STATEMENT OF BASIS/ FINAL DECISION AND RESPONSE TO COMMENTS SUMMARY

REGION II ID
PRD000632182

Remedy Decision for:
Puma Energy Caribe, LLC
Road #28, Luchetti Industrial Park
Bayamón, Puerto Rico
(Signed on **August 21, 2018**)

Facility/Unit type:	**Petroleum products terminal and storage facility/Site wide**
Contaminants:	**Soil: arsenic** **Groundwater: arsenic, vanadium, lead, mercury, naphthalene, methyl tert butyl ether (MTBE), benzo(a)anthracene, benzene, ethylbenzene, xylenes, 1,2-dibromo-3-chloropropane, free-phase hydrocarbons**
Media:	**Soil, Groundwater**
Remedy:	**Monitoring Natural Attenuation (MNA), Institutional/Administrative Controls**

FACILITY DESCRIPTION

Puma Energy Caribe LLC (the Facility or the Site) is located at Road PR-28, km 2, Luchetti Industrial Park in Bayamón, Puerto Rico, approximately 3 miles south of the Atlantic Ocean coast. The land use on adjacent properties is primarily commercial or industrial. Commercial and industrial properties also border the Facility to the south and west; an U.S. Army facility, Fort Buchanan, is to the east; and Highway PR-22 to the north.

The entire Facility encompasses approximately 179 acres, of which 115 acres are developed as a petroleum products storage facility and a liquid propane gas storage and distribution area, including operational buildings, administrative offices, parking areas; and a wastewater treatment plant to the north. The Facility has an aboveground pipeline for the transfer of fuel from loading docks on San Juan Bay and to customers at the Luis Muñoz Marín International Airport. The remainder of the property is undeveloped and includes a wetland area and Las Lajas Creek.

HISTORICAL SITE OPERATIONS

The Facility began operations as a petroleum refinery in 1955 under the name of Caribbean Refining Corporation. Gulf Oil Corporation purchased the Facility in 1962, and renamed it as Caribbean Gulf Refining Corporation. Chevron Corporation acquired ownership of the Facility when it purchased Gulf Oil Corporation in 1984. The Facility was sold to First Oil Corporation in 1987, and operated as an independent refinery under the name Caribbean Petroleum Refining, Limited Partnership (CPR). The Facility operated as a petroleum refinery between 1955 and 2000. After that, the Facility continued to operate as a terminal for storage of a variety of petroleum products. In August 2010, Capeco filed a Chapter 11 bankruptcy petition seeking to liquidate its assets. In December 2010, Puma Energy Caribe LLC (Puma), purchased Capeco's assets through the bankruptcy, including the distressed storage facility and gas stations with leaking USTs.

A series of explosions and fires at the terminal damaged or destroyed many of the storage tanks at the Facility on October 23, 2009. An unknown quantity of petroleum products was released during the incident. It is likely that the fire consumed much of the released material, but at least some was conveyed in runoff to Las Lajas Creek and an associated wetlands area to the north of the active portions of the Facility. The Site has been converted from its former use as a refinery and storage facility to strictly storage and distribution. The refinery, which ceased operations in 2000, was demolished by PUMA between 2012 and 2013 in accordance with the requirements of the "Agreement and Order of Consent for Demolition" (CERCLA-02-2011-2003) between the United States Environmental Protection Agency (EPA) and PUMA in May 2011. Demolition activities began in February 2012. Final report was delivered in October 2013 to the EPA. Order was closed by the EPA in September 2014.

In 1995, CPR entered into a RCRA Administrative Order of Consent under Section 3008(h) (II RCRA-95-3008(h)-0303) with the EPA to conduct corrective action at 22 Solid Waste Management Units (SWMUs) and 12 Areas of Concern (AOCs), closure of the equalization basin and recovery of free-phase hydrocarbons from groundwater. As a result of the 2009 explosion and fire, Puma entered into an agreement with EPA (RCRA-02-2011-7305) amending the 1995 Order and included the implementation of a more holistic approach to Corrective Action.

Equalization Basin

The Facility has a closed RCRA unit, the former equalization basin. This unit, referred also as SWMU 8, is located on the western side of the facility. The equalization basin was an unlined surface impoundment regulated under Subtitle C of RCRA because it managed D018 and F038 wastes. As part of its wastewater treatment system, CPR operated the equalization basin to receive effluent from oil/water separation units, and discharge it to a biological

treatment system. The equalization basin ceased operation and receipt of hazardous waste on June 6, 1993, and was replaced with an aboveground equalization tank. Sludge was removed from the bottom and sides of the basin in April 1994. RCRA closure of the equalization basin was completed in August 1999. Activities for the closure consisted of dewatering the basin; stabilizing the residual sludge; backfilling the basin; and installing impermeable clay and flexible membrane liner cap, a drainage layer, and a vegetative cover. The EPA approved the final closure on December 3, 1999. As part of the Post-Closure Permit, Puma continues the monitoring of groundwater within the former equalization basin semiannually.

