

**Expert Report of
JOHN A. CONNOR, P.E., P.G., D.E.E.**

*Judicial Inspection of Production Station
Shushufindi Sur*

**Maria Aguinda et al v. ChevronTexaco Corp.
Superior Court of Justice, Nueva Loja, Ecuador
Case No. 002-2003**

By:

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President**

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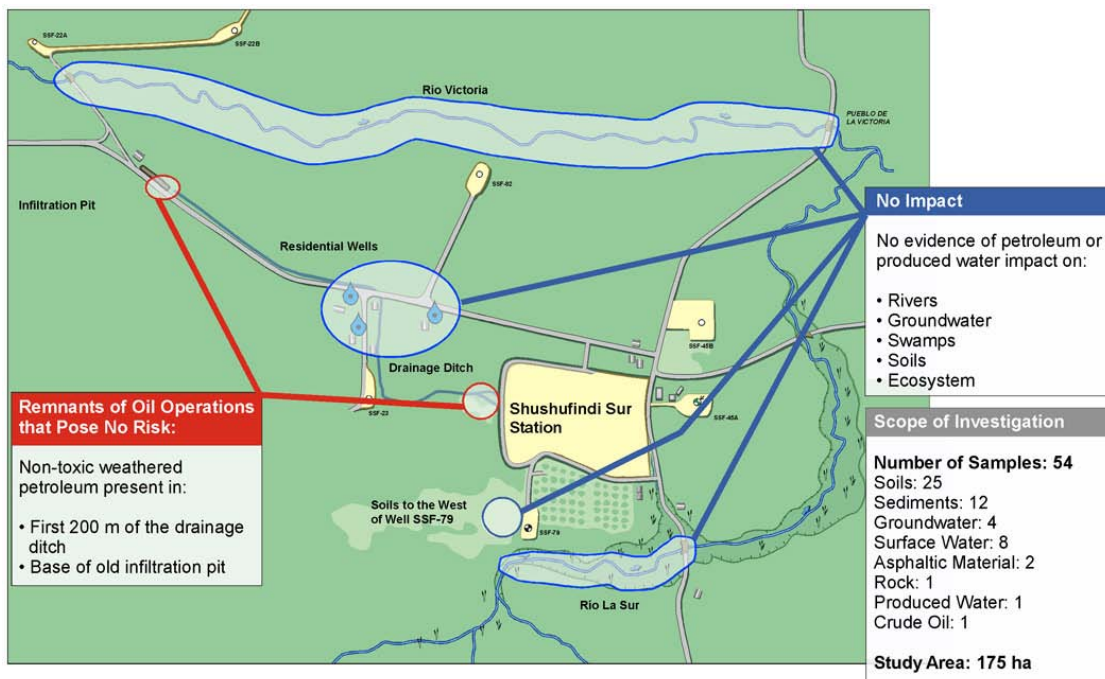
Maria Aguinda et al v. ChevronTexaco Corporation
Proceeding No. 002-2003, Superior Court of Justice, Nueva Loja, Ecuador

1.0 EXECUTIVE SUMMARY

1.1 Principal Findings

I, John A. Connor, have been designated as an expert by the President of the Superior Court of Justice of Nueva Loja, Ecuador, to conduct environmental investigations on behalf of the Court related to Case No. 002-2003, Maria Aguinda et al. v. ChevronTexaco Corporation. For the purpose of this case, on October 27, 2004, the President of the Court initiated a judicial inspection of the Shushufindi Sur production station, located approximately 1 km south of the town of La Victoria in the Province of Sucumbios. This judicial inspection addressed the specific information requested by the Acta de Inspección Judicial issued by the Court on November 8, 2004, including a particular focus on: i) the adequacy of the remedial actions conducted by Texpet at this location in 1996, and ii) the alleged impacts on human health or the environment associated with the former operations of the Petroecuador – Texpet Consortium in this site.

