DAMAGE CASES:

CONSTRUCTION AND DEMOLITION WASTE LANDFILLS

Prepared for

U.S. Environmental Protection Agency
Office of Solid Waste

by

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EXECUTIVE SUMMARY

The U.S. Environmental Protection Agency (EPA) is currently developing a rule addressing non-municipal facilities (industrial waste facilities, including construction and demolition waste landfills) that may receive hazardous wastes from conditionally exempt small quantity generators (CESQGs), or generators of less than 100 kilograms per month of hazardous waste. This report, prepared in support of EPA's rulemaking, presents information on environmental damages from construction and demolition (C&D) waste landfills, i.e., landfills that receive materials generated from the construction or destruction of structures such as buildings, roads, and bridges. C&D waste landfills are being examined because the Agency believes that the largest potential impact from this rulemaking will be on these facilities.

BACKGROUND

The 1984 Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA) required EPA to revise the existing standards and guidelines governing the management of household hazardous wastes and hazardous wastes from small quantity generators. EPA responded in 1991 by revising the existing criteria for solid waste disposal facilities and practices (40 CFR Part 257). In 1991 EPA issued revised criteria in 40 CFR Part 258 for municipal solid waste landfills (MSWLFs) that receive household hazardous wastes and CESQG wastes. EPA did not establish revised criteria for non-municipal facilities and subsequently was sued by the Sierra Club. A consent agreement was reached in January 1994, and EPA is now fulfilling the remainder of the HSWA mandate by regulating CESQG wastes that are disposed in non-municipal facilities. The final rule must be signed by the EPA Administrator by May 15, 1995. The rule will require facilities receiving CESQG wastes to have adequate ground-water monitoring, corrective action requirements, and location restrictions.

PURPOSE OF THIS REPORT

The purposes of this study were to (1) determine whether the disposal of C&D waste in landfills has led to contamination of ground water or surface water, or damages of ecological resources, and (2) examine whether these environmental damages can be attributed to specific aspects of the site such as the types of waste received, design and operating practices, and environmental setting/location.

METHODOLOGY

To compile documentation of environmental impacts resulting from C&D waste landfills, EPA searched for sites that met the following criteria:

- The landfill received predominantly C&D waste, with or without CESQG waste mixed in. Landfills that were known to have received significant quantities of municipal, industrial, or hazardous wastes were excluded.
- The use of the site as a C&D landfill had to be the only potential source of the observed contamination. Sites located near other potential sources of the contamination such as underground storage tanks were excluded.
- There had to be documented evidence of ground-water contamination, surface water contamination, or ecological damage at the site. "Contamination" was defined as an increase in constituent levels above background, or an exceedance of an applicable regulatory standard or criterion attributable to releases from the site.

EPA searched for sites meeting these criteria using four information sources:

- *Existing studies of C&D waste landfills.* Two studies provided particularly useful background information: (1) *Construction and Demolition Debris Disposal Issues: An Alachua County Perspective* (Hanrahan, 1994); and (2) *Construction and Demolition Waste Disposal: Management Problems and Alternative Solutions* (Lambert and Domizio, 1993).

- *Materials available through the Superfund program.* Superfund databases were searched to identify C&D waste landfills on the National Priorities List or under investigation. None of the Superfund sites were found to be appropriate damages cases, typically because they received a wide variety of wastes in addition to C&D waste.

- *Representatives of EPA Regions* were contacted. Because C&D waste landfills are regulated by the states rather than EPA, the representatives provided lists of state contacts.

- *Representatives of state and county environmental agencies* were contacted in 32 states. Only three states -- New York, Virginia, and Wisconsin -- clearly identified C&D waste landfills that met the criteria listed above. These states allowed EPA to review documentation on potential damage cases to obtain more detail on the cases reported here. Documentation reviewed included preliminary site assessments for New York sites, C&D site background files and monitoring data for Virginia sites, and a ground-water impact investigation for Wisconsin sites.

RESULTS

Only 11 damage cases were identified using the above methodology. All 11 sites reported ground-water contamination within the property boundary; none reported ground-water contamination off site. This does not mean that there was no off-site ground-water contamination; in most cases, ground-water monitoring was not performed beyond the site boundary.

Although most of the sites monitored ground water for a wide range of organic and inorganic constituents, virtually all of the contamination was associated with inorganics. Constituents that exceeded state ground-water protection standards or federal drinking water criteria most frequently were iron, manganese, total dissolved solids (TDS), and lead. Two of these constituents -- iron and manganese -- were found to exceed applicable standards by a factor of 100 or more in at least one sample at many landfills (i.e., at 5 of the 11 sites for iron, and at 4 of the 11 sites for manganese). It is noteworthy that for both constituents, the standard that was exceeded is a secondary, rather than primary, drinking water standard (MCL). Secondary MCLs are set to protect the water supply for aesthetic (e.g., taste) rather than health-based reasons.

Six sites had surface water contamination; three of these sites also had some contamination of sediments. At two sites, the surface water and sediment contamination was off site as well as on site. As with ground water, most of the contamination was associated with inorganic constituents. Constituents that exceeded state surface water standards or EPA's Ambient Water Quality Criteria (AWQC) for the protection of freshwater aquatic life most frequently were iron, zinc, lead, copper, and acidity (pH). Two of the sites reporting contamination of sediments had elevated levels of polynuclear aromatic hydrocarbons (PNAs).

The source documents rarely examined the possible link between environmental damages observed at a site and the design, operating, or location attributes of the site. Factors that might have contributed to the damages at the 11 sites are as follows:

- Seven landfills contained other types of wastes that had been disposed of legally or illegally, including tires, household hazardous wastes, and other materials.

- Environmental controls were typically inadequate or absent. Only two landfills were equipped with partial bottom liners and leachate collection systems (LCSs). Run-on and/or run-off controls were mentioned for only three sites. Six sites apparently had some type of final cover, but only two had more than a thin soil cover. For four sites, no environmental controls were mentioned in the source documents.

- Many of the landfills are characterized by environmental settings that could facilitate the release and transport of contaminants, including shallow ground water, complex ground-water flow conditions, and highly permeable subsoils. Many landfills had ponds, streams, or wetlands either on site or within close proximity; one site was located in a 100-year floodplain.

Although this study demonstrates that specific C&D waste landfills can lead to ground-water and surface water contamination, the Agency believes that it has insufficient data, at this point, to require more than the statute requires (i.e., ground-water monitoring, corrective action, and location restrictions). The Agency made a concerted effort to identify C&D damage cases by contacting 32 state agencies and was able to identify only 11 cases where there was a high probability that damages were associated with C&D wastes. The Agency's limited data (11 damage cases out of a total of approximately 1,800 C&D facilities) makes it difficult for the Agency to determine whether C&D facilities are posing sufficient risk to human health and the environment to warrant additional controls beyond those required by the statute.

CHAPTER 1. INTRODUCTION

This report presents information on environmental contamination that has resulted from the operation of construction and demolition (C&D) debris landfills. These are landfills that receive materials generated predominantly from the construction or destruction of structures such as buildings, roads, and bridges. There are currently about 1,800 C&D debris landfills operating in the United States.

This report was written in support of a rulemaking currently being developed by the U.S. Environmental Protection Agency (EPA). This chapter provides a background discussion of this rulemaking, and then discusses the purpose and organization of this report.

REGULATORY BACKGROUND

The Resource Conservation and Recovery Act (RCRA), passed in 1976, required the Environmental Protection Agency (EPA) to promulgate standards and guidelines for the management of solid wastes. In response to this mandate, EPA promulgated regulations for the management of hazardous wastes under Subtitle C of RCRA, and for non-hazardous wastes under Subtitle D. The Subtitle C standards applied to all facilities generating more than 1,000 kg/mo of hazardous wastes, but conditionally exempted from full regulation facilities generating less than this amount. Subtitle D guidelines address the management of all other solid wastes, such as municipal wastes and non-hazardous industrial wastes (including construction and demolition wastes).

In 1984, Congress passed the Hazardous and Solid Waste Amendments (HSWA), which made several changes to RCRA. One important change was the creation of two categories of small quantity hazardous waste generators: generators of 100 to 1,000 kg/mo, and generators of less than 100 kg/mo. HSWA added specific provisions for the first category, but gave EPA discretion as to whether to promulgate new requirements for the second. EPA has since defined generators of less than 100 kg/mo as conditionally-exempt small quantity generators, or CESQGs. CESQGs are responsible for the proper management of their wastes, but are not required to comply with many of the Subtitle C regulations specified for larger hazardous waste generators.

Another important change imposed by HSWA was the addition of Section 4010 to Subtitle D, requiring EPA to promulgate revised criteria addressing the management of household hazardous wastes and hazardous wastes from small quantity generators. EPA responded in October 1991 by promulgating the revised Municipal Solid Waste Landfill (MSWLF) Criteria (40 CFR Part 258). This partially fulfilled the HSWA mandate by addressing household hazardous wastes and CESQG wastes that are disposed in MSWLFs. After a consent agreement with the Sierra Club on January 28, 1994, EPA is now fulfilling the remainder of the HSWA mandate by regulating CESQG wastes that are disposed in non-municipal facilities. The final rule must be signed by the EPA Administrator by May 15, 1995. The rule will require facilities receiving CESQG wastes to have adequate ground-water monitoring, corrective action requirements, and location restrictions.

FOCUS ON C&D LANDFILLS

Many different types of Subtitle D waste management units other than MSWLFs may receive CESQG wastes and may therefore be affected by this rulemaking, including the following:

- Commercial Subtitle D industrial waste landfills;
- On-site Subtitle D industrial waste management units such as landfills, surface impoundments, land treatment units, and waste piles; and
- C&D debris landfills.

EPA believes that the only waste management units that may be impacted significantly by this rulemaking are the C&D landfills. C&D landfills are therefore the focus of this report.

PURPOSE AND ORGANIZATION OF THIS REPORT

The purposes of this study were to (1) determine whether the disposal of C&D debris in landfills has led to contamination of ground water, surface water, or ecological resources; and (2) examine whether these environmental damages can be attributed to specific aspects of the site such as the types of waste received, design and operating practices, and environmental setting/location.

The remainder of this report comprises three chapters.

- Chapter 2 discusses the criteria and information sources used to select sites to include in the study;
- Chapter 3 presents 11 damage cases; and
- Chapter 4 summarizes the types of damages found at these landfills, discusses the possible link between these damages and site operation, design, and location, and presents the conclusions of the study.

To compile documentation of environmental impacts resulting from C&D waste landfills, the Agency used four sources of information:

- Existing studies of C&D waste landfills;
- Materials available through the Superfund program;
- Representatives of EPA regions; and
- Representatives of state and county environmental agencies.

In reviewing information available from these sources, EPA applied certain criteria to select sites to serve as damage cases. EPA's criteria for identifying damage cases are presented below, followed by a discussion of each information source. Using these criteria and information sources, EPA identified 11 sites that document the occurrence of environmental contamination from C&D landfills. These damage cases are presented in Chapter 3.

