Letter Health Consultation

Characterization of Potential Exposures to Contaminants at the
PROTECO National Priorities List (NPL) Site

PROTECO NPL Site

PEÑUELAS, PUERTO RICO

June 9, 2022

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Office of Community Health and Hazard Assessment
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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LETTER HEALTH CONSULTATION

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DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Agency for Toxic Substances
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Atlanta GA 30333

June 9, 2022

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Subject: ATSDR's Health Consultation on the PROTECO NPL Site - Letter of Health Consultation

Greetings Ms. Luna,

Thank you for your continued support to the Agency for Toxic Substances and Disease Registry (ATSDR) as we work together to characterize potential exposures to contaminants present at the PROTECO National Priorities List (NPL) site in Peñuelas, Puerto Rico. We appreciated the opportunity to meet with your team, the Puerto Rico Environmental Quality Board (PREQB) staff, and the manager of the active landfill (Peñuelas Valley Landfill), during our site visit on August 21, 2018. During our visit, we found it very useful to visually inspect and get a more comprehensive view of the status of the site (e.g., after Hurricanes Irma and Maria) and its potential impact to the surrounding community.

The Comprehensive Environmental Response, Compensation, and Liability Act, otherwise known as CERCLA or Superfund, requires ATSDR to conduct public health activities on all sites proposed to the NPL. EPA proposed PROTECO to the NPL on May 17, 2018, and the site was finalized to the NPL on May 13, 2019. As part of its public health assessment process, ATSDR considers past, present, and future exposures to all contaminants present on this site.

This health consultation describes ATSDR's initial observations on potential exposures pathways and documents additional environmental sampling that would best help us understand and evaluate those pathways. Any special considerations related to exposure characterization that we discussed during or after our site visit are summarized below. Currently, there are insufficient environmental sampling data to fully evaluate potential exposures and public health impacts from the site. Including this letter's suggested environmental sampling during the Remedial Investigation/Feasibility Study (RI/FS) will improve the accuracy and completeness of any future evaluation of the site.

Background and Past Actions

PROTECO Superfund site is in Barrio Tallaboa in the town of Peñuelas in the southern part of Puerto Rico (Figure 1). Originally named Servicios Carbareon, Inc., PROTECO was a treatment, storage, and disposal facility (TSDF) for hazardous and non-hazardous wastes from 1975 through 1999. It accepted electroplating sludge, wastewater treatment plant sludge, slurries, petroleum wastes, pesticide wastes, and pharmaceutical and manufacturing wastes from multiple industries (EPA, 2018b).

PROTECO landfill performed closure activities in the 1990s but abandoned the site in 2009 and has not conducted required maintenance or monitoring. On-site groundwater is contaminated with mercury and

chlorinated volatile organic compounds. The uncontained waste sources and contaminated groundwater at the site threaten contamination of public and private drinking water supply wells in the area, which serve more than 17,000 people. PROTECO has been out of compliance for post-closure care provisions since the 1990s and does not have a groundwater monitoring system.

In July 2008, EPA conducted a drinking water assessment of the various off-site potable and irrigation wells from the Puerto Rico Power Authority (PREPA), Puerto Rico Aqueduct and Sewer Authority (PRASA), and non-PRASA entities. EPA communicated individual results to well owners and stated that all samples collected from all wells were below established EPA's Maximum Contaminant Levels (MCLs) and risk-based Superfund Removal Management Levels (RMLs). Samples collected were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and metals, as well as for mercury and cyanide.

ATSDR Site Visit and Community Interest

ATSDR staff conducted a visit to the site and to adjacent areas during the week of August 20, 2018. They met and gathered information from staff from Caribbean Environmental Protection Division (CEPD), PREQB, active landfill administrators from Peñuelas Valley Landfill, and community leaders to discuss ATSDR's upcoming activities regarding the site and listened to their comments or concerns related to the site.

