

Resource Conservation and Recovery Act (RCRA) Corrective Action Determination of Remedy Construction RCRAInfo Code CA550

Facility Name: *Caribe General Electric (GE) Distribution Transformers, Inc.*
Facility Address: *Intersection of Rd 200 and Rd 201, Vieques, Puerto Rico*
Facility EPA ID: *PRD000692582*

Facility Information

Caribe General Electric (GE) Distribution Transformers, Inc. (Caribe GE) is an approximately 4-acre facility involved in the manufacture of power fuses, auxiliary relays, and switch gear accessories. Caribe GE is located near the north coast of Vieques at the intersection of Road 200 and Road 201 in the Barrio Martino section of the Isabel Segunda Ward. Caribe GE started manufacturing in 1969. The property is owned by the Puerto Rico Industrial Development Corporation and leased by GE. A corrective study investigation was performed at Caribe GE to determine the corrective action to be implemented. This investigation and subsequent actions were performed under a voluntary program (1).

Facility Hydrogeology

Three (3) different remedial investigations have been conducted at Caribe GE, since 1990. As part of these investigations a total of eleven (11) on-site monitor well borings were drilled/cored to approximately 110 ft below ground surface (bgs). The following hydrogeologic information was determined from these investigations, subsequent monitor well testing and sampling, and closure activities.

Caribe GE is underlain by late-Cretaceous/early-Tertiary granodiorite bedrock overlain by unconsolidated residual silty sand and gravels that are 0 ft to 28 feet thick. In the vicinity of Caribe GE, the unconsolidated overburden material is predominantly unsaturated, and consists of soil and saprolite. The soil is poorly sorted, very fine to medium grained sand with little silt and clay, highly organic, coarsening down to predominantly sandy gravel from weathered granodiorite bedrock grains. This gravel saprolite is highly decomposed bedrock that retains the structure of the parent bedrock while remaining in its original place. The soil horizon is thickest in the northeast portion of Caribe GE. The only area where groundwater levels have been historically noted to occur up to eight feet above the bedrock surface, at elevations within unconsolidated material, were at Monitoring Well C-3 measured during the December 6, 2006 quarterly sampling event. The soil horizon is thinnest along the southwest portions of the Caribe GE where bedrock outcrops are noted. Figure 1 illustrates the location of all the monitoring wells installed at Caribe GE.

Bedrock under Caribe GE is composed of fractured igneous granodiorite. Common vertical and horizontal fracture sets have been identified in rock cores. Bedrock coring and drilling notes indicate that the degree of fracturing decreases with depth and that the top and bottom elevation of the uppermost water bearing zone is variable. The first occurrence of a water bearing zone ranges from approximately 50 ft bgs near monitoring well C-3 to 65 ft bgs at monitoring well C-10. This uppermost water bearing

zone extends to a depth of approximately 110 ft bgs at monitoring well C-7 based on packer test data and to a depth of 80 ft bgs at monitoring well C-10 based on observed water bearing zones in its screened interval. At monitoring well C-10, no water bearing zones were encountered from a depth of 80 ft to 110 ft bgs as evidenced by the absence of groundwater inflow in this zone while the borehole was open.

Over the eight (8) quarterly groundwater sampling events from February 2006 through December 2007, the highest elevation of groundwater was measured in December 2006 at four (4) monitoring wells in the SE corner of the Caribe GE, approximately 55.5 ft above means sea level (MSL), approximately 25 to 40 ft bgs. Over this same time frame, the lowest elevation of groundwater was measured in March 2007 at a monitoring well (C-9), approximately 39.6 ft above MSL (approximately 40.9 ft bgs). These elevations are significantly higher than the first occurrence of groundwater noted during drilling, indicating semi-confined upper aquifer conditions. There was no evidence of perched water in the drilling through unconsolidated sediments across the Caribe GE. Based on the above and analyses of contaminant data, the uppermost aquifer is semi-confined and occurs within an interconnected zone of fractures located approximately 50 ft to 110 ft bgs in the granodiorite bedrock. The results of the aquifer testing investigation (see reference (2)) indicate that the hydraulic conductivity of the granodiorite is relatively low. A pumping and recovery test was performed in C-7 after the well was installed. The pumping test in this well indicated a lower value (1.1×10^{-6} cm/s), which suggests that fewer fractures were influenced during the shorter time period of this test. The remaining data are from slug tests, which indicate a geometric mean for hydraulic conductivity of 1.2×10^{-6} cm/s based on data collected in the monitoring wells. A packer pumping test at C-7 indicated that the hydraulic conductivity was highest (3.5×10^{-5} cm/s) in the 90-110 ft bgs depth interval.