CRITERIA FOR SELECTING DAMAGE CASES

The Agency considered three major factors in judging whether a site is an appropriate damage case for this analysis. First, EPA included only those facilities that received predominantly C&D waste, with or without conditionally-exempt small quantity generator (CESQG) waste mixed in. However, if evidence suggested that the site also received significant quantities of municipal, industrial, or hazardous wastes, it was excluded.

Second, the use of the site as a C&D landfill had to be the only potential source of the observed contamination. The site was excluded if it was located near another potential source of contamination (e.g., municipal solid waste landfill, leaking underground storage tank). The site was also excluded if it had a previous use (e.g., mine) that could have contributed to the contamination.

Finally, there had to be documented evidence of ground-water contamination, surface water contamination, or ecological damage at the site. "Contamination" was defined as an increase in constituent levels above background, or an exceedance of an applicable regulatory standard or criterion attributable to releases from the site. Ecological damage to aquatic communities was assumed to have occurred if surface water concentrations exceeded EPA's Ambient Water Quality Criteria, which are designed to be protective of aquatic communities. Terrestrial ecological damage would have been assumed to have occurred if the information source documented impacts to terrestrial flora or fauna at the site, but none of the source documents provided that information.

EXISTING STUDIES

EPA reviewed several existing studies of C&D waste generation and management. Two of these studies were particularly useful in providing background information helpful to this effort, such as the number of C&D waste landfills in each state, whether or not C&D landfills are monitored, and whether or not ground-water contamination has been documented. These two studies are:

- *Construction and Demolition Debris Disposal Issues: An Alachua County Perspective* (Hanrahan, 1994); and

- *Construction and Demolition Waste Disposal: Management Problems and Alternative Solutions* (Lambert and Domizio, 1993).

These reports helped to focus the Agency's search for documented damage cases.

SUPERFUND PROGRAM

Superfund databases were examined to determine whether they included any C&D waste landfills. This was performed in two steps, discussed below.

National Priorities List

The first step was to examine sites that have been listed (or are being proposed for listing) on the National Priorities List (NPL). EPA performed a keyword search of the **[** to be added **]** to identify all sites with "construction" as a site activity-waste source. This resulted in the identification of 14 sites that were listed on the NPL as of February 1991, and 9 additional sites that have been proposed for listing since then.

EPA obtained and reviewed Records of Decision (RODs) for each of the 14 sites on the NPL. Because RODs have not yet been written for most of the other sites, EPA obtained and reviewed the sites' Preliminary Assessments (a preliminary review of available information performed on all sites investigated under the Superfund program) and other available documentation instead.

Based on a review of the documentation for these sites, none were judged to be acceptable as damage cases for this analysis. All of the sites have received a wide variety of wastes in addition to C&D waste, including municipal, industrial, and/or hazardous wastes, and it was not possible to attribute the environmental contamination to the C&D component of the waste.

CERCLIS Characterization Database

Sites listed on the NPL represent only a fraction of sites investigated under the Superfund program. Over 30,000 sites identified through various means have received Preliminary Assessments under Superfund. Some of these sites have been found to require no further action, while others are being investigated in more detail for possible inclusion on the NPL. All sites that have received Preliminary Assessments are listed in the CERCLA Information System (CERCLIS). To determine whether any sites in CERCLIS are C&D waste landfills, the CERCLIS Characterization Database[1] was searched to identify sites with the following characteristics:

- The site contains a landfill associated with the construction industry in which C&D waste was disposed;
- Ground-water, surface water, and/or ecological damage has been documented at the site, and the site has not been deemed innocuous or low priority; and
- The landfill is not a municipal landfill or one that has received hazardous waste.

No facilities were found in the CERCLIS Characterization Database that met all of these criteria.

EPA REGIONS

All of the EPA regional offices were contacted to obtain information on contamination resulting from C&D waste sites in their regions. Since C&D waste landfills fall under the purview of Subtitle D of RCRA, and Subtitle D

[1]CERCLIS itself could not be searched because it does not identify the type of site; i.e., there was no way to determine which sites are C&D debris landfills. The CERCLIS Characterization Database was used instead; this database contains detailed information for eight percent of the approximately 30,000 sites in CERCLIS.

programs are administered by the states rather than EPA, the regions were unable to provide the needed information. Instead, they identified state contacts to call directly. A list of the EPA regional contacts is provided in Appendix A. Some of these contacts noted that because C&D landfills are not regulated or monitored in some states, information on damages is simply unavailable.

STATE AND COUNTY AGENCIES

State and county environmental agencies in 32 states were contacted to obtain information on contamination from C&D landfills. State contacts were originally identified from a list of participants attending EPA's Industrial Subtitle D Workshop in March 1993, representing 11 states. Additional state and county contacts were added based on:

- Information from EPA regional contacts;
- EPA's review of site-specific ground-water monitoring data provided by states to the National Association of Demolition Contractors (NADC); and
- A list of state agencies surveyed by the Alachua County Environmental Protection Department (Hanrahan, 1994) regarding C&D waste disposal.

A list of state and county contacts who provided relevant information to EPA is presented in Appendix A.

Although a large number of states were contacted, only three -- New York, Virginia, and Wisconsin -- identified C&D waste landfills that met the criteria listed above, for a total of 11 damage cases:

- Prior to 1988, C&D disposal facilities in New York State were exempt from solid waste permitting requirements if they operated less than one year. The New York State Department of Environmental Conservation (NYSDEC) investigated nine C&D sites, prompted by public suspicion of hazardous waste disposal, probability of significant environmental or public health impacts, and levels of public concern. Preliminary Site Assessments (PSAs) were conducted to determine (1) if wastes at the site included hazardous wastes (as defined by the New York Code of Rules and Regulations (NYCRR) Part 371) and (2) the impact of the site on human health and the environment. NYSDEC used the information obtained from the PSAs in revising/enhancing the New York Code (6 NYCRR Part 360) on solid waste management facilities in 1988. PSAs were ultimately written for only eight sites, because an ongoing investigation prevented a site assessment at the ninth. Four of the eight investigated C&D sites met the criteria listed above and were used as damage cases.
- Virginia has conducted ground-water monitoring at C&D landfills since 1988. Downgradient wells (as close to the waste management unit boundary as feasible) are compared to initial background levels (pre-1988) and to upgradient wells. If a statistically significant elevation (or decrease, in the case of pH) in a target parameter is observed during Phase I, Phase II monitoring is triggered. Nine target parameters are monitored for Phase I: chloride, hardness, iron, lead, pH, sodium, specific conductance, total organic carbon (TOC), and total organic halides (TOX). The Virginia Department of Environmental Quality (DEQ) provided EPA with a list of 10 C&D facilities for which Phase II monitoring has been triggered. EPA reviewed the available information for all 10 sites, but only 5 sites both met the criteria listed above and had sufficient information available to serve as damage cases.
- The Wisconsin Department of Natural Resources document, *Investigation of Groundwater Impacts at Demolition Landfills* (1994), provided information on contamination at two demolition landfills sufficient to identify those sites as damage cases. Wisconsin has required ground-water monitoring at C&D sites since 1988.

Very few damage cases were found for potentially four reasons. First, about half of the 50 states do not have sufficient documentation to identify damage cases. In some of these states, ground-water monitoring is not conducted at C&D landfills (Hanrahan, 1994). In some cases, ground-water monitoring is conducted only on a case-by-case basis, so information is not available for all C&D landfills (Hanrahan, 1994). In a few cases, monitoring that might provide information on damages is underway, but has begun so recently that results are not yet available.

Second, in approximately one fourth of the 50 states, potential damage cases could not be specifically attributed to C&D waste because of one or more of the following reasons:

- C&D wastes are disposed of in municipal landfills rather than in separate C&D landfills;
- C&D landfills are located near other possible sources of contamination (e.g., leaking underground storage tanks, municipal landfills);
- Site history information indicates a previous use of the site that could have contributed to the damage (e.g., use as an asphalt plant, a mine, etc.), or the state may have no information on the history of the site; and/or
- Sites have been in existence since the 1940s or 50s, and it is possible that non-C&D wastes were dumped in large quantities in the early years, when the sites were unregulated.

Third, other states identified sites where damages may have been attributable to C&D wastes, but unusual circumstances existed, and these cases were not used. For example, damages at one site resulted from pumping water through a landfill to extinguish a landfill fire, and the state representative did not believe it was representative of a typical site.

Lastly, in eight states that regulate C&D waste separately from other landfilled wastes, ground-water monitoring is conducted at all C&D landfills and contamination has not been found (Hanrahan, 1994). In seven of these eight states, liners are required while in six of the eight states, leachate collection systems are required at some or all of the C&D landfills.

This chapter presents a summary of each of the 11 damage cases identified using the methodology and sources discussed in Chapter 2. The names and locations of the damage cases are given in Exhibit 3-1.

EXHIBIT 3-1. C&D DEBRIS LANDFILL DAMAGE CASES

NAME	LOCATION
NEW YORK STATE	
Fair Street C&D Site	Patterson
Garofalo C&D Site	Islip
Moran C&D Site	Philmont
Route 52-Hills Holding Corp.	Fallsburg
VIRGINIA	
Cox's Darbytown Road Landfill	Henrico County
Crippen Stump Dump	Fairfax County
Furnace Road Debris Landfill	Lorton
Qualla Road Landfill	Chesterfield County
Schuylkill Debris Landfill	Prince George County
WISCONSIN	
Janesville Demolition Waste Landfill	Janesville
Terra Engineering Demolition Waste Landfill	Dane County

The damage case summaries are arranged in a standard format.

"Media Affected" identifies whether the damages are associated with ground water, surface water, or ecological receptors.

"Overview of Site/Site History" discusses the location and size of the site, its opening and (if applicable) closing date, any enforcement actions that have been taken, the purpose of the site investigation(s), and the number of people living near the site, if that information is available.

"Facility Operations" discusses the types of waste received, plus any information available on filling operations (e.g., use of daily cover). In most cases, information on filling operations was unavailable.

"Facility Design" presents available information on the presence of engineered controls such as liners, leachate collection systems, run-on/run-off controls, and final cover. Information on facility design was very incomplete for virtually all of the damage cases.

"Site Environment and Hydrogeology" summarizes site characteristics related to the transport of contaminants in the environment. Factors addressed, when available, include soil and bedrock composition and hydraulic conductivity, depth to ground water, direction of ground-water flow, and use of the aquifer for drinking water supplies. Surface water resources are also discussed, including (where relevant) the location of on-site or off-site surface water bodies and the use of surface water for drinking water supplies and other uses. This section also addresses the presence of wetlands, floodplains, and other sensitive environments.

"Summary of Environmental Damages" discusses ground-water contamination, surface water contamination, and ecological damages at the site. Constituents that are detected in ground-water or surface water above applicable state and federal standards are identified, and their maximum detected concentrations are given. The following state and federal standards were used:

- *Federal drinking water standards.* EPA compared ground-water contaminant concentrations to federal drinking water standards: maximum contaminant levels (MCLs) and secondary maximum contaminant levels (SMCLs). MCLs are federally enforceable standards set by EPA that apply to any water system in the U.S. that serves more than 25 people. MCLs are set based both on human health considerations and on technological and economic feasibility. SMCLs are based on aesthetic considerations (e.g., taste and odor), and are not federally enforceable.

