

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

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RCRA Corrective Action  
Environmental Indicator (EI) RCRA Info code (CA725)  
Current Human Exposures Under Control

Facility Name: John Deere Waterloo Works  
Facility Address: 400 Westfield Ave., Waterloo, IA 50704  
Facility EPA ID #: IAD005289806

**DETERMINATION RESULT: YE**

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

  X   If yes - check here and continue with #2 below.

       If no - re-evaluate existing data, or

       if data are not available skip to #6 and enter "IN" (more information needed) status code.

The John Deere Waterloo Works (JDWW) facility is located on about 270 acres in Waterloo, Iowa (see Figure 1). The facility consists of two parts, the John Deere Component Works (JDCW), which is east of Blackhawk Creek, and John Deere Foundry Waterloo (JDFW), which is west of Blackhawk Creek (Black and Veatch Waste Science and Technology Corp [BV] 1991). The facility began operations in 1909 as the Waterloo Gasoline Engine company and was bought by John Deere (JD) in 1918, when operations expanded to include additional farm implements (Roy F. Weston, Inc. [Weston] 2004). The facility expanded to its present size in 1967 with purchase of property north of Blackhawk Creek. Tractor assembly subsequently was moved offsite. In 1991, operations at the facility included manufacturing components for assembly of tractors and other agricultural implements; manufacturing processes included foundry operations, molding operations, machining of cast iron and steel, painting, paint stripping, and electroplating (BV 1991). As of 2000, the facility generated less than 1,000 kilograms per month of hazardous waste (JDWW 2001).

The JDWW facility also has stored and treated hazardous waste on site, and it has held a U.S. Environmental Protection Agency (EPA) permit to operate a hazardous waste treatment, storage, and disposal facility (TSDF) since 1991 (Weston 1998). Hazardous waste treated and stored on site was generated on site, off site by other JD facilities, and off site by facilities with other owners. At some unspecified date, JDWW built an onsite wastewater treatment plant (WWTP). The WWTP accepted hazardous aqueous and oil wastes from other facilities – for the most part, wastes from metal finishing operations (BV 1991). JDWW also operated a container storage facility for onsite treatment (by unspecified methods) or for wastes awaiting off-site treatment. These wastes were generated at JDWW and other JD facilities (Weston 1994). By 1998, the facility was disposing of waste-paint solids in the county landfill, sending most of its foundry sand to cement kilns, and disposing of solvents off site or using them as a secondary fuel source (Weston 1998). In 2000, EPA issued a Class 1 permit modification that eliminated regulated units and most TSDF waste management activities at the JDWW facility. This modification resulted from the clean closure of all regulated units. The facility also stopped accepting hazardous waste from off site (JDWW 2001).

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The JDWW facility has been monitored and investigated since at least 1985, when EPA conducted a preliminary assessment of the site (BV 1991). In 1991, EPA performed a Resource Conservation and Recovery Act (RCRA) facility assessment (RFA) that identified 22 solid waste management units (SWMU) and 5 areas of concern (AOC). As a condition of the 1991 permit, EPA required the facility to conduct a RCRA facility investigation (RFI) to determine the nature and extent of releases from SWMUs and AOCs (Weston 1994) (see Figure 2). Investigations of groundwater, soil, sediment, and surface water contamination have continued at the facility, including investigations to:

- Close the J4 container storage building in 1994 (Ries Environmental Corp. [Ries] 1994)
- Close the M12 container storage area in 2000 (Earth Tech Inc. 2000)
- Characterize SWMUs and prepare for planned expansion of building T-10 and possible expansion of buildings H and Z (Weston 2001b)
- Expand building T-10 in 2001 (Weston 2001a)
- Determine the existence of an additional SWMU in building H3 (JDWW 2004)
- Update existing groundwater data (Weston 2004)

The SWMUs and AOCs characterized in the RFI and subsequent investigations are listed below. For ease of identification, SWMUs and AOCs have been organized into four geographic groups: (1) Chromium and Cyanide Waste Area, (2) JDFW Sand Waste Area, (3) Foundry Settling Pond Area, and (4) Skimmer Pond Area (Weston 1994) (see Figure 2). Compounds detected at concentrations above background at the facility include volatile organic compounds (VOC), semivolatile organic compounds (SVOC), metals, polychlorinated biphenyls (PCB), and dioxins. A limited number of pesticides and herbicides also have been detected. SWMUs and AOCs still under investigation or that have evidence of release are listed below. The RFA identified an additional 11 SWMUs and AOCs (BV 1991). The 2004 investigation showed that contaminated areas in building H3 were not SWMUs, but the location of incidental small spills; the areas of the spills were cleaned up in 2004 (JDWW 2004)

**Chromium and Cyanide Waste Area.** The Chromium and Cyanide Waste Area is on the west end of the JDWW facility and includes two SWMUs.

Cyanide and Chromium Waste Disposal Areas. In this SWMU, chromium and cyanide sludges from plating operations were put in drums and buried (BV 1991). Although the exact dates of operation are unknown, JD memos from the 1960s said that the area had been used for “many years.” The practice of burying drums here was discontinued in 1970 or 1971 (BV 1991). The extent and number of burial sites also is unknown (BV 1991). This SWMU is now under the corner of building 8002. No source characterization was performed at this SWMU for the RFI, although groundwater samples were collected from the area of the SWMU (Weston 1994). No significant groundwater contamination was found in the area of this SWMU.

Electric Arc Furnace Baghouse. This SWMU stored dust collected from the four baghouses serving the foundry. The dust was once stored in waste piles but was later stored in roll-off containers for off-site disposal (BV 1991). This SWMU operated from the early 1970s until 1998 or later (BV 1991; Weston 1998). No source characterization was performed at this SWMU for the RFI, though groundwater samples were collected from the area of the SWMU (Weston 1994). No significant groundwater contamination was found in the area of this SWMU.

**JDFW Foundry Sand Waste Area.** The JDFW Foundry Sand Waste Area is at the eastern half of the JDFW facility and includes four SWMUs.

Waste Casting Sand Disposal Areas. This SWMU encompasses about 75 acres and received casting sands from foundry operations (BV 1991). The sands potentially were contaminated with cyanide, phenols, oils, and petroleum-based solvents (BV 1991). The SWMU is overlapped by the other three SWMUs in the area. Dates of operation of the SWMU are unknown, but it was no longer in use after 1979 (BV 1991; Weston 1994). JDWW has

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since built several buildings over the SWMU. Subsurface soils in this area contained VOCs, SVOCs, metals, and PCBs (Weston 1994).

Sludge Drying Ponds. This SWMU included two ponds, each about 100 by 500 feet in area. The ponds received sludges from the settling and skimmer ponds and also were used for temporary storage of iron waste from the foundry (BV 1991). Before the ponds were constructed, the area was used for disposal of foundry sand (Weston 1994). The date of construction is unknown, but in 1993 the west unit was backfilled with foundry waste sand and demolition debris (Weston 1998). Subsurface soil and pond sediment in this area contained VOCs, SVOCs, PCBs, herbicides, dioxins and furans, and metals (Weston 1994).

