of this technical expertise involves the quality and geochemistry of natural and contaminated waters and sediments as related to mining, nuclear fuel cycle sites, industrial development, geothermal resources, hazardous wastes, and water supply development. In addition, I have significant experience in the application of remote sensing to natural resource issues, development of resource policy, and litigation support. I have often taught courses to technical and general audiences, and have given expert testimony on numerous occasions. Countries worked in include: Australia, Greece, Bulgaria, Mali, Senegal, Guinea, Gambia, Ghana, South Africa, Iraqi Kurdistan, Oman, Pakistan, Kazakhstan, Kyrgyzstan, Mongolia, Romania, Russia (Buryatia), Papua New Guinea, Argentina, Bolivia, Chile, Colombia, Guatemala, Honduras, Mexico, Peru, El Salvador, Belgium, France, Canada, Great Britain, United States. A copy of my resume is attached as Appendix 1.

2. I was invited to El Salvador in 2005 by the Asociación de Desarrollo Económico Social Santa Marta (ADES), an organization of citizens from a community in the department of Cabañas whose members were concerned about the effects that metallic mining could have on their lives and especially their water resources. ADES asked me for assistance in reviewing Pacific Rim's Environmental Impact Assessment (EIA) for El Dorado. I reviewed an electronic copy of Pacific Rim's 2004 EIA and then worked in El Salvador between October 3 and October 11, 2005. During that time, I had meetings with the Pacific Rim El

Salvador (PRES) staff, participated in a forum in the city of Sensuntepeque (department of Cabañas), toured the proposed mine site at El Dorado, reviewed the 2005 EIA at the Ministry of Environment and Natural Resources (MARN) and had meetings with the MARN technical staff.

3. Because the PRES staff could not answer my technical, water-related questions, the President of PRES, Mr. Earnest, suggested that I meet with the water consultants that conducted the EIA activities. Thus, upon my return to the United States, I met with Vector Colorado, the preparers of Pacific Rim's current EIA, to review portions of the EIA and ask water-related questions.

4. Based on my review of the materials and conversations with the people involved, I prepared a technical review of Pacific Rim's EIA in October 2005,¹ and have had no further role in the project since that time. Apparently PRES provided a response to the Government's comments based on my report on September 12, 2006, but I have not read it, nor was it ever sent to me by Pacific Rim.

5. I am providing this witness statement to the Arbitral Tribunal to provide more information about my work in El Salvador and respond to some comments made by Pacific Rim about me and my report.

A. Community Forum

6. The public forum in Sensuntepeque was held on October 8, 2005, before a crowd of more than 500 people from communities close to the project (see photo on electronic page 4 of my report (C-165)). Mr. Frederick Earnest, President of the Pacific Rim El Salvador Project, and I made presentations. Additional presentations were made by several Salvadoran speakers, followed by questions from the audience.

¹ A copy of my report was submitted by Pacific Rim in this arbitration (C-165).

7. As part of Mr. Earnest's presentation, he stated that no significant water-related impacts were anticipated. My presentation summarized the general findings described in my subsequent report, and I stated that projects similar to this one often generated water-related impacts such as: lowering of water tables; drying up of springs; increased competition for water; possible contamination of local water resources; and that such operations normally used cyanide to extract the gold (and silver).

8. Following these presentations, the audience began to ask questions. It was clear from the content and tone of these questions, that the citizens in the audience had not previously been informed about the possibility for such impacts. A significant portion of this audience voiced concerns about possible impacts to the water resources if the project became operational. They specifically voiced concerns about the drying-up of springs, the lowering of water levels in shallow wells, and water contamination that would be caused by the mining operations. It became clear to me that Pacific Rim had not *adequately* communicated such risks previously to these communities.

