Kim-Stan Landfill

Selma, Virginia

EPA Facility ID: VAD077923449

Basin: Upper James

HUC: 02080201

Executive Summary

The Kim-Stan Landfill is located next to the Jackson River, a tributary of the James River, which supports a run of anadromous American shad. The landfill operated as a municipal and industrial landfill from 1972 to 1990. Waste oils, sludges, and medical wastes were reportedly disposed of in the landfill, with few controls of surface runoff. Over the period of operation, substantial amounts of runoff flowed through fill areas and ultimately discharged to the Jackson River. Landfill soils, groundwater, surface water, and river sediment are contaminated with trace elements and PAHs at concentrations that exceed screening guidelines. American eel have access to the Jackson River near the site. American shad are present in the James River as far as the Scott's Mill Dam, which prevents further movement of shad upstream.

Site Background

The Kim-Stan Landfill occupies approximately 10 hectares (24 acres) in Selma, Virginia, adjacent to the Jackson River (Figure 1). The Jackson River flows for about 11 km (7 mi) to the James River, which flows for over 320 km (200 mi) to Chesapeake Bay.

The Kim-Stan Landfill operated as a municipal and industrial landfill from 1972 until 1990, when it was shut down by a court order. During these years, an estimated 860,000 tons of solid waste was placed in the landfill. Historical records indicate waste oils contaminated with PCBs, aluminum waste sludges, asbestos, and medical wastes were disposed of at the site. In 1992, a Groundwater Assessment Investigation reported large amounts of surface water flow into the landfill from an adjacent mountain with no provisions for a groundwater interceptor system in place. At that time, an estimated 260,000 L (68,300 gal.) of contaminated leachate and groundwater was discharged daily from the site (CH2M Hill 1993). No floor liners were used in waste disposal areas, no erosion control or storm water management facilities were used, no groundwater monitoring wells were drilled, and no facilities were installed to prevent contaminated surface runoff (Weston 1998).

Between 1990 and 1998, the Virginia Department of Waste Management and Department of Transportation conducted several remedial actions including covering exposed portions of the landfill with soil; installing erosion controls such as silt fencing, berms, and drainage ditches; off-site disposing of leachate held in a storage basin; building a new channel to route storm water; building a temporary sedimentation basin; and installing monitoring wells (Weston 1998).

Shallow groundwater is the primary pathway for transport of contaminants to NOAA trust resources. Leachate seeps occur at the base of the landfill; and there is a contaminated groundwater plume in the shallow aquifer. Groundwater is encountered at 1.5 m (5 ft) bgs near the landfill; and there are numerous springs in the area. Shallow groundwater flows to the north, discharging

