

International Centre for Settlement of Investment Disputes

Burlington Resources Inc.

Claimant

v.

Republic of Ecuador

Respondent

ICSID Case No. ARB/08/5

DECISION ON COUNTERCLAIMS

Arbitral Tribunal
Professor Gabrielle Kaufmann-Kohler, President
Professor Brigitte Stern, Arbitrator
Mr. Stephen Drymer, Arbitrator

Secretary of the Tribunal
Mr. Marco Tulio Montañés-Rumayor

Assistant to the Tribunal
Dr. Magnus Jesko Langer

Date: 7 February 2017

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TABLE OF ABBREVIATIONS AND DEFINITIONS

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|--------------------------|---|
| 2 nd SMCC | Respondent [Ecuador]’s Second Supplemental Memorial on Counterclaims of 24 April 2012 (corrected as of 7 May 2012) |
| Andrade ER | Expert Report of Fabián Andrade Narváez of 20 February 2013 |
| API | American Petroleum Institute |
| Arbitration Rules | ICSID Rules of Procedure for Arbitration Proceedings |
| Award | Decision on Reconsideration and Award |
| Bedón ER1 | 1 st Expert Report of Dr. René Bedón of 27 September 2012 |
| Bedón ER2 | 2 nd Expert Report of Dr. René Bedón of 2 July 2013 |
| BIT | Bilateral Investment Treaty; specifically “Treaty between the United States and Ecuador concerning the Encouragement and Reciprocal Protection of Investments” of 11 May 1997 |
| BP | British Petroleum Development Limited |
| Burlington | Burlington Resources Inc. |
| CEPE | Corporación Estatal Petrolera Ecuatoriana |
| Civil Code or CC | Ecuadorian Civil Code |
| CMCC | Claimant [Burlington]’s Counter-Memorial on Counterclaims of 29 September 2012 |
| Consortium | Consortium formed by Perenco Ecuador Limited and Burlington Resources Oriente Limited |
| CPF | Central Production Facility |
| C-PHB | Claimant [Burlington]’s Post-Hearing Brief of 3 October 2014 |
| C-PSVB | Claimant [Burlington]’s Post-Site Visit Brief of 15 July 2015 |
| CPUF | Coca-Payamino Unified Field |
| Crespo ER | Expert Report of Ricardo Crespo Plaza of 29 September 2011 |
| Decision on Liability | Decision on Liability of 14 December 2012 |
| Decision on Jurisdiction | Decision on Jurisdiction of 2 June 2010 |
| EIS | Environmental Impact Study |
| EML | Environmental Management Law (<i>Ley de Gestión Ambiental</i>) |
| ER | Expert Report |
| Exh. | Exhibit |
| Exh. C- | Claimant [Burlington]’s Exhibits |

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| Exh. CL- | Claimant [Burlington]'s Legal Exhibits |
| Exh. E- | Respondent [Ecuador]'s Exhibits |
| Exh. EL- | Respondent [Ecuador]'s Legal Exhibits |
| GSI | GSI Environmental Inc. |
| GSI ER1 | 1 st Expert Report of GSI of 20 September 2012 |
| GSI ER2 | 2 nd Expert Report of GSI of 2 July 2013 |
| HL | Hydrocarbons Law (<i>Ley de Hidrocarburos</i>) |
| ICSID | International Centre for Settlement of Investment Disputes |
| ICSID Convention | Convention on the Settlement of Investment Disputes between States and Nationals of other States |
| IDW | Inverse Distance Weighting |
| IEMS | Integrated Environmental Management Services, S.A. de C.V. |
| IEMS ER1 | 1 st Expert Report of IEMS of 11 January 2011 |
| IEMS ER2 | 2 nd Expert Report of IEMS of 29 September 2011 |
| IEMS ER3 | 3 rd Expert Report of IEMS of 23 April 2012 |
| IEMS ER4 | 4 th Expert Report of IEMS of 18 February 2013 |
| MAB | UNESCO Man and the Biosphere Program |
| NTU | Nephelometric Turbidity Units |
| P&T | Pump-and-Treat |
| Perenco | Perenco Ecuador Limited |
| PHB | Post-Hearing Brief |
| PO [No.] | Procedural Order [number] |
| PRB | Permeable Reactive Barriers |
| Protocol | Joint Site Visit Protocol signed by both Parties of 20 January 2015 |
| PSC | Production Sharing Contract |
| PSE | Prediction Standard Error |
| RAOHE | Environmental Regulation for Hydrocarbon Operations in Ecuador (<i>Reglamento Ambiental para las Operaciones Hidrocarburíferas en el Ecuador</i>) |
| REC | Recognized Environmental Condition |
| Rejoinder | Claimant [Burlington]'s Rejoinder on Counterclaims of 8 July 2013 |
| Reply | Respondent [Ecuador]'s Reply on Counterclaims of 18 March 2013 |
| ROH | Regulation of Hydrocarbon Operations (<i>Reglamento de Operaciones</i>) |

Hidrocarburíferas)

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| R-PHB | Respondent [Ecuador]'s Post-Hearing Brief of 3 October 2014 |
| RPS | RPS Group Plc |
| RPS ER2 | 2 nd Expert Report of RPS of February 2013 |
| R-PSVB | Respondent [Ecuador]'s Post-Site Visit Brief of 15 July 2015 |
| Saltos WS1 | 1 st Witness Statement of Wilfrido Saltos of 28 September 2012 |
| Saltos WS2 | 2 nd Witness Statement of Wilfrido Saltos undated |
| Site Visit | The inspection of a number of sites within Blocks 7 and 21 |
| SMCC | Respondent [Ecuador]'s Supplemental Memorial on Counterclaims of 30 September 2011 |
| SNAP | National System of Protected Areas (<i>Sistema nacional de áreas protegidas</i>) |
| SPLP | Synthetic Precipitation Leaching Procedure |
| TCLP | Toxicity Characteristic Leaching Procedure |
| TPH | Total Petroleum Hydrocarbons |
| Tr. [(Day)] [(Language)] [page:line] | Transcript of the Hearing on Counterclaims of 1-7 June 2014, English or Spanish version, as indicated |
| Tr. Site Visit [(Day)] (ENG) [page:line] | Transcript of the Site Visit of 29 March to 1 April 2015, English version |
| TULAS | Unified Text of Secondary Environmental Legislation (<i>Texto Unificado de Legislación Ambiental Secundaria</i>) |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UPL | Upper Prediction Limit |
| USD | United States Dollar |
| USEPA | United States Environmental Protection Agency |
| VOC | Volatile Organic Compounds |
| WS | Witness Statement |

I. THE PARTIES

A. The Counter-Claimant

1. The Counter-Claimant is the Republic of Ecuador (“Ecuador” or the “Counter-Claimant” or the “Respondent”).
2. The Counter-Claimant is represented in these proceedings by Dr. Diego García Carrión, Procurador General del Estado, Dr. Blanca Gómez de la Torre, Directora de Asuntos Internacionales y Arbitraje, Dr. Christel Gaibor, and Dr. Diana Moya at the PROCURADURÍA GENERAL DE ECUADOR; by Professor Eduardo Silva Romero, Mr. José Manuel García Represa, Mr. Philip Dunham, Mr. Alvaro Galindo, Ms. Maria Claudia Procopiak, Ms. Audrey Caminades and Ms. Gabriela González Giráldez of the law firm DECHERT (Paris) LLP; and by Professor Pierre Mayer who left DECHERT (Paris) LLP on 1 June 2015.

B. The Counter-Respondent

3. The Counter-Respondent is Burlington Resources Inc. (“Burlington” or the “Counter-Respondent” or the “Claimant”), a corporation created under the laws of the State of Delaware, United States of America, in 1988 and active in the exploitation of natural resources. On 31 March 2006, Burlington was acquired by ConocoPhillips, a multinational energy company with headquarters in the State of Texas, United States of America.
4. The Counter-Respondent is represented in these proceedings by Mr. Nigel Blackaby, Ms. Noiana Marigo, Ms. Lauren Friedman, Mr. Leon Skornicki and Ms. Giulia Previti of the law firm FRESHFIELDS BRUCKHAUS DERINGER US LLP; by Ms. Tracie Renfroe, Mr. Wade Corriell, Mr. Esteban Leccese, Ms. Jamie M. Miller, Ms. Anisha Sud and Ms. Sara McBrearty of the law firm KING & SPALDING; and by Mr. Javier Robalino-Orellana of the law firm FERRERE.

II. PROCEDURAL HISTORY

5. The counterclaims addressed in this decision (the “Decision”) were filed as part of ICSID Case No. ARB/08/5, which has already given rise to decisions on jurisdiction and liability and which will end by the notification of an Award shortly following this Decision.

A. Initial Phase

6. Pursuant to Rule 40(2) of the ICSID Arbitration Rules, Ecuador asserted two counterclaims in its Counter-Memorial on Liability of 17 January 2011. Although Burlington initially stated that it would challenge the Tribunal's jurisdiction, the Parties later executed an agreement dated 26 May 2011 by which Burlington accepted the jurisdiction of the Tribunal over the counterclaims.¹

B. Written Phase

7. After having consulted with the Parties, the Tribunal issued Procedural Order No. 8 on 21 July 2011 (Procedural Orders are referred to herein as "PO" followed by their respective numbers; for example, Procedural Order No. 8 is "PO8"), which referred to and annexed the Parties' jurisdictional agreement and contained the calendar for the written phase of the counterclaims proceedings.
8. In accordance with this calendar as later amended on the Parties' request, Ecuador filed a Supplemental Memorial on Counter-Claims on 30 September 2011 and a Second Supplemental Memorial on Counter-Claims on 24 April 2012. Burlington then filed its Counter-Memorial on Counter-Claims on 29 September 2012. Ecuador filed its Reply on 18 March 2013 and Burlington its Rejoinder on 8 July 2013.
9. On 6 July 2012, the Tribunal issued PO9 with regards to Burlington's request for production of documents. On 14 December 2012, the Tribunal issued PO10 with regard to Ecuador's request for production of documents. On 22 May 2013, the Tribunal issued PO13 with regard to Burlington's additional requests for production of documents.
10. On 8 April 2014, the Tribunal issued PO16 with regard to Ecuador's request to add new evidence to the record. On 16 April 2014, the Tribunal issued PO17 with regard to Burlington's request to add new evidence to the record. On 16 May 2014, the Tribunal issued PO20 with regard to Burlington's request to add new evidence in response to exhibits admitted by the Tribunal in PO16.

¹ Agreement between Burlington et al. and Ecuador dated 26 May 2011 (**Exh. E-251**).

C. Hearing on Counterclaims

11. Pursuant to PO14 dated 16 July 2013, the hearing on counterclaims (the “Hearing”) was initially set to take place from 26 August to 31 August 2013. Due to the Proposal for Disqualification of Professor Francisco Orrego Vicuña submitted on 25 July 2013, the proceedings were suspended in accordance with Rule 9(6) of the ICSID Arbitration Rules. The proceeding was resumed on 10 January 2014 following the disqualification of Professor Orrego Vicuña and the appointment of Mr. Stephen Drymer as arbitrator. The Hearing was thus rescheduled and, in accordance with PO19 dated 16 May 2014, took place from 1 to 7 June 2014.

12. The Hearing was held at the World Bank offices in Paris. The following persons attended the Hearing:

- The Tribunal

- Members of the Tribunal

- Professor Gabrielle Kaufmann-Kohler, President

- Professor Brigitte Stern, Arbitrator

- Mr. Stephen L. Drymer, Arbitrator

- Secretary of the Tribunal

- Mr. Marco Tulio Montañés-Rumayor

- Assistant to the Tribunal

- Mr. Magnus Jesko Langer

- Ecuador’s representatives

- Counsel

- Mr. Pierre Mayer Dechert (Paris) LLP

- Mr. Eduardo Silva Romero Dechert (Paris) LLP

- Mr. Philip Dunham Dechert (Paris) LLP

- Mr. José Manuel García Represa Dechert (Paris) LLP

- Mr. Timothy Lindsay Dechert LLP

- Ms. Meredith Bloch Dechert (Paris) LLP

- Ms. Audrey Caminades Dechert (Paris) LLP

- Ms. Gabriela González Giráldez Dechert (Paris) LLP

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- Ecuador's witnesses and experts

- Witnesses

| | |
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| Ms. Claudia Sanchez de Lozada | GSI Environmental Inc. |
| Mr. Geoffrey R. Egan | Intertek |
| Mr. Dr. René Bedón | Albán Bedón Macías & Associates |
| Mr. Shahrokh Rouhani | NewFields |

13. The Tribunal heard opening and closing statements by counsel as follows:

- For Ecuador: Mr. Eduardo Silva Romero, Mr. Pierre Mayer, Mr. José Manuel García Represa, Mr. Philip Dunham, and Mr. Timothy Lindsay.
- For Burlington: Mr. Nigel Blackaby, Mr. Wade Coriell, and Ms. Tracie Renfroe.

14. The Tribunal also heard evidence from the fact witnesses and experts listed in paragraph 12.
15. The Hearing was interpreted to and from English and Spanish. It was also sound-recorded and transcribed verbatim, in real time, in both English and Spanish. Copies of the sound recordings and the transcripts were delivered to the Parties. At the end of the Hearing, the Tribunal and the Parties held a procedural discussion in relation to post-hearing matters, including the advisability and feasibility of a site inspection.

D. Post-Hearing Phase

16. Pursuant to PO21, and after several postponements, the Parties simultaneously filed Post-Hearing Briefs on 3 October 2014.
17. On 22 December 2014, the Tribunal issued PO24 with regard to Burlington's requests for production of documents, of which one request partially related to the counterclaims proceedings.

E. Site Visit

18. Having secured the Parties' consent at the Hearing, the Tribunal proceeded with the inspection of a number of sites within Blocks 7 and 21 (the "Site Visit"). The Tribunal informed the Parties by letter of 23 July 2014 that the main objective of the Site Visit was to focus on (i) soil contamination, including issues of topography and groundwater and (ii) land use, including the Sumaco Biosphere Reserve.² Upon the invitation and with the guidance of the Tribunal, the Parties drew up a Joint Site Visit Protocol (the "Protocol"). For this purpose, the Parties and the Tribunal held two telephone conferences, respectively on 8 October 2014 and 4 November 2014. The Protocol was executed by the Parties on 20 January 2015.
19. The Protocol was incorporated into PO30 dated 25 March 2015. It set out the scope of the Site Visit, provided for the preparation of joint site information packets ("Joint Site Packets"), addressed pre-Site Visit inspections, detailed the Site Visit itinerary and schedule, provided for a confidentiality regime as well as immunities, and touched on miscellaneous other issues, such as transportation and security, accommodation, food, safety and health.

² Letter of 23 July 2014 from the Tribunal to the Parties.

20. Up to 12 representatives per Party were permitted to attend at each visited site.³ Counsel for the Parties were invited to make oral presentations at each site and to respond to the Tribunal's questions. The Tribunal also addressed questions to the group of experts and to the fact witness designated by each Party for a given site.⁴ Follow-up questions by the Parties were not allowed, subject to the Tribunal's permission under certain circumstances (such as the particular relevance of the topic and available time), which was in fact granted on many occasions.⁵
21. Under the Protocol, Party presentations were considered to be in the nature of submissions and expert and witness responses to Tribunal questions were deemed to be evidence. Accordingly, the experts and witnesses who participated in the Site Visit made the declaration provided in Rule 35(2) or (3) of the ICSID Arbitration Rules at the outset of the Site Visit.⁶
22. The Protocol further specified that any objection regarding the conduct of the Site Visit had to be raised immediately whenever possible and at the latest at dinner time on the day when the incident complained of occurred.⁷ In fact, informal debriefing meetings were held each day before dinner to discuss the conduct of the Site Visit that day and to seek to agree on possible improvements.
23. The Joint Site Packets included information relating to the specific sites to be visited (for instance, excerpts from expert reports, pleadings, photographs, maps and/or historical records), their content being limited to evidence already in the record.⁸ The Parties agreed that no sampling was to be undertaken and that no media would be disturbed

³ Protocol, ¶ 7.

⁴ *Id.*, ¶ 4. On Ecuador's side, IEMS was the designated expert for Yuralpa Pad A, Payamino 2/8, Payamino 1, Payamino CPF, Coca 8, Jaguar 7/8, Mono CPF, Gacela 2, Gacela 1/8, Gacela CPF and Coca 15. Mr. Crouch was the designated expert for Coca CPF and Jaguar 1. Mr. Puente was the designated fact witness for Payamino 2/8, Payamino 1, Payamino CPF, Coca CPF, Coca 8, Jaguar 1, Jaguar 7/8, Mono CPF, Gacela 2, Gacela 1/8, and Coca 15. Mr. Luna was the designated fact witness for Yuralpa Pad A and Gacela CPF. On Burlington's side, GSI was the designated expert for all sites and Mr. Saltos the designated fact witness for all sites.

⁵ *Id.*, ¶ 4.

⁶ *Id.*, ¶ 5.

⁷ *Id.*, ¶ 9.

⁸ *Id.*, ¶¶ 10-11.

(soil, groundwater, sediment, or surface water) before or during the Site Visit.⁹ Off platform locations could be inspected upon request and disagreements concerning the planned Site Visit were to be resolved by the Tribunal prior to the Site Visit.¹⁰

24. The Site Visit was conducted in English and Spanish with simultaneous translations.¹¹ It was audio- and video-recorded, the audio/video record capturing (i) the presentations by the Parties, (ii) questions from the Tribunal, (iii) answers to such questions, and (iv) any features of the sites requested by the Tribunal.¹²

25. The Site Visit took place from 29 March 2015 to 1 April 2015, with 2 April 2015 in reserve. The following persons attended the Site Visit:¹³

- For the Tribunal

Professor Gabrielle Kaufmann-Kohler, President of the Tribunal

Professor Brigitte Stern, Arbitrator

Mr. Stephen Drymer, Arbitrator

- Secretary of the Tribunal

Mr. Marco Tullio Montañés-Rumayor

- Assistant to the Tribunal

Mr. Magnus Jesko Langer

- Ecuador's representatives

Dr. Diego García Carrión, Procuraduría General del Estado

Dr. Blanca Gómez de la Torre, Procuraduría General del Estado

Dr. Diana Moya, Procuraduría General del Estado

Mr. Eduardo Silva Romero, Dechert (Paris) LLP

Mr. José Manuel García Represa, Dechert (Paris) LLP

Ms. Audrey Caminades, Dechert (Paris) LLP

⁹ *Id.*, ¶ 28.

¹⁰ *Id.*, ¶ 29.

¹¹ *Id.*, ¶ 30.

¹² *Id.*, ¶ 31.

¹³ See Joint List of Participants, submitted by Burlington on 20 March 2015, and confirmed by Ecuador on the same day. This list does not include Ecuadorian military or police personnel in charge of the security during the Site Visit.

Ms. Gabriela González Giráldez, Dechert (Paris) LLP

- Burlington's representatives

Ms. Suzana Blades, Burlington/ConocoPhillips

Mr. Rick Greiner, Burlington/ConocoPhillips

Ms. Laura Robertson, Burlington/ConocoPhillips

Mr. John Urby, Burlington/ConocoPhillips¹⁴

Mr. Nigel Blackaby, Freshfields Bruckhaus Deringer

Ms. Tracie Renfroe, King & Spalding LLP

Ms. Jamie Miller, King & Spalding LLP

Mr. Thomas Norgaard, Debevoise & Plimpton LLP

Mr. Javier Robalino, Paz Horowitz

- Ecuador's witnesses and experts

Ms. Martha Pertusa, RPS

Mr. Scott Crouch, Di Sorbo Consulting

Mr. Francisco Alfaro, IEMS

Mr. Henry Chaves, IEMS

Mr. Rodrigo Anota, IEMS

Mr. Marcel López, IEMS

Mr. Marco Puente, Petroamazonas

Mr. Pablo Luna, Petroamazonas

- Burlington's witnesses and experts

Mr. John Connor, GSI Environmental

Mr. Gino Bianchi, GSI Environmental

Mr. Danielle Kingham, GSI Environmental

Mr. Wilfrido Saltos, Perenco

- Technical team

Mr. Daniel Giglio, Interpreter

Mr. Charles Roberts, Interpreter

Mr. Favio Claire, AV Contractor

¹⁴

Pursuant to paragraph 53 of the Protocol, Mr. Urby attended the Site Visit as security, thus not counting towards the 12 participant maximum.

Mr. Christian Richard Winter, AV Contractor

26. The Tribunal and the Parties visited the following sites:

On day 1 (29 March 2015): Yuralpa Pad A;

On day 2 (30 March 2015): Payamino 2/8, Payamino 1/CPF, Coca 8 and Coca CPF;

On day 3 (31 March 2015): Jaguar 1, Jaguar 7/8 and Mono CPF;

On day 4 (1 April 2015): Gacela 2, Gacela CPF, Gacela 1/8 and Coca 15.¹⁵

27. While the Protocol provided that there would be no record of the Site Visit other than the transcript, audio and video recordings mentioned above, it was arranged with the consent of the Parties that an official photograph be taken on day 2 at the Coca 8 site. Such photograph, reproduced below, shows the Tribunal, its Secretary and Assistant, the Party representatives and their Counsel, the experts, the fact witnesses, and the interpreters.



¹⁵ Site Visit Schedule annexed to the Protocol as Annex A.

F. Post Site Visit Phase

28. Pursuant to paragraph 31 of the Protocol and paragraph 2 of PO31 dated 21 April 2015, the ICSID Secretariat made copies of the unedited audio/video recording available to the Parties on 21 April 2015. It also provided the Parties with the “floor” transcripts on 19 May 2015 and circulated the translated transcripts on a rolling basis from 31 May 2015 to 6 June 2015.
29. Burlington objected to Ecuador’s wish to make public use of the audio/video recording. The Tribunal decided that absent the consent of both Parties, under the Protocol and Regulation 22(2) of the ICSID Administrative and Financial Regulations, the audio/video recording and its transcript could not be made available to the public or used outside the present proceedings. However, in light of Ecuador’s insistence on its duty of transparency within its domestic legal framework, the Tribunal indicated that if Ecuador wished to use the audio/video recording and/or transcript, it could apply for leave from the Tribunal by (i) identifying with precision the excerpts which it wished to use, (ii) describing the specific purpose for which the identified excerpts would be put to use, and (iii) explaining the reasons why such publication is deemed necessary.¹⁶ Ecuador did not seek leave from the Tribunal thereafter.
30. In accordance with PO31, the Parties filed Post-Site Visit Briefs on 15 July 2015. In PO31, the Tribunal had asked the Parties to jointly file certain depth-integrated maps for the sites inspected during the Site Visit so as to enable the Tribunal to more easily compare the Parties’ respective delineations of the alleged contamination and of the areas to be remediated as a result. This request raised difficulties for the parties in terms of the data required to generate these maps and the potential use of data and maps not previously filed in the record. As a result, after a lengthy series of correspondence, the Tribunal advised the Parties on 12 August 2015 that, in light of such unexpected difficulties, it preferred not to receive these maps.
31. Following the issuance on 14 August 2015 of the Interim Decision on Ecuador’s Environmental Counterclaim in ICSID Case No. ARB/08/6, *Perenco Ecuador Limited v. the Republic of Ecuador* (“*Perenco v. Ecuador*”), the Tribunal invited the Parties to provide their comments on that decision, which they did on 18 September 2015.

¹⁶ PO31, ¶ 9.

32. In the course of its deliberations, the Tribunal provided the Parties with status reports on its progress on 13 November 2015, on 25 February 2016, on 27 July 2016 and on 29 November 2016. Upon the invitation of the Tribunal, the Parties filed their cost submissions on 2 May 2016, and their reply submissions on 23 May 2016.
33. By letter of 18 January 2017, Ecuador requested leave from the Tribunal to submit the audio and video recording of the site visit to Blocks 7 and 21 conducted in *Perenco v. Ecuador*. By letter of 20 January 2017, Burlington objected to Ecuador's request. After due deliberation, the Tribunal reached the conclusion that the submission of the audio and video recording of the site visit in *Perenco v. Ecuador* would not assist the resolution of the counterclaims in these proceedings. Accordingly, by letter of 25 January 2017, the Tribunal denied Ecuador's request to file the audio and video recording of the *Perenco* site visit into the record of this arbitration. Further, by means of the same letter, the Tribunal, declared the proceedings closed as of 25 January 2017 in accordance with ICSID Arbitration Rule 38(1).

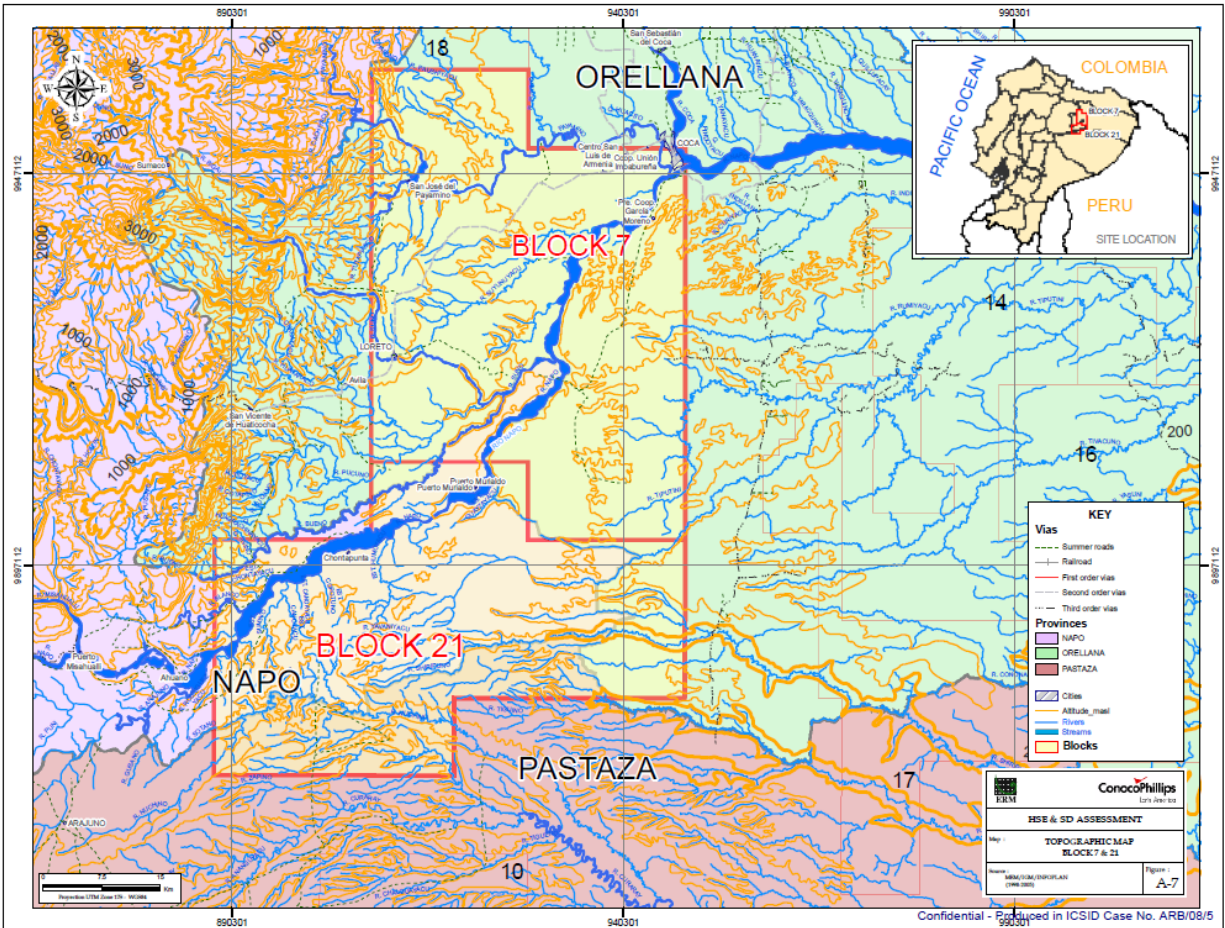
III. GENERAL INFORMATION REGARDING BLOCKS 7 AND 21

34. To the extent relevant for purposes of the counterclaims, the descriptions of fact contained in decisions previously rendered in this arbitration, i.e. the Decision on Jurisdiction and the Decision on Liability, are incorporated into the present Decision. Similarly, terms and abbreviations used there are used here with the same meaning.
35. This section addresses various characteristics of Blocks 7 and 21 not previously discussed, in particular as regards their geography and the oilfield operations that have been conducted in the Blocks, including by Petroamazonas after July 2009. It is based on allegations of facts that were not disputed or on facts that the Tribunal considers established. Where a fact referred to has been disputed it is noted as such.
36. Blocks 7 and 21 are located in the provinces of Francisco de Orellana, Napo and Pastaza, in the Amazon region of the Ecuadorian Oriente.¹⁷ Situated east of the Andean mountains in North-Eastern Ecuador, the Oriente is located in a slightly

¹⁷ IEMS ER1, p. 8, Section 2.1.

undulated plain between 200 and 350 meters above sea-level, characterized by the presence of swamps and numerous water bodies flowing into the Napo River.¹⁸

Topographic Map of Blocks 7 and 21¹⁹



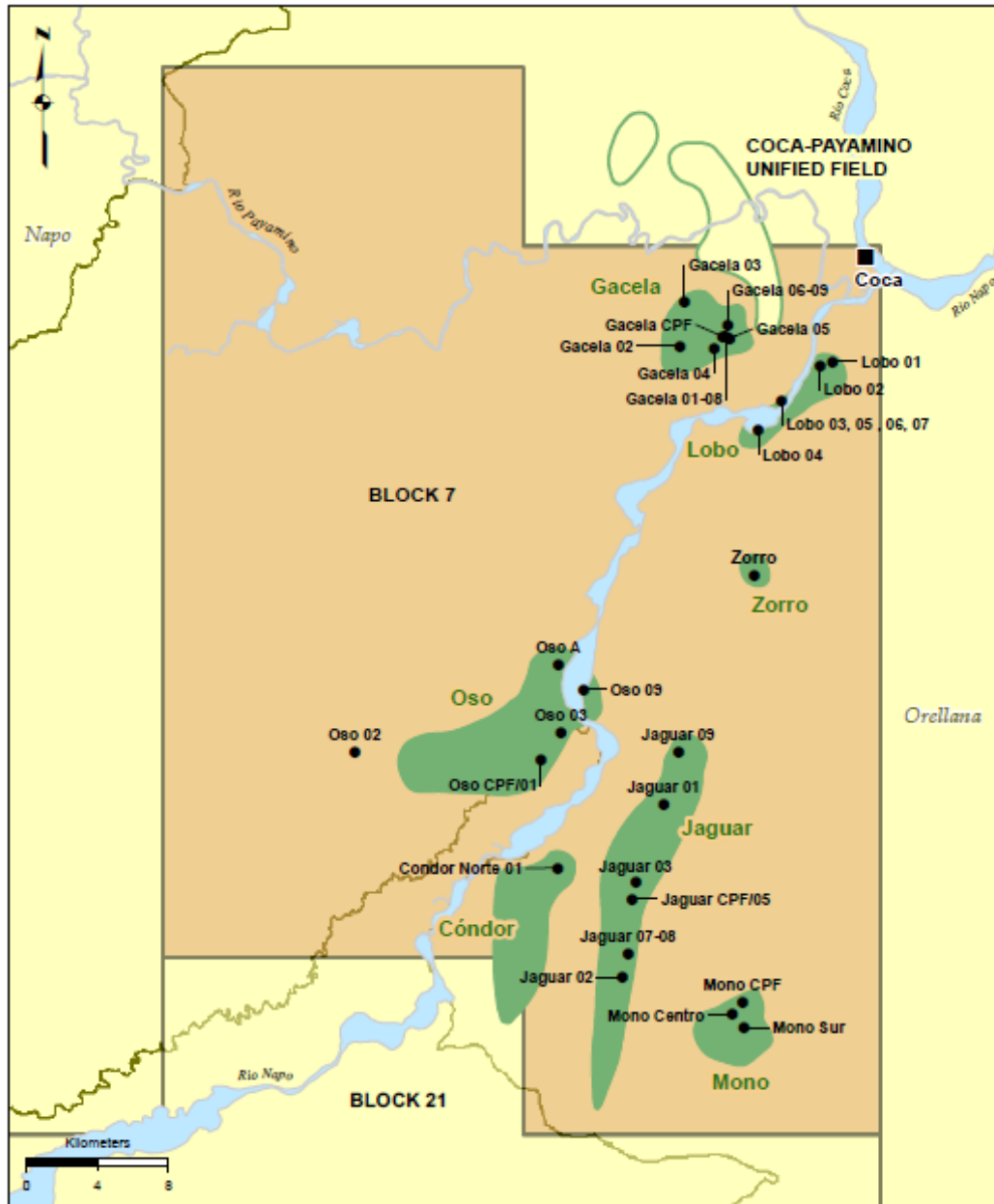
A. Block 7 (including the Coca-Payamino Unified Field)

37. Block 7 and the Coca-Payamino Unified Field (the “CPUF”), which extends to the northeast of Block 7, cover an area of nearly 2,000 square kilometers located approximately 160 kilometers east of the capital Quito.
38. It is also a relatively populated area: the city of Francisco de Orellana (also known as “Coca”), capital of Orellana province, is located on this Block at the confluence of the

¹⁸ *Id.*, p. 11, Section 2.3.2.

¹⁹ Map taken from: HSE & SD Assessment and other Technical Services, *Assets in Ecuador*, November 2006, p. 76 (**Exh. CE-CC-126**).

Napo, Coca and Payamino Rivers.²⁰ Orellana province has a population of 136,000, of which about 73,000 live in the city of Coca.²¹ Coca is the main hub for oilfield contractors and functions as the platform for numerous oilfield operations throughout the region. The following map shows Block 7:²²

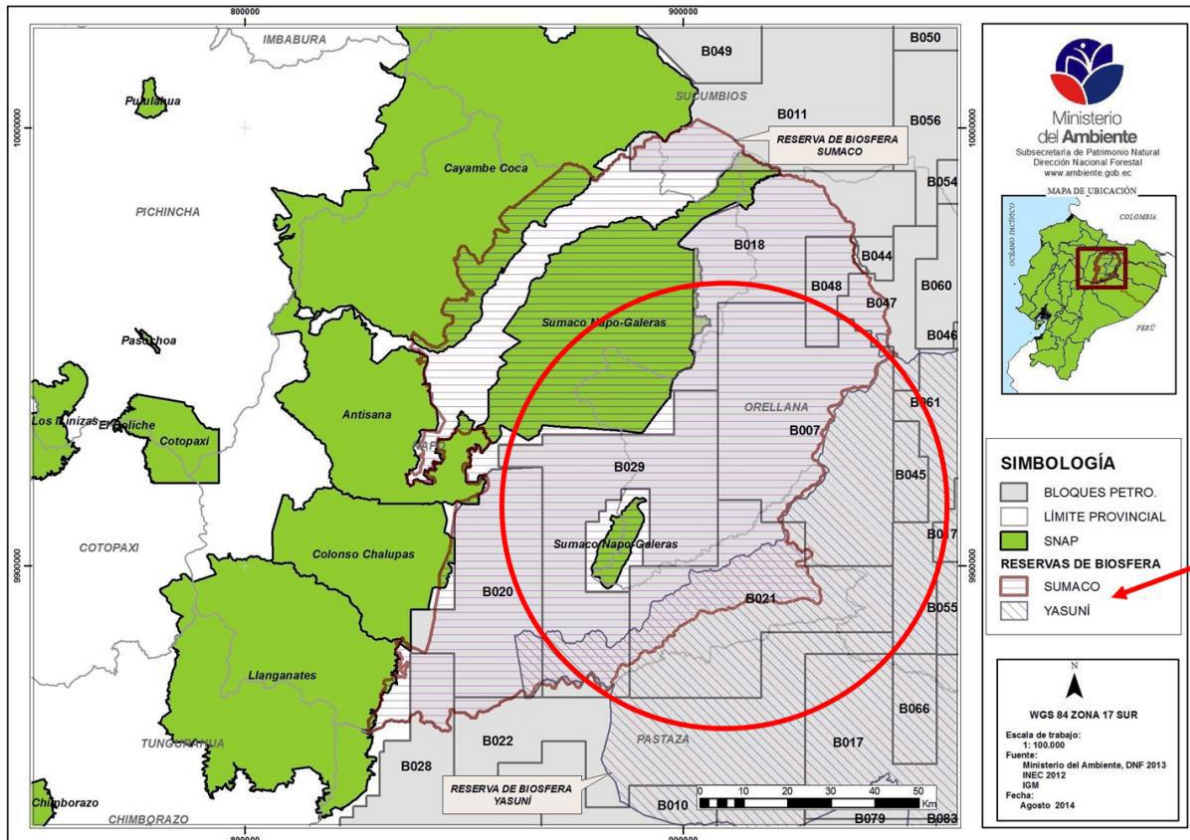


²⁰ SMCC, ¶ 61.

²¹ *Ibid.*

²² Map taken from: GSI ER1, App. D, p. 187, Figure D.2.b.

39. A large part of Block 7, including the city of Coca, overlaps with the Sumaco Biosphere Reserve,²³ and with the Yasuní Biosphere Reserve, both of which are UNESCO MAB reserves established pursuant to the UNESCO Man and Biosphere Program.²⁴ The following map shows the Sumaco and Yasuní Biosphere Reserves:²⁵



²³ Oilfield Sites and Sumaco Biosphere Reserve Map (**Exh. E-339**). See also: C-PSVB, ¶ 12.

²⁴ Mapa, UNESCO Biospheres, *Ministerio del Ambiente* (**Exh. E-565**). See also: Health, Safety, Environment and Sustainable Development Assessment and Other Technical Services: Assets in Ecuador, prepared for ConocoPhillips in November 2006, p. 80 (**Exh. E-222**); *Reservas de Biosfera del Ecuador: Lugares excepcionales*, Ministry of the Environment of Ecuador, GTZ/GESOREN-DED-WCS-NCI-UNESCO Quito, 2010 (**Exh. E-380**); Oilfield Sites and Sumaco Biosphere Reserve Map (**Exh. E-339**).

²⁵ Mapa, UNESCO Biospheres, *Ministerio del Ambiente* (**Exh. E-565**). See also: Health, Safety, Environment and Sustainable Development Assessment and Other Technical Services: Assets in Ecuador, prepared for ConocoPhillips in November 2006, p. 80 (**Exh. E-222**); *Reservas de Biosfera del Ecuador: Lugares excepcionales*, Ministry of the Environment of Ecuador, GTZ/GESOREN-DED-WCS-NCI-UNESCO Quito, 2010 (**Exh. E-380**); Oilfield Sites and Sumaco Biosphere Reserve Map (**Exh. E-339**). The term “SNAP” in the map’s legend refers to the Ecuadorian system of nationally protected areas (*Sistema nacional de áreas protegidas*).

40. Other than some exploratory wells, such as Zorro and Cóndor, which were drilled by Texaco in the 1970s, Block 7 was first developed by British Petroleum Development Limited (“British Petroleum” or “BP”) under a Service Contract concluded in December 1985 (“Service Contract”) with the then Ecuadorian State Petroleum Corporation (*Corporación Estatal Petrolera Ecuatoriana*; “CEPE”).²⁶ At that time, Block 7 did not include the Coca field or the portion of the Payamino field that extended to the north of Block 7 and that were operated by CEPE.²⁷ Following BP’s 1986 discovery of oil in the Payamino field, in the northeastern corner of Block 7,²⁸ CEPE’s drilling of the Payamino 2 well in 1987 and the drilling by CEPE’s upstream subsidiary Petroproducción of the Coca 4 and Coca 7 wells, the conclusion was reached in 1989 that the oil reservoir from the Payamino field extended beyond the borders of Block 7 into the Coca field, thus forming a “common oil deposit”.²⁹
41. As a result, negotiations began for a Unified Exploitation Operating Agreement for the Common Oil Deposits of Basal Tena, Napo “U”, and Hollín Superior and Hollín Principal of the CPUF (“Unitization Agreement”).³⁰ On 11 October 1990, Oryx (which had acquired 100% of BP’s rights under the Service Contract in September 1990) and Petroecuador (which had replaced CEPE in September 1989) executed the Unitization Agreement, providing for alternate operatorship of the CPUF between Oryx and the State-owned enterprise Petroproducción (which exercised Petroecuador’s rights under the Unitization Agreement).³¹ Accordingly, Petroproducción operated the CPUF between February 1991 and February 1994. Oryx operated the CPUF between

²⁶ On 18 December 1985, the Ecuador State Petroleum Corporation (“CEPE”) and BP entered into a Services Contract for the Exploration and Exploitation of Hydrocarbons in Block Seven of the Ecuadorian Amazon Region. Service Contract for the Exploration and Exploitation of Hydrocarbons in Block 7 of the Ecuadorian Amazon Region, 18 December 1985 (**Exh. CE-CC-4; Exh. P-5**). See also: Participation Contract for the Exploration and Exploitation of Hydrocarbons in Block 7, 23 March 2000, Clause, 2.1 (**Exh. CE-CC-28**); Saltos WS1, ¶ 28.

²⁷ SMCC, ¶ 63.

²⁸ *Ibid.* See also: (**Exh. CE-CC-7**).

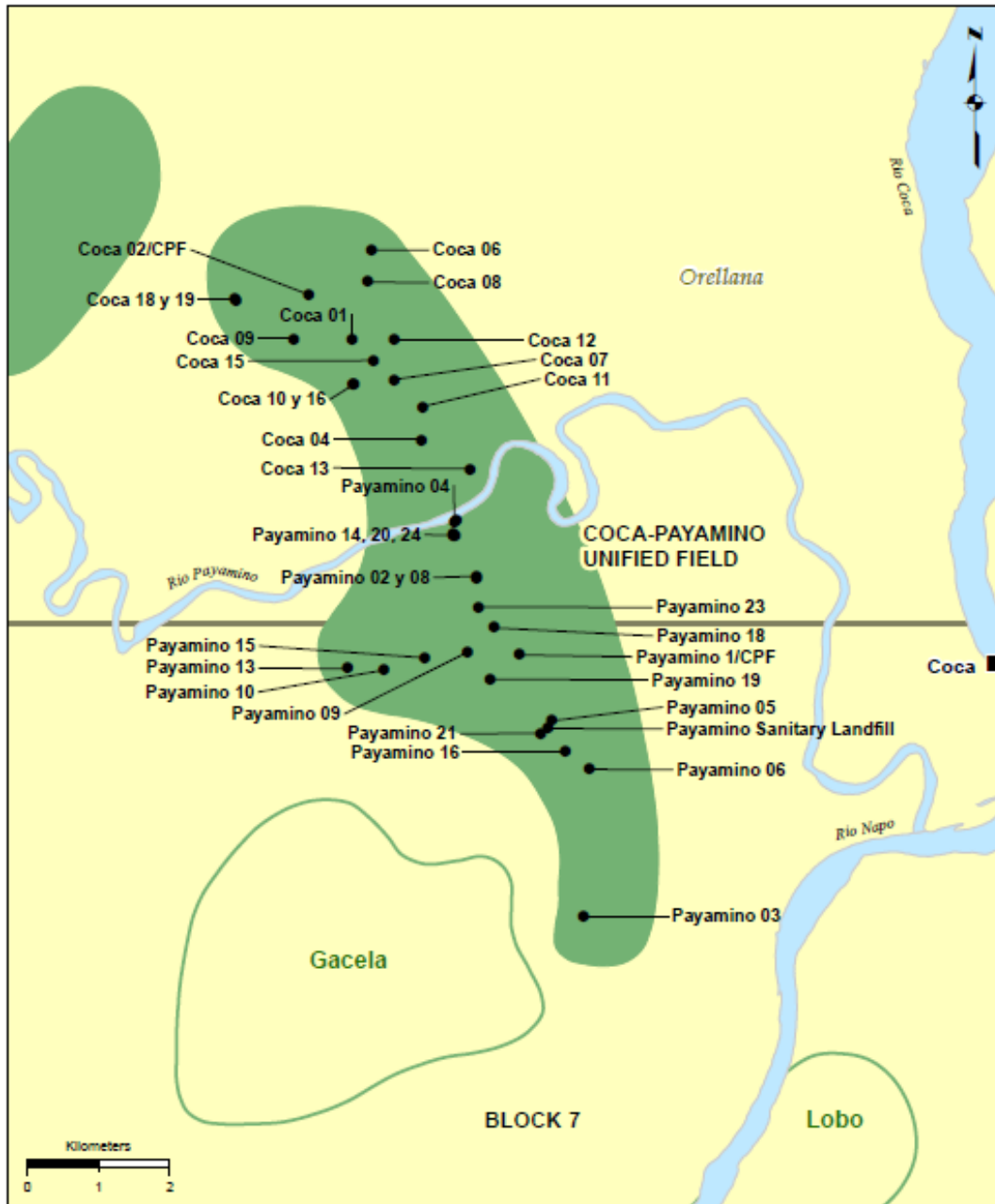
²⁹ Saltos WS1, ¶ 35; CMCC, ¶ 94; SMCC, ¶ 63.

³⁰ 2nd SMCC, ¶¶ 58-63; Saltos WS1, ¶ 36.

³¹ Operational Agreement for Unified Exploration of the Common Fields Basal Tena, Napo “U”, Hollín Superior and Hollín Principal of the Coca-Payamino Field, 20 July 1990 (**Exh. CE-CC-8**).

February 1994 and June 1997, and Petroproducción reassumed operations from June 1997 through February 2000.³²

42. The CPUF is depicted on the map below:³³



³² CMCC, ¶ 95.

³³ Map taken from: GSI ER1, App. D, p. 187, Figure D.2.a.

43. As shown in the maps at paragraphs 38 and 412 above, Block 7 (including the CPUF) features seven active oil fields: Payamino, Coca, Lobo, Mono, Jaguar, Oso, Gacela, and C6ndor.³⁴ As noted above, Oryx acquired British Petroleum’s interest in the Block 7 Service Contract in 1990. In 1993, Santa Fe Minerales del Ecuador, S.A. (“Santa Fe”), Sociedad Internacional Petrolera (“Sipetrol”) and Sigdoil, S.A. (later renamed Compa1ia Latinoamericana Petrolera Numero Dos, S.A. or “Clapsa II”) acquired interests in the Service Contract.³⁵ In 1995, Santa Fe transferred its rights to Preussag Energie GmbH (“Preussag”).³⁶
44. In 1999, Oryx became Kerr McGee Ecuador Energy Corporation (“Kerr McGee” or “KmG”).³⁷ In March 2000, an amendment to the Service Contract was executed and the contractual framework was migrated into a Production Sharing Contract (“PSC”), which was entered into between Petroecuador on the one hand, and Kerr McGee, Preussag, Sipetrol and Clapsa II on the other hand, for the joint operation of Block 7 and the Coca-Payamino Unified Field.³⁸ As a result of that transaction, Kerr McGee became the joint operator of Block 7 and the Coca-Payamino Unified Field, and the two areas have been jointly administered ever since.³⁹ Under the Participation Contract, the Contractor companies were to invest in the Block at their own risk in exchange for a share of the crude oil produced.⁴⁰
45. In the course of 2001, Perenco Ecuador Limited (“Perenco”) and Burlington both acquired interests in the Block 7 PSC, Perenco holding 45%⁴¹ and Burlington 42.5%.⁴²

³⁴ The Zorro field was never put into production.

³⁵ Saltos WS1, ¶ 28, item 3.

³⁶ *Id.*, ¶ 28, item 4; SMCC, note 49. See also: Block 7 Participation Contract, Clause 2.4 (**Exh. C-1 Corrected translation**).

³⁷ Saltos WS1, ¶ 28, item 5; CMCC, ¶ 87.

³⁸ In March 2000, the consortium between KmG, Preussag, Sipetrol and Clapsa II entered into a Participation Contract for the Exploration and Exploitation of Hydrocarbons (Crude Oil) in Block 7 of the Ecuadorian Amazonian Region (**Exh. CE-CC-28**). Saltos WS1, ¶ 28, item 6; CMCC, ¶ 88; SMCC, ¶ 70.

³⁹ SMCC, ¶¶ 65-71.

⁴⁰ CMCC, ¶ 88. With respect to the Coca-Payamino field, a joint operating agreement was entered into in May 2000, pursuant to which Kerr McGee, as operator of Block 7, took on the operation of the Coca-Payamino field. Save for the allocated percentage of production, all rights and obligations in the Block 7 PSC were incorporated into the Coca-Payamino Agreement. SMCC, ¶ 71. See also: the Coca-Payamino Agreement (**Exh. C-97**).

⁴¹ CMCC, ¶ 89.

Perenco became the operator of the block on 12 December 2002. The Perenco-Burlington Consortium (the “Consortium”) then became the 100% operator of Block 7 in September 2005.

46. By the time the Consortium ceased operating the Blocks in July 2009, Block 7 included six CPFs; multiple platforms – 7 in Gacela, 11 in Mono, 7 in Jaguar, 16 in Coca, 10 in Oso, 17 in Payamino, 4 in Lobo, and a platform in the C3ndor field (a field where no oil was found); fluid lines and pipelines connecting these facilities with each other and beyond; three camps for employees; and a waste management area.⁴³ With Perenco as operator, the production in Block 7 increased from approximately 13,000 barrels a day in February 2003 to approximately 19,000 barrels a day in February 2009.⁴⁴

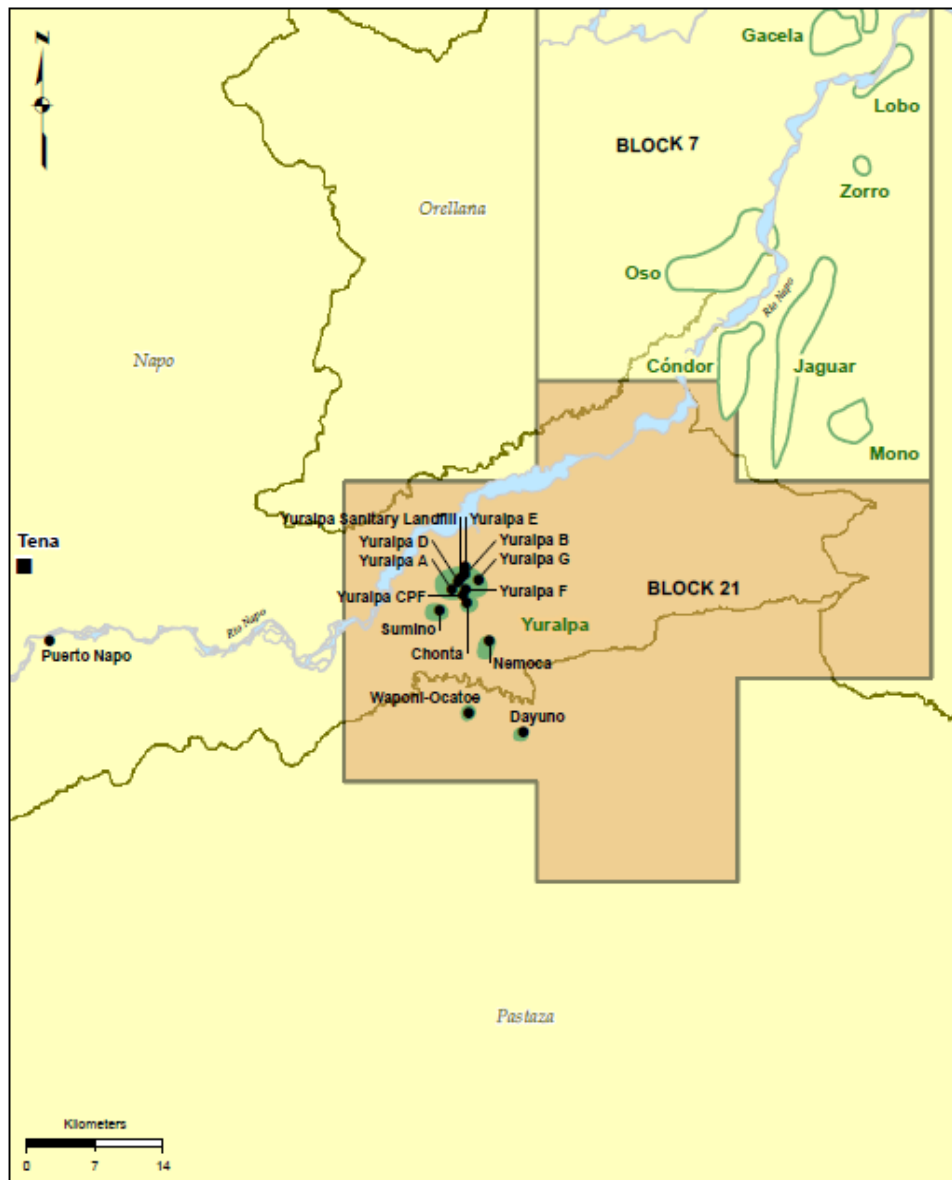
⁴² With respect to Block 7, Burlington Oriente acquired a 25% interest on 25 September 2001, a 5% interest on 13 December 2001, and a 12.5% interest in September, each transaction being duly approved and registered by the Government.

⁴³ CMCC, ¶ 91 and SMCC, ¶ 76.

⁴⁴ SMCC, ¶¶ 73-76.

B. Block 21

47. To the south of Block 7, Block 21 covers an area of nearly 1,550 square kilometers in the Eastern-Central Oriente basin about 240 kilometers southeast of Quito.⁴⁵ Block 21 is shown on the following map:⁴⁶



⁴⁵ 2nd SMCC, ¶ 79.

⁴⁶ Map taken from: GSI ER1, App. D, p. 187, Figure D.2.c.

48. Several indigenous communities reside in Block 21, including fourteen Kichwa and three Huaorani communities.⁴⁷ Block 21 partly overlaps with the Sumaco Biosphere Reserve, the Yasuni Biosphere Reserve, as well as with the Huaorani Indigenous Reserve located in the eastern part of the Block.⁴⁸
49. Prior to 1995, Block 21 had been explored by Texaco and Exxon, each drilling a single well in 1972 and 1987 respectively.⁴⁹ On 20 March 1995 Oryx and Ecuador entered into a Participation Contract for Block 21.⁵⁰ Burlington acquired a 37.5% interest in the Block in late 2001 and a further 8.75% in 2005 (for a total of 46.25%). Perenco owned the remaining share and was the operator of the Block.
50. Although exploitation of the Block began on 8 June 2001,⁵¹ as late as 2002 Block 21 remained sparsely developed⁵² with only a small number of wells and no CPF.⁵³ Actual production in the Block began only in 2003 and it was largely developed by the Consortium.⁵⁴ By July 2009, the Consortium had increased the number of wells from 3 to 31⁵⁵ and Block 21 contained a total of 6 platforms in the Yuralpa field, 2 platforms in

⁴⁷ SMCC, ¶¶ 78-81.

⁴⁸ Tr. (Day 1) (ENG), 58:2-5 (Opening, Silva Romero); Confidential Memorandum, ConocoPhillips, Huaorani Reserve and Block 21 Map, p. 36 (**Exh. E-214**).

⁴⁹ SMCC, ¶ 83.

⁵⁰ Participation Contract for the Exploration and Exploitation of Hydrocarbons in Block 21, 20 March 1995 (**Exh. C-2, Exh. CE-CC-13**). The Consortium comprised Oryx (50%, operator), Santa Fe (17.5%), Sipetrol (17.5%) and Compañía Latinoamericana Petrolera (“Clapsa”, 15%). In September 1995, Santa Fe transferred its interests to Preussag, and in February 1999, KmG assumed Oryx’s 50% interest in Block 21. SMCC, ¶ 84, note 70.

⁵¹ 2nd SMCC, ¶ 86. Letter of 24 May 2001 from Kerr McGee to Petroecuador and Letter of 8 June 2001 from Petroecuador to Kerr McGee (**Exh. E-259**).

⁵² Until 1999, Oryx had conducted three environmental impact studies for seismic operations, four environmental impact studies for exploratory drilling, and one environmental impact study for the construction of the Yuralpa-Puerto Napo pipeline. In November 1999, Oryx conducted an environmental impact study for the Development and Production Program of the Yuralpa Field, contemplating the construction of a CPF in Yuralpa, flow lines, two platforms, a base camp, as well as the reactivation of two existing platforms. CMCC, ¶¶ 99-101.

⁵³ By the time Burlington and Perenco acquired their interests in Block 21, the Block “remained largely a greenfield development project with no oil producing infrastructure”. 2nd SMCC, ¶ 87.

⁵⁴ CMCC, ¶ 98.

⁵⁵ *Id.*, ¶ 101.

Chonta and Waponi-Ocatoe, two injection wells in Sumino and Nemoca, one camp, one CPF, one waste management area and a pipeline linking Yuralpa and Puerto Napo.⁵⁶

51. Burlington highlights the fact that, in contrast to Block 7 which had already been developed by prior operators, Block 21 only accounts for 8.3% of Ecuador's soil remediation claims and 16.7% of the total cost for groundwater remediation.⁵⁷

IV. SUMMARY OF THE PARTIES' POSITIONS AND REQUESTS FOR RELIEF

A. Ecuador's Position and Request for Relief

52. Ecuador's case on the counterclaims can essentially be summarized as follows:

- i. Under Ecuadorian law, Burlington is strictly liable for any environmental damage found in Blocks 7 and 21. There is environmental damage in Blocks 7 and 21 in the form of significant soil and groundwater pollution. IEMS, Ecuador's environmental experts, discovered that close to 2.5 million cubic meters of soil and all groundwater locations tested (18) are polluted with hydrocarbons, heavy metals or both. Burlington is liable for this damage.
- ii. Under the PSCs and Ecuadorian law, Burlington was bound to maintain the infrastructure, and return it to Ecuador, in good working condition in accordance with industry standards. Burlington breached this obligation and is thus liable.
- iii. As a result of these breaches, Burlington must pay damages to Ecuador in the total amount of USD 2,797,007,091.42 composed of USD 2,507,107,626 for soil remediation and USD 265,601,700 for groundwater remediation, USD 3,380,000 to complete groundwater studies, USD 3,500,000 for the abandonment of wells in Block 7, and USD 17,417,765.42 for infrastructure damage,⁵⁸ plus interest and costs.

⁵⁶ SMCC, ¶¶ 84-88.

⁵⁷ CMCC, ¶ 98.

⁵⁸ R-PHB, ¶¶ 1014-1017.

53. On this basis, in its Post-Hearing Brief, Ecuador requests that the Tribunal to render an award:

1. Declaring

- (i) That Burlington is liable towards Ecuador for the costs of restoring the environment in areas within Blocks 7 and 21 of the Ecuadorian Amazon Region;
- (ii) That Burlington is liable towards Ecuador for the costs required to remedy the poor state of the infrastructure of Blocks 7 and 21 left behind by Burlington;

2. Ordering

- (i) Burlington to pay damages to allow the State to proceed with full restoration of the environment in areas within Blocks 7 and 21 of the Ecuadorian Amazon Region quantified at USD 2,507,107,626 (or, alternatively, USD 790,465,298) for soil clean up costs and USD 265,601,700 for groundwater remediation costs;
- (ii) Burlington to pay the costs for Ecuador to complete groundwater studies in 52 additional locations quantified at USD 3,380,000;
- (iii) Burlington to pay the costs of abandonment of wells in Block 7, quantified at USD 3,500,000;
- (iv) Burlington to pay damages for its failure to return the Blocks' infrastructure in good condition to Ecuador in an amount quantified at USD 17,417,765.42 with interest at an adequate commercial interest rate from the date of disbursement thereof until the date of the Award;
- (v) Burlington to pay all the costs and expenses incurred in this arbitration in connection with Ecuador's counterclaims, including but not limited to Ecuador's legal and expert fees and costs and ICSID's other costs; and
- (vi) Claimant to pay interest at an adequate commercial interest rate on all amounts stated in the preceding paragraphs from the date of the Award until the date of full payment; and

3. Awarding

- (i) Such other relief as the Tribunal considers appropriate.⁵⁹

54. In its Post-Site Visit Brief, Ecuador has expressly maintained these prayers for relief.⁶⁰

⁵⁹ *Id.*, ¶¶ 1012-1020.

⁶⁰ R-PSVB, ¶ 14.

B. Burlington's Position and Request for Relief

55. In essence, Burlington makes the following submissions:

- i. Ecuador's multi-billion environmental claim is no more than tactical retaliation fabricated after Burlington lodged its ICSID claim, with the objective of offsetting the significant damages that are owed to Burlington by Ecuador for its unlawful seizure of the Blocks.⁶¹ Similarly, the infrastructure claim is opportunistic and lacks merit.⁶² It was fabricated to provide additional support for Ecuador's environmental claim. Not satisfied in having cashed in over USD 4 billion in "unanticipated" oil revenues from the seizure of the Blocks, Ecuador now seeks USD 2.6 billion for an alleged "tremendous environmental harm" caused by a "series of small incidents", and an additional USD 17 million to upgrade infrastructure it took from the Consortium.⁶³
- ii. Ecuador in fact seeks to impose on Burlington responsibility for environmental conditions preexisting the Consortium's operation of Blocks 7 and 21, and even preexisting any human activity on the Blocks. Moreover, whatever environmental damage may be present in the Blocks today is the result of, or has been severely exacerbated by, Ecuador's own operation and indeed expansion of oilfield operations.
- iii. Ecuador's claims must be rejected *in toto*, since Ecuador relies on invented legal tests that have never been applied in practice and are scientifically unsupported. Alternatively, the Tribunal should evaluate the reasonable costs of remediating "the pockets of exceedances at the two sites that are possibly attributable to the Consortium, as would have occurred in a normal orderly handover, absent Ecuador's unlawful actions".⁶⁴ These costs amount to USD 1.09 million and include the remediation of Yuralpa Pad A and Jaguar 1 Area 3T.

⁶¹ Rejoinder, ¶ 2.

⁶² C-PHB, ¶ 228.

⁶³ *Id.*, ¶ 1.

⁶⁴ *Id.*, ¶ 13.

56. Accordingly, in its Post-Hearing Brief, Burlington requests the Tribunal to grant the following relief:

- (a) DISMISS with prejudice Ecuador's environmental counterclaims in their entirety;
- (b) In the alternative, determine that the reasonable cost of remediating the exceedances possibly attributable to the Consortium, including the costs of closing four pits and abandoning seven wells is no more than USD 1.09 million;
- (c) DECLARE that, beyond the exceedances assessed by the Tribunal, Burlington has no further liability for environmental harm in Blocks 7 and 21;
- (d) DISMISS with prejudice Ecuador's infrastructure counterclaims in their entirety;
- (e) ORDER Ecuador to pay all of the costs and expenses of this arbitration, including Burlington's legal and expert fees, the fees and expenses of any experts appointed by the Tribunal, and ICSID's other costs;
- (f) ORDER Ecuador to pay compound interest on the sum awarded in (e) above, until the date of effective and complete payment, at a rate of 4 percent compounded annually, or at such a rate and for such a period of compounding as the Tribunal considers just and appropriate in the circumstances; and
- (g) AWARD such further and other relief as the Tribunal considers appropriate.⁶⁵

57. The Post-Site Visit Brief did not change these requests for relief.

V. ANALYSIS

58. Having considered the Parties' extensive submissions as well as the very extensive evidentiary record, including the evidence gathered during the Site Visit, the Tribunal now proceeds with its analysis of the counterclaims. It will first address various preliminary matters (Section A). Thereafter, it will review Ecuador's environmental counterclaims (Section B) and then turn to the infrastructure counterclaims (Section C) before concluding on the counterclaims, including on the avoidance of double recovery

⁶⁵ *Id.*, ¶ 277.

in connection with the counterclaims pending against Burlington's consortium partner Perenco (D). Finally, the Tribunal will discuss interest (VI) and costs (VII) before setting out its decision (VIII).

A. Preliminary Matters

59. The present section deals with (1) the Tribunal's jurisdiction over the counterclaims, (2) the scope of this Decision, (3) the relation between this arbitration and the *Perenco* arbitration, (4) the law applicable to the merits of Ecuador's counterclaims, and (5) certain evidentiary matters.

1. Jurisdiction

60. The Tribunal's jurisdiction in respect of Ecuador's counterclaims is not challenged, and rightly so. As noted in PO8, it derives from an agreement entered into by the Parties on 26 May 2011.⁶⁶ In this agreement, Burlington and Ecuador expressed their agreement and consent that this arbitration is the "appropriate forum for the final resolution of the Counterclaims arising out of the investments made by Burlington Resources and its affiliates in Blocks 7 and 21, so as to ensure maximum judicial economy and consistency".⁶⁷

61. Burlington committed not to raise any jurisdictional objections.⁶⁸ The Parties further agreed that (i) the Tribunal's decision would be final and binding,⁶⁹ (ii) Ecuador (including its emanations, agencies, instrumentalities, subdivisions and controlled corporations) waived its right to file the counterclaims against Burlington, its subsidiaries or any other corporation in the ConocoPhillips Group before "any jurisdiction whatsoever whether arbitral or judicial, national or international except for this Arbitration".⁷⁰

⁶⁶ Agreement between Burlington et al. and Ecuador, 26 May 2011 (**Exh. E-251**). See also: SMCC, ¶ 6.

⁶⁷ Agreement between Burlington et al. and Ecuador, 26 May 2011 (**Exh. E-251**), introductory clause 9.

⁶⁸ *Id.*, operative clause (a).

⁶⁹ *Id.*, operative clause (b).

⁷⁰ *Id.*, operative clause (c).

62. Since the agreement just described deals with jurisdiction over counterclaims, one must in addition refer to Article 46 of the ICSID Convention. Article 46 allows for counterclaims “arising directly out of the subject-matter of the dispute provided that they are within the scope of the consent of the parties and are otherwise within the jurisdiction of the Centre”.⁷¹ These conditions are met here: (i) the counterclaims arise directly out of the subject-matter of the dispute, namely Burlington’s investment in Blocks 7 and 21; (ii) they are within the scope of the Parties’ consent to ICSID arbitration which is manifested in the agreement just referred to; and (iii) they also fall within the jurisdiction of the Centre as circumscribed by Article 25 of the ICSID Convention (legal dispute arising out of an investment, and nationality requirement).

2. Scope of this Decision

63. This Decision resolves one part of the dispute which forms the subject matter of this arbitration, namely Ecuador’s environmental and infrastructure counterclaims raised in the course of the proceedings over Burlington’s claims against Ecuador. Burlington’s claims, which form the other part of this dispute, have been dealt with in part in the Decision on Jurisdiction of 31 May 2010 and the Decision on Liability of 14 December 2012. Ecuador’s request for reconsideration of the latter decision as well as the quantification of Burlington’s claims will be settled in the forthcoming Award.

3. Relation with the Perenco arbitration

64. In the separate ICSID arbitration initiated by Burlington’s Consortium partner, Perenco, Ecuador has raised counterclaims essentially resting upon the same facts and legal arguments as those before this Tribunal. On 11 August 2015, the *Perenco* tribunal issued an Interim Decision on the Environmental Counterclaim (the “*Perenco* Decision”), in which it ruled on certain issues of fact and law with a view to narrowing its analysis of the counterclaims.⁷²

⁷¹ ICSID Convention, Article 46.

⁷² *Perenco Ecuador Limited v. Republic of Ecuador* (“*Perenco v. Ecuador*”), ICSID Case No. ARB/08/6, Interim Decision on the Environmental Counterclaim of 11 August 2015. The *Perenco* tribunal also addressed a number of subsidiary issues.

65. While the evidence gathered in the two proceedings was not identical, among other things, in terms of the witnesses heard,⁷³ it remains that the two arbitrations essentially deal with the same alleged damages. Not surprisingly, questions thus arose during the arbitration on the relation between these two parallel proceedings, in particular in respect of (i) their potential consolidation or other “coordination” between the two tribunals, (ii) the admissibility in these proceedings of submissions and testimony presented in the *Perenco* arbitration (including transcripts from that arbitration), (iii) the impact of the *Perenco* Decision on this Tribunal’s decision-making, and (iv) the risk of double recovery.
66. With respect to item (i), Ecuador opposed the possibility of a consolidation of the counterclaim proceedings.⁷⁴ While acknowledging that the two arbitrations were “parallel”, Ecuador disagreed with Burlington that they were “nearly identical”.⁷⁵ At the end of the Hearing, the Tribunal enquired whether the Parties would accept some level of coordination between the two tribunals.⁷⁶ Subject to consulting with Perenco, Burlington was in favor of such coordination if it could reduce the risk of contradictory decisions.⁷⁷ By contrast, Ecuador maintained its opposition to consolidation and stated that it was “too late” for a coordination between the two tribunals.⁷⁸ Lacking the consent of the Parties, the Tribunal had no choice but to refrain from any coordination with the *Perenco* tribunal.
67. In connection with item (ii) above, the issue arose whether the Parties could rely on the transcripts of the *Perenco* hearing. Ecuador opposed the introduction into the record of

⁷³ Ecuador’s Letter of 10 April 2014 to the Tribunal, p. 3 (mentioning that witnesses Mr. Gilberto Martinez, Mr. Courteaud and Mr. Hoffman were heard in the *Perenco* arbitration but not in this arbitration).

⁷⁴ Letter of 10 April 2014 from Ecuador to the Tribunal, p. 3, citing the letter of 6 June 2012 from Ecuador to the Perenco tribunal (**Exh. E-520**). The Tribunal notes that, even if the Parties had agreed to consolidation or coordination, it would still have remained necessary to approach both Perenco and the *Perenco* tribunal.

⁷⁵ Letter of 10 April 2014 from Ecuador to the Tribunal, p. 3. See also: Tr. (Day 7) (ENG), 2357:13-20 (Tribunal, Silva Romero): “The first comment is that these cases, Perenco and Burlington on the counterclaims have evolved very differently. The arguments are not exactly the same in both cases. The evidence is not exactly the same. Both tribunals have made decisions as to new documents. There are documents that were admitted by the Perenco Tribunal that were not admitted by this Tribunal”.

⁷⁶ Tr. (Day 6) (ENG), 2161:1-20; Tr. (Day 7) (ENG), 2353:4-6.

⁷⁷ Tr. (Day 7) (ENG), 2363:8-2364:12 (Tribunal, Blackaby).

⁷⁸ Tr. (Day 7) (ENG), 2356:11-2358:13 (Tribunal, Silva Romero).

the *Perenco* transcripts on the grounds that it “would threaten the structural integrity of the [present arbitration, as well as] violate the separate identity of the proceedings and create an unacceptable risk of pre-judgment”.⁷⁹ Following various exchanges, the Parties agreed to admit the *Perenco* transcripts, but only for impeachment purposes during cross-examination of each other’s witnesses.⁸⁰ Accordingly, except for a few instances where specific passages of the *Perenco* transcript were used for this purpose at the Hearing, the *Perenco* transcripts are not part of this record.⁸¹

68. The Parties were asked to comment on the third issue, concerning the impact of the *Perenco* Decision on this case, after that decision was rendered. In its comments dated 18 September 2015, Ecuador reiterated that the two sets of proceedings are separate and invited the Tribunal to consider only the arguments and evidence before it in this present arbitration.⁸² For its part, Burlington commented that the *Perenco* Decision “substantially narrowed the disputed issues” and therefore invited the Tribunal to carefully assess that decision’s conclusions.⁸³ Burlington further stated that the Site Visit effectively eliminated the need to appoint an independent expert or to engage in further fact-finding.⁸⁴

69. The Tribunal is mindful of the separate nature of the two arbitrations and of its duty to resolve the dispute before it solely on its own record and merits. This said, the Tribunal is also mindful of the risk of double recovery, to which it will revert, and of the potential risk of contradictory decisions. For reasons linked to the value of coherence of the legal system, it considers that contradictory decisions on identical issues should be avoided

⁷⁹ Letter of 10 April 2014 from Ecuador to the Tribunal, p. 1. See also: Letter of 31 March 2014 from Ecuador to the Tribunal, pp. 2-3; Letter of 21 March 2014 from Ecuador to the Tribunal, p. 2; Letter of 14 March 2014 from Ecuador to the Tribunal, p. 4. Ecuador further specified that the introduction into the record of a letter of 3 June 2009 from counsel to Perenco to counsel to Ecuador relating to the so-called “Suspension Plan” (**Exh. E-311**) and other documents obtained through document productions in the *Perenco* arbitration (**Exhs. E-433, E-434, E-464, E-467, E-468, E-469, E-470 and E-471**) “should not constitute a basis for the introduction” of the *Perenco* transcripts. Letter of 10 April 2014 from Ecuador to the Tribunal, p. 4.

⁸⁰ Letter of 28 April 2014 from the Tribunal to the Parties. On this issue, see for instance, the discussions during the Hearing: Tr. (Day 2) (ENG), 348:16-352:14.

⁸¹ This said, the Tribunal notes that certain decisions, witness statements, expert reports and other documents from the *Perenco* proceedings have been filed in this arbitration, especially in the context of the phases dealing with Burlington’s claims.

⁸² Letter of 18 September 2015 from Ecuador to the Tribunal, p. 2.

⁸³ Letter of 18 September 2015 from Burlington to the Tribunal, pp. 1-2.

⁸⁴ *Id.*, p. 4.

to the degree possible without sacrificing any party's rights of due process or fairness. While ruling on the basis of the record in this case exclusively, the Tribunal will refer to the *Perenco* Decision in those instances where, in spite of the desire to avoid contradictions, it reaches a conclusion different from that of the *Perenco* tribunal.

70. As regards the risk of double recovery (item (iv) above), Ecuador does not dispute that it seeks what Burlington calls “identical overlapping compensation with regard to the same alleged damage” in both proceedings.⁸⁵ It also agrees that there is a risk of double recovery.⁸⁶ This being so, at the end of the Hearing, Ecuador explained that it does not intend to recover its claimed damages twice, but that it will rely on whichever decision proves to be more favorable to its position.⁸⁷ Burlington, on its part, requested that the Tribunal expressly address the risk of double recovery, such that “if the dispositive part of either of the awards on counterclaims provides for any compensation, Ecuador would be prevented from enforcing the second award to the extent that it has already been compensated by the first”.⁸⁸ The Tribunal addresses double recovery below (Section D).

4. Applicable Law

71. The law governing the conduct of the procedure on the counterclaims is addressed in the rules of the ICSID Convention, the ICSID Arbitration Rules and the Tribunal's procedural orders, in particular PO8 (Proceedings on Counterclaims), PO14 (Hearing on Counterclaims), PO21 (Post-Hearing Matters), PO30 (Site Visit), and PO31 (Post Site Visit Matters).
72. As regards the substance of the dispute, it is undisputed that Ecuadorian law applies to both the environmental and the infrastructure counterclaims. This being so, there is no common ground between the Parties with respect to the applicability to the environmental counterclaims of the Block 7 and Block 21 PSCs and the relevance of international law.

⁸⁵ Tr. (Day 1) (ENG), 155:14-22 (Opening, Blackaby); Letter of 18 September 2015 from Burlington to the Tribunal, p. 2.

⁸⁶ Reply, ¶ 547; Tr. (Day 7) (ENG), 2358:14-17 (Tribunal, Silva Romero).

⁸⁷ Tr. (Day 7) (ENG), 2358:14-17 and 2359:7-11 (Tribunal, Silva Romero).

⁸⁸ Letter of 18 September 2015 from Burlington to the Tribunal, p. 2.

73. With respect to the environmental counterclaims, Ecuador affirmed throughout the proceedings that its action is solely based on Ecuadorian tort law, as opposed to contract law, although it relies on several provisions of the PSCs to support its interpretation of the strict liability regime under Ecuadorian law.⁸⁹
74. According to Article 42(1) of the ICSID Convention, the Tribunal shall decide the dispute “in accordance with such rules of law as may be agreed by the parties”, absent which “the Tribunal shall apply the law of the [host State] ... and such rules of international law as may be applicable”.⁹⁰ Here, Ecuador brings a tort action, and neither Party has argued that the choice of (Ecuadorian) law in the PSCs encompasses torts. Therefore, the Tribunal will apply Ecuadorian tort law, not as the law chosen by the Parties under the first leg of Article 42(1) of the ICSID Convention, but as the law of the host State under the second leg of that provision. The relevance of this distinction is that, under the second leg, international law also “may be applicable”. According to prevailing case law,⁹¹ it is left to the Tribunal’s discretion to apply either municipal or international law depending on the type of issue to be resolved. Subject to any particular matter that may call for the application of international law, which will be discussed if and when it arises in the analysis, the Tribunal will thus apply Ecuadorian law to the environmental counterclaims. The fact that the dispute is governed by tort law does not mean, however, that the Tribunal may not look to the PSCs to inform its understanding of the obligations assumed by the Consortium in terms of environmental stewardship.
75. With respect to the infrastructure counterclaims, Ecuador argues that Burlington’s liability for the poor condition of the infrastructure arises both under the Block 7 and 21 PSCs and under Ecuadorian law.⁹² In this regard, the PSCs contain a choice of Ecuadorian law and, accordingly, the Tribunal will apply such law (under the first leg of Article 42(1) of the ICSID Convention) as well as any relevant contractual provisions of the PSCs.

⁸⁹ See, for instance: Tr. (Day 1) (ENG), 27:12-15 (Opening, Silva Romero), 301:22-302:7, 303:4-20 (Tribunal, Silva Romero).

⁹⁰ ICSID Convention, Article 42(1).

⁹¹ *Vestey Group Ltd v. Bolivarian Republic of Venezuela*, ICSID Case No. ARB/06/4, Award of 15 April 2016, ¶¶ 116-117; *Burlington Resources Inc. v. Republic of Ecuador*, ICSID Case No. ARB/08/5, Decision on Liability of 14 December 2012, ¶ 179; *Wena Hotels Limited v. Arab Republic of Egypt*, ICSID Case No. ARB/98/4, Award of 8 December 2000, p. 911.

⁹² SMCC, ¶ 14.

5. Assessment of evidence

76. At the Hearing, in accordance with its powers in evidentiary matters, the Tribunal suggested to the Parties that an inspection of various sites would assist its understanding of several key issues connected to the environmental counterclaims, such as soil and groundwater contamination, the experts' sampling programs, land use, the topography of the Blocks and specific sites, and the extensive modelling and delineation employed by the Parties' respective experts. As discussed above, both Parties having given their consent prior to the close of the Hearing, the Tribunal decided to conduct a Site Visit in accordance with ICSID Arbitration Rule 34(2)(b).⁹³
77. Further, in light of the technical nature of many of the factual issues at stake in the environmental counterclaims, including issues explored during the Site Visit, the Tribunal put to the Parties whether, in their view, it should seek the assistance of a Tribunal-appointed expert in addition to the experts offered by the Parties. The Tribunal ultimately concluded in the negative, because (i) neither Party requested the appointment of a Tribunal expert (for example, Burlington stated that with the benefit of the Site Visit it considered that the Tribunal was fully equipped to decide the environmental counterclaims "without the need for an independent expert or additional fact finding"),⁹⁴ (ii) it had before it extensive evidence from qualified experts, (iii) it also had detailed evidence from fact witnesses, including persons with long-time familiarity with the fields, (iv) it had visited relevant sites and had thus acquired a further, first-hand, visual understanding of the physical environment in which the oil exploration and production operations were conducted, of the situation of the platforms and the other installations, and of the terrain and areas modelled and delineated by the experts. In addition, (v) developing and engaging in a process involving a Tribunal-appointed expert would have caused delays and costs which the Tribunal considered would be

⁹³ See above paragraph 18.

⁹⁴ Letter of 18 September 2015 from Burlington to the Tribunal, p. 2. At the Hearing, Burlington indicated that the appointment of an independent expert would fall within the discretion of the Tribunal, but that with the benefit of a site visit the Tribunal could further obtain evidence from the Parties' experts. The appointment of an independent expert might only become necessary once the Tribunal decided the legal framework and some technical questions would still remain unclear. Tr. (Day 7) (ENG), 2362:5-2363:7 (Tribunal, Blackaby). For its part, Ecuador stated at the Hearing that the decision to appoint an independent expert fell within the discretionary powers of the Tribunal, and in its letter of 18 September 2015, Ecuador did not opine on the appointment of an independent expert. Tr. (Day 7) (ENG), 2367:10-13 (Tribunal, Silva Romero); Letter of 18 September 2015 from Ecuador to the Tribunal.

disproportionate to the possible usefulness of such an exercise in the circumstances, and contrary to the Tribunal's duty of efficiency.

78. Several issues also arose in the context of the document production exercise, which will be addressed if and to the extent relevant to the Tribunal's analysis of particular claims or submissions discussed later in this Decision.

B. Environmental Counterclaims

79. In a nutshell, Ecuador claims that the Consortium abandoned Blocks 7 and 21 leaving behind a massive environmental catastrophe, a claim which Burlington strongly denies (save for an admission of liability in an amount of approximately USD 1.09 million). The Parties are in sharp disagreement on nearly all issues of fact and law raised by these counterclaims. To untangle this disagreement, the Tribunal will first set out the Parties' positions on matters of law (Section 1). It will then review the regulatory framework applicable to oilfield operations in Ecuador, in particular as it relates to environmental protection and stewardship (Section 2). This will then allow the Tribunal to assess the legal positions advocated by the Parties (Section 3). In the light of this assessment of the law, the Tribunal will thereafter summarize the Parties' positions on the facts and proceed to analyze such facts on soil contamination (Section 4), mud pits (Section 5), groundwater (Section 6), and well site abandonment (Section 7).

1. Parties' positions

1.1 Ecuador's position

1.1.1 Burlington is liable for all environmental harm in Blocks 7 and 21

80. According to Ecuador, Burlington is incorrect when alleging, and in any event it fails to establish, that Ecuador's counterclaims are a mere set-off strategy. As Professor Crespo explained at the Hearing, Ecuador's position in and approach to these proceedings are proof that Ecuador is pursuing its constitutional obligation to vindicate any environmental harm caused by the Consortium in Blocks 7 and 21.⁹⁵ Furthermore, Burlington's novel theory on sustainable development does not withstand scrutiny.

⁹⁵ Tr. (Day 2) (ENG), 343:10-15 (Cross, Crespo): "Well, not only through sanctions, but also through demanding that actions be taken completely restoring an environmental harm or imposing administrative penalties to dissuade the economic activities so as to prevent environmental harm".

Sustainable development cannot amount to a “license to pollute”.⁹⁶ Quite to the contrary, this principle encompasses the polluter-pays principle, and Ecuador only allowed oil operations to be carried out because such operations are highly regulated and any environmental harm must be fully restored under the maxim *ubi emolumentum, ibi onus*.⁹⁷ If one were to accept Burlington’s permissible limits theory, it would signify that “the Ecuadorian environment and the society at large will be forced to assume part of the costs of Burlington’s oil activities [...]”; an unacceptable position.⁹⁸ As stated by Professor Crespo, sustainable development implies that operators internalize environmental costs.⁹⁹

1.1.2 Burlington is strictly liable for any environmental harm found in Blocks 7 and 21

81. According to Ecuador, under the 2008 Constitution, oil operators bear strict liability for environmental harm. Strict liability means that oil operators are liable upon a mere showing of environmental harm in the areas where they performed oil operations. The State need not prove that the oil operator is at fault, nor that there is a causal nexus between a breach of the duty of care and the environmental damage.¹⁰⁰
82. Under the strict liability regime, the State must only prove the existence of an economic activity in the relevant area entailing serious risks to the environment and a negative impact on the environment of the type that comes with such perilous economic activity. For Ecuador, Burlington is wrong in seeking to downplay the significance of the impact of its operations on the environment. Indeed, Burlington’s “*significant admission*” of liability to restore soils in the amount to USD 10 million is itself a manifestation of a “significant impact”.¹⁰¹

⁹⁶ R-PHB, ¶ 44.

⁹⁷ *Id.*, ¶ 46.

⁹⁸ *Ibid.*

⁹⁹ Tr. (Day 2) (ENG), 328:9-18 (Direct, Crespo): “And in closing, I would like to say sustainable development, as I said at the beginning, does not mean that the environment is harmed. It means that one needs to guarantee the environment [...] internalizing costs [of] economic activities”.

¹⁰⁰ SMCC, ¶¶ 16-23.

¹⁰¹ R-PHB, ¶ 36.

1.1.3 The 2008 Constitution applies to damage discovered after its entry into force

83. In terms of temporal application, Ecuador submits that the 2008 Constitution applies to any environmental harm discovered after its entry into force, no matter when the harm actually occurred. Burlington did not contradict Ecuador’s legal experts, Professors Crespo and Andrade, who stated that the 2008 Constitution applies, at the very least, to all environmental harm that occurred after its entry into force. This follows from Articles 11.3 (direct application)¹⁰² and 396 of the 2008 Constitution (strict liability for environmental torts), the latter providing for full reparation of any environmental harm (“*todo daño al ambiente*”).
84. Professor Bedón, Burlington’s expert, also did not deny that the 2008 Constitution could apply to environmental harm preceding the entry into force of the Constitution if a particular norm dictated its application.¹⁰³ Such norm does exist, so argues Ecuador, as the court confirmed in *Nelson Alcívar* in reliance on the principle *in dubio pro natura* (enshrined in Article 395(4) of the 2008 Constitution),¹⁰⁴ in the following terms:

“It is important that we highlight that the constitutional principal [sic] that states that in doubt, the rule that most favors environmental protection shall apply, as it is a standard that generates ample protection, the matters contemplated by the current Constitution will apply, as it is a standard that creates a broad protection to the environment, above the matters outlined by the Environmental Management Law or the 1998 Constitution. The provisions of the current Constitution as it relates to environmental issues and its protection is also preferably applied, since, in procedural matters, the rules in force at the time of filing the action apply, and not those that were in force when the legal situation was created”.¹⁰⁵

¹⁰² On the notion of direct application, Ecuador refers to Doyen Roubier’s distinction between dynamic situations and static situations. “A new law cannot govern a situation or phase that has ended. Conversely, a new law can govern a situation that started before its enactment but which is not yet ended. Environmental harm, *i.e.* continuing harm, is precisely an example of a dynamic situation”. R-PHB, ¶ 52, note 63.

¹⁰³ See R-PHB, ¶ 54, referring to: Tr. (Day 2) (ESP), 624:18-625:3 (Cross, Bedón), corresponding to Tr. (Day 2) (ENG), 599:14-21 (Cross, Bedón).

¹⁰⁴ Article 395(4) of the 2008 Constitution (**Exh. P-12**): “In case of doubt as to the scope of legal provisions on environmental matters, these shall be applied within the meaning most favorable to nature’s protection” (Translation by the Tribunal).

¹⁰⁵ R-PHB, ¶ 55. *Nelson Alcívar v OCP*, Corte Provincial de Justicia, 2011, ¶ 12 (**Andrade ER, Annex 29**).

1.1.4 Environmental claims are imprescriptible

85. The Respondent further emphasizes that in *Nelson Alcívar* the court also held that, under Article 396(4) of the 2008 Constitution, environmental claims are “*imprescriptibles*”, that is subject to no statute of limitation, and that the Constitution applies to all environmental claims filed after its entry into force.¹⁰⁶ Accordingly, since Ecuador filed its environmental counterclaims in January 2011, i.e. after the entry into force of the 2008 Constitution, Burlington cannot rely on Article 2235 of the Ecuadorian Civil Code (the “Civil Code” or “CC”) to argue that claims relating to environmental harm caused prior to January 2007 are prescribed, i.e. time-barred.
86. Burlington’s argument that Ecuador’s claims are time-barred with regard to harm resulting from acts prior to January 2007, i.e. four years before Ecuador first filed its counterclaims, is also misplaced. Burlington ignores that Article 2235 of Ecuador’s Civil Code exclusively governs fault-based liability. The present environmental claims are for strict liability and are not subject to a statute of limitation according to Article 396(4) of the 2008 Constitution, as acknowledged by the Claimant’s expert Professor Bedón at the Hearing.¹⁰⁷ Even if Article 2235 of the Civil Code were to apply, the time period for prescription (the “clock”) would only start running upon discovery of the harm, which in this case was after the Consortium abandoned the Blocks in July 2009.¹⁰⁸
87. This understanding of Ecuadorian law is reinforced by Burlington’s policy of concealing and failing to report environmental harm,¹⁰⁹ which incidentally also does away with Burlington’s “utterly misplaced” argument that environmental impact studies approved by Ecuador would somehow allow Burlington to evade liability.¹¹⁰

¹⁰⁶ R-PHB, ¶ 57; Ecuador’s Opening Statement, Slides 15-16.

¹⁰⁷ R-PHB, ¶ 69, referring to: Tr. (Day 2) (ESP), 591:22-592:5 (Cross, Bedón), corresponding to Tr. (Day 2) (ENG), 570:6-10 (Cross, Bedón).

¹⁰⁸ R-PHB, ¶ 72.

¹⁰⁹ *Id.*, ¶¶ 765-815.

¹¹⁰ *Id.*, ¶¶ 746-764.

88. In any event, by acquiring its interest in the Blocks and contractually assuming the environmental liabilities of prior operators, Burlington waived its right to invoke any statute of limitations.¹¹¹
89. In the alternative, so argues Ecuador, Burlington has not denied that norms of public order may be applied with retroactive effect, as was held in *Baquerizo*.¹¹² The Claimant’s expert Professor Bedón acknowledged at the Hearing that Article 14(2) of the 2008 Constitution characterizes the constitutional environmental protection regime as a matter of public order.¹¹³ Incidentally, the same approach has been adopted in various other jurisdictions.¹¹⁴
90. Be that as it may, for the Respondent, even if the 2008 Constitution had no retroactive effect, the result would be the same. Read in conjunction with the *Delfina Torres* decision, the environmental regime set out in the 1998 Constitution also imposes strict liability (*responsabilidad objetiva*) for environmental torts.¹¹⁵ As explained by the Respondent’s expert Professor Andrade at the Hearing, the only differences between the 1998 and the 2008 regimes concern the burden of proof and the statute of limitations.¹¹⁶ Similarly, the court in *Aguinda v. Chevron* confirmed the objective nature

¹¹¹ *Id.*, ¶¶ 71, 636-672.

¹¹² *A Baquerizo G.C. Ltda. v. Shulton Inc.*, Supreme Court of Justice, Third Civil and Mercantile Chamber, published in Judicial Gazette No. 12 of 25 September 2003 (**Exh. CA-CC-29**). Ecuador’s Opening Statement, Slide 17.

¹¹³ R-PHB, ¶ 58, referring to: Tr. (Day 2) (ESP), 601:13-17 (Cross, Bedón), corresponding to Tr. (Day 2) (ENG), 578:16-19 (Cross, Bedón).

¹¹⁴ Reply, ¶ 322; R-PHB, ¶ 59, pointing to the United States, the United Kingdom, and Norway. For instance, Norway’s Pollution Control Act provides that it “applies to activities which were initiated before the Act entered into force” (**Exh. EL-189**).

¹¹⁵ Comité Pro Mejoras Barrio Delfina Torres vda. de Concha v. Petroecuador, Petrocomercial and their affiliates (“Delfina Torres v. Petroecuador”), Case No. 229-03, Judgment of the Supreme Court of Justice, 29 October 2002, published in Official Register No. 43, 19 March 2003 (**Exh. EL-160**).

¹¹⁶ R-PHB, ¶¶ 60-61. See also the statement of Professor Andrade at the Hearing: Tr. (Day 2) (ENG), 496:8-14 (Tribunal, Andrade), and Tr. (Day 2) (ENG), 424:8-9 (Direct, Andrade). The Tribunal notes that Mr. Andrade spoke of the burden of proof in his testimony (“*carga de la prueba*”), which was erroneously translated as “the quality of the evidence”. See: Tr. (Day 2) (ESP), 434:2-5 (Direct, Andrade).

of the liability, holding that “[l]iability for environmental harm is always strict, regardless of whether a legal provision exists that establishes so”.¹¹⁷

1.1.5 Burlington bears the burden to prove the inexistence of harm

91. As regards the burden of proof, Ecuador notes that Burlington “conveniently remained silent” on Article 397(1) of the 2008 Constitution, which places the burden of proving the inexistence of potential or real environmental damage on the operator. Its expert Professor Andrade explained that Ecuador must only establish the existence of a “negative impact”, that is an “alteration of the natural environment” (something far less than “harm”) for the burden of proof to shift to Burlington:¹¹⁸

“[W]hat the Constitution did in relation to these two components – harm on the one hand and quantum on the other, the quantum of environmental harm – what it did it was transfer the burden of proof to the person carrying out the activity or the defendant. So, the only modification of the 2008 Constitution in connection with this matter is that what must be shown, the evidence that must be given by the Claimant, is the negative impact, obviously the impact, negative impact upon nature. This is as far as he has to go”.¹¹⁹

92. More specifically, Ecuador argues that it only needs to establish that the Blocks have been “adversely impacted”, upon which the burden shifts to Burlington to show that this negative impact is “not significant within the meaning of the *Ley de Gestión Ambiental*”.¹²⁰ It is sufficient for it to establish that Burlington performed environmentally risky activities in a certain area and that an adverse environmental impact of the kind that may be caused by such activities is present in that area.¹²¹ Finally, Professor Andrade confirmed without being contradicted, that pursuant to Article 2217 of the Civil

¹¹⁷ R-PHB, ¶ 62. *María Aguinda Salazar et al. v. Chevron Corporation* (“*Aguinda v. Chevron*”), National Court of Justice, 12 November 2013, p. 115 (**Exh. EL-233**).

¹¹⁸ R-PHB, ¶ 64.

¹¹⁹ Tr. (Day 2) (ENG), 420:13-421:1 (Direct, Andrade).

¹²⁰ R-PHB, ¶¶ 66, 612. This is further reinforced by (1) the *travaux préparatoires* of the Constitution. Constituent Assembly of Ecuador, Final Report of Working Group 5 on Natural Resources and Biodiversity, 2008, p. 15 (**Crespo ER, Annex 9**); (2) the wording of Article 397 of the 2008 Constitution; (3) the *Aguinda* decision; and (4) the principle *in dubio pro natura* enshrined in Article 395(4) of the 2008 Constitution.

¹²¹ R-PHB, ¶ 606.

Code, even if the harm to the Blocks were caused by several persons, including prior operators, Burlington remains jointly liable with all third parties for all such harm.¹²²

1.1.6 Under strict liability, causation is presumed

93. Ecuador argues primarily that under the strict liability regime, causation is presumed and Burlington can only escape liability if it shows that *force majeure*, Ecuador, or a third party caused the environmental harm.¹²³ Burlington cannot, however, escape liability for the actions or omissions of prior operators since the PSCs require the operator to restore the Blocks so as to “allow the potential return to environmental conditions similar to those encountered at the beginning of the operations”.¹²⁴ In other words, Burlington contractually agreed to repair any environmental harm found in the Blocks that may have been caused by prior operators.¹²⁵ Nor can Burlington escape liability by showing that it took appropriate measures to prevent damage during its tenure as operator.¹²⁶
94. More specifically, the Respondent cites to Article 396 of the 2008 Constitution under which “[l]iability for environmental harm is strict”.¹²⁷ It also refers to Article 397(1) pursuant to which the burden to prove the inexistence of potential or real environmental harm falls on the operator.¹²⁸ In addition, in its Final Report on Natural Resources and Biodiversity, the Constituent Assembly of Ecuador indicated that it is not for the claimant to prove causation, but for the respondent to disprove its existence.¹²⁹ This

¹²² *Id.*, ¶¶ 75-76.

¹²³ Reply, ¶¶ 7, 10, 356, 406; R-PHB, ¶¶ 8, 603, 703; Ecuador’s Opening Statement, Slide 45.

¹²⁴ Block 7 Participation Contract, Art. 5.1.20.10 (**Exh. C-1 Corrected translation; Exh. CE-CC-28**); Block 21 Participation Contract, Art. 5.1.20 (**Exh. C-2; Exh. CE-CC-13**). See also: Ecuador’s Opening Statement, Slide 44.

¹²⁵ Ecuador Opening Statement, Slide 44, referring to: Saltos WS1, ¶ 111 (“the Consortium also performed tasks to remediate areas identified by KmG”).

¹²⁶ Reply, ¶ 357, referring to: Bedón ER1, ¶ 61. See also: Andrade ER, ¶ 55.

¹²⁷ Article 396 of the 2008 Constitution (**Exh. P-12**).

¹²⁸ *Id.*, Article 397(1).

¹²⁹ Constituent Assembly of Ecuador, Final Report of Working Group 5 on Natural Resources and Biodiversity, 2008, p. 15 (**Crespo ER, Annex 9**). See also: Ecuador’s Opening Statement, Slide 45.

approach was first applied in *Delfina Torres*¹³⁰ and again in *Aguinda* where the National Court of Justice confirmed that strict liability presumes causation.¹³¹

95. Once the existence of harm in the area of oil operations is proven, the oil operator is liable, unless it can show that the harm results from *force majeure*, the actions or omissions of the victim, or a third party. As Professor Crespo explained, the rationale for such a regime is that in most instances it is very difficult or impossible to establish that the operator's fault caused the environmental damage.¹³²
96. Ecuador concludes that, in the present case, there is environmental harm in Blocks 7 and 21. Since the Consortium has not demonstrated that the damage is due to *force majeure*, a third party, or the victim, the Consortium is strictly liable for the harm and must fully restore the ecosystems or pay damages to allow the State to proceed with such restoration.¹³³
97. Furthermore, Ecuador argues that, contrary to Burlington's assertion, the presumption of causation applies not only to entities operating simultaneously in the Blocks but also to successive operators. Article 2217 of the Civil Code reinforces this view by providing for joint liability "where a single harm has been caused by several tortfeasors".¹³⁴ Joint liability in environmental law precisely addresses the issue of contamination resulting from years of environmentally risky operations. In any event, according to the Respondent, Burlington failed to establish that Petroamazonas caused any harm in Blocks 7 and 21.¹³⁵
98. Finally, Ecuador argues that it has proven that Blocks 7 and 21 have suffered widespread environmental harm and must be fully restored to background values, or, in

¹³⁰ *Delfina Torres v. Petroecuador*, p. 48, ¶ 20 (**Exh. EL-160**): "However, since the burden of proof of such fault is almost impossible or very difficult to be borne by the victim, shifting the burden of proof was considered necessary, in the sense that, he who uses the risky thing and takes advantage of it must show that the harmful act was caused either by force majeure or act of God, or the fault of a third party or the exclusive fault of the victim itself" (Translation by the Tribunal). See also: Ecuador's Opening Statement, Slide 48.

¹³¹ *Aguinda v. Chevron*, p. 217 (**Exh. EL-233**). See also: Ecuador's Opening Statement, Slide 47.

¹³² Crespo ER, ¶¶ 33-35; 2nd SMCC, ¶ 26.

¹³³ 2nd SMCC, ¶¶ 24-27, 42, 50-52. See also: R-PHB, ¶ 609.

¹³⁴ R-PHB, ¶¶ 624-625.

¹³⁵ *Id.*, ¶¶ 628-633.

the alternative, to the sensitive ecosystem standard set out in *Reglamento Ambiental para las Operaciones Hidrocarburíferas en el Ecuador* (“RAOHE”). It also emphasizes that Burlington must bear the full costs of restoration.

1.1.7 Burlington must fully restore the damaged environment to background values or, in the alternative, to the sensitive ecosystems standard

a. Environmental harm is distinct from violations of regulatory permissible limits

99. In reliance on the 2008 Constitution, Ecuador argues that Burlington is under an obligation to repair the harm “found in the Blocks” and to restore the environment to its original condition (*restitutio in pristinum*).¹³⁶ Ecuador also points to Burlington’s identical obligation in Clause 5.1.20.10 of the Block 7 PSC and Clause 5.1.20 of the Block 21 PSC.¹³⁷
100. As Ecuador’s expert Professor Crespo explains, the notion of “environmental harm” under the Constitution was intentionally left undefined in order to cover as many types of environmental harm as possible. The notion includes the loss of biodiversity as well as impacts on air quality, health of local populations, cultural heritage, and the local economy.¹³⁸
101. According to the Respondent, Burlington’s reliance on the regulatory permissible limits is misplaced. As Ecuador puts it, “[b]elow the numerical permissible limits, pollution is not simply dirt that can be swept under the carpet”.¹³⁹ While a harmful activity may be

¹³⁶ Ecuador’s Opening Statement, Slide 25. Also referring to: Peña Chacón, *Responsabilidad y Reparación Ambiental*, Commission on Environmental Law, Online Papers IUCN, p. 73 (**Crespo ER, Annex 8**).

¹³⁷ R-PHB, ¶ 81. Block 7 Participation Contract, Clause 5.1.20.10 (**Exh. C-1 Corrected translation; Exh. CE-CC-28**); Block 21 Participation Contract, Clause 5.1.20 (**Exh. C-2; Exh. CE-CC-13**). Ecuador’s Opening Statement, Slide 26.

¹³⁸ Crespo ER, ¶ 8, item 7 and ¶ 76; SMCC, ¶¶ 29-38. Professor Crespo indicated that the notion of “environmental damages” covered damage to nature and damage to assets of individuals, as well as various types of environmental threats such as: impact on bodies of water, loss of vegetation, loss of air quality, loss of environmental quality due to increased noise levels, loss of wildlife, impacts on the health of local population, impact on local economies, socio-environmental conflicts, and tangible and intangible impact on cultural heritage. Crespo ER, ¶ 76.

¹³⁹ R-PHB, ¶ 82.

conducted lawfully, it still gives rise to an obligation to repair where harm occurs. The Claimant confuses fault and harm, which are independent from each other.

102. In reliance on decisions of the Colombian Constitutional Court and on scholarly writings, specifically Betancor Rodríguez and Peña Chacón, Ecuador submits that RAOHE and the *Texto Unificado de Legislación Ambiental Secundaria* (“TULAS”) do not define compensable environmental harm. That definition is found in the Environmental Management Law of Ecuador (*Ley de Gestión Ambiental*) (“EML”). The EML defines environmental harm as “all loss, reduction, detriment or significant damage to the preexisting conditions in the environment or one of its components. It affects the functioning of the ecosystem or the renewal of its resources”.¹⁴⁰

103. Therefore, under the EML, “the significance of the harm depends exclusively on the magnitude of the impact on the environment”, whereas RAOHE and TULAS make environmental harm dependent on the economic use of the land affected.¹⁴¹ In other words, the significant harm standard under the EML “is perfectly operational, without the need for numerical standards”,¹⁴² which is reinforced by the fact that the EML makes no reference to limits.¹⁴³ In addition, asserts the Respondent, Article 396 of the 2008 Constitution mandates that *all* environmental damage is to be fully repaired, and Article 397 similarly mentions *full* restoration. In any event, TULAS also requires that contaminated soils be restored to their “prior condition”.¹⁴⁴ This “prior condition” is represented by the background values established by IEMS.

b. Burlington must remediate contaminated soils back to background values

104. What Ecuador refers to as its “main case” is its claim that full restoration under Article 396(2) in conjunction with Article 71 of the 2008 Constitution requires remediation of all

¹⁴⁰ Ecuador’s translation taken from: Reply, ¶ 239. The original Spanish version is in the Glossary of the Environmental Management Law (*Ley de Gestión Ambiental*), Codification 19, published in Supplemental Official Register N° 418 of 10 September 2004 (**Exh. CA-CC-33**).

¹⁴¹ Reply, ¶ 241.

¹⁴² *Id.*, ¶ 242. Ecuador further points to the EU Directive on Environmental Liability and various legislation in Latin American countries, which employ three criteria to define significant environmental harm: (1) environmental impact affecting human health; (2) environmental harm constituting a permanent alteration of the environment; and (3) environmental impact more significant than naturally-occurring negative fluctuations.

¹⁴³ R-PHB, ¶ 111.

¹⁴⁴ Reply, ¶ 246, referring to: TULAS, Volume VI, Annex 2, Article 4.1 (**Exh. EL-173**).

environmental harm to the level of the so-called background values, i.e. restoration of the environment to a condition equivalent to its condition prior to the initiation of oil operations. In Ecuador’s submission, any “alteration to the natural state”¹⁴⁵ qualifies as contamination or harm and must be fully remedied back to so-called background values. There is no “right to freely pollute up to the permissible limits”.¹⁴⁶

105. This approach is consistent with case law of the highest court in Ecuador¹⁴⁷ and was endorsed by Professor Andrade’s oral evidence.¹⁴⁸ From a scientific point of view, IEMS also testified that the regulatory criteria are insufficient to fully protect the environment or the health of the population. In IEMS’s opinion, there is contamination whenever a contaminant exceeds the background values triggering the duty of the operator to “remediate the affected area so as to return it to its natural state”.¹⁴⁹
106. Ecuador argues six grounds for its background values case. First, the Parties’ experts agree that the 2008 Constitution requires full restoration. Since the permissible limits set forth in RAOHE and in TULAS do not represent full restoration, the Tribunal should disregard them and apply the background values established by IEMS.
107. Second, as stated above, RAOHE and TULAS do not define compensable environmental harm. They merely set limits within which hazardous activities may be lawfully conducted in a manner so as to prevent to the extent possible the occurrence of harm.¹⁵⁰
108. Third, the Hearing confirmed that RAOHE and TULAS do not purport to define environmental harm, but that their purpose is to regulate the *activities* of operators.¹⁵¹ The “hollow theory of tolerable and intolerable impact” put forward by the Claimant’s expert Professor Bedón was put to rest when, confronted with Professor Peña Chacón’s comprehensive quote, he had to admit that the strict liability regime excluded

¹⁴⁵ SMCC, ¶ 157.

¹⁴⁶ Reply, ¶ 233.

¹⁴⁷ *Aguida v. Chevron*, p. 141 (**Exh. EL-233**).

¹⁴⁸ Reply, ¶ 234; R-PHB, ¶ 88; Tr. (Day 2) (ENG), 480:15-22 (Cross, Andrade).

¹⁴⁹ SMCC, ¶ 156; IEMS ER2, pp. 12-13.

¹⁵⁰ Reply, ¶ 235.

¹⁵¹ R-PHB, ¶ 114.

a requirement of fault. For Ecuador, “[i]f the fault element disappears with strict liability, then infringing regulations such as those contained in RAOHE and TULAS regulations becomes irrelevant to assessing the existence and extent of environmental harm”.¹⁵²

109. Fourth, RAOHE and TULAS are merely risk management tools. They seek to prevent environmental harm and therefore apply *ex ante*.¹⁵³ Compliance with administrative regulations is no shield against environmental harm. For instance, harm can occur as a result of the “cumulative effect of certain emissions [...] where no permissible limits have been infringed”.¹⁵⁴
110. Fifth, as Professor Crespo confirmed, RAOHE and TULAS govern administrative liability, not civil liability for environmental harm. While the administrative liability regime aims at preventing the occurrence of environmental harm, the civil liability regime provides for full restoration.¹⁵⁵
111. Sixth and last, environmental harm cannot be determined in the abstract by ‘blindly’ applying the permissible limits provided in RAOHE and TULAS. It must be assessed on the facts specific to each case.¹⁵⁶ Referring to Professor Andrade's evidence, Ecuador submits that the permissible limits in RAOHE and TULAS are irrelevant “because any harm must be assessed on site”¹⁵⁷ and because “*ex ante* empirical data cannot determine, in advance, whether the renewability of a specific ecosystem has been impaired, let alone significantly impaired”.¹⁵⁸ More importantly, RAOHE and TULAS do not distinguish between “types and characteristics of lands (deserts, forest, rainforest, mountains, islands...)”, making them unsuitable for the sensitive ecosystem of the Amazon rainforest.¹⁵⁹ Finally, while the limits set in RAOHE and TULAS are bound to

¹⁵² *Id.*, ¶ 124.

¹⁵³ *Id.*, ¶¶ 125-136.

¹⁵⁴ *Id.*, ¶ 135.

¹⁵⁵ *Id.*, ¶¶ 137-140.

¹⁵⁶ *Id.*, ¶ 141.

¹⁵⁷ *Id.*, ¶ 143 (emphasis in the original).

¹⁵⁸ *Id.*, ¶ 145.

¹⁵⁹ *Id.*, ¶ 146.

vary over time, thus making them unreliable, the notion of environmental harm in the EML will not change over time.¹⁶⁰

112. In sum, it is Ecuador's submission that remediation to background values is no extraordinary requirement. Comparative law corroborates this approach.¹⁶¹ Burlington's argument that it has the right to pollute up to the permissible limits is incompatible with "two of the most fundamental principles of environmental law".¹⁶² The first is the polluter-pays principle according to which operators must internalize the environmental costs of their economic activities, as enshrined in the 2008 Constitution, general tort law, and the Rio Declaration. The second fundamental principle is that nature itself is a bearer of rights entitled to protection and reparation in the event of environmental harm under Article 71 of the Constitution.¹⁶³ According to Ecuador, the 2008 Constitution also establishes that, in case of doubt, "environmental regulations should be interpreted in the sense most favourable to the protection of Nature" (*in dubio pro natura*).¹⁶⁴ Hence, absent proof to the contrary, any damage found must be considered significant and thus compensable.

c. In the alternative, Burlington must remediate contaminated soils back to the sensitive ecosystems standard

113. Alternatively, if the Tribunal were to discard the background values approach and refer to RAOHE and TULAS as the basis for defining environmental harm, it should apply the permissible limits for *sensitive ecosystems* in those laws,¹⁶⁵ for the two following reasons. First, the future land use, taken into account under RAOHE to determine the applicable limits, must be taken to refer to the time "when oil operations will end", as opposed to the end of a given operator's activities, as was clarified at the Hearing.¹⁶⁶ Oil

¹⁶⁰ *Id.*, ¶ 148.

¹⁶¹ Reply, ¶ 249, referring to: the EU Directive on Environmental Liability; the Argentine General Environmental Law No. 25675, Article 28; the Honduran General Environmental Law, Decree N° 104-93, Article 87; the Nicaraguan General Law on Environment and Natural Resources No. 217, Article 145; the Spanish Environmental Liability Law 26/2007, Annex II, 1.1.1; and the Peruvian General Environmental Law No. 28611, Article 147.

¹⁶² Reply, ¶ 250.

¹⁶³ *Ibid.*

¹⁶⁴ *Id.*, ¶ 255.

¹⁶⁵ R-PHB, ¶¶ 151-192.

¹⁶⁶ *Id.*, ¶ 158; Tr. (Day 7) (ENG), 2202:3-10 (Closing, Silva Romero).

operations are temporary and the oilfields in Blocks 7 and 21 are “destined to be absorbed again by rainforest”.¹⁶⁷ As a result, the sensitive ecosystem standard must apply, which implies restoration to the state of pristine rainforest.

114. Second, the oilfields were “carved out” of the sensitive ecosystems of the Amazonian rainforest, an area of “significant ecological importance” vulnerable to change and in need of protection.¹⁶⁸ According to Ecuador, Block 7 is situated in a “fragile and diverse ecosystem” with numerous rivers and streams, such as the Napo River crossing the entire Block, the Suno River crossing the Oso field, and the Payamino River in the northern part of Block 7.¹⁶⁹ Similarly, Block 21 is an ecologically rich but vulnerable area, characterized by rainforest and drained by several rivers, of which the most important is the Napo River.¹⁷⁰ Burlington’s argument that Blocks 7 and 21 do not qualify as sensitive ecosystems under RAOHE and TULAS, because they are not so-called “designated protected areas” under Ecuadorian law, is ill-founded. According to Ecuador, by devising a distinction in RAOHE between industrial use, agricultural use and sensitive ecosystem, “the Ecuadorian legislator obviously intended for the Amazonian rainforest, which does not fulfill any industrial or agricultural use, to be included in the latter category”.¹⁷¹
115. In this respect, Ecuador stresses that the map showing the ‘*Sistema nacional de áreas protegidas*’ (“SNAP”), filed by Burlington – disproves the latter’s position that would imply that all non-colored areas of the map would be industrial or agricultural land.¹⁷² Even GSI, the Claimant’s environmental expert, acknowledged at the Hearing, says

¹⁶⁷ R-PHB, ¶ 163.

¹⁶⁸ *Id.*, ¶ 192.

¹⁶⁹ SMCC, ¶¶ 58-59; 2nd SMCC, ¶ 58. Ecuador points to the description of Block 7 as a fragile and diverse ecosystem by one of the prior private operators in that Block, Oryx Ecuador Energy Company (“Oryx”): “[...] given that Oryx’s operations take place in the fragile and diverse amazonic ecosystem and particularly in the ecosystem that dominates the course of the Napo river and its tributaries, it is also justified that those operations be performed adopting all possible technical and economical, preventive and corrective measures to reduce to the minimum possible the undesirable environmental effects, thereby complying with its environmental obligations foreseen in the Hydrocarbons Law, the Exploration and Exploitation Agreement, the Rules of Hydrocarbons Operations in Ecuador and its own environmental policy”. Description of the Petroleum Project of the Environmental Impact Study, Oryx Ecuador Energy Company, January 1993, p. 2 (**Exh. E-254**).

¹⁷⁰ 2nd SMCC, ¶¶ 79-80.

¹⁷¹ R-PHB, ¶ 170.

¹⁷² *Id.*, ¶¶ 171-172.

Ecuador, that some sites within Blocks 7 and 21 were “sensitive ecosystems”.¹⁷³ More significantly, Burlington’s position is contradicted by the wording of RAOHE, which defines sensitive ecosystems in a non-exhaustive way by referring to areas “*such as the National Heritage of Natural Areas and others identified in the corresponding Environmental Study (tales como Patrimonio Nacional de Areas Naturales y otros identificados en el correspondiente Estudio Ambiental)*”.¹⁷⁴

116. Ecuador further emphasizes that Blocks 7 and 21 are located in the Napo River basin, which is “one of the most bio-diverse regions in the world”.¹⁷⁵ Similarly, it notes that the “greater part of the Blocks is entirely within the Sumaco and Yasuni Biosphere Reserves”, while a significant portion of Block 21 lies additionally in the Huaorani indigenous reserve.¹⁷⁶
117. For Ecuador, the “mega-diversity” of the area is further supported by environmental impact studies carried out in 2010 as well as by IEMS, which note the high diversity of the area and the fact that some species are endangered.¹⁷⁷ More importantly, in various environmental impact studies, the Consortium itself concluded “that the characteristics of the Blocks 7 and 21 area were those of a sensitive ecosystem”.¹⁷⁸ In addition, Burlington’s witness Mr. Wilfrido Saltos also recognized the dynamic nature of the ecosystem around the platforms.¹⁷⁹

¹⁷³ *Id.*, ¶ 173, referring to: Tr. (Day 5) (ENG), 1582:4-1583:16 (Cross, Bianchi).

¹⁷⁴ Translation by the Tribunal. R-PHB, ¶ 175 (emphasis added), referring to: RAOHE, Annex 2, Table 6 (**Exh. EL-174**). See also: Tr. (Day 7) (ENG), 2203:7-13 (Closing, Silva Romero).

¹⁷⁵ R-PHB, ¶ 176.

¹⁷⁶ *Ibid.*, referring to: Oilfield sites and Sumaco Biosphere Reserve Map (**Exh. E-339**); Reservas de Biosfera del Ecuador: Lugares excepcionales, Ministry of the Environment of Ecuador, GTZ/GESOREN-DED-WCS-NCI-UNESCO, Quito, 2010 (**Exh. E-380**); Confidential Memorandum, ConocoPhillips, Huaorani Reserve and Block 21 map, p. 36 (**Exh. E-214**). See also: Mapa, UNESCO Biospheres, Ministerio del Ambiente (**Exh. E-565**); Health, Safety, Environment and Sustainable Development Assessment and Other Technical Services: Assets in Ecuador, prepared for ConocoPhillips in November 2006, p. 80 (**Exh. E-222**).

¹⁷⁷ IEMS ER4, Att. 15, Evaluation of Biological Resources in the Area of Blocks 21 and 7, p. 6.

¹⁷⁸ R-PHB, ¶ 186, referring to: Environmental Impact Assessment for drilling project in Lobo 3, December 2005, p. 36 (**Exh. E-338**).

¹⁷⁹ R-PHB, ¶¶ 187-190.

1.2 Burlington's position

118. In brief, Burlington's submission is that Ecuador's USD 2.6 billion environmental claim is a "work of fiction", unsupported by the facts and ill-founded as a matter of law.¹⁸⁰ Essentially, to succeed with its claim, the Respondent must show that (i) the Consortium acted in breach of its duty of care; (ii) Ecuador suffered harm; and (iii) there is a causal nexus between the act and the harm. Ecuador has not established any of these elements.
119. In support of its defense, Burlington contends that (i) the Consortium was a responsible operator; (ii) Ecuador misstates the applicable legal standards; (iii) it uses the wrong definition of harm; (iv) it erroneously relies on background values; (v) it applies the wrong standards when it alternatively refers to regulatory criteria; (vi) it does not prove causation; and (vii) it raises a claim that is time-barred.

1.2.1 The Consortium was a responsible and environmentally conscientious operator

120. Ecuador's attempt to depict the Consortium as a careless operator is contradicted by Ecuador's own data. Indeed, there were no material oil spills during the Consortium's operations and there are only limited pockets of regulatory exceedances in the Blocks.¹⁸¹ In reality, the Consortium "was a responsible operator and good corporate citizen that prioritized environmental conditions, complied with government regulations, promptly reported and remediated spills and invested in the neighboring communities".¹⁸² In particular, the environmental audits attested to the Consortium's "overall regulatory compliance and sound stewardship of the Blocks".¹⁸³ In any event, Burlington asserts that there can be no liability so long as the Consortium acted as a *bonus pater familias* or a reasonably prudent operator.¹⁸⁴
121. As a responsible member of the Consortium, Burlington is willing to accept responsibility for exceedances above regulatory criteria for two sites "at which it cannot

¹⁸⁰ CMCC, ¶¶ 25, 189; C-PHB, ¶ 91.

¹⁸¹ Rejoinder, ¶ 93.

¹⁸² *Id.*, ¶¶ 17, 280.

¹⁸³ CMCC, ¶ 121.

¹⁸⁴ *Id.*, ¶ 500.

definitively link harm to non-Consortium activities (Yuralpa Pad A and Jaguar 1 Area 3T)” and to bear the costs to close four open pits and abandon seven wells.¹⁸⁵

1.2.2 Ecuador misstates the applicable legal standards

122. First, fault-based and not strict liability governs Ecuador’s environmental claim. Ecuadorian law imposed strict liability in October 2008. Under Article 7 of the Civil Code, “the law provides only for the future; it has no retroactive effect [...]” (Translation by the Tribunal). Hence, the strict liability regime of the 2008 Constitution does not govern Ecuador’s claim in respect of harm that predates the entry into force of the Constitution in October 2008.¹⁸⁶ Accordingly, Burlington cannot be held liable unless it is proven that the Consortium breached its duty of care.¹⁸⁷ No such proof has been addressed.
123. Burlington further notes that, as Professor Bedón explains, the relevant date to determine the applicable legal regime is the date of the *occurrence* of the act. This date is consistent with the statute of limitation for torts in the Civil Code, which runs from the date on which the harmful act occurred.¹⁸⁸ As a result, it rejects Ecuador’s argument that strict liability governs because that regime was only in place at the time of IEMS’s inspection in 2011. Similarly, it discards Ecuador’s view that the Ecuadorian Supreme Court imposed strict liability as early as 2002. Indeed, in *Delfina Torres*, the Supreme Court merely discussed strict liability in *dícta*, and in fact applied fault-based liability with a reversal of the burden of proof.¹⁸⁹ In any event, Burlington reiterates that whatever changes were made in 2008, the new Constitution “cannot have any retroactive effect”,¹⁹⁰ since the applicable legal regime is the one in force at the time of the

¹⁸⁵ C-PHB, ¶ 71.

¹⁸⁶ *Id.*, ¶¶ 200-203.

¹⁸⁷ CMCC, ¶¶ 498-504; Rejoinder, ¶¶ 280-318.

¹⁸⁸ Article 2235 Civil Code (**Exh. CA-CC-38**). See: CMCC, ¶ 208; Rejoinder, ¶ 327; Bedón ER1, ¶¶ 77-78.

¹⁸⁹ CMCC, ¶¶ 205-213, referring to: *Delfina Torres v. Petroecuador* (**Exh. EL-160**); Bedón ER1, ¶¶ 60-63.

¹⁹⁰ *Id.*, ¶ 190.

allegedly harmful act.¹⁹¹ Accordingly, the 2008 regime only applies to acts that postdate the Constitution's entry into force.¹⁹²

124. The Claimant identifies a second misstatement of the law argued by Ecuador, relating to the burden of proof. For Burlington, Ecuador has the burden of proving environmental harm.¹⁹³ Proof of harm is an essential element of tortious liability. Ecuador's position that *any effect* on the environment is an environmental harm and that it only needs to make a showing of a "negative impact" defies common sense. An effect on the environment in compliance with environmental regulations cannot constitute recoverable "harm". Otherwise, there would be no purpose in regulations and government authorizations.¹⁹⁴ Astonishingly, Professor Crespo erroneously believes that Ecuador need only "allege" or "point out the *probability* of harm".¹⁹⁵ If that were true, Ecuador's theory would imply that "any participant in human activity in Ecuador is presumptively liable for an environmental damage figure chosen by any plaintiff", since any human activity causes some impact to the environment.¹⁹⁶
125. Third, contrary to Ecuador's contention, Ecuadorian law requires causation even for strict liability. The Supreme Court of Ecuador held so and Article 396 of the 2008 Ecuadorian Constitution expressly provides that persons are strictly liable for damages which they have "caused". Thus, Ecuador is wrong to argue that it "need only establish that environmental harm exists".¹⁹⁷ In addition, it must prove that Burlington and Perenco caused such harm.¹⁹⁸

¹⁹¹ *Id.*, ¶¶ 206-210.

¹⁹² *Id.*, ¶ 210.

¹⁹³ C-PHB, ¶¶ 21-24.

¹⁹⁴ CMCC, ¶¶ 218-221.

¹⁹⁵ C-PHB, ¶¶ 21-22.

¹⁹⁶ *Id.*, ¶ 22.

¹⁹⁷ CMCC, ¶ 228, referring to: 2nd SMCC, ¶¶ 8, 28.

¹⁹⁸ CMCC, ¶¶ 222-229.

1.2.3 Ecuador’s definition of environmental harm is baseless, since a significant impact requires an exceedance of permissible limits

126. According to Burlington, Ecuador’s allegation of widespread environmental harm in the Blocks is a “fantasy”¹⁹⁹ based on novel and unsupported theories about the definition of environmental harm and on flawed reports from its expert IEMS. Among other things, IEMS applied incorrect legal standards, analyzed the soil in mud pits as though it were regular soil, overestimated the volume of contaminated soil through unreliable modelling, and failed to properly filter groundwater samples.
127. Burlington notes that it is common ground that the EML defines harm under Ecuadorian law and that the 2008 Constitution left this definition untouched. Ecuador is wrong to deny that the notion of harm is further specified in RAOHE and TULAS, and to make artificial distinctions between the notion of harm and the idea of setting limits to prevent harm. Ecuador’s first argument in its Second Supplemental Memorial that its own regulations were “arbitrary” is just as erroneous as its second argument that RAOHE and TULAS do not define harm but merely seek to set limits on dangerous activities.²⁰⁰
128. In conformity with the EML, “harm” requires a “significant negative impact”. As the Respondent’s experts Professors Andrade and Crespo acknowledged, this wording implies that some negative impacts are significant, while others are not.²⁰¹ If all types of negative impacts were prohibited, there could be no development at all.²⁰² While the EML defines “harm”, it does not set specific permissible limits for each contaminant. Burlington therefore considers it necessary to resort to Ecuador’s implementing regulations, specifically RAOHE and TULAS, where the notion of “harm” is further specified.²⁰³
129. Burlington also asserts that reliance on the limits set in RAOHE and TULAS conforms with the “constitutional right of legal certainty”.²⁰⁴ In other words, “there must be a clear

¹⁹⁹ *Id.*, ¶ 231.

²⁰⁰ Rejoinder, ¶ 33.

²⁰¹ C-PHB, ¶ 27.

²⁰² *Id.*, ¶ 30.

²⁰³ *Id.*, ¶ 34.

²⁰⁴ *Id.*, ¶ 31, referring to: Article 82 of the 2008 Constitution (**Exh. P-12**).

dividing line determining the point at which environmental impacts become significant – a dividing line between ‘insignificant impacts’ and ‘harm’”.²⁰⁵

130. The Claimant further points to Ecuador’s practice after 2008, which shows that it refers to permissible limits, not to background values, when it defines “harm”. For instance, the Ministerial Accord 169 provides that environmental harm must be restored to the conditions “determined by the environmental authority”, and the Ministerial Resolution No. 1 refers to “harm” by reference to permissible limits.²⁰⁶ Ecuadorian case law and the practice of Ecuador’s regulatory agencies equally demonstrate that harm is always defined by reference to permissible limits. With respect to case law, Professor Andrade, the Respondent’s expert, conceded at the Hearing that no Ecuadorian court had ever applied background values.²⁰⁷ The *Los Vencedores* and the *Municipality of Orellana* decisions support the proposition that there is no harm if there is no exceedance of permissible limits.²⁰⁸ In respect of *Aguinda*, Professor Andrade admitted that the court speaks of “full reparation”, but does not once make reference to – let alone apply – background values.²⁰⁹
131. In connection with regulatory practice, Ecuador’s agencies have never applied background values either.²¹⁰ In support, Burlington cites the following elements: (i) Ecuador’s Ministry of the Environment applies Ministerial Resolution No. 1, i.e. permissible limits, when a spill occurs; (ii) Petroamazonas remediates spills by reference to permissible limits; (iii) Professor Andrade acknowledged that if a spill occurs, agencies apply permissible limits; (iv) an agency of the Ministry of the Environment called PRAS issued operational policies and norms explicitly based on RAOHE; (v) IEMS applied regulatory criteria in their first expert report before being instructed by Ecuador to discard them; and (vi) Professor Bedón testified that he had

²⁰⁵ C-PHB, ¶ 31.

²⁰⁶ *Id.*, ¶¶ 39-43, referring to: Ministerial Agreement 169, p. 0003 (**Exh. EL-228**); Ministerial Resolution No. 1, p. 0012 (**Exh. CA-CC-55**).

²⁰⁷ C-PHB, ¶ 48, referring to: Tr. (Day 2) (ENG), 501:19-502:5 (Tribunal, Andrade).

²⁰⁸ C-PHB, ¶¶ 46-47, referring to: *Irma A. Imbaquingo et al. v. Perenco Ecuador Limited*, Provincial Court of Justice of Orellana, Ecuador, 17 September 2013, Section 6.7, pp. 0017-0018 (**Exh. CA-CC-57**); *Municipality of Orellana v. OCP*, Provincial Court of Justice of Orellana, Ecuador, 26 November 2013, Section 3, p. 0021 (**Exh. CA-CC-58**).

²⁰⁹ C-PHB, ¶¶ 52-51.

²¹⁰ *Id.*, ¶ 53.

never seen background values applied.²¹¹ In conclusion, Ecuador has provided no evidence of even a single instance where background values have been applied, whereas Burlington has shown that in fact Ecuador applies permissible limits in determining the existence of environmental harm.²¹²

1.2.4 Ecuador uses background values to falsely portray and inflate alleged environmental harm

132. Burlington opposes Ecuador's use of background values, including IEMS's position that only background values are sufficiently protective of the public health. Burlington highlights that IEMS was instructed by Ecuador to employ background values and never actually analyzed whether the ecosystem was in fact affected.²¹³ IEMS's first expert report actually referred to permissible limits as applicable standard.²¹⁴ "Astonishingly – argues Burlington – IEMS admitted that if the Consortium were operating today [...], it *would* be subject to RAOHE and TULAS regulations, not 'background values'".²¹⁵ Thus, had Burlington not been expropriated, it would be subject to the regulatory standards. Having been expropriated, it is somehow subject to background values "resulting in billions of dollars of bogus damages".²¹⁶
133. In support of its argumentation, the Claimant also relies on the purpose of RAOHE, which in the regulation's words, is to set "[p]ermissible limits for the identification and remediation of contaminated soils in all phases of the hydrocarbon industry".²¹⁷ Should background values govern, as Ecuador claims, RAOHE would serve no apparent purpose. Further, IEMS itself acknowledged, in its first report and in the *City Oriente v. Ecuador* arbitration, that RAOHE establishes the criteria to define the scope of

²¹¹ *Ibid.*

²¹² *Id.*, ¶ 54.

²¹³ *Id.*, ¶¶ 79, 99, referring to: Tr. (Day 1) (ENG), 47:15-20 (Opening, Silva Romero) ("Ecuador fails to see how in this case it could be disputed that all environmental harm should be repaired so as to restore the site to its original, natural condition, and this is the reason why IEMS, the technical experts of Ecuador, were instructed to employ 'background values'").

²¹⁴ C-PHB, ¶ 100, referring to: IEMS ER1, p. 48 ("In the opinion of IEMS, the regulatory limits of concentration of contaminants in Ecuador must be used to establish the legal obligation of the Consortium for Block 7 and Block 21 to implement the environmental clean-up and/or restoration measures").

²¹⁵ C-PHB, ¶ 79.

²¹⁶ *Id.*, ¶ 105.

²¹⁷ CMCC ¶ 109, citing: RAOHE, Table 6 (**Exh. EL-174**).

environmental harm.²¹⁸ If background values were relevant, then active oil fields would have to be restored to a pristine state of nature even as the oil fields continue to be in operation. This is absurd, especially considering Ecuador’s aggressive expansion of oil production.

134. In refutation of Ecuador’s reliance on RAOHE Table 6, Burlington remarks that Table 6 states that background values may be used to *increase* permissible limits, not to *decrease* them. Thus, if the natural concentration of a given element in the soil is higher than its regulatory limit, the permissible limit may be increased to that naturally occurring level – the reverse is not true.²¹⁹
135. Burlington also rebuts Ecuador’s further argument according to which background values alone comport with the 2008 Ecuadorian Constitution. First, the 2008 Constitution cannot apply retroactively and thus would cover at most a 10-month period (between its coming into force in October 2008 and Ecuador’s takeover of the Blocks in July 2009). Second, Article 396 of the 2008 Constitution only comes into play in the event of “harm”, which is defined in environmental regulations and in particular RAOHE.²²⁰
136. Burlington further disputes IEMS’s assertion that the Ecuadorian regulatory criteria “might not be enough to protect the health of the local population [...]”.²²¹ On the contrary, says Burlington, “Ecuador’s regulatory limits are remarkably stringent”.²²² Ecuador is more protective than other oil producing regions such as Venezuela, Texas and Louisiana. Its regulations are also more stringent than the Risk-Based Corrective Action (“RBCA”) methodology widely adopted in European countries, the United States, and other parts of the world. In a nutshell, RAOHE criteria are highly protective of human health and no public health rationale warrants the application of a more stringent standard.²²³

²¹⁸ CMCC, ¶¶ 245-248.

²¹⁹ *Id.*, ¶¶ 244, 249-254.

²²⁰ *Id.*, ¶¶ 255-258.

²²¹ *Id.*, ¶ 260, citing: IEMS ER3, p. 38.

²²² CMCC, ¶ 262.

²²³ *Id.*, ¶¶ 240-242, 260-265.

137. Burlington moreover criticizes IEMS’s methodology in calculating the background values that it employs, which resulted in labeling clean samples as contaminated ones. When aggregated across contaminants, Ecuador’s background values result in 84% of clean samples being labeled as contaminated.
138. Finally, according to Burlington, Ecuador’s reliance on background values, as opposed to RAOHE criteria, has enormous consequences for its counterclaims. An amount of damages of approximately USD 1.3 billion of Ecuador’s claim depends on the application of background values. If the background values are discarded, Ecuador’s claims shrink from USD 2.2 billion to USD 895 million.²²⁴

1.2.5 IEMS’s “regulatory case” based on sensitive ecosystems is likewise incorrect

139. Burlington also challenges Ecuador’s alternative submission based on regulatory criteria because it exclusively relies on the sensitive ecosystem standard, which is inapposite in most cases. Burlington disagrees with Ecuador’s assertion that the entirety of the Blocks is situated in a “sensitive” region or that they are located in a biosphere reserve, noting that only a very limited number of areas are designated by Ecuador’s Ministry of the Environment as “sensitive ecosystem”.²²⁵
140. Burlington further argues that, according to RAOHE Table 6, the permissible levels of contamination depend on the “use” of the land, which is classified by RAOHE as industrial, agricultural or sensitive ecosystem, the first being the most permissive and the last the least permissive. IEMS’s calculation of contamination levels based on the sensitive ecosystem threshold is unwarranted as only a small number of sites in the Blocks intersect with designated “sensitive ecosystems” areas.²²⁶ Most of the areas where the Consortium’s active operations take place are a “quintessential example” of land use for industrial purposes, with the surrounding areas being used mostly for agriculture.²²⁷

²²⁴ *Id.*, ¶ 276.

²²⁵ Tr. (Day 1) (ENG), 247:10-19 (Opening, Renfroe).

²²⁶ CMCC, ¶¶ 278-279; C-PHB, ¶ 125.

²²⁷ CMCC, ¶ 289.

141. For Burlington, Ecuador’s argument that the Blocks are to be considered as sensitive ecosystem in their entirety is inconsistent with RAOHE and with Ecuador’s own application of RAOHE other than in this arbitration.²²⁸ Under RAOHE, the “posterior use that will be given to the remediated soil” determines the land use. Posterior use is “immediate subsequent use to the seizure”, and not use when the oil operations are completed as advocated by Ecuador.²²⁹ The areas within the oilfields, such as platforms and drilling equipment, are used to conduct hydrocarbon operations – an industrial use. This is the sole purpose, present and foreseeable, of these areas. The lands surrounding the oilfields, in turn, are used mostly for pastures, crops, or wood gathering, that is, for agricultural purposes. According to GSI, “95% of the areas surrounding the inspected platforms constitute agricultural areas or secondary forests”.²³⁰
142. Burlington also considers that Ecuador’s exclusive reliance on the sensitive ecosystem standard is contrary to its own practice. According to Burlington, that practice confirms that most of the land in the Blocks is destined for either “industrial” or “agricultural” use. On multiple occasions, Ecuador approved, or did not object to, plans where the land in the Blocks was classified as either “industrial” or “agricultural”.²³¹ For instance, IEMS conceded at the Hearing that the ex-post studies on the environmental condition of the Blocks after Ecuador’s takeover applied the agricultural use standard.²³² In application of RAOHE, the “posterior use” of any soil remediated will continue to be either “industrial” or “agricultural”. In short, the “sensitive ecosystems” classification bears no relationship to the actual use of the land and must be rejected.²³³
143. IEMS also incorrectly relies on Table 2 of Annex 2, Book VI of TULAS. For the Claimant, this table only establishes pre-estimated background values for substances not included in RAOHE Table 6 (such as barium and vanadium). It does not express remediation criteria, which are found in Table 3 of Annex 2, Book VI of TULAS, entitled “Criteria for Remediation and Restoration of Soils”. TULAS expressly states that the

²²⁸ *Id.*, ¶ 283.

²²⁹ C-PHB, ¶ 125.

²³⁰ CMCC, ¶¶ 302.

²³¹ C-PHB, ¶ 127.

²³² *Ibid.*, referring to: Tr. (Day 3) (ENG), 761:11-17 (Cross, Alfaro).

²³³ CMCC, ¶¶ 291-299, 303-310.

standards for remediation or restoration “are included in Table 3”,²³⁴ a fact that IEMS itself has acknowledged in the *City Oriente* arbitration. Hence, Burlington views TULAS Table 3 as the appropriate table to determine soil remediation standards.²³⁵

144. As a final point, Burlington stresses that the land use designations in RAOHE are sufficiently protective of the human health and the environment, since Ecuador’s standards are amongst the most stringent worldwide.²³⁶
145. As noted above, for Burlington, applying the proper regulatory criteria has an enormous impact on Ecuador’s damages claim. In particular, GSI found that 74% of the soil samples analyzed by IEMS that show exceedances of the “sensitive ecosystems” limits are in reality compliant with Ecuadorian regulations for industrial and agricultural land.²³⁷ Applying correct regulatory criteria, Ecuador’s alleged damages are further reduced by USD 885 million to a total of approximately USD 10 million, for which Burlington accepts liability in the amount of USD 1.09 million.²³⁸

1.2.6 Ecuador entirely ignores its duty to prove causation

146. Burlington opposes Ecuador’s view that Ecuadorian law imposes a rebuttable presumption of causation. For Burlington, the 2008 Constitution imposes the burden to prove causation on Ecuador and Burlington is only liable for harm caused during its tenure of the Blocks, not for the one caused by Ecuador itself or prior operators.

a. Ecuador bears the burden to prove causation

147. Burlington’s submission is that causation is not presumed, and that Ecuador must prove causation. Professor Bedón gave clear evidence to this effect at the Hearing and even Professor Crespo acknowledged that environmental harm must “be caused by the operator’s activity”.²³⁹ Ecuadorian courts consistently require plaintiffs to prove

²³⁴ TULAS Book VI, Annex 2, ¶ 4.2.2 (**Exh. EL-173**).

²³⁵ CMCC, ¶¶ 280-281.

²³⁶ C-PHB, ¶¶ 133-135.

²³⁷ CMCC, ¶ 311 and graph.

²³⁸ *Id.*, ¶¶ 17, 282.

²³⁹ *Id.*, ¶ 223, referring to: Crespo ER, ¶ 79.

causation, including in strict liability cases.²⁴⁰ For instance, in *Medardo Luna*, the Ecuadorian Supreme Court held that the injured party must prove (i) the fact, (ii) the damage, and (iii) the causal nexus. The same conclusion was reached by the re-named National Court of Justice in *Aguinda*, where it held that in the post-2008 strict liability regime the plaintiff must only “corroborate the risky activity and the relation of causality”.²⁴¹

b. Burlington is only liable for harm caused during its tenure of the Blocks

148. The Claimant further submits that it is only liable for damage caused while the Consortium operated the Blocks. Causation must be proven because each operator is responsible for the damage which it has caused, not for harm caused by someone else.²⁴² Since Professor Crespo testified that Ecuador must prove that the damage was caused “during the time of the Consortium’s operations”, it follows that Petroamazonas, who is presently operating the Blocks, is presumptively liable for any harm that occurred after July 2009. In this context, Professor Andrade’s explanations that Petroamazonas somehow plays by different rules must be rejected.²⁴³

149. Consequently, Burlington also disputes that it is jointly liable for harm caused by prior operators.²⁴⁴ Joint and several liability can only result from “the *same* tort or wrongful act, not *successive* ones”.²⁴⁵ Hence, Burlington is only liable for the conduct of Perenco, as operator for the Consortium, and not for the conduct of previous or subsequent operators.²⁴⁶

c. Contamination in Coca-Payamino was caused by Ecuador itself

150. Burlington submits that the environmental harm in Coca-Payamino, which constitutes more than half of Ecuador’s claim, was “almost certainly” caused by CEPE and

²⁴⁰ CMCC, ¶ 224 (“Ecuadorian courts have explicitly confirmed that causation is a critical element of strict liability as well as of fault-based liability”).

²⁴¹ Emphasis by Burlington. C-PHB, ¶ 61, citing: *Aguinda v. Chevron*, p. 239 (**Exh. EL-233**).

²⁴² C-PHB, ¶ 62.

²⁴³ *Id.*, ¶ 64, referring to: Tr. (Day 2) (ENG), 442:14-443:4 (Direct, Andrade).

²⁴⁴ Reply, ¶¶ 269-275.

²⁴⁵ Emphasis by Burlington. C-PHB, ¶ 66; Reply, ¶ 272.

²⁴⁶ C-PHB, ¶ 66.

Petroproducción when they operated the fields in the 1980s and during the latter's alternate operatorship with Oryx of the CPUF in the 1990s.²⁴⁷

151. Indeed, there is abundant evidence of oil spills, problems with mud pits, lack of remediation, and continuous discharges into the environment during CEPE and Petroproducción's tenures of the Blocks. For instance, an environmental audit in 1999 found Petroproducción's operating practices to be "reactive and not proactive".²⁴⁸ Furthermore, Burlington notes that, notwithstanding the express order of the Tribunal, Ecuador failed to produce any spill report or remediation program from that period.²⁴⁹ In support of its allegations, Burlington cites the following facts: (i) in Coca CPF, Petroproducción "permanently discharged production water" into the environment prior to 1994;²⁵⁰ (ii) in Payamino 2 and 8, the crude oil and heavy metals found in the Jungal swamp originate from a pre-1992 rupture of the mud and production test pits built by CEPE in 1987;²⁵¹ (iii) in Coca 6, a serious spill was recorded by Oryx in 1999 and the pit in the northern part of the platform was built by Petroproducción in 1989, while the 2007 spill was fully remediated;²⁵² (iv) in Payamino 4, CEPE built pits in 1988 without using liners and filled them with oil-based drilling muds;²⁵³ and (v) in Coca 4, drilling was undertaken by CEPE in 1989 which explains the presence of barium in that area.²⁵⁴

d. Ecuador fails to account for environmental harm caused by Petroamazonas after July 2009

152. Burlington calls attention to the fact that Ecuador's claim ignores that the latter took over the Blocks in July 2009 and aggressively expanded operations. In this context,

²⁴⁷ CMCC, ¶ 441. Petroproducción assumed operations of the CPUF, from April 1991 through February 1994, and from June 1997 through March 2000. Oryx operated the field from February 1994 through June 1997. The CPUF was continuously operated by the Block 7 Contractor after March 2000. *Id.*, ¶¶ 95-96.

²⁴⁸ CMCC, ¶ 443, referring to: Patrick Grizzle, *Environmental Audit of Petroproducción Operations of the Coca-Payamino Field*, January 1999 (**Exh. CE-CC-21**).

²⁴⁹ CMCC, ¶ 444, referring in note 578 erroneously to "Procedural Order No. 2 dated 9 July 2012", corresponding to PO9 dated 6 July 2012, Annex A, Request No. 9.

²⁵⁰ CMCC, ¶¶ 447-450, referring to: Ecomapa/Western Oilfield Environmental Services Ltd., *Environmental Assessment of Oryx Ecuador Energy Company Coca-Payamino Field*, May 1994, p. 30 (**Exh. CE-CC-12**).

²⁵¹ CMCC, ¶¶ 451-455.

²⁵² *Id.*, ¶¶ 456-463.

²⁵³ *Id.*, ¶¶ 464-466.

²⁵⁴ *Id.*, ¶ 467.

Ecuador's insistence on the sensitive ecosystem standard is "absurd" when one considers that Ecuador itself has actively increased the industrial use of the Blocks.²⁵⁵ According to Burlington, Ecuador's expansion of the fields has obviated the need for any remediation, as is shown by three illustrations.

153. First, the Coca 13 site has been expanded by over 40,000 square meters, 11 new wells, four new mud pits and a new CPF. Doing so, Ecuador has subsumed and "wiped out" the alleged zone of contamination for which it claims that Burlington is liable. Yet, it claims USD 26.5 million in damages under its background values case and USD 7.4 million under its sensitive ecosystem case for this site.²⁵⁶
154. Second, Oso A has also been dramatically expanded, with Ecuador drilling 14 new wells. As with Coca 13, "Petroamazonas's extensive development of Oso A since July 2009 has obviated the need for any remediation and rendered IEMS's conclusions obsolete – if contamination even existed in the first place".²⁵⁷
155. Third, Burlington argues that Ecuador failed to mention or account for the occurrence of a spill in Mono CPF that occurred in 2010 or 2011. In this context, Burlington highlights that IEMS's first report identified this spill as a recognized environmental condition ("REC"), but "curiously" did not include it in its third report "despite the fact that Mono CPF represents one of the single largest claims by dollar amount in all of Ecuador's counterclaims".²⁵⁸ Therefore, Ecuador's claims for over USD 100 million must fail because it cannot show that the alleged contamination is attributable to the Consortium.²⁵⁹

e. The PSCs exonerate the Consortium for harm caused by others

156. Burlington notes that Ecuador relies on the PSCs to absolve it from having to prove causation, the Consortium being allegedly liable for environmental harm caused by prior operators. Not only is Ecuador's reference to the PSCs barred by the tortious nature of

²⁵⁵ *Id.*, ¶ 469.

²⁵⁶ *Id.*, ¶ 474.

²⁵⁷ *Id.*, ¶ 481.

²⁵⁸ *Id.*, ¶ 486.

²⁵⁹ *Id.*, ¶ 486.

its counterclaim, it is also wrong in and of itself. Indeed, the PSCs “expressly exonerate the Consortium from responsibility for harm caused by others”.²⁶⁰

157. In this context, Burlington further observes that the limited exceedances above regulatory criteria found at 17 sites were not caused by the Consortium, but by prior operators, including State-owned operators. For instance, there is ample proof that the contamination of the Jungal swamp in Payamino 2 and 8 was caused by CEPE between 1988 and 1992. In fact, Burlington produced evidence linking the contamination found at all but two of the 17 sites to the activities of parties other than the Consortium. As a responsible member of the Consortium, Burlington is “willing to accept liability for the two sites at which it cannot definitely link harm to non-Consortium activities” for a total cost of USD 1.09 million.²⁶¹

1.2.7 Ecuador’s claims are time-barred under Ecuadorian law

158. Burlington’s last defense is that the counterclaim is time-barred. Article 2235 of the Civil Code enshrines a four-year limitation period. Ecuador’s reliance on the so-called ‘discovery rule’, which it borrows from other jurisdictions, is ill-founded. Indeed, Ecuador fails to cite a single case in support of this rule. Even if such a discovery rule were to exist, the period would start to run only when Ecuador knew or should have known (“constructive knowledge”) about the alleged environmental harm.²⁶² In light of the fact that the Consortium was strictly supervised by Ecuadorian regulatory authorities, that Ecuador consistently approved the Consortium’s environmental impact studies, that the Consortium regularly filed reports and audits, and that regular inspections were carried out, Ecuador must be deemed to have had constructive knowledge of any alleged harm throughout the Consortium’s operations.²⁶³ Thus, even if Ecuador had legitimate claims, they are now time-barred under Article 2235 of the Civil Code.

²⁶⁰ C-PHB, ¶ 67. Clause 5.1.20.10 of the Block 7 Participation Contract provides that “[t]he Contractor shall not be liable for environmental conditions preexisting at the beginning of operations under the Services Contract” (**Exh. CE-CC-28**); while Clause 5.1.20 of the Block 21 Participation Contract stipulates that “[t]he Contractor shall not be responsible for pre-existing environmental conditions at the start of the operations under the Contract” (**Exh. CE-CC-13**).

²⁶¹ C-PHB, ¶ 71.

²⁶² *Id.*, ¶¶ 72-73.

²⁶³ *Id.*, ¶ 74.

2. Applicable legal framework

159. Since the 1970s, Ecuador has incorporated environmental norms into its legal order, including with respect to hydrocarbons activities, at the constitutional, legislative and regulatory levels, as discussed below.²⁶⁴ After setting out the relevant provisions of the Hydrocarbons Law (2.1), the Tribunal will review the evolution of Ecuador's environmental framework for oilfield operations, including the Law on the Prevention and Control of Environmental Contamination (2.2), the 1978 and 1998 Constitutions (2.3), the Law on Environmental Management (2.4), the Substitute Environmental Regulation for Hydrocarbon Operations in Ecuador (2.5), the Unified Text of Secondary Environmental Legislation (2.6), and the 2008 Constitution (2.7). Finally, it will set out relevant provisions of the PSCs (2.8).

2.1 The Hydrocarbons Law and regulation of hydrocarbons industry

160. The Hydrocarbons Law (*Ley de Hidrocarburos* ("HL")) was enacted in 1971.²⁶⁵ It contained the first expression of the State's general duty to ensure that the oil industry "does not cause harm to people, property or the environment", obligating the State to conduct periodical socio-environmental audits.²⁶⁶ The Ecuadorian legislature progressively imposed environmental obligations on oilfield operators, such as the 1982 amendment of the HL providing for the obligation of operators to comply with applicable environmental laws and regulations²⁶⁷ and to conduct environmental impact studies and prepare environmental management plans.²⁶⁸ In 2002, the Regulation of Hydrocarbon Operations (*Reglamento de Operaciones Hidrocarburíferas* ("ROH")) was enacted.²⁶⁹ It

²⁶⁴ SMCC, ¶ 7; CMCC, ¶ 107. See also: Chronology of Ecuador's Environmental Laws and Regulations, 1971-2008 (**Exh. CE-CC-269**).

²⁶⁵ Supreme Decree No. 1459, published in the Official Register No. 322 of 1 October 1971 (**Exh. CA-CC-04**); Supreme Decree No. 2967, published in the Official Register No. 711 of 15 November 1978 (**Exh. CA-CC-07**). See also: Bedón ER1, App. B 0008; Chronology of Ecuador's Environmental Laws and Regulations, 1971-2008 (**Exh. CE-CC-269**).

²⁶⁶ Hydrocarbons Law, Article 93(D) (**Exh. CA-CC-07**).

²⁶⁷ *Id.*, Article 31(s) (**Exh. CA-CC-07**). Letter (s) was amended by Law No. 101, published in the Official Register No. 306 of 13 August 1982 (**Exh. CA-CC-08**).

²⁶⁸ Hydrocarbons Law, Article 31(t) (**Exh. CA-CC-07**). Letter (t) was amended by Law No. 101, published in the Official Register No. 306 of 13 August 1982 (**Exh. CA-CC-08**). The Hydrocarbons Law was further amended in 1989 and 2010, see: Hydrocarbons Law, published in the Official Register No. 34 of 13 March 2000 (**Exh. CL-218**); Hydrocarbons Law, published in Official Register No. 244 of 27 July 2010 (**Exh. CL-217**).

²⁶⁹ *Reglamento de Operaciones Hidrocarburíferas* ("ROH"), *Acuerdo Ministerial No. 389*, published in the Official Register No. E 2 on 26 September 2002 (**Exh. EL-181**).

contains rules applicable to all phases of the hydrocarbon operations, exploration, drilling and exploitation, as well as an annex with definitions of terms.²⁷⁰ Article 7 prescribes that oilfield operators must comply with applicable laws and regulations relating to the protection of the environment.²⁷¹

2.2 The Law on the Prevention and Control of Environmental Contamination

161. In 1976, Ecuador adopted the Law on the Prevention and Control of Environmental Contamination, establishing for the first time rules to prevent soil, water and air contamination, without however specifying any parameters.²⁷²
162. As regards water, for instance, Article 16 prohibited the dumping of waste water containing contaminants harmful to human health, fauna or property “into the sewage network, or into streams, irrigation channels, rivers, natural or artificial lakes, or in the ocean, or to let it infiltrate onto land”.²⁷³ In connection with soils, Article 20 prohibited the discharge of “any type of contaminants that could alter the quality of the soil and affect human health, flora, fauna, natural resources and other goods” without complying with applicable technical and regulatory standards.²⁷⁴

2.3 The 1978 and 1998 Constitutions

163. Protection of the environment was enshrined in the constitution for the first time in the 1978 Constitution.²⁷⁵ Article 19 of such Constitution enshrined the fundamental right to live in an environment free of contamination, specifying that environmental protection

²⁷⁰ *Ibid.* See also: 2nd SMCC, note 30.

²⁷¹ ROH, Article 7 (**Exh. EL-181**).

²⁷² Law on Prevention and Control of Environmental Contamination, Supreme Decree No. 374, published in the Official Register No. 97 of 31 May 1976 (**Exh. CA-CC-06**), currently codified and published in the Official Register Supplement No. 418 of 10 September 2004 (**Exh. CA-CC-34**). See also: Bedón ER1, App. B 0008.

²⁷³ Law on Prevention and Control of Environmental Contamination, Article 16 (**Exh. CA-CC-06**). In 1989, Ecuador promulgated the Regulation for the Prevention and Control of Environmental Contamination Related to Water Resources (*Reglamento para la Prevención y Control de la Contaminación Ambiental, en lo Relativo al Recurso Agua*), Ministerial Accord No. 2144 of the Ministry of Energy and Mines, published in Official Register No. 204 of 5 June 1989 (**Exh. CE-CC-12**).

²⁷⁴ Law on Prevention and Control of Environmental Contamination, Article 20 (**Exh. CA-CC-06**).

²⁷⁵ Crespo ER, ¶ 13; Bedón ER1, ¶ 13.

would require laws restricting the “exercise of certain rights or liberties”.²⁷⁶ In 1996, a constitutional reform instituted the collective right to a healthy environment and declared the following to be of public interest: (i) the protection of the environment and the conservation of ecosystems and biodiversity, (ii) the principles of prevention and sustainable exploitation of natural resources, and (iii) the establishment of a system of protected areas.²⁷⁷

164. The 1998 Constitution further elaborated the environmental regime by enshrining the principles of sustainable development, prevention, precaution, rehabilitation, and participation.²⁷⁸ Furthermore, Article 91 provided for the State’s liability, including that of its “delegates and concessionaires”, for environmental harm.²⁷⁹

2.4 The 1999 Environmental Management Law (EML)

165. In order to implement the environmental provisions of the 1998 Constitution, Ecuador adopted in 1999 the EML.²⁸⁰ The EML established the principles and guidelines of Ecuador’s environmental policy, determining the obligations, responsibilities and levels of participation of the public and private sectors in environmental management and indicating “the permissible limits, controls and sanctions” in such matters.²⁸¹ It set out

²⁷⁶ 1978 Constitution, codified in 1984, and published in Official Register No. 763 of 12 June 1984, Article 19(2) (**Exh. CA-CC-09; Crespo ER, Annex 3**): “Notwithstanding other rights necessary for the full moral and material development arising from the very nature of a person, the State guarantees: [...] 2. The right to live in an environment free of contamination. The State has a duty to ensure that this right is not curtailed, as well as to safeguard nature preservation. The law shall establish the restrictions to the exercise of certain rights or liberties so as to protect the environment” (Translation by the Tribunal). Article 50 further provided for police powers allowing municipalities to render environmental protection effective: “In furtherance of the right to housing and the conservation of the environment, municipalities may expropriate, reserve and control areas for future development pursuant to law”. It is to be noted that in 1985, the Ministry of Energy and Mines published a Guide for the Preparation of Environmental Impact Studies (*Instructivo para la Preparación de Informes y Estudios de Impacto Ambiental*), Ministerial Accord No. 764 of the Ministry of Energy and Mines, published in Official Register No. 330 of 9 December 1985 (**Exh. CA-CC-10**).

²⁷⁷ 1996 Reform of the Political Constitution of the Republic of Ecuador, published in Official Register No. 969 of 17 June 1996, Article 44 (**Exh. CA-CC-16**). Bedón ER1, ¶ 13.

²⁷⁸ 1998 Political Constitution, published in Official Register No. 1 of 11 August 1998, Articles 86 and 88 (**Exh. CA-CC-18**). Bedón ER1, ¶ 14.

²⁷⁹ 1998 Political Constitution, Article 91 (**Exh. CA-CC-18**). Andrade ER, ¶ 54; Bedón ER1, ¶ 14.

²⁸⁰ Environmental Management Law, Law No. 37, published in Official Register No. 245 of 30 July 1999, subsequently codified and published in Official Register No. 418 of 10 September 2004 (**Exh. CA-CC-33**).

²⁸¹ *Id.*, Article 1.

the scope and principles of environmental management; the institutional regime underlying environmental management; the various instruments of environmental management; financial mechanisms; as well as provisions on information and participation, and the protection of environmental rights.

166. With respect to the instruments of environmental management, the EML provided for the assessment of environmental impacts and environmental controls. For instance, Article 21 EML provides that licenses for economic activities may only be granted if environmental management systems are drawn up, which must include “base line studies; an environmental impact assessment; risk assessment; management plans; risk management plans; monitoring systems; contingency and mitigation plans; environmental hearings and plans for withdrawal”.²⁸² The EML also defines many relevant terms, such as contamination, environmental harm, and environmental impact.²⁸³

2.5 The Environmental Regulation for Hydrocarbon Operations in Ecuador (RAOHE)

167. In 1992, Ecuador enacted RAOHE,²⁸⁴ which was amended in 1995²⁸⁵ and replaced in 2001 by an expanded and updated version.²⁸⁶ RAOHE contains various chapters and annexes that apply to all phases of oilfield operations in Ecuador,²⁸⁷ including prospection, exploration, exploitation, industrialization, storage and transportation, and

²⁸² *Id.*, Article 21.

²⁸³ *Id.*, Glossary of definitions. Contamination (“*contaminación*”) is defined as follows: “It is the presence in the environment of substances, elements, energy, or a combination thereof, the concentration and permanence of which are higher or lower than those prescribed by the laws in force”. Environmental harm (“*daño ambiental*”) is defined as follows: “It is any significant loss, decrease, detriment or impairment to the preexisting conditions in the environment or one of its components. It affects the functioning of the ecosystem or the renewability of its resources”. Environmental impact (“*impacto ambiental*”) is defined as follows: “It is the positive or negative alteration of the environment, caused directly or otherwise by a project or activity in a given area” (Translations by the Tribunal).

²⁸⁴ Environmental Regulation for Hydrocarbons Activities in Ecuador, Accord No. 621 of the Minister of Energy and Mines dated 21 February 1992, published in Official Register No. 888 of 6 March 1992 (**Exh. CA-CC-14**).

²⁸⁵ Environmental Regulation for Hydrocarbons Activities in Ecuador, Executive Decree No. 2982, published in Official Register No. 766 of 24 August 1995 (**Exh. CA-CC-15**).

²⁸⁶ Environmental Regulation for Hydrocarbons Activities in Ecuador, Executive Decree No. 1215, published in Official Register No. 265 of 13 February 2001 (**Exh. EL-174**). CMCC, ¶ 107.

²⁸⁷ RAOHE, Article 1 (**Exh. EL-174**).

commercialization of crude oil, its derivatives, and natural gas susceptible of causing environmental impacts.

168. RAOHE requires operators to submit environmental programs and audits to the relevant Ministry on a regular basis,²⁸⁸ to undertake regular internal monitoring of environmental conditions in relation to atmospheric emissions, solid and liquid discharges, as well as remediation of contaminated soils or pits.²⁸⁹ It also requires operators to present environmental impact studies prior to any new phase in oilfield operations,²⁹⁰ including by providing environmental management and monitoring plans to mitigate and control adverse impacts.²⁹¹
169. Article 42 of RAOHE further provides that operators must conduct biennial environmental audits,²⁹² in order to determine whether their oilfield operations comply with applicable environmental standards, including the management and monitoring plans.²⁹³ Article 42 reads as follows:

ART. 42.– Environmental audit.– The Undersecretariat of Environmental Protection, through the National Environmental Protection Directorate, shall audit, at least every two years, or whenever the Undersecretariat of Environmental Protection so orders upon detecting non-compliance with the Environmental Management Plan, the environmental aspects of the various hydrocarbons activities conducted by the ones subjected to control.

The Undersecretariat of Environmental Protection, through the National Environmental Protection Directorate (DINAPA), shall determine the type and scope of the Environmental Audit for the operations of those subjected to control based on compliance with the Environmental Management Plan.

At least every two years, those subjected to control shall conduct an Environmental Audit of their activities, following approval of the corresponding Terms of Reference by the Undersecretariat of Environmental Protection, and they shall submit the respective audit report to the Undersecretariat of Environmental Protection.

²⁸⁸ See, for instance: *Id.*, Article 10.

²⁸⁹ See, for instance: *Id.*, Article 12.

²⁹⁰ See, for instance: *Id.*, Articles 13, 33-41.

²⁹¹ *Id.*, Article 41, paragraphs 7-8.

²⁹² *Id.*, Article 42.

²⁹³ *Id.*, Article 43(b).

Additionally, the parties, upon the termination of hydrocarbons exploration and exploitation, or in the event of a change of operator, shall conduct the audit referenced in Art. 11 of the Regulation to Law 44, amending the Hydrocarbons Law.

To the effect of the aforementioned audits, the ones subjected to control shall select an environmental auditor qualified by the Undersecretariat of Environmental Protection to carry out the monitoring and verification of compliance with the Environmental Management Plan, in accordance with the Terms of Reference previously approved by the Undersecretariat of Environmental Protection, in which the documentary framework is determined against which the audit shall be conducted (Translation by the Tribunal).

170. Article 16 of RAOHE stipulates that the operator must present for approval to the Undersecretariat of Environmental Protection (*Subsecretaría de Protección Ambiental*) a remediation plan in cases of remediation of pits, contaminated soils, and “major accidents with spills of more than five barrels of oil, combustibles or other product”.²⁹⁴ Within 15 days after completion of the remediation works, the operator must submit a technical evaluation report to the Undersecretariat for Environmental Protection through the National Direction of Environmental Protection (*Dirección Nacional de Protección Ambiental*).²⁹⁵
171. RAOHE also requires that operators comply with permissible limits, i.e. with maximum benchmark values set out in the annexes. Thus, with respect to atmospheric emissions, liquid discharges and solid wastes, Article 86 of RAOHE requires that operators comply with the permissible limits set out in Annexes Nos. 1, 2 and 3, which constitute the “minimum program for the internal environmental monitoring” of the operator.²⁹⁶ If a permissible limit set in the annexes is exceeded, the operator must immediately notify

²⁹⁴ *Id.*, Article 16(2). The Parties disagree on the scope of the obligation of notification. Ecuador submitted that the Consortium was under a duty to report any spill, not just those exceeding five barrels of crude oil. According to Ecuador, the Consortium in any event failed to report all spills that exceeded the five barrel limit. For its part, Burlington argued that it reported all spills exceeding five barrels of crude oil, in addition to other, more minor spills. See, for instance: Reply, ¶¶ 44-52; R-PHB, ¶¶ 766-774; Rejoinder, ¶¶ 290-298; C-PHB, ¶¶ 2, 7.