B. Specific Technical Comments

9. My report was submitted to the Salvadoran non-governmental organization (NGO) Asociación de Desarrollo Económico Social, Santa Marta (ADES) by approximately mid-October 2005. Following that date, I have had no technical communications or interactions with ADES, the staff of Pacific Rim or their consultants to the present date. Likewise, neither Pacific Rim nor any of their consultants have ever communicated directly to me any of their responses to my report, either verbally or in writing, during this same period—from mid-October 2005 until the present date.

10. My October 2005 report presented **detailed discussions** of the major water-related / geochemical inadequacies I identified in the Pacific Rim EIA. Selected major points include:

a) *baseline* surface water and ground water quality and quantity data and interpretation were inadequate to define pre-mining conditions. If future impacts did occur or were alleged, these data were inadequate to reliably demonstrate such changes. Many of the data (surface and groundwater quality and quantity) the EIA relied on were outdated and incomplete. The EIA included no detailed hydrogeologic testing, such as aquifer / pump tests to indicate the water-yielding properties of the rock units, the faults, and the interconnections between surface waters and ground waters (including springs), that would occur under conditions of mine dewatering. There is no information on the hundreds or thousands of exploration boreholes drilled at the site or their current status. Such boreholes provide new pathways for ground water movement both vertically and horizontally, and can often lead to changes in the baseline water quality. No detailed analytical data were presented to define ground water quality—either from existing wells (shallow, deep, drilled, hand-dug), or from the underground workings. The EIA failed to include a detailed Water Balance for the project.

b) Inadequate geochemical testing results were presented and summarized in the EIA (whole rock chemistry, static and kinetic tests). Limited data are presented in Annex 4.4. These data indicate that the tailings, waste rock and underground workings are likely to generate contaminated discharges. Such discharges may, or may not be acidic, but the overall data suggest they will contain concentrations of numerous major and trace constituents and sediments that are significantly elevated with respect to baseline.

c) The EIA did not indicate the detailed chemistry of the ground waters in the historic, underground mine workings. Such water quality data would routinely be obtained for any similar EIA in Canada, the U.S. or the E.U. Such data would have revealed a great deal about the quality of the

waters to be pumped from the future underground workings, which was to be discharged into the local surface waters.

d) The water / water quality / geochemical-related data were not organized and summarized in a fashion that makes it easy for the regulators or the general public to evaluate either the pre-mining conditions or the future impacts. In most cases, none of these data were summarized in the main body of the EIA itself.

e) As stated in my October 2005 report, this EIA would not have been approved by mine regulators in Pacific Rim's home country of Canada, the U.S.A., or the E.U.

C. Responses to Mr. Matthew Fuller's Criticisms of My Report.

1. General Criticisms

11. Mr. Fuller's statement that I am "...a known anti-mining advocate..." is false. Apparently he believes it is only acceptable for a scientist to write positive statements about projects and to work only for industry clients. My criticism of this technically-inadequate EIA does not mean I am anti-mining.

12. As a minimum, I have consulted **for** the following major & minor mining companies or their attorneys: Kennecott Utah Copper, Newmont, Molycorp-Unocal, Minera Escondida, Homestake, Southern Peru Copper Corp., ASARCO, Echo Bay, Zortman-Landusky, Amax, Chino Mines, Bunker Hill Corp., Anschutz Minerals, Hecla Mining, Gulf & Western Corp., New Jersey Zinc Corp., Cotter Corp., Anaconda Copper, Kemmerer Coal, Union Carbide, Snowmass Coal, Marline Uranium, Southern Pacific Petroleum, United Nuclear-Homestake Partners, Homestake Uranium, EG&G, Kerr-McGee Corp.