In summary, both aquifer pumping test data and rapid water level declines during well development indicate that the hydraulic conductivity of the granodiorite is low. Using estimated values of 1.1×10^{-6} cm/s (0.0031 ft/day based on pump test at monitoring well C-7) to 1.0×10^{-4} cm/s (0.28 ft/day, which is a factor of 3 higher than maximum observed value) for the horizontal hydraulic conductivity, a horizontal hydraulic gradient of 0.0094 ft/ft between two monitoring wells (C-4 and C-10), and an estimated effective porosity of 0.1, the average linear groundwater velocity is estimated to range from 0.11 ft/yr to 9.6 ft/yr at Caribe GE. These values indicate that groundwater moves relatively slowly, which is consistent with the limited observed plume migration distance at Caribe GE.

Water level elevations have been measured since 1992. A typical potentiometric surface map of the water level data for October 2015 is shown as Figure 3 of the June 2016 groundwater sampling report (see reference (3)). A comparison of horizontal (0.0208 ft/ft between monitoring wells C-4 and C-10) and vertically upward (0.0008 ft/ft between two monitoring wells (C-7 and C-4)) hydraulic gradients on this date indicates that groundwater flow is primarily horizontal in the uppermost aquifer. The minor upward hydraulic gradient is consistent with the proximity of the Atlantic Ocean, which is where groundwater discharges. An upward hydraulic gradient was observed between monitoring wells C-7 and C-4 in 7 of the eight (8) quarterly sampling events in 2006 and 2007, ranging from 0.03 to 0.18 ft. Based on previous reports submitted to EPA, historical water level data indicate that the water levels in the monitoring wells rise and fall in a pattern consistent with precipitation events. Given the low permeability of the granodiorite, lower precipitation rate in Vieques, and the high evapotranspiration

rate, local rainfall may not reach the uppermost aquifer at Caribe GE, which is consistent with the absence of a water table. Recharge likely occurs in upland areas located to the south where aquifer conditions are unconfined.

The groundwater monitoring report from the October 2015 sampling event (3) shows that the groundwater elevations and flow direction observed during this monitoring event are consistent with previous monitoring events and historical records. The report's hydrographs indicate long-term groundwater elevation trends which generally correlate with higher elevations during the rainy season (August to November) and lower elevations during the dry season (February to March).

Summary of Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs)

The Puerto Rico Environmental Board (EQB) prepared a RCRA Facility Assessment (RFA) report dated September 30, 1988 (4), and submitted it to EPA for review. After review, EPA accepted the report on April 1, 1991. At the time of the RFA, Caribe GE was generating degreasing solvents (F001), acids (D002) and rinse waters (D003). EQB identified four (4) solid waste management units (SWMUs) and three (3) areas of concern (AOC). The SWMUs and AOC are:

SWMUs	AOC
SWMU-1 – Hazardous waste container area	AOC-1 – Raw material storage area
SWMU-2 – Leach field	AOC-2 – Degreaser tank
SWMU-3 – Concrete treatment/settling sump (sediment tank)	AOC-3 – Electroplating area
SWMU-4 – Septic tank system	

As per a letter prepared by Caribe GE, stated that Caribe GE identified the Bright Dip Area as a new AOC (5). EQB recommended no further action at SWMU-1, AOC-1, AOC-2 and AOC-3. In January 13, 2000 EQB updated the RFA and did not identify additional areas.

SWMUs 2, 3 and 4 were investigated, closure activities completed, and recommended to EPA for clean closure. On March 21, 2005, EPA issued a letter granting the clean closure certification for the following units:

- Inactive subsurface leach field system (leach field – SWMU-2, closed April 1991)
- Sediment tank (associated with the leach field) (SWMU-3, closed April 1991)
- Septic tank system (SWMU-4, closed September 1993)
- Bright dip area (formerly located at the southwest of the main building, closed 1991)

During an investigation performed for the closure of the above-mentioned SWMUs and AOCs, Caribe GE found chlorinated volatile organic compounds (cVOCs) in the groundwater to the south of the leach field. These cVOCs were trichloroethene (TCE), 1,1-dichloroethene (1-1 DCE) and cis 1,2-dichloroethene (cDCE). The area where the cVOCs were found represented a new AOC. In the closure certification EPA required the installation of additional wells and to continue with groundwater monitoring of the new AOC. During the fall of 2005, Caribe GE installed four (2) additional wells and

collected groundwater samples. By the end of 2005, Caribe GE had installed ten (10) wells, identified C-1 to C-10. Currently, Caribe GE monitors these wells on a semiannual basis.

