

**DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION**

August 29, 2007

**RCRA Corrective Action  
Environmental Indicator (EI) RCRIS code (CA750)**

**Migration of Contaminated Groundwater Under Control**

**Facility Name:** General Electric Residential Products, Inc. (formerly Caribe General Electric Products, Inc.)  
**Facility Address:** State Road 191 Palmer, Puerto Rico  
**Facility EPA ID #:** PRD090510793

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?
- If yes - check here and continue with #2 below.
- If no - re-evaluate existing data, or
- if data are not available, skip to #8 and enter "IN" (more information needed) status code.

**BACKGROUND**

The **General Electric Residential Products, Inc., formerly Caribe General Electric Products, Inc. (Caribe GE)** is a former electro-plating facility, located in Palmer Ward, Municipality of Rio Grande, Commonwealth of Puerto Rico. The facility is located on both sides of State Road 191, adjacent to the Mameyes River which forms the Facility's southeast boundary. The Rio Mameyes flows north and drains an area of approximately 17 square miles from the flanks of the Luquillo National Rain Forest ("El Yunque") to the Atlantic Ocean. The surface waters of the Rio Mameyes are used as a municipal drinking water source, at a municipal intake point located approximately 2,000 feet downstream (i.e., northeast) of the Caribe GE facility. Besides the Rio Mameyes, the areas surrounding the facility include agricultural fields, dense overgrown areas (non-cultivated), and residential housing located approximately 1000 feet north of the facility, in the Mameyes development (Palmer post office). No other manufacturing facilities are nearby.

The facility commenced operations in 1956. From 1956 until 1981 wastewaters from the facility's electroplating (metal plating) operations, located in Building No.1 on the west side of State Road 191, were transferred via underground piping from the electroplating area to two surface impoundments (Lagoons A and B), located on the east side of State Road 191. The wastewaters were temporarily held in Lagoons A and B to allow particulates to settle out and accumulated as a sludge. This sludge is the listed hazardous waste F006. Following settling of the sludges, the wastewaters were formerly discharged by underground piping to the Rio Mameyes. According to GE, the two lagoons stopped receiving wastewaters in December 1981. However, the lagoons were not closed until between November 1989 and September 1991, when, under an approved RCRA Closure Plan, all liquids, sludges and contaminated soils were removed from the two surface impoundments, and they were closed and capped. Because subsequent groundwater monitoring revealed that dissolved cadmium continued to be detected in the groundwater at concentrations exceeding the MCL of 0.005 mg/L, a RCRA Post-closure permit was issued in 1998. The post-closure permit required investigations to fully delineate the dissolved cadmium plume in the groundwater and continued groundwater monitoring to confirm that there are no unacceptable impacts from the two closed surface impoundments. Almost ten years of groundwater monitoring have revealed no unacceptable impacts from the two closed surface impoundments.

In 2003, Caribe GE closed all operations at the Facility, and in 2004 sold that portion of the facility located on the west side of State Road 191 to the Puerto Rico Industrial Development Company (PRIDCO); however, GE retained ownership of the portion of the Facility on the east side of State Road 191, where the two closed surface impoundments are located. Currently, no portions of the Facility (both the PRIDCO and GE owned) are being utilized or occupied.

In conjunction with the sale of part of the Facility to PRIDCO, Caribe GE performed extensive groundwater investigations on the portion of the facility on the west side of State Road 191. Based on those investigations, Caribe GE discovered chlorinated solvent plumes in the groundwater underlying the portion of the Facility on the west side of State Road 191, which were not associated with any SWMUs or AOCs addressed under the 1998 Post-closure permit. The chlorinated solvent constituents in the groundwater include: cis -1,2-Dichloroethene (“DCE”), tetrachloroethene “PCE”), and trichloroethene (“TCE”). Since 2004, Caribe GE has performed extensive groundwater investigations and submitted the results to EPA. The chlorinated solvent constituents in the groundwater underlying the portion of the Facility on the west side of State Road 191 appear to discharge to the surface waters of the Rio Mameyes. However, in 2007 Caribe GE conducted sampling of the surface waters of the Rio Mameyes and found no detections of chlorinated solvents in the surface waters of the Rio Mameyes. Therefore, based on the information currently available to EPA and current site usage, no unacceptable risks to human health are indicated. Nevertheless, EPA has requested Caribe GE to submit by September 30, 2007 a proposed corrective action and groundwater monitoring plan for the chlorinated solvent plumes under the PRIDCO-owned portion of the former facility.