Interim Corrective Measures

CPR installed an Underground Recovery System (URS), which operated until October 2009 after been completely destroyed in the explosion and fire. Sixty (60) monitoring wells were routinely pumped to collect free-phase hydrocarbons of which twenty-two (22) were equipped with pneumatic ejector pumps that operated continuously in the most contaminated part of the groundwater aquifer. Three-hundred to seven-hundred gallons of free product were recovered per month. Between October 1991 and October 2009 over 70,000 gallons of free-phase hydrocarbons were recovered from groundwater and recycled back into the facility's process stream when the refinery was operating or sold as product.

SITE GEOLOGY AND HYDROGEOLOGY

The Facility is situated at approximate elevations between 10 and 35 feet above mean sea level (amsl), with a general surface gradient sloping to the north. Within the Facility, topography is higher in the southeast and southwest corners, away from the primary storage areas. The undeveloped area to the north of the Facility is relatively flat and is considered a wetland. Las Lajas Creek, a named water body that originates south of the Facility, flows through this area. Flow in Las Lajas Creek is influenced significantly by rainfall in the area. In addition to Las Lajas Creek, this area is bordered by Diego Creek to the west and Santa Catalina Creek, which borders the property towards the east. The regional topography includes mogotes from the limestone formations present in the area.

Soils at the Facility are predominantly low-permeability clays. The Facility is located on alluvium deposits (Qa), consisting of sand, clay, and sandy clay, according to the USGS Geologic Map of the Bayamón Quadrangle. The overburden thickness varies from about 10 feet at the southern perimeter of the Facility to about 90 feet at the northern perimeter. A layer of carbonate sediments is located beneath the clay soils overlying limestone bedrock. Undulations of the carbonate sediment layer result in natural "domes" covered by clay soils.

Two general hydrogeologic units have been described at the Facility. The uppermost clay unit contains a low permeability semi-perched layer and a permeable carbonate water-bearing zone (referred to as Zone A in CPR documents). The general horizontal groundwater flow direction in Zone A is to the north, although localized mounds and depressions reportedly occur in the central portion of the Facility. The underlying carbonate sediment layer also contains a water-bearing zone (referred to as Zone B in CPR documents). Groundwater flow in Zone B is generally in the north to northwest direction. Groundwater in Zone B is semi-confined. The potentiometric surface of groundwater for wells completed in the carbonate sediment layer is generally higher than water level elevations measured in Zone A (i.e., the water table wells). The groundwater gradient is generally towards the north. Water migration into and through the surface soils is slow as a result of the Facility's geology.

EXPOSURE PATHWAYS

Potentially complete exposures pathways for the Facility are described below:

• Soil: direct contact exposure pathways for on-site commercial/industrial workers are potentially complete. However, the primary constituent of potential concern identified in on-site soils at concentrations greater than Industrial Regional Screening Levels (RSLs) is arsenic. During the 2014 RCRA Facility Investigation (RFI), soil samples showed concentrations of arsenic above Industrial RSLs; however, most of these data are below or comparable to the background arsenic concentration established for the facility during previous investigations (i.e. 45 mg/kg). The only exception is soil sample SB-P-119-0-1, which yielded 81.7 mg/kg of arsenic, in excess of the 45 mg/kg background. Still, these were less than the historical, pre-2009, detected soil concentrations of arsenic of 92.5 mg/kg. Human Exposures calculations using the maximum historical concentrations of 92.5 mg/kg indicate that potential risk to on-site commercial/industrial workers fall within the range of acceptable risks ($1x10^{-6}$ to $1x10^{-4}$). This approach is extremely conservative, and overstates actual potential risk to on-site commercial/industrial workers. Therefore, since the soil results for arsenic collected as part of the RFI (2014) were lower than the previous maximum detected concentration of 92.5 mg/kg, potential risk to on-site commercial/workers from exposure to soil is still anticipated to be within or below the EPA range of acceptable risks.

The analytical results for the soil sampling completed for the 2015 Supplemental RFI indicated detectable levels of Total Petroleum Hydrocarbons (TPH) from gasoline and diesel (TPH-GRO and/or TPH-DRO, respectively). However, analytical results of selected petroleum-related compounds show that concentrations of these were below

Industrial RSLs. As per agreement RCRA-02-2011-7305, the facility will continue to be used as an industrial bulk oil terminal; therefore, potential exposure pathways from TPHs are limited or non-existent.

• Wetlands: Exposure pathways are also potentially complete for ecological receptors in the undeveloped wetland areas north of the operational portion of the facility. However, concentrations of inorganic constituents in sediment and surface water samples collected in Las Lajas Creek and in the adjacent wetland areas are less than screening levels and/or the background threshold concentrations. Therefore, potential exposure of ecological receptors to facility-related concentrations of these constituents in sediment and surface water is likely negligible.