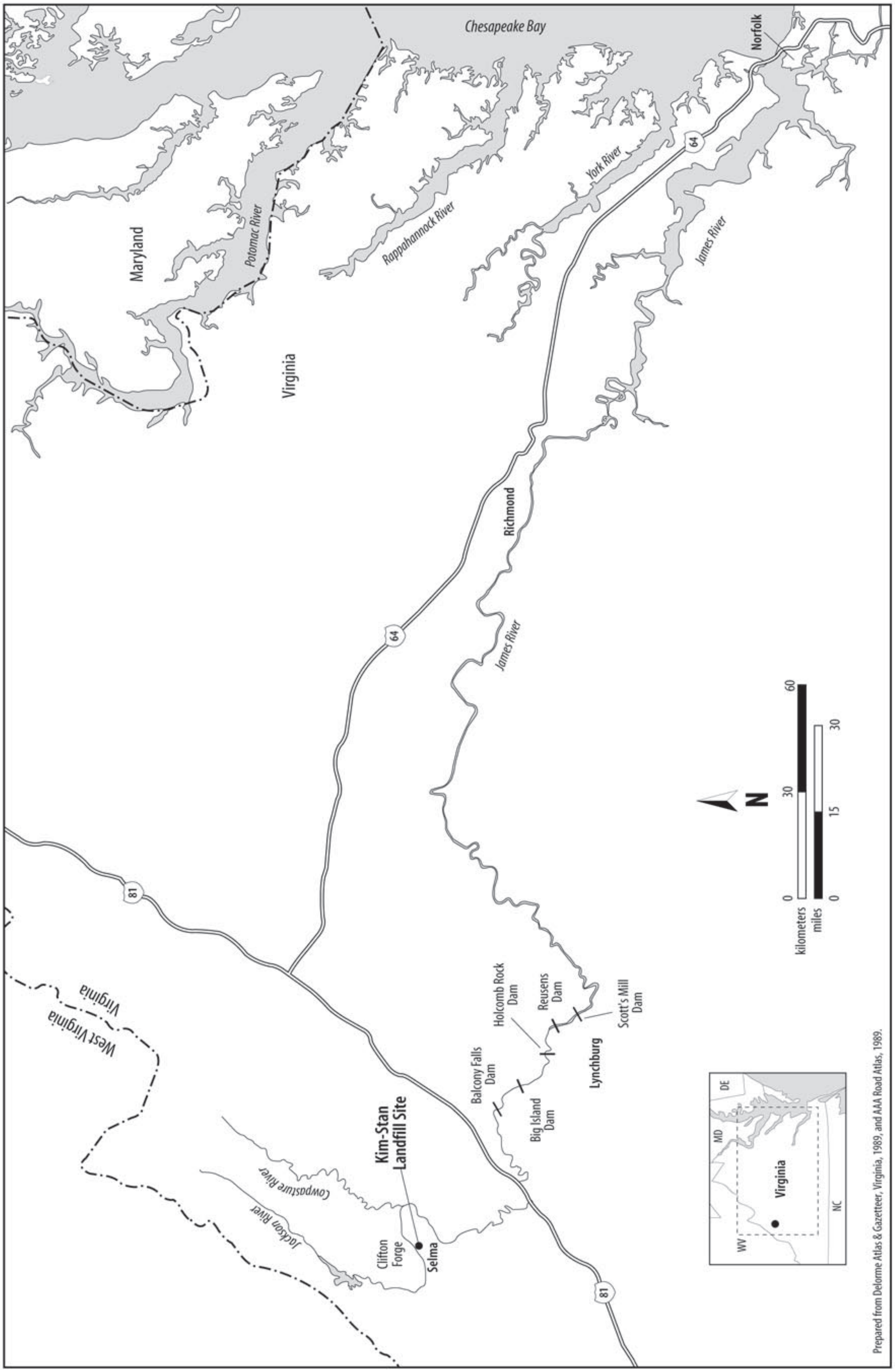

Figure 1. Location of the Kim-Stan Landfill Site in Selma, Virginia.

to the Jackson River. A groundwater study conducted at the landfill found that it takes about 90 days for groundwater to reach the Jackson River (Weston 1998).

The U.S. Environmental Protection Agency placed the Kim-Stan Landfill on the National Priorities List of hazardous waste sites in July 1999 (USEPA 2000a). A Site Inspection report was completed in September 1998 (Weston 1998).

NOAA Trust Resources

The NOAA habitat of concern is the Jackson River, which is adjacent to the landfill (Figure 2). The Jackson River is a moderate size and grade, ranging from 60 to 100 m (200 to 330 ft) wide and up to 3 m (10 ft) deep. River substrates range from fine sands to cobble. The Jackson River is a tributary of the James River near the West Virginia border.

The catadromous American eel is the trust resource that can access the Jackson River near the site. Although fish surveys have not documented eel in the river, eel have been documented in much of the James River basin, over 250 km (150 mi) inland of Chesapeake Bay. American eel is found throughout Virginia streams and has been found in several upper watersheds near the West Virginia border. Eel can traverse lowhead dams and low-grade waterfalls as they migrate upstream to establish residence in fresh water. The habitats and water quality in the Jackson River are suitable for eel (Miller 2000).

Anadromous American shad are gradually being restored to the major river basins of Virginia through the construction of fish passage facilities at formerly impassable dams. Shad are present in the James River as far inland as Lynchburg, Virginia where the Scott's Mill Dam prevents further movement upstream. The Scott's Mill Dam is located approximately 100 km (60 mi) downstream of the Kim-Stan Landfill (Martell 2000). There are no known restoration plans for Scott's Mill Dam in the next five years. Upstream of Scott's Mill Dam is a series of four more dams. The first of these, Reusens Dam, is a hydroelectric dam without fish passage facilities. There is little effort being made to add fish passage to this series of dams. This is due to the low number of American shad that have been found to migrate as far upstream as the Scott's Mill Dam. Should the number of shad reaching Scott's Mill Dam significantly increase there will be a greater effort made towards restoring this series of dams (Weaver 2002).

There are recreational fisheries on the Jackson River and in tributary streams near the landfill (Weston 1998). Warm-water species, including small- and large-mouth bass are sought in the Jackson River while the tributary streams support trout fisheries (Martell 2000). No information was available on recreational fishing in the oxbow ponds located on private property next to the site (Weston 1998).

No health advisories are in effect on the Jackson or James rivers near the Kim-Stan Landfill (USEPA 2000b).