ATSDR made the following observations during the site visit that may be relevant to the evaluation of the site:

- Accessibility

    - PROTECO lies between two active non-hazardous waste landfills with a road circling around the site. The site consists of three sources of hazardous substances. Sources 1 and 3 are evaluated as landfills and Source 2 as a surface impoundment (See Figure 2). Peñuelas Valley Landfill (started operation around same time as PROTECO) lies to the west, and Ecosystems Peñuelas Landfill (received operation permits around 2012) lies to the east. The site is approximately 35 acres in size with an elevation approximately 300-450 feet above mean sea level (msl). The immediate area surrounding the site is mountainous (up to 1,000 feet above msl) and unpopulated (except for landfill workers moving around the site).
    - In order to access the main security gate, one must drive approximately ¼ mile to where a security guard registers visitors and grants access (if allowed by administrators) to the site. There are signs indicating "No trespassing, Private Property," on the security guard's fence.
    - The perimeter of the site is fenced with a three-string barbed wire typical of cattle ranches in PR. There are occasional trespassers accessing the site (e.g., cattle owners). Although the site is accessible, heavy vegetation makes it difficult to traverse and inspect. On-site hazards (e.g., buried chemicals drums, unlined waste piles, and lagoons) may also pose potential risks to trespassers.
    - "No trespassing" signs were visible in some areas of the perimeter of the site.
    - Portions of the site had cattle roaming and grazing the land, which according to the operator, roam around all the landfills, but mainly graze within PROTECO property boundaries. Water baths were present near the entrance of the site to supply water brought in by the cattle owner (not the site owner or administrator).
    - As noted by EPA, the full physical extent of the groundwater contamination on the site has not been determined and thus site boundaries cannot be established now (EPA, 2019).

- On-Site Features

    - The site's interior area does not have any existing buildings. There are remnants of a leachate collection housing pump within the site and a lagoon (dry during time of the site visit) at the southern portion of the site that collects runoff and leachate from the area.
    - The site is heavily vegetated with trees and shrubs. Heavy damage from Hurricanes Irma and Maria is evidenced by downed and uprooted trees and vegetation that could create voids providing a pathway for precipitation to reach waste units. This damage may have affected or opened unlined waste piles.
    - There are signs indicating "No Digging, Buried Synthetic Membrane" on the barbed wire fence near the area containing the Corrective Action Management Unit (CAMU).
    - An estimated 200 head of cattle have access to and roam the site.
    - We saw a horse grazing along the side of the road (adjacent to the site), and goats roam the western portion of the area nearby the site. However, during our visit, we did not see any on-site. We are also uncertain if these animals come this far on-site.
    - The topography of the entrance road towards the site slopes to the south, and surface water runoff flows towards stormwater channels located in the edge of the site near roads, facilitating possible contaminant migration off-site.

- Off-Site Features

    - There are no community facilities of interest (libraries, schools, city halls, civic centers, places of worship, day care centers, or parks) within one mile of the site. The nearest schools are located approximately 3 miles from the site.
    - The nearest body of water (Río Tallaboa) is approximately 1.75 miles west of the site in the Rio Tallaboa Valley. It flows from the north central mountains to Tallaboa Bay (1.75 miles from the site).
    - As mentioned by community members, wetlands south of the site flood periodically during heavy rains.
    - Along the road before entering the security gate, sediment runoff can be seen accumulated near a bridge. Most sediments and stormwaters flow south along the road and near the bridge, then south under PR-22 towards the Tallaboa Bay.
    - The demographic profile within a 2-mile buffer from the site according to US Census 2010 was estimated at 3,067 residents, 286 children, 386 adults aged 65 and older, and 1,122 housing units (Figure 3).
    - The nearest residential areas are located 1 mile to the northeast and 1.25 to 2 miles to the west and southwest of the site. Peñuelas municipality has approximately 20,000 residents.
    - Groundwater at the site is found surrounded by alluvial deposits between 10 to 20 feet below ground surface (bgs), in the silty clay between 30 and 70 feet bgs, and lastly in the limestone between 100 to 200 feet bgs.
    - The Ponce-Juana Diaz aquifer, which is the most productive in the Río Tallaboa valley area (1-2miles west of the site) is interconnected by the alluvial deposits of the area where there are several active drinking water wells.
    - EPA documents state that groundwater flows towards the west and northwest and can potentially impact potable water wells that serve the nearby community (EPA 2019).

Available Data

Soils (On-Site)

Soil samples, at various depths ranging up to 2.5 - 3 feet bgs, were collected in 1988 using Shelby Tube samplers, auger borings, and/or split-spoon samplers during a Phase III Investigation (Hart, 1988). The purpose of this work was to determine the horizontal and vertical extent of contaminated soil surrounding each waste unit (active or inactive). During the investigation, multiple waste units' samples showed evidence of presence of VOCs and metals from the different buried hazardous substances in the units in the shallower depths of the cores. Investigators also found leaking and damaged drums, soil contamination, and migration of hazardous substances in all four drum burial units (1,2,3 and 5). Prior to the installation of the landfill caps, no removal of drums occurred, nor was there any installation of liners.

