COMMISSION FOR ENVIRONMENTAL COOPERATION

Hydraulic Fracturing in Nuevo León

Factual Record Regarding Submission SEM-18-003

Submitted to Council in accordance with Article 24.28(5) of the *Agreement between the United States of America, the United Mexican States, and Canada*

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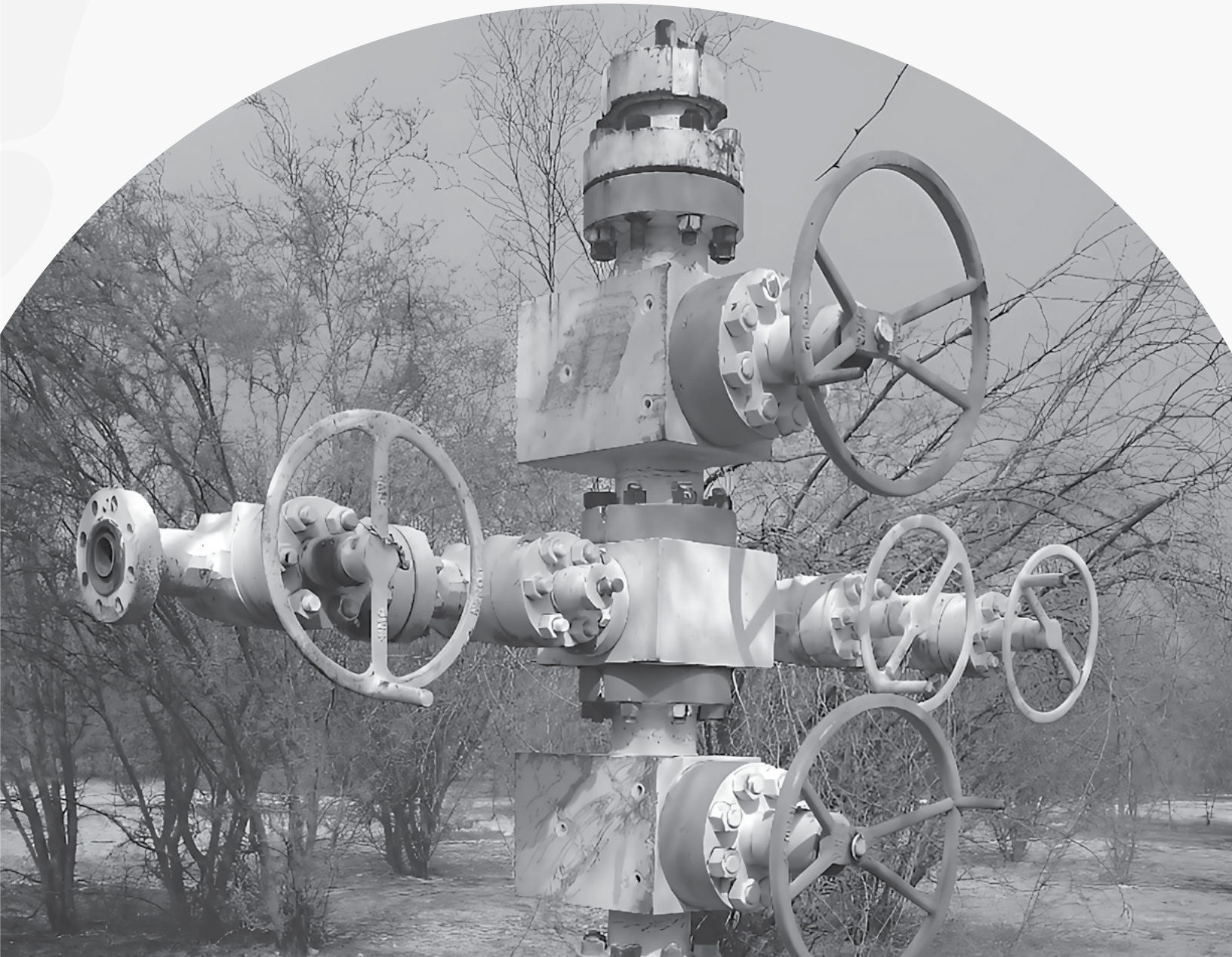

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Acronyms

AIA	environmental impact approval (*autorización en materia de impacto ambiental*)
Asea	National Agency for Industrial Safety and Environmental Protection in the Hydrocarbon Sector (*Agencia Nacional de Seguridad Industrial y de Protección al Medio Ambiente del Sector Hidrocarburos*)
BOD	biochemical oxygen demand
CEC	Commission for Environmental Cooperation
CNH	National Hydrocarbons Commission (*Comisión Nacional de Hidrocarburos*)
COD	chemical oxygen demand
Conagua	National Water Commission (*Comisión Nacional del Agua*)
DGIRA	Environmental Impact and Risk Branch (*Dirección General de Impacto y Riesgo Ambiental*) of Semarnat
DOF	Official Gazette of the Federation (*Diario Oficial de la Federación*)
E. coli	*Escherichia coli*
ECA	Agreement on Environmental Cooperation (effective 1 July 2020)
EIS	environment impact statement
FC	fecal coliforms
Fec_Entrecoc	fecal enterococci
JPAC	Joint Public Advisory Committee
LGEEPA	General Ecological Balance and Environmental Protection Act (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*)
NAAEC	North American Agreement on Environmental Cooperation
NOM	Mexican Official Standard (*Norma Oficial Mexicana*)
Pemex	Petróleos Mexicanos
PEP	Pemex Exploración y Producción
PNT	National Transparency Platform (*Plataforma Nacional de Transparencia*)
SEM	Submissions on Enforcement Matters
Semarnat	Ministry of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*)
Sener	Ministry of Energy (*Secretaría de Energía*)
Tox	toxicity
TDS	total dissolved solids
TSS	total suspended solids
UCAI	International Affairs Coordinating Unit (*Unidad Coordinadora de Asuntos Internacionales*) of the Ministry of the Environment and Natural Resources
USMCA	United States-Mexico-Canada Agreement (effective 1 July 2020)
VOC	volatile organic compounds

Definitions

Agreement	North American Agreement on Environmental Cooperation (NAAEC)
Burgos Basin Project	Comprehensive Project for the Burgos Basin 2004–2022, approved by the Environmental Impact and Risk Branch (*Dirección General de Impacto y Riesgo Ambiental*—DGIRA) of the Ministry of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*—Semarnat) on 28 September 2004, with an area of 40,294.34 km^2 and location on the northeastern border of Mexico, in the states of Nuevo León, Tamaulipas, and Coahuila
Council	Council of the CEC
Council Resolution 23-05	Council Resolution 23-05 of the Commission for Environmental Cooperation (CEC) dated 5 October 2023, Instructions to the Secretariat regarding submission SEM-18-003 (*Hydraulic Fracturing in Nuevo Leon*), which asserts that the Mexican environmental authorities are failing to effectively enforce various provisions of the General Act on Ecological Balance and Environmental Protection (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*—LGEEPA), the Federal Environmental Liability Act (*Ley Federal de Responsabilidad Ambiental*—LFRA), the Regulation to the Mexican Waste Prevention and Management Act (*Reglamento de la Ley General de Prevención y Gestión Integral de Residuos*—LGPGIR Regulation), and the Guidelines for the Protection and Conservation of National Waters in Connection with Hydrocarbon Exploration and Extraction in Unconventional Reservoirs (*Lineamientos para la protección y conservación de las aguas nacionales en actividades de exploración y extracción de hidrocarburos en yacimientos no convencionales*—National Waters Contamination Prevention Guidelines), with respect to hydraulic fracturing in the Tangram I and Nerita I wells, located in the municipality of Los Ramones, Nuevo León
EIA Procedure	environmental impact assessment procedure
Guidelines	*Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation*
Guidelines for Water Conservation-UR	Guidelines for the Protection and Conservation of National Waters in Connection with Hydrocarbon Exploration and Extraction in Unconventional Reservoirs (*Lineamientos para la protección y conservación de las aguas nacionales en actividades de exploración y extracción de hidrocarburos en yacimientos no convencionales*)
Mexico	United Mexican States
Notification	SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), NAAEC Article 15(1) Notification (30 September 2020)
Parties	The governments of Canada, the United States and Mexico
Party	The Government of Mexico
Response	SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), Party Response (8 April 2020)
Secretariat	Secretariat of the CEC
SEM Unit	Legal Affairs and Submissions on Enforcements Matters Unit
Submission	SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), NAAEC Article 14(1) Submission (3 October 2018, and 21 February 2019 in its revised version)
Submitters	Authors of submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*)
United States	United States of America

Units of measure

˚C	degrees centigrade
% DO	percentage dissolved oxygen saturation
bbl	barrels (one barrel is equivalent to 158.987 liters or 0.158987 m^3)
bpm	barrels per minute
cm	centimeters
cP	centipoise
g/l	grams per liter
g/cm³	grams per cubic centimeter
ha	hectare
hm³	cubic hectometer
Kg	kilogram
km	kilometer
km²	square kilometer
m	meter
m³	cubic meter
md	millidarcies
mg	milligram
ml	milliliter
mm	millimeter
MPa	megapascal
pH	potential of hydrogen
Ppm	parts per million
S	seconds
T	metric ton (1,000 kg)
V	volts

Clarifications

Due to the length of some Internet addresses referenced in this document, and for ease of reading, Bitly (https:// bitly.com) was used as an URL shortener. In all cases, the corresponding links were tested prior to sending the draft factual record to the Parties.

The maps and other illustrations included in this factual record were produced from available sources and are for purposes of illustration only.

Unless otherwise indicated, all official documents cited herein are found in the archives of the Secretariat and may be viewed using the links appearing in this document. Furthermore, the page numbers cited in the submission and the response correspond to those of their original Spanish versions.

Terminology

Term	Definition
Abandonment of wells	A set of activities consisting of the removal of materials and dismantling of equipment from a well, which includes its plugging (preserving its integrity) and retirement, as well as the dismantling and removal of facilities, platforms, fixtures, machinery and other equipment used in the performance of petroleum activities.[i]
Cellar	A dug-out structure built for georeferencing of the site where the well is to be drilled.[ii]
Completion of wells	The *completion* of a well occurs when drilling is finished and the well is ready either to produce or, if unproductive, to be plugged and abandoned. If an extraction well is unproductive—or at the end of its useful life—it must be definitively closed in accordance with the established technical provisions, through which the ends of the well are sealed to ensure that it is airtight and that there are no fugitive emissions.[iii]
Connate water	Defined by Mexican law as "water associated with hydrocarbons in the reservoir that emerges during extraction thereof. Contains salts and may contain metals. Considered an unusable byproduct."[iv]
Conventional reservoir	Petroleum system in which hydrocarbons are found in a "geological trap" at high temperature and high pressure and occupy porous spaces. The constituent parts of the system are source rock, reservoir rock, trap, cap rock, and migration and accumulation processes.[v]
Disposal well	Specially engineered structure, or well that is no longer productive, that has a main purpose of final disposal of drill cuttings or fluids resulting from drilling, fracturing, or extraction of shale hydrocarbons.[vi]
Drill cuttings	Rock fragments produced during the drilling of a well, composed of ore from the formation that is saturated with fluids or oil-based muds from the drilling procesvs.[vii]
Dry gas	"Natural gas containing smaller quantities of heavier hydrocarbons than methane. Dry gas is also obtained from gas processing facilities."[viii]

i. CNH (2016), "Lineamientos de perforación de pozos," Glossary (Annex I), Comisión Nacional de Hidrocarburos, *Diario Oficial de la Federación* (*DOF*), 14 de octubre de 2016, en: <https://bit.ly/4fwLRo3>.

ii. Mexican Official Standard NOM-014-ASEA-2022, *Especificaciones de protección al medio ambiente para la construcción y mantenimiento de pozos para la exploración y extracción de hidrocarburos en zonas agrícolas, ganaderas y eriales, fuera de áreas naturales protegidas o terrenos forestales* (cancels and replaces NOM-115-Semarnat-2003, *Que establece las especificaciones de protección ambiental que deben observarse en las actividades de perforación y mantenimiento de pozos petroleros terrestres para exploración y producción en zonas agrícolas, ganaderas y eriales, fuera de áreas naturales protegidas o terrenos forestales*), published in the DOF on 15 September 2022, at: <https://bit.ly/3whMot7>.

iii. Semarnat (2015), *supra* at 57, 27 and 31, at: <https://bit.ly/3tkZXXq>. See also: CNH (2016), "Lineamientos de perforación de pozos," Glossary (annex I), Comisión Nacional de Hidrocarburos, *DOF* 14 October 2016, at: <https://bit.ly/4fwLRo3>.

iv. Mexican Official Standard NOM-143-Semarnat-2003, *Que establece las especificaciones ambientales para el manejo de agua congénita asociada a hidrocarburos*, published in the *DOF* on 3 March 2005, at: <https://bit.ly/3RqmACB>.

v. Sener, Deputy Minister for Hydrocarbons (*Subsecretaría de Hidrocarburos*), Hydrocarbon Exploration and Extraction Branch (*Dirección General de Exploración y Extracción de Hidrocarburos*) (2017), "Glosario de términos petroleros," at 18, at: <https://bit.ly/3TwE4Pg>; CNH (2022), *Retos y Oportunidades de la Producción de Petróleo y Gas Natural de Yacimientos No Convencionales en México*, at 19, at: <https://bit.ly/44xhx8P>.

vi. Semarnat (2015), *Guía de criterios ambientales para la exploración y extracción de hidrocarburos contenidos en lutitas*, at 56, at: <https://bit.ly/3tkZXXq>; Asea (2021), "Disposiciones administrativas de carácter general aplicables al diseño, construcción, operación y taponamiento de Pozos de Disposición," published in the *DOF* on 20 September 2021, at: <https://bit.ly/44s6e1B>.

vii. Semarnat (2015), *supra* at 56, at: <https://bit.ly/3tkZXXq>; Mexican Official Standard NOM-115-SEMARNAT-2003, *Que establece las especificaciones de protección ambiental que deben observarse en las actividades de perforación y mantenimiento de pozos petroleros terrestres para exploración y producción en zonas agrícolas, ganaderas y eriales, fuera de áreas naturales protegidas o terrenos forestales*, published in the *DOF* on 27 August 2004, at: <https://bit.ly/3UxBTdc>.

viii. Sener (2017), *supra* at 10, at:<https://bit.ly/3TwE4Pg>.

Terminology

Term	Definition
Endocrine disruptors	Also known as "hormonally active agents," *endocrine disruptors* are a wide range of chemical substances or compounds that can alter the hormonal balance of an organism or its progeny and cause harmful health effects.[ix]
Enhanced recovery	Recovery of oil remaining in a reservoir through injection of materials not regularly occurring in the reservoir that change the dynamic behavior of the resident fluids. Enhanced recovery can be done at any stage in the life of the reservoir (primary, secondary, or tertiary).[x]
Exploration	A set of activities carried out in a given area for the purpose of identifying, discovering, and assessing the presence of hydrocarbons in the subsoil. In general, *exploration* mainly involves the use of direct methods in the subsoil, such as the drilling of wells.[xi]
Extraction	A set of activities centering around the production of hydrocarbons. *Extraction* includes the processes of well drilling, injection, stimulation, gathering, workover, siting, use, and abandonment of facilities once they are depleted.[xii]
Flow rate	"Quantity of fluid that passes through an orifice or a pipe, under given circumstances, in a given unit of time."[xiii]
Flowback	*Flowback* is defined in Mexican law as "[l]iquids, solids, and gases expelled after hydraulic fracturing is performed in a well. These fluids travel from the formation through the well to the surface. [They are] the mixture of fluids and solids injected during the operation [and the] solids, hydrocarbons, and interstitial water from the formation."[xiv]
Hydraulic fracturing	*Hydraulic fracturing* is a technique used to extract hydrocarbons from low-productivity reservoirs. It consists of pumping or injecting fluids under high pressure to create fissures, cracks, or fractures in the rock and keep them open, for the purpose of increasing the permeability of the producing formation, facilitating the flow of hydrocarbons from it, and thereby increasing the productivity of the well. The terms "fracking" and "stimulation" are also used to refer to this technique.[xv]

ix. M. Pombo Arias *et al*. (2020), "Una revisión sobre los disruptores endocrinos y su posible impacto sobre la salud de los humanos," *Revista Española Endocrinología Pediátrica* 11(2): 34, at: <https://bit.ly/3UdGaUK>.

x. Sener (2017), *supra* at 14, at: <https://bit.ly/3TwE4Pg>; D. Hernández Díaz (2011), *Análisis y metodología del proceso de combustión in situ*, bachelor's thesis in petroleum engineering, Universidad Nacional Autónoma de México, Faculty of Engineering, at 8, at: <https://bit.ly/3AMD5DV>.

xi. Ib.

xii. Ib. at 7.

xiii. Real Academia Española, *Diccionario de la Lengua Española*, at: <https://dle.rae.es/>.

xiv. Asea, (2017), *Disposiciones administrativas de carácter general que establecen los Lineamientos en materia de seguridad industrial, seguridad operativa y de protección al medio ambiente para realizar actividades de exploración y extracción de hidrocarburos en yacimientos no convencionales en tierra*, published in the *DOF* on 16 March 2017, at: <https://bit.ly/3VQ4psn> [Safety Guidelines in Unconventional Reservoirs].

xv. CNH (n.d.), "Glosario," at: <https://bit.ly/3UImsjQ>; M. de las N. Carbonell León (2017), "Fracturación hidráulica y principio precautorio," in M. Anglés Hernández, R. Roux, and E. A. García Rivera, (eds.), *Reforma en materia de hidrocarburos: análisis jurídicos, sociales y ambientales en prospectiva*, (Mexico: Universidad Nacional Autónoma de México, Instituto de Investigaciones Jurídicas, Universidad Autónoma de Tamaulipas), at 80–3, at: <https://bit.ly/4dmYUIq>; S.E. Márquez Boy (2021), *La fractura hidráulica (fracking) en Texas y su trascendencia en los proyectos de esa tecnología en México sobre el uso y control del agua utilizada*, in F. Tortolero Cervantes, (ed.), *Aproximaciones al derecho de los Estados Unidos visto desde México* (Mexico: Universidad Nacional Autónoma de México, Instituto de Investigaciones Jurídicas, Escuela Libre de Derecho de Sinaloa), at 89–90, at: <https://bit.ly/3UlqCwJ>; Semarnat (2015), *supra* at 55, at: <https://bit.ly/3tkZXXq>.

Terminology

Term	Definition
Induced seismicity	Seismic activity in which a disturbance along an active fault line gives rise to a seismogenic movement. Earthquakes are a natural geological process; however, where they are related to injection of fluids into the subsoil along an active fault, at the time of disposing water in injection wells—, or to fracturing of rock during the hydraulic stimulation , the resulting phenomenon is known as induced seismicity.[xvi]
Mean annual groundwater availability	*Mean annual groundwater availability* is the mean annual volume that can be drawn from an aquifer or a hydrological unit, additional to environmental base flow (descarga natural comprometida) and to quantities extracted under existing concessions and those in the process of being granted, without endangering ecosystem balance. Mean annual groundwater availability is determined by subtracting environmental base flow and quantities awarded under concessions from mean total annual recharge.[xvii]
Natural gas	Mixture of hydrocarbons and other components, primarily methane, found in the gas phase in underground reservoirs, or in solution in oil, that remain in the gas phase under atmospheric conditions. *Natural gas* can include non-hydrocarbon impurities or substances (sulfhydric acid, nitrogen, or carbon dioxide).[xviii]
PFAS	Perfluoralkyl and polyfluoralkyl substances (PFAS) are a group of chemicals that includes perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), and other compounds. PFOA and PFOS are highly persistent in the environment and the human body, since they do not break down and can build up over time. Exposure to PFAS has been proven to cause human health harms.[xix]
Play	A number of reservoirs, or prospective reservoirs, grouped into fields in a given region and sharing the same structural geological characteristics (source, reservoir, and cap rocks, and trap type), as well as similar conditions and processes of hydrocarbon generation and migration.[xx]
Produced water	Defined by Mexican law as "water extracted as a byproduct associated with the production of hydrocarbons, which flows from reservoirs to the surface through producing wells, and is obtained in varying proportions throughout the life cycle of the wells. Does not include flowback fluids."[xxi]
Prospective resources	"Volume, as estimated on a given date, of hydrocarbons that have yet to be discovered but whose presence is inferred, and that are believed to be potentially recoverable through the implementation of future development projects."[xxii]

xvi. Semarnat (2015), *supra* at 57, at: <https://bit.ly/3tkZXXq>; CNH (2022), *Retos y Oportunidades de la Producción de Petróleo y Gas Natural de Yacimientos No Convencionales en México*, at 93, at: <https://bit.ly/44xhx8P>.

xvii. Mexican Official Standard NOM-011-CONAGUA-2015, *Conservación del recurso agua-Que establece las especificaciones y el método para determinar la disponibilidad media anual de las aguas nacionales*, published in the DOF on 27 March 2015, at: <https://bit.ly/3RqSXRv>; Conagua, General Technical Branch (*Subdirección General Técnica)*, Groundwater Division (*Gerencia de Aguas Subterráneas*) (2024), *Actualización de la disponibilidad media anual de agua en el acuífero Citrícola Norte (1912), estado de Nuevo León,* at 39, at: <https://bit.ly/45effeR>; M. Tejado Gallegos (2022), *La regulación de la fracturación hidráulica en México: sus impactos sociales y ambientales* (Mexico: Instituto de Investigaciones Jurídicas, Universidad Nacional Autónoma de México), at 102, at: <https://bit.ly/3RhPwN7>.

xviii. IMCO glossary at 221; Semarnat (2015), *supra* at 56; CNIH glossary.

xix. EPA (2024), "Información básica sobre PFAS," at: <https://www.epa.gov/pfas>; CEC (2017), *Furthering the Understanding of the Migration of Chemicals from Consumer Products: A Study of Per- and Polyfluoroalkyl Substances (PFASs) in Clothing, Apparel, and Children's Items*, at v, at: <https://bit.ly/3WIL0Kr>.

xx. Sener (2017), *supra* at 4 and 12, at: <https://bit.ly/3TwE4Pg>; CNH (n.d.), *supra*, at: <https://bit.ly/3UImsjQ>.

xxi. Safety Guidelines in Unconventional Reservoirs, at: <https://bit.ly/3VQ4psn>.

xxii. Id. at 15; CNH (n.d.), *supra*, at: <https://bit.ly/3UImsjQ>.

Terminology

Term	Definition
Reservoir	System composed of oil, gas, and water contained in permeable rock within a unit of the subsoil.[xxiii]
Shale	Fine-grained sedimentary rock made up of clay and silt particles consolidated into thin layers; it is characterized by being porous and relatively impermeable. "It is considered the most abundant of sedimentary rocks."[xxiv]
Shale hydrocarbons	Liquid hydrocarbons (shale oil) and natural gas (shale gas) "generated from the decomposition of organic matter by the action of pressure and temperature in the inner strata of the Earth, and stored within shale pores."[xxv]
Stimulation	*Stimulation* is the process of acidification or fracturing of the rock structure to increase the existing pathways, or create new ones, in the producing formation of a well.[xxvi] Hydraulic stimulation is the same concept as hydraulic fracturing.
Unconventional reservoir	Hydrocarbon reservoir occupying extensive areas that is considered, from a production standpoint, unusual or "different" because of physical factors, primarily low permeability and high viscosity (bitumen). The most common unconventional reservoirs are shale oil and gas, tight sandstone gas, coalbed methane, and methane hydrate.[xxvii]
Wastewater	Defined by Mexican law as "water of varying composition arising from discharges from urban public, domestic, industrial, commercial, service, agricultural, and animal husbandry, from treatment plants and, in general, from any use, as well as from mixtures thereof."[xxviii] Where an act in an industrial use[xxix] involves a discharge[xxx] into a receiving body,[xxxi] (e.g., extraction of raw materials such as oil[xxxii] and natural gas[xxxiii] in which flowback fluids and produced water are generated), the discharged water may be considered wastewater.[xxxiv]
Wet gas	"Natural gas with a predominant concentration of recoverable liquids heavier than methane, that are ultimately convertible to liquid form at ambient temperature and pressure."[xxxv]

xxiii. Sener (2017), *supra* at 18, at: <https://bit.ly/3TwE4Pg>.

xxiv. Id. at 11.

xxv. Semarnat (2015), *supra* at 56, at: <https://bit.ly/3tkZXXq>.

xxvi. Sener (2017), *supra* at 6, at:<https://bit.ly/3TwE4Pg>.

xxvii. Id. at 19; CNH (2022), *supra* at 20–3, at: <https://bit.ly/44xhx8P>.

xxviii. National Waters Act (*Ley de Aguas Nacionales*) published in the *DOF* on December 1, 1992, Article 3 paragraph VI, at: <https://bit.ly/4ectMvE> [LAN].

xxix. *Cf.* LAN Article 3 paragraph LVIII.

xxx. *Cf.* LAN Article 3 paragraph XXII.

xxxi. *Cf.* LAN Article 3 paragraph XVII.

xxxii. See Article 4 paragraph XXVI of the Hydrocarbons Act.

xxxiii. See Article 4 paragraph XVII of the Hydrocarbons Act.

xxxiv. See LAN Article 3 paragraph VI.

xxxv. CNIH, *supra* at XX.

1. Background

1. Articles 14 and 15 of the North American Agreement on Environmental Cooperation (NAAEC or the "Agreement")[1] provide for a process allowing any person or non-governmental organization residing or established in Canada, the United States, or Mexico to file a submission asserting that a Party to the Agreement is failing to effectively enforce its environmental law. The CEC Secretariat (the "Secretariat") initially considers submissions to determine whether they meet the criteria and requirements of Article 14(1) of the Agreement. Where the submission meets these requirements, the Secretariat then determines, pursuant to Article 14(2), whether the submission merits a response from the Party in question. In light of any response from the Party, and in accordance with NAAEC Article 15(1), the Secretariat determines whether the matter warrants the preparation of a factual record and, if so, notifies the CEC Council, providing the reasons for its recommendation. Where, in the presence of certain circumstances, the Secretariat decides that a factual record is not warranted, the submission process is terminated.[2] The Secretariat prepares a factual record as instructed by the CEC Council where the latter decides by a vote of at least two-thirds of its members.

2. On 1 July 2020, the United States-Mexico-Canada Agreement (USMCA) and the Environmental Cooperation Agreement (ECA) entered into force. Pursuant to ECA Article 2(3), the CEC "will continue to operate under the modalities in place as of entry into force of [the ECA]." This factual record was prepared in accordance with the provisions of NAAEC Article 15.

3. On 3 October 2018, a person residing in Mexico, whose name is kept confidential pursuant to NAAEC Article 11(8) (hereinafter, the "Submitter"), filed a submission with the Secretariat in accordance with Article 14(1) of the Agreement.[3] The Submitter asserts that Mexico (the "Party") is failing to effectively enforce its environmental law in relation to hydraulic fracturing that took place in the Tangram–1 and Nerita–1 wells in the state of Nuevo León; specifically, with respect to restoration and abandonment of the site subsequent to the extractive activity that took place there.

4. On 15 November 2018, the Secretariat notified the Submitter that the submission did not meet the requirements of NAAEC Article 14(1).[4]

5. On 21 February 2019, the Secretariat received a revised submission containing additional assertions and information in response to the matters discussed in the 2018 determination.[5] It must be noted that another person who also requested the confidentiality of his personal data under NAAEC Article 11(8)(a) signed the revised submission. For this reason, this factual record refers in what follows to the "Submitters."

6. According to the Submitters, the Party is failing to effectively enforce Article 28 of the General Ecological Balance and Environmental Protection Act (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*—LGEEPA) with respect to the obligation to file an environmental impact statement (EIS); LGEEPA Article 15, concerning the obligation to repair harm arising from work that affects the environment; LGEEPA Article 122, applicable to control of wastewater; LGEEPA Article 170, which authorizes the Ministry of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos* Naturales—Semarnat) to impose safety measures; LGEEPA Articles 1, 15, and 88, in relation to sustainable water use; Articles 7 and 10 of the Federal Environmental Liability Act (*Ley Federal de Responsabilidad Ambiental*—LFRA), in regard to the

1. North American Agreement on Environmental Cooperation, published in the Official Gazette of the Federation (*Diario Oficial de la Federación—DOF*) on 21 December 1993, at: <https://bit.ly/3TU7zJv>.
2. For more details relating to the various phases of the process, and for the Secretariat's determinations and factual records, see the submissions on enforcement matters page of the CEC website at <www.cec.org/peticiones>.
3. SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), NAAEC Article 14(1) Submission (3 October 2018), at: <https://bit.ly/3S0LuIy>.
4. SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), NAAEC Article 14(1) Determination (15 November 2018), at: <https://bit.ly/4eC1jOM>.
5. SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), Revised NAAEC Article 14(1) Submission (21 February 2019), at: <https://bit.ly/4fy35lB > [Revised Submission].

liability of Petróleos Mexicanos (Pemex) for environmental harms; Articles 2 and 91 of the Regulation to the General Waste Prevention and Integrated Management Act (*Reglamento de la Ley General de Prevención y Gestión Integral de* Residuos—LGPGIR Regulation), in regard to wastewater discharges into geologically stable formations, and Articles 8, 16, and 18 of the Guidelines for the protection and conservation of national waters during hydrocarbon exploration and extraction in unconventional reservoirs (*Lineamientos para la protección y conservación de las aguas nacionales en actividades de exploración y extracción de hidrocarburos en yacimientos no convencionales*— "Guidelines for Water Conservation-UR"), applicable to the prevention of subsoil and aquifer contamination.[6]

7. On 8 May 2019, the Secretariat determined that submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*) met the eligibility requirements of Article 14(1), and also met the criteria of Article 14(2) of the Agreement, and therefore requested a response from the Party.[7]

1.1 Summary of the Party Response

8. On 8 April 2020, the Secretariat received a response from the Party pursuant to Article 14(3) of the Agreement.[8] In its response, the Party notified of the existence of a pending administrative proceeding before the National Agency for Industrial Safety and Environmental Protection in the Hydrocarbon Sector (*Agencia Nacional de Seguridad Industrial y de Protección al Medio Ambiente del Sector Hidrocarburos*—Asea) dealing with the probable environmental impact caused by the drilling of the Tangram-1 and Nerita-1 wells by Pemex, using the hydraulic fracturing process in the community of El Carrizo, municipality of Los Ramones, Nuevo León.[9]

9. The Party's response refers to the EIS of the Comprehensive Project for the Burgos Basin 2004–2022 ("Burgos Basin Project"), which includes the Tangram-1 and Nerita-1 wells. The Party contends that Pemex duly complied with the environmental impact assessment (EIA) procedure and the public participation requirements. The Party emphasizes that the wells in question never entered the extractive phase.[10] The Party argues that the Environmental Impact and Risk Branch (*Dirección General de Impacto y Riesgo Ambiental*—DGIRA) heard and ruled on the regional modality of the EIS as well as the risk study for the Burgos Watershed Project.[11] This project encompasses 6,493 wells, 5,897 discharge lines, 230 gas pipelines, 943 production systems (compression and collection stations), and 154 water injection and transfer systems. Two of these 6,493 wells are in fact the Tangram-1 and Nerita-1 wells to which the submission refers.

10. The Party further states that on 11 March 2004, Semarnat published in the Environmental Gazette (*Gaceta Ecológica*) and on its website[12] (where the corresponding MIA can be found by entering the project number) that the Burgos Watershed Project had entered the EIA procedure phase of approval.[13]

11. On 28 September 2004, having concluded its analysis, the DGIRA found that the Burgos Watershed Project was environmentally viable, and therefore gave conditional approval to the EIS in the form of the corresponding AIA.[14]

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6. Id.
7. SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), NAAEC Article 14(1) and (2) Determination (8 May 2019), at: <https://bit.ly/4eAut14>.
8. SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), NAAEC Article 14(3) Response of Mexico (8 April 2020), at: <https://bit.ly/3Z8HgDf> [Response].
9. Id. at 6.
10. Id. at 13.
11. Id. at 11.
12. Semarnat, *Gaceta Ecológica*, at: <https://bit.ly/3nDP2EP>.
13. Response at 9, at: <https://bit.ly/3Z8HgDf>.
14. DGIRA, file no. SGPA/DGIRA.DEI.2440.04, containing the environmental impact and risk approval for the Burgos Watershed Project (28 September 2004), at: <http://b.link/ak6dx> (viewed 19 August 2020).

12. The Party states that the EIS and the AIA for the Burgos Watershed Project constitute public information available on the Semarnat website.[15] It further states that "it is also currently possible for anyone to request any public information they may need from the National Institue of Transparency and Access to Information and Personal Data Protection (*Instituto Nacional de Transparencia, Acceso a la Información y Protección de Datos Personales*—INAI), which the Submitters did not do in this case."[16]

13. Regarding the alleged enforcement failure relating to public participation in the EIA procedure, the Party asserts in its response that no request for public consultation was ever made. Its view is therefore that "the Submitters fail to indicate at what time and in what manner this right [to participate] was violated."[17]

14. The Party argues that based on "a perusal and analysis of the AIA," as well as "the contents of the Asea document," the competent authority—that is, the DGIRA—"effectively complied with its obligation to conduct the relevant [environmental impact assessment] as prescribed by Article 28 paragraph I."[18]

15. In regard to the assertions concerning an alleged failure to effectively enforce LFRA Article 10 and LGEEPA Article 15 paragraphs II and IV with respect to the Tangram-I and Nerita-I wells, the Party states that "the records of the [National Hydrocarbons Commission (*Comisión Nacional de Hidrocarburos*—CNH] indicate that these wells lack discharge lines and aboveground infrastructure to indicate that they are operating"; it adds that they "are not covered by any deed of transfer or contract, and have not been functioning since operations ceased in 2013." It further contends that "there are no grounds for the corresponding mitigation measures to have been applied," since there has been no proof "of the existence of environmental harm requiring a remedy in the case at hand."[19]

16. The Party maintains that the Industrial Supervision, Inspection, and Surveillance Unit (*Unidad de Supervisión, Inspección y Vigilancia Industrial*) of Asea states that a search in its records found no report of environmental incidents or accidents related to the Tangram-1 or Nerita-1 wells, nor to any other well in the municipalities of Los Ramones or China, Nuevo León.[20]

17. In relation to the Tangram-1 and Nerita-1 wells, the Party informs that there has been no report of operating safety incidents or accidents giving rise to supervision, inspection, or surveillance measures on the part of Asea. Likewise, the files transferred by Profepa and Sener indicate that there have been no proceedings initiated in response to alleged environmental or operating safety impacts.[21]

18. The Party reiterates that due to the absence of records of incident or accident reports linked to the Tangram-1 and Nerita-1 wells, as well as the nonexistence of operating safety-related incident or accident reports, Asea has taken no supervision, inspection, or surveillance measures for these facilities, nor has there been any administrative proceeding that gave rise to the application of safety measures.[22]

19. In addition, the Party's view is that since the mechanisms concerning lawsuits for redress of harm prescribed by LFRA Article 27 have not been exhausted, LFRA Article 10 should not be included in the Secretariat's review.[23]

15. EIS for the Burgos Watershed Project, at: <http://b.link/8a4tx> (viewed 19 August 2020).
16. Response at 12, at: <https://bit.ly/3Z8HgDf>.
17. Id. at 13.
18. Id. at 23.
19. Id. at 14.
20. Id.
21. Id.
22. Id.
23. Id. at 14.