Building 1020 and 1021 Disposal Area. This SWMU covered about 5 acres and received foundry waste and sludge from the skimmer pond (BV 1991). Its dates of operation are unknown. Subsurface soil in this area contained VOCs, SVOCs, and metals (Weston 1994).

West Disposal Area. This SWMU covered about 5 acres and now is paved with concrete (BV 1991). It received foundry waste, carbide waste, oil waste, concrete, and sludge from the skimmer pond (BV 1991). At some time, it also was used as an area to rinse trucks (cargo unknown) (Weston 1994). At the time of the RFI, it was still used to store miscellaneous items (Weston 1994). Its dates of operation are unknown. Subsurface soil in this area contained VOCs, SVOCs, PCBs, pesticides, and metals (Weston 1994).

**Foundry Settling Pond Area.** The Foundry Settling Pond Area is east of Black Hawk Creek and covers most of the JDCW area. It includes four SWMUs and two AOCs. One of the AOCs – the tank area – was identified during the RFA. The other – the north parking lot – was identified later.

Old Foundry Settling Ponds. This SWMU included two unlined settling ponds used to store core sand, air pollution washings, and core washings from the foundry (BV 1991). They were constructed in the mid-1960s and operated until 1986 (BV 1991). In 1986, dredged solids were removed from the ponds and taken to the sludge drying beds, but the ponds still contained an unknown quantity of solids from the foundry (BV 1991). The ponds also received dredged sludge from the skimmer pond in 1992 (Weston 2001b). Small trees and other vegetation have grown in and around the ponds, and the ponds still contain surface water (Weston 2001b). Pond sediment and subsurface soil contained VOCs, SVOCs, PCBs, dioxins, and metals (Weston 1994, 2001b).

Waste Casting Sand Disposal Areas. Waste casting sand also was disposed of in the Foundry Settling Pond Area. This SWMU covered about 75 acres and received casting sands from foundry operations (BV 1991). The sands potentially were contaminated with cyanide, phenols, oils, and petroleum-based solvents (BV 1991). The SWMU is overlapped by the three other SWMUs in the area. The dates of operation of the SWMU are unknown, but it was no longer in use after 1979 (BV 1991; Weston 1994). JDWW has since built several buildings over the SWMU. Subsurface soils in this area contained VOCs, SVOCs, metals, and PCBs (Weston 1994, 2001a).

Paint Sludge Disposal Areas. In this SWMU, the JDWW facility burned waste paint containing chromium and lead in pits (BV 1991). Its dates of operation are unknown. Subsurface soil in this area contained VOCs, SVOCs, PCBs, and other metals (Weston 1994, 2001a).

Rubbish Pits. This SWMU includes two pits – one 200 by 50 feet and the other 500 by 200 feet – both now covered by concrete or buildings (BV 1991). Materials disposed of in the pits are unknown, but they included wood, cardboard, and paper (BV 1991; Weston 1994). Construction dates are unknown, but the pits primarily were used in the late 1950s (BV 1991). Subsurface soil in this area contained VOCs, SVOCs, and metals (Weston 1994).

Underground Tanks (Oil Field). Underground storage tanks (UST) were located throughout the JDWW facility (BV 1991). Records indicate the removal of 25 USTs from various locations and 25 10,000-gallon USTs from this AOC (Weston 1994). USTs in the oil field contained diesel, gasoline, oil, antifreeze, and unknown chemicals.

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When removed from the oil field, the majority of USTs were leaking (BV 1991). Free product has been detected in two monitoring wells in the immediate area of the oil field, and product recovery systems still are operating in the area (Weston 1994; IT Group 2002a, 2002b). No soil samples were collected in this area (Weston 1994).

North Parking Lot Area. This AOC was identified during installation of monitoring well GW-9, when oil waste was reported (Weston 1994). The area of stained soil is about 200 by 600 feet in area and may have been part of the foundry settling ponds or an associated pond before it was filled and paved in 1978 (Weston 1994). Subsurface soil in the area contained VOCs, SVOCs, PCBs, dioxins and furans, pesticides, and other inorganic contaminants (Weston 1994).

**Skimmer Pond Area.** The Skimmer Pond Area is at the northeast corner of JDWW, directly south of River Road. It includes seven SWMUs and one AOC. The AOC – the rubbish pit where chromium waste was spilled – was identified after the RFA.

J-4 Container Storage Area. This SWMU was a paved storage pad, about 75 feet by 63 feet in area, where drummed hazardous and non-hazardous waste was stored for both on- and off-site processing (BV 1991). The area was constructed in 1976 and paved in 1983 (BV 1991; Ries 1994). The RFA did not recommend additional investigation at this SWMU, and it was not included in the RFI. However, closure sampling in 1994 revealed elevated levels of metals at concentrations higher than surrounding areas with the same fill (Weston 1998). As a result, it will be included in future corrective action, and it was one of the areas included in the 2001 supplemental investigation (Weston 2001b).

Skimmer Pond. This SWMU was an 8-acre pond, constructed in dredged sand deposits and foundry sand refuse in the early 1960s (BV 1991). It was used for gravity separation of suspended solids in process water, and skimmers in the pond collected free-floating oil. The pond also received storm water runoff and cooling water (Weston 1994). Subsurface soil and pond sediment in this area contained VOCs, SVOCs, PCBs, dioxins, and other inorganic contaminants (Weston 1994).

Waste Casting Sand Disposal Areas. Waste casting sand also was disposed of in the Skimmer Pond Area. This SWMU covered about 75 acres and received casting sands from foundry operations (BV 1991). The sands potentially were contaminated with cyanide, phenols, oils, and petroleum-based solvents (BV 1991). The dates of operation of the SWMU are unknown, but it was no longer in use after 1979 (BV 1991; Weston 1994). JDWW has since built several buildings over the SWMU. Subsurface soils in this area contained VOCs, SVOCs, pesticides, metals, and PCBs (Weston 1994).

Paint Sludge Disposal Areas. Paint sludges also were burned in at least two locations in the Skimmer Pond Area. In this SWMU, the JDWW facility burned waste paint containing chromium and lead in pits (BV 1991). Its dates of operation are unknown. Subsurface soil in this area contained VOCs, SVOCs, herbicides, dioxin, and metals (Weston 1994, 2001b).

Former Settling Pond. This SWMU was used primarily before the mid-1950s for disposal of all types of waste and fill material (Weston 1994). It was replaced by the skimmer pond and currently does not hold surface water (BV 1991; Weston 1994). Subsurface soil in the area contained VOCs, SVOCs, dioxins/furans, and other inorganics (Weston 1994).