In 2008, Caribe GE submitted a Corrective Measures work plan. EPA approved the work plan, with some modifications on July 7, 2012. As part of the modifications, Caribe GE installed an additional well (C-11) at the west side of the main building to determine the extent of contaminants at this area. In addition, pressure transducers were installed in all the wells to continuously log groundwater elevation (2). The contaminants of concern for the Caribe GE are: (1) TCE, 1,1-dichloroethane (1,1-DCA), (2) 1-1 DCE, (3) cDCE and (4) vinyl chloride (VC). The last sampling event occurred on October 19 and 20, 2015 (3).

Remedial Approaches

The contaminants have stayed within their current area since at least 2005. No complete exposure pathway exists for workers at Caribe GE and residences north of Caribe GE. Data collected since at least 2005 show that natural attenuation has occurred.

The chosen remedy for this Site is monitored natural attenuation. GE will continue monitoring the groundwater on a semi-annual basis for a period of ten (10) years. Semi-annual monitoring reports will be submitted to the EPA following the completion of each event and held at Caribe GE for public review. A paper copy will also be placed at the local library. The electronic documents will be available at the EPA website for Caribe GE located at <http://www3.epa.gov/region02/waste/fsgeviequ.htm>.

During the course of the semi-annual monitoring period, EPA and GE will evaluate available technology to determine if it would be suitable to supplement the MNA program at Caribe GE through bioaugmentation or other means of enhancing contaminant degradation. If EPA and GE determine that an enhancement is suitable for the Caribe GE, a pilot may be implemented to determine its suitability and a public notice will be issued.

Every five (5) years GE will prepare a corrective measures assessment summary report. If contaminants continue attenuating and not representing a risk to receptors outside the boundaries of Caribe GE the remediation will be considered achieved after ten (10) years.

Public Participation

On August 15, 2016, EPA published a public notice on the Primera Hora newspaper to request comments on the proposed remedy. A 30-day public comment period on the proposed remedy was opened from August 15 to September 13, 2016. A public availability session was held at EPA Vieques office on August 31, 2016. No public meeting was necessary since it was not requested by the public and no comments on the proposed remedy were received.

Determination of Remedy Construction (CA550RC) granted

Based on a review of the information referenced in this document, a determination about “Remedy Construction” has been granted, where the actual remedy has been constructed (CA550RC).

This determination is expected to be maintained at the GE Vieques site, EPA ID PRD000692582, located in Vieques, Puerto Rico, under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the Caribe GE.

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EPA Region 2

Date: 2016-09-28

Approved by: Ramón Torres
Ramón Torres, Branch Chief
Response & Remediation Branch/CEPD
EPA Region 2

Date: 9/28/16

Locations where references may be found:

References reviewed to prepare this EI determination have been identified under the Caribe GE Information Section. Reference materials are available at U.S. EPA, Region 2 and at GE. Vieques.