#### **Definition of Environmental Indicators (for the RCRA Corrective Action)**

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

#### **Definition of “Migration of Contaminated Groundwater Under Control” EI**

A positive “Migration of Contaminated Groundwater Under Control” EI determination (“YE” status code) indicates that the migration of “contaminated” groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original “area of contaminated groundwater” (for all groundwater “contamination” subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

#### **Relationship of EI to Final Remedies**

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The “Migration of Contaminated Groundwater Under Control” EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

#### **Duration / Applicability of EI Determinations**

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be “**contaminated**”<sup>1</sup> above appropriately protective “levels” (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

**X** If yes - continue after identifying key contaminants, citing appropriate “levels,” and referencing supporting documentation.

If no - skip to #8 and enter “YE” status code, after citing appropriate “levels,” and referencing supporting documentation to demonstrate that groundwater is not “contaminated.”

If unknown - skip to #8 and enter “IN” status code.

Rationale and Reference(s):

<u>Key Contaminants in groundwater</u>	<u>Risk-Based Screening Concentration (RBSC)</u>	<u>Recent Maximum Concentration<sup>1</sup></u>
Tetrachloroethene (“perc”/PCE)	MCL = 5 ug/L <sup>2</sup>	460 ug/L (well MW-E)
Trichloroethene (TCE)	MCL = 5 ug/L	4400 ug/L (well MW-K)
Cis-1,2-Dichloroethene	MCL = 70 ug/L	470 ug/L (well MW-K)
1,1-Dichloroethene (1,1-Dichloroethylene)	MCL = 7 ug/L	10 ug/L (well MW-H)
Vinyl chloride	MCL = 2 ug/L	110 ug/L (well MW-E)

Present in groundwater, but not exceeding RBSCs

1,1- Dichloroethane	Region IX PRG (Tap Water )= 810 ug/L	43 ug/L (well MW-E)
Trans-1,2-Dichloroethene	MCL = 100 ug/L	6 ug/L (well MW-H)
Cadmium	MCL = 5ug/L	2.2 ug/L (well D-2) <sup>3</sup>

**References:**

1) “New Area of Concern, Down -gradient Extent of Volatile Organic Compounds in Groundwater”, prepared by MWH for General Electric, September 2004.

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<sup>1</sup> Measured November 9, 2006 (refer to “New Area of Concern, Revised Plume Delineation and Source Assessment Report ”, prepared by MWH for General Electric, May 2007).

<sup>2</sup> Refer to 40 CFR § 141.61

<sup>3</sup> Measured December 12, 2006. Historical maximum concentration, 72 ug/L in well D-2 in March, 1998.

- 2) "New Area of Concern, Monitored Natural attenuation Summary Report", prepared by MWH for General Electric, December 2005
  - 3) "New Area of Concern, Groundwater Assessment Summary Report", prepared by MWH for General Electric, June 2006
  - 4) "New Area of Concern, Confirmation Sampling Results and Plume Delineation and Source Assessment Work Plan ", prepared by MWH for General Electric, September 2006
  - 5) "New Area of Concern, Revised Plume Delineation and Source Assessment Report ", prepared by MWH for General Electric, May 2007
  - 6) "New AOC Assessment Report", prepared by MWH Americas, Inc for GE, December 2003.
  - 7) Semiannual Post-Closure Groundwater Monitoring Reports, submitted under the 1998 RCRA Post-Closure Permit; the most recent report is the 2006 Second Semiannual Report, submitted March 12, 2007 by MWH Americas Inc. (William Bowen), on behalf of General Electric.
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Footnotes:

<sup>1</sup>"Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"<sup>2</sup> as defined by the monitoring locations designated at the time of this determination)?

  X   If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"<sup>2</sup>).

       If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"<sup>2</sup>) - skip to #8 and enter "NO" status code, after providing an explanation.

       If unknown - skip to #8 and enter "IN" status code.

**Rationale and Reference(s):** Though the dissolved chlorinated solvent groundwater plumes underlying the PRIDCO owned portions of the facility located west of state road 191 do discharge to the Rio Mameyes river; surface water sampling conducted in June 2007 indicates that there are no detections of chlorinated solvents in the surface waters of the Rio Mameyes as a result of that discharge. Except for that discharge, the dissolved chlorinated solvent plumes are expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination" as regards possible lateral and/or vertical expansion of those plumes within the geological strata.