20. Finally, the Party asserts that the Submitters' assertions are unfounded, since Asea has no records of administrative proceedings brought against Pemex. Therefore, "there is no evidence to suggest that the Mexican authorities failed to enforce the obligation to apply safety measures" due to any environmental risk or harm occurred during the exploration process in the Tangram-1 and Nerita-1 wells.[24]

21. The Party specifies in its response that it requested the assistance of the National Water Commission (*Comisión Nacional del Agua*—Conagua), the national body in charge of regulating and administering water resources under federal jurisdiction, to obtain information about concessions issued to Pemex for the use, enjoyment, and exploitation of national waters for the operation of the wells in question.[25] It adds that Conagua reported that concessions for the use, exploitation, or enjoyment of national waters are only granted for the hydrocarbon extraction phase. The Party concludes that since the wells are not currently in the hydrocarbon extraction phase, the Conagua concession for the use, enjoyment and exploitation of national waters was not required.[26]

22. In regard to the effective enforcement of LGEEPA Article 122, the Party states that the Public Registry of Water Rights Office (*Gerencia del Registro Público de Derechos de Agua*) of Conagua reported that "a search in the database of the Public Registry of Water Rights found no wastewater discharge permits issued for the municipalities of Los Ramones or China in the state of Nuevo León, in connection with alleged hydraulic fracturing in the 'Tangram I' and 'Nerita I' wells."[27]

23. In addition, the Party emphasizes that Asea reported that both the EIS and the AIA for the Burgos Watershed Project "established the need for equipment to collect and channel the resulting wastewater," as well as the safety measures necessary to prevent dispersal of the water, with no plan for wastewater to be discharged into geological formations through wastewater wells.[28]

24. As regards the AIA issued by the DGIRA for the project, the authority placed restrictions on the dumping of produced water into natural watercourses, beds, or national property where wastewater is discharged, or onto land where it could seep into and contaminate soil or aquifers.[29]

25. In particular, Asea states that the CNH has no record of the existence of wastewater wells in the municipality of Los Ramones, Nuevo León; thus, there is no indication that produced water from the Tangram-1 and Nerita-1 wells was ever discharged in that municipality.

26. For the foregoing reasons, the Party concludes that the authorities have not failed to effectively enforce LGEEPA Article 122, "since the treatment of wastewater and produced water was subject to collection and transportation for final disposal."[30]

27. Concerning the failure to effectively enforce Article 91 paragraph II of the LGPGIR Regulation in relation to final disposal of hazardous waste in geologically stable formations, the Party states that pursuant to Mexican Official Standard NOM-143-Semarnat-2003, *Establishing the environmental specifications for the management of produced water associated with hydrocarbons,* water arising during the hydrocarbon extraction process is not classified as hazardous waste but as produced water.[31]

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24. Id. at 17.
25. Id. at 18.
26. Id. at 19.
27. See Conagua, Public Registry of Water Rights Unit (*Gerencia del Registro Público de Derechos de Agua*), Water Administration Division (*Subdirección General de Administración del Agua*), memorandum no. BOO.2.02.-2362 (2 December 2019).
28. Response at 20, at: <https://bit.ly/3Z8HgDf>.
29. Id.
30. Id.
31. Id. at 21.

28. In addition, the Party states that a condition of the AIA was that hazardous waste was to be stored in authorized confinement centers and that the dumping of such waste onto the soil, into bodies of water, or onto vegetation was prohibited, with reiteration of the requirement that the project possess wastewater collection and transportation equipment.[32]

29. Regarding the alleged failure to effectively enforce Articles 8, 16, and 18 of the National Waters Contamination Prevention Guidelines, applicable to the prevention of contamination of the subsoil and aquifers, the Party states that these provisions are not relevant in the case of the exploration that took place in the Tangram-1 and Nerita-1 wells, nor in relation to the extraction phase in these wells, because these guidelines were published on 30 August 2017, four years after the conclusion of the exploration phase in the Tangram-1 and Nerita-1 wells.[33]

1.2 The Secretariat's Notification and the Council Resolution

30. After reviewing the revised submission in the light of the response, the Secretariat found that the response left open central issues in relation to the effective enforcement of provisions of the LGEEPA in connection with hydraulic fracturing in the Tangram–1 and Nerita–1 wells, in the state of Nuevo León.

31. The Secretariat found that submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*) warranted the preparation of a factual record with respect to alleged deficiencies in the environmental impact statement for the Tangram–1 and Nerita–1 wells, as well as to the application of safety measures and to sustainable water use, and so notified the CEC Council on 30 September 2020.[34] The Secretariat therefore recommended the preparation of a factual record regarding the effective enforcement of LGEEPA Articles 28 paragraphs I and XIII, 88 paragraph III, and 170.[35]

32. On 5 October 2023, in Council Resolution 23-05, the CEC Council instructed the Secretariat to prepare a factual record for submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*) with a scope limited to enforcement of the provisions relating to sustainable water use and the application of safety measures (Articles 88: paragraph III and 170 of the LGEEPA).[36]

33. In conformity with Article 15(5) of the Agreement, the Secretariat submitted the draft factual record for submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*) on 26 June 2024, the start date of a period of 45 working days in which the Parties may make comments on the accuracy of the draft.

34. On 6 September 2024, the Party submitted comments on the accuracy of the draft factual record. On 7 October 2024, Canada informed that it supported the information presented in the Factual Record while the United States submitted comments on 10 October 2024. In accordance with Article 15(6) of the Agreement, the Secretariat incorporated the relevant comments into the final version of the factual record and, on 22 November 2024, submitted it to Council for a vote pursuant to Article 15(7). Prior to the publication of the factual record, the Party requested that its comments be made public.[37]

32. Id.
33. Id. at 22.
34. SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), NAAEC Article 15(1) Notification (30 September 2020), at: <https://bit.ly/3YY9jE4> [Notification].
35. Id. at §§ 43-55 (on environmental impact assessment); 63-70 (on environmental liablity and safety measures); 85-92 (on sustainable use of water).
36. SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), Council Resolution 23-05 (5 October 2023), at: <https://bit.ly/3Ohemuu> [Council Resolution].
37. UCAI, file no. UCAI/00279/2025 (30 January 2025).

2. Scope of the factual record

35. As stipulated by Council Resolution 23-05, this factual record addresses matters relating to the effective enforcement of the LGEEPA with respect to sustainable water use and the application of safety measures in connection with activities carried out prior to, and during the explorative phase in the Tangram–1 and Nerita–1 wells, in the state of Nuevo León. The Council unanimously decided:

> **TO INSTRUCT** the Secretariat to prepare a factual record in accordance with Article 15(4) of the NAAEC, and consistent with Section 10.4 of the Guidelines, on LGEEPA Article 88 paragraph III and Article 170, taking into account Mexico's statement that the Tangram I and Nerita I wells are not currently in the operation and extraction phase;[38]

36. In its reasoning document, the Council states:[39]

- With respect to Article 88 paragraph III, "[t]he Council agrees with the Secretariat's recommendation[40] that preparing a factual record would serve to obtain information on the activities carried out prior to the explorative phase in accordance with LGEEPA Article 88 paragraph III, in view of the guiding criteria set out by that legal provision for sustainable water use and its requirement that the environmental authorities consider the protection of soils, wooded and forested areas; the maintenance of basic water flows, and the recharge capacity of aquifers when assessing and approving environmental impact."[41]
- With respect to Article 170, "[t]he Council agrees with the Secretariat's recommendation [with respect to the preparation of a factual record] concerning safety measures as provided by LGEEPA Article 170, relating to the temporary partial or total closure of pollution sources; the seizure of materials, wastes, or products, and neutralization or any similar action to prevent ecological disequilibrium or grave harm or deterioration of natural resources."[42]

37. The Council added:

> [I]n this regard, the Council takes note of Mexico's statement that the Tangram-I and Nerita-I wells are not currently operating and did not proceed to the hydrocarbon extraction phase.[43]

38. The Council found that the preparation of a factual record with respect to the effective enforcement of LGEEPA Article 28 paragraphs I and XIII, in relation to the alleged deficiencies in the EIS conducted for the Tangram–1 and Nerita–1 wells, was not warranted.[44] The full text of Council Resolution 23-05 and its reasoning are provided in Appendix 1 to this factual record. In addition, the text of the LGEEPA provisions discussed in the factual record is presented in Appendix 3.

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38. Council Resolution, at 2, at: <https://bit.ly/3Ohemuu> (emphasis in the original).
39. Reasons for the Council's instructions with respect to submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), (5 October 2023) at 3, at: <https://bit.ly/4fB6C2C> [Council's Reasons].
40. Cfr. §89 of the Notification: Mexico presents no information about the activities carried out prior to the extractive phase, in which water was used, as indicated in the Burgos Watershed Project EIS.
41. Council's Reasons at 2, at: <https://bit.ly/4fB6C2C>.
42. Id. at 3.
43. Id.
44. Id. at 2.

39. NAAEC Article 21(1)(a) stipulates that on request of the Council or the Secretariat, each Party shall "promptly mak[e] available any information in its possession required for the preparation of a report or factual record, including compliance and enforcement data…." On this basis, the Secretariat requested information from the Party for the preparation of this factual record (see Appendix 4).[45]

40. In November 2023, the Secretariat sent requests for information to the respective directors of Asea,[46] Conagua,[47] and Pemex.[48] In response to these requests, the Secretariat received responses from Conagua,[49] and from Asea.[50] The Secretariat also posted a general information request in the SEM public registry of submissions on 25 October 2023.[51]

41. Likewise, on 6 February 2024, the Secretariat sent requests for meetings with the directors of Asea,[52] Conagua,[53] and the Río Bravo Watershed Body of Conagua.[54]

42. The Secretariat relied on an external consultant to submit the following requests for information through the National Transparency Platform (*Plataforma Nacional de Transparencia*—PNT) of the National Transparency, Access to Information, and Personal Data Protection Institute (*Instituto Nacional de Transparencia, Acceso a la Información y Protección]de Datos Personales*—INAI):[55]

    Request no. 330026723004447, 31 October 2023, to Semarnat;[56]

    Request no. 331002523000687, 31 October 2023, to Asea;[57]

    Request no. 330023823007982, 31 October 2023, to Pemex;[58]

    Request no. 330023023000838, 31 October 2023, to Pemex Exploración y Producción (PEP);[59]

45. SEM Unit, file no. A14/SEM/18-003/65/REQ, request for information for the preparation of the factual record (25 October 2023), at: <http://cec.org/files/sem/20240501/aaq003.pdf>. It should be noted that the Secretariat holds meetings with submitters, other persons, authorities, and relevant entities in the course of preparing a factual record.
46. CEC, request for information submitted to Asea in connection with factual record SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), signed by the Director of Legal Affairs and SEM Unit (14 November 2023), at: <http://cec.org/files/sem/20240501/aaq004.pdf>.
47. CEC, request for information submitted to Conagua in connection with factual record SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), signed by the Director of Legal Affairs and SEM Unit (14 November 2023), at: <http://cec.org/files/sem/20240501/aaq005.pdf>.
48. CEC, request for information submitted to Pemex in connection with factual record SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), signed by the Director of Legal Affairs and SEM Unit (14 November 2023), at: <http://cec.org/files/sem/20240501/aaq006.pdf>.
49. Conagua, file no. B00.6.01.-149 (28 November 2023), memorandum no. B00.2.-429 (1 December 2023) and file no. B00.6.01.-161 (19 December 2023), in response to the request for information submitted pursuant to NAAEC Articles 15(4) and 21(1)(a), at: <http://cec.org/files/sem/20240501/aaq007.pdf> and <http://cec.org/files/sem/20240501/aaq008.pdf>, respectively.
50. Asea, file no. ASEA/USIVI/DGSIVEERC/0488/2023 (15 December 2023), in response to the request for information submitted pursuant to NAAEC Articles 15(4) and 21(1)(a), at: <http://cec.org/files/sem/20240501/aaq009.pdf> [Response from Asea to CEC information request].
51. CEC, General request for information for preparation of a factual record concerning submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), at: <https://bit.ly/4ewSpSU>.
52. CEC, Requests for meeting with Asea in regard to factual record SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), signed by the Executive Director (5 and 8 February 2024), at: <http://cec.org/files/sem/20240501/aaq013.pdf>, <http://cec.org/files/sem/20240501/aaq010.pdf>, <http://cec.org/files/sem/20240501/aaq012.pdf>, and <http://cec.org/files/sem/20240501/aaq011.pdf>.
53. CEC, Request for meeting with Conagua in regard to factual record SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), signed by the Executive Director (6 February 2024), at: <http://cec.org/files/sem/20240508/aar002.pdf >
54. CEC, Request for meeting with Río Bravo Watershed Body of Conagua in regard to factual record SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), signed by the Executive Director (6 February 2024), at: <http://cec.org/files/sem/20240508/aar001.pdf>.
55. The request search function at <www.plataformadetransparencia.org.mx/> can be used to search for requests for information submitted to the PNT.
56. *Cf.* Semarnat, file no. Semarnat/UCVSDHT/UT/4209/2023 (30 November 2023), in response to request for information no. 330026723004447 filed with the PNT, at: <http://cec.org/files/sem/20240423/aap002.docx>.
57. *Cf.* Asea, file nos. ASEA/USIVI/DGSIVEERC/0467/2023 (5 December 2023), ASEA/UAJ/DGCT/2C.7/4038-2023 (11 December 2023), ASEA/USIVI/DGSIVEERC/0478/2023 (12 December 2023), and ASEA/UGI/DGGEERC/2021/2023 (14 December 2023), and resolution no. 525/2023 (14 December 2023), all in response to request for information no. 331002523000687 filed with the PNT; at: <http://cec.org/files/sem/20240423/aap005.pdf>, <http://cec.org/files/sem/20240423/aap004.pdf>, <http://cec.org/files/sem/20240423/aap006.pdf>, <http://cec.org/files/sem/20240423/aap003.pdf>, and <http://cec.org/files/sem/20240423/aap007.pdf>, respectively.
58. *Cf.* Pemex, unnumbered document (31 October 2023), in response to request for information no. 330023823007982 filed with the PNT, at: <http://cec.org/files/sem/20240423/aap008.pdf>.
59. *Cf.* PEP, unnumbered and undated document, in response to request for information no. 330023023000838 filed with the PNT, at: <http://cec.org/files/sem/20240605/aat002.pdf> [PEP Document in Response to Information Request].

Request no. 330008623000255, 31 October 2023, to the CNH;[60]

Request no. 330009423003464, 31 October 2023, to Conagua;[61]

Request no. 330024423001816, 31 October 2023, to Profepa;[62]

Request no. 331002524000073, 15 January 2024, to Asea.[63]

43. The requests for information concerned the location and infrastructure of projects, works, techniques, substances and materials used for drilling and stimulation; closing and capping and hermetically sealing the Tangram–1 and Nerita–1 wells. They also focused on the source of the water used in the preparation and hydraulic fracturing of both wells.[64] Information was also requested on the abandonment of the wells; however, it should be noted that none of the documents provided to the Secretariat specify the date of abandonment of the wells (removal of materials and dismantling of equipment), nor the reason why they were abandoned.

44. For the purpose of providing official notice of the CEC Secretariat's representatives' presence in Mexico, on 26 January 2024, the Canadian Embassy in Mexico notified the Ministry of Foreign Relations (*Secretaría de Relaciones Exteriores*) of its intention to send a delegation on a special mission to Mexico from 19 to 22 February 2024.[65] Following this notification, a Secretariat representative and three external consultants, who were in Mexico in their capacity as members of this special mission, made a visit to Mexico City to meet with the relevant Mexican authorities, and held a meeting with Conagua staff on 19 February 2024.[66] Representatives of Asea and representatives of the Río Bravo Watershed Body of Conagua in Nuevo León did not confirm their availability to meet with the Secretariat, after the Secretariat requested these meetings; therefore, such meetings did not occur.

45. On 21 February 2024, the Secretariat's representative and its consultants visited the city of Monterrey, Nuevo León to hold a meeting with the Submitters, for the purpose of addressing any concerns relating to this NAAEC process. The next day, February 22, the Secretariat conducted a field visit to the municipality of Los Ramones to collect information.

60. *Cf.* CNH, memoranda nos. 250.252.431/2023 (1 November 2023), 241.136/2023 (6 November 2023), and 270.216/2023 (29 November 2023), all in response to request for information no. 330008623000255 filed with the PNT, at: <http://cec.org/files/sem/20240423/aap011.pdf>, <http://cec.org/files/sem/20240423/aap010.pdf>, and <http://cec.org/files/sem/20240423/aap012.pdf>, respectively.

61. *Cf.* Conagua, file nos. B00.3.00.00.01.-142 (7 November 2023), B00.2.00.00.01.-01228 (13 November 2023), B00.7.03.-287 (14 November 2023), B00.811.09.616/23 (22 November 2023) and unnumbered (14 December 2023), all in response to request for information no. 330009423003464 filed with the PNT; at: <http://cec.org/files/sem/20240423/aap016.pdf>, <http://cec.org/files/sem/20240423/aap015.pdf>, <http://cec.org/files/sem/20240423/aap017.pdf>, <http://cec.org/files/sem/20240423/aap014.pdf>, and <http://cec.org/files/sem/20240423/aap013.pdf>, respectively.

62. *Cf.* Profepa, unnumbered and undated document, in response to request for information no. 330024423001816 filed with the PNT, at: <http://cec.org/files/sem/20240423/aap018.pdf>.

63. *Cf.* Asea, file nos. ASEA/UAJ/DGCT/2C.7/0733-2024 (27 February 2024) and ASEA/USIVI/DGSIVEERC/0078/2024 (26 February 2024), and resolution no. 095/2024 (26 February 2024), all in response to request for information no. 331002524000073 filed with the PNT; at: <http://cec.org/files/sem/20240423/aap019.pdf>, <http://cec.org/files/sem/20240423/aap020.pdf>, and <http://cec.org/files/sem/20240423/aap021.pdf>, respectively.

64. *Cf. requests for information nos*. 330026723004447, 331002523000687, 330023823007982, 330023023000838, 330008623000255, 330009423003464, 330024423001816 y 331002524000073 filed with the PNT.

65. Embassy of Canada, note no. GR-2137/24 (26 January 2024).

66. The Secretariat's special mission was headed by Paolo Solano (CEC's director of legal affairs and SEM unit), and included José Álvarez Rosas (consultant in hydrocarbons security), Karina Novoa (lawyer specialized in environmental and energy law), and Alejandro Razura (environmental consultant).

46. Following up on the 19 February 2024 meeting with Conagua, and for the purpose of gathering complementary information, the Secretariat filed an additional request for information with Conagua on 4 March 2024.[67] The Conagua representatives responded to this request on 19 March 2024.[68] The additional request for information dealt with the exact location of the groundwater concession for agricultural use[69] referred to by PEP,[70] and was aimed at obtaining historical records of inspection, exploration activities or water extraction. Information was also requested regarding the inventory and location of the groundwater wells concessioned in the vicinity of the Tangram–1 and Nerita–1 wells, the historical records of the Citrícola Norte aquifer, and historical records of the monitoring stations located in the San Juan River, Nuevo León.[71]

47. Pursuant to NAAEC Article 15(4), the Secretariat has taken into account all the information provided by the Party, as well as relevant technical, scientific, and other information that is publicly available, submitted by interested persons or organizations, or produced by independent experts and compiled by the Secretariat.

2.1 Environmental law in question

48. This section presents the environmental law cited in the submission and covered by this factual record, in accordance with Council Resolution 23-05;[72] namely, provisions of the LGEEPA relating to two aspects that have a bearing on the Tangram–1 and Nerita–1 wells: i) sustainable water use, and ii) the imposition of safety measures.

49. **LGEEPA Article 88** sets out the criteria to be considered for sustainable water use and aquatic ecosystems. **Paragraph III** of this act provides that in order to maintain the integrity and equilibrium of the natural elements of the water cycle, the protection of soils, the preservation of basic water flow in watercourses, and the recharge capacity of aquifers must be taken into consideration.

50. **LGEEPA Article 170** provides that where there exists an imminent risk of ecological imbalance or of damage to or serious deterioration of natural resources, as well as cases of contamination with dangerous consequences for ecosystems, their components or public health, Semarnat may reasonably and justifiably, order one or more safety measures, including the temporary, partial or total closure of pollution sources (**paragraph I**), the seizure of hazardous materials and wastes, vehicles, tools, and instruments directly related to the conduct giving rise to the imposition of the safety measure (**paragraph II**), and neutralization to prevent the hazardous materials or waste from producing the anticipated effects (**paragraph III**). Semarnat may also arrange for the imposition of safety measures set out in other provisions.

67. CEC, additional request for information addressed to Conagua in connection with factual record SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), signed by the Executive Director (4 March 2024), at: <http://cec.org/files/sem/20240501/aaq014.pdf> and <http://cec.org/files/sem/20240501/aaq015.pdf>.

68. Conagua, file no. B00.7.05.-0122 (19 March 2024), in response to the letter dated 6 February 2024 regarding the preparation of the factual record SEM-18-003, National Water Commission, at: <http://cec.org/files/sem/20240501/aaq018.pdf> [Conagua Official Communication 2024].

69. Concession Title No. 2NVL103180/24ALGR97, granted by the Río Bravo Watershed Body, Water Management Directorate, National Water Commission *Cfr.* CEC, additional request for information addressed to Conagua…, at: <http://cec.org/files/sem/20240501/aaq015.pdf>.

70. *Cf.* PEP, file PEP-DG-SSSTPA-796-2022 (18 August 2022), attached to the response to the request for information No. 330023023000838 to the PNT, at 40, at: <http://cec.org/files/sem/20240613/aau019.pdf> [PEP Official Document Attached to the Response].

71. *Cf.* CEC, additional request for information addressed to Conagua…, at: <http://cec.org/files/sem/20240501/aaq014.pdf>.

72. *See* Council Resolution 23-05, at: <https://bit.ly/3Ohemuu>.

3. Description of the hydraulic fracturing process, its associated environmental effects, and the area of interest of the project

51. Before describing the hydraulic fracturing process and its environmental impacts, it should be noted that the Party, in its response, stated that the Tangram-1 and Nerita-1 wells did not enter the extraction phase.[73] During the development of the wells, the Guidelines for the authorization of well drilling works for hydrocarbon exploration and exploitation activities (*Lineamientos para la autorización de trabajos de perforación de pozos en las actividades de exploración y explotación de hidrocarburos*)[74] where applicable. These guidelines include formats to applications file an application for exploratory well drilling. With respect to the Environmental Criteria Guide for the Exploration and Extraction of Hydrocarbons Contained in Shales (*Guía de criterios ambientales para la exploración y extracción de hidrocarburos contenidos en lutitas*), it was published in 2015 and is not an instrument directly applicable to the project under study, since the drilling of the Tangram-1 and Nerita-1 wells dates back to 2013.

52. The Party informed the Secretariat[75] of several regulatory instruments issued by the Asea, the Conagua and the CNH, as well as 11 Mexican Official Standards.[76] The information from the Party includes the infographic *Regulation for the Exploration and Extraction of Unconventional Resources*,[77] which explains of regulations "that define the obligations for a safe and environmentally friendly operation in the exploration and exploitation of unconventional resources"[78] which "incorporates best practices of Argentina, Canada and the United States."[79]

53. In line with NAAEC Article 15(4), the Secretariat cites specialized literature and has taken into account "any relevant technical, scientific or other information: (a) that is publicly available…"

3.1 The hydraulic fracturing technique

54. Initially developed in the United States in the mid-twentieth century, hydraulic fracturing, also known as hydrofracturing or "fracking," is a procedure designed to increase the permeability of rock from which hydrocarbons are to be extracted by drilling both vertical and horizontal wellbores and then injecting fluids of diverse composition (also called "fracturing fluids")[80] under high pressure, thereby creating controlled fractures and fissures in the reservoir and increasing the rate of flow and the volume of hydrocarbons extracted.[81] The economic purpose of fracking is to render otherwise largely unproductive hydrocarbon reservoirs economically viable by increasing their yield. By the late 1970s, this technology had largely proven its worth and was being applied in a standardized fashion, mainly for extracting hydrocarbons (primarily

73. Response, at 13, at: <https://bit.ly/3Z8HgDf>.

74. Sener (2012), "Lineamientos para la autorización de trabajos de perforación de pozos en las actividades de exploración y explotación de hidrocarburos", Ministry of Energy, published in the *DOF* on 21 June 2012, at: <https://bit.ly/4hOxKf5>.

75. UCAJ (2024), Comments to the Draft Factual Record SEM-18-003 (*Fracturación Hidráulica en Nuevo León*) (6 September 2024).

76. NOM-001-Semarnat-1996; NOM-003-CNA-1996; NOM-004-CNA-1996; NOM-011-Conagua-2015; NOM-027-SESH-2010; NOM-080-Sermarnat-1994; NOM-115-Semarnat-2003; NOM-138-Semarnat/SSA1-2012; NOM-143-Semarnat-2003; NOM-018-STPS-2000; y NOM-117-Semarnat-2006.

77. Asea (2017) "Regulación para la exploración y extracción de recursos no convencionales", Secretaría de Medio Ambiente y Recursos Naturales, 16 March, 2017, at: <https://bit.ly/4i1WQXE>.

78. Id.

79. Id.

80. Asea, (2017), *Disposiciones administrativas de carácter general que establecen los Lineamientos en materia de seguridad industrial, seguridad operativa y de protección al medio ambiente para realizar actividades de Exploración y Extracción de Hidrocarburos en Yacimientos No convencionales en tierra,* National Agency for Industrial Safety and Environmental Protection of the Hydrocarbon Sector, published in the DOF on 16 March 2017, at : <https://bit.ly/3VQ4psn> [Safety Guidelines in Unconventional Reservoirs].

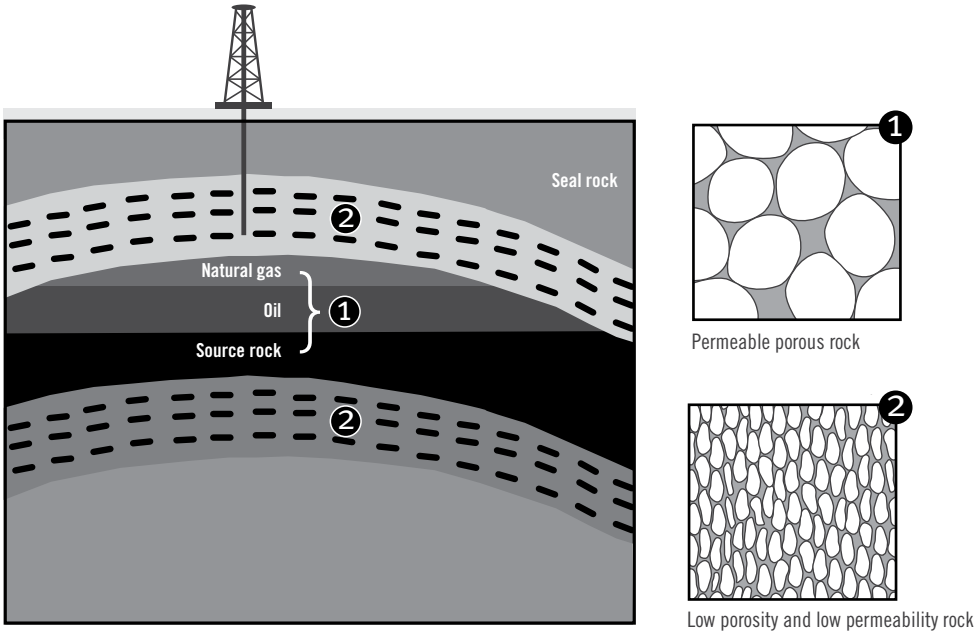
81. Semarnat (2015), *Guía de criterios ambientales para la exploración y extracción de hidrocarburos contenidos en lutitas*, Ministry of the Environment and Natural Resources, pp. 6-7, at: <https://bit.ly/3tkZXXq>.

natural gas) from low-productivity conventional reservoirs.[82] At least since 2010, Pemex has identified five geological provinces for shale gas exploration and exploitation: Chihuahua, Sabinas-Burro-Picachos, Burgos, Tampico-Misantla and Veracruz.[83]

55. According to Semarnat's guide to environmental criteria for exploration and extraction of hydrocarbons contained in shales published in 2015 that is cited for informational purposes, "a combination of horizontal drilling with various fracking stages in a single well began to be used to mine gas from unconventional reservoirs in [North America] at the start of the twenty-first century."[84] This technological innovation marked the beginning of the "modern fracking industry," and its application has been extended in recent years to countries around the world, including the United States, Russia, Argentina, China, and Canada.[85] The technique is used during the exploration phase in order to verify the availability of resources in the reservoir, and is used repeatedly during the extraction or exploitation phase.

56. In relatively impermeable (low-porosity) rock formations, the flow of hydrocarbons can be stimulated by injecting a fluid mixture under high pressure, causing artificial fissures or pore channels with greater interconnectivity, allowing for greater hydrocarbon flow (see Figure 1).[86] Hydraulic fracturing increases the permeability of the rock formation: the more interconnected the network of fractures, the more efficient the flow of gas and oil, hence the greater the recovery of hydrocarbons.[87]

Figure 1. Permeability of rock formations

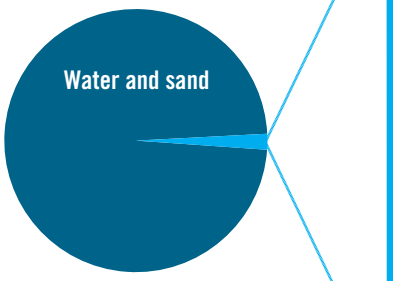


Source: Diagram derived from E. López Anadón (2015), *El abecé de los hidrocarburos en reservorios no convencionales* (Buenos Aires: Instituto Argentino del Petróleo y del Gas (IAPG)), at 6, at <https://bit.ly/3CL2tu4>.

82. Id.
83. A. de la Vega Navarro and J. Ramírez Villegas (2015), "El gas de lutitas (*shale gas*) en México: recursos, explotación, usos, impactos", *Economía UNAM*, vol. 12, no. 34, at 95, at: <https://bit.ly/3YnAp7s>.
84. Semarnat (2015), *supra* at 6, at: <https://bit.ly/3tkZXXq>.
85. *Cf.* U.S. Energy Information Administration (2016), "Shale Gas Production Drives World Natural Gas Production Growth" (15 August 2016), *Today in Energy*, at: <https://bit.ly/4bySYdS>; R. Rapier (2024), "Global Leaders in Shale Oil and Gas Reserves," *Forbes*, at: <https://bit.ly/3JUZxf1>.
86. E. López Anadón (2015), *El abecé de los hidrocarburos en reservorios no convencionales* (Buenos Aires: Instituto Argentino del Petróleo y del Gas (IAPG), at 6, at: <https://bit.ly/3CL2tu4>.
87. Semarnat (2015), *supra* at 7, at: <https://bit.ly/3tkZXXq>.

57. In both the exploration and extraction phases, water has been the main component of fracturing fluids used globally, due to its low cost, optimal properties, and ease of handling.[88] But to "keep the fracture from closing up again with the decrease in the hydraulic pressure" that has created or enlarged the channels in the rock formation, pumped water is usually mixed with a proppant, commonly sand; this keeps the fractures open and allows gas and oil to flow to the surface.[89] In addition, a number of chemical compounds are typically added to the mix of water and sand (see Figure 2). These compounds help ensure that the mixture injected under pressure overcomes the resistance of the rock, and have functions such as reducing friction during pumping, improving proppant placement, limiting corrosion of the well structure, and making well maintenance easier.[90] The compound mixture is used throughout the hydraulic fracturing process in both exploration and extraction phases of the reservoirs.

Figure 2. Examples of chemical additives commonly used in fracturing fluids



Additive type	Use	Main compound
Acid	Removes near well damage	Hydrochloric acid
Biocide	Controls bacterial growth	Glutaraldehyde
Breaker	Delays breakdown of the geling agent	Ammonium persulfate
Corrosion inhibitor	Prevent corrosion of pipe	N, n-dimethyl formamide
Crosslinker	Maintains fluid viscosity as temperature increases	Borate salts
Friction reducers	Decreases pumping friction	Polyacrylamide
Gelling agents	Improves proppant placement	Guar gum
KCl	Creates a brine carrier fluid	Potassium chloride
Oxygen scavenger	Prevents corrosion of well tubulars	Ammonium bisulfite
pH adjusting agent	Adjusts the pH of fluid to maintain the effectiveness of other components	Sodium carbonate
Scale inhibitor	Prevents scale deposits in the pipe	Ethylene glycol
Surfactant	Winterizing agent	Isopropanol

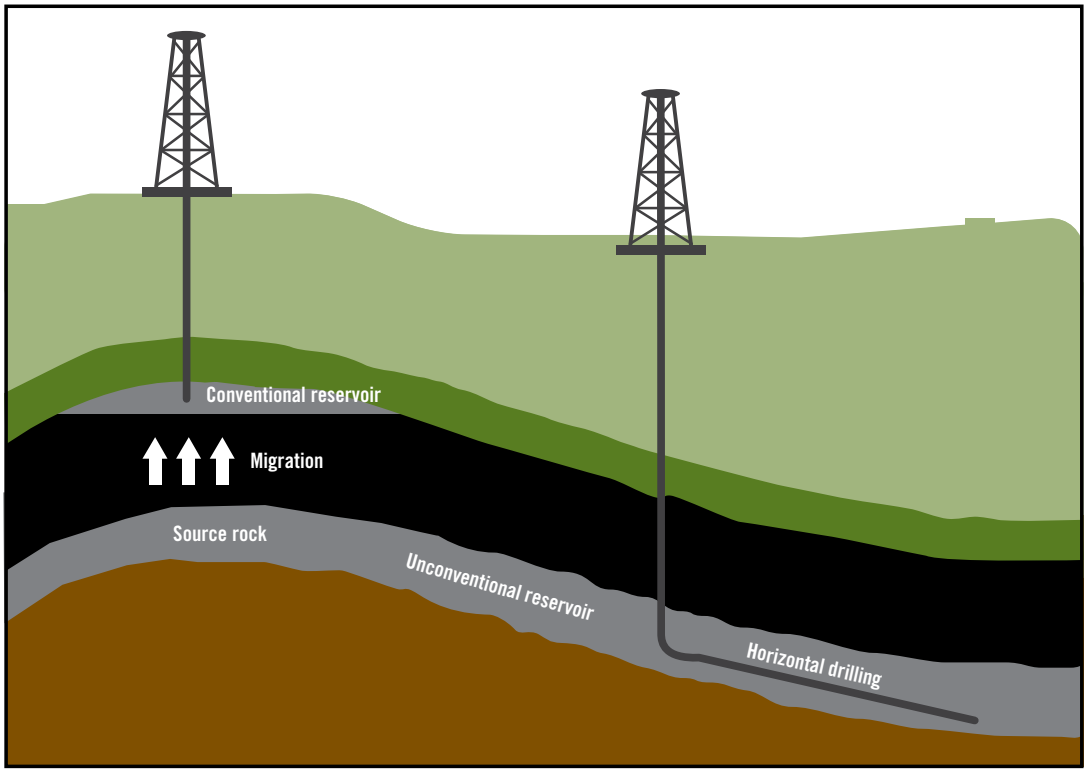
Source: Diagram derived from United States Government Accountability Office (2012), *Oil and Gas: Information on Shale Resources, Development, and Environmental and Public Health Risks*, report to the United States Congress (Washington: GAO), at 12, at <https://bit.ly/3Q5wbxM>.

58. There are categories of fluids and other substances, other than water, that are used in the hydraulic fracturing process.[91] In formations where water-based solutions do not create the conditions required for fracturing, oil-based fluids are used. There are also emulsion-based fluids: mixtures of acid or water in hydrocarbons, whose chief characteristic is that they reduce the viscosity of the crude to be extracted. As for foam-based fluids, these may be either water- or oil-based.[92]

88. Id.
89. Id. at 6.
90. United States Government Accountability Office (2012), *Oil and Gas: Information on Shale Resources, Development, and Environmental and Public Health Risks*, report to the United States Congress (Washington: GAO), at 12, at: <https://bit.ly/3Q5wbxM>.
91. CSCIM (s/f), *Gas no Convencional en España, una Oportunidad de Futuro*, High Council of Mining Engineering Colleges, Madrid, at 57, at: <https://bit.ly/4cpyB2W>.
92. Semarnat (2015), *supra* at. 6, at: <https://bit.ly/3tkZXXq>.