No samples have been collected outside the boundaries of PROTECO site to determine potential runoff contamination that may have affected adjacent soils. To the south of the site, where the leachate collection impoundment is collected, there has been no collection of soils or sediment samples.

Groundwater samples (On-Site)

Groundwater at this site occurs in alluvial deposits ranging in depths from 10 -20 feet bgs and is known to be present in the area where waste unit 9 is located. Sampling of existing groundwater monitoring wells within the site and in the boundaries of the site were conducted from 1986 to 1991 and documents the detection of 1,1-dichloroethane (1,1-DCA) – 9,300µg/L; 1,2-dichloroethane (1,2-DCA) – 13,000 µg/L; 1,1-dichloroethylene (1,1-DCE) – 70 µg/L; trans-1,2-DCE – 150 µg/L; tetrachloroethylene (PCE) – 120,000µg/L; 1,1,1-trichloroethane (1,1,1-TCA) – 280,000 µg/L; trichloroethylene (TCE) – 26,000µg/L; and mercury – 1.80µg/L (EPA, 2018b; PROTECO, 1988a,b,c).

Potable Water Well (Off-Site)

Overview

PRASA operates two drinking water supply wells within 4 miles of the site, Carlos Andinos (1.75 miles west) and Blasini (3-4 miles east). The Carlos Andinos (0.31-0.38 million gallons per day MGD) well is part of the Peñuelas Urbano water system which gets its waters from the Río Peñuelas (Peñuelas Filtration Plant - 1 MGD) and Garzas Reservoir (Guayanes Filtration Plant - 0.7 MGD). The Carlos Andinos Well (closest to the site) has 16.0% relative contribution to the Peñuelas Urbano System. The system serves 17,039 clients. The school Encarnacion Tallaboa receives water from the Carlos Andinos well.

Two non-PRASA domestic wells used for drinking water were identified in the Seboruco community (Tallaboa Saliente #9 and #8), and one domestic well is used for drinking water in Cuebas community (Cuebas). There are also four wells used by PREPA for industrial purposes and as a drinking water supply for employees (PREPA 8, 9, 10, and 13). The approximate number of individuals that drink from the non-PRASA wells is ten, and according to PREPA there were 207 employees at the Peñuelas Plant. The total estimate of people drinking groundwater within 1-2 miles radius of the site is 3,109.

ATSDR reviewed groundwater sampling data presented in EPA's Final Removal Assessment sampling of off-site wells conducted on April 25, 2018. Samples were collected from residential wells (6 samples) and one irrigation well that ranged in depth between 60-155 feet. Samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, PCBs, and Target Analyte List

(TAL) metals, including mercury and cyanide. In this assessment, EPA concluded and communicated with well owners that results were found to be below EPA's MCLs and RMLs, and samples did not detect any of the known contaminants of concern associated with PROTECO. ATSDR also reviewed information from PRASA about the Peñuelas Urban system, where the Carlos Andinos well is a contributor, and noted the presence of additional non-regulated metals (e.g., hexavalent chromium, Cr^{6+}) above ATSDR's comparison value in the system. Nevertheless, ATSDR is unable to evaluate information specific to the Carlos Andinos well since results are system wide, and not well-specific.

ATSDR also reviewed reports from PRASA for the Costa Sur drinking water system for 2014-2016 which noted some contaminants reported below the method detection limits, but no raw data were shown. EPA documents stated that PRASA analytical water quality records from 2010-2017 for the wells, prior to being combined with surface water intake, did not indicate the presence of VOC contamination (EPA, 2018b).

Conclusions and Recommendations

One of the critical steps in an ATSDR public health assessment or health consultation is evaluating exposure pathways – different ways in which people may be exposed. Based on the currently available data and information, ATSDR reached the following preliminary conclusions and recommendations for the PROTECO site regarding potential exposure pathways (Table 1).