References:

- 1) "New Area of Concern, Down-gradient Extent of Volatile Organic Compounds in Groundwater", prepared by MWH for General Electric, September 2004.
- 2) "New Area of Concern, Monitored Natural Attenuation Summary Report", prepared by MWH for General Electric, December 2005
- 3) "New Area of Concern, Groundwater Assessment Summary Report", prepared by MWH for General Electric, June 2006
- 4) "New Area of Concern, Confirmation Sampling Results and Plume Delineation and Source Assessment Work Plan", prepared by MWH for General Electric, September 2006
- 5) "New Area of Concern, Revised Plume Delineation and Source Assessment Report", prepared by MWH for General Electric, May 2007
- 6) "New AOC Assessment Report", prepared by MWH Americas, Inc for GE, December 2003.
- 7) August 8, 2007 letter submitted on behalf of General Electric to Adolph Everett from William Bowen, regarding "Preliminary [Rio Mameyes] Surface Water Sampling Results"
- 8) April 1999 report "Assessment of Nature and Extent of Dissolved Cadmium in Groundwater", prepared by Montgomery Watson for GE, and
- 9) Semiannual Post-Closure Groundwater Monitoring Reports, submitted under the 1998 RCRA Post-Closure Permit; the most recent report is the 2006 Second Semiannual Report, submitted March 12, 2007 by MWH Americas Inc. (William Bowen), on behalf of General Electric.

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<sup>2</sup> "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

**X** If yes - continue after identifying potentially affected surface water bodies.

If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s): Contaminated groundwater discharges to the Rio Mameyes

Refer to:

- 1) Figure 3 of the Draft Surface Water Sampling Work Plan, , prepared by MWH for General Electric, March 2007

2) "New Area of Concern, Revised Plume Delineation and Source Assessment Report", prepared by MWH for General Electric, May 2007

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be "**insignificant**" (i.e., the maximum concentration<sup>3</sup> of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

Yes - Any discharge of "contaminated" groundwater into surface water has been shown to be "**insignificant**" (i.e., the maximum concentration<sup>3</sup> of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level"). Surface water sampling conducted in June 2007 indicates that there are no measurable impacts to the surface waters in the Rio Mameyes from that groundwater discharge. A total of six surface water samples were collected from the Rio Mameyes, within and down stream of the "projected groundwater discharge zone", as well as two background samples, collected up-stream of the "projected groundwater discharge zone". The chlorinated solvent constituents in the surface water were all measured at non-detect levels (less than 1.0 ug/L - 0.8 ug/L), all of which are below the respective MCL or RBSC levels listed under item #2, above. In addition, there is no significant discharge of the cadmium contaminated groundwater underlying the two RCRA closed, former hazardous surface impoundments, since sampling results in the April 1999 "Assessment of Nature and Extent of Dissolved Cadmium in Groundwater" report, prepared by Montgomery Watson for GE, showed that the dissolved cadmium plume did not impact the surface waters of the Rio Mameyes. Since then, semiannual Post-Closure Groundwater Monitoring, required under the 1998 RCRA Post-Closure Permit, has shown that the dissolved cadmium plume has not migrated or expanded. The most recent data is given in the 2006 Second Semiannual Report, submitted March 12, 2007 by MWH Americas Inc. (William Bowen), on behalf of General Electric.

    X If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration<sup>3</sup> of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

\_\_\_\_\_ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration<sup>3</sup> of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations<sup>3</sup> greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and

identify if there is evidence that the amount of discharging contaminants is increasing.

\_\_\_\_\_ If unknown - enter "IN" status code in #8.

Rationale and Reference(s): The chlorinated solvent groundwater plumes, underling the PRIDCO owned portions of the facility (located west of state road 191), are indicated to discharge to the surface waters in the Rio Mameyes just east of state road 191, downgradient of wells MW-H, MW-I, and MW-J. However, surface water sampling conducted in June 2007 indicates that there are no detections of chlorinated solvents in the surface waters in the Rio Mameyes from that groundwater discharge. A total of six surface water samples were collected from the Rio Mameyes, within and down stream of the "projected groundwater discharge zone", as well as two background samples, collected up-stream of the "projected groundwater discharge zone". The chlorinated solvent constituents in the surface water were all measured at non-detect levels (less than 1.0 ug/L - 0.8 ug/L), all of which below the respective MCL or RBSC levels listed under item #2. In addition, the cadmium contaminated groundwater underlying the two RCRA closed, former wastewater treatment surface impoundments, does not impact the surface water quality of the Rio Mameyes.