59. Stimulation by hydraulic fracturing is primarily used in land-based wells at depths varying according to the location of the oil or gas-bearing rock, which generally becomes exploitable starting at 2500 meters below the surface.[93] At first, hydraulic fracturing was only applied in vertically drilled wells; however, advances in directional drilling technology for shale reservoirs have made it possible to change the drilling angle in order to produce slanted and horizontal wells (see Figure 3).[94]

Figure 3. Reservoirs and wellbores in which hydraulic fracturing may be used



Source: Diagram derived from E. López Anadón (2015), *El abecé de los hidrocarburos en reservorios no convencionales* (Buenos Aires: Instituto Argentino del Petróleo y del Gas (IAPG)), at 11, at <https://bit.ly/3CL2tu4>.

60. In unconventional reservoirs horizontal wellbores are drilled at specific depths (there can be many horizontal branches off a vertical well and in every direction) and then hydraulic fracturing is conducted in successive stages and in every branch.[95]

93. E. López Anadón (2015), *supra* at 17, at: <https://bit.ly/3CL2tu4>. For example, in Argentina, the Vaca Muerta formation, cited in this same source, lies at a depth of 3,000 m, while the Tangram–1 and Nerita–1 wells in Nuevo León, Mexico were both drilled down to depths below 4,000 meters (as indicated in section 3.3.3 of the factual record).

94. See, e.g., H. Ben Mahmud *et al.* (2020), "A Review of Fracturing Technologies Utilized in Shale Gas Resources," in K. Imo-Imo Israel Eshiet and R. G. Moghanloo, (eds.), *Emerging Technologies in Hydraulic Fracturing and Gas Flow Modelling*, IntechOpen, ch. 2, at: <https://bit.ly/4dy8Jn4>.

95. Government of British Columbia (2016), "Conventional versus Unconventional Oil and Gas," 3 March 2016 update, at: <https://bit.ly/3WBW1O0>. On high volume hydraulic fracturing, *see*: Government of Spain (n.d.), "Fracturación hidráulica y fracturación hidráulica de alto volume," Ministerio para la Transición Ecológica y el Reto Demográfico, Madrid, at: <https://bit.ly/4dxvXtB>.

61. Hydraulic fracturing technology is subdivided according to the direction of the well (vertical, slanted, horizontal) and the type of fluid employed. Various factors, including the depth and capacity of the reservoir, the natural structure of the rock formation, and the available drilling and casing techniques, determine the selection of fracturing fluid and the orientation of the wells.[96]

62. The process of construction of an oil well begins in the same way, regardless of whether it is drilled for hydraulic fracturing or conventional extraction. In all cases, the well must be protected with a casing bonded to the wall of the wellbore, in order to keep the well hermetically sealed off from the surrounding rock; this preserves its structure, and prevents contact between fluids present in the substrate or rock formation and fluids injected into the well.[97] In addition, the physical integrity of the wellbore must be checked to ensure the absence of leaks or fluid movements through vertical channels adjacent to the casing that could affect the aquifer.[98] Once the vertical drilling is complete, the next step is horizontal drilling—also called "directional drilling"—of one or more segments that may—or may not, depending on the reservoir—undergo hydraulic fracturing. Meaning, the hydraulic fracturing process only begins once the drilling and construction of the vertical and horizontal segments of the well are completed.[99] Given the length of horizontal wellbores (generally from 600 to 1,800 meters, although ranging up to 3,600 m or even more), hydraulic fracturing is often done in stages, each of which centers around a limited linear section and may be repeated several times.[100]

63. During the exploration phase and irrespective of the technology used (direction of drilling and type of fluid, depending on the characteristics of the formation),[101] in all cases some of the fluid injected into the well that returns to the surface (known as "flowback" fluid) is recovered, as the mixture that returns contains the target resource (gas or oil), sometimes mixed with water occurring naturally in the formation (known as "produced water"). Recovery capacity is limited due to physical and technological barriers, causing a significant portion of the injected fluid to remain in the well. In regard to the management of the flowback fluid, it can be redirected into disposal wells for final storage, or stored in on-site ponds, where it can either be reused in other operations or undergo treatment.[102]

3.2 Environmental effects associated with hydraulic fracturing

64. Exploration activities of oil and gas in both conventional and unconventional reservoirs (for example, shale formations, tight sandstones, coalbeds) poses inherent risks to the environment and public health. The effects vary depending on, for instance: the location of the wells and the processes used; the geology of the site; the climate; the commercial and industrial practices in use; chemicals and other products used; the applicable legal framework, and the inspection and surveillance measures implemented.[103]

65. The main adverse environmental effects that may derive from hydraulic fracturing during the exploration phase) depend on the environmental protection measures applied in the preparation phase. These include large volumes of water used and probable reduced availability of water for ecosystems (and for human use and consumption); pollution of aquifers; soil contamination; air pollution; loss of biodiversity; intense noise, and impacts on local and surrounding areas.[104]

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96. To consult information on drilling technologies, see: H. Ben Mahmud *et al*. (2020), *supra*, at: <https://bit.ly/4dy8Jn4>.
97. United States Government Accountability Office (2012), *supra* at 9, at: <https://bit.ly/3Q5wbxM>. *Cf*. Semarnat (2015), *supra* at 18, at: <https://bit.ly/3tkZXXq>; E. López Anadón (2015), *supra* at 8, at: <https://bit.ly/3CL2tu4>.
98. Semarnat (2015), *supra* at 27, at: <https://bit.ly/3tkZXXq>.
99. United States Government Accountability Office (2012), *supra* at 9, at: <https://bit.ly/3Q5wbxM>.
100. Id. at 9 and 13.
101. H. Ben Mahmud *et al.* (2020), *supra*, at: <https://bit.ly/4dy8Jn4>.
102. United States Government Accountability Office (2012), *supra* at 12–13, at: <https://bit.ly/3Q5wbxM>.
103. Id. at 32.
104. Semarnat (2015), *supra* at 7, at: <https://bit.ly/3tkZXXq>.

3.2.1 Effects on water

66. Hydraulic fracturing demands large volumes of water: as previously stated, water is the main component of fracturing fluid. Even before fracturing begins, during the process of wellbore drilling for exploration purposes, a mixture of water and clay known as drilling mud is used in order to balance the pressure in the well, carry drill cuttings to the surface, and cool and lubricate the drill bit.[105] The quantity of water necessary for drilling varies considerably.[106]

67. Flowback (fluid that returns to the surface after injection, mixed with solids, interstitial water, and hydrocarbon fluids)[107] and produced water (water extracted as a byproduct associated with hydrocarbon production) are generated during the hydraulic fracturing process during the exploration phase.[108] In addition, the well may also gush mud, which could be considered hazardous waste under applicable regulations, depending on its characteristics. In the event of a discharge[109] into a receiving waterbody,[110] flowback and produced water may be considered wastewater.[111]

68. According to the information reviewed by the Secretariat, fracturing a single wellbore requires anywhere from 9,000 to 29,000 cubic meters (m^3) of water depending on the depth, breadth, and permeability of the reservoir.[112] Some studies have suggested that "one of the main problems generated by shale gas production is the large amount of water demanded, to the detriment of alternative uses"[113] and it has been asserted that "when a number of wells are drilled in a given region, there is competition for water with other uses,"[114] and its availability for other vital uses, like household consumption, farming, other industrial uses and sustaining ecosystems, is affected.[115] In this regard, the Party notes that the entity that carried out exploration activities (i.e., PEP) maintains that, "competition for water with other uses has not been demonstrated conclusively [and] that regulatory frameworks governing hydraulic fracturing processes have evolved in a manner suggesting that the availability of water is not necessarily compromised."[116]

69. The water used in hydraulic fracturing operations can be obtained from various sources, including surface water (rivers, lakes, reservoirs), aquifers, wastewater from industry or water treatment plants, or water recycled from previous fracturing operations.[117]

70. Drawing water from surface sources can have direct and immediate (albeit at times temporary) effects by altering water flow and decreasing water levels and availability, with concomitant impacts on aquatic life and riparian vegetation. In deep aquifers, the consequences for groundwater and connected springs may be long-lasting since aquifer recharge from rainwater is a long process. Freshwater is a particularly limited resource in arid and semi-arid regions such as Nuevo León, where the problem of water availability becomes more complicated and intense during drought years and with projected increases in global warming.[118]

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105. United States Government Accountability Office (2012), *supra* at 8 and 37, at: <https://bit.ly/3Q5wbxM>.
106. U. A. Alemán Contreras *et al.* (2022), "Riesgos de la fractura hidráulica: Casos de las cuencas de Burgos, México y Neuquina, Argentina," *Investigación y Ciencia de la Universidad Autónoma de Aguascalientes* 30(87): 8, at: <https://bit.ly/4jiqnhg>.
107. Safety Guidelines in Unconventional Reservoirs, article 2, at: <https://bit.ly/3VQ4psn>.
108. Id.
109. *Cf.* Ley de Aguas Nacionales (*Ley de Aguas Nacionales*), *DOF* 1 December 1992, Article 3 paragraph XXII, at: <https://bit.ly/4ectMvE> [LAN].
110. *Cf.* LAN Article 3 paragraph XVII.
111. *Cf.* LAN Article 3 paragraph VI.
112. Semarnat (2015), *supra*, p. 7, en: <https://bit.ly/3tkZXXq>.
113. A. de la Vega Navarro and J. Ramírez Villegas (2015), *supra* at. 84, at: <https://bit.ly/3YnAp7s>.
114. Semarnat (2015), *supra* at 7, at: <https://bit.ly/3tkZXXq>.
115. Id.
116. UCAI, file no. UCAI/00279/2025 (30 January 2025).
117. CFE (2020), Caracterización del agua y los impactos medioambientales derivados de la fracturación hidráulica, Mexico, at 48, at: <https://bit.ly/4lwpqmT>.
118. M. Tejado Gallegos (2022), *supra* at 106-109, at: <https://bit.ly/3RhPwN7>.

71. Several scientific studies have highlighted evidence of negative effects on surface and groundwater quality related to shale gas activities.[119] On another note, drilling and fracking, and disposal of the flowback entailed by these activities, pose an inherent risk to ecosystems and groundwater, and represent a risk to surface water sources as well.[120]

72. Of over one thousand chemicals confirmed as ingredients in fracturing fluids (also used in the exploration phase), it is estimated that around one hundred are endocrine disruptors and at least 48 are potentially carcinogenic.[121] In addition, heavy metals, radioactive elements, brine, and volatile organic compounds (VOC) occurring naturally in deep geological formations may be transported to upper layers with the flowback fluid coming up from the hydraulic fracturing zone.[122]

73. The presence of naphthalene, a chemical used as a surfactant in hydraulic fracturing, has been reported in the air and water at sites in the vicinity of gas and oil operations. At high concentrations, this crude oil component can become an endocrine-disruptor.[123] and various health problems, including, cancer, reproductive disorders, metabolic diseases, and developmental abnormalities.[124]

74. Studies have shown a possible relationship between exposure to known or presumed endocrine disruptors from pollution of local water supplies by hydraulic fracturing operations and various health problems, including obesity, cancer (particularly hormone-dependent cancers), infertility and other reproductive disorders, metabolic diseases, and developmental abnormalities.[125]

75. Other chemicals commonly used as ingredients in fracturing fluids (including throughout the exploration phase) are perfluoralkyl and polyfluoralkyl substances (PFAS).[126] PFAS are highly toxic substances, even in minimal concentrations, and are highly persistent in the environment (they do not break down and can accumulate over time).[127]

76. The information available to the Secretariat indicates that these substances, and other chemical precursors to PFAS, continue to be used in hydraulic fracturing activities.[128] In Mexico, there is no public information available on the composition of the fluids used in this activity (and therefore, on the associated risks).

119. A. de la Vega Navarro and J. Ramírez Villegas (2015), *supra* at 84, at: <https://bit.ly/3YnAp7s>.

120. Concerned Health Professionals of New York, Science & Environmental Health Network, and Physicians for Social Responsibility (CHPNY/SEHN/PSR) (2022), *Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking and Associated Gas and Oil Infrastructure*, 8th ed., at 122, at: <https://bit.ly/3S7orfc>.

121.. CHPNY/SEHN/PSR (2022), *supra* at 122, at: <https://bit.ly/3S7orfc>.

122. U. A. Alemán Contreras *et al*. (2022), *supra* at 8, at: <https://bit.ly/4jiqnhg>.

123. C.D. Kassotis *et al*. (2016), "Endocrine-Disrupting Chemicals and Oil and Natural Gas Operations: Potential Environmental Contamination and Recommendations to Assess Complex Environmental Mixtures," *Environmental Health Perspectives* 124(3): 256–64, at: <https://bit.ly/4bvmvVK>.

124. CFE (2020), *supra* at 36-37, 39, 75, 89-90 and 94, at: <https://bit.ly/4lwpqmT>.

125. Id.

126. On the use of PFAS in Mexico, *see*: INECC (2017), "Diagnóstico Nacional del Uso de Nuevos Contaminantes Orgánicos" Instituto Nacional de Ecología (*National Institute of Ecology*), at: <https://bit.ly/3Y67tBA>, at 20. *See also*: CHPNY/SEHN/PSR (2022), *supra* at 122, at: <https://bit.ly/3S7orfc>. See also EPA (2024) "Our Current Understanding of the Human Health and Environmental Risks of PFAS" at: <https://bit.ly/4dqlWgK>.

127. CHPNY and PSR (2022), *supra* at 123, at: <https://bit.ly/3S7orfc>. See also PSR (2024), *Fracking with "Forever Chemicals" in West Virginia* (Washington, DC: Physicians for Social Responsibility), at i, at: <https://bit.ly/4dTn2ma>.

128. PSR (2024), *supra*, p. i, à l'adresse : <https://bit.ly/4dTn2ma>.

77. A significant challenge in determining the use of substances that pose risks to health and the environment, as components of fracturing fluids lies in the current trade secret protections and industrial property rights regime. In a response to a request for information before the PNT, the Transparency Committee of CNH stated that industrial and commercial information "represents a competitive advantage over third parties" and is therefore covered by trade secret protections and industrial property rights,[129] making it impossible to accurately determine the chemicals used in the hydraulic fracturing process.[130] Without naming fracturing fluids or materials and substances used in the process, Mexican legislation establishes that "geological, geophysical, petrophysical, petrochemical information, as well as information generally obtained from the Surface Surveys and Exploration activities belongs to the Nation" and states that the CNH "will guarantee the confidentiality of the information."[131]

78. In addition to the diverse chemicals making up the fluid injected to stimulate the productive formation, there is the fact that drilling fluids may combine with substances naturally occurring in shale sediment, such as heavy metals, metalloids, and methane, during the hydraulic fracturing process (including throughout the exploration phase) "causing unforeseen chemical reactions that are harmful to the health of human beings and other organisms."[132] In addition, injection fluids can "come into contact with radioactive elements present deep in the rock, such as radon"[133] and may trigger fugitive emissions.[134]

79. Spills of flowback fluid and produced water associated with hydraulic fracturing may occur during the different phases of this activity, even during their transportation (see Figure 4).[135]

80. Public concern about the risks associated with leaks and spills of liquid pollutants used in the operations of the shale oil and gas industry has increased. With a view to preventing *in situ* spills (on drill pads) during hydraulic fracturing operations, especially due to equipment failure, and also subsequently, during remediation processes, it is recommended constant monitoring and regular inspection of the sites in question.[136] Although it was not possible to identify public studies on the operational risks of hydraulic fracturing specialists around the world have recorded the mean spill volumes, the most common pathways by which spills occurred, and the incidence of spills during the life cycle of the affected wells.[137] Another reported effect element of risk is the integrity of the cement sheath around the well casing. In this regard, it has been noted that "When there is a failure in the structure of the injector well (cementing and casing), and it is located in the proximity of aquifers, these can be contaminated by the chemicals added to the fracturing water or by the extracted hydrocarbon."[138] For this reason, it is insisted on having measures that seek to guarantee the integrity of the well and its tightness during drilling and completion of the well.[139]

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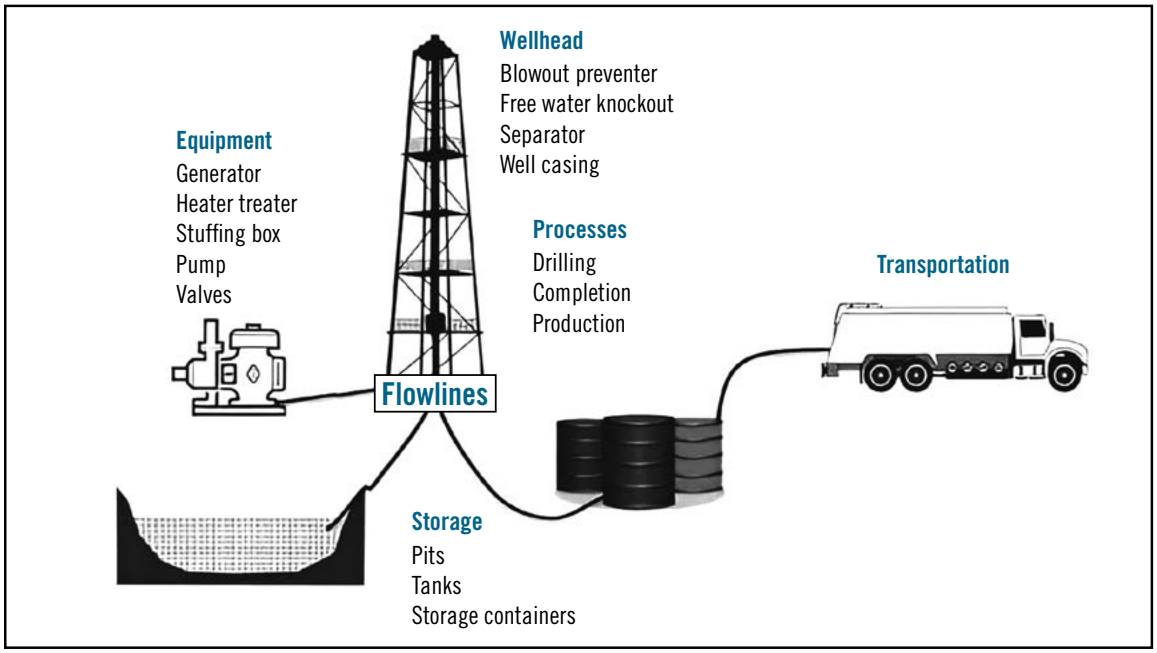
129. CNH, Transparency Committee, response no. PER–009–2019 (20 March 2019), at 5 **,** at: <https://bit.ly/4cajP0f>.
130. M. de las N. Carbonell León (2017), "Fracturación hidráulica y principio precautorio," in M. Anglés Hernández, R. Roux and E.A. García Rivera, (eds.), *Reforma en materia de hidrocarburos: análisis jurídicos, sociales y ambientales en prospectiva*, Universidad Nacional Autónoma de México, Instituto de Investigaciones Jurídicas, Universidad Autónoma de Tamaulipas, Mexico, at 82, at: <https://bit.ly/4dmYUIq>. It should be noted that the information received through the national transparency platform on chemicals contained in the fracturing fluid that is used in the wells covered by this factual record was generic and imprecise. *Cf.* Information prepared by Pemex Exploración y Producción (PEP), included in the public documentation consulted in connection with the public complaint filed before the Asea. , folios 0081–0092, at: <http://cec.org/files/sem/20240423/aap001.pdf> [Information from PEP].
131. *Hydrocarbons Act*, published in the DOF on August 11, 2014, last amendment DOF 01-04-2024, articles 32 and 33, in: <https://bit.ly/4c1g1i3>.
132. Semarnat (2015), *supra* at 7, at: <https://bit.ly/3tkZXXq>.
133. Id.
134. Id. at 27
135. CFE (2020), *supra* at 19, 57, 63, 90, 92 and 93, at: <https://bit.ly/4lwpqmT>.
136. M. Tejado Gallegos (2022), *supra* at 106-109, at: <https://bit.ly/3RhPwN7>.
137. Id.
138. Semarnat (2015), *supra* at 7, at: <https://bit.ly/3tkZXXq>.
139. Id. at 18.

Figure 4. Common spill pathways associated with hydraulic fracturing operations



Source: Diagram derived from Patterson et al. (2017), "Unconventional Oil and Gas Spills: Risks, Mitigation Priorities, and State Reporting Requirements," *Environ. Sci. Technol.* 51(5): 2563–73, at <https://bit.ly/4bSoFyR>.

81. Accidental spills and discharges of fracturing fluids into surface water significantly affect the chemistry and ecology of water flow in entire watersheds.[140] Spills in hydraulic fracturing operations are a problem around the world.[141]

82. On 1 December 2018, the Mexican president stated, among his commitments announced after his inauguration, that "[w]e will not use extractive methods that affect nature and deplete water sources, such as fracking".

3.2.2 Other relevant effects

83. According to the various studies shale oil and gas operations pose risks to air quality, especially in relation to exhaust gases emitted by the engines of transport trucks; emissions from injection pumps and diesel generators used to power equipment; the intentional burning or venting of natural gas for operational reasons, and unintentional emissions of pollutants from defective equipment or tanks.[142]

84. As part of the process of extracting hydrocarbons from unconventional reservoirs, air quality is affected by natural gas emissions.[143]

85. Furthermore, fracturing fluids and produced water stored in surface tanks and reservoirs pose a risk to flora and fauna in surrounding ecosystems and to air quality, since their evaporation can release toxic substances into the atmosphere.[144]

86. Over 200 different air pollutants have been identified at sites near drilling and hydraulic fracturing operations. Of these, 61 are classified as air pollutants with known health risks, while 26 are endocrine disruptors.[145]

140. *Cf.* CFE (2020), *supra* at 19 and 36, at: <https://bit.ly/4lwpqmT>.
141. CHPNY/SEHN/PSR (2022), *supra* at 123, at: <https://bit.ly/3S7orfc>.
142. Id. at 167.
143. United States Government Accountability Office (2012), *supra* at 35, at: <https://bit.ly/3Q5wbxM>.
144. Id. at 36.
145. CHPNY/SEHN/PSR (2022), *supra* at 91, at: <https://bit.ly/3S7orfc>.

87. It has been found that hydraulic fracturing is associated with two types of seismic activity: microseismic events (frequent and a consequence of the propagation of fractures) and major seismic events (atypical but can be induced in the presence of faults).[146]

88. The possible causality of seismic and microseismic events recorded in other parts of the world has been documented in the project area.[147] According to a study published in 2015, the rate of earthquakes detected in the state of Nuevo León changed significantly from 2006 to 2015, with a considerable increase being recorded in the years 2012, 2013, and 2014. No relationship was found between the data collected and "random fluctuations in rates of naturally occurring seismicity."[148] By means of a statistical analysis, the study conducted in the Burgos oil province found that the earthquake sequence or swarm coincided with the exploratory wells drilled in the area (a change in the aftershock sequence is an indicator of induced seismicity). The study concluded that the earthquakes recorded and studied could be linked to hydraulic fracturing.[149]

89. Finally, it should be noted that, in relation to hydraulic fracturing activities in Mexico, there have been eight bills—introduced between 2018 and 2020—stemming from both houses of Congress[150] and one Presidential bill.[151] These bills include a draft decree reforming several provisions of the Political Constitution of the United Mexican States; the Hydrocarbons Act; the National Agency for Industrial Safety and Environmental Protection in the Hydrocarbons Sector Act; the LGEEPA, and initiatives to enact further legislation to legally prohibit hydraulic fracturing in Mexico. As of the date of preparation of this factual record, none of the bills have been adopted. Specific actions have been called for including adoption of a legal ban on hydraulic fracturing.[152]

90. It is also relevant to note that, in 2015, Semarnat published the Environmental Criteria Guide for the Exploration and Extraction of Hydrocarbons Contained in Shales (*Guía de criterios ambientales para la exploración y extracción de hidrocarburos contenidos en lutitas*).[153] Also, in 2017, Asea published the Guidelines on Industrial Safety, Operational Safety and Environmental Protection to Carry out Exploration and Extraction Activities of Hydrocarbons in Onshore Unconventional Reservoirs (*Lineamientos en materia de seguridad industrial, seguridad operativa y de protección al medio ambiente para realizar actividades de exploración y extracción de hidrocarburos en yacimientos no convencionales en tierra*).[154] Also, in 2017, Semarnat published

146. CartoCrítica (2015), "Sismicidad inducida y fracking", *CartoCrítica, Investigación, mapas y datos para la sociedad civil*, at: <https://bit.ly/3EjV6ez>.

147. Id.

148. J.M. Rodríguez Martínez *et al.* (2015), *Sismicidad inducida por la fractura hidráulica en el estado de Nuevo León, México*, paper, XV Congreso Colombiano de Geología, 2015, "Innovar en Sinergia con el Medio Ambiente," Bucaramanga, Colombia, at 1, at: <https://bit.ly/3PLLKuA>.

149. Id. The epicenters of the earthquakes were located in the municipalities of China, General Terán, Montemorelos, and Los Ramones, Nuevo León; nine of the recorded quakes were of magnitudes of 4.0–4.5 on the Richter scale and may have been associated with the operations carried out in the Arbolero–1, Batial–1, Durian–1, Kernel–1, Nerita–1, and Tangram–1 exploratory wells. The foci of the epicenters coincided with the depth at which the Pimienta and Agua Nueva plays are found.

150. Deputies Evaristo Lenin Pérez Rivera and Raúl Gracia Guzmán of the National Action Party, *draft decree enacting federal law to prohibit hydraulic fracturing* (October 9, 2018), at: <https://bit.ly/3RvcAIi>; Deputy Benjamín Robles Montoya of the Labor Party, *draft decree adding Article 6 of the National Agency for Industrial Safety and Environmental Protection in the Hydrocarbon Sector Act* (October 25, 2018), Cámara de Diputados, *Gaceta Parlamentaria*, XXI, no. 5143-II, at: <https://bit.ly/3KIgmtN>; Deputy María Guadalupe Almaguer Pardo of the Democratic Revolution Party, *draft decree amending and adding various provisions of the National Agency for Industrial Safety and Environmental Protection in the Hydrocarbon Sector Act, regarding fracking* (18 March 2020), Cámara de Diputados, *Gaceta Parlamentaria*, XXIII, no. 5481-VII, at: <https://bit.ly/4c0OAF7> ; Labor Party senators, *draft decree amending Article 95 of the Hydrocarbons Act, to prohibit the use of hydraulic fracturing* (December 6, 2018), Senado de la República, at: <https://bit.ly/3xn0D0j> ; Senator Verónica Delgadillo García of the Citizen Movement, *draft decree amending and adding Article 27 of the Political Constitution of the United Mexican States* (13 December 2018), at: <https://bit.ly/3KKxzD3>; Deputy Evaristo Lenin Pérez Rivera of the National Action Party, *draft decree amending and adding various provisions of the General Ecological Balance and Environmental Protection Act and the Hydrocarbons Act* (3 December 2019), Cámara de Diputados, *Gaceta Parlamentaria*, XXIII, no. 5415-III at: <https://bit.ly/3VIO60F>; Deputies of the Citizen Movement Parliamentary Group, *draft decree reforming articles 4 and 130 of the Hydrocarbons Act* (10 December 2019), Cámara de Diputados, *Gaceta Parlamentaria*, XXII, no. 5420-III, at: <https://bit.ly/3VENXLz>; Senator Antares Guadalupe Vázquez Alatorre of the National Regeneration Movement, *draft decree issuing the General Act for the Prohibition of Hydraulic Fracturing* (10 July 2019), Senado de la República, at: <https://bit.ly/4cnYSia>.

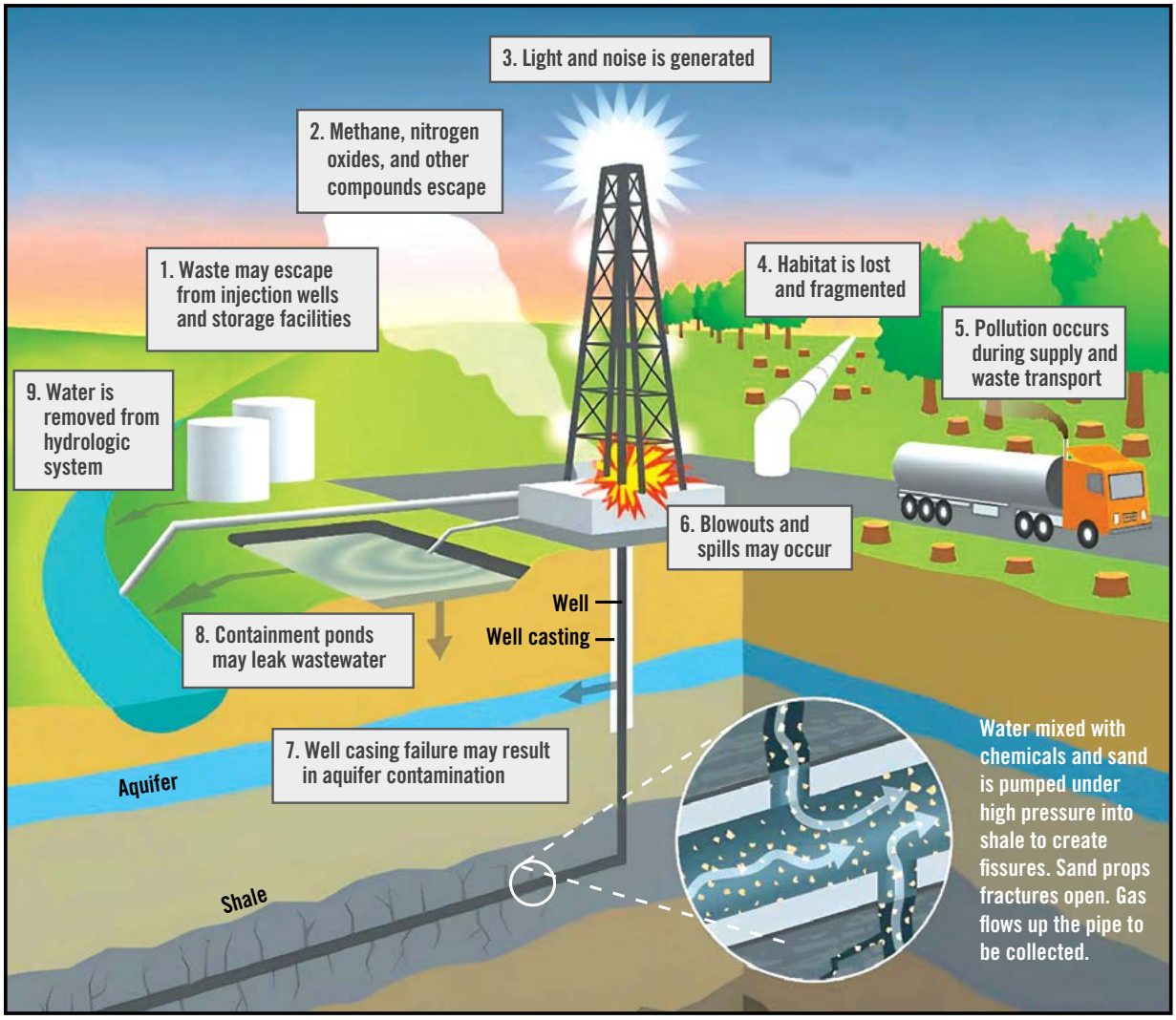
151. Presidency of the Republic, "Iniciativa con proyecto de decreto por el que se reforman diversas disposiciones de la Constitución Política de los Estados Unidos Mexicanos, en materia de derecho a la alimentación, medio ambiente sano y derecho al agua", *Gaceta Parlamentaria*, annex I, XXVII, no. 6457-1, at: <https://bit.ly/3z38tNb>.

152. M. Tejado Gallegos (2022), *supra* at 47-48, at: <https://bit.ly/3RhPwN7>.

153. Semarnat (2015), *supra* at: <h7ttps://bit.ly/3tkZXXq>.

154. Safety Guidelines in Unconventional Reservoirs, at: <https://bit.ly/3VQ4psn>.

Figure 5. Various effects associated with hydraulic fracturing activities



Source: Princeton University (2014), "'Fracking' in the dark: Biological fallout of shale-gas production still largely unknown," *Phys.org*, at <https://bit.ly/4exDSHG>.

the Guidelines for Water Conservation-UR.[155] Asea has published documents explaining the content of its regulations.[156]All these instruments were adopted in order to have environmental safety measures in place during hydraulic fracturing activities.

91. In contrast to the above, the Ministry of Energy's Five-year Bidding Plan for the Exploration and Extraction of Hydrocarbons 2020-2024 (*Plan quinquenal de licitaciones para la exploración y extracción de hidrocarburos 2020-2024*) excludes—explicitly—the extraction of unconventional resources in shales and states that hydraulic fracturing will not be used until technologies and processes that avoid impacts to the environment and the social environment are available.[157]

155. Conagua (2017), "Lineamientos para la protección y conservación de las aguas nacionales en actividades de exploración y extracción de hidrocarburos en yacimientos no convencionales", Comisión Nacional del Agua, *DOF* 30 August 2017, Article 5, at: <https://bit.ly/4bKOT6N> [Guidelines for Water Conservation-UR].
156. Asea (2017), *supra* at: <https://bit.ly/4i1WQXE>.
157. Sener (undated.), *Plan quinquenal de licitaciones para la exploración y extracción de hidrocarburos 2020-2024*, Secretaría de Energía, at 35, at: <https://bit.ly/3YrTRQe>.

