

## Expert Report of John A. Connor, P.E., P.G., D.E.E.

### Judicial Inspection of Station Shushufindi Norte

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

#### 1.0 EXECUTIVE SUMMARY

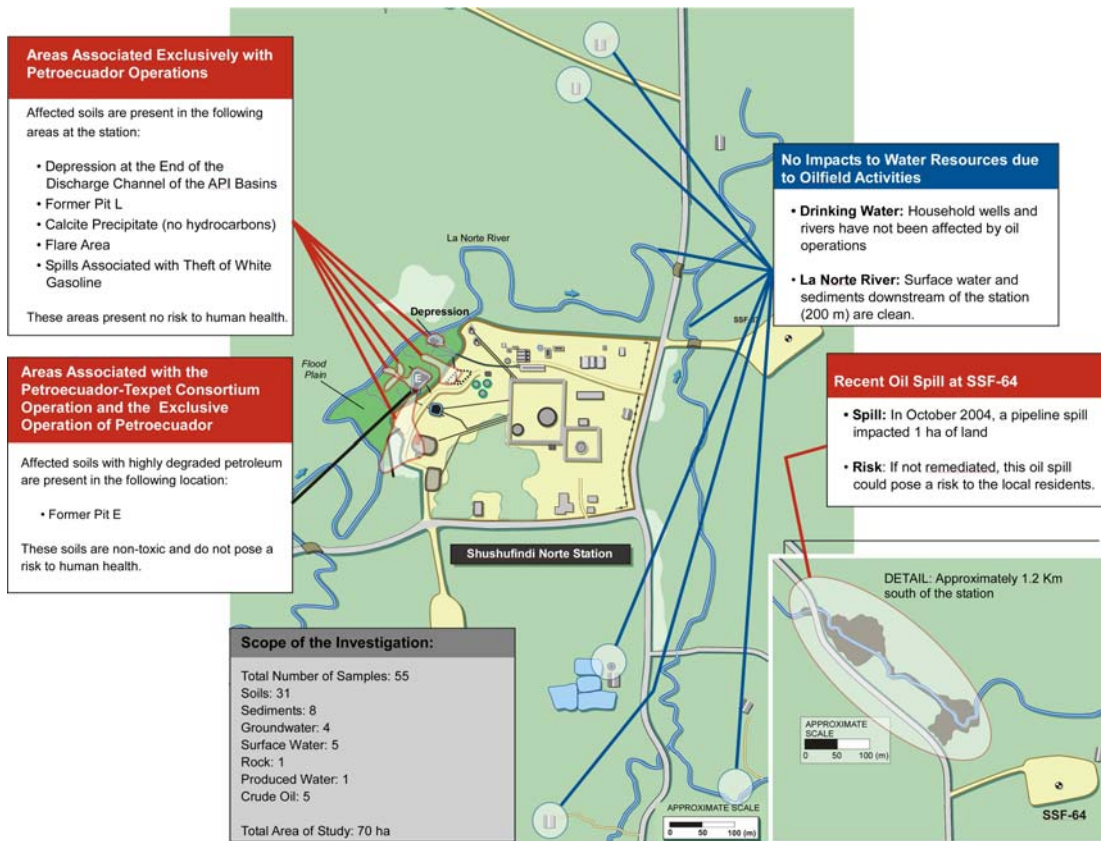
##### 1.1 Principal Findings

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 vs. ChevronTexaco Corporation. For the purpose of this case, on December 8, 2004, the President of the Court initiated a judicial inspection of the Shushufindi Norte production station, located approximately 3.8 km north of the town of Shushufindi in the Province of Sucumbios. This judicial inspection addressed the specific information requested by the Acta de Inspección Judicial issued by the Court on December 13, 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 at this site.