There is no significant discharge of the cadmium contaminated groundwater underlying the two RCRA closed, former hazardous surface impoundments, since sampling results in the April 1999 "Assessment of Nature and Extent of Dissolved Cadmium in Groundwater" report, prepared by Montgomery Watson for GE, showed that the dissolved cadmium plume did not impact the surface waters of the Rio Mameyes. Since then, semiannual Post-Closure Groundwater Monitoring, required under the 1998 RCRA Post-Closure Permit, has shown that the dissolved cadmium plume has not migrated or expanded. The most recent data is given in the 2006 Second Semiannual Report, submitted March 12, 2007 by MWH Americas Inc. (William Bowen), on behalf of General Electric.

See:

- 1) August 8, 2007 letter and attachments regarding "Preliminary [Rio Mameyes] Surface Water Sampling Results", submitted to Mr. Adolph Everett of EPA, on behalf of General Electric by MWH (William Bowen).
- 2) "New Area of Concern, Revised Plume Delineation and Source Assessment Report", prepared by MWH for General Electric, May 2007
- 3) April 1999 report "Assessment of Nature and Extent of Dissolved Cadmium in Groundwater", prepared by Montgomery Watson for GE, and
- 4) Semiannual Post-Closure Groundwater Monitoring Reports, submitted under the 1998 RCRA Post-Closure Permit; the most recent report is the 2006 Second Semiannual

Report, submitted March 12, 2007 by MWH Americas Inc. (William Bowen), on behalf of General Electric.

<sup>3</sup> As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.



6. Can the **discharge** of “contaminated” groundwater into surface water be shown to be “**currently acceptable**” (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented<sup>4</sup>)?

\_\_\_\_\_ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site’s surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR

2) providing or referencing an interim-assessment,<sup>5</sup> appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment “levels,” as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

\_\_\_\_\_ If no - (the discharge of “contaminated” groundwater can not be shown to be “**currently acceptable**”) - skip to #8 and enter “NO” status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

\_\_\_\_\_ If unknown - skip to 8 and enter “IN” status code.

Rationale and Reference(s): \_\_\_\_\_

<sup>4</sup> Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refuge) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

<sup>5</sup> The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the “existing area of contaminated groundwater?”

  X   If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the “existing area of groundwater contamination.”

\_\_\_\_\_ If no - enter "NO" status code in #8.

\_\_\_\_\_ If unknown - enter "IN" status code in #8.

Rationale and Reference(s): The specific well locations which will be tested in the future to verify the expectation (identified in #3) that chlorinated solvent groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination." have not yet been fully defined. However, the specific plan for future chlorinated solvent groundwater monitoring is due to be submitted by the General Electric Company to EPA by September 30, 2007. See July 27, 2007 letter to Adolph Everett of EPA Region 2 from William Bowen of MWH Americas, Inc, submitted on behalf of General Electric Company.

In addition, the cadmium contaminated groundwater underlying the two RCRA closed, former hazardous waste surface impoundments, located on the east side of state road 191, is already required to be monitored semiannual under the 1998 RCRA Post-Closure Permit.

- 8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

   X    YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the former **General Electric Residential Products, Inc., formerly Caribe General Electric Products, Inc. facility, EPA ID #:    PRD090510793**, located at **Km. 0.5, State Road 191 Palmer, Puerto Rico**. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

\_\_\_\_\_ NO - Unacceptable migration of contaminated groundwater is observed or expected.

\_\_\_\_\_ IN - More information is needed to make a determination.

Completed by \_\_\_\_\_  
   Timothy R. Gordon     
   Remedial Project Manager     
   EPA Region 2   

Date Aug 29, 2007

Supervisor 1 (signature) \_\_\_\_\_  
(print)    Dale Carpenter     
(title)    Chief, Caribbean Section, RCRA Programs Branch     
   EPA Region 2   

Date Aug 31, 2007

Supervisor 2 (signature) \_\_\_\_\_  
(print) Adolph S. Everett, P.E.  
(title) Chief, RCRA Programs Branch  
EPA Region 2

Date Aug. 31, 2007

**Locations where References may be found:**

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