Site-Related Contamination

Environmental investigations on and near the Kim-Stan Landfill report contamination of landfill soil, underlying groundwater, surface water, sediments of the Jackson River, oxbow ponds, and leachate migrating from the landfill. The Site Inspection collected four soil samples from the land

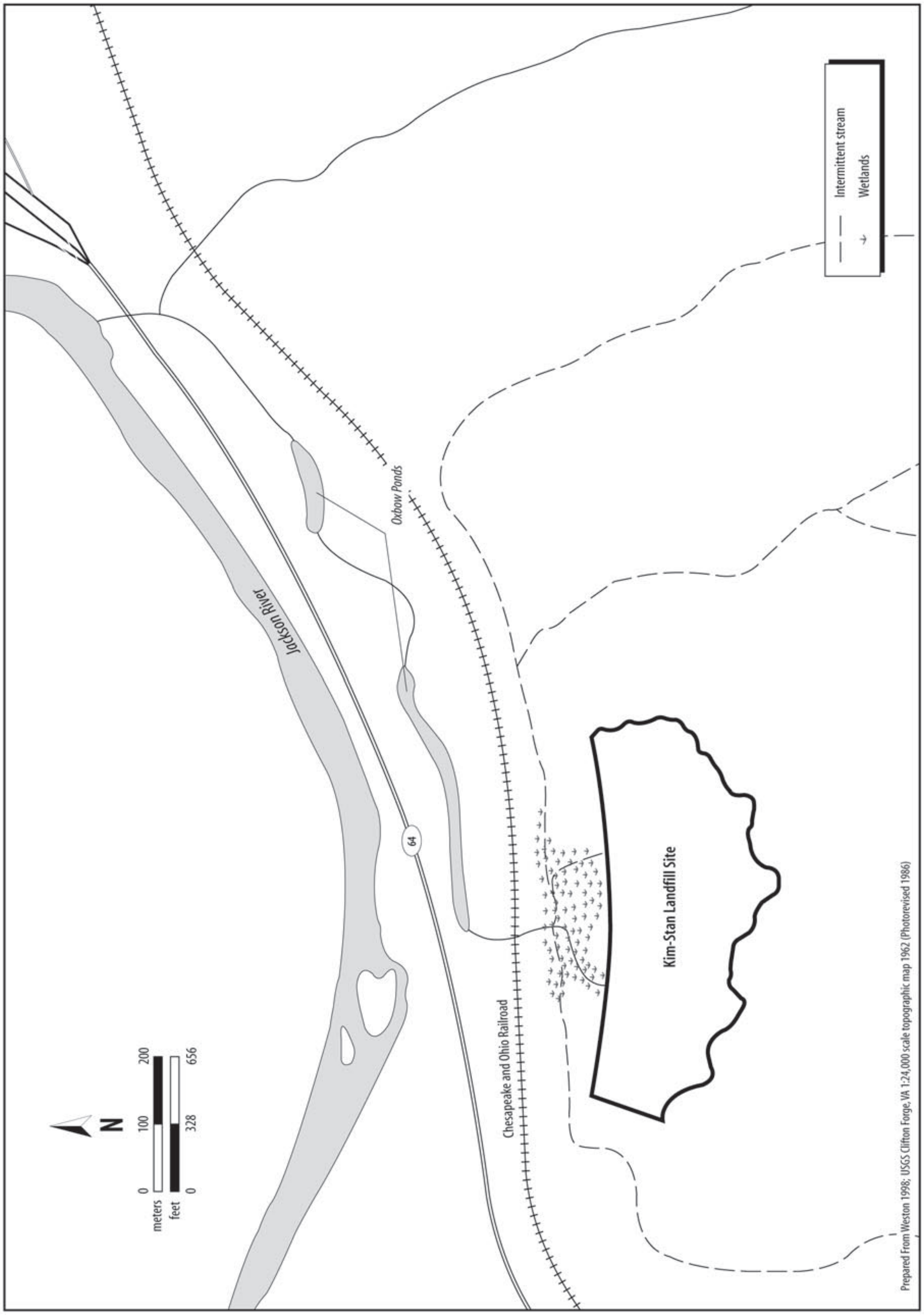

Figure 2. Detail of the Kim-Stan Landfill Site.

fill, two leachate samples from the base of the landfill, groundwater samples from seven wells, and surface water and sediment samples from 14 locations on the landfill, oxbow ponds, and Jackson River (Weston 1998).

The contaminants of concern to NOAA include trace elements and several PAHs, which were observed primarily in landfill soils, pond sediments, and river sediments at concentrations exceeding screening guidelines. The maximum concentrations of contaminants in environmental media on the site are presented in Table 1, along with appropriate screening guidelines.

Concentrations of arsenic, cadmium, copper, lead, mercury, nickel, and zinc in landfill soils exceeded soil screening guidelines. The pesticide DDT and several PAHs were also observed in landfill soil, although there are no screening guidelines for these organic compounds in soil.