²⁹⁵ RAOHE, Article 16(4) (**Exh. EL-174**).

²⁹⁶ *Id.*, Article 86(1).

the Undersecretariat of Environmental Protection and explain what corrective measures have been applied.²⁹⁷

172. Annex 2 contains six tables detailing “parameters, maximum benchmark values and permissible limits” for routine environmental monitoring and control relating to atmospheric emissions (Table 3), liquid water and effluent discharges (Table 4), black and grey water discharges (Table 5), soil remediation (Table 6), mud pit leachates (Table 7), and waste disposal (Table 8). Finally, Annex 3 contains additional parameters, benchmarks and limits for more in-depth environmental monitoring and control.²⁹⁸
173. RAOHE Table 4 establishes permissible limits for the permanent environmental monitoring of water and effluent discharges during all phases of hydrocarbons operations. It requires oilfield operators to routinely monitor discharges in accordance with the limits for discharge points (Table 4a) and for points at the receptor bodies (Table 4b).²⁹⁹
174. RAOHE Table 6 sets out permissible limits for the identification and remediation of contaminated soils “in all phases of the hydrocarbons industry”.³⁰⁰ It specifies that “the permissible limits to be applied to a determined project depend on the subsequent use (*uso posterior*) to be given to the remediated soil”.³⁰¹ As already mentioned, Table 6 distinguishes between three types of land use: industrial, agricultural and sensitive ecosystems.³⁰² Industrial land use criteria apply to “sites of industrial use (constructions, etc.)”; agricultural land use criteria focus on the “protection of soils and crops”; and sensitive ecosystem land use criteria are employed for the “protection of sensitive ecosystems such as the National Heritage of Natural Areas and others identified in the corresponding environmental study”.³⁰³

²⁹⁷ *Id.*, Article 86(2).

²⁹⁸ *Id.*, Article 86(a)-(c).

²⁹⁹ *Id.*, pp. 55-56, Annex 2, Table 4.

³⁰⁰ *Id.*, p. 57, Annex 2, Table 6 (Translation by the Tribunal).

³⁰¹ *Ibid.* (Translation by the Tribunal).

³⁰² *Ibid.*

³⁰³ *Ibid.*, notes 2-4 (Translation by the Tribunal).

175. The permissible limits set in RAOHE Table 6, Annex 2 are the following:³⁰⁴

RAOHE Table 6, Annex 2

| Parameter | Expressed in | Unit | Agricultural Use | Industrial Use | Sensitive Ecosystems |
|---|--------------|-------|------------------|----------------|----------------------|
| Total hydrocarbons | TPH | mg/kg | <2500 | <4000 | <1000 |
| Polycyclic Aromatic Hydrocarbons (PAHs) | C | mg/kg | <2 | <5 | <1 |
| Cadmium | Cd | mg/kg | <2 | <10 | <1 |
| Nickel | Ni | mg/kg | <50 | <100 | <40 |
| Lead | Pb | mg/kg | <100 | <500 | <80 |

176. Table 6 also contemplates the possibility of increasing the maximum allowable limits where uncontaminated soils show natural concentrations, in other words background values, above the limits of Table 6. In such a case, RAOHE stipulates that these background values must prevail.

177. According to Table 6, contaminated soils must be monitored at least every six months with at least one sample and a final characterization once remediation works are finalized.

178. RAOHE Table 7 spells out the permissible limits for leachates during the “final disposal at surface-level of mud drillings and cuttings”.³⁰⁵ The limits vary depending on whether a pit is lined or not (has an “impermeabilization at its base or not”).³⁰⁶ Table 7a applies to unlined pits and Table 7b to lined pits. Table 7a contains the following permissible limits:

³⁰⁴ *Id.*, p. 57, Annex 2, Table 6 (Translation by the Tribunal, footnotes omitted).

³⁰⁵ *Id.*, p. 58, Annex 2, Table 7 (Translation by the Tribunal).

³⁰⁶ *Ibid.* (Translation by the Tribunal).

RAOHE Table 7a, Annex 2

| a) WITHOUT impermeabilization at the base | | | |
|--|---------------------|-------------|--------------------------------|
| Parameter | Expressed in | Unit | Permissible limit value |
| Hydrogen potential | pH | --- | 6<pH<9 |
| Electrical conductivity | CE | μS/cm | 4,000 |
| Total hydrocarbons | TPH | mg/l | <1 |
| Polycyclic Aromatic Hydrocarbons (PAHs) | C | mg/l | <0.003 |
| Cadmium | Cd | mg/l | <0.05 |
| Total chromium | Cr | mg/l | <1.0 |
| Vanadium | V | mg/l | <0.2 |
| Barium | Ba | mg/l | <5 |

179. And Table 7b contains the following limits:

RAOHE Table 7b, Annex 2

| b) WITH impermeabilization at the base | | | |
|---|---------------------|-------------|--------------------------------|
| Parameter | Expressed in | Unit | Permissible limit value |
| Hydrogen potential | pH | --- | 4<pH<12 |
| Electrical conductivity | CE | μS/cm | 8,000 |
| Total hydrocarbons | TPH | mg/l | <50 |
| Polycyclic Aromatic Hydrocarbons (PAHs) | C | mg/l | <0.005 |
| Cadmium | Cd | mg/l | <0.5 |
| Total chromium | Cr | mg/l | <10.0 |
| Vanadium | V | mg/l | <2 |
| Barium | Ba | mg/l | <10 |

180. RAOHE Table 7 further indicates that, in addition to the initial analysis of the mud drillings and cuttings for final disposal, the operator must undertake periodic sampling and analysis of the pit (i) seven days after the disposal, (ii) three months after the disposal, and (iii) six months after the disposal.³⁰⁷

³⁰⁷

ibid.

2.6 Unified Text of Secondary Environmental Legislation (TULAS)

181. TULAS was promulgated on 31 March 2003 in furtherance of the principles established in the EML.³⁰⁸ It deals *inter alia* with the environmental authorities, environmental management, forest regime, biodiversity, coastal resources, environmental quality, the special regime of the Galápagos, the Institute for the eco-development of the Amazon region or ECORAE, and a special tax regime for the use of resources under the authority of the Ministry of the Environment.
182. The provisions relevant to the present case are found in Book VI of TULAS, which is composed of a number of sections and annexes. TULAS establishes a Single Environmental Management System (the “SUMA”) in order to ensure *inter alia* the State’s oversight of compliance with environmental management plans of regulated entities.³⁰⁹ One of the main objectives of TULAS, in particular in Title IV, is to provide the necessary regulations in pursuance of the Environmental Management Law for the Prevention and Control of Environmental Contamination.³¹⁰ Article 42 of Title IV provides that TULAS seeks to “determine, at the national level, the permissible limits for discharges into water bodies or sewer systems; emissions in the air, including noise, vibrations and other forms of energy; wastes, application and disposal of liquids, solids or a combination, into the soil”, and to “establish the quality criteria of a resource and criteria or objectives of remediation of an impacted resource”.³¹¹
183. Article 45 of Title IV sets forth general principles of environmental stewardship of regulated entities, such as sustainability, equity, prior informed consent, valid representation, coordination, precaution, prevention, mitigation and remediation of

³⁰⁸ 2nd SMCC, note 30.

³⁰⁹ TULAS, Book VI, Title I, Article 2 (**Exh. EL-173 (ESP) 0204**). See also: Bedón ER1, App. B, ¶ 5(b).

³¹⁰ See, for instance: TULAS, Book VI, Title I, Article 1 and Title IV (**Exh. EL-173 (ESP) 0204**). See also: Bedón ER1, App. B, ¶ 5(c).

³¹¹ Translation by the Tribunal. TULAS, Book VI, Title IV, Article 42 (**Exh. EL-173 (ESP) 0243**). Article 42 reads as follows:

“Art. 42.- Specific Objectives

(a) To determine, at the national level, the permissible limits for discharges into water bodies or sewer systems; emissions in the air, including noise, vibrations and other forms of energy; spills, application and disposal of liquids, solids or a combination, into the soil.

(b) To establish the quality criteria of a resource and criteria or objectives of remediation of an impacted resource” (Translation by the Tribunal).

negative impacts, solidarity, co-responsibility, co-operation, recycling and reuse of wastes, conservation of resources in general, minimization of wastes, use of clean technologies, alternative and environmentally sound technologies, and respect for traditional cultures and practices as well as ancestral possessions.³¹²

184. Chapter IV of Title IV addresses environmental control techniques, such as environmental impact studies, environmental management plans, environmental audits, and inspections.³¹³ In this context, Article 70 specifies that the approval of environmental management plans or other environmental studies cannot exonerate operators from liability for environmental contamination.³¹⁴ Chapter V sets out the rights and obligations of regulated entities, such as the duties to submit annual reports on environmental monitoring,³¹⁵ to obtain approval of environmental management plans and environmental audits,³¹⁶ to immediately notify emergency situations,³¹⁷ and to obtain permits for discharges or emissions.³¹⁸ Finally, Chapter VIII addresses environmental norms, including the various stages for the elaboration of standards in pursuance of Article 4 of the EML.
185. According to Ecuador, TULAS sets out general rules for the evaluation of environmental impacts of water and soil resources “from a technical perspective”.³¹⁹ TULAS is therefore complementary to RAOHE, since it supplies chemical parameters not present in RAOHE and also provides for the application of background values.³²⁰
186. By contrast, according to Burlington, RAOHE is the primary source of environmental obligations of oilfield operators in Ecuador, because, unlike the more general TULAS, it expressly and specifically applies to oilfield operations, and TULAS merely supplements RAOHE. Burlington submits that the rules in RAOHE trump the more general

³¹² TULAS, Book VI, Title IV, Article 45 (**Exh. EL-173 (ESP) 0244**).

³¹³ TULAS, Book, VI, Title IV, Chapter IV, in particular Articles 58-62 (**Exh. EL-173 (ESP) 0249-0250**).

³¹⁴ TULAS, Book, VI, Title IV, Article 70 (**Exh. EL-173 (ESP) 0252-0253**).

³¹⁵ *Id.*, Article 80 (**Exh. EL-173 (ESP) 0255-0256**).

³¹⁶ *Id.*, Article 82 (**Exh. EL-173 (ESP) 0256**).

³¹⁷ *Id.*, Article 87 (**Exh. EL-173 (ESP) 0257-0258**).

³¹⁸ *Id.*, Article 96 (**Exh. EL-173 (ESP) 0260**).

³¹⁹ 2nd SMCC, note 30.

³²⁰ *Id.*, ¶¶ 170-171.

regulations contained in TULAS, except where RAOHE is silent. This is so, for instance, with respect to some soil contaminants that are not listed in RAOHE Table 6, Annex 2.³²¹

187. The Annexes to Book VI of TULAS establish the limits for different environmental media.³²² For present purposes, Annex 1 relating to the quality of water resources and effluent discharge standards and Annex 2 relating to soil quality standards and remediation criteria are of particular relevance.
188. Turning first to soil quality, Annex 2, entitled “Environmental Quality Standard for Soil Resources and Remediation Criteria for Contaminated Soils”, sets out regulatory standards in furtherance of the EML and the Regulation of the EML for the Prevention and Control of Environmental Contamination. Its application is mandatory across the entire Ecuadorian territory.³²³ Its main objective is to prevent and control soil contamination, so as to preserve the integrity of humans, ecosystems and their interrelationships, as well as the environment at large.³²⁴ To this end, it establishes (i) norms of general application for soils with distinct uses, (ii) soil quality standards, (iii) remediation criteria for contaminated soils, and (iv) technical norms for the evaluation of the agrological capacity of soils.³²⁵
189. Article 4.1.2 deals with activities that are degrading the soil quality.³²⁶ It provides that public or private entities engaged *inter alia* in hydrocarbons exploration and exploitation must take the necessary measures to avoid harm to soils.³²⁷ Article 4.1.3, relating to contaminated soils, states that contamination due to spills or leaks must be remediated

³²¹ CMCC, ¶ 108; Bedón ER1, ¶ 31. Professor Bedón explained that “TULAS is applied in a general manner to all of those activities that may cause an impact that requires environmental authorization. The activities that have a specific regulation due to their subject matter, such as those for hydrocarbons, mining or telecommunications, must be carried out pursuant to said specific regulation and resort to the regulations of TULAS only in the absence of a specific regulation, in which case TULAS will be applied in a supplementary manner”. Bedón ER1, App. B, ¶ 5(a).

³²² TULAS, Book VI, Annexes 1-6 (**Exh. EL-173 (ESP) 0312-0496**). See also: Bedón ER1, note 26.

³²³ TULAS, Book VI, Annex 2, Introduction (**Exh. EL-173 (ESP) 0367**; **Exh. EL-173 (EN) 0005**).

³²⁴ *Id.*, Article 1 (**Exh. EL-173 (ESP) 0367**; **Exh. EL-173 (EN) 0005**).

³²⁵ *Id.*, Introduction (**Exh. EL-173 (ESP) 0367**; **Exh. EL-173 (EN) 0005**).

³²⁶ *Id.*, Article 4.1.2 (**Exh. EL-173 (ESP) 0380**).

³²⁷ *Id.*, Article 4.1.2.1 (**Exh. EL-173 (ESP) 0380**).

taking into account “the remediation criteria for contaminated soils found in [TULAS]”.³²⁸ It prescribes that the competent regulatory authority must request that remediation and monitoring be undertaken until the “remediation objectives or remediation values” established in TULAS are achieved.³²⁹ It further states that “in case of the inapplicability for the specific case of any parameter established in [TULAS] or in case of the absence in the regulation of a relevant parameter for the soil under study”, the regulated entity must establish the “background or reference value of the parameter of interest present in the soil” in the affected area, in order to compare the actual values with these background values.³³⁰ This provision further indicates that a concentration exceeding three times the background value for the soil constitutes contamination that requires “immediate attention” on the part of the environmental control authority.³³¹ In such cases, the regulated entity must remediate the contaminated soil until the concentration is lower or equal to 1.5 times the background value.³³²

190. Article 4.2 establishes soil quality standards and remediation standards. It defines soil quality standards as “approximate background values or analytical detection limits for a contaminant in the soil”.³³³ Background values refer to “representative environmental levels for a contaminant in the soil”, which can reflect natural geological variations of undeveloped areas or areas free of the influence of generalized industrial or urban activities.³³⁴ Table 2 sets out soil quality standards, comprising 3 general parameters (electric conductivity, pH and sodium adsorption ratio), 19 inorganic parameters (including arsenic, barium, cadmium, total chromium, mercury, nickel, lead, vanadium and zinc), and 14 organic parameters (including polycyclic aromatic hydrocarbons).³³⁵ The table below sets out the relevant parameters:

³²⁸ *Id.*, Article 4.1.3.1 (**Exh. EL-173 (ESP) 0381**; **Exh. EL-173 (EN) 0006**).

³²⁹ *Id.*, Article 4.1.3.2 (**Exh. EL-173 (ESP) 0381**; **Exh. EL-173 (EN) 0006**).

³³⁰ *Id.*, Article 4.1.3.3, paragraph 1 (**Exh. EL-173 (ESP) 0382**; **Exh. EL-173 (EN) 0006**).

³³¹ *Ibid.*

³³² *Id.*, paragraph 2.

³³³ *Id.*, Article 4.2.1 (**Exh. EL-173 (ESP) 0387**; **Exh. EL-173 (EN) 0007**).

³³⁴ *Ibid.* (**Exh. EL-173 (ESP) 0387-0388**; **Exh. EL-173 (EN) 0007**).

³³⁵ *Id.*, Table 2 (**Exh. EL-173 (ESP) 0388-0389**; **Exh. EL-173 (EN) 0007-0008**).

Excerpts of TULAS, Book VI, Annex 2, Table 2

| Substance | Units (Concentration in Dry Weight) | Soil |
|----------------------------------|--|-------------|
| General Parameters | | |
| Conductivity | mmhos/cm | 2 |
| pH | | 6 to 8 |
| Inorganic Parameters | | |
| Arsenic | mg/kg | 5 |
| Barium | mg/kg | 200 |
| Cadmium | mg/kg | 0.5 |
| Total Chromium | mg/kg | 20 |
| Nickel | mg/kg | 20 |
| Lead | mg/kg | 25 |
| Vanadium | mg/kg | 25 |
| Organic Parameters | | |
| Polycyclic Aromatic Hydrocarbons | mg/kg | 0.1 |

191. In this context, Article 2.38 of Annex 2 defines background values as the “prevailing environmental conditions, prior to any disturbance”, that is, the “conditions that would have predominated in the absence of anthropogenic activities, with only natural processes being active”.³³⁶

192. Article 4.2.2 defines soil remediation or restoration standards in accordance with the use of the soil, distinguishing agricultural, commercial, residential and industrial uses. The standards set out in Table 3 are meant to determine the “maximum contaminant concentration levels for soil in the process of remediation or restoration”.³³⁷ It contains the following relevant parameters:

³³⁶ *Id.*, Article 2.38 (**Exh. EL-173 (ESP) 0373; Exh. EL-173 (EN) 0005**).

³³⁷ *Id.*, Article 4.2.2 (**Exh. EL-173 (ESP) 0389; Exh. EL-173 (EN) 0009**).

Excerpts of TULAS, Book VI, Annex 2, Table 3

| Substance | Units | Land Use | | | |
|----------------------------------|----------|--------------|-------------|------------|------------|
| | | Agricultural | Residential | Commercial | Industrial |
| General Parameters | | | | | |
| Electrical Conductivity | mmhos/cm | 2 | 2 | 4 | 4 |
| pH | | 6 to 8 | 6 to 8 | 6 to 8 | 6 to 8 |
| Inorganic Parameters | | | | | |
| Arsenic | mg/kg | 12 | 15 | 15 | 15 |
| Barium | mg/kg | 750 | 500 | 2000 | 2000 |
| Cadmium | mg/kg | 2 | 5 | 10 | 10 |
| Total Chromium | mg/kg | 65 | 65 | 90 | 90 |
| Nickel | mg/kg | 50 | 100 | 100 | 100 |
| Lead | mg/kg | 100 | 100 | 150 | 150 |
| Vanadium | mg/kg | 130 | 130 | 130 | 130 |
| Organic Parameters | | | | | |
| Polycyclic Aromatic Hydrocarbons | mg/kg | < 2 | | < 5 | < 1 |

193. Coming now to groundwater, Annex 1 of Book VI of TULAS determines (a) permissible limits for discharges into water bodies or sewer systems, (b) water quality standards according to their various uses, and (c) methods and procedures to determine the presence of contaminants in water.³³⁸ Its objective is to prevent and control contamination of water resources, to preserve the integrity of humans, ecosystems and their interrelationships, as well as the environment more generally.³³⁹
194. Article 4.1.3 addresses quality standards for groundwater.³⁴⁰ It stipulates that any proven alteration of the quality of groundwater triggers the duty to remediate the contaminated groundwater and the affected soil.³⁴¹ Table 5 sets out the quality standards for groundwater “considering a soil with clay content between (0-25.0)% and

³³⁸ TULAS, Book VI, Annex 1, Introduction (**Exh. EL-173 (ESP) 0312**).

³³⁹ *Id.*, Article 1 (**Exh. EL-173 (ESP) 0312**).

³⁴⁰ *Id.*, Article 4.1.3 (**Exh. EL-173 (ESP) 0332; Exh. EL-173 (EN) 0002**).

³⁴¹ *Id.*, Article 4.1.3.6 (**Exh. EL-173 (ESP) 0334; Exh. EL-173 (EN) 0002**).

organic material content between (0-10.0)%”.³⁴² It contains the following relevant parameters:

Excerpts of TULAS, Book VI, Annex 1, Table 5

| Parameters | Expressed As | Unit | Maximum Permissible Limit |
|------------------------------|--------------|------|---------------------------|
| Arsenic (total) | As | µg/l | 35 |
| Barium | Ba | µg/l | 338 |
| Cadmium | Cd | µg/l | 3,2 |
| Cobalt | Co | µg/l | 60 |
| Copper | Cu | µg/l | 45 |
| Total Chromium | Cr | µg/l | 16 |
| Molybdenum | Mo | µg/l | 153 |
| Mercury (total) | Hg | µg/l | 0,18 |
| Nickel | Ni | µg/l | 45 |
| Lead | Pb | µg/l | 45 |
| Zinc | Zn | µg/l | 433 |
| Total Petroleum Hydrocarbons | | µg/l | 325 |

2.7 The 2008 Constitution

195. Ecuador entered a new stage of environmental protection with the adoption of the 2008 Constitution. Most notably, the new Constitution bestows rights to nature (called *Pacha Mama* using the term employed in traditional Andean cultures) and codifies the fundamental principles of environmental stewardship. It declares that the elimination of poverty and the promotion of sustainable development, as well as the equitable redistribution of resources and wealth are fundamental duties of the State.³⁴³ It also specifies that constitutional principles and rights, including those relating to environmental matters, are “unalienable, obligatory, indivisible, interdependent and of equal importance”.³⁴⁴

³⁴² *Id.*, Table 5 (**Exh. EL-173 (ESP) 0334-0337; Exh. EL-173 (EN) 0002-0004**).

³⁴³ Constitución de la República del Ecuador, published in the Official Register of 20 October 2008, Article 3(5) (**Exh. C-413**). Except where otherwise indicated, the English translations are from the Claimant.

³⁴⁴ *Id.*, Article 11(6).

196. Addressing first the rights of nature, the Tribunal notes Article 10 providing that “[n]ature shall be the subject of those rights that the Constitution recognizes for it”. These rights are then specified in Articles 71 to 74.
197. Article 71 declares that “Nature or Pacha Mama, where life is reproduced and occurs, has the right to integral respect for its existence and for the maintenance and regeneration of its life cycles, structure, functions and evolutionary processes”.
198. Article 72 further provides that “Nature has the right to be restored” and that the duty to restore nature runs in parallel to the duty to compensate individuals and communities that depend on affected natural systems.³⁴⁵ The exploitation of non-renewable natural resources leading to “severe or permanent environmental impact” must be subject to “the most effective mechanisms to achieve the restoration”, including through “adequate measures to eliminate or mitigate harmful environmental consequences”.³⁴⁶
199. Article 73 requires the State to apply “preventive and restrictive measures on activities that might lead to the extinction of species, the destruction of ecosystems and the permanent alteration of natural cycles”.³⁴⁷
200. Article 74 then qualifies the rights of nature by stating that persons, communities, peoples and nations have the “right to benefit from the environment and the natural wealth” so as to enable them “to enjoy the good way of living”, while specifying that environmental services are not subject to appropriation.³⁴⁸
201. Turning then to environmental protection in general, the Constitution declares as matters of “public interest”, *inter alia*, environmental conservation, the protection of ecosystems, biodiversity, the prevention of environmental damage and the recovery of degraded natural spaces.³⁴⁹ The Constitution further recognizes the “right of the

³⁴⁵ *Id.*, Article 72(1) (Translation by the Claimant). The translation provided by Ecuador reads as follows: “Nature has the right to restoration” (**Exh. P-12**).

³⁴⁶ *Id.*, Article 72(2).

³⁴⁷ *Id.*, Article 73(1).

³⁴⁸ *Id.*, Article 74 (“Persons, communities, peoples, and nations shall have the right to benefit from the environment and the natural wealth enabling them to enjoy *the good way of living*. Environmental services shall not be subject to appropriation; their production, delivery, use and development shall be regulated by the State”).

³⁴⁹ *Id.*, Article 14(2).

population to live in a healthy and ecologically balanced environment that guarantees sustainability and *the good way of living (sumak kawsay)*.³⁵⁰ In this context, the State is called upon to promote the use of environmentally clean technologies, nonpolluting and low-impact alternative sources of energy, while certain noxious substances, such as highly toxic persistent organic pollutants or toxic wastes, are forbidden.³⁵¹

202. The Constitution also highlights the special value of the Amazon ecosystem, providing that, in addition to the regular territorial subdivisions, special systems may be established for reasons of environmental conservation.³⁵² With respect to the Amazonian region, Article 250 insists on the conservation of its ecosystem as part of the planet's environmental equilibrium:

“The territory of the Amazon provinces is part of an ecosystem that is necessary for the planet's environmental balance of the planet [sic]. This territory shall constitute a special territorial district, for which there will be integrated planning embodied in a law including social, economic, environmental and cultural aspects, with land use development and planning that ensures the conservation and protection of its ecosystems and the principle of *sumak kawsay (the good way of living)*”.³⁵³

203. To implement these objectives, Article 259 requires the State to adopt sustainable development policies:

“With the aim of safeguarding the biodiversity of the Amazon ecosystem, the central State and decentralized autonomous governments shall adopt sustainable development policies which shall also offset disparities in their development and consolidate sovereignty”.³⁵⁴

204. In connection with the economic aspects of environmental protection, the Constitution reserves the State's powers to administer, regulate, monitor and manage strategic sectors,³⁵⁵ such as the hydrocarbons industry,³⁵⁶ in accordance with “the principles of

³⁵⁰ *Id.*, Article 14(1). The *Good Way of Living System*, is further expanded on in Title VII, Articles 340 to 415, focusing on inclusion and equity on the one hand (Chapter I), and biodiversity and natural resources on the other hand (Chapter II).

³⁵¹ *Id.*, Article 15.

³⁵² *Id.*, Article 242(1).

³⁵³ *Id.*, Article 250.

³⁵⁴ *Id.*, Article 259.

³⁵⁵ Strategic sectors come under the “exclusive control of the State” and are defined as those sectors “that, due to their importance and size, exert a decisive economic, social, political or

environmental sustainability, precaution, prevention and efficiency”.³⁵⁷ Only on an exceptional basis may the State delegate to private enterprise the management of strategic resources, including the sustainable use of natural resources.³⁵⁸

205. Non-renewable natural resources are declared part of the “unalienable heritage of the State and are not subject to a statute of limitations”.³⁵⁹ Their management must take into account the “responsibility between generations” and “the conservation of nature” as well as the objective to “minimize the negative impacts of an environmental, cultural, social and economic nature”.³⁶⁰ Water, as a “vital element for nature and human existence”, forms part of the “country’s strategic heritage for public use” which is “unalienable” and imprescriptible property of the State.³⁶¹
206. Of particular relevance for present purposes is Chapter II of Title VII which deals with biodiversity and natural resources management as part of the so-called *Good Way of Living System*. It addresses fundamental environmental principles,³⁶² biodiversity conservation,³⁶³ natural assets and ecosystems,³⁶⁴ natural resources,³⁶⁵ soils,³⁶⁶ water,³⁶⁷ and the biosphere, urban ecology and alternative sources of energy.³⁶⁸
207. Within Chapter II, Article 395 sets forth fundamental environmental principles, such as sustainable development, based on a model that is “environmentally balanced and

environmental impact and must be aimed at ensuring the full exercise of rights and the general welfare of society”. *Id.*, Article 313(2).

³⁵⁶ Strategic sectors are “energy in all its forms, telecommunications, nonrenewable natural resources, oil and gas transport and refining, biodiversity and genetic heritage, the radio spectrum, water and others as established by law”. *Id.*, Article 313(3).

³⁵⁷ *Id.*, Article 313(1).

³⁵⁸ *Id.*, Article 316(2).

³⁵⁹ *Id.*, Article 317, 1st sentence.

³⁶⁰ *Id.*, Article 317, 2nd sentence.

³⁶¹ *Id.*, Article 318(1).

³⁶² *Id.*, Articles 395-399.

³⁶³ *Id.*, Articles 400-403.

³⁶⁴ *Id.*, Articles 404-407.

³⁶⁵ *Id.*, Article 408.

³⁶⁶ *Id.*, Articles 409-410.

³⁶⁷ *Id.*, Articles 411-412.

³⁶⁸ *Id.*, Articles 413-415.

respectful of cultural diversity, conserves biodiversity and the natural regeneration capacity of ecosystems, and ensures meeting the needs of present and future generations”,³⁶⁹ integration,³⁷⁰ and public participation.³⁷¹ Article 395(4) embodies the principle *in dubio pro natura* in the following terms:

“In the event of doubt about the scope of legal provisions for environmental issues, it is the most favorable interpretation of their effective force for the protection of nature that shall prevail”.

208. Article 396 then addresses the risks and consequences of human-induced environmental impacts. Having articulated the principles of prevention and precaution,³⁷² it provides in paragraph 2 that strict liability governs environmental harm and that full restoration of ecosystems must be achieved in addition to compensating affected persons and communities:

“Responsibility for environmental damage is objective. All damage to the environment, in addition to the respective penalties, shall also entail the obligation to integrally restoring the ecosystems and compensating the affected persons and communities”.³⁷³

209. The third paragraph of Article 396 then imposes on all economic actors the duty to prevent environmental impacts, and to mitigate and repair the “damages caused” by them to the environment:

³⁶⁹ *Id.*, Article 395(1).

³⁷⁰ *Id.*, Article 395(2) (“Environmental management policies shall be applied cutting across all sectors and dimensions and shall be mandatorily enforced by the State at all of its levels and by all natural persons or legal entities in the country’s territory”).

³⁷¹ *Id.*, Article 395(3) (“The State shall guarantee the active and permanent participation of affected persons, communities, peoples and nations in the planning, implementation and monitoring of all activities exerting environmental impacts”).

³⁷² *Id.*, Article 396(1) (“The State shall adopt timely policies and measures to avoid adverse environmental impacts where there is certainty about the damage. In the case of doubt about the environmental impact stemming from a deed or omission, although there is no scientific evidence of the damage, the State shall adopt effective and timely measures of protection”). The translation provided by Ecuador reads as follows: “The State shall adopt the appropriate policies and measures to avoid negative environmental impacts, where there is a certainty of harm. In the case of doubt regarding the environmental impact of an action or omission, even where there is no scientific evidence of the harm, the State shall adopt effective and appropriate measures of protection” (**Exh. P-12**).

³⁷³ *Id.*, Article 396(2) (**Exh. C-413**) (Translation by the Claimant). The translation provided by Ecuador reads as follows: “Liability for environmental harm is strict. Any harm to the environment, in addition to the corresponding sanctions, shall also give rise to an obligation to fully restore the ecosystems and compensate the individuals and communities affected” (**Exh. P-12**).

“Each one of the players in the processes of production, distribution, marketing and use of goods or services shall accept direct responsibility for preventing any environmental impact, for mitigating and repairing the damages caused, and for maintaining an ongoing environmental monitoring system”.³⁷⁴

210. Finally, the fourth paragraph of Article 396 provides for the imprescriptibility of environmental claims in the following terms:

“The legal proceedings to prosecute and punish those responsible for environmental damages shall not be subject to any statute of limitations”.³⁷⁵

211. In case of environmental harm, Article 397 provides that the “State shall act immediately and with a subsidiary approach to guarantee the health and restoration of ecosystems”. That provision further specifies that, in addition to sanctions, “the operator of the activity that produced the damage” must procure “integral reparation, under the conditions and on the basis of the procedures provided for by law”.

212. In this context, the (individual and collective) right to live in a healthy and ecologically balanced environment is secured by a guarantee of access to justice, ascertaining “effective custody in environmental matters”.³⁷⁶ This entails among other things that the operator of the impugned activity bears the burden of proving the “absence of potential or real danger”.³⁷⁷

213. In this section of Chapter II dealing with fundamental principles, the State further pledges to “ensure the intangibility of protected natural areas, so as to guarantee the conservation of biodiversity and the maintenance of the ecological functions of the

³⁷⁴ *Id.*, Article 396(3) (**Exh. C-413**) (Translation by the Claimant). The translation provided by Ecuador reads as follows: “Each of the participants in the processes of production, distribution, commercialization and usage of goods and services shall be directly liable for preventing any environmental impact, for mitigating and repairing the harm that it has caused, and for maintaining a permanent environmental monitoring system” (**Exh. P-12**).

³⁷⁵ *Id.*, Article 396(4) (**Exh. C-413**) (Translation by the Claimant). The translation provided by Ecuador reads as follows: “Legal actions to prosecute and sanction environmental harm shall be imprescriptible” (**Exh. P-12**).

³⁷⁶ *Id.*, Article 397(1), 1st sentence.

³⁷⁷ *Id.*, Article 397(1), 2nd sentence.

ecosystems”.³⁷⁸ Finally, Article 399 vests a decentralized national environmental management system with overall stewardship over the environment and nature.³⁷⁹

214. Among the other provisions of Chapter II which may be relevant for the resolution of this dispute, the Tribunal notes in Section III: Article 404 under which ecosystems³⁸⁰ must be managed “in accordance with land use planning and ecological zoning, in compliance with the law”; Article 405 referring to the “national system of protected areas” which serves to guarantee the conservation of biodiversity and the “maintenance of ecological functions”; Article 406 mandating that the State regulate “fragile and threatened ecosystems”, such as “high Andean moorlands, wetlands, cloud forests, dry and wet tropical forests and mangroves, marine ecosystems and seashore ecosystems”; and Article 407 prohibiting extractive industries of non-renewable natural resources in protected areas and in “areas declared intangible assets”, subject to limited exceptions.
215. In the remainder of Chapter II, attention is called to norms of the following content: Section IV which deals with non-renewable natural resources as part of the “unalienable property of the State, immune from seizure and not subject to a statute of limitations”,³⁸¹ the production of which must be “in strict compliance with the environmental principles set forth in the Constitution”,³⁸² soil conservation as a matter of “public interest and national priority”,³⁸³ the State must regulate water resources and the equilibrium of

³⁷⁸ *Id.*, Article 397(4), 1st sentence.

³⁷⁹ *Id.*, Article 399. This provision reads as follows: “The full exercise of state guardianship over the environment and joint responsibility of the citizenry for its conservation shall be articulated by means of a decentralized national environmental management system, which shall be in charge of defending the environment and nature”.

³⁸⁰ Article 404 defines Ecuador’s “unique and priceless” natural assets as including “the physical, biological and geological formations whose value from the environmental, scientific, cultural or landscape standpoint requires protection, conservation, recovery and promotion”. *Id.*, Article 404, 1st sentence.

³⁸¹ *Id.*, Article 408(1) (**Exh. C-413**) (Translation by the Claimant). The translation provided by Ecuador reads as follows: “Non-renewable natural resources [...] are of the State’s inalienable, imprescriptible and unseizable property” (**Exh. P-12**).

³⁸² *Id.*, Article 408(1).

³⁸³ *Id.*, Article 409(1).

ecosystems,³⁸⁴ mitigate climate change, limit greenhouse gas emissions, deforestation and air pollution, as well as conserve “forests and vegetation”.³⁸⁵

216. This overview demonstrates that environmental protection is one of the 2008 Constitution’s fundamental pillars and that environmental stewardship has taken on a new dimension in Ecuadorian society, where nature (or *Pacha Mama*) is itself bearer of constitutional rights.

2.8 The PSCs

217. Although its claim is not contractual in nature, Ecuador has relied on the PSCs to strengthen its contention that Burlington is liable for the environmental conditions found in Blocks 7 and 21.
218. Under the Block 7 and Block 21 PSCs, the Contractor agreed to comply with “all laws, regulations and other provisions” of Ecuador that are applicable to the contracts.³⁸⁶ The Consortium also gave its consent to a series of reporting requirements, such as keeping Petroecuador informed of the activities carried out under the contracts, including by submitting environmental management plans;³⁸⁷ carrying out environmental impact studies in accordance with RAOHE;³⁸⁸ providing the Ministry of Energy and Mines and

³⁸⁴ *Id.*, Articles 411-412.

³⁸⁵ *Id.*, Article 414.

³⁸⁶ Clause 5.1.18 of the Block 7 PSC reads as follows: “Without prejudice to the other obligations contained in this Contract, the Contractor is obliged to: [...] Comply with and require that its subcontractors comply with all laws, regulations and other provisions applicable to this Contract in the Republic of Ecuador” (**Exh. C-1 Corrected translation; CE-CC-28**). Similarly, Clause 5.1.17 of the Block 21 PSC provides that the Contractor shall “comply with all the laws, regulations and any other applicable provisions of the Republic of Ecuador” (**Exh. C-2; Exh. CE-CC-13**).

³⁸⁷ Clause 5.1.8 of the Block 21 PSC (**Exh. C-2; Exh. CE-CC-13**).

³⁸⁸ Clause 5.1.4 of the Block 7 PSC (**Exh. C-1 Corrected translation; Exh. CE-CC-28**). Under Clause 5.1.11 of the Block 7 PSC, the Contractor agreed to provide to the Ministry of Energy and Mines these environmental impact studies and any supporting documentation. Under Clause 5.1.20.3 of the Block 7 PSC, the Contractor confirmed that “as of the effective date” of the contract, it had completed the required environmental impact studies, and that they had been submitted and approved by the Undersecretary of the Environment. Clause 5.1.20.4 of the Block 7 PSC states that any additional environmental studies that would be required for additional oilfield activities have to be submitted in accordance with the RAOHE. Clause 3.3.12 defines environmental impact studies as follows: “Environmental Impact Study (EIS): Is the document whereby the Contractor reports the risks and potential positive and negative effects which hydrocarbon operations or other activities foreign to the ecosystem could have on nature and social organizations, and the measures that shall be taken in order to prevent, control, and mitigate the risks and negative effects, as well as the necessary actions to rehabilitate affected

Petroecuador with copies of environmental information related to the Consortium's activities,³⁸⁹ and conducting periodical socio-environmental audits "in order to prevent, as much as possible, any negative impact of the Contractor's activities on human settlements and on the environment".³⁹⁰

219. Under Clause 5.1.20 of the Block 7 PSC, the Contractor agreed to "preserve the existing ecological equilibrium in the Contract Area" in accordance with all pertinent standards and the environmental impact studies.³⁹¹ The Contractor also accepted to "[t]hroughout the term of this Contract, take all necessary measures to conserve and safeguard life and property and to protect the environment".³⁹² In order to achieve these goals, the Contractor further undertook to employ "qualified personnel, equipment, machinery, materials, operational procedures and, in general, technology which complies with environmental protection standards and practices used in the international petroleum industry, subject to compliance with existing standards in Ecuador".³⁹³

areas". Clause 5.1.20.4 spells out the content of environmental impact studies, as including (i) an inventory and diagnostic (baseline) study to determine the environmental situation and the level of contamination in the Contract Area, including a description of natural resources, in particular forests, flora and fauna; (ii) a description and technical evaluation of the foreseeable direct and indirect effects on the physical, biotic and social environment, in the short and long term; (iii) a detailed environmental management plan, aimed at avoiding exceeding the maximum tolerable levels; and (iv) an abandonment plan for the area. Since the Block 21 PSC was executed prior to any oilfield operations, that contract is drafted in different terms, indicating that exploration had to be undertaken within 6 months of the so-called "effective date", which is defined in Clause 3.3.15 as the "date of approval of the Environmental Impact Study by the Ministry of the Environment for the seismic prospection phase of Block 21" (**Exh. C-2; Exh. CE-CC-13**).

³⁸⁹ Clause 5.1.10 of the Block 7 PSC (**Exh. C-1 Corrected translation; Exh. CE-CC-28**). Compare with: Clause 5.1.9 of the Block 21 PSC (**Exh. C-2; Exh. CE-CC-13**).

³⁹⁰ Clause 5.1.20.6 of the Block 7 PSC (**Exh. C-1 Corrected translation; Exh. CE-CC-28**). Compare with: Clause 5.1.18 of the Block 21 PSC (**Exh. C-2; Exh. CE-CC-13**).

³⁹¹ Clause 5.1.20 of the Block 7 PSC (**Exh. C-1 Corrected translation; Exh. CE-CC-28**). That same provision adds that the Undersecretary of Environmental Protection "may request the performance of studies complementary to" already existing environmental impact studies.

³⁹² Clause 5.1.20.8 of the Block 7 PSC (**Exh. C-1 Corrected translation; Exh. CE-CC-28**). Clause 5.1.19 of the Block 21 PSC reads as follows: "While conducting the operations, the Contractor shall take every necessary measure to ensure the preservation and safety of lives and properties and preserve the environment. The above notwithstanding, the Contractor shall not be responsible for changes to the ecosystem caused by third parties within the Contract Area" (**Exh. C-2; Exh. CE-CC-13**).

³⁹³ Clause 5.1.20.9 of the Block 7 PSC (**Exh. C-1 Corrected translation; Exh. CE-CC-28**). Clause 5.1.7 of the Block 21 PSC is worded slightly differently: "To use personnel, equipment,

220. The Block 7 and Block 21 PSCs also addressed the issue of remediation and post-operations cleanup, in particular by providing that the Contractor would not be liable for preexisting environmental conditions (prior to the Services Contract for Block 7, and prior to the Participation Contract for Block 21), or for environmental conditions resulting from operations that are subsequent to the expiry of the PSCs. Clause 5.1.20.10 of Block 7 PSC reads as follows:

“The Contractor will take responsibility for cleanup and reforestation of the area with species similar to those originally found at the site, in order to, with time, allow the site to return to its original potential, with environmental conditions similar to those found at the beginning of the operations. The Contractor will also be responsible for abandonment of the wells and installations for which the Contractor has been responsible under the terms of this Contract. The cleanup, reforestation and return to similar conditions and abandonment activities will comply with the Environmental Regulations for Hydrocarbon Operations and with the provisions of the Environmental Impact Study. The Contractor will not be liable for preexisting environmental conditions at the beginning of the Service Contract activities. In situations where government authorities order remediation of the environment in the Contract Area due to preexisting conditions, the Contractor will not be liable for the costs and services. Moreover, the Contractor will not be liable for environmental conditions resulting from operations conducted by PETROECUADOR or third parties after the Contractor has returned the Contract Area”.

221. Similarly, Clause 5.1.20 of the Block 21 PSC reads as follows:

“The Contractor shall be responsible for the clean-up, reforestation, and abandonment of non-productive wells and facilities as a result of this Contract. These activities shall be carried out in accordance with the legislation in effect in Ecuador at the time that such clean-up, reforestation, or abandonment is carried out and as contemplated in the Environmental Impact Study.

The Contractor shall not be responsible for pre-existing environmental conditions at the start of the operations under the Contract.

In such cases where the competent authorities order mitigation of the environment in the Contract Area due to pre-existing conditions, any costs incurred in connection with such activities shall be assumed by the Ecuadorian State.

Nor shall the Contractor be responsible for environmental conditions resulting from operations by PETROECUADOR or third parties after the Contract Area is returned by the Contractor”.³⁹⁴

machinery, materials, and technology in accordance with the best standards and practices generally accepted in the international hydrocarbon industry” (**Exh. C-2; Exh. CE-CC-13**).

³⁹⁴

Clause 5.1.20 of the Block 21 PSC (**Exh. C-2; Exh. CE-CC-13**).

222. Finally, in the context of the Contracts' termination, the PSCs specify that the Consortium was to undertake a "comprehensive environmental audit" two years prior to the termination of the PSC. Clause 5.1.20.7 of the Block 7 PSC, for instance, reads as follows:

"Two (2) years prior to the termination date of this Contract, the Contractor will contract a comprehensive environmental audit of the Contract Area, based on the Environmental Impact Studies, and this audit must be completed no later than six (6) months prior to the termination date of this Contract. The final results of the audit will be binding for the Parties. The cost of performing the audit will be paid by the Parties in equal proportions (50/50). This audit will be performed by a company selected by mutual agreement of the Parties in a written agreement and the audit will comply with applicable Ecuadorian Law. The parties who perform these studies and audits must be previously qualified by the Ministry of Environment through the Undersecretary of the Environment"³⁹⁵.

3. Conditions of liability

223. The Tribunal will start by reviewing the liability regime applicable to hazardous activities, such as oilfield operations, in Ecuador (3.1). It will then address the statute of limitation (3.2) and the liability for successive operators (3.3).

3.1 The liability regime for hydrocarbons operations in Ecuador

224. The Tribunal is called to rule on Burlington's possible liability in tort, as opposed to contractual liability under the PSCs. It will thus review the tort liability regime for environmental harm as it arises from the 2008 Constitution (3.1.1) and as it existed before (3.1.2), to then draw the necessary conclusions for the case at hand.

3.1.1 The strict liability regime under the 2008 Constitution

225. The Parties agree, and rightly so, that the 2008 Constitution establishes strict liability for environmental harm.³⁹⁶ The Constitution also sets the following rules of the strict liability

³⁹⁵ Clause 5.1.20.7 of the Block 7 PSC (**Exh. C-1 Corrected translation; Exh. CE-CC-28**). Compare with: Clause 5.5.5 of the Block 21 PSC (**Exh. C-2; Exh. CE-CC-13**).

³⁹⁶ Article 396(2): "Responsibility for environmental harm is objective. All damage to the environment, in addition to the respective penalties, shall also entail the obligation of integrally restoring the ecosystems and compensating the affected persons and communities" (**Exh. C-413**).

regime: (i) the burden of proof of the inexistence of harm falls on the operator;³⁹⁷ (ii) the operator is only responsible for the harm caused by him;³⁹⁸ and environmental claims are imprescriptible.³⁹⁹

226. The constitutional regime has been clarified in case law. Specifically, the burden of proof of environmental harm was addressed in *Los Vencedores*, a decision dealing with a claim against Perenco for soil contamination in Block 7 that occurred after the entry into force of the 2008 Constitution.⁴⁰⁰ The Court held that the burden of proving harm had been reversed by Article 397(1) of the 2008 Constitution, which provides that “[t]he burden of proof regarding the inexistence of potential or real harm shall lie with the manager of the activity or the defendant”. The Tribunal’s understanding is that the plaintiff still has the burden to make a showing of harm plausibly connected to the defendant’s activities and the defendant then has the burden of proving its absence.
227. Applied to the present case, the rule contained in Article 397(1) means that once Ecuador has made a showing of the existence of environmental harm reasonably related to the Consortium’s risky activities, for example by way of the IEMS sampling exercise, Burlington then carries the burden of demonstrating that there is no harm or, if there is harm, what its limits are.
228. Ecuadorian courts have also held that fault is not a requirement of strict liability. The National Court of Justice explained that strict civil liability is the equivalent of “risk liability” or “fault-less liability” that is triggered “regardless of whether there was willful misconduct or negligence from the person”.⁴⁰¹ The Court added that the duty to repair

³⁹⁷ Article 397(1), 2nd sentence: “The burden of proof regarding the absence of potential or real danger shall lie with the operator of the activity or the defendant” (**Exh. C-413**).

³⁹⁸ Article 396(3): “Each one of the players in the processes of production, distribution, marketing and use of goods or services shall accept direct responsibility for preventing any environmental impact, for mitigating and repairing the damages caused, and for maintaining an ongoing environmental monitoring system” (**Exh. C-413**).

³⁹⁹ Article 396(4): “The legal proceedings to prosecute and punish those responsible for environmental damages shall not be subject to any statute of limitations” (**Exh. C-413**).

⁴⁰⁰ *Irma A. Imbaquingo et al. v. Perenco Ecuador Limited*, Provincial Court of Justice of Orellana, Ecuador, 17 September 2013, ¶¶ 5.2, 5.7, 6.7 (**Exh. CA-CC-57**).

⁴⁰¹ *Aguida v. Chevron*, pp. 211-212 (**Exh. EL-233**).

environmental harm is based on the fact that the harm caused “may be materially attributed to a certain activity, not on the existence of fault”.⁴⁰²

229. Applied to this case, the absence of a requirement of fault implies that Burlington may not avoid liability by raising that it acted diligently.
230. Another element of strict liability addressed by the courts is the requirement of causation. Under the strict liability regime, causation is presumed. In *Aguinda*, the National Court of Justice referred to the *Delfina Torres* decision, where it was held that under strict liability the operator could only escape liability by showing that the harm was caused by *force majeure* (*hecho fortuito*), a third party or the victim.⁴⁰³
231. The reliance on a presumption of causation under the constitutional regime is further substantiated by the Final Report of Committee 5 on Natural Resources and Biodiversity of the Constituent Assembly that prepared the 2008 Constitution. This report explains that the reversal of the burden of proving harm is due to the need to establish a “presumption of innocence” in favor of the environment,⁴⁰⁴ which, in turn, entails a reversal of the burden of proving the causal nexus between the act and the damage:

“The presumption of innocence should be established in favour of the environment. From this perspective, the burden of proof should be reversed to be against the defendant [...], in other words, counter to the former principle which assumes innocence until guilt is proven, strict liability would be the defense in environmental matters. The plaintiff will not be required to prove causal nexus, and the burden of proof would correspond to the defendant. This principle eliminates one of the barriers impeding access to environmental justice, which is the cost of producing evidence and the technical requirement to prove environmental damages”.⁴⁰⁵

⁴⁰² *Ibid.* The National Court of Justice also cited Resolution No. 378-1999 (Tercera Sala, R.O. No. 23, 23 II del 2000) where it is stated: “The principle that any harm should be repaired gives rise to entirely reconsidering the law of liability. From this principle derives strict liability, in which it is not necessary for fault to link the damaging act with the victim, since the production of harm may be sufficient [...]”. *Id.*, pp. 115-116 (**Exh. EL-233**).

⁴⁰³ *Id.*, p. 210, referring to: *Delfina Torres v. Petroecuador*, p. 28 (**Exh. EL-160**).

⁴⁰⁴ Translation by Ecuador. Constituent Assembly of Ecuador, *Final Report of Committee 5 Natural Resources and Biodiversity*, 2008, p. 15 (**Crespo ER, Exh. 9**).

⁴⁰⁵ *Ibid.*

232. For present purposes, this holding means that Burlington can be exempted from liability if it proves that the harm was caused by *force majeure*, by a third party, or by Ecuador and in particular by Petroamazonas after the takeover of the Blocks.⁴⁰⁶ Burlington accepts that the strict liability regime established under the 2008 Constitution involves “some burden shifting within the concept of causation”. It insists, however, that Ecuador needed first to prove that the harm “occurred on the Consortium’s watch”, after which Burlington could show that the harm was caused by force majeure, the victim or a third party.⁴⁰⁷ While the Tribunal will revert to the issue of successive tort liability, it disagrees with Burlington’s position that Ecuador must prove that the harm was caused during the time of the Consortium’s operations. Indeed, proof of causation is not required. Causation is presumed, with the result that liability ensues from the mere exercise of a risky activity and the occurrence of harm that is plausibly connected to such activity as far as the type and location of the harm is concerned.
233. The constitutional regime just described has no retroactive effect. Indeed, Article 7 of the Civil Code restates the general principle that laws have no retroactive effect.⁴⁰⁸ It is true that the decision in *Baquerizo* held that rules of public order do apply retroactively.⁴⁰⁹ However, environmental protection is not a matter of public order under the 2008 Constitution. It is merely a matter of public interest. Public interest, which is dealt with in Article 14 of the Constitution cannot be equated with public order, the latter notion being more restrictive than the former. As a result, there is no room to apply a rule on environmental protection such as the imprescriptibility of claims under Article 396(4) retroactively.

⁴⁰⁶ *Aguinda v. Chevron*, p. 210 (**Exh. EL-233**).

⁴⁰⁷ “It’s typical in a strict liability regime that you would have some burden shifting within the concept of causation. So, for example, under a strict liability regime like the 2008 Constitution, if a claimant can prove that a certain type of harm occurred on the Consortium’s watch, then it’s up to the Consortium as the defendant at that point to say, well, that event, although it occurred on my watch, was actually caused by a third party, someone from outside came in and sabotaged the well or something of that nature”. Tr. (Day 1) (ENG), 214:1-11 (Opening, Coriell).

⁴⁰⁸ Article 7 CC reads as follows: “The law does not provide but for what is to come; it has no retroactive effect” (**Exh. CA-CC-38**).

⁴⁰⁹ *Baquerizo G. C. Ltda. v. Shulton Inc.*, Supreme Court of Justice, Third Civil and Mercantile Chamber, published in Judicial Gazette No. 12, 25 September 2003 (**Exh. CA-CC-29**).

3.1.2 The liability regime for hydrocarbons operations prior to the 2008 Constitution

234. The strict liability regime of the 2008 Constitution not applying retroactively, the Tribunal must assess the rules governing liability for hydrocarbons operations prior to the 2008 Constitution.
235. The Parties diverge on whether these rules provided for fault-based or strict liability. Burlington argues in favor of the former, with the result that Ecuador must prove the existence of environmental harm and that the harm was caused by the Consortium's lack of diligence, that is, its fault. In other words, for Burlington, Ecuador must prove harm, fault and causation. For its part, Ecuador argues that the Consortium's activities were always subject to strict liability, or at the latest since the 2002 *Delfina Torres* decision of the Ecuadorian Supreme Court. Accordingly, says Ecuador, Burlington can only be exonerated if it establishes that the harm was caused by *force majeure*, a third party or the victim.⁴¹⁰ A showing of diligence, or lack of fault, would not suffice.
236. Prior to the entry into force of the 2008 Constitution, tort liability was governed by the Civil Code. While liability was fault-based, the Civil Code also provided for an objective liability standard applicable to particular situations.⁴¹¹ Moreover, the Ecuadorian courts, especially the Supreme Court in the *Delfina Torres* case, had extended objective liability to hazardous activities such as oilfield operations based on the theory of risk.⁴¹² In *Delfina Torres*, the Supreme Court of Justice provided the legal foundations for risk based liability in the following language:

“Today's world and the coming world, with its extraordinary and progressive accumulation of risks, requires greater defense of the values of man, created by a technology that, while it enables everything, it also threatens everything. The variety of real contingencies of dangers and risks that are actually drawn as a result of dissatisfaction and aside from any idea of damages, led to a slow evolution of elements and knowledge that enabled the most advanced legal systems to enter into socialization

⁴¹⁰ R-PHB, ¶ 5; Crespo ER, ¶ 37.

⁴¹¹ Art. 2229 (prior to 2005, Article 2256) CC reads in relevant part: “The following are particularly liable for reparation: [...] 3. He who removes slabs from an irrigation ditch or pipe in a street or path, without the precautions necessary so that those walking or traveling around the area during the day or night do not fall; [...] 4. He who, being compelled to build or repair a water line or bridge crossing a path, keeps it in a condition that may be harmful to those transiting through it” (Translation by the Tribunal) (**Exh. CA-CC-38**).

⁴¹² *Delfina Torres v. Petroecuador* (**Exh. EL-160**).

regimes of risk leading to the proposition that the victim is not left defenseless. This gave rise to the theory of risk, according to which, he who uses and takes advantage of any type of means that endow it with benefits, generates social risks through such means, and, as a result of that circumstance, must assume liability for harm caused by them [...]. No fault or wrongfulness is required to recognize tort liability. It is enough that the harm is a direct consequence of the event that has caused it. It is purely strict liability”.⁴¹³

237. The Supreme Court of Justice then identified the elements of strict liability showing that it is for the alleged tortfeasor to prove that he or she did not cause the harm:

“Hence, the need arises to promulgate a new type of liability for this type of harm, eliminating the criteria of fault through strict liability or the establishment of an absolute presumption of such. The owner of an exploitation or industry should respond directly for harm caused by the referenced industry or exploitation, and he may only exempt himself from liability if he shows that the harm did not arise from the exploitation, and arose instead from a foreign act (force majeure, fault of a third party or the fault of the victim itself)”.⁴¹⁴

238. Accordingly, the following elements are characteristic of the strict liability regime for environmental harm under Ecuadorian law as established in *Delfina Torres*:

- (i) the plaintiff must prove harm connected to the defendant’s activities;
- (ii) fault is not required; and
- (iii) causation is presumed, the defendant being exonerated if he or she proves that the harm was caused by *force majeure*, the victim or a third party.

239. The Supreme Court of Justice also held in *Medardo Luna* that fault is not required for strict liability.⁴¹⁵ In the context of the Code of Aeronautics, the *Medardo Luna* court held that it was irrelevant whether the company followed applicable regulations and whether the pilot acted with care.⁴¹⁶

⁴¹³ Translation by the Tribunal. *Id.*, pp. 27-28, ¶ 20.

⁴¹⁴ Translation by the Tribunal. *Id.*, pp. 28-29, ¶ 20.

⁴¹⁵ *Medardo Luna c. AECA*, Corte Suprema de Justicia, 20 September 2004, p. 4, ¶ 3 (**Exh. CA-CC-32**): “[I]n strict liability, however, the individual identified as the culprit is imposed the obligation to compensate the victim, regardless of foresight or intent that the aforementioned may have had from the damage resulting from the accident. In other words, the party acting out of malice, negligence or inexperience is no longer solely responsible, but responsibility also lies upon the individual that created the hazardous activity or used the riskful asset”.

⁴¹⁶ *Id.*, p. 5, ¶ 4, where the following is stated: “it is unquestionable that said company incurred in extracontractual civil liability; being it irrelevant whether said company complied with the

240. The Tribunal notes that the Parties' experts disagree on whether fault is not a requirement of strict liability at all or whether it remains a requirement but is presumed. Differently worded, they disagree on whether there is a rebuttable presumption of fault (Burlington) or an irrebuttable one (Ecuador). The Respondent's expert Professor Andrade speaks of an irrebuttable presumption ("*presunción de culpabilidad absoluta*"),⁴¹⁷ while the Claimant's expert Professor Bedón considers the presumption to be *iuris tantum*, that is rebuttable.⁴¹⁸ The analysis of the *Delfina Torres* and *Medardo Luna* decisions just referred to show that the presumption of fault cannot be rebutted by a showing that all precautions have been followed. Only a showing of *force majeure*, an act of a third party or of the victim can exonerate the defendant.⁴¹⁹
241. Even if the Tribunal were to adopt the position that the pre-2008 strict liability regime implies a rebuttable presumption of fault, any exceedance of RAOHE or TULAS values would defeat a due diligence argument. In addition, the non-compliances identified by Ecuador's expert RPS in connection with the biennial audits for instance,⁴²⁰ as well as evidence of Mr. Saltos, one of Burlington's witnesses, on various practices of the Consortium (discharges, mud pits, spills), would produce the same result.
242. More specifically, RPS reviewed the compliance record of the Consortium in environmental matters and identified the following non-compliances during the Consortium's operatorship: (i) failure to conduct biennial environmental audits in 2004 in breach of Article 42 of RAOHE and Article 61 of Book VI of TULAS; (ii) lack of key environmental documents, such as environmental management plans and environmental licenses; (iii) irregularities in the management of drill cuttings and mud pits, such as exceedances in maximum permissible limits of leachates in unlined pits; (iv) exceedances in maximum permissible limits for wastewater, as well as soil quality; (v) additional non-compliances, such as irregular waste and chemical management, or

regulating standards for flight security, or whether the pilot took the precautions indicated for the case".

⁴¹⁷ Andrade ER, ¶ 58.

⁴¹⁸ Bedón ER1, ¶ 75.

⁴¹⁹ See, in particular: "hence, the need arises to promulgate a new type of liability for this type of harm, *eliminating the criteria of fault through strict liability, or establishing an absolute presumption of fault*" (emphasis and translation by the Tribunal). *Delfina Torres v. Petroecuador*, ¶ 20 (**Exh. EL-160**).

⁴²⁰ RPS ER2, Section 6.

failure to respect a “highly sensitive ecological area” in Block 21; and (vi) environmental liabilities associated with the Payamino field operations resulting in offsite contamination and affecting third parties.⁴²¹

243. These instances refute Burlington’s contention that the Consortium complied with all regulatory requirements.⁴²² It is further preoccupying that the Consortium was operating the Coca-Payamino, Jaguar, Mono and Gacela fields without any proper environmental license⁴²³ and was relying on an outdated environmental impact study for the Coca-Payamino Field.⁴²⁴ And while the Consortium sought to downplay the fact that it produced no biennial environmental audit in 2004, the Subsecretary of Environmental Protection held this omission to be a serious breach of RAOHE.⁴²⁵ In this overall context, the Tribunal further observes that Burlington has not put into the record any baseline studies or internal due diligence studies generated at the outset of operations, allowing to assess the environmental condition of the Blocks at the start of operations as well as preexisting environmental liabilities.⁴²⁶
244. The testimony of Mr. Saltos, also revealed various instances of Consortium malpractices. For instance, Mr. Saltos mentioned that production water was discharged on the sand bank of the Napo River at the Oso 4 site, so as to filter these discharges

⁴²¹ RPS ER2, pp. 85-103.

⁴²² CMCC, ¶ 140. See also: Saltos WS1, ¶ 112.

⁴²³ RPS ER2, Section 6.2.2, p. 89.

⁴²⁴ *Id.*, Section 6.2.3, pp. 89-90.

⁴²⁵ *Id.*, Section 6.2.1, p. 88.

⁴²⁶ Article 41, Section 6(5) RAOHE reads: “In the intervened zones, it is necessary for the Baseline to include an analysis of prior impacts caused by other activities” (Translation by the Tribunal). Article 41, Section 6(6) reads in relevant part: “The choice of assessment and evaluation techniques shall be at the discretion of the party conducting the study; however, care shall be taken to: - Analyze the prior environmental situation (Baseline) in comparison with the environmental transformations resulting from the hydrocarbons activities conducted” (Translation by the Tribunal). See also: Articles 13(2), 51, 55 and 87(a) RAOHE (**Exh. EL-174**). Article 2.37 of the TULAS defines the Baseline as follows: “Denotes the state of an altered system at a particular point in time, before a subsequent change. It is also defined as the conditions at the time of investigation within an area that may be influenced by productive or human activities”. Whereas the baseline refers to prevailing environmental conditions in an altered system, background level (*línea de fondo*) refers to prevailing environmental conditions “prior to any disturbance”, i.e., “conditions that would have predominated in the absence of anthropogenic activities, with only natural processes being active”. See: TULAS, Book VI, Annex 2, Articles 2.37-2.38 (**Exh. EL-173 (ESP) 0373; EL-173 (EN) 0005**).

before they reached the water body.⁴²⁷ Mr. Saltos further testified that the Consortium was using auxiliary mud pits, such as the well workover pit in Area 2MT in Payamino 1/CPF, which is located beneath the CPF close to the Añango River.⁴²⁸ Mr. Saltos also conceded that, during well workovers, the Consortium was moving drilling muds from one site to another site with open pits, eventually even reopening sealed pits to introduce newly contaminated soils.⁴²⁹ In addition, as the example of auxiliary pits shows, the Consortium also made use of pits that were not reported to the authorities, thus forcing Ecuador's experts to discover unreported mud pits as a result of their sampling campaigns (see, for instance, Payamino 1/CPF; Payamino 16).⁴³⁰ Mr. Saltos also confirmed that the collapse of the pit at Cónдор Norte due to a landslide in 2006 was not remediated until the Consortium left the Blocks in 2009.⁴³¹

245. With respect to spills, the evidence provided by Mr. Manuel Solís of Petroamazonas shows that Mr. Saltos' list of spills during the Consortium operatorship is incomplete, further showing that the Consortium did not report all spills to the authorities. Mr. Saltos confirmed that at Jaguar 1, for instance, the 2005 spill in Area 3T was left unreported and, worse, was left unremediated with a 30cm layer of clean soil having been put on top of the affected area, which is not more than 8 meters away from a water body in close proximity to human dwellings and a school.⁴³² Mr. Saltos also testified at Coca CPF during the Site Visit that, while the malpractice of prior operators in discharging produced water into the drainage leading to the Chalá swamp was discontinued and

⁴²⁷ Reporte de taponamiento de piscinas de Oso 4-5, noviembre 2004, p. 5 (**Exh. E-467**): "Water was transported to the beach of the ballast mine, so that such beach worked as an infiltration field, thus preventing direct discharge into the river" (Translation by the Tribunal). Mr. Saltos provided the following testimony: "Yes, I was referring here specifically to the fact that we did not mix water to reduce exceedance and then discharge it back into the river, as you were saying. In this specific case here, what it says right here, was released into the beach. Now, the beach acts as the filter for the water, and this is probably the reason why it was done here. But it's simply because the beach allowed for that to happen". Tr. (Day 4) (ENG), 1356:1-8 (Cross, Saltos). See also: Saltos WS2, ¶ 26; Saltos WS2, ¶ 29. This practice was also employed, for instance, in: Coca 18, Payamino 24.

⁴²⁸ Tr. (Day 4) (ENG), 1228:1-17 (Cross, Saltos).

⁴²⁹ For instance, Mr. Saltos conceded that the Payamino 16 pit was reopened to deposit drilling muds from other platforms. This pit was not reported and poorly covered. Tr. (Day 4) (ENG), 1335:9-10 and 1335:16-1336:12 (Cross, Saltos).

⁴³⁰ Tr. (Day 4) (ENG), 1228:1-17; 1226:8-1235:12 (Cross, Saltos) (Payamino 1/CPF); Tr. (Day 4) (ENG), 1335:9-10, 1335:16-1336:12 (Cross, Saltos) (Payamino 16).

⁴³¹ Saltos WS2, ¶ 37; Tr. (Day 4) (ENG), 1342:3-5 (Cross, Saltos).

⁴³² Tr. (Day 4) (ENG), 1246:8-1247:20, 1253:7-10 (Cross, Saltos).

remediated, oil seeping continued during the Consortium's operatorship without any proper remediation being undertaken by the Consortium.⁴³³

246. While the Tribunal accepts Mr. Saltos' representation that the risk of spills is always present in oilfield operations "no matter how cautious the operator is", the Tribunal has much more difficulty in accepting his statement that the Consortium had a "robust spill prevention system" in place.⁴³⁴ The Tribunal is even less inclined to accept Mr. Saltos' attempts to minimize the importance of certain spills, which he qualified as "*casi derrames*" or "*liqueos*",⁴³⁵ since the accumulation over time even of minute amounts of certain contaminants can in certain circumstances lead to significant environmental harm if left unremediated. Finally, while Mr. Saltos is right to argue that discharging effluents into a river was not prohibited prior to the entry into force of TULAS on 31 March 2003,⁴³⁶ this practice does not support Burlington's contention that the Consortium was a responsible operator.
247. To conclude, the Tribunal reaches the conclusion that in Ecuadorian law strict liability governed instances of environmental harm at the latest since the *Delfina Torres* decision was handed down in 2002.⁴³⁷

⁴³³ Saltos WS1, ¶¶ 290, 294, 297; Tr. Site Visit (Day 2) (ENG), 139:17-23 (Tribunal, Saltos at Coca CPF). "Unfortunately, it continued discharging water from the API separator, and this water may have had traces of hydrocarbons that ended up in the swamp. And, logically, they continued to go through the swamp until they reached Chalá. And that area, as it is lower lying, and cannot pass directly to the other side of the road, would become sedimented and contamination accumulated there. When I lived in Chalá, we tried to reach an agreement with Chalá, we tried, with him, to carry out a remediation Project. Unfortunately, 2009 came and we could not execute it. That's how it was".

⁴³⁴ Saltos WS1, ¶ 102. The Spanish version merely refers to the existence of "un sistema de prevención de derrames".

⁴³⁵ Mr. Saltos stated in relevant part: "These things that are called spills are now not really spills. These are leaks, small leakages. They're not really important volume wise. The ideal thing, of course, would have been not to have leaked even one drop of crude, obviously, but these things are bound to happen in the course of the operations. These operations are carried out by men, and men are always capable of making a mistake". Tr. (Day 4) (ENG), 1215:9-16 (Cross, Saltos).

⁴³⁶ Saltos WS2, ¶ 26.

⁴³⁷ The Supreme Court held that: "We fully agree with this position and such is the reason why we adopt it as foundation for this ruling, in light of the fact that the production, industry, transportation and operation of hydrocarbon substances undoubtedly constitute hazardous or dangerous activities". *Delfina Torres v. Petroecuador*, ¶ 20 (**Exh. EL-160**).

248. The Tribunal is mindful that the *Perenco* tribunal held that fault-based liability governed Ecuador’s claims for environmental harm that predates the 2008 Constitution. While the Tribunal agrees with the finding in the *Perenco* Decision that “an operator can in general be held only to the legal standards that applied to its conduct at the time”,⁴³⁸ it has difficulty following the *Perenco* tribunal’s view that decisions of the Ecuadorian courts have merely “strengthened the presumptions in favour of a finding of liability in the case of damage caused through hazardous activities”.⁴³⁹ It finds indeed that these courts have established a strict liability regime for hazardous activities, in particular oilfield operations.
249. In addition, it is not disputed that Burlington may be held liable for the harm caused by its Consortium partner, Perenco, which operated the Blocks during the Consortium’s tenure.⁴⁴⁰ It is a different issue whether Burlington may be held liable for harm caused by prior operators as Ecuador claims and Burlington opposes, to which the Tribunal will revert after having addressed the limitation period.⁴⁴¹

3.2 Statute of limitations

250. Burlington submits that most of Ecuador’s claims are time-barred under the four-year statute of limitations of Article 2235 of the Civil Code,⁴⁴² which runs from the date when the allegedly harmful act occurred.⁴⁴³ For Burlington, Ecuador is wrong in seeking to import the so-called “discovery rule” into the Ecuadorian legal system or to argue that the imprescriptibility rule of the 2008 Constitution could apply retroactively.⁴⁴⁴

⁴³⁸ *Perenco v. Ecuador*, ¶ 357.

⁴³⁹ *Id.*, note 881.

⁴⁴⁰ CMCC, ¶ 228 (“Regardless of whether strict liability or fault-based liability governs this dispute, Burlington and Perenco can only be held liable for damages that *they have caused*”) (emphasis in the original). See also: Bedón ER1, ¶ 69. Article 2217 CC stipulates as follows: “If an offence or tort has been committed by two or more persons, each of them shall be jointly and severally liable for any harm arising from such crime or tort, except in the cases set forth in Arts. 2223 and 2228” (Translation by the Tribunal) (**Exh. CA-CC-38**).

⁴⁴¹ Rejoinder, ¶¶ 268-279.

⁴⁴² CMCC, ¶¶ 488-487; Rejoinder, ¶¶ 319-334; C-PHB, ¶¶ 72-74.

⁴⁴³ CMCC, ¶ 489; Rejoinder, ¶ 319.

⁴⁴⁴ Rejoinder, ¶ 319.

Accordingly, Burlington submits that claims arising out of incidents that occurred before 18 January 2007 are time-barred and inadmissible.⁴⁴⁵

251. Ecuador opposes Burlington’s argument mainly on the ground that Article 2235 of the Civil Code only governs liability based on fault.⁴⁴⁶ Claims for strict liability are subject to the limitation set forth in Article 396(4) of the 2008 Constitution, as the Claimant’s expert Professor Bedón acknowledged at the Hearing.⁴⁴⁷ Even if Article 2235 of the Civil Code were to apply, says Ecuador, the period would start to run when the harm is discovered, which is after the Consortium abandoned the Blocks in July 2009.⁴⁴⁸ Ecuador adds that its argumentation is reinforced by Burlington’s concealment policy and lack of reporting,⁴⁴⁹ and that by acquiring its interest in the Blocks, Burlington contractually took over the environmental liabilities of prior operators.⁴⁵⁰
252. It is common ground that environmental claims for harm caused after the entry into force of the 2008 Constitution are imprescriptible. The Parties disagree, however, on the prescriptibility of claims for harm caused prior to the Constitution’s entry into force. They diverge on whether such claims are subject to the four-year limitation of Article 2235 of the Civil Code or whether they are imprescriptible.
253. The Tribunal is not convinced by Ecuador’s argument that questions related to the statute of limitations are procedural rather than substantive. The approach in *Nelson Alcívar* in this regard is not convincing, nor is its criterion of the date of the filing of the claim.⁴⁵¹ Article 7(20) of the Civil Code is of no help either here, since it leaves

⁴⁴⁵ CMCC, ¶ 489.

⁴⁴⁶ Reply, ¶¶ 385-401.

⁴⁴⁷ R-PHB, ¶ 69, referring to: Tr. (Day 2) (ESP), 591:22-592:5 (Cross, Bedón), corresponding to Tr. (Day 2) (ENG), 570:6-10 (Cross, Bedón).

⁴⁴⁸ R-PHB, ¶ 72.

⁴⁴⁹ *Id.*, ¶¶ 765-815.

⁴⁵⁰ *Id.*, ¶¶ 71, 636-672.

⁴⁵¹ *Nelson Alcívar v. OCP*, Corte Provincial de Justicia, 2011, ¶ 12 (**Andrade ER, Annex 29**): “The provisions of the current Constitution as it relates to environmental issues and its protection is also preferably applied, since, in procedural matters, the rules in force at the time of filing the action apply, and not those that were in force when the legal situation was created. In this case, we observe the moment on which the appeal was filed for application of constitutional rules in procedural matters, related to the environmental case, in application of the provisions of Art. 7, point 20 of the Civil Code”.

unaffected terms that have begun to run prior to a change in law.⁴⁵² More generally, the Tribunal is of the view that in comparative law and private international law the trend is to consider the statute of limitation as a substantive rather than a procedural issue.⁴⁵³

254. In the Tribunal's view, it is correct that in principle the four-year statute of limitation period provided in Article 2235 CC applies to harm caused prior to the entry into force of the 2008 Constitution, subject to the following specifications.⁴⁵⁴ The date of the discovery must apply for environmental harm, not the date of the act, since strict liability is focused on the result, not on the act causing the harm. This is so because it is difficult to identify the precise time when environmental harm is generated⁴⁵⁵ and because, in oilfield operations in Ecuador, the identification of environmental harm is essentially dependent on the operator's self-reporting.⁴⁵⁶ In the same vein, reliance by Burlington on environmental audits produced by the Consortium as a means to establish constructive knowledge is misplaced here, since (i) environmental audits have no preclusive effect as a general matter under Ecuadorian law,⁴⁵⁷ and (ii) the Consortium

⁴⁵² Article 7(20) CC reads: "Laws concerning the substance and procedure of cases prevail over earlier ones from the time they take effect. But the terms that have begun to run and the actions and proceedings that have already begun shall be governed by the law that was in force then" (**Exh. CA-CC-38**).

⁴⁵³ In civil law countries, limitation periods are considered to be substantive in nature. While common law countries traditionally considered limitation periods to be procedural in nature, various countries have progressively shifted away from that traditional approach. See, for instance the Report of the Law Reform Committee "Limitation Periods in Private International Law" (Singapore Academy of Law, 2011), ¶ 2.

⁴⁵⁴ Article 2235 CC reads: "Claims that this Title grants for harm or willful wrongdoing have a statute of limitations of four years, counted from the perpetration of the act" (**Exh. CA-CC-38**).

⁴⁵⁵ See, for instance, Mr. Saltos' statements on the necessity to assume facts due to the difficulty to determine the origin and date of contamination. Saltos WS1, ¶ 252 (Payamino 2-8), ¶ 265 (Payamino 14-20-24); Saltos WS2, ¶¶ 54, 93, 123; Tr. (Day 4) (ENG), 1279:18-22 (Cross, Saltos). Also, GSI acknowledged at the Hearing that they were providing "best estimates" as to when the alleged damage might have occurred. See, for instance, in relation to the workover pit at Payamino 1: Tr. (Day 5) (ENG), 1556:20-21 (Cross, Connor).

⁴⁵⁶ See, for instance: RAOHE, Article 16 (**Exh. EL-174**).

⁴⁵⁷ TULAS, Book VI, Article 70 reads as follows: "The approval of environmental management plans and other environmental studies shall not be used as exonerating evidence in environmental contamination incidents or accidents attributable to any activity, project or construction. The natural or juridical persons, public or private, that represent such activities shall be liable for payment of any applicable damages and penalties" (**Exh. EL-173 (EN) 0001**). See also: Crespo ER, ¶¶ 97-98; SMCC, ¶¶ 46-47; 2nd SMCC, ¶¶ 46-47. The Block 7 2008 Environmental Audit indicated that it verified the global compliance of the operations with Ecuadorian regulations, but that it could by definition not ensure complete compliance: "*Por definición, la auditoría no asegura que se hayan revisado la totalidad de los requisitos establecidos en el marco legal y*

did not generate the required 2004 biennial audits.⁴⁵⁸ Accordingly, the limitation period only starts to run from the discovery of the harm. The same applies to harm that has been insufficiently remediated, since Ecuador could only assume on the basis of remediation plans and reports submitted by the Consortium that identified harm had been properly remediated. In this context, the notion of “*pasivo ambiental*” in Article 1 of the Ministerial Agreement No. 169 (2012), which refers to insufficiently remediated harm, further reinforces the Tribunal’s findings above.⁴⁵⁹

255. In sum, (i) environmental harm caused and/or discovered after the entry into force of the October 2008 Constitution is actionable (Articles 396(4) *and* 11(3) Cst.), (ii) environmental harm caused between 17 January 2007 and the entry into force of the 2008 Constitution is actionable, and (iii) environmental harm caused prior to 17 January 2007 is actionable to the extent that it was discovered thereafter (Article 2235 CC read in light of strict liability). This extends to harm that has been insufficiently remediated, since any remaining exceedances were only discovered by IEMS in 2011 or thereafter.

3.3 Successive liability of operators

256. Burlington rejects Ecuador’s attempts to hold it liable for harm caused by prior operators as a matter of tort law (successive tort liability) or pursuant to Clause 5.1.20.10 of the Block 7 PSC and Clause 5.1.20 of the Block 21 PSC (successive contractual liability).⁴⁶⁰ After addressing the issue of Burlington’s liability for the acts of prior operators, the Tribunal will also address the matter of liability for acts of Petroamazonas, the operator that succeeded the Consortium and is presently operating the Blocks.

reglamentario y en las prácticas ambientales dentro de la operación que lleva a cabo PERENCO en el Bloque 7. Block 7 Environmental Audit, November 2008, p. 41 (**Exh. E-252**).

⁴⁵⁸ See above, paragraphs 242-243.

⁴⁵⁹ Article 1 contains various principles and definitions relating to the governance of public environmental policies, including a definition of environmental liability (*pasivo ambiental*) which reads as follows: “These are environmental damages and/or negative environmental impacts not repaired or restored respectively, *or those that have previously been worked on but insufficiently or incompletely and that continue to be present in the environment constituting a risk to any of its components*, which are generated by a work, project or a productive or economic activity in general” (emphasis added by the Tribunal). Ministerial Agreement No. 169, published in Official Register No. 655 of 7 March 2012 (**Exh. CA-CC-53**). The Tribunal notes that this regulation postdates the initiation of these counterclaims proceedings.

⁴⁶⁰ Rejoinder, ¶¶ 268-279.

257. With respect to successive tort liability for prior operators, the Tribunal has already held above that causality is a component of strict liability (both under the liability regime of the 2008 Constitution and under the anterior regime elaborated by Ecuadorian courts), although it is presumed. Accordingly, to be exonerated, Burlington must prove that any alleged harm was caused by *force majeure*, the victim, or a third party. In other words, under the strict liability regime, Burlington cannot be held liable for harm which it can prove to have been caused by prior operators.
258. The situation is different under the PSCs. As was seen above, Clause 5.1.20.10 of the Block 7 PSC excludes the Consortium’s liability for environmental harm caused prior to the first service contract, i.e., prior to January 1986 and after return of the contract area, i.e. in July 2009.⁴⁶¹ A similar provision is found in the Block 21 PSC, with the difference that the starting point for the Consortium’s liability is set at the conclusion of the first participation contract in 1995.⁴⁶² Within these time spans, the Consortium is under a contractual obligation to remediate any environmental harm caused by prior operators.
259. The question is thus whether the Tribunal should apply this contractual obligation for harm caused by prior operators in the present context. Ecuador’s position has somewhat fluctuated on this issue.⁴⁶³ At the Hearing, it sought to clarify matters as follows: “Now, our case, Members of the Tribunal – and we don’t want you to have any confusion about it – our case is not based upon any contractual liability, but rather of a

⁴⁶¹ Clause 5.1.20.10 of the Block 7 PSC reads in relevant part: “The Contractor shall not be liable for environmental conditions preexisting at the beginning of operations under the Services Contract. [...] The Contractor shall also not be liable for those environmental conditions which are the consequence of operations performed by PETROECUADOR or third parties after the Contractor has returned the Contract Area”. Clause 2.1 of the Block 7 PSC specifies that the Services Contract was concluded on 18 December 1985, effective as of 17 January 1986 when it was inscribed in the National Hydrocarbons Directorate (**Exh. CE-CC-28**).

⁴⁶² Block 21 Participation Contract, Clause 5.1.20 (**Exh. CE-CC-13**). The Block 21 PSC was first executed on 20 March 1995.

⁴⁶³ In its Counter-Memorial on Liability, Ecuador mainly relied on Ecuadorian tort law to invoke Burlington’s liability. It mentioned the PSCs “*ex abundanti cautela*” and stated that “[b]ecause Ecuadorian law recognizes the principle of strict liability for environmental damages caused by hydrocarbons operations, there is no need to consider separately whether, in addition, Burlington could be contractually liable to Ecuador for that same environmental damage under the Participation Contracts [...]” (Counter-Memorial on Liability, ¶¶ 760-761). Ecuador did not invoke the PSCs in relation to the environmental counterclaim in its Supplemental Memorials on Counterclaims. In its Reply, however, Ecuador referred to the PSCs to extend the temporal scope of the strict liability regime (Reply, ¶ 430).

tort liability”.⁴⁶⁴ In spite of this clear statement, Ecuador sought relief in reliance on the Constitution and the PSCs⁴⁶⁵ and one part of its oral presentation focused on the construction of the PSC provisions on successive operators.⁴⁶⁶ On a question from the Tribunal, Ecuador further explained that “the basis for Ecuador’s claim is principally the 2008 Constitution tort liability principles; and [...] tentatively the Contract would apply, if you don’t find that a [sic] tort liability principles apply here. Second point, is that, even if you have, as the main case of Ecuador, these tort liability principles encompassed in the 2008 Constitution, it is our position [...] that there are some contractual provisions that have a bearing on the issue of causation, which you understood especially in this scenario of succession of operators [...]”.⁴⁶⁷ In its Post-Hearing Brief, Ecuador then invoked strict liability and stated that, in addition, the obligation to fully restore the Blocks also arises from the PSCs⁴⁶⁸ and the transfers authorized by the Ministry,⁴⁶⁹ which obligation extends to the CPUF.⁴⁷⁰

260. On this basis, the Tribunal understands that (i) Ecuador’s environmental counterclaim is a strict liability claim in tort and that (ii) Ecuador refers to the PSCs first, to provide principles of liability in the event that such principles are lacking in the legal framework governing strict liability and, second to regulate causation in respect of other operators in the field.

⁴⁶⁴ Tr. (Day 1) (ENG), 27:12-15 (Opening, Silva Romero).

⁴⁶⁵ Tr. (Day 1) (ENG), 81:10-15 (Opening, Mayer).

⁴⁶⁶ Tr. (Day 1) (ENG), 70:22-81:15 (Opening, Mayer); Tr. (Day 7) (ENG), 2176:9-2177:2 (Closing, Silva Romero) and 2206:9-2214:8 (Closing, Mayer).

⁴⁶⁷ Tr. (Day 1) (ENG), 303:4-17 (Tribunal, Silva Romero). See also: Ecuador’s Opening Statement, Slides 44, 51-58; Ecuador’s Closing Statement, Slides 53-69; R-PHB, ¶¶ 673-702.

⁴⁶⁸ R-PHB, ¶¶ 635-672.

⁴⁶⁹ R-PHB, ¶¶ 673-677. See also: Tr. (Day 1) (ENG), 72:15-75:13 (Opening, Mayer); Ecuador’s Opening Statement, Slide 52; Tr. (Day 7) (ENG), 2207:16-2214:8 (Closing, Mayer); Ecuador’s Closing Statement, Slides 56-69. For Block 7, see: Approval of Ministry of Energy and Mines No. 243 of 8 January 2002, Article 1 (**Exh. C-130**); Approval of Ministry of Energy and Mines No. 342 of 9 May 2002, Article 1 (**Exh. C-26**); Approval of the Ministry of Energy and Mines No. 56 of 2 August 2006, Article 1 (**Exh. C-133**). For Block 21, see: Approval of Ministry of Energy and Mines No. 242 of 8 January 2002 (**Exh. C-116**); Approval of the Ministry of Energy and Mines No. 343 of 8 May 2002 (**Exh. C-27**); Approval of the Ministry of Energy and Mines No. 55 of 2 August 2006 (**Exh. C-120**).

⁴⁷⁰ R-PHB, ¶¶ 678-702. See also: Ecuador’s Closing Statement, Slide 65, referring to: Common Fields Basal Tena, Napo “U”, Hollín Superior and Hollín Principal of the Coca-Payamino Field, 11 October 1990, Clause 7.1 (**Exh. CE-CC-8**).

261. For its part, Burlington regards this counterclaim as one based exclusively on tort law.⁴⁷¹ It also considers that the outcome under the PSCs would be no different, as “the PSCs exonerate Burlington from liability for harm caused by others”.⁴⁷² Before proceeding further, the Tribunal notes that the outcome would, however, be different, as the contractual liability starts to accrue from the first contracts for the Blocks and not from the beginning of the Consortium’s operations, as is shown by Clause 2.1 in conjunction with Clause 5.1.20.10 of the Block 7 PSC and by Clause 5.1.20 of the Block 21 PSC.
262. The Tribunal does not consider that resort to the PSCs is well-founded here. The 2008 Constitution and Ecuadorian case law provide the relevant tort liability principles, as established above, and there is no basis to import liability principles from the PSCs. As regards the contractual rules on successive liability of operators more specifically, Ecuador has not convincingly explained why the Tribunal would need to apply such contract rules to a tort claim in derogation from the tort liability rules contained in the 2008 Constitution and case law. The same reasoning applies to Ecuador’s argument in respect to the successive transfers of the prior contractor’s obligation to restore the Blocks which were authorized by the Ministry of Mines and Energy.⁴⁷³ While Ecuador characterizes these transfers as a “parallel source of Burlington’s obligation to fully restore the environment in Blocks 7 and 21”,⁴⁷⁴ it has not sufficiently substantiated that this obligation must take precedence over the general tort liability regime discussed above.
263. Ecuador has also relied on Article 2217 of the Civil Code to argue that, where harm is attributable to several authors, each one is liable for the full amount.⁴⁷⁵ There is no need to dwell on the rather obvious point that this rule concerns a situation in which several actors create the same harm; it does not govern a situation in which an operator which has not caused the harm may, by operation of law or contract, be liable for the harm caused by another.

⁴⁷¹ C-PHB, ¶ 67. See also: Rejoinder, ¶¶ 52-55, 241-244.

⁴⁷² C-PHB, ¶ 67.

⁴⁷³ See references in note 469 above.

⁴⁷⁴ R-PHB, ¶ 673.

⁴⁷⁵ Reply, ¶¶ 417, referring to: Andrade ER, ¶¶ 72-79. See also: Reply, ¶¶ 418-429.

264. Accordingly, Burlington can only be held liable in these proceedings for harm caused by the Consortium. In other words, Burlington can avoid liability if it shows that the alleged harm was caused by prior operators. This conclusion is nuanced to take account of the possibility that pre-existing environmental harm may have continued to expand or disperse as a result of the Consortium's breach of its duty to monitor the environmental conditions in the Blocks and remediate any exceedances, as well as for the possibility that the Consortium increased the environmental liabilities of an already contaminated site. In either case, such harm could properly be said to have been at least partially caused by the Consortium.
265. In application of the principles of causation discussed above, the Consortium cannot either be held liable for harm caused by Petroamazonas, the operator that took over the oilfields in 2009 and expanded operations since then. The Tribunal, however, rejects Burlington's argument that the Consortium bears no liability for the environmental conditions of the Blocks simply by virtue of the fact that Petroamazonas took over the Consortium's rights and obligations by substituting itself to the Consortium.
266. Having set out the key components of the strict liability regimes, the Tribunal will now address the Parties' positions and set out the Tribunal's approach regarding soil contamination (Section 4), mud pits (Section 5) and groundwater contamination (Section 6). Finally, the Tribunal will address the issue of well site abandonment (Section 7).

4. Soil contamination

267. With respect to soil contamination, the Tribunal will start by addressing the notion of environmental harm (4.1), followed by general considerations on permissible limits (4.2), land use criteria (4.3), as well as guidelines to calculate impacted areas and volumes of impacted soils (4.4) and the remediation costs (4.5). This will then allow the Tribunal to outline its approach to assessing the environmental conditions in the Blocks and engage in a site-specific analysis (4.6).

4.1 The notion of environmental harm

268. The Parties disagree on the definition of environmental harm. The opposition hinges on whether environmental harm is defined by reference to "permissible limits" set out in applicable regulations (as argued by Burlington) or to "background values" that reflect

environmental conditions as they were prior to any human interference (as argued by Ecuador);⁴⁷⁶ and, if the permissible limits approach is adopted, whether the relevant limits are those applicable to industrial or agricultural land use (as argued by Burlington) or to sensitive ecosystems (as argued by Ecuador in the alternative).

269. The consequences of adopting one or the other of these positions are significant in terms of the monetary relief for soil remediation claimed by Ecuador. Indeed, Ecuador's primary case is for soil remediation of any environmental harm in the Blocks back to background values, for which it claims USD 2,507,107,626 (the "background values case"). In the alternative, Ecuador claims soil remediation back to the sensitive ecosystems criteria, i.e. the most protective land use standards under RAOHE Table 6, in the amount of USD 790,465,298 (the "regulatory criteria case"). The Tribunal will therefore first assess the merits of Ecuador's argument that background values should apply as a general matter, and it will only address Ecuador's alternative case if its background values case is ill-founded.

4.1.1 Parties' positions

270. In support of the background values case, Ecuador essentially argues that the notion of environmental harm under the 2008 Constitution and the EML is distinct from the notion of regulatory permissible limits enshrined in RAOHE and TULAS.⁴⁷⁷ For Ecuador, the Tribunal must determine environmental harm by examining whether there is a "negative impact" of any sort on the environment, that is, whether the alleged alteration affects "the functions of the environment or the renewability of the resources" in accordance with the EML.⁴⁷⁸ The Consortium, Ecuador states, had no right to pollute up to regulatory permissible limits and it must repair all harm found in the Blocks so as to restore the environment "to its original '*background*' condition".⁴⁷⁹ This must be so, according to Ecuador, because (i) Burlington's permissible limits theory is contrary to the Constitution's aim of full restoration,⁴⁸⁰ (ii) the notion of environmental harm is not

⁴⁷⁶ Mr. Alfaro defined background values as follows: "The concept of background value [...] entails the conditions of the facilities without or prior to the hydrocarbons operation". Tr. (Day 3) (ENG), 660:15-18 (Direct, Alfaro).

⁴⁷⁷ R-PHB, ¶¶ 81-150.

⁴⁷⁸ Tr. (Day 1) (ENG), 53:1-8 (Opening, Silva Romero).

⁴⁷⁹ R-PHB, ¶ 81 (emphasis in the original).

⁴⁸⁰ *Id.*, ¶ 83; Tr. (Day 1) (ENG), 48:12-15 (Opening, Silva Romero).

defined in RAOHE and TULAS,⁴⁸¹ which are mere instruments (iii) aimed at regulating the activities of oil operators,⁴⁸² (iv) and at operating as risk management tools,⁴⁸³ which (v) govern administrative liability, not civil liability for harm.⁴⁸⁴ In the end, Ecuador argues that (vi) the significance of a “negative impact” can only be assessed on the specific facts of each case and environmental harm “cannot *per se* be defined through quality standards or permissible limits”,⁴⁸⁵ in particular because RAOHE and TULAS do not differentiate the “types and characteristics of lands (deserts, forest, rainforest, mountains, islands...)”.⁴⁸⁶

271. For Burlington, the background values case has no technical or scientific basis, and only serves to inflate Ecuador’s claims in the arbitration.⁴⁸⁷ In particular, Burlington highlights that IEMS, acting independently, initially applied the permissible limits in RAOHE and TULAS to determine the existence of harm in the Blocks, but was subsequently instructed by Ecuador to apply background values without ever evaluating whether the ecosystem had in fact been impacted.⁴⁸⁸ IEMS further confirmed that if the Consortium were still operating today it would be subject to RAOHE and TULAS, not background values,⁴⁸⁹ and RPS agreed that it is appropriate to consider local regulations when determining volumes of contaminated soils.⁴⁹⁰ According to Burlington, meeting permissible limits avoids environmental harm and it is these limits that determine whether remediation is warranted.⁴⁹¹ While Ecuador failed to present a single example where background values had been applied in practice,⁴⁹² the record is replete with examples where permissible limits were applied, including instances of remediation by Petroamazonas pursuant to RAOHE and TULAS. The 2010 Ex-Post

⁴⁸¹ R-PHB, ¶ 97; Tr. (Day 1) (ENG), 48:15-18 (Opening, Silva Romero).

⁴⁸² R-PHB, ¶ 114; Tr. (Day 1) (ENG), 50:1-5, 50:20-51:1 (Opening, Silva Romero).

⁴⁸³ R-PHB, ¶ 125.

⁴⁸⁴ *Id.*, ¶ 137; Tr. (Day 1) (ENG), 51:1-6 (Opening, Silva Romero).

⁴⁸⁵ R-PHB, ¶ 141.

⁴⁸⁶ *Id.*, ¶ 146.

⁴⁸⁷ C-PHB, ¶ 98.

⁴⁸⁸ *Id.*, ¶¶ 8, 79, 99.

⁴⁸⁹ *Id.*, ¶ 104; Tr. (Day 3) (ENG), 741:12-16 (Cross, Alfaro).

⁴⁹⁰ C-PHB, ¶ 105; Tr. (Day 4) (ENG), 1075:19-1076:2 (Cross, Crouch).

⁴⁹¹ C-PHB, ¶ 101.

⁴⁹² *Id.*, ¶ 102.

Studies also evaluated the environmental condition of the Blocks under regulatory criteria.⁴⁹³ In addition, Burlington argues that IEMS applied a flawed methodology for calculating background values of metals resulting in 84 percent of IEMS’s clean samples being deemed contaminated.⁴⁹⁴ In the end, Burlington submits that “[r]emediation must be limited to those soils that exceed Ecuador’s protective regulatory limits”, and therefore Ecuador’s background case should be dismissed in its entirety.⁴⁹⁵

4.1.2 Discussion

272. The Tribunal will first ascertain the meaning of environmental harm within the Ecuadorian regulatory framework (Section a) and then address Ecuador’s argument that background values provide the relevant threshold for determining the existence of environmental harm (Section b).

a. Environmental harm under Ecuadorian law

273. The Tribunal starts its analysis by noting that neither the 2008 Constitution, nor RAOHE or TULAS contain a definition of environmental harm. Paragraph 2 of Article 396 of the Constitution provides that any environmental harm triggers the duty to fully restore the affected ecosystem. It reads in relevant part:

“All damage to the environment, in addition to the respective penalties, shall also entail the obligation of integrally restoring the ecosystems and compensating the affected persons and communities”.⁴⁹⁶

274. The Tribunal further observes that Article 71 of the Constitution states that nature has the “right to integral respect for its existence and for the maintenance and regeneration of its life cycles, structure, functions and evolutionary processes”, and Article 72 provides for nature’s “right to be restored”. This latter provision further stipulates that in cases of “severe or permanent environmental impact” caused *inter alia* by the

⁴⁹³ *Id.*, ¶ 103, referring to: Coca Ex-Post Environmental Impact Study (**Exh. CE-CC-241**); Mono Ex-Post Environmental Impact Study (**Exh. CE-CC-242**); Oso Ex-Post Environmental Impact Study (**Exh. CE-CC-236**); Yuralpa Ex-Post Environmental Impact Study (**Exh. CE-CC-244**); Waponi Ex-Post Environmental Impact Study (**Exh. CE-CC-243**).

⁴⁹⁴ C-PHB, ¶¶ 106-107.

⁴⁹⁵ *Id.*, ¶ 109.

⁴⁹⁶ Article 396(2), 2nd sentence of the 2008 Constitution (**Exh. C-413**) (Translation by the Claimant). The translation provided by Ecuador reads as follows: “Any harm to the environment, in addition to the corresponding sanctions, shall also give rise to an obligation to fully restore the ecosystems and compensate the individuals and communities affected” (**Exh. P-12**).

exploitation of nonrenewable resources, “the State shall establish the most effective mechanisms to achieve the restoration and shall adopt adequate measures to eliminate or mitigate harmful environmental consequences”.⁴⁹⁷

275. Article 397 further states that, in case of environmental harm, the State is to act immediately to ensure the restoration of affected ecosystems, and that, in addition to sanctions, “the State shall file against the operator of the activity that produced the damage proceedings for the obligations entailing integral reparation, under the conditions and on the basis of the procedures provided for by law”.⁴⁹⁸ Thus, under the 2008 Constitution, any environmental harm triggers the duty of full restoration but *under the conditions and on the basis provided for by law*. The concept of integral or full restoration has been addressed in various instances. The *travaux préparatoires* of the 2008 Constitution indicate, for example, that full restoration means returning things to their original state (“*volver las cosas a su estado original o a su lugar*”).⁴⁹⁹ And in *Aguinda*, the National Court of Justice held that integral reparation served to achieve the ultimate finality of “global restoration of environmental goods”.⁵⁰⁰ In sum, the Constitution does not define environmental harm, but states that such harm must be fully restored according to the conditions set out in the law. The Tribunal therefore finds no support for Ecuador’s argument that the notion of full reparation or full restoration under the 2008 Constitution mandates a return to pre-human conditions or, as Ecuador

⁴⁹⁷ The Tribunal notes Ecuador’s representation that Article 72 “only pertains to environmental disasters, such as Chernobyl, where the State has a duty to intervene without awaiting the operator’s actions”. R-PHB, ¶ 105.

⁴⁹⁸ Article 397 (**Exh. C-413**) (Translation by the Claimant). The translation provided by Ecuador reads as follows: “In the event of environmental harm, the State shall act immediately and subsidiarily to ensure the health and the restoration of the ecosystems. In addition to the corresponding sanction, the State shall seek restitution from the operator of the activity that produced the harm for the obligations entailed by full reparation, under the conditions and on the basis of procedures established by law” (**Exh. P-12**).

⁴⁹⁹ Minority Report of the Assembly member Sergio Chacón Padilla on the rights of Nature (**Exh. EL-230**); Majority Report on the rights of Nature (**Exh. EL-231**). The Ministerial Agreement No. 169 (2012) defines “integral restoration” and “integral reparation”. Integral restoration, as a right of nature, is defined in relevant part as a return “to the conditions set forth by the environmental authority that ensure the reestablishment of natural balances, cycles and function”. Integral reparation is defined in relevant part as the “[s]et of actions, processes and measures that, when comprehensively applied, tend toward reverting environmental damage and liabilities through the reestablishment of the quality, dynamics, ecological balance, life cycles, structure, functioning and evolutionary process of the affected ecosystems”. Ministerial Agreement No. 169 (2012), published in Official Register No. 655 of 7 March 2012, Article 1 (**Exh. CA-CC-53**).

⁵⁰⁰ *Aguinda v. Chevron*, p. 141 (**Exh. EL-233**).

puts it, the return to a state of the environment “prior to any form of contamination”.⁵⁰¹ In the end, Ecuador’s reliance on the notion of full restoration sheds no light on the notion of environmental harm. The question remains whether relying on permissible limits to define environmental harm would be contrary to the 2008 Constitution as Ecuador contends.⁵⁰²

276. The notion of environmental harm is defined in the glossary of the EML, which also contains definitions of the terms contamination and environmental impact.⁵⁰³ Environmental harm is defined as:

“any significant loss, decrease, detriment or impairment to the preexisting conditions in the environment or one of its components. It affects the functioning of the ecosystem or the renewability of its resources”.⁵⁰⁴

277. Accordingly, environmental harm is more than a mere “negative impact” (as argued by Ecuador), it implies a *significant* loss or impairment. Ecuador’s definition also fails to capture *de minimis* or socially and environmentally tolerable impacts, that is, as IEMS puts it, impacts which do not “significantly [affect] human health or the environment”.⁵⁰⁵ The second sentence of the EML definition provides some criteria for determining when

⁵⁰¹ R-PHB, ¶ 96.

⁵⁰² R-PHB, ¶ 83.

⁵⁰³ Contamination is defined as: ““The presence in the environment of substances, elements, energy or a combination thereof, the concentration and permanence of which are higher or lower than those prescribed by the laws in force”. Environmental impact is defined as: “The positive or negative alteration of the environment, caused directly or otherwise by a project or activity in a given area” (Translations by the Tribunal) (**Exh. CA-CC-33**).

⁵⁰⁴ Translation by the Tribunal. A similar definition is provided in Article 1 of Ministerial Decree No. 169: “Environmental harm: It is the negative environmental impact on the environmental conditions present in a given space, caused by the conduct of development projects, leading to an imbalance in the functioning of ecosystems and altering the supply of the services that such ecosystems contribute to society” (Translation by the Tribunal) (**Exh. EL-228**).

⁵⁰⁵ Ecuador’s experts from IEMS explained in their first expert report that the “need to use comparison criteria is based on the fact that, on properties that are used for productive purposes related with petroleum activities, we tolerate certain concentrations of contaminants without altering its functions, and without significantly affecting human health and the environment. Furthermore, the presence of contaminants resulting regularly from petroleum activities, in tolerable quantities and concentrations, represents a [sic] alteration of little relevance compared with the other alterations caused by the same productive activity (deforestation, noise, modification of the hydrological environment, etc.). Therefore, the comparison criteria (which, in this case in particular, consist in the permissible limits set forth in the Ecuadorian legislation), make it possible to establish whether the presence of contaminants at certain levels and components of the environment (soil, surface water, and underground water) is tolerable”. IEMS ER1, p. 20.

an environmental impact is “significant” and thus constitutes environmental harm, namely when it “affects the functioning of the ecosystem or the renewability of its resources”.

278. Neither Party has put much emphasis on the second sentence in the definition. Burlington has tendered evidence showing that the permissible limits in RAOHE and TULAS pose no risk to human health,⁵⁰⁶ but has not otherwise sought to demonstrate that compliance with these standards is sufficiently protective to ensure the ecosystem’s functioning and the renewability of its resources. For its part, Ecuador has offered a preliminary analysis of certain macro-invertebrates,⁵⁰⁷ but has otherwise not provided an ecological risk assessment or any other analysis of possible impacts of the Consortium’s operations on the ecosystem of the allegedly contaminated sites. The Tribunal will thus form its opinion on the background values case on the basis of other elements in the record.

279. In this context, the Tribunal notes that the EML not only provides a definition of environmental harm, it also refers to permissible limits. Article 1 states that the EML establishes principles and guidelines of environmental policy, determines obligations and responsibilities, and “indicates the permissible limits, controls and sanctions in this matter”. Moreover, Article 33 stipulates that “environmental quality parameters” shall be established as “instruments for the application of environmental norms”, which shall be “governed by the respective regulation”.⁵⁰⁸ This provision tends to support the proposition that RAOHE and TULAS refine and implement the general provisions of the EML.

280. The Tribunal further notes that Ecuador’s adoption in 1999 of the definition of environmental harm in the EML, was followed shortly thereafter by revisions to the permissible limits in RAOHE in 2001 and by the adoption of limits in TULAS in 2003. It

⁵⁰⁶ GSI ER1, App. E (Evaluation of Potential Human Health Risks Associated with Environmental Conditions).

⁵⁰⁷ IEMS ER4, Att. 25.

⁵⁰⁸ Article 33 EML reads as follows: “The following shall be established as instruments for the application of environmental norms: environmental quality parameters, rules on effluents and emissions, technical rules on product quality, system of administrative permits and licenses, environmental impact assessments, lists of contaminating products harmful to human health and the environment, environmental quality certification of products, services and others to be *governed by the respective regulation*” (emphasis and translation by the Tribunal) (**Exh. CA-CC-33**).

is also particularly noteworthy that the definition of environmental harm under the EML, as well as the permissible limits under RAOHE and TULAS, remained unchanged following the adoption of the 2008 Constitution.

281. It is also relevant that RAOHE Table 6 and TULAS Table 3 apply specifically to soil contamination and remediation. RAOHE Table 6 is entitled “Permissible limits for the identification and remediation of contaminated soils in all phases of the hydrocarbons industry”. In this context, it is noteworthy that the glossary in RAOHE Annex 6 defines permissible limits as the “maximum value of concentration of element(s) or substance(s) in the different components of the environment, *determined through standardized methods, and regulated through legal instrument*”.⁵⁰⁹ Article 4.2.2 of TULAS which comprises TULAS Table 3 is similarly entitled “Soil Remediation or Restoration Criteria”, further specifying that the values in Table 3 aim at “establish[ing] the maximum contaminant concentration levels for soil in the process of remediation or restoration”.⁵¹⁰

282. The Tribunal agrees with Ecuador that the constitutional duty of full or integral restoration is not in all cases necessarily exhausted by referring to permissible limits under RAOHE and TULAS, but it cannot agree with Ecuador’s position that remediating back to permissible limits for the relevant parameters set out in these regulations would be unconstitutional.

283. Harm to the environment could indeed be caused in a myriad of different ways, but in the Tribunal’s view, when it comes to allegations of soil contamination by one of the parameters set out in RAOHE Table 6, then the dividing line between impact and harm (or between *impacto ambiental* and *daño ambiental*) is encapsulated in the very notion of permissible limits.

b. The subsidiary nature of background values

284. It is only when there is soil contamination by an element not contemplated in RAOHE Table 6, such as for instance barium or arsenic, that recourse must be had to supplementary means such as TULAS, which contains permissible limits for additional parameters, and otherwise enshrines rules prescribing recourse to background values

⁵⁰⁹ Translation and emphasis added by the Tribunal. RAOHE, Annex 6, Glossary (**Exh. EL-174**).

⁵¹⁰ TULAS, Article 4.2.2 (**Exh. EL-173 (EN) 0009**).

as a subsidiary means to determine the proper remediation standard. Of particular relevance in cases of soil contamination is Article 4.1.3.3 of TULAS, which specifically contemplates having recourse to background values only in the absence of a parameter in TULAS or in case of inapplicability of a certain parameter:

“In case of the inapplicability for the specific case of any parameter established in the present regulation, or in case of the absence in the regulation of a relevant parameter for the soil under study, the Environmental Control Entity shall adopt the following evaluation criteria: The regulated entity must establish the background or reference value of the parameter of interest present in the soil. The regulated entity shall determine the present or current concentration of the parameter under study in the affected area. It shall then proceed to compare the obtained results for the concentration present in the soil against the background values. In general, it is considered that a present concentration greater than three times the background value for the soil denotes contamination that requires immediate attention on the part of the Environmental Control Entity”⁵¹¹

285. Accordingly, recourse to background values is subsidiary and only permitted in two cases, namely when a specific parameter is inapplicable or the absence of a relevant parameter, an issue to which the Tribunal will revert further below. In contrast to the regime established in RAOHE, TULAS further differentiates between screening criteria and remediation criteria by stating that any concentrations exceeding three times the mean background value (screening criteria or action level) must be remediated back to 1.5 times the background value (remediation criteria).

“If the concentration is found to be three times higher than the background value, the Environmental Control Entity shall give immediate attention to this situation and must oblige the regulated entity to remediate the soil until the present concentration is less than or equal to 1.5 times the background value”⁵¹²

286. This provision not only demonstrates the subsidiary or residual nature of recourse to background values to determine remediation criteria, but also puts to rest Ecuador’s thesis that Burlington must remediate any alleged harm back to background values, since any remediation would *ex hypotesi* be limited to reducing any contamination present in soils to 1.5 times the mean background value of the relevant parameter. In

⁵¹¹ TULAS, Book VI, Annex 2, Article 4.1.3.3 (**Exh. EL-173 (EN) 0006**). A similar rule relating to marine water discharges can be found in Article 4.2.3.10 of Book VI, Annex I of TULAS.

⁵¹² TULAS, Book VI, Annex 2, Article 4.1.3.3 (**Exh. EL-173 (EN) 0006**).

sum, in addition to the fact that Ecuador has not pointed to a specific provision in its legal order which would mandate having recourse to background values as remediation criteria, the existing references to background values in Ecuadorian law have a much more limited scope of application than suggested by Ecuador.⁵¹³

287. Two further considerations are of relevance here, namely the actual practice in Ecuador when it comes to the remediation of environmental harm and the methodology initially adopted by Ecuador's experts from IEMS. With respect to actual practice, the Tribunal notes that Ecuador has not provided a single example where background values have been applied in practice. All remediation reports in the record show that instances of contamination were remediated back to permissible limits as specified in RAOHE and TULAS, be that before or after the promulgation of the 2008 Constitution.⁵¹⁴ The *Los*

⁵¹³ For instance, Table 2 in TULAS, Book VI, Annex 2 sets out soil quality criteria, which are defined in Article 4.2.1 as "approximate background values or analytic detection limits" serving as representative environmental values of a contaminant in the soil reflecting natural geological variations in non-developed areas or areas free of industrial or urban activities. Accordingly, Table 2 only sets out approximate background values, but does not spell out remediation criteria or otherwise provide any insight into what amounts to environmental harm under Ecuadorian law.

⁵¹⁴ For practice in the Blocks during the Consortium's operatorship see, for instance: Letter of 28 January 2003 from Luis Cobos (Perenco) to Edgar López (DINAPA) attaching the Remediation Program for Block 7, including Coca-Payamino field, p. 4 (**Exh. CE-CC-51**) ("The objective of remediation is to decrease the concentration of contaminants to minimal levels specified in the 'Industrial Use' column in Table 6 of the Environmental Regulation" (Translation by the Tribunal)); Letter of 13 June 2003 from Vicente Inepa (Ministry of Energy and Mines) to Luis Cobos (Perenco), approving the Block 7/CPUF remediation plan (**Exh. CE-CC-57**); Remediation report on incident in Mono CPF, including subsequent communications and approvals, July to October 2008, p. 4 (**Exh. CE-CC-334**) ("The [remediation] procedure shall be carried out in the operator's facilities prepared to such effect at Jaguar Station until the soil meets the parameters set forth in Table 6 of Annex 2 of the RAOHE (1215)" (Translation by the Tribunal)); Final report by the Consortium on the remediation following a spill incident in a flow line at Oso 2 on 26 May 2007 (**Exh. E-432**) ("Laboratory results attained the minimum value set forth in Table 6 of Annex 2 of RAOHE (1215)" (Translation by the Tribunal)).

For practice in other Blocks in Ecuador, see: Final Report of the Environmental Remediation of the Spill from the Flow Line at the Sacha 161 Well, 2008, p. 7 (**Exh. CE-CC-161**) ("The purpose of the bioremediation program is to decontaminate the area impacted by the spill occurred in the flow line of the platform of the Sacha 161 Well to concentrations below the permissible limits established for the different parameters set forth in [RAOHE Table 6] for soils for agricultural use" (Translation by the Tribunal)).

For practice post-dating the 2008 Constitution, see: Ecuambiente Consulting Group, Bioremediation Report of Contaminated Soils Generated in the OCP Spill, January 2010, p. 1 (**Exh. CE-CC-231**) ("The project for remediation of contaminated soils in the OCP spill shall comply with the provisions of [RAOHE] Table 6 which determines the permissible limits and parameters to be controlled in the remediation of contaminated soils in all phases of the hydrocarbon industry" (Translation by the Tribunal)); Ministry of the Environment, Remediation of Environmental Impact in the Amazon District from the Spill from the Well Shushuqui 13 Flow

Vencedores case is particularly apposite here since it deals with a 12-barrel crude spill that occurred in Block 7 on 11 June 2009 when the Consortium was still operating the Blocks. The court in that case repeatedly referred to permissible limits in RAOHE Table 6 and ultimately found that Perenco had properly remediated the spill within those permissible limits.⁵¹⁵ The same can be said of the environmental audits in the record, whether commissioned by the Consortium or by Petroamazonas, which identify environmental conditions by reference to permissible limits.⁵¹⁶ Interestingly, the court in *Los Vencedores* also referred to numeral 11 of Article 1 of the preliminary title of TULAS (which was not added to the record by Ecuador), which expressly refers to permissible limits and indicates that the duty to repair and restore the environment arises once these limits are exceeded.⁵¹⁷

Line, September 2011, pp. 89-89 (**Exh. CE-CC-257**) (“The analyses conducted on the soils of the area directly affected by the spill show that TPH levels are not high, but that they nonetheless exceed the levels established by the regulation 1215 [i.e., RAOHE]” (Translation by the Tribunal)); Final Report of clean up and remediation of the Shushuqui 16 well by Garner Environmental Services (**Exh. E-429**).

See also: Dirección de Investigaciones y Proyectos Académicos de la Universidad de Guayaquil, Procedural Manual for Remediation of Contaminated Zones Affected by the Hydrocarbons Industry, March 2011, p. 14 (**Exh. CE-CC-253**) (“The policies or rules used have been based on [RAOHE] Table 6 [...], which deals with permissible limits for the identification and remediation of contaminated soils” (Translation by the Tribunal)).

⁵¹⁵ The court held in relevant part: “By reason of the above, and given that it was established through the laboratory analysis of soil as well as water samples taken at the location of the incident, that the permissible limits set forth in Tables 4a, 4b and 6 of the Substitute Regulation for the Environmental Regulation for Hydrocarbons Operations, contained in Executive Decree No. 1215, were not exceeded; and it having been proven that Mr. Enrique Galarza, the person directly affected, was compensated, we conclude that the objection regarding the nonexistence of environmental damage proposed at the conciliation hearing has been established”. *Los Vencedores*, pp. 8-9 (English version) (**Exh. CA-CC-57**).

⁵¹⁶ Coca Ex-Post Environmental Impact Study (**Exh. CE-CC-241**); Mono Ex-Post Environmental Impact Study (**Exh. CE-CC-242**); Oso Ex-Post Environmental Impact Study (**Exh. CE-CC-236**); Yuralpa Ex-Post Environmental Impact Study (**Exh. CE-CC-244**); Waponi Ex-Post Environmental Impact Study (**Exh. CE-CC-243**).

⁵¹⁷ *Los Vencedores*, ¶ 5.4 (English version) (**Exh. CA-CC-57**). Numeral 11 of Article 1 of the preliminary title of TULAS reads in relevant part: “Without prejudice to addressing environmental issues as a whole, including related legal regulations, special priority shall be given to prevention and control, so as to prevent environmental damage resulting from degradation of the environment and contamination, making sure that permits are obtained in advance, that tolerance limits for each substance are established, and that the State monitors and controls all activities that are potentially degrading and/or contaminating. Degradation and contamination as illegal acts (*once the permissible limits are exceeded*) shall be grounds for penalizing infringers *and imposing on them the obligation to repair the damage caused and restore the environment or natural resource affected*” (emphasis added by the Tribunal).

288. It is also noteworthy that the 32 Environmental Impact Statements and Environmental Management Plans issued since 2001 for both Blocks (that is, after Decree 1215 was enacted) and reviewed by GSI show that RAOHE and TULAS were consistently referred to as the applicable regulations.⁵¹⁸ GSI further pointed to 20 remediation projects undertaken in other Blocks in the Oriente region, all of which applied regulatory criteria under RAOHE Table 6 and none requiring remediation back to background levels.⁵¹⁹
289. Of further relevance is the fact that Ecuador's own expert IEMS initially sought to determine the environmental conditions of the Blocks by reference to the permissible limits in RAOHE and TULAS,⁵²⁰ before being instructed by Ecuador to apply background values on the grounds that permissible limits were not sufficiently protective of the environment.⁵²¹ Ecuador admitted at the Hearing that it instructed IEMS to apply background values⁵²² and explained that IEMS employed permissible limits in RAOHE and TULAS during its first sampling campaign "for the sake of information only", since IEMS did not yet have the reference background values at its disposal.⁵²³ IEMS

⁵¹⁸ GSI ER1, App. B.1. See also: GSI ER1, p. 39. The Tribunal notes that Appendix B.1 contains a list of 52 Environmental Impact Studies and Environmental Management Plans spanning from February 1991 to September 2011, and of which 21 were generated by the Consortium. Of those generated by the Consortium, 5 do not specify what regulatory criteria are used for soil quality; 4 refer only to RAOHE Table 6; 1 only to TULAS Table 2; 8 to RAOHE Table 6 and TULAS Table 2; 2 to RAOHE Table 6 and TULAS Table 3; and 1 to RAOHE Table 6 and TULAS Tables 2 and 3.

⁵¹⁹ GSI ER1, App. B.2. See also: GSI ER1, pp. 39-40.

⁵²⁰ IEMS ER1, p. 25.

⁵²¹ Tr. (Day 3) (ENG), 710:20-711:5, 711:20-712:5 (Cross, Alfaro). IEMS put it in the following terms: "We received instructions to apply a criterion that would be compatible with the restoration back to original conditions. And to us that, that meant background levels".

⁵²² Tr. (Day 1) (ENG), 47:15-20 (Opening, Silva Romero). Counsel for Ecuador stated the following: "Ecuador fails to see how in this case it could be disputed that all environmental harm should be repaired so as to restore the site to its original, natural condition, and this is the reason why IEMS, the technical experts of Ecuador, were instructed to employ 'background values'".

⁵²³ SMCC, note 145. Ecuador indicated that: "For the sake of information only, IEMS analyzed the collected soil samples in accordance with the parameters set forth in the Ecuadorian regulations (RAOHE and TULAS). Nevertheless, it stresses that the correct criteria to be applied in order to guarantee the full reparation of the damage [...] are the real Reference Values. At the time of its first report, IEMS did not have the Reference Values yet, reason why it applied the criteria provided in the regulations for comparative purposes".

moreover opined that Ecuadorian benchmarks are “arbitrary” and “not sufficiently protective of the health of the people who live in the area”.⁵²⁴

290. Whatever the merits of these explanations, it remains that IEMS chose to use regulatory limits in its first report and then shifted to background values under the pretext that, in its expert opinion, the regulations were not protective enough, but in reality because it was instructed to do so.⁵²⁵ As to Ecuador’s argument that its own regulatory limits are not sufficiently protective of the environment or human health, the Tribunal observes that Ecuador set the permissible limits in RAOHE and TULAS further to the adoption of the EML, that it did not amend these limits following the entry into force of the 2008 Constitution, and that it is not for the Tribunal to modify Ecuador’s duly enacted regulatory framework in place of the competent authorities. The same applies to Ecuador’s argument that its regulations are deficient since they do not differentiate between various ecosystems in Ecuador, and that the Amazon region should find particular protection. As already noted above, the 2008 Constitution makes special reference to the Amazon region and this element will be of some relevance when it comes to determining the applicable land use, but here again it falls within the remit of the Ecuadorian authorities to set different criteria for the Amazon region, if they so wish; it is not for this Tribunal to do so.

291. In light of the foregoing, it is the Tribunal’s view that environmental harm is defined by reference to regulatory criteria. In the case of oilfield operations, these regulatory criteria are to be found primarily in RAOHE, and subsidiarily in TULAS. In other words,

⁵²⁴ IEMS ER3, p. 38.

⁵²⁵ For instance, in its third expert report, IEMS stated that “[i]n this case, to determine whether a site was contaminated, the comparison criterion that was considered, *according to our technical opinion*, was the concentrations of the substance in question that were found in a natural state in areas not affected by hydrocarbon activity (called ‘background levels’ or ‘benchmarks’); if background levels are exceeded, it has been shown that the operations conducted had a negative impact on the environment, that is, that there had been an alteration of the natural state, which should be restored”. IEMS added that “[i]n the opinion of an IEMS expert, the benchmarks stipulated in Ecuadorian law [...] should not be used generally to determine liability [because] [t]he allowable limits established in [TULAS] do not appear to be based on criteria aimed at the protection of the health of the ecosystem or persons who reside in the impacted area and, therefore, the effectiveness of such limits appears to be limited. The amounts expressed in the regulations appear to be defined in a manner better characterized as arbitrary” and “[i]n the opinion of the IEMS expert [...], the obligation to conduct cleanup and/or environmental restoration operations should be based on benchmark concentrations obtained through evaluations of the risk to human health and the environment”) (emphasis added). IEMS ER3, pp. 36-38.

an oilfield operator could not be considered to have caused environmental harm if permissible limits were observed, since precisely these permissible limits allow determining when a negative impact crosses the threshold of harm.

292. Consequently, the Tribunal will resort to RAOHE and TULAS to define harm under the EML. Hence, the limits set out in these regulations establish when impacts become significant, and thereby become harm, thus allowing the inference that these limits determine when the functioning of the ecosystem or the renewability of its resources are affected.⁵²⁶ In other words, any exceedance of applicable limits triggers extra-contractual civil liability and the ensuing obligation of full restoration back to these limits, independently from parallel administrative liability and possible sanctions.
293. Having rejected Ecuador's background values case, the Tribunal will now assess the regulatory criteria cases presented by the Parties respectively, starting with the applicable permissible limits for soil remediation and thereafter setting out the applicable land use criteria. Following its analysis for soil remediation, the Tribunal will address the applicable regulatory framework for mud pits and for the alleged groundwater contamination.

4.2 Permissible limits for soil remediation

294. Turning to Ecuador's alternative case for soil remediation based on regulatory criteria, the Tribunal must now determine which standards apply to the allegedly impacted areas in the Blocks. The Parties agree that under the regulatory criteria scenario, RAOHE Table 6 applies for soil remediation, but they disagree whether the values in that table must be adjusted to higher natural values and, if so, what the proper values should be (4.2.2). They further disagree whether TULAS Table 2 (as Ecuador contends) or Table 3 (as Burlington contends) applies for parameters not contemplated in RAOHE Table 6 (4.2.1).⁵²⁷

⁵²⁶ See IEMS's statement that "we tolerate certain concentrations of contaminants without altering its [i.e., the environment's] functions, and without significantly affecting human health and the environment". IEMS ER1, p. 20.

⁵²⁷ Ecuador's experts from IEMS indicated that "[s]ince at this point, there is no remediation taking place, it is not clear that Table 3 levels can be asserted proactively as a maximum contaminant level". IEMS ER4, p. 43.

4.2.1 Applicable table under TULAS for soil remediation

295. TULAS Table 2, entitled “soil quality criteria”, is part of Article 4.2.1 and sets out soil quality criteria for different “parameters” or substances. Article 4.2.1 defines soil quality criteria as “approximate background values or analytical detection limits for a contaminant in the soil”. It further provides that background values “refer to the representative environmental levels for a contaminant in the soil” and that these values “reflect the natural geological variations of undeveloped areas or areas free of the influence of generalized industrial or urban activities”. In other words, Table 2 only provides for approximate background values reflecting natural variations in undeveloped areas. By contrast, Table 3 is entitled “Soil Remediation or Restoration Criteria” and sets forth the “maximum contaminant concentration levels for soil in the process of remediation or restoration”. In light of the subject matter of the two tables, Table 3 is the proper source for soil contamination parameters not contemplated in RAOHE Table 6.

4.2.2 Adjustment to higher natural values

296. The Tribunal now turns to the need to adjust the permissible limits to account for higher natural values. After setting out the adjusted values adopted by the Parties as well as the justifications provided by the Parties (Section a), the Tribunal will address the methodologies adopted by the Parties to calculate their adjusted values and then establish the adjusted values applicable to the present case (Section b).

a. Parties’ positions

297. The Parties adjusted the permissible limits of various compounds to take into account higher natural concentrations in the soils, but reached different conclusions in great part because they applied different methodologies. The Tribunal will first set out the adjusted values adopted by the Parties ((i) below) and then the justifications provided by the Parties ((ii) below).

(i) The adjusted values adopted by the Parties

298. Ecuador’s expert IEMS collected 192 soil samples in areas not impacted by oilfield operations to calculate the natural concentrations of (i) cadmium, nickel and lead, which

are regulated under RAOHE Table 6,⁵²⁸ and (ii) barium and vanadium, which are regulated under TULAS Table 3.⁵²⁹ In addition to making its own calculations for the values of these compounds, Burlington's expert GSI also calculated the natural value for chromium in Block 7 but not Block 21.⁵³⁰ As a result, each Party adopted the higher values which it had reached as remediation criteria for barium, cadmium, lead, nickel and vanadium.⁵³¹ The relevant values adopted by the Parties are the following.⁵³²

| Chemical | IEMS Soil Criteria (mg/Kg) | | GSI Soil Criteria (mg/kg) | | | | |
|----------------------|----------------------------|----------------------------|---------------------------|------------|--------------|---------------------|-------------|
| | IEMS "Background" Criteria | IEMS "Regulatory" Criteria | Applicable Rule | Industrial | Agricultural | Sensitive Ecosystem | Residential |
| CPUF/ Block 7 | | | | | | | |
| Barium | 213.1 | 639.3 | TULAS | 2000 | 750 | - | 706 |
| Cadmium | 2 | 1.9967 | RAOH | 10 | 3.8 | 3.8 | - |
| Chromium | - | 60 | TULAS | 90 | 65 | - | 65 |
| Lead | 18.41 | 80 | RAOH | 500 | 100 | 80 | - |
| Nickel | 14.41 | 40 | RAOH | 100 | 50 | 40 | - |
| Vanadium | 106.71 | 320.75 | TULAS | 311 | 311 | - | 311 |
| TPH | - | 1000 | RAOH | 4000 | 2500 | 1000 | - |
| Block 21 | | | | | | | |
| Barium | 113.93 | 600 | TULAS | 2000 | 750 | - | 500 |
| Cadmium | 1.775 | 1.775 | RAOH | 10 | 2 | 2 | - |
| Chromium | - | 60 | TULAS | 90 | 65 | - | 65 |
| Lead | 18.41 | 80 | RAOH | 500 | 100 | 80 | - |
| Nickel | 34.13 | 40 | RAOH | 100 | 50 | 47 | - |
| Vanadium | 62.31 | 186.93 | TULAS | 130 | 130 | - | 130 |
| TPH | - | 1000 | RAOH | 4000 | 2500 | 1000 | - |

299. Accordingly, with respect to Block 7/CPUF, the Parties agree that RAOHE Table 6 be adjusted for cadmium, not for lead and nickel, but disagree on the adjusted value and the relevant land use. Ecuador argues that the cadmium value be adjusted to 2 mg/kg for sensitive ecosystems, whereas Burlington argues that the cadmium value be adjusted to 3.8 mg/kg for sensitive ecosystem as well as agricultural use. And with respect to compounds regulated under TULAS, the Parties agree that TULAS Table 3 be adjusted for barium and vanadium, and not for chromium. They disagree, however,

⁵²⁸ Ecuador set the background value for TPH at zero.

⁵²⁹ IEMS also tested for pH and electrical conductivity but Ecuador raised no claim with respect to these two parameters. IEMS ER4, p. 15. See also: IEMS ER4, Att. 4; IEMS ER3, Section IV.1.A, Annex L.4 and Annex Y.

⁵³⁰ GSI ER1, Att. I, p. I.6.

⁵³¹ IEMS ER4, p. 44.

⁵³² For Ecuador, see: IEMS ER4, p. 44, Table 1; RPS ER2, Table 3-2, p. 21. For Burlington, see: GSI ER2, Table 6.

on the adjusted values. Ecuador argues that the barium value for sensitive ecosystem land use should be increased from 500 mg/kg to 639 mg/kg, whereas Burlington argues for an increase to 706 mg/kg. With respect to vanadium, Ecuador's adjusted value of 320.75 mg/kg is higher than Burlington's adjusted value of 311 mg/kg.

300. With respect to Block 21, the Parties disagree on the adjusted value for cadmium for sensitive ecosystems, Ecuador arguing for an increase to 1.77 mg/kg and Burlington to 2 mg/kg. They further disagree on whether the value for nickel for sensitive ecosystems should be adjusted, Burlington arguing that the value for nickel should be increased from 40 mg/kg to 47 mg/kg. In addition, Ecuador calculated the background value for barium at 133 mg/kg and the remediation criteria at 600 mg/kg, while Burlington provided no adjusted value for barium. Finally, Ecuador proposed an adjusted value of 186 mg/kg for vanadium, while Burlington did not adjust the vanadium limit.

(ii) *Justifications*

301. In general terms, the disagreement between the Parties on adjusting regulatory criteria to reflect higher natural concentrations in the soils essentially turns on when a specific TULAS parameter is inapplicable and, when it is, whether the adjusted value should be calculated using the mean value of all samples (as Ecuador and its experts contend) or the 99% upper prediction limit ("UPL") (as Burlington and its experts contend).
302. The approach adopted by Ecuador's experts can be summarized as follows. IEMS gathered 192 samples from the Blocks to calculate the background values.⁵³³ For IEMS, background values under TULAS are determined by calculating the population mean, i.e. the mean of the complete set of samples. IEMS thus calculated the population mean by taking "all particles of soil from the unaffected areas in each block, to average them, and to calculate an average concentration of all the particles".⁵³⁴ Since IEMS did

⁵³³ IEMS ER4, Att. 4.

⁵³⁴ IEMS ER4, p. 16. To take account of the fact that "different populations may have different distributions and different variability" across the two Blocks, IEMS classified the results of soil samples in four groups according to the block and the sample depth in accordance with Chapter 4 of *PROUCL Version 4.0 Technical Guide, EPA/600/R-07/041 (USEPA, 2007)*. IEMS's analysis of variance showed that, except for lead, the parameters were not statistically similar between Block 7 and Block 21. Accordingly, IEMS estimated separately the background levels for Block 7 and Block 21, except for lead where the analysis of variance showed that the results were statistically similar across the Blocks but statistically different between samples less than 1 meter and those below 1 meter. Thus, IEMS estimated separately the background levels for lead

not sample the entire Blocks, it constructed a confidence interval (“CI”) around “a range that contains the population mean with a specified probability”.⁵³⁵ IEMS estimated the 99% CI of the mean concentrations, such that there is, in its opinion, a “99% probability that the true but unknown background mean concentration is below the value presented by IEMS and, conversely, only a 1% probability that it be above”.⁵³⁶ This approach, says IEMS, is “consistent with the provision of TULAS, although slightly more conservative”, since using a 95% CI would result in lower background concentrations thus increasing the size of the contaminated area.⁵³⁷ Thus, for barium in Block 7 for instance, IEMS calculated the population mean to be 183.65 mg/kg, with a 99% CI value set at 213.10 mg/kg whereas a 95% confidence interval would have resulted in a value of 203.21 mg/kg. In other words, if the 99% CI method is chosen, as advocated by IEMS, there is a 99% probability that the background value for barium is below 213.10 mg/kg and a 1% probability that it is above that value.

303. IEMS then compared the values of the 99% CI with the values in TULAS Table 2 and then estimated the adjusted regulatory criteria by multiplying by three the site-specific background value “or 3 times the Table 2 criteria (general background values), whichever was higher”.⁵³⁸ IEMS stressed that, by contrast, GSI’s “selective use of the criteria” by estimating background values as the 99% UPL is “erroneous and unreliable”, since it is “inconsistent with regulatory requirements”.⁵³⁹ For IEMS, no provision states that the background values must be estimated by comparing the 99% UPL to any table in TULAS, let alone to Table 3 as GSI did. Instead of using the 99% UPL, GSI should have calculated the “true population mean” of all 192 samples to estimate the 99% CI.⁵⁴⁰ IEMS further argued that GSI engaged in “biased manipulation”, since the “99th percentile is the value that is above 99% of the dataset”, and thus artificially increased the “tolerance to contamination”.⁵⁴¹ In other words, had

for samples collected at less than 1 meter and for samples collected at more than 1 meter. See: IEMS ER4, p. 18.

⁵³⁵ *Id.*, p. 16.

⁵³⁶ *Id.*, p. 17.

⁵³⁷ *Id.*, pp. 17, 46.

⁵³⁸ *Id.*, p. 46.

⁵³⁹ *Id.*, p. 18.

⁵⁴⁰ *Id.*, pp. 16, 18.

⁵⁴¹ *Id.*, p. 19.

GSI applied a 100% UPL, the background value would have equalled the highest measured value in clean soil samples. Similarly, after GSI eliminated outliers, its 99th percentile approach resulted in a background value that is above 99% of the dataset, and therefore biased and excessively conservative.

304. Ecuador's experts from RPS concur with IEMS that GSI's use of the 99% UPL is inconsistent with the methodology specified in TULAS. RPS explains that remediation criteria for a particular parameter are not applicable if "the remediation criterion for a parameter is less than the background concentration".⁵⁴² In such cases, the "background threshold values" ("BTVs") is equal to three times the mean of the background value. In other words, if concentrations at an oilfield site exceed the BTV, "then remediation is required and the actual cleanup level (remediation criteria) is set equal to 1.5 times the mean of the background data set".⁵⁴³ While GSI's block-specific remediation criteria equal to 3 times the mean background value are correct, RPS argues that GSI should also have shown "the actual remediation criteria as 1.5 times the mean background concentration".⁵⁴⁴ Instead, GSI's approach underestimates the volume of impacted soils to be remediated. In addition, RPS highlights GSI's use of "incorrect values for the background soil concentrations", pointing to discrepancies between the data used by GSI in the ProUCL software with the background soil concentration included in GSI's Table D.18 *Analytical Results for Background Metal Concentrations*.⁵⁴⁵
305. GSI adopts a different approach to estimate background values. While GSI accepts that IEMS's tests may be representative of background soil conditions, GSI criticizes the "fundamental conceptual error" committed by IEMS when calculating their background metals concentrations.⁵⁴⁶ By calculating the 99% upper confidence limit on the mean concentration, GSI considers that IEMS adopted an adjusted mean concentration that is only slightly above the average "but far below the upper range of concentrations

⁵⁴² RPS ER2, p. 18.

⁵⁴³ *Ibid.*

⁵⁴⁴ *Id.*, p. 19.

⁵⁴⁵ *Ibid.* RPS pointed in particular to sample CO11-BKGD1-1.90-2.70 showing a "true barium concentration" of 250 mg/kg, whereas GSI used a value of 1200 mg/kg as background calculations.

⁵⁴⁶ GSI ER1, p. 37.

observed in clean samples”, thus resulting in “approximately 80% of the clean soils at all sites” being declared by IEMS as being contaminated.⁵⁴⁷

306. According to GSI, background values are in practice “commonly established at or near the upper range of observed concentrations (e.g., 99th percentile) of a compound in unaltered “clean soils”.⁵⁴⁸ According to GSI, the use of the UPL is “a well-recognized statistic” that “can be employed as a conservative measure of the upper range of normal metals concentrations”, where UPL is defined “as the value below which a given percentage of the background sample population falls” and corresponds to the “upper end of the normal range of measured background concentration”.⁵⁴⁹ To that end, GSI conducted additional background soil sampling, collecting 91 additional samples, including 12 duplicate samples in the CPUF and Block 7.

307. GSI’s approach can be summarized as follows. As a first step, GSI compiled all background samples in a Microsoft Access database and compared the population distributions of metal concentrations in both Blocks. Using the Wilcoxon-Mann-Whitney statistical test, GSI then determined that the mean background concentrations of all metals, except for lead and nickel in Block 7, were different from those in Block 21, thus justifying evaluating the background soil samples from CPUF/Block7 and Block 21 as “two distinct background populations, representing site-specific conditions”.⁵⁵⁰ Since the comparison of IEMS and GSI samples collected in CPUF/Block 7 presented similar background populations, GSI combined its analytical results with those of IEMS “to create an encompassing background soil dataset (CPUF/Block 7) comprised of 243 unaltered soil samples”.⁵⁵¹

308. As a next step, GSI excluded data outliers from the background populations in the calculation of the UPL by using Rosner’s Outlier Test in the ProUCL software.⁵⁵² GSI

⁵⁴⁷ *Id.*, pp. 38-39.

⁵⁴⁸ *Id.*, App. I, p. I.1. See also: GSI ER1, p. 37 (“According to accepted technical guidelines, “background” levels of metals in soils are commonly established at or near the upper range of the observed concentrations, such that a concentration above this level (i.e., beyond the normal range of observations) may be considered abnormal and possibly indicative of an impact”).

⁵⁴⁹ GSI ER1, pp. 37-38; GSI ER1, App. I., p. I.1, referring to: USEPA 1989, 1992, 2009; Idaho DEQ, 2009; Sara, 2003.

⁵⁵⁰ GSI ER1, App. I, p. I.3. See also: GSI ER1, App. I, Tables I.2 and I.3.

⁵⁵¹ *Id.*, App. I, p. I.3.

⁵⁵² *Id.*, App. I, Attachment I.1.

also used half of the detection value for non-detect concentrations. After deriving the 99% UPL for each data set,⁵⁵³ GSI evaluated the 99% UPL value against the population of metals measured in background soil samples.⁵⁵⁴ It finally proceeded to adjust the soil cleanup criteria based on the applicable regulations in RAOHE and TULAS.⁵⁵⁵ For GSI, the fact that outliers were excluded and more than 1% of clean soil samples exceeded the 99% UPL for several metals (barium, cadmium and nickel), confirms that its approach is conservative.⁵⁵⁶ GSI rebuts IEMS's criticism that outliers should only be removed after careful review and that Rosner's Outlier Test should only be used when data follows a normal distribution, by stating that the inclusion of the outliers would have skewed the 99% UPL towards less conservative estimates.⁵⁵⁷

309. With respect to RAOHE Table 6, GSI considers that the 99% UPL background level is the appropriate cleanup criteria for chemicals for which the relevant 99% UPL background level exceeds the regulatory criteria.⁵⁵⁸ With respect to TULAS, GSI opines

⁵⁵³ GSI explained its approach as follows: "UPLs can be computed using either parametric methods, whereby the data is assumed to display a normal bell-shaped pattern, or non-parametric methods, whereby the data does not exhibit a predictable distribution (e.g., data may be highly skewed towards low or high concentrations). The application of non-parametric statistical methods to normally distributed data is acceptable, although the reverse (application of parametric statistical methods to non-parametric data) is not appropriate [...]. [A]ll metals in the CPUF/Block 7 region and Block 21 displayed non-parametric population distributions, except for lead, which exhibited a normal distribution for both the CPUF/Block 7 region and Block 21, and chromium, which exhibited a normal distribution for CPUF/Block 7. The 99% UPL for each of these metals in the CPUF/Block 7 region and Block 21 was then calculated according to the respective population distribution using the ProUCL Software [...]. Because the nonparametric 99% UPLs for lead in CPUF/Block 7 and Block 21 were actually equal to or lower (i.e., more conservative) than the parametric 99% UPL, the non-parametric 99% UPL statistic has been chosen as a conservative representation of background values for lead in the appropriate geographic areas. In contrast, the parametric 99% UPL for chromium in CPUF/Block 7 was chosen as a conservative representation of the chromium background value in CPUF/Block 7 soils". GSI ER1, Att. I, p. I.4. GSI added that "[w]hen background populations from CPUF/Block 7 and Block 21 contained non-detect measurements, the Kaplan Meier estimation method was used to determine summary statistics (e.g., mean and standard deviation) for the computation of the 99% UPL". GSI ER1, Att. I, p. I.5.

⁵⁵⁴ GSI sought to confirm that the 99% UPLs provide "reasonable estimates of the normal range of metals in background soils". It concluded that based on the small percentage of clean samples exceeding the 99% UPL, this method served as an appropriate estimate of the "typical range of metals in background soils", further confirming that the estimates are conservative. GSI ER1, App. I, p. I.8.

⁵⁵⁵ *Id.*, App. I, p. I.8.

⁵⁵⁶ *Id.*, App. F, p. F.3.1.2.

⁵⁵⁷ GSI ER2, App. F, pp. F.3.1.2-F.3.1.2.

⁵⁵⁸ GSI ER1, App. I, p. I.9; GSI ER2, App. F, pp. F.3.1.7-F.3.1.8.

that IEMS not only misinterpreted TULAS but also misrepresented GSI's approach,⁵⁵⁹ which it explains in the following terms: "for chemicals for which the relevant 99% UPL background level exceeded the regulatory cleanup level provided in TULAS Table 3 (meaning that the cleanup level logically cannot apply), an action level equal to three times the average background concentration measured for that chemical [is to be used] as the appropriate site-specific cleanup level".⁵⁶⁰ Accordingly, this approach not only recognizes that remediation below natural background concentrations is "infeasible", but also that "an additional 'significance' factor" is applied "to more accurately indicate abnormal conditions that may warrant action".⁵⁶¹

310. In other words, since TULAS does not define when a relevant remediation criterion is inapplicable, GSI opined that the "only reasonable interpretation" is that a criterion is inapplicable "when it is less than the observable range of clean background concentrations".⁵⁶² Thus, if the 99% UPL of a given parameter exceeded the remediation criterion, GSI calculated a substitute criterion as mandated by TULAS by (i) establishing the mean background levels, (ii) calculating a substitute criterion by multiplying the mean concentration of the clean background soil samples by three, and (iii) comparing concentrations in the affected area to the substitute criterion to determine if remediation is required.⁵⁶³ By contrast, the effect of IEMS's approach is "absurd" according to GSI, since 84% of IEMS's actual clean samples require cleanup under its approach, which constitutes a "gross overestimate of the cleanup requirements".⁵⁶⁴ By ignoring that TULAS specifically requires that soil measurements must be compared to a substituted criterion that is three times the average background concentration, IEMS erroneously concluded that 84% of clean soils are contaminated.⁵⁶⁵

311. For GSI, RPS also misinterpreted TULAS by claiming that a relevant criterion is inapplicable when the mean value of clean background samples is greater than the

⁵⁵⁹ GSI ER2, App. F, pp. F.3.1.4-F.3.1.5.

⁵⁶⁰ GSI ER1, App. I, p. I.9; GSI ER2, App. F, p. F.3.1.8.

⁵⁶¹ GSI ER1, App. I, p. I.9.

⁵⁶² GSI ER2, App. F, p. F.3.1.4.

⁵⁶³ *Id.*, p. F.3.1.5.

⁵⁶⁴ *Id.*, pp. F.3.1.6-F.3.1.7.

⁵⁶⁵ *Id.*, p. F.3.1.7; C-PHB, ¶ 107.

relevant criterion.⁵⁶⁶ This approach is “irrational” according to GSI, since this would mean that “approximately half of clean samples used to represent naturally occurring background conditions would require remediation under TULAS regulations”.⁵⁶⁷ RPS further misapplied TULAS by claiming that the background threshold value should be calculated using three times the mean background concentration. According to GSI, TULAS instructs that three times the mean value should be used as a replacement regulatory criterion “only when the regulatory criterion provided by TULAS is ‘inapplicable’”.⁵⁶⁸ RPS also misrepresented GSI’s actions when claiming that GSI should have calculated the actual remediation criteria as 1.5 times the mean value of the background concentration.⁵⁶⁹ GSI explained that the volume of impacted soils should be determined by using three times the mean value of the background dataset, and TULAS only requires that this volume of soil should be remediated to 1.5 times the mean background samples.⁵⁷⁰ Accordingly, RPS’s approach for calculating soil remediation criteria violates TULAS, since RPS “replaced the Ecuador criteria with a value equal to 1.5 times the mean background concentration”.⁵⁷¹

b. Discussion

(i) *Preliminary remarks*

312. At the outset, the Tribunal notes that, with slight divergences, both Parties accepted that their background values apply to the entire block, even though the actual background concentrations may vary significantly from one site to another within the same block. The Tribunal further notes that neither Party has pointed to any practice where regulatory criteria have been adjusted to take into account higher natural concentrations in the Blocks.

⁵⁶⁶ *Id.*, p. F.3.2.1.

⁵⁶⁷ *Id.*, p. F.3.2.2.

⁵⁶⁸ *Id.*, p. F.3.2.3.

⁵⁶⁹ *Ibid.*

⁵⁷⁰ *Id.*, pp. F.3.2.3-F.3.2.4 (“TULAS never states that soil samples with concentrations exceeding 1.5 times the mean of background samples must be remediated”).

⁵⁷¹ *Id.*, p. F.3.2.5.

(ii) *Methodologies to adjust values under RAOHE and TULAS*

313. RAOHE Table 6 and Article 4.1.3.3 TULAS allow adapting permissible limits to take into account that natural concentrations of certain chemicals in the soil exceed permissible limits for those substances. However, these two regulations adopt different approaches. RAOHE Table 6 provides for adjusting the Table 6 limits upwards – “se pueden incrementar” – where they are exceeded by natural concentrations.⁵⁷² The use of the word “incrementar” defeats Ecuador’s contention that these limits can also be adjusted downwards. On the other hand, RAOHE Table 6 does not indicate how to assess the natural concentrations or how to adjust the permissible limits to account for these.

314. Article 4.1.3.3 of TULAS adopts a different approach to the adjustment of the remediation criteria:

“In case of the inapplicability for the specific case of any parameter established in the present regulation, or in case of the absence in the regulation of a relevant parameter for the soil under study, the Environmental Control Entity shall adopt the following evaluation criteria: The regulated entity must establish the background or reference value of the parameter of interest present in the soil. The regulated entity shall determine the present or current concentration of the parameter under study in the affected area. It shall then proceed to compare the obtained results for the concentration present in the soil against the background values. In general, it is considered that a present concentration greater than three times the background value for the soil denotes contamination that requires immediate attention on the part of the Environmental Control Entity. [...] The procedure described shall be coordinated and supervised by the environmental control entity”.⁵⁷³

315. This provision goes on to state that the most reliable way to calculate natural concentrations is to collect samples in areas “immediately outside the area under study” with no local contamination. Where there is a “total absence” of such values in the immediate area surrounding the area under study, the background values may be obtained in regional or national areas. More specifically, it provides some indications on the sampling:

⁵⁷² “If the natural (non-contaminated) soils in the area present concentrations higher than the established limits, the values of the respective parameter may be increased to this level, so long as this phenomenon has been statistically verified through monitoring of undisturbed and uninfluenced soils in the same area” (Translation by the Tribunal). RAOHE, Annex 2, Table 6 (**Exh. EL-174**).

⁵⁷³ TULAS, Book VI, Annex 2, Article 4.1.3.3 (**Exh. EL-173 (EN) 0006**).

“In order to determine the background or reference value, at least 5 samples must be taken, if between 5 and 20 samples are taken, the mean value must be selected as the background value”.⁵⁷⁴

316. In sum, with different approaches, both RAOHE and TULAS allow adjusting relevant remediation criteria to take into account higher natural concentrations in soils. On the one hand, RAOHE Table 6 merely states that permissible limits can be adjusted upwards when natural concentrations exceed the regulatory criteria without specifying how this is done. On the other hand, TULAS provides that contamination exists when concentration in the soil is greater than three times the mean background value in case a given parameter is absent or inapplicable. In addition, TULAS provides that background values are to be determined by taking at least 5 samples and that “if between 5 and 20 samples are taken, the mean value must be selected as the background value”.⁵⁷⁵ This formulation is confusing, as it might be read to suggest using another methodology above 20 samples. Since the regulation provides for no alternative methodology, the Tribunal rejects this suggestion. It therefore finds that, where IEMS collected 192 samples, the mean value of these samples must in any event be estimated so as to comply with TULAS.
317. The Parties diverge significantly on the proper methodology for adjusting permissible limits. Ecuador’s experts from IEMS adopted the 99% CI to determine the mean background concentration, whereas Burlington’s experts from GSI held that the proper methodology is to estimate the 99% UPL for each metal in clean background soil samples. In this context, the Tribunal notes that neither RAOHE nor TULAS refer to either methodology, TULAS only referring, as seen above, to the “mean” background value (*valor promedio*).⁵⁷⁶ The Tribunal further notes that GSI, while invoking “accepted technical guidelines”, in particular of the Environmental Protection Agency of the United States but none from Ecuador, indicated that resort to the 99% UPL “can be employed as a conservative measure of the upper range of normal metals concentrations”,⁵⁷⁷ and that it was “*our understanding* [...] that sound technical judgment should be applied in this determination”.⁵⁷⁸ Absent any express stipulation in the regulations, the Tribunal is

⁵⁷⁴ *Ibid.*

⁵⁷⁵ *Id.* (**Exh. EL-173 (EN) 0007**).

⁵⁷⁶ *Ibid.*

⁵⁷⁷ GSI ER1, p. 38 (emphasis added by the Tribunal).

⁵⁷⁸ GSI ER2, App. F, p. F.3.2.2 (emphasis added by the Tribunal).

disinclined to follow GSI's approach and thus relies on IEMS's approach of estimating the 99% CI even if it too is not strictly compliant with TULAS. This is so, because the 99% CI is a slightly more conservative method than the mean value, there being only a 1% probability that the background mean concentration is above the confidence interval calculated by IEMS. Accordingly, the Tribunal will estimate the background values on the basis of the mean background concentration as adjusted by the 99% CI.

(iii) *Adjusted values determined by the Tribunal*

318. With respect to RAOHE, the Tribunal notes that the only divergence between the Parties lies in the cadmium values for both Blocks and the nickel value for Block 21. IEMS accepts that the sensitive ecosystem land use criterion for cadmium be adjusted to 2 mg/kg for Block 7, which is the same criterion for agricultural land use, and to 1.77 mg/kg for Block 21. For its part, GSI estimated the background value for cadmium in Block 7 at 3.8 mg/kg, thus requiring in its view an adjustment of both the sensitive ecosystem and agricultural land use criteria. For nickel, GSI estimated the background value in Block 21 to be 47 mg/kg instead of 40 mg/kg. Consistent with its decision to discard GSI's use of the 99% UPL to estimate background values, the Tribunal will adjust the criteria for cadmium as follows: 2 mg/kg for Block 7 and 1.77 mg/kg for Block 21. Similarly, the Tribunal did not adjust the nickel value for Block 21. This approach is consistent with the few instances of practice that the Tribunal discerned in the record. For instance, the Tribunal observes that in two remediation reports for spills in Oso 2 in 2007 and in Mono CPF in 2008, the applicable cadmium value for agricultural land use was held to be 2 mg/kg and not the 3.8 mg/kg advocated presently by Burlington.⁵⁷⁹
319. With respect to TULAS, there is a first significant disagreement between the Parties on when a specified criterion is inapplicable under TULAS, thus justifying adjusting that criterion to reflect background conditions. For IEMS, a given criterion is inapplicable if the mean background concentrations exceed the criterion provided in TULAS Table 2.⁵⁸⁰ RPS also stated that a remediation criterion is not applicable, for instance, if

⁵⁷⁹ Remediation report on incident in Mono CPF, including subsequent communications and approvals, July to October 2008, pp. 16, 17 and 19 (**Exh. CE-CC-334**); Final report by the Consortium on the remediation following a spill incident in a flow line at Oso 2 on 26 May 2007, pp. 5-9 (**Exh. E-432**).

⁵⁸⁰ IEMS ER4, p. 46.

the remediation criterion for a parameter is less than the background concentration.⁵⁸¹ For its part, GSI indicated that a remediation criterion is to be considered inapplicable under TULAS “when it is less than the observable range of clean background concentrations”, meaning that only if the 99% UPL exceeds the established criterion in Table 3, in which case an adjusted criterion should be established by multiplying by three the mean background concentrations.⁵⁸²

320. TULAS contemplates adjusting remediation criteria in two scenarios, namely in case (i) of the “inapplicability for the specific case of any parameter established in the present regulation”, or (ii) of the “absence in the regulation of a relevant parameter for the soil under study”.⁵⁸³ At the outset, the Tribunal stresses that, while TULAS speaks of the “inapplicability of any parameter” relevant for the specific case, it should properly be interpreted for present purposes as meaning the inapplicability of any criterion for a given relevant parameter (since it would be contradictory to establish new criteria for a parameter which is held to be inapplicable). The Tribunal notes that neither Party argued that in the present case a relevant parameter is absent in TULAS, but that they advocated differing interpretations on when a criterion of a given parameter is inapplicable. In this context, the Tribunal recalls that TULAS Table 3 contemplates four land uses, namely industrial, commercial, agricultural and residential, but does not provide specific criteria for sensitive ecosystem land use. Thus, it may reasonably be considered that the remediation criteria established in TULAS are inapplicable for sensitive ecosystem land use and that new criteria should be established for this hypothesis by following the procedure provided for in Article 4.1.3.3. This also avoids having to choose either agricultural or residential criteria as a proxy for sensitive ecosystem land use.

321. In conformity with its decision not to use GSI’s 99% UPL, the Tribunal also rejects GSI’s interpretation that a given criterion becomes inapplicable only if the 99% UPL value exceeds the relevant criterion set in Table 3. For the Tribunal, the correct approach to establish new or adjusted permissible limits for sensitive ecosystem land use is to multiply the mean background value by three, and to compare the result with the

⁵⁸¹ RPS ER2, p. 18.

⁵⁸² GSI ER2, Att. F, p. F.3.2.2.

⁵⁸³ TULAS, Book VI, Annex 2, Article 4.1.3.3 (**Exh. EL-173**).

relevant criterion set out in TULAS Table 3. This approach does away with GSI's criticism that relying on mean background values would imply that clean samples are considered contaminated, an argument that would hold true for Ecuador's background value case (which was rejected above), but not for Ecuador's regulatory criteria case. Thus, for instance, with respect to barium, IEMS calculated a mean background value (adjusted to the 99% CI) of barium in Block 7/CPUF of 213.10 mg/kg, meaning that the permissible limit for barium in that block is 639.30 mg/kg. This value appears reasonable when compared to the permissible limit of 750 mg/kg for agricultural land use and 500 mg/kg for residential land use.⁵⁸⁴

322. The issue is somewhat different with respect to vanadium in Block 7, the only other parameter where the Parties disagree on the adjusted value. They concur, however, that the permissible limits for all relevant land uses should be adjusted upwards. This is thus truly a case where the regulatory remediation criteria need adjustment. For the Tribunal, a given criterion becomes inapplicable if (i) the mean background value exceeds the soil quality criterion established in Table 2 and (ii) the newly adjusted criterion calculated as three times the mean background value exceeds any given permissible limit. Thus, for vanadium, the relevant criteria for the contemplated land uses (i.e., industrial and agricultural) must be adjusted since the mean background value calculated by IEMS of 106.71 mg/kg exceeds the 25 mg/kg criterion established in Table 2. Here too, the Tribunal will rely on IEMS's mean background value of 106.71 mg/kg, thus adjusting the applicable permissible limit to 320.75 mg/kg.⁵⁸⁵ The Tribunal also adopts this value for sensitive ecosystem land use. Although this value is somewhat higher than the one calculated by GSI (i.e., 311 mg/kg), the Tribunal notes that it does not make any difference in terms of actual volumes of soils to be remediated since there are no samples showing vanadium values in between those proposed by either Party. For the same reasons, the Tribunal adopts Ecuador's

⁵⁸⁴ The Tribunal notes that for Block 21, IEMS estimated the mean background value for barium at 113.93 mg/kg, but multiplied the barium value of 200 mg/kg in Table 2 by three to calculate a permissible limit of 600 mg/kg for sensitive ecosystem land use. GSI calculated the 99% UPL at 163 mg/kg. Since Burlington did not specifically challenge Ecuador's use of 600 mg/kg for sensitive ecosystem land use, instead arguing that the primary land use in Block 21 is agricultural, the Tribunal accepts IEMS's value of 600 mg/kg for sensitive ecosystem land use in Block 21.

⁵⁸⁵ While 3×106.71 equals 320.13, IEMS uses 320.75 (IEMS ER4, Att. 38), which the Tribunal will employ as well.

adjusted value of 186 mg/kg for vanadium in Block 21 for agricultural and industrial land uses, as well as for sensitive ecosystem land use.

323. Finally, the Tribunal rejects RPS’s approach of calculating the remediation criteria as 1.5 times the mean background value concentrations, since the volume of contaminated soils is determined on the basis of the adjusted permissible limit (i.e., a multiple of three of the mean background value), not the adjusted remediation criteria set in TULAS (i.e., a multiple of 1.5 of the mean background value). As GSI correctly stressed, “TULAS never states that soil samples with concentrations exceeding 1.5 times the mean of background samples must be remediated”, since this would lead to an overestimation of the volume of soil requiring remediation.⁵⁸⁶

324. On this basis, the Tribunal has determined that the applicable remediation criteria are as follows (the adjusted criteria are in bold):

- Under RAOHE for Block 7

| Parameter | Ecuadorian Regulation | Regulatory Criteria SE/Agr/Ind | Ecuador’s adjusted value | Burlington’s adjusted value | Tribunal’s adjusted value | Adjusted Criteria SE/Agr/Ind |
|-----------|-----------------------|--------------------------------|--------------------------|-----------------------------|---------------------------|------------------------------|
| Cadmium | RAOHE Table 6 | 1/2/10 | 2 | 3.8 | 2 | 2/2/10 |
| Lead | RAOHE Table 6 | 80/100/500 | 80 | 80 | 80 | 80/100/500 |
| Nickel | RAOHE Table 6 | 40/50/100 | 40 | 40 | 40 | 40/50/100 |

- Under TULAS for Block 7

| Parameter | Ecuadorian Regulation | Regulatory Criteria Res/Agr/Ind | Ecuador’s adjusted value | Burlington’s adjusted value | Tribunal’s adjusted value | Adjusted Criteria Res/SE/Agr/Ind |
|-----------|-----------------------|---------------------------------|--------------------------|-----------------------------|---------------------------|---|
| Barium | TULAS Table 3 | 500/750/2000 | 639 | 706 | 639 | 500/ 639 /750/2000 |
| Chromium | TULAS Table 3 | 65/65/90 | 60 | 65 | 65 | 65/65/65/90 |
| Vanadium | TULAS Table 3 | 130/130/130 | 320.75 | 311 | 320.75 | 130/ 320 / 320 / 320 |

⁵⁸⁶

GSI ER2, Att. F, p. F.3.2.4.

- Under RAOHE for Block 21

| Parameter | Ecuadorian Regulation | Regulatory Criteria SE/Agr/Ind | Ecuador's adjusted value | Burlington's adjusted value | Tribunal's adjusted value | Adjusted Criteria SE/Agr/Ind |
|-----------|-----------------------|--------------------------------|--------------------------|-----------------------------|---------------------------|------------------------------|
| Cadmium | RAOHE Table 6 | 1/2/10 | 1.77 | 2 | 2 | 1.77/2/10 |
| Lead | RAOHE Table 6 | 80/100/500 | 80 | 80 | 80 | 80/100/500 |
| Nickel | RAOHE Table 6 | 40/50/100 | 40 | 47 | 40 | 40/50/100 |

- Under TULAS for Block 21

| Parameter | Ecuadorian Regulation | Regulatory Criteria Res/Agr/Ind | Ecuador's adjusted value | Burlington's adjusted value | Tribunal's adjusted value | Adjusted Criteria Res/SE/Agr/Ind |
|-----------|-----------------------|---------------------------------|--------------------------|-----------------------------|---------------------------|----------------------------------|
| Barium | TULAS Table 3 | 500/750/2000 | 600 | 500 | 600 | 500/600/750/2000 |
| Chromium | TULAS Table 3 | 65/65/90 | 60 | 65 | 65 | 65/65/65/90 |
| Vanadium | TULAS Table 3 | 130/130/130 | 186 | 130 | 186 | 130/186/186/186 |

4.3 Land use criteria

325. Having determined that RAOHE Table 6 and TULAS Table 3 apply to soil remediation, the Tribunal will now address the issue of land use classification. As seen above, both RAOHE Table 6 and TULAS Table 3 set different limits depending on the subsequent use (*uso posterior*) of the land.
326. RAOHE Table 6 distinguishes between industrial, agricultural and sensitive ecosystem land uses, the first being more permissive than the last. TULAS Table 3, for its part, distinguishes between industrial, commercial, agricultural and residential land uses. While the first is also here the most permissive, agricultural or residential use is the least permissive depending on the particular parameter. Since TULAS Table 3 does not contemplate land use for sensitive ecosystems, the Tribunal used the adjusted background values calculated by IEMS as the applicable values for sensitive ecosystems for the relevant parameters (i.e., for barium and vanadium).
327. The Parties diverge on the meaning of *uso posterior*, and on the question whether the entire Blocks should be classified as sensitive ecosystem (as Ecuador contends) or agricultural land (as Burlington contends). They further disagree whether the notion of *uso posterior* in RAOHE Table 6 refers to use immediately after remediation (as

Burlington argues) or to eventual use at the end of hydrocarbons operations (as Ecuador argues). After setting out the Parties' positions (4.3.1), the Tribunal will first clarify the meaning of *uso posterior*, before addressing the time at which *uso posterior* must be assessed and then setting out its own approach to determine the land use at each site (4.3.2).

4.3.1 Parties' positions

328. For Ecuador, *uso posterior* refers to future land use. It does not refer to land use after the Consortium leaves the Blocks but to the time "when oil operations will end",⁵⁸⁷ especially since oil operations are "*per se* temporary" and that the oilfields are destined "to be absorbed again by rainforest".⁵⁸⁸ Accordingly, the *current* use of the Blocks, whether Petroamazonas' expansion or the use made by farmers of the land around active fields "is obviously of no relevance to *future* land use".⁵⁸⁹ The Tribunal should therefore characterize all facilities and surrounding areas in the Blocks as sensitive ecosystems,⁵⁹⁰ especially taking into account IEMS's ecological studies demonstrating that the "areas in question display characteristics similar to those of a National Natural Area".⁵⁹¹ Such conclusion is further reinforced by the fact, Ecuador argues, that the Blocks overlap with the Sumaco and Yasuní biosphere reserves, and that a "significant portion of Block 21 lies within the Huaorani indigenous reserve".⁵⁹²
329. For its part, Burlington rejects Ecuador's "broad and extraneous characterizations of the Amazon rainforest as generally sensitive".⁵⁹³ It points to various instances of practice where Ecuadorian regulators applied the "immediate subsequent use" to classify land use for remediation purposes,⁵⁹⁴ further highlighting that industrial facilities have consistently been classified as falling under the industrial land use criteria, and that

⁵⁸⁷ Tr. (Day 7) (ENG), 2202:3-10 (Closing, Silva Romero); R-PHB, ¶ 158.