Potential Exposure Pathways

- Drinking Water Pathway

PROTECO's operation dates back from the early 1970s. There are no available records indicating potential exposures in the past; therefore, ATSDR is unable to evaluate past exposures. The Carlos Andinos well (PRASA) and several domestic and irrigation wells (PREPA and non-PRASA) are within 1.5 miles of the site, towards the west. Hydrogeological studies have suggested that the groundwater in the area flows towards the west and northwest of the site. Currently, there has not been a thorough characterization of the extent of the contamination. ATSDR screened the 2018 groundwater sampling data and identified arsenic, hexavalent chromium, and mercury to be above ATSDR comparison values (CVs) (See Table 2). ATSDR CVs are concentrations of substances (environmental guidelines) set well below levels that are known or anticipated to result in adverse health effects. CVs are used as screening tools, and chemicals found to exceed them are selected for further evaluation during the public health assessment process. ATSDR supports the efforts, through the RI/FS work, to identify the potential contamination plume as soon as possible to help to identify potential points of exposure.

Additional information needed to evaluate this exposure pathway

- ATSDR recommends further characterization to delineate the nature and extent of the groundwater contamination in order to safeguard public health and potable drinking water wells, especially if there is a potential migration of a groundwater plume towards drinking water systems.
- ATSDR recommends the retrieval of historical raw water data reports detailing concentrations of water chemicals found in PRASA water (e.g., Carlos Andinos and Blasini wells), as well as PREPA and non-PRASA wells.

- Surface Water and Sediments Pathway

Depending on groundwater flow and extent of contamination, contaminated groundwater could potentially flow towards the west of the site and discharge contaminants that might impact surface waters and sediments in areas of recreational use (e.g., along the Tallaboa River).

- ATSDR suggest incorporating sampling points along the Tallaboa River (e.g., recreational areas) to ensure site contaminants are not detected along the shore of rivers or where recreational activities may occur in order to safeguard public health.
- ATSDR suggest collecting sediments and soils along the leachate collection impoundment.
- ATSDR suggest incorporating sediment sampling points (preferable surficial depth 0-2 inches) along the stormwater drainage channels surrounding the perimeter of the site and their drainage catchment areas.

- Soil Pathway

During closure, PROTECO had 17 waste units with pits that were underlain by native silt and clay, not designed with liner systems or leachate collection systems, and a surface impoundment with acidic waste. Events like Hurricanes Irma and Maria released copious amount of rain during a relatively short period of time that may have contributed to contaminant migration. Soil erosion and water surface runoff from the site may have mobilized contaminants to the southern portions of the site, where storm drainage channels along the road would have carried contaminants to the southern wetland areas near Tallaboa Bay. There is also the potential of runoff being carried to nearby outer boundaries of the site where heavy truck traffic and workers may potentially be exposed through inhalation and ingestion of fugitive dusts.

Additional information needed to evaluate this exposure pathway

- ATSDR recommends the collection of surface soil samples (0-2 inches in depth), preferably in areas near the site's perimeter (e.g., across the road and along stormwater channels and their drainage areas) and in southern portions of the site that connect to the Tallaboa Bay so as to better understand the potential exposure pathway that may exist.
- ATSDR recommends the collection of surface soil samples in areas of known cattle grazing.
- ATSDR recommends the collection of soil samples in the southern area of the site, where the storm water channels that border the site discharge and the area of the leachate collection impoundment.
- ATSDR suggest incorporating sampling points along the Tallaboa River (e.g., recreational areas) to ensure site contaminants are captured so as to better understand potential exposure pathways.

- Vapor Intrusion Pathway

ATSDR recognizes the presence of VOCs in the groundwater monitoring wells located on-site, and therefore the potential for exposure through the vapor intrusion pathway.

Additional information needed to evaluate this exposure pathway

- ATSDR recommends delineation and characterization of the nature and extent of the contamination to determine if off-site groundwater is impacted from on-site VOCs contamination and might pose a vapor intrusion concern.

- Food Chain/Biota

Cattle, horses, and goats around the site and on-site means the animals could be exposed to site contaminants,

posing a potential threat to the animals and to humans that may possibly consume them. There is prior history of the beef cattle being sent to a slaughterhouse in western PR (e.g., Yauco) for processing, packaging, and local distribution in nearby grocery stores. The owner of the cattle estimates the heads to be around 200, and some of them frequent the PROTECO site and neighboring landfills. During our site visit we documented an area approximately 10,000 square feet next to PROTECO border fence that housed the water bath containers used for the cattle to drink. Because of a lack of rain in the area, water is brought in from an unknown source. The cattle wander freely, and their movements are not tracked. Thus, potential exposure to contaminants may be occurring if cattle graze on contaminated plants and/or drink from contaminated water within the site pits.