Carbide Pit. This SWMU – about 50 feet in diameter – was used to dispose of calcium hydroxide wastes produced by the generation of acetylene (BV 1991; Weston 1994). Its dates of operation are unknown, but it was no longer in use in 1991 (BV 1991). Subsurface soil in this area contained VOCs, SVOCs, and other inorganics (Weston 1994).

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Sludge Pit. This SWMU – about 50 feet in diameter – was used to dispose of all types of liquid waste and sludge. The types of wastes and dates of operation are unknown, but the SWMU was used primarily during the 1950s (Weston 1994). Subsurface soil in this area contained VOCs, SVOCs, PCBs, pesticides, and metals (Weston 1994).

Waste Pit. The source and types of wastes disposed of in this 1,000-square foot SWMU are unknown. Its dates of operation also are unknown, but it was no longer in use in 1991 (BV 1991). Subsurface soil in this area contained VOCs, SVOCs, PCBs, and metals (Weston 1994, 2001b).

Rubbish Pit/Chromium Rinse Water Spill Area. This SWMU included two pits – one 200 by 50 feet, the other 500 by 200 feet – both now covered by concrete or buildings (BV 1991). Materials disposed of in the pits were unknown (BV 1991). The construction date is also unknown, but the pits were used primarily in the late 1950s (BV 1991). In 1985, an underground line carrying chromium rinse water past the SWMU sprang a leak (Weston 1994). Subsurface soil in the area contained VOCs, SVOCs, and metals (Weston 1994, 2001b).

## **BACKGROUND**

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

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

### **Definition of “Current Human Exposures Under Control” EI**

A positive “Current Human Exposures Under Control” EI determination (“YE” status code) indicates that there are no “unacceptable” human exposures to “contamination” (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all “contamination” subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

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

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The “Current Human Exposures Under Control” EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program’s overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

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

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

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2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **“contaminated”**<sup>1</sup> above appropriately protective risk-based “levels” (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria [e.g., Maximum Contaminant Levels (MCLs), the maximum permissible level of a contaminant in water delivered to any user of a public water system under the Safe Drinking Water Act] from releases subject to RCRA Corrective Action (from SWMUs, RUs, or AOCs)?)

Media	Yes	No	?	Rationale/Key Contaminants
Groundwater	X			
Air (indoors) <sup>2</sup>		X		
Surface Soil (e.g., <2 ft)	X			
Surface Water	X			<b>See below for details</b>
Sediment	X			
Subsurf. Soil (e.g., >2 ft)	X			
Air (outdoors)		X		

\_\_\_\_\_ If no (for all media) - skip to #6, and enter “YE,” status code after providing or citing appropriate “levels,” and referencing sufficient supporting documentation demonstrating that these “levels” are not exceeded.

  X   If yes (for any media) - continue after identifying key contaminants in each “contaminated” medium, citing appropriate “levels” (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

\_\_\_\_\_ If unknown (for any media) - skip to #6 and enter “IN” status code.

Rationale and Reference(s):

The JDWW facility is in Waterloo, Iowa, adjacent to the Cedar River (see Figure 1). Although the facility is zoned for heavy industrial uses, the surrounding land is used for a mix of residential, recreational, commercial, and light industrial activities (Weston 1994). The facility is bordered on the north and east by the Cedar River and on the

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<sup>1</sup> “Contamination” and “contaminated” describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based “levels” (for the media, that identify risks within the acceptable risk range).

<sup>2</sup>Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

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south and west by railroad tracks and U.S. Highway 218 (BV 1991). The closest residential neighborhoods are about 0.25 mile south and west of the facility (BV 1991). The facility itself is covered by a mix of buildings and pavement, with very little exposed soil, and surrounded by a security fence (Weston 1994). Security guards monitor the facility 24 hours per day (Weston 1994).

The JDW W facility is in the 500-year floodplain of the Cedar River (Weston 1994). It is bisected by Blackhawk Creek, which runs into the Cedar River on the northeastern boundary of the property (BV 1991). However, levees confine both the Cedar River and Blackhawk Creek, and the facility was not flooded during the major 1993 floods (Weston 1994). The Cedar River has a number of intensely-used recreational facilities near the JDW W facility, including those directly across the river, 0.25 mile upstream, and 0.5 mile downstream (Weston 1994). The facility also has three manmade surface water features – two inactive foundry settling ponds and the skimmer pond (Weston 1994). The skimmer pond receives stormwater runoff and process wastewater that then is discharged into the Cedar River by permitted outfalls (BV 1991).

The surficial geology and hydrogeology of the site is dominated by alluvial materials and weathered bedrock. Unconsolidated materials at the facility consist of interbedded clay, silt, sand, and gravel (BV 1991). The depth to bedrock ranges from 8 feet near the southeast corner of the site to 83 feet near a bedrock channel north of the property (Weston 1994). The uppermost bedrock is fractured Devonian limestone that has been weathered at its surface (BV 1991). The Devonian bedrock is underlain by Silurian bedrock (BV 1991). Both the unconsolidated materials and the Devonian bedrock are used as aquifers. The unconsolidated aquifer serves as a potable water source for the city, with six wells in this aquifer about 4,000 feet north of the facility. The Devonian aquifer also is used as a drinking water source, with eight wells within a 2-mile radius of the facility (BV 1991). The eight process wells at the facility are completed in the Devonian aquifer (Weston 1998). Monitoring wells at the facility are completed in the unconsolidated material and the top of the bedrock, and in 1992 and 1993, the depth to groundwater in these wells ranged between 5 and 25 feet below ground surface (bgs) (Metcalf & Eddy [M&E] 1994). When the process wells are not pumping, groundwater flows to the south and southeast (Weston 1994). When operating, the process wells generally control gradients, keeping contaminated groundwater on site (M&E 1994; Weston 2004).

### **Groundwater**

Groundwater at the facility has been contaminated with metals, VOCs, SVOCs, and PCBs. As of 2004, it continues to be contaminated with VOCs, SVOCs, and one PCB.

Groundwater samples at the JDW W facility were collected in two phases during the RFI, in four rounds over the period from 1992 to 1993 (Weston 1994). Immediately following the RFI, the facility had 38 monitoring wells at a range of depths (M&E 1994). Groundwater was analyzed for all 40 Code of Federal Regulations (CFR) Part 264 Appendix IX parameters during the first round of sampling. Analytes for subsequent sampling events were based on the results of this first round (Weston 1994). Metals were analyzed both for total and dissolved concentrations (Weston 1994). In general, unfiltered samples have higher concentrations of metals because of the contribution of metal in suspended sediment. Four wells at the western end of the facility (GW-14, GW-15, GW-18, GW-19) were designated as background wells. The background wells were arranged in two-well nests, each with one well screened at the top and one at the bottom of the alluvial aquifer (Weston 1994). In 1994, nine additional wells were installed for a free-product delineation study (Weston 1998). Groundwater samples were collected again in 2004, at the request of EPA (Weston 2004). The free-product recovery system is still operating (Weston 2004). Monitoring well locations are shown on Figure 3.