⁵⁸⁸ R-PHB, ¶ 163.

⁵⁸⁹ *Id.*, ¶ 158.

⁵⁹⁰ *Id.*, ¶ 163. Ecuador points to various instances of industry practice regarding future land use in other countries, such as guidelines of the US EPA and the Canadian environmental agency. *Id.*, ¶¶ 160-161.

⁵⁹¹ IEMS ER4, p. 41 and Att. 15 (with the following study areas: Mono 6, Mono 10-12, Coca 8, Dayuno, the Michel Chimbo Estate in the buffer zone of the Yasuní National Park).

⁵⁹² Reply, ¶ 295(d); R-PHB, ¶ 176.

⁵⁹³ C-PHB, ¶ 118.

⁵⁹⁴ *Id.*, ¶ 115. See also: GSI ER1, p. 40.

otherwise agricultural land use was applied as a default criteria, except for the few instances where sites have been expressly designated as protected areas under the *National System of Protected Areas* (“SNAP”).⁵⁹⁵ In this context, Burlington argues that sensitive ecosystem land areas are areas which are either “(1) certified under the National System of Natural Areas, or ‘SNAP’ program, or (2) expressly designated as sensitive ecosystem in an Environmental Impact Study”.⁵⁹⁶ Accordingly, Ecuador’s “colloquial description” of the Amazon as sensitive ecosystem in its entirety for regulatory purposes should be rejected.⁵⁹⁷ Burlington further argues that the certificates of intersection issued by the Ministry of Environment under the SNAP program show that “the majority of the Blocks *do not intersect* with the SNAP program”.⁵⁹⁸ Burlington also indicates that the Environmental Impact Studies, including the 2010 Ex-Post Studies, consistently apply agricultural and industrial land use standards.⁵⁹⁹ Finally, Burlington calls Ecuador’s reliance on the Sumaco Biosphere Reserve a “red herring”, and irrelevant, since that reserve has not been designated as sensitive ecosystem in the SNAP program or in any Environmental Impact Study which are “the only two ways to designate an area as sensitive ecosystem under RAOH”.⁶⁰⁰

4.3.2 Discussion

a. The meaning of *uso posterior*

330. First, the Tribunal must determine the meaning of *uso posterior* and at what point in time such use must be assessed. RAOHE Table 6 speaks of “subsequent use to be given to the remediated soil” (*uso posterior a darse al suelo remediado*).⁶⁰¹ It adds that

⁵⁹⁵ C-PHB, ¶¶ 118, 125-132. See also: GSI ER1, p. 40 (“Available records for remediation projects completed in Ecuador oilfields over the past decade show that approximately 80% of sites have been remediated subject to RAOH Table 6 agricultural soil criteria”).

⁵⁹⁶ C-PHB, ¶ 111. See also: GSI ER1, p. 40 (“Subject to the specifications of RAOH Table 6, the “sensitive ecosystem” designation is applicable to designated ecological preserves, not to agricultural lands or secondary forest, which represent the principal land uses in the areas surrounding oilfield facilities in the Consortium area”).

⁵⁹⁷ C-PHB, ¶ 111.

⁵⁹⁸ *Id.*, ¶ 112 (emphasis in the original).

⁵⁹⁹ *Id.*, ¶ 113.

⁶⁰⁰ *Id.*, ¶ 119.

⁶⁰¹ Translation by the Tribunal. The accompanying text to RAOHE Table 6 indicates the following: “The permissible limits to be applied in a determined project depend on the subsequent use to be given to the remediated soil, which shall be included in the respective Remediation Program

such use must be indicated in the remediation program to be approved by the Subsecretariat of Environmental Protection, which tends to show that the determination is both context-driven and immediately posterior to any remediation. This is reinforced by the use of the expression *uso posterior* (subsequent use), as opposed to the more indeterminate *uso futuro* (future use). It thus appears that the *uso posterior* of land is determined on a case by case basis according to its use immediately after remediation, and that this determination is subject to approval in each instance by the Subsecretariat.⁶⁰² This reading consequently does not support the argument of a single standard to be applied across the board. Accordingly, the Tribunal cannot accept Burlington's position that the agricultural standard applies by default to all off platform areas not specifically designated as sensitive ecosystems.

331. For the same reason, the Tribunal cannot accept Ecuador's position either according to which the entire Blocks must be deemed to be sensitive ecosystem or that their future use, as the expression is used in Ecuadorian law, is necessarily and in all cases to revert to rainforest.⁶⁰³ Ecuador's argument that the Consortium must remediate the entire Blocks back to sensitive ecosystem criteria is incorrect for practical reasons. It makes no sense that an operator should be required to restore to sensitive ecosystem values the soil of an operating platform that will continue in operation. This is especially so in a situation where Ecuador itself concedes that Petroamazonas may well continue to operate the Blocks for another 30 years.
332. Furthermore, the evidence on record does not support Ecuador's view. To the contrary, the record demonstrates that the *uso posterior* of platforms and other industrial facilities

or Project approved by the Undersecretariat of Environmental Protection" (Translation by the Tribunal) (**Exh. EL-174**).

⁶⁰² This conclusion is further reinforced by the introductory comments of Ms. Rosa Zehner, technical assessor of the Subsecretariat of Environmental Protection of the Ministry of Energy and Mines, attached to RAOHE: "In the case of contaminated soils, permissible limits and parameters are established in view of the use that, subsequent to a remediation, is planned to be given thereto" (Translation by the Tribunal). See: IEMS ER1, Exh. 9, p. 8. Note that these introductory remarks were not attached to Ecuador's exhibit of RAOHE, but were attached to IEMS's exhibit of RAOHE (cp. Exh. EL-174 with IEMS ER1, Exh. 9).

⁶⁰³ Ecuador's expert, RPS, conceded that it would be speculative to determine the long term future land use of the Blocks: "we don't know what will happen in this area in 30 years or more, it could be used for homes, schools, recreation, agriculture, or just be returned to habitat". Tr. (Day 4) (ENG), 1047:12-15 (Direct, Kerr).

has been consistently classified as industrial.⁶⁰⁴ This practice has continued after Petroamazonas took over the Blocks in July 2009.⁶⁰⁵

b. The time at which *uso posterior* is assessed

333. This raises the question of the time at which the subsequent land use must be assessed. When the operator alleged to have caused the harm is still operating the facilities, the subsequent use is normally assessed at the time of remediation. The position is different here as the Consortium stopped operations in July 2009 and the harm was allegedly caused before, but only brought forward in 2011. In the circumstances, the Tribunal considers that the most appropriate solution is to assess the subsequent use at the time of the expropriation in August 2009. Indeed, the

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The 2003 Remediation Plan of Contaminated Areas in Block 7 and Coca-Payamino (covering Payamino Sanitary Landfill, Payamino 22, and CPFs in Payamino, Coca, and Jaguar), approved by Ecuador's Ministry, indicates that remediation will be done in accordance with the industrial land use criteria set forth in RAOHE Table 6. See: Letter from Luis Cobos (Perenco) to Edgar López (DINAPA), attaching the Remediation Program for Block 7, including Coca-Payamino field, 28 January 2003 (**Exh. CE-CC-51**); Letter from Vicente Inepa (Ministry of Energy and Mines) to Luis Cobos (Perenco), approving the Block 7/CPUF remediation plan, 13 June 2003 (**Exh. CE-CC-57**).

The 10-barrel spill in Payamino 19 in June 2009 was to be remediated back to industrial land use criteria of RAOHE Table 6. See: Perenco Ecuador Limited, (Blasting, Painting and Mechanical Repairs on Gacela Station Tank), March 2005. See: CMCC, note 358.

The Oso A and Oso B EIS of April 2006 indicates that at the end of the drilling operations, contaminated soils will be remediated to levels below 4000 mg/kg of TPH, which is the industrial standard under RAOHE Table 6. See: EIS, Oso A and Oso B, Block 7, April 2006, p. 7-70 (**CE-CC-110**) ("Soil samples shall be taken in areas showing evidence of contamination in order to determine hydrocarbon concentrations and potential contamination. Areas where concentrations above 4,000 mg/Kg are detected shall be remediated to levels below this value" (Translation by the Tribunal)).

Also, the remediation progress report in 2003 regarding remediation in Coca CPF stated that criteria of Table 6 RAOHE are applicable. See: Letter from Luis Cobos (Perenco) to Dr. Huga Chamba (DINAPA), 22 April 2003, p. 1 (**Exh. CE-CC-54**) ("The value that is important to consider is the TPH (4211.5 mg/Kg), which shows a degree of contamination very close to, but still above, the maximum reference value for industrial-use soils as established in Table 6 of [the RAOHE], which is 4000 mg/Kg").

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The 2010 Ex-Post EIS' commissioned by Ecuador also employ industrial land use criteria to measure potential effects in the operational areas. See, for instance, Ex-Post EIS for Coca, Payamino, Gacela, Section 3, p. 17 (**Exh. CE-CC-241**); Ex-Post EIS for Mono and Jaguar, Section 3.1.6.2., pp. 15-17 (**Exh. CE-CC-242**); Ex-Post EIS for Oso, Section 3.1.6.3 (**Exh. CE-CC-236**).

Tribunal must determine the existing liabilities of the Consortium at the time it was expropriated.⁶⁰⁶

c. The Tribunal's approach to determining subsequent land use

334. The Tribunal is of the view that functioning platforms should be classified as 'industrial'. This applies also to areas that were not industrial in August 2009 but became so under Petroamazonas, with the exception of rights of way which are cleared strips of land and which the Tribunal, in part based on its observations during the Site Visit, classifies as agricultural land.⁶⁰⁷ The question also arises as to the classification of platforms no longer in operation in August 2009 and which should have been revegetated by the Consortium in accordance with RAOHE.⁶⁰⁸ Because they were no longer in use in August 2009 (and were not put into use by Petroamazonas), the Tribunal is of the view that these platforms do not qualify as industrial areas and will therefore classify them under the remaining land use categories on a case by case basis according to the circumstances of the relevant site.
335. The classification of land is more complex with respect to off platform areas. Ecuador argues that all these areas must be classified as sensitive ecosystem. Burlington concedes that sensitive ecosystem criteria apply to a limited number of designated protected areas in Block 7 (Payamino 1/CPF, Payamino 2/8 and Payamino 18) located in the Protected Forests Scientific Station Napo Payamino Cuerpos 1 and 2 Cerro Sumaco, Cuenca Alta of the River Suno Ampliación,⁶⁰⁹ which form part of the National System of Protected Areas, Protective Forests, and Forestry Assets of the State

⁶⁰⁶ Expansion activities took place at the following sites: Coca 13, Oso A, B and G, Coca A, Coca K, Yuralpa Pad A. Petroamazonas also undertook to construct a new pipeline connecting Coca 1, Coca CPF and Gacela 1-8. See: CMCC, ¶ 469; Rejoinder, ¶ 80; Saltos WS2, ¶¶ 125-133. Also: Video of Petroamazonas's Expansion of Operations in Blocks 7 and 21, 2 July 2013 (**Exh. CE-CC-384**).

⁶⁰⁷ The glossary in RAOHE Annex 6 defines a right of way (*derecho de vía*) as follows: "Fringe of terrain of specific dimensions, in which a duct and/or access road is installed, which traverses one or various properties and to which the owner of the duct has access or a transit servitude, and in which area are established limitations of dominion" (**Exh. EL-174**) (Translation by the Tribunal).

⁶⁰⁸ See, in particular: Articles 49(i)(2) and 53(c) of RAOHE (**Exh. EL-174**).

⁶⁰⁹ CMCC, ¶ 284. See: Letter of 16 March 2009 from Milton Freire (Ministry of Environment) to Eric D'Argenté (Perenco) (**Exh. CE-CC-207**); Map showing the Blocks' intersections with protected areas (**Exh. CE-CC-266**).

(SNAP).⁶¹⁰ Burlington also agrees that Nemoca and Waponi-Ocatoe in Block 21 fall within a designated area qualifying as sensitive ecosystem.⁶¹¹ At these locations, GSI applied sensitive ecosystem criteria although the actual land use in Payamino 2/8 and Payamino 1/CPF was arguably different. The Tribunal also notes that ConocoPhillips' own environmental assessment of the Blocks in 2006 recognized that the Puerto Napo – Yuralpa pipeline in Block 21 traverses three privately managed protected areas, namely the Venecia Protected Forest, the Jatun Sacha Foundation and the Selve Viva Foundation.⁶¹² Beyond this, Burlington takes the position that the subsequent use of all off platform, non-industrial land should be considered agricultural.

336. RAOHE Table 6 provides that the sensitive ecosystem values apply to “sensitive ecosystems *such as* Natural Areas of the National Patrimony or others identified in the corresponding environmental study” (“*valores límites permisibles para la protección de ecosistemas sensibles tales como Patrimonio Nacional de Areas Naturales y otros identificados en el correspondiente Estudio Ambiental*”) (emphasis added by the Tribunal). The use of the words “such as” – “tales como” – shows that the reference to formally designated protected areas is illustrative as opposed to exhaustive.⁶¹³ Hence, the Tribunal cannot accept Burlington's restrictive understanding of sensitive ecosystems. Neither does it agree with Ecuador that all areas within the Sumaco or Yasuní biosphere reserves automatically qualify as sensitive ecosystems. Indeed, the

⁶¹⁰ The Tribunal notes that the SNAP map used by Burlington at the Hearing does not mark the protected areas in Block 7 and Block 21 as being part of the SNAP system (**Exh. CE-CC-363**). Additionally, the PANE sheet filed by Burlington indicating the National Heritage of Protected Areas does not contain any protected areas in Block 7 and Block 21 (**Exh. CE-CC-266**).

⁶¹¹ CMCC, ¶ 284. See: Letter of 10 March 2009 from Milton Freire (Ministry of Environment) to Eric D'Argenté (Perenco) (**Exh. CE-CC-206**).

⁶¹² HSE & SD Assessment and other Technical Services, *Assets in Ecuador*, November 2006, p. ES-4 (**Exh. CE-CC-126**).

⁶¹³ This conclusion is reinforced by the introductory remarks attached to RAOHE by Ms. Rosa Zehner, technical assessor of the Subsecretariat of Environmental Protection of the Ministry of Energy and Mines: “Also, a category is established for soils of ecological value subject to specific protection, such as the Amazon swamps” (Translation by the Tribunal). See: IEMS ER1, Exh. 9, p. 8. These introductory remarks were attached to IEMS's copy of RAOHE (IEMS ER1, Exh. 9).

biosphere reserves under the UNESCO Man and the Biosphere (“MAB”) Program are not in fact strictly protected areas in which no human economic activity is tolerated.⁶¹⁴

337. UNESCO launched the MAB program in 1971 and the biosphere reserve network in 1976. In 1995, the Seville Strategy was adopted as well as the Statutory Framework of the World Network of Biosphere Reserves, which sets out the key components of MAB reserves, such as designation, support and promotion of biosphere reserves.⁶¹⁵ MAB biospheres should “strive to be sites of excellence to explore and demonstrate approaches to conservation and sustainable development on a regional scale”. Such sites must fulfill three functions: (i) the conservation of landscapes, ecosystems, species and genetic diversity; (ii) the achievement of human and economic development from a sociocultural and ecological point of view; and (iii) the support of local, regional, national and global projects of education, training, research and monitoring of the environment and sustainable development.⁶¹⁶ Biosphere reserves comprise a “mosaic of ecological systems” that are of significance for “biological diversity conservation”.⁶¹⁷
338. Land use in these biosphere reserves depends on zoning, each reserve being divided into three zones: (i) a nature reserve or national park as the core area where no economic activity is tolerated (except for traditional uses), (ii) the buffer zone where only activities compatible with the conservation of the ecosystems is allowed, and (iii) the transition zone, which is the external ring of the biosphere and where sustainable

⁶¹⁴ *Reservas de Biosfera del Ecuador: Lugares excepcionales*, Ministry of the Environment of Ecuador, GTZ/GESOREN-DED-WCS-NCI-UNESCO, Quito, 2010 (**Exh. E-380**); Oilfield sites and Sumaco Biosphere Reserve Map (**Exh. E-339**).

⁶¹⁵ UNESCO, “Biosphere Reserves. The Seville Strategy & the Statutory Framework of the World Network” (UNESCO: Paris, 1996) (**Exh. EL-308**). Biosphere reserves are defined as “areas of terrestrial and coastal/marine ecosystems or a combination thereof, which are internationally recognized within the framework of UNESCO’s programme on Man and the Biosphere (MAB), in accordance with the present Statutory Framework”. Statutory Framework, Article 1.

⁶¹⁶ Statutory Framework, Article 3 (**Exh. EL-308**); *Reservas de Biosfera del Ecuador: Lugares excepcionales*, Ministry of the Environment of Ecuador, GTZ/GESOREN-DED-WCS-NCI-UNESCO, Quito, 2010, p. 13 (**Exh. E-380**).

⁶¹⁷ Statutory Framework, Article 4(1)-(2) (**Exh. EL-308**).

development and urbanization can take place.⁶¹⁸ The Yasuní reserve was designated by Ecuador as a MAB biosphere in 1989, and the Sumaco reserve in 2000.⁶¹⁹

339. On this basis, the Tribunal notes that neither of the Blocks intersect with the core area or buffer zone of these reserves; the sites under review only overlap with the transition zones.⁶²⁰ Further, the Yasuní and Sumaco biosphere reserves under the MAB program have not been designated as part of the protected areas known as SNAP, with the exception of their core areas (i.e., the Parque Nacional Sumaco and the Parque Nacional Yasuní).⁶²¹ The partial overlap of the Blocks with the Sumaco and Yasuní reserves does not *per se* impose a classification as sensitive ecosystems. Finally, the Tribunal notes that the Huaorani reserve partly overlaps with Block 21, but not with the Yuralpa field where most of the environmental harm in that block is alleged to have occurred. It is therefore not material to determine the land use in that field.⁶²²

⁶¹⁸ *Id.*, Article 4(5); *Reservas de Biosfera del Ecuador: Lugares excepcionales*, Ministry of the Environment of Ecuador, GTZ/GESOREN-DED-WCS-NCI-UNESCO, Quito, 2010, p. 14 (**Exh. E-380**).

⁶¹⁹ The Yasuní reserve covers an area of approximately 2,740,000 hectares and the Sumaco reserve an area of approximately 932,000 hectares. *Reservas de Biosfera del Ecuador: Lugares excepcionales*, Ministry of the Environment of Ecuador, GTZ/GESOREN-DED-WCS-NCI-UNESCO, Quito, 2010, p. 26 (**Exh. E-380**).

⁶²⁰ For the Sumaco reserve, compare the following maps: Oilfield Sites and Sumaco Biosphere Reserve Map (**Exh. E-339**) and *Reservas de Biosfera del Ecuador: Lugares excepcionales*, Ministry of the Environment of Ecuador, GTZ/GESOREN-DED-WCS-NCI-UNESCO, Quito, 2010, p. 85 (**Exh. E-380**). ConocoPhillips's Health, Safety, Environment and Sustainable Development (HSE&SD) assessment conducted in 2006 states that although neither block overlaps with the Sumaco Napo-Galeras National Park, "both blocks do overlap (about 50 percent of the total surface area) the 'transition zone' or buffer area of the Sumaco Napo-Galeras Biosphere Reserve, established in 2000 by the Man and Biosphere program of the United Nations Educational, Scientific and Cultural Organization (UNESCO)". HSE & SD Assessment and other Technical Services, *Assets in Ecuador*, November 2006 (**Exh. CE-CC-126**).

⁶²¹ The Tribunal notes that the Yasuní National Park and Sumaco-Napo Galeras National Park were designated under the SNAP system in 1979 and 1994, respectively, but they do not overlap with the oilfields in the Blocks and Ecuador has not alleged this to be the case. See: Map of Sites in Blocks 7 and 21 that Intersect Protected Areas (2012) (**Exh. CE-CC-266**); Ministry of the Environment, PANE data sheet, 18 April 2013, items 8 and 9 (**Exh. CE-CC-363**). See also the SNAP map presented by Burlington at the Hearing: Burlington's Closing Statement, Slide 63; R-PHB, ¶ 171; C-PHB, ¶ 121.

⁶²² The Huaorani reserve extends to the Waponi-Ocatoe and Dayuno fields. See map of Huaorani reserve and Block 21 attached to: Confidential Memorandum, ConocoPhillips, p. 36 (**Exh. E-214**); Ecuador's Opening Statement, Slide 38. Burlington concedes that Waponi-Ocatoe falls in a designated area where sensitive ecosystem criteria apply. See: Map of Sites in Blocks 7 and 21 that Intersect Protected Areas (2012) (**Exh. CE-CC-266**). As seen further below, the Tribunal has classified the land use surrounding the platforms at these sites as being sensitive

340. This said, the Tribunal is mindful that the Amazon region in Ecuador is considered to be one of the most diverse and sensitive ecological areas in the world,⁶²³ and that it finds special mention in the 2008 Constitution as was seen above.⁶²⁴ The Tribunal also recalls IEMS's evidence that secondary forests surrounding platforms can function as biological corridors connecting preserved areas and modified primary forests, thus fostering biodiversity conservation and protection.⁶²⁵ However, IEMS's biological resource assessment in no way justifies qualifying the entirety of the Blocks as sensitive ecosystems for present purposes.⁶²⁶ Indeed, in light of the existing human dwellings in proximity of many platforms in both Blocks, especially in the northern part of Block 7, the Tribunal considers IEMS's opinion concerning the "regeneration capacity of the rainforest"⁶²⁷ too general and vague to support the adoption of a single, all-encompassing standard across the Blocks and thus disregard the actual situation on the ground. In line with the Tribunal's earlier conclusion, subsequent land use must be assessed case by case, by reference to the particular circumstances of each site.
341. The Site Visit provided the Tribunal an important, first-hand view of the actual use of land surrounding the platforms. By way of general observations, the Tribunal noted that the vegetation cover was much denser in Block 21 than in Block 7, and that the CPUF

ecosystem based on the fact that they are surrounded by dense forest, without needing to rely on the fact that these areas fall within the Huaorani indigenous reserve.

⁶²³ The Consortium and previous operators have acknowledged the sensitivity of the land surrounding several platforms, for example in the Environmental Impact Assessment and Environmental Management Plans for C ndor Norte and Lobo 3 ("All water bodies that are localized in the area of influence of the project correspond to zones that are sensitive to the activities of the project, therefore sensitivity is high"). See further examples compiled by IEMS regarding Yuralpa Pad D and West Lobo. IEMS ER4, pp. 41-42; Environmental Impact Study for the Yuralpa Field, Block 21, p. 2-2 (**Exh. E-156**). See also Oryx's Environmental Impact Study for Block 7, where it is stated that "[g]iven that Oryx's operations take place in the fragile and diverse amazonic ecosystem and particularly in the ecosystem that dominates the course of the Napo river and its tributaries, it is also justified that those operations be performed adopting all possible technical and economical, preventive and corrective measures to reduce to the minimum possible the undesirable environmental effects [...]" (Translation by IEMS). Environmental Impact Study of Block 7, pp. 2-3 (**Exh. E-254**).

⁶²⁴ See paragraphs 202-203 above. In particular, refer to: Articles 250 and 259 of the 2008 Constitution (**Exh. C-413**; **Exh. P-12**).

⁶²⁵ IEMS ER4, Att. 15, pp. 29-30.

⁶²⁶ For instance, IEMS conceded that secondary forests around platforms showed various degrees of human intervention, presented "low values of mammalian diversity" and "medium values of bird diversity" as a result of oilfield operations, but also because of crop areas and grasslands. IEMS ER4, Att. 15, p. 34.

⁶²⁷ IEMS ER4, Att. 15, p. 34.

is located in the most developed part of the Blocks. This does not mean that all disputed areas in Block 21 are sensitive ecosystems, nor that all land surrounding platforms in the CPUF is agricultural. Again, a site-specific assessment is needed. Yet, the general characterization just mentioned may inform such assessments.

342. On the basis of the foregoing considerations, the Tribunal has engaged in a case-by-case assessment of each site to determine subsequent land use. Its assessment is primarily based on evidence gathered during the Site Visit, the explanations provided by the experts,⁶²⁸ and the satellite imagery and aerial photographs of the sites closest in time to the date of expropriation. Where the record contains no images or photographs from that period, the Tribunal decided on the basis of the best available evidence.
343. Consequently, the Tribunal developed the following guidelines to assess land use at any given site:
- i. Platforms in operation on or after the date of expropriation have been classified as industrial, as explained above.
 - ii. Formally designated protected forests are classified as sensitive ecosystems (except for platforms), regardless of other current uses.⁶²⁹
 - iii. Where platforms are completely surrounded by primary or secondary forest, the Tribunal classified the forested areas as sensitive ecosystem.
 - iv. Where areas surrounding the platform are largely cleared, the Tribunal classified the land use of those areas as agricultural.
 - v. Where multiple land uses may apply to a single site,⁶³⁰ the Tribunal looked more specifically at the sampling locations to determine the land use in that specific area.⁶³¹

⁶²⁸ For IEMS, refer in particular to: IEMS ER3, Annexes C and C Corrected; IEMS ER4, Att. 38. For GSI, refer in particular to GSI ER1, App. L and GSI ER2, App. L.

⁶²⁹ The following sites in the CPUF fall within a protected forest: Payamino 1/CPF, Payamino 2/8, and Payamino 18. Payamino 4, Payamino 14, 20 & 24 and Payamino 23 are immediately adjacent to the protected forest. The following sites in Block 21 fall within State Forest Heritage: Nemoca and Waponi-Ocatoe. Dayuno and Yuralpa 01 are in close proximity of the State Forest Heritage. Map of Sites in Blocks 7 and 21 that Intersect Protected Areas (2012) (**Exh. CE-CC-266**).

- vi. Where land use appeared mainly agricultural, the Tribunal nonetheless looked more closely at particular features, such as swamps, creeks and rivers, that may justify stricter criteria.
 - vii. Where human dwellings, including school or other community buildings are adjacent to a water system and in close proximity to a contaminated site, the Tribunal applied sensitive ecosystem criteria for RAOHE parameters and residential criteria under TULAS Table 3 (for parameters not contemplated in RAOHE Table 6).⁶³²
 - viii. For platforms that have been abandoned, the Tribunal did not apply industrial criteria to the platform, but the relevant land use of the surrounding area.⁶³³
 - ix. In cases of doubt, the Tribunal adopted the most protective standard in conformity with the principles of precaution and *in dubio pro natura*.
344. In applying these guidelines, the Tribunal also considered the administrative practice of land classification, as it arises from approved remediation reports. Most remediation reports address on platform exceedances and classify the land as industrial. As regards off platform exceedances, the few remediation reports referred to by Burlington mostly refer to agricultural use.⁶³⁴
345. In addition to remediation reports, the Tribunal also reviewed the ex-post studies prepared by Entrix (at the request of Petroamazonas) as well as the post-expropriation practice of Petroamazonas. The ex-post reports very generally apply agricultural criteria to the Coca, Payamino, Lobo and Mono fields,⁶³⁵ which appears too wide an approach for the Tribunal to follow without proceeding to its own site-specific assessment. As for

⁶³⁰ See, for instance: Lobo 1.

⁶³¹ See, for instance: Coca 2/CPF, Gacela 4, Jaguar 2, Jaguar 9, Lobo 3.

⁶³² See, for instance: Jaguar 1 (Area 2M), Mono CPF.

⁶³³ See, for instance: C3ndor Norte, Jaguar 1, Jaguar 2, Jaguar 9.

⁶³⁴ See, for instance: Payamino CPF (**Exh. CE-CC-151**), Mono CPF (**Exh. CE-CC-189**) and Oso 2 (**Exh. CE-CC-116**, **CE-CC-153**, **CE-CC-138**, **CE-CC-197**).

⁶³⁵ Refer to: Entrix, Ex-post Environmental Impact Study and Environmental Management Plan: Coca Complex of Block 7, July 2010 (**Exh. CE-CC-241**), and Entrix, Ex-post Environmental Impact Study and Environmental Management Plan: Mono Complex of Block 7, July 2010 (**Exh. CE-CC-242**).

Petroamazonas, it applied agricultural criteria to Coca 6 and Yuralpa Pad E. In this context, the Tribunal also observes that IEMS indicated that agriculture partly surrounds the platforms at Coca 6, Coca 8, Lobo 3, Lobo 1, Oso 9, Mono CPF and Payamino CPF.⁶³⁶

346. This being so, the Tribunal stresses that the administrative practice of Ecuadorian authorities was certainly helpful. At the same time, reliance on such practice cannot excuse the Tribunal from the task of making its own assessment on the basis of the entire record to ensure that it applies the regulatory criteria correctly.

347. The result of the Tribunal's land use assessment following the parameters just set out is described in the site review (Section 4.6).

4.4 Guidelines for calculating impacted areas and volumes of impacted soils

348. The Parties advocated divergent approaches for calculating the extent of soil contamination in the Blocks. Whereas Ecuador argued that, due to the impossibility of sampling the entire Blocks, the extent of soil contamination can only be established by extensive modelling (4.4.1), Burlington favored delineation through a process described as "hand-contouring" (4.4.2). After reviewing the Parties' methodologies, the Tribunal will set out its own approach (4.4.3).

4.4.1 IEMS's methodology and Ecuador's position

349. For Ecuador, GSI's approaches "to sampling, data collection and analysis do not provide a sound or reasonable basis" to quantify the extent of harm in the Blocks, since they are "inherently subjective and arbitrary", and thus should be disregarded.⁶³⁷ By contrast to GSI's "contrived and unreliable *sui generis* delineation theory", Ecuador submits that IEMS reliably and conservatively quantified the extent of harm through modelling and by using the "widely accepted" Inverse Distance Weighted ("IDW") interpolation technique.⁶³⁸

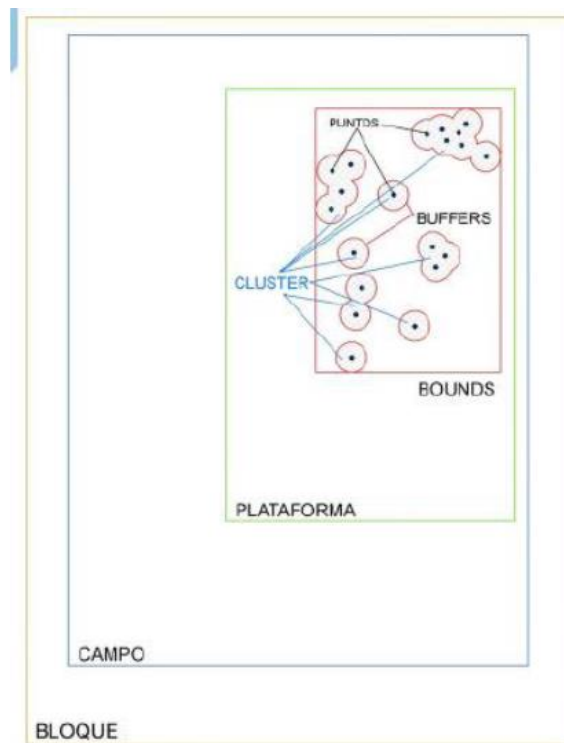
⁶³⁶ See, for instance: CMCC, ¶ 301, referring to: IEMS ER3, Annex H (REC 7-COC06-389, p. 5; REC 7-LOB3-475, p. 47; REC 7-LOB1-208, p. 44; REC 7-OS09-345 p. 62).

⁶³⁷ R-PHB, ¶ 329.

⁶³⁸ *Id.*, ¶ 331.

350. Ecuador explains that IEMS used the computer software ArcGIS to calculate the total volume of contaminated soil.⁶³⁹ Using ArcGIS, IEMS developed a Geographical Information System for Quantifying Environmental Impact Soil (“SIGAAS”), which mapped every production facility within Block 7/CPUF and Block 21.⁶⁴⁰ For the areas of contaminated soil, IEMS mapped each sample it collected, delineated a 10-meter radius around it (called a “buffer”), and defined the boundaries of the contaminated area as the outer limits of all buffers (a group of buffers is referred to as “cluster”) marked by a rectangle called “bounds” (see figure below).⁶⁴¹

IEMS’s schematic representation of macro to micro scales⁶⁴²



Legend:
 Puntos = points
 Plataforma = platform
 Campo = field
 Bloque = block

⁶³⁹ 2nd SMCC, ¶ 174. IEMS used ArcGIS 10.0 software and included therein: (i) the geographic location of the sites, including oilfield facilities, population centers, principal roads, rivers, land use in 2009 and 2010, (ii) the geographic locations of the identified RECs, (iii) the geographic location of the sampling, and (iv) the relation between the previous information with the general characteristics of the sites using satellite imagery, maps and aerial photographs. IEMS ER3, Annex A.8, pp. 2-3.

⁶⁴⁰ IEMS ER3, p. 145 and Annex A.8, p. 1.

⁶⁴¹ 2nd SMCC, ¶¶ 174-175; IEMS ER3, p. 145.

⁶⁴² Table taken from: IEMS ER3, p. 145, Table 3. See also: Reply, p. 47, Figure 1.

351. To calculate the volumes of contaminated soil, IEMS modeled six different layers of depths (from 0 to 1 meter, 1-2 meters, 2-3 meters, 3-4 meters, 4-5 meters, and more than 5 meters deep).⁶⁴³ For each layer, IEMS measured the level of pollution for each contaminant. IEMS explained that its analytic model required at least three polluted samples per layer and that layers with less than 3 polluted samples were disregarded.⁶⁴⁴ Once the bounds and the layers were established, IEMS (i) divided the area within the bounds into “cells” of one square meter; (ii) categorized each cell where samples were taken as non-contaminated, contaminated in excess of background values but below regulatory levels, or contaminated in excess of regulatory thresholds; and (iii) categorized each surrounding cell applying the IDW method of interpolation with ArcGIS.⁶⁴⁵ With that method, the value attributed to each surrounding cell is a function of the value of the sample data cells and the distance between the sample cells and the surrounding cells. In other words, the closer a sample data cell is to a surrounding cell, the more impact it has on the surrounding cell’s value. In consonance with IEMS’s conservative model, argues Ecuador, total volumes of contaminated soil were calculated only within the bounds.⁶⁴⁶
352. The IDW interpolation method was necessary, according to Ecuador, due to the sheer scale of the contaminated areas and because hand contouring would require disproportionate resources.⁶⁴⁷ IDW was chosen among various other models on the basis of the characteristics on the ground, and the model was duly adjusted to account for the particular characteristics of each site. In addition, Ecuador argues that literature confirms that IDW is a recognized and well-understood form of linear interpolation.

⁶⁴³ 2nd SMCC, ¶ 176; IEMS ER3, Annex A.8, pp. 6-7.

⁶⁴⁴ IEMS explained that: “Since the interpolation method requires at least three sampling points within the same analysis layer in order to generate an area, and also the samples corresponding to these points must have significant contamination values in order to be able to evaluate the level of dispersion, those sampling points which showed the existence of contamination but which did not meet these conditions (for example, when only two samples were available for a layer, even if they were contaminated) were not included in the modeling process, in keeping with the conservative methodology used for the study”. IEMS ER3, p. 146. IEMS further held that: “This methodology is conservative since it did not include identified or suspected areas of contamination that could not be quantified with acceptable certainty (e.g., because our modeling requires at least three contaminated samples within the same depth; anything less than three samples were not modeled)”. IEMS ER4, p. 5. See also: R-PHB, ¶ 429; Tr. (Day 3) (ENG), 932:21-933:5 (Tribunal, Chaves).

⁶⁴⁵ IEMS ER3, p. 147; IEMS ER3, Annex A.8, p. 10.

⁶⁴⁶ 2nd SMCC, ¶¶ 176-179.

⁶⁴⁷ R-PHB, ¶ 409, referring to: Tr. (Day 3) (ENG), 689:18-690:2 (Direct, Chaves).

Contrary to the assertion of Burlington’s expert Professor Rouhani, the “*deterministic* linear interpolator IDW is not conditional on mathematical semivariance (*‘spatial correlation’*)”, since semivariance is only required with the *geostatistical* linear interpolation method known as “kriging”.⁶⁴⁸ In this context, Ecuador explains that IDW is a deterministic, not a geostatistical interpolator. The corollary of the foregoing is that IDW assumes spatial correlation. Accordingly, spatial correlation was not tested by IEMS because IDW is not mathematically dependent on semivariance.⁶⁴⁹

353. Ecuador further contends that Professor Rouhani’s “desktop review” employed a wholly inapplicable analysis.⁶⁵⁰ For instance, variograms are not used to evaluate IDW on a post hoc basis. Indeed, Professor Rouhani conceded that his approach was “sub-optimal”.⁶⁵¹ Moreover, IEMS confirmed that the contamination in the Blocks was in any event sufficiently correlated at each particular site, and Professor Rouhani conceded that practical experience trumps statistical analysis.⁶⁵² Finally, Burlington’s reference to literature suggesting that IDW should not be used for decision-making is misplaced, since (i) the literature relied upon by Burlington is published by the software developer of ArcGIS Geostatistical Analyst, (ii) that manual does not exclude the use of IDW but merely cautions users about the reliability of the IDW interpolations, and (iii) IEMS applied IDW conservatively and with all due caution, for instance, by applying control systems and prediction capacity.⁶⁵³

354. With regard to the last point, Ecuador insists that IEMS’s comprehensive model relies on robust sampling taking into account topography and site features. Furthermore, modeling was undertaken within small-bounded and well-sampled areas. These bounds circumscribed areas of known contamination. Also, contrary to Professor Rouhani’s assertion, IEMS included clean samples in its modeling. In addition, IDW was only used in those locations with a minimum of three nearby data points, and IEMS weighted the IDW interpolations conservatively by using a power of 3, instead of the standard power of 2, the consequence being that the importance given to each sample decreased

⁶⁴⁸ R-PHB, ¶ 412 (emphasis in the original).

⁶⁴⁹ *Id.*, ¶ 414.

⁶⁵⁰ *Id.*, ¶ 415.

⁶⁵¹ *Ibid.*, referring to: Tr. (Day 5) (ENG), 1821:16-17 (Cross, Rouhani).

⁶⁵² R-PHB, ¶ 418, referring to: Tr. (Day 5) (ENG), 1808:18-1809:1 (Cross, Rouhani).

⁶⁵³ R-PHB, ¶ 419.

rapidly.⁶⁵⁴ Finally, IEMS did not interpolate between points separated by more than 300 meters.⁶⁵⁵

355. Ecuador further asserts that Burlington errs when stating that the IDW method is “conceptually flawed” or “scientifically inappropriate”.⁶⁵⁶ In fact, Professor Rouhani confirmed at the Hearing that IEMS’s IDW approach is a “systematic space-wide analysis”.⁶⁵⁷ Indeed, the experts on both sides employed some form of linear interpolation. Yet, as Professor Rouhani noted at the Hearing, GSI used the “rudimentary” hand contouring technique, while IEMS used the more powerful and conservative IDW.⁶⁵⁸ Ecuador further explains that GSI also used mathematical forms to interpolate the extent of negative impacts. In fact, “all experts agree that a mathematical approach is the scientifically correct way to estimate environmental contamination”.⁶⁵⁹ Moreover, GSI’s criticism of using computer software is unfounded, since GSI also used a computer for its “hand-drawn” contour lines.⁶⁶⁰ Finally, GSI’s claim that IEMS extrapolated from a given point outwards is plainly wrong, according to Ecuador. Interpolation was done within well-defined bounds, circumscribing “heavily sampled areas which were known to contain contamination”.⁶⁶¹
356. Regarding GSI’s quantification of contamination, Ecuador argues that GSI’s approach is unreliable for various reasons: (i) GSI did not undertake a site-wide analysis; (ii) GSI’s self-made and arbitrary topographical exclusion rules are scientifically flawed; (iii) GSI failed to “step out” to take additional samples until clean soil was reached; (iv) GSI’s manual delineation approach is arbitrary and (v) produces massive errors; and (vi) GSI’s contingency factor cannot iron out the wide-scale methodological shortcomings of GSI’s delineation approach.⁶⁶²

⁶⁵⁴ *Id.*, ¶ 431. See also: IEMS ER3, Annex A.8, p. 9.

⁶⁵⁵ R-PHB, ¶ 432.

⁶⁵⁶ *Id.*, ¶ 394, referring to: Rejoinder, ¶ 159.

⁶⁵⁷ R-PHB, ¶¶ 339, 407, referring to: Tr. (Day 5) (ENG), 1799:5 (Cross, Rouhani).

⁶⁵⁸ R-PHB, ¶ 396.

⁶⁵⁹ *Id.*, ¶ 399.

⁶⁶⁰ *Id.*, ¶¶ 400-404.

⁶⁶¹ *Id.*, ¶¶ 405-406.

⁶⁶² *Id.*, ¶¶ 333, 335-391.

357. First, Ecuador stresses that GSI limited itself to IEMS’s sampling without itself engaging in a site-wide analysis, thus undermining its claim of a comprehensive assessment.⁶⁶³ For Ecuador, proper delineation would require an assessment on a meter-by-meter grid basis. Since it is Burlington’s burden to prove the absence of significant negative impacts, says Ecuador, one would have expected GSI to undertake a systematic assessment: “[T]he easiest way for GSI to disprove IEMS’ quantification of the negative impact was to sample, meter-by-meter, across the sites and perform a true delineation”.⁶⁶⁴ Critically, Burlington not only decided not to undertake site-wide sampling, it also decided not to test seriously, “whether or not IEMS’ sampling program was representative of contamination across the Blocks”.⁶⁶⁵ Ecuador further argues that Burlington’s and GSI’s punctual criticisms fail to address the more general question “whether, as a whole, IEMS’ sample design produced a representative sample set upon which to found their interpolations”.⁶⁶⁶

358. Second, GSI’s “*sui generis* delineation” rests on a set of misplaced arbitrary and self-made topographical exclusion rules,⁶⁶⁷ which GSI nonetheless does not follow, according to Ecuador. As a starting point, Ecuador states that it bears recalling that both RPS and IEMS confirmed that once contamination reaches the subsoil “any surface topographic features will no longer have any impact on how the contamination migrates through the subsoil”.⁶⁶⁸ Importantly, GSI applied its own topographical rules in an arbitrary manner. In doing so, Professor Rouhani admitted that GSI failed to take further delineation samples around exceedance points, such as, for instance, in Coca 8,

⁶⁶³ *Id.*, ¶ 358.

⁶⁶⁴ *Id.*, ¶ 344.

⁶⁶⁵ *Id.*, ¶ 345.

⁶⁶⁶ *Ibid.*

⁶⁶⁷ *Id.*, ¶¶ 349-351, where Ecuador provides a list of these topographical exclusion rules: (i) topographic features, such as streams and catchment areas were considered; (ii) impacts within stream features were bounded by the stream banks; (iii) upstream and downstream extents of impacts extend to the nearest point with concentrations below the applicable criteria in each direction; (iv) impacts that affect a localized area on a slope are assumed to extend twice as far down slope than across slope; (v) site features were always considered, such as edges of pits, platforms, oil-water separators, and/or roads; (vi) sampling results of points located more than 100 meters away from an exceedance point were only considered from a qualitative standpoint on a case-by-case basis, but were not used for interpolation purposes. Ecuador admonishes GSI for not providing any justification for these rules, or not providing explanations how factors within these rules were considered. See, for instance: GSI ER1, App. L, Att. L.6.E, p. L.1 (Coca 8).

⁶⁶⁸ R-PHB, ¶ 350.

where GSI did not take any delineation samples to the northeast, east, southeast, south or southwest of exceedance point # 5 (CO08-4M-03).⁶⁶⁹ Ecuador highlighted that Professor Rouhani accepted that “it would have been much easier to solve this problem by just having one more delineation sample”.⁶⁷⁰

359. Third, Ecuador criticizes that GSI did not “step outwards” to take additional samples until clean soil was reached.⁶⁷¹ Ecuador explained that “[i]n every case GSI’s delineations are founded on only two samples – one being an ‘*exceedance*’ and one being a ‘*non-exceedance*’”.⁶⁷² Yet, as IEMS stated, the most obvious step to achieve a true delineation would have been to continue sampling until clean soil was uncovered. To compound matters, Ecuador stresses that GSI willfully put dirty samples back into the ground, discarding them totally.⁶⁷³ This happened not only in a few instances as claimed by GSI, but in at least 6 sites (of the 17 where GSI took delineation samples).⁶⁷⁴ When asked to comment, Ecuador states, GSI “cynically” explained: “And the reason for that is because we stepped out because we’re looking for the clean margin”.⁶⁷⁵ For Ecuador, “[t]rue delineation required continued sampling in all directions until all contamination was captured”.⁶⁷⁶

360. Fourth, Ecuador states that GSI’s delineation approach is in any event wholly subjective and arbitrary.⁶⁷⁷ GSI cites no literature in support of its *sui generis* approach. The hand drawn isoconcentration contour lines are a “very rudimentary form” of interpolation, as Professor Rouhani conceded.⁶⁷⁸ In addition, this technique provides no certainty as it is

⁶⁶⁹ *Id.*, ¶ 360. Ecuador further points to Exceedance #1 (CO08-4M-07), where GSI did not take any further delineation samples to the northwest, west, southwest, or the south, and Exceedance #4 (CO08-4M-04), where GSI did not take any further delineation samples to the south. Also referring to: Tr. (Day 5) (ENG), 1805:19-1806:3 (Cross, Rouhani).

⁶⁷⁰ R-PHB, ¶ 353, referring to: Tr. (Day 5) (ENG), 1805:16-18 (Cross, Rouhani).

⁶⁷¹ R-PHB, ¶ 356.

⁶⁷² *Id.*, ¶ 359 (emphasis in the original).

⁶⁷³ *Id.*, ¶ 363.

⁶⁷⁴ *Id.*, ¶ 365, pointing to: Coca 1, Coca 6, Coca 8, Jaguar 1, Mono CPF and Payamino 23.

⁶⁷⁵ *Id.*, ¶ 363, citing: Tr. (Day 5) (ENG), 1588:6-8 (Cross, Bianchi).

⁶⁷⁶ R-PHB, ¶ 362.

⁶⁷⁷ *Id.*, ¶¶ 372-381.

⁶⁷⁸ *Id.*, ¶ 374, referring to: Tr. (Day 5) (ENG), 1793:19-1794:3 (Cross, Rouhani).

not possible to assess the errors associated with the tick marks or the hand drawn contour lines.

361. Fifth, GSI's approach produced massive errors according to Ecuador, notably because of its "sample dilution" (both through the use of composite samples and by putting dirty samples back into the ground).⁶⁷⁹ Finally, GSI's "all purpose 20% 'contingency'" cannot account for the errors in GSI's delineations and is a "completely inadequate margin for the massive limitations to, and errors inherent in, GSI's delineations".⁶⁸⁰ Ecuador nonetheless points out that both Parties' experts agree that a contingency factor ranging from 20%-30% should be included.⁶⁸¹

4.4.2 GSI's methodology and Burlington's position

362. For Burlington, Ecuador's reliance on IEMS's computer model to estimate volumes of allegedly contaminated soil is "[o]ne of the most consequential flaws in Ecuador's environmental claim".⁶⁸² The result is to artificially inflate the estimates of soil contamination by relying on modelling instead of delineating actual contamination in the fields.⁶⁸³ Burlington also criticizes IEMS for committing serious errors in constructing its model,⁶⁸⁴ and argues that had IEMS engaged in validation testing, it would have realized that the model is "highly unreliable".⁶⁸⁵
363. According to Burlington, the modelling methodology is incorrect and unreliable,⁶⁸⁶ in particular because specific circumstances which may justify using computer predictions as a substitute for real data are not present here.⁶⁸⁷ Relying on Professor Rouhani, Burlington argues that the only reliable method for the Blocks is "site-specific field

⁶⁷⁹ R-PHB, ¶¶ 382-386.

⁶⁸⁰ *Id.*, ¶ 333, 387-391 (emphasis in the original).

⁶⁸¹ *Id.*, ¶ 873.

⁶⁸² Rejoinder, ¶ 154.

⁶⁸³ *Id.*, ¶¶ 159-171.

⁶⁸⁴ *Id.*, ¶¶ 172-182.

⁶⁸⁵ *Id.*, ¶¶ 183-194.

⁶⁸⁶ CMCC, ¶¶ 383-396.

⁶⁸⁷ Rejoinder, ¶ 156.

delineation, relying on real data and observations”.⁶⁸⁸ Therefore, GSI employed the methodology known as “hand-contouring” which involves “sampling known or suspected areas of contamination and then ‘delineating’ these areas by taking additional samples until clean soil is reached”.⁶⁸⁹ These clean samples together with topographical features then provide the “*contours* of the contaminated area”.⁶⁹⁰

364. With respect to Ecuador’s modelling exercise, Burlington argues that IEMS used ArcGIS to model the extent of contamination, although that software is “not designed to extrapolate outwards from a particular data point” but serves only to “interpolate between plotted data values”.⁶⁹¹ As Professor Rouhani indicated, IDW is “simply not an appropriate method for modeling soil contamination in the Blocks, as it cannot make predictions within any acceptable range of reliability”.⁶⁹²

365. Burlington explains that IEMS should have interpolated whereby “samples are taken moving outward from a contaminated point until compliant samples are found”.⁶⁹³ Instead, IEMS used a “fill” function in ArcGIS to connect “non-clean” samples, thus ignoring topography (as the examples of Punino and Coca 1 demonstrate)⁶⁹⁴ and other physical features (such as low-lying drainages, roads or hills),⁶⁹⁵ resulting in a modelling exercise where the “vast majority of areas” claimed to be contaminated are in fact areas where IEMS’s own samples comply with Ecuadorian regulatory criteria “or areas where

⁶⁸⁸ *Id.*, ¶¶ 156, 161; Rouhani ER, ¶¶ 88, 98, 100. Burlington further argued that “[b]y its nature, therefore, this modeling process generates an imperfect image of reality, and it should only be used when real data is not reasonably obtainable”. Rejoinder, ¶ 162.

⁶⁸⁹ Rejoinder, ¶ 160.

⁶⁹⁰ *Ibid.* (emphasis in the original); GSI ER1, ¶ 234 and App. D, pp. 10-11, 23-25; GSI ER2, ¶ 49(c). See also the video explaining hand-contouring (**Exh. CE-CC-368**).

⁶⁹¹ CMCC, ¶ 384; GSI ER1, ¶¶ 120-121 and Exhibit 20.

⁶⁹² Rejoinder, ¶ 155; Rouhani ER, ¶¶ 50, 69.

⁶⁹³ CMCC, ¶ 385.

⁶⁹⁴ GSI ER1, ¶ 125 and App. F.5, pp. 10-12, 14-15. Burlington explained the consequence of the failure to take into account topography and other physical features as follows: “IEMS’s election to wholly ignore the physical characteristics of the Blocks, many areas of which would naturally constrain contamination, appears deliberate. It specifically selected low-lying areas for its sampling points, since contamination naturally migrates down-gradient. It then selected a modeling procedure that ignored these physical boundaries and “found” contamination in surrounding upland areas where impacts are simply unfeasible” (footnotes omitted). CMCC, ¶ 388. See further: GSI ER1, ¶ 117 and App. F.5, p. 14.

⁶⁹⁵ CMCC, ¶ 393.

no samples were taken at all”.⁶⁹⁶ In addition, IEMS’s models extend “far beyond the vicinity of any of IEMS’s samples” thus imputing alleged contamination to areas where no sampling was undertaken.⁶⁹⁷ Burlington also criticizes IEMS’s “inconsistent treatment of samples taken from pits”, in particular by using those samples to interpolate in areas extending beyond the boundaries of the pits,⁶⁹⁸ as well as IEMS’s substitution of “near-detection-limit values” for non-detect samples.⁶⁹⁹

366. According to Burlington, IEMS provided no explanation for choosing the IDW method over other methods.⁷⁰⁰ IDW only calculates an “average, weighted by distance”, based on the assumption that all points are “correlated”, irrespective of “how far away one travels from those samples, how unrelated the area being interpolated is to the one from which the samples were taken, or whether there are topographic or other features that would naturally isolate one area from the other”.⁷⁰¹ In other words, Burlington submits that IEMS’s model is “blind to the absence of correlation between the existing data and the point that it has been instructed to predict”.⁷⁰²
367. Ecuador’s argument that the assessment of actual soil conditions would have required 1.12 million additional samples is unavailing according to Burlington, especially since (i) sampling was not required in a majority of the Blocks where IEMS did not even identify any exceedances or recognized environmental conditions (“RECs”), (ii) 88% of IEMS’s sampling locations comply with regulatory criteria, and (iii) IEMS failed to consider all available data, ignoring “*more than 500 soil samples, including all of the data collected by GSI (390 soil samples) as well as IEMS’s own samples from its most recent field campaign (157 soil samples)*”.⁷⁰³ Burlington argues that the difference between IEMS’s and GSI’s approaches is best illustrated when comparing the results for barium contamination in Mono CPF, where IEMS’s model predicts contamination “that has no

⁶⁹⁶ *Id.*, ¶ 386; GSI ER1, ¶¶ 124-127 and Exhibit 21; Rejoinder, ¶ 182; GSI ER2, App. F.5, pp. 12-14.

⁶⁹⁷ CMCC, ¶ 393.

⁶⁹⁸ Rejoinder, ¶ 182; GSI ER2, App. 5, pp. 14-19.

⁶⁹⁹ Rejoinder, ¶ 182; GSI ER2, App. 5.

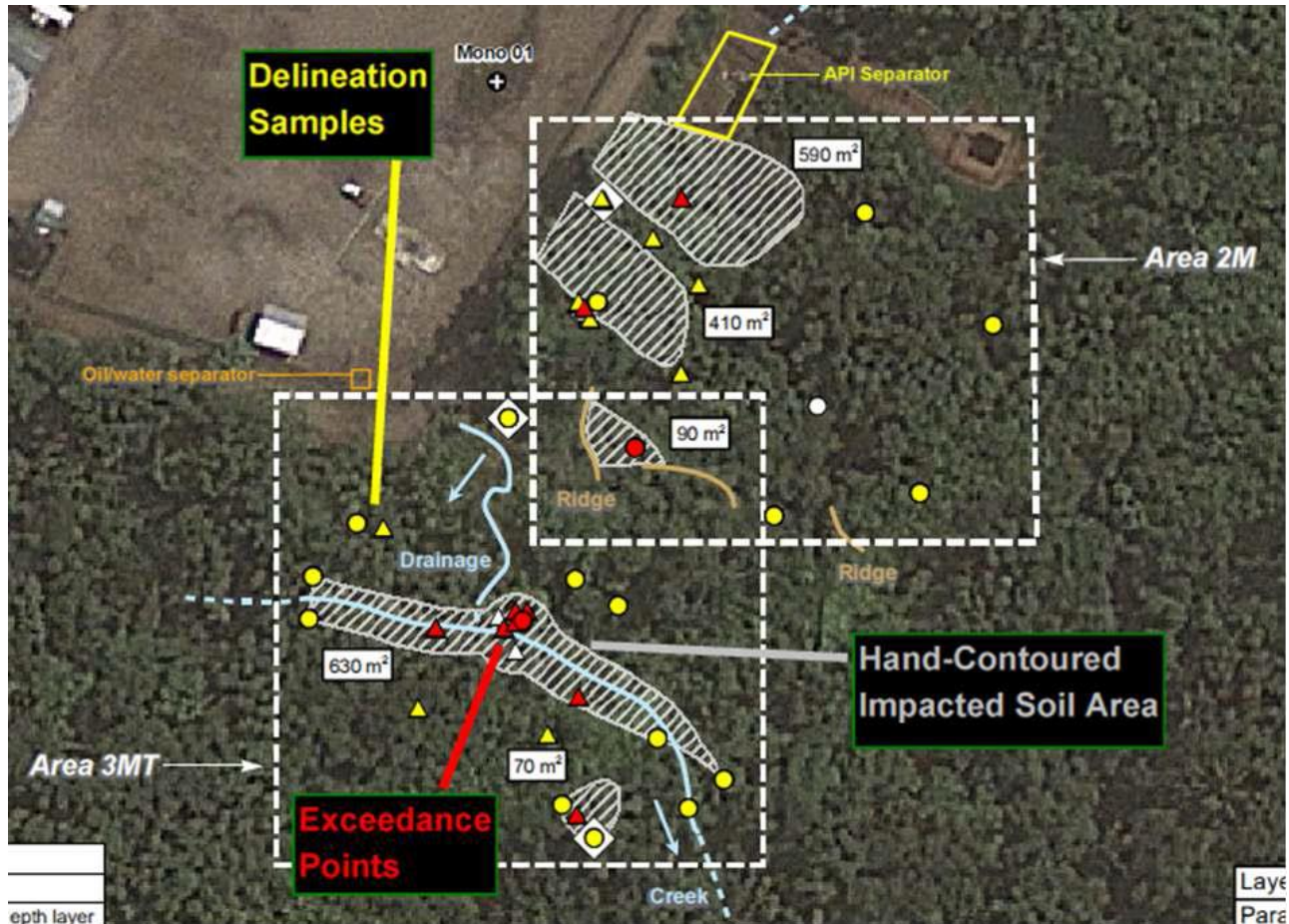
⁷⁰⁰ Rejoinder, ¶ 173.

⁷⁰¹ *Id.*, ¶¶ 173-174.

⁷⁰² *Id.*, ¶ 174.

⁷⁰³ *Id.*, ¶ 168 (emphasis in the original).

relation to the topography of the site or the existence of clean samples”.⁷⁰⁴ The following image is used by Burlington to show how GSI used delineation samples and topography to hand-contour the contamination:⁷⁰⁵

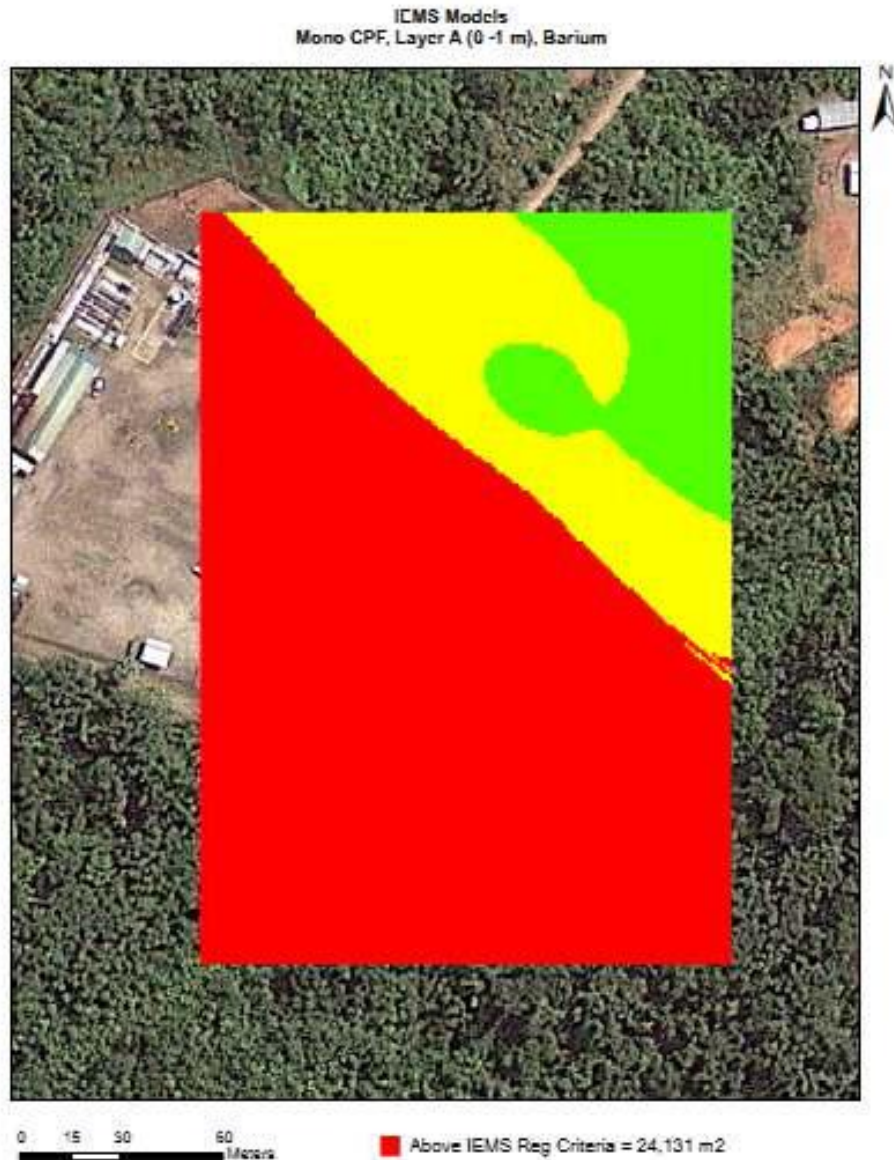


368. By contrast, Burlington explains that the red area in IEMS’s model below⁷⁰⁶ shows Ecuador’s regulatory case and demonstrates how IEMS predicted contamination that has no relation to topography or clean samples.⁷⁰⁷

⁷⁰⁴ *Id.*, ¶¶ 163-165.

⁷⁰⁵ *Id.*, ¶ 163; GSI ER1, App. L, Mono CPF, Figure L.50.E.B.1.

⁷⁰⁶ Rejoinder, ¶ 164; see also image at ¶ 180. The Tribunal notes that this map does not correspond to the one found in IEMS’s annexes and that Burlington did not identify the source of this map. See: IEMS ER3, Annex C, Mono CPF, p. 26 and Annex C Corrected, Mono CPF, p. 27; IEMS ER4, Att. 38, Mono CPF, p. 29. It appears that the map was generated by GSI as part of an exercise to assess the effect of various model search radiuses on the predicted area of impacted soils, and in particular the effect of the variable search radius employed by IEMS. See: GSI ER2, p. 35, Exhibit 17 and Annex F.5, p. F.5.7, Figure F.5.5. As seen below (paragraph 376), the Tribunal relied on the maps prepared by IEMS.



369. According to Burlington, employing appropriate delineation methods would reduce IEMS’s estimations “to virtually nothing”.⁷⁰⁸ Burlington further explained that IEMS compounded matters by engaging in a series of “extraordinary errors and omissions” in constructing and applying its method, thus producing distorted results.⁷⁰⁹ In particular,

⁷⁰⁷ Rejoinder, ¶ 164. Burlington explained that: “The red area represents predicted exceedances of IEMS’s regulatory criteria, and suggests that there is ‘contamination’ spreading uphill and over the platform. Such a result is clearly irrational: it bears no apparent relationship to the topography observed on the ground or the location of the actual exceedances (none of which were on the platform)”. *Id.*, ¶ 165.

⁷⁰⁸ CMCC, ¶ 396.

⁷⁰⁹ Rejoinder, ¶ 157.

Burlington highlights the fact that IEMS converted non-detect samples into positive values (so-called false positives) with the result that the ArcGIS software erroneously used “positive data values to generate maps of allegedly “contaminated” areas”.⁷¹⁰ This resulted, Burlington says, in a manipulation of 79% of IEMS’s data points.⁷¹¹ Ecuador’s explanation regarding the power function is to no avail since the power function simply instructs the IDW model “how *heavily* to weight one sample compared to another based on their proximity”, but will “always calculate a value for every cell in the modeled area that is between the minimum and maximum sample value, *no matter what power is used*”.⁷¹² Instead of using a fixed search radius to avoid overreaching, IEMS used a variable search radius resulting in the model’s IDW calculations continuing to run “until it reaches the model’s bounds”,⁷¹³ as GSI demonstrated when modifying the bounds in the model.⁷¹⁴

370. Finally, Burlington argues that IEMS’s failure to engage in meaningful validation testing proves the unreliability of its model, Professor Rouhani having confirmed that these kinds of models require validation testing.⁷¹⁵ As a basic reality check, IEMS should at the very least have compared its model to GSI’s 390 soil samples or its own additional 157 samples. Instead, IEMS only plotted its new sample locations on its site maps resulting in clean samples appearing in allegedly contaminated areas such as Coca 8, Coca 9, Coca 18-19, Payamino 4, Mono CPF, Mono 10-12 and C6ndor Norte.⁷¹⁶ In this context, IEMS’s cross-validation at Coca 8 taking “a single analyte in a single layer in a single site” is unreliable, since cross-validation “only works in points for which the model *already contains data*” and not at locations distant from known samples.⁷¹⁷ In any event, IEMS’s cross-validation shows that “the average difference between known values and

⁷¹⁰ CMCC, ¶ 399; Rejoinder, ¶ 182; GSI ER2, App. F.5, p. 5.

⁷¹¹ CMCC, ¶ 403; GSI ER1, ¶ 74.

⁷¹² Rejoinder, ¶ 175 (emphasis in the original).

⁷¹³ *Id.*, ¶¶ 177-178.

⁷¹⁴ *Id.*, ¶¶ 178-181; GSI ER2, ¶ 86 and App. F.5, pp. 6-9.

⁷¹⁵ Rejoinder, ¶ 183; Rouhani ER, ¶¶ 38-39.

⁷¹⁶ Rejoinder, ¶¶ 184-185, referring to: IEMS ER4, Att. 36.

⁷¹⁷ Rejoinder, ¶ 187 (emphasis in the original).

predicted values” is ten times greater than the acceptable error level calculated by Professor Rouhani.⁷¹⁸

371. Moreover, argues Burlington, IEMS should have engaged in further tests by measuring the correlation of the data and mapping the reliability of the model’s predictions through a prediction standard error (“PSE”) map.⁷¹⁹ With respect to data correlation, Professor Rouhani’s variograms showed that “more than half of the model layers” are not correlated with the result that linear interpolation is unreliable.⁷²⁰ IEMS should also have tested the reliability of its interpolation by generating a PSE map showing “zones of reliability” and indicating the range of error within each zone.⁷²¹ For Burlington, Professor Rouhani’s testing of IEMS’s model through cross-validation and the use of PSE maps confirmed that the model is not reliable.⁷²²

4.4.3 Discussion

372. After closely reviewing the evidence and the Parties’ arguments, the Tribunal comes to the conclusion that, as between the methods presented to it, the delineation of discrete pockets of contamination by relying on actual sampling is best suited to estimate the impacted areas and to calculate the volumes of contaminated soil requiring remediation. It therefore discards IEMS’s modelling, which it considers unreliable, or at least less reliable, in the circumstances. For various reasons, however, the Tribunal does not rely completely on the results of GSI’s delineation exercise and has therefore independently calculated impacted areas and volumes of soil. The Tribunal first provides its reasons for discarding IEMS’s modelling ((a) below), then addresses the problems with certain of GSI’s delineations ((b) below), before explaining its own approach ((c) below).

a. IEMS’s modelling

373. The Tribunal discarded IEMS’s modelling for various reasons. In far too many instances there appears to be no reasonable relationship between the model’s predictions and the

⁷¹⁸ *Id.*, ¶ 188; Rouhani ER, ¶¶ 34-37.

⁷¹⁹ Rejoinder, ¶ 190.

⁷²⁰ *Id.*, ¶ 191; Rouhani ER, ¶¶ 26-28 and Table A.1.

⁷²¹ Rejoinder, ¶ 192.

⁷²² *Id.*, ¶ 193; Rouhani ER, ¶¶ 50, 69.

actual data, thus excessively inflating the size of contaminated areas. Among other things, the model does not properly consider clean samples, extends to areas where no sampling was undertaken, and insufficiently takes account of topography and other physical features. In addition, it appears that IEMS did not test the reliability of its conclusions although the ArcGIS user instructions require cross-validation.⁷²³ These failings of IEMS's modelling are discussed below.

374. First, the Hearing and the Site Visit showed that IEMS's model extends to demonstrably uncontaminated areas. It is common ground among the experts that soil sampling data determine the existence of contamination.⁷²⁴ Burlington rightly pointed to Gacela 4 and Jaguar 3 as examples where clean samples collected by IEMS during its fourth sampling campaign are located in areas that were modelled as contaminated after the first three sampling campaigns, thus disproving the model's predictions.⁷²⁵ IEMS's re-modelling of Gacela 4 after the fourth campaign still predicted contamination in areas where new clean samples had been found.⁷²⁶

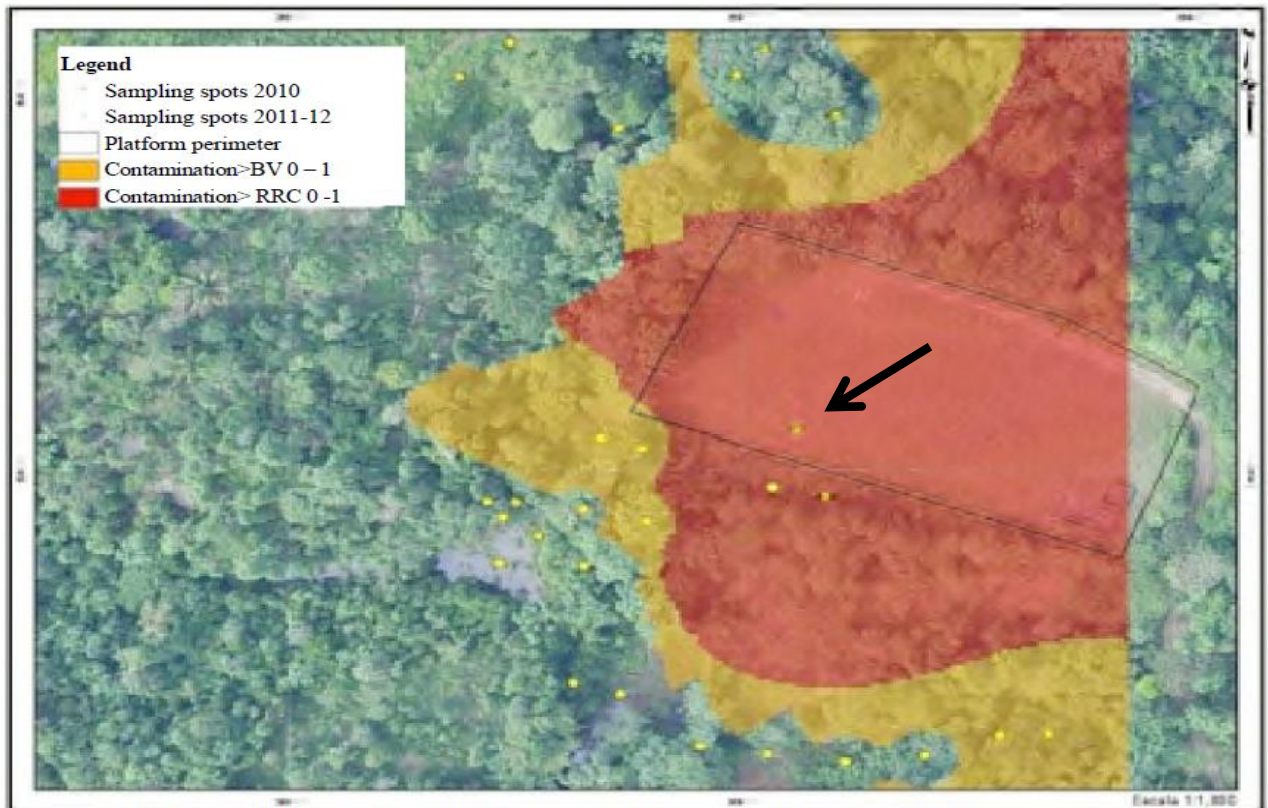
⁷²³ The ArcGIS user instructions provide in relevant part: "Before you produce the final surface, you should have some idea of how well the model predicts the values at unknown locations. Cross-validation and validation help you make an informed decision as to which model provides the best predictions. The calculated statistics serve as diagnostics that indicate whether the model and/or its associated parameter values are reasonable". Performing Cross-Validation and Validation, p. 1 (**Exh. CE-CC-439**).

⁷²⁴ Tr. (Day 3) (ENG), 716:7-12 (Cross, Alfaro); Tr. (Day 5) (ENG), 1527:12-17 (Cross, Connor).

⁷²⁵ C-PHB, ¶¶ 160-164. For Gacela 4 refer to: C-PHB, ¶¶ 160-161 and compare IEMS ER4, Att. 38, Gacela 4, p. 17 with Gacela 4_Remodeled, Figure 2D (**Exh. E-501**) as well as Gacela 4, Figure 06-B (**Exh. E-499**). For Jaguar 3, refer to: C-PHB, ¶¶ 162-163 and compare IEMS ER4, Att. 38, Jaguar 3, p. 17 with Jaguar 3_Remodeled, Figure 08-B (**Exh. E-499**).

⁷²⁶ C-PHB, ¶ 161.

375. Similarly, during the Site Visit, the Tribunal observed the absence of correlation of the data included in IEMS's models, in particular at Gacela 2 and Mono CPF. The image of Gacela 2 below shows how IEMS's model predicts contamination extending up and across most of the platform to the north (and beyond) to areas where not a single soil sample had been collected.⁷²⁷ In fact, only one sample taken on the platform – indicated by the Tribunal with an arrow – appears to drive the model's predictions (all other samples are to the south or southwest of the platform and lie in lower altitudes than the platform):

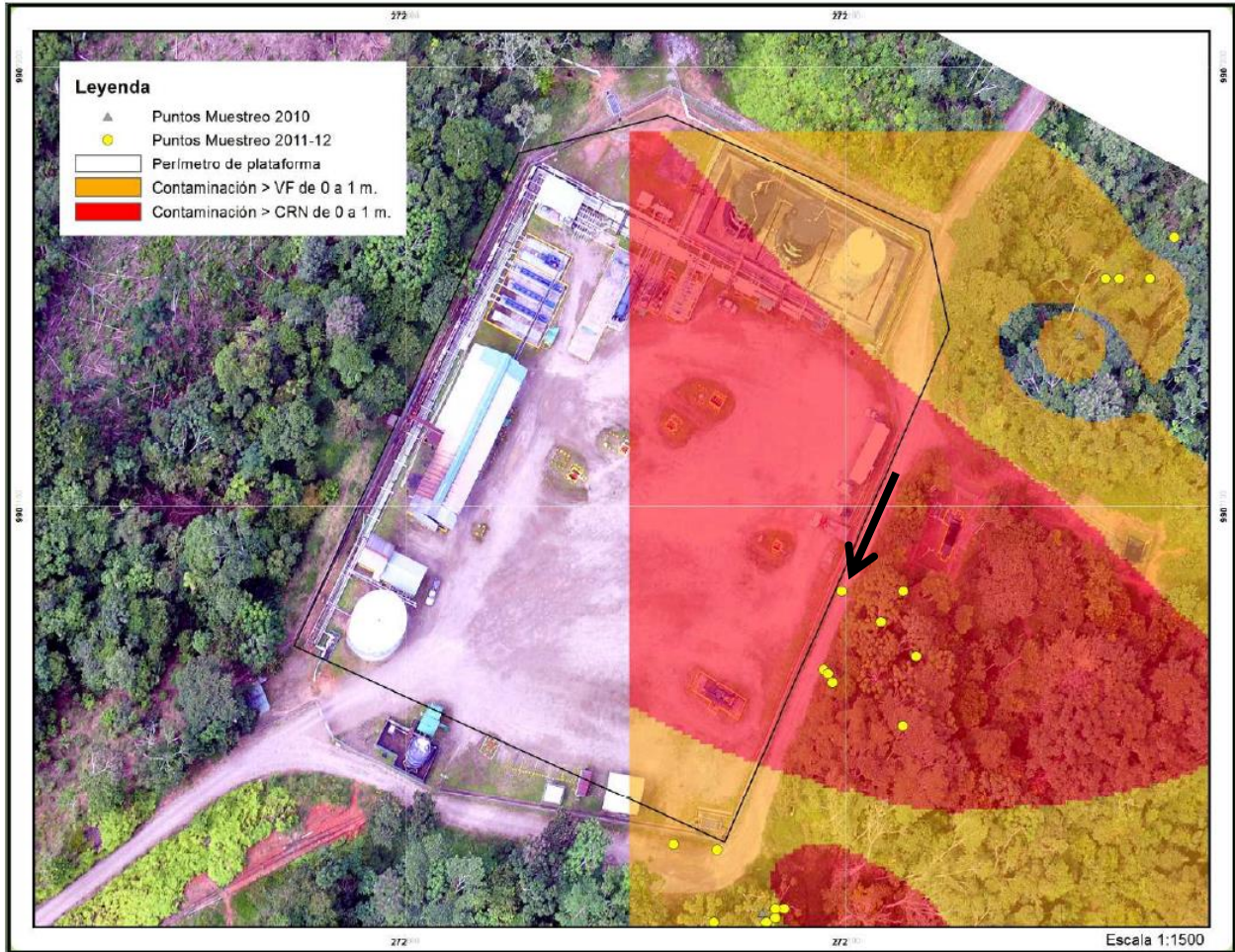


Source: Aerial photograph taken by the IEMS team from a helicopter (February 2012)
Scale 1:1,000

⁷²⁷

IEMS ER4, Att. 38, Gacela 2, p. 19. The red area shows IEMS's predictions of contamination above Ecuador's regulatory criteria for sensitive ecosystems under RAOHE Table 6.

376. In a comparable manner, the image of Mono CPF below depicts low-lying off platform samples to the east of the platform in the area designated by GSI as Area 2M – again indicated by the Tribunal with an arrow – projecting contamination up and across more than a third of the platform although not a single sample was taken on the platform.⁷²⁸

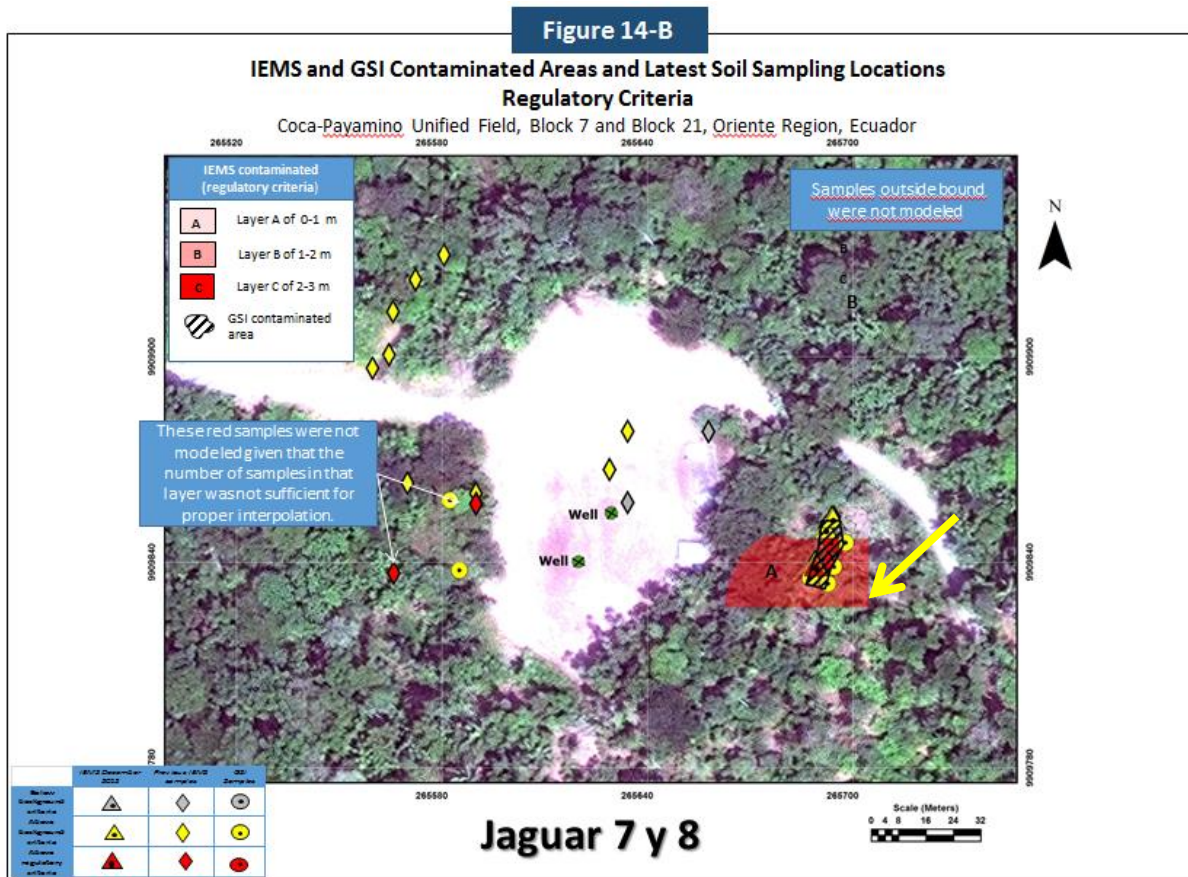


377. The pictures above also illustrate that the bounds on IEMS’s modelling are determined by clusters of samples and/or discrete samples without considering that large areas inside the bounds have not been sampled at all. Much of IEMS’s modelling is thus rather speculative. It also involves a degree of arbitrariness as the models commonly predict that contamination abruptly stops at straight lines.

378. As was already mentioned, IEMS’s model also fails to sufficiently factor in topography and other physical features of the sites, which is exemplified in the following figure

⁷²⁸ Refer to: IEMS ER4, Att. 38, Mono CPF, p. 29. See also: Tr. Site Visit (Day 3) (ENG), 88:7-16 (Tribunal, Bianchi at Mono CPF); Video Clip (Day 3), 2:01:09-2:01:42 (Bianchi); C-PSVB, ¶ 46.

showing Jaguar 7-8. IEMS's model predicts, without supporting sampling data, that contamination spreads east across a creek for approximately 10 meters and uphill for several meters – indicated by the Tribunal with a yellow arrow –,⁷²⁹ which is contrary to IEMS's own explanation that contamination could conceivably spread uphill some 50 centimetres when the water level rises during the rainy season.⁷³⁰ In addition, IEMS's model ignores GSI's samples on the other side of the creek which show no exceedances.⁷³¹

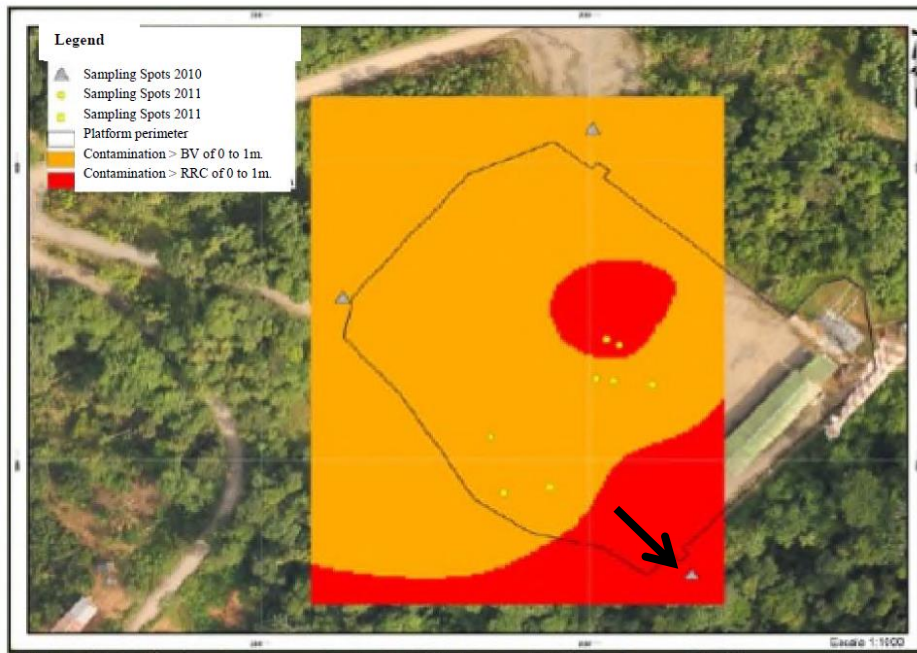


⁷²⁹ Jaguar 7-8, Figure 14-B (**Exh. E-499**).

⁷³⁰ Tr. Site Visit (Day 3) (ENG), 56:1-4 (Tribunal, Chaves at Jaguar 7/8). While the Tribunal might agree with IEMS's explanation that the water level of the creek, and thus also contamination, could rise some 50 centimeters during the rainy season, it does not justify the extension of the model some 10 meters beyond the creek amounting to far more than 50 centimeters height difference.

⁷³¹ GSI ER1, App. L, Tables L.42.3 and L.42.4 for soil confirmation sample JA78-1M-1 and Table L.42.5 for soil delineation samples JA78-1M-3 and JA78-1M-4. See also: GSI ER1, App. L, Figure L.42.5.

379. IEMS's modelling at Yuralpa Pad A provides another example of the lack of relation to actual site data. On the basis of a single sample taken next to the oil water separator in the southern corner of the platform (i.e., in the area designated by GSI as Area 2M) – indicated by the Tribunal with an arrow – the model predicts that contamination not only spreads downhill to the southeast, but also towards the southwest without any substantiated explanation for this pathway.⁷³² Indeed, there are no IEMS samples showing contamination in that particular area. To the contrary, GSI samples show that the contamination flowed some distance in the southeast direction,⁷³³ but that in fact it did not extend to the southwest of the oil water separator.⁷³⁴ This is illustrated by IEMS as follows:⁷³⁵



SOURCE: Aerial photograph taken by an IEMS team from a helicopter (February 2012)

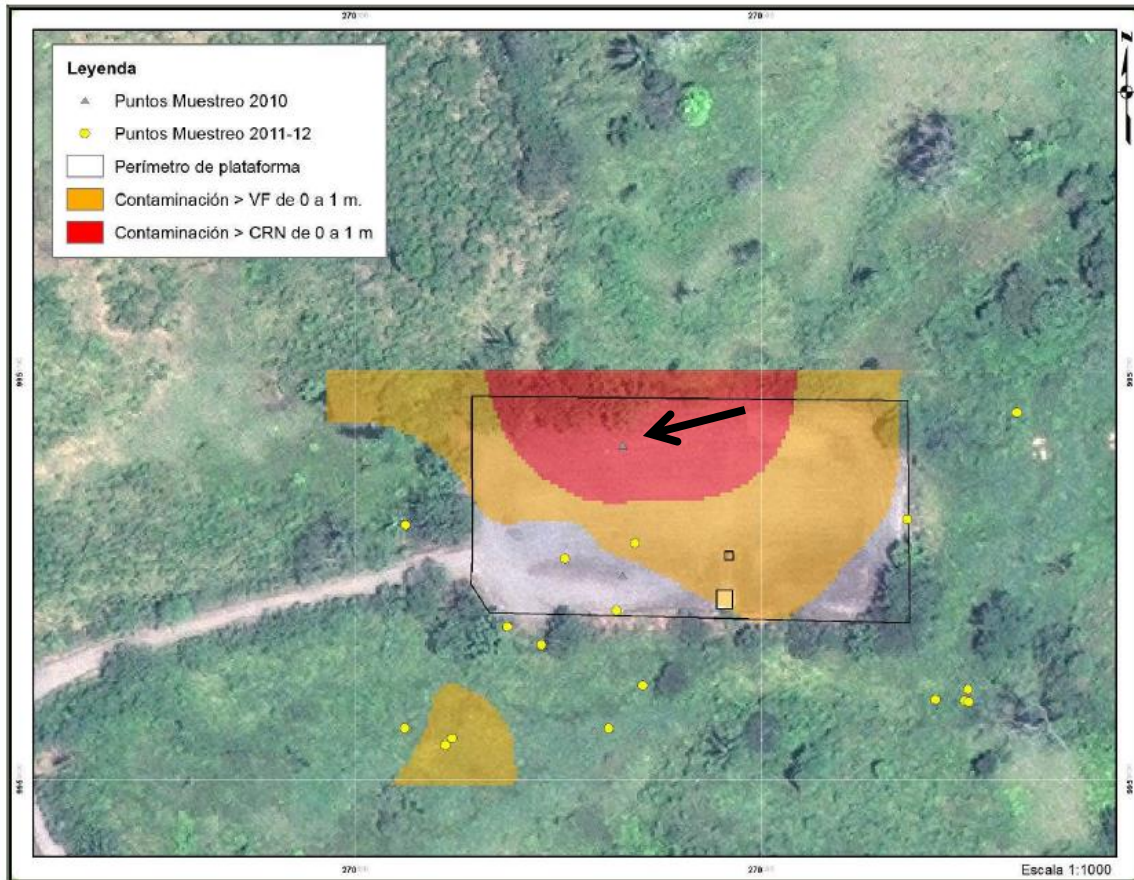
⁷³² During the Site Visit, IEMS pointed to two potential contamination pathways. First, IEMS mentioned in passing the existence of a river surrounding the platform without providing more specific indications as to the direction of the water flow. Second, IEMS spoke about the structure of the material used to build platforms, which would facilitate the migration of contamination to off platform areas. Tr. Site Visit (Day 1) (ENG), 18:22-19:9 (Tribunal, Chaves at Yuralpa Pad A).

⁷³³ GSI ER1, Att. L.66_Yuralpa Pad A, Tables L.66.3 to L.66.5 and Att. A-E, Figure L.66.E.A.1. In particular, GSI sample YUPA-2M-1-(0.0-0.3)R, sample YUPA-2M-1-(0.0-0.3)C Dup, and sample YUPA-2M-3-(0.0-1.0) Dup. The duplicate samples in this case show higher concentrations than the original samples.

⁷³⁴ GSI ER1, Att. L.66_Yuralpa Pad A, Table L.66.5 and Att. A-E, Figure L.66.E.A.1. In particular, GSI sample YUPA-2M-2-(0.0-1.0).

⁷³⁵ IEMS ER4, Att. 38, Pad A, p. 10.

380. IEMS’s predictions for contamination at Coca 15 also demonstrate the flaws of its model. At that site, a single sample with a TPH value purportedly exceeding permissible limits – signalled by the Tribunal with an arrow – drives the entire model and predicts contamination in excess of regulatory limits across approximately one-fourth of the platform.⁷³⁶ This is illustrated by IEMS as follows:⁷³⁷



FUENTE: Fotografía aérea tomada por el equipo de IEMS desde un helicóptero (febrero de 2012)

⁷³⁶ The Tribunal is concerned here with assessing the reliability of IEMS’s model, not on whether any particular sample location has been properly classified under applicable land use criteria. As will be seen further below, this sample (MS-COC-C2-15.3-0.5) has a TPH value of 3,571 mg/kg but shows no exceedance of the correct applicable regulatory criteria, since it is located on the platform and thus must be compared to industrial land use criteria. As stated by Burlington’s counsel during the Site Visit: “So, there’s no reason to have the model call for any remediation, and, yet, this site really allows me to illustrate, perhaps, most vividly why this model is so detached from reality and detached from the data. One sample point for a TPH exceedance that is not real drives this red part of the model”. Tr. Site Visit (Day 4) (ENG), 72:26-31 (Presentation by Ms. Renfroe at Coca 15).

⁷³⁷ IEMS ER3, Annex C, Coca 15 Corrected, p. 16.

381. During the Site Visit of Coca 15, the Parties' experts disagreed whether the model extended north of the platform where the terrain shows a steep slope upwards.⁷³⁸ While IEMS opined that its model perfectly aligned with topography,⁷³⁹ the Tribunal observes that the red area extends approximately 5 meters beyond the platform (the scale of the map is 1:1000) and thus predicts contamination going up the slope.⁷⁴⁰
382. In addition, the Tribunal notes that IEMS did not perform any analysis to determine whether its data was spatially correlated.⁷⁴¹ It also conceded at the Hearing that it did not conduct a quantitative review to verify the reliability of its model.⁷⁴² IEMS actually stated that it could not assess the level of precision or imprecision of its model for lack of quantitative analysis⁷⁴³ and admitted being unable to opine whether a 50 percent margin of error would be acceptable.⁷⁴⁴

⁷³⁸ Tr. Site Visit (Day 4) (ENG), 76:1-30 (Tribunal, Chaves) and 76:31-77:10 (Tribunal, Bianchi).

⁷³⁹ During the Site Visit, IEMS conceded that they did not verify that their bounds aligned to local topography at this particular site, although IEMS thought that this site demonstrated how well its model worked: "Q: How could the contamination get up there?. A. It doesn't rise. Q: It doesn't rise. Then how does it get here? A. We have a sampling point with TPH values of 3571; the truth is that I hadn't paid attention to that, but, what a good model we made!". Tr. Site Visit (Day 4) (ENG), 76:1-8 (Tribunal, Chaves).

⁷⁴⁰ As GSI explained during the Site Visit: "This is clear evidence of the arbitrariness of how this model works and how it does not consider topography. The model, even if he used it correctly, does not have any input for topography. There is nowhere that you tell it, "This is higher. This is lower." So, we have to dispel that notion that it considers topography. But more than that – I'm going to hurry. Look at the scale, 1:1000. Every measurement here of one inch would be a thousand inches. This is putting us on the other side. I mean, we can talk about the trees, the clouds, we can talk about anything you want, but this model is on the other side of the slope". Tr. Site Visit (Day 4) (ENG), 76:35-77:9 (Tribunal, Bianchi).

⁷⁴¹ C-PHB, ¶¶ 165-166. IEMS confirmed at the Hearing that it did not engage in any quantitative analysis to test the spatial correlation of its dataset. Tr. (Day 3) (ENG), 835:21-836:7 (Cross, Chaves).

⁷⁴² During cross-examination, IEMS responded as follows: "Q. And before submitting your Final Report in this case, you did not undertake to evaluate in any quantitative fashion the margin of error or degree of reliability or certainty or uncertainty in your Report, did you? A. Quantitative, no, we didn't conduct a quantitative analysis". Tr. (Day 3) (ENG), 787:20-788:4 (Cross, Alfaro).

⁷⁴³ Tr. (Day 3) (ENG), 788:4-7 (Cross, Alfaro).

⁷⁴⁴ IEMS responded as follows during cross-examination: "Q. I want to focus on the risk that the number you have given this Tribunal of \$2.6 billion has a margin of error, has a significant margin of error. And as the Project Manager for this project, and the man who has recommended \$2.6 billion of remediation, I'm asking you, sir: Is it acceptable to you for that number to have a 50 percent margin of error? A. Honestly, I don't know if it's acceptable or not acceptable. I am sorry that I'm unable to answer your question". Tr. (Day 3) (ENG), 786:4-14 (Cross, Alfaro).

383. Finally, the Tribunal observes that Ecuador's other expert, RPS, did not peer review IEMS's model predictions or otherwise test the validity of IEMS's work.⁷⁴⁵ More importantly, it appears to the Tribunal that, although RPS criticised GSI's sampling methodology (such as using composite samples or sampling at different depths than IEMS), it did not express any principled criticism of GSI's contour delineation.⁷⁴⁶
384. For these reasons, the Tribunal will not rely on IEMS's modelling. It does not, however, discard the extensive sampling data collected by IEMS. The Tribunal now turns to GSI's delineation approach.

b. GSI's delineation

385. Before addressing in more detail GSI's approach to delineation (iii), two preliminary issues need to be addressed, namely GSI's indicator parameter theory (i) and GSI's recourse to composite sampling for delineation purposes (ii).

(i) *Indicator parameters*

386. GSI only delineated around samples showing TPH or barium exceedances and discarded other heavy metal exceedances as "background metals issues", on the ground that such exceedances are unrelated to oilfield operations.⁷⁴⁷ Ecuador strongly objected to this practice,⁷⁴⁸ in particular by stressing that Mr. Saltos confirmed that numerous chemicals are used during various phases of the oilfield operations and that

⁷⁴⁵ RPS testified as follows during cross examination: "Q. And you're not endorsing the model that they have prepared for this case, are you? A. I have not reviewed the details of the models, no". Tr. (Day 4) (ENG), 1061:14-17 (Cross, Crouch). And further: "[L]ike I say, I'm not certain of everything IEMS ran. I didn't review all four of their Reports. I looked at what GSI brought forward into their Reports". Tr. (Day 4) (ENG), 1100:9-12 (Cross, Crouch). See also: C-PHB, ¶ 175.

⁷⁴⁶ For instance, RPS stated the following under cross-examination: "Q. And so – and you've provided no criticism of the actual delineation of impacted soils done by GSI at the 17 sites that they identified in their Report? A. No, I think my primary criticisms there were the compositing of the delineation samples – I guess I offered two criticisms". Tr. (Day 4) (ENG), 1072:8-13 (Cross, Crouch). RPS also criticized GSI more generally for only analyzing for metals and TPH, but not other petroleum chemicals of concern such as BTEX or PAHs. RPS ER2, p. 43. The Tribunal further notes that even IEMS appeared to agree that delineation is a reliable methodology if properly applied: "When delineation per se is carried out, it can be done in a relatively trustworthy way, but it has to be very well-done". Tr. (Day 3) (ENG), 947:14-16 (Tribunal, Alfaro).

⁷⁴⁷ Rejoinder, ¶¶ 97, 139-141; GSI ER1, pp. 89-92, ¶ 225 and Exhibits 37-39; GSI ER2, pp. 17-18, ¶ 45(d).

⁷⁴⁸ Reply, ¶¶ 69-74; IEMS ER4, pp. 12-14.

Burlington failed to provide a list of the chemicals the Consortium used.⁷⁴⁹ The Tribunal rejects Burlington's indicator parameter theory for the simple reason that under RAOHE and TULAS any exceedances of applicable remediation criteria (adjusted as required to account for higher natural concentrations) in the area of the oilfield operations, warrant remediation by the Consortium, unless Burlington can rely on one of the three exculpatory causes referred to in paragraph 238(iii) above.

(ii) *Composite sampling*

387. Another issue with GSI's approach lies in the use of composite delineation samples. The Tribunal notes that GSI collected discrete risk characterization and soil confirmation samples and that GSI initially started out by collecting discrete delineation samples, only later collecting composite samples since IEMS was projecting contamination in 1-meter layers.⁷⁵⁰
388. In addition to various other criticisms raised by Ecuador with respect to composite samples,⁷⁵¹ Ecuador notes the risks of dilution and volatilization.⁷⁵² Ecuador stressed

⁷⁴⁹ R-PHB, ¶ 240, referring to: Tr. (Day 4) (ESP), 1267:1-13 (Cross, Saltos), corresponding to Tr. (Day 4) (ENG), 1210:5-15 (Cross, Saltos).

⁷⁵⁰ While GSI first took 30 centimeter interval discrete samples, it then resorted to 1-meter interval composite sampling for delineation purposes. GSI explained that prior to its second sampling campaign "it was discovered that IEMS used discrete sampling intervals to represent full 1 m depth intervals. For example, if an exceedance was detected from 1.2 to 1.5 m, then IEMS assigned that exceedance to the entire 1 to 2 m depth interval. In response, GSI collected composite delineation soil samples [...] from 1-m intervals (i.e., 0.0 – 1.0 m) to provide full lateral delineation. In addition, if the target IEMS sampling location was collected from a portion of a 1-m depth interval, then the GSI composite delineation samples were collected from that full 1-m interval". See: GSI ER1, pp. D.10-D.11. At the Hearing, GSI explained its course of action as follows: "The goal of our or the objective of our program, was to delineate soil impacts and also to check the IEMS model, and it is true that we began taking these discrete samples and then we switched to taking the 1-meter samples for the purposes of delineation and checking the model". Tr. (Day 5) (ENG), 1454:14-19 (Direct, Bianchi). See also: Ecuador's Closing Statement, Slide 104.

⁷⁵¹ For instance, Ecuador stated that GSI collected its delineation samples at different depths from IEMS's samples showing contamination. Ecuador's Closing Statement, Slide 107. Ecuador's expert RPS already raised concerns with respect to GSI's use of composite samples for its risk characterization of mud pits, using Oso 9 as an illustration. RPS ER2, p. 48. RPS stated that GSI's risk characterization samples collected at mud pits at the Oso 9 site were "two-part composites". RPS further stated that the use of composite samples led to (i) the loss of VOCs such as TPH, benzene and 1-methylnaphtalene prior to analysis, and (ii) dilution of sample results that are biased low and do not represent the potential concentration of contaminants in the media. According to RPS, "[i]t is standard risk assessment protocol to collect "discrete" rather than "composite" samples for determining exposure point concentrations". RPS further pointed to the EPA's guidance on composite sampling, which provides as follows: "If the integrity of the individual sample values changes because of compositing, then composite sampling may

that GSI conceded that 1-meter composite samples are biased towards the lower value since they only show an average and not the highest concentration.⁷⁵³ For these reasons, IEMS did not rely on GSI's delineation samples to compile its models.⁷⁵⁴

389. The Tribunal need not enter with great detail into the Parties' discussion on composite samples.⁷⁵⁵ It generally agrees that discrete samples allow for greater accuracy in determining the highest concentration of a contaminant in the soil. There is thus a certain risk of dilution inherent in composite sampling which mixes larger intervals of soil instead of testing thinner intervals. On the other hand, IEMS's 30 centimeter interval samples also involve a degree of composition, merely on a smaller portion. Thus, the Tribunal notes that a certain level of vertical compositing is inevitable for any soil sample.
390. More importantly, the Tribunal notes that Ecuadorian regulations do not mandate a particular sampling method, and, in particular, do not impose discrete sampling. Rather, RAOHE provides that composite sampling is acceptable.⁷⁵⁶ RAOHE Annex 5 determines various analytical methods and provides that the method for soil sampling is

not be the desired approach. For example, volatile chemicals can evaporate upon mixing of samples or interaction can occur among sample constituents. Another limitation is imposed by potential dilution, when an individual sample with a high value is combined with low values resulting in a composite sample that falsely tests negative". USEPA, EPA Observational Economy Series, Volume 1: Composite Sampling, EPA/2010/R-95/005, August 1995, p. 5 (RPS ER2, Exh. 30a). See also: RPS Direct Presentation, Slide 14.

⁷⁵² Ecuador's Closing Statement, Slide 106.

⁷⁵³ See, for instance, Ecuador's Closing Statement, Slide 108, referring to: Tr. (Day 5) (ENG), 1656:12-19 (Tribunal, Bianchi).

⁷⁵⁴ During the Site Visit, Ecuador explained at Coca 8 why IEMS did not use GSI's delineation samples to model the extent of contamination: "all of these delineation samples here are composite [...] and explains why GSI results are simply not reliable. They cannot be used. If you were to use that, you will be using wrong data [...] If delineation had been done and they had the choice at the same depth, horizontally, in the same location vertically, we could be talking about delineation, but that's not what they did". Tr. Site Visit (Day 2) (ENG), 83:19-24 (Presentation of Mr. García Represa at Coca 8). See also: R-PSVB, pp. 38-39.

⁷⁵⁵ For Ecuador's position, refer to: R-PHB, ¶¶ 25, 199, 277-287; R-PSVB, ¶¶ 149-152; Tr. (Day 4) (ENG), 997:13-1011:15 (Direct, Crouch); Ecuador's Closing Statement, Slides 104-108; RPS Direct Presentation, Slides 17-22; RPS ER2, pp. 48, 50. For Burlington's position, refer to: C-PHB, ¶¶ 31-32; C-PSVB, ¶¶ 202-209; Tr. (Day 5) (ENG), 1454:14-1455:8 (Direct, Bianchi) and 1663:10-1669:15 (Tribunal, Bianchi); Burlington's Closing Statement, Slides 73-74; GSI ER2, ¶¶ 196-198.

⁷⁵⁶ RAOHE Annex 5 (**Exh. EL-174**). Table 7 of RAOHE Annex 2 also expressly contemplates composite sampling within mud pits. It reads in relevant part: "The sampling shall be performed so as to obtain representative composite samples as a function of total volume disposed of at the respective site" (Translation by the Tribunal). See also: GSI ER2, ¶ 196.

to collect a “composite and representative sample” (“*Muestra compuesta y representativa*”).⁷⁵⁷

391. Finally, the Tribunal accepts GSI’s composite samples in light of the fact that IEMS itself calculated the allegedly impacted areas on the basis of 1-meter layers, the values of which were determined based on samples that ranged from only 10 to 30 centimeters in length.⁷⁵⁸

392. As to the risk of volatilization referred to above, the Tribunal notes that IEMS did not test its samples for Volatile Aromatic Hydrocarbons,⁷⁵⁹ and that RPS confirmed that GSI screened its samples with a photo ionization detector (“PID”) before sending them to the laboratory.⁷⁶⁰ In any event, the Tribunal is satisfied with GSI’s explanation that by the time the sampling took place, these compounds had volatilized to a large extent, since the alleged contamination dated back several years and a key characteristic of these compounds is their high mobility.⁷⁶¹

(iii) *Linear interpolation*

393. With these considerations in mind, the Tribunal now turns to GSI’s approach to delineation through linear interpolation. While the Tribunal generally accepts Burlington’s delineation methodology, it cannot simply rely on GSI’s calculations for several reasons. First, GSI only investigated 22 sites to confirm and delineate the extent of contamination at 74 facilities (of which GSI inspected 58) based on the erroneous assumption that most off platform areas must be evaluated against

⁷⁵⁷ It then goes on to state as follows: “a minimum of 15-20 sub-samples per hectare or equivalent, homogenization” (Translation by the Tribunal). RAOHE Annex 5 (**Exh. EL-174**).

⁷⁵⁸ GSI provided the following explanation: “IEMS collected soil samples that typically ranged from 10 to 30 cm in length but assigned the concentration of those samples to the entire 1-meter depth interval of the layer being modeled in their volume calculations. GSI, however, collected soil samples of the full 1-meter length or thickness of the layer being delineated. Consequently, GSI did not have to extrapolate concentrations from a small vertical interval and assume that they applied to a much thicker layer”. GSI ER2, ¶ 197.

⁷⁵⁹ The Tribunal also notes that IEMS only initially analyzed its samples for PAHs, i.e. compounds which Ecuador’s other expert RPS qualified as being pervasive, more toxic and mobile than volatiles, but stopped when it found no exceedances. Tr. (Day 4) (ENG), 1097:19-1098:2 and 1100:17-1101:5 (Cross, Crouch).

⁷⁶⁰ Tr. (Day 4) (ENG), 1087:20-1088:1 (Cross, Crouch).

⁷⁶¹ Tr. (Day 5) (ENG), 1425:18-1426:13 (Direct, Connor).

agricultural land use criteria.⁷⁶² Consequently, for the contaminated sites for which GSI provided no delineation, the Tribunal will have to undertake its own assessment.

394. Second, as discussed above (see paragraphs 318-322) for the 17 sites where GSI identified exceedances, GSI's adjusted remediation criteria for certain metals (i.e., barium, cadmium and nickel) have now been found to be incorrect. As GSI conceded under cross-examination, it would have had to delineate around more IEMS samples if the regulatory criteria had been lower than those which it applied.⁷⁶³ Moreover, GSI did not propose alternative delineations considering different regulatory criteria. In other words, GSI's delineation data is insufficient for purposes of the Tribunal's establishment of soil contamination.
395. Third, various aspects of GSI's sampling procedure have led the Tribunal to adjust GSI's estimates. In this respect, it may be useful to start by outlining GSI's approach of physical delineation and hand-contouring. GSI first reviewed the laboratory results of soil samples to identify and locate impacted soils.⁷⁶⁴ It then surrounded these exceedance points with additional soil samples "until a clean perimeter is defined as needed to delineate the extent of the impacted soils".⁷⁶⁵ This "clean perimeter" is also referred to as the "clean margin".⁷⁶⁶ It then drew hand contour lines "by interpolating among the sample points" (this process is described below), to finally delineate the

⁷⁶² GSI ER1, p. 70. In its second expert report, GSI recognizes that remediation of 37,555 m³ of contaminated soil is required at 17 sites, although it denies that the Consortium caused this contamination. These sites are: Coca 1, Coca 4, Coca 6, Coca 8, Coca CPF, Payamino 1, Payamino 2/8, Payamino 4, Payamino 23, Gacela 1/8, Gacela 2, Jaguar 1, Jaguar 2, Jaguar 7/8, Mono CPF, Mono Sur and Yuralpa Pad A. See: GSI ER2, p. 24, Exhibit 8 and Table 4; Tr. (Day 5) (ENG), 1462:22-1463:8 (Direct, Bianchi); GSI's Direct Presentation, Slides 22 and 54. In its first expert report, GSI originally recognized that remediation was warranted at 16 sites, corresponding to 33,415 m³ of total soil volume. See: GSI ER1, p. 88.

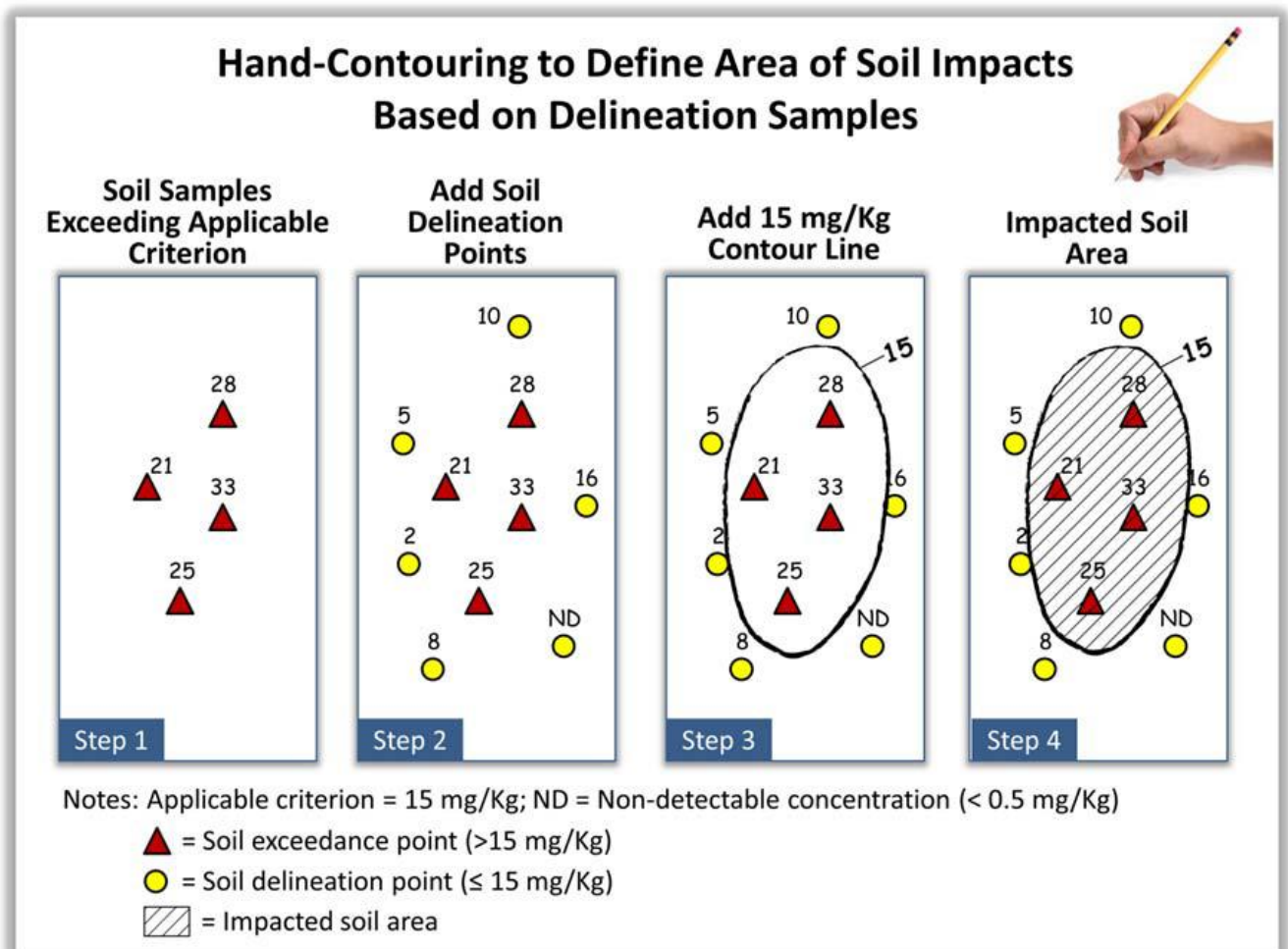
⁷⁶³ GSI responded as follows: "Q. So, the definition of what an exceedance is is really material, and what I'm putting to you is, if the exceedance threshold is lower, you may be required to delineate around other IEMS samples; correct? A. That is correct. That is possible". Tr. (Day 5) (ENG), 1585:9-14 (Cross, Bianchi). And also: "Q. Now, you recognize, sir, that had you lowered the threshold for an exceedance, there would be more IEMS samples that would need to be delineated around, and some of your own samples may not show clean, and, therefore, you would be required to go even farther to delineate; correct? A. In that hypothetical, yes". Tr. (Day 5) (ENG), 1586:3-8 (Cross, Bianchi).

⁷⁶⁴ GSI ER2, p. 21.

⁷⁶⁵ *Ibid.*

⁷⁶⁶ See, for instance: Tr. (Day 5) (ENG), 1588:8 (Cross, Bianchi).

impacted soil area and its total volume.⁷⁶⁷ The following image shows the four steps employed by GSI:⁷⁶⁸



396. The contour lines above (so-called isoconcentration lines) circumscribe the area that fails to comply with the applicable regulatory criteria for one of the indicator parameters tested by GSI, namely TPH or barium, for a given layer of soil depth.⁷⁶⁹ These contour lines were determined through a combination of one or more of (i) linear interpolation, (ii) physical site features and boundaries (such as edges of pits, platforms, oil-water

⁷⁶⁷ GSI ER2, p. 21.

⁷⁶⁸ GSI ER2, p. 22, Exhibit 6.

⁷⁶⁹ See, for instance: GSI ER2, Annex D.7.1.4.1 (Coca 8).

separators, roads), and (iii) topographic features (such as slopes, streams and catchment areas) and field observations.⁷⁷⁰

397. GSI relied on linear interpolation using an equation “to mathematically locate the isoconcentration contour line between a sampling location that exceeded the specified criterion to a corresponding sampling location that was below the criterion”.⁷⁷¹ The interpolated points were indicated on a map using “tick marks” and then connected to create an isoconcentration contour line at the specified regulatory criterion for a certain parameter.⁷⁷² GSI considered site features “particularly in situations where linear interpolation was not possible”.⁷⁷³ It further explained that “[f]or selected portions of potentially impacted areas at some sites”, it determined a “set distance beyond points of exceedance” based on local topography and field observations where “linear interpolation was not applicable and/or site features were not available to delineate potentially impacted areas”.⁷⁷⁴ At the Hearing, GSI acknowledged that the methodology involved a degree of uncertainty in some areas, but that by using professional judgment, providing for additional sampling, and allowing for a contingency factor – all of which it did – that uncertainty could be significantly reduced.⁷⁷⁵

398. The Tribunal’s concerns with GSI’s approach can be well illustrated using Coca 8 as an example. Indeed, this could be called the “poster child” of Ecuador’s critique of GSI’s methodology in view of the prominence that it was given at the Hearing. The figure below shows GSI’s delineation for barium in the 1-2 meter layer in the area south of the mud pits (located south of the Coca 8 platform).⁷⁷⁶

⁷⁷⁰ *Ibid.*

⁷⁷¹ See, for instance: GSI ER2, Annex D.7.1.4.1 (Coca 8); Tr. (Day 5) (ENG), 1460:2-16 (Direct, Bianchi).

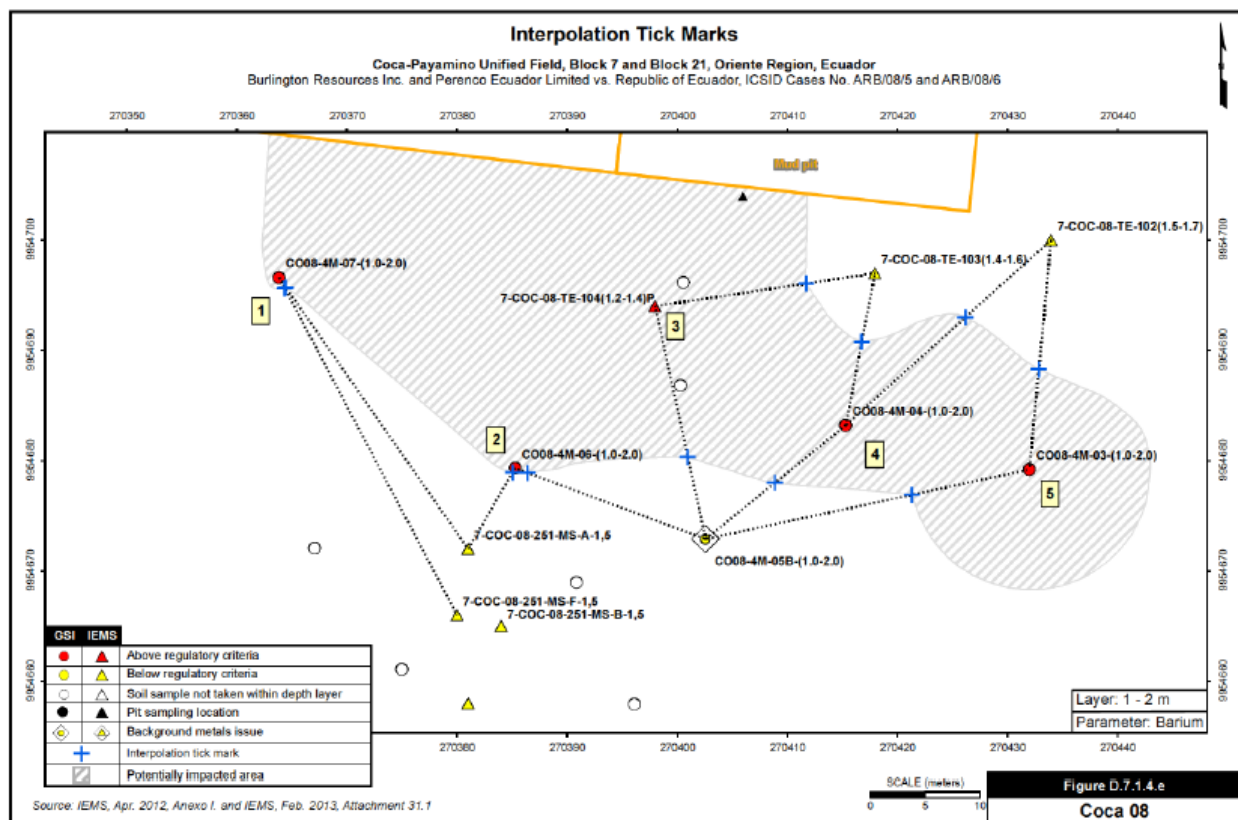
⁷⁷² *Ibid.*

⁷⁷³ See, for instance: GSI ER2, Annex D.7.1.4.2 (Coca 8).

⁷⁷⁴ See, for instance: GSI ER2, Annex D.7.1.4.3 (Coca 8).

⁷⁷⁵ Tr. (Day 5) (ENG), 1460:17-1461:14 (Direct, Bianchi).

⁷⁷⁶ GSI ER2, App. D, Figure D.7.1.4.e (Coca 8). See also: R-PHB, ¶ 359.



399. As a first concern, although it does not share Ecuador's criticism that GSI failed to engage in a site-wide assessment,⁷⁷⁷ especially since the burden to make a showing of harm rests on Ecuador, the Tribunal notes that, as this figure graphically depicts, GSI failed at times to comprehensively collect delineation samples around certain known exceedance points. In the example above, this is the case for instance at: (i) sample location CO08-4M-07 in Area 4M, where no delineation samples were taken to the northwest, west, southwest or south; (ii) sample location CO08-4M-03, where no delineation samples were taken to the northeast, east, southeast, south and southwest; (iii) sample location CO08-4M-04, where no sample was taken to the south; and (iv) sample location CO08-4M-06, where no sample was taken to the west.

400. The Tribunal is aware of the fact that the barium value for sample location CO08-4M-07 (770 mg/kg) is close to permissible limit for agricultural use (i.e., 750 mg/kg). The Tribunal nonetheless considers that, as a general matter, and in the light of its own description of its methodology, GSI should have taken additional samples, in particular

⁷⁷⁷ See, for instance: R-PHB, ¶ 339.

because GSI purportedly “stepped out” of impacted areas to find clean soil.⁷⁷⁸ This is compounded by the fact that here the applicable criterion is the adjusted sensitive ecosystem limit of 639 mg/kg (see below paragraph 472).

401. The Tribunal further notes GSI’s explanation for sample location CO08-4M-03, where the “potentially impacted area” was extended by 11 meters southeast since that sample location “did not have a bounding delineation sampling location or site feature to the east”.⁷⁷⁹ GSI explained that the 11 meter perimeter was “a conservative estimate based on the relatively flat localized terrain; therefore, the potentially impacted area was assumed to extend radially an equivalent distance from the GSI exceedance point”.⁷⁸⁰ However, Professor Rouhani conceded that “it would have been much easier to solve this problem by just having one more delineation sample”.⁷⁸¹ Admittedly, he also concurred with GSI’s explanation that practical limitations may militate for using “professional judgment” in cases where the results of delineation samples come back from the laboratory with higher than expected values, thus compelling engineers to apply practical approaches instead of relying on purely statistical methods.⁷⁸²
402. A second and potentially more problematic difficulty is GSI’s resort to linear interpolation combined with its practice, during its stepping-out from exceedance points to locate the clean margin, of putting visually “dirty” samples back into the soil without actually testing them in the laboratory. At the Hearing, GSI justified this practice by saying that it was inconsequential to its procedure of “stepping out” to find the “clean margin”, that is, a clean sample that could be interpolated with an exceedance point:

“Q. Now, leaving aside the conceptually [sic] caveat you put to your answer, in practice, were there instances in which you made a hole in the ground, you looked at the contents of that soil boring – you took a sample – and in which you did not submit that sample for laboratory testing? Yes or no.

A. I believe so, yes, if I understood correctly your question. So, we saw evidence of contamination, and we did not submit that sample. Did I understand that correctly?

⁷⁷⁸ See, for instance: Tr. (Day 5) (ENG), 1459:13-1460:1 (Direct, Bianchi).

⁷⁷⁹ GSI ER2, Annex D.7.1.4.3 (Coca 8).

⁷⁸⁰ *Ibid.*

⁷⁸¹ Tr. (Day 5) (ENG), 1805:16-18 (Cross, Rouhani).

⁷⁸² Tr. (Day 5) (ENG), 1806:21-1809:1 (Cross, Rouhani).

Q. Right.

A. And the reason for that is because we stepped out because we're looking for the clean margin. So, if we're here and we take the sample – the exceedance is that monitor there in the middle, and we come here because we believe we're going to be in a clean zone. We look at the sample and like we're not in a clean zone, so that's what I described in my presentation, I think, that we step out. We go further out so that we make sure we include this point, if appropriate – and that's a key, if appropriate – within that area".⁷⁸³

403. GSI further indicated at the Hearing that this practice was infrequent, pointing to Coca 8 as one instance.⁷⁸⁴ But Ecuador reviewed GSI's boring logs and pointed to certain other instances⁷⁸⁵ at Coca 1,⁷⁸⁶ Coca 6,⁷⁸⁷ Jaguar 1,⁷⁸⁸ Mono CPF⁷⁸⁹ and Payamino 23.⁷⁹⁰ Generally speaking, the Tribunal has no issue with and accepts using linear interpolation between an exceedance point and a non-exceedance point in order to determine the impacted area based on regulatory criteria. Stepping out looking for clean samples seems appropriate, especially if the clean sample point is taken as the outer limit of the impacted area. However, it also appears to the Tribunal that, as with any methodology, linear interpolation that is based on incomplete data – in this instance where "dirty" borings were not considered – can distort the results and end up underestimating or otherwise misrepresenting the contaminated area. When linear interpolation between an exceedance point A and a non-exceedance point B is applied, but a "dirty" sample C in between is not considered, there is a risk that the contour line is too close to A or otherwise does not reflect the true contours of the contaminated area.

⁷⁸³ Tr. (Day 5) (ENG), 1587:17-1588:16 (Cross, Bianchi). See also: R-PHB, ¶ 363.

⁷⁸⁴ GSI stated that it "can think of Coca 8 as being one example", further stating that it could not "recall it happening very often" and that "there was very, very few [instances], if more than one". Tr. (Day 5) (ENG), 1589:19-1590:6 (Cross, Bianchi). See also: GSI ER2, Annex D.7.1.1, Field Forms, p. 16, GSI Log Book for sample CO-08-4M-05A.

⁷⁸⁵ R-PHB, ¶ 365.

⁷⁸⁶ GSI Log Book for samples CO01-2T-02 and CO01-2T-0 (**Exh. E-475**).

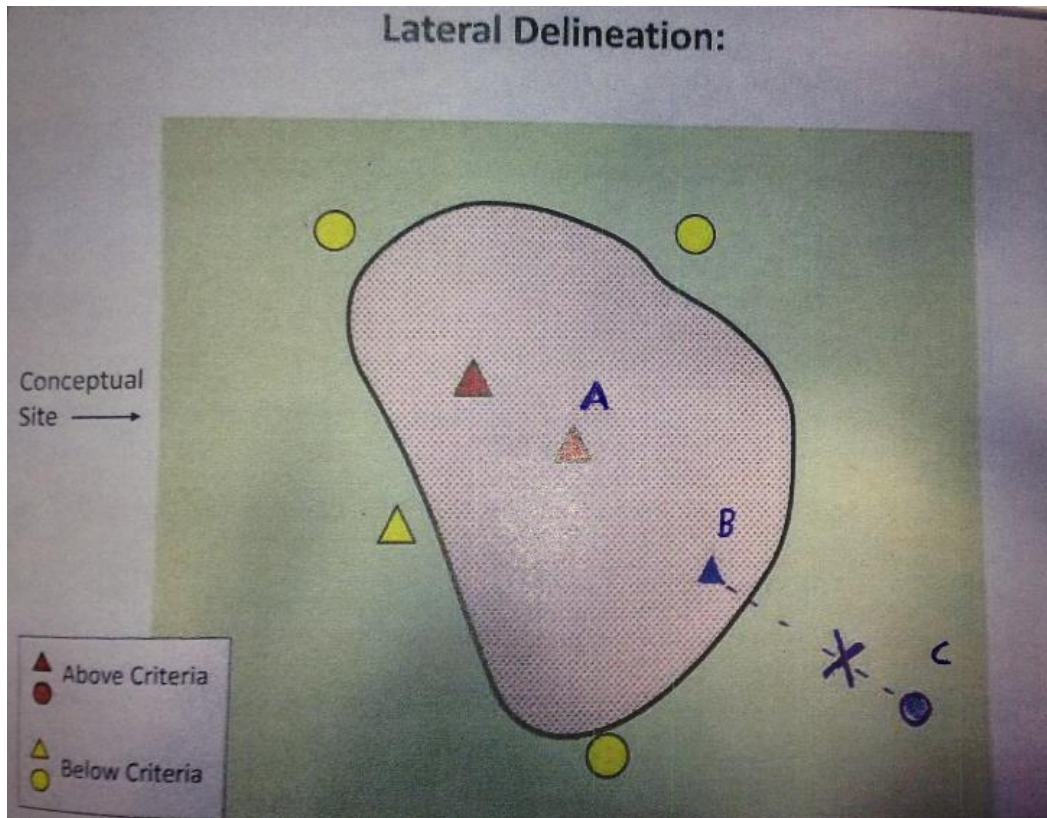
⁷⁸⁷ GSI Log Book for sample CO06-1M/T-07 (**Exh. E-475**).

⁷⁸⁸ GSI ER2, Annex D.7.2.1, Field Forms, p. 15, GSI Log Book for sample JA01-2M-11.

⁷⁸⁹ GSI Log Book for sample MOC PF-3MT-04 (**Exh. E-475**).

⁷⁹⁰ GSI ER2, Annex D.7.3.1, Field Forms, p. 9, GSI Log Book for sample PAY-23-1M-02.

404. This underestimation became clear during Professor's Rouhani's examination, when he was confronted with the following demonstrative:⁷⁹¹



405. In connection with this demonstrative, the following question was put to Professor Rouhani:

“Q. [...] Now, what I sought to do is I sought to put A and C sort of equidistant from the hand contour line, and you will recall that what we discussed earlier was that, if we had an exceedance that was the same level in excess of the regulatory criteria and a non-exceedance that was the same distance below, or the same volume below, we would arrive roughly in the middle. Now, B, B is our hypothetical exceedance. If B has the same exceedance level as A, and we apply the linear interpolation formula that we have been discussing this evening, and C, the non-exceedance, remains the same level, our tick mark is going to end up further to the east; right? It's going to end up outside the hand contour?”

A. Yes.

Q. Would you agree with that?

A. Yes”.⁷⁹²

⁷⁹¹

Demonstrative based on GSI's Direct Presentation (Slide 49) used during the cross-examination of Professor Rouhani. See also: R-PHB, ¶ 367.

406. In light of the fact that GSI had recourse to this practice in no less than 6 out of 17 sites where GSI delineated impacted areas, the Tribunal cannot but agree with Ecuador that this practice was more systematically used than GSI is willing to concede.⁷⁹³ As discussed above, the Tribunal considers that at certain sites the result of the practice may be to underestimate the contaminated area, in particular where there are no clean samples that define the clean margin in the relevant part of the contour line.
407. The Tribunal's third concern is that GSI has only delineated areas impacted by its so-called indicator parameters, i.e., barium and TPH.⁷⁹⁴ As the figure at paragraph 398 above for Coca 8 shows (see also paragraph 471 below), GSI did not delineate areas impacted by what it qualifies as "background metals issues" or areas where metal concentrations exceed regulatory limits but no indicator parameter was found. Sample point CO08-4M-05B demonstrates this flaw with respect to its "background metals" and indicator parameter approach.
408. GSI indicates that sample CO08-4M-05B in the figure at paragraph 398 above, presents a background metals issue in the layer between 1 to 2 meters. Since the nickel value for that sample at that depth is 53 mg/kg, there is an exceedance at that point both under the agricultural and the sensitive ecosystems limits,⁷⁹⁵ and GSI should have delineated around that exceedance point, which it has not done. Further, this sample location also serves to disprove GSI's indicator parameter theory. Sample CO08-4M-05B in the layer between 1 to 2 meters has a barium value of 310 mg/kg,

⁷⁹² Tr. (Day 5) (ENG) 1815:7-1816:2 (Cross, Rouhani).

⁷⁹³ R-PHB, ¶ 366.

⁷⁹⁴ GSI ER1, ¶ 181(1). GSI explained its indicator parameter theory as follows: "[For the] characterization of oilfield-related soil impacts, the IEMS soil test results for the primary indicators of oilfield materials (i.e., barium for drilling mud; TPH for crude oil; soil electrical conductance for produced water) were compared to Ecuador regulatory criteria for the relevant land use. The presence of other chemicals in the soil, in the absence of a primary indicator (e.g., nickel in the absence of elevated barium or TPH), *cannot be caused by an oilfield material* and was therefore not retained for further investigation" (emphasis added). GSI further stated: "In simple terms, there cannot be an impact by drilling mud, without drilling mud (as indicated by barium), and there cannot be an impact by crude oil without crude oil (as indicated by TPH). The additional chemicals specified in the regulations serve to assess the other constituents (i.e., 'the cream') in the spilled material, but they are not reliable to identify the source and/or delineate the spilled material". GSI ER2, p. 18, ¶ 45(d).

⁷⁹⁵ GSI ER2, App. D, Table D.10, p. 1.

which is below regulatory limits. However, the barium value in the layer between 0 and 1 meters at that same location is above regulatory criteria (i.e., 830 mg/kg).⁷⁹⁶

c. Tribunal's approach to determining the extent of soil contamination

409. Having determined that it cannot use IEMS's models and that GSI's methodology is affected by certain deficiencies, the Tribunal will now outline its own approach to assess the extent of impacted areas and volumes of contaminated soils. Doing so, the Tribunal relies on all of the elements in the record, including evidence and observations gathered during the Site Visit, which it considers can usefully inform its analysis, in the exercise of its discretion in matters of evidence and quantification of damages.
410. In application of the regulatory and land use criteria as set forth in paragraphs 324 and 343 above, the Tribunal starts by determining all exceedance points for a particular site as they arise from the sample results provided by the Parties.⁷⁹⁷ It then assesses whether the contamination can be attributed (at least partly) to the Consortium, it being recalled that (i) fault is not required, (ii) causation is presumed, the Consortium being exonerated if it proves that the harm was caused by *force majeure*, the victim or a third party (including prior and subsequent operators), and (iii) a finding of fault can lead to the partial attribution of pre-Consortium harm to the Consortium (for instance, with respect to the Consortium's mismanagement of pits built by preceding operators). Where harm is attributed to the Consortium, it then engages in delineating the impacted areas.
411. For sites delineated by GSI, the Tribunal adjusts as necessary GSI's impacted areas obtained through linear interpolation by extending them to the next "clean" delineation sample (i.e., a sample showing no exceedance under applicable regulatory criteria), where an appropriate "clean" sample exists. Where the Tribunal considers that insufficient delineation samples were taken (such as for example in the area in proximity to Coca 8 sample CO08-4M-03 in the figure reproduced at paragraph 398 above), the Tribunal adopts GSI's set distance (for instance, 8 meters at Payamino 23 and 11 meters at Coca 8), if that distance appears sufficiently protective of the

⁷⁹⁶ *Ibid.*

⁷⁹⁷ See, for instance: IEMS ER3, Annex C and Annex C Corrected; IEMS ER4, Att. 38; GSI ER1, App. L; GSI ER2, App. D.

environment. Otherwise, the Tribunal extends that distance as it considers appropriate in the light of all of the circumstances.

412. For sites not delineated by GSI, the Tribunal seeks to take into consideration all information in the record. Where a number of samples are clustered in a given area, the Tribunal calculates the impacted area on the basis of the scale of the maps, while also considering site features and local topography.
413. For sites not delineated by GSI but showing discrete exceedance points, the Tribunal also considers site features and local topography, but mostly applies a set radius around the exceedance point to determine a circular impacted area. The length of the radius depends on various factors, such as the type of contaminant, the level of contamination, the location of the exceedance point, the land use, local topography and proximity to human settlements. Thus, the radius is for instance larger for heavy metals than TPH exceedances due to the increased mobility of the former. The radius is also larger for higher than for lower levels of contamination, or if the exceedance is located in a sensitive ecosystem as opposed to on a platform.
414. In general, the Tribunal applies a 5-meter radius for TPH exceedances (amounting to an impacted area of approximately 80 m²) and an 8-meter radius for heavy metal exceedances, including barium (amounting to an impacted area of approximately 200 m²). It considers that these radiuses are adequately protective of the environment. It, however, also takes into consideration that GSI itself sometimes applied slightly larger distances (see, for instance, above paragraph 401; 11 meters at Coca 8, and 8 meters at Payamino 23). As stated above, the radiuses are thus increased as appropriate at certain sites.
415. On that basis, the Tribunal establishes the impacted area for each site. To calculate the volume of contaminated soil, it then multiplies the impacted area by the depth of the contamination, rounding-up the depth to the next meter. Doing so, it seeks to take account of differences in contamination per layer where appropriate. For instance, if the impacted area in the layer between 0 and 1 meter is 200 m² and the impacted area in the layer between 1 and 2 meters is 80 m², the total volume of contaminated soil would amount to 280 m³. Where feasible and practicable, the Tribunal calculates total volumes of contaminated soil on the basis of layer-by layer values in an effort to avoid over-

estimating such volumes.⁷⁹⁸ However, the Tribunal does not always enter into this level of detail. For instance, where the impacted area of the top layer is smaller than the impacted area in a lower layer (and so, perforce, must be removed and remediated along with the larger contaminated area that lies below), or where the difference of impacted areas between layers is not significant, the Tribunal simply multiplies the largest impacted area by the maximum depth of contamination.

4.5 Remediation costs for contaminated soils

4.5.1 Parties' positions

416. Ecuador calculates the remediation costs by (i) increasing the volume of the compacted clayey soils by a 30% volumetric expansion factor, (ii) applying different costs per cubic meter according to three remediation technologies depending on whether the soil is polluted with TPH only, heavy metals only, or a mixture of both, (iii) adding other costs for studies, remedial design, logistics, transportation, replenishment of excavated areas, safety measures, management and consulting costs, reforestation and environmental monitoring, and (iv) adding a contingency factor.⁷⁹⁹
417. Relying on international price comparisons and in particular costs for soil remediation charged by companies in the United States of America, Ecuador envisages *ex situ* bioremediation for soils mostly contaminated with hydrocarbons at a unit cost of USD 280/m³,⁸⁰⁰ *ex situ* controlled confinement for soils only contaminated with heavy metals at a unit cost of USD 320/m³,⁸⁰¹ and *ex situ* soil washing for soils contaminated both with hydrocarbons and heavy metals at a unit cost of USD 240/m³.⁸⁰² It rejects

⁷⁹⁸ 2nd SMCC, ¶ 297. Ecuador's expert IEMS confirmed that its remediation program included remediating clean soil: "Q. Isn't it true that the cost estimate includes remediation of clean soils, based on your own soil-sampling data? A. [...] our models include, to your question, to a certain extent, the removal of clean soil". Tr. (Day 3) (ENG) 782:8-10, 783:4-5 (Cross, Chaves).

⁷⁹⁹ 2nd SMCC, ¶¶ 296, 304-305; IEMS ER3, pp. 168-175. See also: Reply, ¶¶ 206-217.

⁸⁰⁰ 2nd SMCC, ¶¶ 299-300; IEMS ER3, Annex T.1, p. 6; Reply, ¶ 208. In its third expert report, IEMS calculated that the total cost of ex-situ bioremediation amounts to USD 16,299,614.

⁸⁰¹ 2nd SMCC, ¶¶ 301-302; IEMS ER3, Annex T.1, p. 8; Reply, ¶ 209. In its third expert report, IEMS calculated that the total cost of ex-situ confinement amounts to USD 263,829,192.

⁸⁰² 2nd SMCC, ¶ 303; IEMS ER3, Annex T.1, p. 10; Reply, ¶ 208. In its third expert report, IEMS calculated that the total cost of ex-situ soil washing amounts to USD 404,782,508.

Burlington's proposal to treat and dispose of contaminated soils on site as contrary to the principle of full restoration enshrined in the 2008 Constitution.⁸⁰³

418. On that basis, Ecuador estimates the total volume of contaminated soil at 654,687 m³ and claims total costs of USD 790,465,298, amounting to an average unit cost of USD 1,220 per cubic meter.⁸⁰⁴
419. Burlington contends that Ecuador's remediation costs have no factual basis, and are based on wholly unnecessary remediation technologies and cost elements when equally effective and less costly methods are available, in Ecuador, from Ecuadorian companies.⁸⁰⁵ Burlington calculates remediation costs by (i) identifying sites exceeding regulatory criteria, (ii) measuring the areas requiring remediation, (iii) evaluating available remediation technologies, (iv) selecting the appropriate remediation technology, (v) creating a site-specific preliminary engineering design, and (vi) calculating the total costs based on local prices.⁸⁰⁶
420. With respect to remediation technologies, GSI observes that technologies used in the Oriente region to remediate oil spills include (i) on site bioremediation, such as landfarming, composting or biopiles, (ii) off site treatment and disposal, and (iii) a combination of both.⁸⁰⁷ Among these, it retained off site treatment and disposal.⁸⁰⁸ For

⁸⁰³ Tr. (Day 3) (ENG), 703:9-11 (Direct, Green).

⁸⁰⁴ Ecuador's Opening Statement, Slides 81-82. Compare with: Reply, ¶ 217. Ecuador's average unit cost of 1,220 USD is composed of 255 USD for off road transportation, off site treatment costs depending on the remediation technology ranging from 240 USD/m³ to 320 USD/m³, backfill costs of 50 USD/m³, engineering and administrative costs of 305 USD/m³, and a contingency of 366 USD/m³.

⁸⁰⁵ CMCC, ¶¶ 405-429; Rejoinder, ¶ 196. GSI reviewed the environmental remediation industry in Ecuador, in particular by looking at environmental management plans, environmental remediation reports, a public list of prices for services of spill cleanup in the Amazon region, a list published by the Ministry of the Environment of companies licensed to clean-up contaminated sites, remediation contractor websites, direct information from local contractors, and the price list from the *Cámara de la Construcción de Quito*. In addition to identifying remediation contractors providing on site remediation services, GSI also listed various contractors offering off site treatment and disposal, including Ecuambiente Consulting Group Cia. Ltda., PECS IECONSTA S.A., GPOWER Group S.A., GOGEMINPA Cia. Ltda., and Corena. See: GSI ER1, App. G.2; GSI ER2, Exhibit 29; Burlington's Opening Statement, Slide 109.

⁸⁰⁶ Burlington's Opening Statement, Slide 110. See also: CMCC, ¶ 412; Rejoinder, ¶ 197; GSI ER1, ¶ 246 and App. H, p. 4.

⁸⁰⁷ GSI further indicated that at approx. 50% of the remediation projects in the Oriente region between 2002 and 2011 "soil remediation was completed using excavation and off site treatment and disposal". GSI ER1, App. G.2, p. G.2.5; App. H, Table H.2. Burlington screened out various

soils impacted by heavy metals, GSI considered (i) off site treatment and disposal, (ii) on site confinement and (iii) capping in place,⁸⁰⁹ and contemplated off site treatment and disposal as well as on site confinement.⁸¹⁰ Nonetheless, Burlington indicated its preference that soils contaminated with heavy metals should be excavated and confined in pits on site.⁸¹¹

421. In addition to inflating the cost for soil treatment and disposal,⁸¹² Burlington contends that Ecuador includes unnecessary transportation costs to a transfer station,⁸¹³ inflates backfilling costs,⁸¹⁴ and applies excessive mark ups and contingency.⁸¹⁵ Relying on the “upper-range” costs of local contractors, Burlington calculates unit costs of USD 80/m³ for off site treatment and disposal (rounded up to USD 100/m³);⁸¹⁶ USD 0.40/m³/km for transportation; USD 3/m³ for backfill material; USD 2.50/m³ for excavator rental; and USD 800/day for front loader and bulldozer rental.⁸¹⁷ Burlington also includes pre-design assessment costs (including for additional soil sampling and testing, as well as travel costs),⁸¹⁸ a base cost of USD 20,000 per site for permitting and reporting; and a contingency ranging from 20% (for sites with no potential delineation or access issues) to 30% (for sites with both delineation and access issues).⁸¹⁹
422. In total, Burlington calculates an average all-in unit cost for off site landfill disposal of USD 260/m³, which is comparable to and mid-way between the average cost in Europe

other technologies, mainly because they are ineffective in clayey soils, such as in-situ soil vapor extraction, on site soil washing, bioventing, enhanced biodegradation, or passive remediation.

⁸⁰⁸ GSI ER2, App. H, Table H.3.

⁸⁰⁹ GSI ER1, App. H, Table H.2. Burlington screened out on site soil washing because it is ineffective in clayey soils.

⁸¹⁰ GSI ER1, App. H, Table H.3.

⁸¹¹ CMCC, ¶ 412; Rejoinder, ¶ 197; GSI ER1, ¶ 246 and App. H, p. 4.

⁸¹² GSI ER1, ¶¶ 144-145.

⁸¹³ *Id.*, ¶¶ 146-147.

⁸¹⁴ *Id.*, ¶ 148.

⁸¹⁵ *Id.*, ¶¶ 152-153.

⁸¹⁶ Burlington accepts an average reasonable unit cost for excavation, followed by treatment and disposal at an off site remediation facility, of 100 USD/m³. See: Rejoinder, ¶ 209; GSI ER1, ¶ 145.

⁸¹⁷ GSI ER1, App. G.2, pp. G.2.6-G.2.7, Exhibit G.2.2 and App. H, pp. H.8-H.9.

⁸¹⁸ *Id.*, App. H, Table H.9.

⁸¹⁹ *Id.*, App. H, pp. H.11-H.12.

of USD 303/m³ and in the United States of America of USD 218/m³.⁸²⁰ On that basis, Burlington arrives at a total cost of USD 10,513,000 for the remediation of the 17 sites where it identified exceedances, including closing four open pits and abandoning seven wells⁸²¹ (although Burlington insists that it is only responsible for remediation at Yuralpa Pad A for USD 110,000 and Jaguar 1 for USD 213,000, in addition to the four pit closures and the seven well abandonments for a total of USD 1,091,000).⁸²²

4.5.2 Discussion

423. First, the Tribunal must decide whether to apply local or international prices. Contrary to Burlington's computations, Ecuador's remediation costs are mostly based on international prices charged by international contractors. Ecuador's expert, IEMS, rejects the use of Ecuadorian contractors because it claims that they are unable to "provide all of the services required for remediation in compliance with standard[s] which truly protect the environment"⁸²³ and because of the extraordinary amount of remediation under Ecuador's background value case:

"the reason we didn't choose Ecuadorian contractors, is because the job that we envisaged, that we costed, is a job that has not been done in Ecuador yet [...] It's a job at a level that really has not been done very much in the world. No one has worked those standards before".⁸²⁴

424. In fact, the volumes of soil requiring remediation fall significantly below Ecuador's estimates (be it under its background value or its regulatory criteria case). Moreover,

⁸²⁰ Burlington's Opening Statement, Slide 111.

⁸²¹ The cost for plugging and abandonment of inactive oil wells is estimated by Burlington at USD 100,000 per well. GSI ER1, App. H, p. H.12.

⁸²² Burlington's Opening Statement, Slides 112 and 116. The Tribunal notes that GSI mentioned an amount of USD 395,000 for the remediation of Jaguar 1, which, in addition to the USD 213,000 for which Burlington accepts liability (Area 3T), includes the remediation costs for the contamination in Area 2M, which Burlington attributes to pre-Consortium activities. See: GSI ER2, Table 4.

⁸²³ IEMS ER3, p. 174, note 31.

⁸²⁴ Tr. (Day 3) (ENG), 952:21-953:5 (Tribunal, Green). And further: "Q. And am I correct that you did not undertake to rely upon local Ecuadorian remediation contractors to develop that estimate? A. That is correct, ma'am. Q. And you didn't develop any local Ecuadorian market information or market price information for remediation of soils in Ecuador to develop that cost estimate, did you? A. That is correct, ma'am". Tr. (Day 3) (ENG), 865:11-19 (Cross, Green). See also: C-PHB, ¶ 215.

the type of remediation activities contemplated here are routinely undertaken in the Oriente region.⁸²⁵ Therefore, the Tribunal sees no reason not to use local prices.

425. Second, the Tribunal must assess whether the remediation must be processed on or off site. Off site remediation appears the more environmentally protective technique. As GSI confirmed, it is indeed used in the Oriente region in about 50% of cases.⁸²⁶ On the basis of the Site Visit and the information on local contractors in the record,⁸²⁷ the Tribunal is satisfied that qualified remediation contractors are available in El Coca and its surroundings which can handle the volumes of contaminated soils off site.⁸²⁸ For these reasons, the Tribunal decides in favor of off site remediation by local contractors.

426. Third, as to remediation technology, RAOHE Annex 8, which relates to the treatment of wastes, indicates in its sub-section on non-hazardous wastes, that soils and drillings/cuttings contaminated with crude must be remediated through bioremediation or landfarming.⁸²⁹ The regulations are silent about treatment of heavy metals contamination, but Burlington agrees with Ecuador's view that controlled confinement is the proper technology for soils contaminated with heavy metals (although Burlington favors on site confinement, which the Tribunal rejects for the reasons just mentioned) and that soils contaminated with crude be treated off site, for instance, through bioremediation (whether landfarming, composting or biopiles).⁸³⁰ As to soils contaminated both with TPH and heavy metals, the Tribunal accepts Ecuador's suggestion of off site soil washing, especially in light of the fact that this kind of technology has also been applied by other operators in the Oriente region.⁸³¹

427. Accordingly, the following remediation technologies appear the most appropriate in the present circumstances: *ex situ* controlled confinement of soils contaminated with heavy

⁸²⁵ See the updated summary compiled by GSI of key information from environmental remediation projects conducted at oilfield facilities in the Oriente region of Ecuador. GSI ER2, App. B.2.

⁸²⁶ GSI ER1, App. G.2, p. G.2.5.

⁸²⁷ GSI ER2, App. B.2.

⁸²⁸ In particular, Ecuambiente Consulting Group CIA. Ltda has a 700 hectare treatment and disposal facility nearby the city of El Coca.

⁸²⁹ RAOHE, Annex 8, Section B, items B3001 and B3002 (**Exh. EL-174**).

⁸³⁰ GSI ER2, App. H, Table H.3.

⁸³¹ GSI ER1, App. B.2.

metals; *ex situ* bioremediation of soils contaminated with crude; and *ex situ* soil washing for soils contaminated both with crude and heavy metals.

428. On that basis and taking into account all relevant facts and evidence in the exercise of its discretion in matters of damage quantification, the Tribunal reaches the conclusion that an average all-in unit cost of USD 300/m³ is appropriate in the present circumstances. This unit cost includes all cost items, including pre-design, transportation, additional sampling, backfilling, mark-ups etc, but for a contingency which the Tribunal applies in a range of 20 to 30%. The percentage of the contingency factor depends on whether there are particular remediation challenges in terms of accessibility or exposure issues, such as difficulties in the terrain, larger distances between exceedance points and platform or access road, or proximity to streams and human settlements. Thus, the Tribunal typically applies a 20% contingency to exceedances on platforms and a 30% contingency to exceedance points off platform, unless the latter present no challenges in terms of accessibility or exposure. The all-in unit price used by the Tribunal is applied to volumes of soil as extracted. The Tribunal did not add additional volumes of soil to take account of a possible volumetric expansion, since the all-in unit price already accounts for such expansion.

4.6 Site review

4.6.1 Preliminary remarks

429. In application of the standards established above, the Tribunal will now review Ecuador's soil contamination claim site by site. Although Ecuador included in its claim for soil contamination the removal of the mud pits, the Tribunal will address that claim separately.
430. Ecuador investigated a total of 74 sites, sometimes modelling two platforms together.⁸³² IEMS collected a total of 2,950 soil samples to assess the environmental condition in the Blocks, 2,769 in Block 7 and 181 in Block 21.⁸³³ Under its regulatory criteria case, Ecuador submits that the impacted area in Block 7 and 21 totals 414,506.14 m² and

⁸³² This is the case for Gacela CPF and Gacela 1/8, Payamino CPF and Payamino 1, Yuralpa CPF and Yuralpa Pad F, which were modelled together by IEMS. Revised Attachment 35 to IEMS ER4 (Excel), lines 21, 55 and 68 (**Exh. E-500**).

⁸³³ GSI ER2, Table 2.

that a total of 851,093.75 m³ of soil must be remediated.⁸³⁴ Ecuador's total claim for soil contamination for the regulatory criteria case amounts to USD 790,465,298.⁸³⁵

431. The Tribunal notes that Ecuador does not claim any soil remediation at Payamino 9, Payamino 13, Payamino 18, Zorro, Yuralpa Pad B, Puerto Napo and Waponi-Ocatoe.⁸³⁶ Neither does it seek soil remediation if regulatory criteria apply at Coca 7, Payamino 6, Payamino 19, Gacela 3, Lobo 2, Lobo 4, Oso 2, Oso 3, Oso A and Yuralpa CPF/Pad F.⁸³⁷ In sum, Ecuador claims for soil remediation at 56 sites.
432. In addition to relying on IEMS samples, Burlington's experts from GSI collected an additional 535 soil samples, 482 in Block 7 and 53 in Block 21.⁸³⁸ Burlington disputes any liability for Ecuador's soil remediation claims, although it recognizes that 37,555 m³ of non-pit soil may require remediation for a total cost of USD 9,748,000 at 17 sites.⁸³⁹ Burlington identifies six principal sites, namely Payamino 2/8, Mono 1/CPF, Payamino 1, Gacela 1/8, Coca 8 and Jaguar 1, where more than 1,000 m³ of soil may potentially require remediation.⁸⁴⁰ Burlington also identifies eleven additional sites that may require remediation of minor quantities of contaminated soil, namely Coca 1, Coca 4, Coca 6, Payamino 23, Coca CPF, Gacela 2, Jaguar 7/8, Mono Sur, Payamino 4 and Yuralpa Pad A.⁸⁴¹
433. Burlington acknowledges its liability for the "reasonable costs of remediating the pockets of exceedances at the two sites that are possibly attributable to the Consortium", namely USD 323,000 to remediate Yuralpa Pad A and Jaguar Area 3T,

⁸³⁴ Revised Attachment 35 to IEMS ER4 (Excel) (**Exh. E-500**).

⁸³⁵ *Idid.*

⁸³⁶ *Id.*, lines 44, 48, 54, 62, 66 and 67 (**Exh. E-500**). This exclusion is explained by the fact that IEMS excluded exceedance points from its modelling exercise in (i) clusters where the values did not exceed background values, (ii) clusters where two sample locations were at a distance beyond 500 meters, and (iii) layers with less than three contaminated samples. See: IEMS ER3, Annex A-8.

⁸³⁷ Revised Attachment 35 to IEMS ER4 (Excel), lines 5, 17, 29, 31, 36, 39, 42, 49 and 68 (**Exh. E-500**). For the reasons for not modelling these sites and IEMS's exclusion criteria, see: IEMS ER3, Annex A.8, p. 7.

⁸³⁸ GSI ER2, Table 2.

⁸³⁹ *Id.*, Tables 1, 3 and 4.

⁸⁴⁰ *Id.*, Table 4.

⁸⁴¹ *Ibid.*

since it could not “definitively link harm to non-Consortium activities” at those sites.⁸⁴² In addition, Burlington accepts to pay USD 68,000 to close four open and unused pits (Coca 4, Coca 8 and Payamino 15). Moreover, Burlington accepts to pay USD 700,000 for costs linked to the abandonment of seven platforms (Cóndor Norte, Gacela 2, Gacela 3, Jaguar 2, Jaguar 7/8, Jaguar 9 and Lobo 4).⁸⁴³ Accordingly, Burlington accepts to pay a total of USD 1,091,000.

434. The Tribunal will now review the circumstances of the 56 sites for which Ecuador claims soil remediation, starting with the sites in Block 7/CPUF (4.6.2) before addressing those in Block 21 (4.6.3). Doing so, it will first address claims for non-pit soil and turn to pit soil in the following section. In this context, the Tribunal notes that GSI states that a number of IEMS samples were in reality taken from pits and/or misplaced by IEMS because of inaccuracies in the assignation of coordinates or in the labelling.⁸⁴⁴ Taking into account the Parties’ and their experts’ explanations,⁸⁴⁵ the Tribunal will decide these matters on a case by case basis where relevant.

4.6.2 Block 7/CPUF

a. Coca 1

435. Ecuador submits that the impacted area in Coca 1 covers an area of 12,960 m² and it claims for remediation of 16,848 m³ of soil, for a total cost of USD 15,232,093.⁸⁴⁶ Although Burlington disputes that the Consortium caused any exceedances at Coca 1, it accepts that there is contamination at that site covering 520 m² in Area 1MT and 70 m² in Area 2T (see figure in paragraph 437).⁸⁴⁷

⁸⁴² C-PHB, ¶¶ 13, 71; GSI ER2, Table 4. Burlington also stated that “as a responsible member of the Consortium”, it is “willing to accept liability for the two sites at which it cannot definitively link harm to non-Consortium activities (Yuralpa Pad A and Jaguar 1 Area 3T)”.

⁸⁴³ GSI ER2, Table 3.

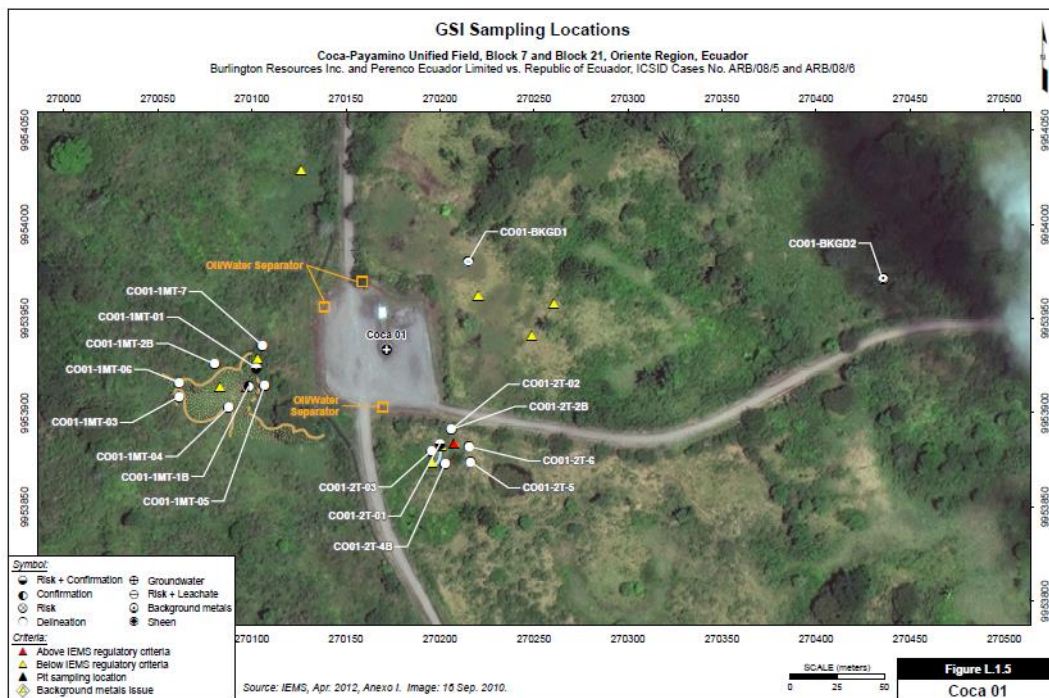
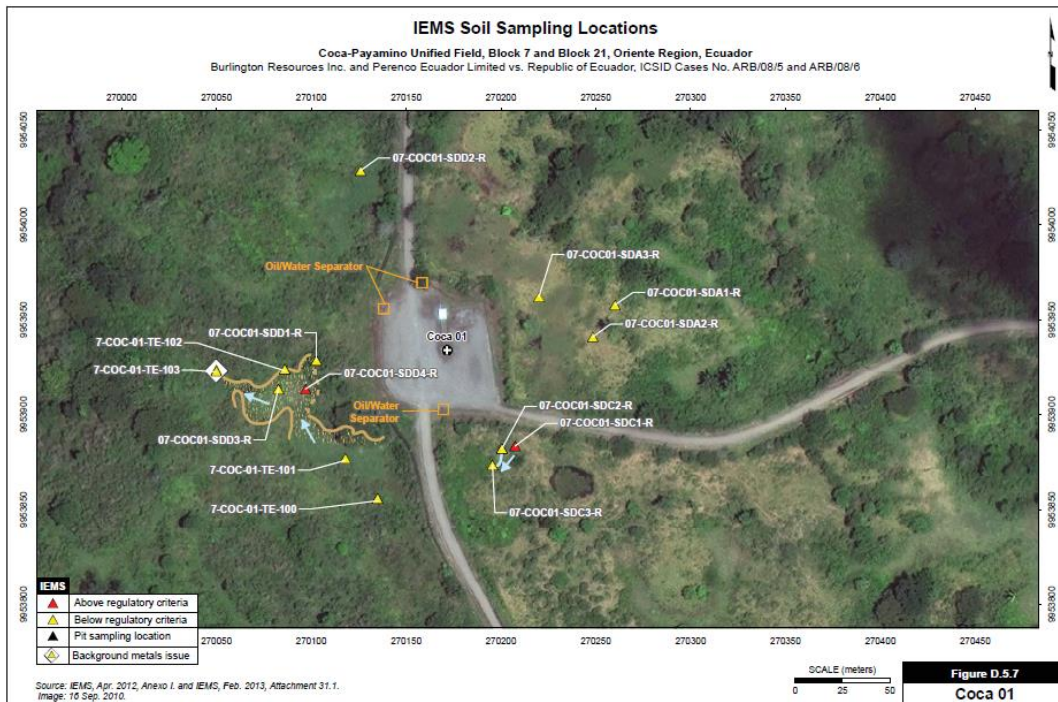
⁸⁴⁴ See, in particular: GSI ER1, App. D, Annex D.2; GSI ER2, App. D, Annex D.2.

⁸⁴⁵ In addition to the references in the previous note, see in particular: IEMS ER4, pp. 108-112 and Tables 2 and 3.

⁸⁴⁶ Revised Attachment 35 to IEMS ER4 (Excel), line 1 (**Exh. E-500**); Results of remodeling exercise, Figures 01-A and 01-B (**Exh. E-499**). Compare with: IEMS ER3, Annex C Corrected, Coca 1, p. 12; IEMS ER4, Att. 38, Coca 1, p. 16.

⁸⁴⁷ GSI ER1, App. L, Att. L.1.E, Table L.1.E.1, Figures L.1.E.A.1, L.1.E.B.1-L.1.E.B.3; GSI ER2, App. D, Figures D.1.10 and D.5.7.