3.3 Geographical location of project

3.3.1 Domestic context

92. Pemex's 2013 annual report makes reference to a filing with the Ministry of the Treasury and Public Credit (*Secretaría de Hacienda y Crédito Público*—SHCP) concerning an investment project titled "Aceite y Gas en Lutitas" (Shale Oil and Gas).[158] Situated in the geological provinces (oil basins) of Chihuahua, Sabinas, Burro-Picachos, Burgos, Tampico-Misantla, and Veracruz (see Figure 6), this exploratory project focuses on identifying and assessing hydrocarbons in unconventional shale oil and gas plays[159] in Mexico.[160]

93. The prospective (inferred and potentially recoverable) hydrocarbon resources identified in the assessed plays are geographically distributed as shown in Figure 6:[161]

94. The Prospective of the Natural Gas Market 2012-2026 (*Prospectiva del mercado de gas natural 2012-2026*) proposed scenarios in which shale gas offered an opportunity for promotion. In this document, it is stated that it was necessary to "take advantage of this exceptional situation to achieve a responsible and sustainable exploitation of this resource."[162] However, "the mentions of shale gas are marginal, only a prospective scenario is proposed and its contribution to satisfy demand in the 2027 horizon is marginal."[163]

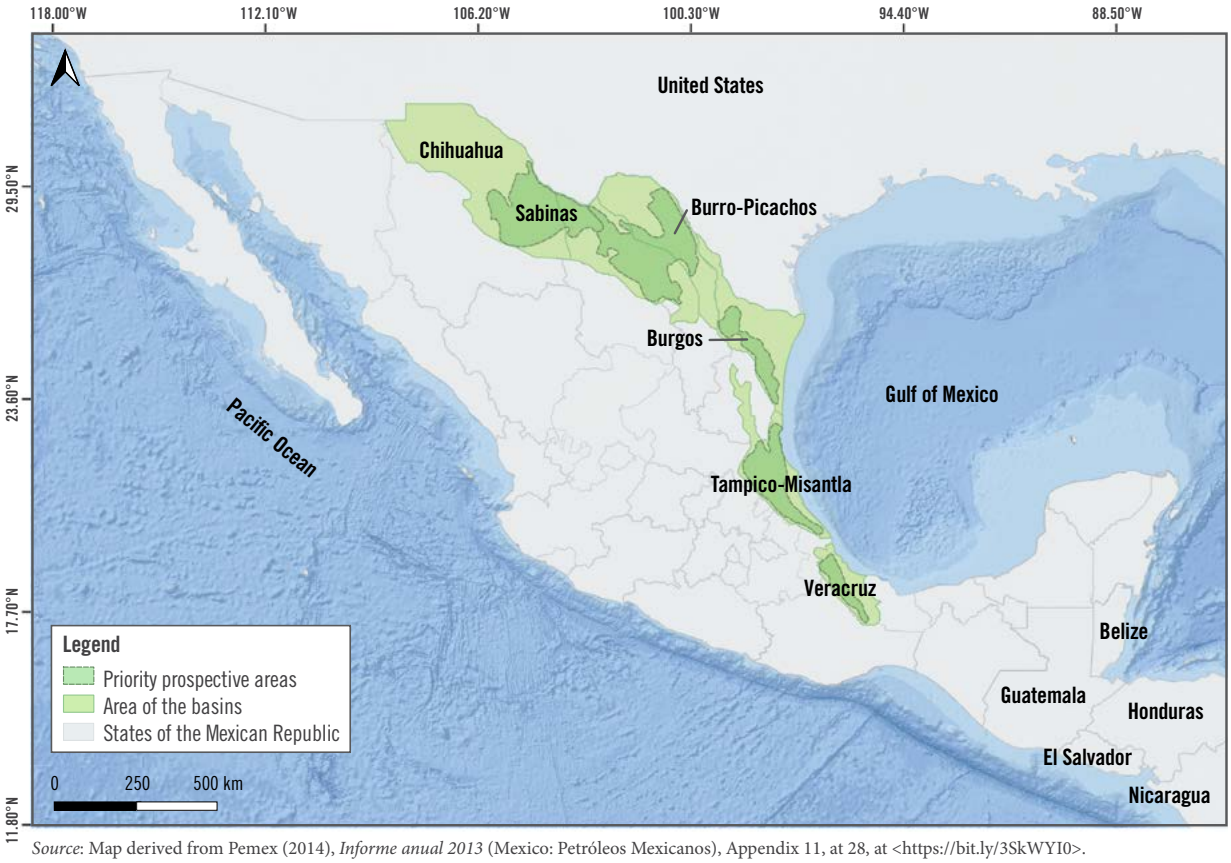
95. According to Pemex's 2013 annual report, in the Burgos Basin, the Tangram–1 well was completed during the assessment of the corresponding play, while as of December 2013, the Nerita–1 well was in the completion stage.[164]

3.3.2 Regional context in the Burgos Basin

96. The Tangram–1 and Nerita–1 wells are part of the Burgos Basin Project, implemented by *Pemex Exploración y Producción* (in this case, a regulated entity) and approved by the relevant authority, the DGIRA of Semarnat on 28 September 2004.[165] The approval was issued with a validity period of 20 years, extendable for half of the originally granted period.[166] This project encompasses an area of 40,294.34 km^2 in the following states and municipalities along the northeastern border of Mexico:[167]
    - Nuevo León: Agualeguas, Los Aldama, Anáhuac, Cerralvo, China, Doctor Coss, General Bravo, General Terán, General Treviño, Los Herreras, Melchor Ocampo, Paras, Los Ramones, Vallecillo;
    - Tamaulipas: Burgos, Camargo, Cruillas, Guerrero, Gustavo Díaz Ordaz, Matamoros, Méndez, Mier, Miguel Alemán, Nuevo Laredo, Reynosa, Río Bravo, San Fernando, Valle Hermoso;
    - Coahuila: Hidalgo and Guerrero.

158. Pemex (2014), *Informe anual 2013* (Mexico: Petróleos Mexicanos), Appendix 11, at 26, at: <https://bit.ly/3SkWYI0>.
159. A *play* consists of a number of reservoirs, or prospective reservoirs, grouped into fields in a given region and sharing the same structural geological characteristics (source, reservoir, and cap rocks, trap type), as well as similar conditions and processes of hydrocarbon generation and migration. See: Sener (2017), Deputy Minister for Hydrocarbons (*Subsecretaría de Hidrocarburos*), Hydrocarbon Exploration and Extraction Branch (*Dirección General de Exploración y Extracción de Hidrocarburos*) (2017), "Glosario de términos petroleros," at 18, 12, at: <https://bit.ly/3TwE4Pg>; CNH (undated), "Glosario", Comisión Nacional de Hidrocarburos (*National Hydrocarbons Commission*), Mexico, at: <https://bit.ly/3UImsjQ>.
160. Pemex (2014), *supra* annex 11, at 28.
161. Id. at 31.
162. Sener (2012), *Prospectiva del mercado de gas natural 2012-2026*, Secretaría de Energía, México, at 15-16, at: <https://bit.ly/4fninJj>.
163. A. de la Vega Navarro and J. Ramírez Villegas (2015), *supra* at 97, at: <https://bit.ly/3YnAp7s>.
164. Pemex (2014), *supra*, Appendix 11, at 32, 38 and 41, at: <https://bit.ly/3SkWYI0>.
165. Semarnat, file number S.G.P.A./DGIRA/.DEI.2440.04 (September 28, 2004), "Resolution on Environmental Impact and Risk," "General Directorate of Environmental Impact and Risk, Office of Environmental Protection Management, Ministry of Environment and Natural Resources, third and fourth terms., at 53, at: <http://cec.org/files/sem/20240605/aat001.pdf>. Regarding the authorization, the developer must request the renewal 30 days "prior to expiration." For the renewal process, see Federal Administrative Procedure Act, Article 31, at:[EIA Authorization].
166. Id. Regarding the authorization, the developer must request the renewal 30 days "prior to expiration." For the renewal process, see Federal Administrative Procedure Act, Article 31, at: <https://bit.ly/4bXKCNy>.
167. EIA Authorization, at 14–15, at: <http://cec.org/files/sem/20240605/aat001.pdf.>.

Figure 6. Geological provinces of the exploratory project titled "Shale Oil and Gas"



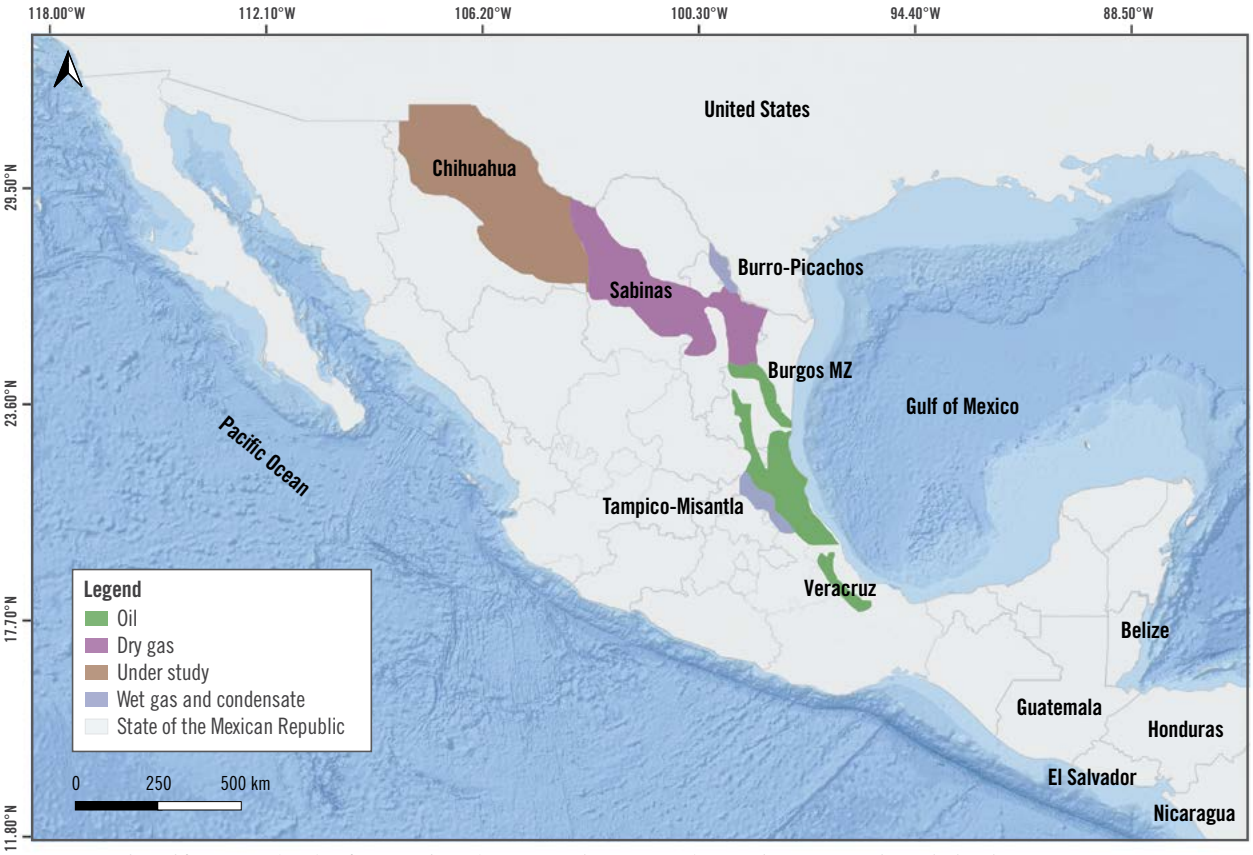
Source: Map derived from Pemex (2014), *Informe anual 2013* (Mexico: Petróleos Mexicanos), Appendix 11, at 28, at <https://bit.ly/3SkWYI0>.

97. The Burgos Basin Project includes the development of 13,657 facilities, divided into 6,493 wells, 5,897 discharge lines, 230 gas pipelines, 943 production systems (compressor and collection stations), and 154 water injection and transfer systems.[168] Between 2004 and 2011, an area of 12,541 hectares was used to conduct 2D seismic prospecting, and 24,439 hectares was used for conducting 3D seismic prospecting. Tangram–1 and Nerita–1 are two of the 6,493 wells included in the Burgos Basin Project. The information presented in this section was obtained mostly from requests for information to the PNT. The Secretariat did not identify relevant information on compliance with the environmental conditions related to the sustainable use of water for the wells in question, which are the subject of this factual record. The Party asserts that PEP informed of its compliance with the environmental law in force at the time of the events, that is, the LGEEPA and its regulations, as well as the guidelines to file an application for exploratory drilling works.[169]

168. Id. at 14. It should be noted that the decision by DGIRA-Semarnat appears to contain an error in the values presented, since the sum of the figures indicated yields a total of 13,717 works and not 13,657.

169. Sener (2012), *supra*, at: <https://bit.ly/4hOxKf5>.

Figure 7. Plays comprised by the "Shale Oil and Gas" project



Source: Map derived from Pemex (2014), *Informe anual 2013* (Mexico: Petróleos Mexicanos), Appendix 11, at 31, at <https://bit.ly/3SkWYI0>.

3.3.3 Location and purpose of the Tangram–1 and Nerita–1 wells

98. The purpose of the Tangram–1 well, located in the municipality of China, Nuevo León (see Figure 8), was to assess the unconventional play of the Upper Jurassic Pimienta Formation. The well was able to produce dry gas after reaching a measured depth of 4,426 meters. On this basis, horizontal drilling was done and, according to the information reviewed, "multi-fracturing" was performed.[170]

99. The purpose of the Nerita–1 well, located in the municipality of Los Ramones, Nuevo León (see Figure 8), was to serve as proof of concept for the play (Upper Jurassic Pimienta Formation) as well as to assess its potential with regard to productivity of oil and wet gas from carbonaceous shales. By the completion stage, the well had reached a measured depth of 4,100 meters.[171]

170. Pemex (2014), *supra*, Appendix 11, at 38, at: <https://bit.ly/3SkWYI0>.

171. Id. at 41.

3.4 Description of hydraulic fracturing in the Tangram–1 and Nerita–1 wells

100. The Tangram-1 and Nerita-1 wells were fractured using the hydraulic fracturing technique during the exploratory phase and were respectively classified as "dry gas producer" and "non-commercial dry gas producer."[172] The wells did not move to the production or extraction phase. The Tangram-1 and Nerita-1 wells were constructed and completed as follows:

3.4.1 Tangram–1 well

101. Drilling of the Tangram–1 well began on 10 April 2013 and the completion process concluded that same year, on December 31.[173] At a depth of 4,426 meters, the well started producing dry gas. The well reached a gas flow rate of 308,852 m^3/day and a water flow rate of 68.7 m^3/day, with salinity of 88,504.65 ppm.[174] In order to drill the wellbore, a drilling rig was built, along with roads and a storage dam.[175]

102. The cement sheath around the casing measured 13 3/8 inches. During this operation, normal circulation on the surface of the cement slurry was observed (with no blockage or leaks from the casing) and no fluid loss was reported. In addition, adequate sealing conditions were in place to prevent the infiltration of flowback into the aquifers on its way to the surface during the well completion stage (from 27 September to 31 December 2013).[176]

103. For the drilling of the well, a polymer mud was used from 11 to 307 m depth, whereas from 301 to 1,923 meters, an invert emulsion mud was used, with no recorded fluid loss in either case.[177] The plan for fracturing the horizontal wellbores consisted of 16 hydraulic fracturing stages distributed along an interval of 2,800 to 4,400 meters.[178]

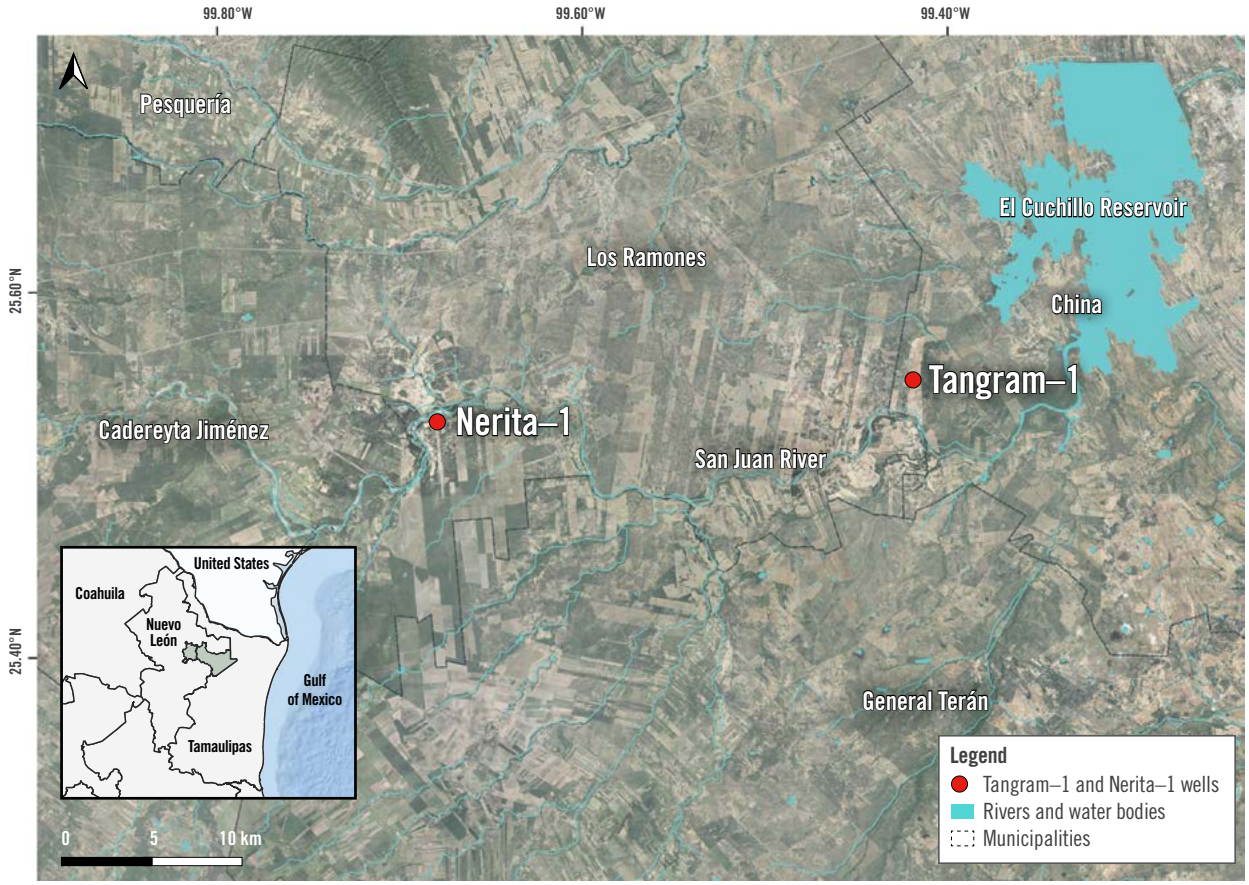
172. PEP, file no. GMPEIR-OPGEOL-1221-773-2013 (31 December 2013) and GMPEIR-OPGEOL-722-508-2014 (11 August 2014), Pemex Exploración y Producción, at: <http://cec.org/files/sem/20241101/aaw011.pdf>.
173. Asea, inspection record no. ASEA/USIVI/DGSIVEERC/AMB/AI/0006/2022 and no. ASEA/USIVI/DGSIVEERC/AMB/AI/0007/2022 (24 March 2022), included in the public documentation consulted in connection with the public complaint filed with the Asea, folio 0030, at: <http://cec.org/files/sem/20240423/aap001.pdf> [Asea Inspection Records].
174. Id. at folio 0022.
175.. PEP Document in Response to Information Request, at 1, at: <http://cec.org/files/sem/20240605/aat002.pdf>.
176. ASEA Inspection Records, folios 0023–0024, at: <http://cec.org/files/sem/20240423/aap001.pdf>.
177. Id. at folio 0024.
178. Id. at folio 0081.

Table 1. Location of Tangram–1 and Nerita–1 wells

Well	Locality	Location (UTM z14 ITRF08 coordinates)
Tangram–1	Municipality of China, Nuevo León, 19 km from the community of Hacienda El Carrizo.	X: 457942.825 Y: 2826076.04
Nerita–1	Municipality of Los Ramones, Nuevo León, 6 km from the community of Hacienda El Carrizo.	X: 431675.735 Y: 2823668.72

Source: Exploración y Producción (PEP), unnumbered document (n.d.), in response to request for information no. 30023023000838 filed with the PNT, at 1, at <http://cec.org/files/sem/20240605/aat002.pdf>.

Figure 8. Location of Tangram–1 and Nerita–1 wells



Note: Location approximate. Map derived from hydrocarbon industry map of the Hydrocarbon Information System (*Sistema de Información de Hidrocarburos*—SIH), using the options "Información CNIH," "Pozos," a]nd "Zona Burgos."

Source: Comisión Nacional de Hidrocarburos (CNH) (2024), "Mapa de hidrocarburos," at <https://bit.ly/49x209H>.

Table 2. Commencement of drilling and completion of Tangram–1 and Nerita–1 wells

Well	Start of drilling	Completion of the well
Tangram–1	10 April 2013	31 December 2013
Nerita–1	26 August 2013	8 August 2014

Note: It should be noted that, although there is information available to verify the start and completion dates of the wells, there are no documents available to the Secretariat to certify the date of abandonment (i.e., removal of materials and dismantling of equipment, including the plugging of the structure).

Source: PEP, file no. GMPEIR-OPGEOL-1221-773-2013 (31 December 2013) and GMPEIR-OPGEOL-722-508-2014 (11 August 2014), Pemex Exploración y Producción, at: <http://cec.org/files/sem/20241101/aaw011.pdf>.

104. The initial fracturing project called for using water treated with 15% hydrochloric acid (HCl) as a friction reducer, as well as high-strength 20/40 mesh silica and 20/40 mesh white sand. In addition, "it was proposed to use a hybrid treatment (water with friction reducer and linear gel)." Using a water-based fluid—although the composition of the compounds used is not known to date—16 horizontal sections were fractured at different depth intervals.[179] In the Tangram-1 well, only about 2% of the flowback fluid was recovered, representing a volume of 2,939 barrels (bbl) (see Figure 9).

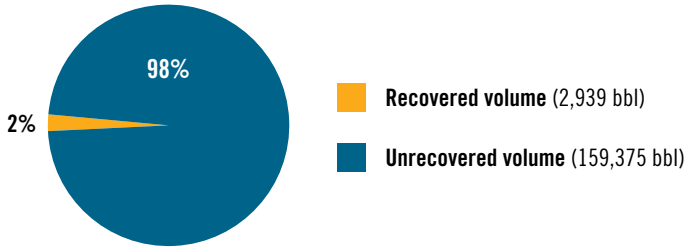
105. The information provided by Asea indicates that in the hydraulic fracturing work (which consisted of 16 operations), a bottomhole proppant concentration of 59.91–359.48 g/l was used,[180] which involved the use of 54,900 bags of sand (of various particle sizes).[181] Drilling began with the following parameters: maximum pressure of 66.78 MPa (equivalent to 678 atmospheres of pressure), drilling mud pumping rate of 80 bpm, pumped mud volume of 162,314 bbl, and flowback fluid recovery rate of 1.814% (for a recovered volume of 2,939 bbl).[182] Data on types of drilling muds employed and lost in the Tangram–1 well are given in Table 3.[183]

106. According to Pemex, the *abandonment*[184] of the Tangram–1 well took place in accordance with the Single operational guide for integrity management during the design, construction, productive life and abandonment of wells (*Guía operativa única para el manejo de la integridad durante el diseño, construcción, vida productiva y abandono de pozos en PEP clave GO-DE-TC-0015-2019)*, an internal operating document from 2019 that establishes the design methodology for cement sheaths to be used in primary and secondary cementing of development and exploratory wells.[185] However, it should be noted that the information available to the Secretariat does not specify the date of abandonment of the wells or the reason why the materials were removed and the equipment was dismantled. The official date of completion and hermetic sealing of the well was 31 December 2013,[186] while Pemex indicates that for the abandonment of the project (i.e., removal of materials, dismantling of equipment, etc.) used the aforementioned guide, published in 2019, six years later. The minutes of the Asea's inspection visit state that, as of 31 December 2013, the well had been capped, with production valves closed and no discharge lines.[187]

107. No valve, production tree, or wellhead corrosion was observed during the inspection of the Tangram–1 well by Asea on 24 March 2022, nor any muds in the casing annulus.[188] No liquids were present in the cellar, nor did it give off the characteristic odor of liquid hydrocarbons, gas, or hydrogen sulfide gas.[189]

179. Id.
180. Id. The Asea inspection record presents these values in English-system units: a bottomhole proppant concentration of 0.50–3.0 lb/gal.
181. Id. at folio 0082.
182. Id.
183. Id. at folio 0086.
184. *Abandonment* is the set of activities of removal of materials and dismantling (disassembly and removal) of equipment from a well, including plugging. See the corresponding entry in the *Terminology* section of this factual record.
185. PEP Document in Response to Information Request, at 1, at: <http://cec.org/files/sem/20240605/aat002.pdf>. *Cf.* PEP (2019), *Guía operativa única para el manejo de la integridad durante el diseño, construcción, vida productiva y abandono de pozos en PEP clave GO-DE-TC-0015-2019,* Pemex Exploración y Producción, at: <http://cec.org/files/sem/20240613/aau013.pdf> [PEP Operational Guide].
186. PEP, file no. GMPEIR-OPGEOL-1221-773-2013 (31 December 2013), Pemex Exploración y Producción, at: <http://cec.org/files/sem/20241101/aaw011.pdf>.
187. ASEA Inspection Records, folio 0023, at: <http://cec.org/files/sem/20240423/aap001.pdf>.
188. Id. at folio 0027.
189. Id. at folio 0026.

Figure 9. Recovery percentage of flowback fluid from the Tangram–1 well



Source: Developed by CEC Secretariat with data from information on geological operations in the Burgos Basin Integral Asset, folio 0082, at <http://cec.org/files/sem/20240423/aap001.pdf>.

Table 3. Drilling muds employed and lost in the Tangram–1 well

Properties of drilling muds employed

Stage	Company	Starting depth (m)	Ending depth (m)	Density (g/cm³)	Viscosity (s)	Plastic viscosity (cP)	Yield point (lb/100 ft²)	Filtrate (ml)	Solids (%)	Salinity (ppm)	pH	Water/oil ratio	Emulsion (V)	Mud type and observations
1	Q-Max	11	307	1.25	48	13	14	8	12	58,000	11	---	---	Inhibited-polymer
2	Q-Max	307	1,923	1.18	56	16	15	5	13	243,395	-	79/21	890	Invert emulsion
3	Q-Max	1,923	2,880	1.24	62	18	13	4	14	258,038	-	79/21	970	Invert emulsion
3	Q-Max	2,339	2,724	1.24	60	20	16	5	15	255,034	-	81/19	1,136	Invert emulsion
4	Q-Max	2,724	4,426	1.65	73	31	19	4	25	279,088	-	83/15	1,200	Invert emulsion

Mud volumes lost

Interval (m)	Mud type	Volume lost (m³)
11-307	Inhibited-polymer	0.0
301-1,923	Invert emulsion	0.0
1,923-2,880	Invert emulsion	25 m³ contaminated
2,339-2,724	Invert emulsion	4 m³ by impregnation

Note: m = meters; g/cm³ = grams per cubic centimeter; s = seconds; cP = centipoise; lb = pounds; ft² = square feet; ml = milliliters; ppm = parts per million; pH = potential of hydrogen; V = volts.

Source: PEP, "Drilling Fluids Report" in public documentation consulted in connection with the public complaint filed with the Asea, folio 0086, at <http://cec.org/files/sem/20240423/aap001.pdf>.

3.4.2 Nerita–1 well

108. Drilling of the Nerita–1 well began on 26 August 2013 and its completion process concluded on 8 August 2014. At a depth of 4,100 m, it was documented as a "noncommercial dry gas producer."[190] In order to drill the wellbore, a drilling rig was built, along with roads and a storage dam.[191]

109. The well produced a gas flow rate of 9,628 m^3/day and a water flow rate (associated with flowback) of 21.8 m^3/day, with a salinity of 122,000 ppm.[192]

110. For the drilling of the well, water-based inhibited-polymer muds were used from depths of 10 to 298 meters,[193] while a total volume of 13,341.20 m^3 of water and gel was used for the hydraulic fracturing process (equivalent to the volume of water in 5.3 Olympic-size pools), although the composition of the compounds used is not known to date.[194]

190. Id. at folios 0006; see also: Information from PEP folio 0079, at: <http://cec.org/files/sem/20240423/aap001.pdf>.
191. PEP Document in Response to Information Request, at 1, at: <http://cec.org/files/sem/20240605/aat002.pdf>.
192. ASEA Inspection Records, folio 0006, at: <http://cec.org/files/sem/20240423/aap001.pdf>..
193. Id.
194. Asea, file no. ASEA/USIVI/DGSIVEERC/0478/2023 (12 December 2023), in response to request for information no. 331002523000687 filed with the PNT, at 4, at: <http://cec.org/files/sem/20240423/aap006.pdf> [Asea File in Response to PNT Request]. It should be noted that in the information obtained from PEP, the figure mentioned is 12,236.5 m^3.

111. The table below (see Table 4) presents data on the types of fluids used for hydraulic fracturing of the Nerita–1 well.[195]

Table 4. Drilling muds employed and lost in the Nerita–1 well

Properties of drilling muds employed

Stage*	Company	Starting depth (m)	Ending depth (m)	Density (g/cm³)	Viscosity (s)	Plastic viscosity (cP)	Yield point (lb/100 ft²)	Filtrate (ml)	Solids (%)	Salinity (ppm)	pH	Water/oil ratio	Emulsion (V)	Mud type and observations
17½	Q-Max	10	298	1.15-1.12	45	18	14	8	11	48,000	11			Inhibited-polymer
12 ¼	Q-Max	298	1,720	1.14	50	22	19	4	10	242,489		76/24	815	Invert emulsion
8 ½	Q-Max	1,787	2,360	1.22	60	24	14	4	21	251,137		75/25	910	Invert emulsion
8½	Q-Max	1,817	2,310	1.50	60	24	14	4	21	251,137		75/25	910	Invert emulsion
6⅛´	Q-Max	2,310	4,100	1.50	65	22	12	5	20	234,650		78/22	900	Invert emulsion

Mud volumes lost

Interval (m)	Mud type	Volume lost (m³)
9–298	Inhibited-polymer	5
298–1,784	Invert emulsion	13

Note: m = meters; g/cm³ = grams per cubic centimeter; s = seconds; cP = centipoise; lb = pounds; ft² = square feet; ml = milliliters; ppm = parts per million; pH = potential of hydrogen; V = volts. *The drilling "stages" correspond to the diameter of the pipe: the deeper the pipe, the smaller the diameter.

Source: PEP, "Drilling Fluids Report" in public documentation consulted in connection with the public complaint filed with the Asea, folio 0085, at <http://cec.org/files/sem/20240423/aap001.pdf>.

112. During cementing of the casing, normal circulation on the surface of the cement slurry was observed (without obstruction or leaks from the casing) and no fluid loss was reported during operation; in addition, adequate sealing conditions were in place to prevent the infiltration of connate water and flowback fluid into the aquifers on their way to the surface during the well completion stage.[196]

113. According to Pemex, the Nerita-1 well was abandoned in accordance with the Single operational guide for integrity management during the design, construction, productive life and abandonment of wells (*Guía operativa única para el manejo de la integridad durante el diseño, construcción, vida productiva y abandono de pozos clave GO-DE-TC-0015-2019)*.[197] The official date of completion and hermetic sealing of the well was 8 August 2014[198] while the *guide* was published in 2019, five years later. The minutes of the Asea inspection visit, it is stated that the well was capped as of 8 August 2014 with top of cement (TOC) at an approximate depth of 2,360 m and without discharge lines.[199]

195. Information from PEP, folios 0083-0085, at: <http://cec.org/files/sem/20240423/aap001.pdf>.
196. ASEA Inspection Records, folio 0007, at: <http://cec.org/files/sem/20240423/aap001.pdf.
197. PEP Document in Response to Information Request, at 1, at: <http://cec.org/files/sem/20240605/aat002.pdf>. *Cf.* PEP Operational Guide, at: <http://cec.org/files/sem/20240613/aau013.pdf>.
198. PEP, file no. GMPEIR-OPGEOL-722-508-2014 (11 August 2014), Pemex Exploración y Producción, at: <http://cec.org/files/sem/20241101/aaw011.pdf>.
199. ASEA Inspection Records, folio 0006, at: <http://cec.org/files/sem/20240423/aap001.pdf>.

4. Measures taken by the Party

114. This section describes the enforcement measures implemented by the Party with respect to LGEEPA Article 88 paragraph III, in relation to sustainable water use, and Article 170, in relation to the implementation of safety measures.

4.1 Sustainable water use

115. The Submitters assert that the water wells used in their community for daily consumption began to dry up after the construction of the Tangram–1 and Nerita–1 wells (located 19 and 6 km from the town of Hacienda El Carrizo, respectively),[200] making it impossible for them to draw water for their ranching and agricultural activities. They had to dig deeper wells in order to obtain water. According to the Submitters, the water that they drew gave off a fetid odor.[201] The Submitters state that testing results of this water showed "a high concentration of salts and other substances," confirming that the water is unpotable.[202] Under these circumstances, they fear that drinking the water could cause harm to human health, domestic animals, and trees irrigated with it.[203] The Submitters state that millions of liters of water are required to extract gas through the hydraulic fracturing process, making it obvious that water demand for fracking will greatly exceed the capacity of the local aquifers.[204] The Submitters emphasize that "when in 2014 we noticed the water shortage we attributed this to a drought" and that following the hydraulic fracturing wells, they assigned the cause to this activity.[205] In support of their assertions, the Submitters attach, among other documents, an analysis of water quality in the wells near Tangram–1 and Nerita–1 that purports to substantiate the contamination of those wells.[206]

116. In its response, the Party specifies that it requested the support of Conagua in order to obtain information on the concessions granted to Pemex for the use and development of national waters to operate the wells in question.[207] In addition, the Party states that Conagua reported that concessions are only granted for the hydrocarbon extraction phase. Also, the Party adds that, based on information provided by Asea, as well as information published by the CNH, and Pemex's response to a formal notice of irregularities or violations detected during an inspection stemming from a citizen complaint,[208] it is evident that the Tangram–1 and Nerita–1 wells are not operating and they lack the surface infrastructure to support their operation.[209] Moreover, the available information substantiates that the construction and completion processes of these wells took place between 10 April 2013 and 8 August 2014.[210] The Party states that since the wells are not in the hydrocarbon extraction phase, in accordance with the current energy policy,[211] the concession in question was not required by Conagua for the use, enjoyment, and development of national waters.[212]

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200. See Table 1 of this factual record.
201. Revised Submission at 5, at: <https://bit.ly/4fy35lB>.
202. Id. at 5.
203. Id. at 5–6.
204. Id. at 8.
205. Id.
206. Water quality analysis of wells adjacent to Tangram-1 and Nerita-1, dated December 12, 2018, annexed to the revised submission, at: <http://cec.org/files/sem/20240613/aau001.pdf> [Water Quality Analysis].
207. Response at 18, at: <https://bit.ly/3Z8HgDf>.
208. *Cf.* Asea, file no. ASEA/UAJ/DGCT/2C.7/0733-2024 (27 February 2024), in response to request for information no. 331002524000073 filed with the PNT, and by which the direct consultation of the file of the popular complaint No. DP-ASEA/UAJ/DGCT/139-18 was enabled, Secretariat's manuscript transcription of the notice of irregularities or violations detected during inspection (*acuerdo de emplazamiento*), file no. DP-ASEA/UAJ/DGCT/139-18, at: <http://cec.org/files/sem/20240618/aav001.pdf>.
209. Response at 18–19, at: <https://bit.ly/3Z8HgDf>.
210. PEP, files no. GMPEIR-OPGEOL-1221-773-2013 (31 December 2013) and GMPEIR-OPGEOL-722-508-2014 (11 August 2014), Pemex Exploración y Producción, at: <http://cec.org/files/sem/20241101/aaw011.pdf>.
211. The Five-year Bidding Plan for the Exploration and Extraction of Hydrocarbons 2020-2024 of the Ministry of Energy (*Plan quinquenal de licitaciones para la exploración y extracción de hidrocarburos 2020-2024*) highlights that, in accordance with the current energy policy, the extraction of unconventional resources in shales through hydraulic fracturing will no be required. Sener (undated), *supra* at 35, at: <https://bit.ly/3YrTRQe>.
212. Response at 19, at: <https://bit.ly/3Z8HgDf>.

117. It should be noted that, in accordance with the Council instructions in its Resolution 23-05, no other environmental impacts arising from the work on the Tangram–1 and Nerita–1 wells are addressed in this factual record. Nor does this factual record include information concerning the rest of the works authorized within the context of the Burgos Basin Project, since they do not form part of the facts narrated in submission SEM-18-003.

4.1.1 Description of the Citrícola Norte and China-General Bravo aquifers

118. By virtue of their geographical location, the Nerita–1 and Tangram–1 wells are situated within the area occupied by the Citrícola Norte and China-General Bravo aquifers, respectively, both in the state of Nuevo León.