Summary of the Investigation and Principal Findings



Based on the results of the environmental sampling and testing activities conducted during the period of October 27 through October 30, 2004, as well as an ecological investigation of the nearby rivers and swamps conducted on April 3, 2005, and my review of documents related to the remedial actions conducted by Texpet and the former operations of the Petroecuador-Texpet Consortium at this site, I have reached the following conclusions regarding environmental conditions in the vicinity of the Shushufindi Sur production station:

- 1) **Compliance with the Remedial Action Plan:** *Texpet complied with the remediation requirements for the Shushufindi Sur production station as specified in the Remedial Action Plan.*
- 2) **Minimal Impacts Posed by Oilfield Operations:** *The results of the investigation conducted in an area of 175 ha centered around the Shushufindi Sur production station demonstrate that, apart from the active operations of Petroecuador inside the station, there is no impact to the surrounding rivers, swamps, soils, groundwater, or drinking water, with the exception of affected soils in 3 locations of a combined area less than 0.12 ha, which pose no risk to human health or the environment. None of these three areas were included in the Remedial Action Plan.*
- 3) **No Human Health Risk:** *Based on risk analysis procedures that are accepted worldwide, the 3 small areas of affected soils that have been identified in this judicial inspection pose no risk to human health today nor did they pose such risk in the past.*
- 4) **No Ecological Impacts:** *In the rivers located north (Río Victoria) and south (Río La Sur) of this production station, there are no contaminated environmental media or ecological impacts related to oil production activities at the present time and there is no evidence of such impacts having occurred in the past.*
- 5) **No Further Remediation Needed:** *Results of this judicial inspection clearly demonstrate that there are no environmental impacts associated with past Texpet operations that pose a risk of negative effects to human health or the ecosystem, or damage to surface water or groundwater resources. Therefore, there is no need for any further remedial action.*
- 6) **Past Texpet Operations Complied with the Regulations and Practices in Place at the Time:** *During the period in which Texpet served as operator of the Shushufindi Sur production station (i.e., from 1975 to 1990), the management of produced water by means of treatment and discharge to surface water, the use of earthen pits with natural clay lining, and the flaring of non-usable natural gas were standard practices in the oil industry worldwide, and these practices continue to be used in many countries today, including Latin America and the United States.*
- 7) **Effects of Colonization:** *Due to colonization, the area surrounding Shushufindi Sur production station, as well as the entire Shushufindi oilfield, has been transformed from virgin forest to cleared land and secondary growth that is used mainly for agriculture purposes, unrelated to oil production activities.*

A more detailed discussion of each of the judicial inspection findings is provided below.

1.2 Compliance with the Remedial Action Plan

Texpet complied with the remediation requirements for the Shushufindi Sur production station as specified in the Remedial Action Plan.

According to the requirements of the Contract of May 4, 1995, and the associated Remedial Action Plan, Texpet completed the remediation activities for the affected soil areas in the station (designated Areas B, D and E) in August to September 1996, as well as the delivery of equipment to Petroecuador in October 1996 for the treatment and re-injection of produced water, as shown by project records and my recent site inspection (see Section 4.2 of this report and Appendices B to G). Based on inspections conducted during and after the remediation work in October 1996, the Government of Ecuador and Petroecuador approved and accepted the satisfactory completion of these remediation activities by Texpet, as documented in the Actas and correspondence issued by these parties. Copies of these documents are provided in this report (see Appendix F).

1.3 Areas Affected by the Oil Production Activities are Minimal

The results of the investigation conducted in an area of 175 ha centered around the Shushufindi Sur production station demonstrate that, apart from the active operations of Petroecuador inside this station, there is no impact to the surrounding rivers, swamps, soils, groundwater, or drinking water, with the exception of affected soils in 3 locations of a combined area less than 0.12 ha, which pose no risk to human health or the environment. None of these three areas were included in the Remedial Action Plan.