- *Ambient Water Quality Criteria.* EPA compared surface water contaminant concentrations to Ambient Water Quality Criteria (AWQC) for the protection of aquatic life. AWQC for the protection of aquatic life are designed to protect aquatic communities (excluding the benthic community, which can also be exposed through sediments).

- *New York State Water Quality Standards.* For New York C&D sites, EPA compared ground-water and surface water contaminant concentrations to New York State water quality standards. New York State classifies its water bodies according to their "best uses" and provides a different set of water quality standards for each classification. Class B standards are designed to protect surface waters for swimming, fish survival, and fish propagation; Class C standards to protect for fish survival and propagation; and Class D standards to protect for fish survival (but not fish propagation). In addition, all non-saline ground waters in New York State are classified as GA and are protected for use as drinking water.

This section also identifies whether the contamination was found in on-site or off-site resources. This is of particular importance because exceedances found on site may not indicate that off-site ground-waters or surface waters are at risk. In the interest of brevity, "negative" monitoring results are not presented in this section (i.e., it does not identify all of the constituents that were monitored for, but not detected, at the site).

"Discussion" summarizes the environmental damages and discusses whether a link might exist between the damages and attributes of the site such as the types of waste received, operation, design, and location. This section also identifies any corrective actions that have been recommended or taken at the site.

"Source" simply identifies the information source(s) used to prepare the damage case summary.

The remainder of this chapter presents the damage case summaries. The implications of these damage cases are discussed in Chapter 4.

FAIR STREET C&D SITE — Patterson, New York

Media Affected: Ground Water, Surface Water

Overview of Site/Site History

The Fair Street Site landfill comprises approximately 3 acres of a 19.5-acre plot in Patterson, New York. Unpermitted dumping of C&D waste began in late 1987 and lasted until mid-February of 1988. Complaints of odors from the site were received in 1988 and 1989. Judgments were issued against the landfill operators to pay for closure.

It is estimated that more than 10,000 people live within three miles of the site, with the nearest residential community located approximately one-third of a mile away. The majority of the Town of Patterson is not on public water supply; instead, certain residential complexes operate private wells for their residents.

Facility Operations

The site was used primarily as a C&D dump from late 1987 until mid-February 1988. The landfill consists of 40 to 80 percent wood and wood products, 10 to 40 percent ash, brick, tires, concrete, carpet, metal, glass, and asphalt, and 10 to 20 percent oily silt and silty sand. An estimated five percent of the waste is non-C&D material, including household hazardous wastes such as furniture polish and engine degreaser.

C&D material was used to level the existing topography, which included filling a natural drainage channel that formerly connected two wetlands on the northeastern and southwestern portions of the property. The landfill operator installed a culvert pipe beneath the landfill, allowing surface water to flow between these two wetlands.

Facility Design

A thin layer of clayey-silt soil averaging about one foot in thickness was placed as cover material. The PSA reported that the cover was inadequate in many sections of the landfill.

The landfill has no liner system and does not appear to have run-on or run-off controls. Surface water runoff was found to be percolating below the ground surface at the landfill, and a malodorous pond containing leachate was found near the landfill. Discharge from the buried culvert was foamy and discolored.

Site Environment and Hydrogeology

Three small wetlands are located on the property. As discussed above, wetlands on the northeastern and southwestern portions of the property are connected by a culvert pipe that runs beneath the landfill. The southwestern wetland is topographically the lowest point on the property. It is connected to a wetland located off site, across Interstate 84, by a second culvert pipe that runs beneath the highway. Surface water and sediment from the site ultimately flow through this road culvert, discharging into a series of wetlands connected to Middle Branch Reservoir.

A very thin layer of soil and residual glacial till material overlie bedrock at the Fair Street site. Overburden soils are 25 percent gravel, 40 percent sand, 33 percent silt, and 2 percent clay. The shallow bedrock is strongly fractured and faulted. The nature of the discontinuities greatly influences the direction of local ground-water flow. The average hydraulic conductivity was determined to be 3.1×10^{-4} centimeters per second (cm/sec). The ground water in the shallow bedrock is an unconfined water table and likely discharges to the local wetland areas west and southwest of the site.

Summary of Environmental Damages

Surface water and sediment samples were taken at a drainage ditch northeast of the site, at a point near the effluent of the landfill culvert, and at wetlands at the northeastern and southwestern parts of the site. Surface water samples showed the presence of inorganics at levels above the New York State Class D standard for surface water and/or EPA's Ambient Water Quality Criteria (AWQC) for the protection of aquatic life; these are shown in Table 1. Some unidentified semivolatile organics were detected in the surface water samples.

TABLE 1
SURFACE WATER CONTAMINANTS EXCEEDING NYS CLASS D STANDARDS AND/OR FEDERAL AWQC

Contaminant	Highest Detected Level (µg/l)	Class D Standard (µg/l)	Fresh Chronic AWQC (µg/l)
antimony	56[a]	--	30[b]
cadmium	12	23[c]	4[d]
copper	199[a]	76[c]	44[d]
cyanide	61[a]	22	5
iron	195,000	300	1,000
zinc	591	1,152[c]	390[d]

a The value was estimated in the source document.
b Antimony AWQC is proposed.
c Class D value was calculated in the source document based on formula (6NYCRR 703.5) using an estimated hardness value of 466 ppm.
d EPA calculated the AWQC value using an estimated hardness value of 466 ppm.

Numerous semivolatile organics were found at parts-per-million levels in sediment samples, most notably polynuclear aromatic hydrocarbons (PNAs) and alkanes.

Ground-water samples taken downgradient of the landfill, but within the property boundary, revealed the presence of inorganic compounds at levels above New York State Class GA ground-water standards and/or EPA's drinking water standards (primary or secondary MCLs). These are shown in Table 2. (Note: Aluminum and iron also exceeded standards in the downgradient wells. These are not shown on the table because their concentrations were highest in the upgradient well.) In addition, some unidentified semivolatile organics were detected in many of the wells. No off-site ground-water samples were taken, so it could not be determined whether or not contamination migrated off site.

Discussion

According to the preliminary site assessment (PSA), contamination of surface water, sediments, and ground water on the property of this site is possibly attributable to migration of constituents from the landfill. The PSA found oil and hazardous constituents in the fill but was unable to document the presence of hazardous waste as defined by New York State. Household hazardous waste was present, however.

The landfill cap was inadequate in many places, and there was no liner or leachate collection system. Surface water runoff percolated below the ground surface at the landfill, and runoff and leachate flowed into an interconnecting system of wetlands. The aquifer is characterized by fractured and faulted bedrock, possibly facilitating movement of constituents in ground water.

The PSA recommends that the landfill be (1) properly closed, in accordance with New York regulations, and (2) capped, to limit infiltration and provide surface water drainage control.

TABLE 2
GROUND-WATER CONTAMINANTS EXCEEDING
NYS AND/OR FEDERAL DRINKING WATER STANDARDS

Contaminant	Highest Detected Level (μg/l)	Class GA Standard (μg/l)	MCL (μg/l)	SMCL (μg/l)
magnesium	128,000	35,000[a]	--	--
manganese	46,700	300	--	50
sodium	276,000	20,000	--	--
TDS	2,850,000	500,000	--	500,000

a Value is New York State "guidance value."

Source

Final Preliminary Site Assessment: Fair Street C&D Site; New York State Department of Environmental Conservation (NYSDEC); November 1991.

GAROFALO C&D SITE — Islip, New York

Media Affected: Ground Water

Overview of Site/Site History

The Garofalo C&D landfill was operated illegally by the Garofalo Carting Company (the Company) on land owned by Pilgrim State Psychiatric Center (PSPC) in Islip, New York. In 1978 the Company was confronted by the New York State Department of Environmental Conservation (NYSDEC) concerning illegal dumping and excavating on land owned by the PSPC. The Company has been fined and repeatedly ordered to clean up the site, but has not complied with the sanctions.

The Garofalo site is located in a densely populated section of Long Island. Approximately 10,000 people reside within three miles of the landfill, including 1,200 people at the PSPC located immediately south of the site. Several schools are located within one mile of the site.

Facility Operations

The Garofalo C&D landfill was cited for violations under the New York State Environmental Conservation Law, Article 27, in 1986. Testing found the landfill material to be comprised of 10 to 60 percent sandy soil with lesser amounts of silt, and mechanically crushed wood, metal, plastic, bricks, concrete, whole trees and brush, large timbers, pilings, railroad ties, chain link fencing, rugs, plastic, and fiberglass sheeting. In 1989, approximately 100 syringes with needles and some intravenous tubing were found on PSPC property, near the landfill site.

Facility Design

Five test pits excavated at the site revealed no engineered cover material. We assume that there is no liner or leachate collection system, but the PSA did not specifically discuss these features.

Site Environment and Hydrogeology

The landfill is located in the Upper Glacial geologic unit, which extends to at least 90 feet below the land surface. The unit is comprised of coarse to fine sand and medium to fine gravel, with less than five percent silt. The soils are highly permeable, with hydraulic conductivities ranging from 1.46×10^{-1} to 6.55×10^{-1} centimeters per second (cm/sec). Average annual precipitation for the region is 43.4 inches per year, 21 inches of which is available for infiltration.

The landfill is located in a primary recharge area to the Upper Glacial aquifer, which is hydraulically connected to two other aquifers (the Magothy Formation and the Lloyd Sand of the Raritan Formation). Both the Upper Glacial and the Magothy aquifers are pumped for domestic and industrial uses in the vicinity of the site. Two municipal well fields are located about 1.25 miles and 3 miles from the site. The aquifer system has been designated a "Sole Source Aquifer" by the U.S. EPA under the provisions of the Federal Safe Drinking Water Act.

Although wetlands are located near the site, they are isolated from the landfill by road systems. It is not likely that surface water run-off will reach any rivers or creeks due to topographic and human-built borders.

Summary of Environmental Damages

Ground-water monitoring at the perimeter of the landfill detected seven inorganic contaminants at elevations that exceed the New York State Class GA standards for ground water. The levels of these contaminants, as well as the level of total dissolved solids (TDS), are compared to Class GA standards and EPA drinking water standards (MCLs and SMCLs) in Table 1.

TABLE 1
GROUND-WATER CONTAMINANTS EXCEEDING
NYS AND/OR FEDERAL DRINKING WATER STANDARDS

Contaminant	Highest Detected Level (μg/l)	Class GA Standard (μg/l)	MCL (μg/l)	SMCL (μg/l)
chromium	134	50	100	--
iron	130,000	300	--	300
lead	90	25	15[a]	--
magnesium	94,900	35,000	--	--
manganese	33,200	300	--	50
sodium	178,000	20,000	--	--
zinc	391	300	--	500
TDS	1,630,000	500,000	--	500,000

a Value is action level for lead at the tap.

Discussion

Ground water at the perimeter of the landfill was found to contain several contaminants at levels above their drinking water standards.