13. I have the following experience supportive of responsible mining:

- Between roughly 2000 and 2003, I took part at numerous levels of a long-term evaluation of the status of worldwide mining projects, their common practices and impacts, conducted by the International Institute for Environment and Development, and entitled Mining Minerals and Sustainable Development (MMSD), which *was funded by many of the major international mining companies and the World Bank (WB)*.
- At the invitation of the United Nations Environment Program (UNEP) and the mining industry-backed International Council on Metals and the Environment (ICME), I participated in the first meetings intended to develop the “Cyanide Code” held at the Ecole de Mine in Paris, 25-26 May, 2000.
- I was a member of the Advisory Board to the World Bank Extractive Industries Review (EIR) and participated in preparation of the final report evaluating the environmental and socioeconomic successes and failures of WB-funded projects involving extractive industries (mining and oil & gas) in 2002-2003.
- From late 2011 until 2014, I have been an advisor to the main auditing arm of the Colombian government (Bogotá, Colombia), the Contraloría, training their staffs in technical aspects necessary to conduct water-related audits at mining operations.

14. Regarding footnote 180 in Mr. Fuller's statement and Claimant's exhibit C-600, after many years of consulting to mostly industry clients, I became frustrated by the fact that only portions of my technical findings were being made public, that the industry controlled the production and dissemination of most relevant data, and that the technical capabilities of the regulatory agencies (domestic and international) and civil society groups were woefully inadequate. This “power”

imbalance was obviously leading to poor public interest decisions regarding water and mining issues, in my opinion. Therefore, beginning in 1996, I chose to work mostly for civil society groups / NGOs, and governments. Some of these citizens groups have wanted a mine to go forward (e.g. Quellaveco, Peru), usually because of extreme financial necessity; they simply desired assistance in minimizing the likely impacts. I have no aversion to working for mining companies if they provide me the adequate technical and financial independence. My choice was not an anti-mining choice, but was intended to increase the chances that the broader “truth” of such might become public.

2. *Meeting with Pacific Rim Consultants—Vector Colorado, Oct. 13, 2005.*

15. Mr. Fuller’s description of our meeting is wrong and misleading. I went to the Vector meeting wanting to find answers to the following questions (relevant to water-related activities at El Dorado conducted by Vector or any other consultant):

- Had any aquifer / pump tests been conducted at this site, either long-term or short-term tests? If so, would they provide the results?
- Where were the detailed water level measurements for the monitoring wells?
- Were water level measurements made during more than one time period to show seasonal variations?
- Would they provide the baseline water quality data for all the wells / boreholes sampled?
- Would they provide the summary tables of all water quality data, both historical and recent, including analytical detection limits?
- Would they provide detailed verification of how the water quality samples had been collected, and handled (filtered, preserved, stored prior to analysis, etc.)?

- What details could they provide on the chemistry of the water in the existing underground workings?
- Had they performed a detailed survey of existing springs, wells (shallow, deep, hand-dug, etc.), and would they provide those details?

16. Part of the problem was that when I arrived at the Vector offices, only a few miles from my home, the only relevant water-discipline specialist, Mr. Larry Breckenridge (hydrogeologist), was introduced to me, but could not stay for our meeting. Instead, he provided me the two Vector (May 7, 2004) Technical Memoranda he had authored (cited at the end of my report), stated that no long-term, hydrogeologic testing had been conducted (aquifer tests), and then departed. I was left talking with the Vector project manager (Matt Fuller), and a consultant to Vector (Patricia Acker), who presented me a business card stating that she was with Patricia Acker Consulting LLC, but most of the specific information had been crossed out and she said she now was on the staff of Goldcorp. Fuller claimed that she had been responsible for the water quality activities on the El Dorado Project, but the EIA, (Vol. 1, p. 2-4) lists Patricia Acker's contribution to the EIA as "coordinadora general y coautora"—general coordinator and coauthor—not one of the hydrogeology, water quality, or geochemical specialists. Furthermore, I knew from past experience at the Marlin Mine in Guatemala that she was not a water or water quality-related specialist, but was instead another manager, project oversight person, and compiler of EIAs and similar reports.