Reconnaissance groundwater samples also were collected during the RFI using Geoprobe<sup>®</sup> samplers and lead-screen augers (Weston 1994). Reconnaissance samples were collected at the hypothetical lateral edge of the plume, as determined by field screening with photoionization detectors. Reconnaissance samples were analyzed only for

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VOCs or total petroleum hydrocarbons (Weston 1994). Reconnaissance sample locations also are shown on Figure 3.

At the time of the RFI, groundwater at the facility was contaminated with metals, VOCs, SVOCs, and PCBs. In 2004, groundwater continued to be contaminated with VOCs, SVOCs, and PCBs. Groundwater also contained detectable concentrations of dioxins and furans for which no EPA maximum contaminant levels (MCL) or preliminary remediation goals (PRG) have been established. Table 1 shows the maximum concentrations of a range of constituents detected at the facility, and Table 2 shows the maximum concentrations of the same constituents during the June 2004 sampling event. During the RFI, background wells contained benzene and carbon disulfide but at concentrations below the MCL (benzene) or PRG (carbon disulfide) (Weston 1994). In addition, several total metals exceeded MCLs in the background well, but dissolved concentrations were below MCLs except for one mercury detection. However, because total mercury for this sample was below the detection limit, dissolved mercury concentrations may have resulted from laboratory contamination (Weston 1994). Neither VOCs nor mercury were detected in the background wells in 2004 (Weston 2004).

During the RFI, groundwater in the JDFW Foundry Sand Waste Area was contaminated with VOCs (1,2-dichloroethene, trichloroethene [TCE], and tetrachloroethene [PCE]), SVOCs (bis[2-ethylhexyl]phthalate [DEHP]), and one dissolved metal (arsenic) (Weston 1994). Groundwater in the Foundry Settling Pond Area was contaminated with one SVOC (DEHP), one PCB (Aroclor-1254), and one dissolved metal (lead). Groundwater in this area also contained dioxin and furans for which no MCL or PRG has been established (Weston 1994). Groundwater in the Skimmer Pond Area was contaminated with VOCs (PCE, TCE, and benzene), one SVOC (DEHP), one PCB (Aroclor-1254), and dissolved metals (lead and mercury) (Weston 1994). Groundwater in the Chromium and Cyanide Waste Area was not contaminated (Weston 1994).

In 2004, groundwater continued to be contaminated, with increases in some compounds. In the JDFW Foundry Sand Waste Area, groundwater was contaminated with VOCs (chloroethane, vinyl chloride) and SVOCs (DEHP and 1,4-dioxane) (Weston 2004). Groundwater in the Foundry Settling Pond Area was contaminated with one SVOC (DEHP) and one PCB (Aroclor-1254). Groundwater in this area also contained dioxin and furans for which no MCL or PRG has been established (Weston 2004). Groundwater in the Skimmer Pond Area was contaminated with one VOC (chloroethane), two SVOCs (DEHP and 1,4-dioxane), and one PCB (Aroclor-1254) (Weston 2004). Groundwater in the Chromium and Cyanide Waste Area was not contaminated (Weston 2004). Between the RFI sampling and 2004, vinyl chloride increased to a concentration above the MCL, and the extent of groundwater contaminated with DEHP and 1,4-dioxane has increased.

Investigations at the site also have found free floating product in wells near the old foundry settling ponds and skimmer ponds. It appeared to be light hydraulic oil containing PCBs, with thicknesses ranging from 0.14 to 0.77 feet (Weston 1998). As recently as 2004, the facility continued to recover product in wells GW-08 and GW-24 (Weston 2004).

**Table 1 – Maximum Concentrations of Constituents in Groundwater**

Constituent	Concentration (µg/l)	Sample Location	Date	EPA MCL (µg/l)	Other Locations Exceeding MCL
<b>Metals</b>					
Arsenic, dissolved	36	MW-06B	11/1992	50	
Lead, dissolved	<b>65 J</b>	MW-04B	7/1993	15*	GW-09, GW-05, MW-02B
Mercury, dissolved	<b>2.8</b>	GW-14	7/1992	2	LS-09

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**Table 1 – Maximum Concentrations of Constituents in Groundwater**

Constituent	Concentration (µg/l)	Sample Location	Date	EPA MCL (µg/l)	Other Locations Exceeding MCL
<b>Volatile Organic Compounds</b>					
Acetone	88	MW-03B	6/2004	610	
Benzene	<b>82.0</b>	LS-09	4/1993	5	
Carbon disulfide	27.0	GW-07	7/1992	1,000**	
Chloroethane	<b>900</b>	GW-12	7/1992	4.6**	GW-09, GW-05, MW-03B, MW-04B, MW-06B
Chloroform	3.0 J	GW-03	4/1993	6.2**	
1,1-Dichloroethane	<b>840</b>	GW-12	11/1992	810**	
1,2-Dichloroethane	<b>6.0</b>	GW-05	7/1993	5	GW-12
1,1-Dichloroethene	6.0	GW-12	7/1992	340	
1,2-Dichloroethene (total)	<b>420</b>	MW-03B	7/1992	70***	
Ethylbenzene	110	LS-09	4/1993	700	
Methyl ethyl ketone	20	MW-03B	6/2004	1,900**	
Methyl isobutyl ketone	16.0 J	MW-03B	4/1993	160	
Tetrachloroethene	<b>17.0</b>	MW-03B	11/1992	5	GW-07
Toluene	8.0	GW-14	7/1992	1,000	
1,1,1-Trichloroethane	190	MW-03B	11/1992	200	
Trichloroethene	<b>100</b>	MW-03B	11/1992	5	GW-07
Vinyl chloride	<b>2.1</b>	MW-03B	6/2004	2	
Xylene	480 J	LW-09	4/1993	10,000	
<b>Semivolatile Organic Compounds</b>					
Acenaphthene	5	GW-09	7/1993	370**	
Anthracene	210 J	GW-09	4/1993	1,800**	
Benzo(a)anthracene	<b>230 J</b>	GW-09	4/1993	0.092**	
Chrysene	<b>180 J</b>	GW-09	4/1993	9.2	
2,4-Dimethylphenol	23	GW-09	7/1993	730**	
1,4-Dioxane	<b>2,000</b>	GW-22	7/1993	6.1**	GW-12, MW-02B, MW-03B, MW-04B, MW-06B

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**Table 1 – Maximum Concentrations of Constituents in Groundwater**