Municipal well fields are located about 1.25 to 3 miles from the site. Off-site ground-water monitoring was not conducted as part of this study. According to the investigators, data from this one round of sampling do not conclusively determine whether or not the C&D landfill is affecting ground-water quality near the site.

No disposal of hazardous waste (as defined in 6NYCRR Part 371) was documented during the PSA. The PSA recommended closing the Garofalo C&D site, and capping it to reduce infiltration and provide surface water control.

Source

Final Preliminary Site Assessment: Garofalo C&D Site; New York State Department of Environmental Conservation (NYSDEC); November 1991.

MORAN C&D SITE — Philmont, New York

Media Affected: Ground Water, Surface Water

Overview of Site/Site History

The Moran C&D site is a landfill comprising 1.75 acres of a 12-acre lot in Philmont, New York. The landfill received processed C&D waste from April 1988 until November 1988. From the summer of 1988 until its closure, there were numerous complaints of noise and illegal dumping. A New York State Department of Environmental Conservation (NYSDEC) inspection of the site indicated that approximately 10,000 tires were buried at the bottom of the valley. The site caught fire in April 1989. The fire was controlled but not extinguished due to high internal temperatures. During the fire fighting efforts, a temporary impoundment was constructed along the southern edge of the Moran property to contain the fire water run off. In March 1990 the fire broke out again. Once again the fire was controlled but not extinguished. As of November 1991, the site was still smoldering.

The site is located in close proximity to the most populated section of the Village of Philmont. The population within a one-mile radius is estimated to be 1,875. There are five residences in close proximity to the landfill.

Facility Operations

The landfill consists primarily of C&D waste with a low percentage of solid waste and non-hazardous industrial waste. The filled materials are approximately 70 percent charred, partially decomposed wood pallets and construction lumber. Other materials included armored electrical cable, steel and copper pipes, thin plastic sheeting, concrete rubble, carpet, and a crushed drum. The fill materials are in a sand, silt, and clay matrix that comprises 15 percent of the fill by volume. Additional solid waste at the site includes approximately 10,000 tires.

NYSDEC site inspections noted numerous violations of Departmental rules and regulations during the landfilling operation. The improper operation of the site also resulted in several complaints from citizens regarding odors, additional traffic, noise, etc.

Facility Design

The site was originally a narrow valley or gorge between two north-south oriented ridges. This valley was about 100 feet deep and bounded by a steep bank on the west side and a vertical rock cliff on the east side. The average thickness of the fill in the central portion of the site is 50 feet with a range from 10 to 95 feet. The fill is covered by 18 inches of soil cover that generally supports grass.

A three- to four-foot "leachate control berm" composed primary of soil materials separates the flat section of the Moran property from the broader base of the valley to the south. Run off (not leachate) accumulates on the site behind this berm and ultimately infiltrates into the ground.

Site Environment and Hydrogeology

The geologic units at the site consist of a glacial till, an alluvial sand and gravel unit, and shale/phyllite and greywacke bedrock. The glacial till is comprised of 41 percent sand, 24 percent gravel, and 35 percent silt and clay. Its average hydraulic conductivity is 9.3×10^{-6} centimeters per second (cm/sec). The alluvial unit is 80 percent sand, 2 percent gravel, and 18 percent silt and clay, and its average hydraulic conductivity is 6.95×10^{-4} cm/sec. The bedrock is intensely folded and tilted and has an average hydraulic conductivity of 1.1×10^{-3} cm/sec.

Ground water occurs in both the glacial till and bedrock, both of which are sources of drinking water for the residents of Columbia County. Both units typically have low yields that can only satisfy small requirements such as those needed for domestic supplies. The overburden recharges the bedrock. The presence of two ponds on the adjacent property south of the site also suggest that these may also receive recharge from the overburden system.

Poorly drained glacial till, which is found in many flat areas in this region, has created many wetlands. Two freshwater wetlands exist within one mile of the site. As mentioned above, there are also two small ponds on private property immediately south of the site.

Summary of Environmental Damages

Three sediment samples and two surface water samples were taken during the PSA. Sediment samples were taken at the northern property boundary in an area frequently characterized by seeps, and both sediment and surface water samples were taken from the on-site run-off pond next to the leachate control berm, and a pond located beyond the leachate control berm on an adjacent property south of the site.

Sediments sampled in the off-site pond contained a part per billion (ppb) concentration of di-n-octyl phthalate, and sediments in the on-site run-off pond contained six polynuclear aromatic hydrocarbons (PNAs) below the reporting limit. Sediment metal concentrations of lead and mercury exceeded the sediment criteria used by the NYSDEC Division of Fish and Wildlife in the northern seep area; zinc and arsenic exceeded these criteria in two locations (the northern seep area and the on-site and off-site pond, respectively); and manganese exceeded the sediment criteria in all three locations.

Both surface water locations had concentrations of inorganics above NYSDEC water quality standards for Class C surface water and/or federal Ambient Water Quality Criteria (AWQC) (see Table 1). Concentrations were highest in the off-site pond.

Ground-water samples were taken at bedrock (deep) and overburden (shallow) wells at two upgradient locations and four downgradient locations (two within the fill and two downgradient of the fill but within the property boundary). According to the source document, comparing metals results in one of the upgradient wells to the on-site shallow wells indicates that the site contributes dissolved metals to ground water. Constituents whose concentrations exceeded NYS Class GA ground-water standards or federal

TABLE 1
SURFACE WATER CONTAMINANTS EXCEEDING NYS CLASS C STANDARDS AND/OR FEDERAL AWQC

Contaminant	Highest Detected Level (μg/l)	NYS Class C Standard (μg/l)	AWQ C (μg/l)
aluminum	1,670	100	--[a]
iron	2,720	300	1,000
zinc	51	30	220

a We are unable to calculate the AWQC for aluminum because it is pH-dependent and the source document did not provide a pH value for the surface water sampled.

drinking water standards (primary or secondary MCLs) are shown in Table 2.

It is also noteworthy that area residents complained of a rotten egg odor as well as a variety of symptoms (e.g., eye and respiratory irritation) similar to the known health effects of hydrogen sulfide. Ambient air quality samples found hydrogen sulfide levels up to 11 parts per billion.

TABLE 2
GROUND-WATER CONTAMINANTS EXCEEDING NYS AND/OR FEDERAL DRINKING WATER STANDARDS

Contaminant	Highest Detected Level (µg/l)	Class GA Standard (µg/l)	MCL (µg/l)	SMCL (µg/l)
aluminum	13,500	--	--	50-200
iron	24,200	300	--	300
lead	24[a]	25	15[b]	--
magnesium	127,000	35,000	--	--
manganese	20,300	300	--	50
sodium	167,000	20,000	--	--

a Value is reported as estimated value in source document.
b Value is action level for lead at tap.

Discussion

The PSA found contamination of on-site and off-site surface water and sediments with metals at concentrations exceeding applicable standards. The site was also found to contribute dissolved metals to ground water. Many metals exceeded applicable standards in on-site ground-water monitoring wells; no off-site monitoring was conducted. Area residents complained of a rotten egg odor as well as a variety of symptoms similar to the known health effects of hydrogen sulfide.

Based on the PSA and previous sampling, the site investigators recommended that the site be closed, and that ground-water quality and flow direction be monitored to identify seasonal variations and long-term trends in ground-water quality.

Source

Final Preliminary Site Assessment: Moran C&D Site; New York State Department of Environmental Conservation; November 1991.

ROUTE 52 - HILLS HOLDING CORPORATION SITE — Fallsburg, New York

Media Affected: Ground Water, Surface Water

Overview of Site/Site History

The Route 52 - Hills Holding Corporation Site is a landfill comprising 8 acres of a 26.4-acre lot located in Fallsburg, New York. The landfill began C&D operation in the summer of 1988 as an exempt C&D debris site. The debris was deposited on a hillside between a pond and the Neversink River. The landfill was closed by the New York State Department of Environmental Conservation (NYSDEC) in October 1988.

There are 12 public wells within a 3-mile radius of the site that supply water to approximately 12,000 people year round, with as much as a fivefold increase in the summer months. A house is located on the property east of the pond and west of the landfill, and another residence is located adjacent to the site about 200 feet to the north.

Facility Operations

The waste present in the landfill is composed mainly of oily-appearing soil, wood and lumber products, concrete, brick, steel re-bar, carpet, glass, plastic sheeting, wires, rags, telephone cable, and steel pipes. Disposal of refuse and unpermitted burning were noted at the site. In September 1988, the disposal of four five-gallon pails with roofing compound was observed at the site. The compound was referred to as a New York State hazardous waste by the source document. The pails were removed from the landfill and placed in an overpack drum.

Facility Design

The PSA revealed a one-foot-thick silty sand and gravel cover material. There does not appear to be any liner or leachate collection system at the site. Leachate was observed by state officials to be emanating from the northeast corner of the landfill into the Neversink River. Berms have been constructed at some areas of the landfill.

Site Environment and Hydrogeology

The Neversink River, a major tributary to the Delaware River, flows southward past the site about 100 feet from the eastern side of the landfill. The Neversink River is classified as a Class B waterway. A five-acre pond exists along the western side of the landfill. An area of approximately 10 feet by 20 feet of shallow standing water with wetland vegetation lies between the Neversink River and the landfill's southeast corner.

Surface drainage is poor and flows to the Neversink River. Surface water run-off and associated sediments from all but the northern third of the landfill area are bounded by natural levees or man-made berms on the site. Surface water and sediments from the northern third of the site enter the Neversink River via intermittent streams or a drainage ditch on an adjacent residential property. A small quantity of run-off enters the on-site pond.

Two unconsolidated units overlie weathered bedrock at the site. The lower unit is a glacial till comprised of 35 percent gravel, 40 percent sand, 20 percent silt, and 5 percent clay. The average hydraulic conductivity is 2.9×10^{-4} centimeters per second. The upper unit is comprised of alluvial soils, described as loose brown fine silty sand. These overburden materials overlie highly weathered and fractured bedrock at depths ranging from 6 inches to 12 feet. The bedrock has a hydraulic conductivity of 9.0×10^{-3} to 7.5×10^{-4} cm/sec. The ground-water movement within the overburden and shallow bedrock is affected by the on-site pond, which causes a local radial flow pattern eastward toward the Neversink River. The shallow ground water in the bedrock is believed to be hydraulically connected to the overburden. Therefore, landfill leachate can potentially recharge the local aquifer system.

Summary of Environmental Damages

Surface water samples were taken from the Neversink River upstream of the site, adjacent to the site, and in a public access fishing area downstream of the site; from the on-site pond west of the landfill; and from an effluent stream south of the landfill. Concentrations of inorganic constituents in the Neversink River adjacent to the site were elevated compared to samples taken upstream. Many inorganics exceeded their Class B surface water standard or EPA's Ambient Water Quality Criteria (AWQC) in the river sample adjacent to the site (Table 1). Only vanadium exceeded its Class B standard in the pond surface water samples. Polynuclear aromatic hydrocarbons (PNAs) were detected in sediment samples in the Neversink River and in a wet area southwest of the landfill.

