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DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

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

Migration of Contaminated Groundwater Under Control

General Electric (Waste Water)
CTD000842492
R-13
RDMS # 100190

Facility Name: **GE Waste Water**
Facility Address: **41 Woodford Ave, Plainville, CT 06062**
Facility EPA ID #: **CTD000842492**

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?

   __X__ 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

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).

REFERENCES

Draft final RCRA Preliminary Assessment, June 1986.
Final Preliminary Assessment, September 22, 1989.
Site Characterization Workplan, Plainville Lagoon and Pipeline, October 1991.
Letter to John Podgurski from GE, regarding meeting, plans, status of GE remediation efforts, 11-11-92.
Closure Plan For An Abandoned Effluent Pipeline, GE Electrical Distribution & Control, 2-93.
Soil Sampling and Analysis Plan, Former Effluent Pipeline, June 1994.
Summary of Remediation Efforts For Surface Impoundments and Waste Pile Units, April 1997.
Part 1 Closure Plan, Former Effluent Pipeline, April 1999.
Quality Assurance Project Plan, Part 1 Closure Plan, Former Effluent Pipeline, November 1999.
Letter of Transmittal, from D. M. Downie to CTDEP, re: soil sample results, pipeline, 5-25-01.
Draft Environmental Indicator, prepared by GE, 7/8/02.
Letter re: Requested Attachments (1 and 2) for EI and Pipeline Study Data, July 26, 2002.
Revised Task Work Plan for Soil/Source, Groundwater, and Sediment Sampling, GE Company, 8-5-02.
2002 Annual Groundwater Monitoring Report, March 4, 2003.
Letter from B. Fuller, GE, to B. Brackett re: soil and water sample results from surface impoundment, 4-23-03.

SITE HISTORY

The GE facility in Plainville consists of three separate facilities, the North Plant, the South Plant, and the Wastewater Pipeline and Treatment Plant. Each of these facilities were assigned a separate EPA ID number after GE submitted to EPA notification of hazardous waste activity. Currently, GE manufactures circuit breaker enclosures and switchboard power breakers at the North Plant facility. The South Plant is the corporate headquarters for industrial systems at GE, and no manufacturing takes place on the property. **This EI determination concerns only the 1,800 foot long Pipeline and Wastewater Treatment Plant (WWTP).**

Since 1899, there has been a manufacturing facility located at 41 Woodford Ave, and GE has operated at the site since 1952. From 1952 until 1985, GE conducted metal finishing operations, including electroplating, the application of protective coatings to metal surfaces, and solvent degreasing at the North Plant. Metal finishing wastewater was discharged to the South Plant where they were pretreated prior to discharge through an underground pipeline to the WWTP, which is located on Milford Street adjacent to the Quinnipiac River, approximately 0.34 miles southeast of the South Plant.

The WWTP area is approximately 5 acres in size. Beginning in the 1950's, it was operated as a primary sewage treatment plant by the Trumbull Electric Company. In the mid 1960's, GE began using the WWTP as a metal hydroxide settling lagoon and dewatering operation. The treated aqueous phase was discharged to the Quinnipiac River through a NPDES permitted outfall. Metal hydroxide sludge was removed from settling ponds on a regular basis and transferred to four lined sludge drying beds for dewatering. After dewatering, the sludge was removed and disposed of in an off-site landfill. In 1985, electroplating operations were discontinued at the North Plant, and in 1987 the North Plant was connected to the municipal sewer system. Closure and removal of the settling ponds and sludge drying beds at the WWTP began in 1989.

The pipeline was constructed in 1975 and extends from the South Plant in a southeast direction beneath Woodford Ave, and turns to the southwest beneath Woodland Street to the end of the street where it intersects Milford Street and Locust Street. The pipeline lies at depths of between 4 and 7 feet below the paved roadway, which lies above the 100 year flood plain. Storm water runoff along the pipeline route flows to catch basins and through storm sewer pipes to the Quinnipiac River.

SITE SETTING

The lagoon area lies within 75 feet of the Quinnipiac River. Currently, the lagoon area continues to drain surface water runoff to the Quinnipiac River. Runoff from offsite properties to the west of the lagoon enters the lagoon area as sheet flow and crosses the site in a west to east direction, where a 12 inch PVC pipe carries runoff through the berm to the river.

The local geology consists of approximately 200 feet of surficial glacial deposits consisting of approximately 25 feet of surficial medium to coarse grained sands which are underlain by an approximately 20 feet of silt and clay, which in turn overlies sand. Bedrock beneath the site is the New Haven Arkose, a sedimentary rock consisting of arkosic sandstone, siltstone, and shale. The clay deposits act as an aquitard between the upper and lower water bearing zones. Comparison of groundwater levels from wells screened in the upper and lower water bearing zones indicate an upward vertical hydraulic gradient. The direction of groundwater flow in the upper water bearing zone is southeast toward the Quinnipiac River. Groundwater flow is to the east in the deeper overburden. Average flow velocity range from 0.06 to 9.94 feet per day.