Additional information needed to evaluate this exposure pathway

- ATSDR recommends actions are taken to prevent animals (e.g., cattle) from roaming or grazing on the site.
- ATSDR recognizes the limitations and challenges when conducting biota sampling; therefore, as a first step, ATSDR suggests sampling surface soils and other media in areas where cattle roam and graze to help determine the potential for bioaccumulation of contaminants in cattle. This information can inform if there is a potential for past or present exposures from consuming beef with elevated levels of contaminants related to the site.

Other potential threats that may be of concern:

- Physical Hazards

Even with a security gate, PROTECO can be accessed by trespassers. The site contains physical hazards such as broken-up barbed wire fences and void holes from the uprooted trees. The present seventeen waste units containing hazardous substances may have been altered by the hurricanes, and thus trespassers may potentially encounter these dangers and possible exposures if wandering on-site.

ATSDR looks forward to working with EPA, PREQB, PRDOH, and other local stakeholders as more information about the site becomes available. We will identify next steps when more environmental sampling data from the RI/FS are available. Please do not hesitate to contact me by phone (732-906-6933) or email (lqx8@cdc.gov) with updates or questions.

Sincerely,

Luis O. Rivera-González, Ph.D., M.S.
Region 2 Toxicologist, Office of Community Health and Hazard Assessment
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Figure 1. PROTECO satellite imagery with 1-mile buffer zones