Constituent	Concentration (µg/l)	Sample Location	Date	EPA MCL (µg/l)	Other Locations Exceeding MCL
bis(2-Ethylhexyl)phthalate	<b>250 J</b>	GW-09	4/1993	6	GW-05, GW-10, GW-20, GW-21, MW-02B, LS-12
Fluoranthene	440	GW-09	4/1993	1,500**	
Fluorene	85 J	GW-09	4/1993	240**	
2-Methylphenol	7.5	GW-21	6/2004	1,800**	
4-Methylphenol	9.7	GW-21	6/2004	180**	
Naphthalene	<b>16</b>	LS-09	4/1993	6.2**	GW-09, GW-21
5-Nitro-o-toluidine	12 J	LS-12	4/1993	NA	
N-Nitroso-di-n-propylamine	<b>73 J</b>	GW-09	7/1992	0.096**	
Ortho-Cresol	29	GW-09	7/1993	NA	
Phenanthrene	210 J	GW-09	4/1993	NA	
Phenol	370	GW-22	7/1993	2,200**	
Pyrene	<b>580</b>	GW-09	4/1993	180	
2,4,5-Trichlorophenol	2.5 J	GW-21	6/2004	3,600**	
<b>Polychlorinated Biphenyls</b>					
Aroclor 1254	<b>1,900</b>	GW-09	4/1993	0.5	GW-08, GW-21, LS-12
<b>Dioxins and Furans</b>					
Hexachlorodibenzodioxins	0.035	GW-09	7/1992	NA	
Hexachlorodibenzofurans	0.036	GW-09	7/1992	NA	

**Notes:**

Concentrations in bold exceed the MCL or PRG (EPA 2002a, 2002b). Table derived from the 1994 RFI and June 2004 sampling (Roy F. Weston, Inc. 1994, 2004).

\* EPA specifies an action level for lead, rather than an MCL (EPA 2002a).

\*\* EPA does not specify a MCL for this compound (EPA 2002a). This value is the EPA Region 9 PRG for drinking water (EPA 2002b).

\*\*\* The MCL for *cis*-1,2-dichloroethene is used here.

EPA = U.S. Environmental Protection Agency

J = Estimated

MCL = Maximum contaminant level

µg/l = Micrograms per liter

NA = Not applicable. PRGs have not been established for this constituent.

PRG = Preliminary remediation goal

RFI = Resource Conservation and Recovery Act Facility Investigation

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**Table 2 – Maximum Concentrations of Constituents in Groundwater, June 2004**

Constituent	Concentration (µg/l)	Sample Location	EPA MCL (µg/l)	Other Locations Exceeding MCL
<b>Metals</b>				
Arsenic, total	13	GW-07	50	
Lead, total	9	GW-09	15*	
Mercury, total	0.31	MW-04B	2	
<b>Volatile Organic Compounds</b>				
Acetone	88	MW-03B	610	
Benzene	2.5	GW-22	5	
Carbon disulfide	ND		1,000**	
Chloroethane	<b>460</b>	GW-12	4.6**	GW-22, MW-03B
Chloroform	ND		6.2**	
1,1-Dichloroethane	44	GW-12	810**	
1,2-Dichloroethane	1.1	GW-12	5	
1,1-Dichloroethene	1.9	GW-12	340	
1,2-Dichloroethene (total)	ND		70***	
Ethylbenzene	28	GW-21	700	
Methyl ethyl ketone	20	MW-03B	1,900**	
Methyl isobutyl ketone	1.4 J	GW-21	160	
Tetrachloroethene	ND		5	
Toluene	2.2	GW-21	1,000	
1,1,1-Trichloroethane	ND		200	
Trichloroethene	1.3	MW-03B	5	
Vinyl chloride	<b>2.1</b>	MW-03B	2	
Xylene	180	GW-21	10,000	
<b>Semivolatile Organic Compounds</b>				
Acenaphthene	ND		370**	
Anthracene	ND		1,800**	
Benzo(a)anthracene	ND		0.092**	
Chrysene	ND		9.2	
1,2-Dichlorobenzene	1.9 J	GW-21	600	

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**Table 2 – Maximum Concentrations of Constituents in Groundwater, June 2004**

Constituent	Concentration (µg/l)	Sample Location	EPA MCL (µg/l)	Other Locations Exceeding MCL
2,4-Dichlorophenol	1.1	GW-21	110**	
2,4-Dimethylphenol	9.8 J	GW-21	730**	
1,4-Dioxane	<b>270</b>	GW-22	6.1**	GW-12, MW-02B, MW-03B, MW-04B, MW-06B
bis(2-Ethylhexyl)phthalate	<b>230 J</b>	GW-20	6	GW-05, GW-10, GW-20, GW-21
Fluoranthene	1.1	GW-09	1,500**	
Fluorene	ND		240**	
2-Methylphenol	7.5	GW-21	1,800**	
4-Methylphenol	9.7	GW-21	180**	
Naphthalene	5.1	GW-21	6.2**	
5-Nitro-o-toluidine	ND		NA	
N-Nitroso-di-n-propylamine	ND		0.096**	
Ortho-Cresol	ND		NA	
Phenanthrene	0.59 J	GW-08	NA	
Phenol	53	GW-21	2,200**	
Pyrene	1.1	GW-09	180	
2,4,5-Trichlorophenol	2.5 J	GW-21	3,600**	
<b>Polychlorinated Biphenyls</b>				
Aroclor 1254	<b>19</b>	GW-09	0.5	GW-08
<b>Dioxins and Furans</b>				
Hexachlorodibenzodioxins	0.0027	GW-09	NA	
Hexachlorodibenzofurans	0.0022	GW-09	NA	

**Notes:**

Concentrations in bold exceed the MCL or PRG (EPA 2002a, 2002b). Table derived from the June 2004 sampling (Roy F. Weston, Inc. 2004).

\* EPA specifies an action level for lead, rather than an MCL (EPA 2002a).

\*\* EPA does not specify a MCL for this compound (EPA 2002a). This value is the EPA Region 9 PRG for drinking water (EPA 2002b).

\*\*\* The MCL for *cis*-1,2-dichloroethene is used here.

EPA = U.S. Environmental Protection Agency

J = Estimated

MCL = Maximum contaminant level

µg/l = Micrograms per liter

NA = Not applicable. PRGs have not been established for this constituent.

ND = Not detected

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PRG = Preliminary remediation goal  
 RFI = Resource Conservation and Recovery Act Facility Investigation

**Surface and Subsurface Soil**

Surface and subsurface soils at the JDWW facility are contaminated with metals, VOCs, SVOCs, and PCBs. Subsurface soil also contains detectable concentrations of dioxins and furans for which no PRGs have been established. Surface soil also contains herbicides and pesticides but at concentrations below PRGs. Surface (collected from a depth of less than 2 feet) and subsurface (collected from a depth of more than 2 feet) soil samples were collected at JDWW during site investigations associated with the RFI, RCRA closure activities, and in support of proposed building expansions (Weston 1994, 2001a; Ries 1994). Samples were analyzed for selected 40 CFR Part 264 Appendix IX parameters, based on the results of groundwater sampling at adjacent SWMUs (Weston 1994). Concentrations were compared with background soil samples, which contained only metals, at concentrations below PRGs (Weston 1994). RFI soil sampling locations are shown in Figures 4, 5, and 6. No significant soil contamination was found in the Chromium and Cyanide Waste Area. In general, metals, SVOCs, and PCBs were detected in the soils throughout the rest of site, and VOCs were detected primarily in the Skimmer Pond Area (Weston 1994).