Based on the results of the environmental sampling and testing activities conducted during the period of December 8 through 12, 2004, as well as an ecological investigation of the floodplain of the Rio La Norte conducted on April 4, 2005, and my review of documents related to remedial actions and oilfield operations at this site, I have reached the following principal conclusions regarding environmental conditions in the vicinity of the Shushufindi Norte production station:

- 1) ***Compliance with the Remedial Action Plan:*** Texpet complied with the remediation requirements for the Shushufindi Norte production station, as specified in the Remedial Action Plan (see Section 4.2 and Appendices B through F). These actions included: i) remediation of petroleum-affected soils in two areas within the station, completed by Texpet in September 1996, and ii) delivery of equipment for reinjection of produced water, which Texpet completed in December 1997.
- 2) ***None of the Affected Soil Areas Investigated During the Judicial Inspection of December 2004 Were Included in the Texpet Remedial Action Plan of 1995:*** The judicial inspection of December 2004 included the investigation of several areas of affected soils in the vicinity of the Shushufindi Norte production station which were not part of the scope of work specified in “Annex A: Scope of Work of the Environmental Remediation Program.” Annex A was published in conjunction with the “Contract for Execution of Environmental Remediation Work and Liberation of Obligations, Responsibilities, and Demands,” signed on May 4, 1995, by the Minister of Energy and Mines of Ecuador, the Executive President of Petroecuador, and the Vice President and General Counsel of Texpet.

## Summary of the Principal Findings of the Judicial Inspection at the Shushufindi Norte Production Station



- 3) **No Impacts to Drinking Water Resources:** Laboratory test results for water samples collected from household water wells and surface water in the vicinity of this production station demonstrate that there are no drinking water impacts by oilfield activities (see Section 4.4.3). However, according to the guidelines of the World Health Organization (WHO), the presence of coliform bacteria in these drinking water supplies, unrelated to oilfield operations, could represent a serious human health hazard to the people consuming this water.
- 4) **No Impacts to Rio La Norte Downstream of the Station:** Investigation of a 70-hectare area centered on the Shushufindi Norte station shows that impacts associated with the operation of this facility have not extended beyond the immediate vicinity of the station and that there are no impacts in Rio La Norte or in its tributary waters downstream of the station.
- 5) **Areas of Affected Soils:** During this judicial inspection, six areas of affected soils have been investigated in the floodplain of Rio La Norte on the west side of the station. As summarized below, of these six areas, five areas are associated with the period of exclusive operation by Petroecuador after 1990. One area is associated with the operation of the Petroecuador-Texpet Consortium before June 30, 1990, as well as with the subsequent operation of Petroecuador. The total area of affected soils in the floodplain is limited to 0.8 hectares on the east bank of the river, and there is no evidence of soil impacts on the west bank of the river or outside of these six areas. In addition, the judicial inspection evaluated a significant oil spill,

extending over an area of approximately 1 hectare in the vicinity of well SSF-64, located 1.2 km south of the station, which occurred in October 2004 under the exclusive operation of Petroecuador.