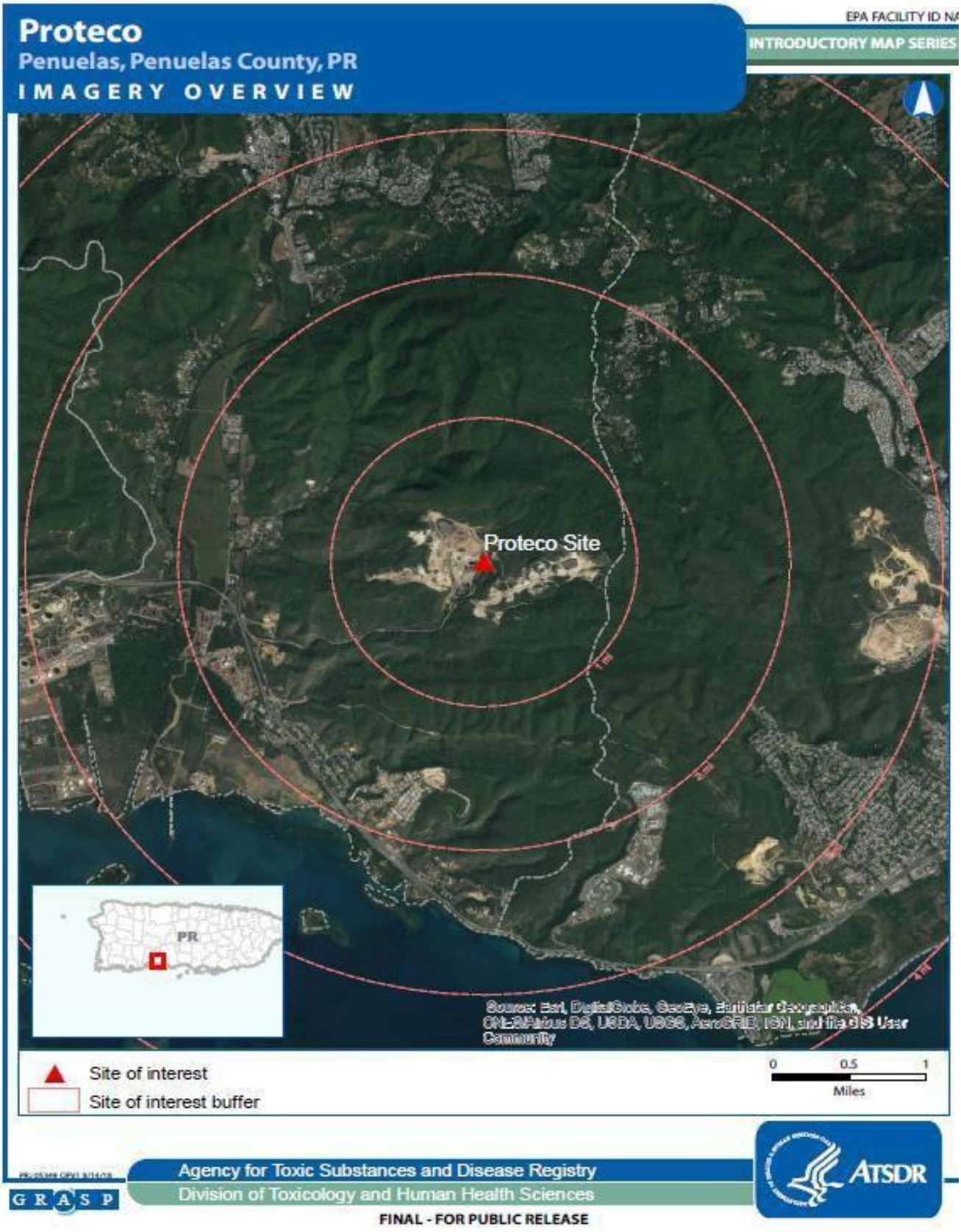

Figure 2. PROTECO contamination sources and waste units (EPA 2018b)