Surface soil at the facility is contaminated with metals, VOCs, SVOCs, and PCBs. Table 3 shows maximum concentrations of a range of constituents found in surface soil. The highest levels of metals contamination in surface soil are from the JDFW Foundry Sand Waste Area. Two metals exceeded industrial PRGs – arsenic (estimated maximum concentration of 8.5 milligrams per kilogram [mg/kg]) and lead (5,300 mg/kg) – and two exceeded residential PRGs – chromium (240 mg/kg) and copper (4,400 mg/kg). Only one VOC exceeded the residential PRG, in a sample collected from the north parking lot area – TCE in one sample had an estimated concentration of 0.094 mg/kg. Only one SVOC exceeded the residential PRG, in a sample collected from the oil field area – benzo(a)anthracene in one sample had a concentration of 0.59 mg/kg. Finally, only one PCB was detected in surface soil at a concentration above the residential PRG – Aroclor 1254 in one sample had a concentration of 0.23 mg/kg.

**Table 3 - Maximum Concentrations of Constituents Detected in Surface Soil**

Constituent	Concentration (mg/kg)	Sample	Depth (ft bgs)	EPA Region 9 Residential PRG (mg/kg)	EPA Region 9 Industrial PRG (mg/kg)
<b>Metals</b>					
Arsenic	<b>8.5 J</b>	SB-38-01	0 - 5	0.39	1.6
Cadmium	11.2	SB-38-01	0 - 5	37	450
Chromium	240	J 4-8	0 - 5	210	450
Copper	4,400	J 4-12	1.5 - 2	3,100	41,000
Lead	<b>5,300</b>	J 4-7	0 - 0.5	400	750
<b>Volatile Organic Compounds</b>					
1,1-Dichloroethane	0.058 J	SB-25-01	0 - 4	510	1,700
1,2-Dichloroethene (total)	0.024 J	SB-25-01	0 - 4	43*	150*
Methylene chloride	0.017 J	SB-25-01	0 - 4	9.1	21
Methyl ethyl ketone	0.027	SB-26-01	0 - 5	7,300	27,000

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**Table 3 - Maximum Concentrations of Constituents Detected in Surface Soil**

<b>Constituent</b>	<b>Concentration (mg/kg)</b>	<b>Sample</b>	<b>Depth (ft bgs)</b>	<b>EPA Region 9 Residential PRG (mg/kg)</b>	<b>EPA Region 9 Industrial PRG (mg/kg)</b>
1,1,1-Trichloroethane	0.160 J	SB-25-01	0 - 4	1,200	1,200
Trichloroethene	<i>0.094 J</i>	SB-25-01	0 - 4	0.053	0.11
<b>Semivolatile Organic Compounds</b>					
Benzo(a)anthracene	<i>0.59</i>	SB-26-01	0 - 5	0.62	2.1
bis(2-Ethylhexyl)phthalate	1.4	SB-38-01	0 - 5	35	120
Fluoranthene	<i>0.77</i>	SB-38-01	0 - 5	2,300	22,000
2-Methylnaphthalene	1	SB-38-01	0 - 5	NA	NA
Naphthalene	2.3	SB-37-01	0 - 5	5.6	190
Ortho-cresol	0.89 J	SB-37-01	0 - 5	NA	NA
Phenanthrene	1.1	SB-38-01	0 - 5	NA	NA
Phenol	12	SB-33-01	0 - 5	370,000	100,000
Pyrene	0.92	SB-38-01	0 - 5	2,300	29,000
<b>Polychlorinated Biphenyls</b>					
Aroclor 1254	<i>0.23</i>	SB-23-01	0 - 5	0.22	0.74

**Notes:**

Concentrations in bold exceed industrial soil target concentrations. Concentrations in italics exceed residential soil target concentrations. Table derived from the 1994 RFI and additional sampling at the J-4 and T-10 buildings (Roy F. Weston, Inc. 1994, 2001a; Ries Environmental, Inc., 1994).

\* = The PRG for *cis*-1,2-dichloroethene is used here.

EPA = U.S. Environmental Protection Agency

J = Estimated concentration

ft bgs = Feet below ground surface

mg/kg = Milligrams per kilogram

NA = Not available. EPA Region 9 has not established PRGs for these compounds.

PRG = Preliminary remediation goals (EPA 2002b).

RFI = Resource Conservation and Recovery Act Facility Investigation

Subsurface soil at the facility is contaminated with metals, VOCs, SVOCs, and PCBs. Dioxins and furans for which no PRGs have been established also were detected in subsurface soil. Table 4 shows the maximum concentrations of a range of constituents found in subsurface soil. The highest levels of metals contamination in surface soil are from the Foundry Settling Pond Area – in particular the north parking lot, the waste casting sand disposal area, and the paint sludge disposal area. Four metals exceeded industrial PRGs – arsenic (maximum concentration of 83.7 mg/kg), cadmium (2,590 mg/kg), chromium (942 mg/kg, estimated), and lead (17,500 mg/kg). Only one VOC exceeded the residential PRG, in a sample collected from the area of the skimmer pond – vinyl chloride in one sample had an estimated concentration of 0.18 mg/kg. The highest concentrations of SVOCs were from samples collected in the area of the rubbish pit in the Settling Pond Area. Five SVOCs exceeded the industrial PRGs – benzo(a)anthracene (4.7 mg/kg), benzo(a)pyrene (9.4 mg/kg), benzo(b)fluoranthene (17 mg/kg), dibenzo(a,h)anthracene (1.4 mg/kg, estimated), and indeno(1,2,3-c,d)pyrene (4.4 mg/kg, estimated). Naphthalene

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also was detected at concentrations above the residential PRG (maximum of 15 mg/kg). Two PCBs were detected in subsurface soil, one above the residential PRG – Aroclor 1242 (0.31 mg/kg) – and one above the industrial PRG – Aroclor 1254 (290 mg/kg). Finally, three dioxin and furans were detected in subsurface soil from the area of the north parking lot (see Table 4). No PRGs have been established for these compounds.