INVESTIGATION AREA	PERIOD WHEN OPERATION STARTED	PERIOD WHEN OPERATION ENDED	CURRENT CONDITION (DEC. 2004)	AFFECTED MEDIA	ESTIMATED AREA	POSES RISK?	INCLUDED IN RAP?
<b>Exclusive Operation of Petroecuador (1990-2004)</b>							
Depression at the End of the Drainage Ditch from the API Basins	Between 1995 - 1998	Between 2003 - 2004	Abandoned by Petroecuador	Soil: Moderately degraded hydrocarbons	0.03 ha	No	No
Former Pit L and Associated Discharge Area	Between 1993 -1998	Between 2000-2004	Closed by Petroecuador	Soil: Fresh to moderately degraded hydrocarbons	0.1 ha	No	No
Area of the Flare Stacks and White Gasoline Tank	On-Going		Recovery trench installed by Petroecuador	Soil: Fresh to moderately degraded hydrocarbons Groundwater: Crude oil on phreatic surface	0.5 ha	No	No
Spills Associated with Theft of White Gasoline	On-Going		Various spills associated with the transport of drums of white gasoline through the woods west of the station	Soil: Fresh to moderately degraded hydrocarbons on ground surface in woods inside station area	0.05 ha	No	No
Calcite Precipitate	Between 1993 - 1998	Between 2000 -2004	Present at the discharge of former Pit L and the depression at end of API Basin drainage ditch	Soil: Calcite rock, precipitated from produced water flow	0.0004 ha	No	No
Oil Spill Near Well SSF-64	Oct-04	On-Going	Significant spill caused by pipeline failure; under remediation by Petroecuador	Soil and Groundwater: Relatively fresh crude oil on the surface in an open area 1.2 km south of station	1 ha	Possibly	No
<b>TOTAL AREA:</b>					1.7 ha		
<b>Operation of the Petroecuador-Texpet Consortium (1975-1990) and the Exclusive Operation of Petroecuador (1990-2004)</b>							
Former Pit E and Associated Discharge Area	Before 1975	Between 1993-1998	Abandoned by Petroecuador	Soil: Highly degraded hydrocarbons.	0.15 ha	No	No

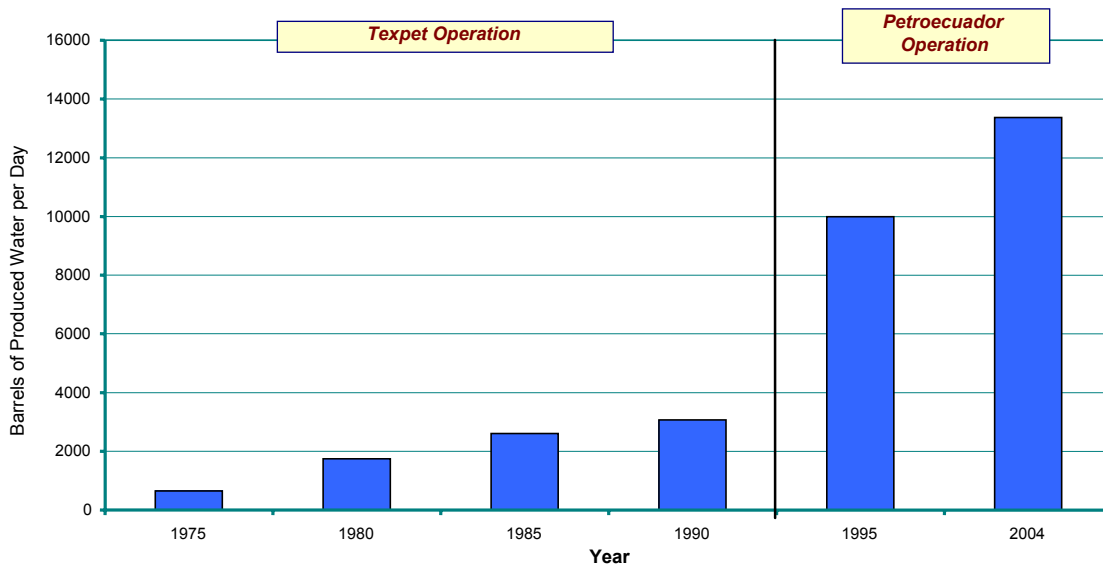
RAP: Texpet Remedial Action Plan

- 6) **No Human Health Risk Associated with Past Operations of Texpet:** Evaluation of the potential risks posed to human health, based on worldwide-accepted scientific procedures and the results of the sampling and testing activities conducted during this judicial inspection, show no risk associated with drinking water resources or with the areas of affected soils due to oilfield operations, with the exception of the recent oil spill near well SSF-64.
- 7) **No Ecological Impacts:** Currently, there is no evidence of vegetative damage in comparison with the surrounding woodland areas in the floodplain area located between the western side of the station and the adjacent Rio La Norte, where

Petroecuador continued to manage produced water until 2003 (see Section 4.7 and Appendix V).