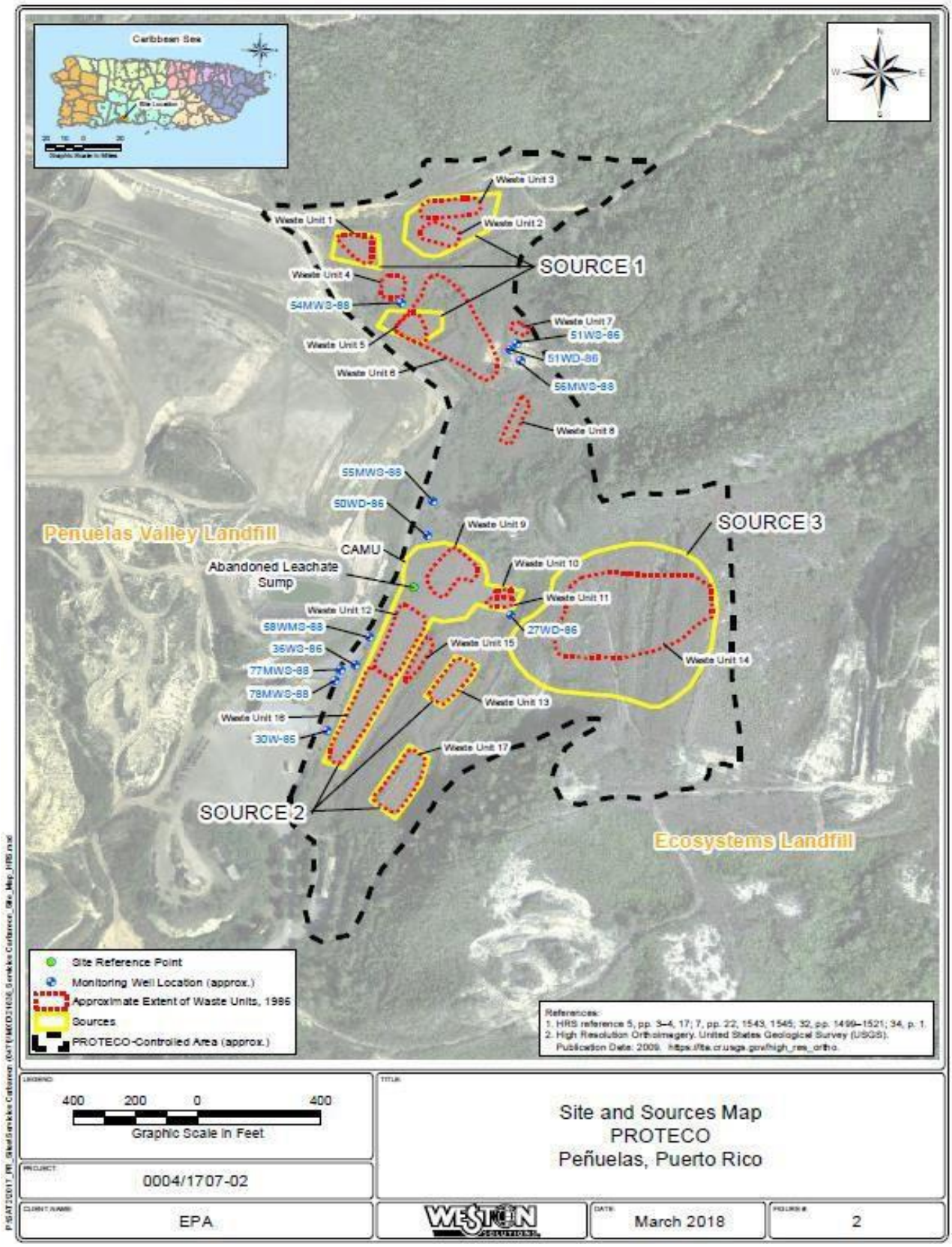

Figure 3: Site demographics

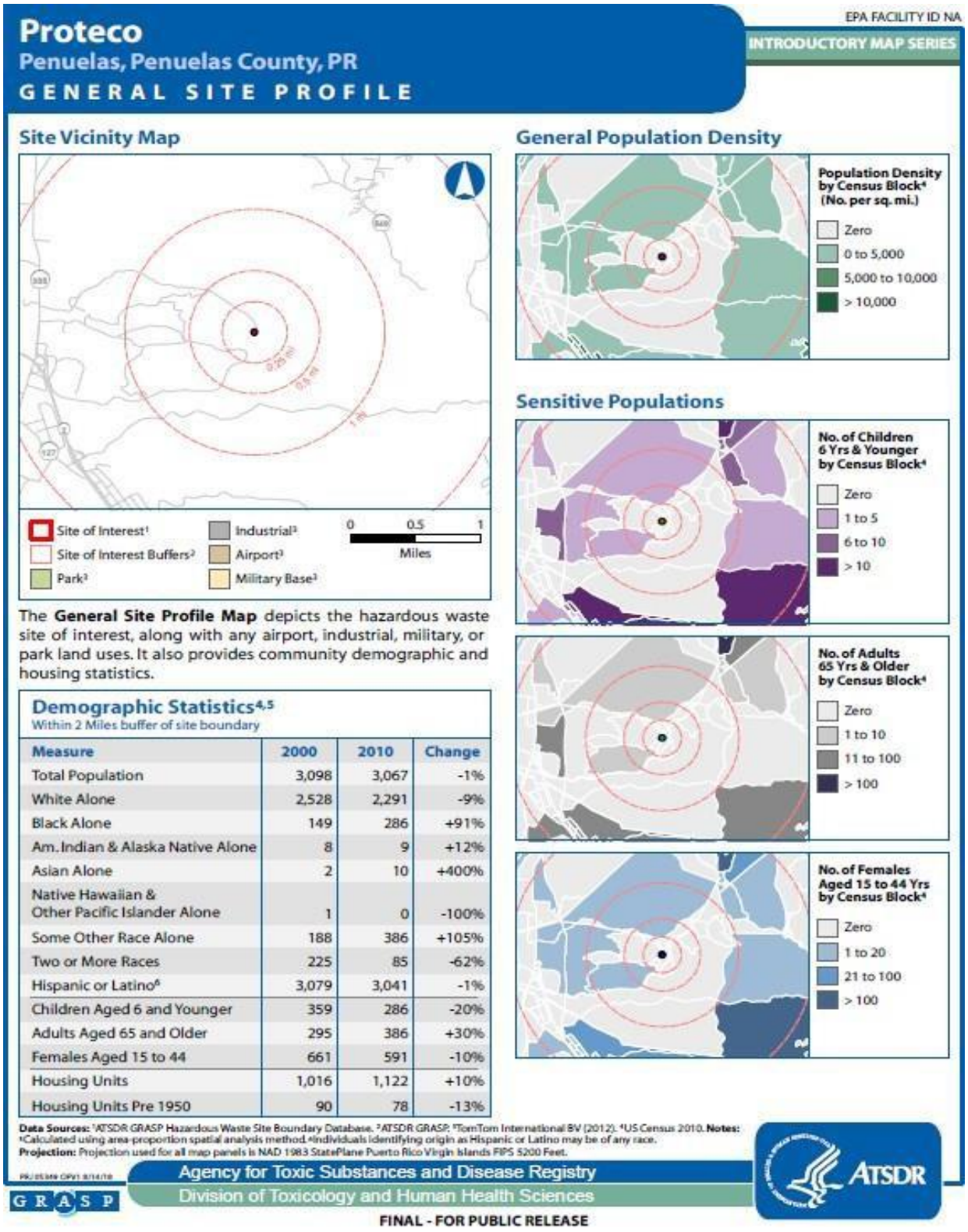

Table 1: Exposure pathways for PROTECO Superfund site, Peñuelas, Puerto Rico

Exposure Pathways	***Sources of Contamination***	***Fate and Transport***	***Point of Exposure***	***Exposed Population***	***Route of Exposure***	***Pathway Classification***	***Comments***
Public Water Supply (PWS) PRASA and PREPA	TSDF[1]	Infiltration of contaminants to municipal wells; infiltration of contaminants in ground through broken water pipes	Residential faucet/tap	Residents in the area who receive public drinking water PREPA workers	Dermal Ingestion Inhalation	Past (Potential) Current (Potential) Future (Potential)	PWS is located off-site
Groundwater Private Wells non-PRASA	TSDF	Infiltration of contaminants to municipal wells; infiltration of contaminants in ground through broken waterpipes	Residential tap water; other potable water taps	People who use private wells	Dermal Ingestion Inhalation	Past (Potential) Current (Potential) Future (Potential)	Private community wells are located off-site

Exposure Pathway	*Sources of*	*Fate and Transport*	*Point of Exposure*	*Exposed Population*	*Route of Exposure*	*Pathway Classification*	*Comments*
Surface water	TSDF	Migration of contaminated groundwater or surface runoff off-site	Irrigation Public, Industrial	People who use surface water for recreation, and while irrigating Livestock water	Dermal Ingestion	Past (Potential) Current (Potential) Future (Potential)	Surface water is off-site
Sediment	TSDF	Surface runoff Contaminated surface water	Recreational Area Site runoff	Workers Recreational users	Dermal Ingestion	Past (Potential) Current (Potential) Future (Potential)	Sediment that may have migrated off-site and adjacent to paved road surrounding the site

Exposure Pathway	*Sources of Contamination*	*Fate and Transport*	*Point of Exposure*	*Exposed Population*	*Route of Exposure*	*Pathway Classification*	*Comments*
Vapor intrusion	TSDF	Migration of subsurface vapors into indoor air	Buildings located over contaminated groundwater	People living or working in homes or buildings above contaminated water Workers	Inhalation	Past (Potential) Current (Potential*) Future (Potential) * Pending characterization and delineation of contamination	Potential off-site presence in residential areas