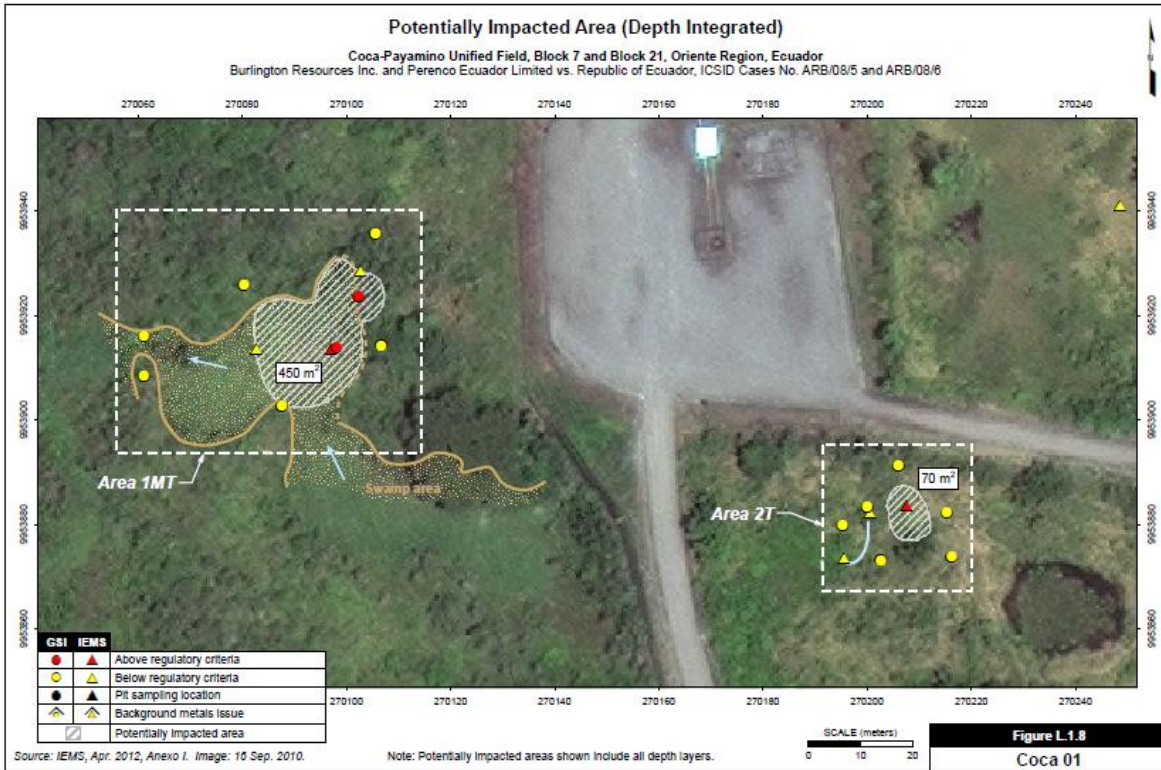
436. The following figures depict first IEMS's⁸⁴⁸ and second GSI's⁸⁴⁹ soil sampling locations at Coca 1:



848 GSI ER2, App. D, Figure D.5.7.

849 GSI ER1, App. L, Figure L.1.5.

437. The potentially impacted areas calculated by GSI, which – as determined in section 4.4.3.c and paragraph 411 – the Tribunal will use as basis for its own delineation, are shown in the following figure.⁸⁵⁰



438. Applying the guidelines set out above (section 4.3.2.c) and thus considering that the “subsequent use” of the land in this area is agricultural, the Tribunal identified a TPH exceedance in Area 2T,⁸⁵¹ and TPH, barium and cadmium exceedances in Area 1MT.⁸⁵²

439. Coca 1 was drilled in 1970 by Texaco, but was on stand-by until 1986 when it started operating.⁸⁵³ There are no records of historical spills⁸⁵⁴ and the Consortium conducted a

⁸⁵⁰ GSI ER1, App. L, Figure L.1.8.

⁸⁵¹ Sample 07-COC01-SDC1-R(1,2)m. See: GSI ER2, App. D, Table D.3, p. 1.

⁸⁵² Samples 07-COC01-SDD4-R(1,10)m, CO01-1MT-1B-(0.8-1.1), CO01-1MT-01-0.0-0.3, 7-COC-01-TE-100(0.5-0.7), 7-COC-01-TE-101(1.5-1.7), 7-COC-01-TE-102-(2.4-2.6) and 7-COC-01-TE-103-(2.4-2.6). See: IEMS ER4, Att. 38, Coca 1, pp. 6-13; GSI ER1, App. L, Table L.1.1; GSI ER2, App. D, Table D.3, pp. 1-2.

⁸⁵³ R-PHB, ¶ 692. See also: Burlington’s Opening Statement, Slide 144.

⁸⁵⁴ GSI ER1, App. B.3.

well workover in 2005,⁸⁵⁵ although Burlington generally argues that exceedances are linked to drilling activities pre-dating the Consortium's time,⁸⁵⁶ as evidenced in part by the fact that there is no pit at Coca 1 implying that drilling muds were discharged into the environment by prior operators.⁸⁵⁷

440. The Tribunal accepts Burlington's evidence and submissions with respect to Area 1MT. Considering the depth of the exceedances (up to 2.6 meters) and the fact that there is no pit at Coca 1, it finds that contamination in Area 1MT is associated to drilling activities and was thus caused by prior operators. Burlington has thus succeeded in rebutting the presumption of causation with respect to the contamination found in that area. By contrast, Burlington failed to convincingly rebut the presumption that it caused the TPH exceedance in Area 2T.

441. GSI applied linear interpolation to calculate the impacted area,⁸⁵⁸ placing certain dirty borings back into the soil during its stepping out procedure⁸⁵⁹ – although the Tribunal notes that GSI's delineation samples bear relatively low TPH levels.⁸⁶⁰

442. On that basis and in accordance with the guidelines established above (sections 4.4.3.c and 4.5.2 above), the Tribunal determines that 200 m² in Area 2T are impacted. Since remediation is required up to 2 meters depth, the total volume of contaminated soil amounts to 400 m³, for a cost of USD 120,000. Adding a 20% contingency (see paragraph 428 above), the total cost for which Burlington is liable amounts to **USD 144,000** for Coca 1.

⁸⁵⁵ The record shows that the Consortium conducted workover # 7 in November 2005, which involved the use of chemicals. Well Workovers on Blocks 7 and 21 dated 1992 and 2012, Coca 1, Reacondicionamiento # 7, November 2005, p. 3 (**Exh. E-573**); R-PHB, note 876.

⁸⁵⁶ Rejoinder, ¶ 267; GSI ER1, App. L.1, p. 3.

⁸⁵⁷ GSI ER2, App. B.5. Ecuador's list of pits contains no information for Coca 1. See: Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009 (**Exh. E-563**).

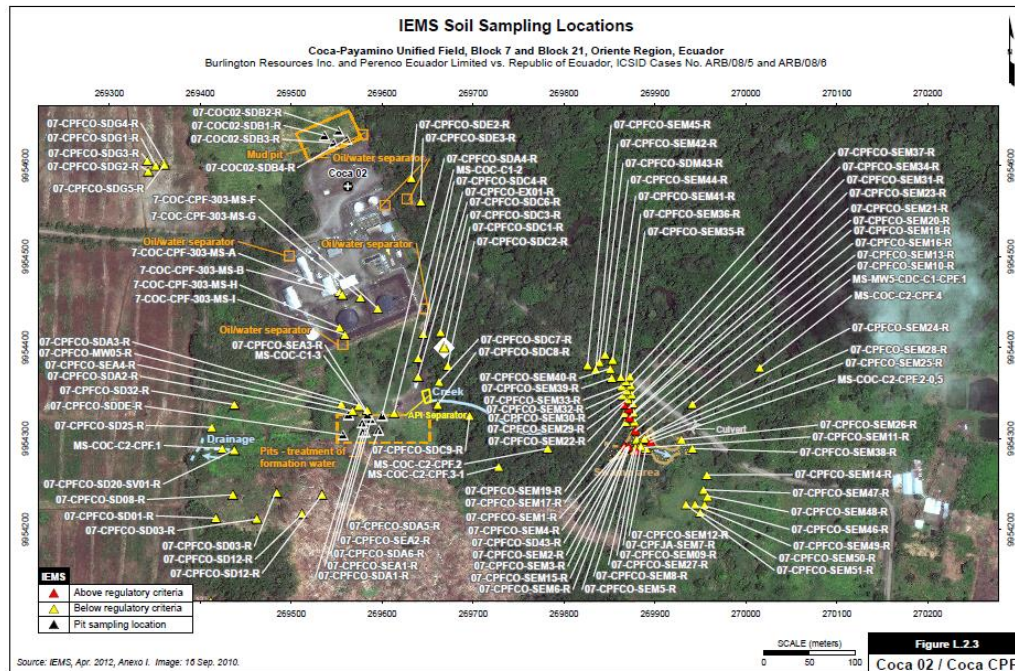
⁸⁵⁸ GSI ER1, App. L, Table L.1.E.1 and Figure L.1.E.A.1.

⁸⁵⁹ GSI Log Book for sample CO01-2T-02, 29 February 2012, p. 1; GSI Log Book for sample CO01-2T-02, 3 March 2012, p. 1 (**Exh. E-475**); R-PHB, ¶ 365, notes 423-425 and ¶ 383(b), note 451. See also: Tr. (Day 5) (ENG), 1586:9-1588:8 (Cross, Bianchi).

⁸⁶⁰ See: GSI ER1, App. L, Table L.1.5. TPH values range from 3.3 to 103 mg/kg. GSI only tested for TPH in Area 2T.

b. Coca 2 and CPF

443. Ecuador submits that the impacted area in Coca 2/CPF extends 54,795 m²,⁸⁶¹ and claims the remediation of 95,946.50 m³ of soil,⁸⁶² for a total cost of USD 83,465,389.⁸⁶³ Although Burlington points to prior operators and disputes that the Consortium caused any exceedances at Coca 2/CPF,⁸⁶⁴ it recognizes that there is contamination in Area 2T extending 630 m² for a total cost of USD 234,000.⁸⁶⁵
444. The following figures depict IEMS's⁸⁶⁶ and GSI's⁸⁶⁷ sampling locations at Coca 2/CPF:



⁸⁶¹ The Tribunal assesses Coca 2 and Coca CPF simultaneously. For Ecuador, the impacted area in Coca 2 is 800 m² and in Coca CPF 53,995 m². Revised Attachment 35 to IEMS ER4 (Excel), lines 2 and 14 (**Exh. E-500**).

⁸⁶² For Ecuador, the total volume of contaminated soil in Coca 2 is 1,456 m³ and in Coca CPF 94,490.50 m³. Revised Attachment 35 to IEMS ER4 (Excel), lines 2 and 14 (**Exh. E-500**).

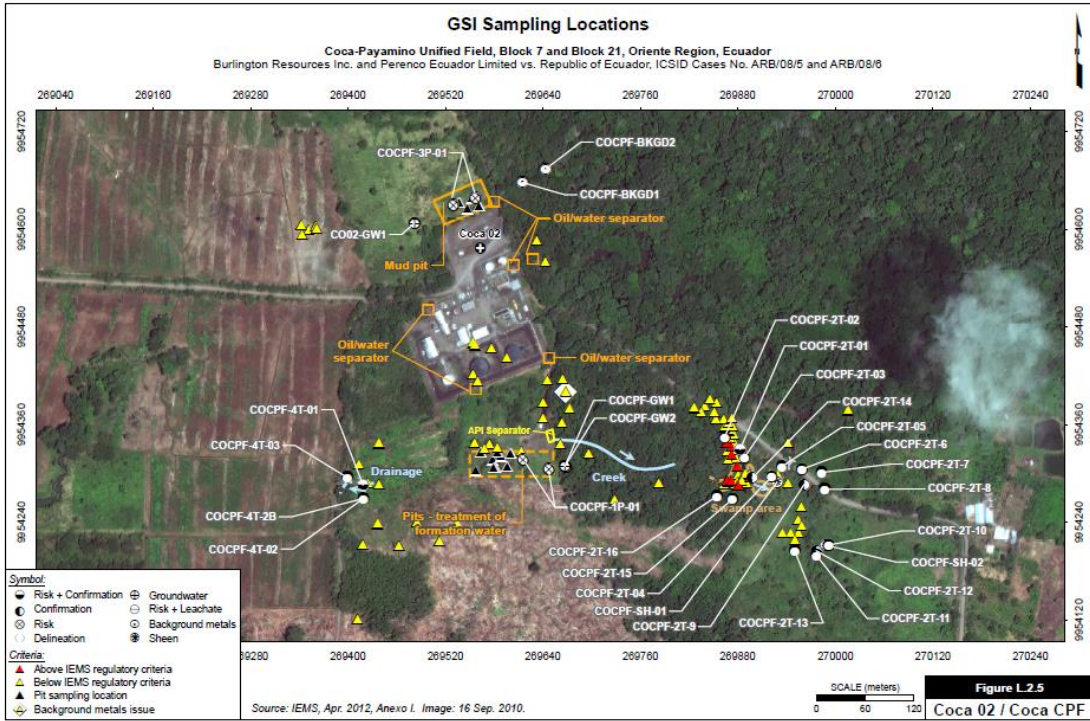
⁸⁶³ Ecuador claims USD 1,342,014 for Coca 2 and USD 82,123,375 for Coca CPF. Revised Attachment 35 to IEMS ER4 (Excel), lines 2 and 14 (**Exh. E-500**). Compare with: IEMS ER3, Annex C Corrected, Coca 2, pp. 12-13 and Coca CPF, pp. 40-41; IEMS ER4, Att. 38, Coca CPF, p. 49.

⁸⁶⁴ Tr. Site Visit (Day 2) (ENG), 141:2-15 (Presentation of Ms. Renfroe at Coca CPF); C-PSVB, ¶ 24.

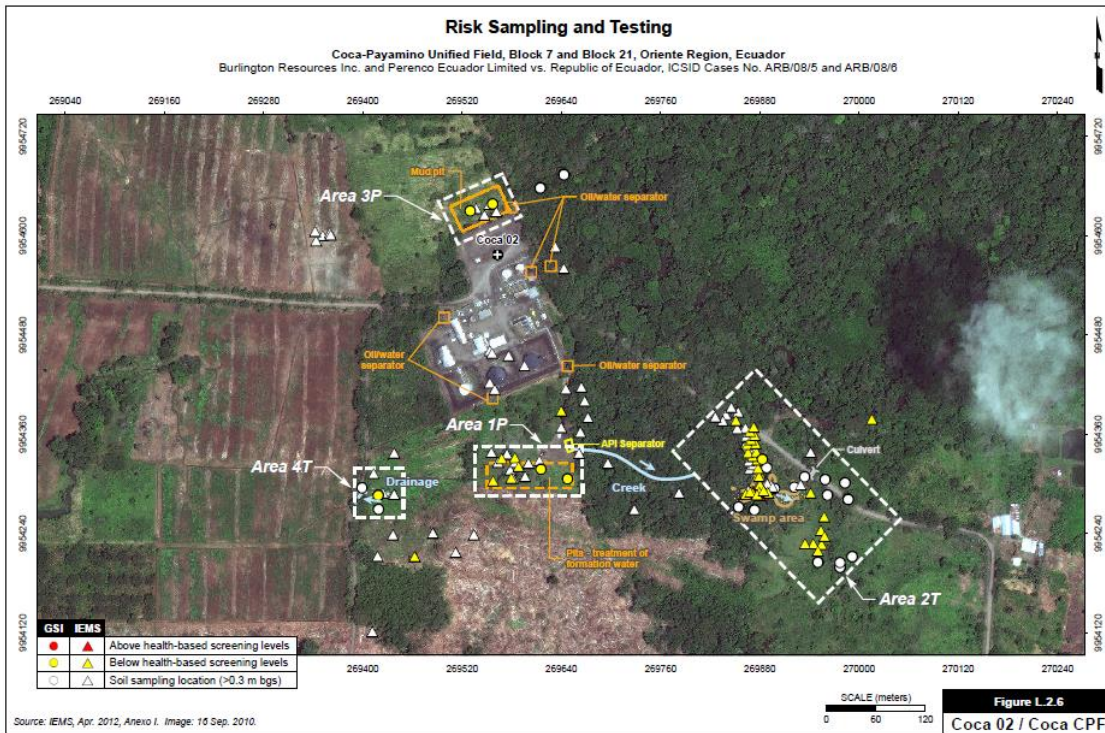
⁸⁶⁵ GSI ER1, App. L, Figure L.2.1, pp. 7-8, Figure L.2.8, and Att. L.2.E, Table L.2.E.1, Figures L.2.E.A.1 and L.2.E.B.1.

⁸⁶⁶ GSI ER1, App. L, Figure L.2.3.

⁸⁶⁷ *Id.*, Figure L.2.5.



445. The following image shows Areas 1P, 2T, 3P and 4T designated by GSI.⁸⁶⁸



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Id., Figure L.2.6.

446. There are various land uses around Coca 2/CPF.⁸⁶⁹ With reference to the guidelines set out above (section 4.3.2.c), the Tribunal generally applied agricultural land use criteria to the areas identified by GSI as Areas 4T and 2T (Areas 1P and 3P are pits), especially considering that at the right-of-way in the so-called Chalá swamp in Area 2T was recently created for a Petroamazonas pipeline. It applied sensitive ecosystem criteria in the vicinity of Coca 2,⁸⁷⁰ near the API separator,⁸⁷¹ along the creek,⁸⁷² and on the other side of the culvert in Area 2T.⁸⁷³
447. On that basis, the Tribunal identified no exceedances at Coca 2.⁸⁷⁴ It observed, however, the following exceedances at Coca CPF: one cadmium exceedance to the southwest of the pit area and south of Area 4T used for the treatment of formation water⁸⁷⁵ and another cadmium exceedance north of the API separator.⁸⁷⁶ In addition, the Tribunal identified various TPH exceedances in Area 2T.⁸⁷⁷
448. Coca CPF is one of the sites where there is a long record of spills caused by prior operators.⁸⁷⁸ There is also evidence of a 1.5 barrel crude spill on 13 June 2005 at the

⁸⁶⁹ GSI accepts multiple land uses at Coca 2/CPF. According to GSI, agriculture is found to the north and west, and secondary forest is located to the east. Secondary forest is also immediately adjacent to the south, extending to the stream, with agriculture beyond. See. GSI ER1, App. L.02.1, p. 11.

⁸⁷⁰ For the following sample locations: 07-CPFCO-SDE2-R and 07-CPFCO-SDE3-R.

⁸⁷¹ For the following sample locations: 07-CPFCO-SDC1-R, 07-CPFCO-SDC2-R, 07-CPFCO-SDC3-R, 07-CPFCO-SDC7-R and 07-CPFCO-SDC8-R.

⁸⁷² For the following sample locations: 07-CPFCO-SDC8-R, MS-COC-C2-CPF.2 and MS-COC-C2-CPF.3-1.

⁸⁷³ For the following sample locations: MS-MW5-CDC-C1-CPF.1 and MS-COC-C2.CPF.4.

⁸⁷⁴ See: GSI ER2, App. D, Table D.3, p. 2.

⁸⁷⁵ Sample 07-CPFCO-SD01-R(1,0-1,2)m. See: GSI ER2, App. D, Table D.3, pp. 17-22.

⁸⁷⁶ Sample 07-CPFCO-SDC1-R(2,5-2,7)m. See: GSI ER2, App. D, Table D.3, pp. 17-22.

⁸⁷⁷ Samples 07-CPFCO-SEM09-R(0,0-0,3)m, 07-CPFCO-SEM13-R(0,0-0,3)m, 07-CPFCO-SEM18-R(0,0-0,5)m, 07-CPFCO-SEM21-R(0,0-0,3)m, 07-CPFCO-SEM22-R(0,0-0,3)m, 07-CPFCO-SEM2-R(0,0-0,5)m, 07-CPFCO-SEM4-R(0,5-1,0)m, 07-CPFCO-SEM5-R(0,0-0,3)m and MS-COC-C2-CPF.2-0,5. See: GSI ER2, App. D, Table D.3, pp. 17-22.

⁸⁷⁸ The following spills have been recorded: 20 bl crude spill on 1 January 1994 at transfer pump (Petroproduccion), of which 16 bl were recovered; 2 bl crude spill on 26 December 1994 (Oryx) at tank, of which 1 bl was recovered; 4 bl crude spill on 1 March 1996 at transfer pump (Oryx), none of which was recovered; 3 bl crude spill on 11 May 1996 at power oil line (Oryx), of which 1 bl recovered; 4 bl condensate spill on 25 May 1996 at API separator (Oryx), none of which was recovered; 4 bl crude spill on 26 June 1996 at Monarch2 separator (Oryx), none of which was recovered; 40 bl crude spill on 15 September 1996 at Manifold separation line (Oryx), of which 30 bl recovered; 30 bl crude spill on 25 September 1996 at separators (Oryx), which was all

Coca 9 flow line reaching the CPF manifold and an unreported spill at the washing tank that occurred on 31 August 2008.⁸⁷⁹ These appear unrelated to the exceedances identified above because of their location. It is nonetheless noteworthy that the 2006 biennial audit identified a non-conformity with respect to wastewater discharges.⁸⁸⁰ It is further of particular relevance that, between 1989 and 1996, Petroproducción permanently discharged produced water, without skimming the oil, into the environment from the pits to the south of the CPF into the creek flowing southeast towards the Chalá swamp where Area 2T is located.⁸⁸¹

449. While Mr. Saltos indicated that Oryx discontinued this practice and the area was remediated in 1997,⁸⁸² he also stated that oil seeping continued thereafter, and that this state of affairs persisted during the Consortium's operatorship, and that the Consortium did not reach an agreement with Mr. Chalá because of the takeover in 2009.⁸⁸³ Accordingly, the Tribunal holds that the Consortium is partially responsible for the

recovered; 10 bl crude spill on 18 February 1997 at Monarch separator (Oryx), all of which was recovered; 40 bl crude spill on 19 February 1997 at Production Separator Gas Burner (Oryx) of which 4 bl were recovered; 20 bl crude and production water spill on 20 February 1997 at Monarch2 Separator (Oryx), none of which was recovered; and 20 bl crude spill on 5 June 2000 at power oil unit (Kerr McGee), of which 19 bl were recovered. See: GSI ER1, App. B.3.

⁸⁷⁹ Solís WS2, ¶ 76, item 18 and Annex 57 (Email from the Operations Manager of 1 September 2008), Annex 58 (Email from the B7 Production Supervisor (Manuel Solís) of 5 September 2008).

⁸⁸⁰ Block 7 Environmental Audit, November 2006, p. 48 (**Exh. E-334**).

⁸⁸¹ See: CMCC, ¶ 448. The following is stated in a 1994 environmental assessment prepared for Oryx: "The produced water is gravity discharged from a pipe approximately 200mm in diameter to two lined earthen retention ponds for disposal into a natural drainage channel. No oil skimming equipment is in place within the pond system. An oil collection system comprised of a series of weirs made of palm leaves is utilized within the drainage channel. The oil is manually skimmed from the pools created by the weirs. The output of the weirs flows down the hillside into a creek which flows into the Rio Huashito. The system has been successful in the collection of oil; however, floating oil is still lost into the creek. Oil contaminated material is stored adjacent to the channel and requires regular disposal". Ecomapa/Western Oilfield Environmental Services Ltd., *Environmental Assessment of Oryx Ecuador Energy Company Coca-Payamino Field*, May 1994, p. 30 (**Exh. CE-CC-12**). See also: Saltos WS1, ¶¶ 290, 294; Tr. Site Visit (Day 2) (ENG), 141:2-15 (Presentation by Ms. Renfroe at Coca CPF).

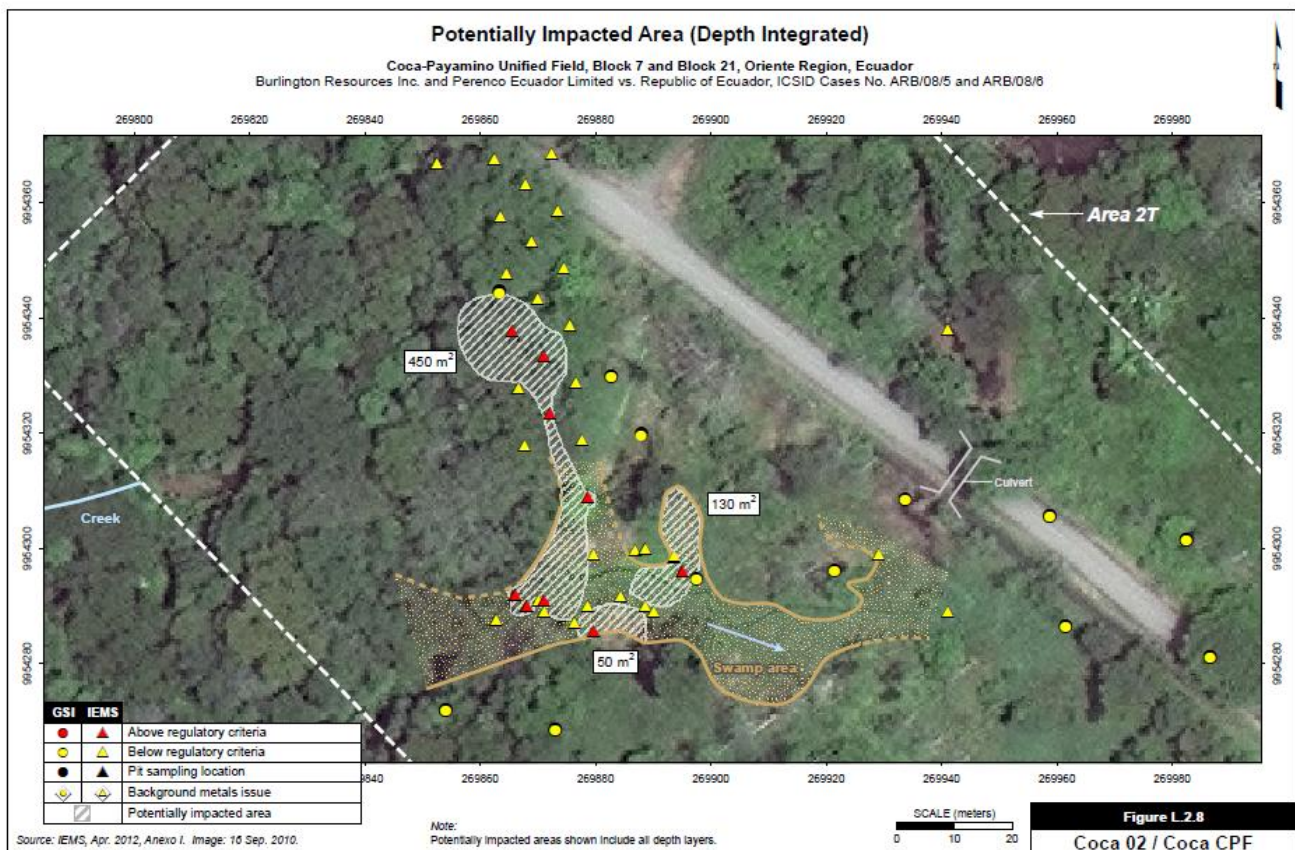
⁸⁸² Saltos WS1, ¶¶ 297-298.

⁸⁸³ Mr. Saltos stated the following: "Unfortunately, it continued discharging water from the API separator, and this water may have had traces of hydrocarbons that ended up in the swamp. And, logically, they continued to go through the swamp until they reached Chalá. And that area, as it is lower lying, and cannot pass directly to the other side of the road, would become sedimented and contamination accumulated there. When I lived in Chalá, we tried to reach an agreement with Chalá, we tried, with him, to carry out a remediation project. Unfortunately, 2009 came and we could not execute it. That's how it was". Tr. Site Visit (Day 2) (ENG), 139:17-23 (Tribunal, Saltos at Coca CPF).

environmental condition in the Chalá swamp. In the exercise of its discretion in matters of the quantification of damages, it determines that Burlington shall pay 50% of the remediation costs.

450. In addition, the Tribunal sees no elements in the record to rebut the presumption that Burlington caused the contamination at the other exceedance points mentioned in paragraph 447. Therefore, Burlington is liable to pay the full costs of remediation of these other areas.

451. With respect to Area 2T in the Chalá swamp, two additional difficulties arise. In this context, it is useful to refer to GSI's impacted area designation in the Chalá swamp.⁸⁸⁴



452. The first difficulty in connection with the Chalá swamp relates to the Parties' disagreement on the location of IEMS's sample points in the swamp. Ecuador indicates

⁸⁸⁴ GSI ER1, App. L, Figure L.2.8.

that IEMS sampled south of the culvert,⁸⁸⁵ whereas Burlington argues that IEMS sampled north of the culvert.⁸⁸⁶ The issue was discussed during the Site Visit. While IEMS reiterated that it sampled south of the culvert,⁸⁸⁷ GSI explained that IEMS did not use a GPS but a tape measure to locate its samples and that one point was missed causing a discrepancy of 100 meters.⁸⁸⁸ In addition, GSI stated that it found no indication of sampling to the south of the culvert, that GSI itself took verification samples there and found no exceedances, and that TPH exceedances in fact exist to the north of the culvert where GSI sampled.⁸⁸⁹ On that basis, GSI argues that “both the geographic and the soil data tell us that we were in the right location”.⁸⁹⁰

453. Because IEMS did not use state of the art (and in fact commonly used) technology to locate its samples, the Tribunal is inclined to rely on GSI's location. Further, the Tribunal notes that GSI places IEMS's samples where the creek flowing from the API separator reaches the swamp area.⁸⁹¹ Accordingly, the Tribunal will work on the basis of GSI's locations for IEMS samples.

454. The second difficulty relates to the fact that Petroamazonas built a pipeline in Area 2T after IEMS collected its samples in 2012.⁸⁹² Because the right of way built by Petroamazonas partly passes through Area 2T, the Tribunal discarded from its analysis

⁸⁸⁵ The Tribunal notes that the maps provided by IEMS in its third and fourth reports indicate sample locations south of the culvert: IEMS ER3, Annex C, Coca CPF corrected, p. 38; IEMS ER4, Att. 38, Coca CPF, p. 46.

⁸⁸⁶ GSI ER1, pp. 53-54 and App. D, Annex D.2, p. 14. GSI explained that on the one hand, IEMS Annex I locates these samples south of the culvert, whereas the IEMS GIS database places these samples north of the culvert. GSI therefore relied on the GIS database, since these locations match the locations plotted in IEMS's second report and the site features in the swamp. See also: Tr. Site Visit (Day 2) (ENG), 155:3-14 (Tribunal, Connor at Coca CPF); C-PSVB, ¶ 33, note 79. See further: GSI field notes, forms, maps and checklists of GSI Environmental – Second campaign (produced by Burlington on 14 November 2012), JAC Field Notes Redacted, pp. 17-18 (**Exh. E-476**).

⁸⁸⁷ Tr. Site Visit (Day 2) (ENG), 152:24-153:22 (Tribunal, Chaves at Coca CPF); R-PSVB, ¶¶ 162-164.

⁸⁸⁸ Tr. Site Visit (Day 2) (ENG), 155:1-7 (Tribunal, Connor at Coca CPF).

⁸⁸⁹ Tr. Site Visit (Day 2) (ENG), 155:8-16 (Tribunal, Connor at Coca CPF).

⁸⁹⁰ Tr. Site Visit (Day 2) (ENG), 155:19-20 (Tribunal, Connor at Coca CPF).

⁸⁹¹ GSI ER1, App. L, Figure L.2.3.

⁸⁹² See, for instance: C-PSVB, ¶ 14.

various sample locations, the remediation of which was superseded by the construction of the pipeline.⁸⁹³

455. On that basis and applying the guidelines set out earlier (section 4.4.3.c and in particular paragraph 414), the Tribunal determined the following impacted areas: 480 m² in Area 2T,⁸⁹⁴ 200 m² for the cadmium exceedance southwest of the pit area and 200 m² for the cadmium exceedance north of the API separator, for a total impacted area of 880 m². The total soil volume is 1,480 m³: 480 m³ in Area 2T, 400 m³ for the cadmium exceedance southwest of the pit area and 600 m³ for the cadmium exceedance north of the API separator.
456. In application of the Tribunal's approach explained above (section 4.5.2) and adding a 30% contingency (see paragraph 428 above), the remediation cost for Area 2T is USD 187,200, of which Burlington must bear **USD 93,600**. Adding a 20% contingency to the cadmium exceedances, the remediation cost for these locations is **USD 360,000**. Accordingly, Burlington is liable to pay **USD 453,600** for soil remediation at Coca CPF.

c. Coca 4

457. Ecuador submits that the impacted area in Coca 4 extends over 2,732 m² and claims the remediation of 3,551.60 m³ of soil, for a total cost of USD 3,617,276.⁸⁹⁵ Although Burlington disputes that the Consortium caused any exceedances at Coca 4, it accepts

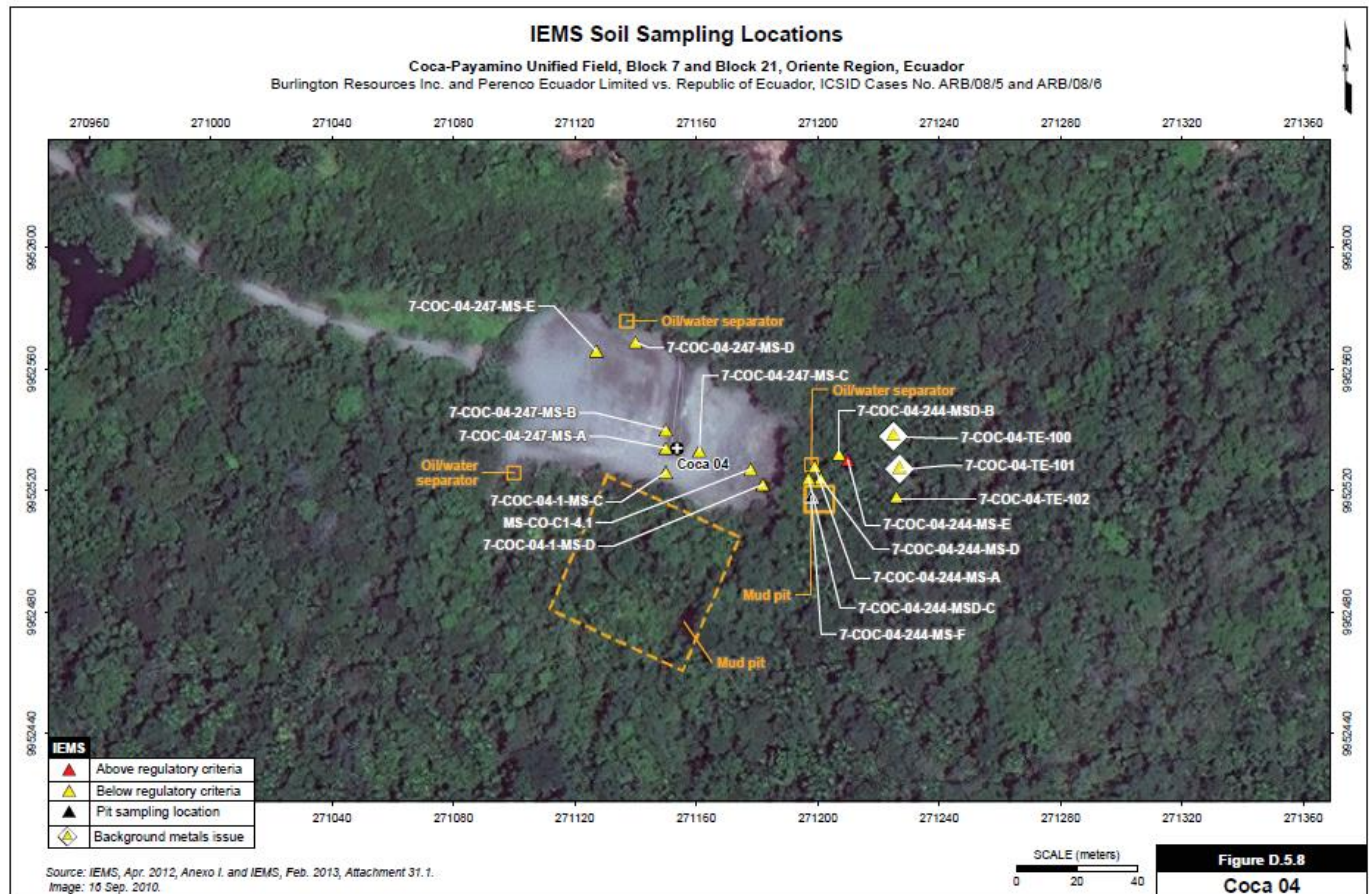
⁸⁹³ The Tribunal discards the following samples: 07-CPFCO-SEM18-R, 07-CPFCO-SEM21-R and 07-CPFCO-SEM22-R. Because the Tribunal does not have the exact location of the right-of-way, and because in the doubt the burden falls on Burlington, the Tribunal maintained in its analysis the following samples: 07-CPFCO-SEM13-R and MS-COC-C2-CPF.2-0,5. The Tribunal stresses that the same approach would have been adopted by the Tribunal if it had considered IEMS's samples to be located south of the culvert, since the right of way also traverses that area.

⁸⁹⁴ The Tribunal determined the impacted areas as follows: 150 m² around sample MS-COC-C2-CPF.2-0,5 due to the high TPH level; 100 m² around sample 07-CPFCO-SEM09-R(0,0-0,3)m due to the high TPH level and the site features of the swamp; 80 m² around sample 07-CPFCO-SEM13-R(0,0-0,3)m due to the relatively low TPH level; and 150 m² around samples 07-CPFCO-SEM2-R(0,0-0,5)m, 07-CPFCO-SEM4-R(0,5-1,0)m, 07-CPFCO-SEM4-R(0,0-0,3)m, 07-CPFCO-SEM5-R due to the high TPH level of sample SEM5.

⁸⁹⁵ Revised Attachment 35 to IEMS ER4 (Excel), line 3 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Coca 4, p. 16; IEMS ER4, Att. 38, Coca 4, p. 17.

that there is contamination in Area 1M extending 20 m² for a total remediation cost of USD 72,000, but argues that this was caused by pre-Consortium drilling activities.⁸⁹⁶

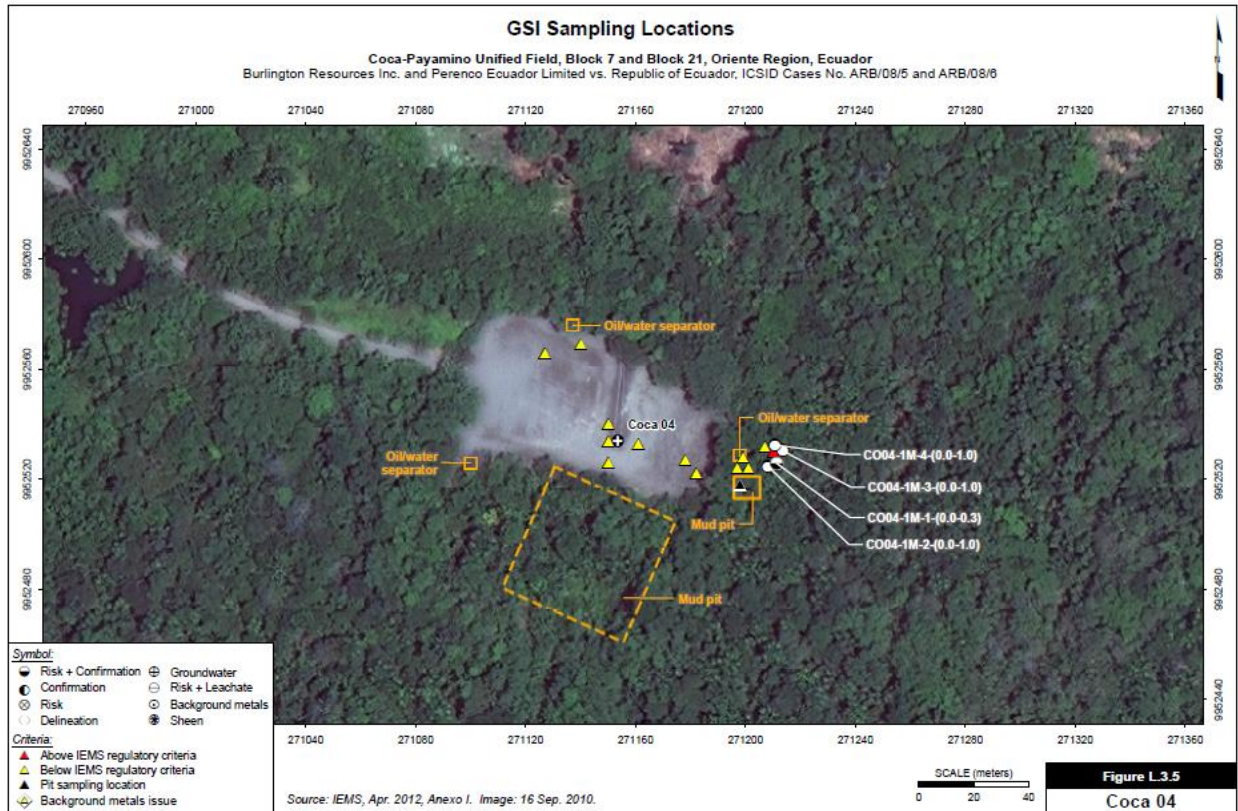
458. The following figures depict IEMS's⁸⁹⁷ and GSI's⁸⁹⁸ sampling locations:



⁸⁹⁶ GSI ER1, App. L, L.03, pp. 4-5, Figure L.3.8, and Att. L.3.E, Table L.3.E.1, Figures L.3.E.A.1 and L.3.E.B.1. See also: R-PHB, ¶ 383(c).

⁸⁹⁷ GSI ER2, App. D, Figure D.5.8.

⁸⁹⁸ GSI ER1, App. L, Figure L.3.5.

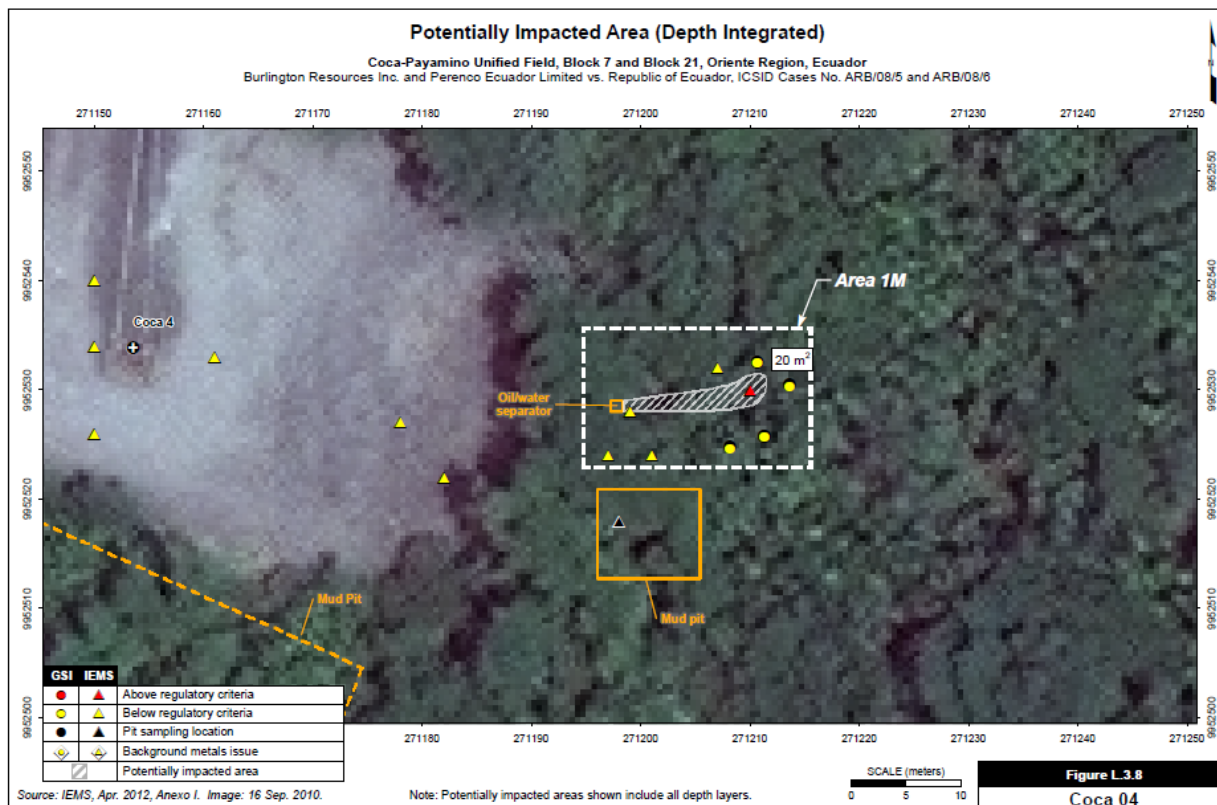


459. By reference to the approach set out above (section 4.3.2.c) and applying sensitive ecosystem use for Area 1M,⁸⁹⁹ the Tribunal identified barium, cadmium and nickel exceedances in Area 1M.⁹⁰⁰
460. The potentially impacted area calculated by GSI which the Tribunal will use as a basis for its delineation (see section 4.4.3.c and especially paragraph 411 above) is illustrated below:⁹⁰¹

⁸⁹⁹ Although IEMS acknowledged that lands adjoining the platform are used for agricultural activities, GSI conceded that secondary forest borders the eastern part of the platform, where Area 1M is located. In any event, the Tribunal observes that the satellite imagery of 2010 suggests that secondary forest surrounded the platform and that land use changes have therefore occurred thereafter. See: C-PHB, ¶ 130; GSI ER1, App. L, L.03, p. 6; IEMS ER4, Att. 38, Coca 4, p. 1. See further: GSI ER1, App. L, Figure L.3.3 and Att. L.3.A.6.

⁹⁰⁰ Samples 7-COC-04-244-MS-E-0,5, 7-COC-04-244-MS-D-0,5, 7-COC-04-244-MSD-C-0,5, 7-COC-04-TE-100 (0.5-0.7), 7-COC-04-TE-101 (0.5-0.7) and 7-COC-04-TE-102 (0.5-0.7). See: GSI ER2, App. D, Table D.3, pp. 2-3.

⁹⁰¹ GSI ER1, App. L, Figure L.3.8.



461. Coca 4 was drilled by CEPE in 1989-1990⁹⁰² and Burlington links the exceedances to drilling activities that pre-date the Consortium.⁹⁰³ There is no specific record of historical spills.⁹⁰⁴ Ecuador's witness Mr. Solís testified that Perenco did not report a spill at the production pipeline on 10 September 2006 affecting approximately 4 m³.⁹⁰⁵ Accordingly, the Tribunal considers that Burlington failed to rebut the presumption that the Consortium caused the exceedances, which appear linked to an overflow of the oil/water separator rather than to drilling mud discharges, in particular since there are eight closed pits at that site and all exceedances are at a relatively shallow depth (<0.7m). Accordingly, Burlington is liable to remedy all exceedances at Coca 4.

⁹⁰² GSI ER1, App. B.5; GSI ER2, App. B.5; Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 4 (**Exh. E-563**).

⁹⁰³ Rejoinder, ¶ 267.

⁹⁰⁴ GSI ER1, App. B.3.

⁹⁰⁵ Solís WS2, ¶ 76, item 6 and Annex 44 (internal spill report of 10 September 2006).

462. On that basis and in application of the approach discussed above (see sections 4.4.3.c and 4.5.2), the Tribunal increased GSI's delineation around sample 7-COC-04-244-MS-E-0,5 from 20 m² to 100 m².⁹⁰⁶ One must then add 80 m² for the cadmium exceedances between the oil/water separator and the mud pit, and 400 m² around the nickel exceedances,⁹⁰⁷ for a total impacted area of 580 m² and total volume of soil of 580 m³. Adding a 30% contingency (see paragraph 428 above), the total remediation cost for which Burlington is liable amounts to **USD 226,200** for Coca 4.

d. Coca 6

463. Ecuador submits that the impacted area in Coca 6 extends over 8,053 m² and that 10,468 m³ of soil must be remediated for a total cost of USD 9,997,490.⁹⁰⁸ Although Burlington argues that the exceedances at Coca 6 were caused by a spill in 1999,⁹⁰⁹ it accepts that there is contamination in Area 1MT extending 780 m² for a total remediation cost of USD 242,000.⁹¹⁰

⁹⁰⁶ See GSI's interpolation tick marks: GSI ER1, App. L, Figure L.3.E.A.1.

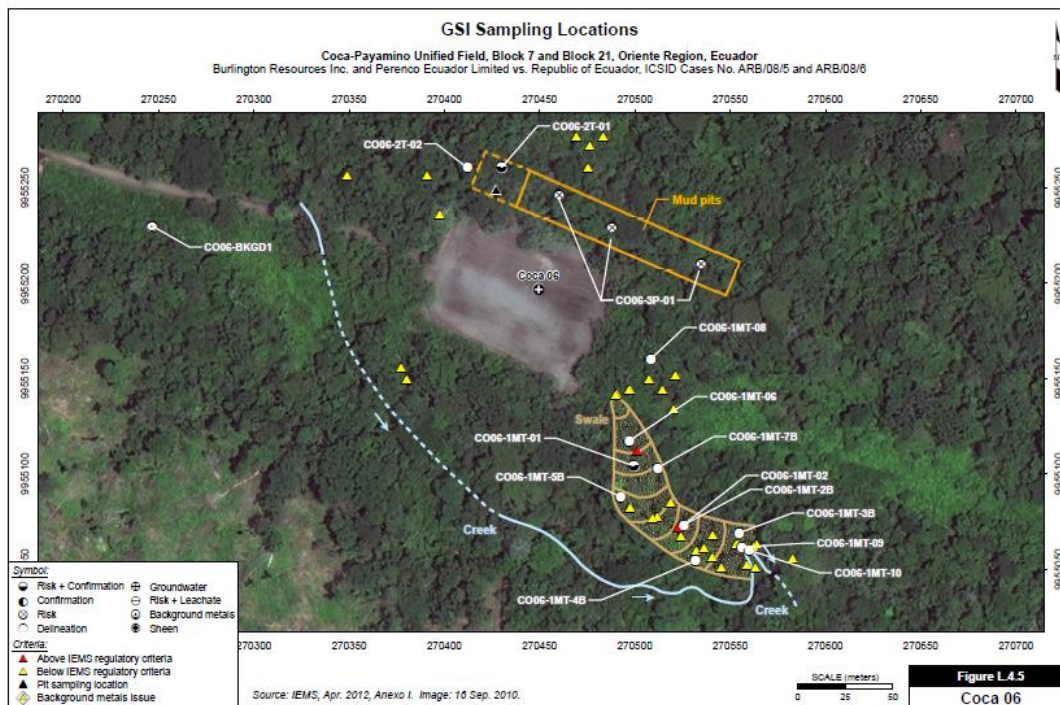
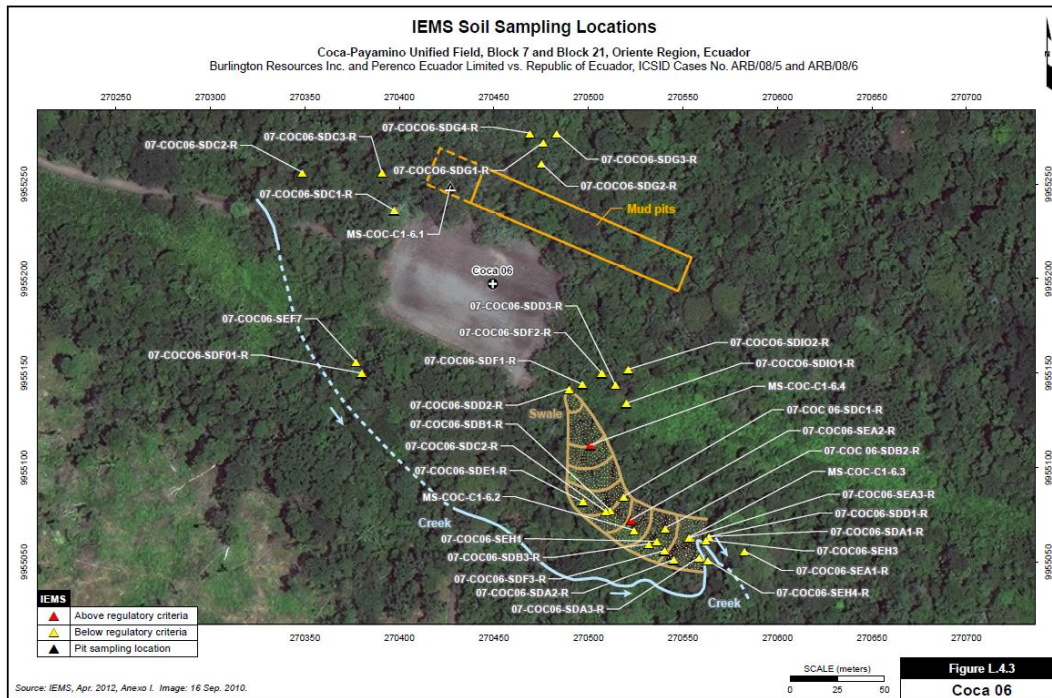
⁹⁰⁷ For the location of the nickel exceedances, see: GSI ER2, App. D, Figures D.1.11 and D.5.8.

⁹⁰⁸ Revised Attachment 35 to IEMS ER4 (Excel), line 4 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Coca 6 corrected, p. 27.

⁹⁰⁹ GSI ER2, Table 4.

⁹¹⁰ GSI ER1, App. L, L.04, p. 5, Figure L.4.8, and Att. L.4.E, Figures L.4.E.B.1 and L.4.E.B.2.

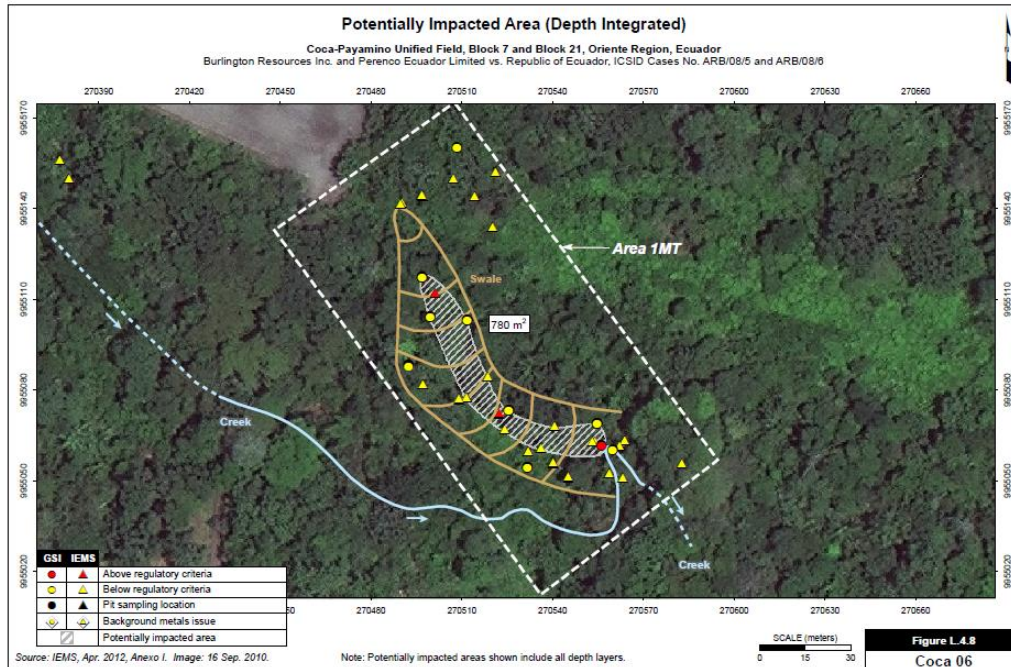
464. The following figures depict IEMS's⁹¹¹ and GSI's sampling locations:⁹¹²



911 GSI ER1, App. L, Figure L.4.3.

912 *Id.*, Figure L.4.5.

465. The following image depicts GSI's delineation of the potentially impacted area, from which the Tribunal will start, as explained earlier (see section 4.4.3.c and in particular paragraph 411):⁹¹³



466. In reliance on the approach explained above (see section 4.3.2.c) and thus accepting sensitive ecosystem use for Coca 6,⁹¹⁴ the Tribunal identified TPH, barium and cadmium exceedances in Area 1MT.⁹¹⁵

467. Coca 6 was drilled by CEPE in 1989, but the well was shut in by the Consortium.⁹¹⁶ Burlington links all exceedances to a spill that occurred in 1999.⁹¹⁷ However, Ecuador

⁹¹³ GSI ER1, App. L, Figure L.4.8.

⁹¹⁴ GSI concedes that secondary forest surrounds the platform at Coca 6. See: GSI ER1, App. L, L.04, p. 6; Figure L.4.2 and Att. L.04.A and L.04.B.

⁹¹⁵ Samples 07-COC06-SEA2-R(0,0-0,3)m, 07-COC06-SEA3-R(0,0-0,3)m, 07-COC06-SEH2-(0,0-0,3)m, CO06-1MT-09-0.0-0.46, MS-COC-C1.6.2-0,3, MS-COC-C1.6.4-0,7 and 07-COC06-SDE1-R(2,5-2,7)m. GSI ER1, App. L, Tables L.4.1, L.4.3, L.4.4, L.4.5; GSI ER2, App. D, Table D.3, pp. 3-5. The precise location of sample 07-COC06-SEH2-(0,0-0,3)m is unclear, since there are no coordinates (no easting and northing) and is otherwise not located on GSI's maps. See: GSI ER1, App. L, Figure L.4.3. However, since all samples with the reference "SEH" (for instance, SEH1, SEH3, SEH4) are located in the swale of Area 1MT, the Tribunal worked on the assumption that sample SEH2 is also located there.

⁹¹⁶ GSI ER1, App. B.5; GSI ER2, App. B.5; Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 5 (**Exh. E-563**).

demonstrated that the Consortium conducted a well workover at that site involving drilling and the use of chemicals, which could also be the cause of heavy metal exceedances.⁹¹⁸ The Tribunal further notes that there was a spill in 2006 and another one of 10 barrels in 2007.⁹¹⁹ In addition, GSI stated that a remediation program was in place when the Consortium took over the operations, but that it was never completed due to unsuccessful negotiations with local communities to gain access to the stream area.⁹²⁰ In light of the fact that the Consortium assumed the remediation program for the 1999 spill, but that it failed to conduct the remediation, and considering the 2002 workover and the 2006 and 2007 spills, the Tribunal holds the Consortium fully responsible for the environmental condition in Area 1MT.

468. In application of the guidelines set earlier (sections 4.4.3.c and 4.5.2), the Tribunal reaches the following conclusion. Since GSI's delineation does not include all exceedance points in Area 1MT,⁹²¹ and in light of the high TPH values reaching the creek to the southeast of the swale, the Tribunal determined the impacted area to extend to 1,100 m² and the total volume of soil to be remediated to amount to 1,100 m³. Considering a contingency of 30% (see paragraph 428 above), the remediation cost amounts to **USD 429,000** for Coca 6.

e. Coca 8

469. Ecuador submits that an area of 12,457 m² is impacted at Coca 8 and that 36,571.60 m³ of soil must be remediated, for a total cost of USD 34,628,076.⁹²² Burlington argues that the contamination found in Coca 8 is attributable to drilling

⁹¹⁷ According to Mr. Saltos, the 1999 spill flowed southeast from the platform and he has no knowledge whether Petroproducción remediated any spill at Coca 6. Saltos WS1, ¶¶ 282-286.

⁹¹⁸ R-PHB, ¶ 719 and note 876; Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Coca 6, Reacondicionamiento # 6, November 2002, pp. 3-4 (**Exh. E-573**).

⁹¹⁹ According to Burlington, the "small spill" of 2007 was remediated and therefore cannot be the cause of exceedances in Coca 6 "today". Rejoinder, ¶ 265; Saltos WS1, Annex A.

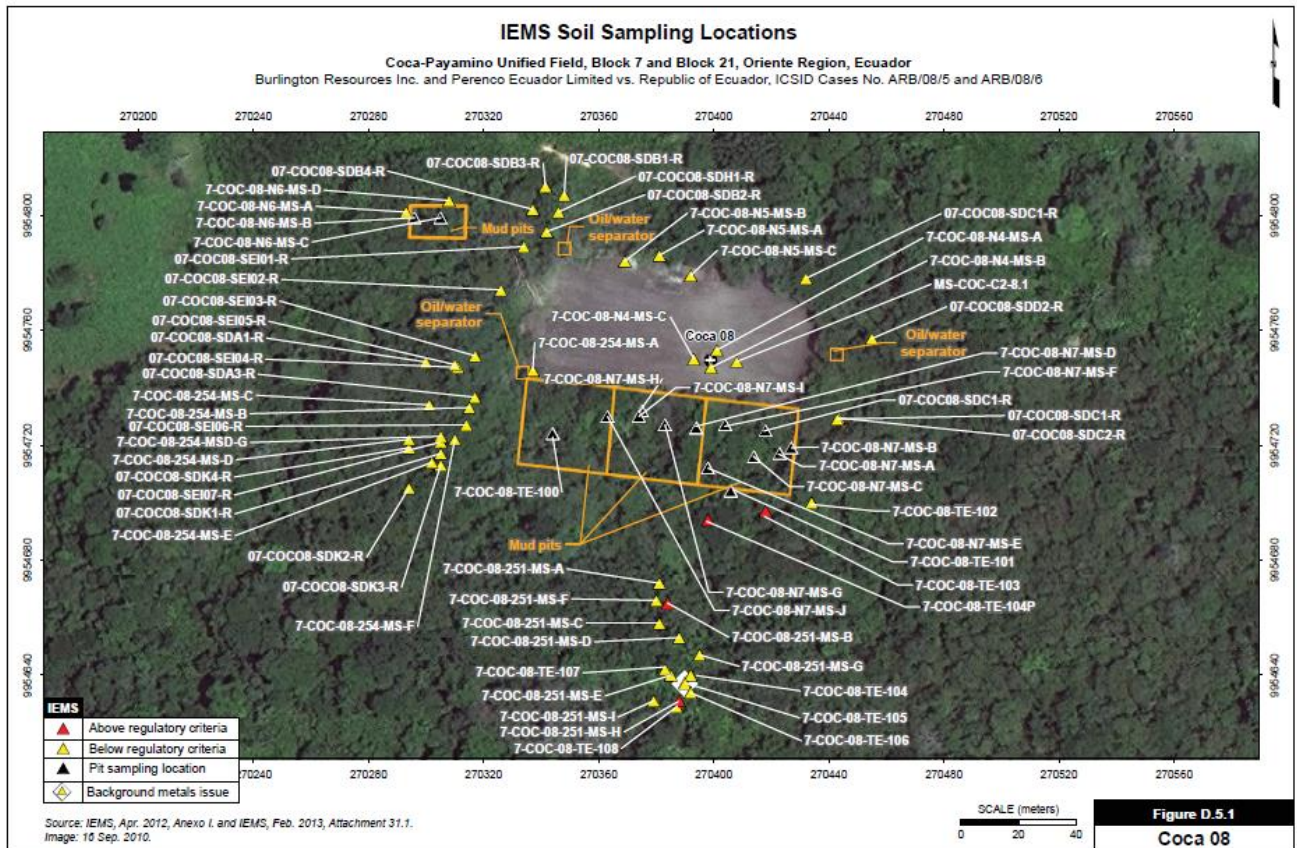
⁹²⁰ GSI ER1, App. L.04, p. 3. The Tribunal also notes that Mr. Noteño, President of the community of *Corazón del Oriente*, filed a complaint in 2006, which, however, appears to relate to the pits to the north of the platform, not to the exceedances in Area 1MT. See: Reply, ¶ 440; IEMS ER3, Annex C, Coca 6, p. 4; Letter of 22 March 2007 from the President of the Corazón del Oriente Community to Salvadore Quishpe (**Exh. E-285**). See also: Rejoinder, ¶ 266; Saltos WS, ¶ 287.

⁹²¹ See: GSI ER1, App. L, Figure L.4.8.

⁹²² Revised Attachment 35 to IEMS ER4 (Excel), line 6 (**Exh. E-500**); Results of remodeling exercise, Coca 8, Figure 02-B (**Exh. E-499**). Compare with: IEMS ER3, Annex C, Coca 8, p. 39.

activities of prior operators,⁹²³ that the potentially impacted area is in any event only 2,280 m²,⁹²⁴ and that remediation is warranted for 3,470 m³ of soil, for a total cost of USD 449,000.⁹²⁵

470. The following images show IEMS's⁹²⁶ and GSI's⁹²⁷ sampling locations at Coca 8:



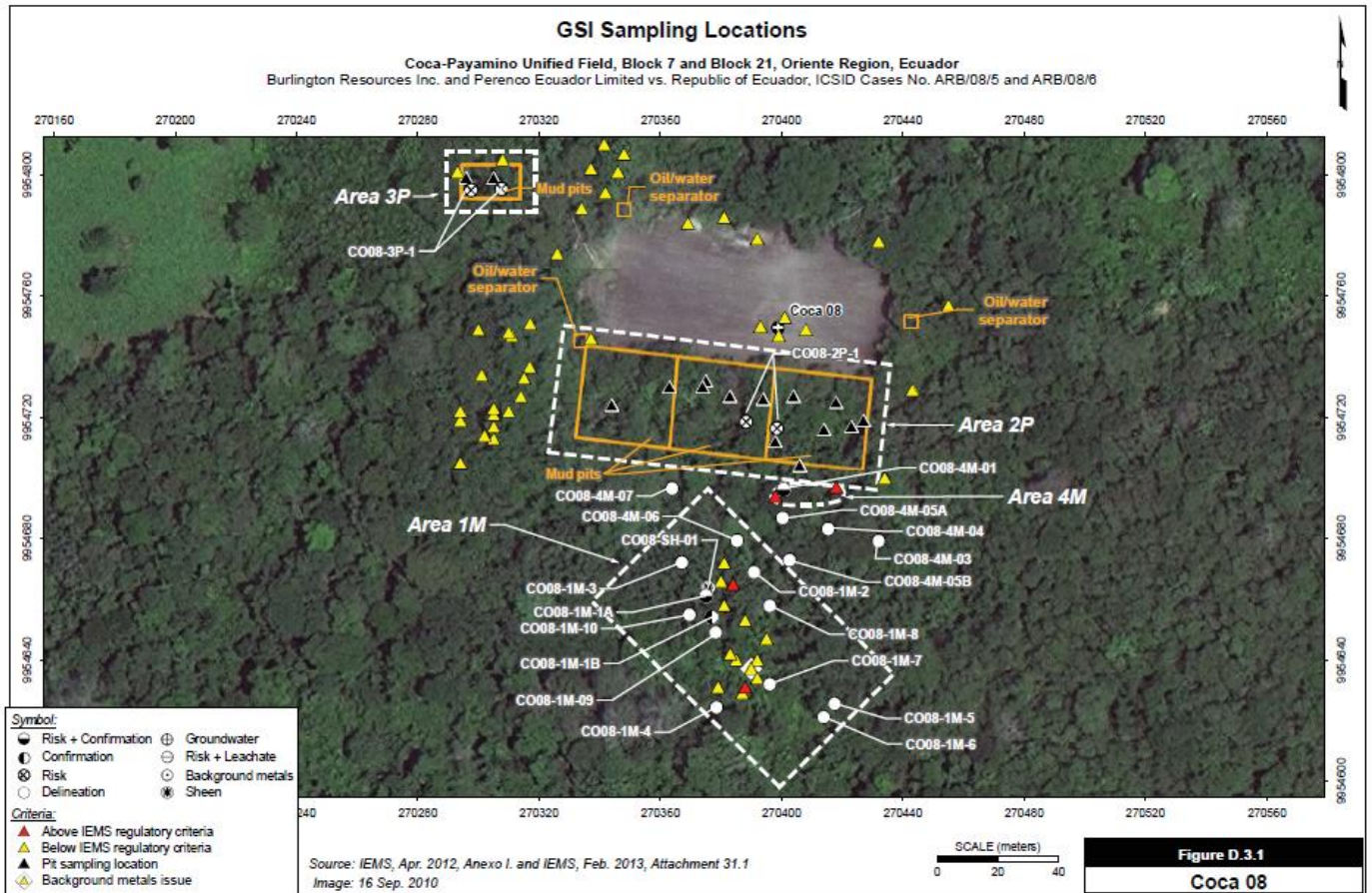
923 Tr. Site Visit (Day 2) (ENG), 94:10-16 (Presentation of Ms. Renfroe at Coca 8); C-PSVB, ¶ 24.

924 GSI ER2, Table 4. See also: GSI ER2, App. D.4, Figure D.4.1 and App. H, Figure H.9.

925 According to GSI, the impacted area in Area 4M is 2,070 m² and the volume of soil to be remediated 3,260 m³. In the Area 1M, the impacted area is 210 m² and the volume of soil 210 m³. See: GSI ER2, Tables 3 and 4. In its first report, GSI estimated the impact area at 280 m², the volume of contaminated soil at 280 m³, and the total cost of remediation at USD 167,000. See: GSI ER1, App. L.6.1, p. 5, Att. L.6.E, Table L.6.E.1, Figures L.6.E.A.1 and L.6.E.B.1.

926 GSI ER2, App. D, Figure D.5.1.

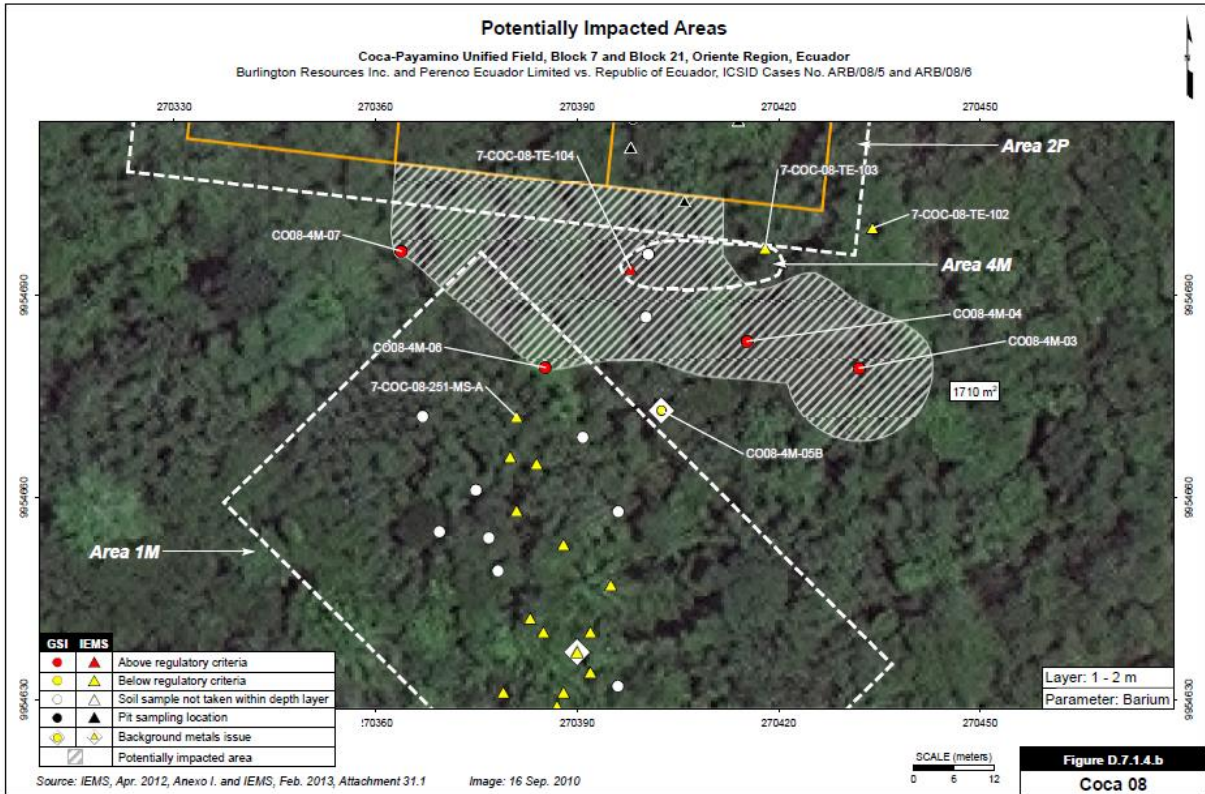
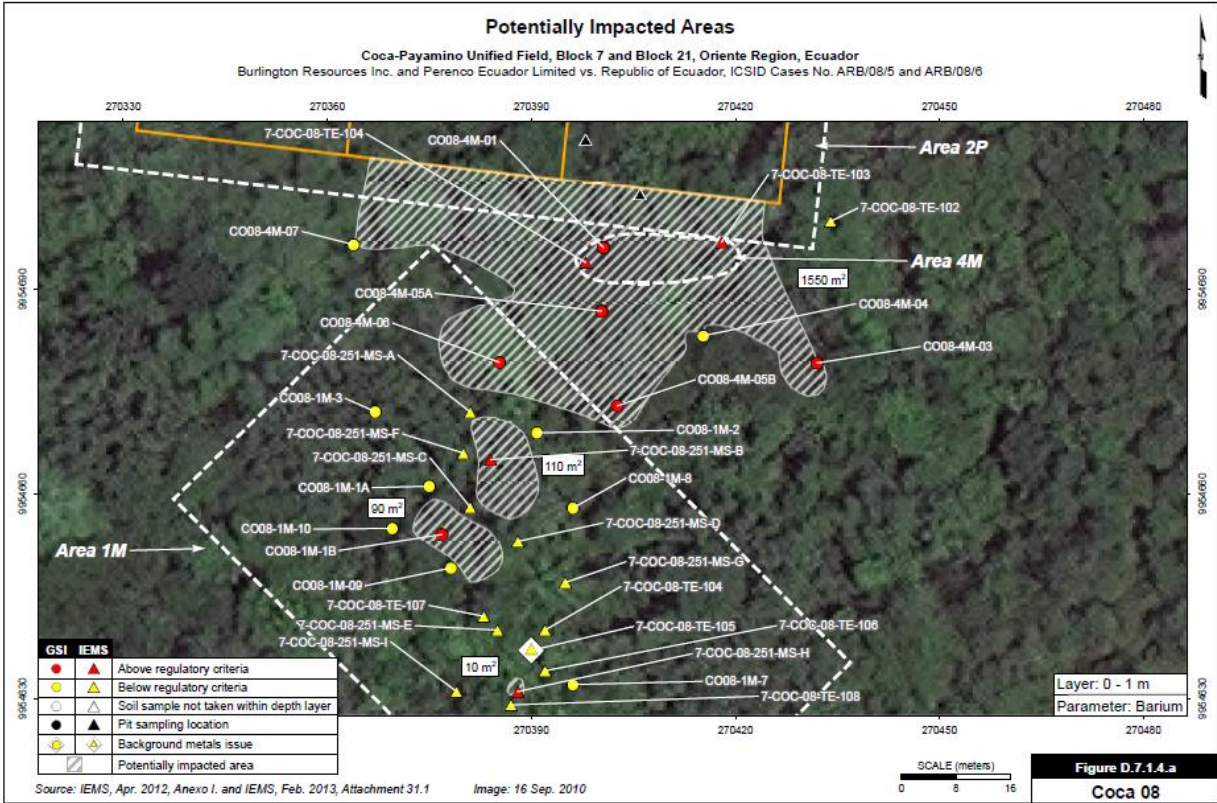
927 *Id.*, Figure D.3.1.



471. GSI's delineation of impacted areas and depth in Areas 1M and 4M which will serve as basis for the Tribunal's delineation (see section 4.4.3.c above and in particular paragraph 411) is shown below, first for the 0-1 meter layer⁹²⁸ and then for the 1-2 meter layer:⁹²⁹

⁹²⁸ *Id.*, Figure D.7.1.4.a.

⁹²⁹ *Id.*, Figure D.7.1.4.b. For a depth-integrated potentially impacted area calculated by GSI, see: *Id.*, Figure D.4.1.



472. There are various land uses around Coca 8. With reference to the Tribunal's approach explained above (section 4.3.2.c), the platform falls within the industrial land use criteria. The area northwest of the platform, along the entry road is used for agricultural purposes. All other areas surrounding the platform are properly classified as sensitive ecosystem.⁹³⁰ Applying these criteria, there are no exceedances on the platform and no exceedances to the north of the platform.⁹³¹
473. Further, applying the sensitive ecosystem criteria to the other areas, the Tribunal identified numerous barium, cadmium and nickel exceedances in the area visited by the Tribunal south of the three mud pits bordering the southern edge of the platform, which includes the areas designated by GSI as Area 4M, immediately adjacent to the mud pits, and Area 1M further downhill.⁹³² The highest barium level reaches 23,368.3 mg/kg at the sample location 7-COC-08-TE-104P.⁹³³ In addition, there are various barium, cadmium and nickel exceedances to the west of the platform and the pit area.⁹³⁴

⁹³⁰ GSI concedes that secondary forest is immediately adjacent to the platform, with agriculture 50 meters to the north, 100 meters northwest and 120 meters to the south. GSI ER1, App. L.6.1, p. 6. The Tribunal did not give much weight to the statement in 2007 of the landowner Mr. Noteño, that the lands around the platform were destined for agriculture, in light of the explanation by Mr. Saltos that the areas immediately surrounding the platform cannot be used by private owners while oilfield operations are ongoing: "In addition, this area over here is not used because compensation was paid previously by the private company for the operation of the platform. And while the operation of the platform is ongoing, they cannot use it". Tr. Site Visit (Day 2) (ENG), 107:1-3 (Tribunal, Saltos at Coca 8). See further: Letter of 22 March 2007 from the President of the Corazón del Oriente Community to Salvadore Quishpe (**Exh. E-285**).

⁹³¹ Sample 7-COC-08-N5-MS-A has TPH and barium, but below the limit for agricultural land use. See: GSI ER1, App. L, Figure L.6.3; GSI ER2, App. D, Table D.3, p. 9.

⁹³² IEMS samples with exceedances are the following: 7-COC-08-TE-102(0.5-0.7), 7-COC-08-TE-102(1.5-1.7), 7-COC-08-TE-102(2.0-2.2), 7-COC-08-TE-103(0.5-0.7), 7-COC-08-TE-103(1.4-1.6), 7-COC-08-TE-104-(0.5-0.7), 7-COC-08-TE-104(0.5-0.7)P, 7-COC-08-TE-104(1.2-1.4)P, 7-COC-08-TE-104-(1.50-1.70), 7-COC-08-TE-105-(0.5-0.70), 7-COC-08-TE-105-(1.50-1.70), 7-COC-08-TE-106-(0.5-0.70), 7-COC-08-TE-106-(1.50-1.70), 7-COC-08-TE-108-(0.5-0.70), 7-COC-08-251-MS-A-0,5, 7-COC-08-251-MS-B-0,2, 7-COC-08-251-MS-B29, 7-COC-08-251-MS-F-0,5, 7-COC-08-251-MS-H-0,5, 7-COC-08-251-MS-H-1,5, 7-COC-08-251-MS-I-0,5, 7-COC-08-251-MS-I-1,5. GSI samples with exceedances are as follows: CO08-1M-1B-(0.0-0.2), CO08-4M-01-(0.0-0.3), CO08-4M-01-(0.0-0.3)-, CO08-4M-01-(0.5-0.7), CO08-4M-01-(0.5-0.7)-DUP, CO08-4M-03-(0.0-1.0), CO08-4M-03-(1.0-2.0), CO08-4M-04-(0.0-1.0), CO08-4M-04-(1.0-2.0), CO08-4M-05A-(0.0-1.0), CO08-4M-05A-(0.0-1.0)-DUP, CO08-4M-05B-(0.0-1.0), CO08-4M-05B-(1.0-2.0), CO08-4M-06-(0.0-1.0), CO08-4M-06-(1.0-2.0), CO08-4M-07-(0.0-1.0), CO08-4M-07-(1.0-2.0). IEMS ER4, Att. 38, Coca 8, pp. 13-42; GSI ER2, App. D, Table D.3, pp. 6-10 and Tables D.8-D.10.

⁹³³ IEMS ER4, Att. 38, Coca 8, p. 27; GSI ER2, App. D, Table D.3, p. 6.

⁹³⁴ Samples 07-COC08-SEI01-R(0,0-0,3)m, 07-COC08-SEI02-R(0,0-0,3)m, 07-COC08-SEI05-R(0,0-0,3)m, 7-COC-08-254-MS-A-1,5, 7-COC-08-254-MS-A24, 7-COC-08-254-MS-B-0,5, 7-

474. The Coca 8 well was drilled by CEPE in 1991 and the Consortium operated the platform from 2002 until the takeover in 2009.⁹³⁵ There is evidence of a 150 barrel crude spill on 4 March 2000 under the operatorship of Kerr McGee due to equipment failure, which affected an area of 600 m², although 145 barrels were recovered.⁹³⁶ On the other hand, there is no evidence of spills during the Consortium's time or of workovers undertaken by the Consortium.⁹³⁷ As a result, the Tribunal considers that the exceedances must be deemed due to the activities of prior operators.
475. As the related analysis will show (see paragraph 820 below), there is evidence that the mud pits have been leaking into the surrounding environment, in particular in Areas 1M and 4M. The Consortium was made aware of this situation at the latest in March 2007 when Mr. Noteño, the President of the *Corazón de Oriente* community, filed a complaint.⁹³⁸ The record does not show that the Consortium took action to mitigate the harm and prevent it from spreading further.⁹³⁹ As a result, the Tribunal finds that Burlington shares a responsibility for this damage and must accordingly contribute 50% to the cost of remediating it. This applies to the area south and west of the pits. By contrast, the two barium exceedances to the west of the platform are unrelated to the condition of the pits at issue and are, therefore, not attributable to Burlington.⁹⁴⁰
476. Since GSI applied agricultural criteria, its delineation for Areas 1M and 4M does not encompass all exceedance points.⁹⁴¹ With reference to the approach set out above

COC-08-254-MS-C-0,5, 7-COC-08-254-MS-D-0,5, 7-COC-08-254-MS-F-0,5. GSI ER1, App. L, Figure L.6.3; GSI ER2, App. D, Table D.3, pp. 7-9.

⁹³⁵ Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 6 (**Exh. E-563**); IEMS ER4, Att. 38, Coca 8, p. 5; GSI ER1, App. B.4 and B.5; GSI ER2, App. B.5.

⁹³⁶ GSI ER1, App. B.3, line 48, p. 2.

⁹³⁷ The record shows that the last workover (workover #5) was completed on 7 June 1998. See: Workover Folders by Well for Blocks 7 and 21, p. 53 (**Exh. E-241**).

⁹³⁸ Letter of 22 March 2007 from the President of the Corazón del Oriente Community to Salvadore Quishpe (**Exh. E-285**). See also: Reply, ¶ 440; IEMS ER3, Annex C, Coca 6, p. 4; IEMS ER4, Att. 38, Coca 8, pp. 8-9 (REC No. 7-COC-08-404). See also: Rejoinder, ¶ 266; Saltos WS, ¶ 287.

⁹³⁹ It is noteworthy that not a single sample was taken in Coca 8 for the 2008 audit. Block 7 Environmental Audit, November 2008, p. 40, Table 3-3 (**Exh. E-252**).

⁹⁴⁰ Samples 07-COC08-SEI01-R(0,0-0,3)m and 07-COC08-SEI02-R(0,0-0,3)m.

⁹⁴¹ GSI ER2, App. D, Figures D.4.1, D.5.1 and Annex D.7.1.4, Table D.7.1.4, Figures D.7.1.4.a to D.7.1.4.e. For instance, sample 7-COC-08-TE-102 was included in Area 4M, and the Tribunal took into consideration that most sample locations have exceedances extending to a depth of 2

(sections 4.4.3.c and 4.5.2), the Tribunal has thus adopted its own approach and finds that the impacted area south of the pits amounts to 3,270 m² and the total volume of contaminated soil 6,220 m³.⁹⁴² Considering a 30% contingency (see paragraph 428), the total cost to remediate Areas 1M and 4M is **USD 2,425,800**.

477. The exceedance points to the west of the pits make up five discrete impacted areas of 1,000 m² in the aggregate (200 m² each) and a total volume of 1,000 m³ of soil to be remediated,⁹⁴³ for a total cost of **USD 390,000** with a contingency of 30% (see paragraph 428).
478. The exceedance next to the oil/water separator impacted an area of 80 m² and requires remediation of 160 m³, for a cost of **USD 57,600** that includes a 20% contingency (see paragraph 428).⁹⁴⁴
479. To conclude, the total impacted area in Coca 8 is 4,350 m²; the total volume of soil to be remediated is 7,380 m³; and the total cost of remediation of regular soil at Coca 8 amounts to USD 2,873,400, of which Burlington shall bear 50%, totalling **USD 1,436,700**.

meters, including the nickel exceedance at sample point CO08-4M-05B and the cadmium exceedance at sample point 7-COC-08-TE-103. In addition, the Tribunal extended the impacted area to the west of sample point CO08-4M-07 by 8 meters. On that basis the Tribunal extended the impacted area to 2,600 m² and the total volume of soil to 5,200 m³. In Area 1M, the Tribunal extended GSI's delineation around sample 7-COC-08-251-MS-B from 110 m² to an impacted area of 200 m² and a total volume of soil of 200 m³. It also slightly extended the area around sample CO08-1M-1B from 90 m² to 120 m², corresponding to 120 m³ of contaminated soil, to factor in the fact that GSI put dirty borings back into the ground at Coca 8. See: R-PHB, ¶¶ 363-365. Finally, the impacted area around sample 7-COC-08-251-MS-H was significantly expanded from 10 m² to 350 m² and a volume of soil of 700 m³, in order to factor in the numerous additional cadmium exceedances (7-COC-08-251-MS-I, 7-COC-08-TE-104, 7-COC-08-TE-105, 7-COC-08-TE-106, 7-COC-08-TE-108).

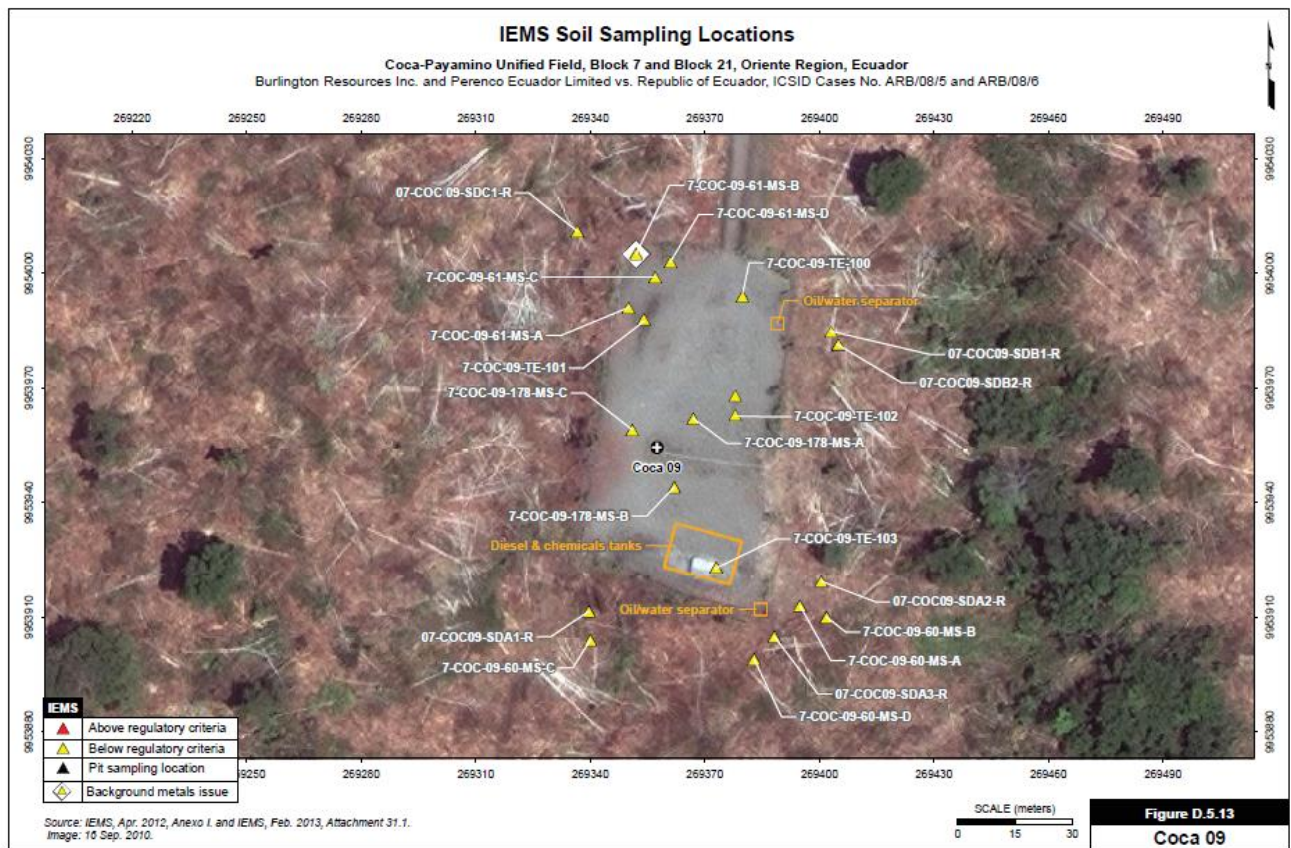
⁹⁴² In accordance with the information in the previous note, the Tribunal determined an impacted area of 2,600 m² and a total volume of soil of 5,200 m³ in Area 4M, and an impacted area of 670 m² and a total volume of soil of 1,020 m³ in Area 1M.

⁹⁴³ Samples 07-COC08-SEI05-R(0,0-0,3)m, 7-COC-08-254-MS-B-0,5, 7-COC-08-254-MS-C-0,5, 7-COC-08-254-MS-D-0,5, 7-COC-08-254-MS-F-0,5.

⁹⁴⁴ Samples 7-COC-08-254-MS-A and 7-COC-08-254-MS-A24.

f. Coca 9

480. Ecuador submits that an area of 7,511 m² is impacted at Coca 9 requiring the remediation of 16,789.50 m³ of soil, for a total cost of USD 16,772,147.⁹⁴⁵ For its part, Burlington argues that no remediation is called for at this site, since there are no exceedances of any indicator parameters and the vanadium exceedance on the northwestern corner of the platform is a “background metals issue”.⁹⁴⁶
481. The following image depicts IEMS’s sampling locations,⁹⁴⁷ being specified that GSI collected no samples at this site.⁹⁴⁸



⁹⁴⁵ Revised Attachment 35 to IEMS ER4 (Excel), line 7 (**Exh. E-500**); Results of remodeling exercise, Coca 9, Figure 03-B (**Exh. E-499**). Compare with: IEMS ER3, Annex C, Coca 9, p. 19; IEMS ER4, Att. 38, Coca 9, p. 18.

⁹⁴⁶ GSI ER1, App. L, Figure L.7.4.

⁹⁴⁷ GSI ER2, App. D, Figure D.5.13.

⁹⁴⁸ See: GSI ER1, App. L.07; GSI ER2, App. D, Table D.4.

482. Coca 9 was drilled by Oryx in 1992 and 1993,⁹⁴⁹ and it remains in operation under Petroamazonas. There are no records of historical spills at that site.⁹⁵⁰ In its preliminary assessment, IEMS identified discoloration of the floor in the northwestern corner of the platform and signs of contamination in a marshy area located at the southeast corner of the platform.⁹⁵¹ The 2008 audit mentioned the lack of labelling of fuel tanks and chemical products, the lack of signage concerning industrial safety or the handling of chemicals, the lack of maintenance of the perimeter ditch, the unmarked oil well, and the accumulation of loose materials on the platform.⁹⁵² While these facts are not evidence of environmental harm, they suggest faulty conduct, which reinforces a finding of a causation. In light of these facts and of Burlington's argument described above, Burlington cannot be held to have rebutted the presumption that the Consortium caused the harm found at that site.
483. Applying industrial use criteria to the platform pursuant to its general approach (see section 4.3.2.c), the Tribunal finds an exceedance with a relatively high level of vanadium (385 mg/kg) on the northwestern corner of the platform. In reliance on its methodology explained above (sections 4.4.3.c and 4.5.2), the Tribunal calculated an impacted area of 200 m² and a volume of soil to be remediated of 400 m³, for a total cost of **USD 144,000** which includes a 20% contingency (see paragraph 428).⁹⁵³
484. Considering sensitive ecosystem land use criteria for off platform locations,⁹⁵⁴ there is one nickel exceedance to the southeast of the platform, amounting to an impacted area

⁹⁴⁹ IEMS ER4, Att. 38, Coca 9, p. 1; GSI ER1, App. B.4 and B.5.

⁹⁵⁰ IEMS ER4, Att. 38, Coca 9, p. 5; GSI ER1, App. B.3.

⁹⁵¹ See: RECs No. 7-COC-09-60 and 7-COC-09-61. IEMS ER4, Att. 38, Coca 9, p. 6.

⁹⁵² IEMS ER4, Att. 38, Coca 9, p. 5; Block 7 Environmental Audit, November 2008, pp. 203-207, Coca 9 (**Exh. E-252**). The verification list mentions in relevant part: "Condition of drains, sewers: lack cleaning; [...] signaling: none; [...] retention area: filled with water; [...] equipment cleaning: head house evidences no maintenance; [...] right of way: lacks cleaning; [...] ditches and drains: lack cleaning; [...] grease traps: 2 lack cleaning; [...] platform soil composition: lacks compacting in specific areas; [...] perimeter fence: incomplete wire fence, lacks maintenance; [...] floor cleaning/rubbish: presence of dry vegetal material and rubbish; [...] signaling: none; [...] area for chemicals: lacks cleaning, signaling of tanks according to applicable rules and regulations and EPP" (Translation by the Tribunal).

⁹⁵³ Sample 7-COC-09-61-MS-B-1,5. IEMS ER3, Annex C, Coca 9, p. 12; IEMS ER4, Att. 38, Coca 9, p. 13; GSI ER2, App. D, Table D.3, p. 11.

⁹⁵⁴ GSI concedes that secondary forest surrounds the platform. GSI also indicated that the area was totally cleared in 2010 by the landowner, but that it was re-vegetated since then. GSI ER1, App. L, Att. L.07, Coca 9, p. 3. See, in particular, the images in GSI ER1, App. L, Att. L.07, Coca

of 200 m², a volume of contaminated soil of 200 m³, and a remediation cost of **USD 78,000** that includes a 30% contingency (see paragraph 428).⁹⁵⁵

485. Accordingly, Burlington is liable to pay **USD 222,000** to remediate the 600 m³ of contaminated soil found covering an impacted area of 400 m² at Coca 9.

g. Coca 10/16

486. Ecuador claims USD 252,891 to remediate 175 m³ of soil covering an area of 135 m² at Coca 10/16.⁹⁵⁶ Burlington objects that no remediation is required at this site, although it recognizes that a TPH and barium exceedance exists at sample location 7-COC-10-175-MS-E-1,5, if agricultural land use criteria apply.⁹⁵⁷

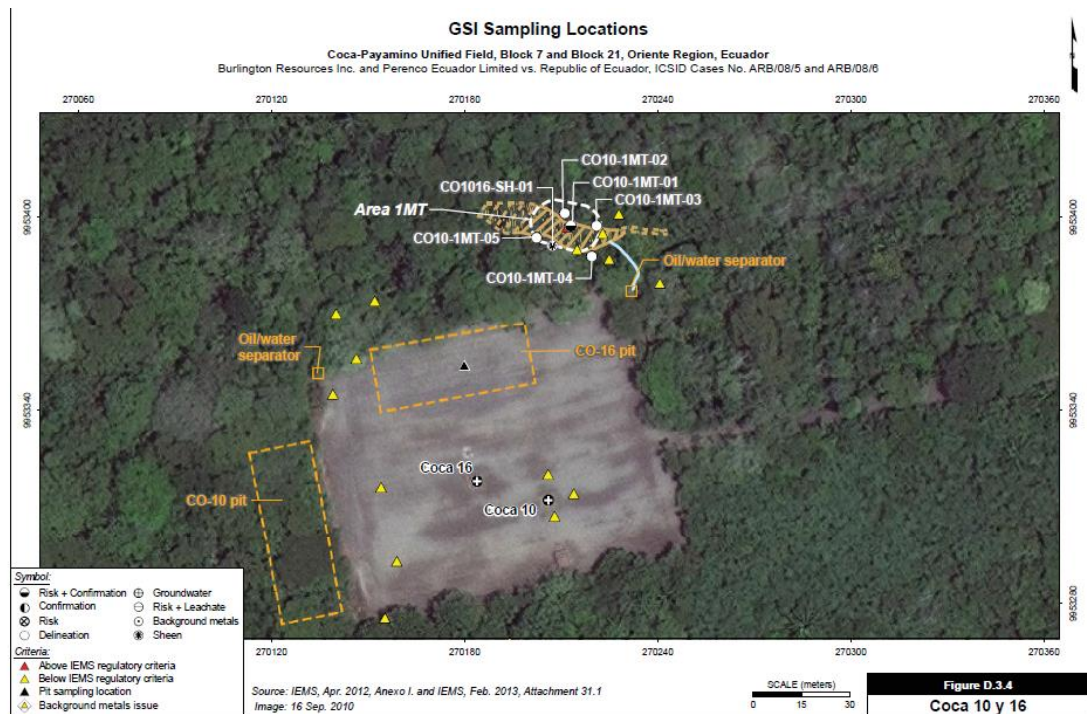
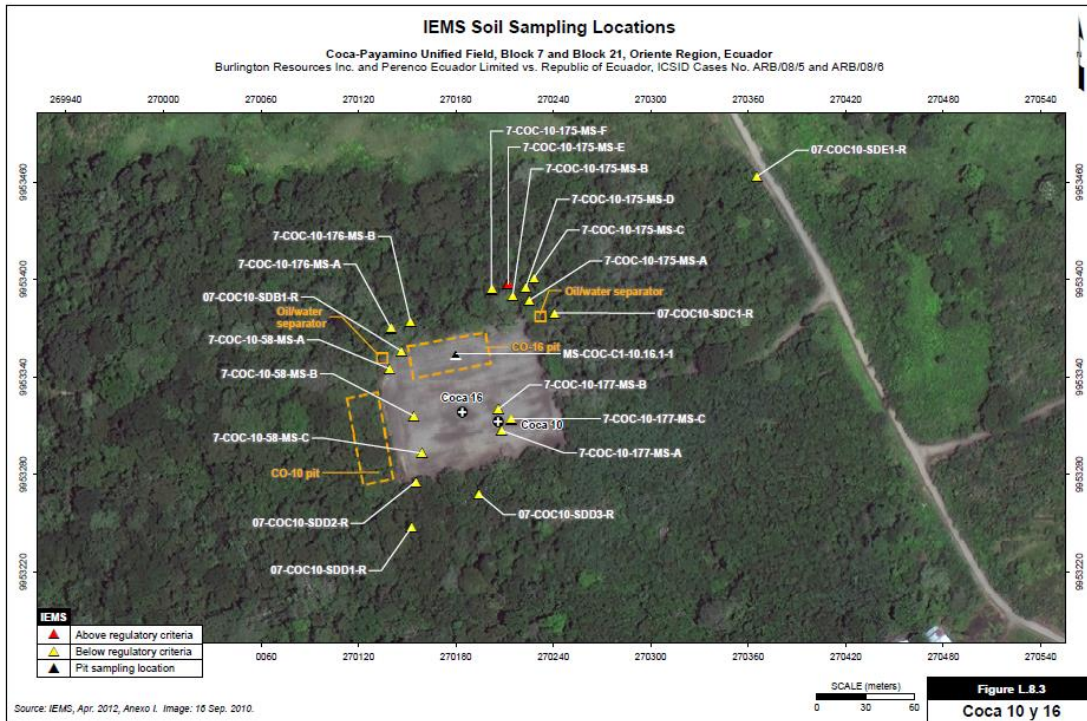
9, p. 1, Att. L.07.B, and compare with those taken in 2010 in Figures L.7.2 to L.7.4. See also: GSI ER2, App. D, Figure D.5.13.

⁹⁵⁵ Sample 7-COC-09-60-MS-B-0,5. IEMS ER3, Annex C, Coca 9, p. 9; IEMS ER4, Att. 38, Coca 9, p. 9; GSI ER2, App. D, Table D.3, p. 11.

⁹⁵⁶ Revised Attachment 35 to IEMS ER4 (Excel), line 8 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Coca 10/16, p. 20.

⁹⁵⁷ GSI ER1, App. L.08.1, p. 4 and Figure L.8.4. Also: GSI ER2, Tables 1 to 3. Coca 10/16 was a site that GSI only investigated in its second sampling campaign. GSI ER2, pp. 3, 22-23. For Coca 10/16, GSI concluded that “the results of the GSI sampling and testing program, as well as additional evaluation of the IEMS data, confirm that there are no concentrations of oil-related chemicals in excess of the applicable soil criteria [...], and, therefore, no remediation is required”. GSI ER2, p. 26 and Annex D, Figures D.1.4, D.3.4, and D.6.4.

487. The following images depict IEMS's⁹⁵⁸ and GSI's⁹⁵⁹ sampling locations at Coca 10/16:



958 GSI ER1, App. L, Figure L.8.3.

959 GSI ER2, App. D, Figure D.3.4.

488. Applying its approach on land use (section 4.3.2.c), the Tribunal observes that there are no exceedances on the platform. By contrast, using sensitive ecosystem criteria to off platform locations,⁹⁶⁰ the Tribunal identified a TPH exceedance and various barium and cadmium exceedances to the north of the northeastern corner of the platform.⁹⁶¹
489. There are no historical records of spills⁹⁶² and there is no allegation that the Consortium conducted any well workovers at that site.⁹⁶³ The 2008 audit apparently did not assess Coca 10/16, although Annex B contains some pictures of the site and commentaries, for instance, that the perimeter drain is improperly maintained or that the grease trap is insufficiently cleaned,⁹⁶⁴ which increases the risk that contaminants flow over the platform into the surrounding environment.⁹⁶⁵ Because the exceedance points are in the vicinity of the grease trap and because any overflows from that oil/water separator flow directly into the swale identified by GSI as Area 1MT,⁹⁶⁶ the Tribunal finds that the Consortium is liable for damage to this site.
490. Ecuador has not increased its claim for Coca 10/16 after GSI's site investigation, although two of GSI's samples show additional exceedances in Area 1MT. Therefore, the Tribunal grants Ecuador's request that 175 m³ of soil be remediated. With a 30% contingency (see paragraph 428), the total remediation cost for this site is **USD 68,250** for Coca 10/16.

⁹⁶⁰ GSI concedes that secondary forest is "immediately adjacent to" the platform at Coca 10/16 "and beyond". GSI ER1, App. L.08.1, p. 5.

⁹⁶¹ IEMS samples 7-COC-10-175-MS-B-0,5; 7-COC-10-175-MS-B-1,5; 7-COC-10-175-MS-B6; 7-COC-10-175; 7-COC-10-175-MS-E-1,5; 7-COC-10-175-MS-F-1,5; 7-COC-10-175-MS-F-2,5; and GSI samples CO10-1MT-01-(0.0-0.3) and CO10-1MT-02-(0.0-1.0). Sample 7-COC-10-175-MS-A-1,5 has a cadmium level of 2 mg/kg, right at the upper end of the adjusted permissible limit. See: IEMS ER3, Annex C, Coca 10/16, pp. 8-18; GSI ER2, App. D, Table D.3, pp. 12-13.

⁹⁶² GSI ER1, App. B.3.

⁹⁶³ See, for instance: R-PSVB, ¶ 200 and note 227. The Tribunal notes, however, that the record shows that the Consortium completed a workover (#2) on the Coca 16 well in November 2003, which involved the use of chemicals. See: Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Coca 16, Reacondicionamiento # 2, November 2003, p. 2 (**Exh. E-573**).

⁹⁶⁴ Block 7 Environmental Audit, November 2008, pp. 107, Photographs CO.27, CO.28, CO.29 and CO.30 (**Exh. E-252**). See also: *Id.*, p. 90, "'Non-Conformities – Table 5.1a", item 5 ("Lack of maintenance in perimeter drains and grease traps")" (Translation by the Tribunal).

⁹⁶⁵ Coca 10/16 was not assessed either in the 2006 biennial Block 7 audit. See: Block 7 Environmental Audit, November 2006 (**Exh. E-334**).

⁹⁶⁶ GSI ER2, App. D, Figure D.3.4.

h. Coca 11

491. Ecuador claims USD 1,833,746 to remediate 1,765 m³ of soil covering an impacted area of 844 m².⁹⁶⁷ Burlington rejects the claim. IEMS only collected three non-pit samples, one on the platform and two outside of it.⁹⁶⁸ There is no exceedance at that site under any land use criteria.⁹⁶⁹ Accordingly, Ecuador's claim for Coca 11 is dismissed.

i. Coca 12

492. Ecuador claims USD 935,761 to remediate 924.30 m³ of soil coming from an impacted area of 283 m².⁹⁷⁰ Here again, there are no exceedances at this site under any regulatory criteria,⁹⁷¹ with the result that the claim for Coca 12 must be dismissed.

j. Coca 13

493. Ecuador claims USD 8,176,102 to remediate 8,126.30 m³ of soil from an impacted area of 6,251 m².⁹⁷² Here too, the Tribunal dismisses the claim for Coca 13 on the ground that there are no exceedances under any regulatory criteria,⁹⁷³ to which it adds that Petroamazonas has significantly expanded the dimensions of the platform.⁹⁷⁴

⁹⁶⁷ Revised Attachment 35 to IEMS ER4 (Excel), line 9 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Coca 11, p. 15.

⁹⁶⁸ GSI ER2, App. D, Table D.3, p. 13. See also: GSI ER1, App. L, Table L.9.1, Figures L.9.3 to L.9.4. For GSI sampling locations, see: Figures L.9.5 to L.9.6.

⁹⁶⁹ For IEMS sampling results, see: IEMS ER3, Annex C, Coca 11, pp. 11-13; GSI ER2, App. D, Table D.3, p. 13. For GSI sampling results, see: GSI ER1, App. L, Table L.9.3.

⁹⁷⁰ Revised Attachment 35 to IEMS ER4 (Excel), line 10 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Coca 12, p. 13.

⁹⁷¹ GSI ER2, App. D, Table D.3, pp. 13-14.

⁹⁷² Revised Attachment 35 to IEMS ER4 (Excel), line 11 (**Exh. E-500**). Compare with: IEMS ER3, Annex C Corrected, Coca 13, p. 14.

⁹⁷³ IEMS ER3, Annex C Corrected, Coca 13, pp. 8-12; GSI ER2, App. D, Table D.3, pp. 14-15; GSI ER1, App. L, Table L.11.1 and Figures L.11.3 and L.11.4.

⁹⁷⁴ GSI ER1, App. L.11.1, p. 1.

k. Coca 15

494. Ecuador claims USD 10,987,069 for the remediation of 12,560.60 m³ to be recovered from an impacted area of 7,585 m².⁹⁷⁵ The claim for Coca 15 cannot succeed because there are no exceedances under any regulatory criteria.⁹⁷⁶ Indeed, sample point MS-COC-C2-15.3-0.5, which is within the confines of the platform and which the Parties and the Tribunal had an opportunity to inspect, has a TPH value of 3,571 mg/kg that falls below the 4,000 mg/kg limit for industrial soil.⁹⁷⁷

l. Coca 18/19

495. Ecuador claims USD 36,483,570 for the remediation of 37,329.50 m³ of soil from an area of 11,485 m².⁹⁷⁸ Burlington initially classified Coca 18/19 as one of five priority sites for potential soil remediation with a possibly impacted area of 160 m².⁹⁷⁹ After reviewing the pit closure report for Coca 19, GSI concluded that the exceedances in the area designated as Area 1M were in fact drilling muds disposed in two off platform auxiliary pits.⁹⁸⁰ On this basis, Burlington opposes this claim.

⁹⁷⁵ Revised Attachment 35 to IEMS ER4 (Excel), line 12 (**Exh. E-500**). Compare with: IEMS ER3, Annex C Corrected, Coca 15, p. 17.

⁹⁷⁶ IEMS ER3, Annex C Corrected, Coca 15, pp. 8-15; GSI ER1, App. L, Tables L.12.1 and L.12.3, Figures L.12.3 to L.12.6; GSI ER2, App. D, Table D.3, pp. 15-16.

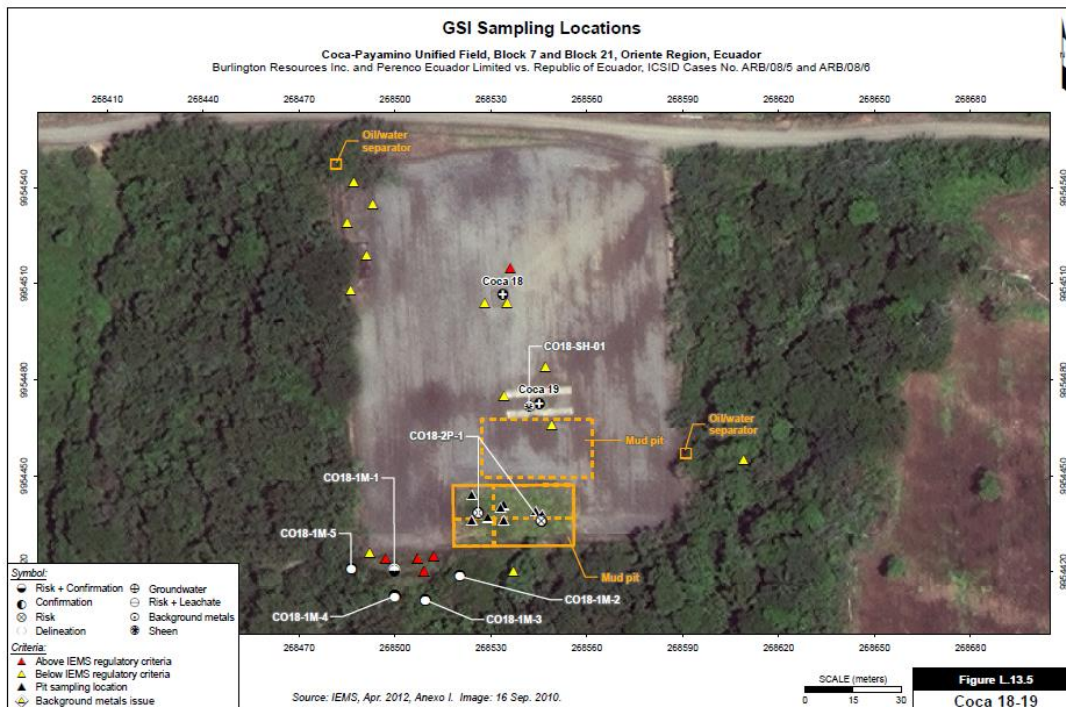
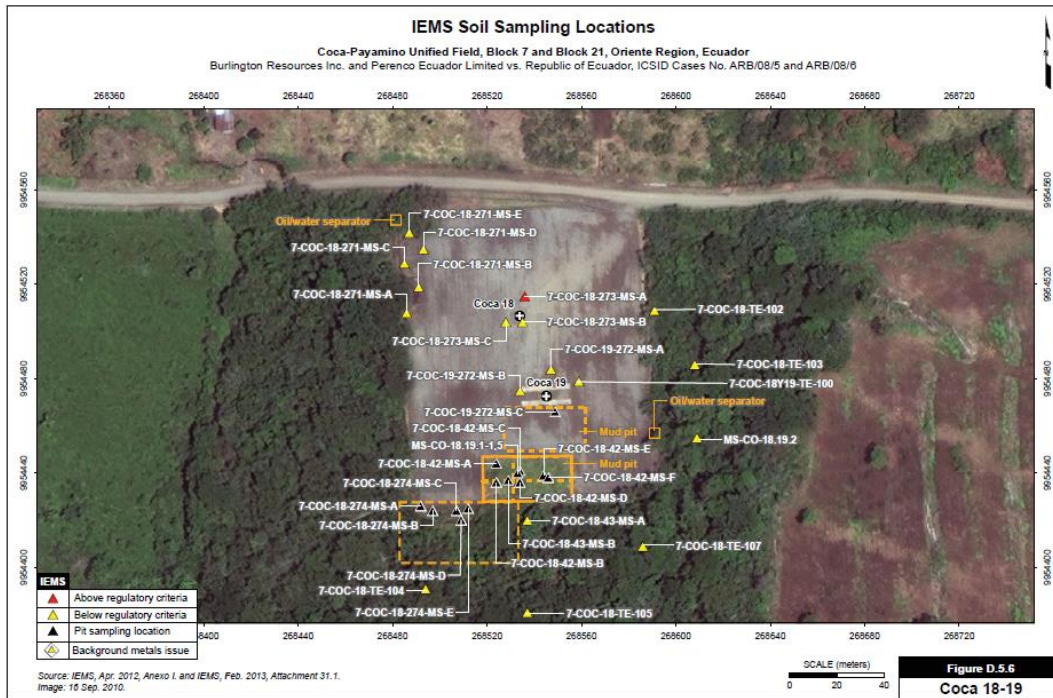
⁹⁷⁷ GSI ER2, App. D, Table D.3, p. 16.

⁹⁷⁸ Revised Attachment 35 to IEMS ER4 (Excel), line 13 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Coca 18/19, p. 20; IEMS ER4, Att. 38, Coca 18/19, p. 21.

⁹⁷⁹ GSI ER1, Table 4.

⁹⁸⁰ GSI ER2, ¶¶ 57-58.

496. The following figures show IEMS's⁹⁸¹ and GSI's⁹⁸² sampling locations at Coca 18/19:



981 *Id.*, App. D, Figure D.5.6.

982 GSI ER1, App. L, Figure L.13.5.

497. Coca 18 was drilled by Kerr McGee in July 2001 and Coca 19 by Perenco in December 2003.⁹⁸³ As will be discussed in the analysis of mud pits, when the Consortium drilled the Coca 19 well in 2003, it deposited drilling wastes in four pits adjacent to that well and in two auxiliary pits located just beyond the southwestern corner of the platform, the latter two corresponding to Area 1M.⁹⁸⁴ Therefore, the Tribunal will address the content of the auxiliary pits as part of its analysis of mud pits.
498. In addition to alleged exceedances in Area 1M, the Tribunal identified one barium exceedance on the platform next to the Coca 18 well.⁹⁸⁵ While that well was drilled by Kerr McGee in 2001, the Tribunal notes that the Consortium conducted some workovers at that well.⁹⁸⁶ It, therefore, holds the Consortium liable to remediate that exceedance. In application of its methodology (sections 4.4.3.c and 4.5.2), it admits an impacted area of 80 m²⁹⁸⁷ and a volume of 80 m³, for a total cost of **USD 28,800** for Coca 18/19, taking into account a 20% contingency (see paragraph 428).
499. Finally, applying agricultural land criteria to off platform locations, there are no additional exceedances in areas surrounding the platform.⁹⁸⁸ Therefore, besides the on platform exceedance mentioned above and subject to the Tribunal's analysis of the mud pits, no additional remediation is required for Coca 18/19.

⁹⁸³ Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, lines 13-14 (**Exh. E-563**); GSI ER2, App. B.5, p. 1.

⁹⁸⁴ The closure report indicates as follows: "Drilling muds were treated with borrow material and distributed in the existing pits and in two auxiliary pits built outside the platform" (Translation by the Tribunal). Reporte de taponamiento de piscinas de Coca 19, October 2004, p. 4 (**Exh. E-337**). Photographs of the auxiliary pits can be seen at: *Id.*, pp. 27-29. See also: GSI ER2, App. B.3.1.

⁹⁸⁵ Sample 7-COC-18-273-MS-A-0,5m. See: IEMS ER3, Annex C, Coca 18/19, p. 13; GSI ER2, App. D, Table D.3, p. 16 and Figures D.1.9 and D.5.6.

⁹⁸⁶ See, for instance: Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Coca 18, Reacondicionamiento # 2, November 2004 (**Exh. E-573**); R-PSVB, ¶ 200.

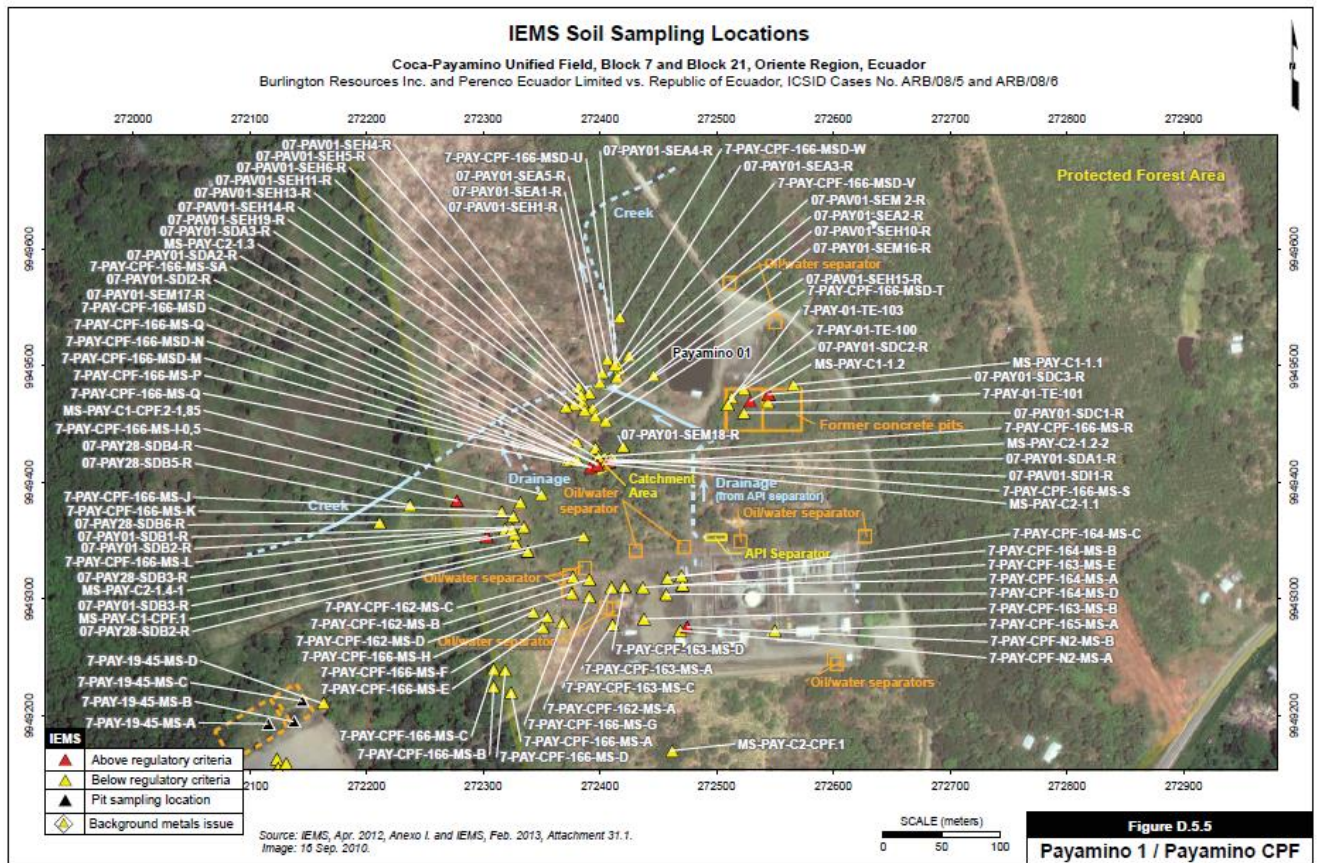
⁹⁸⁷ Considering the relatively low level of barium on industrial land (2031.8 mg/kg) and the fact that the exceedance is centrally located on the platform, the Tribunal deems a 5 meter radius to be sufficient in this case.

⁹⁸⁸ See: samples 7-COC-18-43-MS-A-2,0, 7-COC-18-TE-104 and 7-COC-18-TE-105. GSI ER2, App. D, Table D.3, pp. 16-17.

m. Payamino 1 and CPF

500. Ecuador claims USD 44,642,039 to remediate Payamino 1/CPF, where it contends that an area of 36,613 m² is impacted and that 50,659.70 m³ of soil need to be remediated.⁹⁸⁹

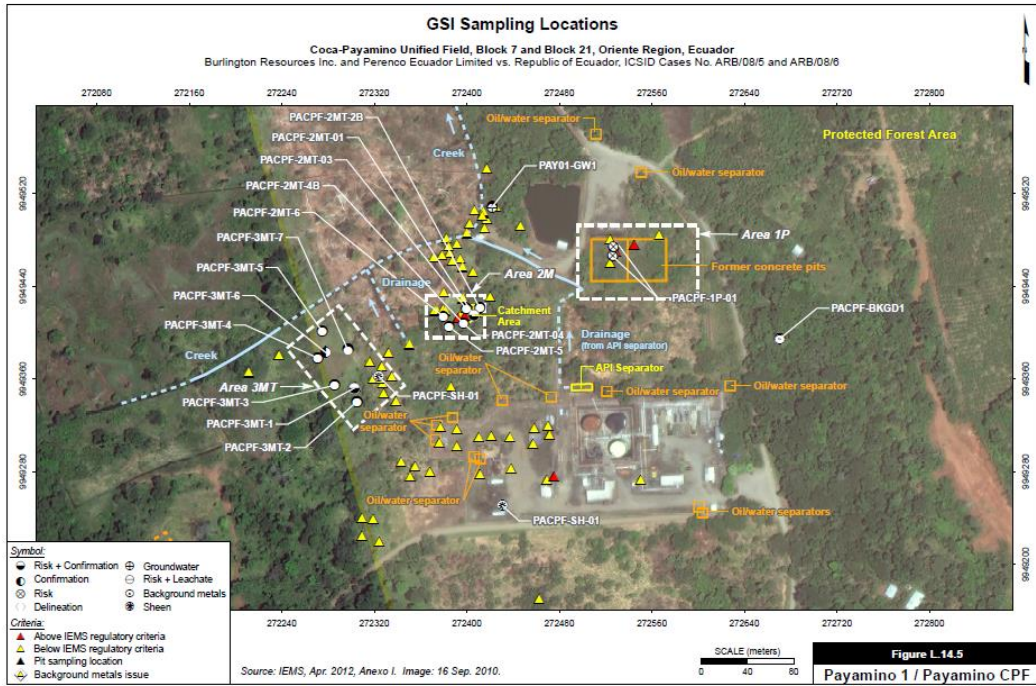
501. The following figures show IEMS's⁹⁹⁰ and GSI's⁹⁹¹ sampling locations at Payamino 1/CPF:



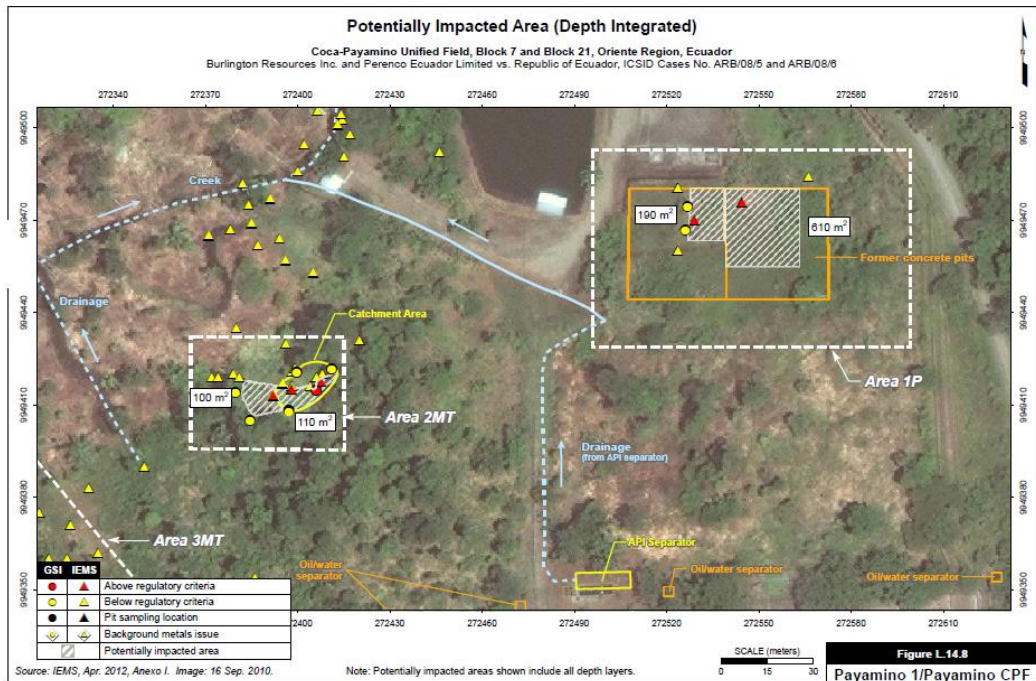
989 Revised Attachment 35 to IEMS ER4 (Excel), line 55 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Payamino 1, p. 18 and Payamino CPF, p. 27; IEMS ER4, Att. 38, Payamino 1, p. 17 and Payamino CPF, p. 31. See also: Remodeled site for Payamino CPF, August 2013, Figure 10-B, (**Exh. E-499**).

990 GSI ER2, App. D, Figure D.5.5.

991 GSI ER1, App. L, Figure L.14.5.



502. Further, GSI's delineation of Areas 1P and 2MT, which will serve as basis for the Tribunal's determination of the extent of contamination (see section 4.4.3.c above and in particular paragraph 411), is illustrated as follows:⁹⁹²



⁹⁹² GSI ER1, App. L, Figure L.14.8.

503. Burlington classifies Payamino 1 as a priority site, i.e. one where it accepts the existence of contamination potentially requiring remediation for a total cost not exceeding USD 307,000.⁹⁹³ Burlington submits that the source of contamination in Area 1P is a concrete water basin removed in 2001, which thus predates the Consortium's operatorship. According to Burlington, remediating the 800 m³ of potentially contaminated soil would cost no more than USD 243,000.⁹⁹⁴ Burlington also accepts that 210 m³ of soil potentially require remediation in Area 2MT for a total cost of USD 64,000.⁹⁹⁵ Finally, Burlington rejects all other claims for remediation in Payamino 1/CPF, in particular by arguing that IEMS samples in Area 3MT are in reality misplaced and were taken from Payamino 2/8.⁹⁹⁶ With respect to the sample collected close to the exhaust stack of a diesel-powered compressor at Payamino CPF,⁹⁹⁷ GSI opined that less than 20 liters (0.02 m³) of soot were collected "as a thin film on the ground surface" and that the soils beneath were clean.⁹⁹⁸ This does not, in Burlington's eyes, justify a claim of over USD 5 million to remediate 5,373 m³ of soil.
504. After Coca 1, Payamino 1 is the second oldest operating well in Block 7/CPUF. It was drilled by BP in 1986 and evidence suggests that 13 workovers were conducted at that well between 1991 and 2005, including by the Consortium.⁹⁹⁹ The Payamino 1 well is located north and approximately 30 meters downhill of the CPF, which was put in operation between 1991 and 1992.
505. Before addressing the off platform exceedances in the areas designated by GSI as Areas 1P, 2MT and 3MT, the Tribunal will address the on platform exceedance of TPH

⁹⁹³ GSI ER2, Table 4. See also: GSI ER1, Table D.21.

⁹⁹⁴ GSI ER2, Table 4.

⁹⁹⁵ *Ibid.*

⁹⁹⁶ Samples 07-PAY2.8-SDB3(0,3-0,5)m and 07-PAY2.8-SDB4-R(0,3-0,5)m. According to GSI, the inclusion of these two incorrectly plotted samples "created an alleged impacted soil volume of approximately 18,000 m³", accounting for "over \$18 million of the IEMS soil remediation cost". GSI ER1, ¶¶ 130-131 and Exhibit 24.

⁹⁹⁷ Sample 7-PAY-CPF-N2-MS-B-0,5. See: GSI ER1, App. L, Figure L.14.3; GSI ER2, App. D, Figures D.1.8 and D.5.5.

⁹⁹⁸ GSI ER1, p. 53, ¶ 132 and Exhibit 24.

⁹⁹⁹ GSI ER1, p. 101. See further: Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Payamino 1 Reacondicionamiento # 12, March 2005, Reacondicionamiento # 13, May 2005, Reacondicionamiento # 14, June 2007 (**Exh. E-573**).

(5,138 mg/kg) adjacent to the diesel-powered compressor at the CPF.¹⁰⁰⁰ Since Petroamazonas operated the compressor after the takeover without addressing that situation, the Tribunal deems it correct to apportion the liability between the Consortium and its successor and, in its discretion in assessing the evidence and quantifying damages, finds that Burlington shall bear 50% of the remediation costs. Because the impacted area appears to be localized, the Tribunal determines that remediation of 30 m³, for a total cost of USD 10,800 including a 20% contingency (see paragraph 428), is adequate and reasonable. Burlington shall thus pay 50% of that cost, i.e. **USD 5,400**.

506. Turning now to off platform locations, it is undisputed that sensitive ecosystem land use criteria apply to areas surrounding Payamino 1/CPF, notably because this site is part of a designated protected area under the SNAP system (see section 4.3.2.c above).¹⁰⁰¹ On that basis, the Tribunal identified two TPH exceedances in Area 1P¹⁰⁰² and various TPH and barium exceedances in Area 2MT.¹⁰⁰³ In light of the fact that IEMS confirmed that it mislabeled samples 07-PAY28-SDB3-R and 07-PAY28-SDB4-R and that they were indeed collected in Area 3MT at Payamino 1/CPF,¹⁰⁰⁴ the Tribunal finds that TPH and barium contamination has been shown also in Area 3MT.
507. In light of the fact that Area 1P hosted a former concrete produced water basin that was remediated in 1999 and then removed in 2001,¹⁰⁰⁵ that this basin was above ground, that a concrete layer now covers the TPH exceedance points, the Tribunal is of the view

¹⁰⁰⁰ Samples 7-PAY-CPF-N2-MS-B-0,5 and 7-PAY-CPF-N2-MS-B23.

¹⁰⁰¹ CMCC, ¶ 284; Map of Sites in Blocks 7 and 21 that Intersect Protected Areas, 2012 (**Exh. CE-CC-266**).

¹⁰⁰² Samples 07-PAY01-SDC3-R(1,2-1,3)m and MS-PAY-C1-1.2-0,5. See: GSI ER1, App. L, Table L.14.1; GSI ER2, App. D, Table D.3, pp. 22-24, 43-46.

¹⁰⁰³ IEMS samples with TPH exceedances are: 07-PAY01-SDA1-R(0,6-0,8)m and 7-PAY-CPF-166-MS-Q-0,5. IEMS samples with barium exceedances are: MS-PAY-C2-1.1-0,5 and 7-PAY-CPF-166-MS-SA-0,2. GSI samples with TPH exceedance are: PACPF-2MT-01-0.0-0.3 See: GSI ER1, App. L, Table L.14.1; GSI ER2, App. D, Table D.3, pp. 22-24, 43-46.

¹⁰⁰⁴ IEMS ER4, pp. 109-110 and Table 3.

¹⁰⁰⁵ GSI explained the following: “Area 1P, located directly south of the well platform, corresponds to the former location of aboveground concrete basins used for management of produced water from 1996 to 1999. Residual petroleum found in subsurface soils at this location is potentially associated with leakage from the base of these former basins, which were removed from service by 1999 and demolished in 2001. Soil test results indicate that the elevated TPH levels are present beneath only a portion of the former footprint of the produced water basins”. GSI ER1, p. 101.

that the exceedances were not caused by the Consortium but are liabilities of prior operators. Accordingly, Burlington is not liable for the condition of Area 1P.

508. The situation is the opposite as concerns the catchment area labelled Area 2MT, which appears to be a workover pit located some 120 meters southwest of the Payamino 1 platform in the proximity of the River Añango. This pit was unreported and thus served as a concealed location to dump industrial wastes in the middle of a protected area adjacent to a water body. GSI indicated that 13 workovers had been conducted at Payamino 1 until 2005, including by the Consortium,¹⁰⁰⁶ which Mr. Saltos confirmed.¹⁰⁰⁷ GSI opined that it was unable to determine the cause of the exceedances in Area 2MT.¹⁰⁰⁸ Neither Burlington nor its key witness, Mr. Saltos, appeared to dispute that the Consortium used that workover pit. Accordingly, the Tribunal holds Burlington liable to remediate Area 2MT. By reference to the methodology set out above (sections 4.4.3.c and 4.5.2), the impacted area is 500 m²,¹⁰⁰⁹ the total volume of soil 500 m³, for a total cost of **USD 195,000**, which includes a 30% contingency (see paragraph 428).

509. Finally, Burlington argues that the samples showing TPH exceedances in Area 3MT were mislocated, but does not provide an alternative explanation as to the possible cause of these exceedances. Further, the spill record for Payamino CPF, including the area formerly known as Payamino 22, both of which overlook Area 3MT, reveals numerous spills during the Consortium's operations, including an oil runoff from Payamino 22 in 2002, a 0.1 barrel crude spill in 2004,¹⁰¹⁰ a 2.4 barrel crude oil spill on

¹⁰⁰⁶ GSI ER1, App. K. See also: Payamino – 1 Well History (**Exh. E-245**). In particular, the Consortium conducted workover # 13 on 9 April 2005 to perforate in the Napo "U" reservoir. Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Payamino 1, Reacondicionamiento # 13, May 2005 (**Exh. E-573**).

¹⁰⁰⁷ Mr. Saltos responded as follows at the Hearing: "Q. In Payamino 1, because of the age of the well – A. Yes, many, many workovers". Tr. (Day 4) (ENG), 1228:5-7 (Cross, Saltos). For Mr. Saltos' testimony on Payamino 1 workovers, see also: Tr. (Day 4) (ENG), 1226:8-1235:12 (Cross, Saltos).

¹⁰⁰⁸ GSI indicated the following: "Consequently, the date of construction and use of this apparent workover pit is unknown, based upon currently available information". GSI ER1, ¶ 271(3).

¹⁰⁰⁹ GSI calculated a total impacted area of 210 m², including 110 m² within the catchment area, corresponding to a little more than half its size, and an additional 100 m² outside the area to remediate the TPH exceedance at sample location 7-PAY-CPF-166-MS-Q. The Tribunal holds that the entire catchment area must be remediated, amounting to 200 m², and further increased the impacted area outside to catchment area from 100 m² to 300 m², in order to remediate the entire northern flank outside of the catchment area.

¹⁰¹⁰ Solís WS2, ¶ 76, item 2 and Annex 40 (Internal report).

2 January 2007,¹⁰¹¹ an unreported spill of contaminated fluids on 1 October 2007 affecting the API separator, perimeter drains and the Añango River,¹⁰¹² a 6.28 barrel crude spill on 6 October 2007 affecting the River Añango,¹⁰¹³ and a 2009 crude spill some 10 meters away from the CPF along the Payamino 19 flowline.¹⁰¹⁴ These facts support a determination that the exceedances were caused during the Consortium's operatorship, which Burlington has not rebutted. This view is reinforced if one looks to the definition of "affected areas" in the settlement agreement of 11 May 2010 between Mr. Jungal, Ms. Cárdenas Hernández and the Consortium, which includes "landslides on the slope of well Payamino 22" and "erosion and sliding of the slope at Payamino Station".¹⁰¹⁵

510. In light of the high levels of TPH present and by reference to its approach explained above (sections 4.4.3.c and 4.5.2), the Tribunal determines a total impacted area of 400 m², a total volume of soil of 1,000 m³,¹⁰¹⁶ and a remediation cost of **USD 390,000**, including a 30% contingency (see paragraph 428).

511. In conclusion, the Tribunal determines that Burlington must bear the remediation cost for Areas 2MT and 3MT and half of the cost for the TPH exceedance at Payamino CPF, for a total amount of **USD 590,400** for Payamino 1/CPF.

n. Payamino 2/8

512. Ecuador claims USD 31,899,459 for the remediation of 36,643 m³ of soil from an impacted area of 21,600 m².¹⁰¹⁷ Burlington includes Payamino 2/8 as one of its principal sites for potential soil remediation, accepting that an area of 15,850 m² and a volume of 18,345 m³ of soil are affected in an area of the Jungal swamp located to the north and

¹⁰¹¹ Reply, ¶ 135, item d; GSI ER1, App. B.3, line 85.

¹⁰¹² Solís WS2, ¶ 76, item 13 and Annex 51 (Internal spill report of 1 October 2007).

¹⁰¹³ Reply, ¶ 135, item f; GSI ER1, App. B.3, line 91.

¹⁰¹⁴ Saltos WS1, Annex A, Table of Spills Reported in Blocks 7 and 21, 2002-2009.

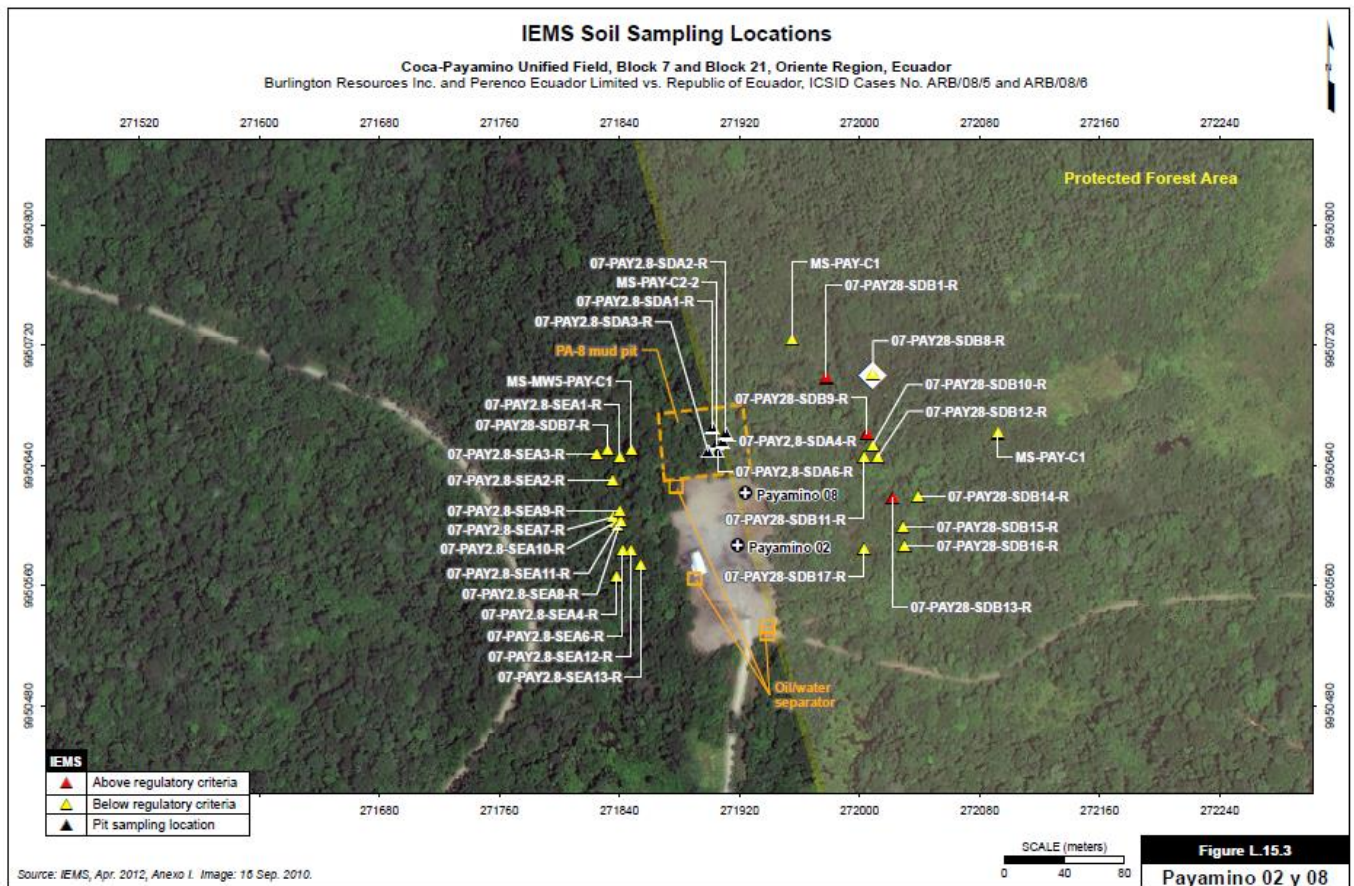
¹⁰¹⁵ Agreement between José Daniel Jungal, Nancy Cecilia Cárdenas Hernández and the Consortium, 11 May 2010 (English translation), p. 14 (**Exh. CE-CC-235**).

¹⁰¹⁶ Exceedance point 07-PAY28-SDB3-Rm requires remediation up to 2 meters, for a total volume of 400 m³ and exceedance point 07-PAY28-SDB4-R requires remediation up to 3 meters, for a total volume of 600 m³. See: GSI ER2, App. D, Table D.3, p. 43.

¹⁰¹⁷ Revised Attachment 35 to IEMS ER4 (Excel), line 52 (**Exh. E-500**). Compare with: IEMS ER3, Annex C Corrected, Payamino 2/8, p. 22; IEMS ER4, Att. 38, Payamino 2/8, p. 19. See also: 2nd SMCC, ¶¶ 213-219.

east of the Payamino 2/8 platform and the Payamino 8 mud pit.¹⁰¹⁸ However, Burlington denies that the Consortium caused the harm, which it attributes to drilling mud discharges and oil spills from the Payamino 2 test pit prior to 1992.¹⁰¹⁹

513. The following figures depict IEMS's¹⁰²⁰ and GSI's¹⁰²¹ sampling locations at Payamino 2/8:

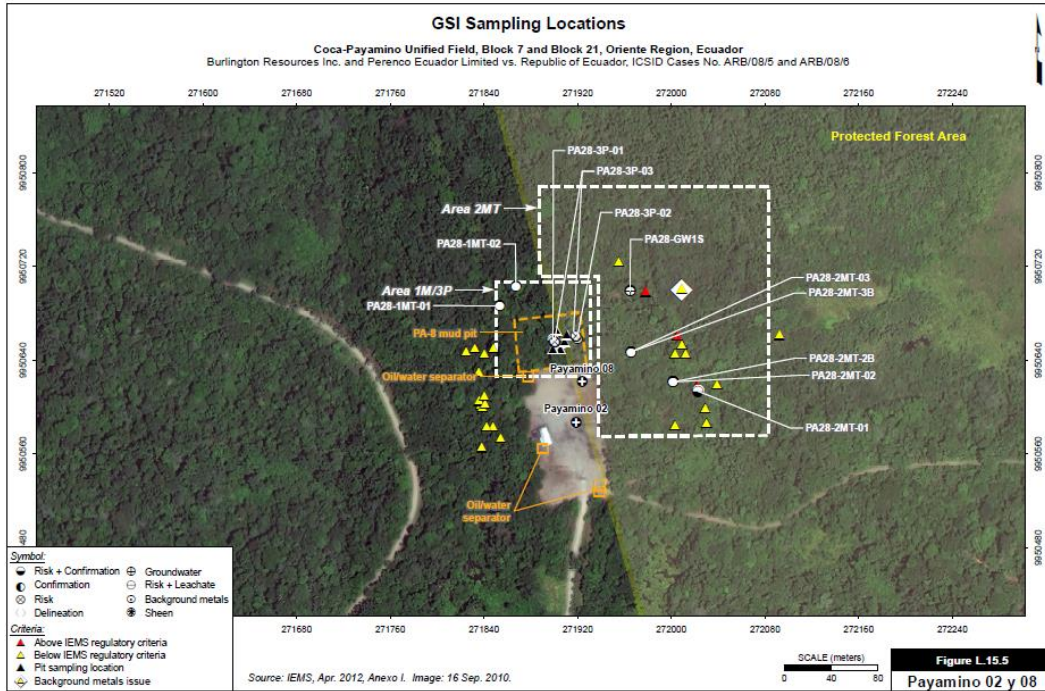


1018 GSI ER1, App. L, Figure L.15.8; GSI ER2, Table 4.

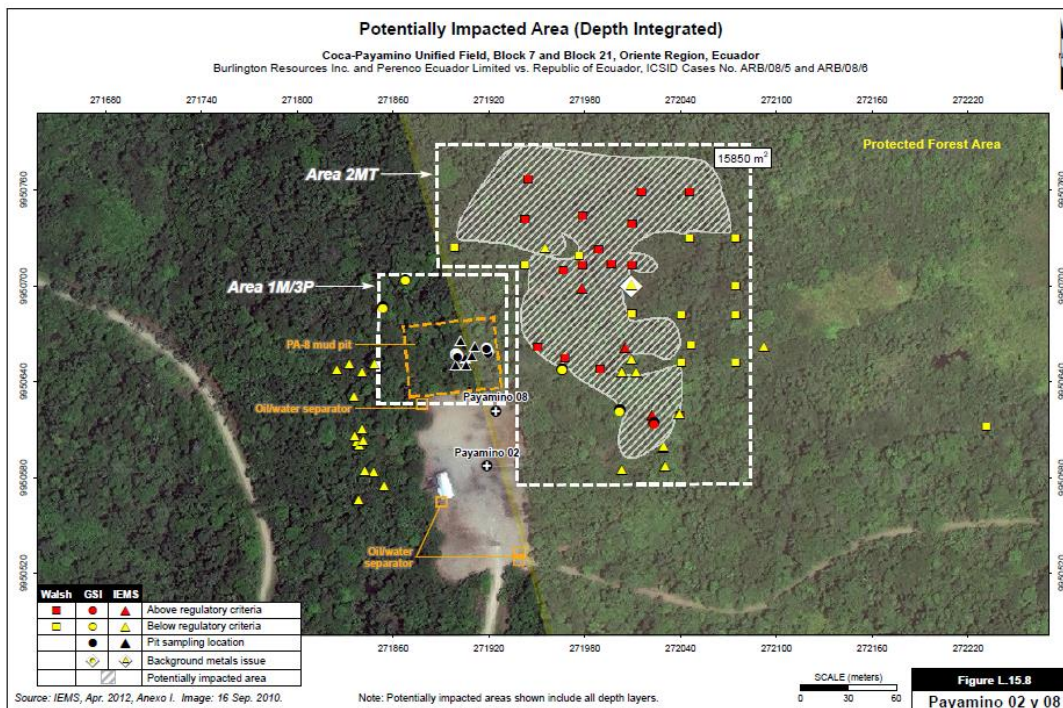
1019 GSI ER2, Table 4.

1020 GSI ER1, App. L, Figure L.15.3.

1021 *Id.*, Figure L.15.5.



514. The potentially impacted areas calculated by GSI, to which the Tribunal will revert, are illustrated below:¹⁰²²



¹⁰²²

Id., Figure L.15.8. The Walsh samples are marked as red boxes.

515. Payamino 2/8 is one of the most contentious sites and the Parties have extensively debated the potential causes for the environmental condition encountered in the swampy area known as the Jungal swamp. The Tribunal will address Ecuador's submissions on the pits in its analysis of mud pits below. Here it will only deal with the off platform sampling locations to the west, north and east of the Payamino 2/8 platform and adjoining pits.¹⁰²³ In its review, the Tribunal also considers the samples collected for the Walsh report as GSI relies on these samples (shown as red boxes in the preceding figure).¹⁰²⁴
516. It is undisputed that the land to the east of the Payamino 2/8 platform is located in a designated protected area under the SNAP system that qualifies as sensitive ecosystem.¹⁰²⁵ Burlington disputes, however, that the area to the west of the designated area falls within that same category and calls for the application of agricultural land use criteria. In accordance with its methodology (see section 4.3.2.c above), as the areas in question are immediately adjacent to a designated protected area, the Tribunal will apply the sensitive ecosystem criterion to all areas surrounding the platform (except for the access road, where no samples were in any event taken).
517. On that basis, the Tribunal identified various TPH, barium and cadmium exceedances in the area of the Jungal swamp identified by GSI as Area 2MT,¹⁰²⁶ with the highest TPH level reaching 10,661 mg/kg.¹⁰²⁷ The Walsh samples identify numerous TPH and barium exceedances, with TPH levels reaching 64'616 mg/kg and the highest barium

¹⁰²³ No samples were taken from the platform. See: GSI ER2, App. D, Table D.3.

¹⁰²⁴ Informe Técnico: Caracterización del Pasivo Ambiental Adyacente a la Plataforma Payamino 2-8 – Campo Unificado Coca-Payamino, Walsh Número de Proyecto: EC103-29 (“Walsh Report”), October 2010, Section 4.1.1 (**Exh. E-271**). See also: GSI ER2, App. L, Figures L.15.4 and L.15.8.

¹⁰²⁵ CMCC, ¶ 284; Map of Sites in Blocks 7 and 21 that Intersect Protected Areas, 2012 (**Exh. CE-CC-266**). See also: GSI ER1, App. L, Figures L.15.2 to L.15.8.

¹⁰²⁶ Samples 07-PAY28-SDB10-R(0,4-0,5)m, 07-PAY28-SDB13-R(0,5-0,8)m, 07-PAY28-SDB1-R(0,3-0,5)m, 07-PAY28-SDB1-R(1,3-1,5)m, 07-PAY28-SDB8-R(0,4-0,5)m, 07-PAY28-SDB9-R(0,4-0,5)m and PA28-2MT-01-0.0-0.3. See: IEMS ER4, Att. 38, Payamino 2/8, pp. 9-14; GSI ER2, App. D, Table D.3, pp. 24-26.

¹⁰²⁷ Sample 07-PAY28-SDB13-R(0,5-0,8)m. See: IEMS ER4, Att. 38, Payamino 2/8, p. 9; GSI ER1, App. L, Tables L.15.1, L.15.3, L.15.4 and L.15.5; GSI ER2, App. D, Table D.3, p. 25.

level at 3,584 mg/kg,¹⁰²⁸ when the permissible limits are at 1,000 mg/kg for TPH and 639 mg/kg for barium.

518. It is not seriously disputed that a major environmental incident occurred in connection with the drilling of the Payamino 2 and Payamino 8 wells between 1987 and 1992. It can be left open for present purposes whether it was caused by the discharge of test crude into the Jungal swamp or by the rupture of the Payamino 2 pit.¹⁰²⁹ In any event, it occurred prior to the Consortium's operatorship. While it is true that successive operators did not indicate the presence of contamination at that site,¹⁰³⁰ thus suggesting that the area was remediated when Oryx so requested in 1994, the Tribunal notes that Ecuador has provided no evidence of any remediation.¹⁰³¹ Therefore, the Tribunal cannot rule out that the environmental harm identified above was caused by prior operators and continues to be present in the swamp until today.
519. Nonetheless, there are several reasons for the Tribunal to hold the Consortium partially liable to remediate the exceedances in the Jungal swamp. First, there is contradictory expert evidence generated on the Consortium's behalf regarding the age of the crude found in the swamp. On the one hand, a report by Grüntech dated 2 June 2010 estimated that age to be 4 to 7 years, which suggests that the contamination occurred during the Consortium's time, although the report specified that exact dating was impossible without a patron sample and that other factors influenced the dating

¹⁰²⁸ Walsh Report, October 2010, Section 4.1.1 (**Exh. E-271**).

¹⁰²⁹ Reply, ¶¶ 93-116; Rejoinder, ¶¶ 248-264.

¹⁰³⁰ See, for instance: Reply, ¶¶ 101-105. Ecuador points to various environmental audits conducted by prior operators that do not mention the existence of an environmental liability in the Jungal swamp. Laboratory result for water sample from swamp nearby Payamino 2 & 8, 6 October 1992 (**Exh. E-325**); Environmental Assessment of Oryx Ecuador Energy Company – Coca-Payamino Field, Audit Utilized for the Transfer of Operations of the Coca-Payamino Unified Field from Petroproducción to Oryx on 12 February 1994, performed by Ecomapa/Western Oilfield, p. 8 (**Exh. CE-CC-12**); Environmental Assessment of Oryx Ecuador Energy Company, Coca-Payamino Field, May 1994 (**Exh. E-326**); Internal Environmental Audits of Oryx Ecuador Operations, 11-14 March 1996, 6-9 June 1997 and 22-23 June 1998 (**Exh. E-327** to **E-329**); Environmental Audit of Petroproducción's Operation of the Coca-Payamino Field, January 1999, p. 3 (**Exh. CE-CC-21**); Diagnostico Ambiental del Campo Unificado Coca – Payamino, prepared by Entrix for Kerr-McGee Ecuador Energy Corporation, September 2000, p. 1-1 (**Exh. E-330**).

¹⁰³¹ Ecuador merely stated without supporting evidence: "The March 1992 letter alerted the Coca-Payamino Unified Field Operating Committee of a spill and recommended that Petroproducción take remedial actions without delay. Claimant has not even entertained the possibility that Petroproducción took such actions". Reply, ¶ 99; R-PHB, ¶ 781.

procedure.¹⁰³² On the other hand, a report by Mr. Douglas from NewFields assessed Grüntech's conclusion and opined that the rate of degradation of petroleum is "highly variable" depending on numerous factors not considered by Grüntech, and finally concluded that any attempt to date the crude oil would be a guess and that it was "equally as possible that the crude oil was released more than 20 years ago".¹⁰³³

520. Second, the Consortium was aware of claims of environmental pollution at the latest since early 2007,¹⁰³⁴ when Mr. Eduardo Greta Cerda, Political Lieutenant of the Parrish San Luis de Armenia, lodged a complaint with the Provincial Council of Orellana. That council ordered an inspection which took place on 4 April 2007 and discovered "[o]n the #02-08 platform (point 4) and to the side of it, a large area of approximately 20,000 m² [...] containing crude oil residues in large quantities".¹⁰³⁵ Burlington's silence about that inspection in these proceedings and its conclusion that crude oil was found *on the platform* and to its eastern side are disturbing.¹⁰³⁶ The same is true of the fact that the Consortium apparently took no immediate action and that no samples were taken for the 2008 audit.¹⁰³⁷
521. Third, an internal memorandum prepared by Perenco in May 2010 "on the characterization of the environmental issues in Payamino 2-8" following a renewed

¹⁰³² The report stated the following: "This affects the estimate of the age of the hydrocarbon, and a pattern sample is necessary to compare it, since, in absence thereof, its characteristics may suggest that its age would range between 4 and 7 years" (Translation by the Tribunal). Grüntech Analysis Report, 2 June 2010 (**Exh. E-270**). See also: R-PHB, ¶ 783.

¹⁰³³ NewFields Evaluation of Gruentec Cia. Ltda. Contaminated Soil Report No. 1005164 S, pp. 1-5; GSI ER1, App. J, pp. 2-3. See also: Reply, ¶ 116.

¹⁰³⁴ Ecuador also pointed to a complaint by Mr. Jungal in 2005, which was discussed before an Ombudsman with a Consortium lawyer in attendance. Mr. Saltos' attempts to justify that the Consortium took no action, on the grounds that Mr. Jungal always was a rather difficult person, does not appear convincing. See: Tr. (Day 4) (ENG), 1288:20-1289:12 (Cross, Saltos); R-PHB, ¶¶ 789-790.

¹⁰³⁵ Informe de inspección N° 07-07, H. Consejo Provincial de Orellana – Departamento del Ambiente, 10 April 2007, p. 2 (**Exh. E-335**) (Translation by Ecuador). See also: Reply, ¶ 109; R-PHB, ¶¶ 793-794.

¹⁰³⁶ Even assuming that, as Mr. Saltos testified, neither the Consortium nor himself were notified of the inspection or report of the Provincial Council, the report does confirm that the Consortium could not have been unaware of the existence of crude on the platform. Tr. (Day 4) (ENG), 1374:1-14 (Re-cross, Saltos). See also: Tr. (Day 4) (ENG), 1289:21-1290:3 (Cross, Saltos).

¹⁰³⁷ The Tribunal also notes that there is no verification list for that site in the 2008 Audit. See: Block 7 Environmental Audit, November 2008, p. 41, Table 3-3 and pp. 212-279 (with verification lists for Payamino 3 up to Payamino 23) (**Exh. E-252**). See also: Reply, ¶ 110.

complaint by Mr. Jungal,¹⁰³⁸ states that “we [the Consortium] know the true extent of the problem” just as Mr. Jungal. It continues saying that Petroamazonas’ health, safety and environment department knows the existence, but not the location and extent of the contamination, and that the local ombudsman knows the location but not the extent. The memorandum then goes on setting out three “possible solutions”, namely (i) to remedy the site, (ii) to confine the problem by buying the land, or (iii) to dismiss any liability.¹⁰³⁹ About this last option, the memorandum is quite explicit:

“- very probably, Mr. Jungal would sue us before the [criminal] courts for pollution (this crime has already been defined) and will seek multimillion dollar compensation

- the State (Ministry of the Environment and/or Petroamazonas (sic)) will force us to remedy the site under their conditions

- the cost will reach amounts very difficult to estimate now

- the reputational cost to Perenco is also going to be very high

- probably the State will assume that we are hiding many more damages and will scrutinize the operations area in search of more damages *and it will probably find them.*¹⁰⁴⁰

522. This memorandum shows that the Consortium was aware of and concerned about the existing liabilities in the Jungal swamp.¹⁰⁴¹ In 2010, it eventually reached a settlement agreement with Mr. Jungal for an amount of USD 110,000, which agreement contained a confidentiality clause.¹⁰⁴² It is only thereafter that, on 11 June 2010, the Consortium notified the Ecuadorian authorities of the existence of contamination in the Jungal swamp.¹⁰⁴³

¹⁰³⁸ Letter of 23 February 2010 from Mr. Jungal to Perenco (**Exh. E-268**).

¹⁰³⁹ Memorandum prepared by Perenco on the characterization of the environmental issues in Payamino 2-8, May 2010 (**Exh. E-269**). See also: 2nd SMCC, ¶ 99.

¹⁰⁴⁰ Memorandum prepared by Perenco on the characterization of the environmental issues in Payamino 2-8, May 2010 (**Exh. E-269**) (Translation by Ecuador; emphasis added by Tribunal). See also: 2nd SMCC, ¶¶ 99-101.

¹⁰⁴¹ Mr. Saltos testified that he referred to historical liabilities and that he was not aware of any liabilities of the Consortium. However, Mr. Saltos immediately conceded that he was not present in Block 7 at the relevant time. See: Tr. (Day 4) (ENG), 1303:13-1305:9 (Cross, Saltos).

¹⁰⁴² Agreement between José Daniel Jungal, Nancy Cecilia Cárdenas Hernández and the Consortium, 11 May 2010 (English translation), clause 2(1.1) (**Exh. CE-CC-235**).

¹⁰⁴³ Letter of 11 June 2010 from Perenco to the Minister of Environment (**Exh. E-261**).

523. These facts lead the Tribunal to conclude that the Consortium indeed played some role in causing the environmental condition, or at least in not mitigating the harm when it became aware of it in 2005 and 2007, a role which is much more important than what Burlington would have the Tribunal believe. As a result, on the basis of the record and in the exercise of its powers in the assessment of the evidence and in the quantification of the damage, the Tribunal comes to the conclusion that Burlington must bear 60% of the remediation cost for that site.
524. As mentioned above, IEMS estimates the impacted area at 21,600 m², while GSI accepts 15,850 m². More specifically, GSI resorted to linear interpolation to calculate the impacted area for barium in the layer 0-1 meter (7,460 m²),¹⁰⁴⁴ the impacted area for TPH in the layer 0-1 meter (13,090 m²),¹⁰⁴⁵ and the impacted area for TPH in the layer 1-1.5 meters (4,990 m²).¹⁰⁴⁶ These areas partly overlap and yield a maximum impacted area of 15,850 m².
525. Considering that only one exceedance contains TPH to a depth of 1.5 meters, the Tribunal accepts GSI's calculation of the impacted area for TPH in the layer 1-1.5 meters, namely 4.990 m²,¹⁰⁴⁷ amounting to a total volume of 4,990 m³ of soil to be remediated in the 1-2 meter layer. Considering the TPH and barium levels of clean samples, the Tribunal is also in agreement with GSI's delineation of the impacted area of the 0-1 meter layer, considering that GSI extended the potentially impacted areas by 20 meters further to the north of the Walsh samples, which in turn are further north of IEMS's samples (see figure in paragraph 514).¹⁰⁴⁸ In accordance with its general approach set out earlier (section 4.4.3.c), the Tribunal nevertheless extends GSI's maximum impacted area of 15,850 m² to 17,000 m² to take into account the relatively high cadmium exceedance at sample point 07-PAY28-SDB8-R.
526. In light of the foregoing and of its methodology on assessing remediation costs (section 4.5.2), the total volume of contaminated soil is 21,990 m³ and the total cost of

¹⁰⁴⁴ GSI ER1, App. L, Att. L.15.E, Table L.15.E.1, Figures L.15.E.A.1.A, L.15.E.A.1.B and L.15.E.B.1.

¹⁰⁴⁵ *Id.*, Att. L.15.E, Table L.15.E.1, Figures L.15.E.A.2 and L.15.E.B.2.

¹⁰⁴⁶ *Id.*, Att. L.15.E, Table L.15.E.1, Figures L.15.E.A.3 and L.15.E.B.3.

¹⁰⁴⁷ *Id.*, Figure L.15.E.B.3.