Groundwater in the vicinity of the pipeline is classified as GA. Shallow groundwater flow is southeast toward the Quinnipiac River, which is classified as C/B. In the vicinity of the site, the river is too shallow to make swimming or boating practical. The Quinnipiac River flows southerly approximately 56 miles to New Haven Harbor.

SITE INVESTIGATIONS AND REMEDIATION

LAGOONS

In 1982, Dames and Moore completed a hydrological investigation of the lagoons. The investigation included the installation and sampling of 6 shallow monitoring wells (MW-101 through MW-106), and surface water samples from upstream and downstream locations in the Quinnipiac River. Several metals (barium, cadmium, lead, and chromium) and VOCs (methylene chloride, chloroform,) were detected in at least one well at levels above the GWPC. Total VOCs were measured at 8.4 ppb at an upstream location in the Quinnipiac, and 56 ppb at a downstream location. The study also concluded that releases of cadmium were occurring to the river via groundwater discharge and/or NPDES surface water discharge.

In 1986, GE installed three deep monitoring wells to depths of approximately 60 feet.

The closure of the lagoons occurred between September 1989 and November 1990, and included excavation and removal of 30,000 cubic yards of contaminated soils including portions of neighboring residences. Much of the excavated area was removed to the water table, and in some cases below the water table. Following excavation of the site, a layer of clean fill was placed across the site and seeded or sodded with grass. Results of confirmation soil sampling were that all of the samples collected from above the water table produced a TCLP filtrate which met drinking water standards. Beneath the water table, some soils still contained elevated concentrations of cadmium.

Shallow monitoring wells, MW-101 through MW-106, are screened in the upper sands. Deep wells MW-107, MW-108, and MW-109, are screened in the partially confined lower sands. Groundwater data collected over the years indicates that the shallow groundwater flows to the river, and that shallow/deep groundwater gradients are vertically upward.

Groundwater sampling at the former lagoons is conducted quarterly. Wells are sampled for dissolved metals (aluminum, cadmium, chromium, hexavalent chromium, copper, iron, lead, nickel, silver, tin, and zinc), total cyanide, cyanide amenable to chlorination, and indicator parameters (specific conductance, pH, total organic carbon (TOC), and total organic halogen (TOX)). VOCs are sampled on an annual basis. Results of the groundwater sampling conducted in January, April, July, and October 2002 include the following:

VOCs were not detected in any of the nine wells.

RSR GWPC and SWPC standards were not exceeded in any of the three deep wells, but standards were exceeded for cadmium, copper, and/or zinc in four of the six shallow wells. Cadmium was the only contaminant detected at concentrations above the GWPC.

Upgradient shallow wells MW-101 and MW-102 (located near the western border of the lagoon) had higher concentrations than the downgradient shallow wells located near the Quinnipiac River. The highest concentrations were found in shallow well MW-102 (located in a former sludge drying bed), with maximum concentrations of 426 ppb of cadmium (GWPC= 5ppb, SWPC = 6ppb), 111 ppb of copper (SWPC = 48 ppb), and 240 ppb of zinc (SWPC = 123 ppb). Shallow well MW-105 is located approximately 110 feet downgradient from MW-102 and approximately 30 feet upgradient from the Qunnipiac River. Cadmium was detected at significantly lower concentrations in MW-105, ranging between non detect (in two of four rounds) and 60 ppb, with an average of less than 20 ppb. Copper and zinc were not detected above GWPC or SWPC standards in MW-105.

Concentrations of cadmium ranged between 11 ppb and 53 ppb in upgradient well MW-101. MW-104 is a shallow well located approximately 150 feet downgradient of MW-101, and had lower concentrations of cadmium ranging from non detect (in 2 of four rounds) to 9 ppb. However, copper was detected in well MW-104 once at a concentration of 78 ppb, which is above the SWPC of 48 ppb.

Surface water samples were collected from the Quinnipiac River on six occasions between July 1992 and February 1993 to determine whether cadmium was impacting the River. In a letter dated April 19, 1997, GE provided the results for the two downstream locations, SW-1 and SW-2. The results for cadmium ranged from non detect in eight of the twelve samples, to a maximum concentration of 8 ppb.

PIPELINE

In 1992, GE implemented a CTDEP approved site characterization work plan to assess the condition of the pipeline. Groundwater samples were collected from four wells located along Woodford Ave and Woodland Street (wells MW-301, 302, 303, and MW-202) and analyzed for cyanide and metals. Cadmium concentrations were below MCLs (the highest concentration detected was 4 ppb in well MW-302). Three additional rounds of groundwater sampling have been conducted since the 1992 investigation in April 1994, June 1994, and July 1995.