TABLE 1. NEVERSINK RIVER SURFACE WATER CONTAMINANTS EXCEEDING NYS CLASS B STANDARDS AND/OR FEDERAL AWQC

Contaminant	Highest Detected Level (µg/l)	Class B Standard (µg/l)	Fresh Chronic AWQC (µg/l)
copper	30	2 [a]	2 [b]
iron	24,000	300	1,000
lead	70[c]	0.23[a]	0.23[b]
vanadium	26	14	--
zinc	156	30	18 [b]

a Class B value was calculated in the source document based on formula (6NYCRR 703.5).
b EPA calculated the AWQC value using an estimated hardness value of 12.6 ppm (the hardness value was calculated in the PSA).
c The value is reported in the source document as "estimated."

Six ground-water monitoring wells were installed, one background well and the remainder positioned around the landfill at locations likely to intercept ground-water contamination. Concentrations of inorganics were significantly higher in samples from three downgradient wells compared to the upgradient well. Many inorganic constituents exceeded Class GA ground-water standards and/or federal drinking water standards (primary or secondary MCLs) in downgradient wells. These are shown in Table 2.

Prior to the PSA, a private laboratory sampled the adjacent residence's well water and found low levels of contamination from carbon tetrachloride.

TABLE 2
GROUND-WATER CONTAMINANTS EXCEEDING
NYS AND/OR FEDERAL DRINKING WATER STANDARDS

Contaminant	Highest Detected Level (µg/l)	Class GA Standard (µg/l)	MCL (µg/l)	SMCL (µg/l)
aluminum	51,200[a]	--	--	50 to 200
barium	1,290	1,000	2,000	--
beryllium	5	3[b]	4	--
chromium	151[a]	50	100	--
iron	90,500	300	--	300
lead	90	25	15[c]	--
magnesium	55,200	35,000[b]	--	--
manganese	36,300	300	--	50
nickel	157[a]	--	100	--
sodium	73,200	20,000	--	--
zinc	364	300	--	5,000
TDS	812,000	500,000	--	500,000

a The value was reported in the source document as "estimated."
b New York State Guidance Value.
c Value is action level for lead at tap.

Discussion

Elevated concentrations of inorganics were detected in an adjacent river and in ground water; many of the samples exceeded applicable standards. Although off-site ground-water samples were not taken, the PSA noted that municipal well fields are vulnerable to contamination due to their proximity to the site and the nature of the hydrogeology.

The PSA recommends that the landfill be (1) properly closed, in accordance with New York regulations, and (2) capped, to limit infiltration and provide surface water drainage control.

Source

Final Preliminary Site Assessment: Route 52 - Hills Holding Corp. Site; New York State Department of Environmental Conservation; November 1991.

COX'S DARBYTOWN ROAD LANDFILL — Henrico County, Virginia

Media Affected: Ground Water

Overview of Site/Site History

The 100-acre site is located in Henrico County, Virginia, adjacent to a road and two miles from the Richmond International Airport runway. According to an engineering company working for the landfill, the shallow aquifer in the area of the landfill receives only limited use. Although the exact opening date of the landfill is unknown, the landfill received a permit on June 20, 1989 for its third parcel (a 34-acre area) to accept wastes; the other two parcels had already been receiving demolition wastes. According to the source documents, the landfill has accepted only construction, demolition, and debris wastes.

Facility Operations

The site is permitted to accept only construction, demolition, and debris wastes, including construction debris, demolition debris, broken brick, block, concrete rubble, brush, tree trimmings, stumps, and leaves. Excluded are municipal solid waste (any putrescible waste), industrial waste, liquid waste, and hazardous waste. According to the 1989 site investigation, the site apparently also accepted tires.

Facility Design

The design of the landfill required a one-foot liner of on-site soil with a permeability of less than 1×10^{-6} centimeters/second, a leachate collection system of PVC pipe for each cell, a collection manhole for each cell, and a pump and haul process to a treatment facility. A 1988 memo from the Wiley and Wilson engineering firm noted that where existing sand pits were located, the pits would be filled with non-organic waste material consisting of broken concrete, bricks, broken pavement, and soil up to an elevation of one foot below the bottom of the landfill and then covered with a one-foot liner layer. The design included a 100-foot wide buffer strip around the perimeter of the entire landfill with a 50-foot buffer strip on the inside boundaries of the adjoining sections of the landfill. Ground-water monitoring is conducted at one upgradient and three downgradient wells.

Site Environment and Hydrogeology

The shallow aquifer lies 1 to 14 feet below the ground surface in the area of the landfill, but the landfill design required at least 3 feet between the seasonal high ground-water elevation and the bottom of the landfill, including a one-foot liner. It is unclear whether the landfill design is in violation of this requirement. A nearly impermeable marl layer serves as a confining layer to the deeper aquifer. The site apparently has gently sloping topography.

In the shallow aquifer, the dominant ground-water flow direction at the site is northward. The ground-water velocity ranges from 5.6×10^{-6} cm/sec at the eastern portion of the site to 8.8×10^{-6} cm/sec at the western portion of the site. The hydraulic gradient ranges from 0.012-0.019 ft/ft at the site. Little is known about the deeper aquifer except that it is virtually confined by an overlaying marl.

Summary of Environmental Damages

A 1989 site inspection revealed waste slopes exposed due to lack of sufficient cover, a breach of the 50-foot buffer zone between wastes and the edge of the property, and leachate seeps that did not leave the site.

1993 monitoring results indicated statistically significant increases in specific conductance and total organic carbon (TOC) in downgradient on-site wells when compared to an upgradient well. In addition, pH was found to be unusually low during the 1991 monitoring.

TABLE 1. GROUND-WATER PARAMETERS EXCEEDING BACKGROUND LEVELS AND FEDERAL DRINKING WATER STANDARDS

Parameter	Highest Detected Level	Background Level	MCL	SMCL
TOC (µg/l)	57,000	21,200	--	--
conductance (umhos/cm)	2758	170	--	--
Parameter	**Lowest**	**Background**	**MCL**	**SMCL**
pH	5.98	6.6	--	6.5-8.5

Discussion

According to the 1993 Annual Report, data gathered from ground-water monitoring indicate that contamination may be occurring in the ground water at Cox's Darbytown Road Landfill. The facility was moved into the Phase II monitoring program because specific conductance and TOC were significantly higher in downgradient wells than in the upgradient/background well. The source documents do not address whether or not the contamination extends off site.

Sources

1993 Annual Report, Cox's Darbytown Road Landfill, Inc. Prepared by Joyce Engineering, Inc., June 1994.

1st Quarter Phase I Sampling Event Results, Cox's Darbytown Road Landfill, Inc. Prepared by Joyce Engineering, Inc., May 1994.

2nd Quarter Water Monitoring Analyses, Cox's Darbytown Road Landfill, Inc. Prepared by Joyce Engineering, Inc., July 1990.

Chemical Analytical Report, Central Virginia Laboratories and Consultants, May 1994.

Commonwealth of Virginia, Solid Waste Disposal Site Inspection Report of Darbytown Landfill, September 5, 1989.

Commonwealth of Virginia, Department of Health Permit to M & M Wrecking Company, Inc., for a Sanitary Landfill, July 3, 1975.

Commonwealth of Virginia, Department of Waste Management, Application for Permit to M & M Wrecking Company, Inc., October 28, 1987.

Memorandum from Linda K. Lightfoot to Berry F. Wright, Virginia Department of Waste Management, November 20, 1987.

Memorandum from Wiley & Wilson to Berry F. Wright, Jr., Virginia Department of Waste Management, January 13, 1988.

Memorandum from Wiley & Wilson to Berry F. Wright, Jr., Virginia Department of Waste Management, January 20, 1988.

Memorandum from John F. Deal to Dr. W. Gulevich, Virginia Department of Waste Management, August 19, 1987.

Memorandum from S.B. Cox, Inc. to Hassan Vakili, Virginia Department of Waste Management, January 8, 1993.

Memorandum from Edward Hollos, Joyce Engineering, Inc., to Howard Freeland, Virginia Department of Environmental Quality, June 30, 1994.

Memorandum from Harry Gregori, Virginia Department of Waste Management, to S. B. Cox, Inc., June 21, 1991.

Solid Waste Facility Permit, June 20, 1989.

Solid Waste Facility Permit, July 26, 1988.

CRIPPEN STUMP DUMP — Fairfax County, Virginia

Media Affected: Ground Water, Surface Water

Overview of Site/Site History

The Crippen Stump Dump is located in a residential area in the Dranesville District of Fairfax County. The site consists of 66 acres and is separated from the surrounding residences by 50-foot fire breaks and rows of white pine trees acting as screens. The landfill is divided into two areas, separated by Green Branch. The main area, in the northwest portion of the site, is accessible by a bridge over Green Branch, and the supplementary area, in the southeast, is used when the northwest portion is inaccessible. Sixty-seven homes are located within 1,000 feet of the landfill and rely on private ground-water wells for drinking water.

A landfill fire broke out on December 19, 1986, and had not yet been extinguished as of April 1987.

Facility Operations

The Crippen Stump Dump accepts inert debris such as C&D debris, large stumps, boards, and scrap metal. Loads may not contain more than 10 percent paper and cardboard. Asbestos, household trash, and hazardous materials are prohibited. An on-site operator is supposed to inspect material after it has been dumped, and place unacceptable wastes in a separate bulk container for proper disposal. However, a site inspection in 1987 found that asbestos had been illegally accepted, and the landfill was cited for not having a spot checker to inspect loads. Also, trucks have been stored on site in violation of the landfill's zoning permit.

Daily cover is applied to minimize litter and scavenging.

Facility Design

The Crippen Stump Dump is unlined and we assume that there is no leachate collection. Local soil and subsoil are used as cover. Ground-water and surface water monitoring are conducted.

Site Environment and Hydrogeology

The landfill is underlain by brown silty sand to depths of 0 to 8 feet, and brown sand silt to depths of approximately 15 to 30 feet, where decomposed rock lies. Uncompacted permeabilities were not found in the source documents. Silty sand stockpiled at the site for use as cover has a permeability of 1.3×10^{-6} cm/sec when recompacted to 93.6 percent.

The ground water is used for drinking water by local residents. Ground water is an average of 5 feet from the ground surface, ranging from 1 to 3 feet near the stream, and 55 feet at one monitoring well. The source documents note that the flow from the northwest portion of the site appears to be south or east toward Green Branch, which bisects the property in a southwest to northeast direction.

Summary of Environmental Damages

In 1986 the landfill was found to be in noncompliance with its permit due to steep slopes. A 1990 inspection found erosion had exposed solid waste and created leachate seeps flowing into Green Branch. The landfill received a Notice of Violation for (1) failing to provide proper maintenance of erosion controls and (2) failing to protect county and state waters from pollution.

According to a source document, stream monitoring opportunities exist in Green Branch, above and below the landfill, and in two conduit systems. Two surface water samples were reported. Their location was not specifically stated, but it seems likely that the samples were from Green Branch, above and below the landfill. Whether the samples were on or off site is unknown. A 1988 source document noted that the surface water data indicate "no apparent problems," but that

the pH and alkalinity of the already acidic stream was low, and that the stream is losing the ability to buffer itself. The pH was 6.2 at sampling site S1 (apparently the background sample) and the pH was 4.4 at sampling site S2.