119. The Nerita–1 well sits on top of the Citrícola Norte aquifer (no. 1912), located in western-central Nuevo León. This aquifer covers a total area of 5,721 km^2 and encompasses the entirety of the municipality of Allende, nearly the entirety of Cadereyta Jiménez, General Terán, Montemorelos, and Rayones, and smaller portions of Galeana, Santiago, Juárez, and Los Ramones. Administratively, the aquifer belongs to the Río Bravo Water Administration Region VI (*Région Hidrológico-Administrativa* VI "Río Bravo").[213]

120. From a hydrologic perspective, the Citrícola Norte aquifer is located in hydrological region 24, "Bravo-Conchos;" "Río San Juan" subregion; "Río Bravo-San Juan" basin, and "Río Monterrey," "Río San Juan," "Río Ramos," and "Río Pilón" subbasins.[214]

121. The surface hydrology of the Citrícola Norte aquifer empties into the San Juan River, which in turn receives water from various subbasins, where they combine before flowing into the El Cuchillo Reservoir in the municipality of China, Nuevo León.[215] The Citrícola Norte aquifer is unconfined, with low permeability and reduced capacity, and consists of granular (superior) and fractured components (inferior). The upper layer is made up of alluvial sediments of varying sizes, below which are underlying fractured and altered shales.[216]

122. The Tangram–1 well sits atop the China-General Bravo aquifer in northeastern Nuevo León. This aquifer occupies an area of 2,822 km^2, partially comprising the municipalities of Los Ramones, accounting for 33.09% of its surface area, and China, accounting for 28.92%. Administratively, the aquifer belongs to the Río Bravo Water Administration Region VI.[217]

123. From a hydrologic perspective, the China-General Bravo aquifer is situated within Hydrological Region 24, Bravo-Conchos; "Río San Juan" hydrological subregion; "Río Bravo-San Juan" basin, and "El Castillo-Jesús Martínez," "Río Medio Pesquería," "Bajo San Juan," "El Cerrito-Rene Álvarez," "Bonanza-El Coyote," "Alto Pesquería," "Carricitos-La Concepción," and "Medio San Juan" subbasins.[218]

124. The largest portion of the Río Grande-San Juan basin lies within the state of Nuevo León, and one of its principal watercourses is the San Juan River. The main bodies of water in the area of the China-General Bravo aquifer are the El Cuchillo (Solidaridad) Reservoir and the Las Lajas Dam (a diversion or bypass dam). With the exception of the San Juan River, the watercourses in the region are largely intermittent; that is, they flow only in direct response to precipitation or according to the flow of an intermittent source, while they are usually found to be dry the rest of the year and have no base flow.[219]

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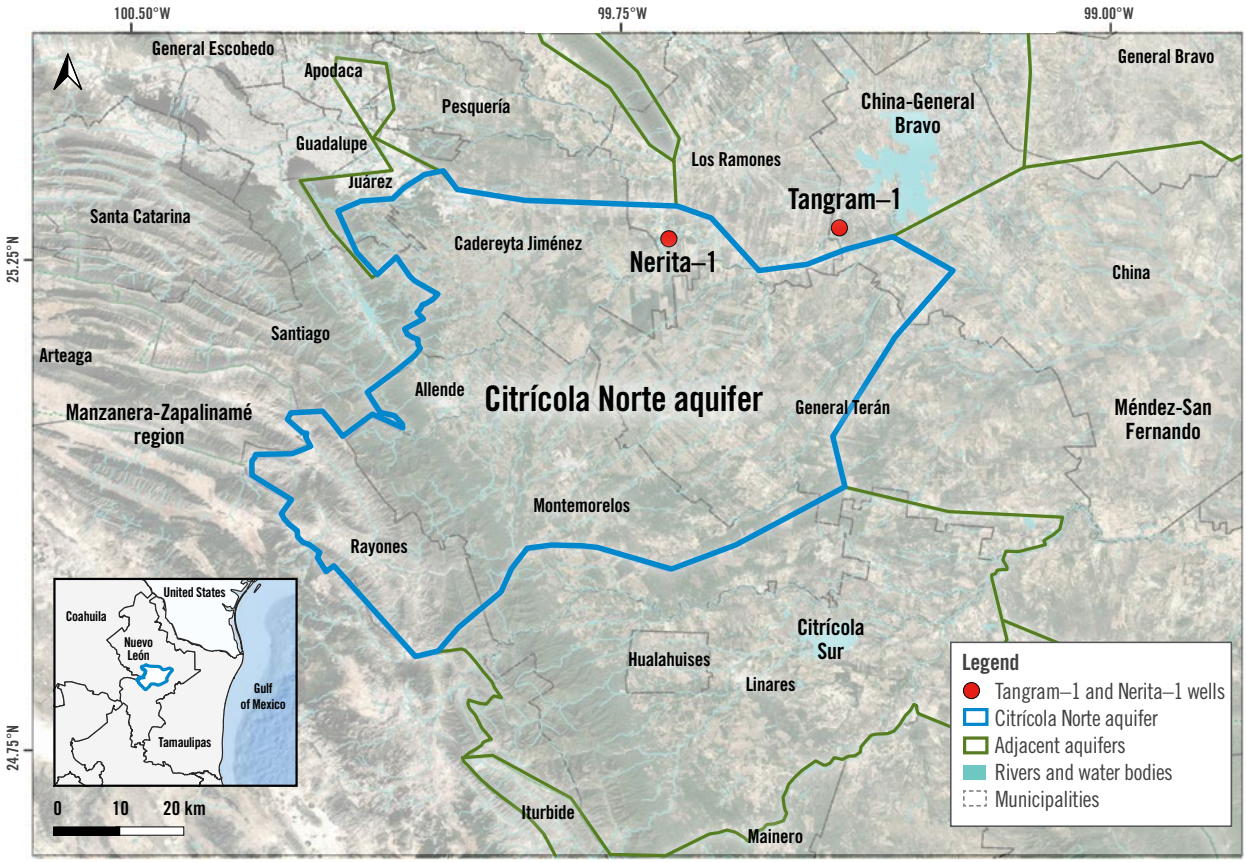
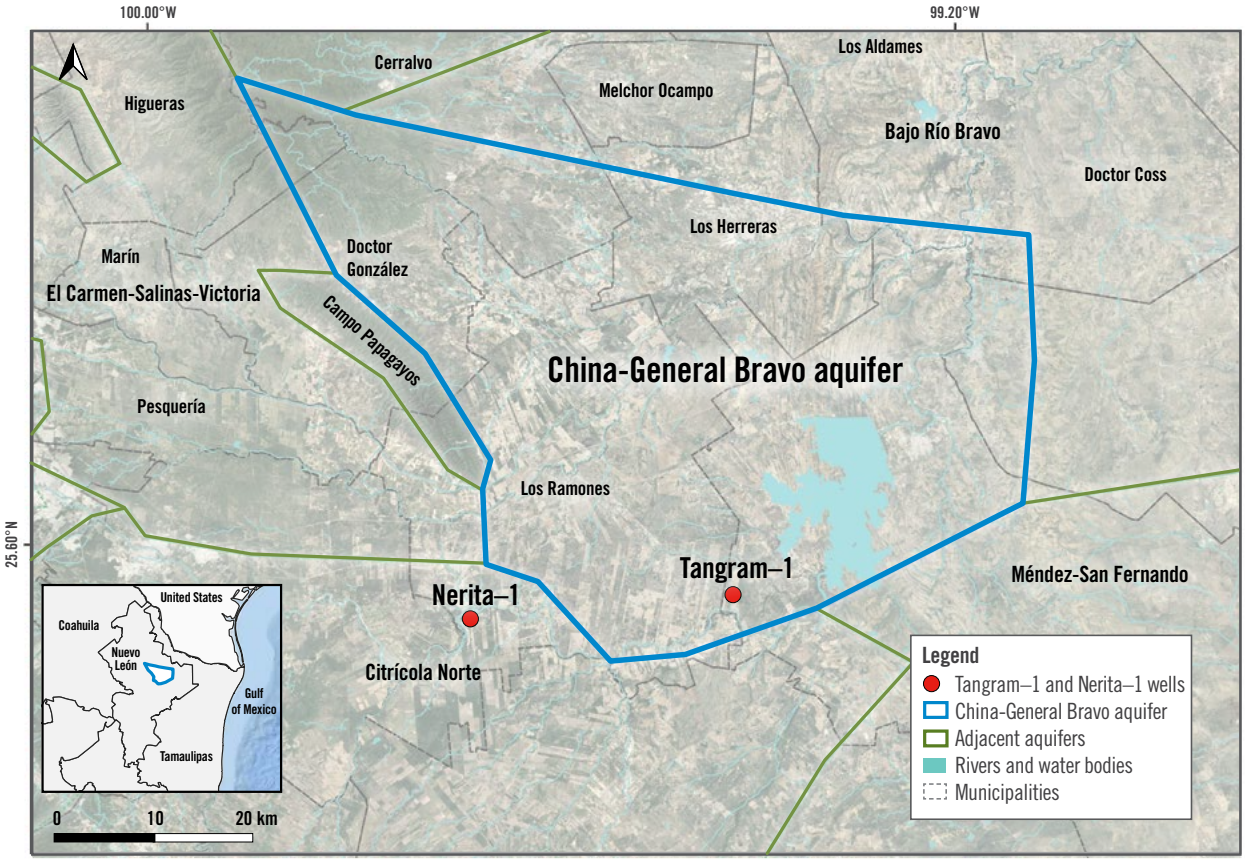
213. Conagua, General Technical Branch, Groundwater Division (2024), *Actualización de la disponibilidad media anual de agua en el acuífero Citrícola Norte (1912), estado de Nuevo León*, at 2–3, at: <https://bit.ly/45effeR>.
214. Id. at 9.
215. Id. at 10.
216. Id. at 26-27.
217. Semarnat (2015), "Acuerdo por el que se da a conocer el resultado de los estudios técnicos de aguas nacionales subterráneas del acuífero China-General Bravo, clave 1913, en el estado de Nuevo León, Región Hidrológico-Administrativa Río Bravo," published in the *DOF* on 30 June 2015, at: <https://bit.ly/3RhVxJI> [Technical Studies China-General Bravo Aquifer].
218. Conagua (2024), *Actualización de la disponibilidad media anual de agua en el Acuífero China-General Bravo (1913)*, *state of Nuevo León*, General Technical Branch, Groundwater Division, at 6, at: <https://bit.ly/4cdz3Bh>.
219. Technical Studies China-General Bravo Aquifer, at: <https://bit.ly/3RhVxJI>.

Figure 10. Location of Citrícola Norte aquifer



Source: Produced by the Secretariat with data from Conagua, General Technical Branch (*Subdirección General Técnica*), Groundwater Division (*Gerencia de Aguas Subterráneas*) (2024), *Actualización de la disponibilidad media anual de agua en el acuífero Citrícola Norte (1912), estado de Nuevo León*, at 3, at <https://bit.ly/45effeR>.

Figure 11. Location of China-General Bravo aquifer



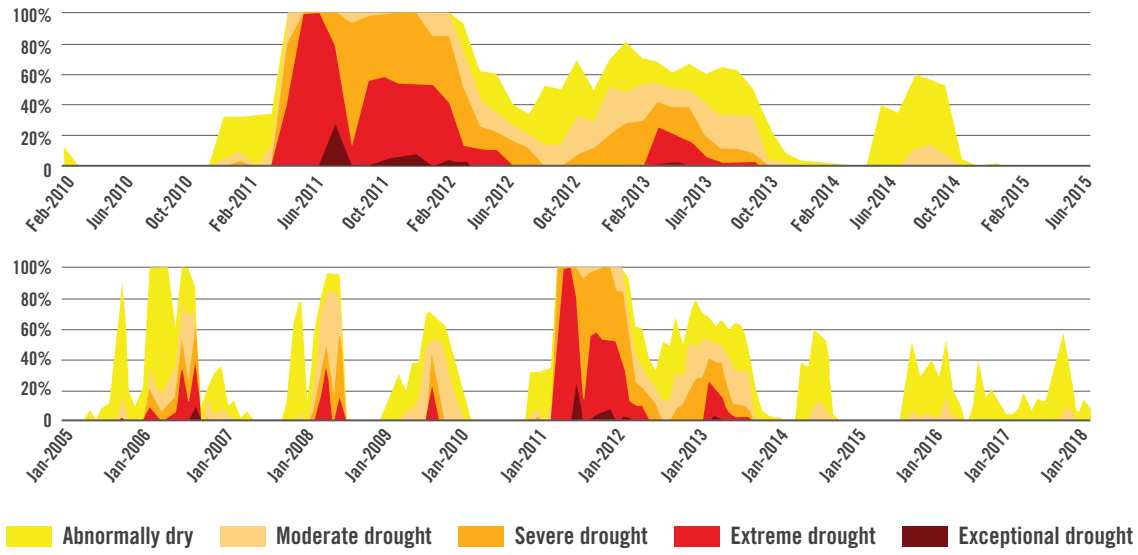
Source: Conagua (2024), *Actualización de la disponibilidad media anual de agua en el China-General Bravo aquifer (1913), estado de Nuevo León*, General Technical Branch, Groundwater Division, at 3, at <https://bit.ly/4cdz3Bh>.

4.1.2 Water availability in the area of interest

125. According to the information available to the Secretariat as part of the environmental audit, prior to the construction of the Tangram–1 and Nerita–1 wells, Pemex evaluated the environmental feasibility of the wells and considered a number of variables, among them the quality of the water available to carry out the planned works and activities. In this regard, the documentation on the environmental feasibility of the Burgos Basin Project states that "the aquifers in the area are currently assessed as underexploited, and there is brackish groundwater."[220]

126. Other sources consulted by the Secretariat reveal that due to its geographic location, Nuevo León is a state that is especially susceptible to droughts[221] and has historically been affected by droughts—this situation is even more pronounced in the northern and southern municipalities of the state.[222] According to the records, the last major drought event in Nuevo León occurred in 2011–2012. The information reviewed indicates that more than 40,000 ha of crops were lost, no planting occurred on 50,000 ha, and more than 9,000 head of cattle were slaughtered in 2011. Due to water scarcity, water had to be trucked to approximately 60,000 people.[223] Figure 12 shows the drought events in Nuevo León during the periods 2010–2015 and 2005–2018.

Figure 12. Drought in Nuevo León (% of area), 2010–15 and 2005–18



Source: National Drought Mitigation Center, University of Nebraska-Lincoln (2024), "North American Drought Monitor," at <https://bit.ly/4c3LnVp>.

220. EIA Authorization at 33–4, at: <http://cec.org/files/sem/20240605/aat001.pdf>.

221. National Weather Service (*Servicio Meteorológico Nacional*—SMN) defines drought categories as follows:
Abnormally dry (D0): This is a condition of short-term dryness, not a drought category. Occurs at the beginning or the end of a period of drought. At the beginning of a period of drought: short-term dryness may cause delays in the planting of annual crops, limited growth of crops or forages, and fire risk. At the end of a period of drought: water deficit may persist, forage and other crops may not completely recover. **Moderate drought (D1)**: Some damage to crops and forages; a high risk of fire, low water levels in rivers, streams, reservoirs, watering holes, and wells; voluntary restriction on water use is suggested. **Severe drought (D2)**: Probable loss of crops or forages, high fire risk, water scarcity common, restrictions on water use must be imposed. **Extreme drought (D3)**: Major crop and forage loss, forest extreme fire risk, widespread water use restrictions due to water scarcity. **Exceptional drought (D4)**: Exceptional and widespread crop and forage losses, exceptional fire risk, absence of water in reservoirs, streams, and wells; probable emergency situation due to the absence of water.
Cf. Conagua and SMN (2024), "Categorías de sequía," at: <https://bit.ly/3z3TaDM>.

222. For example, 20 drought events occurred in the state during the years 1900 to 1996; see D. Ortega-Gaucin (2012), *Sequía en Nuevo León: vulnerabilidad, impactos y estrategias de mitigación* (Nuevo León: Instituto del Agua del Estado de Nuevo León), at 57-60, 209, at: < https://bit.ly/3VOWdZu>.

223. Id. at 210.

127. In accordance with the drought records, during the drilling of the Tangram–1 well (started in April 2013) in the municipality of China, a "severe drought" event was underway, while for the Nerita–1 well (August 2013), the municipality of Los Ramones was experiencing a "moderate drought." Between 2011 and 2014, both municipalities were experiencing drought most of the time, with drought events ongoing during 33 and 32 months, respectively. In the case of Los Ramones, "extreme drought" was the applicable category during 8 of the 32 months. Table 5 shows the number of months during which each municipality was recorded in various drought categories during the years 2011 to 2014.[224]

Table 5. Drought categories in the municipalities of China and Los Ramones (2011–2014)

	Municipality	
Category	**China** (number of months)	**Los Ramones** (number of months)
No drought	15	16
Abnormally dry	10	12
Moderate drought	9	9
Severe drought	11	3
Extreme drought	3	8

Note: The different drought categories were assigned when at least 40% of the municipality's area was affected by that level of drought.
Source: National Weather Service (*Servicio Meteorológico Nacional*—SMN) (2024), "Monitor de Sequía en México (MSM)," at <https://bit.ly/4fWF4nT>.

128. A study published in 2022 addressed water availability in those areas of the Sabinas-Burgos and Tampico-Misantla hydrocarbon basins that offered unconventional hydrocarbon potential. This study suggests that those areas located in Río Bravo Water Administration Region VI (corresponding to the Tangram–1 and Nerita–1 wells) exhibit high levels of water stress.[225] In this regard, studies and updates on mean annual surface water availability in the watershed of the Río San Juan 1 basin—the largest body of surface water in the region of the wells in question—indicate that there was a water deficit in the period 2008–2020, as shown in the following table:[226]

Table 6. Mean annual surface water availability in the Río San Juan 1 basin

Date of publication in the *DOF*	**Deficit** (million m^3)
22/09/2008	-69.500
29/08/2013	-91.797
08/03/2016	-82.136
07/07/2016	-81.997
21/09/2020	-82.181

Source: Conagua, file no. B00.6.01.-149 (28 November 2023), in response to the request for information under Articles 15(4) and 21(1)(a) of the NAAEC of 17 November 2023 concerning submission SEM-18-003, at <cec.org/files/sem/20240613/aau018.pdf>.

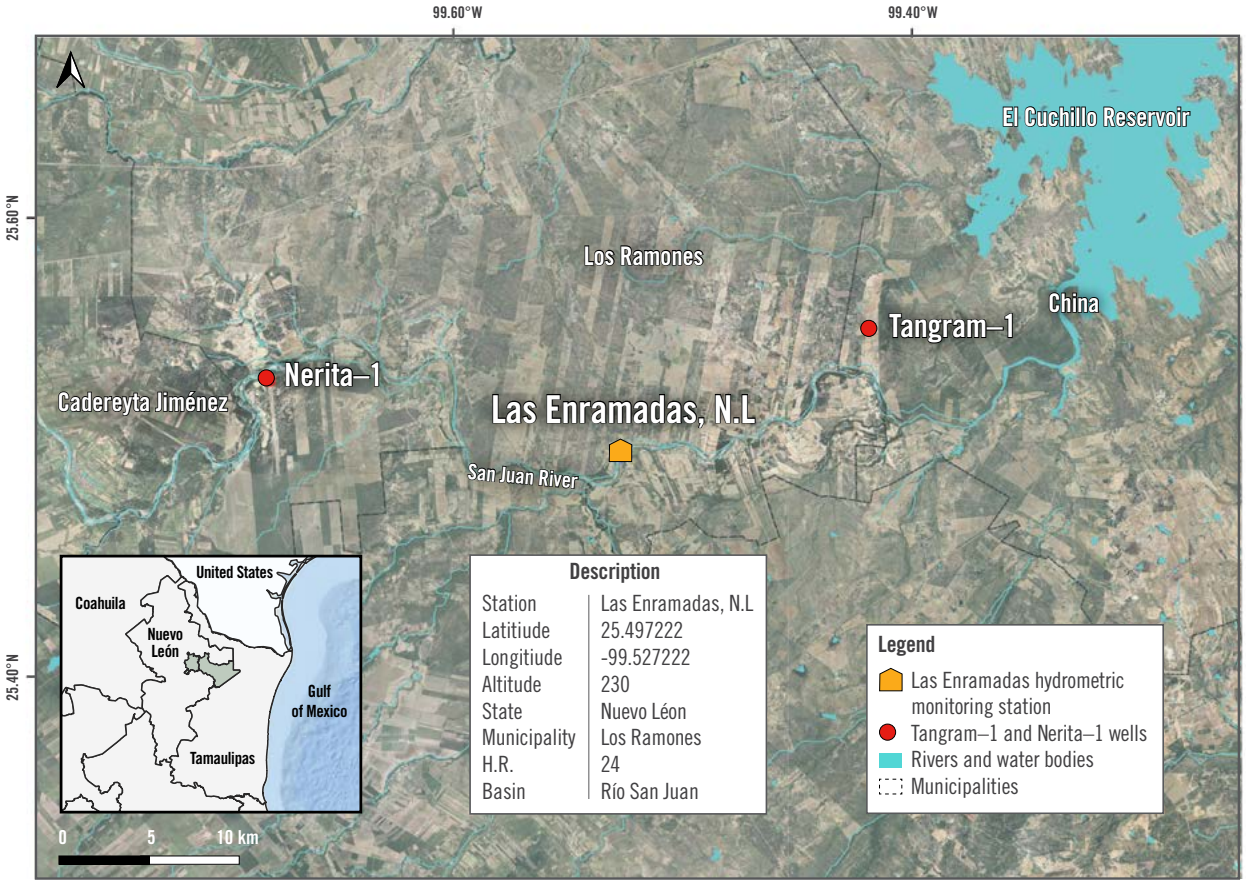
224. *Cf.* SMN (2024), "Categorías de sequía," at: <https://bit.ly/3z3TaDM>.
225. M. Tejado Gallegos (2022), *La Regulación de la Fracturación Hidráulica en México: Sus Impactos Sociales y Ambientales* (Mexico City: Universidad Nacional Autónoma de México, Instituto de Investigaciones Jurídicas), at 100, at: <https://bit.ly/3RhPwN7>.
226. Conagua, file no. B00.6.01.-149 (28 November 2023), in response to response to the request for information under NAAEC Articles 15(4) and 21(1)(a) of the ACAAN, at 3 (attached memo), Comisión Nacional del Agua, at: <http://cec.org/files/sem/20240613/aau018.pdf> [Conagua Official File 2023].

129. According to testimony by the Submitters and by local residents that was collected during the Secretariat's site visit on 22 February 2024,[227] the water used for the drilling of the Nerita-1 well was drawn from the San Juan River—a major surface waterway in the area—that already had compromised water availability for other uses prior to the drilling of the Tangram-1 and Nerita-1 wells (completed in December 2013 and august 2014, respectively).

130. To analyze historical flow rates in the San Juan River, data from the "Las Enramadas" hydrometric monitoring station, the one closest to the study area and located midway between the Nerita–1 and Tangram–1 wells, was taken into account.

131. The following presents the daily flow rate in the San Juan River as per data from the Las Enramadas station (2012–2023).[228] The peaks corresponding to the rainy season (September) have been eliminated in order to reveal the relevant historical pattern. In this regard, it noted that flow remained uniform without any clearly observable, drastic, or sustained change subsequent to completion of drilling of the Nerita–1 well (8 August 2014).[229]

Figure 13. Location of Las Enramadas hydrometric monitoring station



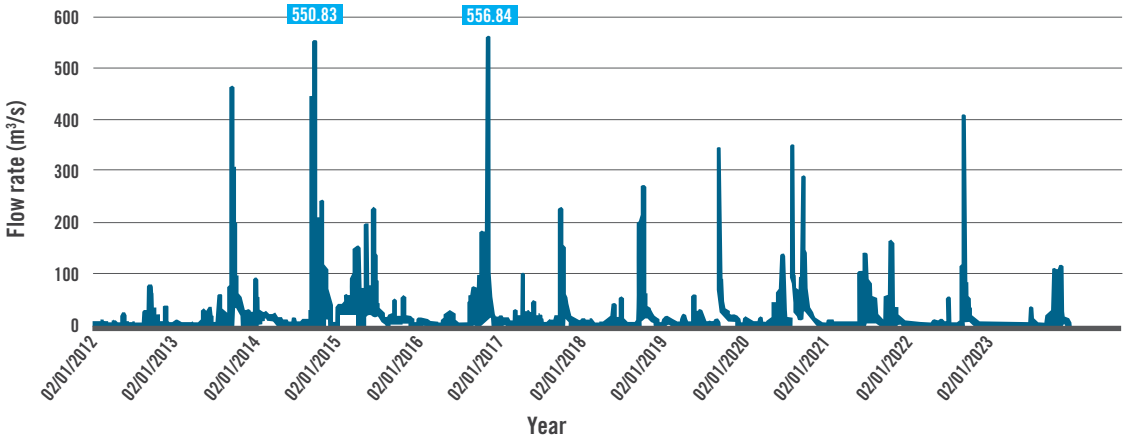
Source: Produced by the Secretariat from information provided by Conagua, file no. B00.6.01.-149 (28 November 2023), in response to memo of 17 November 2023 concerning submission SEM-18-003, at <http://cec.org/files/sem/20240613/aau018.pdf> and <http://cec.org/files/sem/20240613/aau011.jpg>.

227. Statements made by inhabitants of the Los Ramones community to Secretariat officials and experts during the special mission (February 22, 2024).

228. Conagua Official Communication 2024, appendix, "Las Enramadas," at: <http://cec.org/files/sem/20240501/aaq018.pdf> and <http://cec.org/files/sem/20240618/aav002.xlsm>.

229. This observation is consistent with statements made by inhabitants of the Los Ramones community to representatives of the Secretariat during the special mission (February 22, 2024) that surface water from the San Juan River was used for the drilling activities of the Nerita-1 well.

Figure 14. Flow rate in the San Juan River at the Las Enramadas monitoring station (2012–2023, without annual peaks associated to rain season)



Source: Produced by the Secretariat from information provided by Conagua, file no. B00.7.05.-0122 (19 March 2024), in response to document dated 6 February 2024 concerning the preparation of factual record SEM-18-003, "Las Enramadas.xlsm" appendix, at <http://cec.org/files/sem/20240501/aaq018.pdf> and <http://cec.org/files/sem/20240618/aav002.xlsm>.

Table 7. Flow (m^3/s) at the Las Enramadas station (2005, 2012–2023)

Year	2005		2012		2013		2014		2015		2016		2017	
Flow rate (m^3/seg)	> 10m^3	> 100m^3	> 10m^3	> 100m^3	> 10m^3	> 100m^3	> 10m^3	> 100m^3	> 10m^3	> 100m^3	> 10m^3	> 100m^3	> 10m^3	> 100m^3
No. of days	109	13	12	0	54	15	149	23	231	4	83	6	68	5

Year	2018		2019		2020		2021		2022		Apr-23	
Flow rate (m^3/seg)	> 10m^3	> 100m^3	> 10m^3	> 100m^3	> 10m^3	> 100m^3	> 10m^3	> 100m^3	> 10m^3	> 100m^3	> 10m^3	> 100m^3
No. of days	71	8	92	4	120	14	100	3	46	6	0	0

Source: Produced by the Secretariat from information provided by Conagua, file no. B00.6.01.-149 (28 November 2023) in response to the request for information under NAAEC Articles 15(4) and 21(1)(a), Appendix 4, at: <http://cec.org/files/sem/20240613/aau018.pdf> and <http://cec.org/files/sem/20240613/aau014.xlsx>.

132. The flow data for the San Juan River at the Las Enramadas monitoring station (2005, 2012–2023) show that the number of days with flow rates between 10 and 100 m^3 in contrast with the number with flow rates above 100 m^3. The annual number of days in which the San Juan River is at its highest levels at the Las Enramadas monitoring station (>100 m^3) is rather small (maximum of 23 days). This corroborates the above-mentioned surface water deficit.

133. On the other hand, with regard to the changes in mean annual groundwater availability in the Citrícola Norte and China General Bravo aquifers (2013, 2015, 2018, 2020), the following observations may be made:

- **Citrícola Norte.** The total annual volume drawn from the Citrícola Norte aquifer is 315.5 cubic hectometers (hm^3)/year, of which 267.5 hm^3 (84.8%) was devoted to agriculture, 19.0 hm^3 (6.0%) to urban/public use, 3.3 hm^3 (1.0%) to domestic and livestock needs, 2.4 hm^3 (0.8%) to industry, 2.2 hm^3 (0.7%) to services, and 21.1 hm^3 (6.7%) to other uses.[230]

230. Conagua, General Technical Branch, Groundwater Division (2024), *Actualización de la disponibilidad media anual de agua en el acuífero Citrícola Norte (1912), estado de Nuevo León*, at 33, at: <https://bit.ly/45effeR>.

According to the 2000–2014 groundwater budget,[231] mean total annual recharge of the Citrícola Norte aquifer amounts to 336.7 hm^3, corresponding to the sum of all the volumes of natural recharge entering the aquifer.[232] The volume of groundwater extracted was 386.3 hm^3/year (as of 30 December 2022).[233] The information reviewed indicates that by 2022, its deficit was 57.5 hm^3 per year and that there is no remaining volume available for the granting of new concessions.[234] As of 2013,this aquifer already presented a deficit in groundwater availability (the Nerita well was completed in 2014), a deficit that remained very similar in 2015, registering -3.8 hm^3 in 2018 and increasing to -64 hm^3 in 2020.

- **China-General Bravo.** The China-General Bravo aquifer exhibits natural water scarcity, with mean annual precipitation of 552.1 mm. As of 2013, there was a provisional moratorium on new wells.[235] In addition, there is high mean annual potential evaporation (1,811.98 mm) and a progressive decline in rainfall.[236] The main use of the groundwater from this aquifer is in agriculture (78.34%); this is followed by multiple uses (20.25%), while livestock and services correspond to 1.28% and 0.14%, respectively, of the total volume used.[237]

Concerning the groundwater budget, mean total annual recharge of the China-General Bravo aquifer amounts to 23.9 hm^3 and the groundwater volume extracted is 8.2 hm^3/year (equal to the concessioned volume as of 31 March 2013) which considering its committed natural flow (*descarga natural comprometida*) yields an annual availability of 15.7 hm^3/year.[238]

Mean annual groundwater availability from the aquifer has remained virtually unchanged since 2013, the year of completion of the Tangram–I well; however, a decline has been observed since 2018.[239]

134. According to the data in the table below, the Citrícola Norte aquifer already exhibited a deficit in water availability as of the start of the drilling of the Nerita–1 well (2013), even if the trend of this deficit after the well was completed (2014) is not clearly observable. As for the China-General Bravo aquifer, water availability in it has continued to decline since the completion of the Tangram–1 well (2013). Nevertheless, the Secretariat has no information concerning the water supply sources for the construction of the wells. Nor is it possible to determine the degree of impact of the construction on water availability due to insufficient data. As attested by the residents of the community of Los Ramones, water from the San Juan River was used during the drilling of the Nerita–1 well (see section 4.1.4 *infra*).[240] Although these observations of local residents could be subjective, the information is relevant in order to determine the source of water used for the construction of the well in question. On the other hand, the data reviewed indicate that between 2011 and 2014, the municipalities where the two wells were built experienced drought events for a cumulative total of up to 33 months. In fact, since the drilling of the Nerita-1 well in 2013 and even years after its completion in August 2014, the area has registered a historical deficit in water availability.

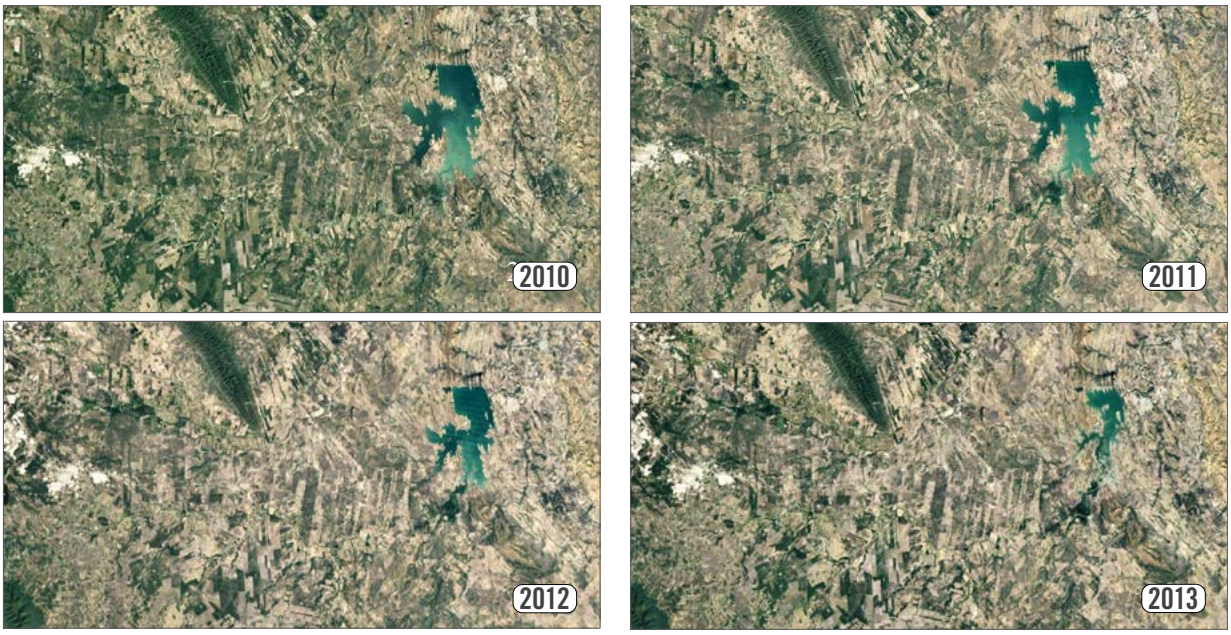
231. Id. at 37.
232. Id. at 38.
233. Id. at 39.
234. Id.
235. Technical Studies China-General Bravo Aquifer, at: <https://bit.ly/3RhVxJI>. In 2013, a provisional moratorium was declared on well drilling for extraction of national waters in the China-General Bravo aquifer, which banned well drilling and the construction of infrastructure or the installation of any other mechanism for groundwater extraction. In addition, it was prohibited to increase authorized or registered volumes.
236. Id.
237. Id.
238. Id.
239. Agua para tod@s (n.d.), "Disponibilidad de agua en los acuíferos de México," Agua para tod@s Agua para la vida, Social Data Ibero, at: <https://bit.ly/3wYg2nN>.
240. Statements of residents of the community of Los Ramones to Secretariat representatives during the special mission (22 February 2024).

Table 8. Change in water availability in the aquifers of the area in question (2013–2020)

Aquifer	2013 (hm^3)	2015 (hm^3)	2018 (hm^3)	2020 (hm^3)	Percentage change	2013–2020
1912- Citrícola Norte	-118.876540	-119.509910	-3.808122	-65.390600	45.0	
1913- China-General Bravo	15.682138	15.682138	11.618104	4.936382	-68.5	

Source: Agua para tod@s (n.d.), "Disponibilidad de agua en los acuíferos de México," Agua para tod@s Agua para la vida, Social Data Ibero, at <https://bit.ly/3wYg2nN>.

Figure 15. Satellite image of the San Juan River and the El Cuchillo Reservoir (2010–2013)



Source: Produced by the Secretariat from Google Earth, at <https://bit.ly/3VxA4O1>.