**Table 4 – Maximum Concentrations of Constituents Detected in Subsurface Soil**

Constituent	Concentration (mg/kg)	Sample	Depth (ft bgs)	EPA Region 9 Residential PRG (mg/kg)	EPA Region 9 Industrial PRG (mg/kg)
<b>Metals</b>					
Arsenic	<b>83.7</b>	SB-15-02	5 - 9	0.39	1.6
Cadmium	<b>2,590</b>	SB-14-01	15 - 17	37	450
Chromium	<b>942 J</b>	SB-22-01	5 - 10	210	450
Copper	2,700	SB-15-02	5 - 9	3,100	41,000
Lead	<b>17,500</b>	SB-14-01	15 - 17	400	750
<b>Volatile Organic Compounds</b>					
Benzene	0.072 J	SB-15-02	5 - 9	0.6	1.3
1,1,2-Trichloroethane	0.009	SB-09-02	15 - 20	0.73	1.6
Trichloroethene	0.019 J	SB-51-01	10 - 15	0.053	0.11
Vinyl chloride	0.18 J	SB-54-01	10 - 15	0.079	0.75
<b>Semivolatile Organic Compounds</b>					
Benzo(a)anthracene	<b>4.7</b>	SB-47-01	2 - 5	0.62	2.1
Benzo(a)pyrene	<b>9.4</b>	SB-47-01	2 - 5	0.062	0.21
Benzo(b)fluoranthene	<b>17</b>	SB-47-01	2 - 5	0.62	2.1
Benzo(k)fluoranthene	3.1	SB-47-01	2 - 5	6.2	21
Benzo(g,h,i)perylene	3.3 J	SB-32-01	5 - 10	NA	NA
Chrysene	10	SB-47-01	2 - 5	62	210
Dibenzo(a,h)anthracene	<b>1.4 J</b>	SB-47-01	2 - 5	0.062	0.21
bis(2-Ethylhexyl)phthalate	2.5 J	SB-23-02	5 - 10	35	120
Indeno(1,2,3-c,d)pyrene	<b>4.4 J</b>	SB-47-01	2 - 5	0.62	2.1
2-Methylnaphthalene	39 J	SB-15-02	5 - 9	NA	NA
Naphthalene	15	SB-16-02	5 - 10	5.6	190
Phenanthrene	20	SB-15-02	5 - 9	NA	NA

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**Table 4 – Maximum Concentrations of Constituents Detected in Subsurface Soil**

Constituent	Concentration (mg/kg)	Sample	Depth (ft bgs)	EPA Region 9 Residential PRG (mg/kg)	EPA Region 9 Industrial PRG (mg/kg)
<b>Polychlorinated Biphenyls</b>					
Aroclor 1242	<i>0.31</i>	SB-05-02	5 - 10	0.22	0.74
Aroclor 1254	<b>290</b>	SB-22-01	5 - 10	0.22	0.74
<b>Dioxins and Furans</b>					
Hexachlorodibenzodioxins	0.0125	SB-22-01	5 - 10	NA	NA
Hexachlorodibenzofurans	0.0067	SB-22-01	5 - 10	NA	NA
2,3,7,8-Tetrachlorodibenzodioxin	0.0003	SB-16-02	5 - 10	NA	NA

**Notes:**

Concentrations in bold exceed industrial soil target concentrations. Concentrations in italics exceed residential soil target concentrations. Table derived from the 1994 RFI and additional sampling at the J-4 and T-10 buildings (Roy F. Weston, Inc. 1994, 2001a; Ries Environmental, Inc., 1994).

- EPA = U.S. Environmental Protection Agency
- J = Estimated concentration
- ft bgs = Feet below ground surface
- mg/kg = Milligrams per kilogram
- NA = Not available. EPA Region 9 has not established PRGs for these compounds.
- PRG = Preliminary remediation goals (EPA 2002b).
- RFI = Resource Conservation and Recovery Act Facility Investigation

**Surface Water**

Surface water near the facility is contaminated with metals. Surface water samples were collected during the RFI (Weston 1994). Figure 3 shows the sampling locations. Table 5 shows maximum detected concentrations, and Table 6 shows the maximum concentrations at the edge of the Cedar River. Surface water was analyzed for all 40 CFR Part 264 Appendix IX parameters, except for samples SW-10 and SW-11, which only were analyzed for VOCs and metals, based on previous sampling of the skimmer pond (SW-04) (Weston 1994). Samples were collected from two locations upstream (background samples), from the confluence of the Cedar River and Blackhawk Creek, and from outfall locations along the Cedar River (Weston 1994). Because both the Cedar River and Blackhawk Creek are used for swimming, waterskiing, and other contact recreation, concentrations were compared to EPA MCLs for drinking water. Though surface water collected near the facility contained low concentrations of VOCs and SVOCs, only one constituent attributable to the facility exceeded its MCL – dissolved selenium was found in a sample collected from the westernmost outfall at a concentration of 71 µg/l. Dissolved mercury was found in the background sample at a concentration (5.5 µg/l) that exceeded its MCL. Other than this detection of mercury, no other samples collected from the edge of the Cedar River exceeded the MCL or PRG for dissolved constituents.

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**Table 5 – Maximum Concentrations of Constituents Detected in Surface Water**

Constituent	Concentration (µg/l)	Sample Location	Date	EPA MCL (µg/l)
<b>Metals</b>				
Lead, dissolved	ND			15*
Lead, total	110	SW-10	4/1993	NA
Mercury, dissolved	<b>5.5</b>	SW-01BG	7/1992	2
Mercury, total	30	SW-09	6/1992	NA
Selenium, dissolved	<b>71</b>	SW-04	7/1992	50
Selenium, total	130	SW-05	6/1992	NA
<b>Volatile Organic Compounds</b>				
1,2-Dichloroethane	3.0 J	SW-09	7/1992	5
<b>Semivolatile Organic Compounds</b>				
2,4-Dimethylphenol	6	SW-09	6/1992	730**

**Notes:**

Concentrations in bold exceed the MCL (EPA 2002a). Table derived from the 1994 RFI (Roy F. Weston, Inc. 1994).

\* EPA specifies an action level for lead, rather than an MCL (EPA 2002a).

\*\* EPA does not specify a MCL for this compound (EPA 2002a). This value is the EPA Region 9 preliminary remediation goal for drinking water (EPA 2002b).

EPA = U.S. Environmental Protection Agency

J = Estimated

MCL = Maximum contaminant level

µg/l = Micrograms per liter

NA = Not applicable. MCLs are established for dissolved concentrations.

RFI = Resource Conservation and Recovery Act Facility Investigation

**Table 6 – Maximum Concentrations of Constituents Detected in Surface Water at Cedar River**

Constituent	EPA MCL (µg/l)	SW-01 (BG) (µg/l)	SW-02 (µg/l)	SW-03 (BG) (µg/l)	SW-05 (µg/l)	SW-06 (µg/l)	SW-07 (µg/l)	SW-08 (µg/l)	SW-09 (µg/l)
<b>Metals</b>									
Lead, dissolved	15*	ND	ND	ND	ND	ND	ND	ND	ND
Lead, total	NA	ND	ND	ND	ND	ND	ND	ND	ND
Mercury, dissolved	2	<b>5.5</b>	ND	ND	ND	ND	ND	ND	ND
Mercury, total	NA	ND	ND	ND	ND	ND	ND	ND	30
Selenium, dissolved	50	ND	ND	ND	30	ND	ND	ND	ND

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**Table 6 – Maximum Concentrations of Constituents Detected in Surface Water at Cedar River**

Constituent	EPA MCL (µg/l)	SW-01 (BG) (µg/l)	SW-02 (µg/l)	SW-03 (BG) (µg/l)	SW-05 (µg/l)	SW-06 (µg/l)	SW-07 (µg/l)	SW-08 (µg/l)	SW-09 (µg/l)
Selenium, total	NA	ND	ND	ND	40	ND	ND	ND	ND
<b>Volatile Organic Compounds</b>									
1,2-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	3.0 J
<b>Semivolatile Organic Compounds</b>									
2,4-Dimethylphenol	730**	ND	ND	ND	ND	ND	ND	ND	6 J

**Notes:**

Concentrations in bold exceed the MCL (EPA 2002a). Table derived from the 1994 RFI (Roy F. Weston, Inc. 1994).