Four wells, apparently on site, are used for ground-water monitoring. In 1985, elevated levels (above MCLs) of cadmium, iron, and lead, as well as low pH, were reported in ground-water monitoring wells (Table 1).

TABLE 1. GROUND-WATER CONTAMINANTS EXCEEDING FEDERAL DRINKING WATER STANDARDS

Contaminant/ Parameter	Highest Detected Level (μg/l)	MCL (μg/l)	SMCL (μg/l)
cadmium	28	5	
iron	15,000	--	300
lead	54	15[a]	--
manganese	540	--	50
Parameter	**Lowest**	**MCL**	**SMCL**
pH	5.1	--	6.5-8.5

a Value is action level for lead at tap.

Discussion

Elevated levels of inorganics and low pH have been found in the ground water, probably on site, but the source documents noted the potential for off-site migration of ground water from the northeast portion of the landfill. It is unclear whether the landfill is further reducing the alkalinity of an already-low-alkalinity stream that bisects the Crippen property.

Sources

Closure Plan Narrative for Stump Dump Inc., Debris Landfill, by Draper Aden Associates, Inc. October 20, 1988

"Great Falls Dump Gets a Temporary Reprieve on Operation," The Washington Post, October 27, 1988.

Letter from C.G. Cooper, Department of Environmental Management, County of Fairfax, to M.S. Crippen, Jr., Stump Dump, Inc. November 17, 1987.

Letter from C.G. Cooper, Department of Environmental Management, County of Fairfax, to M.S. Crippen, Jr., Stump Dump Inc. April 28, 1987.

Letter from Janine Durbecq, Landfill Administrator, Department of Environmental Management, to Lock Crippen, Stump Dump Inc., October 26, 1987.

Letter from Joseph Beben, Department of Environmental Management, County of Fairfax, to M.S. Crippen, Jr., Stump Dump, Inc., February 27, 1990.

Letter from Robert Forman, Bureau of Solid and Hazardous Waste, Department of Health, Commonwealth of Virginia, to M.S. Crippen, Jr., June 13, 1985.

Letter from Robert Forman, Bureau of Solid and Hazardous Waste, Department of Health, Commonwealth of Virginia, to M.S. Crippen, Jr., July 16, 1985.

Letter from C.G. Cooper, Department of Environmental Management, County of Fairfax, to M.S. Crippen, Jr., Stump Dump Inc., March 2, 1987.

Letter from C.G. Cooper, Department of Environmental Management, County of Fairfax, to Douglas Davis, November 17, 1987.

Letter from Mack Crippen, Jr., Stump Dump Inc., to Robert Forman, Bureau of Solid and Hazardous Waste, Department of Health, Commonwealth of Virginia, November 17, 1986.

Letter from Fred Miller, Law Engineering Testing Company, to Stump Dump, Inc., May 16, 1986.

Letter from Randy McFarland, Regional Geologist, to Robert Forman, State Department of Health, Commonwealth of Virginia, January 31, 1985.

Letter from Lock Crippen, Stump Dump, Inc., to Kenton Chestnut, Bureau of Solid Waste Management, Commonwealth of Virginia, March 25, 1986.

Letter from Robert Forman, Bureau of Solid Waste Management, Commonwealth of Virginia, to M.S. Crippen, Jr., June 11, 1986.

Letter from Dean Starook, Department of Waste Management, Commonwealth of Virginia, to John Watt, The Crippen Companies, February 12, 1990.

Letter and data summary from William Bukevicz, Dewberry and Davis (engineering firm), to Lock Crippen, Stump Dump Landfill, December 21, 1988.

Letter from John Watt, The Crippen Companies, to Dean Starook, Department of Waste Management, Commonwealth of Virginia, February 16, 1990.

Letter from Mary Holden, Stump Dump, Inc., to Air Pollution Control Division, Fairfax County Health Department, February 9, 1987.

FURNACE ROAD DEBRIS LANDFILL — Lorton, Virginia

Media Affected: Ground Water, Surface Water

Overview of Site/Site History

The Furnace Road Debris Landfill, also called the Lorton Landfill, is a 264-acre C&D landfill located off of Furnace Road near Shirley Memorial Highway in Fairfax County, Virginia. It has operated as a C&D landfill since it was originally permitted in 1981. The landfill is located in a "mixed use area" near the District of Columbia's Lorton Landfill, the Lorton Correctional Institution, and the Fairfax County Energy Recovery Facility. It is also downgradient of a residential subdivision, which is separated from the landfill by vacant land and a gas line easement.

Facility Operations

The landfill accepts construction debris such as dirt, wood, and concrete, with small amounts of paper, plastic, and miscellaneous metal items such as reinforcing steel, strapping, structural steel, and piping. The landfill also accepts tires. Non-hazardous soil contaminated with petroleum products is disposed as daily cover at the landfill. This soil must be regularly sampled, and total petroleum hydrocarbon concentrations must be less than 50 parts per million (ppm), total organic halides (TOX) less than 100 ppm, total benzene, toluene, ethylbenzene, and xylenes (BTEX) less than 10 ppm, and the Toxicity Characteristic Leaching Procedure (TCLP) must result in less than 5 mg/l of arsenic and lead.

Facility Design

There does not appear to be a liner for the landfill. Leachate is collected in a plugged siltation pond. Ground-water monitoring has been conducted since 1981, when the landfill was originally permitted.

Site Environment and Hydrogeology

Shallow ground water in Coastal Plain sediments is underlain by a deeper bedrock aquifer. Depth to ground water is less than 13 feet in some places. The flow direction and rate were not mentioned in the source documents. Ground water in the area is naturally high in iron.

Stormwater drains to Giles Run, a tributary to the Occoquan and Potomac Rivers. Two smaller tributaries run from the landfill to Giles Run.

Summary of Environmental Damages

The main problem in surface water is elevated levels of fecal coliform bacteria, which do not appear to be related to the landfill. However, hardness and total dissolved solids (TDS) levels in some on-site surface water samples also exceed recommended levels due to the influence of

TABLE 1. SURFACE WATER CONTAMINANTS EXCEEDING RECOMMENDED LEVELS

Contaminant	Highest Detected Level (μg/l)	Recommended Level (μg/l)
hardness	500,000	100,000
TDS	1,125,000	250,000

leachate, according to a 1988 memo from the Dewberry and Davis engineering firm (Table 1). There are no AWQC for hardness or TDS.

Four ground-water wells were used to monitor contamination, two wells that a source document assumes to be background, and two apparently downgradient of the fill, but within the property boundary. Elevated levels of iron, manganese, total organic carbon (TOC), TOX, and hardness and slightly elevated levels of total dissolved solids (TDS) have been found in the ground water at various times. Table 2 shows the contaminants that exceeded federal drinking water standards (MCLs or SMCLs).

TABLE 2
GROUND-WATER CONTAMINANTS EXCEEDING FEDERAL DRINKING WATER STANDARDS

Contaminant	Highest Detected Level (μg/l)	MCL (μg/l)	SMCL (μg/l)
iron	69,600	--	300
manganese	1,980	--	50

Discussion

According to the source documents, leachate from the landfill is contributing to elevated levels of contaminants in ground water and surface water. A 1985 memo from Randy McFarland, Regional Geologist, to John Clayton noted that much of the leachate generated in the landfill probably migrates in shallow ground water, discharges at springs, and flows on the surface to Giles Run. He also noted that some portion of the leachate probably migrates from the sediments down through the bedrock to the deeper aquifer. According to McFarland, the main problem in the bedrock aquifer is that metals and hardness are elevated, probably because naturally-occurring metals (e.g., iron) are mobilized in dissolved forms by leachate-associated acids. McFarland also commented that the shallow ground water has the same problems as the bedrock ground water. In addition, a 1988 memo from Dewberry and Davis to George Neal noted that hardness and total dissolved solids (TDS) in surface water were elevated above recommended levels due to influence of the leachate.

Another source document noted that some of the ground-water contamination is directly attributable to specific C&D wastes. According to a 1994 memo from Dewberry and Davis to Burwin Reed, TOC in the ground water is elevated due to the decomposition of wood buried in the landfill, TOX levels are elevated probably due to the decomposition of construction debris such as asphalt, and hardness levels are elevated due to the breakdown of wood and concrete in the landfill. However, EPA believes that the petroleum-contaminated soils permitted for use as daily cover may contribute to TOX levels in the ground water.

However, two other source documents indicate that the damage to the environment is not significant. A 1989 memo from Dewberry and Davis reported "no significant problems, overall." In 1993, a Professional Engineer certified that, based on his review of documents, drawings, and reports regarding the Furnace Road Landfill, "it is not an open dump and does not pose a substantial present or potential hazard to human health and the environment" and "it appears that the leachate and residues from this solid waste facility do not pose a threat of contamination or pollution of air, surface water, or groundwater in a manner constituting an open dump or resulting in substantial present or potential hazard to human health or the environment." This appears to be standard language used in a Petition for Variance to extend C&D landfill permits.

Sources

Biospherics Incorporated, Table of surface water and ground-water sampling data for W.H. Gordon Assoc., Inc., October 26, 1984.

Memorandum from William Bukevicz, Associate, Dewberry and Davis (engineering firm), to Burwin Reed, Lorton Landfill, January 14, 1994.

Memorandum from William Bukevicz, Associate, Dewberry and Davis (engineering firm), to Burwin Reed, Lorton Landfill, July 7, 1993.

Memorandum from William Bukevicz, Director, Environmental Laboratory, Dewberry and Davis (engineering firm), to Burwin Reed, Wiser Brothers, Inc., July 20, 1990.

Memorandum from William Bukevicz, Director, Environmental Laboratory, Dewberry and Davis (engineering firm), to George Neal, Wiser Brothers, Inc., December 20, 1988.

Memorandum from Elaine Schaeffer, Director, Environmental Services, County of Fairfax, to Burwin Reed, Lorton Landfill, March 17, 1988.

Memorandum from Ulysses B. Brown, Jr., Solid Waste Compliance Manager, Office of Waste Resource Management, Commonwealth of Virginia, Department of Environmental Quality, to Terre Sulock, Production Manager, EnviroCraft Corporation, May 31, 1994.

Memorandum from Janice Durbecq, Landfill Administrator, Public Utilities Branch, Department of Environmental Management, Commonwealth of Virginia, County of Fairfax, to Elmer Wiser, Wiser Brothers, Inc., October 11, 1989.

Memorandum from Randy McFarland, Regional Geologist, Commonwealth of Virginia, State Water Control Board, to John Clayton, Fairfax County Health Department, February 7, 1985.

Memorandum from William Bukevicz, Director, Environmental Laboratory, Dewberry and Davis (engineering firm), to Burwin Reed, Wiser Brothers, Inc., February 8, 1990.

Memorandum from Elmer Wiser, Lorton Landfill, to William Woodfin, Department of Waste Management, January 12, 1993.