In May 1994, Ge submitted the Groundwater Monitoring Report, Former Effluent Pipeline (contained in Appendix B of the April 1999 Part 1 Closure Plan). This monitoring report describes existing and new monitoring well and piezometer installations, groundwater flow direction, and results of groundwater sampling. Data indicate a downward component of flow in the area of the pipeline along Woodford Ave, and an upward component of flow in the area of Woodland Street and the lagoons. Results of sampling for metals were that all samples met GWPC for metals.

2. Is **groundwater** known or reasonably suspected to be **"contaminated"**[1] 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):

Lagoons: Quarterly sampling of monitoring wells at the former lagoons indicates exceedences of cadmium above GWPC, and cadmium and copper above SWPC in shallow wells near the river. 2002 Annual Groundwater Monitoring Report.

Pipeline: Four rounds of groundwater samples were collected between 1992 and 1995 from four wells located along Woodford Ave and Woodland Street and analyzed for cyanide and metals. Contaminants were not detected above RSRs. Appendix B of the April 1999 Part 1Closure Plan (Groundwater Monitoring Report, Former Effluent Pipeline, dated May 1994).

Footnotes:

[1]"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"[2] 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"[2]).

_____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - 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):

Quarterly sampling of monitoring wells at the former lagoons over the last few years indicates: 1)VOCs have not been detected in lagoon wells in recent years; 2) GWPC and SWPC standards have not been exceeded in any of the three deep wells, but standards have been exceeded for cadmium, copper, and/or zinc in four of the six shallow wells; 3) upgradient shallow wells MW-101 and MW-102 (located near the western border of the lagoon) had higher concentrations than the downgradient shallow wells located near the Quinnipiac River.

Site data indicates that contaminated groundwater at the former lagoons is confined to the shallow overburden and is discharging to the Quinnipiac River. Contaminated groundwater is not expected to move deeper into the overburden because 1) much of the source has been removed; 2) contamination has not been detected in deeper wells; and 3) vertical gradients indicate groundwater is moving upward. Contaminated groundwater is not expected to move horizontally beyond the River.

[2] "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):

Shallow well MW-105 is located approximately 30 feet upgradient from the Qunnipiac River. In 2002, cadmium was detected at an average concentration of less than 20 ppb, which is greater than the GWPC of 5 ppb and the SWPC of 6 ppb. MW-104 is a shallow well located approximately 50 feet upgradient of the River. The maximum concentration of cadmium detected in 2002 was 9 ppb. In addition, copper was detected in well MW-104 once at a concentration of 78 ppb, which is above the SWPC of 48 ppb. 2002 Annual Groundwater Monitoring Report.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] 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)?

__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[3] 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 judgement/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[3] 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[3] 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):

There are three shallow wells, MW-104, MW-105, and MW-106) located near the Quinnipiac River. The highest concentrations were found in well MW-105, located approximately 30 feet upgradient from the Quinnipiac River. During four rounds of sampling in 2002, cadmium was detected in MW-105 at concentrations ranging between non detect (in two of four rounds) and 60 ppb, with an average of less than 20 ppb. The appropriate groundwater "level" for cadmium is the GWPC of 5 ppb. Thus, it is considered likely that cadmium is discharging to the river at concentrations less than 50 ppb.

MW-104 is located approximately 50 feet upgradient of the river. Results of the four sampling rounds conducted in 2002 were that concentrations of cadmium ranged from non detect (in 2 of four rounds) to 9 ppb. However, copper was detected in well MW-104 once at a concentration of 78 ppb, which is above the SWPC of 48 ppb.

No exceedences of RSR GWPC or SWPC were detected in well MW-106 in 2002.

There is no evidence that these levels are increasing. Since much of the source area was removed in 1990, it is expected that concentrations of metals discharging to the river should decrease over time.

The Quinnipiac River is classified as Class C/B, which indicates that the river is impaired, and has unacceptable quality to support one or more Class B uses. It is considered unlikely that the continued discharge of low levels of contaminated groundwater will have an unacceptable impact to the Quinnipiac surface water, sediments, or eco-system.

[3] 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[4])?

____ 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,[5] 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):

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) 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.

[5] 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):

Quarterly sampling will continue to be conducted in accordance with the work plan that was approved by CTDEP as part of the July 22, 1988 Surface Impoundment Closure Plan.

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 GE Waste Water facility, EPA ID # **CTD000842492**, located at 41 Woodford Ave, Plainville, CT. 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 (signature) Robert W. Brackett Date 9/25/03
(print) Robert W. Brackett
(title) RCRA Facility Manager

Supervisor (signature) Matthew R. Hoagland Date 2/9/04
(print) Matthew R. Hoagland
(title) RCRA Corrective Action Section Chief
(EPA Region or State) EPA New England, Region I

Locations where References may be found:

References can be found in the site file at the Records Center at One Congress Street in Boston, MA.

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