4.1.3 Water quality in the area of interest

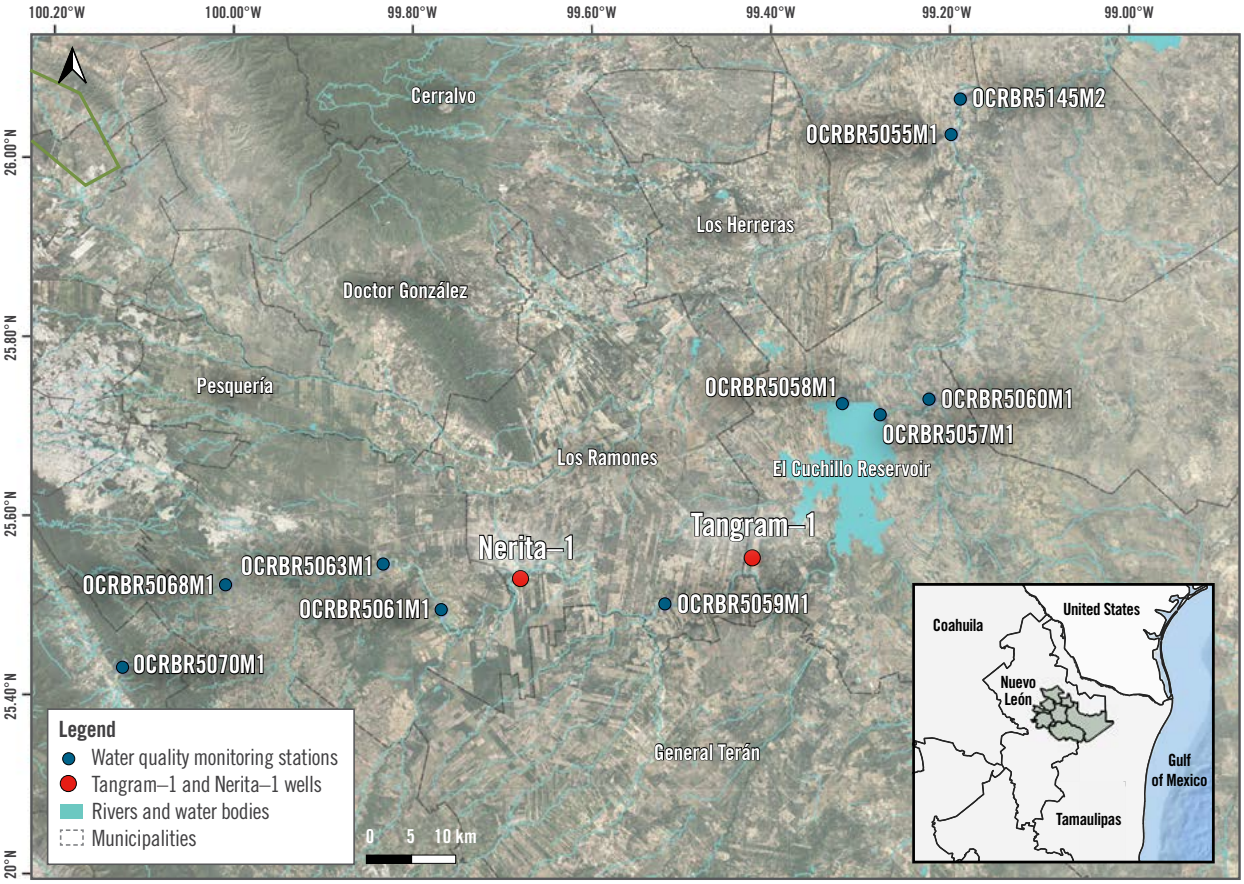
135. Conagua is in charge of implementing the National Water Quality Measurement Network (*Red Nacional de Medición de la Calidad del Agua*—Renameca) with various monitoring stations along the San Juan River in Nuevo León, which monitor multiple parameters: biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), fecal coliforms (FC), fecal enterococci (Fec_Entrecoc), *Escherichia coli* (E_coli), toxicity (Tox), and dissolved oxygen saturation percentage (% DO). Based on the values recorded, a water quality index is established to classify the degree of contamination.

136. The water quality index is determined on the basis of individual scores for each of the indicators. If one or more of the following parameters BOD, COD, Tox and/or Fec_Entrecoc is not in compliance, the index is red; if these parameters are within acceptable levels but one or more of the parameters TSS, % DO, FC and E coli is outside of acceptable levels, the index is amber, and if all the indicators are within acceptable levels, the index is green. The table below shows the classification ranges to determine the compliance or non-compliance of each parameter, and the corresponding color for the water quality index.[241]

137. Between 2012 and 2022, Conagua monitored water quality in the San Juan River with 11 stations along the watercourse, two of these located in the vicinity of the Tangram–1 and Nerita–1 wells; namely, stations OCRBR5059M1 and OCRBR5061M1, respectively (see Figure 16).

241. Conagua Official Communication 2024, annex "Calidad del Agua Superficial y Subterránea," at 3–5, at: <http://cec.org/files/sem/20240501/aaq018.pdf> and <http://cec.org/files/sem/20240613/aau008.docx>.

Figure 16. Water quality monitoring stations on the San Juan River



Source: Information provided by Conagua, file no. B00.7.05.-0122 (19 March 2024), in response to document dated 6 February 2024 concerning the preparation of factual record SEM-18-003, annex "Calidad del Agua Superficial y Subterránea," at 5, at <http://cec.org/files/sem/20240613/aau008.docx>

Table 9. Surface water quality parameters and water quality index

Indicator	Units	Compliance			Noncompliance		Color in case of noncompliance
		Excellent	Good quality	Acceptable	Contaminated	Highly contaminated	
BOD 5 days	mg/L	BOD<=3	3<BOD<=6	6<BOD<=30	30<BOD<=120	BOD>120	**Red**
COD	mg/L	COD<=10	10<COD<=20	20<COD<=40	40<COD<=200	COD>200	**Red**
TSS	mg/L	TSS<=25	25<TSS<=75	75<TSS<=150	150<TSS<=400	TSS>400	**Amber**
FC	MPN/100 ml	FC<=100	100<FC<=200	200<FC<=1,000	1,000<FC<=10,000	FC>10,000	**Amber**
E_coli	MPN/100 ml	EC<=126	126<EC<=576	576<EC<=850	850<EC<=1,000	EC>1,000	**Amber**
DO	%	70<DO<=110	50<DO<=70 & 110<DO<=120	30<DO<=50 & 120<DO<=130	10<DO<=30 & 130<DO<=150	DO<=10 & DO>150	**Amber**

Indicator	Units	Compliance			Noncompliance	Color in case of noncompliance
		Non-toxic	Low toxicity	Moderate toxicity	High toxicity	
Tox (*Daphnia Magna*) 48 h	TU	HT<1	1<=HT<=1.33	1.33<HT<5	HT>=5	**Red**
Tox (*Aliivibrio Fischeri*) 15 min	TU	HT<1	1<=HT<=1.33	1.33<HT<5	HT>=5	**Red**
All indicators	In the case of compliance with all indicators, the indicator is Green					

Note: TU = toxicity units; HT = high toxicity. *The DO % values express two values: one for low oxygen levels and one for high levels.
Source: Table produced from Conagua, file no. B00.7.05.-0122 (19 March 2024), in response to document dated 6 February 2024 concerning the preparation of factual record SEM-18-003, annex "Calidad del Agua Superficial y Subterránea," at 1, at <http://cec.org/files/sem/20240613/aau008.docx>.

138. The water quality index results at stations OCRBR5059M1 and OCRBR5061M1 (2012–2022) are presented in the following table:

Table 10. Water quality at two monitoring stations on the San Juan River (2012–2022)

Station	Year	Parameter							
		BOD (mg/l)	**COD** (mg/l)	**TSS** (mg/l)	**FC** (MPN/100 ml)	**E_Coli** (MPN/100 ml)	**DO** (%)	**Tox** (TU)	**Grade**
OCRBR5059M1	**2012**	Excellent	Excellent	Excellent	Excellent	Excellent	Acceptable	Non-toxic	**Green**
OCRBR5061M1	**2012**	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Non-toxic	**Green**
OCRBR5059M1	**2013**	Excellent	Excellent	Excellent	Excellent	Excellent	Acceptable	Non-toxic	**Green**
OCRBR5061M1	**2013**	Excellent	Excellent	Excellent	Good quality	Excellent	Acceptable	Non-toxic	**Green**
OCRBR5059M1	**2014**	Excellent	Excellent	Excellent	Good quality	Excellent	Good quality	Non-toxic	**Green**
OCRBR5061M1	**2014**	Excellent	Good quality	Good quality	Excellent	Excellent	Excellent	Non-toxic	**Green**
OCRBR5059M1	**2015**	Excellent	Excellent	Good quality	Acceptable	Good quality	Excellent	Non-toxic	**Green**
OCRBR5061M1	**2015**	Good quality	Good quality	Good quality	**Highly contaminated**	**Highly contaminated**	Excellent	Non-toxic	**Amber**
OCRBR5061M1	**2016**	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Non-toxic	**Green**
OCRBR5059M1	**2017**	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Non-toxic	**Green**
OCRBR5061M1	**2017**	Excellent	Excellent	Excellent	Acceptable	Good quality	Excellent	Non-toxic	**Green**
OCRBR5059M1	**2018**	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Non-toxic	**Green**
OCRBR5061M1	**2018**	Excellent	Excellent	Excellent	Acceptable	Excellent	Excellent	Non-toxic	**Green**
OCRBR5059M1	**2019**	Excellent	Excellent	Excellent	Excellent	Excellent	**Highly contaminated**	Non-toxic	**Amber**
OCRBR5061M1	**2019**	Excellent	Good quality	Excellent	**Highly contaminated**	**Highly contaminated**	Contaminated	Non-toxic	**Amber**
OCRBR5059M1	**2020**	Excellent	Acceptable	Excellent	Contaminated	Excellent	Excellent	Non-toxic	**Amber**
OCRBR5061M1	**2020**	Excellent	Excellent	Excellent	Excellent	Excellent	**Highly contaminated**	Non-toxic	**Amber**
OCRBR5059M1	**2022**	Excellent	Excellent	Excellent	Contaminated	**Highly contaminated**	Excellent	Non-toxic	**Amber**

Source: Information provided by Conagua, file no. B00.7.05.-0122 (19 March 2024), in response to document dated 6 February 2024 concerning the preparation of factual record SEM-18-003, annex "Calidad del Agua Superficial y Subterránea," at 6 and 8, at <http://cec.org/files/sem/20240613/aau008.docx>.

139. A review of the data in the above table shows that for the period 2012–2022, the water quality in the San Juan River at the monitoring stations near the Tangram–1 and Nerita–1 wells was generally acceptable, and the contamination observed during this period was principally linked to the presence of pathogenic microorganisms and organic matter, not toxic substances.

140. Based on the available groundwater information, the water quality data for the Citrícola Norte and China General Bravo aquifers is as follows.

141. **Citrícola Norte.** The results for the parameters analyzed and the corresponding water quality index at the OCRBR5365 station (located in municipality of Cadereyta within the Citrícola Norte aquifer and bordering the China-General Bravo aquifer) are given in Table 11. None of the parameters exceeds the permissible limits, and groundwater quality is therefore rated green.[242] It should be noted that Conagua was unable, for budgetary reasons, to obtain data for the years 2019, 2021, and 2022.[243]

Table 11. Groundwater quality in the Citrícola Norte aquifer (2016–2018)

		Parameter																
Station	Year	Total alkalinity (mg/l)	Conductivity (µS/cm)	TDS agricultural irrigation (mg/l)	TDS salinization (mg/l)	Fluorides (mg/l)	Total hardness (mg/l)	Fecal coliforms (MPN/100 ml)	Nitrates (mg/l)	Arsenic (mg/l)	Cadmium (mg/l)	Chromium (mg/l)	Mercury (mg/l)	Lead (mg/l)	Manganese (mg/l)	Iron (mg/l)	Index
OCRBR5365	2016	High	Permissible for irrigation	Sensitive crops	Potable – soft	Low	Potable – hard	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Green
OCRBR5365	2017	High	Permissible for irrigation	Sensitive crops	Potable – soft	Low	Potable – hard	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Green
OCRBR5365	2018	High	Permissible for irrigation	Sensitive crops	Potable – soft	Moderate	Potable – hard	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Potable – excellent	Green

Note: TDS = total dissolved solids.
Source: Table derived from Conagua, file no. B00.7.05.-0122 (19 March 2024), in response to document dated 6 February 2024 concerning the preparation of factual record SEM-18-003, annex "Calidad del Agua Superficial y Subterránea," at 16–17, at <http://cec.org/files/sem/20240613/aau008.docx>.

142. **China-General Bravo.** In relation to water quality in the China-General Bravo aquifer, concentrations of various ions exceeded the maximum permissible limits established for human consumption in the applicable laws.[244] Sulfate concentrations varied from 10 to 2,713 mg/l, whereas the maximum permissible limit established by regulations is 400 mg/l; calcium varied from 235 to 3,616 mg/l; sodium was found in concentrations of 5.2 to 1,480 mg/l, while the maximum permissible limit is 200 mg/l (with concentrations above that limit the water may have "an unacceptable taste"). Chlorides varied from 6.5 to 2,237 mg/l, while the recommended limit is 250 mg/l; and nitrates, from 0.10 to 46.3 mg/l, while the maximum permissible limit is 10 mg/l (the high nitrate content indicates an anthropogenic impact on the environment).[245]

143. It should be noted that the Secretariat did not have access to sufficient information to present groundwater quality data on the China-General Bravo aquifer similar to the Citrícola Norte aquifer above (see Table 11 above), since Conagua does not have underground monitoring sites in the municipalities of China and Los Ramones, which are closest to the Tangram–1 well.[246]

242. Id. at 16–17, at: <http://cec.org/files/sem/20240613/aau008.docx>.

243. Id. at 12.

244. *See*: Amendment to Mexican Official Standard NOM-127-SSA1-1994, *Salud ambiental. Agua para uso y consumo humano. Límites permisibles de calidad y tratamientos a que debe someterse el agua para su potabilización*, published in the *DOF* on 22 November 2000, at: <https://bit.ly/3Xb4eco>.

245. Technical Studies China-General Bravo Aquifer, at: <https://bit.ly/3RhVxJI>.

246. Conagua Official File 2023, at 5, at: <http://cec.org/files/sem/20240613/aau018.pdf>.

144. An analysis of the available groundwater quality data for the Citrícola Norte and China-General Bravo aquifers indicates that water quality is primarily linked to high values for salinity and total dissolved solids (TDS). However, the available data is very limited because there is little groundwater quality data for the China-General Bravo aquifer, while for the Citrícola Norte aquifer, there is no available information from the years when the well in question was drilled (Nerita-1, 2013-2014). In addition, there is no information on indicators for heavy metals and other toxic substances for both aquifers. Furthermore, the compounds used in drilling the Tangram–1 and Nerita–1 wells are unknown, making it impossible to present a full picture of the water quality in the two aquifers.

4.1.4 Water use in the area of interest

145. The Secretariat gained access to data on water use for hydraulic fracturing in the Tangram–1 and Nerita–1 wells. After reviewing documents provided by Conagua, Asea and Pemex, there is incomplete information on all the water supply sources used for the construction of the wells. During the Secretariat's meetings with residents of the Los Ramones community, they stated that surface water from the San Juan River (located at a distance of about 400 meters) was used for hydraulic fracturing activities at the Nerita-1 well. Documents indicate that, for the Nerita-1 well, underground water intended for domestic and agricultural purposes was used. In this regard, both Conagua and Asea stated that they have no information concerning the water supply used for the Tangram–1 well.

146. In particular, Asea states that national waters are not under its jurisdiction,[247] while Conagua states that it has no record of "industrial" water use concessions which would correspond to hydraulic fracturing activities.[248]

147. Concerning disposal of wastewater generated during the process of well construction for Tangram–1 and Nerita–1, the Party's response states that documentation related to the environmental feasibility of the Burgos Basin Project "established the requirement of having collection and transportation equipment for the resulting wastewater,"[249] and established the safety measures necessary to avoid pollution.

148. Regarding connate water, Semarnat established, as part of the terms and conditions for the environmental feasibility of the project, that the applicant must:

> 34. Establish strict control over the management of connate water, it being prohibited to dump such water into natural watercourses or bodies of water, reservoirs, riverbeds, or national property where wastewater is discharged, as well as onto land where it could infiltrate into and contaminate the soil or aquifers.[250]

149. Concerning drilling muds, the same authorization included conditions for the environmental feasibility of the Burgos Basin Project, stating that:

> 43. Diesel-based drilling muds shall be disposed of in metal containers placed on a liner (geomembrane) designed to contain spills in a designated area of the worksite. Management and final disposal of such muds shall take place in accordance with the [LGEEPA], as well as with the General Integrated Waste Management and Prevention Act.[251]

247. Asea, Response from Asea to CEC information request, at 2, at: <http://cec.org/files/sem/20240501/aaq009.pdf>. Information from Asea does not specify water supply data for the Tangram–1 well; *Cf.* Asea File in Response to PNT Request, at 2, at: <http://cec.org/files/sem/20240423/aap006.pdf >.

248. Conagua, memo no. B00.2.-429 (1 December 2023), in response to request for information pursuant to NAAEC Articles 15(4) and 21(1)(a), at 2, at: <http://cec.org/files/sem/20240501/aaq007.pdf>.

249. Response at 20, at: <https://bit.ly/3Z8HgDf>.

250. EIA Authorization, at 59, at: <http://cec.org/files/sem/20240605/aat001.pdf>.

251. Id.

150. In addition, Asea stated that the environmental assessment for the Burgos Basin Project did not "provide for discharge of wastewater into geological formations through disposal wells."[252] In other words, the environmental feasibility assessment of the Burgos Basin Project and the conditions established for its implementation as well as the Party's response and the information provided by Asea all confirmed that the infiltration of water from the hydraulic fracturing process (whether flowback fluid or produced water) into the subsoil was not anticipated.

151. Asea states that national waters are not under its jurisdiction,[253] and that "the National Waters Act mandates that the Federal Executive Branch, acting through the National Water Commission, has authority over national waters and their inherent public property."[254] In response to a request for information on enforcement actions carried out by the water authority with respect to the wells in question, Conagua stated:

> Wastewater from hydraulic fracturing processes does not fall under the definition set out in the National Waters Act, since the water used in hydraulic fracturing is mixed with various chemical additives, such that what is generated is not strictly speaking wastewater, but rather hazardous waste, whose final disposal would therefore be subject to hazardous waste regulations and not wastewater regulations.[255]

152. In summary, in accordance with the documentation reviewed by the Secretariat,[256] the infiltration of water from the hydraulic fracturing process into the subsoil was not anticipated.[257] However, in response to Secretariat requests for information[258] on enforcement actions with respect to the wells in question, Conagua and Asea stated, for different reasons, that inspection and surveillance of the proper management of water deriving from the hydraulic fracturing process are not under their jurisdiction.

a) Water use in the Tangram–1 well

153. According to information provided by Asea, the hydraulic fracturing process required 25,807.93 m^3 of water that had been treated to reduce friction.[259] On the other hand, PEP stated that the contractor, CALFRAC Well Services Ltd., "did not provide information on this point," and thus there were no references to the source of water used for hydraulic fracturing operations in the Tangram–1 well.[260]

154. While there is no information on the origin of the water used, it was indicated in Asea's documents that a total volume of 25,807.93 m^3 of water (equivalent to approximately 10.3 Olympic swimming pools) was used, and that this water was treated to reduce friction, without specifying what this treatment consisted of.[261] According to the Asea's statement, flowback fluid was disposed of in the "Aljibe-2" disposal well located in the municipality of Reynosa, Tamaulipas, approximately 125 km (as the crow flies) from the Tangram–1 well.[262]

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252. Asea, file no. ASEA/UAJ/0068/2019 (10 June 2019), in Response, at 20, at: <https://bit.ly/3Z8HgDf>.
253. Asea, Response from Asea to CEC information request, at: <http://cec.org/files/sem/20240501/aaq009.pdf>. See also: Asea File in Response to PNT Request, at: <http://cec.org/files/sem/20240423/aap006.pdf >.
254. *Cf.* Asea, file no. ASEA/UAJ/DGCT/2C.7/0733-2024 (27 February 2024), in response to request for information no. 331002524000073 filed with the PNT, and by which the direct consultation of the file of the citizen complaint No. DP-ASEA/UAJ/DGCT/139-18 was enabled: File Closing Decision, part 2 (30 May 2022), file no. DP-ASEA/UAJ/DGCT/139-18, folio 124, at: <http://cec.org/files/sem/20240613/aau003.pdf> [File Closing Decision-2].
255. Conagua (2019), memo no. B00.2.03-0721 (12 May 2019), in response to query concerning hydraulic fracturing in Los Ramones, Nuevo León, at 2, at: <http://cec.org/files/sem/20240613/aau015.pdf>.
256. EIA Authorization, at. 59, at: <http://cec.org/files/sem/20240605/aat001.pdf>.
257. Asea, file no. ASEA/UAJ/0068/2019 (10 June 2019), attached to Mexico's response as Annex 3. *Cfr*. Response, at 20, at: <https://bit.ly/3Z8HgDf>.
258. CEC, requests for information available at: <http://cec.org/files/sem/20240501/aaq004.pdf> and: <http://cec.org/files/sem/20240501/aaq005.pdf>.
259. Asea File in Response to PNT Request, at 4, at: <http://cec.org/files/sem/20240423/aap006.pdf>.
260. PEP Document in Response to Information Request, at 1, at: <http://cec.org/files/sem/20240605/aat002.pdf>.
261. Asea File in Response to PNT Request, at 4, at: <http://cec.org/files/sem/20240423/aap006.pdf>.
262.. ASEA Inspection Records, folio 0027, at: <http://cec.org/files/sem/20240423/aap001.pdf>. Google Earth was used for the distance calculation, using the coordinates of the well and the center of the municipal seat of Reynosa, Tamaulipas, since the precise location (in Reynosa) of the latrine pit "Aljibe-2" is unknown.

155. Regarding transportation and final disposal of the recovered fluids, a table in the document provided by Asea indicates that the fluids were transported from 28 September to 31 December 2013 by the companies Multiservicio Calderón; Autotanque ACR; and, to a lesser extent, Transportes GITSA.[263] The analysis shows a total of 197 trips were made (each one with an approximate distance of 100 km—excluding return—amounting to a cumulative total of 3.2 times the distance between Vancouver and Cancún), and a total volume of 5,547 m^3 of flowback fluid was transported. The information in the table in question indicates that the final recipient of the recovered fluids was the "Sigma 52" well in Reynosa, Tamaulipas and not the "Aljibe-2" disposal well mentioned above.[264] Also, since the flowback from the Tangram-1 well was disposed of in a disposal well (Sigma 52 or Aljibe-2), discharges into geological formations did indeed occur, contrary to the conditions imposed by the environmental authority to when evaluating the environmental feasibility of the Burgos Basin Project.[265]

156. On another note, the Secretariat documented the existence of a pond at an approximate distance of 90 m from the production tree of the Tangram–1 well, for the collection and temporary storage of flowback fluid. Adjacent to the well pad and with an approximate capacity of 5,725 m^3 (36,000 bbl), the pond is covered with a geomembrane-like material and is empty (Figure 17).[266]

Figure 17. Location of the fracking pond adjacent to the Tangram–1 well

Source: Figure produced from Google Earth.

263. Information from PEP, folios 0097–0099, at: <http://cec.org/files/sem/20240423/aap001.pdf>
264. Id.
265. Asea, file no. ASEA/UAJ/0068/2019 (10 June 2019), attached to Mexico's response as Annex 3. *Cfr*. Response, at 20, at: <https://bit.ly/3Z8HgDf>.
266. ASEA Inspection Records, folio 0027 and 0032, at: <http://cec.org/files/sem/20240423/aap001.pdf>.

b) Water use in the Nerita–1 well

157. The information provided by PEP indicates that 12,236.5 m^3 of industrial/agricultural quality water was used to prepare 6,250 m^3 of gel and 5,986.5 m^3 of low-friction fluid,[267] and that according to information provided by its contractor,[268] the water was obtained from two sources: an extension on a concession granted by Conagua to a physical person located in General Bravo, Nuevo León, which states that the concessioned water is for "AGRICULTURAL" use;[269] and a "temporary permit" of 120 days allowing for water supply to Transportes Gitsa, S.A. de C.V., issued by the Urban Development Department (*Dirección de Desarrollo Urbano*) to the municipality of General Bravo.[270] The "temporary permit" does not indicate the quantity, use, or purpose of the water.[271]

158. The Secretariat notes that the information reviewed does not indicate that the water would be used for hydraulic fracturing; nor does it indicate the respective volumes drawn from each of the sources; nor does it specify the exact location of each source; nor does it clarify how the total volume of water necessary for the fracturing process (12,236.5 m^3) was transported. The information does not clarify why water from an agricultural concession was used, nor what was the originally intended use of the water supplied by the municipality of General Bravo; and it does not explain how a municipality granted a temporary permit for water use in lieu of the national agency, Conagua, which should be the authority to do so. The information reviewed did not include logs or records documenting the volumes of water drawn and delivered for the hydraulic fracturing work. It is worth adding that until 2017 it was possible to transfer water concession title rights to another party.[272]

159. The foregoing information contrasts with the testimony of an inhabitant of the community of Los Ramones, Nuevo León who was interviewed by the Secretariat during its site visit on 22 February 2024. This person stated that the water used for drilling the Nerita-1 well was obtained from the San Juan River, adjacent to the well, and showed the Secretariat sections of PVC pipe that had allegedly been abandoned after extraction of water at the site. According to the testimony obtained, the pipeline had run from the San Juan River to the Nerita–1 well located at approximately 400 m (as the crow flies).

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267. PEP Document in Response to Information Request, at 1, at: <http://cec.org/files/sem/20240605/aat002.pdf>. It should be noted that the information provided by Asea states that a total volume of 13,341.20 m^3 of water and gel was used for the hydraulic fracturing process for the Nerita-1 well. *Cfr.* Asea File in Response to PNT Request, at 4, at: <http://cec.org/files/sem/20240423/aap006.pdf>.
268. PEP Official Document Attached to the Response, at 1, at: <http://cec.org/files/sem/20240613/aau019.pdf>.
269. Conagua, file no. BOO.00.R07.04.02-0409 (26 February 2009), in response to request for extension of concessions, at: <http://cec.org/files/sem/20240501/aaq019.pdf>.
270. Office of the Mayor of General Bravo, unnumbered file, (22 October 2013), water supply permit granted by the Directorate of Urban Development of the municipality of General Bravo, at: <http://cec.org/files/sem/20240501/aaq020.pdf>.
271. Id.
272. *Cf.* Guidelines for Water Conservation-UR, Article 5, at: <https://bit.ly/4bKOT6N>.

Photo 1. View of the San Juan River

Photo: José Álvarez Rosas

View of the San Juan River, municipality of Los Ramones, Nuevo León; photo taken on 22 February 2024 during the Secretariat's site visit. Photographic appendix available at <http://cec.org/files/sem/20240613/aau012.docx>.

Photo 2. Gate valve in the pipeline

Photo: José Álvarez Rosas

Gate valve in the PVC pipeline for agricultural irrigation, Las Puentes community, municipality of Los Ramones, Nuevo León; photo taken on 22 February 2024 during the Secretariat's site visit. Photographic appendix available at: <http://cec.org/files/sem/20240613/aau012.docx>.

Photo 3. Remains of PVC pipe

Photo: José Álvarez Rosas

Remains of PVC pipe placed on one bank of the San Juan River and which, according to the testimony of an inhabitant of the community of Los Ramones, Nuevo León, supposedly connected with the Nerita–1 well to supply water to the project; photo taken on 22 February 2024 during the Secretariat's site visit. Photographic appendix available at: <http://cec.org/files/sem/20240613/aau012.docx>.

Figure 18. Location of the fracking pond adjacent to the Nerita–1 well

Source: Figure produced from Google Earth.

Photo 4. Fracking pond adjacent to Nerita–1 well

Photo: José Álvarez Rosas

Fracking pond adjacent to Nerita–1 well, municipality of Los Ramones, Nuevo León; photo taken on 22 February 2024 during the Secretariat's site visit. Photographic appendix available at <http://cec.org/files/sem/20240613/aau012.docx>.

160. According to the information available to the Secretariat for the preparation of the factual record, the Party documented that flowback fluid from the stimulation work for the Nerita-1 well was transported for final disposal in the "Aljibe-2" disposal well in the municipality of Reynosa, Tamaulipas,[273] approximately 150 km away (as the crow flies).[274]

161. For collection and temporary storage of flowback, an earthen dam was built 80 m from the production tree of the Nerita–1 well, adjacent to the drill pad.[275] The dam is shown in the following Figure 18 and Photo 4.

162. According to data from a table included in the same Asea documentation, the fluid volumes recovered from the Nerita–1 well during the completion phase was transported for final disposal between 15 January and 26 June 2014. During this period, a total volume of 4,877 m^3 was transported in 168 trips by the companies JR Transport; Trareysa; Transportes García, and TITSA. The final recipient of the recovered volumes was the company Servicios Ecológicos VIDSA, S.A de C.V., based in the municipality of Diaz Ordaz, Tamaulipas.[276] In this regard, the Asea document indicates that the flowback was disposed of in a disposal well located in Reynosa, Tamaulipas,[277] contrasting with the restriction imposed by the environmental authority for the

273.. ASEA Inspection Records, folio 0010, at: <http://cec.org/files/sem/20240423/aap001.pdf>.

274. Google Earth was used for the distance calculation, taking into consideration the coordinates of the well and the center of the municipal seat of Reynosa, Tamaulipas, since the precise location (in Reynosa) of the latrine pit "Aljibe-2" is unknown.

275. ASEA Inspection Records, folio 0011, at: <http://cec.org/files/sem/20240423/aap001.pdf>.

276. Information from PEP, folios 0093-96, at: <http://cec.org/files/sem/20240423/aap001.pdf>.

277. Asea Inspection Records, folio 0010, at: <http://cec.org/files/sem/20240423/aap001.pdf>.

Burgos Basin Project on the injection of wastewater into disposal wells.[278] The information provided by PEP, which reports that the contractor Dowell Schlumberger de México indicated that a total of 6,638 m^3 of flowback was disposed of in wastewater treatment plants;[279] yet there is no documentary information available indicating where and when the flowback was treated, its level of quality, the treatment parameters employed, or whether the facilities possessed the capacity to treat such water.

4.1.5 Inspection and surveillance measures concerning water use

163. With regard to inspection and surveillance measures concerning sustainable water use, it is necessary to determine whether the information relating to the construction of the Tangram–1 and Nerita–1 wells identified the possible water supplies needed for the hydraulic fracturing operations. The environmental assessment information for the Burgos Basin Project—which includes the wells in question—did not indicate the water supply for the project's operations, including hydraulic fracturing (Table 12). The information which served to assess the environmental feasibility of the project merely stated generically that the ordinary, exceptional, and periodic use of raw, treated, and potable water for the different phases of the project would depend on the requirements of the project. The water supplies for the construction of the Tangram–1 and Nerita–1 wells were not determined prior to their construction.

164. In addition, the authorization issued by the environmental authority for the Burgos Basin Project does not reflect Conagua's request for a technical opinion on the project's viability so that it could determine whether to approve the project in terms of sustainable water use.[280]

Table 12. Water types to be used at each phase of the Burgos Basin Project (2004–2022)

		Water required at each phase of the project	
Phase	**Water**	**Ordinary consumption**	**Exceptional or periodic consumption**
Site preparation	Raw	Depends on project requirements	Depends on project requirements
	Treated		
	Potable		
Construction	Raw	Depends on project requirements	Depends on project requirements
	Treated		
	Potable		
Operation	Raw	Depends on project requirements	Depends on project requirements
	Treated		
	Potable		
Maintenance	Raw	Depends on project requirements	Depends on project requirements
	Treated		
	Potable		
Abandonment	Raw	Depends on project requirements	Depends on project requirements
	Treated		
	Potable		

Source: Table derived from Universidad Autónoma Metropolitana (UAM) and PEP (2003), *Manifestación de Impacto Ambiental, Modalidad Regional Proyecto Integral Cuenca de Burgos 2004–2022*, section II.4.2.1, "Agua," at 13–14, at <http://cec.org/files/sem/20240613/aau016.pdf>.

278. EIA Authorization, at 59, at: <http://cec.org/files/sem/20240605/aat001.pdf>.
279. PEP Official Document Attached to the Response, at 1, at: <http://cec.org/files/sem/20240613/aau019.pdf>.
280. EIA Authorization, at 5, 6, and 65–6, at: <http://cec.org/files/sem/20240605/aat001.pdf>.

165. Furthermore, it should be noted that during a meeting of the Secretariat with Conagua representatives on 19 February 2024, Conagua staff stated that they had no knowledge of hydraulic fracturing carried out by Pemex in the area. The authorities stated that *no* surface water or groundwater concessions had been granted for this purpose. This coincides with public information on the Conagua portal with respect to groundwater concessions for unconventional hydrocarbon exploration and extraction through hydraulic fracturing (updated on 29 October 2021), which reflects that no concessions for this activity had been granted.[281] In this regard, anyone using water for productive activities must apply for a concession from Conagua, which is responsible for determining whether the application can be approved, following an assessment of water availability.[282] The Party states that "the records of the CNH indicate that these wells lack discharge lines and aboveground infrastructure to indicate that they are operating"; it adds that they "are not covered by any deed of transfer or contract, and have not been functioning since operations ceased in 2013."[283]

166. On 12 December 2018, Asea accepted a citizen complaint "on environmental impacts caused by drilling of wells using the technique of hydraulic fracturing" filed by the Submitters (see section 4.2 *infra*). During the processing of the complaint, the complainants presented a water quality analysis (dated 8 September 2018) that was also included in the submission filed with the CEC.[284] On 30 May 2022, a decision closing the citizen complaint file was issued, making reference to the water quality analysis. The complainants informed Asea that this water was being used to irrigate trees in the area and that the trees had been weakened to the point of extreme dryness.[285] The Secretariat only had the water quality analysis provided by the Submitters as supporting documentation for their citizen complaint and assertions in the submission.[286]

167. Concerning the water quality analysis presented by the complainants, Asea states that there is no certainty with respect to the analytical results since it does not meet the requirements for sample traceability, analytical methods, and laboratory certifications recognized by Mexican authorities.[287] In February 2019, Conagua conducted a water quality analysis in four wells in the towns of Hacienda and Ejido El Carrizo and in two deep wells for urban public use with measurement of both the static water level and the concentration of total dissolved solids.[288] The results showed values below those established in the reference standard.[289] According to the Party, the assessed parameters related to "organic compounds such as pesticides, herbicides, aromatic hydrocarbons, for which values lower than the reference standards were obtained."[290] The deep wells were located 6 km from the Nerita-1 well and 20 km from the Tangram-1 well.[291] The available information on this water quality analysis does not contain values for organic compounds such as aromatic hydrocarbons. There is no information on the compounds used in the drilling and fracturing operations or contained in the flowback.

281. Conagua (2021), "Fracturamiento Hidráulico: número de dictámenes técnicos emitidos para otorgar título de concesión de agua subterránea cuyo uso sea para la exploración y extracción de hidrocarburos no convencionales mediante fracturación hidráulica," at: <https://bit.ly/4edfICj>.
282. M. Tejado Gallegos (2022), *supra* at 103, at: <https://bit.ly/3RhPwN7>.
283. Response at 14, at: <https://bit.ly/3Z8HgDf>.
284. Water Quality Analysis, at: <http://cec.org/files/sem/20240613/aau001.pdf>.
285. *Cf.* Asea, file no. ASEA/UAJ/DGCT/2C.7/0733-2024 (27 February 2024), in response to request for information no. 331002524000073 filed with the PNT and enabling direct consultation of the file of the popular complaint No. DP-ASEA/UAJ/DGCT/139-18:, File Closing Decision, part 1, file no. DP-ASEA/UAJ/DGCT/139-18, (30 May 2022), Secretariat's manuscript transcription of the file in question, at: <http://cec.org/files/sem/20240613/aau002.pdf> [File Closing Decision Part 1].
286. Water Quality Analysis, at: <http://cec.org/files/sem/20240613/aau001.pdf>.
287.. *Cf.* File Closing Decision-Part 1, folio 09, at: <http://cec.org/files/sem/20240613/aau002.pdf>.
288. Conagua, memo no. B00.7.0133, Gerencia de Aguas Subterráneas, Comisión Nacional del Agua (19 June 2019), at: <http://cec.org/files/sem/20240613/aau001.pdf>.
289. "Modificación a la Norma Oficial Mexicana NOM-127-SSA1-1994, *Salud ambiental. Agua para uso y consumo humano. Límites permisibles de calidad y tratamientos a que debe someterse el agua para su potabilización,*" *DOF* 22 November 2000, at: <https://bit.ly/3Xb4eco>.
290. UCAI, file no. UCAI/00279/2025 (30 January 2025) and appendix, with reference to Conagua, memo BOO.811.-179 (2024).
291. Conagua, memo B00.7.0133 (9 June 2019), at: <http://cec.org/files/sem/20241118/aax001.pdf>.