In order to identify site conditions representing an environmental impact, concentrations of petroleum and produced water constituents measured in the environment have been compared to "international evaluation criteria," which correspond to the maximum allowable concentrations in soil or water that comply not only with applicable regulations in Ecuador but with other oil producing countries of Central and South America, the United States, and international guidelines in effect during the time of the Texpet operations in Ecuador (see Section 4.4.1 and Appendix N). Based on the analysis of more than 50 samples of soil, water, sediment, and other materials collected in the 175-ha investigation area, effects of oilfield operations at this station were found in only the following three areas: i) the first 200 m of a former drainage ditch to the west of the station, where degraded petroleum is present (affected area < 0.06 ha), ii) a branch of this drainage ditch, where a calcite precipitate is present (affected area = 1.5 m²), and iii) in the base of a former infiltration pit, at the end of the drainage ditch, where surface patches of asphaltic material and soils containing degraded petroleum are present (affected area < 0.06 ha) (see Section 4.4). The materials found in these three locations do not contain toxic constituents, including volatile organic compounds (benzene, toluene, ethylbenzene, or xylenes, or BTEX), polycyclic aromatic hydrocarbons (PAHs), or heavy metals, at levels that pose a risk to human health or the ecosystem (see Section 4.6). These results disprove the claims made by the Amazon Defense Front, according to whom the section of Rio La Sur and the adjacent swamp located to the

south of the station were impacted by petroleum, with an affected area of 38 ha. In fact, there is no evidence of any such contamination in this area.

Due to the rapid biodegradation of petroleum, the methods used to date degraded petroleum cannot accurately determine the age of these materials; however, available information on past activities indicates that these materials are probably related to the former discharge of produced water prior to 1995 or to the many oil spills that have occurred since that time. During the judicial inspection in October 2004, the active oil pits located at the west end of the Shushufindi Sur production station were observed to be overflowing. This indicates that the operation practices of Petroecuador still result in the discharge of petroleum to the former drainage ditch.

Although there is no crude oil in the vicinity of either Rio Victoria or Rio La Sur, natural sheens caused by bacterial activity are visible in the swamps and/or muddy banks adjacent to these rivers. These natural sheens, caused by oxidation of bacteria and natural organic compounds, commonly appear in the banks of marshes in climates such as that of the Oriente region. Such sheens can be mistaken as a petroleum film on the water surface; however, natural sheens created by bacteria can be easily differentiated from petroleum films by means of field observation and laboratory analysis, as I have done in this judicial inspection.

1.4 No Risk to Human Health

Based on risk analysis procedures that are accepted worldwide, the 3 small areas of affected soils that have been identified in this judicial inspection pose no risk to human health today nor did they pose such risk in the past.

In three areas where effects of oilfield operations were discovered in the vicinity of the Shushufindi Sur production station, the soils affected with the degraded petroleum and the calcite precipitate do not contain toxic substances in excess of the evaluation criteria, with the sole exception of benzo(a)pyrene, which was detected in the asphaltic material that is present on the ground surface within the first 200 m of the drainage ditch and in the base of the former infiltration pit. However, the chemical and physical composition of this asphaltic material is comparable to road pavement, which commonly contains benzo(a)pyrene as well as other PAHs at much higher concentrations than found in the asphaltic material during this judicial inspection (see Section 4.4.14). Furthermore, there are no pathways for human exposure to this asphaltic material that could result in harmful health effects (see Section 4.6.1). The available data indicate that past impacts were limited to the areas identified in this judicial investigation, and there is no evidence that these impacts posed a greater risk in the past compared to the present day (see Section 4.6.2).

In fact, the only source of potentially harmful health effects found in this judicial inspection was the presence of highly elevated concentrations of coliform bacteria in the local household water wells. Such bacteria, as described in guidelines published by the World Health Organization (WHO), pose a serious hazard to the health of persons who use such water for consumption or personal hygiene (see Section 4.4.5). The presence

of coliform bacteria in these wells indicates poor sanitary practices and is not related with oilfield activities.

1.5 No Ecological Impacts

In the rivers located north (Río Victoria) and south (Río La Sur) of this production station, there are no contaminated environmental media or ecological impacts related to oil production activities at the present time and there is no evidence of such impacts having occurred in the past.

Approximately 200 m south of the station, the Rio La Sur is bordered by a wide swamp densely vegetated by grass, of a foreign species introduced to the region by the colonists, and a few native trees. In addition, approximately 1.2 km northeast of the station, near the former infiltration pit, is the floodplain of the Rio Victoria, consisting of a mature alluvial forest with a high density of vine growth common to such wooded areas. In neither of these two areas is there any sign of impacts of oil or produced water on the surface water, soils, or sediments, nor is there evidence of vegetative stress, as confirmed by results of sampling and testing conducted during the judicial inspection (see Sections 4.4.3 and 4.4.6).