Groundwater and surface water samples collected near the landfill were slightly above the AWQC. In the groundwater sample, copper and lead concentrations were an order of magnitude greater than the AWQC. Dieldrin and DDT concentrations exceeded the AWQC in surface water samples collected from an oxbow pond. No contaminants detected in leachate samples exceeded screening guidelines, but the detection limits were above the screening guidelines for several trace elements, pesticides, and the PAH phenanthrene.

Concentrations of eight of the nine trace elements exceeded sediment guidelines in samples collected from the Jackson River next to the landfill or from the oxbow ponds located between the river and landfill. The highest concentrations were measured in the oxbow ponds. Concentrations of eight PAHs also exceeded sediment-screening guidelines; however, the pattern of PAH contamination was different from the pattern of trace elements in sediment. Only one PAH exceeded sediment guidelines in the oxbow ponds while eight PAHs exceeded guidelines in river sediment.

Table 1. Maximum concentrations of contaminants of concern in environmental media at the Kim-Stan Landfill (Weston 1998).

	Soils (mg/kg)		Aqueous Samples (µg/L)				Sediment (mg/kg)		
Contaminant	Surface Soils	U.S. Average Soils[a]	Ground-water	Leachate	Surface water	AWQC[b]	River Sediment	Oxbow Sediment	TEL[c]
TRACE ELEMENTS									
Arsenic	23	5.2	29	<5	<5	150	6.6	24	5.9
Cadmium	0.8		7	<5	6	2.2	0.9	3.1	0.596
Chromium	13	37	84	<10	<10	11	20	24	37.3
Copper	72	17	110	<20	26	9	25	86	35.7
Lead	120	16	26	<2	12	2.5	29	52	35
Mercury	0.1	0.058	0.3	<0.2	<0.2	0.77	<0.1	0.4	0.174
Nickel	33	13	130	<40	280	52	77	60	18
Silver	<1.0		<10	<10	<1.0	0.12	<1.0	<1.0	1.0[d]
Zinc	250	48	590	<20	490	120	380	380	123.1
PESTICIDES									
Dieldrin	<0.003	NA	<0.1	<0.1	0.11	0.056[f]	<0.003	<0.003	2.85
DDT	0.021	NA	<0.1	<0.1	0.2	0.0005	<0.003	0.019	6.98
Heptachlor Epoxide	ND	NA	<0.05	<0.05	<0.05	0.0019	<0.003	<0.003	0.6
PAHs									
Naphthalene	<0.33	NA	<5	<5	0.079	620[e]	0.6	0.045	0.16
Acenaphthene	0.1	NA	<10	<10	<10	520[e]	0.1	<0.33	0.016[d]
Anthracene	<0.33	NA	<10	<10	<10	300[g]	0.36	<0.33	0.0853[d]
Benzo(a)anthracene	<0.33	NA	<10	<10	<10	300[g]	0.97	<0.33	0.0317[d]
Benzo(a)pyrene	0.09	NA	<10	<10	<10	300[g]	0.67	0.04J	0.0319
Benzo(b)fluoranthene	0.1	NA	<10	<10	<10	300[g]	0.69	0.06	NA
Benzo(k)fluoranthene	0.07	NA	<10	<10	<10	300[g]	0.59	0.05	NA
Chrysene	0.2	NA	<10	<10	<10	300[g]	1.1	<0.33	0.0571
Fluoranthene	0.2	NA	<10	<10	<10	300[g]	2.5	0.09	0.111
Phenanthrene	0.3	NA	<10	<10	<10	6.3[f]	1.2	0.08	0.0419
Pyrene	0.2	NA	<10	<10	<10	300[g]	1.9	0.07	0.053

NA Screening guidelines not available.

a: Shacklette and Boerngen (1984), except for silver and cadmium which are average concentrations in the earth's crust as reported by Lindsay (1979).

b: Ambient water quality criteria for the protection of aquatic organisms (USEPA 1999). Freshwater chronic criteria presented. Criterion expressed as a function of total hardness with the exception of arsenic and silver; concentrations shown correspond to hardness of 100 mg/L.

c: TEL; Threshold Effects Level; Freshwater sediment value. Concentration below which adverse effects were rarely observed (geometric mean of the 15 percent concentration in the effects data set) as compiled by Smith et al. (1996).

d: TEL not available; Effects Range-Low (ERL) value presented. The ERL represents the 10th percentile for the dataset in which effects were observed or predicted in studies compiled by Long et al. (1998; 1995).

e: Lowest Observable Effect Level.

f: Proposed criteria.

g: Value for chemical class; marine acute value is presented.

J: Analyte present. Reported value is estimated: concentration is outside the range of accurate quantitation.

< Not detected; value is the detection limit.

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