168. The Secretariat only had the analysis from 8 September 2018 provided by the Submitters in support of their assertions, which they also used as supporting documentation for their complaint to Asea.[292] Currently, the information available to the Secretariat does not identify all the substances and materials, nor the quantities thereof, used for the drilling and stimulation of the wells in question. Nor is there information on physicochemical composition, nor any material safety data sheets for the substances in question, nor any information on records of quantities of hazardous and specially managed waste produced; nor is there any list of materials and substances used during the closing or capping of the wells in question. In sum, the information reviewed by the Secretariat does not identify the physicochemical characteristics of the produced water and flowback generated by the drilling and completion of the Tangram–1 and Nerita–1 wells.[293]

169. On a final note, the environmental impact information for the Burgos Basin Project includes a generic list of materials that were to be used in the various phases of the project for the implementation of a total of 13,657 activities, but without specifying the substances employed in the drilling and hydraulic fracturing operations, nor indicating the main substances or components used in the specific cases of Tangram–1 and Nerita–1 wells.[294]

170. Therefore, there is uncertainty as to the type of substances and the composition of the materials employed in the drilling and hydraulic fracturing operations for the wells in question, and it becomes impossible to ascertain whether these components could have been present in surface or underground bodies of water near or adjacent to the wells.

4.2 Application of safety measures

171. Concerning the alleged failure to effectively enforce LGEEPA Article 170, the Submitters assert that "the Mexican government failed to take safety measures to protect our homes and aquifers, as witness the fact that the damage began to occur with the onset of hydraulic fracturing in our municipality."[295]

172. On this point, the Party stated in its response that Asea has the authority to imposition of the safety measures contemplated in Article 5 paragraph XI of the Act respecting the National Agency for Industrial Safety and Environmental Protection in the Hydrocarbon Sector (*Ley de la Agencia Nacional de Seguridad Industrial y de Protección al Medio Ambiente del Sector de Hidrocarburos*).[296] In this regard, Asea responded that there are no reports in its records of environmental incidents related to the Tangram–1 and Nerita–1 wells, nor of accidents involving the wells in question or any other well located in the municipalities of Los Ramones and China, Nuevo León.[297] Likewise, the documents provided by Profepa and the Secretary of Energy (*Secretaría de Energía*—Sener) to Asea contain no record of any proceedings opened further to alleged environmental or operating safety impacts of these wells.[298] The Party reiterates that due to the absence of records of reports of environmental or operating safety incidents or accidents related to the wells, Asea did not take any supervision, inspection, or surveillance measures, nor did it open any administrative proceedings leading to the application of safety measures.[299] The Party concludes that "there is nothing to suggest that the Mexican authorities are failing to fulfill their obligation to impose safety measures" in response to a risk or harm to the environment during the exploration process in the Tangram–1 and Nerita–1 wells.[300]

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292. Water Quality Analysis, at: <http://cec.org/files/sem/20240613/aau001.pdf>.
293. *Cf.* Asea File in Response to PNT Request, at: <http://cec.org/files/sem/20240423/aap006.pdf>.
294. UAM-Pemex (2003), *Manifestación de Impacto Ambiental, Modalidad Regional Proyecto Integral Cuenca de Burgos 2004–2022*, section II.4.2.2., "Requerimientos de Personal e Insumos," at 20–2, at: <http://cec.org/files/sem/20240613/aau016.pdf>.
295. Revised Submission at 10, at: <https://bit.ly/4fy35lB>.
296. Response at 15, at: <https://bit.ly/3Z8HgDf>.
297. Id. at 16.
298. Id. at 15–16.
299. Id. at 16.
300. Id. at 17.

173. **LGEEPA Article 170** provides that where there exists an imminent risk of ecological imbalance or of harm to natural resources, or in cases of contamination with dangerous repercussions, Semarnat may order safety measures, including temporary partial or total closing of pollution sources (**paragraph I**); seizure of hazardous materials and wastes, as well as property, vehicles, tools, and instruments directly related to the conduct giving rise to the application of the safety measure (**paragraph II**), or neutralization to prevent hazardous materials or wastes from giving rise to the anticipated effects (**paragraph III**). Semarnat may arrange for the application of safety measures prescribed by other provisions.

174. It is observed that the safety measures set out in LGEEPA Article 170 are preventive, protective, or restorative in nature. In its response, the Party maintains that:

> A record search of the Immediate Notifications and Formalization of Notifications (*Avisos Inmediatos y Formalización de Avisos*), through which the regulated entities report the existence of spills, infiltrations, discharges or dumping of hazardous materials or waste greater than 1 cubic meter, revealed no report of environmental incidents related to the Tangram 1 or Nerita 1 wells, nor is there any record of incidents or accidents related to the wells, or any other well within the municipalities of Los Ramones and China, in the State of Nuevo León.[301]

175. The Party adds that:

> No reports have been filed with the Supervision Unit regarding incidents or accidents related to operational safety for which supervision, inspection or surveillance actions have been carried out. Furthermore, there are no initiated proceedings for alleged environmental or operational safety damages according to the files transferred by Profepa and the [Ministry of Energy] to Asea.[302]

176. The Party asserts that the above explains why no environmental verification, inspection, or supervision measures in relation to the Tangram–1 and Nerita–1 wells.[303]

177. On 7 December 2018, Asea accepted a citizen complaint arising from the drilling of wells using the technique of hydraulic fracturing. The complaint—filed by the Submitters—asserts that "increasingly deep wells had to be drilled in order to find water, which, when drawn, exhibited a fetid odor and was contaminated."[304]

178. In response to the citizen complaint, on 24 March 2022, Asea made an inspection visit to the Nerita–1 well in order to verify compliance with the terms and conditions[305] relating to preventive and mitigation measures that were to have been observed in constructing and operating this well.[306] The inspection record indicates that a person stated that the water coming from a waterwheel-type well (*noria*) used for human consumption did not exhibit water quality problems and that he had not heard of any other residents receiving such complaints.[307] It is also noted that the Asea inspector had observed that the water was transparent, with no visible solids nor any detectable odor or taste.[308] During its inspection, the authority did not observe any corrosion of the valves, the production tree, or the wellhead, nor the presence of fluids in the annulus of the casing.[309] The cellar did not contain any liquids nor give off the characteristic odor of liquid hydrocarbons, gas, or hydrogen sulfide gas.[310] This was also apparent during the Secretariat's site visit to the Nerita–1 well on 22 February 2024.

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301. Id.
302. Id.
303. Id.
304. *Cf.* File Closing Decision Part 2, folio 123, at: <http://cec.org/files/sem/20240613/aau003.pdf>.
305. This refers in particular to the verification of term 9, condition 3 of the environmental impact approval for the Burgos Basin Integral Project; in ASEA Inspection Record, folio 0003, at: <http://cec.org/files/sem/20240423/aap001.pdf>.
306. Id.
307. Id. at folio 0011.
308. Id. at folio 0012.
309. Id. at folio 0010.
310. Id. at folio 0009.

Photo 5. Current view of the Nerita–1 well

Current view of the Nerita–1 well (terminated), municipality of Los Ramones, Nuevo León; photo taken 22 February 2024 during the Secretariat's site visit. Photographic appendix available at <http://cec.org/files/sem/20240613/aau012.docx>.

179. Additionally, an inspection visit was made to the Tangram–1 well that same day, 24 March 2022, with the same purpose of verifying compliance with the terms and conditions[311] relating to preventive and mitigation measures that were to be followed in the construction and operation of this well.[312]

180. The administrative file for both inspection records asserts that:

> The results of the analysis for hydrocarbons show that there are no impacts on bodies of water, whether surface water or groundwater. An indicator of the good health of the aquifers is how they are used by wildlife and livestock… The results indicate that the sampled bodies of water have remained free of hydrocarbon contamination in the areas of influence of the Burgos Basin Integral Asset Project.[313]

181. On this point, the results referenced do not specify parameters for analyzing the compounds contained either in the fluids used for drilling the wells or identified in the flowback.

182. On 30 May 2022, the citizen complaint file no. DP-ASEA/UAJ/DGCT/139-18 was closed,[314] and it was indicated that the decision would be notified to Conagua.[315] The Party notes that Asea sent such notification to the water authority on June 9, 2022.[316] However, during the meeting between the Secretariat and Conagua on 19 February 2024, the water authority stated that they had no knowledge of having received a copy of that file.

183. Concerning the management of hazardous and specially managed waste generated during the stimulation and drilling of the Tangram–1 and Nerita–1 wells, PEP stated that it does not have this information because "the servers containing this information were affected by [a] computer virus in the year 2019."[317] PEP also did not provide information on the produced water from the drilling and hydraulic fracturing of the wells in question, nor on the drilling muds which it is required to manage under the applicable law.[318]

184. Regarding wastewater treatment and discharge, Asea and Conagua contend that they lack jurisdiction over enforcement actions relating to wastewater associated with hydraulic fracturing activities (see section 4.1.4 above, particularly paragraph 146). In the event that any of the flowback or produced water has been discharged into receiving bodies that are national property (such as disposal wells), Asea and Conagua stated that they lack the authority to implement safety measures pursuant to LGEEPA Article 170.

185. In relation to the area of land affected or cleared for drilling, pad construction, stimulation, and hydraulic fracturing of the Tangram–1 and Nerita–1 wells, the following information was obtained:

186. Asea does not specify the source of the information on the affected area of land, nor does it indicate whether the areas that were projected to be impacted coincide with the areas that were ultimately used. This is relevant in ascertaining the negative impact that the removal of vegetation may have on biodiversity, soil conservation, aquifer recharge, and the water cycle.

311. This refers in particular to the verification of term 9, condition 3 of the environmental impact approval for the Burgos Basin Project 2004-2022, Id. at folio 0020.
312. Id.
313. Id. at folio 0013 and 0029.
314. File Closing Decision Part 1, at 1, at: <http://cec.org/files/sem/20240613/aau002.pdf>.
315. *Cf.* File Closing Decision Part 2, folio 126, at: <http://cec.org/files/sem/20240613/aau003.pdf>.
316. UCAI, file no. UCAI/00279/2025 (30 January 2025), with reference to Asea file ASEA/DE/DGCI/028/2024 (9 June 2022).
317. PEP Document in Response to Information Request, at 2, at: <http://cec.org/files/sem/20240605/aat002.pdf>.
318. Id. at 6.

Table 13. Areas of land used for the Tangram–1 and Nerita–1 wells

Area to be impacted

Nerita–1 well					
			Area		
			Area required	Area to be impacted	
Item	Length (m)	Width (m)	m²	m²	ha
New access road	269.00	10	2,690.00	2,690.00	0.2690
Pad area	125	70	8,750.00	8,750.00	0.8750
	105	80	8,400.00	8,400.00	0.8400
Dam	56	56	3,136.00	3,136.00	0.3136
Burner	60	45	2,700.00	2,700.00	0.2700
Total	**269.00**	--	**25,676.00**	**25,676.00**	**2.5676**

Tangram–1 well					
			Area		
			Area required	Area to be impacted	
Item	Length (m)	Width (m)	m²	m²	ha
New access road	290.98	10.00	2,909.80	2,909.80	0.29
Handling area (Area 1)	70.00	125.00	8,750.00	8,750.00	0.88
Handling area (Area 2)	80.00	105.00	8,400.00	8,400.00	0.84
Burning area	45.00	60.00	2,700.00	2,700.00	0.27
Dam access road	114.55	10.00	1,145.50	1,145.50	0.11
Water storage pond	71.50	71.50	5,112.25	5,112.25	0.51
Total	**290.98**	--	**29,017.55**	**29,017.55**	**2.90**

Source: ASEA, file no. ASEA/USIVI/DGSIVEERC/0478/2023 (12 December 2023), in response to request for information no. 331002523000687 filed with the PNT, at 6, at <http://cec.org/files/sem/20240423/aap006.pdf>.

187. Concerning vegetation that may have been affected by the project, Asea provided information indicating that the area where the Nerita–1 well is located consists entirely of agricultural land (both irrigated and seasonal).[319] With regard to the Tangram–1 well, this area consists of Tamaulipan Thornscrub with secondary vegetation (65%), and Mezquital, including = *huisache* (*Vachellia* spp.), with secondary vegetation (45%).[320] In this case, Asea does not specify the source of these facts, nor are any species recovery or relocation measures mentioned, nor is the logbook provided on the final destination of the recovered species. This is relevant to determine whether to impose safety measures.

319. Information from PEP, folio 0100, at: <http://cec.org/files/sem/20240423/aap001.pdf>.

320. Id. at 0101. It is noted that the values provided in the initial site assessment document for the percentage distribution of the two vegetation types (65 and 45) do not add up to 100%.

188. Concerning fauna, three species were recorded at the Nerita–1 well site that are not listed as *special protection*, *threatened* or *endangered* in the applicable regulations;[321] therefore, a protection and recovery program was not required for them.[322] Four fauna species were observed at the Tangram–1 site, one of them—the black-tailed jackrabbit (*Lepus californicus*)—is classified as "special protection."[323] In accordance with applicable regulations, the presence of a species in this category would require the development of a protection plan; however, the available information does not indicate whether this species had a protection plan in the case of the Tangram-1 well. The information provided by Asea refers to the environmental impact resolution of the Burgos Basin Project, but does not indicate or provide any conservation plan or measure implemented;[324] the information provided by Pemex does not refer to any wildlife protection program or measure.[325]

189. The foregoing is relevant to ascertain whether there was an impact on threatened species of wild fauna and flora classified in a category of protection according to the applicable law[326] and whether the number of species affected or relocated could have had an impact on the ecosystem, or on ecological balance, in a manner that could warrant the imposition of a safety measure.

190. In light of the above mentioned, it is observed that no information is available on the area of land affected by the construction and drilling of the Nerita I and Tangram I wells, nor on the fate or management of the cleared material and the affected species of flora and fauna. There is no information about any inspection or surveillance activities undertaken by Asea, or information from PEP to substantiate the effective management of the natural elements in both cases.

191. The Secretariat did not find a record of any other actions related to the implementation of safety measures by Asea or Conagua, nor of enforcement actions of a preventive nature by either of the two environmental authorities, beyond an inspection visit conducted by Asea on 24 March 2022. This is occurring in a context in which Conagua and Asea have stated that they lack sufficient authority to control and regulate the waters arising from the hydraulic fracturing process.

321. Norma Oficial Mexicana NOM-059-Semarnat-2010, *Protección ambiental-Especies nativas de México de flora y fauna silvestres-Categorías de riesgo y especificaciones para su inclusión, exclusión o cambio-Lista de especies en riesgo* [NOM-059].

322. Information from PEP, folio 0100, at: <http://cec.org/files/sem/20240423/aap001.pdf>.

323. Id. at folio 0102.

324. Asea File in Response to PNT Request, p. 6, en: <http://cec.org/files/sem/20240423/aap006.pdf>.

325. PEP Document in Response to Information Request, at 1, at: <http://cec.org/files/sem/20240605/aat002.pdf>.

326. Cf., NOM-059.

5 Ongoing commitment to transparency

192. Factual records provide detailed information regarding asserted failures to effectively enforce environmental laws in North America that may assist submitters, the NAAEC Parties (now USMCA), and other segments of the public with an interest in the matters addressed. This factual record draws no conclusions regarding the Party's alleged failures to effectively enforce its environmental law, as asserted by the Submitters, nor regarding the effectiveness of the Party's enforcement efforts.

193. In accordance with NAAEC Article 15(3), this factual record was produced "without prejudice to any further steps that may be taken" concerning submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*).

194. In 2014, the CEC Council issued instructions to the effect that the Parties to the NAAEC would provide updates on measures taken in connection with submissions concluded in the past year (including those for which a factual record was prepared):[327]

71. This year, we implemented a new reporting approach for submissions on enforcement matters (SEM) as part of our continued commitment to transparency and to the SEM modernization process. Following a proposal by the Joint Public Advisory Committee, each country provided an update on actions taken in connection with submissions concluded in the past year.

195. With the goal of facilitating any follow-up actions that the public or the Party's relevant authorities may wish to undertake, this factual record provides relevant information according to the terms of Council Resolution 23-05 on the matters raised in the submission.

327. CEC (2014), *CEC Ministerial Statement – 2014*, Twenty-first Regular Session of the CEC Council, Yellowknife, Northwest Territories, Canada (17 July 2014), at: <https://bit.ly/4cj0pHt>.

APPENDICES

APPENDIX 1

Council Resolution 23-05
(*Hydraulic Fracturing in Nuevo León*)

Distribution: General
C/C.01/23/RES/05/FINAL
ORIGINAL: English

5 October 2023

COUNCIL RESOLUTION: 23-05

Instructions to the Secretariat of the Commission for Environmental Cooperation (CEC) regarding submission SEM-18-003 (*Hydraulic Fracturing in Nuevo Leon*), which asserts that the Mexican environmental authorities are failing to effectively enforce various provision of the General Act on Ecological Balance and Environmental Protection (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*—LGEEPA), the Federal Environmental Liability Act (*Ley Federal de Responsabilidad Ambiental*—LFRA), the Regulation to the Mexican Waste Prevention and Management Act (*Reglamento de la Ley General de Prevención y Gestión Integral de Residuos*—LGPGIR Regulation), and the Guidelines for the Protection and Conservation of National Waters in Connection with Hydrocarbon Exploration and Extraction in Unconventional Deposits (*Lineamientos para la Protección y Conservación de las Aguas Nacionales en Actividades de Exploración y Extracción de Hidrocarburos en Yacimientos No Convencionales*—National Waters Contamination Prevention Guidelines), with respect to hydraulic fracturing in the Tangram I and Nerita I wells, located in the municipality of Los Ramones, Nuevo León.

THE COUNCIL:

SUPPORTIVE of the process provided for in Articles 14 and 15 of the North American Agreement on Environmental Cooperation (NAAEC) regarding Submissions on Enforcement Matters (SEM) and the preparation of factual records;

AFFIRMING that the process provided for in Articles 14 and 15 of the NAAEC was established by the Parties of the NAAEC to provide an opportunity for residents of Canada, Mexico, and the United States to present their concerns regarding effective enforcement of environmental law and to bring facts to light regarding those concerns;

NOTING that the United States-Mexico-Canada Trade Agreement (USMCA) entered into force on 1 July 2020 and now governs the SEM process;

FURTHER NOTING that the Environmental Cooperation Agreement (ECA) among the Governments of Canada, the United Mexican States, and the United States of America entered into force on 1 July 2020 and superseded the NAAEC on that date;

RECOGNIZING that Article 2(4) of the ECA provides that any submission made pursuant to the NAAEC and not concluded as of entry into force of the ECA shall continue in accordance with the procedures established under Articles 14 and 15 of the NAAEC, unless the Council decides otherwise;

AFFIRMING that the SEM process, which may include the preparation of factual records, is designed to increase public participation and promote transparency and openness on issues related to the enforcement of environmental law in the Canada, Mexico and United States;

HAVING CONSIDERED submission SEM-18-003 filed on 3 October 2018 and the revised submission filed on 21 February 2019, as well as the Response submitted by the Government of Mexico on 8 April 2020;

HAVING REVIEWED the 30 September 2020 Notification of the Secretariat recommending the development of a factual record with respect to the effective enforcement of LGEEPA Articles 28 paragraphs I and XIII, 88 paragraph III, and 170;

REAFFIRMING that the purpose of a factual record is to provide an objective presentation of the facts relevant to the assertion set forth in a submission and will generally outline the history of the environmental enforcement issue raised in the submission, the relevant legal obligations of the Party, and the actions of the Party in fulfilling those obligations; and

TAKING INTO ACCOUNT Guideline 10.4 of the *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation* in relation to the preparation of a factual record, which states that "The Council will provide its reason(s) for the instructions in writing and they will be posted on the [SEM] public registry;"

HEREBY UNANIMOUSLY DECIDES:

TO INSTRUCT the Secretariat to prepare a factual record in accordance with Article 15(4) of the NAAEC, and consistent with Section 10.4 of the Guidelines, on LGEEPA Article 88 paragraph III and Article 170, taking into account Mexico's statement that the Tangram I and Nerita I wells are not currently in the operation and extraction phase;

TO DIRECT the Secretariat to conclude the preparation of the draft factual record, as provided in Section 19.5 of the Guidelines, and present it to the Council in accordance with Article 15(5) of the NAAEC; and

TO FURTHER DIRECT the Secretariat to provide the Council with its overall work plan for gathering the relevant facts; to keep the Council informed of any future changes or adjustments to such plan; and to promptly communicate with the Council in connection with any clarification required with respect to the scope of the factual record hereby authorized.

TO FURTHER INSTRUCT the Secretariat to post the Council members' reasons for their votes on the SEM public registry.

APPROVED BY THE COUNCIL:

_____

Sandra McCardell
Government of Canada

_____

Miguel Ángel Zerón
Government of the United Mexican States

_____

Jane Nishida
Government of the United States of America

Reasoning for the Council's instructions on submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*)

Consistent with its commitment to transparency and its capacity as the governing body of the Commission for Environmental Cooperation (CEC), with the responsibility to oversee the processing of submissions on the effective enforcement of environmental law (the "SEM process") filed prior to 1 July 2020, and through the procedures established by the North American Agreement on Environmental Cooperation (NAAEC), the Council of the CEC (the "Council") hereby makes public its reasons for instructing the Secretariat to prepare a factual record for submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*).

1. Secretariat's NAAEC Article 15(1) notification

In its NAAEC Article 15(1) notification, issued 30 September 2020, the Secretariat informed the Council that the preparation of a factual record is warranted for the Submitters' assertions of alleged failures to effectively enforce the following legal provisions:

A. Article 28 paragraphs I and XIII of the General Ecological Equilibrium and Environmental Protection Act (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*—LGEEPA), with respect to the preparation of an environmental impact statement for the Tangram-I and Nerita-I wells;
B. LGEEPA Article 88 paragraph III, with respect to sustainable water use, and
C. LGEEPA Article 170, with respect to the taking of safety measures.

2. Council's instruction to the Secretariat

By means of Council Resolution 23-05, annexed, the Council unanimously instructed the Secretariat to prepare a factual record for submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*), specifically to address alleged failures to effectively enforce LGEEPA Article 88 paragraph III, with respect to sustainable water use, and LGEEPA Article 170, with respect to the taking of safety measures. In conformity with paragraph 10.4 of the *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation* (the "Guidelines"), the Council hereby presents the reasoning behind this instruction.

3. Explanation of the Council's reasoning

A. LGEEPA Article 28 paragraphs I and XIII, on the preparation of an environmental impact statement for the Tangram-I and Nerita-I wells

The Council observes the Submitters' assertions that the environmental authorities did not enforce compliance with the obligation to file an environmental impact statement for the Tangram-I and Nerita-I wells, located in the municipality of Los Ramones in the state of Nuevo León (see p. 2 of the revised submission). Furthermore, the Council takes into consideration the information provided by Mexico in its Party Response (see pp. 8-12) with respect to the environmental impact statement filed in the regional modality for the "Proyecto integral Cuenca de Burgos 2004–2022" (Burgos Watershed Masterplan 2004–2022), the recitals set out in administrative decision no. S.G.P.A./DGIRA.DEI.2440.04 (see pp. 13-52, Appendix 2), as well as the Secretariat's determination (see paragraph 51) with respect to the existence of an Environmental Impact Statement (EIS) filed in accordance with LGEEPA Article 28.

The Council further takes note of the Secretariat's recommendation for the preparation of a factual record regarding compliance with the public participation requirements and acknowledges Mexico's statement that matters relating to public consultation and publication of a project excerpt in a widely circulated newspaper are regulated by LGEEPA Article 34 and Articles 37, 40, 41, and 43 of the Environmental Impact Regulation to the LGEEPA, not by LGEEPA Article 177 as stated by the Submitters (see p. 7 of the revised submission), or by LGEEPA Article 28 paragraphs I and XIII, as noted by the Secretariat (see paragraph 52 of its notification).

Notwithstanding the foregoing, the Council notes that Mexico, in its Party Response, clarified the issue of publication and reported that pursuant to LGEEPA Article 34, the filing of the EIS for the "Burgos Watershed Masterplan 2004–2022" was published in the ecological gazette of the Ministry of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*—Semarnat), for consultation and that no requests for public consultation were made during the assessment process (see pp. 12 and 13 of the Party Response).

Therefore, the Council[1] observes that the Government of Mexico has submitted the relevant information; and further observes that the matters raised by the Secretariat revolve around alleged deficiencies in the EIS rather than around the content of LGEEPA Article 28 paragraphs I and XIII.

For the foregoing reasons, the Council[2] considers that the preparation of a factual record with respect to LGEEPA Article 28 paragraphs I and XIII is not warranted.

B. LGEEPA Article 88 paragraph III, with respect to sustainable water use

The Council observes that Mexico, in its Party Response, provided relevant information on the Tangram-I and Nerita-I wells, located in the municipality of Los Ramones, Nuevo León; and takes into consideration the Secretariat's determination that the Tangram-I and Nerita-I wells do not hold concessions for the exploitation of national property because they are not in the phase of extracting hydrocarbons (see paragraph 89 of the Secretariat's recommendation).

The Council agrees with the Secretariat's recommendation that preparing a factual record would serve to obtain information on the activities carried out prior to the explorative phase in accordance with LGEEPA Article 88 paragraph III, in view of the guiding criteria set out by that legal provision for sustainable water use and its requirement that the environmental authorities consider the protection of soils, wooded and forested areas; the maintenance of basic water flows, and the recharge capacity of aquifers when assessing and approving environmental impact.

For the foregoing reasons, the Council instructs the Secretariat to prepare a factual record with respect to LGEEPA Article 88 paragraph III.

C. LGEEPA Article 170, with respect to the taking of safety measures

The Council agrees with the Secretariat's recommendation concerning safety measures as provided by LGEEPA Article 170, relating to the temporary partial or total closure of pollution sources; the seizure of materials, wastes, or products, and neutralization or any similar action to prevent ecological disequilibrium or grave harm or deterioration of natural resources. The Council takes note of Mexico's statement that the Tangram-I and Nerita-I wells are not currently operating and did not proceed to the hydrocarbon extraction phase.

For the foregoing reasons, the Council instructs the Secretariat to prepare a factual record with respect to LGEEPA Article 170.

1. The United States does not make this observation.
2. The United States supports the full scope of the Secretariat's NAAEC Article 15(1) notification, issued 30 September 2020, to develop a factual record for submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*) on the Submitters' assertions relating to Mexico's alleged failure to effectively enforce Article 28, paragraphs I and XIII of the LGEEPA, Article 88, paragraph III of the LGEEPA, and Article 170 of the LGEEPA.

APPENDIX 2

Revised submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*) (21 February 2019)

AA14/SEM/18-003/08/RSUB
DISTRIBUTION: General
ORIGINAL: Spanish

Monterrey, N.L., 21 February 2019

Commission for Environmental Cooperation
393, rue St-Jacques Ouest
Bureau 200
Montréal (Québec) H2Y 1N9
sem@cec.org

RE: Presenting complementary information for submission SEM-18-003, *Hydraulic Fracturing in Nuevo León*

[Names and identification data confidential pursuant to NAAEC Article 11(8)(a)]

SECRETARIAT OF THE COMMISSION FOR ENVIRONMENTAL COOPERATION
Mr. Robert Moyer
Mr. Paolo Solano

P R E S E N T :

[redacted] and [redacted], on behalf of and representing the community of Hacienda El Carrizo and other neighboring communities in the municipality of Los Ramones, Nuevo León, Mexico, respectfully present this revised submission in compliance with the criteria set out in the Secretariat's determination of 15 November 2018 on submission SEM-18-003, *Hydraulic Fracturing in Nuevo León*.

MOTIVATION

This purpose of this submission is to report the Government of Mexico's failures to effectively enforce the environmental law applicable to the practice of hydraulic fracturing, also known as fracking. These enforcement failures relate to the following legal instruments:

- General Ecological Equilibrium and Environmental Protection Act (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*—LGEEPA).
- Federal Environmental Responsibility Act (*Ley Federal de Responsabilidad Ambiental*—LFRA).
- Regulation to the General Waste Prevention and Management Act (*Reglamento de la Ley General de Prevención y Gestión Integral de Residuos*—LGPGIR Regulation).
- Guidelines for the Protection and Conservation of National Waters in Connection with Hydrocarbon Exploration and Extraction in Unconventional Deposits (*Lineamientos para la Protección y Conservación de las Aguas Nacionales en Actividades de Exploración y Extracción de Hidrocarburos en Yacimientos No Convencionales*—National Waters Contamination Prevention Guidelines).

This submission seeks to have the Commission for Environmental Cooperation (CEC) prepare a factual record documenting failures in the effective enforcement of environmental law in connection with the approval of hydraulic fracturing projects that degrade water and land ecosystems in the communities of Los Ramones. In response to paragraph 14 of the Secretariat's determination, this revised submission presents details as to the nature of these enforcement failures. But first, we think it important to provide some background on the situation in our community and the events that have occurred.

INTRODUCTION

The community of Los Ramones, Nuevo León, is located in a region where people rely on livestock, agriculture, and on groundwater for their water supply. Nuevo León has an extreme climate characterized by very little rainfall. It is a hot, semiarid region where water is very important for agriculture, ranching, and the residents' household needs. Los Ramones is located more or less in the centre of the state. PEMEX has been exploring for hydrocarbons in the area of Los Ramones and other places in the state of Nuevo León. In particular, PEMEX drilled two wells, Tangram–1 and Nerita–1, to use hydraulic fracturing and explore for hydrocarbons in the unconventional Upper Jurassic Pimienta shale play that lies below the soil surface in Nuevo León and Los Ramones.[1]

The manner in which the Mexican authorities approved hydraulic fracturing in this area illustrates the violation of Mexican environmental law. The harms were caused by fracking, which contaminates fresh water with salt and chemicals, causes earthquakes, and interferes with aquifer recharge.

As shown in this submission, the Ministry of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*—Semarnat), the authority responsible for environmental impact assessment and for approval or denial of environmental permits, has failed to require effective compliance with Mexican environmental legal provisions. As further demonstrated in this submission, Semarnat did not require PEMEX to comply with the requirement to produce an environmental impact statement; or, if one was in fact produced, there was no effective mitigation of the negative impacts on our environment. We have searched on the appropriate portals and websites without finding the environmental impact statement (EIS), leading us to believe that it does not exist, at least in a visible form.

The Government of Mexico approved the PEMEX fracking projects while failing to enforce the following environmental laws: LGEEPA Article 28, on the obligation to file an EIS before a project is approved; LGEEPA Article 15, on the obligation to repair harms ensuing from a work that affects the environment; LGEEPA Article 122, on control of wastewater; LGEEPA Article 170, authorizing the government to apply safety measures; LGEEPA Articles 1, 15, and 88, on sustainable water use; Articles 2 and 91 of the LGPGIR Regulation, requiring that wastewater be discharged into geologically stable formations that isolate it from water sources and the environment in general; and Articles 8 and 16 of the National Waters Contamination Prevention Guidelines, on the prevention of subsoil and aquifer contamination during the fracking process. All these qualify as environmental law in the sense of Article 45 of the North American Agreement on Environmental Cooperation (NAAEC), for the reasons detailed below.

We are filing this submission on enforcement matters in accordance with NAAEC Article 14, and we respectfully request that the Commission prepare a factual record to review Mexico's failures to enforce the environmental law. With a view to fulfilling the requirements of NAAEC Articles 14 and 15, a side agreement of NAFTA, we solemnly and truthfully state the following:

1. PEMEX, *Informe Anual 2013* (March 2014), at 17.

FACTS

a) Hydraulic fracturing

Hydraulic fracturing has taken place within the limits of the municipality of Los Ramones, N.L., specifically during the year 2013. Our in-depth research into this process led to an understanding that this is an unsustainable technique that causes harm to the environment. In particular:

- It requires millions of liters of water, affecting the availability of water for household use and other activities, such as agriculture and ranching.
- Well drilling requires over 750 different chemicals, many of them toxic.
- The wastewater also contains heavy metals and radioactive substances, making it unsuitable and impossible to be treated for return to the water cycle.
- This wastewater is poured into wastewater wells that often leak into and contaminate groundwater.
- Aquifers are contaminated with substances causing grave harm to human health.
- The toxic substances in this wastewater evaporate, causing air pollution.
- A correlation has been found between diseases of the nervous and endocrine systems, allergies, and cancer, on the one hand, and the proximity of wastewater wells and places where fracking has occurred, on the other.
- The gas extraction process emits greenhouse gases that contribute to global warming.
- During the fracking process, the geological formation is subjected to high pressure in order to fracture the rock. This is done by injecting large quantities of water into the ground. The pressure provokes microseisms that may have impacts on the localities where the process occurs.[2]
- There may be many other issues that we are unaware of.

We concluded that this practice threatens not only the environment but also the well-being of present and future generations, running counter to the first objective of the NAAEC. We therefore respectfully request that the Commission produce a factual record to review Mexico's failures to enforce its environmental law.

b) The Tangram–1 and Nerita–1 wells

In 2013, Petróleos Mexicanos (PEMEX) was working on land in the municipality of Los Ramones in the state of Nuevo León, Mexico, drilling deep wells to explore for and extract gas from the subsoil using the hydraulic fracturing technique. We, the local residents, were unaware of the kind of work being done.

We now know that they were working on two wells. According to the company's 2013 annual report, one is called Tangram–1 and is 19 km away from Hacienda El Carrizo in this municipality; the other is called Nerita–1 and is 7.2 km away. The aboveground structure of one of the wells has a plaque indicating the date when work began: 23 July 2013.

2. Centro de Derechos Humanos y Ambiente, *Informe Técnico y Legal Sobre Fracturación Hidráulica en Argentina* (October 2013), at 44, <http://center-hre.org/wp-content/uploads/2013/10/Fracking-Report-CEDHA-final-24-oct–2013-SPANISH.pdf>.

The Tangram–1 well is located in the Burgos watershed in the municipality of China, Nuevo León, and was completed in December 2013.[3] The well ultimately produced dry gas and reached a measured depth of 4,426 meters.[4] The well was drilled horizontally and was completed with multiple hydraulic fractures.[5] Some 25,808 m3 of water were injected into the Tangram–1 well.[6] In general, the water used in the hydraulic fracturing process contains many chemicals, some of which may be toxic.

The Nerita–1 well is located in the Burgos watershed in the municipality of Los Ramones, Nuevo León.[7] Its purpose is to assess the potential and productivity of oil and wet gas in the carbonaceous lutites [fine-grained sedimentary rocks] of the Upper Jurassic Pimienta Formation. It reached a measured depth of 4,100 meters.[8] The Nerita–1 well was completed on 8 August 2014,[9] and 13,039 m^3 of water were injected into it.[10]

c) Seismicity induced by hydraulic fracturing

In October 2013, we began to experience earthquakes in Los Ramones with some regularity. The strongest of these reached 4.5 on the Richter scale, according to official information. Many of our houses suffered structural damage as a result. After several such incidents, the alarmed residents appealed to the municipal authorities, who in turn summoned several company representatives, who never took responsibility for these phenomena. The media came to document and publish reports about what had happened. To date, no one has stepped forward to repair the damage to our houses. We do not know what happened below the surface of the ground after it was so violently subjected to fracking—a technique we are coming to understand and, increasingly, to fear. The company left, leaving us with the earthquakes (for now). But life in the village has not returned to normal.