Surface soils	TSDF	Surface soils over waste units Areas where runoff is evident	On-site property and nearby areas where stormwater runoff have carried surface soils	Facility workers, on-site trespassers, residents off-site in contact with soils	Dermal Ingestion Inhalation	Past (Potential) Current (Potential) Future (Potential)	Off-site soils and adjacent to the site

Exposure Pathway	*Sources of Contamination*	*Fate and Transport*	*Point of Exposure*	*Exposed Population*	*Route of Exposure*	*Pathway Classification*	*Comments*
Sub-surface soils	TSDF	Subsurface soil transported or released from site	Areas included within the contaminated sites (waste units)	People who contact contaminated subsurface soils (workers or trespassers)	Dermal Ingestion Inhalation	Past (Potential) Present (Eliminated) Future (Potential)	
Biota (food chain)	TSDF	Consumed foods	Animals grazing and drinking from contaminated grass, soils, and waters on-site	People who consume contaminated animal products	Ingestion	Past (Potential) Present (Potential) Future (Potential)	Cattle are used for beef production

[1]TSDF: Transport, Storage, and Disposal Facility

Table 2. Summary of contaminants of potential concern screened by ATSDR in off-site drinking water wells during an EPA 2018 sampling event (EPA 2018a)

Off-Site Drinking Water Wells	COPCs	Concentration (ppb)	Comparison Value
PW01 (PREPA #9)	Arsenic	0.20	CREG (0.016); EPA RSL (0.052)
PW03 (PREPA #10)	Chromium	0.43	N/A
	Mercury	0.97	EPA RSL (0.63)
PW04 (PREPA #13)	Chromium	0.28	N/A
[1]PW05 (North Seboruco #10) (PRASA)	Chromium	0.97	N/A
[1]PW06 (Tallaboa Saliente #8) (PRASA)	Arsenic	0.48	CREG (0.016); EPA RSL (0.052)
	Chromium	0.55	N/A
[1]PW07 (Tallaboa Saliente #9) (non-PRASA)	Arsenic	0.18	CREG (0.016); EPA RSL (0.052)
	Chromium	0.26	N/A
	Chloroform	1.8	EPA RSL (0.22)
[1]PW08 Cuebas (PRASA)	Chromium	0.085	N/A

[1]Detection of high concentrations of iron and manganese in PRASA wells; CREG: ATSDR's Cancer Risk Evaluation Guide; EPA-RSL: Environmental Protection Agency Regional Screening Level; N/A: Not available; COPCs: Chemicals of Potential Concern

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