¹⁰⁴⁸ *Id.*, Figure L.15.8.

remediation, including a 30% contingency (see paragraph 428), is USD 8,576,100, of which Burlington shall pay 60%, i.e. **USD 5,145,660** for Payamino 2/8.

o. Payamino 3

527. Ecuador claims USD 2,207,021 to remediate 2,453.10 m³ of soil from an impacted area estimated at 1,258 m².¹⁰⁴⁹ Burlington disputes any liability, since the alleged barium exceedance is located in a pit and any other exceedances are related to pre-Consortium drilling discharges in 1987.¹⁰⁵⁰
528. Leaving aside pit soil, there are no off platform exceedances under any regulatory criteria.¹⁰⁵¹ On the platform, there is a high TPH exceedance (10,364 mg/kg) in the south corner “in an area near a soil stockpile”.¹⁰⁵² There is no indication that the exceedance is due to pre-Consortium drilling activities.¹⁰⁵³ Ecuador also pointed to the fact that no samples were collected at that site for the 2008 audit,¹⁰⁵⁴ although the audit noted that the platform was lacking anti-pollution devices such as perimeter ditches and grease traps.¹⁰⁵⁵
529. On this basis and by reference to its methodology explained above (sections 4.4.3.c and 4.5.2), the Tribunal accepts that Burlington is liable to remediate this area, which it sets at 80 m² and 2 meters in depth for a total volume of soil of 160 m³. With a 20% contingency (see paragraph 428), the total cost amounts to **USD 57,600** for Payamino 3.

¹⁰⁴⁹ Revised Attachment 35 to IEMS ER4 (Excel), line 53 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Payamino 3, p. 10; IEMS ER4, Att. 38, Payamino 3, p. 11.

¹⁰⁵⁰ Rejoinder, ¶ 267. See also: GSI ER1, App. L, Figures L.16.3 and L.16.4.

¹⁰⁵¹ IEMS ER4, App. 38, Payamino 3, pp. 6-9; GSI ER1, App. L, Table L.16.1; GSI ER2, App. D, Table D.3, p. 26.

¹⁰⁵² Reply, ¶ 195(vii).

¹⁰⁵³ Sample 7-PAY-03-79-MS-A-1,5m. See: GSI ER2, App. D, Table D.3, p. 26.

¹⁰⁵⁴ 2nd SMCC, ¶ 220.

¹⁰⁵⁵ 2nd SMCC, ¶ 376; Block 7 2008 Environmental Audit, Annex D, Payamino 3, pp. 3, 5 (“Direct discharge of untreated effluents – There are no grease traps” (Translation by the Tribunal)) (**Exh. E-252**).

p. Payamino 4

530. Ecuador claims USD 20,502,145 for the remediation of 20,529.60 m³ of soil covering an impacted area of 10,807 m².¹⁰⁵⁶ Burlington accepts that 510 m² are impacted corresponding to 730 m³ of soil requiring remediation for an estimated USD 261,000.¹⁰⁵⁷ It argues, however, that Ecuador “ignores the operational history of the site” and points to the discharges of oil-based drilling muds by CEPE in the unlined pit to the west of the platform.¹⁰⁵⁸ More specifically, Burlington submits that two areas make up the impacted 510 m², namely 230 m² in Area 1MT (PA04) corresponding to 230 m³ of soil and a cost of USD 82,000, and 280 m² in Area 1MT (PA14) corresponding to 500 m³ and a cost of USD 179,000.¹⁰⁵⁹ Area 1MT (PA14) is in fact closer to Payamino 14, since it is on the other side of a creek flowing along the Payamino 14 platform, but Burlington alleges that any exceedances in that area result from the leaking Payamino 4 pit.¹⁰⁶⁰ Finally, GSI indicates that exceedances in Area 1MT (PA04) were caused by oil residue from a produced water spill dating back to 1997.¹⁰⁶¹

¹⁰⁵⁶ Revised Attachment 35 to IEMS ER4 (Excel), line 40 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Payamino 4, p. 25; IEMS ER4, Att. 38, Payamino 4, pp. 27-28; 2nd SMCC, ¶ 221; Reply, ¶ 195(viii); Ecuador’s Closing Statement, Slide 115; R-PHB, ¶ 275.

¹⁰⁵⁷ GSI ER1, App. L.17, p. 6 and Figure L.17.8; GSI ER2, Tables 1 and 3.

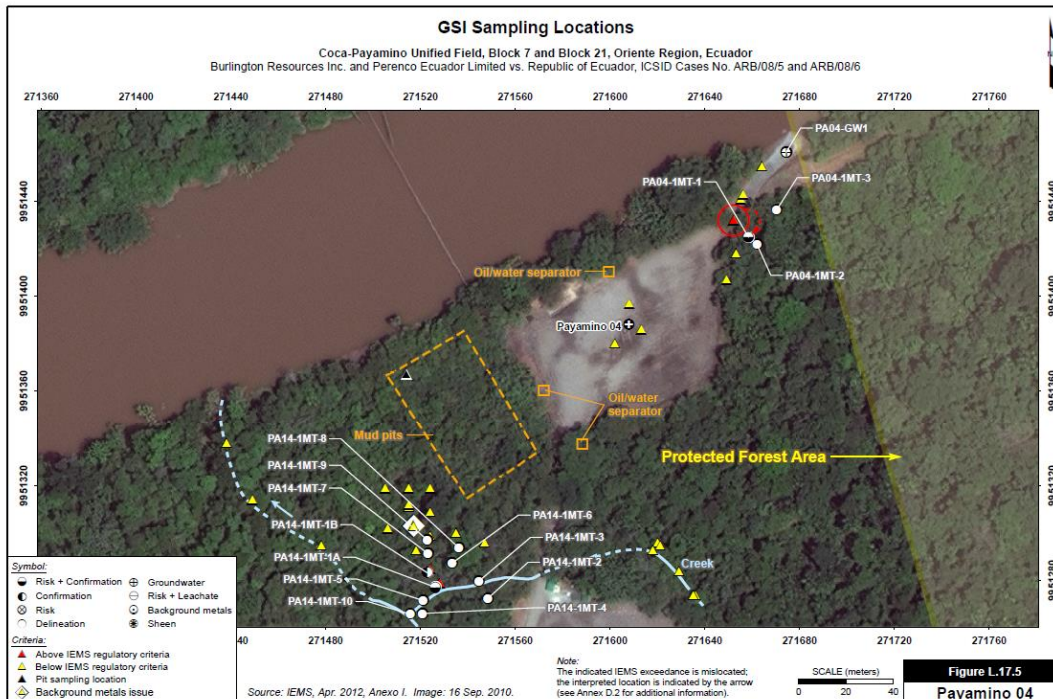
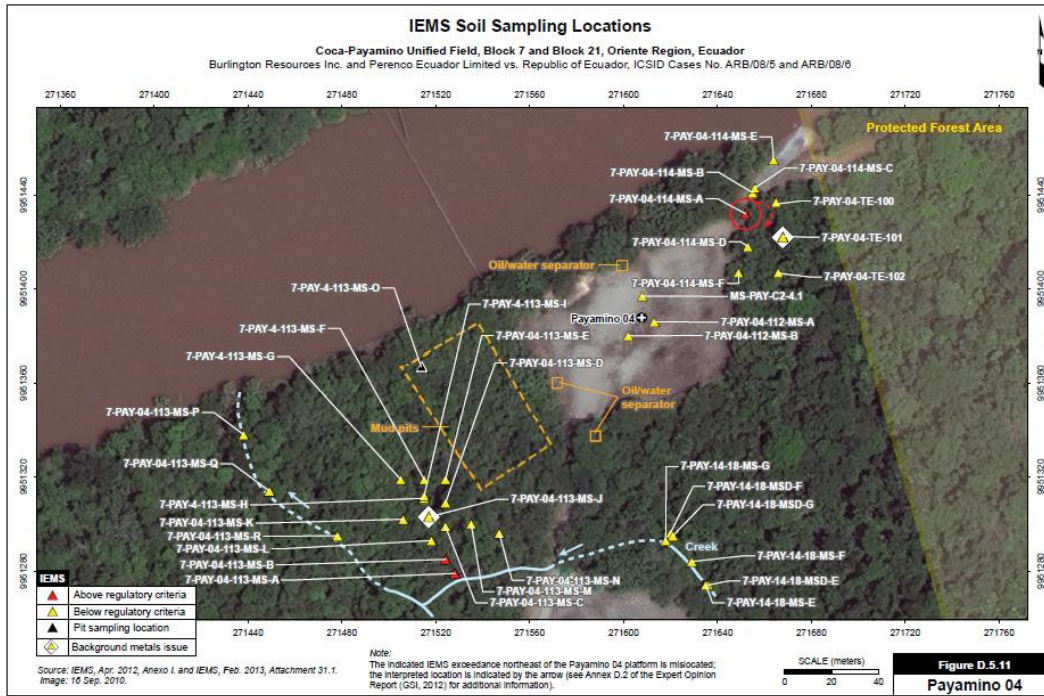
¹⁰⁵⁸ CMCC, ¶¶ 464-466; Rejoinder, ¶ 266; Saltos WS1, ¶ 262; GSI ER1, App. L.17, p. 3.

¹⁰⁵⁹ In Area 1MT (PA04), GSI calculated for barium an impacted area of 40 m² and for TPH an impacted area of 230 m² in the layer 0-1 meter. Both areas fully overlap. In Area 1MT (PA14), GSI calculated for TPH an impacted area of 280 m² in the layer 0-1 meter, 190 m² in the layer 1-2 meters and 30 m² in the layer 2-3 meters, totaling 500 m³. GSI also calculated for barium an impacted area of 10 m² in the layer 1-2 meters, which fully overlaps with the impacted area for TPH. GSI ER1, App. L.17, Att. L.17.E, Figures L.17.E.A.1 to L.17.E.A.5, L.17.E.B.1 to L.17.E.B.5; GSI ER2, Table 4.

¹⁰⁶⁰ CMCC, ¶ 465; GSI ER2, Table 4.

¹⁰⁶¹ GSI ER2, Table 4.

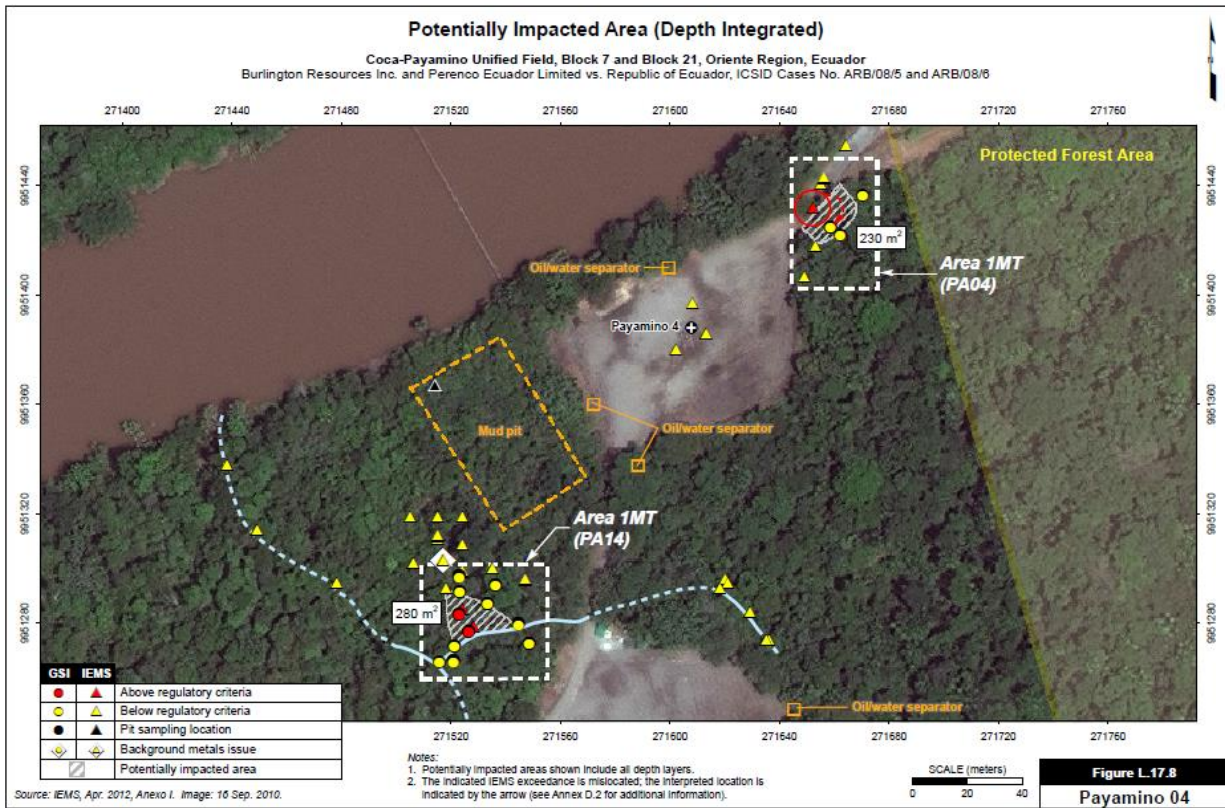
531. The following figures depict IEMS's¹⁰⁶² and GSI's¹⁰⁶³ sampling locations at Payamino 4:



1062 *Id.*, App. D, Figure D.5.11.

1063 GSI ER1, App. L, Figure L.17.5.

532. The contamination in Areas 1MT (PA04) and 1MT (PA14) as delineated by GSI appears as follows.¹⁰⁶⁴



533. By reference to its approach to land use (see section 4.3.2.c above), since the Payamino 4 platform is located immediately adjacent to a protected area and to the Payamino River, the Tribunal applies sensitive ecosystem land use criteria to the off platform locations.¹⁰⁶⁵ Sampling results reveal no exceedances on the platform. There is one IEMS sample location in Area 1MT (PA04) with a high TPH level (12,839 mg/kg) as well as barium and cadmium levels exceeding regulatory criteria.¹⁰⁶⁶ One GSI sample

¹⁰⁶⁴ *Id.*, Figure L.17.8.

¹⁰⁶⁵ GSI concedes that primary forest is immediately adjacent to the east of the platform. The Tribunal further notes that GSI also concedes that the area to the west was only “recently cleared”, and that satellite imagery dated 2010 shows the area with dense forest. GSI ER1, App. L.17.1, p. 7 and Figure L.17.2.

¹⁰⁶⁶ Sample 7-PAY-04-114-MS-A-1,0. GSI ER2, App. D, Table D.3, p. 28.

location also shows TPH exceedances.¹⁰⁶⁷ There are various cadmium exceedances as well.¹⁰⁶⁸

534. The sample results reveal an alarming situation in Area 1MT (PA14), where there are numerous exceedances of regulatory criteria of TPH, barium, cadmium, lead, nickel and vanadium.¹⁰⁶⁹ The highest TPH level is 124,872 mg/kg¹⁰⁷⁰ and the highest vanadium level is 514 mg/kg.¹⁰⁷¹ It further appears that the creek adjacent to these exceedances and flowing into the Payamino River is impacted at two locations with cadmium exceedances.¹⁰⁷²
535. In view of the proximity of Payamino 4 and Payamino 14/20/24 and the fact that Area 1MT(PA14) is close to both platforms, the Tribunal reviewed the operating history of both sites together. The spill history compiled by GSI for Payamino 4 reveals a 12 barrel crude spill in 1994 at a frac tank and a 7 barrel crude spill in 1995 at the transfer pump.¹⁰⁷³ GSI also mentioned without providing supporting evidence the presence of oil residue remaining from a produced water spill in 1997.¹⁰⁷⁴ The record also shows that the Consortium conducted a workover in 2005 on the Payamino 4 well, which involved the use of chemicals.¹⁰⁷⁵ In addition, GSI referred to an unreported spill of produced water at an unspecified date during the Consortium's operatorship, that

¹⁰⁶⁷ Samples PA04-1MT-1-(0.7-1.0) and PA04-1MT-1-(0.7-1.0)Dup. GSI ER1, App. L, Tables L.17.3, L.17.4 and L.17.5.

¹⁰⁶⁸ Samples 7-PAY-04-114-MS-A-0,5, 7-PAY-04-114-MS-A-1,0, 7-PAY-04-114-MS-A-1,5, 7-PAY-04-114-MS-B-1,5, 7-PAY-04-114-MS-C-1,5, 7-PAY-04-114-MS-D-0,5, 7-PAY-04-114-MS-D-1,5, 7-PAY-04-114-MS-D8, 7-PAY-04-114-MS-E-0,5, 7-PAY-04-114-MS-E-1,5 and 7-PAY-04-114-MS-F-0,5. GSI ER2, App. D, Table D.3, p. 28.

¹⁰⁶⁹ GSI ER1, App. L, Tables L.17.1, L.17.3, L.17.4 and L.17.5; GSI ER2, App. D, Table D.3, pp. 26-28. The Tribunal accepts GSI's explanations on the correct location of sample 7-PAY-04-113-MS-B in the stream area west of Payamino 4. See: GSI ER1, App. D, Annex D.2, p. 2.

¹⁰⁷⁰ IEMS sample 7-PAY-04-113-MS-A-0,2. GSI ER2, App. D, Table D.3, p. 27. See also: GSI soil confirmation sample PA14-1MT-1B-(0.0-0.2) with a TPH level of 124,057 mg/kg. GSI ER1, App. L, Table L.17.4.

¹⁰⁷¹ IEMS sample 7-PAY-04-113-MS-J-0,5. GSI ER2, App. D, Table D.3, p. 27.

¹⁰⁷² Samples 7-PAY-04-113-MS-P-0,5, 7-PAY-04-113-MS-P-1,5, 7-PAY-04-113-MS-P-2,5 and 7-PAY-04-113-MS-Q-0,5. GSI ER2, App. D, Table D.3, pp. 27-28. The Tribunal accepts GSI's explanations on the correct location of sample 7-PAY-04-113-MS-Q. See: GSI ER1, App. D, Annex D.2, p. 1.

¹⁰⁷³ GSI ER1, App. B.3 and App. L.17, p. 1.

¹⁰⁷⁴ GSI ER2, Table 4.

¹⁰⁷⁵ Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Payamino 4, Reacondicionamiento # 13, September 2005, p. 4 (**Exh. E-573**).

occurred to the west of the northeast corner of the platform “when a contractor was relocating a former produced water discharge line”.¹⁰⁷⁶ According to GSI, Perenco only later learned of this spill and was told “that the spill area was covered with clean dirt by the contractor”.¹⁰⁷⁷

536. Regarding the Payamino 14/20/24 platform, the record reveals a 4.8 barrel diesel spill in 2000 at Payamino 14. In addition, Mr. Saltos confirmed that Payamino 14 was a stand-by well drilled by prior operators which the Consortium put back into operation, notably by conducting a well workover.¹⁰⁷⁸ There are also indications that diluted effluents were discharged by the prior operator Kerr McGee into the Payamino River during the Payamino 24 pit closure in 2002.¹⁰⁷⁹
537. With respect to Area 1MT (PA04), the Tribunal notes that GSI provides no supporting evidence for its assertion that a produced water spill in 1997 caused the exceedances.¹⁰⁸⁰ The fact that Perenco apparently learned of (another) undated produced water spill, which was simply covered with clean soil, and left the situation unremediated reinforces the presumption that the Consortium caused the exceedances in the northeastern corner of the platform. Finally, considering the distance between Area 1MT (PA04) and Payamino 24, there is nothing to indicate that the diluted effluent discharges by Kerr McGee in 2002 in relation with the Payamino 24 pit closure affected the northeastern corner of the Payamino 4 platform. Accordingly, the Tribunal comes to the conclusion that Burlington failed to rebut the presumption that it caused the harm.

¹⁰⁷⁶ GSI ER1, App. L.17, p. 3. Although GSI stated that the spill location is “west of the northwest corner of the platform”, GSI thereafter referred to that same spill location in relation to a former produced water line “located just east of the road” and IEMS sample 7-PAY-04-114-MS-A-1.0, which clarifies that GSI was in fact referring to the northeast corner of the platform.

¹⁰⁷⁷ *Ibid.*

¹⁰⁷⁸ Tr. (Day 4) (ENG), 1238:16-22 (Cross, Saltos). See also: Payamino-14 Well History, 1994-2002 (**Exh. C-391**).

¹⁰⁷⁹ The 2002 closure report states the following: “Laboratory analyses indicated that water from Payamino River after the discharge site was within parameters similar to the site before the discharge site, which is why it was authorized to discharge water from the pit at a flow rate of up to 1 liter per second. This was done through a 1” trap from the pit to the river as from October 8” (Translation by the Tribunal). Informe final de los trabajos de taponamiento de las piscinas de lodos del pozo Payamino 24, performed by Cerecons for Kerr McGee, February 2002, p. 5 (**Exh. E-361**).

¹⁰⁸⁰ GSI ER2, Table 4.

538. The impacted area in Area 1MT (PA04) covers five sampling locations,¹⁰⁸¹ each amounting to 200 m², for a total area of 1000 m². Contamination reaches a depth of 2 meters for all locations, except for one where contamination has only been confirmed in the first 1 meter layer. Accordingly, the total volume of soil to be remediated is 1,800 m³ and, considering a 30% contingency (see paragraph 428), the total cost is **USD 702,000**.
539. With respect to Area 1MT (PA14), Burlington speculates that “[g]iven the presence of these oily, diesel-based muds and the lack of a liner, drilling mud containing oil could easily have leaked out and contaminated the surrounding soil”.¹⁰⁸² However, the Tribunal notes that Burlington provides no evidence for its contention that the Payamino 4 pit had leaked. It conducted no tests and its expert GSI observes, quite to the contrary, that “[b]ased on field observations, if this was a former pit, it was properly closed”.¹⁰⁸³ Therefore, the Tribunal holds the condition of the pit to be neutral in respect to the presumption of causation.
540. On the one hand, the evidence of diluted effluent discharges conducted by Kerr McGee during the Payamino 24 pit closure could serve to rebut the presumption of causation. On the other, the fact that the Consortium put the Payamino 14 stand-by well back into service and thus conducted well workovers suggests that the Consortium also caused the environmental condition to the north of the Payamino 14/20/24 platform, in the area corresponding to Area 1MT (PA14),¹⁰⁸⁴ which reinforces the presumption. Under the circumstances, the Tribunal is of the view that Burlington partially rebutted the presumption. Since Burlington bears the burden to disprove causation, the Tribunal holds that the Consortium shall bear half of the cost of remediation for Area 1MT (PA14).
541. As to the extent of contamination, in accordance with its general approach (section 4.4.3.c), the Tribunal increases GSI’s delineation around IEMS samples 7-PAY-04-113-MS-A and 7-PAY-04-113-MS-B from 280 m² to 300 m² so as to remediate the other

¹⁰⁸¹ The Tribunal notes that GSI’s revision of IEMS coordinates of sample 7-PAY-04-114-MS-A does not change the extent of the impacted area. See GSI ER1, App. D, Annex D.2, p. 31.

¹⁰⁸² CMCC, ¶ 465.

¹⁰⁸³ GSI ER1, App. L.17, Payamino 4, p. 3.

¹⁰⁸⁴ Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Payamino 14, Reacondicionamiento # 9 Payamino 14, August 2008 (**Exh. E-573**).

bank of the creek. In addition, because of the high level of the vanadium exceedance, the Tribunal adds an impacted area of 300 m² around the vanadium exceedance, and 200 m² around each of the three additional cadmium exceedances.¹⁰⁸⁵ The total impacted area in Area 1MT (PA14) is thus 1,200 m².

542. The volume of soil for the area delineated by GSI as increased by the Tribunal is 900 m³. Around the vanadium exceedance it is 300 m³ and for the three additional cadmium exceedances 1,000 m³.¹⁰⁸⁶ The total volume of soil is thus 2,200 m³. Accordingly, considering a 30% contingency (see paragraph 428 and section 4.5.2 more generally), the total cost for the remediation of exceedances in and around Area 1MT (PA14) amounts to USD 858,000, of which Burlington shall pay **USD 429,000**.

543. In sum, the total cost of remediation incurred by Burlington with respect to Payamino 4 is **USD 1,131,000**.

q. Payamino 5

544. Under its regulatory case, Ecuador claims USD 4,908,735 to clean up an area of 1,600 m² and a volume of soil of 5,375.50 m³.¹⁰⁸⁷ Burlington responds that there are no exceedances at that site when applying correct regulatory criteria and, if there were, they would be related to pre-Consortium drilling activities.¹⁰⁸⁸

545. Leaving aside pit soil,¹⁰⁸⁹ there are no exceedances at Payamino 5 under any regulatory criteria.¹⁰⁹⁰ Accordingly, no remediation is warranted at this site and Ecuador's claim with respect to non-pit soil is dismissed.

¹⁰⁸⁵ Sample locations 7-PAY-04-113-MS-N, 7-PAY-04-113-MS-P and 7-PAY-04-113-MS-Q.

¹⁰⁸⁶ Sample 7-PAY-04-113-MS-P has cadmium levels exceeding regulatory criteria at a depth of 3 meters. The other sampling locations show cadmium exceedances in the first 1-meter layer. GSI ER2, App. D, Table D.3, pp. 27-28.

¹⁰⁸⁷ Revised Attachment 35 to IEMS ER4 (Excel), line 41 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Payamino 5, p. 25; IEMS ER4, Att. 38, Payamino 5, p. 26; 2nd SMCC, ¶ 222.

¹⁰⁸⁸ Rejoinder, ¶ 267. See also: GSI ER1, App. L, Figure L.18.4.

¹⁰⁸⁹ As seen further below at paragraph 833, Burlington accepts to bear the costs of closing two open, unused pits to the east and southeast of the Payamino 5 platform, for a total cost of USD 47,000. See: GSI ER2, Table 3.

¹⁰⁹⁰ IEMS ER3, Annex C, Payamino 5, pp. 11-23; IEMS ER4, Att. 38, Payamino 5, pp. 10-24; GSI ER1, App. L, Table L.18.1 and Figures L.18.3 and L.18.4; GSI ER2, App. D, Table D.3, pp. 28-30.

r. Payamino 10

546. Ecuador claims USD 1,651,792 to clean up an area of 584.14 m² and a volume of 1,816.10 m³.¹⁰⁹¹ Burlington responds that any exceedances are related to drilling activities of prior operators.¹⁰⁹²
547. In reliance on its methodology (section 4.3.2.c) and thus applying sensitive ecosystem land use criteria¹⁰⁹³ (leaving pit soil aside at this stage), the Tribunal identified two off platform barium exceedances at that site,¹⁰⁹⁴ one on the southern edge of the platform¹⁰⁹⁵ and the other to the north of the platform.¹⁰⁹⁶
548. The Payamino 10 well was drilled by Oryx in March 1993 and both pits at that site were closed in June 1993.¹⁰⁹⁷ While there is no evidence of spills at that site,¹⁰⁹⁸ the record shows that the Consortium converted Payamino 10 into an injection well in 2006 and thus conducted workovers, which could explain the presence of barium.¹⁰⁹⁹ Accordingly, the Tribunal finds that Burlington has not discharged the burden to rebut the presumption that the Consortium caused the observed exceedances.
549. The impacted area is 400 m². Since both locations show exceedances reaching down 3 meters, the amount of soil to be recovered is 1,200 m³, for a total cost of

¹⁰⁹¹ Revised Attachment 35 to IEMS ER4 (Excel), line 43 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Payamino 10 Corrected, p. 14; 2nd SMCC, ¶ 225.

¹⁰⁹² Rejoinder, ¶ 267.

¹⁰⁹³ GSI concedes that secondary forest surrounds the platform. GSI ER1, App. L.21, p. 5.

¹⁰⁹⁴ IEMS ER3, Annex C, Payamino 10 Corrected, pp. 8-11; GSI ER1, App. L, Table L.21.1 and Figures L.21.3 and L.21.4; GSI ER2, App. D, Table D.3, pp. 32-33.

¹⁰⁹⁵ Sample 07-PAY10-SDV4-R.

¹⁰⁹⁶ Sample 07-PAY10-SDD2-R. The Tribunal does not accept GSI's explanation that this sample was taken in the mud pit in the northern corner of the platform. GSI indicated that a sample with a matching sample ID (i.e., SDD) is located in the northwest corner of the platform, which is correct, but there is another sample with a matching sample ID on the far south of the platform. In addition, the IEMS map in Annex C shows a sample taken in an off platform location to the north of the platform. See: IEMS ER3, Annex C Corrected, Payamino 10, p. 13; GSI ER1, App. D, Annex D.2, p. 16.

¹⁰⁹⁷ GSI ER2, App. B.5; Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 23 (**Exh. E-563**).

¹⁰⁹⁸ GSI ER1, App. B.3; Saltos WS1, Annex A; Solís WS2, ¶ 76.

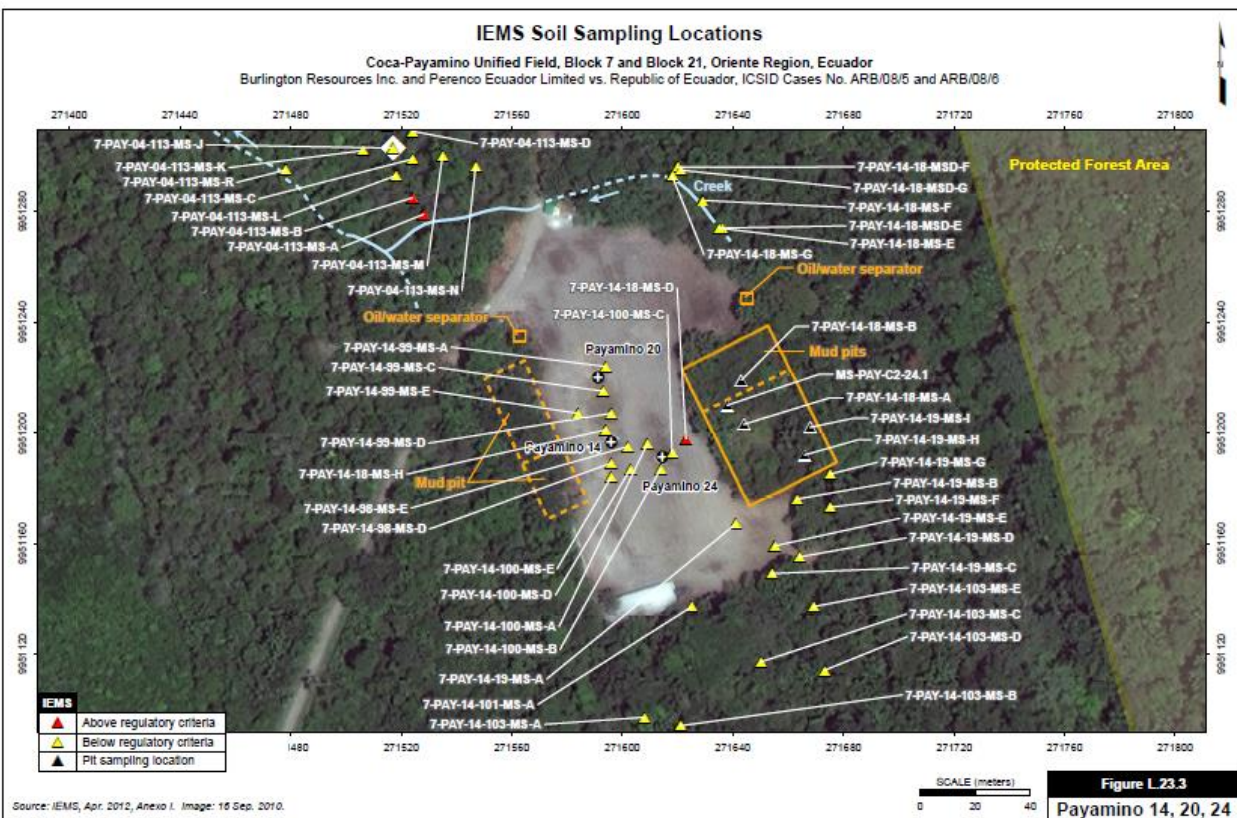
¹⁰⁹⁹ Payamino 10 was initially put in service by Oryx as a production well, but was converted into an injection well by the Consortium in 2006. GSI ER2, Table B.4; Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Payamino 10, Completación y pruebas Payamino 10, February 2006, and Reacondicionamiento # 1 Payamino 10, July 2007 (**Exh. E-573**). See also: R-PSVB, ¶ 200.

USD 468,000 for Payamino 10, which includes a 30% contingency (see paragraph 428).

s. Payamino 14/20/24

550. Ecuador claims USD 32,089,153 to remediate 32,164 m³ of soil covering an area of 18,647 m².¹¹⁰⁰ Burlington disputes any liability for this site.¹¹⁰¹

551. The figures that follow show IEMS's¹¹⁰² and GSI's¹¹⁰³ sampling locations at Payamino 14/20/24:

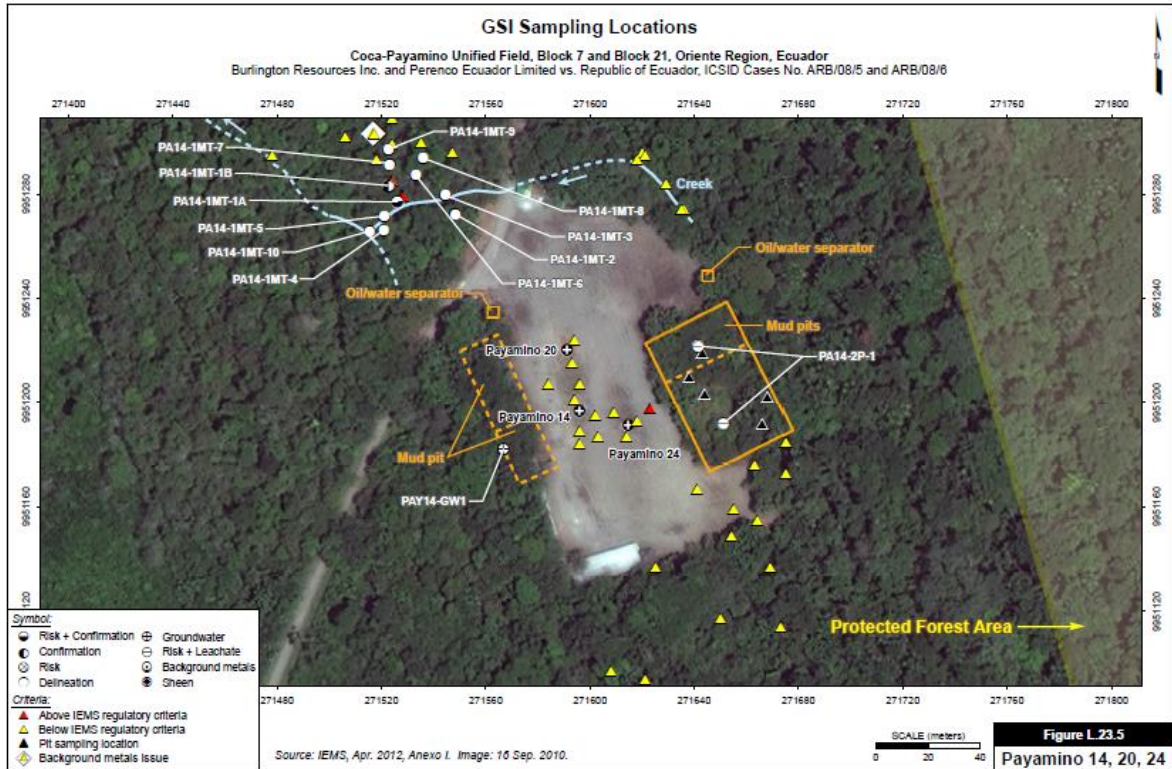


1100 Revised Attachment 35 to IEMS ER4 (Excel), line 45 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Payamino 14/20/24, pp. 28-29; IEMS ER4, Att. 38, Payamino 14/20/24, pp. 28-29; 2nd SMCC, ¶¶ 228-229.

1101 GSI ER2, Table 3.

1102 GSI ER1, App. L, Figure L.23.3.

1103 *Id.*, Figure L.23.5.



552. The Tribunal already addressed some aspects of Payamino 14/20/24 in its analysis of Payamino 4, more specifically in connection with Area 1MT (PA14). It noted that Payamino 14 was a stand-by well put into operation by the Consortium, which involved workovers.¹¹⁰⁴ It further noted that there had been a 4.8 barrel diesel spill in 2000 and diluted effluent discharges in 2002 during Kerr McGee operations.¹¹⁰⁵
553. The sampling results reveal one barium exceedance on the platform.¹¹⁰⁶ In accordance with its approach to land use (section 4.3.2.c) and resulting as a consequence to sensitive ecosystem criteria for off platform locations¹¹⁰⁷ (leaving pit soil aside at this stage), the samples show three locations with cadmium exceedances,¹¹⁰⁸ one of these

¹¹⁰⁴ Tr. (Day 4) (ENG), 1238:16-22 (Cross, Saltos); R-PHB, ¶ 721.

¹¹⁰⁵ GSI ER1, App. B.3; Informe final de los trabajos de taponamiento de las piscinas de lodos del pozo Payamino 24, performed by Cerecons for Kerr McGee, February 2002, p. 5 (**Exh. E-361**).

¹¹⁰⁶ Sample 7-PAY-14-18-MS-D. See: IEMS ER4, Att. 38, Payamino 14/20/24, p. 19; GSI ER1, App. L, Table L.23.1 and Figure L.23.3; GSI ER2, App. D, Table D.3, p. 35.

¹¹⁰⁷ Like Payamino 4, Payamino 14/20/24 is adjacent to a protected forest designated under the SNAP system and in proximity of the Payamino River. In addition, GSI concedes that secondary forest surrounds the platform. GSI ER1, App. L.23.1, p. 7 and Figure L.32.2.

¹¹⁰⁸ IEMS ER4, Att. 38, Payamino 14/20/24, pp. 12-13; GSI ER1, App. L, Table L.23.1; GSI ER2, App. D, Table D.3, pp. 34-36.

locations also showing a barium exceedance.¹¹⁰⁹ More specifically, two exceedances are located on the southern edge of the platform¹¹¹⁰ and two further exceedances are situated to the northeast of the platform along the creek flowing into the Payamino River.¹¹¹¹ Since these are heavy metals exceedances, they appear unrelated to the 2000 diesel spill. In addition, due to their location, the exceedances situated beyond the southern edge of the platform appear unrelated to the 2002 effluent discharges which reached the Payamino River.

554. As the documentary record shows¹¹¹² and Mr. Saltos confirmed¹¹¹³ that the Consortium conducted workovers on the Payamino 14 well, the Tribunal finds that Burlington failed to rebut the presumption of causation in respect of the exceedances on the platform and beyond the southern edge of the platform.
555. Considering the effluent discharges by Kerr McGee in 2002 and the workovers conducted by the Consortium on the Payamino 14 well, the Tribunal holds that Burlington partially rebutted the presumption in respect of the exceedances to the northeast of the platform along the creek flowing into the Payamino River, and that the Consortium shall bear half of the cost of remediation for these exceedances.
556. Taking account of, on the one hand, the relatively low levels of exceedances of some samples and, on the other, the fact that other samples are close to a protected area or in the immediate proximity of a creek, the Tribunal determines the total impacted area to extend to 560 m²¹¹¹⁴ and the total volume of soil to be remediated to 1,000 m³.¹¹¹⁵

¹¹⁰⁹ Sample 7-PAY-14-18-MSD-E-0,5.

¹¹¹⁰ Samples 7-PAY-14-101-MS-A-0,5, 7-PAY-14-101-MS-A-1,5 and 7-PAY-14-103-MS-E-1,5.

¹¹¹¹ Samples 7-PAY-14-18-MSD-E-0,5 and 7-PAY-14-18-MS-E-0,5.

¹¹¹² By conducting workover # 9, the Consortium changed zone from the Upper Hollin reservoir to the Napo "U" reservoir, by re-perforating in the "U" sandstone. See: Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Payamino 14, Reacondicionamiento # 9, August 2008 (**Exh. E-573**).

¹¹¹³ Tr. (Day 4) (ENG), 1238:16-22 (Cross, Saltos).

¹¹¹⁴ The impacted area is composed of 80 m² for the platform exceedance point 14-18-MS-D; 80 m² for the off platform exceedance point 101-MS-A, due to its proximity to the platform and the relatively low exceedance levels; 200 m² for off platform exceedance point 103-MS-E; and 200 m² for off platform exceedance points 14-18-MSD-E and 14-18-MS-E. For the location of these sample points, see: GSI ER1, App. L, Figure L.23.3.

¹¹¹⁵ The total volume of soil comprises: 240 m³ for exceedance point 14-18-MS-D; 160 m³ for exceedance point 101-MS-A; 400 m³ for exceedance point 103-MS-E; and 200 m³ for exceedance points 14-18-MSD-E and 14-18-MS-E. For the depth of the samples, see: GSI ER2, App. D, Table D.3, pp. 34-36.

Considering a 20% contingency for platform locations and 30% for off platform locations (see paragraph 428), the cost of remediation for the exceedances on the platform and beyond its southern edge amounts to **USD 304,800**.¹¹¹⁶ The cost of remediation for the exceedances to the northeast of the platform, including a 30% contingency (see paragraph 428), is USD 78,000, of which Burlington shall pay half, i.e. **USD 39,000**. In total, Burlington is liable to pay **USD 343,800** for Payamino 14/20/24.¹¹¹⁷

t. Payamino 15

557. Ecuador claims USD 1,969,902 to remediate 2,184 m³ of soil corresponding to an impacted area of 600 m².¹¹¹⁸ Burlington objects that, applying correct regulatory criteria, there are no exceedances at Payamino 15¹¹¹⁹ or, if there were any, they are linked to pre-Consortium drilling activities.¹¹²⁰

¹¹¹⁶ The cost to remediate the platform exceedance is USD 86,400 and the cost for the off platform exceedances to the south of the platform is USD 218,400.

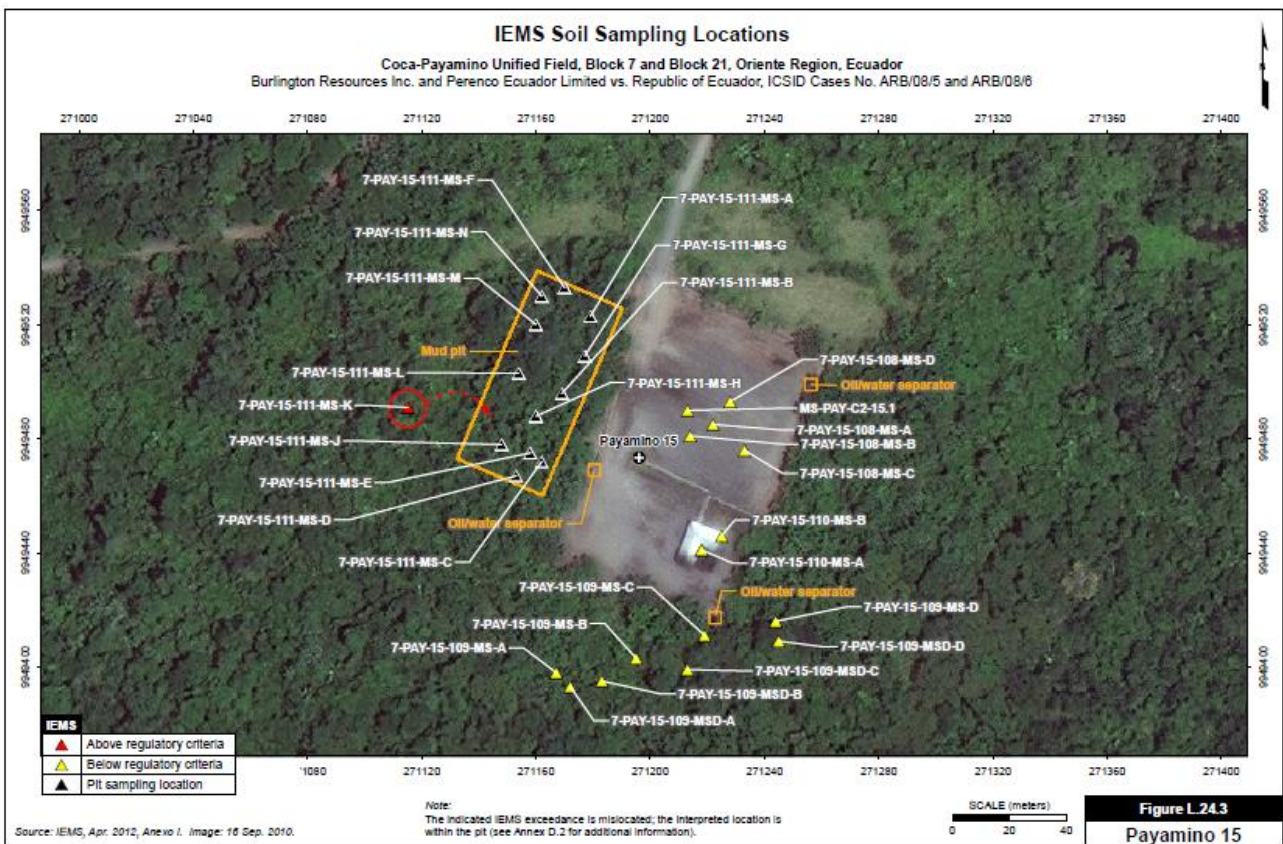
¹¹¹⁷ The total cost incurred by Burlington comprises USD 86,400 for the platform exceedance point and USD 257,400 for the off platform exceedance points.

¹¹¹⁸ Revised Attachment 35 to IEMS ER4 (Excel), line 46 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Payamino 15, pp. 28-29; IEMS ER4, Att. 38, Payamino 15, p. 23; 2nd SMCC, ¶ 227.

¹¹¹⁹ The Tribunal notes that GSI assumes that sample 7-PAY-15-111-MS-K was misplaced by IEMS and that it should be located in the mud pit. See: GSI ER1, App. D, Annex D.2, p. 15 and App. L, Figures L.24.3 to L.24.5.

¹¹²⁰ Rejoinder, ¶ 267.

558. The following figure depicts IEMS's sampling locations,¹¹²¹ being specified that GSI did not collect samples at this site:¹¹²²



559. Applying sensitive ecosystem criteria,¹¹²³ in reliance on its methodology on land use (section 4.3.2.c), the Tribunal identified several exceedance points to the south of the platform with barium, cadmium and nickel.¹¹²⁴ Further, on the basis of the pit dimensions, the Tribunal finds that sample 7-PAY-15-111-MS-K-1,5 is not located

¹¹²¹ GSI ER1, App. L, Figure L.24.3.

¹¹²² GSI ER1, App. L.24; GSI ER2, App. D, Table D.4.

¹¹²³ GSI concedes that the platform is surrounded by secondary forest. GSI indicates that a marsh is “immediately adjacent” to the north of the site extending 25 meters, and that a stream some 20 meters to the south-southeast of the platform flows to the north-northeast. See: GSI ER1, App. L.24, p. 6.

¹¹²⁴ Samples 7-PAY-15-109-MS-A-1,5, 7-PAY-15-109-MS-C-0,5, 7-PAY-15-109-MS-D-0,5, 7-PAY-15-109-MS-D-1,5 and 7-PAY-15-109-MSD-B-0,5. The Tribunal also notes a relatively high level of vanadium (264.5 mg/kg) at one point on the platform (sample 7-PAY-15-110-MS-B-1,5), although it falls below the adjusted permissible limit. See: GSI ER1, App. L, Table L.24.1; GSI ER2, App. D, Table D.3, pp. 36-38.

within a pit, as GSI assumed, and therefore constitutes an additional barium and cadmium exceedance to the west of the platform.¹¹²⁵

560. According to available records, there was a 30-barrel spill on 10 June 2001 at the wellhead, due to vandalism, of which some 20 barrels were recovered by Kerr McGee.¹¹²⁶ There also was an equipment failure at the power oil unit on 31 May 2003 causing a 2-barrel crude spill, all of which was recovered by Perenco.¹¹²⁷ In addition, the record shows that the Consortium conducted well workovers at that site which involved perforations and the use of chemicals.¹¹²⁸ Finally, the Tribunal notes that no soil samples were taken at this site for the 2008 Environmental Audit.¹¹²⁹ Since the contamination is of heavy metals only and considering the Consortium's workovers, the Tribunal holds that Burlington has not rebutted the presumption of causation and, hence, is liable for remediating all exceedances.

561. The impacted area is 1,000 m², made up of five areas of 200 m² each. Considering that two exceedance points extend to a depth of 1 meter and the other three to a depth of 2 meters, the total volume of soil to be remediated is 1,600 m³. Considering a 30% contingency (see paragraph 428), the total cost amounts to **USD 624,000** for Payamino 15.

¹¹²⁵ Samples 7-PAY-15-111-MS-K-0,5 and 7-PAY-15-111-MS-K-1,5. See: GSI ER1, App. D, Annex D.2, p. 15. However, the Tribunal accepts the pit dimensions brought forward by GSI, thus putting a number of IEMS samples within the pit. Compare the maps with sampling locations: IEMS ER4, Att. 38, Payamino 15, p. 28; GSI ER1, App. L, Figures L.24.3 to L.24.5.

¹¹²⁶ GSI ER1, App. B.3, line 53.

¹¹²⁷ *Id.*, line 60.

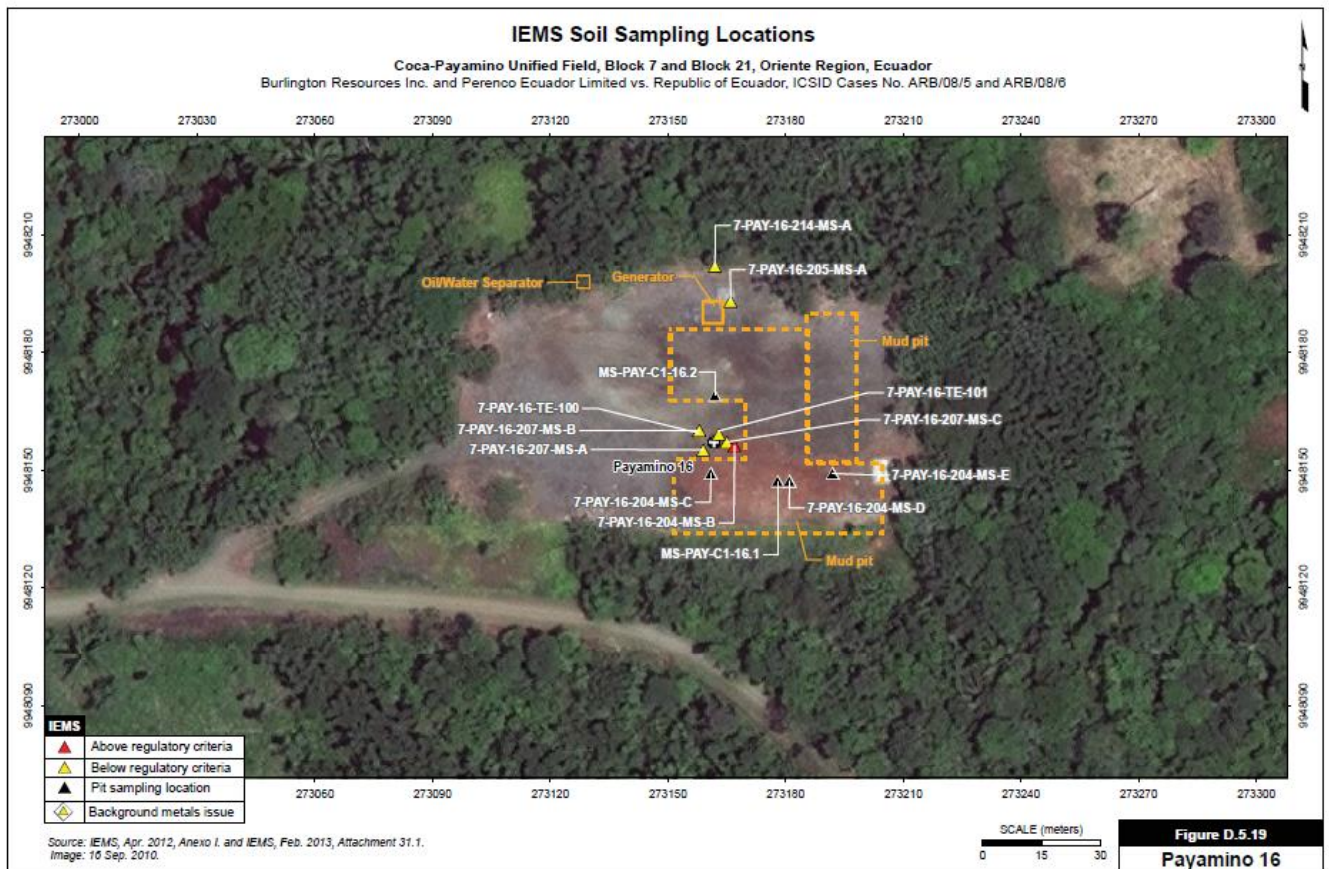
¹¹²⁸ See, for instance workovers ## 5 to 7 conducted by the Consortium between 2005 and 2008. Workover # 5 involved perforating in the Upper Hollin reservoir. Workover # 6 involved piercing in the Napo "U" reservoir, including through the use of chemicals. The reconditioning of the well in workover # 7 involved the use of biocides and surfactants. See: Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Payamino 15, Reacondicionamiento # 6, May 2006; Solicitud perforación reacondicionamiento No. 7, 19 March 2008; and Reacondicionamiento # 7, April 2008 (**Exh. E-573**). See also: R-PHB, ¶ 719, note 876; R-PSVB, ¶ 200.

¹¹²⁹ 2nd SMCC, ¶ 228; Block 7 Environmental Audit, November 2008, p. 40, Table 3-3 (**Exh. E-252**).

u. Payamino 16

562. Ecuador claims USD 13,396,962 to remediate 14,073.80 m³ covering an area of 4,912 m².¹¹³⁰ Burlington attributes any exceedances to pre-Consortium drilling operations and disputes any liability.¹¹³¹

563. The following figure depicts IEMS's sampling locations,¹¹³² being specified that GSI did not take samples at this site:¹¹³³



564. Not considering pit soil for the time being, a review of the sampling results reveals a barium and vanadium exceedance on the platform next to the Payamino well. The

¹¹³⁰ Revised Attachment 35 to IEMS ER4 (Excel), line 47 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Payamino 16, p. 17; IEMS ER4, Att. 38, Payamino 16, p. 17; 2nd SMCC, ¶ 230; Reply, ¶ 195(ix).

¹¹³¹ Rejoinder, ¶ 267; GSI ER2, Table 3.

¹¹³² GSI ER2, App. D, Figure D.5.19.

¹¹³³ GSI ER1, App. L.25; GSI ER2, App. D, Table D.4.

vanadium exceedance shows a high level of 399.5 mg/kg.¹¹³⁴ In addition, there is an off platform cadmium exceedance, irrespective of whether agricultural or sensitive ecosystem land use criteria apply.

565. The historical record of spills is rather scant.¹¹³⁵ Mr. Saltos pointed to a 1999 audit prepared by Mr. Grizzle and commissioned by Oryx, which mentioned that the Payamino 16 diesel tank was overflowing, affecting on and off platform locations.¹¹³⁶
566. While this would tend to point to contamination by prior operators, other evidence leads to a contrary conclusion. Indeed, the record shows that the Consortium used Payamino 16 to store muds from other platforms.¹¹³⁷ Mr. Saltos explained that “[s]ince Payamino 16 had stopped operations, we made these pits in order to put in them the muds coming from other areas, and that we had like too much mud”.¹¹³⁸ He added that the Consortium operated five unreported off platform pits at Payamino 16. As a consequence of this practice, the Tribunal holds Burlington liable for exceedances found in non-pit soil at that site (it will review mud pits below).
567. Accordingly, the impacted area is 280 m²¹¹³⁹ and the total volume of soil 560 m³.¹¹⁴⁰ Considering a 20% contingency (see paragraph 428), the total cost amounts to **USD 201,600** for Payamino 16.

¹¹³⁴ Samples 7-PAY-16-204-MS-B-0,5, 7-PAY-16-204-MS-B-1,5 and 7-PAY-16-204-MS-B12. See: IEMS ER4, Att. 38, Payamino 16, p. 12; GSI ER1, App. L, Table L.25.1 and Figures L.25.3 and L.25.4; GSI ER2, App. D, Table D.3, pp. 38-39 and Figures D.1.22 and D.5.19.

¹¹³⁵ GSI ER1, App. B.3; Saltos WS1, Annex A.

¹¹³⁶ Saltos WS1, ¶ 278; Patrick Grizzle, *Environmental Audit of Petroproducción Operations of the Coca-Payamino Field*, 12-14 January 1999, p. 2 (**Exh. CE-CC-21**).

¹¹³⁷ R-PHB, ¶¶ 724-725. Mr. Saltos explained as follows: “Q. The Consortium had opened pits in certain platforms that were not necessarily in operation and there were, however, drillings going on there, and they brought mud from other platforms to these platforms. A. This only happened in two cases, Payamino 16 and Jaguar 9. That’s it”. Tr. (Day 4) (ENG), 1335:4-10 (Cross, Saltos).

¹¹³⁸ Tr. (Day 4) (ENG), 1334:19-22 (Cross, Saltos).

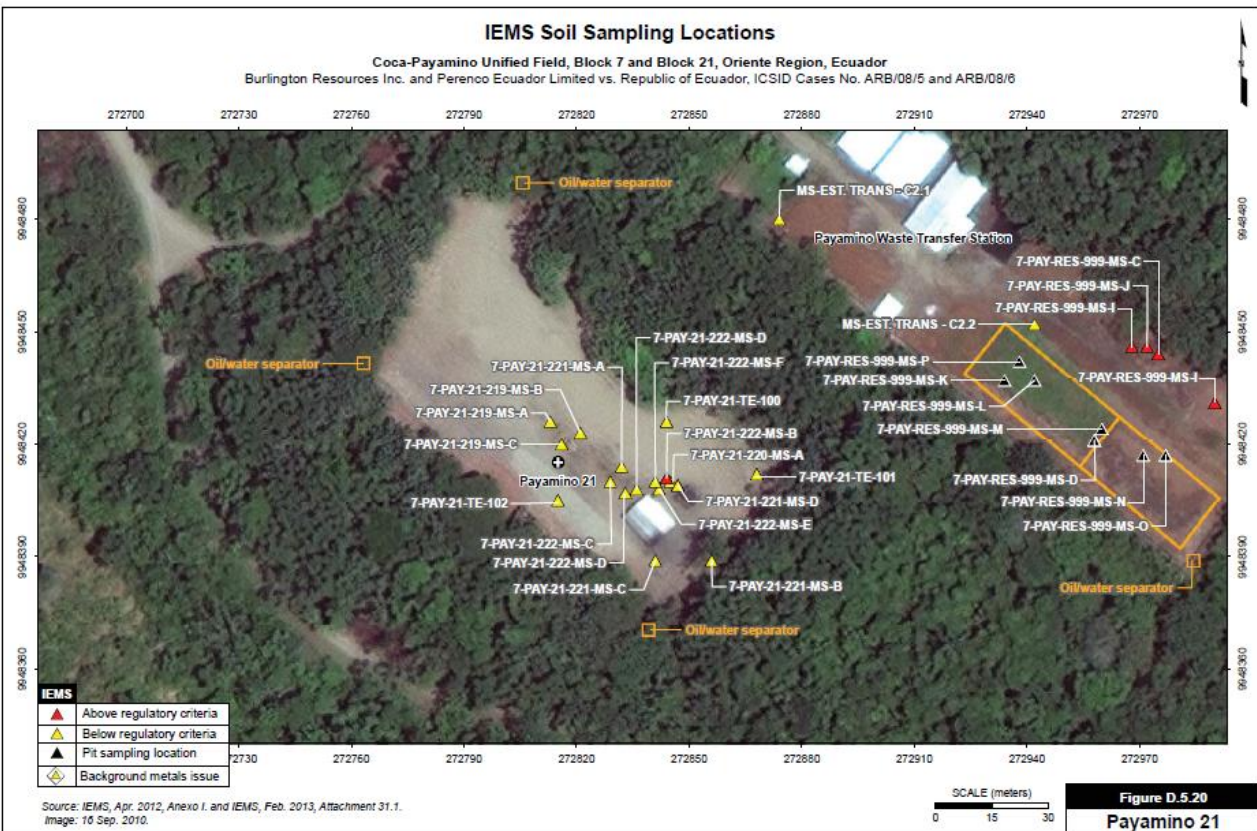
¹¹³⁹ The impacted area comprises 80 m² for the platform exceedance and 200 m² for the off platform exceedance.

¹¹⁴⁰ The total volume of soil comprises 160 m³ for the platform exceedance and 400 m³ for the off platform exceedance.

v. **Payamino 21**

568. Ecuador claims USD 111,683 to remediate 33.80 m³ of soil covering an area of 26 m².¹¹⁴¹ Burlington contests that claim on the ground that any exceedances are related to pre-Consortium drilling activities.¹¹⁴²

569. The following figure depicts IEMS's sampling locations at Payamino 21,¹¹⁴³ being understood that GSI took no samples at this site.¹¹⁴⁴



1141 Revised Attachment 35 to IEMS ER4 (Excel), line 50 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Payamino 21, p. 17; IEMS ER4, Att. 38, Payamino 21, p. 17; 2nd SMCC, ¶ 233; Reply, ¶ 195(x). See also: Remodeled site for Payamino 21, August 2013, Figure 13-B, (**Exh. E-499**).

1142 Rejoinder, ¶ 267; GSI ER1, App. L, Table L.28.1, Figures L.28.3 and L.28.4; GSI ER2, Table 3 and App. D, Table D.3, pp. 40-41 and Figures D.1.23 and D.5.20.

1143 GSI ER2, App. D, Figure D.5.20.

1144 GSI ER1, App. L.28; GSI ER2, App. D, Table D.4.

570. As can be seen from the figure above, IEMS only collected samples at one off platform location and the results show no exceedances under any regulatory criteria.¹¹⁴⁵ With respect to the platform, where industrial criteria apply, there is one TPH exceedance with a level reaching 23,818 mg/kg close to the power oil pump and diesel fuel storage tank.¹¹⁴⁶
571. There is no record of historical spills,¹¹⁴⁷ but Burlington's explanation that the TPH exceedance is related to pre-Consortium drilling activities is unconvincing because of the proximity of the exceedance to the power oil pump and the diesel fuel storage tank.¹¹⁴⁸ In addition, if the cause were drilling activities, one would expect to find barium, not TPH. Therefore, the Tribunal considers that Burlington failed to rebut the presumption of causation and holds it liable to pay for the remediation of that exceedance.
572. The impacted area is 80 m² and the volume of soil 320 m³.¹¹⁴⁹ Applying the remediation standards set out earlier (section 4.5.2), the total cost is USD 115,200, which includes a 20% contingency (see paragraph 428). Since this exceeds the sum claimed by Ecuador, the Tribunal reduces the amount awarded to **USD 111,683** as claimed for Payamino 21.

w. Payamino 23

573. Ecuador claims USD 922,477 to remediate 975 m³ of soil corresponding to an area of 250 m².¹¹⁵⁰ After GSI's second sampling campaign, Burlington accepted that an area of

¹¹⁴⁵ GSI ER2, App. D, Table D.3, p. 41.

¹¹⁴⁶ Samples 7-PAY-21-222-MS-B-1,4 and 7-PAY-21-222-MS-B-3,0M. See: GSI ER1, App. L, Table L.28.1 and Figure L.28.3; GSI ER2, App. D, Table D.3, pp. 40-41 and Figures D.1.23 and D.5.20.

¹¹⁴⁷ GSI ER1, App. B.3; Saltos WS1, Annex A; Solís WS2, ¶ 76.

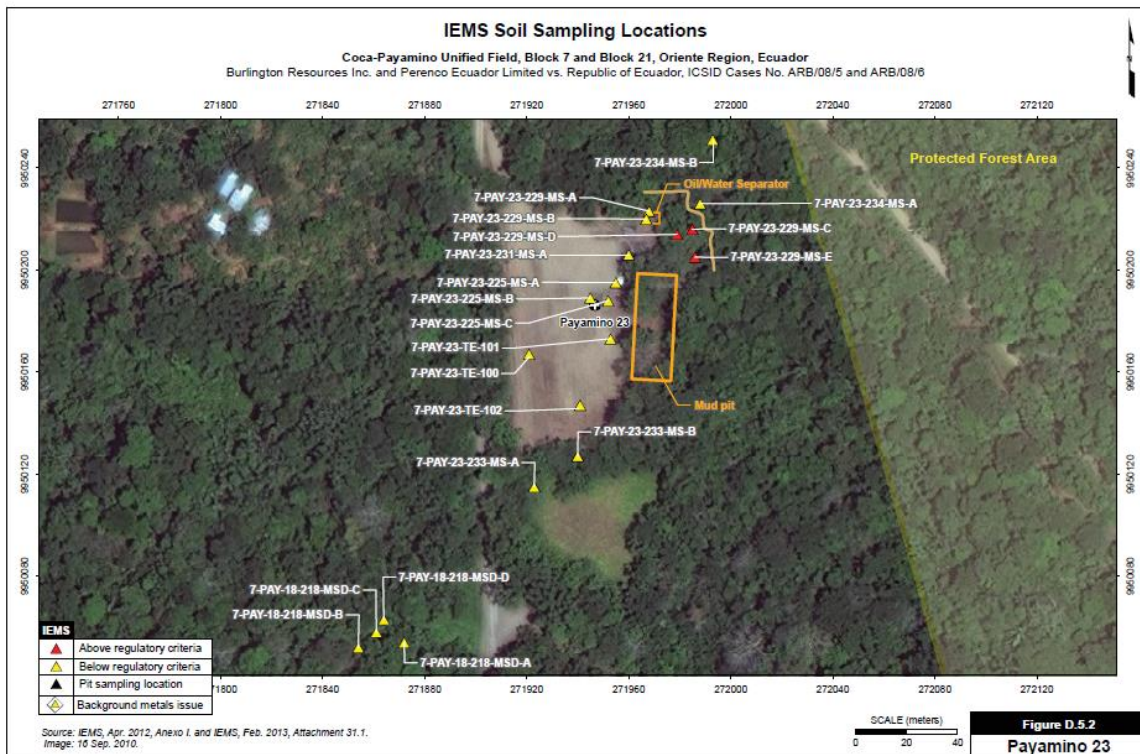
¹¹⁴⁸ The Tribunal notes that GSI mentioned “[m]inor localized oil releases” inside the power oil pumping facility, including outside the containment vault. See: GSI ER1, App. L.28, p. 3. The Tribunal also notes that no soil samples were taken at Payamino 21 for the 2008 audit. See: 2nd SMCC, ¶ 233; Block 7 Environmental Audit, November 2008, p. 40, Table 3-3 (**Exh. E-252**).

¹¹⁴⁹ Sample location 7-PAY-21-222-MS-B still has a TPH level of 6,533 mg/kg at 3 meters depth and a level of 2,930 mg/kg at 4.5 meters depth. Accordingly, the Tribunal deems that remediation up to 4 meters is sufficient here.

¹¹⁵⁰ Revised Attachment 35 to IEMS ER4 (Excel), line 51 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Payamino 23, p. 17; IEMS ER4, Att. 38, Payamino 23, p. 17; 2nd SMCC, ¶ 234; Reply, ¶ 195(xi). See also: Remodeled site for Payamino 23, August 2013, Figure 15-B (**Exh. E-499**).

350 m² may require remediation corresponding to 640 m³ of contaminated soil for a cost of USD 195,000.¹¹⁵¹ It disputes being liable, however, and refers to pre-Consortium drilling activities in 1997 and a 3-barrel crude spill that occurred on 5 March 2000 at the power oil unit.¹¹⁵² GSI further observes that its confirmation sampling did not establish the presence of TPH-impacted soils as noted by IEMS.¹¹⁵³

574. The following figures depicts IEMS's¹¹⁵⁴ and GSI's¹¹⁵⁵ sampling locations at Payamino 23:



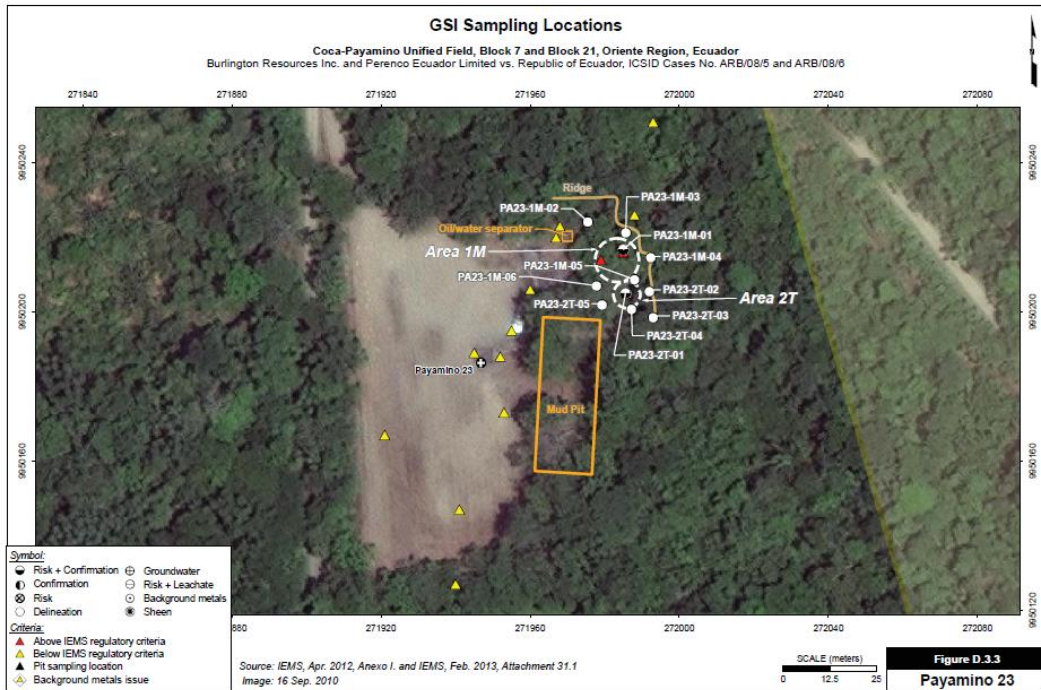
1151 For barium, GSI calculated an impacted area of 270 m² in the layer 0-1 meter, 190 m² in the layer 1-2 meters, and 180 m² in the layer 2-3 meters. These areas partly overlap and yield a maximum impacted area of 350 m². See: GSI ER2, App. D, Figures D.1.3, D.3.3, D.4.3, D.5.2, D.6.3 and D.7.3, as well as Annex D.7.3. For the results of GSI's samples, see: GSI ER2, App. D, Tables D.8 to D.10, as well as Tables D.11 and D.12.

1152 Rejoinder, ¶ 267; GSI ER1, App. B.3, line 49; GSI ER2, pp. 6, 26-27, Exhibit 11 and Tables 1, 3 and 4.

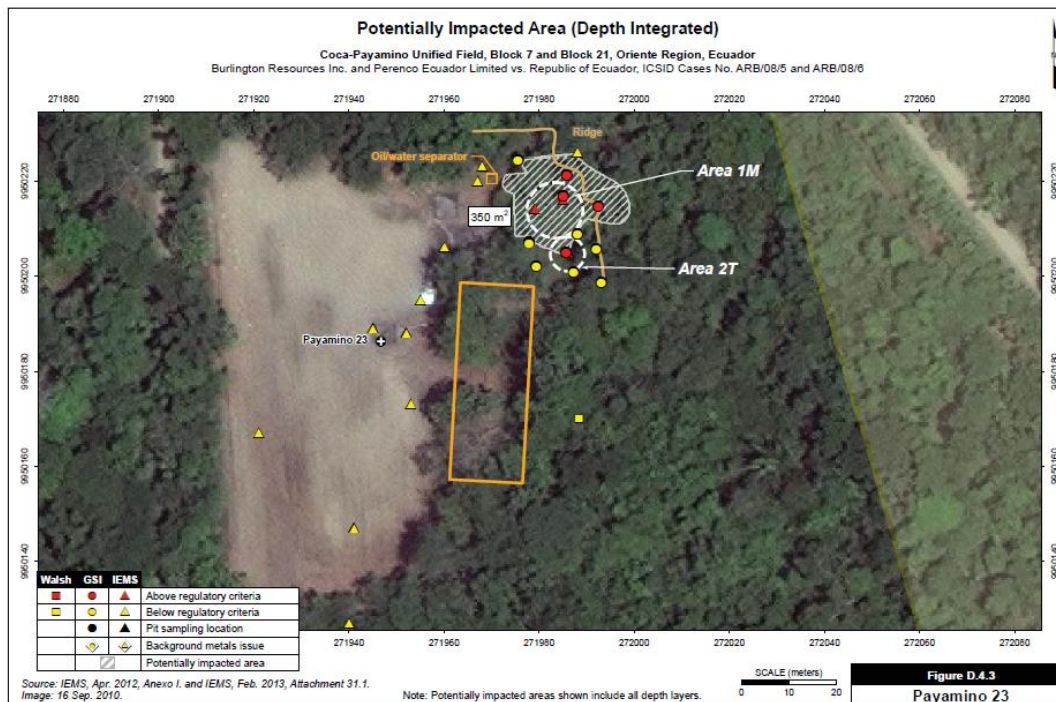
1153 GSI ER2, p. 27 and App. D, Table D.11.

1154 *Id.*, App. D, Figure D.5.2.

1155 *Id.*, Figure D.3.3.



575. The delineation of impacted areas established by GSI and to be used as basis for the Tribunal's own assessment (see section 4.4.3.c) is presented below.¹¹⁵⁶



1156

Id., Figure D.4.3.

576. In application of the Tribunal's general approach (section 4.3.2.c) and consequently in reliance on sensitive ecosystem criteria,¹¹⁵⁷ the Tribunal identified various TPH, barium, cadmium and nickel exceedances in an area off the northeast corner of the platform going in the direction of the designated protected forest.¹¹⁵⁸ In addition, the Tribunal identified one cadmium exceedance in an area further to the southwest of the platform.¹¹⁵⁹
577. With respect to the exceedances around the northeastern corner of the platform, the Tribunal notes the presence of a chemical storage area and an unused concrete pad that according to GSI was "possibly [used] for a former power oil pumping system or electrical generator and diesel fuel storage tank".¹¹⁶⁰ The 3-barrel crude spill in 2000 mentioned by Burlington weakens the presumption of causation. However, it is noteworthy that GSI refers to various allegedly reported and remediated spills "due to failures in the power oil units" at various times in the past, without providing further details.¹¹⁶¹ Burlington did not allege that the power oil unit was removed by prior operators. The Tribunal therefore understands that the Consortium also used it. In the same vein, the Tribunal is also inclined to find that at least some of the failures of the power oil unit and ensuing spills alluded to by GSI occurred during the Consortium's time. The Tribunal further notes that the 2008 Environmental Audit indicated that the perimeter drains and grease traps were in poor condition and that not a single soil sample was taken at that location at that time.¹¹⁶² These elements tend to confirm the presumption that the Consortium caused the exceedances. At the very least, they fail to rebut the presumption. In addition, the Tribunal notes that Mr. Solís referred to ruptures on the Payamino 23 flowline "on at least four occasions", presumably during the

¹¹⁵⁷ Payamino 23 is adjacent to a protected forest area designated under the SNAP system. See, for instance: GSI ER1, App. L, Figure L.29.3.

¹¹⁵⁸ IEMS samples 7-PAY-23-229-MS-C-0,5, 7-PAY-23-229-MS-C-1,5, 7-PAY-23-229-MS-C-2,5, 7-PAY-23-229-MS-D-1,5, 7-PAY-23-229-MS-E-1,5 and 7-PAY-23-229-MS-E-2,5; and GSI samples PA23-1M-03-(0.0-0.3), PA23-1M-03-(1.0-2.0) and PA23-1M-04-(0.0-0.3). See: GSI ER2, App. D, Table D.3, pp. 41-43 and Tables D.8 to D.10, in particular Table D.10, pp. 3-4.

¹¹⁵⁹ Sample 7-PAY-18-218-MSD-B-0,5. See: GSI ER2, App. D, Table D.3, p. 42.

¹¹⁶⁰ GSI ER1, App. L.29, p. 3.

¹¹⁶¹ *Ibid.* See further: GSI ER1, App. B.3.

¹¹⁶² Block 7 Environmental Audit, November 2008, p. 40, Table 3-3, and p. 90, Table 5.1a (**Exh. E-252**). No soil sample was either taken for the 2002 and 2006 audits. See: Block 7 Environmental Audit, Perenco Ecuador Limited, December 2002, pp. 47-48 (Spanish version) (**Exh. E-331**); Block 7 Environmental Audit, November 2006, p. 34 (Spanish version) (**Exh. E-334**).

Consortium's time.¹¹⁶³ However, he did not recall the exact dates of the ruptures nor did he specify the impact of the ruptures on the environment and the measures taken.¹¹⁶⁴ The evidence of Mr. Solís is therefore too vague, although, if anything, it would rather confirm the presumption. As a result, the Tribunal concludes that Burlington did not rebut the presumption of causation and must pay the cost for remediating the area to the northeast of the platform.

578. With respect to the area to the southwest, Burlington provided no specific explanation. As a consequence, the Tribunal considers that it failed to discharge its burden to rebut the presumption of causation and shall pay the full costs of remediation. The impacted area to the southwest of the platform around sample 7-PAY-18-218-MSD-B extends to 200 m². The total volume of soil amounts to 200 m³ and the total cost is thus **USD 78,000**, which includes a 30% contingency (see paragraph 428).

579. In respect of the impacted area to the northeast of the platform. GSI divided this location in two, namely Area 1M surrounding the heavy metals exceedances and Area 2T around the TPH exceedance.¹¹⁶⁵ During its second field trip, GSI put a dirty boring back into the ground without taking any sample in the 2-3 meter layer southwards of sample location PA23-1M-02, just east of the oil/water separator.¹¹⁶⁶ Considering the topography, in particular the ridge to the east of Area 2T, the Tribunal generally accepts GSI's delineation in Area 1M.¹¹⁶⁷ Considering that GSI put a dirty boring back into the ground instead of testing it, the Tribunal will, however, collapse the three 1-meter layers taking the largest surface, namely 350 m² and increase that area by 50 m² to include the piece of land between the oil/water separator and the area designated above, which in total yields 400 m².

¹¹⁶³ Solís WS1, ¶ 25; Solís WS2, ¶ 74.

¹¹⁶⁴ *Ibid.*

¹¹⁶⁵ GSI ER2, App. D, Figures D.3.3, D.4.3, D.6.3, D.7.3.4.a, D.7.3.4.b and D.7.3.4.c.

¹¹⁶⁶ GSI's Field Forms indicate the following for sample location PA23-1M-02: "2.10-2.4m: Dark grey silty clay (CL). Soft consistency. Homogeneous texture. High plasticity. Hydrocarbon odor. *Sampling spot was moved a couple meters to the north (N) of the initial borehole.* 2.4-3.0m: Soil conditions persist. Material is dark grey clay (CL) of soft texture. Homogeneous consistency. Low moist. Very plastic and with hydrocarbon odor" (emphasis by the Tribunal). See: GSI ER2, Annex D.7.3.1, Field Forms, p. 9, GSI Log Book for sample PAY-23-1M-02, 12 March 2013, p. 1. See also: GSI ER2, Annex D, Figures D.7.3.4.a to D.7.3.4.f. And further: R-PHB, ¶¶ 365, 383(d), note 453.

¹¹⁶⁷ GSI ER2, Annex D, Figures D.7.3.4.a to D.7.3.4.f.

580. By contrast, the Tribunal does not adopt GSI's delineation in Area 2T. Indeed, GSI collected a confirmation sample between 2.2 to 2.5 meters with a TPH level of 28.37 mg/kg to discard the two IEMS samples with TPH exceedances taken at 1.5 meters and 2.5 meters.¹¹⁶⁸ Because the expanded Area 1M partly overlaps with Area 2T,¹¹⁶⁹ the Tribunal adds 100 m² to the 400 m² above, for a total area of 500 m². The volume of soil requiring remediation is 1,500 m³, and adding a 30% contingency (see paragraph 428), the total cost is **USD 585,000**.

581. In sum, the total impacted area at Payamino 23 is 700 m². The total volume of soil to be remediated amounts to 1,700 m³ for a cost of **USD 663,000** for Payamino 23.

x. Payamino Sanitary Landfill

582. Ecuador claims USD 26,488,219 to remediate 30,517.50 m³ of soil to be taken from an area of 4,634 m².¹¹⁷⁰ Burlington opposes that claim and contends that various samples located on the platform were in fact misplaced and were actually taken from the mud pits further south on the platform.¹¹⁷¹

583. In light of GSI's statement that its inspection discovered "several abandoned soil borings in the southern portion of the platform" and that there was "[n]o evidence of borings" at a small distance further to the north, still within the confines of the platform, the Tribunal accepts that the disputed samples were indeed taken in the mud pits.¹¹⁷²

584. Accordingly, the Tribunal will address these samples in its analysis on mud pits further below (paragraphs 797 and 801). On that basis, the Tribunal finds no non-pit soil exceedances at the Payamino Sanitary Landfill under any regulatory criteria.¹¹⁷³ Therefore, no remediation for non-pit soil is warranted at that site.

¹¹⁶⁸ GSI ER2, p. 27, App. D, Tables D.9 and D.11 and Annex D.7.3.

¹¹⁶⁹ See, for instance: GSI ER2, App. D, Figure D.7.3.4.a.

¹¹⁷⁰ Revised Attachment 35 to IEMS ER4 (Excel), line 56 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Payamino Waste Transfer Station, p. 20; 2nd SMCC, ¶¶ 235-236.

¹¹⁷¹ GSI ER1, App. D, Annex D.2, p.32, and App. L, Figure L.30.3.

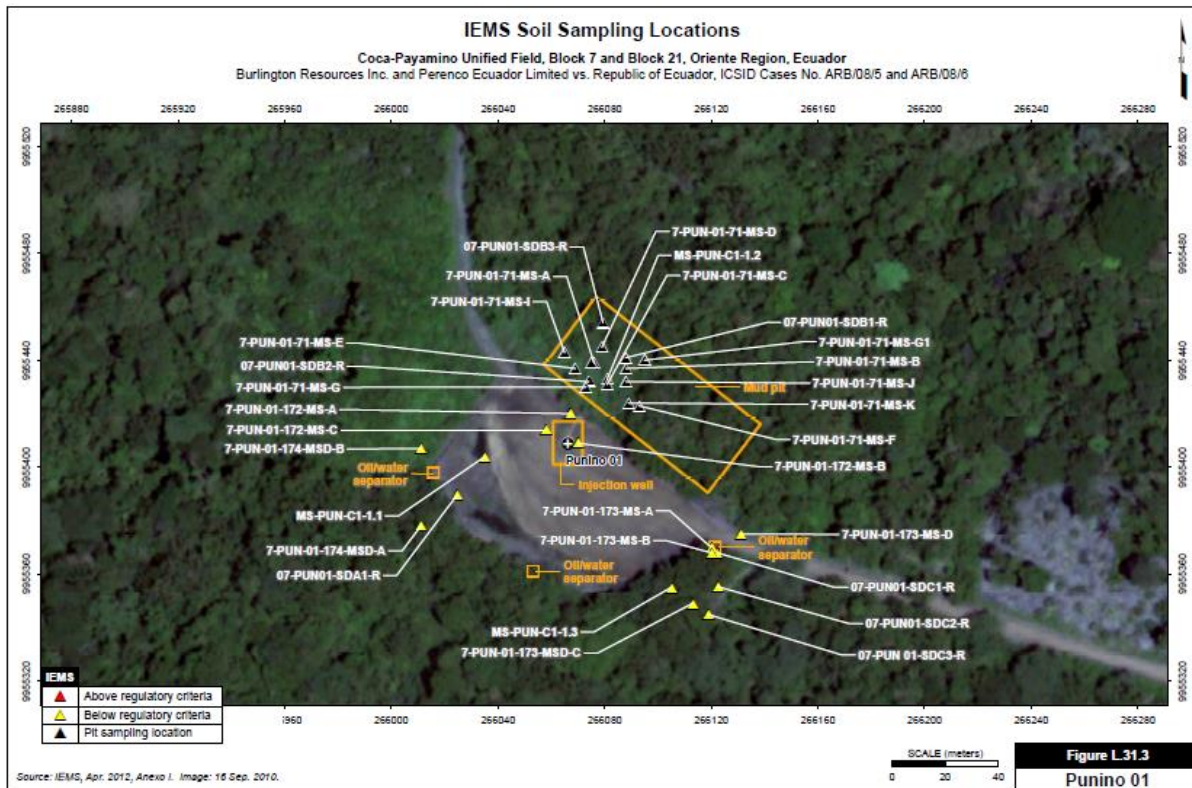
¹¹⁷² Samples 7-PAY-RES-999-MS-A, 7-PAY-RES-999-MS-B, 7-PAY-RES-999-MS-C, 7-PAY-RES-999-MS-E, 7-PAY-RES-999-MS-G, 7-PAY-RES-999-MS-H, 7-PAY-RES-999-MS-I, and 7-PAY-RES-999-MS-J. See: GSI ER1, App. L, Figure L.30.3.

¹¹⁷³ IEMS ER3, Annex C, Payamino Waste Transfer Station, pp. 7-18; GSI ER1, App. L, Table L.30.1; GSI ER2, App. D, Table D.3, pp. 46-47.

y. **Punino**

585. Ecuador claims USD 2,602,562 to remediate 2,848.30 m³ of soil covering an area of 926 m².¹¹⁷⁴ Burlington disputes that claim and argues that any exceedances are linked to pre-Consortium drilling activities.¹¹⁷⁵

586. The following figure depicts IEMS's sampling locations,¹¹⁷⁶ being added that GSI took no samples at this site.¹¹⁷⁷



587. In reliance on its general approach (section 4.3.2.c) and applying thus sensitive ecosystem criteria¹¹⁷⁸ (without taking pits into consideration at this stage), the Tribunal identified a single TPH exceedance just off the southwestern corner of the platform.¹¹⁷⁹

1174 Revised Attachment 35 to IEMS ER4 (Excel), line 57 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Punino 1, p. 16; 2nd SMCC, ¶ 208.

1175 Rejoinder, ¶ 267; GSI ER2, Table 4.

1176 GSI ER1, App. L, Figure L.31.3.

1177 GSI ER1, App. L.31; GSI ER2, App. D, Table D.4.

588. The Punino 1 well was drilled by Petroproducción in 1990 and was converted into an injection well by Oryx in 1995.¹¹⁸⁰ There is no record of historical spills.¹¹⁸¹ The Tribunal notes, however, that during its inspection in 2012 GSI observed that the oil traps were all “plugged, full of water, and needed basic maintenance”.¹¹⁸² Interestingly, this was already the case at the time of the 2008 Environmental Audit which noted: “Lack of maintenance in perimeter drains and grease traps”.¹¹⁸³ In addition, no samples were taken for the 2008 audit and it appears that no verification list was generated. Accordingly, Burlington failed to rebut the presumption that it caused the exceedance in question. For these reasons, the Tribunal holds Burlington liable to remediate the TPH exceedance.
589. In accordance with the Tribunal’s methodology (sections 4.4.3.c and 4.5.2), the impacted area extends to 80 m², the total volume of soil to be remediated being 80 m³ and the total cost amounting to **USD 28,800**, including a 20% contingency (see paragraph 428), for Punino.

z. Cóndor Norte

590. Ecuador claims USD 28,152,512 to remediate 28,263.30 m³ of soil over an area of 8,525 m².¹¹⁸⁴ Burlington opposes that claim but accepts that USD 100,000 are due on account of the improper abandonment of the well site.¹¹⁸⁵
591. Applying its general approach on land use (section 4.3.2.c) and therefore adopting sensitive ecosystem criteria,¹¹⁸⁶ the Tribunal identified two exceedance points: the first

¹¹⁷⁸ GSI concedes that the platform is surrounded by secondary forest and that there was no agriculture in the vicinity. GSI ER1, App. L.31, pp. 3-4.

¹¹⁷⁹ Sample 7-PUN-01-174-MSD-B. See: IEMS ER3, Annex C, Punino 1, pp. 8-14; GSI ER1, App. L, Table L.31.1 and Figures L.31.3 to L.31.4; GSI ER2, App. D, Table D.3, pp. 47-48.

¹¹⁸⁰ Ecuador’s Opening Statement, Slide 80; Ecuador’s Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009 (**Exh. E-563**); GSI ER1, App. L.31, p. 2; GSI ER2, App. B.5.

¹¹⁸¹ GSI ER1, App. B.3; Saltos WS1, Annex A; Solís WS2, ¶ 76.

¹¹⁸² GSI ER1, App. L.31, p. 3.

¹¹⁸³ Translation by the Tribunal. Block 7 Environmental Audit, November 2008, Table 5.1a (**Exh. E-252**). See also: *Id.*, Annex B.1, Photograph CO. 55.

¹¹⁸⁴ Revised Attachment 35 to IEMS ER4 (Excel), line 15 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Cóndor Norte Corrected, p. 15; IEMS ER4, Att. 38, Cóndor Norte, p. 17; 2nd SMCC, ¶¶ 268-270; Reply, ¶ 195(xx).

¹¹⁸⁵ GSI ER2, Tables 1 and 3.

to the north of the pit that collapsed in 2005/2006 with a slight cadmium exceedance,¹¹⁸⁷ and the second to the south of the platform with slight barium and cadmium exceedances.¹¹⁸⁸

592. Since the Consortium drilled the Cónдор Norte well in 2003 and stopped to operate it in 2005, it is clear that the harm was caused during the Consortium's time.¹¹⁸⁹ Burlington is thus liable to remediate the two exceedances identified above. The Tribunal will further address the pit collapse (paragraphs 809-810) and Burlington's duty to properly abandon the platform below (paragraphs 883-888).

593. Under the Tribunal's approach discussed above (sections 4.4.3.c and 4.5.2), the impacted area is 400 m² and the total volume of soil to be remediated is 800 m³. Considering a 30% contingency (see paragraph 428 above), the total cost amounts to **USD 312,000** for Cónдор Norte.

aa. Gacela 1/8 and CPF

594. Ecuador claims USD 23,891,552 to remediate 24,316.50 m³ of soil taken from an area of 12,325 m².¹¹⁹⁰ Burlington disputes that claim and refers to evidence of pre-Consortium drilling activities in 1991.¹¹⁹¹ It, however, included Gacela 1/8 as a principal site where the remediation of 1,350 m³ of soil may be warranted in an area of 960 m² for a total cost of USD 275,000.¹¹⁹² In addition, Burlington asserted that expansion activities of Petroamazonas had "resulted in removing soil and vegetation for which

¹¹⁸⁶ GSI concedes that secondary forest is "immediately adjacent" to the platform. GSI ER1, App. L.32.1, p. 4.

¹¹⁸⁷ Sample 7-CON-NTE-TE-100-(1.50-1.70). See: GSI ER2, App. D, Table D.3, pp. 49-50 and Figure D.5.14.

¹¹⁸⁸ Samples 07-CON01-SDA3-R(0,5-0,7)m and 07-CON01-SDA3-R(1,5-1,7)m. See: GSI ER2, App. D, Table D.3, p. 49.

¹¹⁸⁹ 2nd CMCC, ¶ 268; Rejoinder, ¶ 288; GSI ER1, App. L.32, p. 2; GSI ER2, App. B.5; IEMS ER4, Att. 38, Cónдор Norte, p. 1; Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 36 (**Exh. E-563**). IEMS indicates that the well was drilled in 2003 and abandoned in 2004.

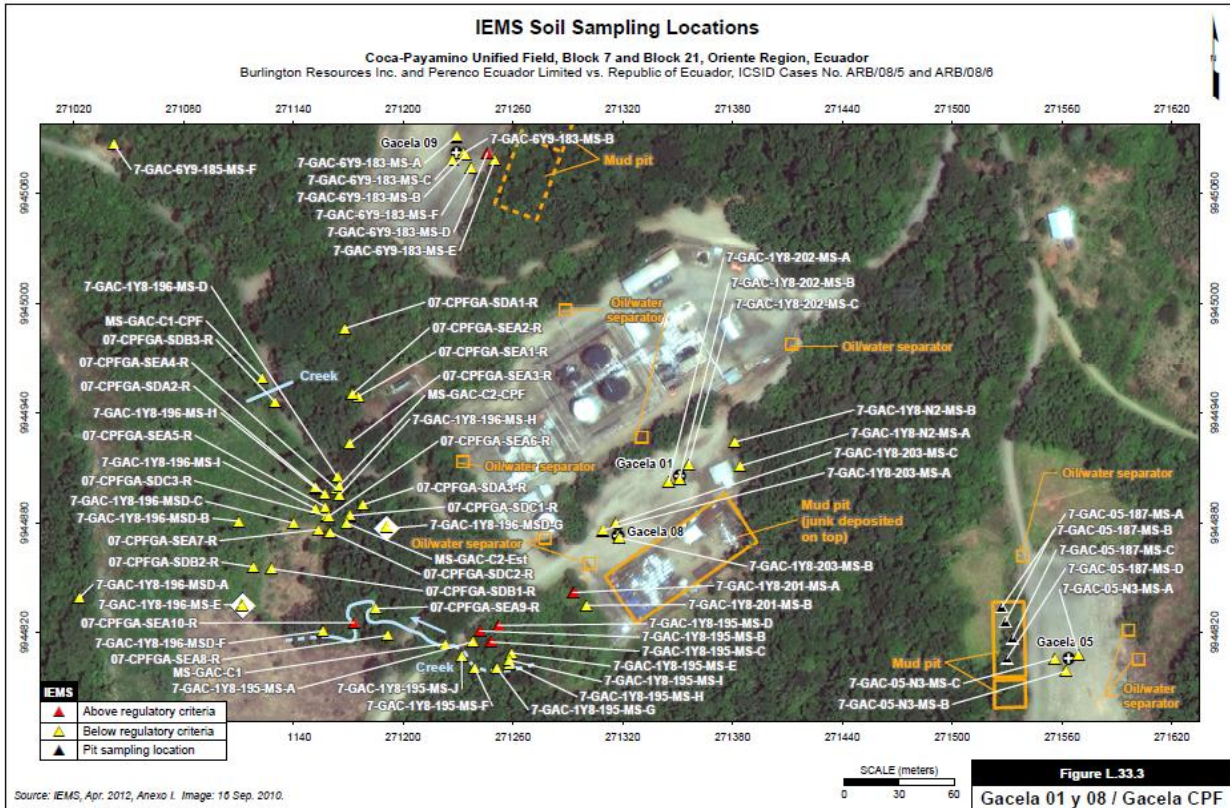
¹¹⁹⁰ Revised Attachment 35 to IEMS ER4 (Excel), line 21 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Gacela 1/8, pp. 21-22 and Gacela CPF Corrected, pp. 19-20; IEMS ER4, Att. 38, Gacela CPF, p. 16; 2nd SMCC, ¶¶ 245-246; Reply, ¶¶ 139-150.

¹¹⁹¹ GSI ER1, pp. 102-103; Tr. Site Visit (Day 4) (ENG), 49:30-50:4 (Presentation of Ms. Renfroe at Gacela 1/8); C-PSVB, ¶ 24.

¹¹⁹² CMCC, ¶¶ 395, 431; GSI ER1, ¶¶ 233, 235 and Table 3; GSI ER2, Table 4.

Ecuador claims remediation costs” to build a 16-inch pipeline connecting the Oso and Gacela fields.¹¹⁹³

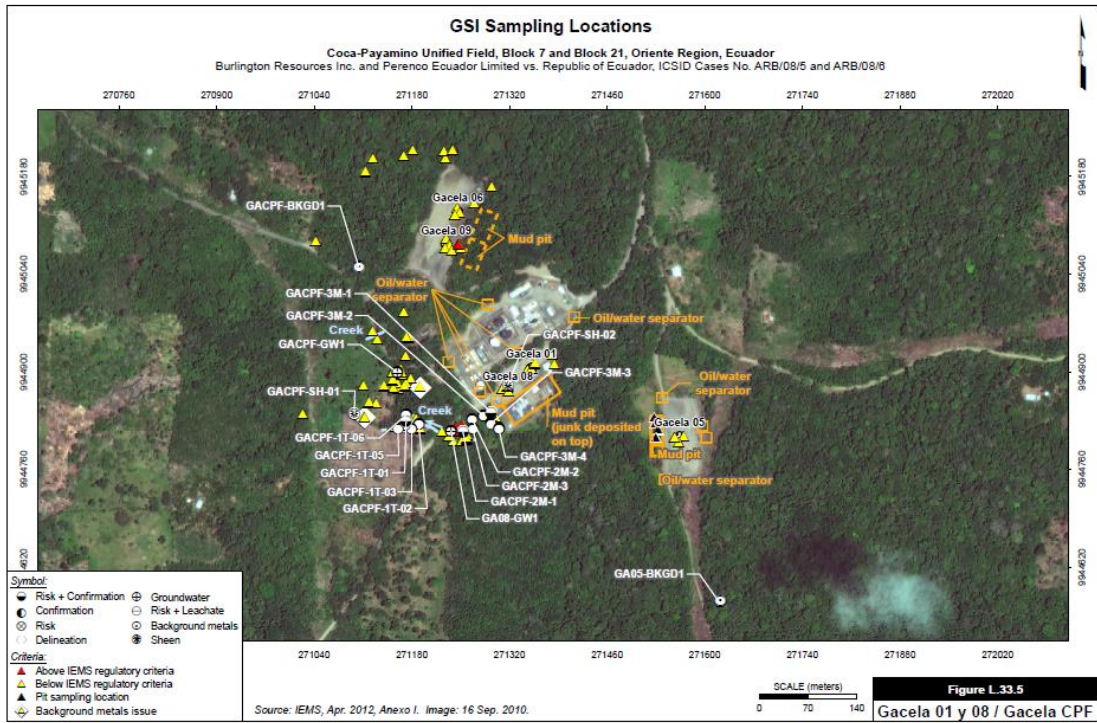
595. The following images show IEMS’s¹¹⁹⁴ and GSI’s¹¹⁹⁵ sampling locations at Gacela 1/8 and CPF:



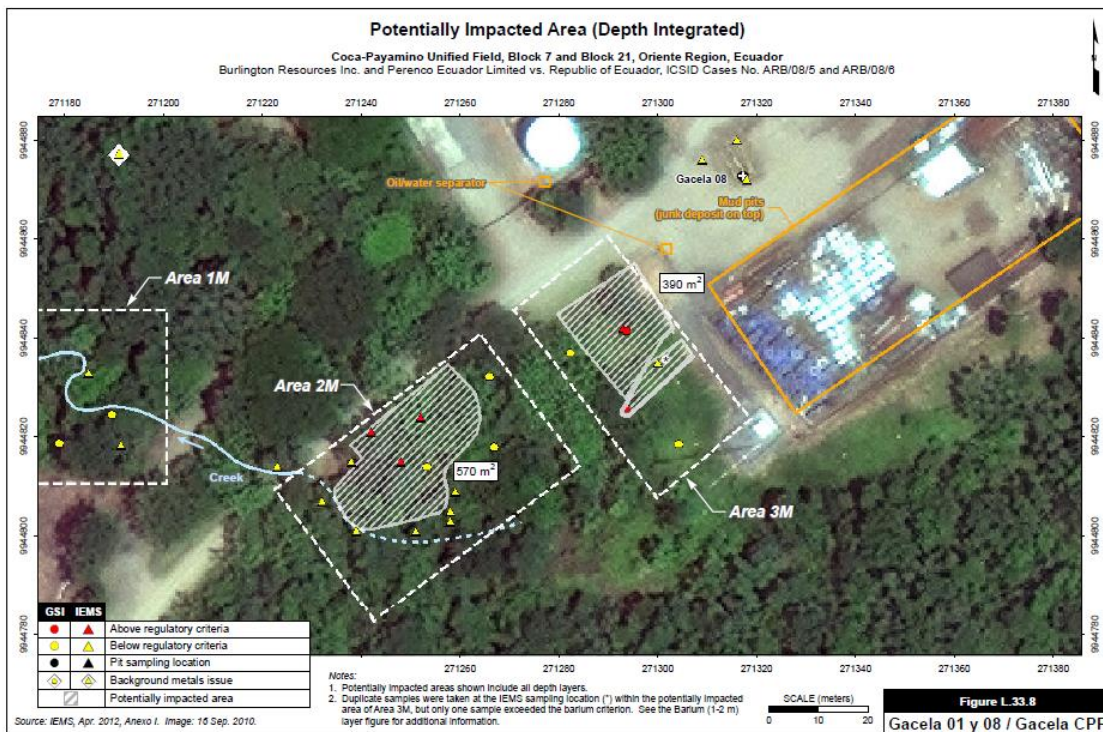
1193 Rejoinder, ¶ 80; Saltos WS1, ¶¶ 311-312; Saltos WS2, ¶¶ 125-126.

1194 GSI ER1, App. L, Figure L.33.3.

1195 *Id.*, Figure L.33.5.



596. GSI's delineation of the potentially impacted areas is illustrated below:¹¹⁹⁶



1196 *Id.*, Figure L.33.8.

597. Applying agricultural criteria to off platform locations pursuant to its land use approach set forth above (section 4.3.2.c), the sampling results show environmental harm in two areas and at other discrete sampling points, with TPH, barium, cadmium, lead and vanadium exceedances scattered around the western flank of Gacela CPF and the Gacela 1/8 platform.
598. The first area is linked to Gacela 1/8. It is a marshy, low-lying area to the southwest with a creek flowing in a plain to the west of Gacela CPF. GSI identified this area as 2M. The following compounds are found there in excess of permissible limits: barium, cadmium and vanadium.¹¹⁹⁷ The vanadium exceedance reaches a level of 460 mg/kg.¹¹⁹⁸ Above Area 2M is another designated by GSI as 3M, which hosts various barium exceedances.¹¹⁹⁹
599. The second area is linked to Gacela CPF and designated by the Tribunal as Area 1TR. It is located in the plain mentioned above along a small creek below the westernmost oil/water separator at Gacela CPF. There, the Tribunal identified various cadmium exceedances and one vanadium exceedance reaching the level of 373.5 mg/kg.¹²⁰⁰
600. In addition, there are several exceedances in the area designated by GSI as Area 1T,¹²⁰¹ as well as a little further to the west¹²⁰² and northwest.¹²⁰³
601. Oryx drilled Gacela 1 in 1991 and Gacela 8 in 1994.¹²⁰⁴ The CPF was built between those two dates.¹²⁰⁵ Gacela 1 is a production well and in 2004 the Consortium

¹¹⁹⁷ Samples 7-GAC-1Y8-195-MS-A-1,5, 7-GAC-1Y8-195-MS-B-0,5, 7-GAC-1Y8-195-MS-B-1,1, 7-GAC-1Y8-195-MS-C-0,5, 7-GAC-1Y8-195-MS-D-0,5, 7-GAC-1Y8-195-MS-D-1,5, 7-GAC-1Y8-195-MS-D13, 7-GAC-1Y8-195-MS-D-2,2, 7-GAC-1Y8-195-MS-E-0,5, 7-GAC-1Y8-195-MS-E-1,2, 7-GAC-1Y8-195-MS-F-0,5 and 7-GAC-1Y8-195-MS-H-0,5. See: GSI ER1, App. L, Table L.33.1 and Figure L.33.3; GSI ER2, App. D, Table D.3, pp. 50-51.

¹¹⁹⁸ Sample 7-GAC-1Y8-195-MS-B-0,5.

¹¹⁹⁹ IEMS samples 7-GAC-1Y8-201-MS-A-2,2, 7-GAC-1Y8-201-MS-A-3,1 and 7-GAC-1Y8-201-MS-B15; and GSI samples GACPF-3M-1-(2.8-3.1) and GACPF-3M-3-(1.0-2.0). See: GSI ER1, App. L, Tables L.33.1, L.33.4 and L.33.5, and Figures L.33.3 and L.33.5; GSI ER2, App. D, Table D.3, pp. 50-51. For GSI sampling locations, see also: GSI ER1, App. D, Annex D.3.4.

¹²⁰⁰ Samples 7-GAC-1Y8-196-MS-I-0,5, 7-GAC-1Y8-196-MS-I-1,5, 7-GAC-1Y8-196-MS-H-1,5 and 7-GAC-1Y8-196-MSD-G-0,7.

¹²⁰¹ Sample 07-CPFGA-SEA10-R.

¹²⁰² Sample 7-GAC-1Y8-196-MS-E-1,1.

¹²⁰³ Sample 7-GAC-1Y8-196-MSD-B-0,5.

converted Gacela 8 into an injection well.¹²⁰⁶ A review of the historical record of spills confirms that Gacela CPF saw various spills over the years.¹²⁰⁷ The pre-Consortium spills weaken the presumption of causation. By contrast, the record also includes several major unreported spills under the Consortium's operatorship, which Mr. Saltos sought to justify by explaining that the crude was contained within the retention walls of the CPF.¹²⁰⁸ However, there are indications in the record that the unreported 100 barrel spill of formation water and crude on 20 January 2007 partly reached the API separator on the west of the CPF and was thus in close proximity to Area 1TR.¹²⁰⁹ GSI also mentioned an allegedly remediated spill west of the API separator in 2007 of 3 barrels of produced water and 26 liters of oil.¹²¹⁰ In addition, there was another unreported crude spill of 17 barrels on 12 June 2008 at an unspecified location, of which 15 barrels were apparently recovered.¹²¹¹ Finally, the Tribunal notes that not a single sample was collected for the 2008 Environmental Audit, notwithstanding these numerous and occasionally large spills.¹²¹² These elements reinforce the presumption of causation in respect to Gacela CPF, and in particular as regards Area 1TR.

602. With respect to Gacela 1/8, the evidence of pre-Consortium drilling and workovers tends to rebut the presumption of causation. Yet, various other events during the Consortium's operatorship do reinforce the presumption. A 3-barrel spill of produced water on 2 October 2004 was reported to DINAPA on 5 October 2004¹²¹³ and a spill of

1204 Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, lines 37-38 (**Exh. E-563**); GSI ER1, App. L.33, p. 2.

1205 IEMS ER3, Annex C, Gacela CPF Corrected, p. 5.

1206 Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Gacela 8, Reacondicionamiento # 5, July 2004 (**Exh. E-573**).

1207 Pre-Consortium spills include: a 1 barrel crude spill on 5 December 1994 at flare sump due to equipment failure, of which Oryx recovered no barrel; a 2 barrel crude spill on 9 May 1995 at separator due to equipment failure, of which Oryx recovered 1 barrel; a 4 barrel crude spill on 21 October 1995 at Tank 101 due to poor operation, of which Oryx recovered 2 barrels; a 4 barrel crude spill on 18 February 1997 at the monarch separator due to equipment failure, of which Oryx recovered 3 barrels; and a 5 barrel crude spill on 24 September 1998 at the sump due to equipment failure, of which Petroproducción recovered 3 barrels. See: GSI ER1, App. B.3.

1208 Saltos WS2, ¶¶ 75, 77.

1209 Solís WS2, ¶ 76, item 7 and Annex 45 (internal spill report of 20 January 2007).

1210 GSI ER1, App. L.33, p. 4.

1211 Reply, ¶ 46; GSI ER1, App. B.3, line 93.

1212 Block 7 Environmental Audit, November 2008, p. 40, Table 3-3 (**Exh. E-252**).

1213 GSI ER1, App. B.3, line 73.

2-3 gallons of crude occurred on 2 October 2005 due to a technician incorrectly opening a valve.¹²¹⁴ The record reveals further that the Consortium conducted three workovers on the Gacela 1 well between 2002 and 2007 involving the use of chemicals during the repair or replacement of pumps.¹²¹⁵ The Consortium also drilled in the Gacela 8 well in 2004 when converting it into an injection well.¹²¹⁶ Finally, the Tribunal notes that not a single sample was collected for the 2008 audit.¹²¹⁷

603. In light of this record, the Tribunal assesses the rebuttal of the presumption of causation and the ensuing apportionment of liability as follows:

- i. Burlington is fully liable for the environmental condition in Area 1TR, mainly because of the unreported spills in 2007 and 2008.
- ii. Burlington is partly liable for the environmental condition in Areas 2M and 3M in a proportion of 50%. This proportion is chosen because Burlington is deemed to have partially overcome the presumption. Indeed, pre-Consortium drilling is likely to be an important cause of the contamination, but spills occurred at Gacela 1/8 under the Consortium's watch in addition to various workovers, and no samples were taken on the occasion of the 2008 audit.
- iii. Burlington is fully liable for the environmental condition in Area 1T. It is true that Petroamazonas built a pipeline and maintains a right of way at that location,¹²¹⁸ but there is no proof of its exact location or that it is located in such a way that it impacted Area 1T.¹²¹⁹ In any event, the Site Visit confirmed that the alleged right of way is not as large as the one seen at Mono CPF.

¹²¹⁴ Saltos WS1, Annex A.

¹²¹⁵ Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Gacela 1, Reacondicionamiento # 8, August 2002, Reacondicionamiento # 9, May 2005, and Reacondicionamiento # 10, June 2007 (**Exh. E-573**).

¹²¹⁶ Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Gacela 8, Reacondicionamiento # 5, July 2004 (**Exh. E-573**).

¹²¹⁷ Block 7 Environmental Audit, November 2008, p. 40, Table 3-3 (**Exh. E-252**).

¹²¹⁸ Rejoinder, ¶ 80; Saltos WS2, ¶¶ 125-126.

¹²¹⁹ Mr. Saltos provided a photograph of the right of way under construction, which does not appear to depict Area 1M, but an area slightly further to the southwest. See: Saltos WS1, ¶ 311.

604. Finally, Burlington is liable to remediate all other exceedance points to the northwest of Area 1T, because it failed to rebut the presumption that it caused the observed harm.
605. In accordance with the Tribunal's general methodology (sections 4.4.3.c ad 4.5.2), the remediation costs for these areas are as follows:
- i. The impacted area in Area 1TR is 600 m² and the total volume of soil to be remediated is 1,000 m³.¹²²⁰ Considering a 30% contingency (see paragraph 428), the total cost payable by Burlington is **USD 390,000**.
 - ii. Although the Tribunal principally agrees with the interpolation undertaken by GSI in Area 2M,¹²²¹ it increases the impacted area from 570 m² to 700 m² to include the remediation of both banks of the creek and the piece of land where the creek reaches the culvert. Since the impacted area at 2 meters of depth is larger than in the layer above, but does not totally overlap,¹²²² the Tribunal decided to collapse both layers for a total volume of soil to be remediated of 1,400 m³. The cost of remediation is thus USD 546,000, which includes a 30% contingency (see paragraph 428). Out of this amount, Burlington shall pay 50%, i.e. **USD 273,000**.
 - iii. In principle, the Tribunal also accepts GSI's delineation of Area 3M.¹²²³ However, it extends the impacted area around sample GACPF-3M-3-(1.0-2.0) by 110 m² to include an area on the downward slope, for a total impacted area of 500 m². Since barium contamination reaches 4 meters in depth and the lowest layer is the largest in terms of impacted area,¹²²⁴ the Tribunal collapsed all four layers for a total volume of soil of 2,000 m³. With a 20% contingency (see paragraph 428), the

¹²²⁰ The impacted area around samples 7-GAC-1Y8-196-MS-I-0,5 and 7-GAC-1Y8-196-MS-I-1,5 is 200 m². With a depth of 2 meters, the volume of soil is 400 m³. The impacted area around sample 7-GAC-1Y8-196-MS-H-1,5 is 200 m² and, with a depth of 2 meters, the volume of soil is 400 m³. Finally, the impacted area around sample 7-GAC-1Y8-196-MSD-G-0,7 is 200 m² and, with a depth of 1 meter, the volume of soil is 200 m³. See: GSI ER1, App. L, Figure L.33.3.

¹²²¹ GSI ER1, App. L, Table L.33.E.1 and Figures L.33.8, L.33.E.A.1, L.33.E.A.2, L.33.E.B.1 and L.33.E.B.2.

¹²²² Compare GSI ER1, App. L, Figure L.33.E.B.1 and Figure L.33.E.B.2.

¹²²³ GSI ER1, App. L, Table L.33.E.1 and Figures L.33.8, L.33.E.A.2, L.33.E.A.3, L.33.E.A.4, L.33.E.B.2, L.33.E.B.3 and L.33.E.B.4.

¹²²⁴ Compare GSI ER1, App. L, Figures L.33.E.A.2, L.33.E.A.3 and Figure L.33.E.A.4. See also: Figures L.33.E.B.2, L.33.E.B.3 and L.33.E.B.4.

cost of remediation totals USD 720,000, of which Burlington shall pay 50%, i.e. **USD 360,000**.

- iv. The impacted area in Area 1T is 200 m² and the volume of soil is 200 m³. Considering a 20% contingency (see paragraph 428), the remediation cost at that location amounts to **USD 72,000**.
- v. The impacted area around the discrete exceedance points to the northwest of Area 1T totals 280 m², comprising 200 m² around the lead exceedance to a depth of 2 meters¹²²⁵ and 80 m² around the slight cadmium exceedance to a depth of 1 meter.¹²²⁶ The total volume of soil is 480 m³ and the total cost, including a 30% contingency (see paragraph 428), is **USD 187,200**.

606. In conclusion, considering the apportionment of liability, Burlington shall pay a total of **USD 1,282,200** to remediate Gacela 1/8 and the CPF.

bb. Gacela 2

607. Ecuador claims USD 17,434,730 to remediate 19,962.80 m³ of soil covering an area of 14,785 m².¹²²⁷ Although Burlington recognizes that an area of 340 m² is impacted outside the southwestern corner of the platform, amounting to 340 m³ of soil to be remediated for a cost of USD 158,000, it disputes that it caused the exceedances observed. It argues that “Perenco and Burlington never operated this platform – didn’t drill, did not put a mud pit in, and so any contamination that we’re speaking of was not from the Burlington/Perenco Consortium”.¹²²⁸

608. The following figures depict IEMS’s¹²²⁹ and GSI’s¹²³⁰ sampling locations at Gacela 2:

¹²²⁵ Sample 7-GAC-1Y8-196-MS-E-1,1.

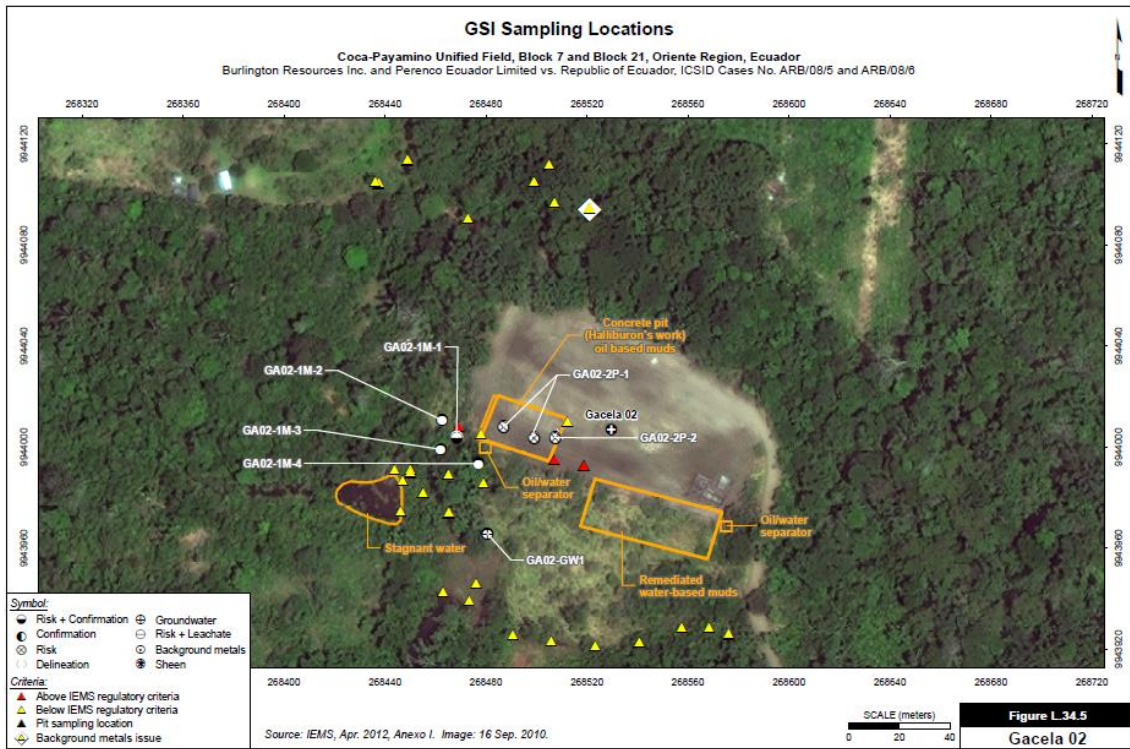
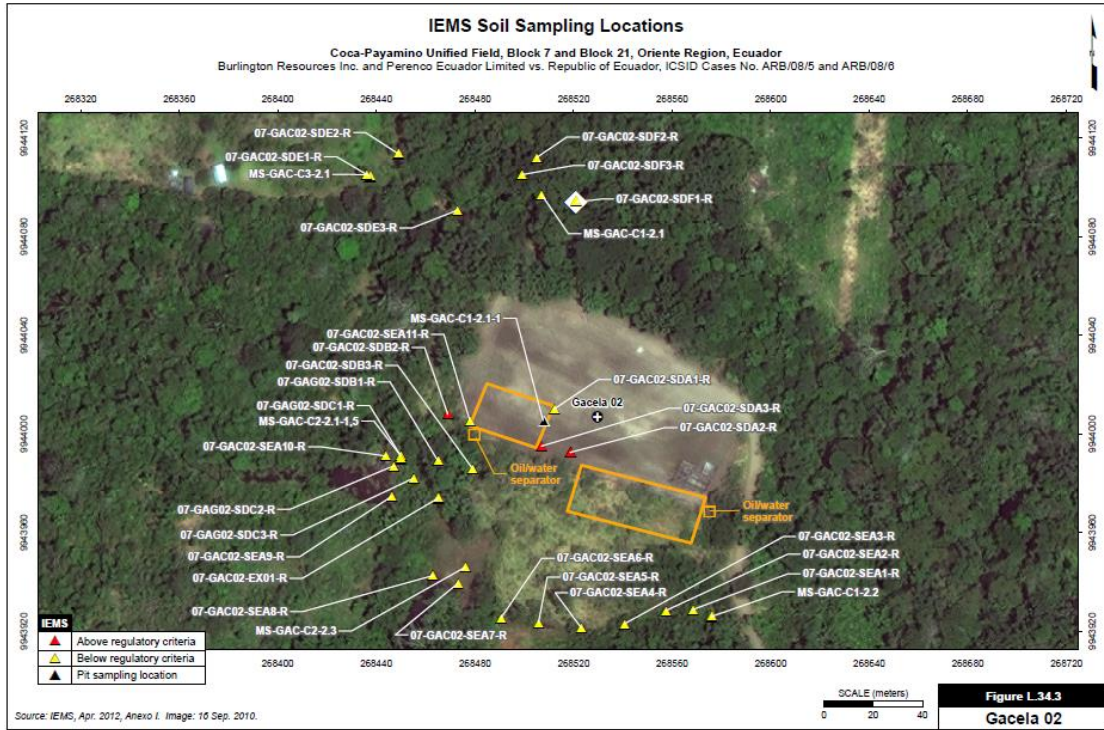
¹²²⁶ Sample 7-GAC-1Y8-196-MSD-B-0,5.

¹²²⁷ Revised Attachment 35 to IEMS ER4 (Excel), line 16 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Gacela 2 Corrected, pp. 21-22; IEMS ER4, Att. 38, Gacela 2, pp. 20-21; 2nd SMCC, ¶¶ 238-239.

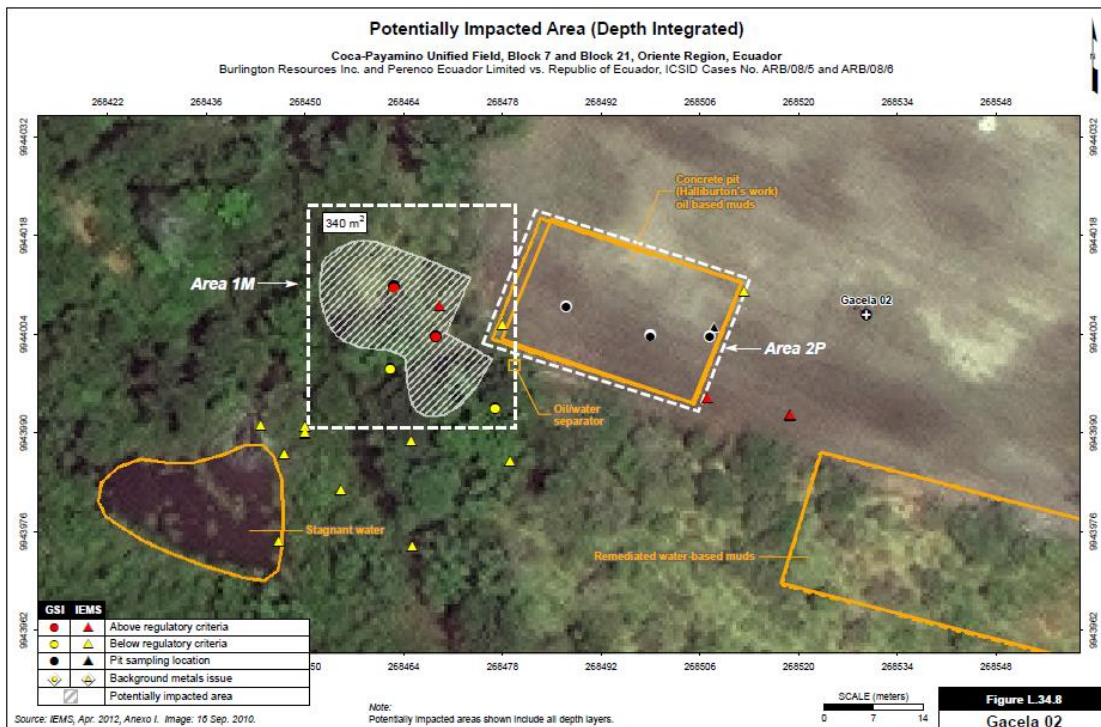
¹²²⁸ Tr. Site Visit (Day 4) (ENG), 28:23-26 (Presentation of Ms. Miller at Gacela 2); C-PSVB, ¶ 24.

¹²²⁹ GSI ER1, App. L, Figure L.34.3.

¹²³⁰ *Id.*, Figure L.34.5.



609. The potentially contaminated areas as calculated by GSI are shown below.¹²³¹



610. Although during the Site Visit the Tribunal witnessed agricultural land use scattered around the platform, it regards the area immediately surrounding the platform to the west and to the north as sensitive ecosystem, in particular because it is marshy land as is shown by the stagnant water below the southwestern corner of the platform and the creek flowing around the platform.¹²³² Contrary to this, the Tribunal applied agricultural criteria to three sample locations further to the northwest, where the land is cleared and used for agricultural purposes by local residents.¹²³³

611. On that basis, the Tribunal identified one exceedance point on the platform to the east of the pit designated by GSI as Area 2P with TPH, barium and vanadium levels in

¹²³¹ *Id.*, Figure L.34.8.

¹²³² The Tribunal also notes that GSI concedes that secondary forest is “immediately adjacent” to the west, north and east of the platform, with some agriculture-livestock pasturage to the west and to the south. GSI ER1, App. L.34.1, p. 6.

¹²³³ For sample locations 07-GAC02-SDE1-R, 07-GAC02-SDE2-R and MS-GAC-C3-2.1. See: GSI ER1, App. L, Figure L.34.3.

excess of the industrial limit.¹²³⁴ The vanadium level reaches 769.56 mg/kg and the TPH level is just under 20,000 mg/kg.¹²³⁵ It further identified four barium exceedances in the area designated by GSI as Area 1M.¹²³⁶ Finally, there are five exceedance points to the north of the platform showing that the soil is contaminated with cadmium, the highest level reaching 4.62 mg/kg.¹²³⁷

612. Gacela 2 was drilled in 1992 by Oryx. In 1994, Gacela 2A underwent directional drilling and Gacela 2B underwent horizontal drilling in 1997.¹²³⁸ The walls of the pit containing oil-based mud on the southwestern corner of the platform were remediated, the pit's contents were cemented, and it was eventually closed in 1998.¹²³⁹ One well was shut in 1999¹²⁴⁰ and, although Burlington argued that the Consortium never produced oil at that site,¹²⁴¹ it appears that the latter conducted a workover on the Gacela 2B well by

¹²³⁴ Sample 07-GAC02-SDA2-R. See: GSI ER1, App. L, Table L.34.1; GSI ER2, App. D, Table D.3, pp. 51-53. The Tribunal accepts GSI's explanation that sample MS-GAC-C1-2.1-1 is located in the pit in Area 2P. See: GSI ER1, App. D, Annex D.2, p. 11. The Tribunal further notes Burlington's explanation at the Site Visit that GSI revised the dimensions of the pit in Area 2P after reviewing the pit closure report of 1998, where it is stated that the pit is in fact 40 meters long. Having reviewed the closure report, the Tribunal accepts this position, although it observes that sample 07-GAC02-SDA-2 still appears to be located outside the pit area, based on the scale in GSI's maps. Accordingly, sample 07-GAC02-SDA3-R is deemed to be within the pit. See, for instance: GSI ER1, App. L, Figure L.34.3. See further: Tr. Site Visit (Day 4) (ENG), 23:24-24:7 (Presentation of Ms. Miller at Gacela 2); Taponamiento de piscina de excedentes de perforación de Gacela 2 por Llori Hnos, 1998 (CP-00026749 – 00026922), p. 68, Annex No. 1 (**Exh. E-472**).

¹²³⁵ GSI ER2, App. D, Table D.3, pp. 51-52.

¹²³⁶ IEMS sample 07-GAC02-SDB2-R(0,5-0,6)m, and GSI samples GA02-1M-1-(0.0-0.3), GA02-1M-1-(0.5-0.6) and GA02-1M-2-(0.0-1.0). See: GSI ER2, App. D, Table D.3, p. 52; GSI ER1, App. L, Tables L.34.3, L.34.4 and L.34.5.

¹²³⁷ Samples 07-GAC02-SDE2-R(0,5-0,7)m, 07-GAC02-SDE3-R(0,6-0,8)m, 07-GAC02-SDF1-R(0,4-0,6)m, 07-GAC02-SDF2-R(0,6-0,8)m and 07-GAC02-SDF3-R(2,4-2,5)m.

¹²³⁸ GSI ER2, App. B.5; Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, lines 39-40 (**Exh. E-563**).

¹²³⁹ Taponamiento de piscina de excedentes de perforación de Gacela 2 por Llori Hnos, 1998 (CP-00026749 – 00026922), pp. 29, item 4 and 65 (**Exh. E-472**). See: Tr. Site Visit (Day 4) (ENG), 17:6-18 (Tribunal, Connor).

¹²⁴⁰ GSI ER1, App. L.34, p. 2.

¹²⁴¹ Burlington put it as follows: "Gacela 2, no operations post 1999. Consortium and Burlington never operated here – never produced any oil there". Tr. Site Visit (Day 4) (ENG), 42:26-28 (Presentation of Ms. Miller at Gacela CPF).

perforating into the Basal Tena and Napo “T” reservoirs,¹²⁴² which well operated for a short time in 2004.¹²⁴³

613. The historical record of spills shows a 1-barrel crude spill in 1994, a 0.1-barrel crude spill in 1998 and a 0.24-barrel crude spill in 2003.¹²⁴⁴ IEMS also pointed to a number of complaints by affected individuals.¹²⁴⁵ According to an interview conducted by IEMS with Mr. Cesar Angamarca, the breakdown of a surface pipe affected the stream to the south of the platform.¹²⁴⁶ Further, on 29 June 2007, Mr. Ángel Verdezoto filed a complaint with the Ministry of Energy and Mines about drainage discharges that occurred on 25 April 2007.¹²⁴⁷ Moreover, the owner of the surrounding land, Ms. Narcisa Gutiérrez, filed a complaint with the ombudsman on 15 October 2007 “for failure to compensate and remediate contamination resulting from hydrocarbon activities developed on her land”.¹²⁴⁸ Equally, on 18 December 2007, several individuals filed a complaint with the ombudsman regarding “contamination caused on 3 July 2006 to rivers and surrounding lands”.¹²⁴⁹
614. Seeking to minimize the importance of these complaints, GSI essentially opined that IEMS relied on “vague anecdotal claims”.¹²⁵⁰ Yet, in the view of the Tribunal, these instances tend to demonstrate that Gacela 2 may not in fact have been properly operated. It is also noteworthy that not a single soil sample was collected for the 2008 Environmental Audit of Block 7.¹²⁵¹ The 2008 audit actually mentions that the perimeter

¹²⁴² The workover report indicates the following: “It was not possible to perforate into Basal Tena, as there was an obstruction in the 5” liner, as a consequence of which the production well of Napo ‘T’ was completed” (Translation by the Tribunal). The report also mentions the use of chemicals and the retrieval of cuttings and muds. See: Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Reacondicionamiento # 2 Gacela 2B, February 2003, pp. 8 and 9-10, items 11-13, 17-18 (**Exh. E-573**). See also: *Id.*, Reacondicionamiento # 2, Gacela 2B, Procedimiento de Trabajo, November 2002, p. 8, item 10 (**Exh. E-573**). See further: R-PSVB, ¶ 200.

¹²⁴³ Chart analyzing oil production and test data by field, reservoir and well for Blocks 7 and 21, p. 838 (**Exh. E-239**).

¹²⁴⁴ GSI ER1, App. B.3.

¹²⁴⁵ IEMS ER4, Att. 38, Gacela 2, pp. 6-10.

¹²⁴⁶ *Id.*, REC No. 7-GAC-02-371.

¹²⁴⁷ *Id.*, REC No. 7-GAC-2-431.

¹²⁴⁸ *Id.*, REC No. 7-GAC-2-429.

¹²⁴⁹ *Id.*, REC No. 7-GAC-2-422.

¹²⁵⁰ GSI ER1, App. L.34, pp. 7-10.

¹²⁵¹ Block 7 Environmental Audit, November 2008, p. 40, Table 3-3 (**Exh. E-252**).

drains and grease traps are not held in good condition. Finally, the Consortium adopted an abandonment plan that was never carried out.¹²⁵²

615. Taking all these elements into account, in particular the fact that the pit located in the southwestern corner was remediated and compacted with cement prior to the Consortium's time, and that the Consortium conducted a workover at that site, the Tribunal considers that Burlington did not rebut the presumption of causation and holds Burlington liable for the environmental condition in Area 1M and on the platform. Burlington is also liable to remediate the exceedances to the north and northwest of the platform, since it provided no explanation on these exceedances and, therefore, left the presumption intact.

616. For these different areas, in accordance with its general approach (sections 4.4.3.c and 4.5.2), the Tribunal establishes the extent of contamination and the remediation costs as follows:

- i. GSI proposed an impacted area in Area 1M of 340 m².¹²⁵³ The Tribunal increases the surface to 400 m² to include all soil between that area and the platform, and in particular the oil/water separator.¹²⁵⁴ Hence, the total volume of soil amounts to 400 m³ and, considering a 30% contingency (see paragraph 428), the total cost is **USD 156,000**.
- ii. The area impacted by the exceedance on the platform is 80 m², the volume of soil 160 m³, and, with a 20% contingency (see paragraph 428), the total cost is **USD 57,600**.
- iii. Finally, the impacted area for the five discrete cadmium exceedances to the northwest of the platform is 1,000 m², with a total volume of soil amounting to

¹²⁵² Block 7 Environmental Audit, November 2008, p. 90, Table 5.1a (**Exh. E-252**). See also: *Id.*, Annex B.3, Photographs GA. 11 and GA. 12. See further the verification list for Gacela 2: *Id.*, pp. 289-292.

¹²⁵³ GSI ER1, App. L, Table L.34.E.1 and Figures L.34.E.A.1 and L.34.E.B.1.

¹²⁵⁴ See, for instance: *Id.*, Figures L.34.8 and L.34.E.B.1.

1,400 m³,¹²⁵⁵ and a remediation cost of **USD 546,000**, which includes a 30% contingency (see paragraph 428).

617. In total, the remediation cost payable by Burlington for Gacela 2 amounts to **USD 759,600**.

cc. Gacela 4

618. Ecuador claims USD 13,092,445 to remediate 13,458.90 m³ of soil covering an area of 11,139 m².¹²⁵⁶ Burlington rejects that claim and argues that no remediation is warranted at that site.¹²⁵⁷ Burlington also pointed to the construction of the Oso-Gacela pipeline by Petroamazonas along the Gacela 4 platform.¹²⁵⁸

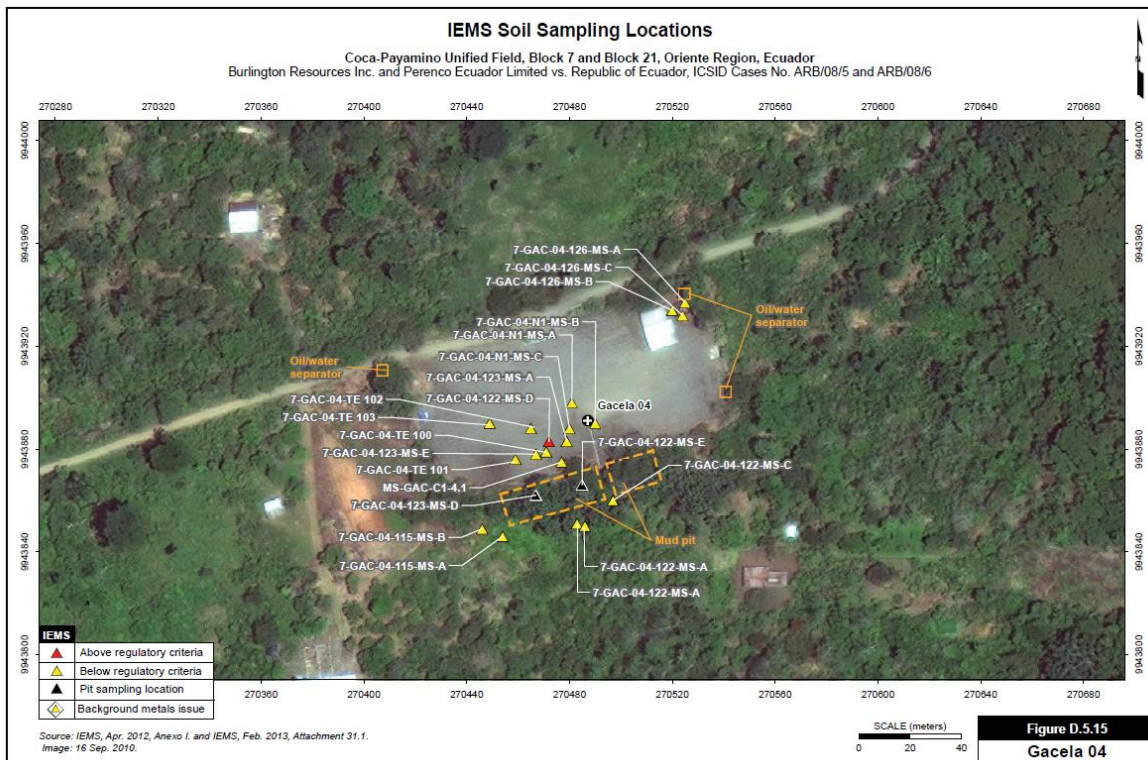
¹²⁵⁵ The impacted area is 200 m² around each exceedance point. The depth of contamination is 1 meter at four exceedance points and 3 meters at sample location 07-GAC02-SDF3-R. See: GSI ER1, App. L, Table L.34.1.

¹²⁵⁶ Revised Attachment 35 to IEMS ER4 (Excel), line 18 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Gacela 4, p. 19; IEMS ER4, Att. 38, Gacela 4, p. 18; 2nd SMCC, ¶ 241; Reply, ¶ 195(xviii). See also: Remodeled site for Gacela 4, August 2013, Figure 06-B (**Exh. E-499**).

¹²⁵⁷ GSI ER1, App. L.36; GSI ER2, Tables 1 and 3. For Burlington's explanations on the models created by IEMS for this site, refer to: C-PHB, ¶¶ 160-161.

¹²⁵⁸ GSI ER1, App. L.36, p. 1.

619. The following figure depicts IEMS's sampling locations,¹²⁵⁹ being specified that GSI collected no samples at Gacela 4.¹²⁶⁰



620. Following its approach on land use (section 4.3.2.c), the Tribunal identified one TPH exceedance on the platform under industrial use criteria,¹²⁶¹ and one cadmium exceedance southwest of the platform applying agricultural land use criteria to off platform locations.¹²⁶²

621. There is only a scant record of historical spills at that location.¹²⁶³ Next to some “localized minor staining”, GSI mentioned only one undated spill next to the power oil pump, which, according to GSI, was reported and remediated.¹²⁶⁴ Further, Ecuador’s

1259 GSI ER2, App. D, Figure D.5.15.

1260 GSI ER1, App. L.36; GSI ER2, App. D, Table D.4.

1261 Sample 7-GAC-04-122-MS-D-1,5. See: IEMS ER4, Att. 38, Gacela 4, pp. 9-16; GSI ER1, App. L, Table L.36.1 and Figures L.36.3 and L.36.4; GSI ER2, App. D, Table D.3, pp. 54-55 and Figures D.1.18 and D.5.15.

1262 Sample 7GAC-04-115-MS-A-1,2.

1263 GSI ER1, App. B.3; Saltos WS1, Annex A; Solís WS2, ¶ 76.

1264 GSI ER1, App. L.36, p. 4.

witness, Mr. Solís, mentioned an unreported 2 to 3 gallon crude oil spill on 3 August 2008 “affecting an area of 40 sq. mts. of land and vegetation, due to a failure in the operation of the Gacela 4 well”.¹²⁶⁵ In addition, the record shows that the Consortium conducted various workovers at that well, including a workover in 2003 with drilling in the Napo “U” reservoir involving the use of chemicals.¹²⁶⁶ Finally, the Tribunal notes that no soil samples were taken for the 2008 Environmental Audit and that the audit reported that the perimeter drains and grease traps were in poor condition.¹²⁶⁷

622. On that basis, the Tribunal holds Burlington fully liable to remediate the exceedances at Gacela 4 identified above. This applies to the TPH exceedance on the platform and the off platform exceedance, in an area that does not appear affected by Petroamazonas’ expansion activities.¹²⁶⁸

623. The impacted area on the platform extends over 80 m²; the volume of soil amounts to 160 m³; and applying a 20% contingency (see paragraph 428), the remediation cost totals **USD 57,600**. The impacted off platform area extends to 200 m²; the volume of soil to be remediated amounts to 400 m³; and, with a 20% contingency (see paragraph 428), the remediation cost totals **USD 144,000**. In conclusion, the total remediation cost at Gacela 4 payable by Burlington amounts to **USD 201,600**.

dd. Gacela 5

624. Ecuador claims USD 2,015,056 to remediate 1,950 m³ of soil to be taken from an area of 600 m².¹²⁶⁹ Burlington disputes that claim and argues that no exceedances exist at that site.¹²⁷⁰

¹²⁶⁵ Solís WS2, ¶ 76, item 18 and Annex 56 (E-mail from the B7 HES Supervisor, 4 August 2008). The Tribunal notes that this e-mail was sent to Mr. Saltos, who did not mention this spill in his own list of spills. The Tribunal further notes that the e-mail mentions an upcoming workover.

¹²⁶⁶ Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Gacela 4, Reacondicionamiento # 5, February 2003, pp. 2 and 5, item 24 (**Exh. E-573**). In 2008, the Consortium conducted workovers ## 6-9 consisting of pump repairs, the last one involving the use of chemicals. See: *Id.*, Resultados reacondicionamiento # 9, October 2008, p. 2. See also: R-PHB, ¶ 200.

¹²⁶⁷ Block 7 Environmental Audit, November 2008, p. 40, Table 3-3 and p. 90, Table 5.1a (**Exh. E-252**).

¹²⁶⁸ Compare the sampling location with the tract of the right of way for the Oso-Gacela pipeline. See: GSI ER1, App. L.36, p. 1 and Figure L.36.3.

¹²⁶⁹ Revised Attachment 35 to IEMS ER4 (Excel), line 19 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Gacela 5, pp. 12-13; 2nd SMCC, ¶ 242.

625. Disregarding pit soil for the time being, there are no off platform exceedances under any regulatory criteria. However, there is a lead exceedance (587.3 mg/kg) next to the Gacela 5 well.¹²⁷¹
626. Burlington did not report any historical spills at that site.¹²⁷² However, the record shows an unreported 3.14-barrel oil spill close to the power oil unit that occurred on 7 September 2007 “due to severe corrosion of the Gacela 5 flowline”.¹²⁷³ In addition, the Consortium conducted two workovers at that well site, the last one involving the use of chemicals.¹²⁷⁴ Accordingly, the Tribunal holds that Burlington has not succeeded in rebutting the presumption of causation and is thus liable for the platform exceedance.
627. The impacted area is 80 m², the volume of soil 80 m³.¹²⁷⁵ With a 20% contingency (see paragraph 428), the total cost of remediation is **USD 28,800** for Gacela 5.

ee. Gacela 6/9

628. Ecuador claims USD 4,691,236 to remediate 4,629.30 m³ of soil covering an area of 3,561 m².¹²⁷⁶ Burlington opposes this claim and argues that no remediation is called for at that site.¹²⁷⁷
629. The following figure depicts IEMS’s sampling locations at Gacela 6/9:¹²⁷⁸

¹²⁷⁰ GSI ER2, Tables 1 and 3.

¹²⁷¹ Sample 7-GAC-05-N3-MS-A23. See: GSI ER1, App. L, Table L.37.1 and Figures L.37.3 and L.37.4; GSI ER2, App. D, Table D.3, p. 55.

¹²⁷² GSI ER1, App. B.3; Saltos WS1, Annex A.

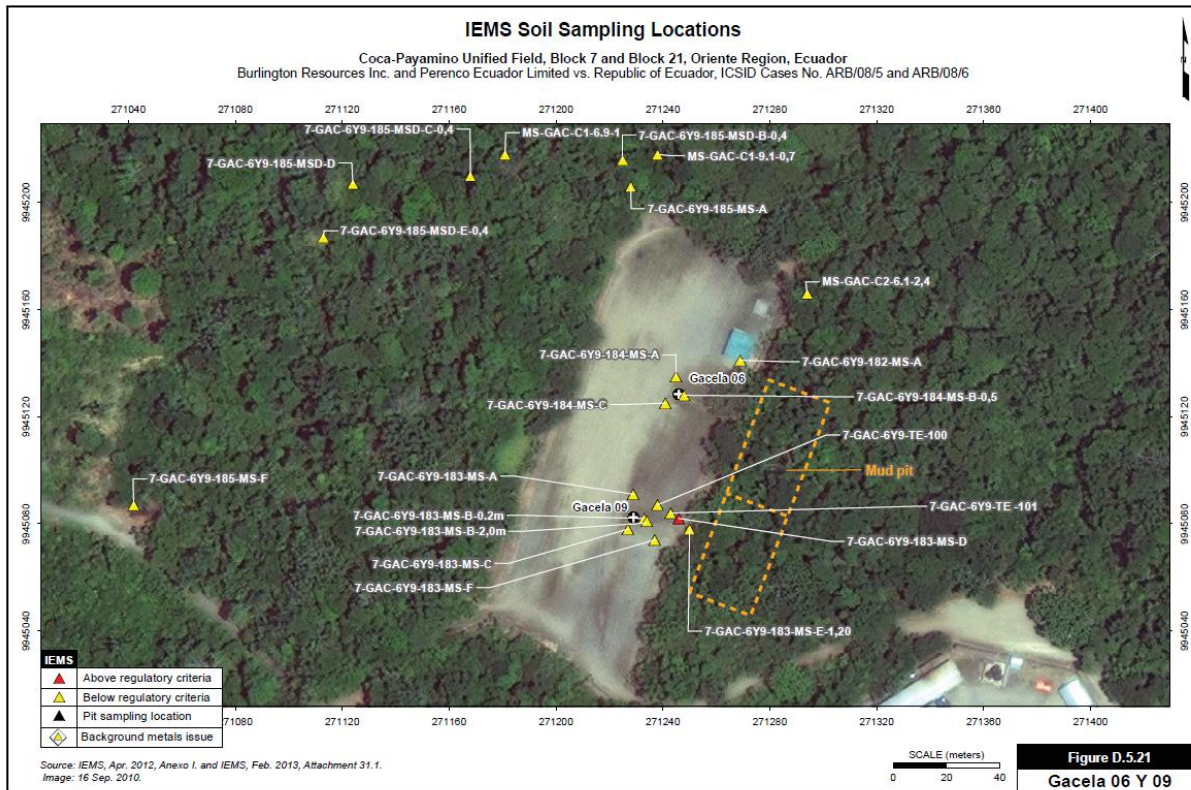
¹²⁷³ According to the incident report, the spill was discovered by an operator when checking the Gacela 5 well. The operator detected “that there is oil at the surface close to the Power Oil unit of the GA 05 Well” and that there is “a leak that surges from the return buried line of the GA 05 well”. According to the report, the spill was due to “internal corrosion of the 4” pipe”. See: Solís WS2, Annex 50, pp. 1-2. See also: Reply, ¶ 51(c); R-PHB, ¶ 837(c); Solís WS2, ¶ 76.

¹²⁷⁴ Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Gacela 5, Reacondicionamiento # 5, 5 December 2005, p. 2 (**Exh. E-573**).

¹²⁷⁵ Sample 7-GAC-05-N3-MS-A23 is not included in IEMS’s sampling results, but GSI included it in both its reports. Not knowing the exact depth of the sample, the Tribunal applied 1 meter.

¹²⁷⁶ Revised Attachment 35 to IEMS ER4 (Excel), line 20 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Gacela 6/9 Corrected, pp. 17-18; IEMS ER4, Att. 38, Gacela 6/9, p. 14; 2nd SMCC, ¶¶ 243-244; Reply, ¶ 195(xix). See also: Remodeled site for Gacela 6/9, August 2013, Figure 07-B (**Exh. E-499**).

¹²⁷⁷ GSI ER2, Tables 1 and 3.



630. Applying sensitive ecosystem criteria in accordance with its land use methodology (Section 4.3.2.c),¹²⁷⁹ the Tribunal identified five separate locations showing cadmium exceedances to the north and west of the platform.¹²⁸⁰ Even under agricultural land use criteria, these sample points would have revealed the same heavy metals exceedances. In addition, the Tribunal identified a barium exceedance on the platform to the east of the Gacela 9 well.¹²⁸¹

1278 *Id.*, App. D, Figure D.5.21. GSI did not collect any soil samples at this site. See: GSI ER1, App. L.38; GSI ER2, App. D, Table D.4.

1279 GSI provided no information on the land use at this site. GSI ER1, App. L.38.1. IEMS stated that the platform is “bordered by native rainforest to the north and west”. IEMS ER3, Annex C, Gacela 6/9, p. 1. Satellite imagery shows that dense forest covers areas to the north and west of the platform. See: GSI ER2, App. D, Figure D.5.21.

1280 Samples 7-GAC-6Y9-MS-A-1,5, 7-GAC-6Y9-MSD-C-0,4, 7-GAC-6Y9-MSD-D-0,2, 7-GAC-6Y9-MSD-D-1,0, 7-GAC-6Y9-MSD-E-0,4, 7-GAC-6Y9-MS-F-0,5 and 7-GAC-6Y9-MS-F-1,5. See: GSI ER1, App. L, Table 38.1; GSI ER2, App. D, Table D.3, pp. 55-56 and Figures D.1.24 and D.5.21.

1281 Sample 7-GAC-6Y9-183-MS-D-0,2.

631. Gacela 6/9 was drilled by Oryx in 1994.¹²⁸² Burlington mentioned three spills at this site: a 6-barrel crude oil spill at the chemical injection nipple on 16 March 1995; a 110-barrel crude oil spill at the hydraulic unit on 5 April 1996; and a 3-barrel crude oil spill due to vandalism along the Gacela 6/9 pipeline on 27 October 2008.¹²⁸³ Ecuador's witness, Mr. Solís, further referred to an unreported discharge of crude oil and water near the power oil unit affecting 21 m³ of soil.¹²⁸⁴ The Tribunal further notes that the Consortium conducted a workover at the Gacela 9 well in 2008 to convert it into an injection well,¹²⁸⁵ in addition to a workover at the Gacela 6 well in November 2002 involving the use of chemicals.¹²⁸⁶ Finally, the Tribunal also observes that no soil samples were collected for the 2008 Environmental Audit, which otherwise indicated that the perimeter drains and grease traps were in poor condition at this site.¹²⁸⁷
632. Considering that all spills mentioned above were crude oil spills, that there are no exceedances of TPH at this site, and that the Consortium conducted a workover, the Tribunal holds Burlington liable for the barium exceedance on the platform and for the cadmium exceedances off the platform.
633. In reliance on the Tribunal's methodology set forth above (sections 4.4.3.c and 4.5.2), the impacted area on the platform is 80 m²; the volume of soil is 80 m³; and, with a 20% contingency (see paragraph 428), the cost of remediation is **USD 28,800**. As to the five

¹²⁸² GSI ER2, App. B.5; Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 43 (**Exh. E-563**).

¹²⁸³ GSI ER1, App. B.3, lines 11, 20 and 95. See also: Saltos WS1, ¶ 108, item 9 and Annex A; Letter of 27 October 2008 from Eric D'Argenté (Perenco) to Byron Arregui (DINAPA) (**Exh. CE-CC-180**).

¹²⁸⁴ Solís WS2, ¶ 76, item 14 and Annex 52 (E-mail of 27 April 2008 from B7 HES Supervisor). The Tribunal notes that the e-mail was addressed to Mr. Saltos and stated the following: "On Saturday, we detected a crude oil and water spill close to the Power Oil unit of GA 06-09. We proceeded to excavate and determined that the contamination came from cracks in the sewer of the power oil tile. We withdrew approx. 21 m³ of contaminated material towards the land farming at Pay[amino] CPF. We replaced the withdrawn material with scraps and the sewer was left for repair. We cannot estimate the crude/oil/water volume that spilled out towards the platform. Observing the grease traps, traces of oil on them can be spotted. There is no contamination outside the platform".

¹²⁸⁵ GSI ER2, App. B.4; Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Gacela 9, Reacondicionamientos y Información, October 2008, pp. 12ff (**Exh. E-573**). See also: R-PSVB, ¶ 200.

¹²⁸⁶ Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Gacela 6, Reacondicionamiento, November 2002, p. 5 (**Exh. E-573**).

¹²⁸⁷ Block 7 Environmental Audit, November 2008, p. 40, Table 3-3 and p. 90, Table 5.1a (**Exh. E-252**).

off platform exceedances, the impacted area is 1,000 m². Considering a depth of two meters at two of these exceedance points and one at the others, the total volume of soil to be remediated is 1,400 m³, for a total cost of **USD 546,000**, which includes a 30% contingency (see paragraph 428).

634. In conclusion, the total remediation cost at Gacela 6/9 for which Burlington is liable amounts to **USD 574,800**.

ff. Jaguar 1

635. Ecuador claims USD 995,206 to remediate 920.40 m³ of soil from an area of 708 m².¹²⁸⁸ Jaguar 1 is one of the two sites where Burlington accepted liability because it “cannot definitively link harm to non-Consortium activities”.¹²⁸⁹ Burlington concedes that there was an oil spill in 2005 affecting an area designated by GSI as Area 3T and accepts to pay USD 213,000 to remediate 430 m³ in that location.¹²⁹⁰ By contrast, Burlington attributes the exceedances in Areas 1M and 2M to pre-Consortium drilling activities in 1987.¹²⁹¹ It thus disputes its liability for the remediation of an area where according to GSI 1,110 m³ would have to be recovered from an area of 370 m².¹²⁹²

¹²⁸⁸ Revised Attachment 35 to IEMS ER4 (Excel), line 23 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Jaguar 1, pp. 22-23; 2nd SMCC, ¶¶ 262-263; R-PHB, ¶¶ 31, 568.

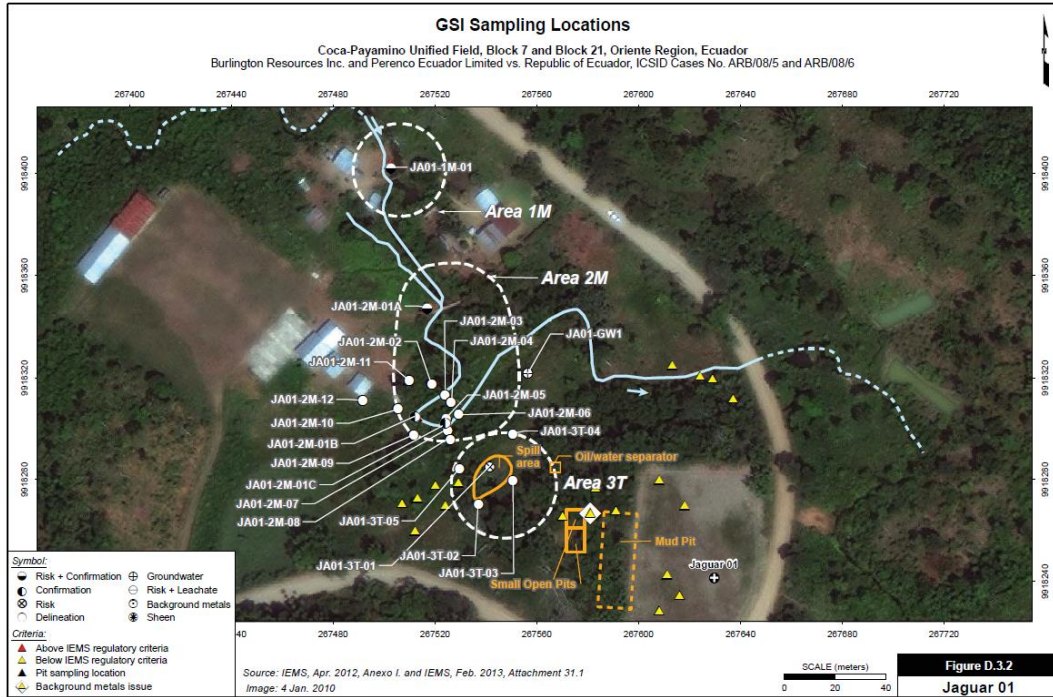
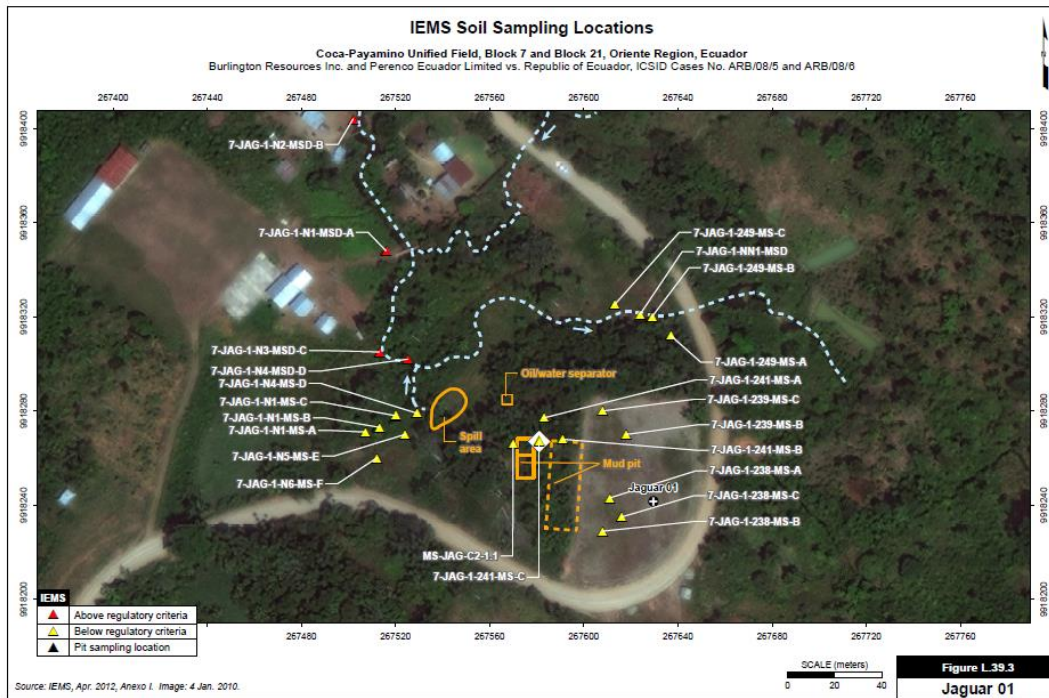
¹²⁸⁹ C-PHB, ¶ 71.

¹²⁹⁰ GSI ER2, Table 4 and App. D, Figures D.4.2 and D.7.2.4.b.

¹²⁹¹ Saltos WS2, ¶ 55.

¹²⁹² GSI ER2, Table 4 and App. D, Figures D.4.2, D.7.2.4.a, D.7.2.4.c and D.7.2.4.d.

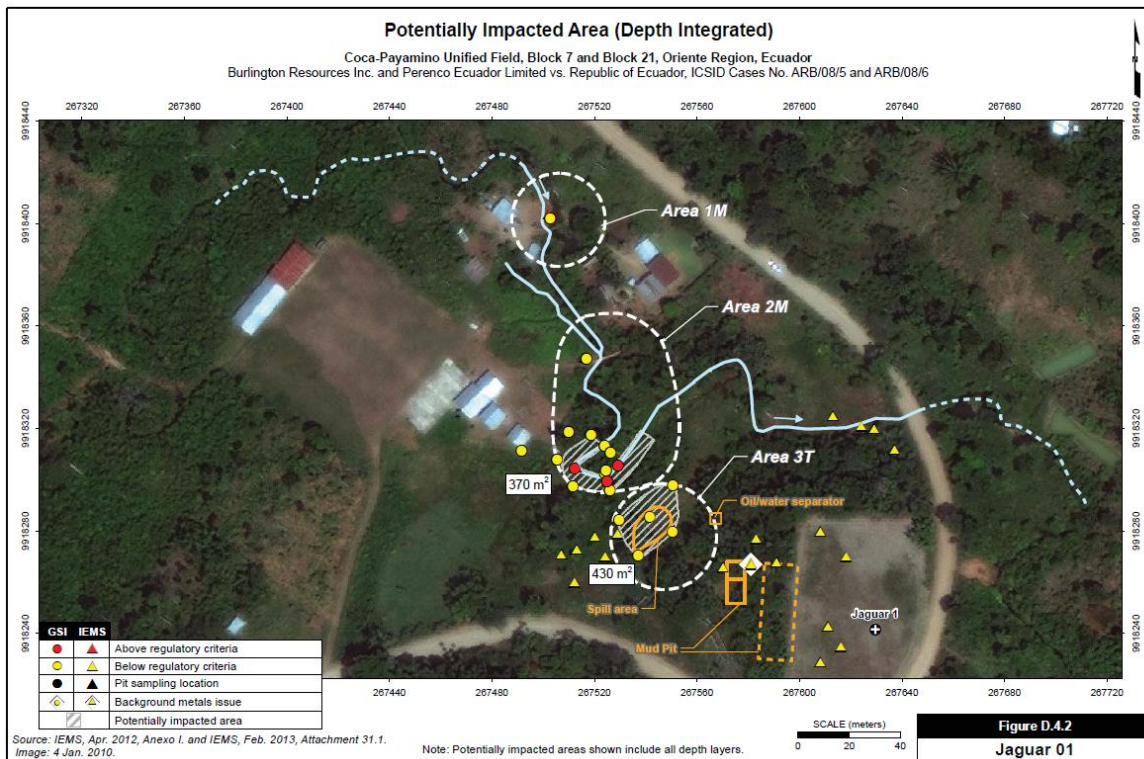
636. The following images show IEMS's¹²⁹³ and the GSI's¹²⁹⁴ sampling locations at Jaguar 1:



1293 GSI ER1, App. L, Figure L.39.3.

1294 GSI ER2, App. D, Figure D.3.2.

637. The contaminated areas as calculated by GSI for these locations are as follows:¹²⁹⁵



638. Because of the close proximity of the platform to the community *La Delicia*,¹²⁹⁶ the Tribunal applies agricultural criteria for parameters analysed under RAOHE (TPH, cadmium, lead and nickel) and residential criteria under TULAS for barium, the latter being more protective of human health. Since the platform was due to be abandoned by the Consortium, the Tribunal also applied agricultural land use criteria to the platform itself, and respectively residential land use criteria for barium.

639. In reliance on the criteria just specified, the Tribunal identified cadmium exceedances at six sample points on the platform¹²⁹⁷ and one nickel exceedance to the west of the platform.¹²⁹⁸ It further identified several barium exceedances in Area 2M,¹²⁹⁹ a barium

¹²⁹⁵ *Id.*, Figure D.4.2.

¹²⁹⁶ IEMS ER3, Annex C, Jaguar 1, p. 1; GSI ER2, App. D, Figures D.3.2 and D.6.2.

¹²⁹⁷ Samples 7-JAG-1-238-MS-A-0,7, 7-JAG-1-238-MS-A-1,5, 7-JAG-1-238-MS-B-0,7, 7-JAG-1-238-MS-B-1,5, 7-JAG-1-238-MS-C-0,7, 7-JAG-1-238-MS-C-1,5, 7-JAG-1-239-MS-B-0,7, 7-JAG-1-239-MS-B-1,5, 7-JAG-1-239-MS-C-0,7, 7-JAG-1-239-MS-C-1,5 and 7-JAG-1-239-MS-D'-1,5. See: GSI ER1, App. L, Table L.39.1 and Figure L.39.3; GSI ER2, App. D, Table D.3, p. 57.