Solid Waste Management Permit, Commonwealth of Virginia, Department of Health, August 18, 1981.

QUALLA ROAD LANDFILL — Chesterfield County, Virginia

Media Affected: Ground Water, Surface Water

Overview of Site/Site History

The Qualla Road Landfill is an active 33-acre C&D landfill located in a mainly agricultural area in Chesterfield County, Virginia. The landfill opened in 1983 with an 11-acre area, and 22 acres were added in 1988. To date, 16 of those 22 acres have received waste. The facility is owned by a private farmer and leased to Sanifill, Inc. The landfill capacity is estimated to be 1.523 million cubic yards over a design life of 12 years.

Two fires have been reported at the landfill, one in 1990 and one in 1993. Both were quickly extinguished.

Facility Operations

The Qualla Road Landfill accepts C&D waste, brick, concrete rubble, brush, tree trimmings, and stumps. Approximately 40 percent of the waste at the site is land-clearing debris, which is currently disposed on approximately ten unlined acres. The remaining 60 percent is building material and demolition waste and is disposed on approximately six lined acres. Prohibited wastes include hazardous waste, liquids, garbage, refuse, agricultural waste, industrial waste, paper products, asbestos, fly ash, bottom ash, sludge, tires, white goods, leaves, and metal scrap. According to the permit, six inches of daily cover must be applied.

Facility Design

The Qualla Road Landfill has been permitted in sections, and the facility design varies depending on when a section was permitted. The original 11 acres probably were unlined. As of 1987, at least five feet between the cell bottoms and the seasonal high ground-water table were required. Of the 22 acres added in 1988, 10 acres are unlined, 6 acres are equipped with a compacted soil bottom liner (permeability of 1×10^{-6} cm/sec) and a leachate collection system, and the remaining 6 acres have not yet been put to use. As of 1994, leachate must be discharged to an underground storage tank to be ultimately pumped and hauled to a waste treatment plant. Run-on and run-off controls, and a ground-water interceptor were also described for portions of the landfill in the 1994 design.

Site Environment and Hydrogeology

Soils under the landfill consist of a 2- to 4-foot upper layer of lean to fat clays and elastic silt, underlain by silty sand and sandy silt soils to depths of 20 to 50 feet. Ground water in the area is found 10 to 38 feet below the ground surface. The general movement of ground water is to the west (toward Reedy Branch), with a gradient of 0.03 to 0.08 feet/feet. Lateral flow is about 3.5×10^{-5} to 3.8×10^{-4} centimeters per second (cm/sec) and vertical flow is about 9.7×10^{-5} cm/sec. Rainfall is estimated at 42 inches a year.

The landfill drains into Swift Creek (to the north) and Reedy Branch (to the west), a tributary to Swift Creek. The original 11 acres were located within the 100-year flood plain of Swift Creek. A flowing stream, possibly fed by discharge through the ground water from a pond at the southern edge of the site, was located on the site prior to the 1987 proposed expansion.

Summary of Environmental Damages

In 1987, debris was protruding from the original landfill adjacent to Swift Creek, and the relief was too steep to retain soil covering. The source documents attested that the presence of a stream within the boundaries of the proposed landfill expansion was "unacceptable" and could present "erosion and sediment control problems." A 1987 Request Analysis and Recommendation also noted that "unless actions are taken to stabilize the existing fill area, siltation of Swift Creek itself may occur" and that "due to the significant topographic relief of the proposed landfill area, the potential for siltation of the adjacent property and streams, including Swift Creek, appears to be even greater than that of the existing landfill." A 1993 inspection found leachate emanating from the landfill that "had the potential for discharging off-site." The leachate break was immediately repaired.

Surface water samples have been taken from two sampling sites, but it is unclear whether the sampling was conducted on or off site. Surface water monitoring found iron, lead, and acidity levels exceeding freshwater chronic AWQC protective of aquatic life (Table 1).

TABLE 1
SURFACE WATER CONTAMINANTS EXCEEDING FEDERAL AWQC

Contaminant /Parameter	Highest Detected Level (μg/l)	Fresh Chronic AWQC (μg/l)
iron	252,000	1,000
lead	113	7[a]
Parameter	**Lowest**	**AWQC**
pH	5.6	6.5-9

a EPA calculated the AWQC value using a reported measured hardness value of 196 ppm.

Ground-water monitoring has been conducted on site at one upgradient and three downgradient wells. For each well, samples are compared to background data for that well (i.e., based on samples taken earlier). In addition, samples from downgradient wells are compared to the background data from the upgradient well. In 1992, ground-water monitoring found elevated levels of lead, manganese, and total organic carbon (TOC) in a downgradient well compared to the upgradient background level. In addition, the lead, manganese, total dissolved solids (TDS), and specific conductance exceeded the background mean for that downgradient well.

TABLE 2. GROUND-WATER CONTAMINANTS EXCEEDING VIRGINIA PROTECTION LEVELS AND FEDERAL DRINKING WATER STANDARDS

Contaminant	Highest Detected Level (μg/l)	MCL (μg/l)	SMCL (μg/l)
iron	103,000	--	300
manganese	4,600	--	50

Ground-water monitoring has also shown iron and manganese levels to exceed federal drinking water standards (secondary MCLs) (Table 2).

Discussion

Schnabel Environmental Services, the company that performs ground-water monitoring at Qualla Road Landfill, concluded in 1993 that the data do not indicate that the landfill poses a "substantial threat to human health or the environment." However, monitoring has indicated exceedances of AWQC in surface water (whether on or off site is unknown) and on-site exceedances of federal drinking water standards in ground water.

Sources

General Testing Corporation, Laboratory Reports, dated November 25, 1992, February 12, 1993, April 13, 1993, July 21, 1993, and March 17, 1994.

Letter from Kenton Chestnut, Jr., Division of Regulation, Department of Waste Management, Commonwealth of Virginia, to Lane Ramsey, County Administrator, Chesterfield County, Virginia, February 5, 1990.

Letter from William Gilley Division of Regulation, Department of Waste Management, Commonwealth of Virginia, to Paul Robins, Qualla Road Landfill, January 12, 1990.

Letter from Carl Benson, Schnabel Environmental Services, to Jim Leiper, Sanifill, October 5, 1993.

Letter from Schnabel Environmental Services, to Chuck Hurt, J.K. Timmons & Associates, February 27, 1992.

Letter from Schnabel Environmental Services, to Jim Leiper, Sanifill, April 8, 1992.

Letter from Stephen Werner, Hatcher-Sayre, Inc. to Paul Robins, Qualla Road Landfill, December 11, 1990.

Letter from A.M. Tope, Hydrogeologist, State Water Control Board, Commonwealth of Virginia, to Berry Wright, Department of Waste Management, Commonwealth of Virginia, May 15, 1987.

Letter from Scott Bullock, Department of Environmental Quality, Commonwealth of Virginia, to Gregory Cekander, Sanifill, February 2, 1994.

Memorandum from Scott Bullock, Department of Environmental Quality, Commonwealth of Virginia, to Timothy Torrez, Qualla Road Landfill, January 12, 1994.

Memorandum from Charles Plott, Landfill Manager, Qualla Road Landfill, to Robert Timmons, Department of Environmental Quality, Commonwealth of Virginia, April 28, 1993.

Memorandum to the file, from Berry Wright, Department of Waste Management, Commonwealth of Virginia, August 25, 1987.

Memorandum from Charles Plott, Landfill Manager, Qualla Road Landfill, to Robert Timmons, Department of Environmental Quality, Commonwealth of Virginia, May 10, 1993.

Memorandum from J.A. Adams to Berry Wright, Department of Waste Management, Commonwealth of Virginia, July 23, 1987.

Qualla Road Landfill Design Report, March 31, 1994.

Request Analysis and Recommendation, Linwood Belcher, Matoaca Magisterial District, January 20, 1987.

Sanifill, Groundwater Monitoring Data, for Robert Timmons, Department of Waste Management, Commonwealth of Virginia, November 11, 1993.

Solid Waste Facility Permit, Permit Amendment Number 516, February 1, 1988.

Solid Waste Management Permit, Department of Waste Management, Commonwealth of Virginia, January 14, 1988.

SCHUYLKILL DEBRIS LANDFILL — Prince George County, Virginia

Media Affected: Ground Water

Overview of Site/Site History

The Schuylkill Debris Landfill comprises approximately seven acres near the western edge of the Appomattox River in Prince George County. The landfill received its permit to accept C&D wastes in November 1984 and closed in 1988. It was owned and operated by the U.S. Army Quartermaster Center and Fort Lee. A few leachate seeps were discovered in 1992, but they led to no obvious visual signs of contamination.

Facility Operations

The landfill is a permitted debris facility. An October 1989 questionnaire revealed that the facility has accepted wood, stumps, brick, concrete, and other inert construction and demolition debris material.

Facility Design

The source document provides no information on facility design.

Site Environment and Hydrogeology

The source document provides no information on site environment or hydrogeology.

Summary of Environmental Damages

A Response Record from August 6, 1992 indicated that the local water supply smelled and tasted badly. However, during the same investigation, the almost adjacent Appomattox River showed no signs of contamination from the landfill.

Various ground-water monitoring records over 1991 and 1992 indicate levels of beryllium, iron, lead, sulfate, and total dissolved solids (TDS) above federal drinking water standards (primary or secondary MCLs) at least several times over the course of the monitoring (Table 1). ,Also, pH was consistently low in the series of ground-water results, often below 5. The location of the monitoring wells (i.e., whether they are on site or off site) was not reported in the available source documents. Monitoring wells at Virginia landfills that reported the well locations generally were located within the landfill owner's property boundaries.

TABLE 1. GROUND-WATER CONTAMINANTS EXCEEDING FEDERAL DRINKING WATER STANDARDS

Contaminant	Highest Detected Level (μg/l)	MCL (μg/l)	SMCL (μg/l)
beryllium	6	4	--
iron	33,500	--	300
lead	56	15[a]	--
sulfate	465,000	--	250,000
TDS	670,000	--	500,000
Parameter	**Lowest**	**MCL**	**SMCL**
pH	4.22	--	6.5-8.5

a MCL is action level for lead at the tap.

Discussion

Ground-water contamination has occurred at the landfill, but the source documents do not specifically state whether the landfill is the cause of the contamination. Because no information is readily available on site geology or facility design

and location, it is not possible to further evaluate the cause of damages at the Schuylkill Debris Landfill. It is also unknown whether off-site contamination has been documented, because the location of the monitoring wells was not presented in the source document.

Sources

Laboratory Report, Schuylkill, Montgomery Laboratories, December 16, 1992.

Memorandum from Thomas L. Kowalski, Environmental Inspector, to Department of Waste Management File, December 8, 1992.

Memorandum from Jonathan P. Adams, Lieutenant, U.S. Army, to Richard Burton, Department of Environmental Quality, April 7, 1994.

Memorandum from William M. Munson, Lieutenant Colonel, U.S. Army, to Linda Lightfoot, Department of Waste Management, October 11, 1989.

Solid Waste Management Permit, Commonwealth of Virginia, Department of Health, December 11, 1984.