- 8) ***No Further Remediation Needed:*** Former Pit E, which is the only area investigated in this judicial inspection associated with past Petroecuador-Texpet Consortium operations and with the exclusive operations of Petroecuador (after 1990), does not pose a risk to human health or pose a negative effect on the nearby ecosystem and, therefore, requires no remedial action to protect human health and the environment. Petroecuador abandoned this former separation pit prior to 1998 without closing it, and currently the former pit remains a swampy, 0.15-hectare area, with sediments that contain highly degraded petroleum (see Section 4.8). This area was not included in the Remedial Action Plan for Texpet in 1995.
  
- 9) ***Produced Water Flow Increased Significantly During the Exclusive Operation of Petroecuador:*** Due to the maturity of the oilfield, the flow of produced water managed by the Shushufindi Norte station during the period of exclusive operation of Petroecuador (1990 to present) has increased more than six times over the average flow managed during the time period of the Petroecuador-Texpet Consortium (1975 – 1990) (see the following plot, as well as Section 4.3.6 and Appendix J). Consequently, any effects associated with the historical operations of Texpet would have been insignificant compared to those that may have been caused by the produced water discharge of Petroecuador, prior to commencement of produced water reinjection in 2003. Nevertheless, at the present time, downstream of the station, Rio La Norte does not contain signs of impacts by produced water or petroleum (see Section 4.4.4). Today, this station reinjects 100% of the produced water flow, utilizing equipment acquired with Texpet assistance.

**Daily Flow of Produced Water Handled at Shushufindi Production Station: 1975 – 2004**



NOTE: The daily average flow of produced water has been estimated using the following methods:

- 1972-1990: The daily average annual flow was based on the sum of the average flows for all wells active during that year, according to Table A-1 of the HBT-Agra report of 1993 (see Appendix J).
- 1995: Average daily flow reported in the preliminary investigation by Woodward-Clyde (see Appendix J).
- 2004: Average daily flow reported in "Area Shushufindi: Pasivos Ambientales, 2004" (see Appendix G).

**10) Former Texpet Operations Complied with the Regulations and Industry Practices of the Time:** During the period in which Texpet served as operator of the Shushufindi Norte production station (i.e., before 1975 until June 30, 1990), the management of produced water by treatment and discharge to surface water and the use of earthen pits were standard practices in the oil industry worldwide. These produced water management practices are presently used in many countries, including the United States (where, in 1984, there were still 125,000 earthen pits present in oilfields) and other Latin American countries (see Section 4.3.4 and Appendix K). In the last 15 years, using funds and equipment provided by Texpet, Petroecuador has achieved reinjection of 100% of the produced water in the former Petroecuador-Texpet Concession area. Nevertheless, worldwide in 2003, approximately 800 million barrels per year of produced water were being discharged to rivers, lakes, and other onshore surface water bodies, of which 100 million barrels per year are associated with discharges to surface water bodies in South America.

**11) Effects of Colonization:** Due to colonization, the area surrounding Shushufindi Norte production station, as well as the entire Shushufindi oilfield, has been transformed from virgin forest to cleared land and secondary growth, used mainly for agriculture purposes unrelated to oil production activities (see Section 4.1.2). Historical aerial photographs and field inspections show that, between 1975 and 2004, in the area surrounding this station, the virgin forest has diminished from 51% 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 31% to 75%. 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, where, with the support of the "Ley de Colonización" of 1978, settlement of the land

in the Oriente region was encouraged allowing the population of this region to double the national growth rate, and resulting in the colonization of nearly 1 million hectares by 1994.

## **1.2 Organization of this Report**

Information supporting my conclusions is provided in Sections 2.0 to 5.0 of this report, as well as in Appendices A through Z. Appendix Z 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, livestock, 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.