¹²⁹⁸ Sample 7-JAG-1-241-MS-C-1,5. See: GSI ER1, App. L, Table L.39.1 and Figure L.39.3; GSI ER2, App. D, Table D.3, p. 58.

exceedance in Area 1M,¹³⁰⁰ and another one between Areas 1M and 2M, which is close to the school of *La Delicia*.¹³⁰¹

640. There is no record of historical spills prior to the Consortium's takeover of the Blocks.¹³⁰² There was an unreported spill in 2005 that the Consortium did not remediate.¹³⁰³ Burlington's witness, Mr. Saltos, confirmed that Jaguar 1 was a stand-by well shortly put back into operation by the Consortium after a workover.¹³⁰⁴ Accordingly, the presumption of causation stands and Burlington must bear the costs of remediating all the exceedances.¹³⁰⁵
641. Turning now to the measure of contamination and remediation costs, the Tribunal first notes that Ecuador brings no claim for Area 3T when Burlington admits liability in an amount of USD 213,000. To the extent that the amount awarded for this site does not exceed the amount claimed, the Tribunal accepts to grant the amount conceded by Burlington, in particular because the latter admitted a spill in 2005.
642. In connection with the impacted areas and remediation costs of the other contaminated locations, the Tribunal makes the following findings:
- i. For Area 1M, the impacted area is 200 m² and the volume of soil 600 m³. The same measurements apply to the sample point between Areas 1M and 2M,

1299 IEMS samples 7-JAG-1-N3-MSD-C and 7-JAG-1-N4-MSD-D; and GSI samples JA01-2M-01B-(2.0-2.3), JA01-2M-06-(0.0-0.3), JA01-2M-06-(0.0-0.3)-DUP, JA01-2M-07-(1.0-2.0), JA01-2M-07-(2.0-3.0), JA01-2M-10-(1.0-2.0). See: GSI ER1, App. L, Table L.39.1 and Figure L.39.3; GSI ER2, App. D, Table D.3, p. 58 and Figures D.1.2 and D.3.2.

1300 Sample 7-JAG-1-N2-MSD-B. See: GSI ER2, App. D, Table D.3, p. 58.

1301 Sample 7-JAG-1-N1-MSD-A. See: *Ibid*.

1302 GSI ER1, App. B.3.

1303 Tr. (Day 4) (ENG), 1246:1-1258:6 (Cross, Saltos); R-PHB, ¶¶ 23, 744, 765, 775, 803-810. See also: GSI ER2, Table 4. Mr. Saltos did not mention this spill in his witness statements, see: Saltos WS1, Annex A.

1304 R-PHB, ¶¶ 721, 804; Tr. (Day 4) (ENG), 1238:9-1239:12 (Cross, Saltos). See also: Field notes, forms, maps and checklists of GSI Environmental – Second campaign, Phase 2 – Jaguar 1, Site Summary Report, Environmental Field Investigation Notebook, May 2012 (**Exh. E-476**). See also: Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Jaguar 1, Reacondicionamiento # 1, May 2004 (**Exh. E-573**); GSI ER2, App. B.4.

1305 Tr. (Day 4) (ENG), 1292:4-14 (Cross, Saltos) (“Well, there I’m assuming responsibility on myself on behalf of the Consortium, because these were the times when the Consortium was in operation. If at that time there had been any indication of responsibility, I could have said yes, it was the Consortium who caused that”); R-PHB, ¶ 810.

i.e. sample 7-JAG-1-N1-MSD-A. Thus, the total for these two exceedance points is 400 m² and 1,200 m³.

- ii. Area 2M is in close proximity to human dwellings and located in the neck of a stream that flows away from the residential area. GSI estimated an impacted area of 370 m² and a total volume of soil of 1,110 m³.¹³⁰⁶ Considering in particular that GSI put dirty borings back into the soil¹³⁰⁷ and that it did not account for sample JA01-2M-10, which exceeds the limit for residential land use for barium, the Tribunal sets the impacted area at 500 m² and the soil volume for remediation at 1,500 m³.
- iii. In respect of the seven exceedance points on or close to the platform, the Tribunal admits an impacted area of 560 m². Considering a depth of two meters, this brings the volume of soil to be remediated to 1,120 m³.
- iv. With a 30% contingency (see paragraph 428), the total cost incurred to remediate Area 1M and 2M, as well as the barium exceedance between these two areas, is **USD 1,053,000**. With a 20% contingency (see paragraph 428), the cost incurred to remediate the exceedances on or around the platform is **USD 403,200**. To this, the Tribunal adds the amount conceded by Burlington for Area 3T, i.e. USD 213,000, for a total amount to remediate this site of **USD 1,669,200**.

643. As the total remediation cost claimed by Ecuador for Jaguar 1 is lower than the aggregate of the sums just established, the Tribunal awards the full amount claimed by Ecuador, i.e. **USD 995,206**.

gg. Jaguar 2

644. Ecuador claims USD 14,201,806 to remediate 15,403.70 m³ covering an area of 5,328 m².¹³⁰⁸ Burlington disputes that it bears any liability, although it recognizes that

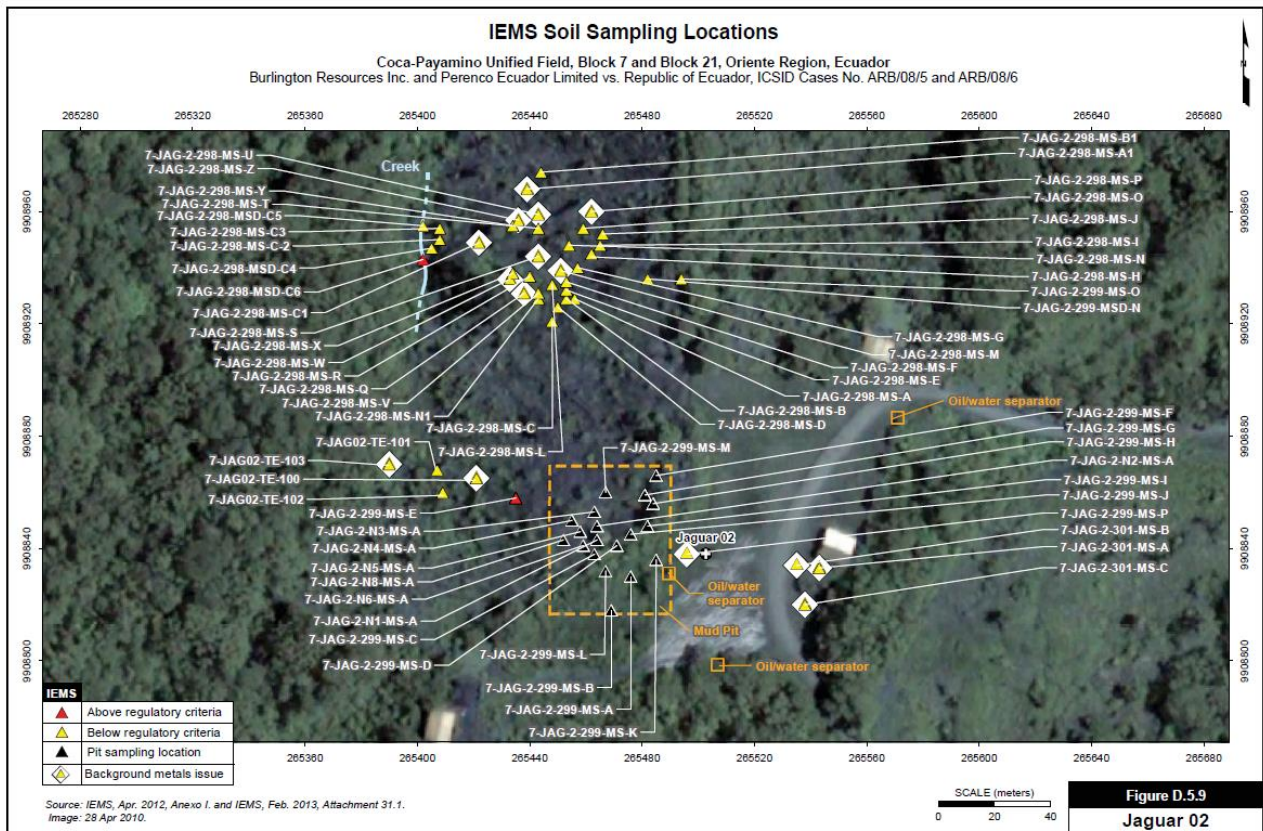
¹³⁰⁶ GSI ER2, Table 4 and App. D, Tables D.7.2.4.a, D.7.2.4.c and D.7.2.4.d. The Tribunal notes that this soil volume exceeds the one claimed by Ecuador. Yet, again to the extent that the total amount that should be awarded according to the Tribunal's determinations for this site does not exceed the amount claimed, the Tribunal does take it into consideration.

¹³⁰⁷ R-PHB, ¶¶ 294, 365. See: GSI ER2, Annex D.7.1.1, Field Forms, p. 16, GSI Log Book for sample CO08-4M-05B, 3 March 2013.

¹³⁰⁸ Revised Attachment 35 to IEMS ER4 (Excel), line 24 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Jaguar 2, p. 44; IEMS ER4, Att. 38, Jaguar 2, p. 57; 2nd SMCC, ¶ 264.

100 m³ of soil have been impacted by pre-Consortium drilling activities and 30 m³ by an undated oil spill, for a total cost of USD 128,000.¹³⁰⁹ Furthermore, Burlington accepts to bear USD 100,000 for costs needed to properly abandon the well.¹³¹⁰ Otherwise, Burlington discards the heavy metals exceedances as unrelated to oilfield operations.

645. The following pictures illustate IEMS's¹³¹¹ and GSI's¹³¹² sampling locations at Jaguar 2:

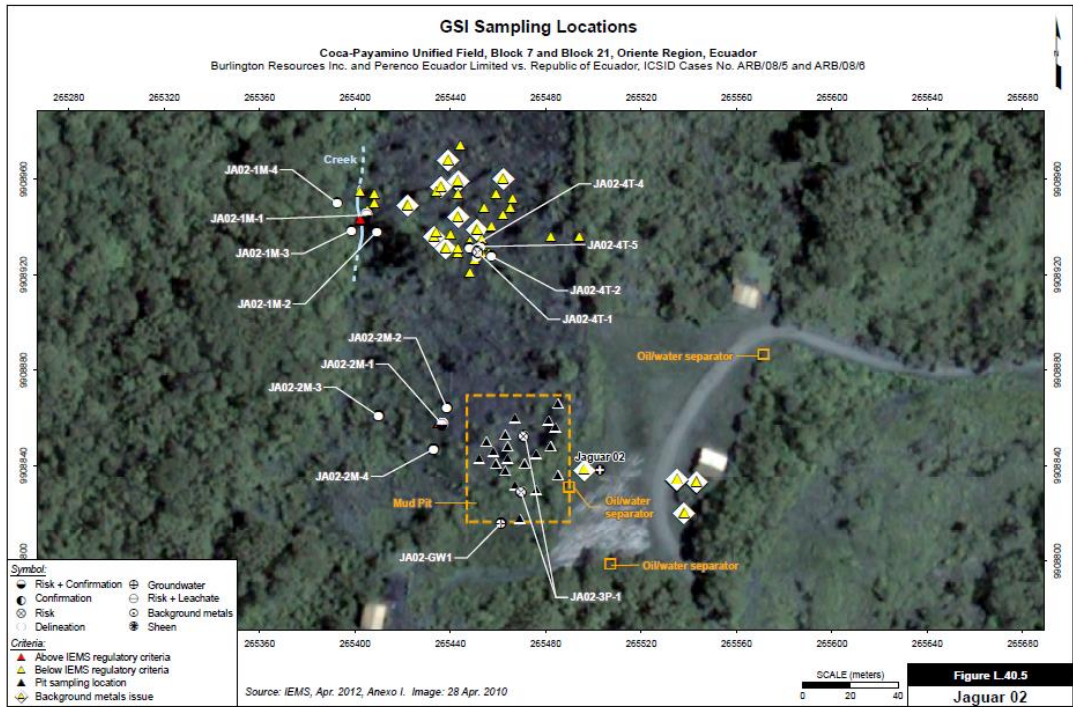


1309 GSI ER2, Tables 1, 3 and 4.

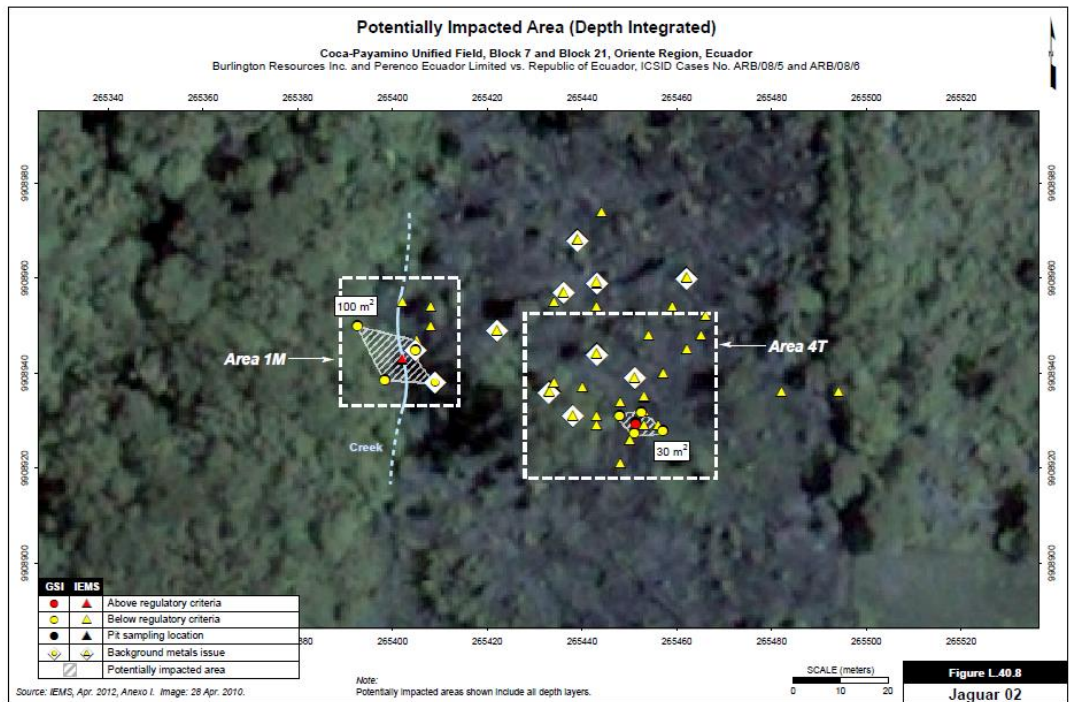
1310 *Id.*, Table 3.

1311 *Id.*, App. D, Figure D.5.9.

1312 GSI ER1, App. L, Figure L.40.5.



646. GSI's calculated impacted area for two of the areas at stake, i.e., 1M and 4T, is shown below:¹³¹³



¹³¹³ *Id.*, Figure L.40.8.

647. In line with its methodology (section 4.3.2.c), since Jaguar 2 formed part of the Consortium's Final Abandonment Plan,¹³¹⁴ the Tribunal applied agricultural land use criteria to the platform,¹³¹⁵ as well as to areas to the northeast, east, southeast and south of the platform. On that basis, it identified one nickel exceedance just west of the wellhead,¹³¹⁶ and three cadmium and nickel exceedances on the eastern side of the platform close to the former crude oil storage tank vault.¹³¹⁷
648. Applying sensitive ecosystem criteria to sampling locations to the west, northwest and north of the platform¹³¹⁸ (leaving aside pit soil in Area 3P at this stage),¹³¹⁹ the Tribunal identified numerous cadmium and nickel exceedances, as well as four separate TPH, barium, chromium and lead exceedances, to the northwest of the platform in and around two areas identified by GSI as Areas 4T¹³²⁰ and 1M.¹³²¹ GSI observed that Area

¹³¹⁴ Plan de Abandono Definitivo y Entrega de Áreas Utilizadas para la Perforación y Producción de Petróleo del Bloque 7: Gacela 2, Gacela 3, Lobo 4, Jaguar 2, Jaguar 8 (subsuelo únicamente), Jaguar 9, Cóndor Norte, 2 November 2008 (**Exh. E-256**).

¹³¹⁵ GSI also applied agricultural limits to platform locations. See: GSI ER1, App. L, Table L.40.1, p. 3.

¹³¹⁶ Sample 7-JAG-2-299-MS-P-1,5. See: *Ibid*.

¹³¹⁷ Samples 7-JAG-2-301-MS-A-0,7, 7-JAG-2-301-MS-A-1,5, 7-JAG-2-301-MS-B-0,5, 7-JAG-2-301-MS-B-1,5 and 7-JAG-2-301-MS-C-0,5. See: *Ibid*.

¹³¹⁸ IEMS indicates that jungle is located to the north of the platform and that agriculture is approximately 250 meters to the west. For its part, GSI accepts that secondary forest is located to the north of the platform, with some agriculture immediately adjacent to it, and that agriculture is located to the west. Based on a review of aerial photographs and satellite imagery, the Tribunal deems that subsequent land use at the sampling locations in Areas 1M, 2M and 4T is properly classified as sensitive ecosystem. See: IEMS ER3, Annex C, Jaguar 2, p. 1; GSI ER1, App. L.40.1, p. 6, Figure L.40.6 and Att. L.40.A-L.40.B.

¹³¹⁹ In light of the very high barium, cadmium, lead, nickel and vanadium values, the Tribunal accepts that Area 3P is a mud pit. This does not appear to be disputed by Ecuador, since IEMS identified an area "to the southwest of the platform [...] presumed to be a potential mud pit due to the resistivity contrast seen in the area" (REC No. 7-JAG-2-301). IEMS ER4, Att. 38, Jaguar 2, p. 7; Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 48 (**Exh. E-563**). See also: GSI ER1, App. B.5 and App. L.40, pp. 3-4, Table L.40.1 and Figure L.40.6.

¹³²⁰ There are TPH, cadmium, lead and nickel exceedances in Area 4T. IEMS samples 7-JAG-2-298-MS-A-1,5, 7-JAG-2-298-MS-A1-1,5, 7-JAG-2-298-MS-B1-1,5M, 7-JAG-2-298-MS-C1-0,5, 7-JAG-2-298-MS-C1-1,5, 7-JAG-2-298-MS-D`-0,5, 7-JAG-2-298-MS-D`-1,5M, 7-JAG-2-298-MS-D´-0,5M, 7-JAG-2-298-MS-D-0,5M, 7-JAG-2-298-MS-D´-1,5M, 7-JAG-2-298-MS-D-1,5M, 7-JAG-2-298-MS-E-0,5M, 7-JAG-2-298-MS-F-1,5, 7-JAG-2-298-MS-G-0,5M, 7-JAG-2-298-MS-G-1,5M, 7-JAG-2-298-MS-H-0,5M, 7-JAG-2-298-MS-I-1,5, 7-JAG-2-298-MS-J-0,5M, 7-JAG-2-298-MS-L-1,5M, 7-JAG-2-298-MS-M-0,5M, 7-JAG-2-298-MS-M-1,5M, 7-JAG-2-298-MS-O-0,5M, 7-JAG-2-298-MS-O-1,5M, 7-JAG-2-298-MS-P-0,5M, 7-JAG-2-298-MS-P-1,5M, 7-JAG-2-298-MS-Q-0,5, 7-JAG-2-298-MS-R-1,5, 7-JAG-2-298-MS-S-0,5, 7-JAG-2-298-MS-S-1,5M, 7-JAG-2-298-MS-U-1,5, 7-JAG-2-298-MS-V-1,5, 7-JAG-2-298-MS-W-0,5M, 7-JAG-2-298-MS-W-1,5M, 7-JAG-2-298-MS-X-1,5M, 7-JAG-2-298-MS-Y-0,5M, 7-JAG-2-298-MS-Y-1,5M and 7-JAG-2-298-MS-Z-1,5M;

4T is a hillside which drops down toward the northwest into a steep ravine, lying above Area 1M which borders a creek.¹³²² Finally, there are a number of barium, cadmium, chromium, lead and nickel exceedances in and around an area designated as Area 2M.¹³²³

649. The Jaguar 2 well was drilled by BP in 1988 as a vertical well, recompleted as a horizontal well in 1996, and taken out of service in 2000 according to GSI.¹³²⁴ While production figures indeed confirm that the well stopped producing in March 2000, they also indicate that production resumed between July 2001 and February 2005.¹³²⁵
650. There is no record of historical spills other than a 10 barrel crude oil spill on 6 April 2005 because the Jaguar 2 flow line was sabotaged.¹³²⁶ Jaguar 2 is one of the few sites where Burlington acknowledged that there were “limited areas of weathered crude oil”.¹³²⁷ Mr. Saltos, Burlington’s witness, testified that the affected area was cleaned and

and GSI sample JA02-4T-1-(0.0-0.3). See: GSI ER1, App. L, Tables L.40.1, pp.1-2, L.40.3 and L.40.5 and Figures L.40.3, L.40.5, L.40.6; GSI ER2, App. D, Table D.3, pp. 59-60 and Figures D.1.12 and D.5.9.

¹³²¹ There are barium, cadmium, chromium and nickel exceedances in Area 1M. IEMS samples 7-JAG-2-298-MSD-C6-0,5, 7-JAG-2-298-MS-C-2-1,5M, 7-JAG-2-298-MS-C-3-1,5M, 7-JAG-2-298-MSD-C4-0,5M, 7-JAG-2-298-MSD-C5-0,5 and 7-JAG-2-298-MSD-C6-0,5; and GSI samples JA02-1M-1(0.0-0.5) and JA02-1M-2-(0.0-1.0). See: GSI ER1, App. L, Tables L.40.1, p. 1, L.40.3 to L.40.5, and Figures L.40.3, L.40.5, L.40.6; GSI ER2, App. D, Table D.3, p. 59 and Figures D.1.12 and D.5.9. Also: R-PHB, ¶ 126.

¹³²² GSI ER1, App. L.40, pp. 3-4.

¹³²³ IEMS samples 7-JAG02-TE-100(2.5-2.7), 7-JAG02-TE-101(1.5-1.7), 7-JAG02-TE-103(1.5-1.7) and 7-JAG-2-299-MS-E; and GSI samples JA02-2M-2-(0.0-1.0), JA02-2M-2-(1.0-2.0), JA02-2M-2-(2.0-3.0), JA02-2M-2-(3.0-4.0), JA02-2M-4-(0.0-0.1) and JA02-2M-4-(3.0-4.0). See: GSI ER1, App. L, Tables L.40.1, L.40.3 to L.40.5 and Figures L.40.3, L.40.4, L.40.6. Also: R-PHB, ¶ 126.

¹³²⁴ GSI ER1, App. B.5 and App. L.40, p. 2; Ecuador’s Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 46 (**Exh. E-563**).

¹³²⁵ Chart analysing oil production data by block, field and reservoir for Blocks 7 and 21, 1990 to July 2009, p. 946 (**Exh. E-239**). For its part, the Abandonment Plan indicates that production lasted until 13 August 2004, with a daily production of 22 bpd. Plan de Abandono Definitivo y Entrega de Áreas Utilizadas para la Perforación y Producción de Petróleo del Bloque 7: Gacela 2, Gacela 3, Lobo 4, Jaguar 2, Jaguar 8 (subsuelo únicamente), Jaguar 9, Cóndor Norte, 2 November 2008, p. 3-1, Table 3-1 (**Exh. E-256**).

¹³²⁶ GSI ER1, App. B.3, line 79; Saltos WS1, Annex A.

¹³²⁷ GSI found visual evidence of a crude oil spill at Jaguar 2, specifying that “[w]eathered crude oil is present in the ground surface within an approximate 30-square meter area located approximately 55 meters west of the northwest corner of the well platform”. See: GSI ER1, pp. 74, 81.

remediated,¹³²⁸ but GSI noted that not a single barrel of crude oil was recovered, without further specifying what remediation technology was used, if any.¹³²⁹

651. The record does not show the exact location of that spill. From GSI's general description, the Tribunal infers that it affected Area 4T and therefore most likely also Area 1M which lays further downhill.¹³³⁰ This understanding is reinforced by the fact that IEMS heard from local residents of a crude oil spill to the northwest of the platform, which was apparently only superficially cleaned.¹³³¹ The Tribunal further notes that no samples were taken at Jaguar 2 for the preparation of the Abandonment Plan,¹³³² and only one soil sample for the 2008 Environmental Audit.¹³³³ Finally, GSI's explanation that the weathered crude found in Area 4T may have been caused by "natural oil seeps, which are known to occur in this area" appears speculative and is not supported by other evidence. As a consequence, the Tribunal considers that Burlington has not rebutted causation and is liable to remediate the exceedances in Areas 4T and 1M.
652. As for the exceedances in and around Area 2M, they appear related to prior discharges into the pit located in Area 3P, since they have similarly high – sometimes even higher values – than the ones in Area 3P.¹³³⁴ These exceedances therefore appear connected to pre-Consortium drilling operations and Burlington must be regarded as having rebutted the causation presumption in this respect.

¹³²⁸ Saltos WS1, Annex A.

¹³²⁹ GSI ER1, App. B.3, line 79.

¹³³⁰ GSI provided the following observations: "GSI investigated an area about 120 m northwest of the platform, where a hillside dropped down toward the northwest into a steep ravine. In this location, the GSI team found a recently cleared area with crude oil on the ground surface and buried at shallow depths at the southeast edge. The crude oil was localized and distributed over an approximately 7 m by 7m area. Available information suggested that these spots may be from a natural oil seep, which are known to occur in this area". GSI ER1, App. L.40, p. 3.

¹³³¹ REC No. 7-JAG-2-298. See: IEMS ER4, Att. 38, Jaguar 2, p. 6.

¹³³² The reason provided in the Abandonment Plan was that there was no evidence of areas contaminated by TPH. See: Plan de Abandono Definitivo y Entrega de Áreas Utilizadas para la Perforación y Producción de Petróleo del Bloque 7: Gacela 2, Gacela 3, Lobo 4, Jaguar 2, Jaguar 8 (subsuelo únicamente), Jaguar 9, Cóndor Norte, 2 November 2008, p. 3-21 (**Exh. E-256**).

¹³³³ Block 7 Environmental Audit, November 2008, p. 40, Table 3-3 (**Exh. E-252**). Similarly, only one sample was collected for the 2006 audit. Block 7 Environmental Audit, November 2006, Table 3-3 (**Exh. E-334**).

¹³³⁴ GSI ER1, App. L, Tables L.40.1, pp. 2-4, L.40.4 and L.40.5; GSI ER2, App. D, Table D.3, pp. 61-62 and Figure D.5.9.

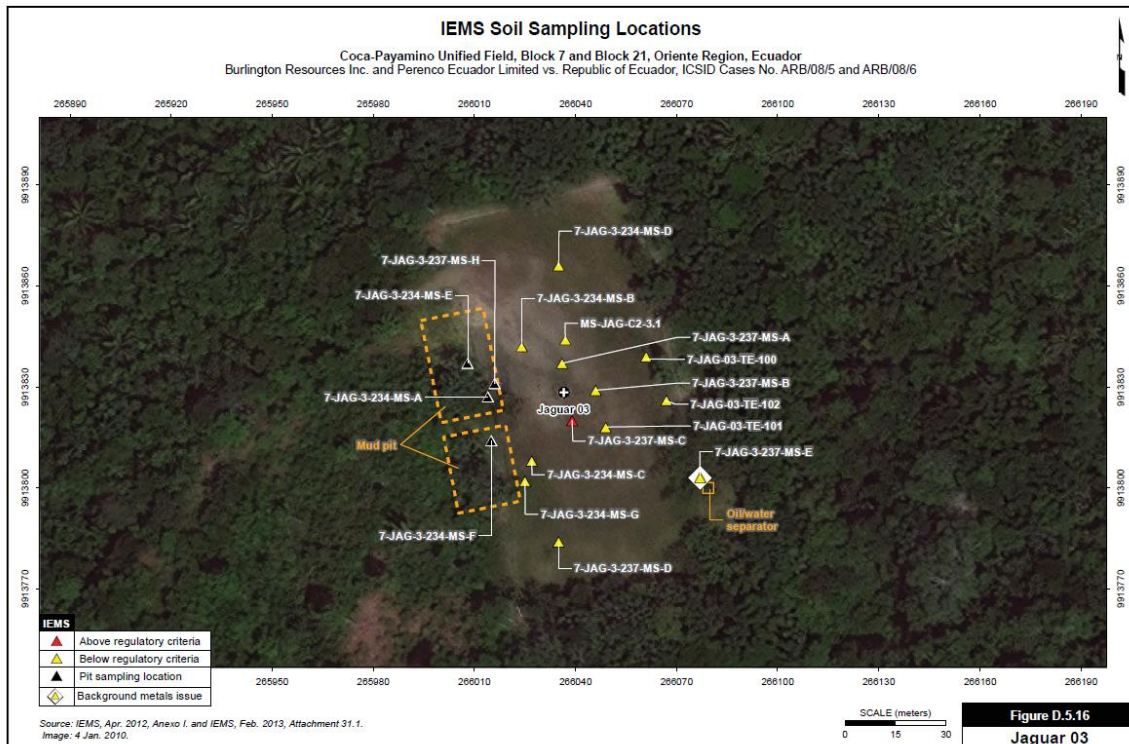
653. Finally, with respect to the discrete heavy metal exceedances located on the platform, the record shows that the Consortium did operate Jaguar 2 from 2002 through 2005. As a result, the Tribunal holds that Burlington failed to rebut the presumption of causation in this regard and, hence, must bear the costs of remediation.
654. Proceeding now to measure the impact and remediation costs for these three locations, the Tribunal makes the following findings:
- i. in respect of Area 4T, GSI delineated 30 m² around the TPH exceedance (see figure in paragraph 646 above), although it is surrounded by heavy metals exceedances. This delineation appears clearly insufficient.¹³³⁵ In reliance on its methodology set out above (sections 4.4.3.c and 4.5.2), the Tribunal considers that the impacted area in and around Area 4T is 2,400 m² and the total volume of soil 4,800 m³. Considering a 30% contingency (see paragraph 428), the total remediation cost amounts to **USD 1,872,000**.
 - ii. In Area 1M, GSI delineated an area of 100 m². Doing so, it incorrectly drew the outer edge of that area at the sample locations with chromium and nickel exceedances.¹³³⁶ Seeking to better align the delineation with the contamination, the Tribunal determines an impacted area of 300 m² surrounding these additional exceedance points, which also lies further upwards the hill, from where the contamination would appear to have flown down. Consequently, the total volume of soil is 600 m³. With a 30% contingency (see paragraph 428), the total remediation cost is thus **USD 234,000**.
 - iii. For the four platform exceedance points, the Tribunal determines the impacted area to be 800 m². Considering a depth of two meters at three exceedance points and of one meter at the fourth point, the volume of soil is 1,400 m³. With a 20% contingency (see paragraph 428), the costs amount in consequence to **USD 504,000**.
655. In sum, Burlington is liable to compensate Ecuador for Jaguar 2 in an amount of **USD 2,610,000**.

¹³³⁵ GSI ER1, App. L, Figures L.40.8 and L.40.E.B.2.

¹³³⁶ GSI ER1, App. L, Figures L.40.8 and L.40.E.B.1.

hh. **Jaguar 3**

656. Ecuador claims USD 15,933,119 to remediate 15,960.10 m³ of soil to be taken from an area of 5,051 m².¹³³⁷ Burlington rejects this claim and refers in support to pre-Consortium drilling activities. It also discarded the vanadium exceedance outside the southeastern corner of the platform as a “background metals issue”.¹³³⁸
657. The following figure depicts IEMS’s sampling locations,¹³³⁹ being noted that GSI took no samples at at Jaguar 3:¹³⁴⁰



658. The Tribunal identified one barium exceedance on the platform to the south of the wellhead.¹³⁴¹ Off platform, applying sensitive ecosystem criteria in application of its land

¹³³⁷ Revised Attachment 35 to IEMS ER4 (Excel), line 25 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Jaguar 3, p. 18; IEMS ER4, Att. 38, Jaguar 3, p. 18; 2nd SMCC, ¶ 265; Reply, ¶ 195(iv). See also: Remodeled site for Jaguar 3, August 2013, Figure 08-B (**Exh. E-499**).

¹³³⁸ GSI ER2, Tables 1 and 3.

¹³³⁹ *Id.*, App. D, Figure D.5.16.

¹³⁴⁰ GSI ER1, App. L.41; GSI ER2, App. D, Table D.4.

¹³⁴¹ Sample 7-JAG-3-237-MS-C-1,5M. See: IEMS ER4, Att. 38, Jaguar 3, pp. 13-54; GSI ER1, App. L, Table L.41.1 and Figure L.41.3; GSI ER2, App. D, Table D.3, pp. 63-64 and Figures D.1.19 and D.5.16.

use approach (section 4.3.2.c),¹³⁴² there is a vanadium exceedance next to the oil/water separator at the southeastern corner of the platform.¹³⁴³ There would also be an exceedance under agricultural land use criteria.

659. The Jaguar 3 well was drilled by Oryx in 1994 and was active until 2005.¹³⁴⁴ There is no record of historical spills for this site.¹³⁴⁵ GSI only mentioned a “small crude oil spill of approximately 3 barrels” in 2002 next to the power oil unit, flowing to the west of the site.¹³⁴⁶ According to GSI, contaminated soil was removed and replaced with clean soil.¹³⁴⁷ Further, the Tribunal notes that no soil samples were taken on the occasion of the 2008 Environmental Audit.¹³⁴⁸ Neither were samples taken for the 2006 Environmental Audit, although the well had stopped producing one year before; it would thus have been the appropriate time to verify the environmental condition of that site.¹³⁴⁹ Finally, the Tribunal notes that the 2008 Environmental Audit mentioned that perimeter drains and grease traps were poorly managed.¹³⁵⁰
660. Because the barium and vanadium exceedances are situated in a different location than the 2002 spill, the Tribunal holds that Burlington did not rebut the presumption that it caused these exceedances and shall bear the cost of remediation.
661. As to the measurement and costs, the total impacted area is 280 m²; with a 2-meter depth at the platform exceedance, the total volume of soil 360 m³. Including a 20% contingency (see paragraph 428), the total cost is **USD 129,600** for Jaguar 3.

¹³⁴² GSI concedes that secondary forest with scattered agricultural use surrounds the platform. In the Tribunal's view, aerial photographs and satellite imagery show that the platform is generally surrounded by dense forest. See: GSI ER1, App. L.41.1, p. 5, Figure L.41.3 and Att. L.41.A-L.41.B.

¹³⁴³ Sample 7-JAG-3-237-MS-E-0,5.

¹³⁴⁴ GSI ER1, App. B.5 and App. L.41, p. 2; Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 47 (**Exh. E-563**); Jaguar – 3 Well History (**Exh. E-248**).

¹³⁴⁵ GSI ER1, App. B.3; Saltos WS, Annex A; Solís WS2, ¶ 76.

¹³⁴⁶ GSI ER1, App. L.41, p. 3.

¹³⁴⁷ *Ibid.*

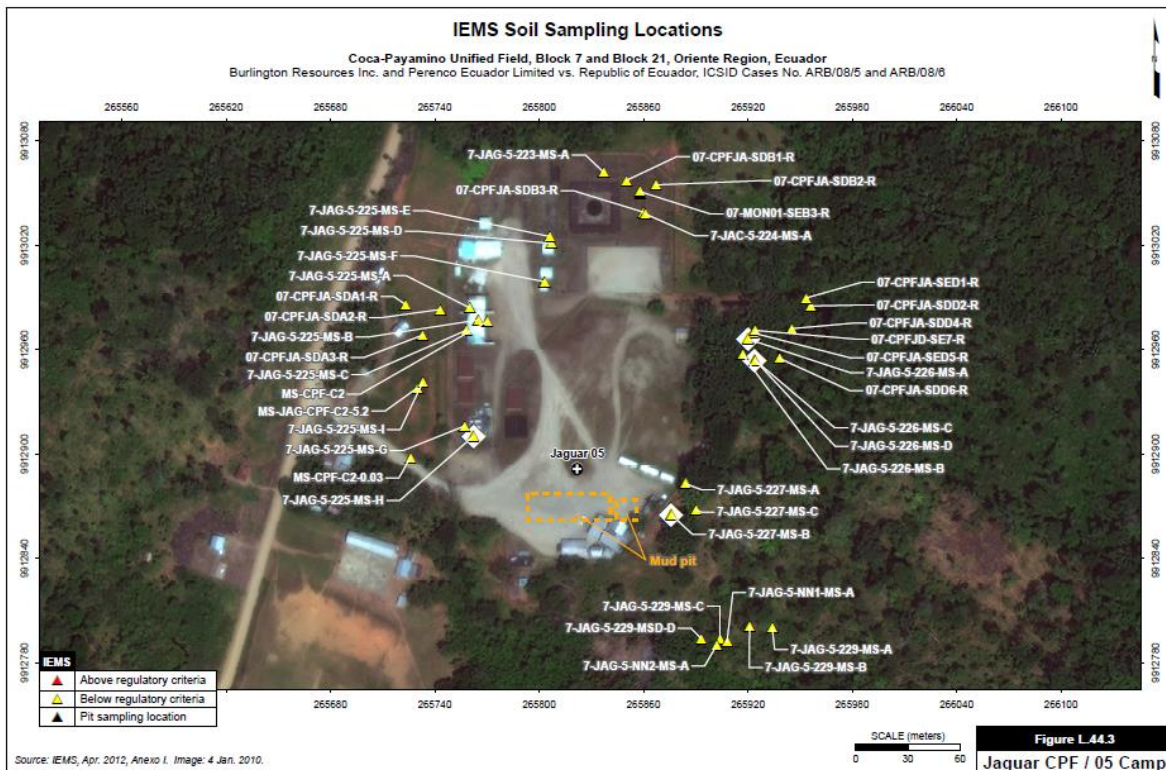
¹³⁴⁸ Bock 7 Environmental Audit, November 2008, p. 40, Table 3-3 (**Exh. E-252**).

¹³⁴⁹ Block 7 Environmental Audit, November 2006, Table 3-3 (**Exh. E-334**).

¹³⁵⁰ Bock 7 Environmental Audit, November 2008, p. 90, Table 5.1a (**Exh. E-252**)

ii. **Jaguar 5/CPF**

662. Ecuador claims USD 307,302 to remediate 230.10 m³ covering an area of 177 m².¹³⁵¹ Burlington disputes this claim on the ground that there are no TPH or barium exceedances at that site.¹³⁵²
663. The following figure depicts IEMS's sampling locations,¹³⁵³ being understood that GSI collected no samples at Jaguar 5/CPF.¹³⁵⁴



664. In keeping with its approach of land use (section 4.3.2.c), the Tribunal identified one vanadium exceedance on the platform next to the fuel deposit.¹³⁵⁵ In the residential area located to the west of the CPF, the Tribunal applied agricultural criteria for parameters

¹³⁵¹ Revised Attachment 35 to IEMS ER4 (Excel), line 22 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Jaguar CPF Corrected, pp. 19-20; IEMS ER4, Att. 38, Jaguar CPF, p. 26; 2nd SMCC, ¶ 261; Reply, ¶ 195(iv).

¹³⁵² GSI ER2, Tables 1 and 3. See also: GSI ER1, App. L, Figure L.44.4.

¹³⁵³ GSI ER1, App. L, Figure L.44.3.

¹³⁵⁴ *Id.*, App. L.44; GSI ER2, App. D, Table D.4.

¹³⁵⁵ Sample 7-JAG-5-225-MS-H-0,5. GSI ER2, App. D, Table D.3, p. 67.

regulated under RAOHE (TPH, cadmium, lead and nickel) and residential use for barium.¹³⁵⁶ It otherwise applied agricultural land use criteria to other locations off the platform. On that basis, it found no exceedances to the west of the CPF, but identified a series of cadmium, lead and nickel exceedances in three pockets to the east and southeast of Jaguar 5/CPF. The first pocket is located to the east of the CPF and shows cadmium and nickel exceedances.¹³⁵⁷ The second is adjacent to the southeast corner of Jaguar 5 with a lead and a cadmium exceedance.¹³⁵⁸ The third pocket is yet further southeast with six sampling points showing cadmium exceedances.¹³⁵⁹

665. The historical record of spills evidences four relatively minor crude oil spills in 1996, two at an API separator, one at the sump, and a fourth one at an unspecified location.¹³⁶⁰ In this context, the Tribunal is struck by an e-mail written by Mr. Saltos to his supervisor in 2008. That communication relates to water releases and requests “immediate corrective actions” before an inspection to avoid having “to regret unfavorable reports”. It further recommends not to create “too much attention around these works (military?), so that there is no resistance, *and so that it cannot be documented*”.¹³⁶¹ The e-mail continues referring to the need to clean the banks of the creek for about 100 meters in the following terms:

“Discharge of served waters from a plant (grey water????)... We have to clean the banks of the canal, about 100 meters below the discharge, clean the grease trap, confirm parameters; we have to take into account that we already have NC+ included in the 2008 audit, precisely due to

¹³⁵⁶ Accordingly, the Tribunal did not apply, as GSI did, industrial limits to the following sample locations: 07-CPFJA-SDA1-R, 07-CPFJA-SDA2-R, 07-CPFJA-SDA3-R and MS-CPF-C2-0.03-1,6.

¹³⁵⁷ Samples 7-JAG-5-226-MS-A-1,5, 7-JAG-5-226-MS-B-1,5, 7-JAG-5-226-MS-C-0,5, 7-JAG-5-226-MS-C-1,5 and 7-JAG-5-226-MS-D-1,5. See: IEMS ER4, App. 38, Jaguar CPF, pp. 16-23; GSI ER1, App. L, Table L.44.1 and Figures L.44.3 and L.44.4; GSI ER2, App. D, Table D.3, pp. 66-68.

¹³⁵⁸ Samples 7-JAG-5-227-MS-B-0,5 and 7-JAG-5-227-MS-C-0,5. GSI ER2, App. D, Table D.3, p. 68.

¹³⁵⁹ Samples 7-JAG-5-229-MS-A-0,5, 7-JAG-5-229-MS-B-1,5, 7-JAG-5-229-MS-C-0,3, 7-JAG-5-229-MS-C-0,5, 7-JAG-5-229-MS-A-1,0, 7-JAG-5-229-MS-D-0,5, 7-JAG-5-229-MSD-D-0,5, 7-JAG-5-NN1-MS-A-0,5, 7-JAG-5-NN1-MS-A-1,5, and 7-JAG-5-NN2-MS-A-0,9. GSI ER2, App. D, Table D.3, p. 68.

¹³⁶⁰ All events had 5 or less barrels spilled. See: GSI ER1, App. B.3, lines 22, 26, 28 and 30.

¹³⁶¹ E-mail of 19 December 2008 from Mr. Saltos to B7 HES Supervisor (emphasis added by Tribunal). This e-mail was attached to the second witness statement of Mr. Solís. See: Solís, WS2, Annex 61.

this finding, and that Dinapah has sentenced us with an ADMINISTRATIVE RECORD and FINE which we have yet to know who will pay (?) or who we will impose it on (?)".¹³⁶²

666. In his e-mail, Mr. Saltos also mentioned the need to review the “site destined to treatment of contaminated soil” so as to ensure that “the containment ditches and grease traps are operating well”, or else – so he suggested – “we have to construct them immediately”.¹³⁶³
667. In light of this evidence, the Tribunal finds Burlington fully liable for the exceedances identified at this site, i.e. the vanadium exceedance and the off platform exceedances to the east and southeast of Jaguar 5/CPF.
668. Since the volumes of soil to be remediated and the remediation costs as calculated by the Tribunal exceed the amount claimed by Ecuador,¹³⁶⁴ the Tribunal grants the full amount claimed for Jaguar 5/CPF, namely **USD 307,302**.

jj. Jaguar 7/8

669. Ecuador claims USD 1,101,436 to remediate 1,017 m³ covering an area of 790 m².¹³⁶⁵ Although Burlington recognizes that 110 m³ of soil may require remediation for a cost of USD 108,000, it denies liability invoking pre-Consortium activities that took place in 1996.¹³⁶⁶ This said, Burlington accepts to pay USD 100,000 for well site abandonment works.¹³⁶⁷

¹³⁶² *Ibid.*

¹³⁶³ *Ibid.* See also: Tr. (Day 4) (ENG), 1261:22-1272:11 (Cross, Saltos).

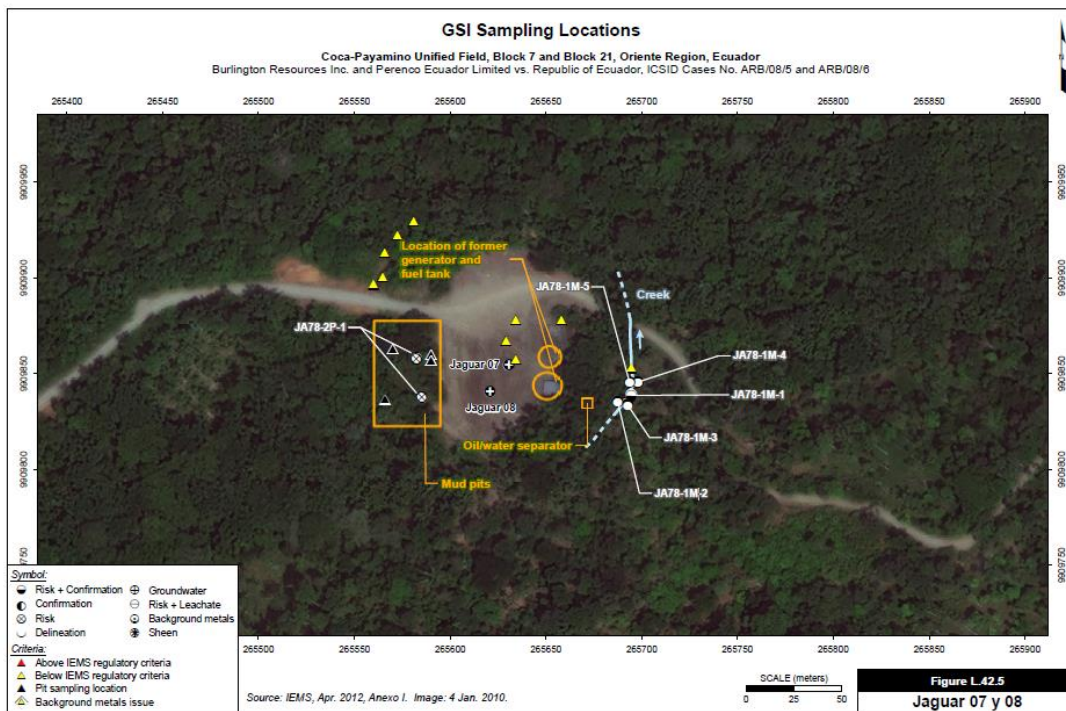
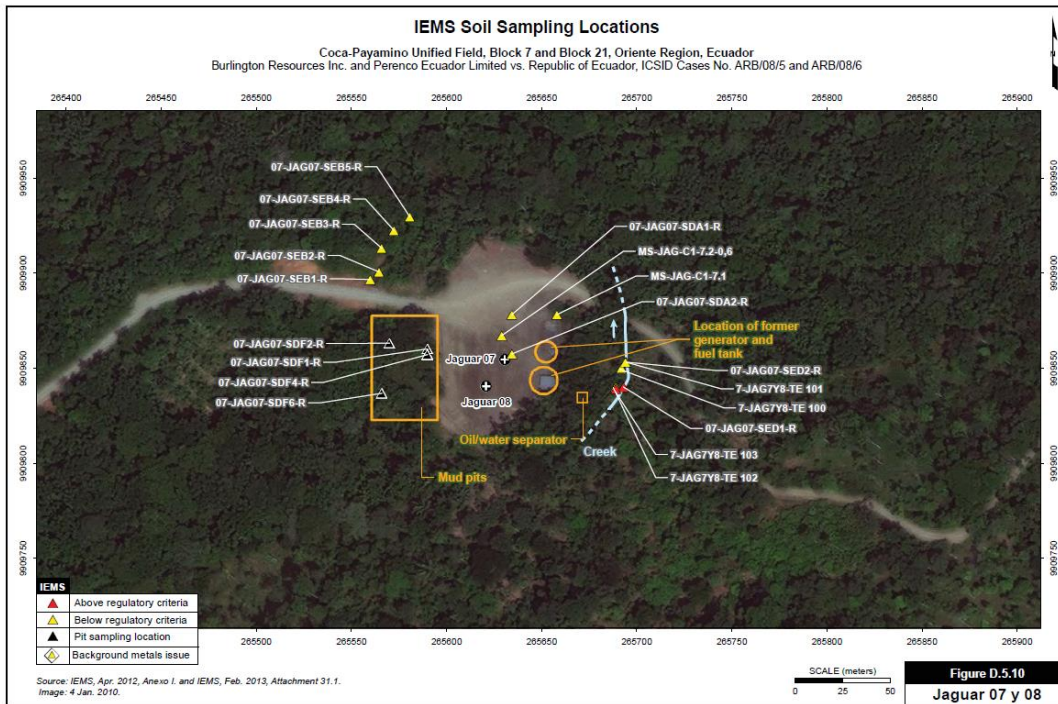
¹³⁶⁴ As seen in paragraph 662 above, Ecuador only claims the remediation of 230.10 m³ of soil covering an area of 177 m². The Tribunal identified one vanadium exceedance on the platform and a series of nickel and cadmium exceedances in three pockets to the southeast and east of the platform. The remediation of the exceedance, for instance, at sample point 7-JAG-5-229-MS-B-1,5 would already have warranted recovering 400 m³ of soil, exceeding the volume claimed by Ecuador.

¹³⁶⁵ Revised Attachment 35 to IEMS ER4 (Excel), line 26 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Jaguar 7/8 Corrected, p. 16; IEMS ER4, Att. 38, Jaguar 7/8, p. 16; 2nd SMCC, ¶ 266; Reply, ¶ 195(v). See also: Remodeled site for Jaguar 7/8, August 2013, Figure 14-B (**Exh. E-499**).

¹³⁶⁶ GSI ER2, Tables 1, 3 and 4.

¹³⁶⁷ *Id.*, Table 3. The Tribunal addresses the issue of well abandonment further below at paragraphs 883-888.

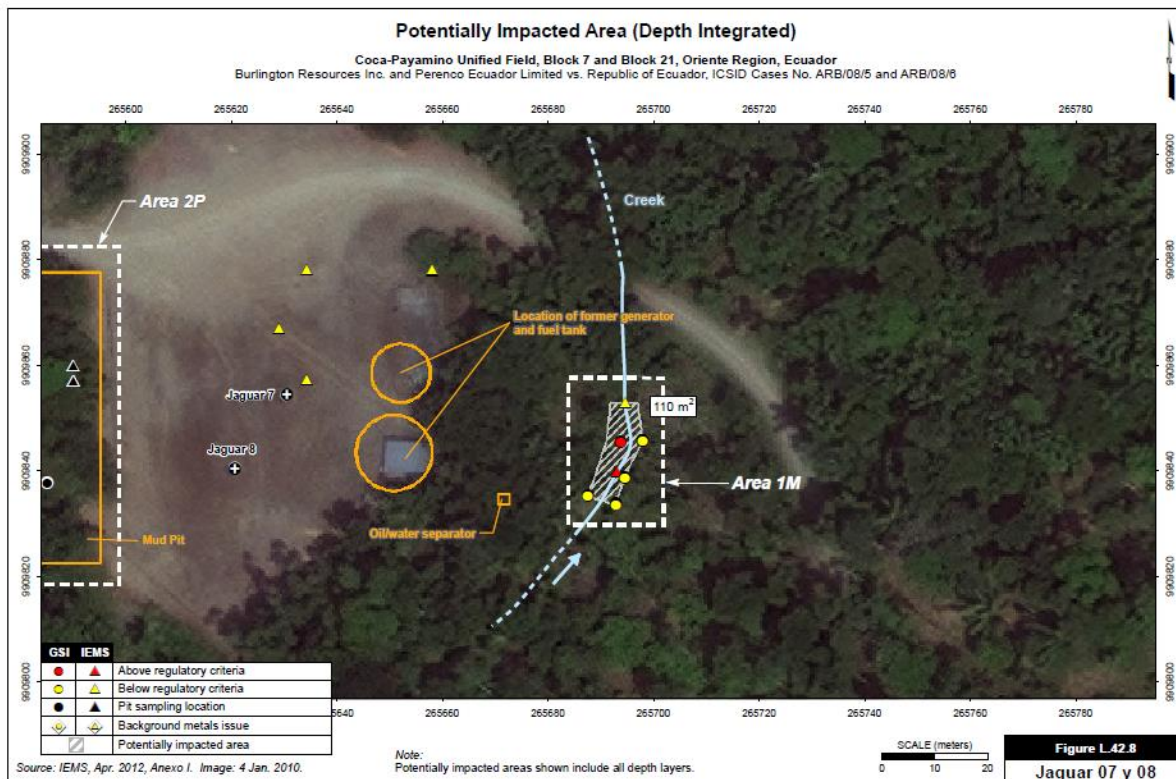
670. The following figures depict IEMS's¹³⁶⁸ and GSI's¹³⁶⁹ sampling locations at Jaguar 7/8:



1368 *Id.*, App. D, Figure D.5.10.

1369 GSI ER1, App. L, Figure L.42.5.

671. GSI calculated the impacted area for one of the contaminated locations at stake here, i.e. Area 1M, a calculation to which the Tribunal will revert:¹³⁷⁰



672. In line with its land use methodology (section 4.3.2.c), since the Consortium had committed to abandon the platform, the Tribunal applied agricultural criteria to all sampling locations at this site. On that basis and accepting that the area designated by GSI as Area 2P is a mud pit,¹³⁷¹ the Tribunal identified three barium exceedances along a creek to the east of the platform in the area designated as Area 1M.¹³⁷²

¹³⁷⁰ *Id.*, Figure L.42.8.

¹³⁷¹ The pit closure report of 1996 mentions that the pit is located outside the platform. At the Site Visit, IEMS confirmed that Area 2P is indeed a pit. See: Pasos y procedimientos ejecutados para el taponamiento de piscinas en las plataformas Mono y Jaguar, performed by Llori Hnos Cia. Ltda. for Oryx Ecuador, September 1996, p. 41 (**Exh. E-350**); Tr. Site Visit (Day 3) (ENG), 62:22-23 (Tribunal, Alfaro). For Ecuador's position, see also: Tr. Site Visit (Day 3) (ENG), 35:3-5, 38:8-39:11 (Presentation of Mr. García Represa at Jaguar 7/8).

¹³⁷² IEMS samples 07-JAG07-SED1-R(0,0-0,5)m and 7-JAG7Y8-TE103(0.5-0.7); and GSI sample JA78-1M-5-(0.0-1.0). See: IEMS ER4, Att. 38, Jaguar 7/8, pp. 8-13; GSI ER1, App. L, Table L.42.1 and Figures L.42.3 to L.42.6; GSI ER2, App. D, Table D.3, pp. 64-65 and Figures D.1.13 and D.5.10.

673. Burlington relies on Mr. Saltos's testimony to argue that Area 1M was impacted during the drilling of the Jaguar 7 and 8 wells by Oryx in 1996.¹³⁷³ The historical record shows a 30 barrel crude oil spill on 1 December 1996 at the hydraulic unit, of which all 30 barrels were recovered.¹³⁷⁴ On the other hand, Ecuador alleges that the Consortium conducted a workover on the Jaguar 7 well,¹³⁷⁵ and the record confirms that in November 2005 the Consortium carried out workover # 5 at that well, which involved drilling into the Napo "U" reservoir.¹³⁷⁶ GSI moreover notes that "an oil spill from Jaguar 8 occurred in approximately 2008 [from an on site power oil unit], but did not extend beyond the platform area".¹³⁷⁷ In addition, according to Ecuador's witness, Mr. Solís and contemporaneous documentary evidence, an unreported spill occurred on 1 February 2004 when 20 gallons of a "blend of crude, oil and water were discharged into the sump of the Jaguar 7-8 *and the surrounding area*".¹³⁷⁸ The Tribunal finally notes that no soil samples were taken for the 2008 Environmental Audit,¹³⁷⁹ although the audit noted that the perimeter drains and grease traps were poorly maintained¹³⁸⁰ and that the flow lines lacked cleaning.¹³⁸¹
674. Faced with this record, the Tribunal holds that Burlington has not rebutted the presumption of causation. As a result, Burlington is fully liable for the environmental condition at Jaguar 7/8 and Burlington shall therefore pay the amount for remediating Area 1M.

¹³⁷³ Mr. Saltos also presented evidence showing that he conducted authorized water discharges into the environment in 1996, when he was working for Oryx. See: Saltos WS2, ¶ 89; Acta de certificación de agua tratadas del pozo Jaguar 7-8, 24 August 1996 (**Exh. CE-CC-288**).

¹³⁷⁴ GSI ER1, App. B.3.

¹³⁷⁵ R-PSVB, ¶ 200.

¹³⁷⁶ Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Jaguar 7, Reacondicionamiento # 5, November 2002, pp. 10-12 (**Exh. E-573**).

¹³⁷⁷ GSI ER1, App. L.42 , p. 3.

¹³⁷⁸ Emphasis added by Tribunal. See: Internal Spill Report of 1 February 2004 (Solís WS, Annex 39). See also: Solís WS2, ¶ 76, item 1.

¹³⁷⁹ Block 7 Environmental Audit, November 2008, p. 40, Table 3-3 (**Exh. E-252**). None were either taken for the 2006 audit. See: Block 7 Environmental Audit, November 2006, Table 3-3 (**Exh. E-334**).

¹³⁸⁰ *Id.*, p. 89, Table 5.1a and p. 332, Verification List.

¹³⁸¹ IEMS ER4, Att. 38, Jaguar 7/8, p. 5.

675. Coming now to the assessment of the impacted soil and remediation costs, GSI delineated an area of 110 m²¹³⁸² (as shown in the picture appearing in paragraph 671 above), which the Tribunal increases to 200 m² to include a part of the cliff going up to the oil/water separator. The volume of soil is 200 m³. Adding a 30% contingency (see paragraph 428), the remediation cost thus amounts to **USD 78,000** for Jaguar 7/8.

kk. Jaguar 9

676. Ecuador claims USD 38,317,842 to remediate 38,411.10 m³ of soil covering an area of 24,015 m².¹³⁸³ Burlington opposes this claim. It submits that most samples taken by IEMS are situated in a pit and that otherwise there are no exceedances at this site.¹³⁸⁴

677. Disregarding pit soil for present purposes, a review of IEMS's sampling results shows that there are no exceedances at this site under any regulatory criteria.¹³⁸⁵ Accordingly, Ecuador's claim is dismissed.

ll. Lobo 1

678. Ecuador claims USD 1,473,242 to remediate 1,400.10 m³ over an area of 1,077 m².¹³⁸⁶ Burlington disputes this claim. It alleges that the three IEMS samples with exceedances were actually collected from mud pits.¹³⁸⁷

679. The Tribunal first observes that the samples collected by IEMS on the southeastern corner of the platform are in fact located in a pit. Evidence indeed shows that a 53x50

¹³⁸² GSI ER1, App. L, Att. L.42.E, Figure L.42.E.B.1.

¹³⁸³ Revised Attachment 35 to IEMS ER4 (Excel), line 27 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Jaguar 9, p. 15; 2nd SMCC, ¶ 267.

¹³⁸⁴ GSI ER1, App. L, Figure L.43.4; GSI ER2, Tables 1 and 3.

¹³⁸⁵ IEMS ER3, Annex C, Jaguar 9 pp. 10-13; GSI ER1, App. L, Table L.43.1 and Figures L.43.4 and L.43.4; GSI ER2, App. D, Table D.3, pp. 65-66.

¹³⁸⁶ The Tribunal notes a slight inconsistency in Ecuador's figures to the extent that the impacted area for its regulatory case is larger than its case based on background values. See: Revised Attachment 35 to IEMS ER4 (Excel), line 28 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Lobo 1, p. 12; IEMS ER4, Att. 38, Lobo 1, p. 11; 2nd SMCC, ¶ 248; Reply, ¶ 195(xxi).

¹³⁸⁷ GSI indicated in its second report that information had become available "that clearly indicated that the sampling results reported by IEMS pertained to the location of a mud/cuttings pit". GSI ER2, p. 26. See further: GSI ER2, App. B.3.2, App. D, p. 13, Tables D.3, pp. 68-69, D.8 to D.10 and Figures D.1.6, D.5.3 and D.6.6.

meter pit was built there by BP in 1989.¹³⁸⁸ The Tribunal further accepts GSI's explanation that sample MS-LOB-C3-1.3-1,20 is in reality located within the mud pit to the northwest of the platform.¹³⁸⁹

680. On that basis and without regard to pit soil at this stage of the analysis, the Tribunal finds that no exceedances exist at this site under any regulatory criteria. Accordingly, Ecuador's claim for non-pit soil remediation is dismissed.

mm. Lobo 3

681. Ecuador claims USD 3,569,648 to remediate 4,030 m³ of soil over an area of 1,200 m².¹³⁹⁰ Burlington rejects this claim, arguing that part of IEMS's samples are located in a pit and that the other samples comply with regulatory criteria.¹³⁹¹

682. Leaving aside pit soil, and applying sensitive ecosystem land use criteria to off platform locations, the Tribunal finds no exceedances at that site.¹³⁹² Accordingly, Ecuador's claim for non-pit soil remediation is dismissed.

nn. Mono 1-5/CPF

683. Ecuador claims USD 103,739,421 to remediate 115,259.30 m³ of soil covering an area of 34,854 m².¹³⁹³ Although Burlington recognizes that 6,830 m³ may require remediation for a cost of USD 659,000,¹³⁹⁴ it disputes that the Consortium caused any of the

¹³⁸⁸ GSI ER2, App. B.3.2, in particular pp. 66 and 74, the latter showing a map of the platform and the pit.

¹³⁸⁹ GSI ER2, App. D, Annex D.2, p. 6. This seems to be confirmed by the sample coordinates provided in IEMS's third expert report. See: IEMS ER3, Annex L.1, p. 74 (Corplab Protocol N°: 1110-978).

¹³⁹⁰ Revised Attachment 35 to IEMS ER4 (Excel), line 30 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Lobo 3 Corrected, p. 17; 2nd SMCC, ¶¶ 250-251.

¹³⁹¹ GSI ER1, App. L, Figure L.47.4; GSI ER2, Tables 1 and 3.

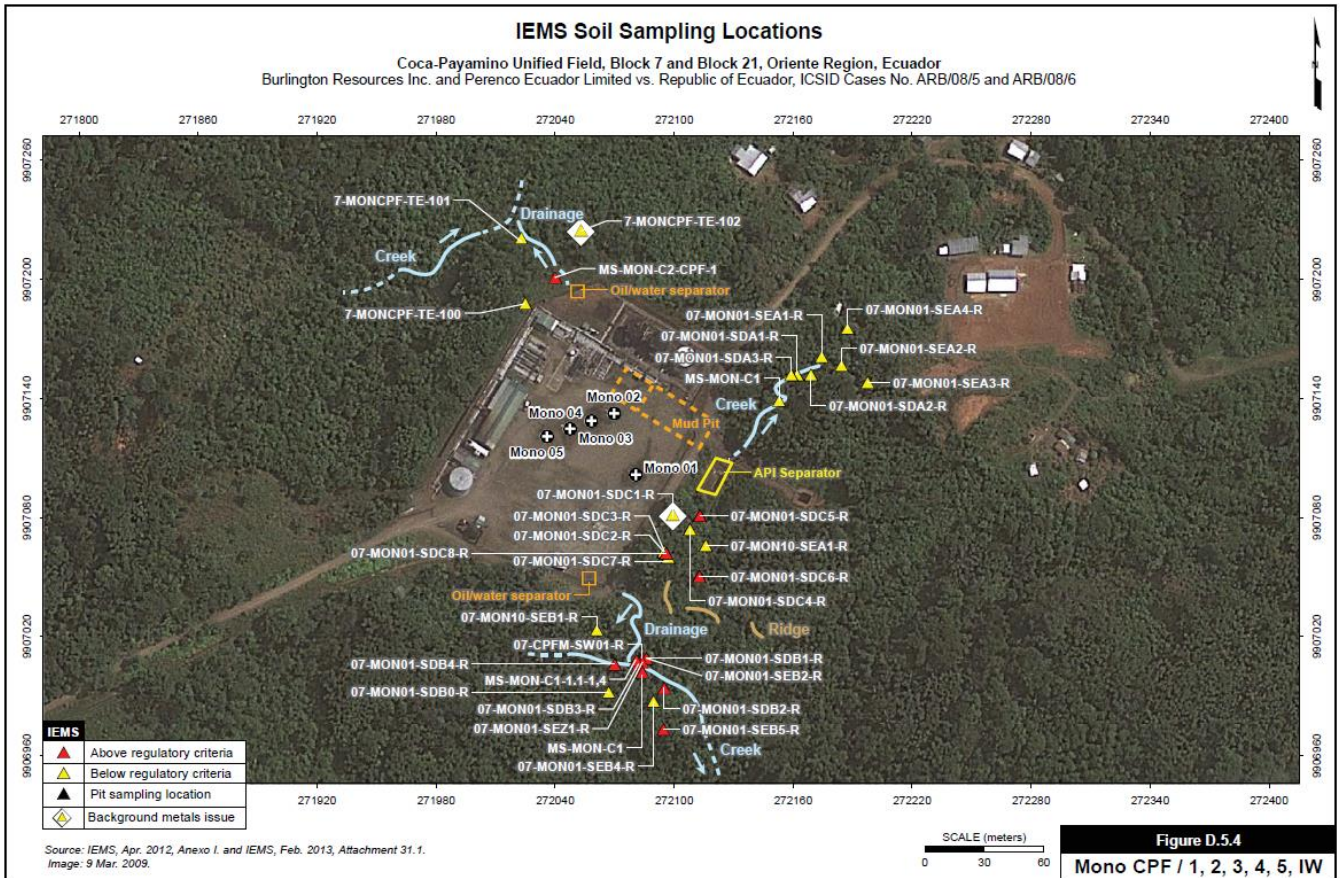
¹³⁹² GSI ER1, App. L, Tables L.47.1, L.47.3 and Figure L.47.3; GSI ER2, App. D, Table D.3, p. 70.

¹³⁹³ Revised Attachment 35 to IEMS ER4 (Excel), line 32 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Mono CPF Corrected, pp. 28-29; IEMS ER4, Att. 38, Mono CPF, p. 30; 2nd SMCC, ¶¶ 254-255; Reply, ¶¶ 117-131, 162 and 195(i).

¹³⁹⁴ GSI ER1, App. L.50, pp. 7-8; GSI ER2, Tables 1, 3 and 4.

exceedances identified and points instead to pre-Consortium drilling activities as the cause.¹³⁹⁵

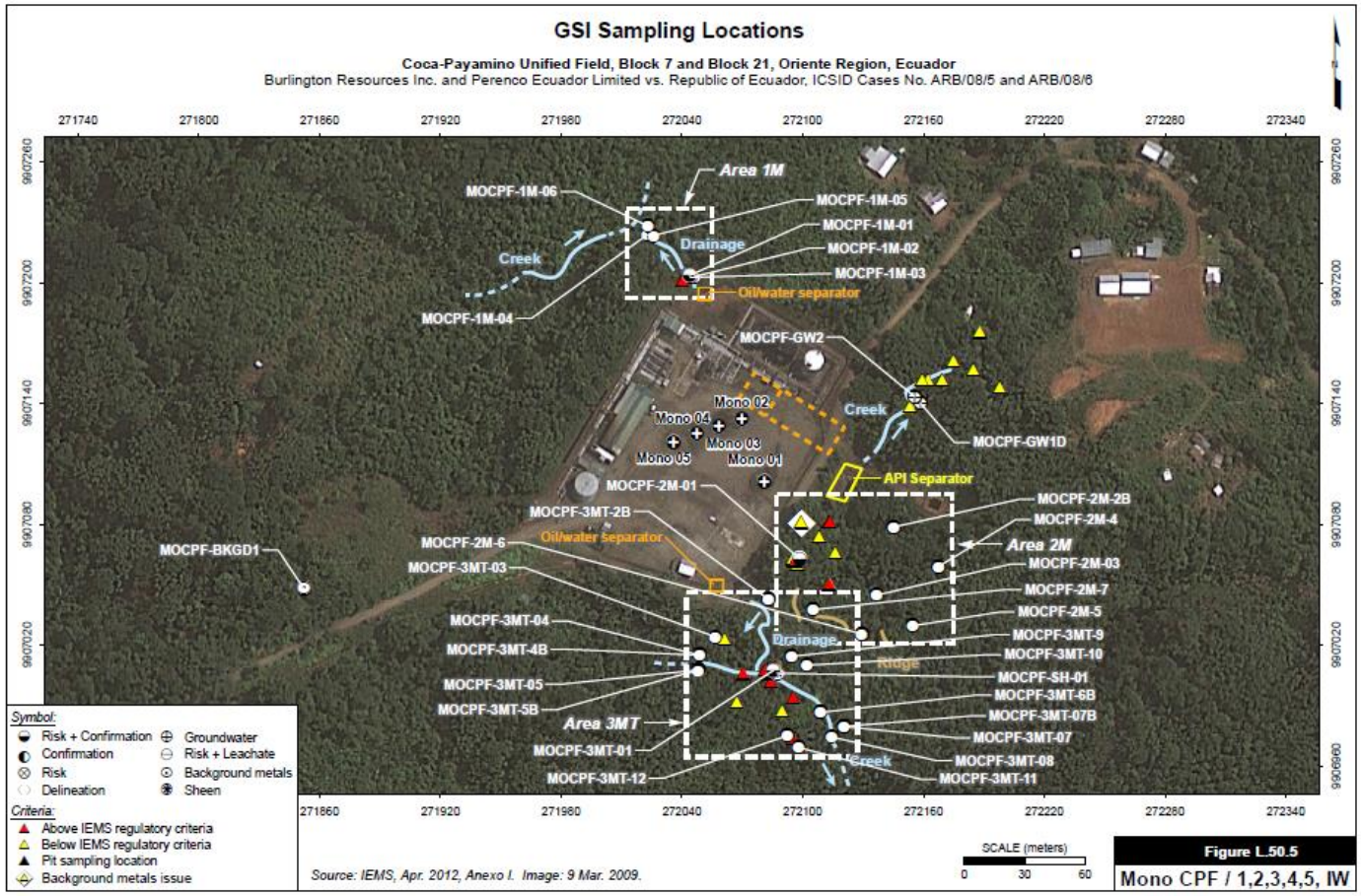
684. The following images illustrate IEMS's¹³⁹⁶ and GSI's¹³⁹⁷ sampling locations at Mono 1-5/CPF:



1395 Tr. Site Visit (Day 3) (ENG), 95:3-96:14 (Presentation of Ms. Renfroe at Coca CPF); R-PSVB, ¶ 25.

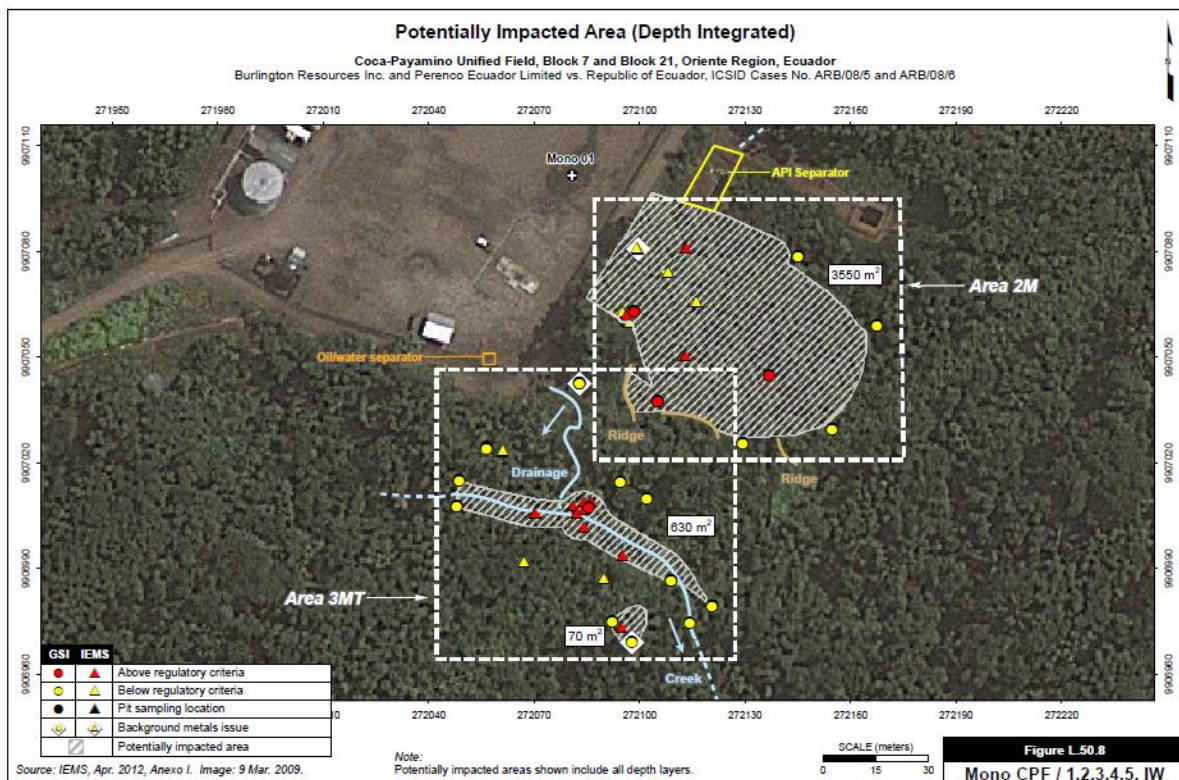
1396 GSI ER2, App. D, Figure D.5.4.

1397 GSI ER1, App. L, Figure L.50.5.



685. The delineation of some of the contaminated areas at issue, namely Areas 2M and 3MT, was assessed by GSI, an assessment to which the Tribunal will revert as shown below:¹³⁹⁸

¹³⁹⁸ *Id.*, Figure L.50.8.



686. During the Site Visit, the Tribunal was able to see first hand the land use at the allegedly impacted areas around Mono CPF. On such basis and in accordance with its methodology (section 4.3.2.c), it applied sensitive ecosystem criteria to off platform sampling locations to the southeast, east and northeast of the platform of Mono 1-5/CPF.¹³⁹⁹ Because sampling points to the northeast of the platform are in proximity of a residential area of the *San Justo* community, the Tribunal applied residential criteria governed by TULAS for barium.¹⁴⁰⁰ Finally, the Tribunal also applied sensitive ecosystem criteria to sample points at the northwestern corner of the platform along a drainage flowing into a creek.¹⁴⁰¹

687. The sampling results show the poor environmental condition of a drainage area at the southeast corner of the platform designated by GSI as Area 3MT and of another area further north just uphill on the other side of a ridge identified as Area 2M.¹⁴⁰² There are

1399 GSI ER2, App. D, Figure D.5.4.

1400 *Ibid.* See also: IEMS ER4, Att. 38, Mono CPF, p. 3.

1401 GSI ER2, App. D, Figure D.5.4.

1402 GSI ER1, App. L, Figure L.50.5.

relatively high levels of TPH, barium, cadmium and lead in the drainage in Area 3MT,¹⁴⁰³ as well as discrete barium, chromium and lead exceedances in a pocket further uphill on the other side of the creek.¹⁴⁰⁴ The Tribunal also identified a number of elevated levels of barium, cadmium, chromium and lead in Area 2M,¹⁴⁰⁵ as well as a barium exceedance and a cadmium exceedance in Area 1M along the drainage at the northwestern corner of Mono 1/CPF.¹⁴⁰⁶ The sampling results do not show any exceedance in the area to the northeast of the platform.¹⁴⁰⁷

688. The Mono 1 well was drilled by BP between 1988 and 1989 and the Mono 2 to 5 wells were drilled by Oryx in 1996.¹⁴⁰⁸ According to information in the record, the two mud pits on the northern side of the platform were put in place by Oryx in 1996.¹⁴⁰⁹ Since there is some uncertainty on whether a pit was used by BP when drilling Mono 1 or whether the cuttings and drilling muds were simply discharged in the environment, the Tribunal turns

¹⁴⁰³ IEMS samples 07-CPFM-SW01-R(0,8-1,0)m, 07-MON01-SDB1-R(0,2-0,4)m, 7-MON01-SDB2-R(0,2-0,4)m, 07-MON01-SDB3-R(0,3-0,4)m, 07-MON01-SDB3-R(0,5-0,6)m, 07-MON01-SDB4-R(0,5-0,6)m, 07-MON01-SDB4-R(0,6-0,8)m, 07-MON01-SEB2-R(0,0-0,3)m, 07-MON01-SEB6-R(0,0-0,3)m and 07-MON01-SEZ1-R(0,0-0,3)m; and GSI samples MOC PF-3MT-01-0.0-0.3, MOC PF-3MT-01-1.2-1.5, MOC PF-3MT-02-2.4-2.7, MS-MON-C1-1.1-1,4 and MS-MON-C1-1.2-1,9. See: IEMS ER4, Att. 38, Mono CPF, pp. 16-28; GSI ER1, App. L, Tables L.50.1, L.50.3 to L.50.5 and Figures L.50.3 and L.50.5; GSI ER2, App. D, Table D.3, pp. 74-76.

¹⁴⁰⁴ IEMS sample 07-MON01-SEB5-R(0,0-0,3)m; and GSI sample MOC PF-3MT-11-(1.0-2.0). See: GSI ER1, App. L, Tables L.50.1 and L.50.5.

¹⁴⁰⁵ IEMS samples 07-MON01-SDC1-R(2,4-2,6)m, 07-MON01-SDC5-R(0,5-0,7)m, 07-MON01-SDC5-R(1,5-1,7)m, 07-MON01-SDC5-R(2,0-2,3)m, 07-MON01-SDC6-R(2,3-2,5)m, 07-MON01-SDC8-R(0,5-0,7)m, 07-MON01-SDC8-R(1,5-1,7)m, 07-MON01-SDC8-R(2,2-2,3)m; and GSI samples MOC PF-2M-01-2.4-2.7, MOC PF-2M-03-2.7-3.0 and MOC PF-2M-7-(0.0-1.0). See: IEMS ER4, Att. 38, Mono CPF, pp. 16-28; GSI ER1, App. L, Tables L.50.1, L.50.3 to L.50.5 and Figures L.50.3 and L.50.5; GSI ER2, App. D, Table D.3, pp. 74-75. Since the Tribunal does not have the exact location of IEMS samples 07-MON01-SDY2-R and 07-MON01-SDY3-R, the Tribunal discarded these two samples. Furthermore, the Tribunal accepts GSI's explanations on the proper location of samples 07-MON01-SDC2-R(0.4-0.6)m and 07-MON01-SDC2-R(1.3-1.5)m. See: GSI ER1, Annex D.2, pp. 5-6.

¹⁴⁰⁶ IEMS samples MS-MON-C2-CPF-1 and 7-MONCPF-TE-102(0.0-0.80). The Tribunal accepts GSI's explanations on the proper location of sample MS-MON-C2-CPF-1. See: GSI ER1, Annex D.2, p. 10.

¹⁴⁰⁷ GSI ER1, App. L, Table L.50.1 and Figure L.50.1; GSI ER2, App. D, Table D.3, p. 74.

¹⁴⁰⁸ GSI ER1, App. B.5 and App. L.50, p. 2; Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 57 (**Exh. E-563**).

¹⁴⁰⁹ *Ibid.*; GSI ER2, App. B.5, p. 2. See, in particular, the 1996 mud pit closure report: Pasos y procedimientos ejecutados para el taponamiento de piscinas en las plataformas Mono y Jaguar, performed by Llori Hnos Cia. Ltda. for Oryx Ecuador, September 1996 (**Exh. E-350**). In its first report, GSI mentioned that there were no closed pits at this facility, and indicated that the cuttings and drilling mud from Mono 2 to 5 “were reportedly disposed into the on-site mud disposal well by injection”. GSI ER1, App. L.50, p. 3.

first to Area 2M. Indeed, GSI initially explained that these muds and cuttings “were possibly discharged to the land surface east of the facility”, corresponding to Area 2M.¹⁴¹⁰ During the Site Visit, Mr. Chaves from IEMS suggested that Area 2M is a pit, and that it is leaking its contents into Area 3MT, which lays further southwards and downhill.¹⁴¹¹ In view of the statement of Mr. Chaves on the existence of a pit, the high levels of metal concentrations (the barium level exceeds 10,000 mg/kg, the cadmium level is above 11 mg/kg and the lead level exceeds 938 mg/kg), and the depth of the contamination (down to the lowest samples at 2.6 meters),¹⁴¹² the Tribunal accepts IEMS’s statement that Area 2M is a pit. It will thus address this area in its analysis of mud pits (see paragraph 811 below).

689. Turning now to the other areas where exceedances have been identified, the Tribunal starts out by noting that the Mono 1 well was put on standby and then reactivated by the Consortium following a workover,¹⁴¹³ which may also explain the presence of barium and other chemicals in areas surrounding the platform.¹⁴¹⁴ In addition, Mr. Saltos confirmed at the Hearing that Mono 1 was used as an injection well, meaning that produced water was injected into the well by using the power oil unit located next to the grease trap on the southeastern corner.¹⁴¹⁵

¹⁴¹⁰ GSI ER1, App. L.50, p. 3. GSI further suggested that, in addition to the exceedances in Area 2M allegedly caused by drilling mud discharges in 1989, that exceedances in Area 3MT were caused by drilling mud discharges and an oil spill in 1996. See: GSI ER1, ¶ 271(2) and Table 4; GSI ER2, Table 4. For Burlington’s submission on causation at the Site Visit, see: Tr. Site Visit (Day 3) (ENG), 95:3-96:14 (Presentation of Ms. Renfroe at Mono CPF); C-PSVB, ¶ 25.

¹⁴¹¹ Tr. Site Visit (Day 3) (ENG), 87:19-21 (Tribunal, Chaves in Area 3MT at Mono CPF). For Burlington’s position, refer to: Tr. Site Visit (Day 3) (ENG), 95:3-9 (Presentation by Ms. Renfroe in Area 3MT at Mono CPF).

¹⁴¹² GSI ER1, App. L, Table L.50.1; GSI ER2, App. D, Table D.3, pp. 74-76.

¹⁴¹³ R-PHB, ¶ 721; R-PSVB, ¶ 198. See also: Tr. (Day 4) (ENG), 1238:9-11 and 16-20 (Cross, Saltos).

¹⁴¹⁴ Tr. (Day 4) (ENG), 1210:16-20 (Cross, Saltos). The Tribunal further notes that the Consortium conducted seven workovers at the Mono 1 well between 2003 and 2008, mostly to repair the electrosubmersible pumps, but also involving the use of chemicals, such as workovers ## 10-12. See, for instance: Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Mono 1, Reacondicionamiento #12, February 2008, p. 3 (**Exh. E-573**).

¹⁴¹⁵ Tr. (Day 4) (ENG), 1193:3-1196:6 (Cross, Saltos). See also: Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Mono 1, Inyección de Agua, Proyecto Instalación Inyección Agua en Campo Mono, Perenco Ecuador Limited, March 2006 (**Exh. E-573**).

690. The historical record of spills shows numerous incidents at Mono 1/CPF over the years, quite a few more during the Consortium's time than under prior operators.¹⁴¹⁶ For instance, GSI only mentions a 1 barrel spill in 1997 at the API separator pump under the operatorship of Petroproducción.¹⁴¹⁷ By contrast, the record evinces a 12 barrel crude oil spill at the Mono 4 well pad on 29 March 2005,¹⁴¹⁸ a 7 barrel crude oil spill at the power oil unit on 8 October 2005,¹⁴¹⁹ and a 30 barrel crude oil and produced water spill at the booster pump on 7 July 2008.¹⁴²⁰ In addition, Ecuador's witness, Mr. Solís, testified to an unreported (but documented) 11 barrel crude oil spill which happened on 28 April 2008 as a result of a mechanical failure in the power oil unit.¹⁴²¹ Finally, Burlington made reference to a spill in 2011 under Petroamazonas, but the record shows that this last spill affected the area to the northeast of the platform, where the Tribunal did not identify any exceedances.¹⁴²²
691. With respect to Area 3MT more specifically, it is noteworthy that GSI initially reported no impact at that location and that prior spills had all been remediated. It in particular noted as follows:

“Historical spills prior to and in 2007 occurred at the oil trap in the southeast corner of the facility and were reported and remediated appropriately. At the time of GSI inspection, this area (located approximately 50 m to the east of the CPF fence line) was covered by dense grass, low brush, and trees. GSI found no evidence of oil staining or sheen on the water or sediments, even when sediments were disturbed”.¹⁴²³

¹⁴¹⁶ GSI ER1, App. B.3.

¹⁴¹⁷ *Id.*, line 42.

¹⁴¹⁸ Reply, ¶ 46. See also: GSI ER1, App. B.3, line 78.

¹⁴¹⁹ GSI ER1, App. B.3, line 81.

¹⁴²⁰ *Id.*, line 94; Saltos WS1, Annex A. See also: Remediation Report on Incident in Mono CPF, including subsequent communications and approvals, July to October 2008 (**Exh. CE-CC-334**); Letter of 7 July 2008 from Eric D'Argentré (Perenco) to Marcelo Mata (DINAPA) (**Exh. CE-CC-166**); Letter of 14 November 2008 from Francisco V. Sanchez (Ministry of Mines and Petroleum) to Eric D'Argentré (Perenco) (**Exh. CE-CC-185**).

¹⁴²¹ Email of 28 April 2008 from the B7 Superintendent (Solís WS, Annex 53). See also: Reply, ¶ 51(d); Solís WS2, ¶ 76, item 14.

¹⁴²² CMCC, ¶¶ 484-486; IEMS ER2, Annex 16, p. 13 (REC No. 111); GSI ER1, App. L, Figure L.50.2. For Ecuador's position, refer to: R-PSVB, ¶¶ 201-202.

¹⁴²³ GSI ER1, App. L.50, p. 5.

692. GSI further added:

“Further downstream, in an area near the southeast corner of the CPF, natural/organic iron bacteria was present and visible in the base of the stream. No evidence of impact was observed and the area appeared to be properly remediated”.¹⁴²⁴

693. The cross-examination of Mr. Saltos, however, brought to light a number of relevant facts. First, Mr. Saltos stated that the Consortium conducted workovers at the Mono 1 well.¹⁴²⁵ Second, he testified that there “is a certain tendency to problems” with power oil pumps, which are “problem-prone”.¹⁴²⁶ Third, Mr. Saltos confirmed that the power oil unit is close to the grease trap on the southeastern corner of the platform.¹⁴²⁷ Fourth, he agreed that, if a spill occurred due to problems with the power oil unit, then the production water mixed with crude oil flows towards that grease trap.¹⁴²⁸ This is in particular so because the grease trap on the southeastern corner of the platform is at the “lowest end of the platform”.¹⁴²⁹ Fifth, Mr. Saltos stated that five barrels of oil migrated outside the platform on 5 July 2008.¹⁴³⁰ Sixth, he explained that Annex A of his witness statement does not list “all of the spills that were not to be reported”, meaning spills which discharge less than 5 barrels or which remain within the confines of the platform were not listed.¹⁴³¹ When asked whether there were other incidents at Mono CPF during the Consortium’s operations, Mr. Saltos responded – in an open manner that the Tribunal appreciated – “Yes, unfortunately”.¹⁴³² Finally, Mr. Saltos did not dispute Mr. Solís’ characterization of the situation at Mono CPF as “critical” and acknowledged that Mr. Solís had requested “urgent repairs” at that site in 2008.¹⁴³³

¹⁴²⁴ *Ibid.*

¹⁴²⁵ Tr. (Day 4) (ENG), 1194:13-1195:7 (Cross, Saltos).

¹⁴²⁶ Tr. (Day 4) (ENG), 1201:3-8 (Cross, Saltos).

¹⁴²⁷ Tr. (Day 4) (ENG), 1195:18-1196:6 (Cross, Saltos).

¹⁴²⁸ Tr. (Day 4) (ENG), 1196:7-12 (Cross, Saltos).

¹⁴²⁹ Tr. (Day 4) (ENG), 1196:16-18 (Cross, Saltos).

¹⁴³⁰ Tr. (Day 4) (ENG), 1314:7-22 (Cross, Saltos). See also: Saltos WS, Annex A.

¹⁴³¹ Tr. (Day 4) (ENG), 1313:14-22 (Cross, Saltos).

¹⁴³² Tr. (Day 4) (ENG), 1200:17-19 (Cross, Saltos). See also: Tr. (Day 4) (ENG), 1313:19-22 (Cross, Saltos).

¹⁴³³ Tr. (Day 4) (ENG), 1204:4-1205:5 (Cross, Saltos).

694. In light of this record, the Tribunal cannot but hold Burlington liable for the environmental condition in Area 3MT. Even if the drainage and creek were remediated by the Consortium, as Burlington alleges, this remediation obviously was insufficient. Burlington's liability also covers the pockets of exceedances in Area 3MT on the other side uphill of the creek. Indeed, since these exceedances are uphill, they cannot be linked to the exceedances in the creek and the only explanation seems to be that they are the product of willful discharges in the environment, rather than the product of accidental spills.¹⁴³⁴
695. Finally, Burlington has not sought to dispute causation in respect of Area 1M. As a result, it must be deemed liable for the environmental condition of that location and bear the remediation cost.
696. Going over to the assessment on impacted soil and remediation costs, the Tribunal makes the following findings always in accordance with its general approach explained above (sections 4.4.3.c and 4.5.2):
- i. GSI estimated that Area 3MT comprises two impacted pockets of 700 m² in total (see picture in paragraph 685 above).¹⁴³⁵ In light of the elevated exceedance levels and considering that GSI put dirty borings back into the ground instead of testing them,¹⁴³⁶ the Tribunal extended the impacted area of 3MT to 1,000 m² to cover both sides of the creek. Moreover, considering that GSI discarded its own delineation sample with a chromium exceedance when delineating the impacted area uphill on the other side of the creek, the Tribunal added an impacted area of 300 m² at that location. The total volume of soil in the creek area is thus 1,000 m³

¹⁴³⁴ Although GSI suggested during the Site Visit that the samples may be mislocated, GSI accepted these exceedance points and delineated around them. Tr. Site Visit (Day 3) (ENG), 100:20-101:2 (Tribunal, Bianchi at Mono CPF). See also: C-PSVB, ¶¶ 33, 43 and note 108. The Tribunal agrees with IEMS that these exceedances most likely occurred during a separate incident, unrelated to the other exceedances in the creek in Area 3MT. See: Tr. Site Visit (Day 3) (ENG), 81:21-82:17 (Tribunal, Chaves at Mono CPF). In any event, GSI's theory that IEMS's samples may be mislocated is proven wrong by GSI's own delineation sample which revealed a chromium exceedance (sample MOCPF-3MT-11-(1.0-2.0)). See: GSI ER1, App. L, Table L.50.5 and Figure L.50.5.

¹⁴³⁵ More specifically, GSI calculated for Area 3MT an impacted area of 700 m² for barium in the 0-1 meter layer, and of 630 m² in the 1-2 meter layer. See: GSI ER1, App. L, Figure L.50.8 and Att. L.50.E, Table L.50.E.1 and Figures L.50.E.A.1, L.50.E.B.1; GSI ER2, Table 4.

¹⁴³⁶ GSI noted the following in its field forms: "Had to move up the bank and upstream (about 1 meter each). First location had a moderate to strong chem odor (Mono CPF)". See: R-PHB, ¶ 365; GSI Log Book for sample MOCPF-3MT-04, 8 March 2012, p. 1 (**Exh. E-475**).

and in the area uphill 600 m³. With a 30% contingency (see paragraph 428), the total remediation cost for Area 3MT thus amounts to **USD 624,000**.

- ii. The impacted area around the two exceedance points in Area 1M is 400 m²; the total volume of soil 400 m³; and, with a 30% contingency (see paragraph 428), the total cost is **USD 156,000**.

697. In sum, the total cost payable by Burlington for Mono 1-5/CPF is **USD 780,000**.

oo. Mono Centro/10-12

698. Ecuador claims USD 9,406,337 to remediate 9,763 m³ over an area of 3,769 m².¹⁴³⁷ Burlington opposes this claim on the ground that there are no exceedances when applying correct regulatory criteria and that most samples are located in a pit.¹⁴³⁸

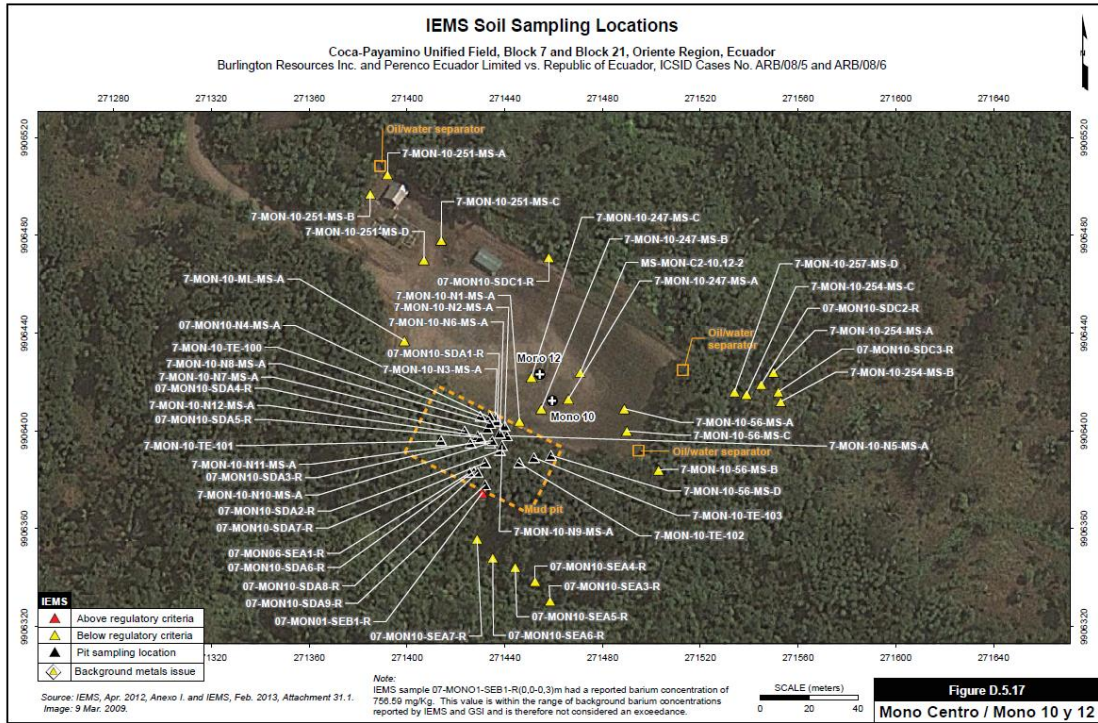
699. The following figure depicts IEMS's sampling locations,¹⁴³⁹ being noted that GSI did not take samples at Mono Centro:¹⁴⁴⁰

¹⁴³⁷ Revised Attachment 35 to IEMS ER4 (Excel), line 33 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Mono 10/12, p. 25; IEMS ER4, Att. 38, Mono 10/12, pp. 22-23; 2nd SMCC, ¶¶ 258-259; Reply, ¶ 195(ii). See also: Remodeled site for Mono 10/12, August 2013, Figure 09-B (**Exh. E-499**).

¹⁴³⁸ GSI ER2, Tables 1 and 3. GSI explains that because the barium level of 756.59 mg/kg in sample 07-MON01-SEB1-R(0,0-0,3)m falls "within the range of background barium concentrations reported by IEMS and GSI", it did not consider this sample to show an exceedance. See: GSI ER1, Figure L.49.3; GSI ER2, Figures D.1.20 and D.5.17.

¹⁴³⁹ GSI ER2, App. D, Figure D.5.17.

¹⁴⁴⁰ GSI ER1, App. L.49; GSI ER2, App. D, Table D.4.



700. In reliance on its land use methodology (section 4.3.2.c) and applying sensitive ecosystem criteria to off platform sampling locations to the east and south of the platform¹⁴⁴¹ (leaving pit soil aside for present purposes), the Tribunal identified a minor barium exceedance just outside the southern edge of the mud pit.¹⁴⁴²
701. The Mono 10 and 12 wells were drilled by Oryx in 1997 and the drilling muds and cuttings were placed in a mud pit to the south of the platform.¹⁴⁴³ Although the Tribunal will address pit soil separately below, it already notes that this one barium exceedance is insufficient to prove Ecuador's allegation that the pit is leaking. Indeed, barium could well have spilled over during the closure process.¹⁴⁴⁴

¹⁴⁴¹ GSI concedes that secondary forest borders the southern edge of the platform, but noted in 2012 that a "[r]ecently cleared area" to the east is used for agriculture. Satellite imagery of 2010 and aerial photographs show that the area to the east was densely forested. GSI ER1, App. L.49.1, p. 5, Figure L.49.3 and Att. L.49.B.

¹⁴⁴² Sample 07-MON01-SEB1-R(0,0-0,3)m. See: GSI ER2, App. D, Table D.3, pp. 71-74 and Figure D.5.17.

¹⁴⁴³ GSI ER1, App. B.5; Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, lines 55-56 (**Exh. E-563**).

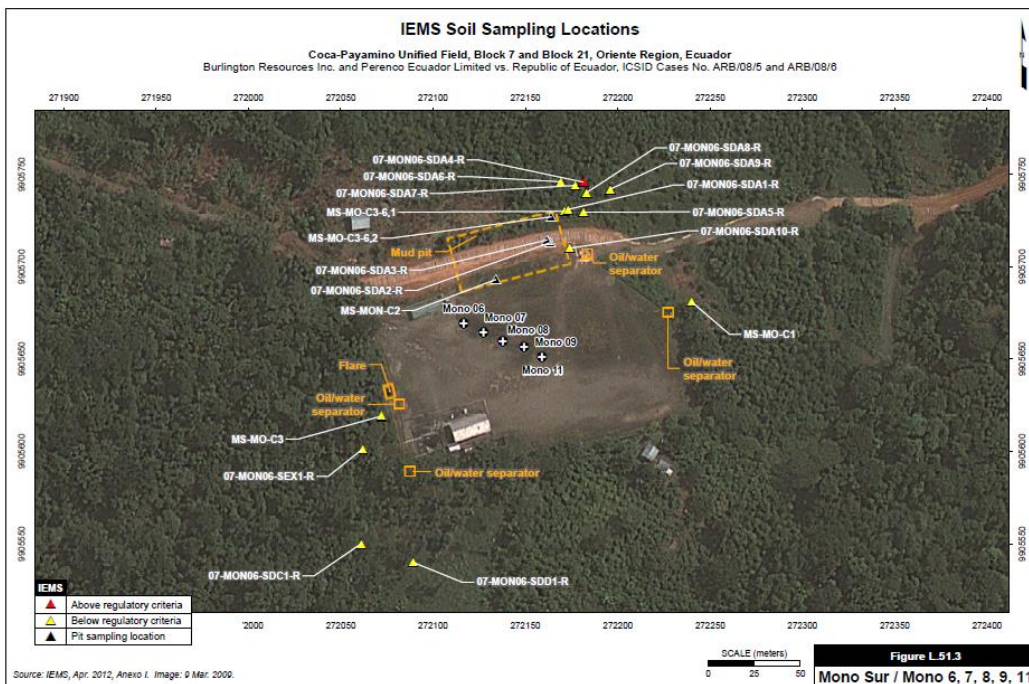
¹⁴⁴⁴ Reply, ¶ 195(ii). Also: GSI ER2, p. 13.

702. Furthermore, there is no record of spills during the operations of the Consortium, except for a spill in 2009 which IEMS located to the northwest of the platform near the oil trap and which is thus unrelated to the barium exceedance situated next to the pit. On that basis, the Tribunal holds that Burlington bears no liability for this site as regards non-pit soil.

pp. Mono Sur/6-9, 11

703. Ecuador claims USD 11,458,398 to remediate 13,088.40 m³ over an area of 9,787 m².¹⁴⁴⁵ Burlington recognizes that 610 m³ of soil may require remediation for a total cost of USD 175,000,¹⁴⁴⁶ but denies that it bears any liability for this environmental condition and points to drilling activities in 1996.¹⁴⁴⁷

704. The following figure depicts IEMS's¹⁴⁴⁸ and GSI's¹⁴⁴⁹ sampling locations at Mono Sur:



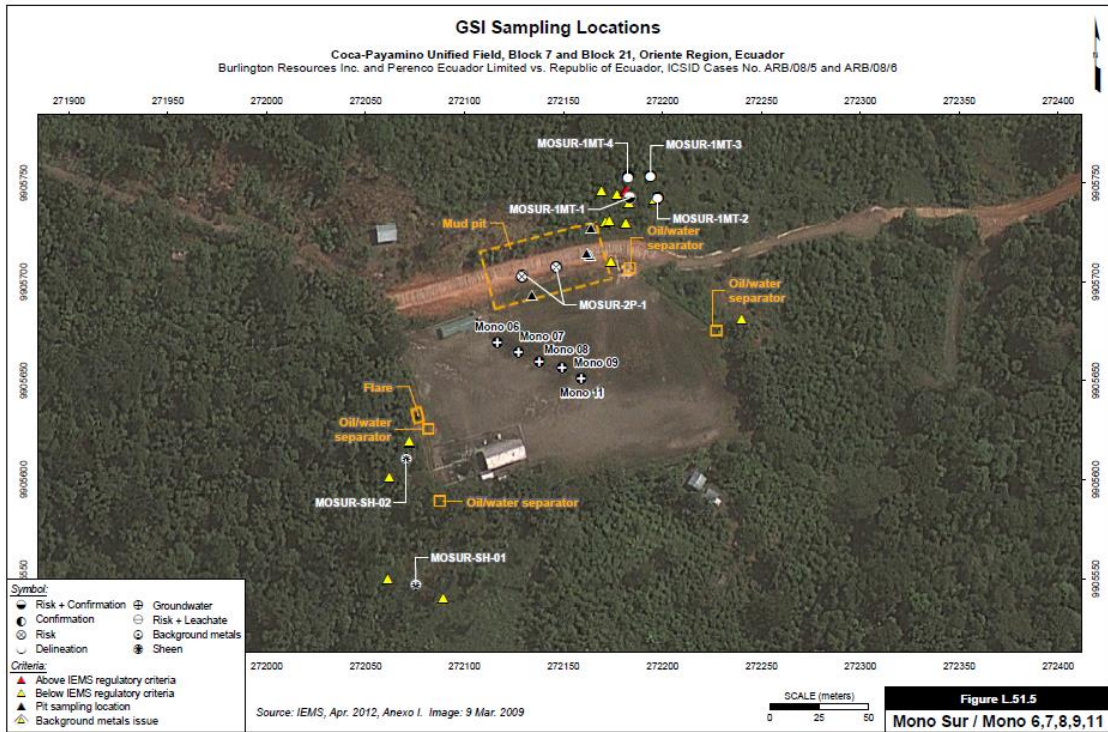
1445 Revised Attachment 35 to IEMS ER4 (Excel), line 34 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Mono 18 Corrected, p. 18; 2nd SMCC, ¶¶ 256-257; R-PHB, ¶ 383(d), note 453.

1446 GSI ER2, Tables 1, 3 and 4.

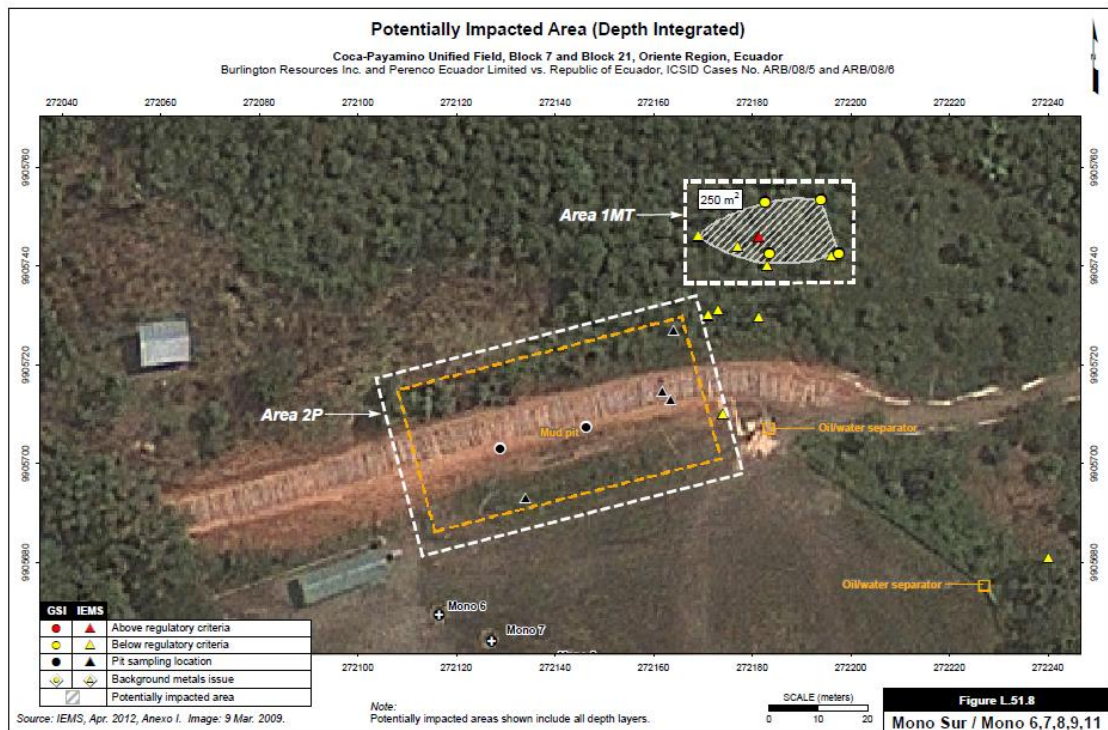
1447 *Id.*, Table 4.

1448 GSI ER1, App. L, Figure L.51.3.

1449 *Id.*, Figure L.51.5.



705. The potentially impacted area calculated by GSI is depicted below:¹⁴⁵⁰



1450 *Id.*, Figure L.51.8.

706. Applying its general approach to land use (section 4.3.2.c) and thus sensitive ecosystem criteria in this instance,¹⁴⁵¹ the Tribunal identified one exceedance point in the area designated by GSI as Area 1MT, located to the north of the platform and beyond the northeastern corner of a mud pit, with levels of TPH, barium, cadmium and lead exceeding permissible limits.¹⁴⁵² In addition, one sample collected by GSI has a chromium level of 65 mg/kg and thus complies with permissible limits.¹⁴⁵³
707. The Mono 6, 7, 8, 9 and 11 wells were drilled by Oryx between 1996 and 1997.¹⁴⁵⁴ Oryx also built and closed the mud pit on the northern side of the platform.¹⁴⁵⁵ The historical record of spills shows several pre-Consortium spills¹⁴⁵⁶ and two relatively minor unreported spills during the Consortium’s operatorship, namely a 1 barrel crude oil spill in 2006 at the Mono 6 high pressure line and a 2.5 barrel crude oil spill on 12 July 2007 at the Mono 6 tank.¹⁴⁵⁷ In addition, Mr. Solís mentioned a rupture in the flow line from Mono Sur, although he was unable to recall the exact date of that incident.¹⁴⁵⁸
708. In light of the high barium levels at the IEMS sample location, the exceedances identified above appear unrelated to these crude oil spills. Considering further that the

¹⁴⁵¹ GSI states that secondary forest is located to the west of the platform, but observes that agriculture is located to the north. IEMS notes that the platform is “mainly surrounded by jungle and estuary”. The satellite imagery does not confirm the presence of agriculture to the north of the platform, in particular in Area 1MT. Accordingly, the Tribunal applied sensitive ecosystem criteria to Area 1MT and to sampling locations to the west and southwest of the platform. See: IEMS ER3, Annex C, Mono 6, p. 4; GSI ER1, App. L.51.1, p. 7 and Figure L.51.3.

¹⁴⁵² Samples 07-MON06-SDA4-R(0,5-0,7), 07-MON06-SDA4-R(1,5-1,7) and 07-MON06-SDA4-R(2,5-2,7). See: IEMS ER3, Annex C, Mono Sur Corrected, pp. 11-16; GSI ER1, App. L, Table L.51.1; GSI ER2, App. D, Table D.3, pp. 76-77.

¹⁴⁵³ Sample MOSUR-1MT-2-(0.0-1.0). See: GSI ER1, App. L, Table L.51.5.

¹⁴⁵⁴ GSI ER1, App. B.5; Ecuador’s Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 58 (**Exh. E-563**).

¹⁴⁵⁵ GSI ER2, App. B.5. GSI relies on aerial photographs and does not state that the pit was constructed by the Consortium.

¹⁴⁵⁶ A 20bl crude oil spill on 1 December 1996 at the Mono 6 power oil unit, of which all crude was recovered; a 1bl crude oil spill on 15 December 1996 at the Mono 8 injection line, of which no crude was recovered; a 5-6bl crude oil spill in 1997/1998 beyond the oil trap to the southwest; and a 1.5bl crude oil spill on 1 October 1999 at the Mono 7 manifold, all of which was recovered. See: GSI ER1, App. B.3, lines 34, 35 and 47.

¹⁴⁵⁷ *Id.*, lines 84 and 90.

¹⁴⁵⁸ Solís WS1, ¶ 25.

Consortium conducted well workovers at this site¹⁴⁵⁹ and that the heavy metals exceedance levels are highest in the upper soil layer implying that contamination is relatively recent, the Tribunal comes to the conclusion that the presumption of causation is not rebutted and Burlington's liability is established.

709. Applying linear interpolation, GSI calculated a depth-integrated impacted area of 250 m² and a volume of soil of 610 m³ (see picture in paragraph 705 above).¹⁴⁶⁰ More specifically, GSI calculated for barium an area of 220 m² in the 0-1 meter layer, 240 m² in the 1-2 meter layer, and 130 m² in the 2-3 meter layer.¹⁴⁶¹ In addition, GSI calculated for TPH an area of 10 m² in the 0-1 and 1-2 meter layers within the area of the barium exceedance.¹⁴⁶²
710. Since the depth-integrated area calculated by GSI reaches clean sample points, the Tribunal accepts in principle the size of the impacted area. This said, it collapses all three layers to calculate the volume of soil, since there is not much difference between the respective areas of the three layers.
711. As a consequence, the total impacted area is 250 m² and the total volume of soil is 750 m³. Considering a 30% contingency (see paragraph 428), the total cost payable by Burlington is **USD 292,500** for Mono Sur/6-9, 11.

qq. Oso 1/CPF

712. Ecuador claims USD 22,624,698 to remediate 22,694.10 m³ of soil covering an area of 7,455 m².¹⁴⁶³ Burlington disputes this claim for the reason that no samples with indicator parameters exceed correct regulatory criteria.¹⁴⁶⁴

¹⁴⁵⁹ The record confirms that the Consortium conducted two workovers at the Mono 9 well, the first involving drilling activities. In 2003, workover # 5 was unsuccessful in its attempt to change the zone from the Upper Hollin to the Napo "U" reservoir; and in 2007, workover # 6 involved another evaluation of the Napo "U" reservoir. See: Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Mono 9, Reacondicionamiento # 6, November 2007, pp. 2, 4.

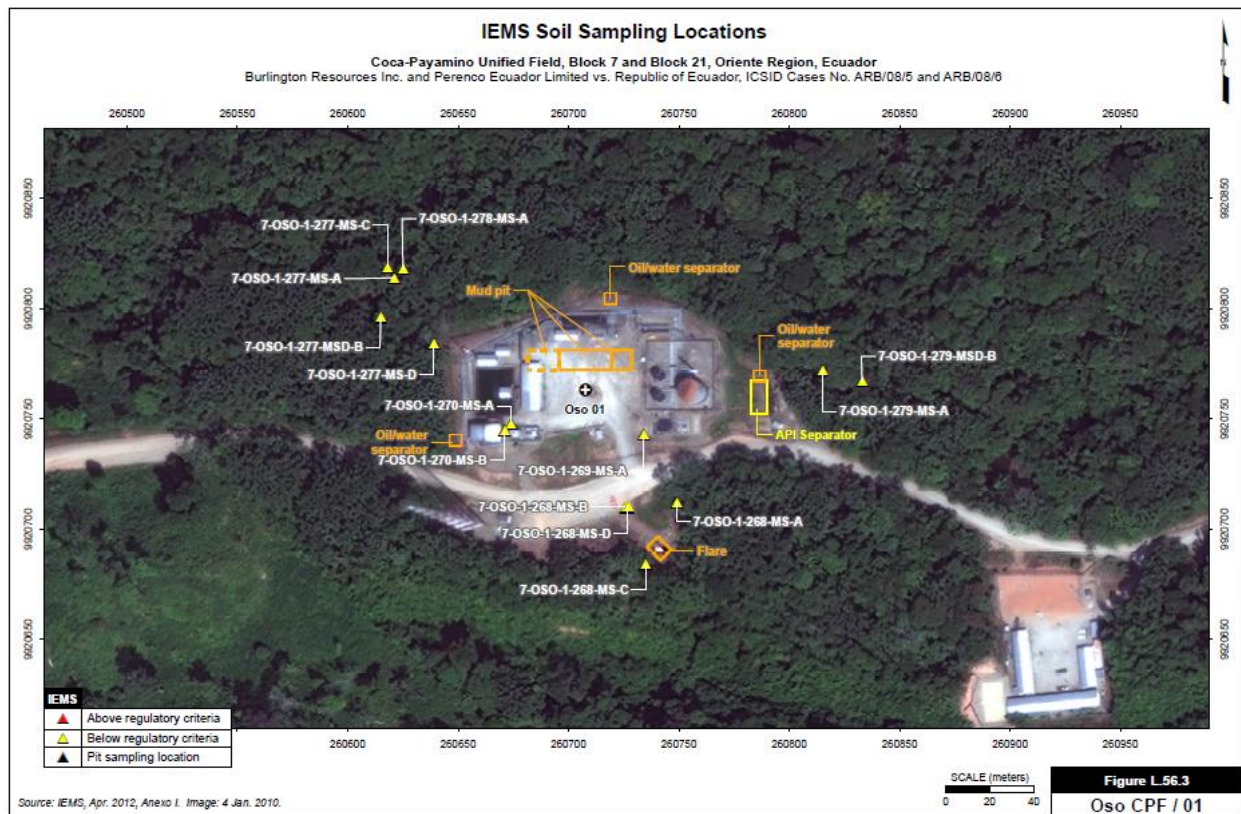
¹⁴⁶⁰ GSI ER1, App. L, Figure L.51.8 and Att. L.51.E, Table L.51.E.1 and Figures L.51.E.A.1 to L.51.E.A.5, L.51.E.B.1 to L.51.E.B.5; GSI ER2, Table 4.

¹⁴⁶¹ GSI ER1, Att. L.51.E, Table L.51.E.1 and Figures L.51.E.A.1 to L.51.E.A.3, L.51.E.B.1 to L.51.E.B.3.

¹⁴⁶² *Id.*, Att. L.51.E, Table L.51.E.1 and Figures L.51.E.A.4 to L.51.E.A.5, L.51.E.B.4 to L.51.E.B.5.

¹⁴⁶³ Revised Attachment 35 to IEMS ER4 (Excel), line 35 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Oso CPF, p. 16; 2nd SMCC, ¶ 272; R-PHB, ¶ 721.

713. The following figure depicts IEMS's sampling locations,¹⁴⁶⁵ being noted that there are no GSI samples for Oso 1/CPF:¹⁴⁶⁶



714. Applying its general approach to land use (section 4.3.2.c) and leaving pit soil aside for present purposes, there are no exceedances on the Oso 1 platform or the other facilities of the CPF measured at industrial land use criteria. Further, referring to sensitive ecosystem criteria to off platform areas to the northwest, north, northeast and east of the CPF,¹⁴⁶⁷ the Tribunal identified several cadmium exceedances in two discrete sampling locations to the northwest¹⁴⁶⁸ and in two locations to the east.¹⁴⁶⁹

¹⁴⁶⁴ GSI ER2, Tables 1 to 3.

¹⁴⁶⁵ GSI ER1, App. L, Figure L.56.3.

¹⁴⁶⁶ *Id.*, App. L.56; GSI ER2, App. D, Table D.4.

¹⁴⁶⁷ GSI states that secondary forest surrounds the platform. GSI ER1, App. L.56.1, p. 5.

¹⁴⁶⁸ Samples 7-OSO-1-277-MS-A-0,5, 7-OSO-1-277-MS-A-1,5, 7-OSO-1-277-MS-D-0,5 and 7-OSO-1-277-MS-D-1,5. See: GSI ER1, App. L, Table L.56.1 and Figure L.56.3; GSI ER2, App. D, Table D.3, pp. 83-84.

¹⁴⁶⁹ Sample 7-OSO-1-279-MS-A-0,5, 7-OSO-1-279-MS-A-1,5 and 7-OSO-1-279-MSD-B-0,5. In addition, there is a cadmium exceedance at sample location 7-OSO-1-279-MS-D'-0,5, which has

Finally, applying agricultural land use criteria around the flare, the Tribunal identified two locations with cadmium exceedances.¹⁴⁷⁰

715. The exact date when Oso 1 was drilled is unclear. GSI indicated that it was drilled by BP in 1970, but it appears more probable that BP drilled it in 1988 as stated by IEMS.¹⁴⁷¹ Be this as it may, it is largely irrelevant for present purposes, since Mr. Saltos testified at the Hearing that this was a standby well which the Consortium put back into operation, notably by conducting workovers.¹⁴⁷² In addition, there is evidence of a 14 barrel crude oil spill on 24 April 2003 at the Oso 1 storage tank, a 7 barrel crude oil spill on 25 January 2004 at the Oso CPF tank pit, and a 4 barrel crude oil spill on 22 July 2004 at the Oso CPF tank.¹⁴⁷³ The record also shows that equipment failure caused a 35 barrel spill on 6 August 2004 at the transfer pipeline in the Oso field, although the exact location is not clear.¹⁴⁷⁴ Finally, the Tribunal notes that Mr. Solís mentioned a post-Consortium diesel spill on 1 September 2009 “apparently caused by an improperly closed valve on the tanker truck” along the road some 300 meters away from the CPF.¹⁴⁷⁵
716. The Tribunal also observed that Mr. Solís testified that he informed his superior in 2007 and 2008 that production levels at Oso CPF had reached a “critical point” and that none of his suggestions to limit the risk were followed, which resulted in a “series of incidents at the Oso CPF station around the beginning of September (including a spill from one of the tanks – which one operator did not close correctly)”¹⁴⁷⁶.

exactly the same coordinates as the two samples 279-MS-A above. See: GSI ER1, App. L, Table L.56.1 and Figure L.56.3.

¹⁴⁷⁰ Samples 7-OSO-1-268-MS-B-0,5, 7-OSO-1-268-MS-B-1,5, 7-OSO-1-268-MS-D-1,5, 7-OSO-1-268-MS-C-0,5 and 7-OSO-1-268-MS-C-1,5.

¹⁴⁷¹ GSI ER1, App. L.56, p. 2; IEMS ER3, Annex C, Oso CPF, p. 5. See also: GSI ER1, App. B.5; Ecuador’s Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 59 (**Exh. E-563**).

¹⁴⁷² Tr. (Day 4) (ENG), 1239:1-2 (Cross, Saltos). See also: R-PHB, ¶ 721.

¹⁴⁷³ GSI ER1, App. B.3, lines 58, 67 and 70.

¹⁴⁷⁴ *Id.*, lines 71-72.

¹⁴⁷⁵ Solís WS2, ¶ 76, item 19 and Annex 58 (Email from the B7 Production Supervisor (Manuel Solís) of 5 September 2008).

¹⁴⁷⁶ *Id.*, ¶¶ 20-23.

717. Since the Oso Field was primarily developed and operated by the Consortium and the diesel spill on 1 September 2009 appears unrelated to the cadmium exceedances identified above, the Tribunal holds Burlington liable for remediating the environmental condition around the CPF.
718. In line with the Tribunal's methodology, the total impacted area around exceedance points to the northwest and east of the CPF is 800 m² and the total volume of soil is 1,400 m³.¹⁴⁷⁷ With a 30% contingency (see paragraph 428), the total remediation cost for these locations is **USD 546,000**. The impacted area around the flare is 400 m² and the total volume of soil 800 m³. With a 20% contingency (see paragraph 428), the total remediation cost is **USD 288,000**.
719. In sum, the total remediation cost awarded amounts to **USD 834,000** for Oso 1/CPF.

rr. Oso 9, 12, 15-20

720. Ecuador claims USD 22,257,459 to remediate 25,599.60 m³ covering an estimated area of 7,566 m².¹⁴⁷⁸ Burlington disputes this claim arguing that IEMS collected nearly all its samples within mud pits and that otherwise all sample results comply with regulatory criteria.¹⁴⁷⁹
721. The Tribunal notes that IEMS collected 127 samples at Oso 9¹⁴⁸⁰ and that Ecuador does not dispute that only one was taken outside the pit area. It will deal with pit soil at this location separately (see paragraphs 797-798, 800, 826-830 below). With respect to non-pit soil, and applying agricultural land use criteria to off platform locations, the Tribunal observes that there are no exceedances at this site.¹⁴⁸¹ Accordingly, Ecuador's claim as it relates to non-pit soil is dismissed.

¹⁴⁷⁷ The impacted area to the northwest of the platform is 400 m² and with a depth of 2 meters the volume of soil is 800 m³. The impacted area to the east of the platform is 400 m² and with a depth of 2 meters at one sample location and 1 meter at the second, the volume of soil is 600 m³.

¹⁴⁷⁸ Revised Attachment 35 to IEMS ER4 (Excel), line 38 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Oso 9 Corrected, pp. 29-30; 2nd SMCC, ¶¶ 276-277.

¹⁴⁷⁹ GSI ER2, Tables 1 to 3.

¹⁴⁸⁰ *Id.*, Table 2.

¹⁴⁸¹ IEMS ER3, Annex C, Oso 9 Corrected, pp. 14-27; GSI ER1, App. L, Tables L.54.1, L.54.3 to L.54.5, and Figures L.54.3 to L.54.6; GSI ER2, App. D, Table D.3, pp. 78-82.

4.6.3 Block 21

a. Yuralpa Pad A

722. Ecuador claims USD 1,683,111 to remediate 1,610.70 m³ over an area of 1,239 m².¹⁴⁸² Yuralpa Pad A is one of the two sites where, according to Burlington, GSI cannot definitively exclude that the Consortium caused the observed exceedances in an area designated as Area 2M.¹⁴⁸³ For Burlington, the exceedances are either due to drilling activities in 1997 or to Consortium operations between 2003 and 2006.¹⁴⁸⁴ Burlington also observes that Petroamazonas has been drilling on Yuralpa Pad A.¹⁴⁸⁵ As to quantification, Burlington estimates the impacted area to be 100 m², the volume of soil 100 m³, and the remediation cost USD 110,000.¹⁴⁸⁶

¹⁴⁸² Revised Attachment 35 to IEMS ER4 (Excel), line 61 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Yuralpa Pad A, p. 13; IEMS ER4, Att. 38, Yuralpa Pad A, p. 11; 2nd SMCC, ¶¶ 178-179, 282; Reply, ¶¶ 201, 205.

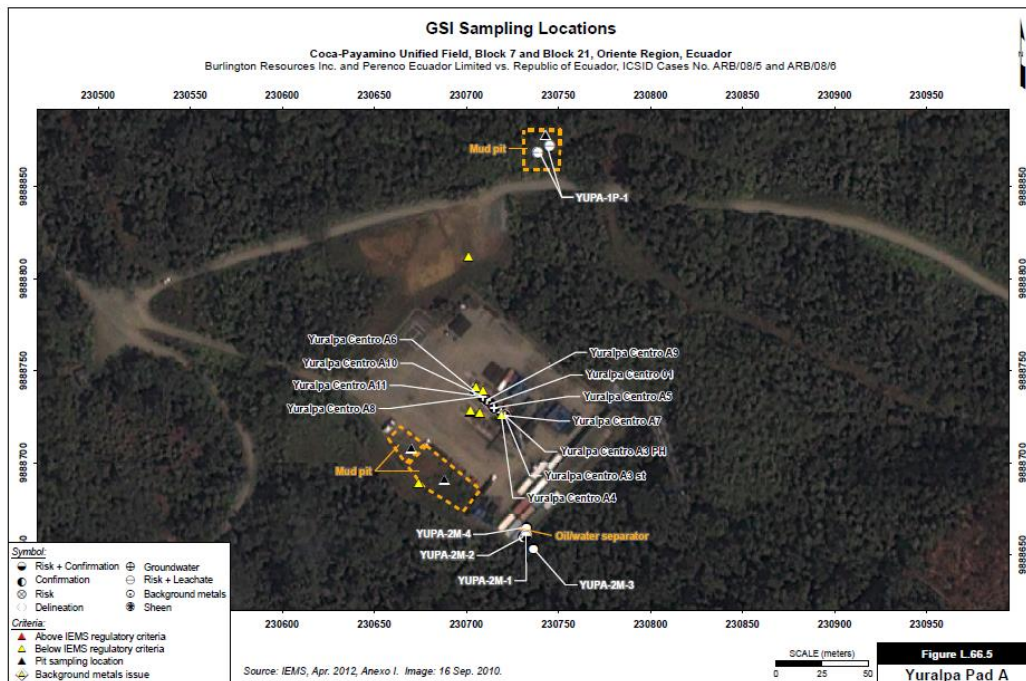
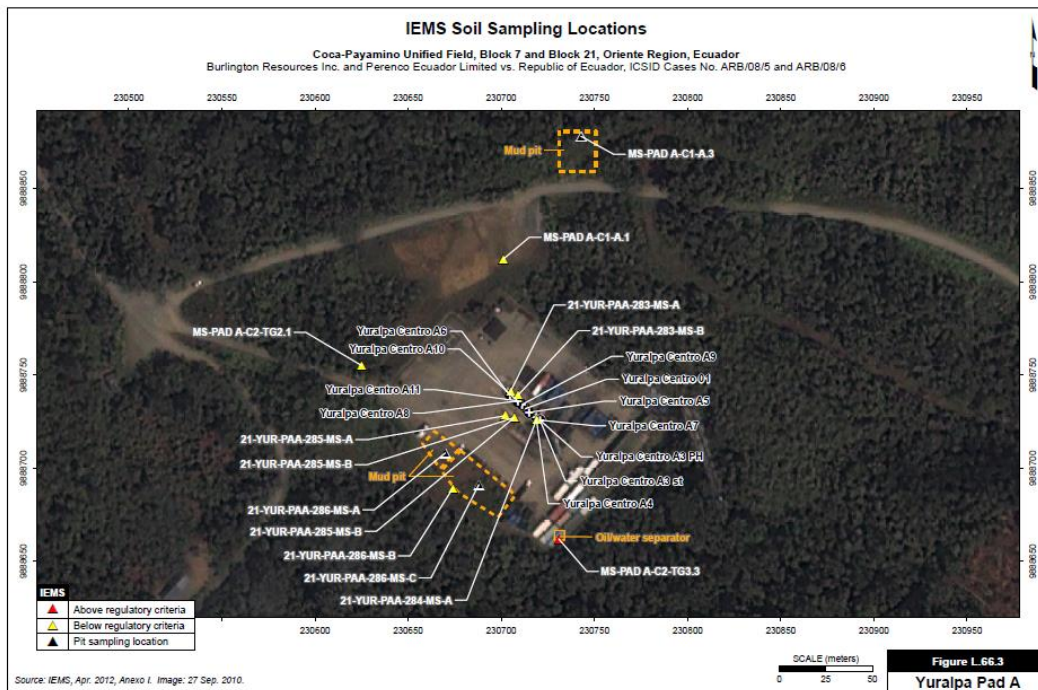
¹⁴⁸³ GSI ER2, Tables 1 to 4.

¹⁴⁸⁴ *Id.*, Table 4.

¹⁴⁸⁵ Rejoinder, ¶ 80, item 4; Saltos WS2, ¶ 126.

¹⁴⁸⁶ GSI ER2, Table 4. See also: GSI ER1, ¶ 135 and App. L, Figure L.66.8.

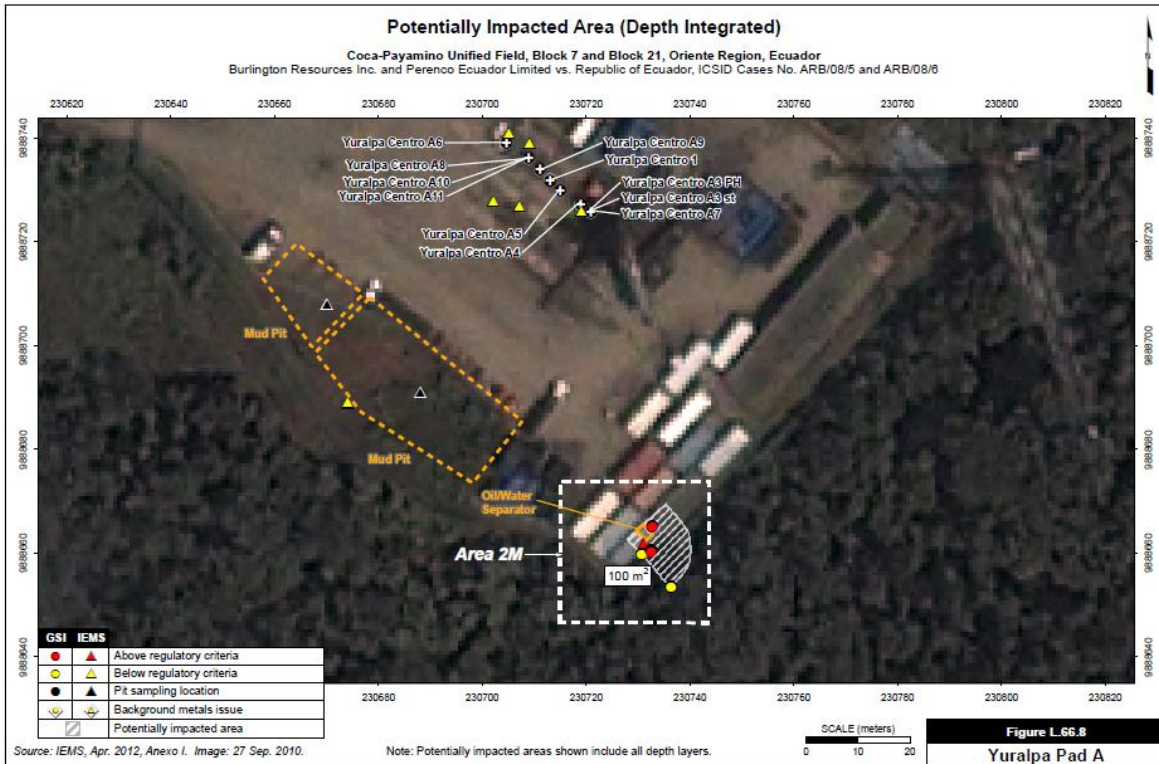
723. The following figures depict IEMS's¹⁴⁸⁷ and GSI's¹⁴⁸⁸ sampling locations at Yuralpa Pad A:



1487 GSI ER1, App. L, Figure L.66.3.

1488 *Id.*, Figure L.66.5.

724. The following figure depicts the potentially impacted area as calculated by GSI for Area 2M:



725. In line with its land use approach (section 4.3.2.c) and accordingly applying here sensitive ecosystem land use criteria to off platform locations,¹⁴⁸⁹ the Tribunal identified four exceedance points outside the oil/water separator in Area 2M on the southern corner of the platform.¹⁴⁹⁰ All four points show barium levels exceeding permissible limits, the highest value reaching 6,877 mg/kg,¹⁴⁹¹ and three of them also show slight nickel levels above permissible limits.¹⁴⁹²

1489 GSI notes that secondary forest surrounds the platform, except for some agriculture southwest of the platform entrance where no sampling took place and which is therefore irrelevant for present purposes. GSI ER1, App. L.66.1, p. 7.

1490 IEMS sample MS-PAD-A-C2-TG3-3-0,30; and GSI samples YUPA-2M-1-(0.0-0.3)R, YUPA-2M-1-(0.0-0.3)C, YUPA-2M-1-(0.0-0.3)C Dup, YUPA-2M-3-(0.0-1.0) Dup and YUPA-2M-4-(0.0-1.0). See: IEMS ER4, Att. 38, Yuralpa Pad A, pp. 7-9; GSI ER1, App. L, Tables L.66.1, L.66.3 to L.66.5, Figures L.66.3 to L.66.6; GSI ER2, App. D, Table D.3, pp. 86-87.

1491 IEMS sample MS-PAD-A-C2-TG3-3-0,30.

1492 GSI samples YUPA-2M-1-(0.0-0.3)C Dup, YUPA-2M-3-(0.0-1.0) Dup and YUPA-2M-4-(0.0-1.0). See: GSI ER1, App. L, Tables L.66.3-L.66.5.

726. Yuralpa Pad A was initially developed by Oryx in 1997 and further expanded by the Consortium when it put the standby Centro 1 well back into operation and drilled wells A2 to A11.¹⁴⁹³ Burlington did not refer to post-Consortium activities and could not exclude the Consortium's liability, but suggested that exceedances may be related to Oryx's drilling activities.¹⁴⁹⁴ In view of the fact that the Consortium developed this platform and that the exceedances are likely linked to an overflow of the oil/water separator, the Tribunal is of the opinion that Burlington did not rebut the causation presumption and is liable for the environmental condition in Area 2M.

727. To quantify the impact and costs, GSI calculated an impacted area of 100 m² (see picture in paragraph 724 above) and estimated a volume of 100 m³ requiring remediation.¹⁴⁹⁵ The Tribunal considers that the impacted area must be increased to 200 m². It extends the area downhill because GSI's delineation sample YUPA-2M-3 on the downward slope shows a barium level above permissible limits. The total volume of soil is thus 200 m³. With a 30% contingency (see paragraph 428), the total cost of remediation to be borne by Burlington is **USD 78,000** for Yuralpa Pad A.

b. Yuralpa Pad D

728. Ecuador claims USD 7,935,332 to remediate 7,900 m³ over an area of 3,840 m².¹⁴⁹⁶ Burlington opposes this claim.¹⁴⁹⁷

729. There are no off platform exceedances at this site when applying sensitive ecosystem land use criteria.¹⁴⁹⁸ However, the Tribunal identified three nickel exceedances on the platform.¹⁴⁹⁹

¹⁴⁹³ GSI ER1, App. B.5; Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, lines 74-76 (**Exh. E-563**).

¹⁴⁹⁴ GSI ER2, Table 4.

¹⁴⁹⁵ GSI ER1, App. L, Figure L.68.8 and Att. L.66.E, Table L.66.1, Figures L.66.E.A.1 and L.66.E.B.1.

¹⁴⁹⁶ Revised Attachment 35 to IEMS ER4 (Excel), line 63 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Yuralpa Pad D, p. 10; 2nd SMCC, ¶ 284.

¹⁴⁹⁷ GSI ER2, Tables 1 to 3.

¹⁴⁹⁸ IEMS ER3, Yuralpa Pad D, pp. 7-8; GSI ER1, App. L, Table L.68.1 and Figure L.68.3; GSI ER2, App. D, Table D.3, p. 88.

¹⁴⁹⁹ Samples 21-YUR-PAD-291-MS-A-1,5, 21-YUR-PAD-291-MS-B-1,5 and 21-YUR-PAD-N1-MS-D`-1,5. The exact location of sample 21-YUR-PAD-N1-MS-D`-1,5 is not indicated in GSI Figure

730. Yuralpa Pad D was drilled by the Consortium in 2006.¹⁵⁰⁰ The record evinces that the Consortium conducted workovers on wells D1 to D3.¹⁵⁰¹ At the same time, Mr. Saltos testified that Petroamazonas had expanded operations by drilling new wells at Pad D,¹⁵⁰² which Ecuador did not challenge. On that basis, the Tribunal considers that Burlington's liability is engaged, but that the consequences of Petroamazonas's expansion cannot be disregarded. Accordingly, it holds Burlington liable for 50% of the remediation costs.

731. The impacted area is 240 m² and the total volume of soil is 480 m³.¹⁵⁰³ Adding a 20% contingency (see paragraph 428), the total cost of remediation is USD 172,800, of which Burlington shall pay **USD 86,400** for Yuralpa Pad D.

c. Yuralpa Pad E

732. Ecuador claims USD 2,599,752 to remediate 2,535 m³ over an area of 1,300 m².¹⁵⁰⁴ Burlington disputes this claim.¹⁵⁰⁵

733. Leaving pit soil aside for present purposes and considering sensitive ecosystem land use criteria for off platform locations,¹⁵⁰⁶ the Tribunal identified no on or off platform

L. 68.3, but the coordinates indicate the same location as sample 21-YUR-PAD-N1-MS-C in between the two mud pits on the western side of the platform.

¹⁵⁰⁰ GSI ER1, App. B.5; Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 79 (**Exh. E-563**).

¹⁵⁰¹ The record confirms, for instance, that the two workovers conducted at the Yuralpa D1 well involved the use of chemicals. See: Well Workovers on Blocks 7 and 21 dated 1992 to 2012, Yuralpa D1, Reacondicionamiento #1 and Reacondicionamiento # 2, October 2006 (**Exh. E-573**). See also: R-PSVB, ¶ 200, note 227.

¹⁵⁰² Saltos WS2, ¶ 126. See also: Rejoinder, ¶ 80.

¹⁵⁰³ In line with the Tribunal's methodology (section 4.3.3.c), the impacted area around each exceedance point is 80 m², and with a depth of 2 meters, the total volume of soil is 160 m³.

¹⁵⁰⁴ Revised Attachment 35 to IEMS ER4 (Excel), line 64 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Yuralpa Pad E, p. 11; 2nd SMCC, ¶ 285.

¹⁵⁰⁵ GSI ER2, Tables 1 to 3.

¹⁵⁰⁶ The Tribunal took note that Petroamazonas tested samples against agricultural land use criteria in 2012, but consistent with the principle of *in dubio pro natura*, the Tribunal chose to rely primarily on aerial images taken in 2010 (such as GSI Figure L.69.3) as well as on GSI's recognition that the platform is surrounded by secondary and even primary forest. See: GSI ER1, App. L.69, p. 5. See also: Rejoinder, ¶ 124; Letter of 9 April 2012 from Guido Abad (Petroamazonas) to María Cristina Urrutia Celi (Ministry of Environment) (**Exh. CE-CC-360**).

exceedances at this site.¹⁵⁰⁷ Accordingly, Ecuador's claim as it relates to non-pit soil is dismissed.

d. Yuralpa Pad G

734. Ecuador claims USD 2,691,730 to remediate 2,631.20 m³ over an area of 809 m².¹⁵⁰⁸ Burlington opposes this claim.¹⁵⁰⁹

735. Not taking into account pit soil for the time being and applying agricultural land use criteria, there are no exceedances at this site.¹⁵¹⁰ Accordingly, Ecuador's claim as it relates to non-pit soil is dismissed.

e. Yuralpa Waste Transfer Station

736. Ecuador claims USD 7,842,852 to remediate 8,892 m³ of soil covering an area of 11,491 m².¹⁵¹¹ Burlington opposes this claim and invokes the absence of exceedances at this site.¹⁵¹²

737. Applying sensitive ecosystem land use criteria to off platform locations and deferring the analysis of pit soil, the Tribunal identified no exceedances at that site.¹⁵¹³ Accordingly, it dismisses Ecuador's claim for the remediation of non-pit soil.

f. Chonta

738. Ecuador claims USD 1,134,025 to remediate 1,218.75 m³ over an area of 375 m².¹⁵¹⁴ Burlington disputes this claim and argues that IEMS mostly sampled within a pit.¹⁵¹⁵

¹⁵⁰⁷ IEMS ER3, Annex C, Yuralpa Pad E, pp. 7-9; GSI ER1, App. L, Table L.69.1 and Figures L.69.3-L.69.4; GSI ER2, App. D, Table D.3, pp. 88-89.

¹⁵⁰⁸ Revised Attachment 35 to IEMS ER4 (Excel), line 65 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Yuralpa Pad G, p. 11; 2nd SMCC, ¶ 287.

¹⁵⁰⁹ GSI ER2, Tables 1 to 3.

¹⁵¹⁰ IEMS ER3, Annex C, Yuralpa Pad G, pp. 7-9; GSI ER1, App. L, Table L.71.1 and Figures L.71.3-L.71.6; GSI ER2, App. D, Table D.3, p. 89.

¹⁵¹¹ Revised Attachment 35 to IEMS ER4 (Excel), line 69 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Yuralpa Waste Transfer Station, pp. 10-11; 2nd SMCC, ¶¶ 280-281.

¹⁵¹² GSI ER2, Tables 1 and 3.

¹⁵¹³ IEMS ER3, Annex C, Yuralpa Waste Transfer Station, pp. 6-7; GSI ER1, App. L, Table L.65.1 and Figures L.65.3-L.65.4; GSI ER2, App. D, Table D.3, p. 90.

¹⁵¹⁴ Revised Attachment 35 to IEMS ER4 (Excel), line 58 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Chonta, p. 14; 2nd SMCC, ¶ 288.

739. Ecuador does not dispute that most of IEMS samples were collected within two pits located to the south of the platform, three others on the platform, and an additional one off the platform. Disregarding pit soil and applying sensitive ecosystem land use criteria to off platform locations, there are no exceedances at this location.¹⁵¹⁶ Accordingly, Ecuador's claim relating to non-pit soil is dismissed.

g. Dayuno

740. Ecuador claims USD 10,559,896 to remediate 12,086.10 m³ over an area of 5,104 m².¹⁵¹⁷ Burlington challenges this claim on the ground that the Consortium never conducted any activities at that site.¹⁵¹⁸

741. Leaving pit soil to the side, the Tribunal identified three exceedance points on the platform with high levels of chromium and nickel as well as a slight vanadium exceedance.¹⁵¹⁹ However, since Ecuador did not dispute Burlington's contention and the related evidence aimed at demonstrating that the Consortium never conducted any activities at Dayuno,¹⁵²⁰ the Tribunal cannot but dismiss Ecuador's claim for non-pit soil.

¹⁵¹⁵ GSI ER2, Tables 1 to 3; Saltos WS1, ¶ 199.

¹⁵¹⁶ IEMS ER3, Annex C, Chonta, pp. 7-12; GSI ER1, App. L, Table L.58.1 and Figures L.85.3-L.85.4; GSI ER2, App. D, Table D.3, p. 84.

¹⁵¹⁷ Revised Attachment 35 to IEMS ER4 (Excel), line 59 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Dayuno, pp. 13-14; IEMS ER4, Att. 38, Dayuno, p. 13; 2nd SMCC, ¶ 291; Reply, ¶¶ 204-205.

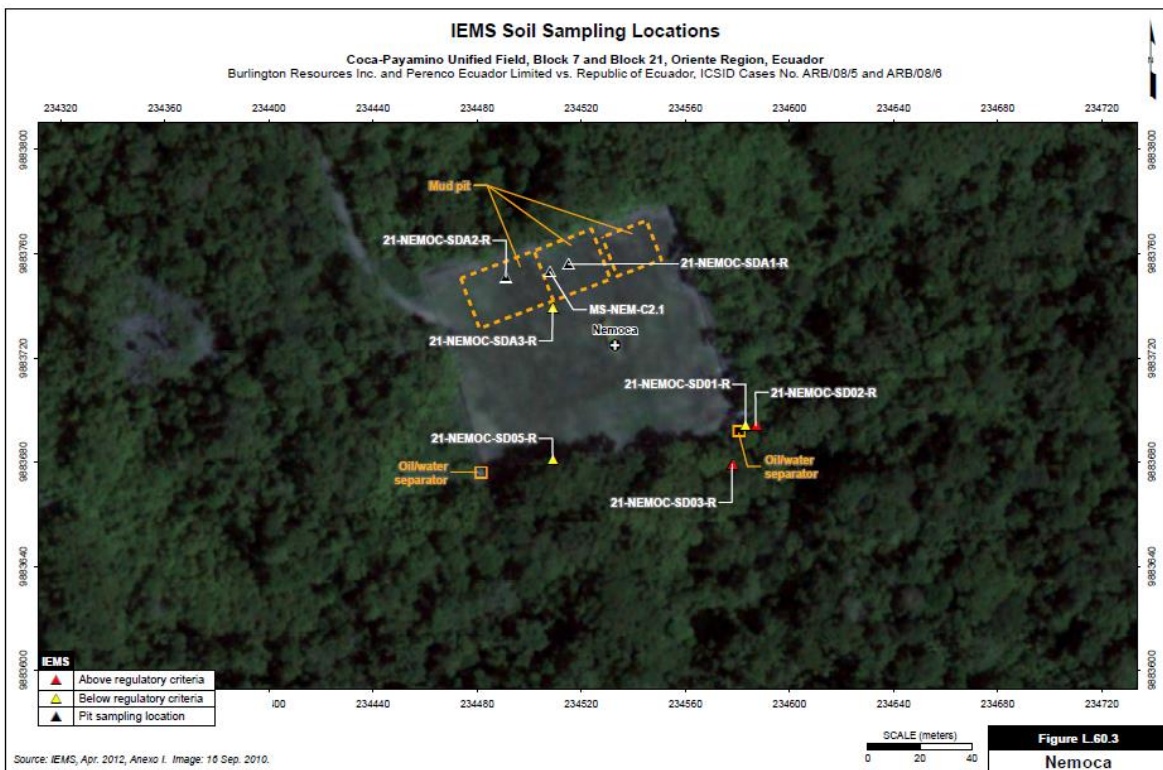
¹⁵¹⁸ CMCC, ¶ 365, item 4; Rejoinder, ¶ 118; Saltos WS1, ¶¶ 266-271; GSI ER2, Tables 1 to 3. GSI did not investigate Dayuno due to "access limitations". See: GSI ER1, ¶¶ 170, 177, 181, 187; GSI ER2, ¶ 194.

¹⁵¹⁹ Samples 21-DAY01-SDC3-R(0,4-0,6)m, MS-WAP-C2-DAY.1-0,5 and MS-WAP-C2-DAY.3-0,5. See: IEMS ER3, Annex C, Dayuno, pp. 7-10; GSI ER1, App. L, Table L.59.1 and Figure L.59.3; GSI ER2, App. D, Table D.3, pp. 84-85.

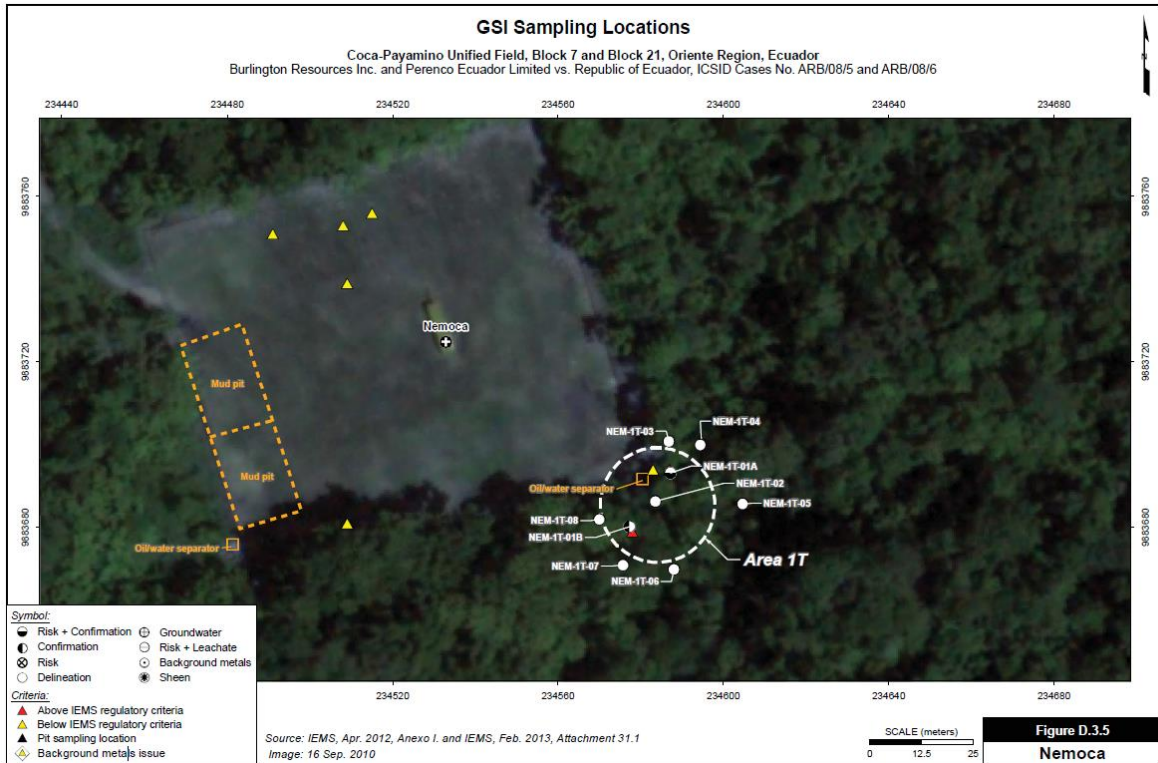
¹⁵²⁰ Mr. Saltos explained that Dayuno was drilled by Esso-Hispanoil in 1987 and that neither Oryx, Kerr McGee or the Consortium operated that site, in particular because the Ministry of Energy and Mines rejected an exploratory plan submitted by the Consortium in 2004. See: Saltos WS1, ¶¶ 266-271; Yuralpa Development Project, Ecuador Block 21 Plan of Development (POD), submitted 28 July 2000 and approved 17 June 2001 (**Exh. CE-CC-281**); Letter of 19 July 2004 from Lauro Mora (Ministry of Energy and Mines) to Marc Vueuille (Perenco) (**Exh. CE-CC-74**). Ecuador accepted that Dayuno was drilled by Esso-Hispanoil, but otherwise merely stated that Burlington failed to establish that harm was caused prior to 1995. See: R-PHB, ¶ 637, note 815.

h. Nemoca

742. Ecuador claims USD 15,057,759 to remediate 16,073.20 m³ over an area of 9,744 m².¹⁵²¹ Burlington disputes this claim; it argues that there are no concentrations of indicator parameters in excess of regulatory criteria and that GSI could not confirm the TPH exceedance measured by IEMS.¹⁵²²
743. The following images show IEMS's¹⁵²³ and GSI's¹⁵²⁴ sampling locations at Nemoca:



- 1521 Revised Attachment 35 to IEMS ER4 (Excel), line 60 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Nemoca Corrected, p. 14; 2nd SMCC, ¶ 290.
- 1522 GSI ER2, ¶ 63 and Tables 1 to 3. GSI excluded Nemoca from its investigation in its first expert report, but investigated the site for its second expert report. See: GSI ER1, ¶ 232; GSI ER2, ¶¶ 13, 51, 62 and App. D, Table D.8 to D.11 and Figures D.1.5 and D.3.5.
- 1523 GSI ER1, App. L, Figure L.60.3.
- 1524 GSI ER2, App. D, Figure D.3.5.



744. In line with its land use approach (section 4.3.2.c) and thus applying sensitive ecosystem criteria,¹⁵²⁵ the Tribunal identified elevated TPH levels at two exceedance points around the oil/water separator.¹⁵²⁶ At one exceedance point, TPH levels reach 23,219 mg/kg.¹⁵²⁷ It is true that GSI could not confirm these TPH levels in its confirmation samples.¹⁵²⁸ However, the Tribunal notes that these confirmation samples were taken at a distance of 0.86 and 1.36 meters respectively from IEMS sample points.¹⁵²⁹ It also notes that GSI did not challenge the validity of the IEMS samples *per se* nor considered that they were misplaced and located in a pit.¹⁵³⁰

1525 GSI notes that primary forest surrounds the platform. GSI ER1, App. L.60.1, p. 4.

1526 Samples 21-NEMOC-SD02-R(0,5-0,6)m, 21-NEMOC-SD02-R(2,7-2,8)m, 21-NEMOC-SD03-R(0,5-0,6)m and 21-NEMOC-SD03-R(1,5-1,6)m. See: IEMS ER3, Annex C, Nemoca, pp. 7-9; GSI ER1, App. L, Table L.60.1 and Figures L.60.3-L.60.4; GSI ER2, App. D, Table D.3, p. 85, Tables D.8-D.10, and Figures D.1.5 and D.3.5.

1527 Sample 21-NEMOC-SD02-R(2,7-2,8)m.

1528 GSI ER2, Annexes D.9 and D.11.

1529 GSI samples NEM-1T-01A-(2.7-2.8) and NEM-1T-01B-(1.5-1.6), respectively. GSI ER2, Annex D.11.

1530 See, for instance: GSI ER1, Annex D.2; GSI ER2, Annex D.2.

745. The Nemoca injection well was drilled by Oryx in 1999.¹⁵³¹ There are no records of historical spills. Nor are there barium exceedances that would indicate contamination caused by drilling activities. This said, because the exceedance points are close to the oil/water separator, the most likely cause would appear to be an incident involving crude oil overflowing from the oil/water separator on the southeastern corner of the platform. On this basis, the Tribunal considers that Burlington has not rebutted the presumption that the Consortium caused this harm. Therefore, the Tribunal holds Burlington liable for these remediation costs.

746. Considering the proximity of sample 21-NEMOC-SD02-R to the oil/water separator, and also considering GSI's sampling,¹⁵³² the Tribunal determined a total impacted area of 350 m² and a total volume of soil of 850 m³.¹⁵³³ With a 30% contingency (see paragraph 428), the total cost amounts to **USD 331,500** for Nemoca.

i. Sumino

747. Ecuador claims USD 523,648 to remediate 447.20 m³ of soil covering an area of 344 m².¹⁵³⁴ Burlington challenges this claim arguing that there are no exceedances of regulatory criteria at that site.¹⁵³⁵

748. Applying sensitive ecosystem land use criteria to off platform locations and leaving pit soil aside in this context, the Tribunal identified no exceedances at that site.¹⁵³⁶ Accordingly, Ecuador's claim for the remediation of non-pit soil is dismissed.

¹⁵³¹ GSI ER1, App. B.5; Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 70 (**Exh. E-563**).

¹⁵³² GSI ER2, App. D, Tables D.8-D.11 and Figure D.3.5.

¹⁵³³ The impacted area around sample 21-NEMOC-SD02-R is 150 m², and with a depth of 3 meters, the volume of soil is 450 m³. The impacted area around sample 21-NEMOC-SD03-R is 200 m², and with a depth of 2 meters, the volume of soil is 400 m³. See: GSI ER1, App. L, Figure L.60.3; GSI ER2, App. D, Table D.3, p. 85 and Figure D.3.5.

¹⁵³⁴ Revised Attachment 35 to IEMS ER4 (Excel), line 70 (**Exh. E-500**). Compare with: IEMS ER3, Annex C, Sumino Corrected, p. 11; 2nd SMCC, ¶ 289.

¹⁵³⁵ GSI ER2, Tables 1 and 3.

¹⁵³⁶ IEMS ER; GSI ER1, App. L, Table L.61.1 and Figures L.61.3-L.61.4; GSI ER2, App. D, Table D.3, p. 86.

5. Mud pits

5.1 Ecuador's position

749. Ecuador claims that all the mud pits in the Blocks, to the exception of those built and maintained by Petroamazonas, must be remediated “as any other contaminated soil within the Blocks”.¹⁵³⁷ According to Ecuador, Burlington accepted at the Hearing that the mud pits in Blocks 7 and 21 contain “significantly high levels of contamination”.¹⁵³⁸ For Ecuador, these mud pits are “environmental ticking bombs” that need to be remediated,¹⁵³⁹ in particular since it was demonstrated that “some of the pits have already collapsed, leaked or leached contamination to the surrounding areas”.¹⁵⁴⁰ According to Ecuador, concentrations in the mud pits exceed both background values and the values for sensitive ecosystems, in some cases even the highest regulatory levels for industrial soil, as the Coca 8 pits show with concentrations exceeding 103,000 mg/kg of TPH.¹⁵⁴¹ And GSI’s “limited visual assessment” is insufficient to dismiss “the evidence of breached or collapsed mud pits as well as the risks of further collapse, leaking and leaching”.¹⁵⁴²
750. For Ecuador, there is overwhelming evidence showing that “pits were not properly constructed, maintained or closed by the Consortium” and that they are releasing contamination into the environment.¹⁵⁴³ In addition to checking the design and construction of mud pits, IEMS took 488 soil samples of mud pits in 37 platforms (32 in Block 7 and 5 in Block 21) and 126 soil samples in areas close to these mud pits.¹⁵⁴⁴ By contrast, says Ecuador, GSI acknowledged the existence of only 158 of the 226 mud pits in both Blocks in July 2009 and limited itself to a visual inspection and to taking 9 leachate samples from 7 closed pits.

¹⁵³⁷ R-PHB, ¶ 450; R-PSVB, ¶ 83.

¹⁵³⁸ R-PHB, ¶ 448.

¹⁵³⁹ Tr. (Day 1) (ENG), 112:7-8 (Opening, García Represa); R-PHB, ¶ 449.

¹⁵⁴⁰ R-PHB, ¶ 448; R-PSVB, ¶ 84.

¹⁵⁴¹ R-PHB, ¶ 451; Tr. (Day 3) (ENG), 670:21-671:5 (Direct, Alfaro).

¹⁵⁴² R-PSVB, ¶ 84.

¹⁵⁴³ R-PHB, ¶ 453.

¹⁵⁴⁴ IEMS ER4, Att. 10.1 and 10.2.

751. Ecuador argues that GSI's limited leachate testing is premised on four erroneous assumptions, namely that all pits are constructed with liners, that all liners are intact, that the pit contents were properly treated before pit closure, and that the Consortium complied with applicable regulations. Ecuador rebuts these assumptions, submitting as follows:¹⁵⁴⁵ (i) GSI adduced no evidence of the proper construction, maintenance and verification of the mud pits; (ii) the Consortium had no written policy of mud pit treatment, as admitted by Perenco and evidenced by the fact that Burlington does not even know the correct number of mud pits located in the Blocks; (iii) Consortium employees confirmed that pits had not been properly constructed, which is well illustrated by the mud pit in Coca 8; (iv) the record shows that only 34 out of the 226 mud pits are lined (but not necessarily adequately maintained), Oso 9 providing a good example of unlined pits;¹⁵⁴⁶ (v) the pits were not properly maintained; (vi) some pits were not reported or properly closed, as confirmed by Mr. Saltos in relation to Payamino 16;¹⁵⁴⁷ and (vii) the mud pits were not properly monitored, as evidenced by Mr. Saltos's statement that the Consortium did not test the mud pits six months after closure as required by Table 7 of RAOHE.¹⁵⁴⁸

752. It is further undisputed, according to Ecuador, that there were incidents at a number of pits and that some are leaking:¹⁵⁴⁹

- Individuals have been affected by leaks from pits at Coca 4, Payamino 1, Oso A, and Gacela 2;
- The Waiponi Ocatoe pit collapsed in 2002/2003 and the Cónдор Norte pit partially collapsed in 2006, as acknowledged by Mr. Saltos;
- The eastern part of the Mono CPF platform contains discharges of drilling mud and cuttings, as admitted by GSI;

¹⁵⁴⁵ R-PHB, ¶¶ 460-480.

¹⁵⁴⁶ *Id.*, ¶ 466. Ecuador states that evidence shows that 33 pits are not lined, and that there is no evidence that the remaining 159 pits are lined.

¹⁵⁴⁷ And as further demonstrated with the examples of Gacela 3, Mono 1-5, Jaguar 7-8, Coca 4, Payamino 5, Chonta 1, Nemoca 1, Coca 15, Payamino 23, Payamino 24, Jaguar 9, Coca 18, Coca 19 and Coca CPF, where contaminated soils were not remediated during pit closure. *Id.*, ¶ 474.

¹⁵⁴⁸ *Id.*, ¶¶ 479-480; Tr. (Day 4) (ENG), 1348:19-1349:12 (Cross, Saltos).

¹⁵⁴⁹ R-PHB, ¶ 482.

- The southern part of the closed pit in Coca 8 contains drilling mud beyond the boundaries of the pit, as admitted by GSI;
- The lining is perforated in the pit of the Payamino 8 well, as discovered by IEMS;
- The pits in Coca 18/19 have released their contents; and
- The pit in Mono 10/12 is leaking.¹⁵⁵⁰

753. These instances thus bely GSI's assumptions, argues Ecuador, as they show that mud pits are bound to collapse or leak and thus contaminate the environment for generations to come, unless tested and restored as regular soil.

754. Finally, Ecuador submits that Burlington never considered the groundwater effects around mud pits, notwithstanding the fact that mud pits are usually 4.5 meters deep and that the water table is between 1 and 3 meters deep.¹⁵⁵¹ Accordingly, mud pits are in direct contact with groundwater. Even if the depth of some pits had been reduced, such as in Oso A, this did not prevent contact with groundwater due to the fluctuation of the water level and of the risk of leaking or leaching.

5.2 Burlington's position

755. For its part, Burlington argues that IEMS improperly passed off mud pit soil as regular soil. Specifically, IEMS collected samples from closed mud pits and subjected them to the testing methodology and regulatory criteria applicable to regular soils. As a result, Ecuador's counterclaims have yet again been grossly inflated.