1st Quarter Groundwater Analysis, Environmental Laboratories, Inc., April 30, 1992.

2nd Quarter Groundwater Analysis, Environmental Laboratories, Inc., July 23, 1992.

JANESVILLE DEMOLITION WASTE LANDFILL — Janesville, Wisconsin

Media Affected: Ground Water

Overview of Site/Site History

The Janesville Demolition Landfill is a six-acre site located in Janesville, Wisconsin, just east of the Rock River. This site was never licensed and began to accept demolition waste in 1981 until its closure in 1992. The site was open to the residents of Janesville and Rock County.

Facility Operations

The landfill received demolition waste from 1981 to 1992. A sign at the site identified concrete, broken pavement, untreated/unpainted wood, and brush as acceptable materials, but a wide variety of waste may have been accepted. An attendant inspected all incoming loads to the landfill.

Facility Design

After the site was closed, two feet of compacted clay was placed on the site to mitigate infiltration of surface water and precipitation. Ground-water monitoring is conducted using one upgradient and four downgradient wells. The source document does not mention any other engineering controls such as liners, leachate collection systems, or run-on/run-off controls.

Site Environment and Hydrogeology

The landfill is located in the drainage basin of the Rock River, which flows south. The landfill lies in a large sand and gravel quarry, which is still partly active. Logs from monitoring well installation indicate that the soils are comprised mostly of sand and gravel, with some clay and rock fragments as well. Samples from the bottom of the deepest well were predominantly silt.

The underlying bedrock is St. Peter Sandstone, which is underlain by other sandstone layers. These sandstones make up the principal aquifer in this area and provide residents with potable water. The ground-water flow is generally from the northeast to the southwest with a strong westward component due to the influence of the Rock River, which is about 1,200 feet west of the site. The depth to ground water in the wells varies from 37 to 75 feet. The large component of sand and gravel in the area suggests that ground water could be moving rapidly.

The total annual precipitation is about 32 inches.

TABLE 1. GROUND-WATER CONTAMINANTS EXCEEDING FEDERAL DRINKING WATER STANDARDS

Contaminant	Highest Detected Level (μg/l)	MCL (μg/l)	SMCL (μg/l)
chloride	430,000	--	250,000
manganese	710	--	50
sulfate	1,900,000	--	250,000
total dissolved solids (TDS)	3,780,000	--	500,000

Summary of Environmental Damages

Ground-water samples were taken periodically over a two-year period at one upgradient, one sidegradient, and two downgradient wells. The source document is unclear as to whether the wells are inside or outside of the property line, but both downgradient wells appear to be within the property line. Several parameters were significantly higher in the two downgradient wells compared to the upgradient well. Constituents that were found in downgradient wells at levels higher than their federal drinking water standard (primary or secondary MCL) are shown in

Table 1. According to the source document, levels of sulfate, chloride, and manganese were above the Wisconsin Public Welfare Standards. The high sulfate levels were attributed to gypsum, a common component of wallboard. Phenolic, a common constituent of tree and vegetative decay products, was detected once in one of the downgradient wells slightly above reporting limits.

Discussion

Adverse on-site ground-water quality impacts from demolition waste disposal were documented at this landfill. Off-site ground-water monitoring was not conducted.

Source

Investigation of Groundwater Impacts at Demolition Waste Landfills, Wisconsin Department of Natural Resources, June 1994.

TERRA ENGINEERING
DEMOLITION WASTE LANDFILL

Dane County, Wisconsin

Media Affected: Ground Water

Overview of Site/Site History

The Terra Engineering Demolition Landfill is about 4.1 acres in size. It is located in a drained marshy area in Dane County near the city of Madison, Wisconsin. This site was licensed in 1971 for demolition waste only, and one owner has operated the site since 1972. The company expects to be able to fill at the present rate for at least 10 more years.

Facility Operations

Since 1972, the site has been filled only with waste materials from the company's construction and demolition projects. The main fill materials have been reinforced and unreinforced concrete, wood, masonry, brick, asphalt pavement, glass, steel and metal pieces, and brush. Some asphalt and scrap metal has been sorted out for the company to sell or reuse.

Facility Design

No information is presented in the source document about the design of the landfill.

Site Environment and Hydrogeology

The landfill is in a drained marshy area bounded on the north and east by drainage ditches. Surface water is routed around the fill on the southern end of the site. The land slopes towards the southeast.

The glacial material underlying the site is undifferentiated glacial deposits consisting of ground moraine. The unconsolidated material below the surface includes layers of brown sand, silt, and clay, along with some sand seams and sand and gravel lenses. About 100 feet below these unconsolidated deposits lies Trempealeau and Franconia sandstone bedrock, which is underlain by Cambrian sandstone down to Precambrian crystalline bedrock. The Cambrian sandstone acts as the principal aquifer for most Dane County residents.

Ground water is close to the surface at the site; the measured depth to ground water is between 2.5 and 10 feet. Regional movement of ground water deep in the sandstone aquifer is southwest towards the Yahara River, which is three miles away. Locally, there is a definite eastward gradient. The ground-water flow is very complex due to the heterogeneous nature of the glacial deposits.

TABLE 1. GROUND-WATER CONTAMINANTS EXCEEDING FEDERAL DRINKING WATER STANDARDS

Contaminant	Highest Detected Level (μg/l)	MCL (μg/l)	SMCL (μg/l)
chloride	380,000	--	250,000
iron	6,400	--	300
manganese	1,400	--	50
sulfate	600,000	--	250,000
TDS	3,340,000	--	500,000

Summary of Environmental Damages

Five ground-water monitoring wells were installed at the site, one within the demolition debris and the others sidegradient to the fill. All wells were sampled periodically for two years. One of the sidegradient wells had elevated levels of manganese, sulfate, and total dissolved solids (TDS); the other three sidegradient wells were generally unaffected. The

well installed within the demolition debris had elevated levels of many inorganics; five were detected at levels above federal drinking water standards (primary or secondary MCLs). These are shown in Table 1.

Discussion

Adverse on-site ground-water quality impacts from demolition waste disposal were documented at this landfill. Off-site ground-water monitoring was not conducted.

Source

Investigation of Groundwater Impacts at Demolition Waste Landfills; Wisconsin Department of Natural Resources; June 1994.

CHAPTER 4. FINDINGS AND CONCLUSIONS

This chapter discusses the findings and conclusions of this study. It begins by summarizing the ground-water, surface water, and ecological damages observed at the 11 case study sites, and discussing the factors that might have contributed to those damages. The implications of these findings are then discussed.

SUMMARY OF DAMAGES AND CONTRIBUTING FACTORS

Exhibit 4-1 summarizes information pertaining to each damage case. Included on the exhibit are each site's operating dates, design and operating characteristics, environmental setting, nature of the contamination, and any corrective actions that were recommended and/or taken.

- Operating dates are given when available.
- Information on design and operations was incomplete in most of the source documents.
- Many of the source documents were quite detailed with respect to environmental setting characteristics such as topography and hydrogeology, but they did not address the relationship between environmental setting and observed damages. Exhibit 4-1 presents the site characteristics that are potentially relevant.
- The environmental contamination column identifies the media contaminated, whether the contamination was on site or off site, and the constituents involved. If the source document was unclear as to whether the contamination was on or off site, it was assumed to be on site. The exhibit focuses on contamination above applicable state or federal standards or criteria; if contamination did not exceed standards or criteria, increases above background levels are reported. Terrestrial ecological damages are not included in this exhibit because none were reported at any of the sites.
- Corrective actions listed in the last column include actions that have been recommended or implemented at the site.

The results are discussed below.

Environmental Contamination

This section summarizes the nature of the ground-water and surface water contamination found at the sites. Again, no terrestrial ecological damages were reported.

Ground Water

All 11 sites reported ground-water contamination within the property boundary; none reported ground-water contamination off site. This does not mean that there was no off-site contamination. Rather, in most cases, ground-water monitoring was not performed beyond the site boundary.

Although most of the sites were monitored for a wide range of organic and inorganic constituents, virtually all of the contamination was associated with inorganics. A small number of sites reported slight

Doyle, Liz

From: Kathryn Nelson [knelson@LMNArchitects.com]
Sent: Monday, May 13, 2013 1:17 PM
To: Kathleen Turner (turnkat@uw.edu); Doyle, Liz; lizjdoyle@gmail.com; Ken Wheaton (wheaton.kr@gmail.com); Trefethen, Daniel B (daniel.b.trefethen@boeing.com); annpool@uw.edu; brinka@uw.edu; ehoffrance@kellerrohrback.com; kaskaskiavic@yahoo.com; Sofia Leung (sofialeu@uw.edu); mary.s.whittaker@boeing.com; janschueller@comcast.net; ngersh@uw.edu; Jessica King (jlking40356@gmail.com)
Subject: Preparing for June Cabinet Meetings and Leadership Orientation
Attachments: DRAFT Chapter Cabinet Minutes Feb 2013.docx; DRAFT Division Cabinet Minutes Feb 2013.docx; DRAFT Joint Cabinet Minutes Feb 2013.docx; Chapter Cabinet agenda draft.docx; Division Cabinet agenda draft.docx; SLA Joint Cabinet agenda draft.docx

Hello,

A heads up about this Monday June 10th 4:00-5:30 get together. All of you are welcome and might be very interesting to those of you who are a little more new to the chapter (how things work, how motions are passed, what's really "hot" within the SLA HQ, etc.).

Liz and I certainly will be there.

Best,

Kathryn

From: Ann Koopman [mailto:a.koopman@verizon.net]
Sent: Monday, May 13, 2013 1:07 PM
To: Leadership - Private
Subject: [sla-leadership] Preparing for June Cabinet Meetings and Leadership Orientation

All Chapter and Division Leaders:

We're looking forward to seeing you at the Leadership Orientation and the Cabinet meetings on Monday, June 10, in San Diego. Leadership orientation is from 4:00 to 5:30; it is open to ALL SLA members. We encourage you to invite your membership chairs and committee members, because the program will feature membership recruitment, retention and engagement. We'll also have an inspiring talk from Phil Blair, President and CEO of Manpower, San Diego. His new book on volunteerism as a career strategy ties right in with the benefits of volunteering for SLA.

Please review the attached draft agendas for the Cabinet meetings, and the draft minutes from February's meetings in Dallas.

If you wish to bring up business, introduce a motion, or otherwise get on the agenda, PLEASE NOTIFY your cabinet chair (Debbie or Ann) as soon as possible.

- **The Chapter and Division Cabinet meetings will start at 6:00 p.m., followed immediately by the Joint Cabinet meeting.**
- **All Chairs/Chairs-Elect and Presidents/Presidents-Elect are expected to attend.**
- **Each unit may have up to two voting delegates; other unit members may attend as non-voting guests. If the expected delegate(s) cannot attend, the unit Chair/President may appoint another unit member as a substitute delegate.**

The final agendas and minutes will be posted to the Chapter and Division wikis.

Looking forward to hearing from you,

Ann Koopman, Division Cabinet Chair
Debbie Schachter, Chapter Cabinet Chair