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References

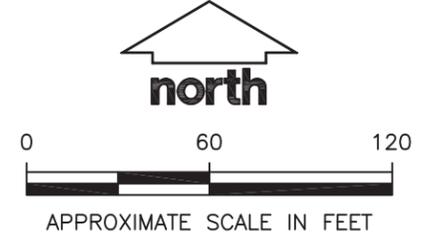
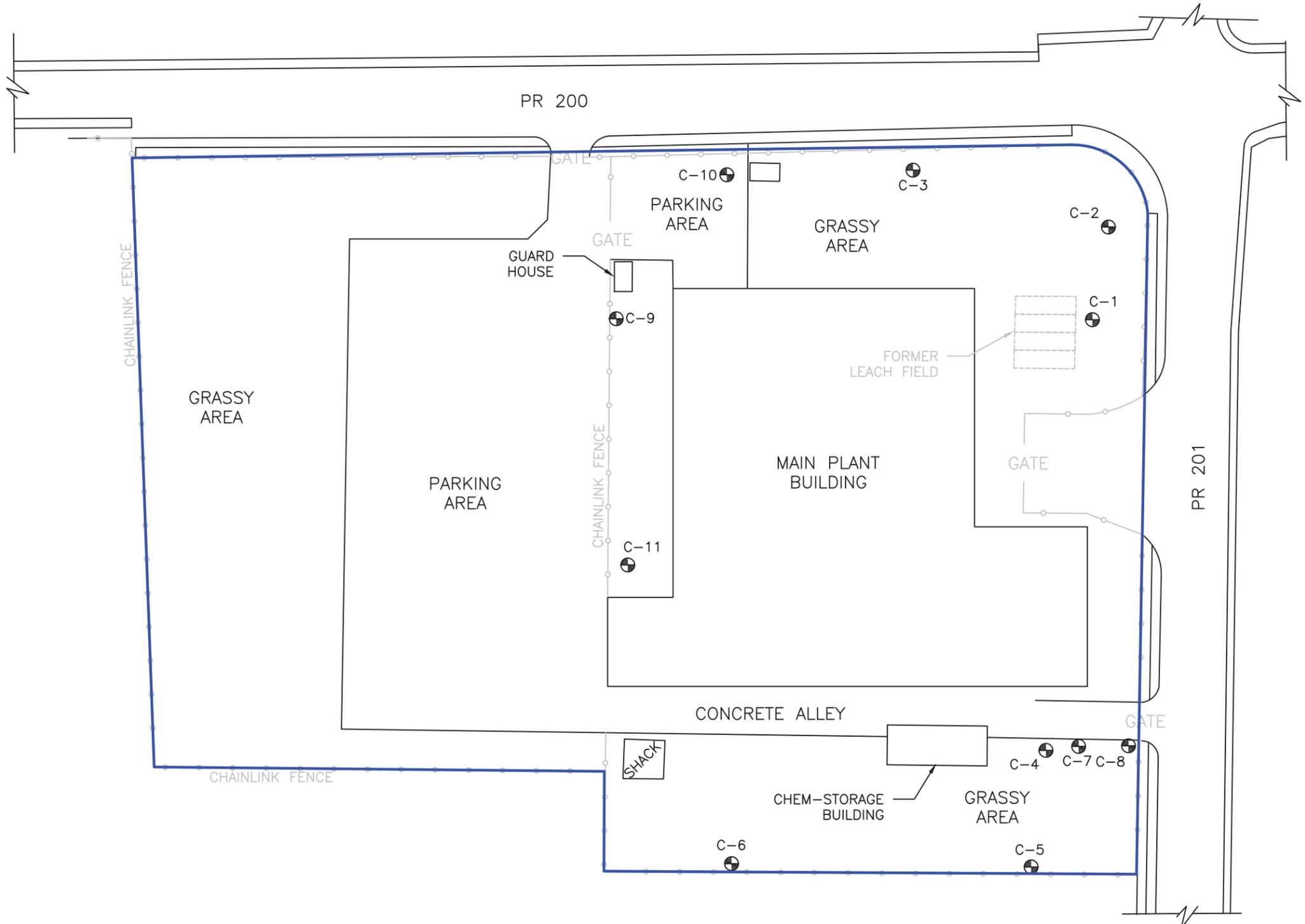
1. **U.S. Environmental Protection Agency.** General Electric Vieques Corrective Measures Memorandum. Guaynabo, PR : s.n., September 13, 2016.
2. **Tetra Tech GEO, Inc.** Focused Corrective Measures Study Work Plan. Sterling, Virginia, United States : s.n., August 17, 2012.
3. **MWH Americas, Inc.** Annual Groundwater Monitoring Report - December 2015. June 7, 2016.
4. **Puerto Rico Environmental Quality Board.** *RCRA Facility Assessment Report Caribe General Electric Products, Inc. Vieques Plant - Vieques, P. R.* Land Pollution Control Area, Puerto Rico Environmental Quality Board. San Juan : Puerto Rico Environmental Quality Board, 1988.
5. **N.A. Water Systems.** Summary of site closure issues. State College, Pennsylvania : s.n., January 10, 2004.
6. **MWH Americas, Inc.** Groundwater Monitoring Report October 2014. Vieques, PR : s.n., December 31, 2014.

Approved By & Date:

Revised By & Date:

Approved By & Date:

Drawn By & Date: TLP 09/29/14



LEGEND

- C-6  MONITORING WELL LOCATION AND DESIGNATION
-  APPROXIMATE SITE BOUNDARY

CARIBE GE PRODUCTS, INC.
VIEQUES, PUERTO RICO

SITE LAYOUT MAP

FIGURE 1