756. Burlington contends that one fifth of IEMS's soil samples were collected from mud pits, none of which should be used to ascertain purported contamination in the Blocks.¹⁵⁵² Thus, Burlington rejects Ecuador's claim to remove all mud pits, but accepts that four open and unused pits at three sites (Coca 8, Coca 4 and Payamino 5) must be closed for a total cost of USD 68,000, assuming that "the pits will require placement and

¹⁵⁵⁰ Reply, ¶ 195(ii).

¹⁵⁵¹ R-PHB, ¶¶ 501-506.

¹⁵⁵² CMCC, ¶¶ 313-316, 333.

compaction of clean backfill soil to grade, followed by re-vegetation of the former pit area”.¹⁵⁵³

757. More specifically, Burlington argues that mud pits are not to be equated with regular soil and IEMS erroneously collected 624 samples from within pits.¹⁵⁵⁴ Mud pits are approved containment areas designed precisely to contain the discharge of industrial substances – such as drilling muds, barium and cuttings. They of course contain higher levels of potential contaminants than does non-pit soil; that is their purpose. It thus makes sense to subject mud pits to regulatory criteria different from those for regular soils. Thus, permissible levels of contaminants for mud pits are provided in the less restrictive Table 7 of RAOHE, whereas the more restrictive limits for regular soils are found in Table 6.

758. In this context, Burlington further argues that Ecuador itself has acknowledged in the past that Table 7 is the applicable regulatory standard for mud pits. Burlington points to the fact that IEMS also applied Table 7 to mud pits in its expert report for the *City Oriente* arbitration while IEMS incorrectly applied Table 6 to mud pits in the present arbitration.¹⁵⁵⁵ In any event, Burlington argues that Ecuador’s concerns regarding the hazards associated with pits are “misplaced” because “[p]its are *not* inherently harmful to the environment” since their contents are “stable and non-toxic”.¹⁵⁵⁶

759. For Burlington, IEMS has also applied the wrong methodology to test mud pit samples. The proper test consists in ascertaining whether the mud pit contents can “leach” impermissible amounts of substances into groundwater sources.¹⁵⁵⁷ However, IEMS did not perform a single leachate test for any of its 624 mud pit samples.¹⁵⁵⁸ Further evincing its biased approach, IEMS omitted testing mud pits built by Petroamazonas. GSI also indicates that, except for barium, the metal concentrations in the 624 pit

¹⁵⁵³ GSI ER1, ¶¶ 243, 248 and 255; GSI ER2, ¶ 141 and Exhibit 28.

¹⁵⁵⁴ CMCC, ¶¶ 271, 327; GSI ER1, p. 91, ¶ 225(3).

¹⁵⁵⁵ CMCC, ¶¶ 318-321.

¹⁵⁵⁶ Rejoinder, ¶ 134 (emphasis in the original).

¹⁵⁵⁷ Accordingly, says Burlington, the regulatory units are different for regular soils and for mud pits. For regular soils, Table 6 of RAOHE tests *solids* and hence measures permissible concentrations in mg/kg. For mud pits, on the other hand, Table 7 of RAOHE tests *liquids leached* and thus sets forth maximum limits in mg/l. See: CMCC, ¶ 324.

¹⁵⁵⁸ CMCC, ¶ 327. See also: GSI ER1, p. 91, ¶ 225(3).

samples collected by IEMS are below background levels in clean natural soils.¹⁵⁵⁹ Therefore, says GSI, “releases of pit materials to surrounding clean soils could not cause an increase in concentrations of cadmium, chromium, lead, nickel, and vanadium above levels already present in the soils”, and only elevated barium levels in soils surrounding pits may signal pit releases.¹⁵⁶⁰

760. Burlington further opposes Ecuador’s argument that each mud pit constructed before July 2009 must be “dug up, moved off site, and re-buried” as wholly unsupported by regulations, local practice, and sound science.¹⁵⁶¹ The use of pits for permanent on site disposal is common practice in Ecuador and around the world. In fact, Table 7 was precisely crafted for this purpose; it conclusively shows that pit soil is subject to different limits than regular soil.

761. In Burlington’s view, Ecuador is also mistaken in claiming that all dry pits must comply both with Tables 6 and 7. Indeed, the introductory paragraph of Article 59, a provision on pit remediation, clarifies that that provision “applies only to a special category of pits”, namely those that contain weathered crude or that were poorly managed, which is not the case of the Consortium’s pits.¹⁵⁶²

762. For Burlington, properly closed pits, i.e., those that were dehydrated, compacted and covered with clean soil and new vegetation, “do not fall within the ambit of Article 59 and need not be remediated”.¹⁵⁶³ This is confirmed by practice, especially by the fact that the Ecuadorian authorities have never requested compliance with both Tables 6 and 7 on the ground of Article 59.¹⁵⁶⁴ Ecuador’s attempt to introduce a barium standard from TULAS so as to apply it to pits “blatantly disregards RAOH’s supremacy in

¹⁵⁵⁹ GSI ER1, p. 91, ¶ 252(3). In GSI ER1, App. D, Table D.3, GSI lists IEMS’s sampling results and identifies samples taken from pit locations. See also GSI ER1, App. D, Annex D.2 for IEMS samples that were misplaced (for instance, Jaguar 7 (p. 7), Payamino 15 (p. 15), Payamino 10 (p. 16), Coca 13 (p. 17) and Payamino Sanitary Landfill (p. 32)). For a comparison of IEMS samples to the regulatory criteria applied by GSI, see: GSI ER1, App. F.4.

¹⁵⁶⁰ GSI ER1, pp. 91-92, ¶ 252(3) and Exhibit 39.

¹⁵⁶¹ C-PHB, ¶ 137.

¹⁵⁶² Rejoinder, ¶¶ 96, 126-128.

¹⁵⁶³ *Id.*, ¶ 128; Bedón ER2, ¶¶ 151-153; Saltos WS2, ¶¶ 13-18.

¹⁵⁶⁴ Rejoinder, ¶¶ 129-130.

regulating matters specific to hydrocarbons operations”, especially since TULAS contains no provisions on pits.¹⁵⁶⁵

763. Finally, in Burlington’s submission, Ecuador is also wrong to claim that all pits should be subject to the more stringent Table 7a for unlined pits, since it was the Consortium’s practice to build all pits with synthetic liners, as Mr. Saltos confirmed, and historical pits do not leak since they are lined with clay soils, as GSI indicated.¹⁵⁶⁶ In sum, Ecuador is seeking to impose remediation costs on Burlington which have never been applied to date.¹⁵⁶⁷ Accordingly, Burlington requests the Tribunal to dismiss Ecuador’s claim to have all pits removed or remediated.

5.3 Discussion

764. The Parties essentially diverge on whether mud pits must be removed from the Blocks, whether Table 6 applies in addition to Table 7, and whether Consortium pits were always lined. The Tribunal will start by discussing the applicable regulatory framework (5.3.1). It then addresses the condition of the pits in the Blocks (5.3.2 to 5.3.6), before drawing conclusions with respect to potential remediation and the costs thereof (5.3.7 and 5.3.8).

5.3.1 Regulatory framework

765. RAOHE expressly regulates the use of mud pits for hydrocarbons operations. Article 12 provides that oilfield operators must undertake internal monitoring, including by remediating contaminated mud pits. Article 16 further provides that mud pit remediation programs must be authorized by the Subsecretariat of Environmental Protection at DINAPA. Article 28(c) prohibits the uncontrolled disposal of any types of wastes, specifying that pits used for final disposal must include an appropriate canalization system to control leachates.¹⁵⁶⁸ Article 58(b) prohibits any disposal of production test fluids in pits.

¹⁵⁶⁵ *Id.*, ¶ 131; Bedón ER1, ¶ 8; Bedón ER2, ¶ 30.

¹⁵⁶⁶ Rejoinder, ¶ 137; Saltos WS1, ¶ 185; GSI ER2, ¶¶ 32-33.

¹⁵⁶⁷ C-PHB, ¶ 143.

¹⁵⁶⁸ The Glossary in RAOHE Annex 6 defines leachates (“*lixiviado*”) as follows: “Solution resulting from the transport of water through the pores or cracks in the soil or other solid and porous media and the physico-chemical interactions of this water with the mineral and organic components of the soil” (Translation by the Tribunal) (**Exh. EL-174**).

766. Article 52(d.2) is entitled “[o]f the treatment and final disposal of drilling fluids and cuttings”. Article 52(d.2)(2.1) provides that any drill site must include a system for the treatment and disposal of fluids and solids generated during drilling operations. More specifically, Article 52(d.2)(2.3) states that, during and after the drilling, all solid wastes, including muds and cuttings “can be disposed once they comply with the parameters and limits in Table 7”.¹⁵⁶⁹
767. Article 59 specifically deals with the treatment and closure of pits. It specifies that, in case of pits containing weathered crude or badly maintained pits, the operator must proceed to cleaning and treating the pit content, recuperating the crude, and then sealing and revegetating the area with native species. For pits containing crude and/or water, Article 59 provides that the crude will be recuperated for subsequent use, that any crude that could not be recuperated would be treated either in the pit or *ex situ* preferably through bioremediation, that the floor and walls of the pit must be treated until they comply with Table 6 before rehabilitating the site. For dry pits containing crude but no water, Article 59 stipulates that they must be remediated until they comply with Tables 6 and 7.
768. Table 7 is entitled “[p]ermissible limits for leachates for the final disposition of drilling muds and cuttings on the surface”. In its opening paragraph, Table 7 states that drilling muds and cuttings destined for “final disposal on the surface” must comply with the parameters and permissible limits in the table “depending on whether the site of final disposal contains an impermeable base or not”.¹⁵⁷⁰ The second paragraph specifies that, in addition to initial testing, the mud pits must be periodically monitored by taking leachate samples seven days, three months, and six months after final disposal.

¹⁵⁶⁹ Translation by the Tribunal.

¹⁵⁷⁰ Translation by the Tribunal.

769. Table 7 is divided into two parts. Part a) applies to pits without impermeable liner and Part b) applies to lined pits. Table 7 contains the following criteria:

| a) SIN impermeabilización de la base | | | |
|--|---------------------|---------------|--------------------------------|
| Parámetro | Expresado en | Unidad | Valor límite permisible |
| Potencial hidrógeno | pH | --- | 6<pH<9 |
| Conductividad eléctrica | CE | µS/cm | 4,000 |
| Hidrocarburos totales | TPH | mg/l | <1 |
| Hidrocarburos aromáticos policíclicos (HAPs) | C | mg/l | <0.003 |
| Cadmio | Cd | mg/l | <0.05 |
| Cromo total | Cr | mg/l | <1.0 |
| Vanadio | V | mg/l | <0.2 |
| Bario | Ba | mg/l | <5 |
| b) CON impermeabilización de la base | | | |
| Parámetro | Expresado en | Unidad | Valor límite permisible |
| Potencial hidrógeno | pH | --- | 4<pH<12 |
| Conductividad eléctrica | CE | µS/cm | 8,000 |
| Hidrocarburos totales | TPH | mg/l | <50 |
| Hidrocarburos aromáticos policíclicos (HAPs) | C | mg/l | <0.005 |
| Cadmio | Cd | mg/l | <0.5 |
| Cromo total | Cr | mg/l | <10.0 |
| Vanadio | V | mg/l | <2 |
| Bario | Ba | mg/l | <10 |

770. Ecuador argues that all mud pits must comply with both Tables 6 and 7,¹⁵⁷¹ whereas Burlington contends that only Table 7 applies to properly managed mud pits.¹⁵⁷² The Tribunal has no difficulty finding that Table 7 applies to mud pits and not Table 6 (subject to the provisions in Article 59 to which the Tribunal will revert below). This follows not only from Article 52(d)(2)(3) which refers only to Table 7,¹⁵⁷³ but also from the fact that Table 6 applies to soil remediation in general and Table 7 to drilling muds and cuttings destined for final disposal in pits specifically. This is further confirmed by the fact that Table 6 provides no criteria for barium, which is the compound most commonly used to drill wells and thus most commonly found in mud pits, whereas Table

¹⁵⁷¹ The Tribunal notes IEMS's different point of view when contemplating recourse to either Table 6 or 7 depending on the "timing and purpose of the study", although IEMS ultimately opined that all pits should be tested against Table 6 in the present case. "The concentrations of contaminants in mud pits can be analyzed as per the Table 6 of RAOHE (total concentration) or Table 7 (concentration of contaminants on leachate) depending on the timing and purpose of the study". IEMS ER4, p. 27.

¹⁵⁷² Bedón ER1, ¶ 43; Bedón ER2, ¶ 147.

¹⁵⁷³ Bedón ER2, ¶¶ 149-150.

7 specifically regulates barium, in addition to other parameters not contemplated in Table 6 that are also used in drilling operations, such as chromium and vanadium.

771. In this context, the Tribunal cannot follow Ecuador's interpretation of Article 59. It shares Professor Bedón's opinion that this provision is not of "general application" to all mud pits.¹⁵⁷⁴ The introductory paragraph shows that Article 59 applies to two discrete situations, namely to pits containing weathered crude and to poorly managed pits. In these two situations, Article 59 requires the complete remediation of such pits, including the cleaning of the floor and walls. In such instance, the floor and walls must comply with Table 6. Further, if a pit is totally removed and backfilled with clean soil, the new location must comply with Table 6 in addition to Table 7. Or, as Professor Bedón put it, "the area after the remediation must comply with Table 6 because it becomes regular soil; but it must also be in accordance with Table 7 to ensure that there are no remnants of drilling muds that might leach into the subsoil".¹⁵⁷⁵
772. For all other situations, only Table 7 applies to mud pits.¹⁵⁷⁶ Indeed, Table 7 contemplates a different method of analysis than Table 6, since it requires the testing of *leachates* "to determine the extent to which barium and other metals in the muds could potentially be dissolved and carried outside the confines of the pit by water".¹⁵⁷⁷ And as GSI put it, RAOHE "sets no limit on the total barium concentration in the solidified mud and soil cuttings enclosed within the pit and does not require the contents of a mud/cuttings pit be tested in the same manner as non-pit soils, as this would require these materials to be removed from the very pit in which they were disposed – an illogical requirement and contrary to accepted practice in the oil industry".¹⁵⁷⁸ The fact that Perenco's abandonment plan for Block 7 spoke of testing three pit samples from

¹⁵⁷⁴ *Id.*, ¶ 152.

¹⁵⁷⁵ *Id.*, ¶ 153.

¹⁵⁷⁶ The Tribunal notes IEMS's mention that, in addition to crude or heavy metals, mud pits might contain hazardous wastes such as "potassium hydroxide, quicklime, iridium (190), uranium (191), thorium, strontium (90)". However, as IEMS concedes, "[t]he contamination of drilling mud with several of these substances in Blocks 7 and 21 has not been studied". IEMS ER4, p. 27. Thus, there is no claim for contamination with hazardous substances other than those listed in RAOHE Table 7.

¹⁵⁷⁷ Translation by the Tribunal. See note 1568 above on the definition of leachates in the Glossary in RAOHE. See further: Rejoinder, ¶ 126; GSI ER1, p. 92 and Exhibit 39; Bedón ER2, ¶¶ 146-150.

¹⁵⁷⁸ GSI ER2, ¶ 26.

Gacela 2, Jaguar 9 and Cóndor Norte against Table 6¹⁵⁷⁹ does not change the Tribunal's conclusion that only Table 7 applies under applicable law, a conclusion which is reinforced by Ecuador's own approval of the Consortium's pit closure reports that tested mud pits only against Table 7.¹⁵⁸⁰

5.3.2 Removal of pits

773. This review of the applicable legal framework evinces that the use of mud pits is common practice in oilfield operations to permanently dispose of drilling muds or cuttings produced during the drilling of wells or subsequent well workovers. This follows, for instance, from the term "final disposal" (*disposición final*) in Table 7, making clear that mud pits serve as permanent disposal grounds.¹⁵⁸¹ Such practice is also confirmed by IEMS, according to which the use of mud pits is a common practice in the oil industry and is a method approved by the Government of Ecuador for the management and disposal of drilling mud associated with well development.¹⁵⁸² The lawfulness of the practice is also clear when one considers that Petroamazonas has continued to build mud pits and discharge drilling muds and cuttings into them, for instance, in Yuralpa Pad G or Oso A (it being noted, once more, that IEMS chose only to identify the Consortium pits at these locations as RECs).¹⁵⁸³ These findings do away with Ecuador's claim that all mud pits in the Blocks need to be removed.¹⁵⁸⁴

¹⁵⁷⁹ Definitive Abandonment and Turnover Plan for Areas Used for Drilling and Petroleum Production, Block 7, November 2008, pp. 3-2, 3-15, 3-17, 3-21 and 3-22 (**Exh. CE-CC-338**). See also: Ecuador's Closing Statement, Slides 161-163; R-PHB, ¶¶ 495-497. The Tribunal further notes that the pit remediation reports for Sacha referred to by Ecuador apply Table 6 precisely because the pits had to be remediated. They therefore do not support the contention that normal pit closure requires testing pits against Table 6. See: Letter of 31 August 2006 from Eng. Consuelo Hernández (DINAPA) to Jaime Crow Montalvo (Petroproducción) (**Exh. CE-CC-415**); Letter of 10 January 2007 from Eng. Manuel Muñoz Neira (DINAPA) to Francisco Silva (Petroproducción) (**Exh. CE-CC-416**).

¹⁵⁸⁰ See, in particular: Pit closure report for Coca 19, October 2004, pp. 4, 6-7 (**Exh. E-337**); Pit closure report for Oso 3, May 2003, pp. 4-5, 9-10 (**Exh. E-466**).

¹⁵⁸¹ See also: Article 52(d)(2) which refers to the final disposal of drilling muds and cuttings. See further: Bedón ER2, ¶ 148.

¹⁵⁸² IEMS ER4, p. 23.

¹⁵⁸³ Saltos WS1, ¶¶ 202-212.

¹⁵⁸⁴ The Glossary in RAOHE Annex 6 defines "final disposal" as follows: "Final storage method and/or site, or waste destruction method" (Translation by the Tribunal) (**Exh. EL-174**).

774. The conclusion that pits need not be removed is further strengthened by the fact that Ecuador, although it calls mud pits “ticking time bombs”,¹⁵⁸⁵ has not adduced evidence of even a single instance where an oilfield operator has been required to remove all mud pits after the end of operations.
775. Consequently, there is no reason to remove properly constructed, managed and approved pits from their actual location. This applies also to approved mud pits located at the edges of platforms, which are at a higher risk of collapsing due to erosion, such as the mud pit at Yuralpa Pad A, which the Tribunal had a chance to see during the Site Visit. Absent proof to the contrary, it must be assumed that these pits are correctly managed and that any deterioration over the course of time will be adequately addressed by the current operator.
776. The situation is obviously different for pits that are demonstrated to have been badly built or managed, in particular pits that collapsed or were leaking their contents into the environment during the Consortium’s operatorship. The situation is also different for the Consortium’s unreported pits, such as the “workover pit” at Payamino CPF (which the Tribunal has addressed in its analysis on regular soil) or the “auxiliary pits” at Payamino 16, which must be removed since they have never been approved by Ecuadorian authorities.¹⁵⁸⁶

¹⁵⁸⁵ R-PHB, ¶ 449; Tr. (Day 1) (ENG), 112:7-8 (Opening, García Represa); Ecuador’s Opening Statement, Slide 79. Ecuador’s contention is partially contradicted moreover by IEMS’s evidence that the “use of synthetic liners is an appropriate engineering control for the protection of the environment, provided they are installed, inspected and maintained properly, as they are not leak-proof. Synthetic liners provide an impermeable barrier that avoids the direct contact of the contaminants with the underlying soil and the direct mobilization of these contaminants when conditions suitable for contaminant transport are present (as with earthen pits). The RAOHE recognizes that synthetic liners increase the level of protection of the environment [...]”. IEMS ER4, p. 39.

¹⁵⁸⁶ With respect to Payamino 16, Mr. Saltos confirmed that five pits had never been reported: “Q. [...] they also say that there were more than five mud pits that were never reported to the authorities. Do you see that? A. Yes, that is correct. Q. So there are more than five pits in Payamino 16; right? A. Yes. Q. That were never reported to the authorities; yes? A. Yes, that is correct. [...] The pits here, however, were very small pits that were three to 4 meters by 2 meters, and two or 3 meters deep. So, these were small auxiliary pits”. Tr. (Day 4) (ENG), 1333:19-1334:18 (Cross, Saltos).

5.3.3 Pit construction

777. With respect to the construction of pits, Burlington indicated that the Consortium had no written policy for the construction, cleanup, monitoring, testing and closing of pits. Mr. Saltos, however, explained that, while it had no “specific little book”, the Consortium had procedures in place which were regularly followed.¹⁵⁸⁷ He added that it was the Consortium’s policy to place geomembranes in the pits (an issue to which the Tribunal will revert below).¹⁵⁸⁸ In this context, IEMS points to the Municipal Ordinance over the Control and Monitoring of Waste Discharges of the Municipality of Francisco de Orellana. Ecuador, however, did not invoke this regulation in its submissions, which regulation does not in any case apply to mud pits for oilfield operations, but to pits in general, and includes requirements such as “a) the distance from the edge of the pit to residential, agricultural and recreational areas and surface water bodies; b) the depth of the groundwater table; c) the geology and hydrogeology; d) the risk of flooding, subsidence and landslides at the site; and e) the protection of the natural and cultural heritage of the area”.¹⁵⁸⁹ Although informative, the Tribunal deems that this ordinance is not sufficiently specific to be helpful in the present context when dealing with mud pits built during oilfield operations.
778. IEMS also pointed to eyewitness evidence suggesting that Consortium pits had not been appropriately constructed.¹⁵⁹⁰ However, the evidence of Mr. Cesar Andrade to which IEMS refers does not support the contention of poorly constructed pits. In fact, he

¹⁵⁸⁷ Mr. Saltos responded as follows during his cross-examination: “Q. Perenco said that it does not have a written specific policy for the construction, cleanup, monitoring, testing and closing of pits. Did you know that? A. A specific policy, no, but for the construction of pits, we knew the dimensions they should have, the depth they should have, what kind of liner or geomembrane should be used in order to protect the pit, and then when the covering of the pits was contracted, we specified the kind of products to be used when there were exceedances, and how to cover these, how thick the layer should be, and how we should compact everything so that no failures arise out of that pit [...] There wasn’t a specific little book, but we had all the procedures that had to be applied in place”. Tr. (Day 4) (ENG), 1328:2-20 (Cross, Saltos).

¹⁵⁸⁸ Tr. (Day 4) (ENG), 1347:8-14 (Cross, Saltos). This is further corroborated by IEMS’s interview of Mr. Cesar Andrade, a construction supervisor employed by Perenco, who indicated that the Consortium used liners “in all the pits with which he was involved”. IEMS ER4, Att. 17, p. 27.

¹⁵⁸⁹ IEMS ER4, p. 24. See also: Municipal Ordinance over the Control and Monitoring of Waste Discharges of the Municipality of Francisco de Orellana, 29 January 2001, Article 6(1)(1)(a)-(e). IEMS ER4, Att. 7. See also: IEMS ER4, p. 24.

¹⁵⁹⁰ IEMS ER4, p. 24 and Att. 17.

stated that he was not aware of leaks in pits, only adding that “geological and hydrological studies were not performed”.¹⁵⁹¹

779. In addition, while Ecuador complains that GSI provides no evidence of the proper construction of pits, for instance by opening pits, it is equally the case that IEMS did not open any of the pits either to ascertain how they were built (even though Ecuador bears the burden to prove harm originating from pits closed before the entry into force of the 2008 Constitution in October 2008).

780. Therefore, Ecuador’s contention that construction requirements “may not have been met by the Consortium” remains speculative and unpersuasive.¹⁵⁹² Specifically, in respect of the Nemoca and Payamino CPF pits, the pits were constructed by prior operators and were remediated in 2000 and 2001 respectively.¹⁵⁹³ As a consequence, there can be no claim against the Consortium on the ground that these pits were poorly built. There could only be an allegation that they have been poorly managed by the Consortium, which Ecuador has, however, not specifically put forward.

5.3.4 Pit management

781. Under Article 12 of RAOHE, oilfield operators are bound to regularly monitor the environmental conditions around existing pits, including historical pits built by previous operators. Moreover, if the condition of the pits deteriorates and poses a threat to the environment or to human health, then pursuant to Articles 16 and 59 of RAOHE the current operator is under an obligation to remediate that situation, even if the defective pit was built by a prior operator. The Tribunal agrees with IEMS’s position that “[s]ound environmental management practice would have been to monitor the conditions of the

¹⁵⁹¹ *Id.*, Att. 17, p. 27 (interview with Mr. Cesar Andrade). The Tribunal notes, however, that Mr. Andrade indicated that the Oso A pit was built close to the river and that the Gacela 2 pit was built in a “very high area”, without providing any further information as to whether these pits were leaking. See also: *Id.*, Att. 17, p. 34 (interview with Fernando Herrera), and p. 36 (interview with Jorge Lara). Only Mr. Ramirez stated that liners “lacked maintenance” and that crystallized liners leaked, pointing to Coca 4 and the concrete pits in “Payaminos”. See: *Id.*, Att. 17, p. 29 (interview with Marco Ramirez). And Mr. Coro stated that he did not know if any pit leaked. *Id.*, Att. 17, p. 32 (interview with Marco Coro). See also: Ecuador’s Closing Statement, Slides 148-149.

¹⁵⁹² For instance, IEMS indicated that “[a]t this point, the construction methods and procedures used by Oryx, Kerr McGee and the Consortium remain unclear. There is no evidence on how these pits were built”. IEMS ER4, p. 38.

¹⁵⁹³ *Id.*, p. 24 and Att. 5 (Nemoca) and Att. 6 (Payamino CPF).

mud pits installed by the previous operators in order to assure that there are no leaks or negative impacts to the environment”.¹⁵⁹⁴ The Consortium appeared to understand being under such a duty as even Mr. Saltos acknowledges that it engaged in the remediation of contamination left behind by prior operators.¹⁵⁹⁵

782. In addition, the Tribunal reads Article 59 as incentivizing oilfield operators to use water-based drilling muds, as opposed to oil-based drilling muds that are still permitted under RAOHE,¹⁵⁹⁶ but which come with the duty to remediate pits containing weathered crude. The Tribunal has more difficulty in accepting Ecuador’s contention that Article 59 further imposes on current operators the duty to remediate any historical pits containing weathered crude left behind by prior operators. This difficulty primarily derives from the text of Article 59 and from the fact that there is no evidence in the record showing that Ecuadorian authorities have ever requested any oilfield operator, and in particular the Consortium (or previous operators regulated under RAOHE since 2001), to remedy historical pits containing weathered crude built by prior operators.

783. As to Ecuador’s argument that mud pits are indiscernible from the surrounding environment and thus can no longer be located with the passing of time, the Tribunal agrees that this is indeed a worrying situation,¹⁵⁹⁷ but here again the Tribunal notes that RAOHE does not require operators to clearly demarcate existing pits, and on the contrary requires that they be revegetated with local flora. Ecuador has not pointed to

¹⁵⁹⁴ *Id.*, p. 32.

¹⁵⁹⁵ Mr. Saltos stated that “as a policy, Perenco had to remedy the soils, regardless of their origins” and “regardless of who caused the problem in the soil”, before carrying out “an investigation to determine final liability”. Tr. (Day 4) (ENG), 1180:9-15 (Cross, Saltos). With respect to mud pits more specifically, Burlington did not challenge IEMS’s statement that the Consortium remediated, for instance, oil outcroppings from the Coca 4 pit that was improperly built by a prior operator. See: IEMS ER4, p. 32.

¹⁵⁹⁶ Oil-based drilling muds must comply with Table 4 of Annex 2 and be disposed in the earth, while the other drilling fluids must comply with Table 7 of Annex 2. Article 52(d.2.5) reads as follows: “Where mineral oil-based muds are used, their final disposal shall be onshore, complying with the permissible limits of Table No. 4 of Annex 2 to this Regulation; any decantation muds resulting from the treatment of fluids shall be treated and disposed of, complying with the permissible limits of Table No. 7 of Annex 2 to this Regulation” (Translation by the Tribunal) (**Exh. EL-174**). The Tribunal notes that the Parties’ experts have not tested any samples against Table 4, and that there is no claim that any limit under that table has been breached.

¹⁵⁹⁷ GSI also indicated that “[f]ollowing closure, these pits are commonly indiscernible from the surrounding terrain and contain a solidified mixture of drilling mud and soil/rock cuttings (generally comparable to natural soils), overlain by a cover of clean soil and vegetation”. GSI ER1, p. 17.

any other potentially relevant provision stipulating such a requirement. What RAOHE requires is that all mud pits must be approved, properly constructed and sealed, monitored and finally revegetated. This leads the Tribunal to turn its attention to the methodology for testing mud pits.

5.3.5 Method for testing pits

784. In the Tribunal's opinion, IEMS's argument that the "best approach" is to evaluate mud pits "per analytical methods for soil contamination", since leachate testing is only limited to six months under Table 7, is unconvincing.¹⁵⁹⁸ IEMS explains that "if samples are collected several years after being buried and exposed to rainwater infiltration, the mobile fractions of contaminants have already leached" and thus contaminated the surrounding soil.¹⁵⁹⁹ Therefore, says IEMS, "collecting samples for determining the residual mobile fractions of contaminants would not provide clear results on whether the drilling mud should have been disposed of into the pit or even remediated several years earlier".¹⁶⁰⁰ The Tribunal does not find this argument convincing, because operators wishing to make use of pits must submit to the Ecuadorian authorities the results of the three leachate tests under Table 7 during the pit closure process. They thus provide the data to determine whether the pits in question comply with applicable standards at and shortly after the time when the pits were actually closed.¹⁶⁰¹ Furthermore, Table 7

¹⁵⁹⁸ IEMS ER4, p. 28.

¹⁵⁹⁹ *Id.*, p. 27.

¹⁶⁰⁰ *Ibid.*

¹⁶⁰¹ The Tribunal notes that Ecuador pointed to the closure report for the Jaguar 9 pit showing that leachate testing was only conducted three years after closure instead of following the timeline provided in Table 7. While this deficiency reflects on the Consortium's contention of being a model operator, it does not overcome the Consortium's evidence that the pits in question comply with regulatory criteria, which Ecuador could only have done by analyzing the relevant pits per Table 7. See: Reply, ¶ 39(d); IEMS ER4, p. 33. IEMS further pointed to Oso 3, Oso 9 and Oso A as examples where leachate testing was not in accordance with Table 7. IEMS ER4, p. 33. With respect to Oso 3 and Oso A, mentioned by IEMS as other examples where the Consortium monitored the pits in 2007 and 2008, the Tribunal notes that the closure reports of these pits were not reviewed by IEMS and that it is therefore speculative whether the Consortium exceeded the timing requirements under Table 7 during the pit closure process or whether additional monitoring took place in 2007 and 2008. The Tribunal is further mindful that, when interrogated about the Oso 9 pits, Mr. Saltos conceded at the Hearing that in some cases the Consortium failed to comply with the monitoring procedure under Table 7, as the following excerpt show: "Q. Now, you make a reference to the exhibit, Table 7b of RAOHE. But there is no six-month test. Do you know why? A. Well, in some cases there is no six-month test. These are some mistakes we made". The Tribunal will deal with the Oso 9 pits further below. See: Tr. (Day 4) (ENG), 1349:4-8 (Cross, Saltos); R-PHB, ¶¶ 479-480.

prescribes three leachate tests in the six months following closure and no recourse to other testing.

785. As to the actual methodology for leachate testing, Annex 5 of RAOHE states that the applicable analytical method is USEPA Method 1311 TCLP (toxicity characteristic leaching procedure), with a footnote allowing for equivalent procedures.¹⁶⁰² GSI undertook its leachate analysis through the TCLP method as well as the USEPA Method 1312 SPLP (synthetic precipitation leaching procedure), which RPS argues is not equivalent to TCLP, since TCLP estimates “potential mobility of materials placed in landfills”, whereas SPLP is used to “determine the potential for leaching of chemicals from contaminated soils”.¹⁶⁰³ The Tribunal can dispense with entering into this discussion, since GSI provided analytic results under both methods,¹⁶⁰⁴ i.e. TCLP and SPLP, and the Consortium itself previously conducted leachate tests applying the TCLP method.¹⁶⁰⁵ As a result, the Tribunal will rely on the results obtained via the TCLP method.

5.3.6 Lined v. unlined pits

786. The opening paragraph of Table 7 provides that mud pits must comply with the permissible limits indicated in the table “depending on whether the site of final disposal [i.e., the pit] has an impermeabilization at its base or not”.¹⁶⁰⁶ Accordingly, Table 7 is divided in two parts with Table 7a applying to unlined and Table 7b to lined pits.

787. GSI considers Table 7b applicable in all cases since in its view all pits in the Blocks have a clay base that effectively functions as a natural liner.¹⁶⁰⁷ The Tribunal disagrees;

¹⁶⁰² GSI ER1, p. 104. See also: RPS ER2, p. 81.

¹⁶⁰³ RPS ER2, p. 81.

¹⁶⁰⁴ GSI ER1, App. D, Table D.12A.

¹⁶⁰⁵ See, for instance, the closure report for Coca 19. Reporte de taponamiento de piscinas de Coca 19, October 2004, pp. 6-10 (**Exh. E-337**).

¹⁶⁰⁶ Translation by the Tribunal. RAOHE, Annex 2, Table 7 (**Exh. EL-174**).

¹⁶⁰⁷ See, for instance, GSI’s testimony at Coca 8: “Q. Does the pit have a liner? [...] A. Yes. The pit was constructed in the time period of 1991. It has a clay liner beneath it. It’s the soil we are standing on. You could see it’s of low porosity because it’s muddy. [...] This is exactly the kind of soil that’s used for lands [sic] fills and pits and ponds throughout the world, and that’s the type of liner it has. The pit is not leaking”. Tr. Site Visit (Day 2) (ENG), 118:1-10 (Tribunal, Connor at Coca 8). See, similarly: GSI ER1, p. 17, ¶ 21; Tr. Site Visit (Day 4) (ENG), 19:17-20 (Tribunal, Connor at Gacela 2).

it understands Table 7b to refer to impermeable synthetic liners (such as geomembranes) and not to natural soils with a high degree of impermeability such as clayey soils. This also appears to be the understanding of Burlington's witness Mr. Saltos, who worked in the Blocks since 1995 and was responsible for environmental and industrial safety.¹⁶⁰⁸

788. The application of stricter standards for unlined pits under Table 7a as opposed to Table 7b makes sense, knowing that slope failures or underground roots may perforate the subsurface soils;¹⁶⁰⁹ mud pits are typically 3 to 4 meters deep¹⁶¹⁰ and thus can potentially come into contact with the groundwater;¹⁶¹¹ some pits are located in sandy not clayey soils (such as Payamino 14/20/24 and Coca CPF/Coca 2).¹⁶¹² Finally, there is evidence in the record that the Consortium also tested several of its pits against Table 7a, as the pit closure reports for Coca 19 and Jaguar 9 demonstrate, for instance.¹⁶¹³
789. Consequently, the Tribunal finds that leachate samples must be tested against Table 7b if they come from pits with a synthetic liner or geomembrane, unless the liner is demonstrably defective. In this latter case, the samples must be tested against Table

¹⁶⁰⁸ Referring to Oso 9, Mr. Saltos testified that pits were tested against Table 7a in cases where the condition of the geomembrane had been altered: "Q. But all of them have geomembranes? A. Yes, geomembranes were placed there. Now, during the operations, at some points, there may have been an alteration of the condition of the geomembrane. That could have happened. And in those specific cases there was a possibility of resorting to Table 7a. Why? Because it was not an obligation to actually put a geomembrane there. Table 7 says either with or without impermeabilization". Tr. (Day 4) (ENG), 1346:4-13 (Cross, Saltos). See also: Saltos WS1, ¶ 177.

¹⁶⁰⁹ R-PSVB, ¶ 174.

¹⁶¹⁰ For instance, Perenco provided the following information to DINAPA in 2007 with respect to the Oso A platform: "On the Oso A platform and in reference to the pit system, the hydrogeological characteristics of the area have not been favourable due to the phreatic levels present; in other words, it was necessary to reduce the initial intended depth of 4.50 meters to 3 meters (a 40% reduction in capacity)". Letter of 17 October 2007 from Eric D'Argenté (Perenco) to Consuelo Hernández (DINAPA), p. 9 (**Exh. CE-CC-142**); Ecuador's Closing Statement, Slide 146.

¹⁶¹¹ For instance, Mr. Saltos confirmed that the phreatic level in the Blocks was between 1 and 3 meters deep. Tr. (Day 4) (ENG), 1257:21-1258:2 (Cross, Saltos); Ecuador's Closing Statement, Slide 146.

¹⁶¹² Ecuador's Closing Statement, Slides 150-153, pointing to GSI ER1, Figure L.23.7 and Att. L.23.D.1 (for Payamino 14/20/24) and GSI ER2, App. L.02 (for Coca CPF/Coca 2). See also: Tr. (Day 4) (ENG), 1024:4-1025:14 (Direct, Crouch). See also: RPS Opening Presentation, Slide 38. Ecuador further pointed to the 1991 Environmental Impact Assessment for Gacela 1, mentioning the "low compactness of the soil" allowing "significant infiltrations". EIA Gacela 1, February 1991, pp. 25-26 (**Exh. CE-CC-428**). Also: Ecuador's Closing Statement, Slide 154.

¹⁶¹³ GSI ER2, App. B, pp. 28, 32-34; IEMS ER4, Att. 11, p. 6.

7a. In case of doubt in this regard, the Tribunal considers it reasonable and appropriate to resort to the most environmentally protective standards of Table 7a.

5.3.7 Remediation methodology and cost

790. For pits containing weathered crude or which have been poorly managed, Article 59 of RAOHE provides that crude that cannot be recuperated will be treated either in the pit or *ex situ*, preferably through bioremediation.¹⁶¹⁴ It further stipulates that the site must be rehabilitated once the crude has been evacuated and the pit walls and floor comply with Table 6.¹⁶¹⁵ Solid wastes found in the pit must be disposed of temporarily in pits with a geomembrane with a recollection and leachate control system, while inorganic solid wastes shall be treated and recycled *ex situ*.¹⁶¹⁶

791. In application of Article 59, the Tribunal will thus assume *ex situ* bioremediation to compute remediation costs. Doing so, it will apply the same unit remediation cost as for regular soil, namely USD 300/m³, since the Parties did not put forward any specific cost estimates specifically relating to pit remediation.

5.3.8 Assessment of mud pits in the Blocks

792. Ecuador essentially argues that all pits in the Blocks require remediation (to the exception of the pits built by Petroamazonas after July 2009), whereas Burlington argues that not a single pit needs to be remediated.¹⁶¹⁷ The Tribunal hence needs to analyze the results of the Parties' sampling. It notes here that the Parties diverge on the actual number of pits in the Blocks (226 for Ecuador¹⁶¹⁸ v. 156 for Burlington).¹⁶¹⁹ Be this as it may, the total figure does not appear pertinent in light of the sampling exercise undertaken by both Parties.

¹⁶¹⁴ RAOHE, Article 59(a.3) (**Exh. EL-174**).

¹⁶¹⁵ *Id.*, Article 59(a.5).

¹⁶¹⁶ *Id.*, Article 59(a.6).

¹⁶¹⁷ GSI ER2, p. 10, Exhibit 3.

¹⁶¹⁸ Reply, ¶ 454; Ecuador's Opening Statement, Slide 80; Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009 (**Exh. E-563**).

¹⁶¹⁹ GSI ER1, App. B.5; GSI ER2, App. B.5. See also: R-PSVB, ¶ 83.

793. IEMS sampled mud pits at 37 platform and off platform sites (32 in Block 7 and 5 in Block 21), analyzing a total of 488 pit samples¹⁶²⁰ and 126 samples from soil surrounding mud pits.¹⁶²¹ For its part, GSI collected 28 samples in 20 closed pits from 16 different platforms, of which 11 samples are leachate samples (including 2 duplicate samples) taken at seven sites (Coca 15, Lobo 3, Oso 9, Payamino 14/20/24, Yuralpa Pad A, Pad F and Pad G).¹⁶²² The other GSI samples are taken from the 30 cm clean soil layer covering mud pits.¹⁶²³
794. Because mud pits must be tested against Table 7, as the Tribunal established earlier, and because IEMS tested its pit samples exclusively against Table 6, the Tribunal cannot consider IEMS's sampling for purposes of ascertaining the condition of the pits under Table 7. Indeed, the values under both tables are incompatible and cannot be transposed from one to the other, as both Parties agree.¹⁶²⁴ The use of IEMS's mud pit data is therefore limited to determining whether the pits contain crude.
795. In the absence of relevant data on the conditions of the majority of the pits, the Tribunal will focus on the specific instances where Ecuador alleged that environmental harm was

¹⁶²⁰ IEMS ER4, p. 29 and Att. 10.1. A review of GSI's data reveals that GSI held that IEMS collected pit samples at 47 sites, namely: Coca 1, 2/CPF, 4, 6, 8, 10/16, 11, 13, 15, 18/19, Payamino 2/8, 3, 4, 5, 10, 13, 14/20/24, 15, 16, 19, Payamino Sanitary Landfill, Punino, Cóndor Norte, Gacela 2, 4, 5, Jaguar 1, 2, 3, 7/8, 9, Lobo 3, Mono 10, Mono Sur, Oso 3, Oso 9, Oso A, Oso CPF, Chonta, Dayuno, Nemoca, Sumino, Yuralpa Pad A, Pad B, Pad E, Pad G, and Yuralpa Sanitary Landfill. See: GSI ER1, App. L. In addition, it appears that IEMS suggested during the Site Visit, that Area 2M at Mono CPF was a pit, although Ecuador did not so argue. Tr. Site Visit (Day 3) (ENG), 87:19-21 (Tribunal, Chaves in Area 3MT at Mono CPF): "And you see the topography: It is declining. The flow of the contamination comes from that, which is a pit, because the records...". For its part, Burlington argued that contamination in Area 2M was caused by mud discharges in 1989: "How did it get here? We know exactly how it got here. In 1989, when BP drilled the Mono 1 well that's on the east side of the platform, in those days mud pits were not constructed. They had not been required yet, and so the practice by BP in those days, in 1989, was to simply discharge the drilling mud, the barium drilling mud, off the side of a platform". Tr. Site Visit (Day 3) (ENG), 95:3-9 (Presentation by Ms. Renfroe in Area 3MT at Mono CPF).

¹⁶²¹ IEMS ER4, p. 29 and Att. 10.2.

¹⁶²² GSI ER1, p. 104 and App. D, Table D.12A. GSI also tested mud pits constructed by Petroamazonas at Yuralpa Pad F and Pad G. GSI ER1, p. 105 and App. D, Table D.12B. See also: IEMS ER4, p. 30.

¹⁶²³ See, for instance: GSI ER1, App. L, Tables L.2.3 (Coca CPF), L.6.3 (Coca 8), L.12.3 (Coca 15), L.13.3 (Coca 18/19), L.15.3 (Payamino 2/8), L.23.3 (Payamino 14/20/24) and L.54.3 (Oso 9).

¹⁶²⁴ Burlington stated that "because the methodology of the two tables is so distinct, it is not possible to transpose data taken for evaluation on the basis of one table into data readable for purposes of the other". CMCC, ¶ 324. Ecuador responded that "[t]he latter is, in fact, correct". Reply, ¶ 303.

caused by defective or poorly managed mud pits. The analysis will first turn on whether mud pits containing weathered crude require remediation and then assess the position with regard to allegedly poorly managed pits. Finally, the Tribunal will review GSI's leachate tests and determine whether these call for remediation.

a. Pits containing weathered crude

796. Article 59 provides no answer to the question of what TPH value in pits calls for remediation. It appears clear to the Tribunal that relatively low TPH values do not justify remediation, i.e. values that fall within the permissible limits for regular soil under Table 6. Moreover, the Tribunal notes that prior operators were subject to a contractual remediation criteria set at TPH < 1%, corresponding to 10,000 mg/kg TPH.¹⁶²⁵ The Parties did not articulate any specific values, although Ecuador took the position that all pits must be remediated back to sensitive ecosystem criteria, which cannot be correct if mud pits host industrial wastes. In the absence of any specification in the PSCs and in the light of the evolving standards for increased environmental protection, the Tribunal deems it reasonable to resort to the 4,000 mg/kg limit prescribed in Table 6 for industrial soil.

797. On that basis and looking at IEMS's sampling data,¹⁶²⁶ the Tribunal identified elevated TPH values in pits at the following sites: Coca 2,¹⁶²⁷ Coca 8,¹⁶²⁸ Jaguar 2,¹⁶²⁹ Mono 10,¹⁶³⁰ Oso 9,¹⁶³¹ Payamino Transfer Station/Sanitary Landfill,¹⁶³² Payamino 5¹⁶³³ and Dayuno.¹⁶³⁴

¹⁶²⁵ GSI ER2, App. B.6 (for instance, Coca 4, Payamino 5, Chonta 1, Sumino 1, Nemoca 1, Yuralpa Centro 2, Coca 15 and Payamino 23).

¹⁶²⁶ In particular: IEMS ER4, Att. 10.1.

¹⁶²⁷ At Coca 2, the following pit samples have TPH exceedances: 7-COC02-SDB4-R(0.5-0.7)m (7'320.36 mg/kg) and 7-COC02-SDB4-R(0.3-0.4)m (6'728.45 mg/kg). IEMS ER4, Att. 10.2, p. 1; GSI ER1, App. L, Table L.2.1.

¹⁶²⁸ At Coca 8, the following pit samples have TPH exceedances: 7-COC-08-N7-MS-F-2.2 (92'930 mg/kg), 7-COC-08-N7-MS-F-1.5 (103'140 mg/kg), 7-COC-08-N7-MS-D-0.5 (6'959.9 mg/kg) and 7-COC-08-TE-101-(1.5-1.7) (9'461 mg/kg). IEMS ER4, Att. 10.1, pp. 3-4; GSI ER1, App. L, Table L.6.1. The Tribunal notes that Ecuador did not challenge GSI's contention that sample TE-101-(1.5-1.7) is located in the pit. See GSI ER2, App. D, Table D.3, p. 6.

¹⁶²⁹ At Jaguar 2, the following pit sample has a TPH exceedance: 7-JAG-2-N3-MS-A-1.5 (7'912 mg/kg). IEMS ER4, Att. 10.1, p. 11; GSI ER1, App. L, Table L.40.1, p. 3.

¹⁶³⁰ At Mono 10, the following pit sample has a TPH exceedance: 7-MON-10-N3-MS-A-1.0 (4'721 mg/kg). IEMS ER4, Att. 10.1, p. 16; GSI ER1, App. L, Table L.49.1, p. 2.

798. All wells at these sites were drilled by prior operators, with the exception of Oso 9 where the well was drilled by the Consortium in September 2005.¹⁶³⁵ With respect to Oso 9, the Tribunal notes that the Consortium's pits have high levels of TPH, at some

¹⁶³¹ At Oso 9, the following samples have TPH exceedances: 07-OSO09-SDD3-R(1.4-1.6)m (4'020 mg/kg), 07-CPFOS-SDB6-R(2.2-2.4) (4'084 mg/kg), 07-CPFOS-SDC5-R(2.5-2.7)m (4'559 mg/kg), 07-OSO09-SDC8-R(1.5-1.7)m (4'617 mg/kg), 07-COF05-SDA3-R(1.5-1.7)m (5'599.4 mg/kg), 07-CPFOS-SDC7-R(2.5-2.7)m (6'106 mg/kg), 07-CPFOS-SDC3-R(2.5-2.7)m (6'855 mg/kg), 07-CPFOS-SDC4-R(2.5-2.7)m (8'081 mg/kg), 07-CPF05-SDF1-R(2.5-2.7)m (9'320.6 mg/kg), 07-OSO09-SDD3-R(2.5-2.7)m (9'604 mg/kg), 07-CPFOS-SDB5-R(2.4-2.6)m (10'176 mg/kg), 07-OSO09-SW05-R(1.0-1.2)m (10'598 mg/kg), 07-CPFOS-SDB4-R(1.4-1.6)m (11'916 mg/kg), 07-OSO09-SDD4-R(1.5-1.8)m (11'920 mg/kg), 07-OSO09-SDE6-R(1.8-2.0)m (15'774 mg/kg), 07-OSO09-SDD2-R(1.5-1.7)m (18'596 mg/kg) and 07-OSO09-SDD2-R(1.8-2.0)m (29'701 mg/kg). IEMS ER4, Att. 10.1, pp. 25-26; GSI ER1, App. Other IEMS samples identifying TPH exceedances, but without coordinates and which are located by GSI in the Oso 9 pits, are: 07-OSO09-SDX2-R(1.5-1.8)m (54'878 mg/kg) and 07-OSO09-SDY-2-R(2.0-2.2)m (4'026 mg/kg). Finally, GSI identified the following IEMS samples as pit samples: MS-OSO-C1-9.1-2,3 (10'165 mg/kg), 07-OSO09-SDD2-R(1.5-1.7)m (18'596 mg/kg) and 07-OSO09-SDD2-R(1.8-2.0)m (29'701 mg/kg). See: GSI ER1, App. L, Table L.54.1.

¹⁶³² At Payamino Transfer Station/Sanitary Landfill, the following pit sample has a TPH exceedance: 7-PAY-RES-999-MS-D-3.5 (5'956 mg/kg). IEMS ER4, Att. 10.1, p. 31. In addition, GSI indicated that the following samples with high TPH levels were mislocated by IEMS and are in reality located in the pits on the southeastern edge of the platform: 7-PAY-RES-999-MS-A-1,5M (4'934 mg/kg), 7-PAY-RES-999-MS-A-2,5M (4'759 mg/kg) and 7-PAY-RES-999-MS-C-2.5 (91'207 mg/kg). According to GSI, "GSI personnel inspected the area and encountered several abandoned soil borings in the southern portion of the platform. No evidence of borings was present in the areas defined by the [IEMS] Annex I coordinates", further stating that the "revised boring locations are consistent with the IEMS boring location identified in the field by GSI personnel. This revised location is also consistent with the description of sample locations in [IEMS] Annex C". See: GSI ER1, App. D, Annex D.2, p. 32 and App. L, Figure L.30.3. Although IEMS made some corrections in its fourth report, it appears that IEMS did not respond to GSI's specific explanations regarding the Sanitary Landfill. See: IEMS ER4, pp. 108-109 and Table 2. In light of GSI's explanations on borings and the fact that IEMS did not respond, the Tribunal is satisfied that the samples are in fact located in the two pits.

¹⁶³³ At Payamino 5, the following pit samples have TPH exceedances: 7-PAY-5-156-MS-F-2.1 (22'850 mg/kg), 7-PAY-5-156-MS-G-2.1 (49'729 mg/kg), 7-PAY-5-156-MS-G-0.5 (8'687.4 mg/kg), 7-PAY-5-156-MS-G-1.5 (17'430 mg/kg), 7-PAY-5-156-MS-H-1.5 (13'294 mg/kg) and 7-PAY-5-156-MS-D-1.1 (14'256.49 mg/kg). IEMS ER4, Att. 10.1, p. 36 and Att. 10.2, p. 12; GSI ER1, App. L, Table L.30.1. The Tribunal notes that Ecuador did not challenge GSI's assertion that sample 7-PAY-5-156-MS-D-1.1 is located in a pit. See: GSI ER1, App. L, Table L.18.1.

¹⁶³⁴ At Dayuno, the following pit samples have TPH exceedances: 21-DAY01-SDD1-R(0,0-0,2)m (32'791 mg/kg), 21-DAY01-SDDO-R(0,0-0,2)m (30'932 mg/kg) and 21-DAY01-SDD1-R(1,4-1,6)m (38'310 mg/kg). IEMS ER4, Att. 10.1, p. 39; GSI ER1, App. L, Table L.59.1.

¹⁶³⁵ Coca 2 was drilled by CEPE in December 1988, although the pit closure date is unknown to both Parties. Coca 8 was drilled by Petroproducción in August 1991, but the pit closure date is unknown. Jaguar 2 was drilled by PB in December 1988, but the pit closure date is unknown. Mono 10 was drilled by Oryx in January 1997, but the pit closure date (for Mono10 and Mono 12) is unknown. Payamino 5 was drilled by Oryx in December 1991, and although the original closure date is unknown, the three closed pits containing oil-based muds were remediated in 1997. Dayuno was drilled by Esso Hispanoil in November 1987, but the pit closure date is unknown. See: GSI ER2, App. B.5; Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009 (**Exh. E-563**).

point even exceeding 54,000 mg/kg.¹⁶³⁶ It is further undisputed that the Consortium used the pits at the Payamino Transfer Station/Sanitary Landfill and therefore remediation is warranted at that site. But except for Oso 9 and the Payamino Transfer Station/Sanitary Landfill, the Respondent has not alleged that the Consortium reused pits at the other sites just referred to.

799. During the Site Visit, the Tribunal also had the opportunity to see the large trees and other vegetation covering the Coca 8 pits to the south of the platform, which appeared to confirm that these pits had not been reopened or reused by the Consortium. On that basis, the Tribunal can only dismiss Ecuador's claim for the remediation of TPH in mud pits, except for the pits containing TPH at Oso 9 and at the Payamino Transfer Station, which must be fully remediated.

800. With respect to Oso 9, the review of the location of the exceedance points reveals that all five central pits in the main pit area immediately to the south of the platform have TPH exceedances. Accordingly, all five pits must be completely remediated *ex situ*. The dimensions of the five pits are identical (approximately 53x14 meters) amounting to an impacted area for each pit of 742 m² and, with a depth of 5 meters, to a total volume of soil of 3,710 m³ per pit.¹⁶³⁷ Therefore, the total volume of soil in the five pits requiring remediation at that site is 18,550 m³, amounting to a total remediation cost of **USD 5,565,000.**

801. With respect to the Payamino Sanitary Landfill, two pits must be remediated up to 5 meters depth with an impacted area for the first pit of 720 m² (40x18 meters) and a total soil volume of 3,600 m³, and an impacted area of 630 m² and total soil volume of 3,150 m³ for the second pit (35x18 meters), for a total volume of 6,750 m³ to be remediated, and a total cost of **USD 2,025,000.**

802. In its review of IEMS's sampling data, the Tribunal further noticed that GSI states that various IEMS samples are misplaced and in reality located in pits,¹⁶³⁸ a statement that

¹⁶³⁶ See note 1631 above. See also: R-PHB, ¶ 479.

¹⁶³⁷ The Tribunal chose a depth of 5 meters in light of Perenco's explanation that they transferred the muds from Oso A to Oso 9 precisely because the depth at Oso A could only comport 3 meters due to the phreatic level instead of the 4.5 meters initially contemplated. See: Letter of 17 October 2007 from Eric D'Argenté (Perenco) to Consuelo Hernández (DINAPA) (**Exh. CE-CC-142**). See also: Saltos WS1, ¶ 184.

¹⁶³⁸ See, in particular: GSI ER1, App. D, Annex D.2.

Ecuador did not challenge.¹⁶³⁹ This is the case at the following sites where high TPH values are identified: Gacela 2,¹⁶⁴⁰ Punino,¹⁶⁴¹ and Oso CPF.¹⁶⁴² Again, all these pits were built by prior operators¹⁶⁴³ and Ecuador has not alleged that they were re-used by the Consortium.¹⁶⁴⁴ Accordingly, the Consortium is under no obligation to remediate these pits.

b. Poorly managed pits

803. The Tribunal now turns to Ecuador's claim that pits were poorly managed. It will particularly review whether there is evidence that pits are leaking their contents into the surrounding environment. Ecuador refers to the following evidence in support of its claim. First, Messrs. Andrade and Ramírez, both Consortium staff, stated that individuals had complained of being affected by leaking pits at Coca 4, Oso A, Gacela 2 and Payamino 1.¹⁶⁴⁵ Second, Mr. Saltos admitted that the Waponi-Ocatoe pit collapsed in 2003 and that the pit at Cóndor Norte partially collapsed in 2006.¹⁶⁴⁶ Third, GSI testified that contamination related to past drilling mud discharges was found in two

¹⁶³⁹ IEMS ER4, pp. 108-109 and Table 2.

¹⁶⁴⁰ This is the case of sample MS-GAC-C1-2.1-1 with a TPH level of 34'907 mg/kg. The Tribunal notes that two other samples to the east of the pit have high TPH levels (namely, 07-GAC02-SDA2-R(1,0-1,2)m and 07-GAC02-SDA3-R(0,5-0,7)m). These exceedances are considered by the Tribunal in its analysis of regular soil contamination under Table 6 of RAOHE (see above note 1234). See also: GSI ER1, App. D, Annex D.2, p. 11.

¹⁶⁴¹ This is the case of sample 7-PUN-01-71-MS-H-3,0 with a TPH level of 6'590 mg/kg. The Parties agree that the Punino well was drilled in 1990 and that the site has one closed pit to the north of the platform. See: GSI ER1, App. L, Table L.31.1 and Figure L.31.3. The Tribunal notes that sample MS-H is not identified in the map in Figure L.31.3, but it is otherwise satisfied that it is located in the pit on the basis of the sample ID (71-MS). IEMS ER4, Att. 10.1 contains no reference to pit samples taken in Punino.

¹⁶⁴² This is the case of sample 07-CPFOS-SDB8-R(2,1-2,3)m with a TPH level of 8'789 mg/kg and sample 07-CPFOS-SDZ5-R(2,5-2,7)m with a TPH level of 7'005 mg/kg. See: GSI ER1, App. L, Table L.56.1. The sample locations are not identified in Figure L.56.3.

¹⁶⁴³ Gacela 2A was drilled by Oryx in 1992 with oil-based muds, and Gacela 2B in 1997. The Gacela 2 pits were closed in 1998. Punino was drilled by Petroproducción in 1990 and the pit closure date is unknown. Oso 1/CPF was drilled in 1970 according to GSI and, according to Ecuador, by BP in 1988; the closure dates of the 3 pits are unknown. See: GSI ER2, App. B.5; Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009 (**Exh. E-563**).

¹⁶⁴⁴ However, Ecuador stressed that Mr. Saltos conceded that Oso 1 was a stand-by well that was put into service by the Consortium following a workover. There is, however, no evidence showing that the Consortium reopened the Oso 1/CPF pits. See: Tr. (Day 4) (ENG), 1239:1-2 (Cross, Saltos); R-PSVB, ¶ 198.

¹⁶⁴⁵ R-PHB, ¶ 482(a).

¹⁶⁴⁶ *Id.*, ¶ 482(b).

areas to the east of Mono CPF.¹⁶⁴⁷ Fourth, IEMS indicated that the Payamino 2/8 pits are perforated by roots and leaking.¹⁶⁴⁸ Fifth, GSI acknowledged that drilling muds extend to the south of the closed pit at Coca 8.¹⁶⁴⁹ Sixth, Ecuador also alleges that the Coca 18/19 pits are releasing their content and that the Mono 10/12 pit is leaking.¹⁶⁵⁰

804. The Tribunal first turns to the allegedly leaking pits at Coca 4, Payamino 1, Oso A and Gacela 2.

805. With respect to Coca 4 and Oso A, Ecuador has not provided any specifics regarding the complaints mentioned by Messrs. Andrade and Ramírez and there are no other elements showing that the mud pits at Coca 4 and Oso A are leaking. Coca 4 has two pits and IEMS collected one sample from the pit to the southeast of the platform, with no exceedance even under Table 6.¹⁶⁵¹ The only exceedance at Coca 4 would appear to be related to the oil/water separator rather than to the mud pit, and does not support a finding that the pit in question is leaking.¹⁶⁵² Similarly, IEMS only took one sample from the Oso A pit and provided no clear information on how or where the alleged leaking is coming from.¹⁶⁵³

806. With respect to Gacela 2, the Tribunal notes that IEMS accepted that Portland cement mixed with oil-based drilling mud prevents TPH from migrating outside of the pit, although IEMS stressed that this was not the case of heavy metals.¹⁶⁵⁴ GSI disagreed with IEMS's position that Portland cement does not stabilize heavy metals,¹⁶⁵⁵ adding

¹⁶⁴⁷ *Id.*, ¶ 482(c).

¹⁶⁴⁸ *Id.*, ¶ 482(e).

¹⁶⁴⁹ *Id.*, ¶ 482(d).

¹⁶⁵⁰ Reply, ¶ 195(ii); R-PHB, ¶ 482(f).

¹⁶⁵¹ GSI ER1, App. L, Table L.3.1 and Figure L.3.3.

¹⁶⁵² *Ibid.*

¹⁶⁵³ GSI ER1, App. L, Table L.55.1.

¹⁶⁵⁴ IEMS stated the following: "Portland cement. So, what that does specifically is work with the TPH, but it doesn't perform the same as with metals. And in the same study, for example, on the sealing of these two pits it clearly says that the risk may exist due to the base of metals highly associated with TPH, mainly in this case it cites vanadium, lead, and cadmium; that in the case of vanadium and cadmium we have the presence of highly significant contamination at this site. So, it may be very safe for TPH, for not perhaps for metals [sic]". Tr. Site Visit (Day 4) (ENG), 18:33-19:5 (Tribunal, Chaves at Gacela 2).

¹⁶⁵⁵ GSI stated as follows: "In the other case with the solidified material, the TPH, the oil, and any metals that are in there are very securely stabilized. I would give you a point of view that's very

that the Gacela 2 pit at issue also had a plastic liner beneath it.¹⁶⁵⁶ The Tribunal is not convinced that the exceedances surrounding the pit are due to a leak in the pit, as opposed to other causes such as spills during workovers. In particular, Oryx took samples from the Gacela 2 pit during the stabilization and solidification procedure in 1998 and the results show that heavy metals were properly fixated in the mixture.¹⁶⁵⁷ This procedure was furthermore approved by Ecuadorian authorities.¹⁶⁵⁸ Most importantly, the Tribunal notes that IEMS has provided no evidence suggesting that the pit is poorly constructed or any analysis on the pit's structure showing that there is a leak. Accordingly, the Tribunal dismisses Ecuador's claims for remediating the pits at Gacela 2.

807. With respect to Payamino 1, and leaving aside the unreported workover pit in Area 2M which the Tribunal addressed in its analysis on contamination of regular soil, the Tribunal notes that the above-surface concrete pit in Area 1P inspected during the Site Visit was removed by the prior operator Oryx in 2001.¹⁶⁵⁹ Accordingly, there is no issue of pit leakage at Payamino 1, since any exceedance surrounding or below the concrete pit forms part of the Tribunal's analysis of contamination of regular soil.
808. Second, with respect to collapsed pits, the Tribunal starts its analysis with the pits in Waponi-Ocatoe. Waponi-Ocatoe was drilled by Kerr McGee in 2000 and Ecuador does not know if it was operated by the Consortium.¹⁶⁶⁰ The three mud pits on the

opposite of what Mr. Chaves offered, that cementing completely retains the metals because Portland Cement is aluminium silicate and other agents that attract and tie those metals up. You don't get metals escaping that material". Tr. Site Visit (Day 4) (ENG), 19:21-27 (Tribunal, Connor at Gacela 2).

¹⁶⁵⁶ Tr. Site Visit (Day 4) (ENG), 21:6-9 (Tribunal, Connor at Gacela 2).

¹⁶⁵⁷ Soil Analytical Services Inc. indicated the following: "The low values of oil, grease and chloride obtained in leaching tests, and the low values of heavy metals obtained in EP toxicity tests, are related to the quality of mixing designs and clearly show the usefulness of solidification for the treatment and disposal of 'oil-based' drilling mud" (Translation by the Tribunal). See: Taponamiento de piscina de excedentes de perforación de Gacela 2 por Llori Hnos, 1998 (CP-00026749 – 00026922), p. 98 (**Exh. E-472**). On the Procedure for the Stabilization and Solidification of OBM at Gacela 2b, see: *Id.*, pp. 93-97 and pp. 99-108.

¹⁶⁵⁸ See, for instance, the letter of the Ministry of Energy approving the solidification process by using Portland cement: Letter of 17 December 1997 from Mr. Morillo Villareal (Ministry of Energy and Mines) to Mr. Luis Cobos (Oryx), in: Taponamiento de piscina de excedentes de perforación de Gacela 2 por Llori Hnos, 1998 (CP-00026749 – 00026922), p. 109 (**Exh. E-472**).

¹⁶⁵⁹ GSI ER1, p. 101.

¹⁶⁶⁰ Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 72 (**Exh. E-563**).

southeastern edge of the platform were closed by Kerr McGee in December 2000. Ecuador alleged that two pits were lined, but could not provide information on the third, further arguing that “[t]he use of a synthetic liner does not mean that it was properly installed, not damaged, and is effectively serving as an “impermeable” barrier”.¹⁶⁶¹ At the Hearing, for the first time, Mr. Saltos indicated that a pit in Waponi-Ocatoe collapsed in 2002 or 2003.¹⁶⁶² However, there are no other elements in the record providing information on the circumstances of the alleged collapse and the remedial action taken by the Consortium,¹⁶⁶³ and Ecuador did not further comment on the matter in its Post-Hearing Brief.¹⁶⁶⁴ The Tribunal further notes that IEMS did not take any sample from the mud pits or immediately adjacent areas to the mud pits, with the exception of four samples taken to the northeast of the northern most pit, which do not show any exceedance.¹⁶⁶⁵ Indeed, IEMS concluded that the platform is free of soil contamination¹⁶⁶⁶ and Ecuador does not claim remediation for this site.¹⁶⁶⁷ Accordingly, no remediation is warranted for the Waponi-Ocatoe pit.

809. The situation is different for C6ndor Norte, especially because the pits were built by the Consortium in 2005.¹⁶⁶⁸ It is undisputed that an area of three pits partially collapsed in 2006¹⁶⁶⁹ and Mr. Saltos acknowledged that the Consortium did not properly remediate

¹⁶⁶¹ *Ibid.*

¹⁶⁶² Tr. (Day 4) (ENG), 1224:6-8 (Cross, Saltos).

¹⁶⁶³ For instance, even the field investigation conducted by IEMS does not mention the allegedly collapsed pit, but refers to an open pit with water discovered in 2010 by Envirotec (REC 21-WAP-WAP-453) and to some weathered crude on the platform close to a “possible pit”. See: IEMS ER3, Annex C, Waponi Corrected, pp. 5-6.

¹⁶⁶⁴ R-PHB, ¶ 482(b).

¹⁶⁶⁵ IEMS ER3, Annex C, Waponi Corrected, p. 8; GSI ER1, App. L, Figure L.63.3 and Table L.63.1.

¹⁶⁶⁶ IEMS ER3, Annex C, Waponi Corrected, p. 9.

¹⁶⁶⁷ Ecuador’s Total Costs of Remediation of Contaminated Soils in United States Dollars, line 67 (**Exh. E-500**).

¹⁶⁶⁸ GSI ER2, App. B.5, p. 2; Ecuador’s Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 36 (**Exh. E-563**). There are three closed pits at C6ndor Norte and the Consortium submitted an Abandonment Plan for C6ndor Norte in September 2005, which was approved by the Ministry of Energy and Mines. See: Letter of 19 September 2005 from Jorge Y6ñez (Perenco) to Stalin Salgado (DINAPA) (**Exh. CE-CC-315**); Letter of 29 September 2005 from Laurent Combe (Perenco) to Stalin Salgado (DINAPA) (**Exh. CE-CC-316**). See also: Rejoinder, ¶ 288.

¹⁶⁶⁹ IEMS ER3, Annex C, C6ndor Norte Corrected, pp. 6-7 (REC 7-CON-NTE-360); GSI ER1, App. L, Att. L.32.B.

the situation prior to July 2009.¹⁶⁷⁰ Although Mr. Saltos testified that the contents of the pits did not leak,¹⁶⁷¹ GSI stated otherwise.¹⁶⁷² It is also unclear whether the pits are properly lined.¹⁶⁷³ The Tribunal does not accept the explanation of Mr. Saltos that the Consortium could not properly remediate the pits due to the takeover in July 2009,¹⁶⁷⁴ since the 2008 abandonment plan makes no mention of problems with the pits and does not contemplate remediating the area.¹⁶⁷⁵ Although it would be sufficient for a finding of liability that the pits were built by the Consortium, the Tribunal in addition finds that the Cónдор Norte pits were poorly built and managed.

810. Therefore, the Tribunal holds that complete *ex situ* remediation of the three pits is due at this site, to a depth of 3 m, corresponding to a total area of 1,300 m² (approx. 65 x 20 meters), for a total soil volume of 3,900 m³ and a total cost of **USD 1,070,000**.¹⁶⁷⁶
811. Third, Ecuador also alleges that GSI admitted that contamination found in the area to the east of Mono CPF was related to past drilling mud discharges.¹⁶⁷⁷ The Tribunal

¹⁶⁷⁰ Tr. (Day 4) (ENG), 1339:16-1340:1 (Cross, Saltos).

¹⁶⁷¹ Mr. Saltos stated as follows: "I maintain this, the pits of Conde [sic] Norte 1 never broke, they never had any run-off problems, the mud never came out of them". Tr. (Day 4) (ENG), 1342:5-8 (Cross, Saltos). See also: Tr. (Day 4) (ENG), 1339:13-15 (Cross, Saltos). And further: Tr. (Day 4) (ENG), 1339:3-15 (Cross, Saltos).

¹⁶⁷² GSI stated the following: "A spill occurred at this site in 2005 when a corner of the mud pits failed, causing mud to run over the adjacent cliff. The pits were closed shortly thereafter, as the well never produced oil. The spill of about 300 barrels of mud reached a stream below. Perenco Ecuador Limited reported the spill and completed remediation". GSI further stated that it "conducted a visual/physical inspection at this location and found erosion and slope failure (landslide) of the pit area, but there was no evidence that the pits had been compromised". GSI ER1, App. L.32 – Cónдор Norte 01, pp. 3, 5.

¹⁶⁷³ The 2005 mud pit closure offer mentions both Tables 7a and 7b of RAOHE. First, it is noted that composite samples are tested against Table 7b, but then it is stated that samples comply with Table 7a. Mud pit closure offer, project and report from Constructora Villacreces for Cónдор Norte (CP-00026612 – 00026667), pp. 13, 21 (**Exh. E-460**). See also: Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 36 (**Exh. E-563**). The Tribunal notes that GSI provided no information on Cónдор Norte. See: GSI ER2, App. B.5, p. 2 and B.6.

¹⁶⁷⁴ Saltos WS2, ¶ 38.

¹⁶⁷⁵ Definitive Abandonment and Delivery Plan of Areas Used for Block 7 Petroleum Drilling and Production, November 2008, Section 4.9, pp. 4-26 to 4-28 (**Exh. CE-CC-338**).

¹⁶⁷⁶ The Tribunal is aware that the 2005 pit closure offer refers to a total volume of 2,300m³, but in light of the dimensions of the pits (65 x 20 meters) and the depth at which IEMS identified elevated barium levels (up to 3 meters), the Tribunal reached a total volume of soil of 3,900 m³. See: Mud pit closure offer, project and report from Constructora Villacreces for Cónдор Norte (CP-00026612 – 00026667), p. 32 (**Exh. E-460**); GSI ER1, App. L, Table L.32.1.

¹⁶⁷⁷ R-PHB, ¶ 482(c).

already accepted in its analysis on regular soil at Mono CPF the statement of IEMS that Area 2M is a historical pit used by BP when drilling Mono 1 (see paragraph 688 above).¹⁶⁷⁸ However, the Tribunal notes that IEMS's statement that the pit is leaking its contents into Area 3MT is speculative, since it is not supported by any evidence on the pit's structure showing that there is a leak. Accordingly, Ecuador's claim regarding the pit in Area 2M is dismissed.

812. Fourth, the Tribunal addresses IEMS's opinion that the Payamino 8 pit is perforated by roots and leaking.¹⁶⁷⁹ At the Hearing, IEMS stated that "part of the material [...] covering the pit has been broken by roots that have grown through it", and that "to this day, it is leaking".¹⁶⁸⁰ Burlington's position is that the Payamino 8 pit ruptured before 1992, thus explaining the still extant contamination in the Jungal swamp.¹⁶⁸¹ To this, Ecuador objected that "Burlington does not entertain the possibility that Petroproducción remediated the area and that a spill during the Consortium's operations *coupled with migration of contaminants from the mud pits* would explain the fresh crude found on the surface of the Jungal swamp in 2007".¹⁶⁸²
813. Apart from pointing to a piece of fractured liner visible at the edge of the cliff at the Payamino 8 mud pit during the Site Visit,¹⁶⁸³ which incidentally led the Parties to disagree on the exact dimensions of the pit, the Tribunal has received no evidence suggesting that the Payamino 8 pit is presently leaking. In particular, there was no sampling in the proximity of the pit, for instance, along the cliff above the Jungal swamp. The closest IEMS sample in the Jungal swamp is some 50 meters away.¹⁶⁸⁴

¹⁶⁷⁸ Tr. Site Visit (Day 3) (ENG), 87:19-21 (Tribunal, Chaves in Area 3MT at Mono CPF).

¹⁶⁷⁹ R-PHB, ¶ 482(e).

¹⁶⁸⁰ Tr. (Day 3), 937:2-6 (Tribunal, Chaves).

¹⁶⁸¹ CMCC, ¶ 452; Tr. Site Visit (Day 2) (ENG), 52:11-13 (Presentation of Ms. Renfroe at Payamino 2/8) ("the test pit failed, and the material in it, primarily crude oil, but some barium drilling muds flowed that way into the swamp"). Similarly, Mr. Saltos stated that: "I believe that the contamination was caused when the wall in the Payamino 2 test pits, built by CEPE in 1987, broke and the test crude and drilling muds flowed downhill and into the swamp". Saltos WS2, ¶ 93, see also: *Id.*, ¶¶ 94, 236 and Saltos WS1, ¶¶ 215-233.

¹⁶⁸² R-PSVB, ¶ 89 (Italics by the Tribunal).

¹⁶⁸³ Tr. Site Visit (Day 2) (ENG), 24:7-18, 26:20-23 (Tribunal, Chaves); R-PSVB, ¶¶ 90-92.

¹⁶⁸⁴ See, for instance, samples MS-PAY-C1 or 07-PAY28-SDB1-R. GSI ER1, App. L, Figure L.15.3. In addition, IEMS did not collect any leachate samples from within the pit allowing determining the mobility of contaminants.

Finally, IEMS's pit samples are not located at the eastern edge of the pit and, in any event, do not show any TPH exceedance and only one sample with a high barium value.¹⁶⁸⁵ In the Tribunal's view, this evidence is insufficient for a finding that the pit is leaking. Accordingly, no remediation is granted for the Payamino 8 pit.

814. Fifth, the Tribunal now turns to the three Coca 8 pits located to the south of the platform that were discussed during the Site Visit.¹⁶⁸⁶ Ecuador complains that the Coca 8 pits are leaking.¹⁶⁸⁷ For its part, GSI agrees that the contamination originated from the mud pits and was caused by an overflow when the pits were compacted during the closure process and not by leakage.¹⁶⁸⁸ In response, IEMS rejected GSI's remediation proposal calling it "unreasonable" and further argued that even "if they remediated, how long will we have to wait for that pit to continue leaking, to continue draining contamination and reach the point of having to be remade? Because it comes from the pit, that's obvious. So are we going to cover the wound with a bandage without healing it from within?"¹⁶⁸⁹
815. IEMS relied on field observations and analysis of laboratory results to conclude that "the release of contaminants from leaching and leaks from the pit would occur towards the hydraulic gradient and follow the topography of the area, placing the body of water at risk of contamination".¹⁶⁹⁰ IEMS further opined that it found that "the portion of the pit located opposite the wellhead had collapsed" and that the material "lacked firmness and

¹⁶⁸⁵ The high barium level was found in sample MS-PAY-C2-2/8.1-2,5 (11'085 mg/kg). See: IEMS ER4, Att. 38, Payamino 2/8, pp. 9-14; GSI ER1, App. L, Table 15.1.

¹⁶⁸⁶ Tr. Site Visit (Day 2) (ENG), 80:8-123:16 (Coca 8).

¹⁶⁸⁷ R-PHB, ¶ 482(d).

¹⁶⁸⁸ GSI stated as follows: "Q. Is there any doubt as to where this contamination may have originated? Did it come from the mud pits? A. Yes, we believe it came from the mud pits. The mud pits contained oil-based drilling mud, which is a mixture of diesel with barite and other materials. Mr. García Represa was correct in saying that there was TPH in that pit, but there are no TPH exceedances out here. There is only barium. Our understanding from looking at the records on this site is that at some point in time there was an overflow from that mud pit which followed the drain in this area, but all the data is consistent with that. We have superficial impacts from barium sulfate". Tr. Site Visit (Day 2) (ENG), 87:14-22 (Tribunal, Connor at Coca 8). GSI further stated that the pit would not leak because it has a natural "clay liner beneath it". Tr. Site Visit (Day 2) (ENG), 118:1-10 (Tribunal, Connor at Coca 8).

¹⁶⁸⁹ Tr. Site Visit (Day 2) (ENG), 92:2-5 (Tribunal, Chaves at Coca 8). See also: Tr. Site Visit (Day 2) (ENG), 120:11-14 (Tribunal, Chaves at Coca 8).

¹⁶⁹⁰ IEMS ER4, p. 36.

was high in moisture”.¹⁶⁹¹ According to IEMS, the results of five samples collected outside of the pit “show clear evidence that the contents of the mud pit are leaking”.¹⁶⁹²

816. Applying regulatory criteria for sensitive ecosystem, IEMS notes the following exceedances:

- Sample 07-COC-08-TE-101 has a TPH level of 9,461 mg/kg and a barium level of 11,614.8 mg/kg in the 1.5-1.7m interval, and a barium level of 10,940.7 mg/kg in the 2-2.2m interval;
- Sample 07-COC-08-TE-103 has a barium level of 946.1 mg/kg in the 0.5-0.7m interval;
- Sample 07-COC-08-TE-104 has a barium level of 23,368.3 mg/kg in the 0.5-0.7m interval, and a barium level of 1,557.9 mg/kg in the 1.2-1.4m interval.¹⁶⁹³

817. For IEMS, these results “demonstrate a catastrophic failure of the Coca 8 pit, which has released hazardous contents into the surrounding sensitive environment”. IEMS attributes this state of affairs to the “poor engineering and construction of the pits, combined with a lack of monitoring and maintenance”.¹⁶⁹⁴

818. GSI responds that the Coca 8 pits did not collapse and do not leak, since (i) physical inspection did not reveal “exposed drilling materials, leaks, or seeps”, (ii) the impacted soils are “solid materials, with no liquid-phase drilling mud or oil”, and (iii) there is no sign of disturbance of vegetation.¹⁶⁹⁵ It also considered that IEMS sample TE-101 with the high TPH level was located in the pit, thus suggesting that IEMS got the dimensions of the pits wrong.¹⁶⁹⁶ GSI therefore concluded that the soil impacts “are most likely associated with a historical release of the pit contents, either during the pit operation or

¹⁶⁹¹ *Ibid.*

¹⁶⁹² *Ibid.*

¹⁶⁹³ *Id.*, pp. 36-37. In addition to various other cadmium exceedances, the Tribunal notes that sample 7-COC-08-TE-105-(0.5-0.70) has a cadmium level of 4.7 mg/kg and sample 7-COC-08-TE-105-(1.50-1.70) a cadmium level of 3.8 mg/kg. See: GSI ER2, App. D, Table D.3, pp. 6-7.

¹⁶⁹⁴ IEMS ER4, pp. 37-38.

¹⁶⁹⁵ GSI ER2, pp. 13-14. See also: GSI ER1, App. L, Coca 8 GSI Site Inspection and Sampling Report, pp. 2-3.

¹⁶⁹⁶ GSI ER2, App. D, Table D.3, p. 6. See also: Tr. Site Visit (Day 2) (ENG), 102:13-16 (Tribunal, Connor at Coca 8).

at the time of the closure process, which are the only times when the pit would have contained liquid or semi-solid materials”.¹⁶⁹⁷

819. The Tribunal starts by observing that the Coca 8 well was drilled by Petroproducción in 1991 and that the pit closure date is unknown.¹⁶⁹⁸ According to available information, the westernmost pit is a water treatment pit, the one in the centre a decantation pit and the easternmost pit a drilling mud pit.¹⁶⁹⁹ It is undisputed that the Consortium operated the well,¹⁷⁰⁰ but that it did not close the mud pits or undertake workovers having the effect of deepening the well.¹⁷⁰¹ Since both Parties agree that the contamination to the south of the pits originates from the pits, the Tribunal must determine whether it is caused by leaks, as Ecuador alleges, or by an overflow of the pit contents during the closure process, as Burlington contends.¹⁷⁰²

820. For a variety of reasons, the Tribunal is inclined to accept Ecuador’s view that the Coca 8 pits are leaking and were poorly managed by the Consortium:

- First, the Coca 8 pits do not have a synthetic liner, as GSI conceded when it testified that in its opinion the clay base provided sufficient impermeabilization.¹⁷⁰³
- Second, although the easternmost pit contains oil-based drilling muds, there are no TPH exceedances outside of the pit area,¹⁷⁰⁴ which one may have expected to find if there had been an overflow.¹⁷⁰⁵ In other words, Mr. Saltos’s so-called

¹⁶⁹⁷ GSI ER2, p. 14.

¹⁶⁹⁸ Ecuador’s Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 6 (**Exh. E-563**); GSI ER2, App. B.5, p. 1.

¹⁶⁹⁹ IEMS ER4, Figure 6, p. 38.

¹⁷⁰⁰ GSI ER1, App. B.4.

¹⁷⁰¹ Tr. Site Visit (Day 2) (ENG), 94:10-13 (Presentation by Ms. Renfroe at Coca 8). Ecuador did not allege that a workover took place at Coca 8. See: Ecuador’s Site Visit PHB, ¶ 200.

¹⁷⁰² See, for instance: Tr. Site Visit (Day 2) (ENG), 107:6-14 (Tribunal, Saltos at Coca 8).

¹⁷⁰³ Tr. Site Visit (Day 2) (ENG), 118:1-5 (Tribunal, Connor at Coca 8).

¹⁷⁰⁴ GSI ER2, App. D, Table D.3, pp. 6-10.

¹⁷⁰⁵ The Tribunal has noted Ecuador’s argument that “contradictions in the record as to the existence, location, size and state of mud pits”, including the Coca 8 pits, “exacerbates the environmental and health risks”. R-PSVB, ¶ 108. However, during the Site Visit, IEMS accepted GSI’s dimensions of the pits, and thus accepted that sample TE-101 is located within the pit: “If it

“sandwich effect” leading to overflows during the compacting process was disproved, since there are no TPH exceedances southwards of the pit in Area 1M as Mr. Saltos expected.¹⁷⁰⁶

- Third, the exceedances to the south of the pit are heavy metal exceedances (i.e., barium, cadmium and lead), which, due to their mobility, could very well have leaked over the years into the surrounding environment.
- Fourth, the Tribunal is not convinced by GSI’s opinion that the exceedances are only superficial, since barium exceedances extend at least 1.4 meters deep and cadmium exceedances are at least 1.7 meters deep.¹⁷⁰⁷
- Fifth, IEMS pointed to a complaint filed on 22 March 2007 by Mr. Noteño, President of the community *Corazón del Oriente*, indicating that the three Coca 8 pits had been seriously affecting the surrounding environment, including the river Huachito.¹⁷⁰⁸ While Mr. Saltos sought to downplay the significance of this type of complaint,¹⁷⁰⁹ there is no indication that the Consortium ever acted upon that complaint to verify the environmental condition of the mud pits and surrounding areas.

weren’t for the fact that they had a diagram, which we did not, we never would have known the actual dimensions of the pit”. See: Tr. Site Visit (Day 2) (ENG), 90:13-14 (Tribunal, Chaves at Coca 8).

¹⁷⁰⁶ Tr. Site Visit (Day 2) (ENG), 107:6-18 (Tribunal, Saltos at Coca 8).

¹⁷⁰⁷ For instance, samples 7-COC-08-TE-104(1.2-1.4)P and 7-COC-08-251-B-29 for barium; and samples 7-COC-08-TE-104-(1.50-1.70) and 7-COC-08-TE-105-(1.50-1.70) for cadmium. See: GSI ER2, App. D, Table D.3, pp. 6-10.

¹⁷⁰⁸ The complaint reads in relevant part: “The wells that the company refers to as Coca 6 and Coca 8 are seriously affecting the environment 24 hours a day; at present, these fields are being operated by Perenco Consorcio B7-B21; in a part of the Coca 8 platform there are three closed pits of approximately 10 to 12 meters each, oil flowing into the surface from each side; this affectation finds itself within the property of Mr. Alberto Tanguila, which is also used for agricultural purposes” (Translation by the Tribunal). Letter of 22 March 2007 from the President of the Corazón del Oriente Community to Salvadore Quishpe (**Exh. E-285**). See also: IEMS ER3, p. 101; IEMS ER4, Annex C, Coca 8, pp. 8-9 (REC 7-COC-08-404). See also: Tr. Site Visit (Day 2) (ENG), 84:10-14 (Presentation of Mr. García Represa at Coca 8) and 84:19-85:10 (Tribunal, Puente). While Mr. Noteño argued that the area was “destined for agriculture”, the Tribunal decided that Area 1M is located in a sensitive ecosystem for purposes of Table 6 of RAOHE, also keeping in mind the statement made by Mr. Saltos that while oilfield operations are ongoing, that area cannot be used by the private owners: “In addition, this area over here is not used because compensation was paid previously by the private company for the operation of the platform. And while the operation of the platform is ongoing, they cannot use it”. Tr. Site Visit (Day 2) (ENG), 107:1-3 (Tribunal, Saltos at Coca 8).

¹⁷⁰⁹ See, for instance: Saltos WS1, ¶ 360.

821. Accordingly, the Tribunal concludes that the Consortium's management of these pits was inadequate and that Burlington is at least partly liable for the remediation of these pits. In the Tribunal's assessment, all three mud pits should be remediated *ex situ*, amounting to an impacted area of approximately 2,500 m², a total volume of 7,500 m³ (depth 3m), and total costs of USD 2,250,000, of which Burlington shall pay half since the pits were not built by the Consortium,¹⁷¹⁰ i.e. **USD 1,125,000**.
822. Sixth, with respect to Coca 18/19, Ecuador argues that the four pits on the southern edge of the platform are releasing their contents,¹⁷¹¹ insisting in particular on the alleged off platform exceedances to the southwest of the pits in the area designated by GSI as Area 1M.¹⁷¹² In its first expert report, GSI delineated contamination in Area 1M by stating that "the exact source of the apparent drilling mud discharge at Area 1M is unclear",¹⁷¹³ to which Ecuador replied that "[a] more logical conclusion would have been that the contamination is caused by leakage from the pits used by the Consortium".¹⁷¹⁴ After reviewing the Coca 19 pit closure report,¹⁷¹⁵ GSI then expressed the view that there were two auxiliary pits located to the south of the platform, in addition to the four pits located on the platform, and that the exceedances identified by IEMS are actually

¹⁷¹⁰ The Tribunal has no information on the exact dimensions of the pits (except for Mr. Noteño's indication that each pit is 10-12 meters wide and long) (**Exh. E-285**), and therefore the Tribunal relied on the figures provided by GSI showing that the pit area is approximately 100x25 meters. Since IEMS sampled 2.5 meters deep, the Tribunal held that the pits were 3 meters deep. See: GSI ER1, App. L, Figure L.6.6.

¹⁷¹¹ Reply, ¶¶ 151-156; R-PHB, ¶¶ 270-272, 482(f).

¹⁷¹² IEMS ER3, Annex C, Coca 18/19, pp. 7, 9-20; IEMS ER4, Att. 37, p. 3 ("GSI recognizes soil contamination in Area 1M; however, the contaminated area identified by GSI is much smaller than the one estimated by IEMS. The new samples show good correlation with the prediction of IEMS' modeling and confirm that the impacted area estimated by IEMS is more realistic than GSI's. From the data and modeling it can be inferred that the source of contamination is related to the existing pits at the south of this field in 2004 according to the pit closure report for Coca 19"). See also: GSI ER1, App. L, Figure L.13.6.

¹⁷¹³ GSI ER1, ¶ 271 and App. L, Figure L.13.3 and Table L.13.1.

¹⁷¹⁴ Reply, ¶ 153.

¹⁷¹⁵ Reporte de taponamiento de piscinas de Coca 19, October 2004 (**Exh. E-337**). See also: Taponamiento de piscinas de Coca 19, performed by Ceracons for Perenco, October 2004 (**Exh. E-365**).

located within the pits.¹⁷¹⁶ Burlington therefore submitted that no remediation was required at this site.¹⁷¹⁷

823. Coca 18 was drilled by Kerr McGee in July 2001 and Coca 19 by Perenco in December 2003.¹⁷¹⁸ According to the closure report, the Coca 19 pits were closed in September 2004.¹⁷¹⁹ The closure report indicates that the platform hosts four pits and that two auxiliary pits were built south of the platform, corresponding to Area 1M.¹⁷²⁰ It is therefore striking that, while IEMS acknowledged the existence of the two auxiliary pits, Ecuador persisted in arguing that contamination in Area 1M was evidence that the pits on the platform were leaking.¹⁷²¹ The Tribunal also notes that all the pits were tested and complied with Table 7a for unlined pits.¹⁷²² Except for elevated barium levels not exceeding 8,000 mg/kg, the samples taken in Area 1M, that is at the location of the auxiliary pits, do not show any high levels of heavy metals.¹⁷²³ The same can be said about the samples taken within the pits on the platform.¹⁷²⁴ In addition, the samples collected by IEMS to the south of the pits do not show any exceedance of regulatory criteria for agricultural land use.¹⁷²⁵ Finally, IEMS took no leachate samples for any of

¹⁷¹⁶ GSI ER2, ¶¶ 57-58, App. B.3.1 and App. D, Table D.3, pp. 44-45, Figure D.1.9, p. 173, Figure D.5.6, p. 255. The Tribunal also took note of GSI's explanations on the location of sample 7-COC-18-TE-106-(0.5-0.7).

¹⁷¹⁷ Rejoinder, ¶ 287; Saltos WS2, ¶ 31.

¹⁷¹⁸ Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, lines 13-14 (**Exh. E-563**); GSI ER2, App. B.5, p. 1.

¹⁷¹⁹ Reporte de taponamiento de piscinas de Coca 19, October 2004 (**Exh. E-337**); GSI ER2, App. B.5, p. 1.

¹⁷²⁰ The closure report indicates as follows with respect to the auxiliary pits: "Drilling muds were treated with borrowed material and distributed in the existing pits and in two auxiliary pits built outside the platform" (Translation by the Tribunal). Reporte de taponamiento de piscinas de Coca 19, October 2004, p. 4 (**Exh. E-337**). Photographs of the auxiliary pits can be seen at: *Id.*, pp. 27-29. See also: GSI ER2, App. B.3.1.

¹⁷²¹ Ecuador stated that "[i]n this particular example, the most likely scenario is that the contamination originates from the pit that is right above the contaminated area". R-PHB, ¶¶ 272, 482(f).

¹⁷²² Reporte de taponamiento de piscinas de Coca 19, October 2004, pp. 4, 6-10 (**Exh. E-337**).

¹⁷²³ GSI ER2, App. D, Table D.3, pp. 44-45. See also: *Id.*, Figure D.1.9, p. 173 and Figure D.5.6, p. 255.

¹⁷²⁴ *Id.*, Table D.3, p. 45.

¹⁷²⁵ See: samples 7-COC-18-43-MS-A-2,0, 7-COC-18-TE-104 and 7-COC-18-TE-105. GSI ER2, App. D, Table D.3, pp. 44-45.

the pits. On this basis, the Tribunal finds that the weight of the evidence is that the pits in Coca 19 are not leaking. Therefore no remediation is due for these pits.

824. Seventh and last, with respect to Mono 10/12, the Tribunal considers that, without more, a single sample with a relatively minor barium exceedance (765 mg/kg) located just outside the southern edge of the pit is insufficient to prove Ecuador's allegation that the pit is leaking, since barium could very well have spilled over during the closure process.¹⁷²⁶ Therefore no remediation is due for this pit.

c. Leachate test analysis

825. The Tribunal now turns to the leachate tests, which GSI conducted at the following sites: Coca 15, Lobo 3, Oso 9, Payamino 14/20/24, Yuralpa Pad A, Pad F and Pad G.¹⁷²⁷ A review of these leachate tests shows that there are no exceedances under either Table 7a or 7b at Lobo 3, Payamino 14/20/24, Yuralpa Pad F and Pad G.¹⁷²⁸ Since the pit closure report for Coca 15 indicates that the pit was lined,¹⁷²⁹ the results must be measured on Table 7b and they evince no exceedance.¹⁷³⁰ Similarly, since Ecuador accepts that the pits in Yuralpa Pad A have been lined and there is no evidence that the liner is damaged,¹⁷³¹ there are no exceedances at this site when judged against Table 7b.¹⁷³²

¹⁷²⁶ See: Reply, ¶ 195(ii). See also: GSI ER2, p. 13.

¹⁷²⁷ GSI ER1, App. D, Table D.12.A. See also: GSI ER1, App. L, Table L.12.6.A (Coca 15), Table L.47.6.A (Lobo 3), Table L.54.6.A (Oso 9), Table L.23.6.A (Payamino 14/20/24), Table L.66.6.A (Yuralpa Pad A), Table L.70.6.A (Yuralpa Pad F) and Table L.71.6.A (Yuralpa Pad G).

¹⁷²⁸ *Id.*, App. D, Table D.12.A.

¹⁷²⁹ Coca 15 was drilled by Oryx in 1997 and the pit was closed in August 2000. The closure report indicates as follows: "En el Coca 15 con la exc(1), por sugerencia del Arq. Wilfrido Saltos se procede a sacar una parte de lodo de la piscina a la plataforma tomando las precauciones del caso, es decir, colocando plásticos en el piso para evitar contaminación". Remediation, taponamiento, revegetación y lastrado de piscinas Coca 15 y Payamino 23, performed by Constructora Villacreses for Kerr McGee, August 2000, p. 14 (**Exh. E-358**). See also: Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 12 (**Exh. E-563**); GSI ER2, App. B.5, p. 1.

¹⁷³⁰ GSI ER1, App. D, Table D.12.A and App. L, Table 12.6.A.

¹⁷³¹ Ecuador's Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, lines 74-76 (**Exh. E-563**). The 2003 and 2004 closure reports indicate that leachate samples comply with Table 7b, the latter report even mentioning having recourse to geo-textiles for the pit walls. See also: Informe final y detallado del trabajo de remediación de piscinas de ripios y lodo de perforación, taponamiento y lastrado en el pozo Yuralpa Centro, Bloque No. 21, performed by Llori Hnos Cia. Ltda. for Oryx Ecuador between 2 March 1998 and 4 April 1998 (**Exh. E-353**); Pit closure report for Yuralpa Centro 1 and 2 (PERPROD0029423 – 0029456),

826. Consequently, there remain the allegations in connection with Oso 9. As already mentioned above, the 23 Oso 9 pits were constructed by the Consortium and 20 of them were closed at the latest in October 2007.¹⁷³³ According to GSI, there are three pits on the platform, nine pits to the south and another pit area yet further south of the platform. The Parties only sampled in the area hosting the nine pits to the south of the platform and, therefore, the Tribunal will concentrate on these pits.
827. Among these nine pits, there is documentary evidence that four are lined with an impermeable base,¹⁷³⁴ and Mr. Saltos confirmed that all pits in Oso 9 are in fact lined,¹⁷³⁵ although he did concede that liners may have been removed in cases of pit failure.¹⁷³⁶ GSI further stated that plastic liners are in fact visible at “some of the pits”.¹⁷³⁷
828. The handwritten field forms drawn up by GSI, filed following a document production order, provide the following indications: “[Some of the pits have plastic liner; others no.

Section 2.2 (**Exh. E-471**); Taponamiento de piscinas de perforación – Yuralpa Centro 2 y Yuralpa Centro 1, Informe de trabajo por administración directa, April-May 2004, p. 6 and Annex 3, section 2.5 (**Exh. E-364**).

¹⁷³² GSI ER1, App. D, Table D.12.A and App. L, Table L.66.6.A.

¹⁷³³ The Parties agree that Oso 9 hosts 23 pits, including 20 closed pits and 3 open pits. See: Ecuador’s Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 65 (**Exh. E-563**); GSI ER2, App. B.5, p. 2.

¹⁷³⁴ Letter of 29 April 2008 from Eric D’Argenté (Perenco) to Marcelo Mata (DINAPA), p. 4 (**Exh. CE-CC-162**). Ecuador also accepts that the 2008 biennial audit confirms that a fifth pit is lined, although the Tribunal could not verify this since there is no clear information in that respect in the exhibits provided by the Parties. For instance, the verification list attached by Ecuambiente merely states that drilling muds and cuttings are treated in mud pits in the “posterior part of the platform”, without specifying whether the pits are lined. See: Block 7 Environmental Audit, November 2008, p. 367 (**Exh. E-252**). For the other pits, Ecuador stated that “[n]o evidence of liners could be found in relation to the other 18 pits. Ecuador’s Opening Statement, Demonstrative 2 – Schedule of mud pits in Blocks 7 and 21 as of 2009, line 65 (**Exh. E-563**). The Tribunal further notes that the leachate test taken from an Oso 9 pit for the 2006 biennial audit was compared to Table 7b for lined pits. See: Biennial Environmental Audit of Block 7, including the Coca-Payamino Unified Field, November 2006, Table 4-15, p. 70 (**Exh. CE-CC-182**); Saltos WS1, ¶ 128.

¹⁷³⁵ Mr. Saltos also attached a picture of a lined pit at Oso 9. See: Saltos WS1, ¶ 185; Tr. (Day 4) (ENG), 1346:4-5, 1347:8-10 (Cross, Saltos).

¹⁷³⁶ Mr. Saltos stated the following: “Now, during the operations, at some points, there may have been an alteration of the condition of the geomembrane. That could have happened. And in those specific cases there was a possibility of resorting to Table 7a”, further explaining that: “I must repeat, perhaps in one of the pits there might have been a failure, it may have been withdrawn, it could have happened. But the policy was to place them there always”. Tr. (Day 4) (ENG), 1346:6-10, 1347:11-14 (Cross, Saltos).

¹⁷³⁷ GSI stated as follows: “Plastic black liner was visible at the corners of some of the pits”. See: GSI ER1, App. L, GSI Site Inspection and Sampling Report, p. 4.

But all contents tested by Perenco [are] shown to meet appl. Stds. of [...] Table 7 – work conducted 2006-2007]”.¹⁷³⁸ In light of this statement and because Burlington did not specify which pits are lined, the Tribunal will apply Table 7a to GSI’s leachate samples.

829. The leachate results for the northernmost pit at Oso 9 show a barium level of 22 mg/l for sample OS09-1P-01-1.5-1.7 exceeding both Table 7a and 7b.¹⁷³⁹ In addition, sample OS09-1P-02-0.8-1.8 has a pH value of 10. While just at the limit, this requires no extra remediation since that pit must in any event already be remediated because of the presence of TPH (see above paragraphs 797-798). Finally, sample OS09-1P-03-1.0-2.4 has a level of electrical conductivity of 5,600 µmhos/cm, above the 4’000 µmhos/cm limit of Table 7a. In consequence, barium remediation is required for the northernmost pit and electrical conductivity for the southeasternmost pit, in addition to the TPH remediation already ordered above for the five centrally located pits (see above paragraph 800).

830. In view of the high level of barium, the Tribunal finds that *ex situ* remediation is appropriate in the circumstances for the northernmost pit, which represents an impacted area of 629 m² (37x17 meters) for a total volume of 2,516 m³ (4 meter depth), and a total cost of **USD 754,800**. Finally, the Tribunal grants **USD 540,000** to remediate the pit (30x15x4) containing the electrical conductivity exceedance. In sum, the Tribunal grants a total amount of **USD 1,294,800** to remediate the pits in Oso 9.

d. Unreported pits

831. Further, as the Tribunal has already stated, the Consortium also is responsible for the remediation costs associated with unreported mud pits, in particular the five unreported pits at Payamino 16.¹⁷⁴⁰ Mr. Saltos conceded that the Payamino 16 pits were reopened to deposit drilling muds from other platforms and that these five pits, which GSI was

¹⁷³⁸ Field notes, forms, maps and checklists of GSI Environmental – First campaign (produced by Burlington on 14 November 2012), Oso 09 Inspection Checklist 2, p. 5 (**Exh. E-475**). See also: Tr. (Day 4) (ENG), 1347:15-1348:11 (Cross, Saltos); R-PHB, ¶ 467.

¹⁷³⁹ GSI re-analyzed sample OS09-1P-01-1.5-2.7 with a barium level of 21 mg/l. See: GSI ER1, App. D, Table D.12.A, note 8, App. L, Table L.54.6.A and Figure L.54.5.

¹⁷⁴⁰ In addition to the workover pit in Payamino 1, which the Tribunal addressed in its analysis on regular soil contamination, Ecuador has specifically alleged the existence of unreported pits only at Payamino 16. R-PHB, ¶ 907.

able to locate on the northwest of the platform, were not reported to the authorities.¹⁷⁴¹ Mr. Saltos indicated that the dimensions of these five auxiliary pits were three to four meters by two meters each and two to three meters deep, amounting to an impacted area of 35 m² and a total volume of 87.5 m³. Accordingly, the Tribunal grants an amount of **USD 26,250** to remediate the unreported pits at Payamino 16.

e. Re-opened and re-used pits

832. Since Mr. Saltos confirmed at the Hearing that the Consortium re-used the mud pit at Jaguar 9 to store muds from other platforms,¹⁷⁴² the Tribunal verified the condition of that pit, although Ecuador makes no specific claim with respect to that pit other than to include it in its general claim that all pits need to be removed.¹⁷⁴³ As the samples taken by IEMS show that the pit contains no crude oil, relatively low levels of barium, and no other elevated heavy metals concentrations,¹⁷⁴⁴ the Tribunal finds that no remediation is required for this pit.

f. Closure of open and unused pits

833. Finally, Burlington accepts that four open and unused pits at Coca 8, Coca 4 and Payamino 5 must be closed for a total cost of **USD 68,000**.¹⁷⁴⁵ Ecuador did not challenge this amount. Accordingly, the Tribunal grants this amount to backfill the pits with clean soil and re-vegetate the area.

834. In conclusion, the Tribunal determines that Burlington is liable for the remediation costs of mud pits at Oso 9, Payamino Sanitary Landfill, C ndor Norte, Coca 8 and Payamino

¹⁷⁴¹ Tr. (Day 4) (ENG), 1333:19-1334:18, 1335:9-10 and 1335:16-1336:12 (Cross, Saltos). GSI provided the following information: "According to available information, another possible closed pit area was present on the northwest of the platform area, in a location that was south and west of the former generator concrete pad". GSI ER1, App. L, Payamino 16, GSI Site Inspection Report, p. 3.

¹⁷⁴² Tr. (Day 4) (ENG), 1335:4-12 (Cross, Saltos); R-PHB, ¶¶ 474, 485(b), 724-725. Ecuador further pointed to Payamino 16 and Oso 9 as further examples where the Consortium stored muds from other platforms. R-PHB, ¶ 724. The pits in these locations are dealt with above.

¹⁷⁴³ See, for instance: R-PHB, ¶ 474.

¹⁷⁴⁴ IEMS ER3, Annex C, Jaguar 9, pp. 10-14. IEMS took no further samples at that site during its fourth campaign. See also: GSI ER1, App. L, Table 43.1 and Figure L.43.3; GSI ER2, App. D, Table D.3, pp. 44-45.

¹⁷⁴⁵ GSI ER1, ¶¶ 243 and 248; GSI ER2, ¶ 141 and Exhibit 28.

16, as well as for the cost of closing the four unused pits at Coca 8, Coca 4 and Payamino 5, for a total amount of **USD 11,174,050**.

6. Groundwater

6.1 Ecuador's position

835. Ecuador claims that the groundwater is contaminated at all the 18 sites it tested and thus seeks compensation for the remediation costs.¹⁷⁴⁶ As a general matter, Ecuador alleges that the Consortium,¹⁷⁴⁷ as well as GSI in the context of the present arbitration, ignored the need to protect water resources, which is particularly worrying in light of the population's dependence on ground and surface water at home and for their livestock.¹⁷⁴⁸ Ecuador further submits that, since IEMS was not in a position to determine background values, it relied on the standards set out in TULAS Annex 1 (Table 5), which was also used by GSI.¹⁷⁴⁹ On that basis, IEMS found heavy metal contamination (zinc, barium, copper, chrome and nickel) at all 18 sites and contamination with hydrocarbons at six sites.¹⁷⁵⁰

¹⁷⁴⁶ 2nd SMCC, ¶¶ 293-294; Reply, ¶ 219; R-PHB, ¶ 507; R-PSVB, ¶ 168; IEMS ER3, p. 164 and Annexes J.1-J.3; IEMS ER4, pp. 73-79. In total, IEMS collected 115 groundwater samples during its four sampling campaigns (12 during the first campaign, 49 during the second campaign, 30 during the third campaign and 24 during the fourth campaign) at the following 18 sites: Payamino 1, Payamino 2/8, Payamino 4, Payamino 13, Payamino 14, Payamino 15, Coca 2, Coca CPF, Oso 9, Gacela 1, Gacela 2, Gacela CPF, Jaguar 1, Jaguar 2 and Mono CPF in Block 7; and the Yuralpa Waste Management Area, Dayuno and Waponi in Block 21. Ecuador's Opening Statement, Slide 67; R-PHB, ¶ 511.

¹⁷⁴⁷ Ecuador explains, for example, that no groundwater samples were collected for the 2002, 2006 and 2008 biennial audits undertaken by the Consortium. Tr. (Day 1) (ENG), 122:5-10 (Opening, Dunham); Ecuador's Opening Statement, Slide 89; R-PHB, ¶ 525, note 667.

¹⁷⁴⁸ Ecuador's Closing Statement, Slide 175; RPS ER2, App. C, Item 4. At the Hearing, RPS explained human water consumption needs as follows: "It is common sense that with respect to Block 7 and Block 21, people could also contact subsurface soils, use water, groundwater domestically, and use surface water domestically. Livestock could also be contacting subsurface soils and drink water in streams and creeks. It's also common sense that ecological exposure is possible". Tr. (Day 4) (ENG), 1050:17-1051:3 (Direct, Kerr).

¹⁷⁴⁹ TULAS, Book VI, Annex I, Table 5 (**Exh. EL-173**). Ecuador explained IEMS's "more conservative approach" of referring to TULAS Table 5, since it was "not in a position to carry out the complex, lengthy and detailed studies needed to determine background values". R-PHB, ¶ 513. See also: Tr. (Day 3) (ENG), 675:22-676:5 (Direct, Alfaro); IEMS ER2, p. 26.

¹⁷⁵⁰ 2nd SMCC, ¶ 293; IEMS ER2, pp. 64-65; IEMS ER3, pp. 160-161; Ecuador's Opening Statement, Slide 83; Tr. (Day 3) (ENG), 676:5-10 (Direct, Alfaro); R-PHB, ¶¶ 513, 553-554. The Tribunal notes that Ecuador initially alleged the existence of contamination with hydrocarbons in the groundwater at Payamino 2/8, but then stated at the Hearing that TPH exceedances exist in six locations. With respect to the first results at Payamino 2/8, the Tribunal further notes that

836. According to Ecuador, Burlington’s allegation that the groundwater claim is the consequence of flawed field procedures is “unfounded and unsupported”.¹⁷⁵¹ Ecuador refutes Burlington’s critique of IEMS’s sampling procedure,¹⁷⁵² starting with the observation that GSI only tested 15 facilities for groundwater contamination.¹⁷⁵³ Ecuador also contends that GSI failed to assess numerous locations with contamination on the “misguided pretext” that IEMS samples were taken from soil with 25% clay content and thus not subject to regulatory control.¹⁷⁵⁴ Since the geologic logs on which GSI relied do not determine the percentage of clay at a given location,¹⁷⁵⁵ GSI failed, according to Ecuador, to undertake any studies assessing the clay content in the areas where groundwater was tested. Ecuador further argues that, even if the content were above 25%, this would not mean that “this same clay content extends to the depths at which groundwater may be found and wells accordingly drilled”.¹⁷⁵⁶
837. Ecuador also states that GSI improperly dismissed IEMS’s samples on the erroneous basis that they should have been filtered.¹⁷⁵⁷ Specifically, Ecuador argues that filtering samples is not in “accordance with Ecuadorian regulations”, since it leads to biased results, in particular by removing colloidal particles which may have contaminants.¹⁷⁵⁸ In this context, GSI relied on Annex 5 of RAOHE, when that regulation does not apply to

although the table in IEMS 3rd ER, p. 160 mentions TPH exceedances in Payamino 2 and 8, the conclusion states “Hydrocarbon contamination was not found” (at p. 164).

1751 Reply, ¶ 218.

1752 *Id.*, ¶ 219.

1753 R-PHB, ¶¶ 509, 516-518. Ecuador explains that GSI failed to collect groundwater samples in Dayuno and Waponi Ocatoe due to purported “access limitations”, and in the Yuralpa Waste Management Area on the pretext that it did not encounter groundwater, although IEMS managed to retrieve five samples at that location.

1754 *Id.*, ¶¶ 519, 534-538.

1755 *Id.*, ¶ 536.

1756 *Id.*, ¶ 535; Tr. (Day 3) (ENG), 677:7-22 (Direct, Alfaro). The Tribunal notes that the English transcript does not accurately translate Mr. Alfaro’s testimony, when it is said that “GSI correctly concludes that there is no contamination of groundwater”. The original Spanish version reads in relevant part: “GSI concluye incorrectamente que no hay contaminación del agua subterránea”. See: Tr. (Day 3) (ESP), 714:13-715:9 (Direct, Alfaro).

1757 R-PHB, ¶ 519.

1758 Reply, ¶ 160; R-PHB, ¶ 540; RPS ER2, p. 23.

groundwater but only to surface waste water.¹⁷⁵⁹ Groundwater, by contrast, according to Ecuador, is regulated by TULAS, which does not require filtration of samples.¹⁷⁶⁰

838. With respect to filtering, Ecuador argues that Burlington's reference at the Hearing to the INEN guidelines to support the use of 0.45µm filters is incorrect.¹⁷⁶¹ Indeed, RPS confirmed that these guidelines apply to surface not groundwater sampling.¹⁷⁶² In addition, IEMS indicated that it tested for the total concentration of heavy metals, including colloidal and suspended fractions, and not for their dissolved concentration, thus making the use of 0.45 µm filters a "fundamental methodological error by GSI".¹⁷⁶³ As IEMS stated, "[f]iltering the samples prior to acidification would result in only the dissolved fraction being analyzed, and produce erroneously low results".¹⁷⁶⁴ In any event, although IEMS opined that using 0.45 µm filters would have "resulted in a serious manipulation of the samples",¹⁷⁶⁵ IEMS considered filtering its samples when turbidity was greater than 5 NTUs (nephelometric turbidity units),¹⁷⁶⁶ and IEMS took both filtered and unfiltered samples on two separate occasions, i.e. in December 2012

¹⁷⁵⁹ Reply, ¶ 159; IEMS ER4, p. 76. IEMS stated: "RAOHE only regulates water quality for superficial water bodies and wastewater discharges, but not groundwater. The methods listed in RAOHE, which require filtration, are intended for analysis of these types of waters, but not of groundwater. This is due to the differences in water chemistry and other physical parameters. Surface water for example is often highly turbid and contains organic matter while groundwater on the other hand often has much higher levels of dissolved solids, and lower levels of organic matter. These differences can make sample preparation much different to accomplish".

¹⁷⁶⁰ Reply, ¶ 159. Ecuador further states that TULAS expressly provides that analyses of groundwater samples for arsenic, cyanide and mercury should be 'total' analyses, i.e. not filtered. Moreover, TULAS requires that groundwater sampling be done according to specific standards set by the Ecuadorian Standardization Institute, which provide for the analyses of 'total metals', i.e. not filtered. See: IEMS ER3, Section 3.3; RPS ER2, Section 3.4, p. 22.

¹⁷⁶¹ R-PHB, ¶ 547.

¹⁷⁶² *Id.*, ¶ 548, referring to: Tr. (Day 4) (ENG), 1113:19-22 (Cross, Crouch) ("[...] if you're collecting a surface-water sample, standard protocol is to collect those and use a .45-micron filter. That is not the same for a groundwater sample").

¹⁷⁶³ IEMS ER4, p. 75.

¹⁷⁶⁴ *Id.*, p. 76.

¹⁷⁶⁵ *Id.*, p. 75.

¹⁷⁶⁶ R-PHB, ¶ 541. Ecuador further explains that "IEMS' sampling plan was to collect samples after purging if turbidity was less than 5 NTUs, and if greater than 5 NTUs, to collect the samples when NTUs and other parameters had been stabilized. Nonetheless, according to the USEPA, '*natural turbidity in groundwater may exceed 10 NTU.*' Hence, where the natural turbidity in the monitoring wells exceeded 5 NTUs, it was simply not possible for IEMS to collect samples with lower NTUs given that groundwater will not '*clear up*' at the moment of sampling. Therefore, stabilization criteria calls for expecting a minimal change between two turbidity measurements, even in excess of 5 NTUs" (emphasis in the original).

and January 2013, where filtering showed no significant impact on the results.¹⁷⁶⁷ In addition, Ecuador indicates that IEMS collected non-turbid, unfiltered and contaminated samples from 6 facilities in Block 7, namely Jaguar 1, Jaguar 2, Payamino 13, Payamino 15, Gacela 1 and Payamino 14.¹⁷⁶⁸

839. Ecuador further rejects GSI's contention that TPH or drilling muds cannot dissolve in groundwater by pointing to TPH contamination in groundwater at six facilities in Block 7, namely Coca CPF, Jaguar 1, Jaguar 2, Payamino 13 and Payamino 2/8.¹⁷⁶⁹ Among these, Ecuador particularly points to Coca CPF where there is a thick sand aquifer and where the wells are adjacent to pits, thus unsurprisingly showing groundwater contamination.¹⁷⁷⁰ In this context, Ecuador stresses that GSI conceded at the Hearing that fresh crude has a soluble portion. And IEMS indicated that GSI failed to measure TPH as per TULAS provisions, since the laboratory was instructed to divide the hydrocarbons in three different parameters, i.e. Gasoline Range Organics, Diesel Range Organics and Oil Range Organics, instead of considering the sum of the total petroleum hydrocarbons.¹⁷⁷¹
840. For Ecuador, GSI's attempts to downplay the risk of groundwater contamination are ill-founded. The studies on which it relies were undertaken in arid regions and do not apply to Blocks 7 and 21 with far higher average annual rainfall. Mr. Saltos confirmed at the Hearing that the groundwater in the Oriente is found close to or just below the surface.¹⁷⁷² GSI also failed to consider the seasonal effect on groundwater contamination and dilution.¹⁷⁷³ In the same vein, Burlington's explanation that the thick, compact layer of clay found in the Blocks prevents contamination caused by oilfield operations from reaching the groundwater is contradicted by the record. GSI's own field

¹⁷⁶⁷ Reply, ¶¶ 161, 220.

¹⁷⁶⁸ Ecuador's Closing Statement, Slides 167-168; IEMS Field Notes (**Exh. E-483**). For Ecuador, the fact that the January 2013 samples showed lower concentrations of contaminants "could be the result of dilution due to heavy rains that happened during the days that the sampling was being performed". Reply, ¶ 161.

¹⁷⁶⁹ Ecuador's Closing Statement, Slide 169; R-PHB, ¶¶ 526, 553-554.

¹⁷⁷⁰ Ecuador's Closing Statement, Slide 170.

¹⁷⁷¹ IEMS ER4, pp. 73-74. IEMS points, for instance, to GSI sample COCPF-GW1 showing 0.047 mg/l for GRO, 0.22 mg/l for DRO and 0.26 mg/l for ORO, for a total of 0.527 mg/l TPH in excess of the TULAS limit of 0.325 mg/l.

¹⁷⁷² R-PHB, ¶ 523, referring to: Tr. (Day 4) (ENG), 1257:21-1258:2 (Cross, Saltos).

¹⁷⁷³ IEMS ER4, pp. 74-75.

logs show the presence of sand and silt layers at multiple locations, such as Coca CPF and Coca 2 which are underlain by a sand layer.¹⁷⁷⁴ Various environmental impact studies undertaken by prior operators of Block 7 also “disprove this notion of a thick, uniform layer of protective clay being present throughout the Blocks”.¹⁷⁷⁵ In addition, Mr. Chaves explained that platforms are built on highly porous materials that facilitate infiltration.¹⁷⁷⁶

841. In sum, Ecuador proposes two techniques for groundwater remediation, namely *ex situ* pump-and-treat (“P&T”) or permeable reactive barriers (“PRBs”).¹⁷⁷⁷ On that basis, Ecuador calculated a “worst case scenario” using the most expensive technique, i.e. P&T, of USD 9,879,000 per location for a total cost of USD 177,660,000; and a “best case scenario” using the less costly technique, i.e. PRBs, of USD 1,680,000 per location for a total of USD 30,240,000.¹⁷⁷⁸ Adding related costs and a contingency of 30%,¹⁷⁷⁹ Ecuador submits a total claim for groundwater remediation of USD 265,601,700 in the worst case scenario and USD 14,277,600 in the best case scenario,¹⁷⁸⁰ in addition to USD 3,380,000 to complete further studies at 52 other locations.¹⁷⁸¹ In this context, Ecuador defends its use of US costs, since “local remediation providers in Ecuador do not have the necessary expertise to perform these remediation works”.¹⁷⁸²

¹⁷⁷⁴ R-PHB, ¶ 528, referring to: GSI ER1, App. L.02, Summary of Soil Borings, Att. L.02.C.

¹⁷⁷⁵ Such as the Gacela EIS done by Oryx in 1991, the Mono 6 EIS by Komex in 1996, the Lobo 5 EIS by Entrix in 2000. R-PHB, ¶ 529.

¹⁷⁷⁶ Tr. (Day 3) (ENG), 918:17-919:3 (Re-direct, Chaves); R-PHB, ¶ 531.

¹⁷⁷⁷ 2nd SMCC, ¶ 309.

¹⁷⁷⁸ *Id.*, ¶ 312; IEMS ER3, pp. 177-178 and Exhibit 3.

¹⁷⁷⁹ 2nd SMCC, ¶ 313; IEMS ER3, pp. 179-180.

¹⁷⁸⁰ 2nd SMCC, ¶¶ 314, 422; Reply, ¶¶ 224, 538; Ecuador’s Opening Statement, Slide 84; IEMS ER3, p. 185; IEMS ER4, p. 128.

¹⁷⁸¹ 2nd SMCC, ¶¶ 315, 423; Reply, ¶ 539.

¹⁷⁸² Reply, ¶ 222. IEMS explained the following: “While it is true that IEMS based its estimate on USA costs (given that no information from local providers was available) this estimate is very conservative if we take into account the specificities of doing groundwater remediation in the Amazon region which will be much more expensive than working in the USA (e.g. due to the lack of local experience and the difficulties of getting supplies and equipment). It is very likely that the real costs of implementing groundwater remediation would be higher than IEMS’ estimates in the tropical setting”. IEMS ER4, p. 122.

6.2 Burlington's position

842. Burlington submits that there is no groundwater contamination in the Blocks and that Ecuador's allegations of contamination are entirely a product of faulty testing procedures.¹⁷⁸³ In any event, the Site Visit confirmed that residents in the Blocks have "absolutely no need to exploit underground water", since they mostly rely on rainwater.¹⁷⁸⁴ According to Burlington, IEMS's alleged findings are "inconsistent with oilfield operations", since minerals used in drilling operations "exhibit very low levels of solubility and mobility", thus rarely causing impacts to water quality.¹⁷⁸⁵ Burlington essentially argues that Ecuador "ignored its own regulations"¹⁷⁸⁶ and that IEMS applied improper sampling techniques in areas with clay content above 25% and failed to filter its samples.
843. Burlington first criticizes IEMS's sampling procedure, particularly IEMS's use of well screens during its first two campaigns which it cut by hand with a saw instead of using factory-machined well screens.¹⁷⁸⁷ IEMS also compromised its samples through cross-contamination, allowing extraneous sediments to enter into the groundwater samples, which resulted in false barium and TPH concentrations.¹⁷⁸⁸ Burlington further indicates that IEMS collected groundwater samples in clayey soil, contrary to TULAS which recognizes that groundwater drawn from soils with clay over 25% "is not really true groundwater", since it is "not usable for any purpose, and it's not even regulated".¹⁷⁸⁹
844. With respect to filtration, Burlington argues that unfiltered samples lead to "biased, unreliable results".¹⁷⁹⁰ In order to properly test groundwater, argues Burlington, the

¹⁷⁸³ CMCC, ¶ 334; Rejoinder, ¶¶ 98, 153; GSI ER2, ¶¶ 98-99 and Exhibit 22.

¹⁷⁸⁴ C-PHB, ¶ 201; C-PSVB, ¶ 50. Also pointing to: IEMS ER1, p. 11.

¹⁷⁸⁵ CMCC, ¶ 340; C-PHB, ¶ 201; Tr. (Day 5) (ENG), 1559:11-1560:6 (Cross, Connor).

¹⁷⁸⁶ C-PSVB, ¶ 52.

¹⁷⁸⁷ GSI ER2, ¶ 113 and Exhibit 24.

¹⁷⁸⁸ C-PSVB, ¶¶ 53-55; Tr. (Day 5) (ENG), 1474:9-1476:18 (Direct, Connor); Tr. Site Visit (Day 2) (ENG), 56:10-15 (Testimony of Mr. Connor at Payamino CPF) and 22:15-20 (Testimony of Mr. Connor at Payamino 2/8).

¹⁷⁸⁹ Tr. (Day 1) (ENG), 255:16-21 (Opening, Renfroe); Tr. (Day 5) (ENG) 1473:19-22 (Direct, Connor); Tr. Site Visit (Day 4) (ENG), 53:21-25 (Presentation of Ms. Renfroe at Gacela 1/8); C-PSVB, ¶ 52; GSI ER2, ¶ 111.

¹⁷⁹⁰ Rejoinder, ¶¶ 98, 153; C-PHB, ¶ 147; C-PSVB, ¶ 53.

samples must be clear of soil particles.¹⁷⁹¹ Burlington considers it undisputed that turbid groundwater samples, like IEMS's samples, must be filtered.¹⁷⁹² This results from RAOHE Annex 5, according to which the procedure for testing heavy metals in water must include filtration.¹⁷⁹³ Pointing to IEMS's field notes showing the presence of heavy sediment in the samples,¹⁷⁹⁴ Burlington notes that IEMS failed to filter its groundwater samples and thus reached unreliable and scientifically unsupported results "due to the nitric acid preservative added to groundwater samples in order to stabilize dissolved metal concentrations prior to testing".¹⁷⁹⁵ RPS's testimony that the goal is to obtain sediment-free samples "undermines the validity of IEMS's samples".¹⁷⁹⁶

845. Burlington also submits that IEMS failed to filter out solid particles from its groundwater samples as required under RAOHE Annex 5 and TULAS.¹⁷⁹⁷ IEMS's improper field procedure led to "scientifically impossible" results, "yielding levels of metals greater than could naturally be dissolved in water", a point IEMS has not denied.¹⁷⁹⁸ For instance, Burlington observes that IEMS reported barium concentrations in groundwater of 8.28 mg/l, when groundwater cannot retain barium above 3.1 mg/l.¹⁷⁹⁹ This result means that barium was present in the water in solid form, which should have been filtered out in advance. IEMS thus tested sediment suspended in the water and not groundwater itself.¹⁸⁰⁰

¹⁷⁹¹ CMCC, ¶ 335; Rejoinder, ¶¶ 89, 143; GSI ER1, ¶ 85; GSI ER2, ¶ 107 and App. F.4, pp. 5-6, 8-9.

¹⁷⁹² C-PHB, ¶¶ 148-149, referring to: Tr. (Day 4) (ENG), 1017:16-1018:4 (Direct, Crouch).

¹⁷⁹³ CMCC, ¶ 335.

¹⁷⁹⁴ C-PHB, ¶ 150, referring to: GSI ER2, App. F.4 (IEMS Field Notes), in particular to IEMS Well ID: MW-2 ("moderate yellow sediment"), IEMS Well ID: MW-3 ("heavy sediment"), and IEMS Well ID: MW-4 ("moderate sediment") (Translation by the Tribunal).

¹⁷⁹⁵ CMCC, ¶ 337; Rejoinder, ¶ 145; C-PHB, ¶ 150.

¹⁷⁹⁶ C-PHB, ¶ 151.

¹⁷⁹⁷ Rejoinder, ¶ 148.

¹⁷⁹⁸ *Id.*, ¶ 144.

¹⁷⁹⁹ CMCC, ¶ 338; GSI ER1, ¶ 81.

¹⁸⁰⁰ CMCC, ¶ 338; Rejoinder, ¶ 144; GSI ER1, ¶¶ 83-85.

846. Furthermore, Burlington stresses that Ecuador’s criticism of GSI’s filtration is inconsistent with Ecuador’s other assertion that filtration made little difference in the results.¹⁸⁰¹
847. Moreover, Burlington refers to RPS’s statement at the Hearing that it took no issue with filtering *per se*, but that it objected to the filter size used by GSI.¹⁸⁰² It argues that Ecuadorian regulations require the size of the filter, namely, 0.45µm, employed by GSI.¹⁸⁰³ Specifically, Burlington refers to Section 5 of Annex 1 of Book VI of TULAS (and not anymore RAOHE Annex 5), which applies to surface water, freshwater, as well as groundwater.¹⁸⁰⁴ This regulation cites to NTE INEN 2169:98,¹⁸⁰⁵ which in turn mandates the use of 0.45µm filters “for all metals at issue in this case”.¹⁸⁰⁶
848. In addition, Burlington argues that Ecuador’s reference to a single unfiltered sample collected by Oryx in 1996 cannot disprove the appropriateness of GSI’s filtration, since that sample was collected before RAOHE or TULAS came into force.¹⁸⁰⁷ Burlington also points to the fact that IEMS’s additional testing in January 2013 showed lower results,¹⁸⁰⁸ and that Ecuador’s explanation that this might be due to increased rainfall fails since the concentration of one analyte – cobalt – actually increased and the rainfall was higher in January 2013 than in December 2012.¹⁸⁰⁹
849. In respect of the objection raised by RPS that GSI insufficiently analyzed the presence of TPH in groundwater, Burlington calls attention to the fact that RPS accepted IEMS’s conclusion at the Hearing that no hydrocarbon contamination was found:¹⁸¹⁰

1801 Rejoinder, ¶ 143.

1802 C-PHB, ¶ 152.

1803 *Ibid.*

1804 *Id.*, ¶ 155.

1805 *Id.*, ¶¶ 155-156, referring to: INEN 2169:98, Table 1 (**Exh. CE-CC-349**). Burlington explains that the “entry for ‘Aluminium’ in Table 1 states ‘filtración en el lugar del muestreo’ [‘leakage in the sampling place’] and the entries for all other metals except for mercury, arsenic, and cyanide state ‘ver aluminio’ [‘see aluminum’]”.

1806 C-PHB, ¶ 156.

1807 Rejoinder, ¶ 150.

1808 *Id.*, ¶ 142, referring to: IEMS ER4, Att. 31.2 (January 2013 groundwater sampling results).

1809 Rejoinder, ¶ 152.

1810 C-PHB, ¶ 200.

“Q. So, that means TPH or petroleum hydrocarbon was non-detect in all of the groundwater samples, according to IEMS?

A. Yes. [...]”¹⁸¹¹

850. Finally, with regard to Ecuador’s discussion of surface water contamination during the Site Visit, Burlington stresses that such contamination is “beyond the record evidence and the scope of the Tribunal’s decision making”, since Ecuador asserted no claim for surface water contamination and that there is in any event no evidence in the record of such contamination or any health risks attributable to surface water.¹⁸¹² Specifically, Ecuador’s claim that the Jungal swamp at Payamino 2/8 communicates with the Payamino River is an unsupported new allegation, which the Tribunal should not consider.¹⁸¹³

6.3 Discussion

851. The Tribunal will start by setting out the legal framework for groundwater remediation (6.3.1). It will then address the areas of contention between the Parties, namely the experts’ sampling procedures (6.3.2), the need for groundwater remediation in clayey soils (6.3.3), and filtration (6.3.4). Finally, the Tribunal will discuss remediation costs (6.3.5).

¹⁸¹¹ Tr. (Day 4) (ENG), 1104:14-17 (Cross, Crouch).

¹⁸¹² C-PSVB, ¶ 50; GSI ER2, ¶ 172.

¹⁸¹³ C-PSVB, ¶ 51.

6.3.1 Legal framework

852. The Parties agree that TULAS, Book VI, Annex 1, Table 5 (“TULAS Table 5”) sets forth the quality criteria for groundwater,¹⁸¹⁴ which reads in relevant part as follows:

Excerpt of TULAS Table 5

| Parameter | Expressed as | Unit | Maximum permissible limit |
|------------------------------|--------------|------|---------------------------|
| Arsenic (total) | As | µg/l | 35 |
| Barium | Ba | µg/l | 338 |
| Cadmium | Cd | µg/l | 3.2 |
| Cyanide (total) | CN- | µg/l | 753 |
| Cobalt | Co | µg/l | 60 |
| Copper | Cu | µg/l | 45 |
| Total Chromium | Cr | µg/l | 16 |
| Mercury (total) | Hg | µg/l | 0.18 |
| Nickel | Ni | µg/l | 45 |
| Lead | Pb | µg/l | 45 |
| Zinc | Zn | µg/l | 433 |
| Total Petroleum Hydrocarbons | | µg/l | 325 |

853. Moreover, Article 4.1.3.6 of TULAS specifies that any “proven alteration” of groundwater must be remediated. Section 5 further provides that groundwater concentrations must be determined by considering NTE INEN Guidelines 2169:98 and 2176:98, which include specifications for filtration methodology.

854. The Parties disagree on the relevance of RAOHE for groundwater contamination. Ecuador argues that RAOHE is irrelevant and that the reference to filtration in Annex 5 only applies to surface waters or effluents, not to groundwater. Burlington replies that no such limitation exists in RAOHE, and notes that Article 16 RAOHE, for instance, refers to groundwater.

855. Annex 5 RAOHE spells out certain testing methods for waters, soils, and air emissions. Regarding waters, Annex 5 specifies that when analyzing barium, total chromium, lead

¹⁸¹⁴ R-PHB, ¶¶ 512-513; IEMS ER2, p. 26; GSI ER1, ¶¶ 87, 181 and App. D, Table D.13; GSI ER2, Section 4.0; GSI’s Direct Presentation, Slide 68. The Tribunal notes that Table 5 expresses units in µg/l, but the Parties have assessed their samples in mg/l. For instance, TPH value in TULAS is 325 µg/l, corresponding to 0.325 mg/l.

and vanadium, samples must be filtered and acidified.¹⁸¹⁵ This suggests that filtration of samples as such is an approved, and indeed a required, element of testing. Another question is whether RAOHE applies to groundwater. Article 16 relating to the monitoring of remediation programs mentions both surface waters and groundwater. Similarly, the glossary in RAOHE Annex 6 defines, aquifers (as extending to groundwater) as well as “groundwater” or “phreatic level” (Translation by the Tribunal). These references tend to demonstrate that Ecuador’s limited reading of RAOHE is incorrect and that RAOHE provides support for filtration of groundwater samples.

6.3.2 Sampling procedures

856. During its first two sampling campaigns, IEMS did not measure various key elements, such as turbidity, pH, electric conductance, temperature, or total dissolved solids. It stated indeed that it started doing so after its first two field trips.¹⁸¹⁶ Moreover, the use of hand-sawn rather than machined well screens does not appear in line with standard practice. As a consequence, the Tribunal does not find the results from these two field trips reliable and will thus discard them.

6.3.3 Testing in clayey soils

857. The next question is whether groundwater testing is warranted in soils with clay contents exceeding 25%. TULAS Table 5 applies to soils with clay content between 0 and 25% and organic material content between 0 and 10%.¹⁸¹⁷ Accordingly, GSI appears to be correct when stating that no groundwater remediation is required at all where the clay content is above 25%, mainly because such soils are “not capable of producing groundwater in sufficient quantities (due to low permeability) or of appropriate natural quality (due to mineral or organic content) to serve as a usable water supply for domestic, agricultural, or industrial use”.¹⁸¹⁸ Hence, TULAS Table 5 restricts the applicability of groundwater quality criteria to soils capable of producing groundwater.

¹⁸¹⁵ RAOHE, Annex 5 reads in relevant part: “Filtration and acidification of the sample, direct determination by atomic absorption spectroscopy (AAS)” (Translation by the Tribunal) (**Exh. EL-174**).

¹⁸¹⁶ IEMS ER3, Annex A.10, p. 3, paragraph 6.

¹⁸¹⁷ The title of Table 5 reads: “Reference quality criteria for groundwater, considering a soil with clay content between (0-25.0)% and organic material content between (0-10.0)%” (**Exh. EL-173 (EN) 0002**).

¹⁸¹⁸ GSI ER1, D.19 (GSI-CMC App D 0058); GSI ER2, ¶ 101.

858. IEMS concedes that TULAS Table 5 does not apply to clayey soils above 25%. It also testified that “a number of monitoring wells may be located in areas with a content of clay greater than 25%, and that therefore the TULAS regulation may not apply”.¹⁸¹⁹ Quite astonishingly, IEMS then continues asserting that background values apply if Table 5 is inapplicable.¹⁸²⁰ As GSI rightly pointed out, clayey soils protect groundwater better than permeable sandy or silty soils. Thus, applying stricter standards to such soils would make no sense, especially in the absence of express wording to that effect in TULAS.¹⁸²¹ Accordingly, the Tribunal understands that TULAS Table 5 does not apply to soils with a clay content above 25%. Consequently, no groundwater remediation is called for in such areas. This finding requires the Tribunal to determine, next, which sites are therefore excluded from groundwater remediation.
859. GSI indicated that 30 out of 46 IEMS groundwater sampling locations (at 18 sites), i.e. over 65%, are reported as having clayey or silty soils.¹⁸²² This said, the measurable indications in the record of the clay content of the soils where groundwater samples were taken are sparse at best. IEMS’s notes from its third field trip do not specify the percentage of clay in the soils.¹⁸²³ Neither have the Parties made their submissions on the basis of concrete levels of clay content. Only GSI’s observations for its own sample locations – often at a considerable distance of IEMS sample locations – provide some relevant data.
860. GSI’s field notes do not specify consistently a precise percentage of clay. Yet, as noted, they do contain some useful information. For its groundwater sampling at Jaguar 1 (boring well JA01-GW1), for instance, GSI indicated that soil between 0.0-0.3 and 0.3-2.0 meters is silty clay, suggesting no groundwater testing warranted there,¹⁸²⁴ and that

¹⁸¹⁹ IEMS ER4, p. 77.

¹⁸²⁰ *Ibid.*

¹⁸²¹ GSI ER2, ¶ 105.

¹⁸²² *Id.*, ¶¶ 101, 112 and App. F.4. In its first report, GSI argued that 56% of IEMS groundwater sampling locations had “primarily clay” as soil composition. See: GSI ER1, ¶ 86.

¹⁸²³ IEMS Field Notes (**Exh. E-483**). See also: GSI ER2, App. F.4.2.

¹⁸²⁴ Jaguar 1 Field Form, Phase 1 (**Exh. E-476**). If the Tribunal’s reading is correct, soil between 0.0-0.3 meters is 100% fine particulate (clay) and soil between 0.3-2.0 meters is 60% fine particulate and 40% with larger grain size. The field form reads: “0.0-0.3: Greenish Gray, Moderately Humid, 100% fines, medium/low plasticity, no odor, silty clay (CL). 0.3-2.0 m: Light brown, saturated, 60% fines and 40% coarse material, hard ran. Subangular blocks of max. diameter of 0.060 m block are composed of sediments/cemented clays”.

turbidity was lowered to 353 NTU (down from 777 NTU, suggesting need for filtering, as will be seen further below).¹⁸²⁵ As a further illustration, the Payamino 14-20-24 GSI field form is more precise: at sample location PAY14-GW1, soil between 0.0-0.8 meters is clayish (“*arcilla ligera*”) and soil between 0.8-1.8 meters is sandy (“*arena pobremente graduada*”), groundwater testing being warranted at this site.¹⁸²⁶ A third example shows that the composition of the soil may vary according to layers. The GSI boring log at Payamino 1 (sample PAY01-GW1) states that the soil between 0.0-0.3 and below 0.5 meters is clayish (usually 100% and 90% between 1.4-1.8 meters) and that the soil layer between 0.3-0.5 meters is sandy (80%).¹⁸²⁷

861. GSI has provided field forms from its groundwater sampling campaigns in respect of 12 sites.¹⁸²⁸ For these sites, on the basis of the information provided by GSI, the Tribunal concludes that no groundwater testing is warranted due to clay contents above 25% at Payamino 1, Jaguar 1, Jaguar 2, Gacela CPF, Gacela 2 and Yuralpa Sanitary Landfill. The Tribunal further concludes that the clay content is lower than 25% and that groundwater testing is therefore needed at the following sites: Coca 2, Coca CPF, Payamino 4, Payamino 13, Payamino 14/20/24 and Gacela 1/8. With respect to Payamino 15, the Tribunal notes that groundwater is found at the surface level with a 2-meter clay layer, but that sandy soil is found 2 meters below. Accordingly, the Tribunal accepts to consider samples taken at depths below 2 meters.
862. Among the sites at which IEMS tested for groundwater, GSI did not provide groundwater sampling forms for Payamino 2/8, Mono CPF, Oso 9, Dayuno and Waponi-Ocatoe. Because the field forms for soil contamination at Payamino 2/8 show the presence of clayey soil and the samples were taken within a swampy area (i.e., the Jungal swamp),¹⁸²⁹ the Tribunal is inclined to hold that the clay content of the soil is

¹⁸²⁵ Jaguar 1 Field Form, Phase 1 (**Exh. E-476**).

¹⁸²⁶ Payamino 14/20/24 Field Form, Phase 1 (**Exh. E-476**). It reads as follows: 0.0-0.80 (m): yellowish brown (10YR, 5/4); scarce humidity, 100% fines of medium to low plasticity, root remains (0.0-0.4(m)), no hydrocarbon odor -> Clayish (CL). 0.80-1.80 (m): greenish grey (GLE Y1:5/1) and brown; high humidity to saturation, 90% fine to medium sands poorly sorted; 10% fines not plastic; no hydrocarbon odor -> sandy (SP)” (Translation by the Tribunal).

¹⁸²⁷ Payamino 1 Field Form, Phase 1 (**Exh. E-476**).

¹⁸²⁸ GSI Field Forms (**Exh. E-476**).

¹⁸²⁹ Payamino 2/8 Field Form, Phase 2 (**Exh. E-476**). The field form provides information on two soil sampling locations in Area 2MT. For sample PA28-2MT-2B, the field form indicates as follows: “(0.0-1.0): Brown silty clay (CH); mud to high plast, mod stick, “sticky”, no chem odor, mod clay

above 25%. The same applies to Mono CPF, where the field forms for 14 soil sampling locations, mostly mention a soil composition of clay or silty clay and only rarely mention the presence of sandy silt.¹⁸³⁰ With respect to the other sites, i.e. Oso 9, Dayuno and Waponi-Ocatoe, the Tribunal rejects IEMS's data, because Ecuador did not provide evidence of the soil content at these locations, which makes it impossible to determine whether groundwater sampling conforms to TULAS Table 5.¹⁸³¹

863. Accordingly, and subject to the following, the Tribunal will review the groundwater sampling results for Coca 2, Coca CPF, Payamino 4, Payamino 13, Payamino 14/20/24, Payamino 15 and Gacela 1/8.

6.3.4 Filtration

864. The Parties and their experts defended opposite positions about filtration, although each expert also at times employed practices advocated by the other. For instance, IEMS started filtering the samples from its third campaign onwards, whereas GSI filtered its samples with 5µm filters together with 0.45µm filters during its second campaign (but not 10µm filters as suggested by RPS). At any rate, the Parties agree that INEN Guideline 2169:98 is the relevant source to determine whether filtration is required.¹⁸³²

865. The Tribunal starts by noting that the experts on both sides concur that 0.45µm filters are appropriate for testing dissolved metals concentrations.¹⁸³³ GSI and RPS also agree that sediments in suspension should be filtered, although RPS favors using a 10µm

moist content; increasing plasticity with depth. (1.0-2-0): Orange-brown clay (CH); with minor silt content, high plasticity, "sticky"; mod stiff, low-mod clay moist content, gray mottling, no chem odor". For sample PA28-2MT-3B, the field form states: "(0.0-0.5m): Dark grey coarse sand combined with gravel. Material resembles same soil as the one used to fill the wellpad. (0.5-0.9m): Grey silty sand of medium-grain size. Homogeneous consistency. Low cohesion. Resembles selected material. Clean appearance. Low moist. (1.0-2.0m): Brown/grey silty clay. Medium hard texture. Homogeneous consistency. Low moist. High plasticity. No odor".

¹⁸³⁰ Mono CPF Field Form, Phase 2 (**Exh. E-476**).

¹⁸³¹ Ecuador only provided some comments on the presence of a "thick sand aquifer" at Coca CPF, but did not otherwise provide evidence on the clay content at this or any other site. R-PSVB, ¶ 175.

¹⁸³² INEN Guideline 2169:98 "Water. Water Quality. Sampling. Handling and Preservation of Samples" (**Exh. CE-CC-349**). See also: IEMS ER4, Att. 23.

¹⁸³³ GSI ER2, ¶¶ 121-122; IEMS ER4, p. 75; RPS ER2, pp. 23-24. The Tribunal notes, however, that RPS stressed that TULAS Table 5 requires that samples for arsenic, cyanide and mercury should be "total" analyses, not "dissolved" analyses.

filter. They do not agree on whether groundwater sampling should only test for dissolved metals, as argued by GSI, or whether it should also test for colloids or “total” metal concentrations, as IEMS purported to do. According to RPS, a 10µm filter would allow testing for colloids as well, which is important, because colloids may still carry metals that might dissolve into the groundwater.¹⁸³⁴

866. The experts thus essentially disagree on whether metals should be tested for their “total” or “dissolved” values. A 0.45µm filter would filter all sediments and colloids, leaving only the metals dissolved in the groundwater. According to GSI, filtration with a 0.45µm filter is essential, since the acidification of the sample dissolves the metals attached to the sediment and/or colloids and therefore artificially increases the metals concentration in the sampled water.

867. As was seen above, filtration is addressed in TULAS and INEN Guideline 2169:98. Section 5 of Annex 1 of TULAS states that INEN Guideline 2169:98 and INEN Guideline 2187:98 “must be considered” to determine the values and concentrations of groundwater samples. Table 5 of TULAS sets the criteria for groundwater remediation in soils with clay content below 25% and requires the measurement of total concentrations for arsenic, cyanide and mercury. By contrast, with respect to chromium, the Tribunal agrees with GSI that Table 5 specifies total chromium since chromium has two valence species, i.e. Cr(+3) and Cr(+6), thus calling for the analysis of the “full chromium mass, without speciation”.¹⁸³⁵ Article 4.5.1 of INEN Guideline 2169:98 provides that “suspended matters, sediments, algae and other microorganisms *should be removed* when taking the sample or immediately afterwards, by filtration through filter paper, filtration membrane or by centrifugation”.¹⁸³⁶ It follows from these provisions that filtration is the regular methodology in groundwater sampling and that TULAS requires the analysis of dissolved (not total) metals concentrations, with the exception of arsenic, cyanide and mercury.

868. Article 4.5.1 further specifies that there should be no filtration where the filter is capable of “retaining one or more of the components that will be analyzed”. Since RPS agrees

¹⁸³⁴ RPS ER2, p. 23.

¹⁸³⁵ GSI ER2, ¶ 124. However, the Tribunal disagrees that such is the case for arsenic, cyanide and mercury, although GSI has not made specific arguments with respect to these compounds.

¹⁸³⁶ Emphasis added by the Tribunal. IEMS-RCM 23 (EN) 0006; INEN Guideline 2169:98 “Water. Water Quality. Sampling. Handling and Preservation of Samples”, p. 0026 (**Exh. CE-CC-349**).

that a 0.45µm filter is appropriate for dissolved metals analyses, it appears that the filters employed by GSI do not fall into the prohibited category, save for arsenic, cyanide and mercury. The Tribunal thus agrees with RPS that TULAS Table 5 indicates that “total analyses” are to be carried out for arsenic, cyanide and mercury.

869. Table 1 of INEN Guideline 2169:98 outlines the general techniques for sample conservation. The methodology specified for barium, cadmium, total chromium, copper, lead, nickel, and zinc is cross-referenced to the methodology for aluminum. For aluminum, Table 1 distinguishes between (i) analysis for dissolved aluminum, for which filtration with a 0.45µm filter is required prior to acidification, and (ii) analysis for total aluminum without filtering the samples. However, it is unclear when analysis for dissolved as opposed to total aluminium is called for.
870. Article 4.5.2 provides some more clarity by stating that “the analysis *can* involve the separation of both soluble and insoluble forms by filtration (for example: of a metal)”. This provision is couched in permissive terms, which suggests that GSI’s filtration method was not improper.
871. RPS concedes that INEN 2169:98 provides that “dissolved samples include the use of 0.45µm filters prior to acidification”, but specifies that “total analyses should not be filtered in the field but only acidified”.¹⁸³⁷ Since RPS also concedes that under TULAS Table 5 “total analyses” are only required for arsenic, cyanide, and mercury, it follows that INEN Guideline 2169:98 does not require “total analyses” for barium, cadmium, copper, total chromium, nickel, lead, zinc, or TPH. Accordingly, GSI’s use of 0.45µm filters appears appropriate, especially because the regulations provide no basis for the use of a 10µm filter as advocated by RPS.
872. The experts seem to agree that filtration – independently of filter size – is necessary where turbidity exceeds 10 NTU. IEMS even appears to agree that samples must be stabilized to a turbidity of 5 NTU.¹⁸³⁸ As noted above, IEMS did not measure the turbidity during its first two sampling campaigns, and its field forms for the third sampling campaign are not of much assistance, since they either do not address NTU or provide a zero value which cannot reflect reality throughout the sampling process

¹⁸³⁷ RPS ER2, p. 23.

¹⁸³⁸ IEMS ER3, Annex A.10, p. 3, paragraph 6; IEMS-SCM Anexo A.10 (SP) 0004.

(even with low-flow).¹⁸³⁹ Moreover, IEMS's fourth campaign shows that unfiltered samples typically have higher turbidity with levels frequently above 15 NTU.¹⁸⁴⁰ Finally, IEMS's observations with respect to turbidity appear to be unreliable, since (i) IEMS's own field notes show that the samples had turbid water (for instance, "turbid water, brown, with presence of solids"),¹⁸⁴¹ (ii) GSI demonstrated that water with 200 NTU is still relatively clear,¹⁸⁴² and (iii) GSI field forms shows significant levels of NTU variations during the sampling process.¹⁸⁴³

873. Accordingly, since IEMS did not filter its samples during its third sampling campaign, the Tribunal cannot rely on these results either as they relate to the metals for which the dissolved concentration was supposed to be analyzed. Indeed, IEMS should at least have used a filter to remove the sediments as RPS conceded and as required under Article 4.5.1 of the INEN Guideline 2169:98.

874. During its fourth field trip, IEMS apparently used both 0.45 µm and 5µm filters to compare the results with unfiltered samples. However, that campaign was limited to Payamino 2/8, Payamino 14/20/24, and Payamino 15. As stated earlier, the Tribunal considers that groundwater testing was unwarranted at Payamino 2/8 because of the elevated clay content at that site. The Tribunal therefore reviewed the results for Payamino 14/20/24 and Payamino 15. The filtered samples show barium and lead exceedances at these sites.¹⁸⁴⁴ Sample 7-PAY-14.20.24-TE-100MW-F at Payamino 14/20/24 has a barium level of 1.07 mg/l in excess of the 0.338 mg/l limit, and a lead level of 0.06 mg/l in excess of the 0.045 mg/l limit. With respect to Payamino 15, sample 7-PAY-15-TE-100MW-F has a barium level of 0.93 mg/l and a lead level of 0.06 mg/l; and sample 7-PAY-15-TE-101MW-F has a barium level of 0.87 mg/l.

¹⁸³⁹ IEMS Field Notes (**Exh. E-483**).

¹⁸⁴⁰ See, for instance: GSI-ROC App F 0081, Table F.4.3 (IEMS Field Observations from Dec. 2012 and Jan. 2013 Study of Filtered vs. Unfiltered Samples).

¹⁸⁴¹ Translation by the Tribunal. See, for instance: GSI ER2, App. F.4.1; GSI-ROC App F 0091-0092.

¹⁸⁴² GSI-ROC App. F 0078, Figure F.4.3.

¹⁸⁴³ Field Notes, Forms, Maps and Checklists of GSI Environmental – First Campaign (produced by Burlington on 14 November 2012) (**Exh. E-475**); Field Notes, Forms, Maps and Checklists of GSI Environmental – Second Campaign (produced by Burlington on 14 November 2012) (**Exh. E-476**).

¹⁸⁴⁴ IEMS ER4, Att. 31.2.2; IEMS-RCM 31.2.2 (EN) 0001.

875. The unfiltered samples also show mercury exceedances at these two locations.¹⁸⁴⁵ The issue still arises whether, under Article 4.5.1 of INEN Guideline 2169:98, filtration of sediments is still required, so that only colloids are kept for the “total analyses”. Since RPS concedes that sediments should be filtered,¹⁸⁴⁶ the Tribunal relies on IEMS’s filtered samples, which only show mercury exceedances at Payamino 15.¹⁸⁴⁷
876. The Tribunal also reviewed GSI’s sampling data, which reveals that remediation is required for TPH at Coca CPF.¹⁸⁴⁸ At that site, the Tribunal identified a TPH exceedance at sampling locations COCPF-GW1 and COCPF-GW1Dup, which have been tested by GSI for gasoline, diesel and oil range organics. The addition of the three values provides the TPH value. COCPF-GW1 thus has a TPH value of 0.53 mg/l and COCPF-GW1Dup has a TPH value of 0.67 mg/l, both in exceedance of the 0.325 mg/l limit under TULAS Table 5.
877. The data also shows a nickel exceedance at Payamino 14/20/24 at sampling locations PAY14-GW1 and PAY14-GW1Dup, with a value of 0.05 mg/l exceeding the limit of 0.045 mg/l.
878. For the three locations where exceedances are established, there are no elements in the record that would allow to rebut the presumption of causation that arises from the findings of harm. Therefore, Burlington is liable to remediate these exceedances.
879. In sum, the Tribunal finds that groundwater remediation is required (i) for nickel, barium and lead at Payamino 14/20/24, (ii) for barium, lead and mercury at Payamino 15, and (iii) for TPH at Coca CPF.

6.3.5 Remediation costs

880. Having reviewed the Parties’ arguments with respect to remediation, the Tribunal finds that *in situ* remediation applying permeable reactive interceptor trenches is the most appropriate method in the present circumstances since it filters compounds out of the

¹⁸⁴⁵ IEMS ER4, Att. 31.2.1; IEMS-RCM 31.2.1 (EN) 0001.

¹⁸⁴⁶ RPS ER2, pp. 23-24.

¹⁸⁴⁷ Sample 7-PAY-15-TE-100MW-F has a mercury level of 1.16 mg/l and sample 7-PAY-15-TE-101MW-F has a mercury level of 0.64 mg/l. See: IEMS ER4, Att. 31.2.2; IEMS-RCM 31.2.2 (EN) 0001.

¹⁸⁴⁸ GSI ER1, App. D, Table D.13.

groundwater over several years. It therefore accepts IEMS's estimated capital cost (based on US price comparisons) of USD 1,680,000 for each contaminated site, which includes USD 350,000 for research and feasibility costs, USD 730,000 capital cost, and USD 600,000 for operation and maintenance for a period of six years.¹⁸⁴⁹ The Tribunal notes that Burlington has not provided alternative cost figures. The total cost of remediation of the three sites identified above thus amounts to **USD 5,040,000**. Since it is Ecuador's burden to prove the existence of groundwater contamination, the Tribunal rejects Ecuador's further request that Burlington pay the cost to complete groundwater studies in 52 other sites in the Blocks.¹⁸⁵⁰

7. Well site abandonment

7.1 Parties' positions

881. Finally, relying both on the Block 7 PSC as well as on Articles 53 RAOHE and 24 ROH (*Reglamento de Operaciones Hidrocarburíferas*),¹⁸⁵¹ Ecuador requests that Burlington pay the costs of abandonment of the wells in Block 7. It estimates the costs per site to be at least USD 500,000 and claims a total of USD 3,500,000 for the seven sites contemplated in the Consortium's Abandonment Plan of 2008.¹⁸⁵² Although the Consortium's Abandonment Plan was approved by the authorities in March 2009, Ecuador argues that the budgeted costs of USD 929,772 "is extremely low", since IEMS estimated the costs for concrete sealing of a well only at USD 500,000.¹⁸⁵³ Therefore, if the Tribunal were minded to consider only the seven sites mentioned in the Abandonment Plan, it should grant at least USD 3,500,000.¹⁸⁵⁴ In addition, Ecuador complains – though without making a specific claim – that "there are other areas that should have been abandoned that were not part of the Abandonment Plan".¹⁸⁵⁵

¹⁸⁴⁹ IEMS ER3, pp. 180-181 and Table IV-14.

¹⁸⁵⁰ 2nd SMCC, ¶ 423.

¹⁸⁵¹ *Id.*, ¶ 321; Reglamento Ambiental para las Operaciones Hidrocarburíferas en el Ecuador, published in the Official Register No. 265 on 13 February 2001 (**Exh. EL-174**); Reglamento de Operaciones Hidrocarburíferas, published in the Official Register No. E 2 on 26 September 2002 (**Exh. EL-181**).

¹⁸⁵² 2nd SMCC, ¶¶ 13, 319-328; Reply, ¶ 539.

¹⁸⁵³ 2nd SMCC, ¶ 327.

¹⁸⁵⁴ *Id.*, ¶ 328.

¹⁸⁵⁵ *Id.*, ¶ 326.

882. Burlington accepts to bear the cost of USD 100,000 per site for properly abandoning seven sites that stopped producing under the Consortium's operation.¹⁸⁵⁶ These sites are Cónдор Norte, Gacela 2, Gacela 3, Jaguar 2, Jaguar 7/8, Jaguar 9 and Lobo 4.¹⁸⁵⁷

7.2 Discussion

883. There is no dispute between the Parties that non-productive sites must be abandoned following a proper procedure. Article 53 RAOHE provides that, in case of definitive abandonment of an area of influence, the operator must remove all equipment and infrastructure, process all wastes, seal the wells, and restore the site by reforesting the area.¹⁸⁵⁸

884. The Consortium submitted an Abandonment Plan to the Ecuadorian authorities in December 2008,¹⁸⁵⁹ which was approved on 20 March 2009 by the Subsecretariat of Environmental Protection.¹⁸⁶⁰ That plan covered the seven sites enumerated above (paragraph 882).

885. It is true that Ecuador alleges that other areas "should have been abandoned".¹⁸⁶¹ However, it does not specify which sites are at issue nor does it present any other fact allegations, not to speak of evidence. As a result, the Tribunal will not further entertain this complaint.

886. By the time the Consortium left the Blocks in July 2009, no action had been taken towards the abandonment of these seven sites.¹⁸⁶² Thus, Burlington must bear the costs involved in abandoning these seven sites, which it does not dispute. The question to be resolved by the Tribunal is merely one of quantum. Burlington accepts liability for USD 100,000 per site and Ecuador claims at least USD 500,000.

¹⁸⁵⁶ C-PHB, ¶¶ 13, 71, 277(b).

¹⁸⁵⁷ GSI ER2, Table 3.

¹⁸⁵⁸ Article 53 of RAOHE (**Exh. EL-174**). See also: 2nd SMCC, ¶ 322.

¹⁸⁵⁹ Plan de Abandono Definitivo y Entrega de Áreas Utilizadas para la Perforación y Producción de Petróleo del Bloque 7 aplicable a siete locaciones: Gacela 2, Gacela 3, Lobo 4, Jaguar 2, Jaguar 8 (subsuelo únicamente), Jaguar 9, Cónдор Norte (**Exh. E-256**).

¹⁸⁶⁰ Letter of 20 March 2009 from DINAPA to the Consortium (**Exh. E-291**).

¹⁸⁶¹ 2nd SMCC, ¶ 326.

¹⁸⁶² *Id.*, ¶ 325; Informe Técnico No. 897-AADNPCA-SCA-MA-2009, 21 August 2009 (**Exh. E-172**).

887. In this context, the Tribunal notes that the Subsecretariat of Environmental Protection approved the budgeted abandonment costs of USD 929,772 for the seven sites.¹⁸⁶³ IEMS, for its part, stated that it “did not have sufficient information to calculate the cost of full restoration”. It added that the abandonment costs “should be calculated by a third party, through an assessment of market characteristics”, since the Consortium’s estimate of USD 929,722 was “extremely low”.¹⁸⁶⁴
888. IEMS also refers to an assessment it performed in 2008, which estimated at USD 500,000 the costs to cap one well operated by the City Oriente petroleum company, adding that this did not cover “soil reconfiguration, dismantlement of infrastructure and cleanup and reforestation”.¹⁸⁶⁵ The Tribunal is unable to rely on this cost figure, as IEMS did not provide any details in respect of City Oriente’s services. It also notes that IEMS itself acknowledges that it lacked sufficient information to compute restoration costs. By contrast, the Tribunal has available the costs budgeted by the Consortium and approved by the Ecuadorian authorities which did state that the proposed abandonment plan contemplated “*las medidas necesarias para asegurar la recuperación de las condiciones ambientales del sitio*” or in English, “the measures required to ensure the restoration of the environmental conditions of the site”.¹⁸⁶⁶ These costs amount in total to **USD 929,722**. Accordingly, the Tribunal grants such amount as costs for abandonment of the seven well sites mentioned above.

¹⁸⁶³ Letter of 20 March 2009 from DINAPA to the Consortium (**Exh. E-291**). The Consortium budgeted USD 159,340 for Gacela 2, USD 93,650 for Gacela 3, USD 148,670 for Lobo 4, USD 154,084 for Jaguar 2, USD 99,250 for Jaguar 8, USD 183,400 for Jaguar 9, and USD 91,378 for Cónдор Norte. See: Plan de Abandono Definitivo y Entrega de Áreas Utilizadas para la Perforación y Producción de Petróleo del Bloque 7 aplicable a siete locaciones: Gacela 2, Gacela 3, Lobo 4, Jaguar 2, Jaguar 8 (subsuelo únicamente), Jaguar 9, Cónдор Norte, pp. 4-11, 4-14, 4-17, 4-20, 4-21, 4-25 and 4-28 (**Exh. E-256**).

¹⁸⁶⁴ IEMS ER3, p. 167.

¹⁸⁶⁵ *Ibid.*

¹⁸⁶⁶ Translation by the Tribunal. Letter of 20 March 2009 from DINAPA to the Consortium (**Exh. E-291**).

8. Recapitulation

889. On the basis of the foregoing analysis, the Tribunal has determined that Burlington owes the following amounts for remediation:

| Non-pit soil | USD |
|---------------------|------------|
| Coca 1 | 144,000 |
| Coca 2 and Coca CPF | 453,600 |
| Coca 4 | 226,200 |
| Coca 6 | 429,000 |
| Coca 8 | 1,436,700 |
| Coca 9 | 222,000 |
| Coca 10/16 | 68,250 |
| Coca 18/19 | 28,800 |
| Payamino 1/CPF | 590,400 |
| Payamino 2/8 | 5,145,660 |
| Payamino 3 | 57,600 |
| Payamino 4 | 1,131,000 |
| Payamino 10 | 468,000 |
| Payamino 14/20/14 | 343,800 |
| Payamino 15 | 624,000 |
| Payamino 16 | 201,600 |
| Payamino 21 | 111,683 |
| Payamino 23 | 663,000 |

| | |
|----------------------------|-----------|
| Punino | 28,800 |
| Cóndor Norte | 312,000 |
| Gacela 1/8 and CPF | 1,282,200 |
| Gacela 2 | 759,600 |
| Gacela 4 | 201,600 |
| Gacela 5 | 28,800 |
| Gacela 6/9 | 574,800 |
| Jaguar 1 | 995,206 |
| Jaguar 2 | 2,610,000 |
| Jaguar 3 | 129,600 |
| Jaguar 5/CPF | 307,302 |
| Jaguar 7/8 | 78,000 |
| Mono 1-5/CPF | 780,000 |
| Mono Sur/6-9, 11 | 292,500 |
| Oso 1/CPF | 834,000 |
| Yuralpa Pad A | 78,000 |
| Yuralpa Pad D | 86,400 |
| Nemoca | 331,500 |
| Pits | |
| Oso 9 | 5,565,000 |
| Payamino Sanitary Landfill | 2,025,000 |
| Cóndor Norte | 1,070,000 |

| | |
|------------------------------|------------|
| Coca 8 | 1,125,000 |
| Oso 9 | 1,294,800 |
| Payamino 16 | 26,250 |
| Payamino 5 | 68,000 |
| Groundwater | 5,040,000 |
| Well site abandonment | 929,722 |
| TOTAL | 39,199,373 |

C. Infrastructure Counterclaims

1. Parties' positions

1.1 Ecuador's position

890. Ecuador claims that when the Consortium abandoned Blocks 7 and 21 in July 2009 and Ecuador (through Petroamazonas) took control of the operations, it became apparent that the Consortium had failed to maintain the Blocks' infrastructure in good working condition in accordance with best industry practices, as required by the PSCs. As a consequence, says Ecuador, Burlington failed to return to Ecuador all equipment, tools, machinery and installations in good condition, thus breaching the provisions of the Hydrocarbons Law.