On April 3, 2005, an ecological inspection was conducted in these two areas, which found no evidence of contamination or negative effects on the physical or biological characteristics or the health of the vegetation in these areas. Consequently, there is no need for any remedial action (see Section 4.7 and Appendix Z). Furthermore, there is no evidence of any ecological impact due to past oilfield activities in the vicinity of this station.

1.6 No Further Remediation Needed

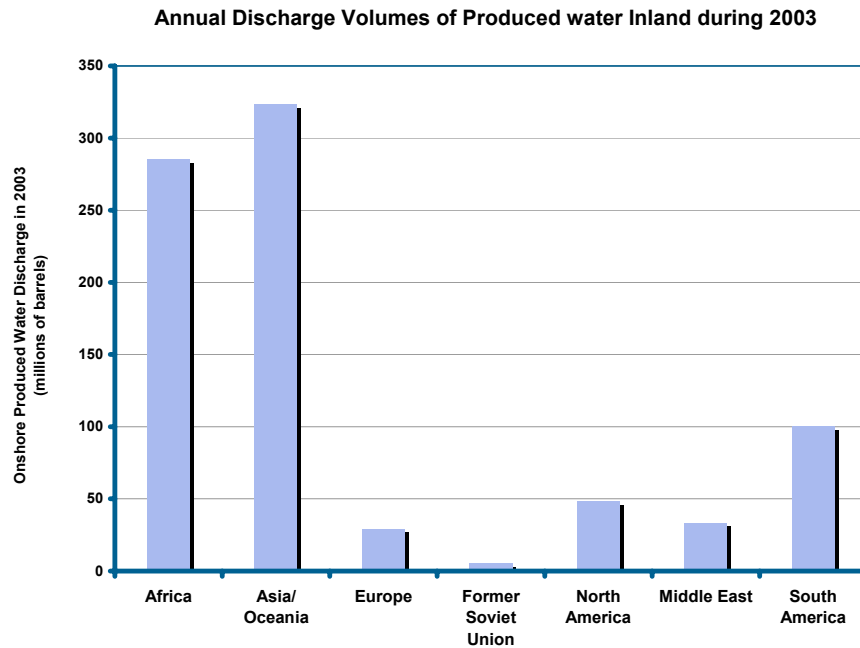
Results of this judicial inspection clearly demonstrate that there are no environmental impacts associated with past Texpet operations that pose a risk of negative effects to human health or the ecosystem or damage to surface water or groundwater resources. Therefore, there is no need for any further remedial action.

Regulatory agencies and international standards organizations define “environmental remediation” as action taken to remove, treat, or contain the movement of a chemical compound so as to mitigate risks to human health and the environment. Such remediation includes those actions needed to protect human health and the environment, but, in general, does not involve complete removal of the chemical from the environment. As observed in the case of the weathered petroleum, the asphaltic material, and the calcite deposit encountered in the judicial inspection, remnants of oilfield activities can remain in the soil without posing a risk to human health or the ecosystem and, consequently, do not require remedial action. Nevertheless, if the materials present in the three small areas (a total area of less than 0.12 ha) were to be removed completely, the associated cost would be minimal, approximately \$50000 U.S., based on actual costs in Ecuador and other countries (see Section 4.8 and Appendix BB). Such a removal action would not result in a net benefit to human health or the environment, as there are no such risks associated with these materials.

1.7 Past Texpet Operations Complied with the Regulations and Practices in Place at the Time

During the period in which Texpet served as operator of the Shushufindi Sur production station (i.e., from 1975 to 1990), the management of produced water by means of treatment and discharge to surface water, the use of earthen pits with natural clay lining, and the flaring of non-usable natural gas were standard practices in the oil industry worldwide, and these practices continue to be used in many countries today, including Latin America and the United States.