17. Hence, I was not allowed to talk with any of the water / geochemical specialists that had actually conducted the relevant field work, or who had authored the original relevant technical reports that were the sources for this EIA. Contrary to Mr. Fuller's allegation, I had no fixed agenda for the meeting other than to talk with the technical, discipline specialists. It has been my experience over many years that the most reliable technical information comes from the technical staff that created it. When talking with project managers and EIA

authors, as with company public relations staff, one usually receives a less-than-candid explanation. Mr. Fuller and Ms. Acker were not able to provide satisfactory answers to most of these questions.

18. For example, regarding Mr. Fuller's statement that he and Ms. Acker "tried to explain that local communities do not rely on groundwater for water supply purposes....", Mr. Fuller argues that they did not need to evaluate the ground water conditions in detail via actual hydrogeologic testing because the local municipalities do not use ground waters for water supply purposes. However, he and the EIA have failed to demonstrate that other water users, such as individual well owners, do not use ground water for various domestic, etc. purposes.² They have not demonstrated that the local springs are not hydrogeologically-connected to the ground waters and will not be impacted by mine dewatering, long-term. Any comparable mine project would conduct a detailed hydrogeologic study, or many studies, to determine as a minimum, the detailed mine dewatering requirements and impacts. And the results of such detailed studies should be, and normally are summarized in the relevant EIA / EIS. Equally importantly, the baseline ground water resources (quality and quantity) should have been investigated in a detailed, quantitative fashion so that future uses of these ground waters might have been understood.

19. This meeting situation illustrates a basic pattern in the development of mining EIAs and EISs. Specialists may prepare the detailed technical reports, but it is the compilers of the EIA who make the choices about what detailed materials to include, in what manner they should be included (e.g. in the main body of the EIA; only in the Appendices; independently-interpreted, or simply appended), and most importantly, which materials to leave out. Mr. Fuller and Ms. Acker were the only individuals that had been involved in the compilation of both the 1997 and

² I note that Mr. Larry Breckenridge, the Vector staff member listed as the project hydrogeologist, states in his Technical Memorandum, "...there are no significant groundwater wells." (Description of the Environment-Hydrogeology, May 7, 2004, p.6) (emphasis added) (attached as Appendix 2). That implies to me that there may be "insignificant wells" in the area.

2005 EIAs, thus they had significant control over which relevant technical documents were included and which were left out, over many years. The materials chosen for inclusion are then rewritten by project managers, often with the assistance and direction of the mining company staff, and integrated into the overall EIA. Unfortunately, in this process, conclusions are frequently changed or omitted, at the discretion of the managers and compilers.

20. In my report of October 2005 I stated that there were severe limitations on the public's ability to review the EIA. On page v of the Executive Summary I stated: "The public EIA review process is clearly lacking in openness and transparency. Only one printed copy of the EIA is available for public review (at the offices of the Ministry of Environment and Natural Resources, MARN) within all of El Salvador. The public must review and submit written comments on this 1400 page document within a period of 10 working days. No photocopies or photos of any part of the document may be made at MARN. As such, the present process is driven largely by the mining industry and the regulatory agencies, without the substantive input from civil society."

21. It is a bit disingenuous for Mr. Fuller to argue that these limitations were due solely to the statutory requirements of MARN. Throughout his Witness Statement he brags about situations where Pacific Rim went beyond any rules or guidelines, to produce an exceptional project and document. It would have been quite simple, inexpensive and pragmatic for Pacific Rim to make several additional copies of the EIA, along with readable figures and tables, available at their company offices, schools, etc. Numerous mining companies do just that throughout the world, in order to promote transparency of the EIA and confidence in their project.

22. Finally, it is true that I have prepared several reports that review and critique similar mining projects, all of which are publicly-available. Many such reports present inadequate technical data and are often overly-optimistic when describing the future water-related impacts. The Conga Project mentioned by Mr.

Fuller, for example, has been held up by massive citizen's demonstrations over the control of the sources of water, both for years before the issuance of my report and after.

I hereby declare that this statement is true and correct to the best of my knowledge and belief.

Golden, Colorado, June 23, 2014.

Robert E. Moran