891. Ecuador argues that, under both the PSCs and Ecuadorian law, the Consortium was under a dual obligation (i) to construct, maintain and replace the infrastructure on Blocks 7 and 21 in accordance with industry standards and (ii) upon contract termination, to return the Blocks to the State in good working condition. According to Ecuador, the Consortium breached both obligations and Burlington is accordingly liable for the remedial costs.¹⁸⁶⁷

892. More specifically, Ecuador contends that, under the PSCs for Blocks 7 and 21, the Consortium was under an obligation to "use personnel, equipment, machinery,

¹⁸⁶⁷ R-Ecuador's Counter-Memorial on Liability, ¶¶ 781-785; 2nd SMCC, ¶¶ 356-362.

materials, and technology in accordance with the best standards and practices generally accepted in the international hydrocarbons industry”.¹⁸⁶⁸ Further, the Consortium was required to deliver to the State “at no cost and in good condition all wells in production at that time, together with all equipment, tools, machinery, installations and other items acquired under the terms of this Contract, and all items must be in good condition except for normal wear”.¹⁸⁶⁹ Article 29 of the Hydrocarbons Law, incorporated by reference in the PSCs, also provides for an obligation to turn over the infrastructure to the State “in good condition”.¹⁸⁷⁰

893. Ecuador agrees with Burlington that the PSCs and Ecuadorian Law refer to generally accepted standards¹⁸⁷¹ and practices in the hydrocarbon industry.¹⁸⁷² Burlington’s expert Intertek and Ecuador’s witness, Mr. Pablo Luna, explain in detail the contents of these standards with respect to building, maintaining and replacing upstream infrastructure in the hydrocarbon industry.¹⁸⁷³

894. Ecuador submits that the Consortium breached its obligation to invest in, maintain and return the infrastructure in good condition and in accordance with industry standards, by following a “run to failure” maintenance strategy.¹⁸⁷⁴ According to Mr. Solís, Perenco’s maintenance policy was driven by an “obsession [...] with reducing costs and making only the most indispensable minimum investments”, which “translated into a lack of operational safety”.¹⁸⁷⁵ The same witness also gave evidence that Perenco exerted “a

¹⁸⁶⁸ 2nd SMCC, ¶ 358, referring to: clause 5.1.7 of the Block 21 PSC (**Exh. C-2; Exh. CE-CC-13**) and clause 5.1.8 of the Block 7 PSC (**Exh. C-1; Exh. CE-CC-28**).

¹⁸⁶⁹ 2nd SMCC, ¶ 360 (emphasis eliminated), referring to: clause 18.6 of the Block 7 PSC (**Exh. C-1; Exh. CE-CC-28**). Ecuador further points to similar provisions in clause 5.1.22 of the Block 7 PSC and in clauses 5.1.21 and 18.6 of the Block 21 PSC (**Exh. C-2; Exh. CE-CC-13**).

¹⁸⁷⁰ 2nd SMCC, ¶ 361, referring to: Ecuadorian Hydrocarbons Law No. 2967 as in effect on 21 May 1999 (**Exh. EL-92**).

¹⁸⁷¹ These include those of the American Petroleum Institute (API), the American Society of Mechanical Engineers (ASME), the National Association of Corrosion Engineers (NACE) and the National Fire Protection Association (NFPA), among others. Reply, ¶ 446, referring to: Intertek ER1, ¶¶ 23-26; Montenegro WS1, ¶ 7.

¹⁸⁷² Reply, ¶ 446, referring to: SMCC, ¶¶ 354-358; CMCC, ¶¶ 516-522.

¹⁸⁷³ Reply, ¶¶ 446-454, referring to: Intertek ER1, ¶¶ 27-32, 131, 496; Luna WS4, ¶¶ 10-9, 15, 34-45, 57-58, 62-64, 99.

¹⁸⁷⁴ R-PHB, ¶ 938.

¹⁸⁷⁵ Solís WS1, ¶¶ 9, 10 and 14.

lot of pressure to extract the highest quantity of oil” in the shortest possible time.¹⁸⁷⁶ It was therefore unsurprising that, when Ecuador took over the operations in July 2009, the infrastructure on the Blocks, and especially in Block 7, was in poor working condition. Mr. Diego Montenegro, another witness of Ecuador, adds that the condition of the infrastructure did not measure up “to international petroleum industry standards”.¹⁸⁷⁷

895. Specifically, Ecuador contends that the Consortium failed to maintain and revert the infrastructure in good condition because (i) it operated and built sub-standard facilities (platforms and CPFs); (ii) it failed to repair, replace and/or properly maintain fluid lines and pipelines; (iii) it damaged power generators through the use of a cheap and potentially harmful blend of crude oil and diesel (rather than diesel fuel alone) and through the failure to perform timely overhauls; and (iv) it failed to replace obsolete equipment and systems, install appropriate back-up systems, hold a sufficient stock of spare parts and maintain roads.¹⁸⁷⁸ Ecuador’s specific arguments are summarized below.

896. Ecuador dismisses Burlington’s arguments regarding the Consortium’s alleged successful operation of Blocks 7 and 21 and Petroamazonas’ continued operation as mere rhetorical defenses:

i. With respect to Burlington’s argument that the Consortium had the economic incentive to maintain and develop production and thus it made “no economic sense for the Consortium to ignore maintenance”, Ecuador denies that this was the case for Block 7.¹⁸⁷⁹ Ecuador notes that the Block 7 PSC was to expire in 2010, and a proactive maintenance program would only pay off in the long term. According to Ecuador’s witnesses, “the Consortium’s maintenance was driven by a ‘fix it when it breaks’ philosophy”.¹⁸⁸⁰

¹⁸⁷⁶ *Id.*, ¶ 26.

¹⁸⁷⁷ Montenegro WS1, ¶ 8.

¹⁸⁷⁸ 2nd SMCC, ¶ 367.

¹⁸⁷⁹ Reply, ¶ 458, citing: CMCC, ¶ 147.

¹⁸⁸⁰ Reply, ¶¶ 458-459, referring to: Luna WS4, ¶ 21; Solís, WS2, ¶ 10.

- ii. Ecuador denies the Consortium’s statement that it “could not have successfully operated for seven years if the construction and the maintenance of its infrastructure were inadequate”.¹⁸⁸¹ As explained by Messrs. Luna and Solís, the fact of producing crude oil does not necessarily mean that the equipment and facilities were in good condition.¹⁸⁸² According to Ecuador, “[i]t is a fact that Burlington’s alleged ‘successful’ operations and production were obtained at the expense of the environment [...] and the safety of its own personnel”, as Mr. Solís’s testimony confirms.¹⁸⁸³
- iii. While it is true that Petroamazonas has managed to increase production in Block 7, it is not true that this has been achieved by using the very same infrastructure used by the Consortium. According to Ecuador, “this increase has been made possible by a massive investment in new infrastructure to replace the obsolete and/or worn-out infrastructure left by the Consortium (the cost of which is included in Ecuador’s infrastructure claim) as well as new infrastructure strictly devoted to expanding the crude processing capacity in Block 7 (the cost of which is not claimed by Ecuador) as well as a radical change of the underlying philosophy of the maintenance program (from a corrective to a proactive approach to maintenance)”.¹⁸⁸⁴

897. According to Ecuador, “the reality is that the Consortium’s alleged comprehensive maintenance ‘program’ was inexistent or flawed and failed to ensure that the infrastructure in Blocks 7 and 21 was maintained and replaced in accordance with international industry standards”.¹⁸⁸⁵ Ecuador alleges in particular that the Consortium (a) did not devote sufficient resources (whether human or material) to ensure a proper maintenance program, and that (b) in any event its maintenance program was either non-existent or dysfunctional.

898. With respect to (a), Messrs. Luna and Solís have testified that the Consortium had only about 60 employees (including third party contractors) entrusted with maintenance

¹⁸⁸¹ Reply, ¶ 460, citing: CMCC, ¶¶ 530, 510.

¹⁸⁸² Reply, ¶ 460, referring to: Luna WS4, ¶ 8; Solís WS2, ¶¶ 9 and 19.

¹⁸⁸³ Reply, ¶ 461, referring to: Solís WS2, Section IV.

¹⁸⁸⁴ Reply, ¶ 463, relying on: Solís WS2, ¶ 528.

¹⁸⁸⁵ Reply, ¶ 464.

(rather than 200, as Burlington claims), and that these employees worked on 14-day shifts, meaning that only half of them were on the Blocks at any given time.¹⁸⁸⁶ Nor did the Consortium devote sufficient material resources to maintenance, as is demonstrated when one compares Petroamazonas' spending with that of the Consortium, and when one looks at the lack of spare parts for maintenance repairs.¹⁸⁸⁷

899. With respect to (b), the evidence and especially the testimony of Messrs. Luna and Solís demonstrates that “neither the Consortium’s maintenance inspections nor record keeping practices ever met the requirements of international industry standards and practices”, and the Consortium did not carry out sufficient preventive maintenance tasks.¹⁸⁸⁸ In particular, Ecuador alleges that (i) the Consortium’s own data show that from 2007 to 2009, 81% of its maintenance activities were corrective;¹⁸⁸⁹ (ii) the Consortium failed to carry out the necessary inspections, and when it did, they did not meet international standards; (iii) similarly, the Consortium’s inspection reports did not meet international standards (for instance, by failing to contain recommendations as to maintenance); and (iv) the Consortium failed to carry out the proactive maintenance tasks required by international standards and practices (for instance, by failing to use “pigs” to clean pipelines and flow lines before injecting chemicals, to maintain tanks and power oil pumps, and to carry out overhauls for engines used for power generation).¹⁸⁹⁰ Ecuador adds that the Consortium’s SAP system could not correct the failures in the Consortium’s maintenance policy.¹⁸⁹¹

900. For Ecuador, the Consortium’s “run to failure” strategy is confirmed *inter alia* by the email of 11 March 2009, in which Mr. D’Argentré instructed the Consortium’s maintenance managers to focus only on urgent and indispensable services and put everything else on standby.¹⁸⁹²

¹⁸⁸⁶ *Id.*, ¶ 467, referring to: Luna WS4, ¶¶ 28-29 and Annex 34; Solís WS2, ¶¶ 17-18 and Annex 4.

¹⁸⁸⁷ Reply, ¶ 468, referring to: Solís WS2, ¶¶ 10-11, 14 and Annex 4.

¹⁸⁸⁸ Reply, ¶¶ 471.

¹⁸⁸⁹ *Id.*, ¶ 472.

¹⁸⁹⁰ *Id.*, ¶¶ 471-479, referring *inter alia* to: Luna WS4, ¶¶ 24 and 114 and Annexes 30-33; Solís WS2, ¶¶ 68-72.

¹⁸⁹¹ Reply, ¶ 480, referring to: Luna WS4, ¶¶ 34-35.

¹⁸⁹² Email of 11 March 2009 from Eric D’Argentré to the Consortium’s maintenance managers (**Exh. E-504**) (“As of today, all orders for min/max (MRP), all services that are not urgent

901. Ecuador also denies that the evidence contemporaneous to the Consortium's operatorship demonstrates the good condition of the Blocks' infrastructure. While Ecuador recognizes that "it is true that these documents include some statements in passing to the effect that most of Block 7 and 21 infrastructure was in good condition", it argues that "none of them were intended to constitute a proper basis for assessing the true technical condition of Block 7 and 21 infrastructure at that time".¹⁸⁹³ Ecuador contends in particular that (i) the 2009 SGS Report was "nothing more than an inventory of the field equipment and facilities for accounting purposes", and was not a technical inspection that could serve to establish the state of the equipment and facilities;¹⁸⁹⁴ (ii) the 2008 Block 7 environmental audit lasted only one week, which would not have been sufficient to assess the condition of all of the Block's equipment;¹⁸⁹⁵ and (iii) as far as the 2008 Block 21 environmental audit is concerned, while it appears to have required more working hours, its conclusions are limited to assessing the Block's facilities and equipment in light of its environmental impact, and as a result does not provide useful information on their physical condition.¹⁸⁹⁶ In any event, Ecuador argues that environmental audits are of limited value to assess the technical condition of equipment and facilities.¹⁸⁹⁷
902. Similarly, Ecuador dismisses the relevance of Dr. Egan's testimony. Ecuador argues in particular that Dr. Egan's factual testimony is of limited value because he only visited the Blocks once in 2012 for a period of one week. Thus, his testimony on the condition of the infrastructure postdates the takeover or relies on the review of documents, which Ecuador characterizes as hearsay. Ecuador further submits that Dr. Egan's expert evidence is unreliable, because "to assess whether equipment is in 'good condition' and whether there has been 'normal wear' the actual rates of degradation need to be assessed", and "[t]hat assessment can only be done contemporaneously; it cannot be gleaned from by an inspection undertaken three years later in 2012 (which is what

(welding, instrumentation, road maintenance, system, etc.), all RRCC expenses, etc., must be placed on standby..."; "We will spend money only on indispensable things to maintain production and to avoid any legal action by the Ecuadorian state" (Translation by the Tribunal)).

¹⁸⁹³ Reply, ¶ 484.

¹⁸⁹⁴ *Id.*, ¶ 485, referring to: Luna WS4, ¶ 69 and Solís WS2, ¶ 85.

¹⁸⁹⁵ Reply, ¶ 486, referring to: Puente WS1, ¶ 19.

¹⁸⁹⁶ Reply, ¶ 487.

¹⁸⁹⁷ *Id.*, ¶ 486, referring to: Luna WS4, ¶ 71.

Dr. Egan did) and not by reference to generic industry practices (which is what Dr. Egan's Expert Reports purport to do with respect to all of the key categories of equipment and infrastructure)". Accordingly, Messrs. Luna and Solís's contemporaneous evidence should be preferred.¹⁸⁹⁸

903. According to Ecuador, the evidence in the record establishes beyond doubt that many of the Blocks' equipment and facilities were either obsolete or in bad condition exceeding normal wear and tear. Ecuador's specific arguments in this respect are summarized further below.

904. Ecuador quantifies the damages suffered as a result of the Consortium's breaches of its infrastructure obligations for Blocks 7 and 21 at USD 17,231,458.85. It describes this amount as modest, given that it represents "only 28% of the Consortium's maintenance budget during the operatorship, or a USD 2 million maintenance shortfall for each year of the Consortium's six and a half year operatorship".¹⁸⁹⁹

905. Contrary to Burlington's contention, Ecuador submits that it has duly substantiated all of its claims for infrastructure damage and is not claiming costs related to the expansion of Blocks 7 and 21.¹⁹⁰⁰

1.2 Burlington's position

906. According to Burlington, Ecuador's infrastructure counterclaims should be dismissed along with its environmental claim. The Consortium complied with its obligation to maintain the Blocks' infrastructure in accordance with international engineering standards and in compliance with the PSCs. Indeed, Ecuador has failed to provide credible evidence to the contrary. Burlington describes Ecuador's infrastructure counterclaims as concocted and "alternatively unsubstantiated or irrelevant to refurbishing or replacing substandard equipment".¹⁹⁰¹

907. Prior to this arbitration, Ecuador had never alerted the Consortium to any major defect in its maintenance practices or the condition of the Blocks' infrastructure. Even though

¹⁸⁹⁸ R-PHB, ¶¶ 942-943 (emphasis eliminated).

¹⁸⁹⁹ *Id.*, ¶ 1007 (footnote omitted).

¹⁹⁰⁰ Reply, ¶¶ 518-534.

¹⁹⁰¹ CMCC, ¶ 637.

the expropriation thwarted any prospect of an orderly handover of the Blocks, the condition of the infrastructure as of July 2009 complied with all of the Consortium's contractual and legal obligations.

908. Burlington draws attention to Clause 5.1.8 of the Block 7 PSC and to Clause 5.1.7 of the Block 21 PSC, under which the Consortium was under an obligation to use the infrastructure “in accordance with the generally accepted norms and practices of the international petroleum industry”.¹⁹⁰²
909. The Claimant further notes that Ecuador adopted the American Petroleum Institute (API) standards. API is one of several international standard-developing agencies establishing industry consensus on best practices regarding the construction and maintenance of equipment. API standards combine preventive and predictive maintenance techniques. Preventive maintenance techniques refer to “time-based, planned maintenance activities or scheduled tasks, irrespective of the conditions under which the equipment operates”, whereas predictive maintenance techniques are used “to tailor maintenance activities to individual pieces of equipment in operation”.¹⁹⁰³ By adopting both, as the Consortium did in the present case, operators ensure compliance with best industry practices.¹⁹⁰⁴
910. Burlington also stresses that Clauses 18.6 of the Block 7 PSC and 18.6 of the Block 21 PSC provided that the Consortium was to return the equipment in good condition except for normal wear. Article 29 of the 1978 Hydrocarbons Law also refers to “good condition”. Contrary to what Ecuador implies, good condition does not require the return of new or upgraded equipment. Ecuador wrongly asserts that the infrastructure present in the Blocks shows more than mere normal wear and tear. There is no obligation under the PSCs or Ecuadorian law to replace equipment simply because it is old.
911. Burlington further claims that Ecuador's notion of “obsolescence” is misconstrued. As the Claimant's expert Dr. Egan has explained, Ecuador's concept of obsolescence does not accord with the commonly used definition in the oil industry.¹⁹⁰⁵ As stated in a

¹⁹⁰² *Id.*, ¶ 516.

¹⁹⁰³ *Id.*, ¶¶ 520-521, referring to: Intertek ER1, ¶ 27.

¹⁹⁰⁴ CMCC, ¶ 522.

¹⁹⁰⁵ *Id.*, ¶ 528; Rejoinder, ¶ 343.

document on which Ecuador relies, “the ‘key is not the age of existing equipment, but its condition’”¹⁹⁰⁶.

912. Burlington affirms that it has complied with international petroleum industry practices. Indeed, had the Consortium not used equipment in compliance with international practices, it would not have been able to operate the fields for over seven years.¹⁹⁰⁷ First, the equipment was built in accordance with international standards. This was confirmed by Moody International, for instance, which inspected the tanks and attested that they had been built in compliance with API 650.¹⁹⁰⁸ It is further confirmed by Dr. Egan and the 2008 Environmental Audit.¹⁹⁰⁹ Second, approximately 200 qualified employees followed a comprehensive maintenance program set up by the Consortium, combining preventive and predictive strategies.¹⁹¹⁰ Third, the Consortium kept detailed maintenance records and was subject to extensive reporting obligations (yearly budgets, annual reports, quarterly reports).¹⁹¹¹
913. Accordingly, the Claimant submits that Ecuador’s infrastructure counterclaims have no legal merit and should be dismissed. Not content with reaping over US\$ 4 billion in revenue from the Blocks since their seizure, Ecuador now seeks an additional US\$ 17 million “to upgrade the infrastructure taken from the Consortium”.¹⁹¹² Considering that they do not amount to more than 1% of the total amount claimed by Ecuador in these proceedings, Burlington argues that the infrastructure counterclaims have been fabricated by Ecuador in order to “provide foundation to its environmental allegations”,¹⁹¹³ and “set off against Perenco and Burlington’s claims for the loss of their investments in the Blocks”.¹⁹¹⁴

¹⁹⁰⁶ Rejoinder, ¶ 343, referring to: Luna WS4, Annex 48, R.L Hughes, *Reasons to Replace Equipment*, 2001, Reliability.com, p. 1.

¹⁹⁰⁷ CMCC, ¶ 530.

¹⁹⁰⁸ D’Argentré WS1, ¶ 92.

¹⁹⁰⁹ Intertek ER1, ¶ 107; Block 21 Environmental Audit, November 2008, Table 5-4, pp. 5-26 (**Exh. CE-CC-183**). Burlington mistakenly refers to Exh. E-153.

¹⁹¹⁰ CMCC, ¶¶ 532-533.

¹⁹¹¹ *Id.*, ¶ 534.

¹⁹¹² C-PHB, ¶ 228.

¹⁹¹³ *Id.*, ¶ 229.

¹⁹¹⁴ CMCC, ¶ 638.

914. Burlington also asserts that the abundant evidence in the record is unequivocal in showing that the Blocks' infrastructure was in good working condition in July 2009. This was expressly confirmed by the two reports drafted by Société Générale de Surveillance conducted in 2009 and 2010 (the "SGS Reports").¹⁹¹⁵ In this respect, Ecuador's "self-serving inspection reports" prepared several years after the seizure are irrelevant. Moreover, Ecuador's damages claim includes costs related to its decision to increase production in the Blocks as well as other costs unrelated to this arbitration.¹⁹¹⁶
915. Contemporaneous assessments of the infrastructure used in Blocks 7 and 21, argues Burlington, contradict Ecuador's thesis of obsolescence and lack of maintenance, as shown by the following reports:
- i. The 2008 Environmental Audits of Blocks 7 and 21 refute Ecuador's allegation that the infrastructure was in "sub-standard conditions". The Block 7 audit reached the conclusion that "[i]n general the installations and equipment are in good condition", identifying only minor issues of normal wear and tear.¹⁹¹⁷ Similarly, the Block 21 audit concluded that the facilities were "appropriately maintained and are subject to an ongoing maintenance program".¹⁹¹⁸
 - ii. The assessment carried out by SGS shortly before the seizure in July 2009 also refutes Ecuador's claims. All of the equipment on the Blocks was examined at that time, resulting in a 9,000 page report. SGS concluded that approximately 92% of the equipment in Block 7 and 99% of the equipment in Block 21 was in "good" to "very good" condition.¹⁹¹⁹ Thus, this report provides no support to Ecuador's exaggerated accusations of disastrous and dangerous conditions.¹⁹²⁰

¹⁹¹⁵ Société Générale de Surveillance, Inventory Report, 2009 (**Exh. CE-CC-217**) and Société Générale de Surveillance, Inventory Report, 2010 (**Exh. CE-CC-240**).

¹⁹¹⁶ C-PHB, ¶ 231.

¹⁹¹⁷ CMCC, ¶ 537; Block 7 Environmental Audit, November 2008 (**Exh. CE-CC-182**), p. 82.

¹⁹¹⁸ CMCC, ¶ 538; Block 21 Environmental Audit, November 2008, Section 7, p. 1 (**Exh. CE-CC-183**), Section 7, p. 1. Burlington mistakenly refers to Exh. E-153.

¹⁹¹⁹ Société Générale de Surveillance, Inventory Report, 2009 (**Exh. CE-CC-217**); Intertek ER1, ¶¶ 36-37.

¹⁹²⁰ CMCC, ¶¶ 539-542; C-PHB, ¶¶ 241-242.

iii. The SGS Report commissioned by Ecuador after the seizure once again confirmed the good condition of the infrastructure in both Blocks.¹⁹²¹

916. All this evidence was further corroborated at the Hearing, during which Mr. D'Argentré explained how the equipment used in both Blocks was subject to "intensive oversight" by the Government during the entire duration of the Consortium's operations.¹⁹²²

917. According to Burlington, the Hearing showed that Ecuador's witnesses lacked credibility or relevant knowledge. Whereas Burlington chose to commission a leading oil and gas infrastructure expert, Dr. Egan, to assess the infrastructure counterclaims, Ecuador decided to rely exclusively on factual witnesses, who lacked credibility and first-hand knowledge of the operations on the Blocks.¹⁹²³

918. Burlington submits that, in any event, Ecuador's infrastructure counterclaims are wholly unsubstantiated and in fact comprise a thinly disguised claim for regular maintenance (of the type that Petroamazonas as operator as of July 2009 must bear) and betterment of the Blocks beyond what the Claimant was contractually required to hand over. The Consortium maintained and returned the infrastructure in accordance with the PSCs and Ecuadorian law. Ecuador has failed to provide credible evidence to the contrary and instead has fabricated infrastructure claims that are unsubstantiated or unrelated to the alleged sub-standard condition of the equipment on the Blocks.¹⁹²⁴

2. Analysis

919. The Tribunal will start by setting out the applicable legal framework (2.1) as well as some general considerations applying to all infrastructure counterclaims (2.2). Thereafter, it will discuss each of Ecuador's infrastructure counterclaims, i.e. the claims in respect of tanks (2.3), fluid lines and pipelines (2.4), power generators (2.5), pumps, equipment and systems, back-up systems, spare parts and roads (2.6), and other claims (2.7) before reaching a conclusion (2.8).

¹⁹²¹ Société Générale de Surveillance, Inventory Report, 2009 (**Exh. CE-CC-217**); CMCC, ¶ 543; C-PHB, ¶¶ 243-244.

¹⁹²² Tr. (Day 6) (ENG), 2050:4-16 (Direct, D'Argentré). See also: C-PHB, ¶ 246.

¹⁹²³ C-PHB, ¶¶ 233-239.

¹⁹²⁴ Rejoinder, ¶¶ 402-423.

2.1 Legal framework

920. It is common ground between the Parties that certain clauses of the PSCs establish the Consortium's particular obligations with respect to the Blocks' infrastructure, both *during the operation* of Blocks 7 and 21 and *upon termination* of the PSCs.

921. Clause 5.1.8 of the PSC for Block 7 and Clause 5.1.7 of the PSC for Block 21 require the Consortium to use qualified personnel and suitable equipment and technology during the operation of the Blocks. Clause 5.1.8 reads as follows:

“5.1 Obligations of the Contractor: [...]

[...]

5.1.8 Use qualified personnel, as well as suitable equipment, machinery, materials and technology, in accordance with generally accepted international petroleum industry practices”.

922. Clause 5.1.7 similarly provides:

“5.1 Contractor's Obligations: [...]

[...]

5.1.7 To use personnel, equipment, machinery, materials, and technology in accordance with the best standards and practices generally accepted in the international hydrocarbon industry”.¹⁹²⁵

923. Upon termination of the PSCs, Clauses 5.1.22 and 18.6 of the PSC for Block 7 and Clauses 5.1.21 and 18.6 of the PSC for Block 21 provide that the Consortium shall return the wells and equipment to PetroEcuador in good condition, except for normal wear and tear, and at no cost. Specifically, these provisions are worded as follows:

Block 7 PSC

“5.1.22 Upon termination of the Contract, deliver the wells, property, installations, equipment and infrastructure related to this Contract to PETROECUADOR, at no cost and in good condition, pursuant to the provisions of Article twenty-nine (29) of the Hydrocarbons Law”.

“18.6 Upon termination of this Contract, either due to expiration of the Production Period or for any other reason during the same Period, the Contractor will deliver to PETROECUADOR, at no cost and in good

¹⁹²⁵ Block 7 PSC (**Exh. C-1**; **Exh. CE-CC-28**) and Block 21 PSC (**Exh. C-2**; **Exh. CE-CC-13**).

condition, all wells in production at that time, together with all equipment, tools, machinery, installations and other items acquired under the terms of this Contract, and all items must be in good condition except for normal wear”.

Block 21 PSC

“5.1.21 Upon termination of the Contract, the Contractor shall deliver to PETROECUADOR, at no cost and in good condition, the wells, property, facilities, and equipment that were acquired for the purpose of the Contract in accordance with article 29 of the Law on Hydrocarbons”.

“18.6 Upon termination of this present Contract at the end of the Production Period or for any other cause occurring during the same Period, the Contractor shall deliver to PETROECUADOR, at no cost and in good production conditions, the wells that are active at such time as well as, in good conditions except for normal wear and tear, all other equipment, tools, machinery, facilities, and other movable and immovable property acquired for the purposes of this present Contract”.¹⁹²⁶

924. The provisions cited above essentially restate the obligations set out in Article 29 of the Hydrocarbons Law, to which both provisions refer:

“[U]pon termination of an exploration and exploitation contract, due to expiration of its term or for any other reason arising during the exploitation period, the contractor or associate must turn over to PETROECUADOR, at no cost and in a good state of production, the oil wells that are in activity at the time; as well as, in good condition, all equipment, tools, machinery, installations and other real or personal property that were acquired for the purposes of the contract [...]”.¹⁹²⁷

925. In the Tribunal’s view, these provisions set out two separate but related obligations: the first one is an *obligation de moyens*, which would be met if the Consortium employed generally accepted standards and practices in the petroleum industry in the operation of the Blocks, while the second is an *obligation de résultat*, which would only be met if the Consortium delivered the Blocks in a certain condition at the expiration of the PSCs. Whether the Consortium complied with the first obligation will depend on its standard of diligence, whereas whether it complied with the second will depend on an objective assessment of the state of the infrastructure, regardless of diligence. Ultimately,

¹⁹²⁶ Block 7 PSC (**Exh. C-1; CE-CC-28**) and Block 21 PSC (**Exh. C-2; Exh. CE-CC-13**).

¹⁹²⁷ Hydrocarbons Law, Article 29 (**Exh. EL-92**) (Translation by the Tribunal).

however, the amount of any compensation is to be determined on the basis of damage actually caused.

926. With respect to the first obligation, the *obligation de moyens*, the Parties agree that the “best standards and practices generally accepted in the international hydrocarbon industry” referred to in the clauses quoted above include in particular the American Petroleum Institute (API) standards, which are endorsed by Ecuadorian legislation.¹⁹²⁸ For example, Article 10 of the ROH provides that contractors “shall apply, at least” the API standard “and any other rule or standard of the petroleum industry”:

“**Norms and standards:** In hydrocarbon operations, PETROECUADOR and contractors shall apply, at least, the practices recommended by the American Petroleum Institute (API) particularly the following: ‘Exploration and Production Standards’ and the ‘Manual of Petroleum Measurement Standards’ and any other rule or standard of the petroleum industry”.¹⁹²⁹

927. In addition, the RAOHE sets specific standards related to infrastructure and contains several references to the API standards.¹⁹³⁰ It is similarly undisputed that the API standards combine preventive and predictive maintenance techniques.

928. With respect to the second *obligation de résultat*, Burlington’s obligation was to return the equipment in good (working) condition, except for normal wear and tear. For Ecuador, this obligation is informed by the Consortium’s obligation to comply with best standards and practices, as follows:

“[T]he content of the Consortium’s positive hand-back obligation is plainly informed by the Consortium’s ongoing obligation to operate the equipment to “*best standards and practices generally accepted in the international hydrocarbon industry*”. Accordingly, for the reasons explained by Dr. Egan under cross-examination: (i) “*Good condition*” means that the equipment and infrastructure has both been maintained in accordance with best international practice *and* is performing in accordance with its expected industry standard performance levels for equipment and infrastructure of that type and age; and (ii) “*Normal wear*” means that the equipment is only degrading at the industry-expected rate for equipment that has been maintained in accordance with best international practice (assessing actual rates of degradation, not merely maintenance in accordance with manufacturer maintenance intervals, is

¹⁹²⁸ See www.api.org and Catalog of the American Petroleum’s Institute’s 2010 Publications Programs and Services (**Exh. E-299**).

¹⁹²⁹ ROH, Article 10 (**Exh. EL-181**) (Translation by the Tribunal).

¹⁹³⁰ RAOHE, Articles 25, 71 and 72 (**Exh. EL-174**).

the relevant enquiry). “*Good condition*” does not simply mean “*no problems*” at the moment of termination”.¹⁹³¹

929. Ecuador also submits that, according to the best standards and practices in the international hydrocarbon industry, upstream infrastructure must be replaced when (a) it has become obsolete, or (b) it is no longer fit for service. The Parties appear to agree that equipment that is no longer fit for service must be replaced, but differ in their definition of obsolescence:

- i. Burlington, relying on Dr. Egan, submits that “properly-functioning equipment that can be serviced is not considered obsolete in the upstream oil industry. Instead, oil field equipment becomes obsolete when it no longer operates and can no longer be maintained because (i) the manufacturer is no longer in business, (ii) spare parts are no longer available, or (iii) service providers for maintenance are no longer available”.¹⁹³² Dr. Egan does not cite to petroleum standards, but to an article commenting on obsolescence in air force equipment.¹⁹³³
- ii. Ecuador, relying on Mr. Luna, contends that “obsolescence is a rule of efficiency which considers both the technology of the equipment as well as the availability of parts, the cost of maintenance (which is based on the quality of the maintenance), whether the useful life [of the asset] has ended [...] Operational safety should be included in the concept of obsolescence”.¹⁹³⁴ Ecuador thus finds Dr. Egan’s criteria too restrictive “and even absurd as they imply that equipment is not obsolete (and accordingly, need not be replaced as long as it does not fail) even though a newer and more efficient technology has become available and / or the equipment is no longer safe to operate”.¹⁹³⁵

930. The Tribunal notes that neither Dr. Egan nor Mr. Luna have cited to standards in the hydrocarbon industry to make these assertions. It has thus considered each position in the context of Burlington’s contractual obligation, which was to return equipment in

¹⁹³¹ R-PHB, ¶ 936 (emphasis in the original).

¹⁹³² Intertek ER2, ¶ 25. See also: Intertek ER1, ¶ 131.

¹⁹³³ Intertek ER1, ¶ 130, citing to: JB Bissell, *Obsolete Obsolescence*, 2 March 2012 (**Exh. CE-CC-262**).

¹⁹³⁴ Luna WS4, ¶¶ 57, 61, citing to: R. L. Hughes, *Reasons to Replace Equipment*, 2001, www.Reliability.com (Luna WS4, Annex 48).

¹⁹³⁵ Reply, ¶ 453(a).

good (working) condition, except for normal wear, without requiring Burlington to upgrade it to the newest and most efficient technology. It thus finds that Burlington had to replace equipment when it was no longer fit for service, when it could no longer be operated or be maintained, when it had exceeded its useful life, or (even if the above conditions were not met), when it posed an operational safety risk.¹⁹³⁶

931. With these standards in mind, the Tribunal will now turn to Ecuador's infrastructure counterclaims.

2.2 General considerations on the assessment of the infrastructure counterclaims

932. Prior to analyzing each of the infrastructure counterclaims below, the Tribunal wishes to mention three points.

933. First, both Parties challenge the credibility or relevance of each other's witnesses and experts. The Tribunal recognizes that the witness and expert testimony submitted by both Parties has some limitations. With respect to witness evidence, the Tribunal notes in particular that only one of Ecuador's witnesses (Mr. Solís) was present in the Blocks during the Consortium's operatorship, and Burlington has challenged his credibility.¹⁹³⁷ Similarly, Ecuador challenges the relevance of Mr. D'Argentré's testimony, because he was only present in the Blocks from 2007 on. With respect to expert evidence, Ecuador challenges the testimony of Dr. Egan. It argues that, because he only visited the fields in 2012, he cannot attest to the state of the infrastructure in 2009 as a factual matter, nor can he provide an expert opinion on the degradation of the infrastructure on that date. The Tribunal agrees that Dr. Egan is not a factual witness, but it sees no reason to dismiss outright Dr. Egan's expert opinions based on his review of contemporaneous documents.

934. As a result, to the extent possible, the Tribunal will primarily rely on contemporaneous documents to determine the state of the infrastructure on the date of the takeover. If it nevertheless relies on witness evidence, the Tribunal will take into consideration the

¹⁹³⁶ The Tribunal has noted in particular the article cited by Mr. Luna at Annex 48: R. L. Hughes, Reasons to Replace Equipment, 2001, www.Reliability.com ("So how do we know when equipment has actually reached, or is approaching, the end of its useful life cycle. [...] First and foremost is safety. [...] When the equipment presents an unacceptable safety risk to the plant, plant personnel or the environment – replace it!").

¹⁹³⁷ C-PHB, ¶¶ 234-235.

actual knowledge of the particular witness. Similarly, if it relies on expert evidence, the Tribunal will consider whether such evidence is based on an objective assessment of contemporaneous documents in light of the applicable industry standards and practices.

935. Second, there are two contemporaneous reports in the record prepared by an independent third party, SGS, in 2009 and 2010 (the “SGS Reports”).¹⁹³⁸ Both documents assess the condition of the infrastructure (including equipment, facilities and other assets) of Blocks 7 and 21 according to five categories: very good, good, fair, bad, and very bad.¹⁹³⁹ According to those reports, a significant majority of the infrastructure was considered to be in a good or very good condition. Indeed, this seems confirmed by some of Ecuador’s claims, such as those related to tanks and pumps: the Respondent seeks compensation for what it claims was the sub-standard condition of only 3 tanks out of the 89 present on the Blocks, and of only 5 pumps out of the 160 on the Blocks. It is true that Ecuador dismisses the SGS Reports on the grounds that they are mere asset inventories.¹⁹⁴⁰ The Claimant’s expert Dr. Egan, for his part, considers these reports “very important” “as a starting point”, but acknowledges that they are not the equivalent of a technical audit of the condition of the equipment.¹⁹⁴¹
936. Bearing these limitations in mind, the Tribunal will take account of the SGS Reports where appropriate, especially where contemporaneous or other compelling evidence is lacking.
937. Third, it is undisputed that Petroamazonas expanded operations and increased drilling and production on both the Blocks from at least January 2010 onwards.¹⁹⁴² To any outside observer, this expansion and increase in production would entail a need to

¹⁹³⁸ Société Générale de Surveillance, Inventory Report, 2009 (**Exh. CE-CC-217**); Société Générale de Surveillance, Inventory Report, July 2010 (**Exh. CE-CC-240**).

¹⁹³⁹ The excel sheets in Exhibits CE-CC-240 and CE-CC-217 show columns with headings “MB”, i.e. “*muy bueno*”, “B”, i.e. “*bueno*”, “R”, i.e. “*regular*”, “M”, i.e. “*malo*” and “D”, i.e. “*deficiente*”.

¹⁹⁴⁰ R-PHB, ¶¶ 980-983; Solís WS2, ¶¶ 94-95.

¹⁹⁴¹ Tr. (Day 6) (ENG), 2152:16-2153:12 (Tribunal, Egan).

¹⁹⁴² Informe de auditoría con un propósito especial a las inversiones, costos y gastos del Bloque 7 (incluye Campo Coca-Payamino), Administración Temporal Petroamazonas S.A. (Actual Petroamazonas EP), Periodos del 17 de julio al 31 de diciembre del 2009 y del 1 de enero al 20 de julio del 2010 (**Exh. E-542**); Informe de auditoría con un propósito especial a las inversiones; ingresos; costos y gastos de producción, transporte y otros costos y gastos Perenco Ecuador Limited, Bloque 21, Periodo 1 de enero al 31 de diciembre del 2010, alcance año (**Exh. E-543**).

improve the existing infrastructure. Here again, Ecuador seeks to diminish the importance of this fact. It in particular stresses that none of the amounts claimed is associated with the expansion of production in the Blocks.¹⁹⁴³ The amounts claimed – approximately USD 17 million – confirms this, says the Respondent, when one compares this figure with Petroamazonas’s average annual maintenance costs of USD 25 million.¹⁹⁴⁴

938. As a general matter, the Tribunal has no reason to doubt Ecuador’s statement that the amounts claimed here are unrelated to the expansion of the activities in Blocks 7 and 21. It remains though that the evidence of Petroamazonas’s expansion activities make it sometimes difficult to establish the facts as they stood when Burlington left the Blocks. The Tribunal will keep this in mind when assessing the evidence and will now review each type of claim individually.

2.3 Claims related to tanks

2.3.1 Ecuador’s position

939. Ecuador argues that the Consortium operated and built sub-standard facilities (referring mostly to platforms and CPFs). It continued to use facilities that had been built “more than 15 years” ago without replacing them.¹⁹⁴⁵ It even built new facilities “using old pumps and tanks recycled from older facilities that were dismantled for this purpose”,¹⁹⁴⁶ including pieces of equipment that were “too old”¹⁹⁴⁷ to be recycled.

940. Ecuador submits that the storage tanks are a salient example of how the Consortium used and built facilities that did not comply with industry standards.¹⁹⁴⁸ First, Ecuador contends that the Consortium purchased sub-standard tanks to avoid the costs of more expensive tanks from established suppliers. In addition, Ecuador emphasizes that the Consortium did not build a single tank in Block 7 with new materials. While recycling parts of old tanks is not prohibited, it must comply with strict requirements that were not

¹⁹⁴³ R-PHB, ¶ 993, in reliance of testimony from Messrs. Montenegro and Luna, in particular: Montenegro WS3, ¶ 19; Luna WS4, ¶ 32.

¹⁹⁴⁴ R-PHB, ¶ 993.

¹⁹⁴⁵ Solís WS1, ¶ 11.

¹⁹⁴⁶ 2nd SMCC, ¶ 371.

¹⁹⁴⁷ *Ibid.*, citing: Solís WS1, ¶ 13.

¹⁹⁴⁸ 2nd SMCC, ¶¶ 368-376.

met in this case. As a consequence, these tanks posed a safety and environmental risk. As for Block 21, the tanks were bought at a discount from an inexperienced company, and it is thus not surprising that they were sub-standard.

941. Second, the Consortium failed to properly maintain these tanks. Inspections carried out from 2010 onwards show that several tanks in Blocks 7 and 21 were in need of repair given their bad condition, which exceeded normal wear and tear. These tanks posed significant safety and environmental risks. A 5,000 barrel storage tank in the Oso CPF, for instance, “only allowed for a 30-minute reaction time from pump failure before a spill”.¹⁹⁴⁹ The Consortium also wrongly sought to minimize the seriousness of the situation in its 2008 Environmental Audit.¹⁹⁵⁰
942. Ecuador specifies that the following tanks were in bad condition beyond normal wear and tear as follows:
- i. The Yuralpa CPF T-400 tank. According to Ecuador, the bad condition of this tank was reported in two inspections in 2010 and 2011. The 2011 inspection reported that 71% of the tank’s internal coating had deteriorated and recommended exhaustive repair of the tank’s interior, which was done by a third party.¹⁹⁵¹
 - ii. The Gacela CPF T-101 (T-72130A), T-102 (T-72130B) and T-104 (now T-72400) tanks. According to Ecuador, various inspections between 2010 and 2012 detected serious corrosion at levels exceeding normal wear and tear, and recommended full repair of tank T-104, which was done in 2012. The inspection reports for tanks T-101 and T-102 also indicated that parts of these tanks were worn out beyond normal wear and tear and had to be replaced.¹⁹⁵² According to Ecuador, this shows that the Consortium’s maintenance was insufficient.
 - iii. The Coca CPF T-101 (T-71130), T-102 (T-71400A) and T-106 (T-71400B) tanks. Ecuador alleges that inspections carried out in 2011 and 2012 identified corrosion levels exceeding normal wear and tear on the shells and roof, as well as leaking

¹⁹⁴⁹ *Id.*, ¶ 373.

¹⁹⁵⁰ *Id.*, ¶ 377.

¹⁹⁵¹ Reply, ¶ 493(a); Luna WS4, Annexes 45, 52 and 53.

¹⁹⁵² Reply, ¶ 493(b); Luna WS4, Annexes 55, 56, 57, 58, 59, 60.

joints and cracked basins.¹⁹⁵³ According to Ecuador, this shows that the repairs carried out by the Consortium in T-101 and T-102 were insufficient.¹⁹⁵⁴

iv. The Payamino CPF T-101 (T-70130), T-102 (T-70100) and T-105 (T-70400) tanks. Ecuador notes that inspections carried out between 2010 and 2011 identified issues of abnormal wear and tear, including the fact that four rings and the roof of the T-101 tank should have been replaced before July 2009 (at the then corrosion rate).¹⁹⁵⁵

943. Out of those tanks, Ecuador claims the amounts spent to repair Gacela T-104, Payamino T-102 and Yuralpa T-400, for a total of USD 902,962.¹⁹⁵⁶

2.3.2 Burlington's position

944. By contrast, Burlington contends that the Consortium had a suitable tank maintenance program which included cathodic protection and frequent inspections to check for external corrosion, dents and leaks.¹⁹⁵⁷

945. Burlington also notes that Ecuador's claim relates to a mere three tanks out of the 89 tanks on the Blocks. The small percentage of tanks that are the subject of this claim (3.3%) shows that the vast majority of the tanks were in good working condition at the time when Ecuador took over the Blocks and is proof that the Consortium's comprehensive tank maintenance and repair program was effective.¹⁹⁵⁸

946. Furthermore, Burlington argues that the Block 7 tanks which, according to Ecuador, needed to be replaced or repaired, underwent comprehensive repairs between 2005 and 2008 or were taken out of service with governmental approval.¹⁹⁵⁹ In respect of the Block 21 tanks, they were built in accordance with industry standards and adequately

¹⁹⁵³ Reply, ¶ 493(c); Luna WS4, Annexes 27, 61, 62, 63, 64, 65.

¹⁹⁵⁴ Reply, ¶ 493(c); Solís WS2, ¶¶ 51-52.

¹⁹⁵⁵ Reply, ¶ 493(d); Solís WS2, ¶ 49; Luna WS4, ¶ 93 and Annex 68.

¹⁹⁵⁶ Reply, ¶¶ 515 and 523; Montenegro WS1, ¶ 23; Montenegro WS3, ¶ 17 and Annexes 3-5; Luna WS4, ¶ 160 and Annexes 54 and 90.

¹⁹⁵⁷ CMCC, ¶ 547.

¹⁹⁵⁸ Rejoinder, ¶ 381.

¹⁹⁵⁹ CMCC, ¶¶ 548-553.

maintained with a cathodic protection process.¹⁹⁶⁰ In particular, Burlington asserts that the reported degradation and corrosion in the three tanks on which Ecuador bases its claim occurred under Petroamazonas's watch, well after the Consortium left the Blocks.¹⁹⁶¹ As a consequence, concludes Burlington, Ecuador's tank claims are groundless and should be rejected.

2.3.3 Discussion

947. Ecuador takes issue with the Consortium's practices for the building and maintenance of storage tanks. It also asserts that 10 tanks out of 89 were in a bad condition beyond normal wear and tear when Ecuador took over the Blocks, but limits its damages claim to the cost of repairing three tanks.
948. The Tribunal finds that Ecuador has not substantiated its claim that the Consortium failed to construct or maintain tanks in accordance with industry standards and practices.
949. First, Dr. Egan has confirmed that, in his expert opinion, these tanks were constructed and maintained in accordance with industry standards. Dr. Egan notes (and Mr. Luna does not disagree) that oil storage tanks are built in accordance with API 650, while their maintenance is governed by API 653 and bolted storage tanks for oil processing are governed by API 12B.¹⁹⁶² After reviewing a selection of the tanks in the Blocks (between 15 to 20) during his visit in 2012, as well as maintenance records, Dr. Egan confirmed that the Consortium abided by these standards. Specifically:
- i. With respect to construction, Dr. Egan confirmed that all of the tanks which he examined had the manufacturers' name plates attached, indicating that the tanks were manufactured in accordance with API 650.¹⁹⁶³
 - ii. With respect to maintenance, Dr. Egan confirmed that "the Consortium (1) regularly inspected the tanks and kept records of observations made during those inspections; (2) monitored the corrosion of the tanks according to API 653; (3)

¹⁹⁶⁰ *Id.*, ¶¶ 554-556.

¹⁹⁶¹ C-PHB, ¶ 264.

¹⁹⁶² Intertek ER1, ¶ 105.

¹⁹⁶³ *Id.*, ¶ 107.

implemented an effective cathodic protection program; (4) worked with independent contractors to conduct periodically comprehensive assessments in order to identify necessary repairs; (5) devised plans to repair the large tanks on the Blocks; (6) kept Ecuador apprised of tank repair plans; and (7) implemented these plans”.¹⁹⁶⁴ Dr. Egan then concluded that “[i]n light of the Consortium’s diligence in inspecting the tanks, the corrosion control and monitoring, the thorough assessments, and the creation and implantation of tank repair plans, I believe the Consortium was a responsible operator and complied with best industry practices”.¹⁹⁶⁵ To support this conclusion, Dr. Egan cited numerous inspection reports and maintenance records.¹⁹⁶⁶

950. The Tribunal is aware that Dr. Egan’s physical inspection was limited to 15 to 20 tanks out of 89, and that Mr. Luna has objected to his assessment of the Consortium’s inspection records. However, the fact that Ecuador has limited its comments to 10 out of 89 tanks (i.e., 11%), and claims damages with respect to only 3 of them (3%), suggests that the Consortium’s maintenance plan was generally adequate, and that problems were the exception.

951. Second, as Dr. Egan has pointed out, the inspections carried out by Petroamazonas took place between 2010 and 2012, i.e. between one to three years after the takeover of the Blocks, and the type of corrosion identified by Petroamazonas in the tanks is one that normally occurs quickly. As a result, inspections carried out one year later or thereafter would not be able to demonstrate whether the alleged corrosion was caused by the Consortium. Dr. Egan explains this as follows:

“Ecuador is relying on ‘tank inspections’ conducted ‘from 2010 onwards’ to demonstrate that a certain degree of corrosion plagued the tanks in July 2009. This is a risky approach because corrosion can develop and propagate rapidly due to internal vapors of the liquid contained in the tank. As Mr. Luna discusses in his third witness statement, there are two types of corrosion: ‘homogenous’ corrosion, which impacts equipment uniformly, and ‘localized’ corrosion, which appears in the form of ‘pitting’ (holes) and fissures. While homogenous corrosion results in normal wear

¹⁹⁶⁴ *Id.*, ¶ 110.

¹⁹⁶⁵ *Id.*, ¶ 123.

¹⁹⁶⁶ *Id.*, ¶¶ 110-123, referring to: Exhs. CE-CC-164; CE-CC-188; CE-CC-212; CE-CC-075; CE-CC-211; CE-CC-005; CE-CC-170; CE-CC-160; CE-CC-086; CE-CC-092; CE-CC-181; CE-CC-087; CE-CC-148.

and can be more easily addressed and repaired, localized corrosion ‘is insidious and often results in failure or even total destruction of equipment without warning’.

‘Localized’ corrosion can occur very quickly and is often unanticipated. This type of corrosion generally occurs from the inside of tanks, as tanks of stored fluids contain a fair amount of oxygen, carbon dioxide and acids, which form a corrosive substance. As acid condenses on the roof of the tank, it gains greater concentration when evaporation occurs and can become extremely corrosive (as seems to have occurred in the Gacela T-104 tank, for example).

It is therefore incorrect to assume, as Mr. Luna does, that corrosion condition at one point in time accurately reflect the condition a year or more earlier”.¹⁹⁶⁷

952. On this basis, Dr. Egan concludes that “[n]one of the inspection reports submitted by Ecuador, some of which were conducted two and a half years after Ecuador took over the Blocks, suggests that the current damage to the tanks was caused by the Consortium’s operations. Rather, it appears that the tanks have fallen into much worse condition since Petroamazonas took control of the Blocks”.¹⁹⁶⁸

953. Having considered both Mr. Luna’s and Dr. Egan’s testimony as well as the documents in the record, the Tribunal reaches the conclusion that Ecuador has not established that the Consortium breached its obligation to construct and maintain tanks according to industry standards.

954. The Tribunal turns now to Ecuador’s claim that the Consortium returned certain tanks evidencing deterioration beyond normal wear and tear. As Ecuador claims damages for only three specific tanks, the Tribunal will focus its analysis on these items.

a. Gacela T-104 tank

955. The record shows that the Gacela T-104 tank was inspected in December 2010, December 2011 and February 2012.¹⁹⁶⁹ The December 2010 inspection detected problems with the tank roof, which had a hole and presented high level of oxidization.¹⁹⁷⁰ The December 2011 inspection reported that “the damages caused by

¹⁹⁶⁷ Intertek ER2, ¶¶ 79-81, citing: Luna WS4, ¶ 65.

¹⁹⁶⁸ Intertek ER2, ¶ 82.

¹⁹⁶⁹ Luna WS4, Annexes 55 to 57.

¹⁹⁷⁰ *Id.*, Annex 55, p.1.

the corrosive processes have increased in a significant manner since the records held for the month of March” and called for a complete change of the roof, among other measures.¹⁹⁷¹ The February 2012 inspection concluded that the tank roof and bottom had to be replaced and a cathodic protection system needed to be put in place.¹⁹⁷² The SGS Reports are of no assistance in this context as they make no mention of this tank.

956. Dr. Egan agrees that the pictures taken during these inspections “clearly demonstrate significant levels of corrosion”, but opines that “Ecuador fails to explain how the pitting corrosion located on the Gacela T-104 tank at the time of the inspections is attributable to the Consortium”.¹⁹⁷³ According to Dr. Egan, the fact that the tank was in good condition when it was inspected in December 2008 and April 2009 suggests that it was also in good condition in July 2009.

957. The Tribunal is not persuaded by Dr. Egan’s explanations. The corrosion of the tank roof reported in 2010 was already signaled during inspections of the Consortium in December 2008 and April 2009, although the roof was still considered in good condition then.¹⁹⁷⁴ Dr. Egan recognizes that “it is entirely possible that the minimal corrosion identified in April 2009 rapidly progressed and became visible in December 2010”.¹⁹⁷⁵ As a result, the Tribunal finds it reasonable to consider that the cause of the corrosion can be traced back to the Consortium’s operatorship.

958. The Tribunal thus grants damages in the amount of USD 293,442.00, which Ecuador spent to repair the Gacela T-104 tank.¹⁹⁷⁶ It notes that Burlington has not challenged the quantification of this claim as such.

b. Payamino T-102 tank

959. Ecuador submits that inspections of the Payamino tank took place between 2010 and 2011. In support, it provides the contract signed between Petroamazonas and Conduto

¹⁹⁷¹ *Id.*, Annex 56, pp. 6-7 (Translation by the Tribunal).

¹⁹⁷² *Id.*, Annex 57, p. 12.

¹⁹⁷³ Intertek ER2, ¶ 87.

¹⁹⁷⁴ Consortium Block 7 and 21 – Block 7 Monthly Inspection of Tanks, 2 July 2008 (**Exh. CE-CC-164**), pp. 15 and 58, and Monthly Inspection Report for Gacela Tank T-104, 4 April 2009 (**Exh. CE-CC-341**).

¹⁹⁷⁵ Intertek ER2, ¶ 89.

¹⁹⁷⁶ Luna WS4, Annex 90.

to perform the repairs on tank T-102 which focused mainly on cleaning and painting the tank both internally and externally.¹⁹⁷⁷ This document does not contain a description of the state of the tank at that time.

960. The documentary evidence regarding the state of this tank before July 2009 is found in a document prepared by the Consortium in April 2008 setting out the basis for the bidding process to repair the Coca and Payamino tanks.¹⁹⁷⁸ It shows that, in March 2008, this tank was not in a critical condition but was in need of further inspection and reparation. The document specifically mentions that the T-102 tank should be cleaned and painted.¹⁹⁷⁹ Dr. Egan recognizes this, but notes that “[b]ased on this repair report, the Consortium developed a project plan with a proposed start date of October 2009 and a duration of eight weeks to conduct the necessary repairs”, but by that time the Consortium was no longer operating the Blocks.¹⁹⁸⁰

961. This may have been so, but the record shows that this tank developed corrosion beyond normal wear and tear during the Consortium’s watch and that on the date of the takeover it had not been repaired. Ecuador claims USD 322,960.42 for the repairs done to this tank,¹⁹⁸¹ an amount that Burlington does not dispute as such. However, the Tribunal notes that the amount claimed by Ecuador includes repairs made to pipelines and other items. While the Tribunal considers that Ecuador’s pipeline claim is justified (see Section 2.4 below), it finds that Ecuador has not justified the claims for other repairs and improvements itemized in Mr. Montenegro’s Annex 3. After a review of this document, the Tribunal grants this claim in an amount of USD 210,130.76, which is the amount that in the Tribunal’s view may be attributed to repairs made to tank T-102 and pipelines.¹⁹⁸²

¹⁹⁷⁷ Montenegro WS3, Annex 5.

¹⁹⁷⁸ Solís WS2, Annex 34. The SGS Reports are again not relevant in this context as they make no specific reference to this tank.

¹⁹⁷⁹ Solís WS2, Annex 34, pp. 60-62 in the Spanish version and pp. 15-17 in the English translation.

¹⁹⁸⁰ Intertek ER2, ¶ 93, referring to: Remediation report on incident in Mono CPF, including subsequent communications and approvals, July to October 2008 (**Exh. CE-CC-343**).

¹⁹⁸¹ 2nd SMCC, ¶ 410, Montenegro WS1, Annex 3.

¹⁹⁸² Specifically, the Tribunal has reviewed Mr. Montenegro’s Annex 3, which contains the list of items adding up to the total amount claimed by Ecuador, and has subtracted all items that manifestly do not relate to repairs done to Payamino Tank T-102 or pipelines, such as, *inter alia*,

c. Yuralpa T-400 tank

962. In connection with the Yuralpa T-400 tank, two inspections were carried out in March 2011. The first inspection recommended a complete repair of the interior of the tank and identified some punctures in the body and roof of the tank that did not pose “an immediate risk to the mechanical and structural integrity of the vessel”.¹⁹⁸³ The second inspection carried out in the same month after having “sand blasted” the tank concluded that “[d]espite punctures present in the roof slaps and beams, there is no evidence of any problems that could put mechanical and structural integrity of the container at immediate risk. We recommend carrying out a careful application of the lining [...] as well as keeping an annual monitoring program for the thickness of the tank roof”.¹⁹⁸⁴ The repairs were subsequently carried out by Conduto.¹⁹⁸⁵ However, all references to Yuralpa T-400 in the SGS Reports indicate that the elements composing this tank were in “good” or “very good” condition.¹⁹⁸⁶
963. Since the first inspection identifying a defective condition of this tank dates from March 2011, which is about 20 months after the Consortium had left the fields, and the SGS Report of June 2009 describes the condition of the components of this tank as “good” or “very good”, the Tribunal considers that Ecuador has not established that any damage to this equipment and costs incurred in relation to the condition of this equipment were caused by the Consortium. As a result, it dismisses this claim.
964. In conclusion, the Tribunal grants the claim related to tanks in part in respect of the Gacela T-104 and the Payamino T-102 tanks in an aggregate amount of USD 503,572.76.

improvements done to the Jaguar camp’s dining room and kitchen, or replacement of floors in the Yuralpa offices.

¹⁹⁸³ Luna WS4, Annex 52, p. 6 (Translation by the Tribunal).

¹⁹⁸⁴ *Id.*, Annex 53, p. 5 (Translation by the Tribunal).

¹⁹⁸⁵ *Id.*, Annex 54.

¹⁹⁸⁶ See, for instance: Société Générale de Surveillance, Inventory Report, 2009, “Amortizable B21”, lines 604 *et seq* (**Exh. CE-CC-217**).

2.4 Claims related to fluid lines and pipelines

2.4.1 Ecuador's position

965. Ecuador submits that the Consortium failed to repair, replace and/or properly maintain fluid lines and pipelines. According to the Respondent, fluid lines transport production fluid (a mixture of crude, gas and formation water, a very corrosive water) from the wellhead to the CPF, where it is filtered, while pipelines transport the crude from the CPF to the main pipeline through which the crude leaves the block.¹⁹⁸⁷
966. Ecuador argues that the Consortium did not have a proper pipeline and fluid line maintenance program. Block 7 had more than 100 kilometers of old and badly maintained fluid lines and pipelines, and neither of the two most important pipelines in Block 7 was replaced or properly maintained. The Consortium did not even have the specialized personnel required to monitor the state of its fluid lines and pipelines.¹⁹⁸⁸
967. Mr. Solís described the poor state of the Consortium's fluid lines and pipelines as "one of the most serious problems we had".¹⁹⁸⁹ According to Mr. Solís, Repsol performed fluid line and pipeline maintenance on a weekly basis, whereas no maintenance was ever done by the Consortium. Fluid lines and pipelines were thus in a state of decay by July 2009, with no maintenance records or corrosion data.¹⁹⁹⁰ Mr. Solís notes in particular that the Consortium failed to "pig" its pipelines.¹⁹⁹¹
968. As a result, when Petroamazonas arrived on the Blocks in July 2009, it "inherited a network of decayed pipes, especially in Block 7, with no maintenance records or data as to the state of corrosion of the pipes, with the corresponding operational and environmental risks. Petroamazonas had, therefore, at great expense, to commission technical studies and replace portions of the pipelines".¹⁹⁹²
969. Specifically, Ecuador explains that Petroamazonas commissioned technical studies for two pipelines: (i) the 12-kilometer pipeline connecting the Gacela and Coca CPFs,

¹⁹⁸⁷ 2nd SMCC, ¶ 379.

¹⁹⁸⁸ *Id.*, ¶ 380.

¹⁹⁸⁹ Solís WS1, ¶ 17.

¹⁹⁹⁰ *Id.*, ¶¶ 21-22.

¹⁹⁹¹ *Id.*, ¶ 22.

¹⁹⁹² 2nd SMCC, ¶ 385, referring to: Luna WS2, ¶ 11-13 and Annex 5; Montenegro WS1, ¶¶ 19-23.

commissioned to SETE (March 2011, the “SETE Report”),¹⁹⁹³ and (ii) a 37-kilometer section of the pipeline connecting the Mono/Jaguar/Oso CPF with the Gacela CPF, commissioned to Petroenergy (January 2012, the “Petroenergy Report”).¹⁹⁹⁴ According to Ecuador, the SETE Report concluded that various sections of the Gacela-Coca pipeline needed to be urgently replaced due to severe corrosion and physical damage, while the Petroenergy Report identified 296 defects in the Mono/Jaguar/Oso to Gacela pipeline, of which 44 were considered critical and thus requiring immediate repair.¹⁹⁹⁵ As a consequence, several replacement and repair works were carried out.

970. Ecuador thus seeks to recover USD 1,667,655.83, i.e. the amount spent on the assessment and repair of the pipelines and fluid lines.¹⁹⁹⁶ In addition, the Respondent alleges that it built two new pipelines, although this cost is not included in its claim.

2.4.2 Burlington’s position

971. Burlington contends that the Consortium had a comprehensive pipeline and fluid line maintenance program that adequately addressed both external and internal corrosion. For Burlington, this is confirmed by the fact that Ecuador’s pipeline claim concerns only a very small percentage of the entire pipeline network of the Blocks. It follows that the vast majority of the pipelines were in good working condition.¹⁹⁹⁷ In any event, Burlington argues that the Consortium’s proper maintenance of the pipelines is confirmed by its maintenance records.¹⁹⁹⁸

¹⁹⁹³ Inspección UT de la Línea de Transferencia Gacela-Payamino-Coca 8” NPS, 17 March 2011; see: Luna WS2, Annex 5.

¹⁹⁹⁴ Informe Final de Inspección del Sistema de Protección Catódica CIS – ACVG – PH-Resistividad Jaguar 5 – Lobo 3, January 2012; see: Luna WS3, Annex 14.

¹⁹⁹⁵ 2nd SMCC, ¶¶ 381-388.

¹⁹⁹⁶ Ecuador’s Opening Statement, Slide 136; Luna WS2, Annexes 8, 10, 12 and Luna WS4, Annexes 93 to 96.

¹⁹⁹⁷ CMCC, ¶¶ 574-575; Rejoinder, ¶ 389; D’Argentré WS1, ¶¶ 7-8.

¹⁹⁹⁸ C-PHB, ¶ 256, referring to: Visual Inspection of Payamino Gacela Pipelines, 2008, p. 0003 (**Exh. CE-CC-150**); Perenco Ecuador Limited, Inspection of Pipe Widths Gacela -03 Gacela CPF, June 2006, p. 0002 (**Exh. CE-CC-114**); Department of Constructions, Report of Measured Thickness in the Flow Lines and Pipelines of Block 7, 2004, p. 0010 (**Exh. CE-CC-63**); Baker Hughes, Perenco Ecuador Limited Block 21 - Monthly Report of Treatment of Dehydration and Reinjection Chemicals, September 2005 (**Exh. CE-CC-94**); Baker Hughes, Perenco Block 7 Chemical Treatment, 2006 (**Exh. CE-CC-10**); Amendment No. 14 to Contract for Provision of Chemical Products and Services for the Treatment of Crude in Block 7, 27 January 2009 (**Exh. CE-CC-194**); Perenco, Pipeline Cathodic Protection, June 2003 to December 2005 (**Exh. CE-**

972. Burlington argues that Ecuador advances two main criticisms to its maintenance of pipelines: (i) that the Consortium failed to carry out a comprehensive inspection of the pipelines between 2004 and 2009, and (ii) that it did not use “pigging” as a method for cleaning pipelines.¹⁹⁹⁹ Burlington rejects each of these claims.
973. With respect to (i), Burlington contends that it was not required to conduct a comprehensive inspection of the pipelines prior to the end of 2009. The Consortium carried out a thorough pipeline inspection in 2004 and, as the API standards only require such inspections every 5 years, the next comprehensive inspection of the pipelines was not due until the end of 2009.²⁰⁰⁰ In any event, in the 2004-2009 period the Consortium performed regular visual inspections, and employed standard industry methods in its maintenance practices.²⁰⁰¹
974. With respect to (ii), Burlington observes that the practice of pigging is only one of several methods to clean pipelines and is not required under industry standards. Indeed, due to their configuration, many pipelines were “unpiggable”.²⁰⁰² The Consortium’s decision to use chemical injection was thus reasonable and in any event equally effective.²⁰⁰³
975. Burlington denies that the SETE and Petroenergy Reports provide evidence that there were serious problems with the pipelines at the time when Ecuador took over the Blocks. Burlington argues that these reports (i) do not actually report “decayed pipes”; (ii) to the contrary, they report problems that amount to typical wear and tear which

CC-56); Accounting List of Creditor Alfredo Cabrera, 2000-2009 (**Exh. CE-CC-30**); Perenco Ecuador Limited, Annual Activity Report for Block 7 for Year 2008, January 2009, pp. 0019-0023 (**Exh. CE-CC-195**); Letter from Christophe Delepine (Perenco) to Javier Egüez (DNH), 28 July 2006, p. 0027 (**Exh. CE-CC-170**); Ministry of Mines and Petroleum, Cathodic Protection Control Report Block 21, March 2008, p. 0052 (**Exh. CE-CC-160**); HSE & SD Assessment and Other Technical Services, November 2006, p. 0161 (**Exh. E-222**); Daily Report, Repair of Buried Pipelines, November 2006 (**Exh. CE-CC-379**).

1999

Rejoinder, ¶ 391.

2000

Id., ¶ 392; Intertek ER2, ¶¶ 104-105.

2001

Intertek ER1, ¶ 80.

2002

Rejoinder, ¶ 393.

2003

Ibid., referring to: D’Argenté WS1, ¶ 82; Intertek ER2, ¶¶ 106-108.

were inexpensive to fix and arise along less than 50 km of pipeline; and (iii) speak of conditions of the pipelines over a year after Ecuador's takeover.²⁰⁰⁴

976. According to Burlington, the Respondent's claim is for costs that relate to routine maintenance activities. The inspection carried out by SETE was part of a normal pipeline maintenance schedule under API standards that only came due after the Respondent took over the Blocks. Similarly, the corrosion inspection carried out by Petroenergy is an inspection that any operator must conduct as part of routine maintenance. Burlington further contends that the objective of both inspections was to determine whether the existing system could handle Petroamazonas' increased production.²⁰⁰⁵

2.4.3 Discussion

977. Ecuador argues that the Consortium failed to carry out proper maintenance of the fluid lines and pipelines and, as a result, the Consortium must compensate Petroamazonas for the cost of assessing and repairing the pipelines.

978. The Parties' positions differ widely as to whether the Consortium complied with its obligation to carry out proper maintenance for fluid lines and pipelines. While Ecuador and its witnesses emphatically assert that the Consortium did not have a maintenance program in place, and "never" carried out maintenance activities, Burlington and its witness and expert strongly affirms that it did have a maintenance program in place, citing numerous maintenance records in support.

979. The Tribunal agrees with Ecuador that Burlington did not appear to have a "written, forward looking maintenance plan" in place for the Consortium's pipelines and fluid lines.²⁰⁰⁶ Mr. D'Argentré was unable to point to a specific document in the record, and contended instead that the pipeline management plan was "live".²⁰⁰⁷ One can only speculate as to what Mr. D'Argentré meant by "live", but if a pipeline maintenance program was in place in an operation such as the Consortium's, it is implausible that there would have been no comprehensive record of such a program. Mr. D'Argentré

²⁰⁰⁴ CMCC, ¶¶ 581-588.

²⁰⁰⁵ *Id.*, ¶¶ 589-592.

²⁰⁰⁶ R-PHB, ¶ 945.

²⁰⁰⁷ Tr. (Day 6) (ENG), 2063:11-2064:18 (Cross, D'Argentré).

clarified that he was not saying that no written plan existed, but rather that he did not have access to it.²⁰⁰⁸ It remains, however, that no written maintenance plan has been submitted into the record.

980. Contrary to what Dr. Egan suggests,²⁰⁰⁹ the manual entitled “Program of Inspection and Integrity Management” to which he refers does not appear to be a pipeline maintenance program, but rather a report on the details of the different pipelines in Block 7.²⁰¹⁰ Indeed, despite its name, this document indicates that no “integrity management programme” is available for any of the pipelines recorded.²⁰¹¹ And as Ecuador points out, had this document indeed been a pipeline management program, Mr. D’Argentré would have referred to it.²⁰¹²
981. That being said, Burlington has submitted numerous maintenance records showing that it carried out maintenance of the pipelines, including (i) visual inspections and ultrasonic thickness measurements;²⁰¹³ (ii) chemical injection programs designed to prevent internal corrosion of pipelines;²⁰¹⁴ (iii) cathodic protection of pipelines;²⁰¹⁵ and (iv)

²⁰⁰⁸ Tr. (Day 6) (ENG), 2063:20-2064:6 (Cross, D’Argentré).

²⁰⁰⁹ Intertek ER1, ¶ 79.

²⁰¹⁰ Inspection and Integrity Management Program, September 2008 (**Exh. CE-CC-175**).

²⁰¹¹ *Id.*, pp. 3-8.

²⁰¹² R-PHB, ¶ 942(a).

²⁰¹³ Visual Inspection of Payamino Gacela Pipelines, 2008, p. 0003 (**Exh. CE-CC-15**); Perenco Ecuador Limited, Inspection of Pipe Widths Gacela -03 Gacela CPF, June 2006, p. 0002 (**Exh. CE-CC-114**); Department of Constructions, Report of Measured Thickness in the Flow Lines and Pipelines of Block 7, 2004, p. 0010 (**Exh. CE-CC-63**).

²⁰¹⁴ Baker Hughes, Perenco Ecuador Limited Block 21- Monthly Report of Treatment of Dehydration and Reinjection Chemicals, September 2005 (**Exh. CE-CC-94**); Baker Hughes, Perenco Block 7 Chemical Treatment, 2006 (**Exh. CE-CC-106**); Amendment No. 14 to Contract for Provision of Chemical Products and Services for the Treatment of Crude in Block 7, 27 January 2009 (**Exh. CE-CC-194**).

²⁰¹⁵ Perenco, Pipeline Cathodic Protection, June 2003 to December 2005 (**Exh. CE-CC-56**); Accounting List of Creditor Alfredo Cabrera, 2000-2009 (**Exh. CE-CC-30**); Perenco Ecuador Limited, Annual Activity Report for Block 7 for Year 2008, January 2009, pp. 0019-0023 (**Exh. CE-CC-195**); Letter from Christophe Delepine (Perenco) to Javier Egüez (DNH), 28 July 2006, p. 0027 (**Exh. CE-CC-170**); Ministry of Mines and Petroleum, Cathodic Protection Control Report Block 21, March 2008, p. 0052 (**Exh. CE-CC-160**); HSE & SD Assessment and Other Technical Services, November 2006, p. 0161 (**Exh. E-222**).

inspections and repairs of buried pipelines.²⁰¹⁶ The Tribunal thus concludes that the Consortium did carry out maintenance activities with respect to fluid lines and pipelines.

982. Whether these maintenance activities were in accordance with industry standards is a different question. Dr. Egan affirms that they were;²⁰¹⁷ Mr. Solís strongly disagrees.²⁰¹⁸ The Tribunal is satisfied that, pursuant to the industry standards, the Consortium did not need to carry out another comprehensive inspection of its pipelines until late 2009 (i.e., after the takeover), as the relevant standard (API RP570 - Piping Inspection Code) requires major inspections to be carried out every 5 years. It also finds that the Consortium's failure to use "pigging" to clean its pipelines was not in breach of industry standards.

983. Whether the Consortium complied with industry standards in its other maintenance activities is more difficult to establish. The Tribunal notes that a 2011 Petroamazonas report on the mechanical integrity of the transfer pipeline between Oso/Mono and Gacela, to which Mr. Luna refers, notes that several parts of that pipeline had not received preventive maintenance since its entry into service.²⁰¹⁹ While this report refers to a single pipeline, it suggests that the Consortium's maintenance of pipelines was substandard.

984. Ultimately, however, what matters here is whether the pipelines that Petroamazonas received at the takeover were in a condition beyond normal wear and tear. The Tribunal has noted the emphatic testimony of Messrs. Luna, Montenegro and Solís, all of whom attested to the dire conditions of the pipelines at the time of the takeover.²⁰²⁰ The evidence of these three witnesses with direct, contemporaneous knowledge of the state of the pipelines is a relevant indication which must be assessed together with the documentation in the record.

²⁰¹⁶ Daily Report, Repair of Buried Pipelines, November 2006 (**Exh. CE-CC-379**).

²⁰¹⁷ Intertek ER1, ¶¶ 79-98.

²⁰¹⁸ Solís WS1, ¶¶ 17-23; Solís WS2, ¶¶ 57-72.

²⁰¹⁹ Petroamazonas, Mechanical Integrity Maintenance Department, Report 001-11 of 3 January 2011, "Integridad mecánica de oleoducto de transferencia Oso y Mono hacia Gacela"; Luna WS4, Annex 47, p. 10, noting *inter alia* that there has been no preventive maintenance in the Mono-Lobo or Lobo-Gacela sections, or in the OPF line (Oso CPF)-Tie in Jaguar or SPF line (Oso 9) – OPF (Oso CPF).

²⁰²⁰ Solís WS1, ¶¶ 17-23; Solís WS2, ¶¶ 57-72; Luna WS2, ¶¶ 11-13 and Annex 5; Montenegro WS1, ¶¶ 19-23.

985. There are three comprehensive studies of the state of the pipelines in Block 7 on record:
- i. The report prepared by the Consortium in November 2004 (the “Consortium Report”);²⁰²¹
 - ii. The SETE Report commissioned by Petroamazonas in March 2011 (the “SETE Report”);²⁰²² and
 - iii. The Petroenergy Report commissioned by Petroamazonas in January 2012 (the “Petroenergy Report”).²⁰²³
986. While none of these reports is contemporaneous to the takeover, they provide evidence with respect to the state of the pipelines at various points in time.
987. The Consortium Report was prepared nearly five years before the Respondent took over the Blocks. It covers part of Block 7, in particular the Gacela, Payamino, Coca and Oso fields and applies standards API 570, ASME B31.3, ASME B31.4, ASME B36.10M, and NACE RP-01-75. Out of all the lines examined, nothing of relevance is signaled, except for a recommendation of regular re-inspection and monitoring in respect of formalities.²⁰²⁴
988. Drafted 18 months after the Blocks were taken over by Petroamazonas, the SETE Report relates to a 12 km pipeline connecting Gacela CPF to Coca CPF. The purpose of this report was among others to:
- “Determine the current state of the line [...]
 - Identify the areas that require repairs or replacement of sections [...]
 - Assess the results obtained applying the standards provided by ASME B31.4 – ASME B31G – API 570”.²⁰²⁵

²⁰²¹ Department of Constructions, Report of Measured Thickness in the Flow Lines and Pipelines of Block 7, 2004 (**Exh. CE-CC-63**).

²⁰²² Luna WS2, Annex 5.

²⁰²³ Luna WS3, Annex 14.

²⁰²⁴ Department of Constructions, Report of Measured Thickness in the Flow Lines and Pipelines of Block 7, 2004, pp. 135-136, in connection with Gacela 3; Coca 6 and Coca 8; Coca 19 (**Exh. CE-CC-63**).

²⁰²⁵ Luna WS2, Annex 5, p. 2.

989. The SETE Report concluded that the pipeline had suffered no “severe” internal corrosion, but that sections of the line showed general external corrosion that in some instances required urgent attention. Specifically, the report observed:

- “[...] the line during the operating period of 19 years did not suffer severe internal corrosive processes, as in average the percentage of loss of thickness does not exceed 30% with respect to its nominal thickness. It must be clarified that if no severe corrosive processes exist, this value should not represent immediate risks for the integrity of the pipeline”.²⁰²⁶
- “There are several sections with generalised external corrosion representing up to 50% of material loss in respect of nominal thickness. These corrosive processes were due to the lack of a coating system that allows to delay the line’s corrosion aggravated by the direct contact of the line [...] with the ground [...]”.²⁰²⁷
- “From the inspection of the 11439m that form the pipeline [...] 64 sections showed generalized external corrosion”.²⁰²⁸
- “Due to the existence of internal and external corrosive processes that coincide in various points, there is a reduction in thickness of up to 70% with respect to the nominal thickness, as is the case with tube 980 in the Coca station, which require urgent attention”.²⁰²⁹
- “It is possible to observe 16 buried sections, where it is necessary to inspect and repair if required the areas of air-ground interphase. In the majority it is possible to observe that the protective coating of the interphase is completely deteriorated”.²⁰³⁰

990. As a result of these findings, the SETE Report recommended a number of actions, including the replacement of certain sections and parts, as well as cleaning and maintenance:

- “As a first step the right of way (the clearings along which the lines are located) must be cleaned [...]”.
- Following the ASME B31.G recommendation, the sections of the transfer line with several external corrosion (pittings of 4mm in depth) should be replaced. [...]
- Taking into consideration ASME B31.4 and 451.6.2 (Ed. 2002), the sections with dents should be replaced.
- A general maintenance of the transfer line should be conducted [...].

²⁰²⁶ *Id.*, p. 11 (Translation by the Tribunal).

²⁰²⁷ *Ibid.* (Translation by the Tribunal).

²⁰²⁸ *Id.*, p. 9 (Translation by the Tribunal).

²⁰²⁹ *Id.*, p. 11 (Translation by the Tribunal).

²⁰³⁰ *Id.*, p. 8 (Translation by the Tribunal).

- Carry out the complete restoration of the interphase areas of the buried lines [...].²⁰³¹

991. Dr. Egan has sought to downplay the SETE Report's conclusions on external corrosion, stating that "apart from a few isolated areas that have external corrosion, the pipe wall thickness is close to the nominal (original) wall thickness" and that most of the wall thicknesses reported by SETE falls within this range.²⁰³² Dr. Egan also notes that "[t]he report, which incorporates these measurements, concludes that the remaining life of the vast majority of the pipes would be 25 years".²⁰³³ The Tribunal notes however that the relevant section of the SETE Report leads to a different conclusion. The report states:

"Considering a homogenous loss of thickness of the remaining wall and assuming that there will be no problems of external corrosion, the remaining life calculated in these conditions would be 25 years. Given that in this particular case there are problems of severe external corrosion added to a loss of thickness of the wall, [which is] normal in this type of lines due to the time of service and to the type of fluid. One observe [sic] sections with a reduction in thickness of 70%, which would represent a remaining life of 0 years in the sections affected by corrosive processes".²⁰³⁴

992. While the drafting of this paragraph is awkward, the Tribunal understands it to be saying that, assuming a homogeneous loss of wall thickness and no external corrosion, the useful life of the pipelines should be of 25 years. However, given that in this particular case there are severe problems of external corrosion, added to a the loss of wall thickness (the latter being normal in this type of pipelines due to the years of service and the type of fluid), there are sections with a reduction of wall thickness of up to 70%, which implies 0 years of remaining useful life for the sections affected by the corrosive processes. While the report acknowledges that the loss of wall thickness is due to normal wear and tear, it is less clear whether the same applies to external corrosion. Seen together with the report's conclusion that external corrosion is caused by a lack of external coating, the Tribunal concludes that the deterioration of these particular sections was caused by a lack of proper maintenance and cannot be attributed to normal wear and tear. Although the report is dated March 2011, i.e. over one year and

²⁰³¹ *Id.*, pp. 11-12 (Translation by the Tribunal).

²⁰³² Intertek ER1, ¶¶ 90-91.

²⁰³³ *Id.*, ¶ 91.

²⁰³⁴ Luna WS2, Annex 5, pp. 7-8 (Translation by the Tribunal).

a half after Petroamazonas' takeover, the Tribunal finds that the lack of external coating can be attributed to the Consortium's operatorship for the following reasons.

993. Dr. Egan acknowledges that there are "isolated" instances of severe corrosion, but opines that Ecuador's claims are exaggerated. Dr. Egan explains that "there were only two pipe sections out of a total number of 981 pipe sections in the 12 km long pipeline that had external corrosion that required replacement", which "represents approximately 0.2% of the pipe sections".²⁰³⁵ He adds that "[e]ach of the pipe sections is about 12 meters in length, and it is most likely that the external corrosion is concentrated in an area of approximately one foot long, which means the amount of the pipeline that would need replacement is closer to 0.02%".²⁰³⁶ In addition, he asserts that "[t]hese two affected pipe sections appear in a pipe section that was intentionally designed to have a thinner wall, as demonstrated by the green line in Figure 6-2", so "the fact that the wall was thin is in part due to the original design of the pipeline system, rather than corrosion".²⁰³⁷ Dr. Egan further asserts that "external corrosion and coating damage are easily repaired by sand blasting to bare metal and recoating to inhibit the corrosion".²⁰³⁸ By contrast, Mr. Luna asserts that all 64 sections that evidenced external corrosion must be replaced.²⁰³⁹

994. The Tribunal notes that the SETE Report only recommends the replacement of those sections affected by "severe" external corrosion:

"Following the recommendation of ASME B31.G, the sections of the fluid line with severe external corrosion must be replaced. There are pittings of a depth of up to 4mm [...]"²⁰⁴⁰

995. The SETE Report also notes that these sections are identified in "reporte UT-002-SETE-2011, Anexo 1",²⁰⁴¹ but this document is not in the record. Dr. Egan has not explained which sections of the pipeline he considers to have shown severe corrosion

²⁰³⁵ Intertek ER1, ¶ 93.

²⁰³⁶ *Ibid.*

²⁰³⁷ *Ibid.*

²⁰³⁸ *Ibid.*

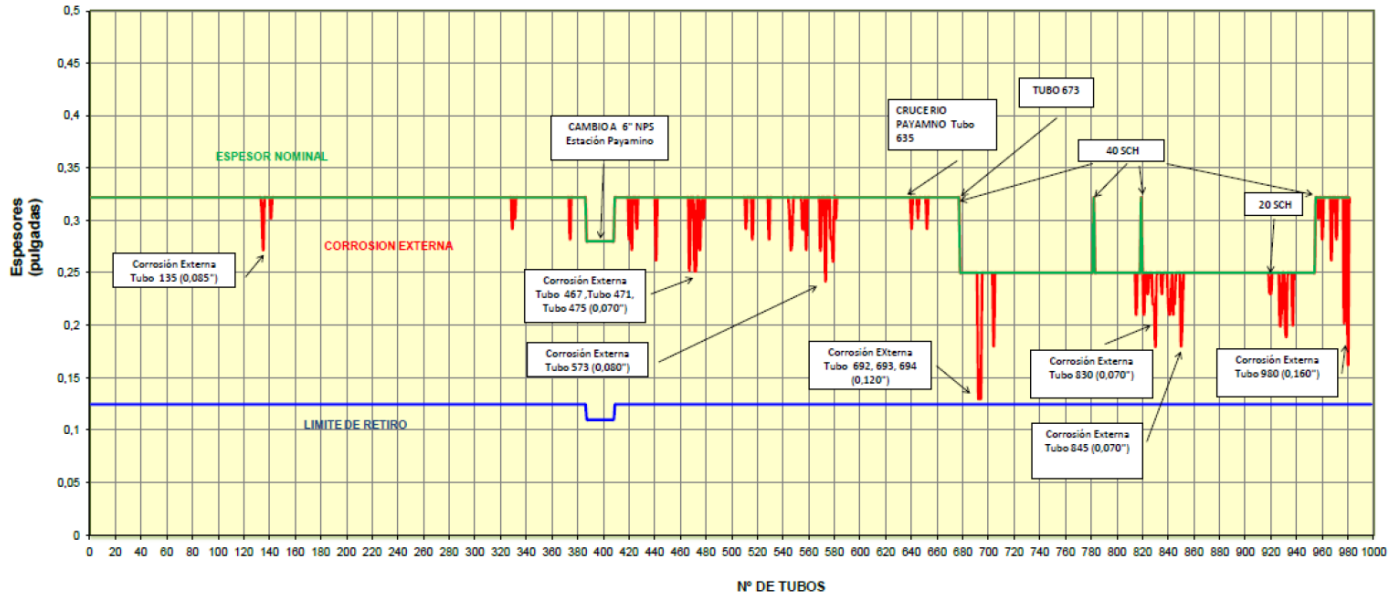
²⁰³⁹ Luna WS4, ¶ 107.

²⁰⁴⁰ Luna WS2, Annex 5, p. 11 (Translation by the Tribunal).

²⁰⁴¹ *Id.*, p. 12.

requiring replacement, but a review of the graphs included in the SETE Report appear to confirm that only two sections were close to the withdrawal limit of the pipeline due to external corrosion: (i) tubes 692, 693 and 694, and (ii) tube 980.²⁰⁴²

GRAFICA 2. Corrosión Externa con Respecto al Espesor Nominal



996. Absent other evidence in the record, the Tribunal accepts Dr. Egan’s assessment that each of these sections refers to approximately 12 meters of pipeline (24 meters in total), representing approximately 0.2% of the length of the pipeline. Dr. Egan also opines that “it is most likely that the external corrosion is concentrated in an area of approximately one foot long, which means the amount of the pipeline that would need replacement is closer to 0.02%”.²⁰⁴³ This latter opinion appears unsubstantiated and thus the Tribunal concludes that approximately 0.2% of the Gacela-Coca pipeline requires replacement.

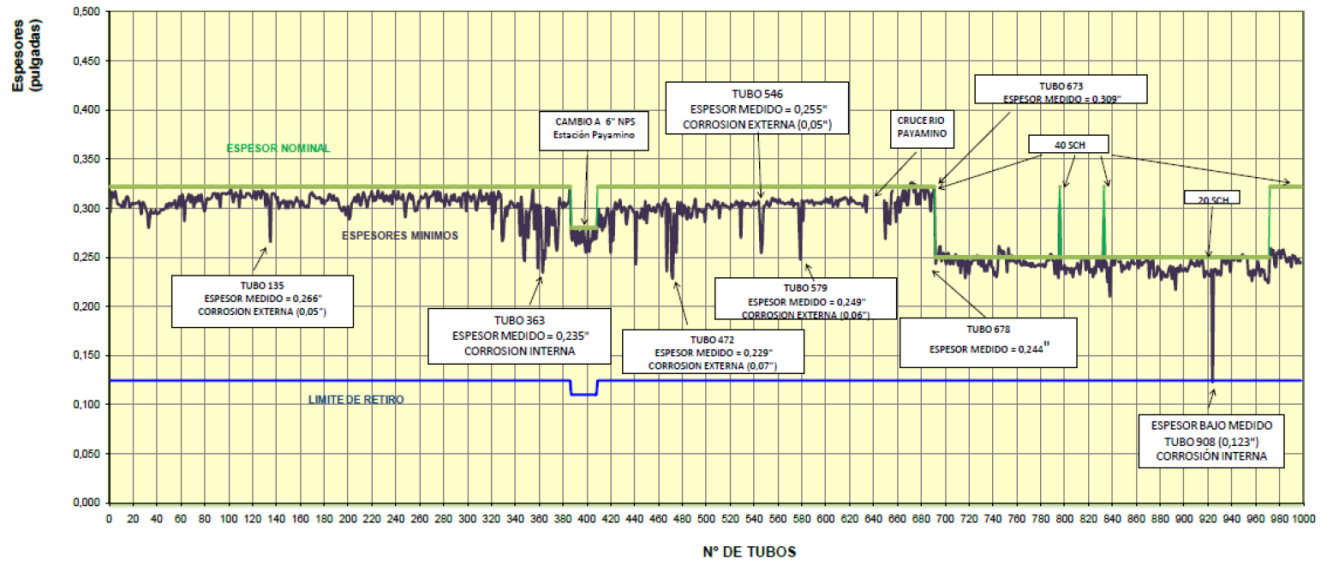
997. The Tribunal also notes that there appears to be one instance of severe internal corrosion (tube 908), as shown in the figure below.²⁰⁴⁴ As a result, it also considers that this tube was beyond normal wear and tear.

2042 *Id.*, p. 7 (graph 2).

2043 Intertek ER1, ¶ 93.

2044 Luna WS2, Annex 5, p. 7 (graph 1).

GRAFICA 1. Perfil de Espesores de la Línea de Transferencia 8" NPS



998. Mr. Luna also emphasizes that the SETE Report indicated that there were 16 buried lines, in which 32 interphase sections were “completely deteriorated”.²⁰⁴⁵ As a result, it recommended “a comprehensive recovery of the interphase areas of the buried lines, including welding of covers if the case so requires and a subsequent application of a system of external coating together with a system of protection with mechanic tape”.²⁰⁴⁶ Dr. Egan does not respond to this point. Be this as it may, SETE’s observation that the protective coating of the interphases is “completely deteriorated” indicates that it was indeed beyond normal wear and tear.

999. The Tribunal now turns to the results of the Petroenergy Report, which was issued in January 2012, almost two and a half years after Petroamazonas took over the Blocks. Based on standard NACE SP0619-07, this report studies the corrosion levels of part of the Mono/Jaguar/Oso to Gacela CPF pipeline, in particular the 37 km connecting Jaguar to Lobo. It identified a number of defects which it classified in terms of severity and need for intervention as follows:²⁰⁴⁷

²⁰⁴⁵ Luna WS4, ¶ 108. See also: Luna WS2, Annex 5, p. 8-9.

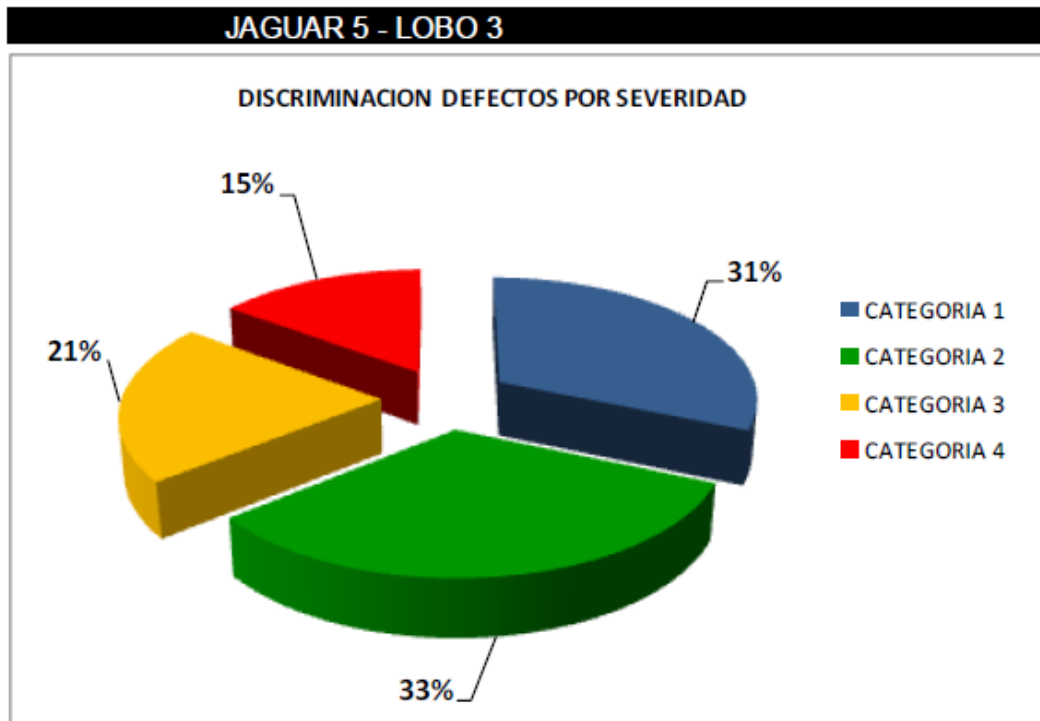
²⁰⁴⁶ Luna WS2, Annex 5, p. 12 (Translation by the Tribunal).

²⁰⁴⁷ Luna WS3, Annex 14, p. 4.

| NUMERO TOTAL DE DEFECTOS | SEVERIDAD (%IR) JAGUAR 5 - LOBO 3 | | | |
|--------------------------|-----------------------------------|---------------|--------------|-------------|
| | 1-50% | 50-65% | 65-80% | 80-100% |
| | LARGO PLAZO | MEDIANO PLAZO | CORTO PLAZO | INMEDIATO |
| | MAS DE 1AÑO | MAX. 8 MESES | MAX. 3 MESES | |
| | CATEGORIA 1 | CATEGORIA 2 | CATEGORIA 3 | CATEGORIA 4 |
| 296 | 93 | 97 | 62 | 44 |

Cuadro 2 DISCRIMINACION DE DEFECTOS POR SU INDICE DE SEVERIDAD

1000. Accordingly, 15% of the defects required an immediate intervention (category 4), 21% within three months (category 3), 33% within eight months (category 2), while the rest, i.e. 31% could wait over one year (category 1), as the following graph illustrates:²⁰⁴⁸



GRAFICA 1 PORCENTAJES DE DISTRIBUCION DE FALLAS DE REVESTIMIENTO V/S SEVERIDAD

²⁰⁴⁸

Ibid.

1001. In addition, the Petroenergy Report concludes that there is severe corrosion in 91.1% of the 37 km or pipeline reviewed.²⁰⁴⁹
1002. In Dr. Egan’s opinion neither of the tests carried out by Petroenergy (the ACVG test nor the pH test) can be used to draw conclusions on the current condition of the pipeline or its state of corrosion; rather the ACVG test “is an indicator of whether active corrosion will become an issue in the future”, while the pH test “analyzes the activity of the hydrogen ion in the soil in which the pipeline is buried in order to identify an environment conducive to corrosion”.²⁰⁵⁰ According to Dr. Egan, the defects identified in the report “are not defects in the sense that they will impact the structural integrity of the line but rather are indications of coating breaches”.²⁰⁵¹ Indeed, Dr. Egan notes that the report concludes that “99.90% of the cathodic protection levels complied with the second criterion of NACE International Standard SP0169”.²⁰⁵²
1003. Mr. Luna does not address these explanations, but emphasizes the following aspects:
- i. “The results of the alternating current gradient measurement (ACVG technique), which shows the condition of the external casing of the buried pipe: 296 defects, of which 44 were critical, 62 should be repaired in a period of not more than 3 months, 97 should be repaired in 8 months, and 93 in one year”;
 - ii. “The results of the hydrogen potential (HP) concentration level study: 91.1% with severe external corrosion, 7.9% with moderate corrosion and only 1.1% had a neutral tendency”.²⁰⁵³
1004. The Tribunal has noted Dr. Egan’s opinion, but cannot overlook the fact that Petroenergy identified 296 defects in the pipeline, 15% of which required immediate attention and another 21% required short-term attention (within 3 months). While it is true that a period of two and a half years had elapsed since the takeover, the Tribunal finds it likely that the defects requiring immediate or short-term attention were caused before Petroamazonas’ takeover. It thus finds that Ecuador has proved that a significant

²⁰⁴⁹ *Id.*, p. 6.

²⁰⁵⁰ Intertek ER2, ¶ 122.

²⁰⁵¹ Intertek ER1, ¶ 96.

²⁰⁵² *Id.*, ¶ 97.

²⁰⁵³ Luna WS4, ¶ 109 (Translation by the Tribunal).

part of the Mono/Jaguar/Oso to Gacela CPF pipeline was beyond normal wear and tear.

1005. Ecuador seeks USD 1,667,655.83 for this claim,²⁰⁵⁴ relying on Mr. Luna's testimony. However, the Tribunal notes that, in his last witness statement, Mr. Luna quantifies the damages related to pipelines at USD 1,462,553.43, broken down as follows.²⁰⁵⁵

- i. The cost of retaining SETE to perform the inspection of the Gacela-Coca pipeline (USD 272,560.41).²⁰⁵⁶
- ii. The cost of retaining Petroenergy to perform external corrosion tests on the Mono/Jaguar/Oso to Gacela CPF pipeline (USD 151,300).²⁰⁵⁷
- iii. The cost of engaging PEC to repair 106 out of the 296 defects identified by the Petroenergy Report in the Mono/Jaguar/Oso to Gacela CPF pipeline (USD 489,404.44).²⁰⁵⁸ Mr. Luna emphasizes that PEC has repaired only the 44 defects identified as urgent as well as the 62 defects identified as requiring an intervention within three months.²⁰⁵⁹
- iv. The cost of engaging Sertecpet S.A. to maintain fluid lines, including changes of pipes, sleeves and welding in Block 7 (in the Gacela, Payamino, Coca and Jaguar fields) between April and August 2012 (USD 355,422.98).²⁰⁶⁰
- v. The cost of engaging Sachatechnology Multiservicios Cia. Ltda. to perform excavation services for the maintenance of pipelines and support to Sertecpect in Block 7, and the maintenance of tubes in Block 21 (USD 193,865.60).²⁰⁶¹

²⁰⁵⁴ Ecuador's Opening Statement, Slide 136.

²⁰⁵⁵ Luna WS4, ¶¶ 162-170.

²⁰⁵⁶ Luna WS2, Annex 6.

²⁰⁵⁷ Luna WS3, Annex 15.

²⁰⁵⁸ Luna WS4, Annex 91.

²⁰⁵⁹ While Mr. Luna states that 110 defects have been repaired, he must have meant 106 (44+62). Indeed, he also states that 97 Category 1 defects and 93 Category 2 defects (a total of 190 defects) still remain to be repaired (Luna WS4, ¶ 168). As Petroenergy identified a total of 296 defects, this must mean that only 106 defects (296-190) have been repaired.

²⁰⁶⁰ Luna WS4, Annexes 93 and 94.

²⁰⁶¹ *Id.*, Annexes 95 and 96.

1006. The Tribunal has found that significant parts of both the Gacela-Coca and Mono/Jaguar/Oso to Gacela pipelines were beyond normal wear and tear. In reliance on this finding and on the testimonies of Messrs. Luna, Solís and Montenegro, the Tribunal considers it reasonable to extrapolate this observation to the remainder of the pipelines in the Blocks. Even if the Consortium had a maintenance program in place and had carried out comprehensive inspections in a timely fashion, the Consortium's maintenance efforts were clearly insufficient to maintain the pipelines in good working condition. The Tribunal also notes that Ecuador is not requesting the replacement of the pipeline system, but has limited its claims to the cost of two inspections and urgent or necessary repairs. The Tribunal thus grants this claim in the amounts identified by Mr. Luna, for a total of USD 1,462,553.43. Awarding this amount, it notes that Burlington did not dispute the quantification of this claim for itself.

2.5 Claims related to generator engines

1007. According to Ecuador, as a result of the Consortium's substandard maintenance of a number of power generator engines in Blocks 7 and 21, the engines were in an appalling state when it arrived on the Blocks. Ecuador's claim focuses on Wärtsilä engines 2, 3, and 4 in Block 21 and on all 27 Caterpillar engines in Block 7.²⁰⁶² Ecuador accuses Burlington in particular of (i) a lack of proper overhauls to these engines, and (ii) the inappropriate use of a harmful crude-diesel fuel mix in the Block 7 engines.

1008. Ecuador claims that these deficiencies caused significant harm to the engines and resulted in Ecuador incurring damages in the form of costs associated with the performance of overdue overhauls, reduced engine life, and the purchase of a new alternator for Wärtsilä engine 4. Ecuador claims the total of these costs amounting to USD 6,540,010.57,²⁰⁶³ of which USD 4,744,733.75 relate to Block 21 and USD 1,795,276.80 concern Block 7.

1009. Burlington dismisses Ecuador's claims as grave accusations unsupported by the evidence.

²⁰⁶² *Id.*, Annexes 81 and 82.

²⁰⁶³ Ecuador's Opening Statement, Slide 136. Luna WS2, Annex 13; Luna WS3, Annexes 14-15; Otros gastos de reacondicionamiento de los Bloques, amended version (**Exh. E-301**).

1010. The Tribunal will first address the claims with respect to overhauls (2.5.1), and then those related to the use of the crude-diesel mix (2.5.2).

2.5.1 Overhauls

a. Ecuador's position

1011. Ecuador explains that, because Blocks 7 and 21 are in remote areas, the power required for the operations must be generated locally. The Consortium thus installed several Caterpillar diesel engine generators at every platform or CPF in Block 7, and four Wärtsilä engines in Block 21. The engines must run 24 hours a day. To ensure their proper performance, they must undergo routine maintenance and also regularly scheduled major maintenance or overhauls.²⁰⁶⁴

1012. Ecuador alleges that the individualized assessment which it carried out upon arrival in the Blocks (which was necessary because the Consortium appeared to have kept no engine maintenance records) showed that the Consortium had failed to perform regular overhauls to the engines prior to July 2009. It asserts that "the state of the engines in both Blocks was appalling".²⁰⁶⁵ As a result, says Ecuador, it had to overhaul all 27 Caterpillar engines of Block 7, and Wärtsilä engines 2, 3 and 4 of Block 21, in addition to buying a new alternator for Wärtsilä engine 4 and supplementing the existing stock of spare parts.²⁰⁶⁶

1013. Ecuador rejects Dr. Egan's assessment of the Consortium's maintenance of the engines. According to Ecuador and Mr. Luna, the Consortium's own documents show that Ecuador's claim regarding delayed overhauls on the engines listed above is "grounded and duly documented".²⁰⁶⁷

²⁰⁶⁴ 2nd SMCC, ¶¶ 389-398; Luna WS1, ¶¶ 8-13.

²⁰⁶⁵ R-PHB, ¶ 973.

²⁰⁶⁶ 2nd SMCC, ¶¶ 389-398; Luna WS1, ¶ 14-15; Luna WS2, Annex 8.

²⁰⁶⁷ Reply, ¶ 502, referring to: Luna WS4, ¶¶ 130-143; List of Corrective, Planned, and Preventative Maintenance Orders, 5 September 2012 (Exh. CE-CC-264), and Luna WS4, Annexes 30, 31, 80 and 81.

b. Burlington's position

1014. Burlington denies that it failed to perform regular overhauls of the engines. It contends that the Consortium had “a robust maintenance program in place” as Wärtsilä overhauls were carried out by Wärtsilä engineers at the intervals prescribed by the manufacturer, and Caterpillar engine overhauls were done by Consortium engineers in accordance with Caterpillar’s recommended guidelines.²⁰⁶⁸ Burlington also alleges that it submitted annual activity reports to the Government which included information on its overhauls,²⁰⁶⁹ and provided extensive records of maintenance activities.²⁰⁷⁰
1015. Burlington’s expert, Dr. Egan, confirms Burlington’s position. Specifically:
- i. With respect to the Wärtsilä engines in Block 21, after having reviewed the Consortium’s service contract and its maintenance records, Dr. Egan concluded that the Consortium had performed overhauls in a timely fashion and in a manner consistent with the manufacturer’s recommendations.²⁰⁷¹ Relying on Dr. Egan’s testimony, Burlington argues that “[g]iven that the Wärtsilä engines were to be overhauled every 12,000 hours (i.e., every 1.36 years if constantly running), Ecuador’s claims for the overhaul of these engines are nothing more than a disguised attempt to obtain reimbursement of post-July 2009 regular maintenance costs for which the Consortium cannot be held liable”.²⁰⁷²
 - ii. As to the Caterpillar engines in Block 7, after reviewing the Consortium’s maintenance records and Mr. Luna’s witness statement, Dr. Egan concluded that the Consortium did not delay overhauls; rather, Ecuador claims for several

²⁰⁶⁸ CMCC, ¶ 559; Wärtsilä Services, Business White Paper: Lifecycle Efficiency, 2011 (**Exh. CE-CC-261**) and Perenco Maintenance Program for Block 7, 2005 (**Exh. CE-CC-100**).

²⁰⁶⁹ CMCC, ¶ 562, referring to: Perenco Ecuador Limited, Annual Activity Report for Block 7 for Year 2008, January 2009, pp. 8-9 (**Exh. CE-CC-213**); Letter from Luis Cobos (Perenco) to Vincente Juepa (Ministry of Energy and Mines), 31 January 2003, pp. 3-9 (**Exh. CE-CC-195**).

²⁰⁷⁰ Wärtsilä, Service Report, Work Order No. PER-001-07, 2007 (**Exh. CE-CC-131**); Wärtsilä, Service Report, Various Work Orders, 2008 (**Exh. CE-CC-155**); List of Corrective, Planned, and Preventative Maintenance Orders, 5 September 2012 (**Exh. CE-CC-264**); Predictive Maintenance Records for Caterpillar and Wärtsilä engines (undated) (**Exh. CE-CC-276**).

²⁰⁷¹ CMCC, ¶ 560, referring to: Intertek ER1, ¶¶ 57-58.

²⁰⁷² CMCC, ¶ 560, referring to: Intertek ER1, ¶¶ 61-62.

engines that had been recently overhauled by the Consortium and as a result could not have been due for overhaul at the time of the takeover.²⁰⁷³

1016. In his second report, Dr. Egan dismisses Mr. Luna's criticisms and confirms his conclusions, both with respect to the Caterpillar and Wärstilä engines.²⁰⁷⁴
1017. Burlington argues that, because the Consortium performed the required maintenance, Ecuador's claim for the increase of maintenance costs and decrease in the engines' useful life should be dismissed. However, even assuming *quod non* that it did not carry out the required maintenance, Burlington, relying on Dr. Egan, contends that "Ecuador has not provided any scientific or engineering basis for concluding that any hypothetical delay would create such an increase in subsequent overhaul costs or reduction of the useful life".²⁰⁷⁵ The claim for the costs of purchasing and installing a new alternator must also be dismissed, because such costs do not qualify as "overhaul" costs.²⁰⁷⁶
1018. More generally, Burlington argues that, had it not performed regular overhauls on the engines, it would not have been able to maintain or increase production levels, because without the engines there is no power, and without power there is no production. For this reason, it asserts that between December 2005 and July 2009 it spent almost USD 3 million in spare parts for the Caterpillar engines alone.²⁰⁷⁷

c. Discussion

1019. It is undisputed that engines require preventive maintenance such as monitoring and testing and overhauls, in which engines are taken apart to be examined and repaired if necessary.²⁰⁷⁸
1020. After reviewing the evidence, including in particular Mr. Luna's witness statements, Dr. Egan's expert reports, and the Consortium's maintenance records, the Tribunal concludes that Ecuador has failed to provide sufficient evidence of the Consortium's

²⁰⁷³ CMCC, ¶ 561, referring to: Intertek ER1, ¶¶ 63-64.

²⁰⁷⁴ Intertek ER2, ¶¶ 39-70.

²⁰⁷⁵ CMCC, ¶ 563, referring to: Intertek ER1, ¶¶ 67-71.

²⁰⁷⁶ CMCC, ¶ 563 referring to: Luna WS2, p. 8; Intertek ER1, ¶ 59.

²⁰⁷⁷ CMCC, ¶ 564, referring to: Perenco Ecuador Limited, Caterpillar Cost Details, 2006-2009, p. 16 (**Exh. CE-CC-105**).

²⁰⁷⁸ See, for instance: Intertek ER1, ¶ 54.

alleged failure to perform timely overhauls to its generator engines, or to prove that such failure increased the maintenance costs or reduced the useful life of the engines.

1021. With respect to the Caterpillar engines in Block 7, the record shows that the Consortium put in place appropriate preventive and corrective maintenance programs. The Consortium's Annual Environmental Report for Block 7 for 2002, which was sent to the Ministry of Energy and Mines, contained a summary of preventive and corrective maintenance programs for engines and other Block 7 equipment.²⁰⁷⁹ There was no objection or protest from Ecuador to this letter at the time. Similarly, the Consortium's maintenance program in place since 2005 explained the parameters to be used for the maintenance of engines and other equipment, and specified in particular when Caterpillar engine overhauls must be carried out.²⁰⁸⁰ Specifically, this program explained that "[m]aintenance of the Perenco equipment installed in Block 7 has been based on the recommendations of those equipment manufacturers, and according to the situation and environmental conditions in which they are operating", and set out the periodicity in which the engines should be overhauled.²⁰⁸¹

1022. As to whether the Consortium performed overhauls to its Caterpillar engines in a timely fashion and the consequences of such alleged untimeliness, the Tribunal has noted the differing opinions and evidence presented by Mr. Luna and Dr. Egan. Having reviewed their respective statements and the evidence on which they rely, the Tribunal reaches the conclusion that Ecuador has not established that the Consortium delayed these overhauls, and more specifically:

- i. According to Dr. Egan, "Caterpillar recommends that operators perform overhauls of Model 3406 engines every 6,000 hours and of Model 3412 every 10,000 hours".²⁰⁸² After reviewing the Consortium's maintenance records,

²⁰⁷⁹ Letter of 31 January 2003 from Luis Cobos (Perenco) to the Vicente Juepa (Ministry of Energy and Mines), attaching the Annual Environmental Report for Block 7 for 2002 (**Exh. CE-CC-213**).

²⁰⁸⁰ Perenco Maintenance Program for Block 7, 2005 (**Exh. CE-CC-100**).

²⁰⁸¹ *Ibid.*

²⁰⁸² Intertek ER1, ¶ 55, relying on: Caterpillar, Operation and Maintenance Manual 3406B and 3406C Industrial and Generator Set Engines, November 1999 (**Exh. CE-CC-25**) and Caterpillar, Operation and Maintenance Manual 3408C & 3412C Industrial & EPG Diesel Engine, December 1999 (**Exh. CE-CC-26**).

Dr. Egan concluded that “the Consortium’s preventative maintenance program followed the per-hour overhaul recommendations provided by Caterpillar”.²⁰⁸³

- ii. According to Dr. Egan, the logs generated by the Consortium’s SAP database, as well as the Consortium’s work orders, demonstrate that the Consortium performed overhauls in its Block 7 engines in a timely fashion.²⁰⁸⁴
- iii. Mr. Luna alleges that, with respect to 14 engines (specifically, engines Nos. 1, 5, 7, 8, 11, 12, 14, 15, 16, 21, 22, 23, 24 and 26), there is no indication of any overhaul between September 2007 and July 2009.²⁰⁸⁵ Dr. Egan notes however that Mr. Luna failed to take into account major overhauls and other maintenance activities performed by the Consortium in this time period.²⁰⁸⁶ As a result, Dr. Egan provided a revised version of Mr. Luna’s Overhaul List for Caterpillar engines,²⁰⁸⁷ which he asserts “clearly demonstrates that the Consortium adequately maintained the 14 Caterpillar engines cited by Mr. Luna”, showing that the Consortium either carried out a major overhaul of the engines at issue or performed other maintenance activities in accordance with its ongoing maintenance program.²⁰⁸⁸ The Tribunal accepts this revised list of maintenance activities. It also agrees with Dr. Egan that whether the Consortium carried out a proper maintenance of its engines is not limited to whether it performed “major” overhauls, and that consideration should also be given to other maintenance activities.²⁰⁸⁹
- iv. Mr. Luna also states that the Consortium did not comply with the manufacturer’s specifications with respect to 13 other engines by not performing overhauls within the appropriate time.²⁰⁹⁰ Mr. Luna accepts that the Consortium carried out

2083 Intertek ER1, ¶ 57.

2084 *Id.*, ¶ 58, referring to: Overhaul Dates for Engines from Block 7, July 2006 (CE-CC-119) and List of Corrective, Planned, and Preventative Maintenance Orders, 5 September 2012 (**Exh. CE-CC-264**).

2085 Luna WS4, ¶ 138(a) and Annex 82.

2086 Intertek ER2, ¶ 57.

2087 Luna WS4, Annex 82.

2088 Intertek ER2, ¶¶ 58-59 and App. C.

2089 *Id.*, ¶¶ 60-64.

2090 Luna WS4, ¶ 138(b) and Annex 82.

overhauls to these engines within a period of approximately one year prior to the takeover of the Blocks (and thus no further overhauls were due before the takeover), but argues that the failure to perform overhauls before that period resulted in damage that increased the maintenance costs of these engines. Dr. Egan rejects this theory and the Tribunal agrees. As Dr. Egan explains, “[o]nce an engine has been overhauled and the worn parts replaced or refurbished, there is no lasting damage to the engine that would result in increased maintenance costs for subsequent overhauls. If, in fact, there had been any increased overhaul cost from some earlier neglected or deferred maintenance in 2006 or 2007 for instance, it would have been borne by the Consortium when it conducted the most recent overhauls in 2008 or 2009. Only at that time would it be necessary to replace or repair more parts than normal”.²⁰⁹¹

1023. As for the engines on Block 21, the Maintenance Services Agreement between the Consortium and Wärtsilä, entered into on 30 May 2008, set out the guidelines for routine and scheduled maintenance.²⁰⁹²

1024. As Dr. Egan explains, Wärtsilä recommends that overhauls start at 8,000 hours and major overhauls be performed every 12,000 hours thereafter.²⁰⁹³ Mr. Luna agrees,²⁰⁹⁴ but asserts that the Consortium failed to abide with these parameters for Wärtsilä engines No. 2, 3 and 4, which Dr. Egan denies. After reviewing the evidence in the record, the Tribunal agrees with Dr. Egan, for the following reasons:

- i. With respect to Wärtsilä engine No. 2, Mr. Luna accepts that it was (correctly) overhauled at 24,000 hours, but asserts that in April 2010 Petroamazonas was forced to overhaul this engine at 32,000 hours (instead of at 36,000, which was the next scheduled overhaul). Mr. Luna alleges that this overhaul had to be brought forward due to leaks in the engine, but he does not explain how these

²⁰⁹¹ Intertek ER2, ¶ 66.

²⁰⁹² Maintenance Services Agreement for the Yuralpa Project Between Consorcio Bloque 7 and Bloque 21 and Wärtsilä Ecuador S.A, 30 May 2008 (**Exh. CE-CC-163**).

²⁰⁹³ Intertek ER1, ¶ 55; Intertek ER2, ¶ 43.

²⁰⁹⁴ Luna WS4, ¶ 137.

leaks could have been attributed to an earlier lack of maintenance by the Consortium.²⁰⁹⁵

- ii. With respect to Wärtsilä engine No. 3, Mr. Luna acknowledges that the Consortium conducted a 12,000 hour overhaul in October 2006. Mr. Luna argues that no other overhaul was performed since then, but as explained by Dr. Egan the next overhaul was not due until July 2009. Given Ecuador's physical takeover on 16 July 2009, the Consortium cannot be held responsible for failing to carry out this overhaul. In any event, the record shows that the Consortium carried out additional maintenance at 16,000 hours.²⁰⁹⁶
- iii. The Tribunal reaches a similar conclusion with respect to Wärtsilä engine No. 4. As Mr. Luna recognizes, this engine was only put into service in 2007. The record shows that the Consortium carried out various preventive maintenances, including a 4,000 hour overhaul in January 2008, but the first major overhaul (at 12,000 hours) was not due until January 2010, after Petroamazonas' takeover.²⁰⁹⁷

1025. On this basis, the Tribunal concludes that the Consortium adequately complied with its maintenance obligations and that the costs incurred by Petroamazonas in the maintenance of the engines were due to regular maintenance or caused by normal wear and tear.

1026. The Tribunal also finds that Ecuador has not proven that any reduction in the useful life of the engines can be attributed to a failure by the Consortium to carry out proper maintenance. Indeed, even if the Tribunal had found evidence of untimely overhauls, it finds that Ecuador has failed to establish that such delays would have caused the increased costs which it claims. The Tribunal accepts Dr. Egan's explanation that

²⁰⁹⁵ Luna WS4, ¶ 137(a) and Annexes 81 and 83; Intertek ER2, ¶¶ 45-48; Wärtsilä Ecuador S.A. Service Report for Work Order # PER-004-06 for Yuralpa, Block 21, June 2006 (**Exhs. CE-CC-319**); Wärtsilä Ecuador S.A. Service Report for Work Order No. 10197956 for Perenco Block 21, Yuralpa, November 2008 (**Exh. CE-CC-340**); Wärtsilä Ecuador S.A. Invoices No. 0002985, 27 September 2005, and No. 0004698, 12 July 2007(**Exh. CE-CC-314**).

²⁰⁹⁶ Luna WS4, ¶ 137(b) and Annex 81; Intertek ER2, ¶¶ 49-50; Wärtsilä Ecuador S.A. Invoices No. 0004245, 4 January 2007, and No. 0004820, 15 August 2007 (**Exhs. CE-CC-324**); Wärtsilä Ecuador S.A. Service Report for Work Order # PER-009-07 for Yuralpa, Block 21, 28 May 2007 (**Exh. CE-CC-326**).

²⁰⁹⁷ Luna WS4, ¶ 137(c) and Annex 81; Intertek ER2, ¶ 51; Wärtsilä Ecuador S.A. Service Report for Work Order # PER-001-08 for Yuralpa, Block 21, January 2008 (**Exh. CE-CC-329**).

“[a]lthough a delay in overhauls may affect the performance of the engine (primarily power output and emissions levels), this will not necessarily increase the maintenance costs or reduce the useful life of the engine. At most, a delay in overhaul will affect the top part of the engine (i.e., valves, combustion chambers and injectors). However, these parts need to be replaced during overhauls regardless of the delay. In other words, there is no penalty for delaying overhauls”.²⁰⁹⁸ The record does not support a different conclusion.

1027. Consequently, this aspect of the engine claim is denied.

2.5.2 Use of crude-diesel fuel blend

a. Ecuador’s position

1028. Ecuador contends that the Consortium failed to use the engines pursuant to the manufacturer’s specifications. Instead of using diesel fuel as required, the Consortium altered the engines on Block 7 in order to use a cheaper diesel/crude mix containing crude produced in the Block (first a 50/50 blend, settling on a blend of 40% crude and 60% diesel after testing).²⁰⁹⁹

1029. Ecuador submits that the effect of these modifications was disastrous. Only a few weeks after making these modifications one of the engines broke down and eventually all of the engines were damaged.²¹⁰⁰ As explained by Mr. Montenegro in his memorandum of 9 January 2011:

“The effect of this new fuel in the engines was immediately felt and was a disaster; exhaust gases changed color, the temperature of exhaust multiples increased and the fuel filters were saturated very soon. [...] Few weeks later the first block of a Cat 3406 Engine for the Power Oil Units in the Coca Station broke; when the engine was taken apart we saw a great accumulation of crude in the internal walls, piston rods blocked, detached rod’s bearings and bed caused by the lack of internal lubrication, [and] severe damage to the turbos and injection pumps. This happened again in various engines since it was not possible to predict when failure would occur [...] After this event, all of the engines without

²⁰⁹⁸ Intertek ER1, ¶ 68.

²⁰⁹⁹ 2nd SMCC, ¶¶ 395-398; Luna WS1, ¶ 16.

²¹⁰⁰ 2nd SMCC, ¶¶ 395-398; Luna WS1, ¶ 16.

exception were affected [...] This fuel system was in place until March/09 [...] but the engines were left damaged”.²¹⁰¹

b. Burlington’s position

1030. Burlington accepts that it used a crude-diesel fuel blend in Block 7, but contends that this choice was a reasonable one and had government approval, and in any event was carried out during a limited time, thus having no lasting impact on the engines.
1031. Due to the sharp increase in diesel prices at the end of 2007, the Consortium began studying the possibility of using a crude-diesel fuel mix in the Caterpillar engines in Block 7. It tested the blend for six months. According to Burlington, this trial period showed that it was an appropriate fuel for the engines.
1032. Burlington also argues that the use of such a blend was consistent with international industry practice, and that Perenco had used the blend before in other countries such as Turkey. Dr. Egan notes in particular that Caterpillar provides guidelines for using blended fuel in its engines, and that the Consortium complied with these guidelines: Caterpillar recommends that the blended fuel used in its engines have a maximum crude-to-diesel ratio of 45%, and the Consortium used a 40% crude-to-diesel blend ratio.²¹⁰²
1033. Burlington also emphasizes that not only was the Ministry of Mines and Petroleum aware of this practice and of the Consortium’s intent to use the blend in the Blocks, it also gave its approval to build the required fuel mixing plant, and Ministry representatives were present during the short period of time when the blend was used. Burlington further submits that, in accordance with the manufacturer’s guidelines, the Consortium conducted more frequent maintenance on the engines using the blend, thus avoiding any damage. It adds that, given that the blend was used only from August 2008 to February 2009, this practice could not have had, and in fact did not have, any lasting impact on the engines.²¹⁰³

²¹⁰¹ Memorandum “Blending Plant. Afectación a los motores CAT”, dated 9 January 2011, pp. 2-3 (Luna WS1, Annex 2) (Translation by the Tribunal).

²¹⁰² Intertek ER1, ¶ 73, referring to: Caterpillar, Application and Installation Guide Diesel Fuels and Diesel Fuel Systems, 2012, Appendix 2 (**Exh. CE-CC-260**).

²¹⁰³ CMCC, ¶¶ 566-572, relying on: Intertek ER1, ¶¶ 72-76.

c. Discussion

1034. The Tribunal agrees with Ecuador that Burlington’s use of a crude-diesel fuel blend in the engines in Block 7 may have impacted the engines’ life and potentially led to higher maintenance costs for Ecuador after it took control of the Blocks. This is supported by Caterpillar’s 2001 fuel recommendations, in which the engine manufacturer warns that, while permissible, the use of “blended fuels” can increase maintenance costs and reduce engine life:

“Diesel engines have the ability to burn a wide variety of fuels. These fuels are divided into two general groups. [...] The preferred fuels provide maximum engine service life and performance. The preferred fuels are distillate fuels. These fuels are commonly called diesel fuel, [...]. The permissible fuels are crude oil or *blended fuels*. *Use of these fuels can result in higher maintenance costs and in reduced engine service life*”.²¹⁰⁴

1035. It is true that Burlington alleges that the Consortium adopted an increased maintenance routine as recommended by the manufacturer.²¹⁰⁵ Yet, the Tribunal notes that the Consortium decided to stop using the blend after seven months because of “serious problems with the engines” and “an average of three engines a month that failed completely”, as explained by Mr. Solís at the Hearing:

“We stopped using [the crude-diesel blend] because we had serious problems with the engines, all of the engines, at Block 7 when we used this mixture. This mixture may be used, but with engines that are manufactured to that end rather than the engines that we had back then at Block 7. Those engines were manufactured to operate only with diesel oil -- with diesel rather than a combination of crude oil and diesel. Perenco tried out that mix so as to reduce production costs. We had several failures with the engines, and I remember that we had an average of three engines a month that failed completely”.²¹⁰⁶

1036. As regards Burlington’s contention that the Ministry of Mines and Petroleum knew of this practice, the Tribunal notes that the record indeed shows that the Ministry was aware that the Consortium was building a mixing plant at the Gacela CPF in August 2008 in order to use this blend in the Block 7 engines. For example, there is correspondence between the Consortium and the Ministry of Mines and Petroleum between November 2007 to June 2008 referring to the trial period and the financial

²¹⁰⁴ Emphasis added by the Tribunal. Luna WS4, Annex 85.

²¹⁰⁵ D’Argentré WS1, ¶ 61.

²¹⁰⁶ Tr. (Day 6) (ENG), 1854:19-1855:8 (Direct, Solís).

motivation behind the Consortium's choice. The Ministry's letters show no opposition to the use of the blend.²¹⁰⁷ To the contrary, in February 2008, the National Hydrocarbons Directorate even authorized Perenco "to use the crude oil coming from the percentage of its share set in the Participation Contract for Hydrocarbons Exploration and Production, combined with diesel as fuel for power generation in Block 7 and Coca Payamino Unified fields".²¹⁰⁸

1037. That being said, although Ecuador was aware of and did not object to the Consortium's use of the blend, it remains that the responsibility for the good condition of the equipment lay with the Consortium. The record shows that the use of the blend, although permissible according to the manufacturer, could lead to higher maintenance costs and affect the engines' life. It also establishes that the Consortium itself discontinued its use of the fuel blend because it experienced problems with the operation of the engines.
1038. For these reasons, the Tribunal considers it sufficiently established that the use of the blend affected the condition of the engines.
1039. Ecuador claims a total of USD 1,795,276.80 in connection with the engines in Block 7,²¹⁰⁹ out of which USD 1,123,800 account for a reduction in the engines' useful life due to lack of regular maintenance and to the use of the crude-diesel blend.²¹¹⁰ Burlington does not dispute Ecuador's quantification as such, but argues that the claim has no technical support. As noted in paragraph 1026 above, the Tribunal has already rejected Ecuador's argument that Burlington's alleged lack of regular maintenance reduced the useful life of the engines, and Ecuador does not explain what portion of the reduction in useful life can be attributed to the use of the blend. In the exercise of its discretionary powers in matters of assessing the evidence and quantifying damages, the Tribunal deems it appropriate to grant Ecuador half of the amount claimed for the

²¹⁰⁷ Letters between 6 November 2007 and 23 June 2008 between the Consortium and the Ministry of Mines and Petroleum (**Exh. CE-CC-146**).

²¹⁰⁸ Letter of 13 February 2008 from Javier Egüez Espinosa (Ministry of Mines and Petroleum) to Eric D'Argentré (Perenco) (**Exh. CE-CC-157**). Other evidence of the Ministry's knowledge can be found at: Letter of 20 August 2008 from Alfredo Coronel (Perenco) to Vicente Guerra (DNH) (**Exh. CE-CC-174**) and Perenco Ecuador Limited, Record of Temporary Suspension of Blending Plant Meter, 11 February 2009 (**Exh. CE-CC-200**).

²¹⁰⁹ Ecuador's Opening Statement, Slide 136.

²¹¹⁰ 2nd SMCC, ¶ 415; Luna WS2, Annex 10.

reduction of useful life of the Block 7 engines. The Tribunal thus grants this claim in an amount of USD 561,900.00.

2.6 Claims related to pumps / electrical systems / IT equipment / road maintenance

1040. Ecuador alleges that, when Petroamazonas took over the operations in July 2009, it discovered that the Blocks' pumps, electrical systems, IT equipment, spare parts, and roads were in sub-standard condition. It thus argues that the Consortium failed to replace obsolete equipment and systems, install appropriate backup systems, hold a sufficient stock of spare parts, and maintain roads, and claims for the costs that Petroamazonas has had (or will have) to incur to upgrade these items.²¹¹¹ Burlington opposes all of these claims. Due to their specific character, the Tribunal will address each claim separately.

2.6.1 Pumps

a. Ecuador's position

1041. Ecuador claims that the Consortium (i) operated with too few pumps and that those that it employed were obsolete, (ii) did no preventive or predictive maintenance, (iii) had either no or insufficient backup systems, and (iv) lacked the necessary stock of spare parts. Petroamazonas must thus purchase new pumps to replace the ones currently in place. However, since this is a costly and protracted process, at the time of its Post-Hearing Brief, it had not yet done so. At that time, it had performed overhauls in pumps 2 and 4 of Coca CPF, which it claims have cost USD 33,662.45.²¹¹²

²¹¹¹ 2nd SMCC, ¶¶ 399-406; Otros gastos de reacondicionamiento de los Bloques, amended version (**Exh. E-301**).

²¹¹² Luna WS4, ¶ 123 and Annex 78.

b. Burlington's position

1042. Burlington stresses that Ecuador's damage claim focused initially on only 5 out of the 160 pumps on the two Blocks. Once it admitted that it had not yet replaced any pumps with new purchases, it reduced its claim to seek merely the costs of the overhaul of two pumps.²¹¹³
1043. In response to Ecuador's four arguments summarized in paragraph 1041 above, Burlington asserts that (i) the pumps were not obsolete in July 2009, pointing to the fact that Ecuador continued to use them well into its own operation period, (ii) it did have a comprehensive preventive and predictive maintenance program in place that complied with manufacturer guidelines, and conducted daily visual inspections, (iii) Ecuador's backup claim is "yet another claim for equipment needed to handle Ecuador's increasing production activity, not to remedy the Consortium's lack of proper maintenance", and (iv) the Consortium kept an adequate inventory of spare parts.²¹¹⁴

c. Discussion

1044. At the time of the Hearing, Ecuador was still operating the pumps it claims are obsolete, but for two pumps in Coca CPF. On these latter two pumps, Ecuador in fact performed overhauls, the cost of which is quantified by Mr. Luna at USD 32,662.45 and claimed here.²¹¹⁵ The fact that 158 of the 160 pumps that were present in the Blocks when Petroamazonas took control of the operations in July 2009 have not been overhauled or replaced after the takeover leads the Tribunal to infer that these pumps were not in the dire condition that Ecuador alleges.
1045. As for the two overhauled pumps in Coca CPF, while it is true that Ecuador has submitted an inspection report showing that the pumps suffered from a number of problems, this report is dated September 2012, over three years after Petroamazonas took over the Blocks.²¹¹⁶ It is consequently of little value to assess the state of the

²¹¹³ C-PHB, ¶ 251 and note 343; Intertek ER2, ¶ 124.

²¹¹⁴ CMCC, ¶¶ 593-601, referring to: D'Argenté WS1, ¶¶ 41-42 and 69-71, and Intertek ER1, ¶¶ 131, 147-148.

²¹¹⁵ Luna WS4, Annex 78. The Tribunal notes that this annex appears to refer to only one pump. Yet, it remains that Ecuador claims USD 32,662.45 on this head of claim (the Reply in paragraph 513 mentions USD 33,662.45, which the Tribunal understands to be due to a typographical error).

²¹¹⁶ Luna WS4, Annex 79.

pumps in July 2009. Burlington, by contrast, has submitted environmental audits that were sent to the Ministry of Energy and Mines from 2003 to 2006, showing the pump maintenance program in place during its operation of the Blocks, which included overhauls every 300 hours.²¹¹⁷ Moreover, the Claimant presented a summary of the maintenance accounts of Block 7, where Coca CPF is located, from 2003 to 2009, which shows that USD 2,500,139.25 were spent on “Pump Maintenance”.²¹¹⁸ Finally, the Tribunal notes in addition that the SGS Reports contain no references to pumps in bad condition at the Coca field.

1046. This claim is consequently dismissed.

2.6.2 Electrical systems

a. Ecuador’s position

1047. As regards the electrical systems, Ecuador submits that the Consortium did not comply with the relevant standards applicable in the petroleum industry, such as those contained in the National Electrical Code. Specifically, Ecuador argues that the Consortium (i) used technologically obsolete equipment, such as variators and switchgear boards that caused problems in the operation of the Blocks, and (ii) had inadequate electrical fittings. Ecuador quantifies its damages for this claim at USD 2,120,254, the cost of the new variators.²¹¹⁹

b. Burlington’s position

1048. According to Burlington, Ecuador’s replacement of 23 variators and other improvements to the electrical facilities were not directed to repair substandard infrastructure, but to support Ecuador’s expansion plan. Burlington argues that “the variators could not have been obsolete, as even spare parts were still available from the supplier at the time of the expropriation and continue as of June 2013 to be available”.²¹²⁰ By contrast,

²¹¹⁷ Letter of 31 January 2003 from Luis Cobos (Perenco) to Vicente Juepa (Ministry of Energy and Mines) (**Exh. CE-CC-213**), specific references to the Coca CPF pumps can be found at pp. 29-30, 67 and 112.

²¹¹⁸ Consortium Block 7 and Block 21, Summary of Maintenance Accounts for Block 7 from 2003-2009 (**Exh. CE-CC-190**).

²¹¹⁹ 2nd SMCC, ¶ 416; Luna WS2, ¶ 29; Invoice for acquisition of 23 frequency variators (**Exh. E-308**).

²¹²⁰ Rejoinder, ¶ 418.

Burlington points to two documents (Luna Annex 13 and Exhibit CE-CC-280) which suggest that Ecuador incurred these costs to improve its profitability.

c. Discussion

1049. While Ecuador criticizes the Consortium’s upkeep of electrical equipment and fittings in general, its claim is limited to the purchase of 23 variators for Block 7 for a price of USD 2,120,254.²¹²¹ However, the memorandum submitted as Luna Annex 13 does not show that the purchase was necessary as a consequence of the bad state of the existing equipment. To the contrary, it states that “technical and financial advantages” underlie a decision to migrate to a different model of variator:

“There are technical and financial advantages that justify the migration from the ICS model to the GCS model. *It is for this reason* that the replacement of 23 of the 26 frequency variators of block 7 has been planned [...]”²¹²²

1050. In addition, Exhibit CE-CC-280, entitled “Repowering the Electrical System in Station Coca B-7” refers to the “repotentiation” (in the original Spanish: *repotenciación*) of the electrical system in Block 7 through a project (in fact, the second phase of a project) whose scope is defined as “Development of Basic and Detailed Engineering for the Improvement of Electrical Facilities and Control of the Coca Station”. The very first sentence of that document explains that the repowering was necessary “[d]ue to increased production”.
1051. As a result, the Tribunal dismisses the claim for lack of proof that the expenses related to the purchase of the new variators were caused by the Claimant’s improper maintenance, or by a bad condition beyond normal wear of the electrical systems of the Blocks in July 2009.

²¹²¹ This is the amount claimed by Ecuador. The Tribunal notes however that neither of the documents cited by Ecuador in support of this claim exactly matches this figure. Luna Annex 13 refers to a cost of USD 2,120,262, while Exh. E-308 contains an invoice for the purchase of 23 generators for a total of USD 2,374,684.48.

²¹²² Luna WS2, Annex 13 (Translation and emphasis by the Tribunal).

2.6.3 IT equipment and software

a. Ecuador's position

1052. Ecuador alleges that the Consortium did not have a proper maintenance software in accordance with industry standards. As a result, after the takeover, Petroamazonas incurred costs in order to upgrade the technology used in its offices and implement "Maximo", a new Computerized Maintenance Management System (CMMS).²¹²³ Mr. Luna highlights that Petroamazonas had to implement the system from scratch, because the Consortium did not transfer the information from its SAP system or other maintenance archives when Petroamazonas took over the Blocks.²¹²⁴
1053. Ecuador now seeks to recover these costs, which Mr. Luna quantifies at USD 151,601.96, including the purchase of computers, cameras, and the cost of hiring specialized personnel to implement the system.²¹²⁵ Excluding the purchase of computers, Ecuador quantifies this claim at USD 81,384.96.²¹²⁶
1054. Ecuador also separately claims for the additional costs of purchasing (additional) new software and computers.²¹²⁷ Ecuador includes this in a global claim for other equipment,²¹²⁸ but has clarified that its total claim for new software and computers (including Maximo) amounts to USD 470,565.01.²¹²⁹ The Tribunal thus understands that its claim for additional computers and software (other than Maximo) amounts to USD 389,180.05 (USD 470,565.01- USD 81,384.96).

b. Burlington's position

1055. For Burlington, the claim related to the Maximo software is another illustration of Ecuador seeking payment for upgrades. Burlington contends that the Consortium owned the software management program known as SAP, which complied with industry standards and was programmed with the information on the Block's infrastructure.

²¹²³ 2nd SMCC, ¶ 406.

²¹²⁴ Luna WS3, ¶ 171.

²¹²⁵ *Id.*, ¶¶ 10-14 and Annex 18; Luna WS4, ¶ 172.

²¹²⁶ 2nd SMCC, ¶ 418.

²¹²⁷ *Id.*, ¶ 417.

²¹²⁸ Otros gastos de reacondicionamiento de los Bloques, amended version (**Exh. E-301**).

²¹²⁹ Ecuador's Opening Statement, Slide 137.

Burlington thus argues that, even if Ecuador had chosen to switch from SAP to Maximo, it could have done so at a minimal cost by transferring the data contained in the SAP database to the Maximo database.²¹³⁰ However, Ecuador chose not to participate in technical meetings with the Consortium to facilitate the transfer of data. As a result, it is solely responsible for any associated costs.²¹³¹

1056. Burlington further argues that an upgrade in technology does not require new or special computers.²¹³²

c. Discussion

1057. With respect to Ecuador's claim for the implementation of the Maximo CMMS, the Tribunal notes that the Consortium had another management software in place (the SAP system), which Dr. Egan characterizes as a "comprehensive" and "internationally recognized management system" complying with industry standards.²¹³³ Dr. Egan explains that:

"The Consortium's SAP program was populated with maintenance information relevant to the Block 7 and Block 21 infrastructure. Based upon the maintenance information entered, the SAP program alerted the Consortium when additional maintenance was needed, according to pre-determined time intervals. Once the maintenance was completed, the SAP program generated a work order to document that the required maintenance was complete".²¹³⁴

1058. Mr. Luna does not dispute these statements, but rather argues that, because the Consortium did not leave its SAP database when it left the Blocks, Petroamazonas had to program the Maximo system from scratch.²¹³⁵ However, as Burlington has pointed out, after the takeover, the Consortium wrote to Petroamazonas to, *inter alia*, "propose a technical meeting to assure an orderly post-takeover transition [...]", but Petroamazonas did not reply.²¹³⁶ While it is true that the Consortium's letter referred

²¹³⁰ CMCC, ¶ 635, relying on: Intertek ER1, ¶ 50.

²¹³¹ CMCC, ¶ 635; Rejoinder, ¶ 422.

²¹³² CMCC, ¶ 634.

²¹³³ Intertek ER1, ¶¶ 48-51.

²¹³⁴ *Id.*, ¶ 49.

²¹³⁵ Luna WS4, ¶ 172.

²¹³⁶ Letter from Rubén Vintimilla (Perenco) to Wilson Pástor M. (Petroamazonas), 23 July 2009, p. 4 (**Exh. CE-CC-221**).

specifically to the transition of employees and contractors, this letter shows the Consortium's willingness to collaborate towards an adequate transition. As a result, the Tribunal finds that Ecuador must bear its costs of implementing a new CMMS.

1059. As to Ecuador's claim for new computers, other than Mr. Luna's assertions that the Consortium did not have sufficient computers to implement the Maximo system²¹³⁷ and Ecuador's allegation that Petroamazonas thus had to purchase new computers,²¹³⁸ Ecuador has not advanced any evidence that the IT equipment and computer software were in need of replacement. Indeed, Ecuador itself characterizes these expenses as an upgrade, rather than a repair.²¹³⁹ In addition, both SGS Reports consider most of the computers and software examined to be in "good" or "very good condition".²¹⁴⁰
1060. As a result, the Tribunal dismisses this claim for lack of sufficient evidence that these expenses were caused by Burlington's negligence.

2.6.4 Road maintenance and vehicles

a. Ecuador's position

1061. Ecuador seeks to recover the amounts which it has spent in the purchase of new vehicles (USD 98,187.16) and road maintenance (USD 381,127.64).²¹⁴¹
1062. According to Ecuador, contemporaneous evidence shows that the Consortium's vehicles had exceeded their useful life. Ecuador alleges in particular that in March 2008, 72% of the vehicles were more than 10 years old and 51% had run over 250,000 kilometers. For this reason, Ecuador argues that it is entitled to be reimbursed for the costs of the replacement vehicles it acquired.²¹⁴²
1063. Ecuador also contends that the Consortium did not invest sufficiently in road maintenance, as proved by the discrepancy between Petroamazonas' and the

²¹³⁷ Luna WS4, ¶ 172.

²¹³⁸ 2nd SMCC, ¶ 417.

²¹³⁹ *Id.*, ¶ 405 (referring to expenses incurred for, inter alia, "upgrading the technology used in the offices with new software and computers").

²¹⁴⁰ Société Générale de Surveillance, Inventory Report, 2009 (**Exh. CE-CC-217**) and Société Générale de Surveillance, Inventory Report, 2010 (**Exh. CE-CC-240**).

²¹⁴¹ Otros gastos de reacondicionamiento de los Bloques, amended version (**Exh. E-301**).

²¹⁴² Reply, ¶ 532(a).

Consortium's spending. According to Ecuador, in 2010 Petroamazonas spent USD 4,264,318.05 on road maintenance, while the Consortium only spent USD 435,051 in 2008.²¹⁴³ Ecuador emphasizes that it only seeks road maintenance costs which it incurred on account of the Consortium's lack of past maintenance during its operatorship of Blocks 7 and 21.²¹⁴⁴

b. Burlington's position

1064. Burlington opposes the claims concerning road maintenance and new vehicles on the ground that Petroamazonas attempts to charge the Consortium for regular maintenance and for improvements necessary for its expanded operations and growing workforce on the Blocks.²¹⁴⁵
1065. Relying on Dr. Egan, Burlington argues that its obligation was limited to maintaining the roads that provided access to the pads and that Ecuador has not shown evidence of a lack of maintenance in any of these roads.²¹⁴⁶ In addition, Dr. Egan notes that the total amount invested in road maintenance on the Blocks from 2006 to 2009 was an average of USD 649,595 per year. While Dr. Egan recognizes that "it is difficult to interpret the trends (the need for road maintenance may be affected by weather causing wash outs for example)", he concludes that "it is clear that the Consortium invested substantially in road maintenance through its operating period".²¹⁴⁷ Burlington also notes that the annual expenses allegedly incurred by Petroamazonas cover its total spending on the 6 blocks which it operates. Adjusted for two blocks the figure is comparable to that of the Consortium.²¹⁴⁸
1066. Burlington also denies that the vehicles left by the Consortium had exceeded their useful life and argues that it was therefore unnecessary to buy new vehicles. According

²¹⁴³ *Id.*, ¶ 532(c).

²¹⁴⁴ *Ibid.*, referring to: Luna WS4, Annex 36.

²¹⁴⁵ CMCC, ¶ 634; Rejoinder, ¶ 413.

²¹⁴⁶ Intertek ER1, ¶ 140.

²¹⁴⁷ *Id.*, ¶ 141.

²¹⁴⁸ Rejoinder, ¶ 413.

to Burlington, Ecuador's purchase of four new vehicles corresponds to an upgrade in view of Petroamazonas' growing workforce.²¹⁴⁹

2.6.5 Discussion

1067. With respect to Ecuador's claim for new vehicles, the Tribunal notes that, according to "the National Transit Commission of Ecuador, the useful life of a double cabin truck is 15 years, and the larger vehicles such as tractors and trucks have a useful life of 32 years".²¹⁵⁰ The Tribunal also notes that Ecuador has put forward no documentary evidence supporting the need to repair or replace specific vehicles. That being said, the SGS reports identify at least two vehicles (both of them Toyota Landcruisers) that are either in "very bad" or "good" but damaged condition.²¹⁵¹ Since Ecuador is claiming the cost of purchasing four similar vehicles for a total of USD 98,187.16²¹⁵² and Burlington has not challenged this amount as such, the Tribunal grants Ecuador half of this claim, i.e. USD 49,093.58.
1068. In respect of roads, Ecuador claims that the amounts spent on road maintenance were due to a lack of past maintenance by Burlington without pointing to any supporting evidence. No mention of the allegedly bad state of the roads is found in either SGS Report, and while the 2008 Environmental Audit refers to a lack of signposting, this can hardly be considered sufficient to support Ecuador's claims.²¹⁵³ Therefore, the claim regarding road maintenance expenditures is dismissed for lack of proof that these expenses were caused by Burlington's negligence.

2.7 Other claims

1069. Ecuador also seeks compensation for other repairs and the upgrade of facilities and purchase of back up equipment, spare parts and materials to bring the Blocks' operations in line with industry standards. These works include the reconditioning of wells, the refurbishment of camps and a new communications tower in Gacela CPF.

²¹⁴⁹ CMCC, ¶ 634; Rejoinder, ¶ 420.

²¹⁵⁰ Intertek ER2, ¶ 175.

²¹⁵¹ Société Générale de Surveillance, Inventory Report, 2009, Line 247, Depreciable B-7 (**Exh. E-CC-217**); Société Générale de Surveillance, Inventory Report, 2010, Line 1628, Perpetuo B-7 (**Exh. CE-CC-240**).

²¹⁵² Otros gastos de reacondicionamiento de los Bloques, amended version (**Exh. E-301**).

²¹⁵³ Block 7 Environmental Audit, November 2008 (**Exh. CE-CC-182**).

1070. Burlington contends that these claims should be dismissed, because it maintained and returned the Blocks' infrastructure in good condition and in accordance with industry standards. For the Claimant, Ecuador's refurbishment works and any increase in the maintenance budget are attributable to its expansion of the Blocks and the resulting rise in production levels, and are unrelated to Burlington's operation of the Blocks.
1071. The Tribunal finds that these claims have not been sufficiently particularized or proven – in certain cases they were not even pleaded – by the Respondent. As an example, Ecuador claims USD 122,540.77 to build a new communications tower in Gacela CPF. However, there is no reference to this item in the Respondent's submissions. The only mentions of this tower which the Tribunal has been able to identify are in Exhibit E-301 and slide 137 of Ecuador's Opening Statement on Counterclaims. Yet, these provide no explanation for the claim nor any indication that the construction of the tower was necessary due to the Consortium's conduct. This is but one example to illustrate that these claims are insufficiently established.
1072. Moreover, as noted above, the Tribunal has found that the infrastructure on the Blocks was generally in proper condition, and that the Respondent's expansion plans and increases in production were bound to require (and in certain cases have in fact been shown to be the cause of) improvements to the existing equipment and facilities.
1073. For all these grounds, these further claims are thus dismissed.

3. Conclusion

1074. For the reasons set forth above, the Tribunal decides to grant a total of **USD 2,577,119.77** in respect of Ecuador's infrastructure counterclaims, itemized as follows:
- i. USD 503,572.76 for the Gacela T-104 and Payamino T-102 tanks, as well as minor repairs to pipelines;
 - ii. USD 1,462,553.43 for repairs related to pipelines and fluid lines;
 - iii. USD 561,900.00 for Block 7 engines; and
 - iv. USD 49,093.58 for new vehicles.

D. Conclusion On Counterclaims

1075. In conclusion, the Tribunal decides to grant a total of **USD 41,776,492.77** in respect of Ecuador's counterclaims, comprising:
- i. USD 39,199,373 for the environmental counterclaims (see paragraph 889 above); and
 - ii. USD 2,577,119.77 for the infrastructure counterclaims (see paragraph 1074 above).
1076. In this context, the Tribunal notes Burlington's request for relief raised in its Post-Hearing Brief seeking a declaration that "beyond the exceedances assessed by the Tribunal, Burlington has no further liability for environmental harm in Blocks 7 and 21".²¹⁵⁴ The declaration sought is in line with the agreement of 26 May 2011 by which the Parties submitted the counterclaims to this Tribunal.
1077. Whereas Clause 9 of such agreement records that this arbitration is "the appropriate forum for the final resolution of the Counterclaims arising out of investments made by Burlington Resources and its affiliates in Blocks 7 and 21, so as to ensure maximum judicial economy and consistency", Clause 1(b) extends the binding force and *res judicata* effects of the present decision as follows:

"The decision of the Arbitral Tribunal constituted in the Arbitration on the Counterclaims shall be final and binding on the Parties and have full ***res judicata*** effect with respect to: (i) Burlington Resources and Ecuador (including its emanations, agencies, instrumentalities, subdivisions and controlled corporations including, without limitation, Petroecuador); and (ii) all affiliates of Burlington Resources, Burlington Oriente and Burlington Resources International, including ConocoPhillips and all of its subsidiaries and affiliates (together, the ***ConocoPhillips Group***) as if such claims had been brought and resolved against them".²¹⁵⁵

²¹⁵⁴ C-PHB, ¶ 277(c). Burlington's earlier memorials do not contain a request of the same content. Its Rejoinder seeks an indemnification from third party claims, a request not later repeated and distinct from the one discussed here. See: Rejoinder, ¶ 426(b).

²¹⁵⁵ Agreement between Burlington, Burlington Resources Oriente Limited and Burlington Resources International and Ecuador, 26 May 2011 (**Exh. E-251**) (emphasis in the original).

1078. Clause 1(c) then provides for a waiver by Ecuador of further actions in the following terms:

“Ecuador (including its emanations, agencies, instrumentalities, subdivisions and controlled corporations including, without limitation, Petroecuador) formally waives its right to bring the Counterclaims, including, but not limited to any claims based on alleged environmental liability arising out of Blocks 7 and 21 (including under the Block 7 PSC and Block 21 PSC) against Burlington Resources, Burlington Oriente and any other corporation in the ConocoPhillips Group, before any jurisdiction whatsoever whether arbitral or judicial, national or international except for this Arbitration”.²¹⁵⁶

1079. In view of this waiver, the Tribunal considers that a ruling is not necessary. It takes formal notice, however, of the content of the agreement of 26 May 2011, especially of the waiver which it contains, as recorded above.

1080. As a final matter, the Tribunal must address the issue of double recovery. As mentioned in paragraph 70 above, Burlington has called the Tribunal’s attention to the potential risk of double recovery in respect of the Respondent’s counterclaims since Ecuador “made a full claim for the alleged environmental harm in each of the Burlington and Perenco cases”.²¹⁵⁷ Burlington requests that the Tribunal address the “potentially pernicious consequences” deriving from that risk so that “if the dispositive part of either of the awards on counterclaims provides for any compensation, Ecuador would be prevented from enforcing the second award to the extent that it has already been compensated by the first”.²¹⁵⁸

1081. The Tribunal notes that there is no dispute between the Parties on the issue of double recovery. More specifically, first, there is no question that Ecuador claims compensation for the same damages in these and in the parallel *Perenco* proceedings. For Burlington, Ecuador is “twice seeking 100% recovery of precisely the same alleged damages, for precisely the same alleged injury, on precisely the same legal and factual bases”.²¹⁵⁹ Ecuador, for its part, does not deny that it seeks compensation for the same harm in both cases, although it distinguishes the two arbitrations in various ways, stating for

²¹⁵⁶

Ibid.

²¹⁵⁷

Letter of 18 September 2015 from Burlington to the Tribunal, p. 2.

²¹⁵⁸

Ibid.; CMCC, ¶ 643.

²¹⁵⁹

CMCC, ¶ 643. See also: Tr. (Day 1) (ENG), 155:17-22 (Opening, Blackaby).

instance that the arguments or the evidence in both cases are not “exactly the same”.²¹⁶⁰ Ecuador actually relies on the joint and several liability of the Consortium partners to justify its claim against Burlington, although only Perenco operated the Blocks.²¹⁶¹

1082. Second, it is also common ground that claiming compensation for the same damage in parallel proceedings creates a risk of double recovery.²¹⁶² In this context, Ecuador submits that whichever tribunal issues the later award on Ecuador’s counterclaims can readily address this risk and thus Burlington’s fear of “pernicious consequences” is misplaced.²¹⁶³

“Ecuador [...] adds that its counterclaims will not result in ‘*pernicious consequences*.’ If Claimant alludes to the issue of double recovery, the prohibition thereof exclusively applies when a party has already been indemnified by a third party. In addition, Claimant cannot pretend to ignore that any second award in the present cases against the Consortium members ‘*could be fashioned in such a way as to prevent double recovery*.’ International law, Ecuadorian law and international decisions offer numerous mechanisms for preventing double recovery, including by taking into account the monetary relief granted by any prior award”.²¹⁶⁴

1083. Third, there is common ground between the Parties that a creditor can only be compensated once for a given harm, and rightly so, as a number of arbitral tribunals have acknowledged that the “prohibition of double recovery for the same loss is a well-established principle”.²¹⁶⁵

²¹⁶⁰ See, for instance: Tr. (Day 7) (ENG), 2357:13-20 (Tribunal, Silva Romero).

²¹⁶¹ For instance, Ecuador stated that: “Pursuant to Ecuadorian law, all the authors of a tort (such as environmental harm) are jointly liable to its victim. Accordingly, Ecuador is entitled to claim for the total amount of damages from Burlington or Perenco or any other author of the environmental harm caused, including CEPE and Petroproduccion, which are entities different from the Ecuadorian state”. Reply, ¶ 8. See also: R-PHB, ¶ 603.

²¹⁶² Letter of 18 September 2015 from Burlington to the Tribunal, p. 2.

²¹⁶³ Reply, ¶ 545.

²¹⁶⁴ Emphasis in the original and citations omitted. Reply, ¶ 547.

²¹⁶⁵ *Venezuela Holdings B.V. and others v. Bolivarian Republic of Venezuela*, ICSID Case No. ARB/07/27, Award of 9 October 2014, ¶ 378. See also: *Pan American Energy LLC and BP Argentina Exploration Company v. The Argentine Republic*, ICSID Case No. ARB/03/13 and *BP America Production Company and others v. The Argentine Republic*, ICSID Case No. ARB/04/8, Decision on Preliminary Objections of 27 July 2006, ¶ 219; among others: *Bayindir Insaat Turzim Ticaret Ve Sanayi A.Ş. v. Islamic Republic of Pakistan*, ICSID Case No. ARB/03/29,

1084. Fourth, the Tribunal takes note that, prior to the end of the Hearing on counterclaims, counsel for Ecuador clearly stated that Ecuador does not seek double recovery in its claims against the Consortium members:

“The second comment I am specifically instructed to make today is that we don’t want the Burlington Tribunal to have any concern regarding double recovery. This is not what Ecuador is looking for”.²¹⁶⁶

1085. The Tribunal takes due notice of Ecuador’s representations, which are in line with the general principle prohibiting double recovery.

1086. As of the date of the present Decision, the *Perenco* tribunal has issued no decision yet on the counterclaims before it. Therefore, this Tribunal lacks the necessary information or basis to adopt any specific measures – to *fashion its decision*, to borrow Ecuador’s phrase – to prevent double recovery, a task that it must leave to the *Perenco* tribunal as the one deciding in second place. This being said, this Tribunal nonetheless states that, as a matter of principle, the present Decision cannot serve and may not be used to compensate Ecuador twice for the same damage.

VI. INTEREST

A. Parties’ Positions

1087. In its Post-Hearing Brief quoted in paragraph 0 above, Ecuador claims interest on all sums awarded at an “adequate commercial interest rate” from the date of the Award. In addition, on sums awarded based on the infrastructure counterclaims, it also requests pre-award interest, to run from the “date of disbursement” of the amounts for which damages are awarded. While in earlier submissions on the counterclaims, the Respondent sought compound interest,²¹⁶⁷ the requests for relief in the Post-Hearing Brief contain no indication whether simple or compound interest is sought. Nor does Ecuador provide any arguments on the entitlement and computation of interest in connection with the counterclaims, unlike in the context of Burlington’s claims. That

Decision on Jurisdiction of 14 November 2005, ¶ 270; *Daimler Financial Services AG v. The Argentine Republic*, ICSID Case No. ARB/05/1, Award of 22 August 2012, ¶ 155.

²¹⁶⁶ Tr. (Day 7) (ENG), 2358:14-18 (Tribunal, Silva Romero).

²¹⁶⁷ CM Liability, ¶ 813; SMCC, ¶¶ 339 and 341; 2nd SMCC; ¶¶ 425 and 427; Reply, ¶¶ 541 and 543.

said, in its submissions on Burlington’s claims Ecuador has clarified that it seeks simple interest for both claims and counterclaims.²¹⁶⁸

1088. Burlington opposes Ecuador’s claims on the merits, but does not take issue with the request for interest as such. For itself, it claims interest on costs and expenses involved in the context of the counterclaims at a rate of 4 percent p.a. compounded annually or any other rate and compounding period that the Tribunal may consider “just and appropriate”.²¹⁶⁹

1089. The Tribunal further notes that, in its costs submission, Ecuador claimed simple interest at an adequate commercial rate, which it equated to a “reasonable commercial rate” and specified as LIBOR plus two percent.²¹⁷⁰ Burlington claimed interest on costs upon the same terms as those set out in the preceding paragraph.

B. Discussion

1090. It is common ground between the Parties that amounts due and paid late must earn interest. It is equally undisputed that interest must accrue at a reasonable commercial rate. For reasons further explained in the Award and because this solution is in line with both Parties’ requests, the Tribunal sets such rate at LIBOR for three month borrowings plus two percent.²¹⁷¹

1091. There is no controversy either that interest on sums awarded for Ecuador’s counterclaims must run from the date of this Decision. As an exception, in connection with the infrastructure claims, Ecuador claims interest from the “date of disbursement” of the amounts expended to remediate the poor condition of the infrastructure. Burlington does not appear to have expressed a view on this claim for pre-award interest. This said, Ecuador has not indicated the relevant “dates of disbursement” that the Tribunal is asked to take into consideration. As a result, the Tribunal cannot but consider that these dates are insufficiently established and, therefore, sets the *dies a quo* of the interest on the date of this Decision.

²¹⁶⁸ Motion for Reconsideration and Counter-Memorial on Quantum, ¶ 563.

²¹⁶⁹ C-PHB, ¶ 277; quoted in paragraph 0 above.

²¹⁷⁰ R-Cost submission, ¶¶ 8, 13, 15 and 29.

²¹⁷¹ See: Section VII.D (5.3.3) of the Award.

1092. There remains the question whether interest should be simple or compound. While Ecuador has argued for simple interest in the context of Burlington’s claims, in its submissions on counterclaims it has first sought compound interest and then remained silent (save in relation to costs, which will be addressed in the Award).
1093. In its submissions in respect of Burlington’s claims, Ecuador has argued that Ecuadorian law prohibits compound interest,²¹⁷² and has clarified that, in accordance with Ecuadorian law, it is limiting its claim for interest on the amounts sought under its counterclaims to simple interest.²¹⁷³ The Tribunal has rejected this argument in respect of interest accruing on the claims because these are subject to international law.²¹⁷⁴ Ecuador’s counterclaims, however, are governed by Ecuadorian law. Burlington objects to the application of Ecuadorian law to interest awarded on its claims, but is silent with respect to the law governing interest on the counterclaims.²¹⁷⁵
1094. The Tribunal notes that, as a general rule, Ecuadorian law prohibits compounding. Pursuant to Article 2113 of the Ecuadorian Civil Code, “[i]t is forbidden to stipulate interest on interest”.²¹⁷⁶ That being said, the Ecuadorian Commercial Code exceptionally appears to allow compounding in certain cases, as follows:

“In commercial loans or other kinds of commercial debt, no returns are owed over accrued returns, but from, once they are settled, the moment in which they are included in a new contract as an increase in the principal, or from the moment when, pursuant to a mutual agreement, or by a judicial declaration, outstanding accounts are settled; settlement that must include the returns accrued up to that moment, and which cannot take place but when the obligations the returns derive from are due and payable in cash”.²¹⁷⁷

²¹⁷² Motion for Reconsideration and Counter-Memorial on Quantum, ¶ 562, citing: Article 308 of the Constitution, Articles 1575 and 2113 of the Ecuadorian Civil Code, and Article 561 of the Ecuadorian Commercial code.

²¹⁷³ Motion for Reconsideration and Counter-Memorial on Quantum, ¶ 563.

²¹⁷⁴ See: Section VII.D (5.3.3) of the Award.

²¹⁷⁵ Burlington declines to comment on whether Ecuadorian law prohibits compounding, arguing that “[e]ven if true (which must at least be questionable given Ecuador’s prior pleadings), the treatment of interest under domestic Ecuadorian law is irrelevant” in the context of Burlington’s international law claims. See Reply on Quantum, ¶ 244.

²¹⁷⁶ Article 2113 of the Ecuadorian Civil Code (Translation by Ecuador) (**Exh. EL-182**).

²¹⁷⁷ Article 561 of the Ecuadorian Commercial Code (Translation by Ecuador) (**Exh. EL-296**).

1095. In the Tribunal's view, it is not sufficiently clear whether the interest to be awarded in this Decision falls under the exception provided in Article 561 of the Ecuadorian Commercial Code. The Tribunal thus defers to Ecuador's interpretation of its own law, according to which compound interest is prohibited, and to its request for relief, which seeks simple interest. Accordingly, the Tribunal will award simple interest on Ecuador's counterclaims.
1096. Finally, the Tribunal notes that it will deal with the matter of interest on the Parties' costs claims in the context of its review of costs in the Award.
1097. In conclusion, the Tribunal deems it just and appropriate to award simple interest at LIBOR for three month borrowings plus two percent, from the date of this Decision until payment in full.

VII. COSTS

1098. The Tribunal will deal with the costs of this arbitration in one decision including interest on costs, to be included in the Award.

VIII. OPERATIVE PART

1099. For the reasons set forth above, the Arbitral Tribunal:

A. Declares

1. That Burlington is liable towards Ecuador for the costs of restoring the environment in areas within Blocks 7 and 21 in the amount specified in paragraph B(1) below;
2. That Burlington is liable towards Ecuador for the costs required to remedy the infrastructure of Blocks 7 and 21 in the amount specified in paragraph B(2) below;

B. Orders

1. Burlington to pay damages to Ecuador in an amount of USD 39,199,373;
2. Burlington to pay to Ecuador USD 2,577,119.77;

3. That amounts awarded in subparagraphs (1) and (2) shall bear simple interest at LIBOR for three month borrowings plus two percent, from the date of this Decision until payment in full;
- C. Reserves costs for a later determination;
 - D. Dismisses all other requests for relief in connection with the counterclaims.

[signed]

Mr. Stephen Drymer
Arbitrator

[signed]

Prof. Brigitte Stern
Arbitrator

[signed]

Prof. Gabrielle Kaufmann-Kohler
President of Tribunal