DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Final: May 16, 2001

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

Migration of Contaminated Groundwater Under Control

Facility Name: **NRG Fossil Fuel Plant – Middletown Station**
Facility Address: **1866 River Road**
Facility EPA ID #: **CTD 000845230**

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).

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): See notes under Section 750-2 in attached text

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): See notes under Section 750-3 in attached text

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).

[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): See notes under Section 750-4 in attached text

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):): See notes under Section 750-5 in attached text

[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): In accordance with the instructions for Section 5, this section is not applicable for "insignificant" discharges.

[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): See notes under Section 750-7 in attached text.

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__ 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 NRG Fossil Fuel – Middletown Station facility**, EPA ID # **CTD000845230**, located at **Middletown, Connecticut**. 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.

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

Completed by (signature) _____ Date 7/12/01
(print) Juan A. Perez
(title) Environmental Scientist

Supervisor (signature) _____ Date 8/16/01
(print) Matthew R. Hoagland
(title) Section Chief
EPA Region or State) Reg. I

Locations where References may be found:

March, 1999 Phase I Environmental Site Assessment (Metcalf & Eddy, Inc.)
April, 1999 Phase II Environmental Field Investigation Report (Metcalf & Eddy, Inc.)
November, 1999 Supplemental Site Investigation Report (Metcalf & Eddy, Inc.)

Contact telephone and e-mail numbers

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Rationale and References
For
Documentation of Environmental Indicator Determination
RCRA Corrective Action Environmental Indicator Code CA 750

Clarified through conference call July 31, 2001 JAP

In 1978, the facility installed an equalization basin (EB-2), as part of its wastewater treatment system. The unit was installed to accept overflows from other treatment facility components to prevent the release of untreated water to the Connecticut River, located approximately 1,775 feet to the east-southeast of the power plant. It was constructed with a single hypalon liner, and had a capacity of 3,160,000 gallons. It was formed by excavating into compacted fly ash that had been deposited when the plant burned coal. The unit was identified as a RCRA hazardous waste impoundment because it received RCRA hazardous waste for treatment. All discharges of RCRA hazardous waste to the unit were halted in November 1988. Formal closure of EB-2 was initiated in 1989, when excess water was drained from the impoundment, bottom sludge was removed, the hypalon liner was removed and disposed, and sub-liner soil was sampled. In addition, above ground piping was removed, and below grade piping was flushed and abandoned. Based on those activities, certificate of clean closure documentation was submitted to the USEPA and CTDEP on August 29, 1991. Additional supporting documentation was submitted to both agencies on August 29, 1991.

In 1985, the facility installed four shallow monitoring wells in the vicinity of the surface impoundment, in order to initiate a groundwater monitoring program designed to assess the impact of the surface impoundment on the quality of groundwater underlying the site. The program was designed to satisfy RCRA's Interim Status Requirements for Hazardous Waste Facilities. An existing overburden well was added, and four additional wells were installed in September, 1987. Three (3) additional monitoring wells and four (4) piezometers were installed in the vicinity of the former EB-2 unit in August of 1990. A revised RCRA Sampling and Analysis Plan was submitted to the EPA and CTDEP on February 12, 1991.

Contradiction!

Groundwater sampling and measurements have indicated that all wells are influenced by river tidal fluctuations. The 1997 RCRA Groundwater Monitoring Annual Report indicates that groundwater beneath the site is of generally fair quality upgradient and downgradient of the surface impoundment. No RCRA indicator parameters (TOC, TOX, pH, or specific conductance) statistically exceeded their regulatory value. Elevated levels of selenium in groundwater were attributed to leaching of coal ash deposits.

750-2 Groundwater Contamination Determination

The entire site is bordered to the north by the Connecticut River, while the remaining portions of the site are surrounded by wooded areas. The CTDEP classification of groundwater at the site is "GB"; not suitable for drinking. Consequently, the CTDEP's Surface Water Protection Criteria ("SWPC") is of primary importance when evaluating groundwater contamination at the site. Groundwater quality data

will, therefore, be compared to the SWPC.

In March, 1999 a Phase I Environmental Site Assessment ("ESA") was prepared to identify potential areas of environmental concern ("AOCs") at the Middletown facility, and to review prior environmental investigations. Subsequently, a limited Phase II ESA was prepared in April, 1999, in order to investigate potential contamination at the AOCs identified during the Phase I ESA. A direct push Geoprobe® unit was used to collect soil and groundwater samples from various locations throughout the facility. A total of 18 groundwater samples were collected from the Geoprobe® borings, and from existing monitoring wells.

Groundwater results in excess of surface water protection were encountered in five (5) groundwater samples collected from two (2) of the AOCs. They are listed in the following table.