• Groundwater: No exposures pathways have been identified from contaminants in groundwater. Arsenic, vanadium, lead, mercury, naphthalene, methyl tert butyl ether (MTBE), benzo(a)anthracene, benzene, ethylbenzene, xylenes, trichloroethene (TCE), vinyl chloride, chloroform, cis-1,2-dichloroethene (DCE), and 1,2-dibromo-3-chloropropane were detected at concentrations exceeding the EPA Tap Water RSLs and/or MCLs at several monitoring well locations. Notably, the presence of TCE and its degradation products (i.e., cis-1,2-DCE and vinyl chloride) are attributable to offsite sources related to the Fort Buchanan property. No drinking water wells exist on-site or off-site. Potable water to surrounding communities is supplied by the Puerto Rico Aqueduct and Sewer Authority. In addition, contaminated groundwater does not discharge into any surface water bodies. Risk for indoor vapors are not warranted given that no buildings exists above the contaminated groundwater plumes.

Free-phase hydrocarbons have also been detected at four monitoring wells (MW-42B, MW-40B, MW-T9, and MW-AD2) within recent years. During the most recent groundwater monitoring event (November/December 2017), only two locations exceeded Puerto Rico EQB's established criteria for product thickness (i.e., 0.125 inches or 0.01 foot) – MW-40B with 0.66 inches and MW-T9 with 0.18 inches. Product thicknesses at these locations generally demonstrate stable to decreasing trends since 2011 or 2014. Notably, well MW-40B, which exhibited an increase in free-phase hydrocarbon thickness from 0.21 inches to 1.41 inches between June and December 2016, showed a decrease between December 2016 and November 2017. The impacted portions of the facility do not contain significant habitat to support ecological receptors.

SELECTED REMEDY

The proposed remedial alternative for the Site is a combination of Monitoring Natural Attenuation (MNA) of contaminants in groundwater and establishment of institutional and/or administrative controls to prevent exposure of workers with contaminated soil and groundwater. It should be noted that EPA's "RCRA FIRST Toolbox" was employed to streamline and expedite the remedy selection process (EPA 2016). Established zoning and deed restrictions ensuring non-residential land use, as well as a detailed excavation plan (including dewatering) should control on-site worker and construction worker exposures. In addition, the maintenance of the asphalt cover currently above former SB-P-119-0-1 should limit rainwater and surface water infiltration and, thus, decrease the potential for arsenic in soil to leach into groundwater at this location. However, Puma will also evaluate groundwater arsenic concentration trends in an annual basis, following each annual groundwater monitoring event, at wells located in the vicinity of former SB-P-119-0-1. If groundwater arsenic concentration trends at these locations (e.g., PMW-119) exhibit statistically significant increases during future groundwater monitoring events, and potential leaching of arsenic at concentrations above 45 mg/kg into groundwater is identified, then the treatment of residual arsenic concentrations in soil at former SB-P-119-0-1 will be considered.

The facility will continue to conduct groundwater monitoring events with an annual frequency through 2021. As part of the annual groundwater monitoring events, a groundwater sample will be collected from the on-site deep production well to confirm concentrations are below established criteria (i.e., RSLs/MCLs) and rule out potential exposure if facility personnel come in contact with water during non-potable uses. Bail down of measurable free phase product will also occur during each annual groundwater monitoring event. Changes in free phase product thickness through time will be recorded and analyzed to ensure stable to decreasing trends. Following the 5-year monitoring period (2017 through 2021), and contingent on improved environmental conditions (i.e., decreased concentrations) and no unacceptable human health and ecological risks, the facility team will petition the EPA for approval of conditional closure with a long-term monitoring component of a sub-set of wells (e.g., sentinel wells and potentially for TCE delineation).

INNOVATIVE TECHNOLOGIES CONSIDERED

MNA and institutional controls were evaluated as alternatives for the remediation of groundwater at the Site, along with establishment of institutional and/or administrative controls to prevent exposure of workers with contaminated soil and groundwater. None of the alternatives evaluated for the Site are considered innovative technologies. EPA's "RCRA FIRST Toolbox" was employed to streamline and expedite the remedy selection process (EPA 2016).

PUBLIC PARTICIPATION

On June 21, 2018 a notice inviting the public to comment on the proposed remedy for the facility was published by EPA on the *Primera Hora* newspaper. A 45-day public comment period on the proposed remedy was opened from June 21, 2018 to August 4, 2018. A public availability session was also held at the *Centro de Usos Múltiples - Comunidad Juana Matos* in Cataño, Puerto Rico on July 12, 2018. There were eleven (11) people that attended the meeting. The attending were representatives from EPA, Puma, Municipality of Cataño, Corredor del Yaguazo (NGO), Club de Leones Bahía Cataño (NGO) and community residents. No comments from the public were received.

NEXT STEPS

Following approval of the selected remedy, EPA will work diligently with Puma representatives in order to monitor and ensure that current protections are maintained in the foreseeable future.

KEY WORDS:	**CONTACT:**
Soils, metals, risk, petroleum hydrocarbons, exposure, SWMU, land use, corrective measures, remedy decision, Puerto Rico, Caribbean Petroleum Refining, Puma Energy, RCRA FIRST.	David N. Cuevas, Ph.D., RCRA PM Region II-United States Environmental Protection Agency Caribbean Environmental Protection Division City View Plaza II – Suite 7000 Guaynabo, PR 00968-8069 Tel: (787) 977-5856 cuevas.david@epa.gov