According to studies by Juan Manuel Rodríguez Martínez and other experts from the Faculty of Civil Engineering of the Universidad Autónoma de Nuevo León, the epicenters of this seismic activity were "located in the municipality of Los Ramones, Nuevo León."[11] These earthquakes "coincide with the exploratory wells drilled in the Burgos watershed."[12] The researchers found that these "seismic movements are linked to hydraulic fracturing."[13]

Many houses have been affected by the seismic activity that occurred after fracking began near our community in Hacienda El Carrizo in the municipality of Los Ramones, N.L. We know that neighboring communities such as Ejido El Carrizo, Ejido La Conquista, Ejido Garza Ayala, Rancho La Peña, and Hacienda El Porvenir, all in the same municipality, also felt the earthquakes and that there were impacts on residential property in those communities as well. The news is that these tremors were also felt in several neighboring municipalities. People's sense of safety and reassurance has diminished due to their fear that these tremors will recur, and to the precarious condition of many dwellings. Most residents in the village are people of limited means who depend on dwindling agriculture and on ranching, which is now also in decline.

3. PEMEX, *Informe Anual 2013* (March 2014), at 38.
4. *Ibid.*
5. *Ibid.*
6. J. Rodriguez-Martinez, E. Rossello, A. Cruz Lopez, L. Arriaga-Díaz de León, and J. Bermudez-Cerda, *Shallow Seismicity and Fluid Exploitation in the Northern Burgos Basin (Nuevo León, Mexico), International Journal of Science and Engineering* (September 2018), at 8., <https://ephjournal.com/index.php/se/article/download/924/573/>.
7. PEMEX, *Informe Anual 2013* (March 2014), at 41.
8. *Ibid.*
9. Comisión Nacional de Hidrocarburos, *Seguimiento a la exploración y extracción de aceite y gas en lutitas* (November 2016), <https://cnh.gob.mx/informacion/docs/Exploraci%C3%B3n%20y%20extracci%C3%B3n%20de%20aceite%20y%20gas%20en% 20lutitas.pdf>.
10. J. Rodriguez-Martinez, V. Kalashnikov, L. Diaz de León, *Sismicidad inducida por la fractura hidráulica en el estado de Nuevo León, Congreso Colombiano de Geología* (September 2015), <https://www.scribd.com/doc/294936501/Sismicidad-inducida-por-la-fractura-hidraulica-en-el-estado-de-Nuevo-Leon-Mexico>.
11. *Ibid.*
12. *Ibid.*
13. *Ibid.*

d) Impacts on water, the environment, and agriculture

Some time after the drilling of the Nerita–1 and Tangram–1 wells, the wells in our homes and fields began to dry up. We attributed this to natural causes; after all, it is a semi-arid area where drought does occur. The drought continued and we could no longer plant seeds or water our animals. There wasn't even any water for basic human consumption, so we started digging deeper in search of water. We did eventually find it, but in many wells, it is clearly contaminated, with a foul odor making it undrinkable. We commissioned a professional water test and it was found that even water samples that appeared to be clean had high levels of salt and other substances. For this reason, we were told that the water is definitely not potable (copy of results attached). We will not know whether fracking had something to do with this contamination until more samples are tested. What we do know is that the water we used to draw from our wells in previous years, before we had to dig deeper, was never problematic. We all drank it and used it for our activities.

Despite the extreme climate of this village, it was always possible to plant crops such as corn, beans, and some vegetables. There are many nut and orange trees and we could plant forage crops for our animals. Today, we have had to stop doing these things. The big trees have been withering. Something is happening with the water that is having a negative impact on the plants. We fear for our animals — cattle, goats, sheep — which have no choice but to drink this water. We dread to think what would happen if fracking were to continue here. No living thing would be able to survive.

The people of the community of Hacienda el Carrizo, in the municipality of Los Ramones, N.L., cannot drink the water pumped from our own wells. We only use it now for household cleaning and personal hygiene, and we do not know whether this latter use can cause skin conditions over the long term. Our backyard animals, which we will eventually eat, drink from these wells, and we do not know whether there could be harm to people who eat this meat. The trees watered from these wells have been declining, some of them even losing their leaves. This affects the already harsh climate, making the summers hotter.

APPLICABLE LAWS AND FAILURES TO ENFORCE THE ENVIRONMENTAL LAW

Although generally applicable, the laws detailed below qualify as environmental law under NAAEC Article 45 because their primary purpose is the protection of the environment or the prevention of danger to human life or health.

These laws include LGEEPA Article 28, requiring the government to approve an environmental impact statement before approving a project; LGEEPA Article 15, requiring those who carry out works that affect the environment to repair the harms; LGEEPA Article 122, on control of wastewater; Article 170, on the government's power to take safety measures; LGEEPA Articles 1, 15, and 88, requiring water to be used sustainably; LFRA Articles 6, 7, and 10; Articles 2 and 91 of the LGPGIR Regulation, requiring that wastewater be discharged into geologically stable formations in order to isolate it from water sources and the environment in general; and Articles 8 and 16 of the National Waters Contamination Prevention Guidelines, requiring the prevention of subsoil and aquifer contamination ensuing from hydraulic fracturing and the listing of chemicals used.

a) Environmental impact assessment under the LGEEPA

The LGEEPA is regulatory to the provisions of the Mexican Constitution that relate to environmental preservation, protection, and restoration. This law is for public order and the social interest and has, among others, the following objectives: 1) achieving sustainable development; 2) preventing and controlling air, water, and soil pollution; 3) establishing the powers of the municipalities, the states, and the federation, and 4) establishing the environmental impact assessment procedure and the criteria that the authority must observe when assessing projects. For its implementation, the LGEEPA has a set of regulations and contains general provisions that are elaborated upon in specific laws.

Semarnat also issues national environmental protection standards such as the Mexican official standards, which complement the above-mentioned legislation.

LGEEPA Article 28 creates the obligation to file an environmental impact statement (EIS) before beginning work that can have an impact on the environment. This same article gives Semarnat the power to approve or reject environmental impact studies, while number E00 of the Internal Regulation of Semarnat identifies the Federal Attorney for Environmental Protection (*Procuraduría Federal de Protección al Ambiente*—Profepa) as the authority in charge of inspecting, monitoring, and verifying that works and activities are covered by an environmental impact approval and comply with its conditions.[14] The Environmental Impact Assessment Regulation to the LGEEPA (*Reglamento de la Ley General del Equilibrio Ecológico y la Protección al Ambiente en materia de Evaluación de Impacto Ambiental*) details the stages of the environmental impact assessment procedure.

We do not know whether PEMEX complied with the requirement to prepare an EIS, or with any other administrative requirement, before using the wells to explore for gas; we have searched on the relevant portals and websites but have found nothing. But we can confidently assert that the environmental impact on our communities has been negative and that no authority to date has taken responsibility for the harms caused since the company began its drilling and exploration. Attached is our official communication on the matter to various local and federal bodies.

If an environmental impact statement has indeed been produced, then neither the government nor PEMEX has complied with the public participation requirement set out in LGEEPA Article 177. In addition, if the company did produce an EIS, it did not meet the requirement to study and mitigate the consequences, because our water is contaminated and our aquifers are not functioning as they did before.

b) Prevention and Control of the Pollution of Water and Aquatic Ecosystems

LGEEPA Article 122 provides that wastewater from industrial uses must meet the conditions necessary to prevent: (i) contamination of receiving bodies; (ii) interference with water treatment processes, and (iii) impediments or alterations to the proper working or use of drainage or sewer systems or to the hydraulic capacity of watersheds, beds of watercourses, ponds, aquifers, and other bodies of water that are the property of the nation.

LGEEPA Article 122 requires the control of wastewater. The hydraulic fracturing process produces wastewater that contaminates the environment. The Mexican government failed to prevent: (i) contamination of receiving bodies, (ii) interference with water treatment processes, and (iii) impediments or alterations to the proper working or use of drainage or sewer systems or to the hydraulic capacity of watersheds, beds of watercourses, ponds, aquifers, and other bodies of water that are the property of the nation.

The government failed to enforce Article 122 in that: (i) as detailed above, our water is contaminated with salts and other chemicals, this being the proof that the government failed to prevent the contamination of receiving bodies; (ii) the presence of contaminants in our water resembling those typically used in hydraulic fracturing, and not removable by the natural filtration processes through which our water passes, suggests that the government also failed to prevent interference with our water treatment processes; and (iii) the groundwater recharge rate is much lower than in times past. Due to the alterations caused by the fracking, we had to drill deeper wells, since the system and the hydraulic capacity of our aquifers are not working as before. These facts demonstrate that the government also failed to prevent alterations to the proper functioning or use of our groundwater systems. It leads us to think that this interference and these changes were caused by the thousands of liters of contaminated water injected during the fracking process, as occurs in wells such as Tangram–1 and Nerita–1.

14. Secretaria de Gobernación, Diario Oficial de la Federación, 13 August 2003, *Manual de Organización General de la Secretaría de Medio Ambiente y Recursos Naturales*, <http://dof.gob.mx/notadetalle.php?codigo=691867&fecha=13/08/2003>.

c) Water sustainability

LGEEPA Article 88 provides that sustainable water use requires the government to consider the recharge capacity of aquifers. Furthermore, according to Article 1, one object of the LGEEPA is to provide for the sustainable use of water so that it remains compatible with both the ability to derive economic benefit and the preservation of ecosystems. The government's duty to protect sustainable water use also derives from Article 15, which provides that "ecosystems and their components must be used in a manner that ensures optimal and sustained productivity compatible with their equilibrium and integrity."

We have learned that fracking for gas requires millions of liters of water. It is obvious that this level of water demand greatly exceeds the capacity of the local aquifers, thus disrupting the sustainable use of this resource. By virtue of its failure to prevent this impediment to sustainable water use, the government violated LGEEPA Articles 1, 15, and 88.

When we began to notice a water shortage in 2014, we attributed it to a natural drought, but while in other years we had not needed to drill deeper, this time we did have to do so. This water shortage, and the need to drill deeper wells, indicates that the recharge capacity of the aquifers has been harmed, a harm that the government failed to prevent, in violation of LGEEPA Article 88. We later learned that the event coincided with the months following the drilling of the fracking wells. That is when we began to notice the clear contamination of our water, leading us to think that the drilling of the fracking wells is also directly connected with this grave problem, which also affects the health of human beings and all living creatures, not to mention the impacts on our ability to earn a living, in violation of LGEEPA Articles 1 and 15.

d) Failure to repair the harm as prescribed by the LGEEPA and the LFRA, and failure to ascertain the costs of the environmental harms as prescribed by the LFRA

LGEEPA Article 15 reads as follows: "Anyone who performs works or activities that affect or may affect the environment is obligated to prevent, minimize, or repair any harm that he may cause and to bear any costs entailed by such impact." Article 15 continues, "ecosystems and their elements shall be used in a manner that guarantees optimal and sustainable productivity, compatible with their equilibrium and integrity." The government did not require PEMEX to comply with this. Not only may our presumption of the nonexistence of an EIS be true, but we also, apparently, have here a clear violation of environmental law causing severe harm to the environment, for which reparation and/or compensation is required under the LFRA, since it would not be possible to fulfill the conditions of Article 6 of the Act.

In this regard, LFRA Article 10 provides that "any physical or legal person who, by his act or omission, directly or indirectly causes harm to the environment shall be responsible and obligated to repair the harm, or, where repair is impossible, to make the applicable environmental compensation, as prescribed by this Act."

In the case at hand, the impacts in the area are clear, evidencing the considerable environmental harm occurred since 2013, yet so far no one has taken responsibility, despite the existence of that obligation in Mexican law.

Moreover, Semarnat has failed to enforce LFRA Article 7 because, since the publication of this Act, no Mexican official standard whatsoever has been issued to regulate fracking. In short, this authority has utterly failed to fulfill its obligations to afford certainty and to induce economic agents to bear the costs of the harms they cause to the environment through this specific technique for the extraction of hydrocarbons.

e) Water discharges under the LGPGIR Regulation

Articles 2 and 91 of the LGPGIR Regulation require that wastewater be discharged into geologically stable formations that isolate it from water sources and from the environment in general.[15] The primary purpose of these articles is the protection of the environment and not the administration of natural resource use. To bolster the argument that this law qualifies as environmental law under NAAEC Article 45, note that the Secretariat has previously found that similar US wastewater laws are environmental law under NAAEC Article 45, even though those laws governed fracking operations.[16] The Secretariat can reach a similar finding in this case—that Mexican wastewater laws are also environmental laws. We can then conclude that the Mexican government failed to enforce these articles, because the wastewater was not discharged into geologically stable formations that isolate it from water sources and the environment in general. Our contaminated water is the proof.

f) Safety measures

LGEEPA Article 170 provides that where there is an imminent risk of ecological disequilibrium or in cases of contamination with dangerous consequences for public health, Semarnat may order safety measures, including (i) temporary partial or total closing of contamination sources; (ii) seizure of hazardous materials and wastes; (iii) neutralization to prevent hazardous materials or wastes from giving rise to certain effects.

Article 170 gives the government the power to take safety measures. The Mexican government failed to take safety measures to protect our houses and aquifers, the proof being that the damage mentioned above occurred in conjunction with the fracking done in our municipality.

g) National Waters Contamination Prevention Guidelines

In addition, under Article 16 of the National Waters Contamination Prevention Guidelines, regulated parties such as PEMEX must prevent the infiltration of contaminating substances into subsoil and aquifers by isolating the ground at the drilling sites through the installation of impermeable coverings. Article 17 reads: "With the objective of protecting groundwater quality, regulated parties shall build an exploration well in each extraction area," and "prior to commencement of activities…they shall submit information on each well to the Commission," including location, characteristics, design, lithological section, and geophysical records. Article 8 of the guidelines requires PEMEX to provide a detailed list of additives, among other things. Under Article 18, regulated parties must build wells to form a regional monitoring network, so that the government can determine the water baseline, as well as a local monitoring network. As per Article 25 of these guidelines, the failure to comply with these requirements can give rise to administrative penalties, an obligation to repair any environmental harm caused, and/or an obligation to pay environmental compensation, as well as other types of civil, criminal, or administrative liability

These guidelines are law because they establish "the requirements with which regulated parties must comply, as regards the protection and conservation of national waters and their inherent public property, when they engage in exploration and extraction of hydrocarbons in unconventional deposits."[17] In other words, the guidelines are requirements with which regulated parties must comply, and in this sense constitute law. They are also law because they give regulated parties only 180 days in which to take the measures necessary in order to comply with these provisions. In addition, the guidelines qualify as environmental law because their primary purpose is the protection of national waters. Under the NAAEC, an article of a law is determined to be "environmental" with

15. LGPGIR Regulation, *Diario Oficial de la Federación* (November 2006), <https://www.informea.org/sites/default/files/imported-documents/UNEP-CHW-NATLEG-NOTIF-Mexico-17-REG-PreventionComprehensiveWastesManagement.Spanish.pdf>.
16. SEM-15-003 (*Municipal Wastewater Drop Shafts*), Article 14(1) and (2) Determination, <http://www.cec.org/sites/default/files/submissions/20112015/15-3-det1412en0.pdf>.
17. Lineamientos para la Protección y Conservación de las Aguas Nacionales en Actividades de Exploración y Extracción de Hidrocarburos en Yacimientos No Convencionales, Article 1, <http://www.dof.gob.mx/nota_detalle.php?codigo=5495543&fecha=30/08/2017> (emphasis added).

reference to its primary purpose, not the primary purpose of the law as a whole.[18] In this case, both the guidelines in general (whose title contains the words "water protection and conservation") and the articles in question have environmental protection as their primary purpose. For example, the purpose of Article 16 of the guidelines is protection of water and subsoils. Article 17 contains the phrase, "with the objective of protecting groundwater quality." The purpose of Article 18 is the monitoring of water quantity and quality. It may thus be seen that these guidelines are environmental law.

The Government of Mexico failed to enforce Article 16 of the guidelines because it did not prevent infiltration of contaminating substances into the subsoil and aquifers. Our subsoil and aquifers are contaminated with salts and chemicals from the fracking process. We do not know whether there was enforcement of Article 8 of the guidelines, requiring PEMEX to provide a detailed list of additives, among other things. We do not know whether PEMEX complied with Article 17, requiring the company to submit information on each well to the Commission. We do not know whether PEMEX has data from a monitoring network pursuant to Article 18. Nevertheless, it appears that the government did not enforce Article 25 by applying penalties due to PEMEX's failure to prevent infiltration of contaminating substances pursuant to Article 16.

CONCLUSIONS

From 2014 on, the residents of the region have seen impacts on our soil. We used to be able to plant regularly, despite the variability in our climate. Starting with the activities carried out in the two above-mentioned wells, our agricultural activities have been harmed and the situation only appears to be getting worse.

Furthermore, the people's peace of mind has been seriously affected by the earthquakes that occurred right after activity in the vicinity of the wells was stepped up, and we felt and heard what sounded like thunder below ground. We know that peace of mind is directly related to health, and in addition our homes were permanently affected with structural damage that now threatens our physical integrity.

Another point is that the harms to flora, fauna, and the soil are affecting the ecosystem as a whole. This can readily be explained as a state of grave ecological disequilibrium. The end result has been an impact on the right to health and well-being, not only of those who live in the vicinity of the affected area but of those who live in the natural region connected with the affected aquifers.

All this is clear evidence of failures to effectively enforce the environmental law and a violation of the rights enshrined in Article 4 of the Mexican Constitution itself, with respect to our right to live in a healthy environment, and with respect to the need to prevent and control air, water, and soil pollution and to care for the ecosystems on which our life and our society depend.

Someone might say that the impacts on our houses from the earthquakes are just minor damage, but for us they are major, since this is our family heritage. A further impact is our inability to work in the field as before, a harm experienced by many residents of these villages. The worst impact is the grave water contamination, although we still do not know the extent to which the health of the people and the whole ecosystem will be harmed.

None of the problems we detail in the submission have been addressed, even though we started appealing as a community to the municipal authorities and to certain PEMEX officials as soon as the problems started to occur. The land on which the wells were drilled is desolate, and the equipment used for the installation and preparation of wastewater management is abandoned, as shown in the attached photographs. No one has come back to remedy any of the harms caused since those months in 2013. We doubt whether anyone has so much as measured or estimated the severity of the harm caused by the responsible party: the quasi-governmental corporation PEMEX.

18. NAAEC Article 45(2)(c).

FULFILLMENT OF THE REQUIREMENT OF COMMUNICATING THE MATTER TO THE GOVERNMENT

With respect to paragraph 31 of the determination issued by the CEC Secretariat, which requires our revised submission to include information indicating that the matter has been communicated in writing to the relevant authorities and to indicate whether there has been any response, we hereby confirm that at the time the events occurred, the only thing we could do was to appeal personally to the municipal authorities and the media, and we managed to obtain some coverage of our case. In order to comply with all the requirements indicated, to ensure that our submission will be allowed and a factual record will be prepared, we immediately set about communicating the matter in writing to the various bodies that we understood could and should resolve our requests. On 27 November 2018, we sent such letters to Semarnat, Conagua, and Servicios de Agua y Drenaje de Monterrey, in addition to mailing the same letter to the National Industrial Security and Environmental Protection Agency for the Hydrocarbon Sector (*Agencia Nacional de Seguridad Industrial y de Protección al Medio Ambiente en el Sector de Hidrocarburos*—ASEA) in Mexico City. Copies of these letters, stamped as received, are attached.

Under Mexican law, the authorities should have responded to these letters within twenty (20) days. We have had no response to the first three letters. ASEA did respond, stating that it would investigate the case (this response is also attached) but providing no details about compensation for the harm perpetrated. To this date, 22 February 2019, two months after this response, nothing has happened.

While one authority has actually read and replied to our letter, we believe that an excessive amount of time has elapsed since the impacts began. The media reported on the case at the time, and the Agua y Drenaje authorities have heard numerous complaints about poor water quality, but they have done nothing. PEMEX knows full well how upset the residents of this municipality are but has done nothing to remedy the situation—not even something so indispensable and vital as ensuring that we have enough water, since it is no longer potable in our communities. This is why, although we have received a response from one of the bodies to which we communicated the case, we need to continue with this submission.

THE SUBMISSION MEETS THE REQUIREMENTS OF NAAEC ARTICLE 14(1) AND WARRANTS THE PREPARATION OF A FACTUAL RECORD

We trust that what we have presented here fills in the gaps in the original submission that you noted in your determination. We think we have now provided better and sufficient information that will allow the Secretariat to review the submission, and that we have included references to the documentary evidence on which it is based. The submission demonstrates that the failure to effectively enforce the environmental law by requiring an environmental impact statement and conducting environmental impact assessment does not reflect a "reasonable exercise of discretion in respect of investigatory, prosecutorial, regulatory or compliance matters," nor does any of this "result from bona fide decisions to allocate resources to environmental matters determined to have higher priorities."[19] The submission demonstrates the various violations and the government's failure to prevent harm to us.

Now that we know all that is entailed by fracking, our final objective, in addition to repair of the harm to our water and land, is that a permanent moratorium be placed on fracking in our state, throughout the country and, if possible, everywhere else, since ecosystems and the vital soil, water, and air resources on which we all depend are gravely endangered by this practice. Our personal experience is the proof.

19. NAAEC Article 45(1)..

In light of the foregoing, and in view of the facts presented, we hereby request:

1. That the CEC kindly allow this revised submission and begin an investigation to corroborate the failure to enforce the environmental law in the case of **Hydraulic Fracturing in Nuevo León**.
2. That a factual record be produced pursuant to NAAEC Articles 14 and 15 with a view to corroborating our assertions of failures to effectively enforce Mexico's environmental law.

Thank you in advance for your kind attention. We look forward to your determination.

[redacted]

APPENDICES:

- Communications to Semarnat, Agua y Drenaje de Monterrey, and Conagua, stamped as received.
- Correos de México postmark for the similar letter sent to ASEA.
- Letter of response from ASEA.

APPENDIX 3

Environmental law in question

General Act on Ecological Balance and Environmental Protection (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*)

Artículo 88. For the sustainable use of water and aquatic ecosystems, the following criteria shall be considered:

I. …

II.-…

III. To maintain the integrity and equilibrium of the natural elements involved in the water cycle, the protection of forest and wooded soils and areas, as well as the maintenance of basic flows in watercourses and the recharge capacity of aquifers, shall be considered.

IV.…

Artículo 170. Where there exists an imminent risk of ecological disequilibrium or of serious harm to or deterioration of natural resources, or in cases of contamination with dangerous consequences for ecosystems, their components, or public health, the Ministry may, with proper justification, order any of the following safety measures:

I. Temporary partial or total closing of contamination sources and of facilities handling or storing specimens, products, or subproducts of wildlife species, forest resources, or carrying on activities that give rise to the conditions to which the introductory paragraph of this article refers.

II. Seizure of hazardous materials and wastes as well as specimens, products, or subproducts of wildlife species or their genetic material, forest resources, and also property, vehicles, tools, and instruments directly related to the conduct giving rise to the application of the safety measure.

III. Neutralization or any similar measure to prevent hazardous materials or wastes from giving rise to the effects contemplated in the introductory paragraph of this article.

In addition, the Ministry may apply to the competent authority for the application of any safety measure that may be prescribed by other provisions.

APPENDIX 4

General request for information for preparation of the factual record concerning submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*)

I. The factual record process

The Commission for Environmental Cooperation (CEC) is an international organization created by the North American Agreement on Environmental Cooperation (NAAEC or the "Agreement"), signed by Canada, Mexico, and the United States in 1994. The Agreement on Environmental Cooperation (ECA), signed by the governments of Canada, the United Mexican States, and the United States of America, came into force on 1 July 2020, as of which date it supplanted the NAAEC. The CEC is composed of three operational bodies: the Council, composed of the highest federal-level environmental authorities of the three countries; the Joint Public Advisory Committee, made up of five citizens of each country, and the Secretariat, headquartered in Montreal, Canada.[1]

Articles 14 and 15 of the NAAEC provided for a process allowing any person or nongovernmental organization to file a submission asserting that a Party to the Agreement is failing to effectively enforce its environmental law. However, the submissions on enforcement matters process is now governed by chapter 24 of the new trade agreement signed by the three countries, the United States-Mexico-Canada Agreement (USMCA), in force as of 1 July 2020. The ECA, signed by the governments of Canada, the United States, and Mexico, came into force on the same date and now supplants the NAAEC for any submission brought to the CEC as of that date. However, ECA Article 2(4) provides that any submission made pursuant to the NAAEC and not concluded as of the entry into force of the ECA shall continue to be processed in accordance with the procedures established under NAAEC Articles 14 and 15, unless the Council decides otherwise.

The Secretariat initially considers such submissions to determine whether they meet the criteria contained in NAAEC Article 14(1). When the Secretariat finds that a submission meets these criteria, it then determines, pursuant to the provisions of NAAEC Article 14(2), whether the submission merits a response from the concerned Party. In light of any response from the concerned Party, and in accordance with the NAAEC, the Secretariat may notify the Council that the matter warrants the development of a factual record, providing its reasons for such recommendation in accordance with NAAEC Article 15(1). Where the Secretariat decides to the contrary, or where certain circumstances obtain, it then proceeds no further with the submission.

1. For detailed information on the various stages of the process, as well as on the Secretariat's determinations and factual records, visit the submissions on enforcement matters page of the CEC website at <www.cec.org/submissions>..

The introduction to the *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation* (the "Guidelines") gives guidance as to the contents of a factual record:

> The purpose of a factual record is to provide an objective presentation of the facts relevant to the assertion set forth in a submission and to allow the readers to draw their own conclusions regarding a Party's environmental law enforcement. Although a factual record is not to contain conclusions or recommendations, it is expected to generally outline the history of the environmental enforcement issue raised in the submission, the relevant legal obligations of the Party, and the actions of the Party in fulfilling those obligations; as such, it is another valuable outcome of this information sharing-process…[2]

Pursuant to NAAEC Article 15(4) and section 11.1 of the Guidelines, in preparing factual records, the Secretariat will consider any relevant technical, scientific or other information that is publicly available; submitted by the Joint Public Advisory Committee (JPAC) or by interested nongovernmental organizations or persons, or developed by the Secretariat or independent experts.[3]

On 3 October 2018, a person residing in Mexico (the "Submitter") filed submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*) in accordance with NAAEC Article 14(1). The Submitter asserts that the government of Mexico is failing to effectively enforce its laws in connection with site restoration and abandonment subsequent to hydraulic fracturing carried out in the community of Hacienda El Carrizo, municipality of Los Ramones, Nuevo León. On 8 April 2020, the government of Mexico submitted its response to the submission. After reviewing the submission in light of the Party's response, the Secretariat recommended the production of a factual record with respect to the effective enforcement of LGEEPA Articles 28 paragraphs I and XIII, 88 paragraph III, and 170.

On 5 October 2023, in Council Resolution 23-05, the CEC Council instructed the Secretariat to prepare a factual record for submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*) as per the Secretariat's recommendation in its notification of 17 December 2018. The Secretariat is therefore requesting relevant information relating to the matters to be addressed in the factual record.

II. Examples of relevant factual information

Examples of information of a technical, scientific or other nature necessary for the preparation of the factual record are given below. You are kindly requested to send this information in electronic format to facilitate its management and integration. Information sent to the CEC Secretariat is understood to be subject to no limitations as regards confidentiality.

1. Information related to safety measures applied in response to the effects of the Tangram–1 and Nerita–1 wells.
2. Letters and documentation relating to the authorities' jurisdiction over the application of safety measures with respect to the Tangram–1 and Nerita–1 wells.
3. Information comprising the application of safety measures to preserve the integrity and equilibrium of the water cycles of rivers, lakes, and other bodies of water in the vicinity of the Tangram–1 and Nerita–1 wells.
4. Information describing matters posing any imminent risk of ecological disequilibrium resulting from the possible effects of the construction and/or, as applicable, the maintenance and operation of the Tangram–1 and Nerita–1 wells.

2. CEC, *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation*, p. 3, available at <www3.cec.org/islandora/en/item/10838-guidelines-submissions-enforcement-matters-under-articles-14-and-15-north>.
3. Guideline 11.1.

5. Information describing matters posing possible serious harm to or degradation of natural resources due to the construction and, as applicable, the maintenance and operation of the Tangram–1 and Nerita–1 wells.
6. Information describing matters relating to possible cases of contamination with dangerous repercussions for ecosystems, their components, or public health as a result of construction and, as applicable, the maintenance and operation of the Tangram–1 and Nerita–1 wells.
7. Reports by the federal, state, or municipal authorities concerning matters relating to the Tangram–1 and Nerita–1 wells.
8. Any other technical, scientific, or other information that may be relevant for inclusion in the factual record.

III. Additional background information

The submission, Mexico's response, the Secretariat's determinations, Council Resolution 23-05, and other information corresponding to submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*) is available in the registry of submissions on the CEC website at <http://www.cec.org/submissions/registry-of-submissions/>. These documents may also be requested from the Secretariat at <sem@cec.org>.

IV. Where to send the information

Relevant information for the preparation of the factual record should preferably be sent by e-mail to <sem@cec.org>. It may also be sent via cloud storage platforms such as SkyDrive, Google Drive, or Dropbox.

Where the information is not available in electronic format, please send it to the Submissions on Enforcement Matters Unit (the SEM Unit) at the following address:

CEC Secretariat
Legal Affairs and SEM Unit
700, rue de la Gauchetière Ouest, bureau 1620
Montreal, QC, H3B 5M2
Canada

Please mention submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*) in your correspondence.

APPENDIX 5

Work plan for the preparation of the factual record for submission SEM-18-003 (*Hydraulic Fracturing in Nuevo León*)

Submitter: **[Confidential information pursuant to NAAEC Article 11(8)(a)]**

Party: United Mexican States

Date of this work plan: 18 October 2023 (updated on 7 June 2024)

Submission no.: **SEM-18-003 (*Hydraulic Fracturing in Nuevo Leon)***

On 5 October 2023, by means of Council Resolution 23-05, the Council of the Commission for Environmental Cooperation (CEC) unanimously decided to instruct the CEC Secretariat to prepare a factual record in accordance with Article 15(2) of the North American Agreement on Environmental Cooperation (NAAEC) with regard to alleged failures to effectively enforce the following legal provisions:[1]

- Article 88 paragraph III of the General Ecological Equilibrium and Environmental Protection Act (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*—LGEEPA), with respect to sustainable water use, and
- LGEEPA Article 170, with respect to the establishment of safety measures.

The Council directed the Secretariat to provide the Parties with an overall work plan for gathering relevant facts; it requested to be kept informed of any future changes or adjustments to such plan, and to be consulted immediately if the Secretariat should require any clarification with regard to the scope of the factual record. In the following, the Secretariat sets out the overall plan of work for developing the draft factual record.

Article 2(4) of the Environmental Cooperation Agreement, in force as of 1 July 2020, establishes that active submissions "shall continue in accordance with the procedures established under Articles 14 and 15 of the NAAEC". Therefore, this general plan conforms to the provisions of the NAAEC and the *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation* (the "Guidelines").

Overall Plan

Pursuant to paragraph 19.5 of the Guidelines, "[t]he Secretariat should conclude the preparation of the draft factual record normally within 180 working days of being so instructed by the Council." In this regard, the estimated time for the preparation of draft factual record SEM-18-003 (Hydraulic Fracturing in Nuevo Leon*) is consistent with the timeframes established in paragraphs 19.5, 19.6, 19.7 a*nd 19.8 of the *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation*.

1. See the public registry corresponding to submission SEM-18-003, which contains all documents and progress in relation to the process, on the CEC website at <http://www.cec.org/submissions-on-enforcement/registry-of-submissions/hydraulic-fracturing-in-nuevo-leon/>.

The overall plan is as follows:

Information gathering

In order to conform to the time period of 180 working days, and to ensure that the Secretariat has sufficient time to gather information and incorporate it into the draft factual record where appropriate, the Parties are invited to provide relevant information within the 30 working days following the request for this information, as detailed below.

1. Through public notices or direct requests for information, the Secretariat will invite the Submitters; the Joint Public Advisory Committee (JPAC); community members; the general public; and municipal, state and federal government from the Parties to submit information relevant to the scope of fact-finding outlined in Council Resolution 23-05. The Secretariat will provide sufficient information to enable interested nongovernmental organizations or persons, and/or the JPAC to provide relevant information to the Secretariat as per NAAEC Article 15(4).

   Planned for: October 2023 to February 2024.

2. The Secretariat will request information relevant to the factual record from the federal authorities of Mexico, as appropriate, and shall consider any information furnished by a Party as per NAAEC Articles 15(4) and 21(1)(a). Also, meetings with relevant authorities will be scheduled. The authorities to which it is planned to send a request for information are as follows:

   - Security, Energy and Environment Agency;
   - National Water Commission;
   - Ministry of the Environment and Natural Resources, and
   - Office of the Federal Attorney for Environmental Protection.

   Planned for: October 2023 to February 2024.

3. The Secretariat will gather relevant technical, scientific or other information that is publicly available, including from existing databases, public files, information centers, libraries, research centers, and academic institutions as per NAAEC Article 15(4)(a).

   Planned for: October 2023 to February 2024.

4. The Secretariat, as appropriate, will collect relevant technical, scientific or other information for the preparation of the factual record, from interested nongovernmental organizations or persons, the JPAC and/or independent experts as per NAAEC Article 15(4)(b) and (c).

   Planned for: October 2023 to February 2024.

5. The Secretariat, as appropriate, will develop, through independent experts, technical, scientific or other information relevant to the factual record as per NAAEC Article 15(4)(d).

   Planned for: October 2023 to February 2024.

Au cours de la même période, le Secrétariat programmera une visite sur le terrain.

Writing, editing, and translation of draft factual record

6. In accordance with NAAEC Article 15(4), the Secretariat will prepare the draft factual record based on the information gathered and developed.

   Planned for: November 2023 to April 2024.

7. The Secretariat will translate and finalize editing of the draft factual record into the other official languages of the CEC.

   Planned for: May to August 2024.

Submission of draft factual record to Council, comments on the accuracy of the factual record, and publication

8. In accordance with NAAEC Article 15(5) and paragraph 19.5 of the Guidelines, the Secretariat will submit a draft factual record to Council within 180 working days of being so instructed by Council.

   Deadline: No later than 26 June 2024.

The deadlines given below will be adjusted if the Secretariat submits a draft factual record to Council prior to the date given in paragraph 8.

9. Any Party may provide comments on the accuracy of the draft within 45 days thereafter, in accordance with NAAEC Article 15(5) and paragraph 19.6 of the Guidelines.

   Deadline: 45 days following the delivery of the draft factual record.

10. As provided by NAAEC Article 15(6) and paragraph 19.7 of the Guidelines, the Secretariat will incorporate, as appropriate, any such comments in the final factual record and submit it to Council, normally within the period of 45 days following receipt of comments from the Parties.

    Deadline: 45 days following the receipt of comments from the Parties.

11. The Council may, by a two-thirds vote, make the final factual record publicly available, normally within 60 days following its submission, in conformance with NAAEC Article 15(7).

    Deadline: 60 days following the submission of the final factual record.

Additional Information

The submission, the Party's response, the Secretariat's determinations, the Council Resolution, and a summary of the foregoing are available in the Registry of Submissions on the CEC home page <www.cec.org/submissions-on-enforcement/registry-of-submissions>, via e-mail at<sem@cec.org> or upon written request to the Secretariat at the following address:

Secretariat of the CEC
Legal Affairs and SEM
1001 Boul. Robert Bourassa, Suite 1620
Montreal, QC, H3B 4L4
Canada

Commission for Environmental Cooperation
1001 Blvd Robert Bourassa, Suite 1620
Montréal, Québec, Canada H3B 4L4
t 514.350.4300; f 438.701.1434
info@cec.org / www.cec.org