- **Management of Produced Water:** Management of produced water by means of treatment in separation pits and subsequent discharge to the environment was a common practice worldwide during the decades of the 1960's to the 1990's (see Section 4.3.4 and Appendix L.1). During the period of Texpet's operation in Ecuador, there were no regulatory limits on the discharge of produced water nor were there any requirements for re-injection of this water. In the past two decades, in response to new regulations established principally after 1990, the re-injection of produced water to the oil production reservoir has been established as the principal disposal method for produced water in a number of countries. The practices employed by Texpet and Petroecuador in the Oriente oilfields have been consistent with and have even surpassed the general pattern observed internationally, with the installation of equipment to re-inject 100% of the produced water volume in the last 15 years, using funds and equipment supplied by Texpet. However, as indicated by the following graph, in 2003, approximately 800 million barrels per year of produced water were still being discharged to rivers, lakes, and other onshore surface waters worldwide, including 100 million barrels per year in South America. In the United States, the rate of produced water discharge to onshore surface waters was relatively constant during the 1960s through the 1980s, but decreased significantly after 1990 due to implementation of new federal regulations.
- **Use of Earthen Pits:** During the 1960s to the 1990s, the use of earthen pits was a standard practice in the oil industry worldwide, including the United States, where, in 1984, 125,000 oilfield pits still existed (see Section 4.3.5 and Appendix L.2). Although there were no technical standards for pits under Ecuador regulations during the time that Texpet served as operator of the Concession, the earthen pits in the Shushufindi Sur station were constructed with natural clay soil liners, which are consistent with the technical standards issued in the United States during the 1980s and 1990s, and later in other Latin American countries. More importantly, the absence of impacts of oil or produced water on groundwater in vicinity of the station shows that the clay soils underlying these earthen pits and the adjoining drainage ditch have indeed served to prevent potential impacts to the groundwater in this area.



Note: These data were presented by the International Organization of Oil and Gas Producers (OGP) and are based on volumes reported by 30 oil and gas companies operating in 54 countries.

- **Use of Flares to Burn Unusable Natural Gas:** In accordance with the Concession Contract and Decreto 625, both issued by the Ecuadorian Government in August 1973, all of the natural gas produced in the Petroecuador-Texpet Concession belonged to the Government, which maintained exclusive control over the use and destruction of the gas during the entire period of Texpet's operations. Today, in oilfields around the world, approximately 108 billion cubic meters of gas associated with oil production is burned each year, a level that has remained relatively constant since 1983 (see Section 4.3.6 and Appendix M). Throughout the world, flares are recognized by government regulatory agencies as an efficient and safe method to eliminate excess natural gas, and, in some cases, as in Ecuador, the use flares is required to prevent the direct discharge of natural gas to the environment. Presently, only 8% of the natural gas produced gas in the Shushufindi Sur station is burned, and the rest is recovered for productive use.

1.8 Effects of Colonization

Due to colonization, the area surrounding Shushufindi Sur production station, as well as the entire Shushufindi oilfield, has been transformed from virgin forest to cleared land and secondary growth that is used mainly for agriculture purposes, unrelated to oil production activities.

Field inspections and an analysis of historical aerial photographs show that, between 1975 and 2004, in the area surrounding the station, the virgin forest has diminished from 52% of the area in 1975 to 0% in 2004, while the area associated with plantations, grasslands, secondary vegetation, and other cleared land (unrelated to oil production

activities) has increased from 30% to 79% (see Section 4.1.1, Appendix H and Figures 10, 11, and 12). The pattern of land clearing and deforestation due to colonization in the area surrounding this station is consistent with the pattern observed throughout the Oriente region in the last two decades. With the support of the “Ley de Colonización” in 1978, which encouraged settlement of the land in the Oriente region, the population of this region has grown at double the national rate, resulting in the colonization of 1 million ha by 1994.

1.9 Organization of this Report

Information supporting these conclusions is provided in Sections 1.0 to 4.0 of this report, as well as in Appendices A through CC. Appendix DD provides the laboratory analytical results and the associated Quality Assurance/Quality Control (QA/QC) records.

For this Judicial Inspection, I have requested the assistance of other recognized experts in the fields of environmental chemistry; fate and transport of petroleum; international environmental regulations and practices; crude oil composition; environmental remediation; and the effects of petroleum, natural biological agents, and pesticides on human health, farm animals, and plants. The appendices that accompany this report present the supporting information provided by these experts, as well as a description of their qualifications and experience.