Should be 0.029 clarified via telephone call July 11, 2001

Monitoring Well Number	Contaminant Name	Contaminant Conc. (mg/l)	SWPC (mg/l)
TW-10	Arsenic (dissolved)	0.29	0.004
	Lead (dissolved)	0.02	0.006 0.013
TW-14	Lead (dissolved)	0.02	0.006 0.013
ME-MDL-1-GW	Arsenic (dissolved)	0.014	0.004
ME-MDL-2-GW	Arsenic (dissolved)	0.015	0.004
ME-MDL-42-GW	Arsenic (dissolved)	0.004	0.004

clarified via conference call on July 11, 2001

As part of the supplemental investigations conducted in November, 1999, groundwater samples were collected from two (2) of the existing monitoring wells located in the vicinity of the former ash disposal areas, and analyzed for dissolved priority pollutant metals (PPM). The samples were collected to assist in the evaluation of groundwater, in light of the CTDEP's Surface Water Protection Criteria (SWPC). No metals were detected above the SWPC in either sample.

750-3 Migration Stabilization Evaluation

As stated, the facility installed four (4) shallow monitoring wells in the vicinity of the surface impoundment, in 1985, in order to initiate a groundwater monitoring program, designed to assess the impact of the surface impoundment on the quality of groundwater underlying the site. The program was designed to satisfy RCRA's Interim Status Requirements for hazardous Waste Facilities. An existing overburden well was added, and four additional wells were installed in September, 1987. Three (3) additional monitoring wells and four (4) piezometers were installed in the vicinity of the former EB-2 unit in August of 1990. A revised RCRA Sampling and Analysis Plan was submitted to the EPA and CTDEP on February 12, 1991. Periodic groundwater sampling has been ongoing since that time.

A review of the 1997 Annual Report for the RCRA Groundwater Monitoring Program indicated that none of the analyzed groundwater quality indicator parameters exceeded their regulatory values for that year.

750 – 4 Contaminated Groundwater Discharge to Surface Water Evaluation

The entire facility is bordered to the north by the Connecticut River, which serves as the drainage basin for local groundwater flow.

The data table at 750-2 shows a limited number of contaminants above SWPC, raising the possibility that contaminants may be discharging to the Connecticut River in excess of SWPC levels. It is important to note, however, that the Connecticut River is classified by the CTDEP as SC/SB. This classification indicates that the water is not of acceptable quality. The water quality goal is achievement of Class SB Criteria and attainment of Class SB designated uses.

750 – 5 Evaluation of Significance of Contaminated Groundwater Discharge to Surface Water

While contaminants have been detected in groundwater in excess of SWPC, it is not known whether contaminants have actually discharged to the Connecticut River at or above those concentrations. Based upon RCRA groundwater monitoring results, it appears that contaminant concentrations from the EB-2 area have decreased below regulatory concern. The Phase II ESA did, however, detect limited groundwater contamination of the excess of CTRSR criteria in the vicinity of the coal ash equalization basin/coal ash disposal area. Flow calculations indicate that, due to the high base flow in the Connecticut River, it is highly unlikely that groundwater contaminated in excess of SWPC would adversely impact that water body.

Based upon the location of the previous goundwater samples collected at the site, five (5) existing monitoring wells and eight (8) temporary wells installed in Geoprobe ® borings, located closest to the Connecticut River were chosen to evaluate the potential impact of contaminated groundwater on surface water.

The analytical results from these sampling points revealed that two (2) existing monitoring wells and three (3) of the soil borings sampled for groundwater exhibited compounds above the SWPC. Arsenic and lead were detected in the monitoring well and soil boring ground water samples collected at the site.. Arsenic was detected in four (4) of the five (5) samples at concentrations ranging from 0.004 mg/l to 0.029 mg/l. Lead was detected in two (2) of the five (5) groundwater samples; both at a concentration of 0.02 mg/l.

The estimated flow of groundwater to the river were 4.51x10-3 ft3/sec and 9.03x10-3 ft3/sec based upon the site's physical settings and estimated hydrogeological values. Based upon a dilution multiplier developed for the compounds detected and the estimated groundwater flow rate, the minimum flows of the Connecticut River required for arsenic and lead to meet the SWPC are 0.135 ft3/sec and 0.028 ft3/sec respectively.

Though there is no flow data available for the Connecticut River near the generating station, data obtained from the USGS at their gauging station located three (3) miles south of the Connecticut - Massachusetts State Line indicates that the annual seven-day minimum flow is 1,870 ft3/sec. Therefore, assuming that this flow is the minimal flow within the river downstream of the gauging station, the volume of water flowing in the Connecticut River is sufficient in allowing the detected contaminants in the groundwater to meet the SWPC.

750 – 7 Future Groundwater Monitoring

The facility is currently under the purview of the CT Property Transfer Act. It is also subject to the groundwater monitoring requirements of RCRA. These programs will provide for further , on-going groundwater monitoring, and verify that contaminated groundwater has remained within the dimensions of the "existing area of groundwater contamination."