\* EPA specifies an action level for lead, rather than an MCL (EPA 2002a).

\*\* EPA does not specify a MCL for this compound (EPA 2002a). This value is the EPA Region 9 preliminary remediation goal for drinking water (EPA 2002b).

EPA = U.S. Environmental Protection Agency

J = Estimated

MCL = Maximum contaminant level

µg/l = Micrograms per liter

NA = Not applicable. MCLs are established for dissolved concentrations.

ND = Not detected

RFI = Resource Conservation and Recovery Act Facility Investigation

**Sediments**

Sediment at the JDWW facility is contaminated, but no sediment samples have been collected from the Cedar River or Blackhawk Creek. However, because of source control measures, it is unlikely that the facility has contributed significant amounts of contaminants to sediment in the Cedar River.

Sediment in ponds on the JDWW facility property is contaminated with metals, SVOCs, and PCBs. Sediment also contains detectable concentrations of dioxins and furans for which no PRGs have been established. During the RFI, sediment samples were collected from the sludge drying ponds in the JDFW Foundry Sand Waste Area, from the old foundry settling ponds in the Foundry Settling Pond Area, and from the skimmer pond in the Skimmer Pond Area. Samples were analyzed for selected 40 CFR Part 264 Appendix IX parameters, based on results of groundwater sampling at adjacent SWMUs (Weston 1994). RFI sediment sampling locations are shown in Figures 4, 5, and 6. In general, metals and SVOCs were detected in the skimmer pond and PCBs, dioxins, and furans were detected in the old foundry settling ponds (Weston 1994).

Table 7 shows the maximum concentrations of a range of constituents found in sediment. One metal, arsenic, exceeded industrial PRGs, with a maximum concentration of 93.9 mg/kg. Two SVOCs exceeded the industrial PRGs – benzo(a)anthracene (4.3 mg/kg, estimated) and indeno(1,2,3-c,d)pyrene (2.2 mg/kg, estimated). Only one PCB was detected in sediment at the facility, at a concentration above the residential PRG – Aroclor 1254 in one sample had an estimated concentration of 0.49 mg/kg. Finally, two dioxin and furans were detected in sediments. No PRGs have been established for these compounds.

Sediment in the Cedar River is unlikely to be contaminated by activities at the JDWW facility. Surface water collected at the river's edge did not contain significant concentrations of dissolved metals (see Table 6). Only

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sample SW-09 had concentrations of total metals (mercury) that exceeded the EPA MCL. Currently, 90 percent of the facility is covered with pavement or buildings (Weston 2004), which reduces the contribution of hazardous constituents to sediment in the river. Moreover, the likely corrective measure alternative at the facility, which includes barrier caps and excavation/removal (Weston 1998), will further reduce the erosion of potentially contaminated surface soil. Groundwater is controlled by process wells at the facility, and very little contaminated groundwater is expected to discharge to surface water or sediment.

**Table 7 – Constituents Detected in Sediment**

<b>Constituent</b>	<b>Concentration (mg/kg)</b>	<b>Sample</b>	<b>EPA Region 9 Residential PRG (mg/kg)</b>	<b>EPA Region 9 Industrial PRG (mg/kg)</b>
<b>Metals</b>				
Arsenic	93.9	SED-05	0.39	1.6
Cadmium	5.5	SED-06	37	450
Chromium	75.2	SED-03	210	450
Lead	297	SED-05	400	750
Mercury	0.75	SED-03	23	310
<b>Volatile Organic Compounds</b>				
Acetone	1.8 J	SED-06	1,600	6,000
Chloroform	0.025 J	SED-03	6.2	6.2
1,1-Dichloroethane	0.018 J	SED-05	510	1,700
1,2-Dichloroethene (total)	0.039 J	SED-03	43*	150*
Methyl ethyl ketone	0.2 J	SED-06	7,300	27,000
Toluene	0.023 J	SED-03	520	520
1,1,2-Trichloroethane	0.017 J	SED-03	0.73	1.6
<b>Semivolatile Organic Compounds</b>				
Acenaphthene	1.0 J	SED-05	3,700	29,000
Anthracene	1.2 J	SED-05	22,000	100,000
Benzo(a)anthracene	4.3 J	SED-05	0.62	2.1
Benzo(g,h,i)perylene	2.2 J	SED-05	NA	NA
Chrysene	4.4 J	SED-05	62	210
Dibenzofuran	0.77	SED-01	290	3,100
2,4-Dimethylphenol	0.8	SED-01	1,200	12,000
bis(2-Ethylhexyl)phthalate	5.4 J	SED-05	35	120
Fluoranthene	10	SED-05	2,300	22,000

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**Table 7 – Constituents Detected in Sediment**

<b>Constituent</b>	<b>Concentration (mg/kg)</b>	<b>Sample</b>	<b>EPA Region 9 Residential PRG (mg/kg)</b>	<b>EPA Region 9 Industrial PRG (mg/kg)</b>
Fluorene	0.94 J	SED-05	2,700	26,000
Indeno(1,2,3-c,d)pyrene	<b>2.2 J</b>	SED-05	0.62	2.1
2-Methylnaphthalene	4.1	SED-01	NA	NA
Naphthalene	3.9	SED-01	5.6	190
Ortho-cresol	1.6	SED-01	NA	NA
Phenanthrene	8.8	SED-05	NA	NA
Phenol	4.3	SED-02	370,000	100,000
Pyrene	11	SED-05	2,300	29,000
<b>Polychlorinated Biphenyls</b>				
Aroclor 1254	<i>0.49 J</i>	SED-03	0.22	0.74
<b>Dioxins and Furans</b>				
Hexachlorodibenzodioxins	0.0021 SJ	SED-03	NA	NA
Pentachlorodibenzofurans	0.00053 SJ	SED-03	NA	NA

**Notes:**

Concentrations in bold exceed industrial soil target concentrations. Concentrations in italics exceed residential soil target concentrations. Table derived from the 1994 RFI (Roy F. Weston, Inc. 1994). PRGs have not been established for sediment.  
\* The PRG for *cis*-1,2-dichloroethene is used here.  
EPA = U.S. Environmental Protection Agency  
J = Estimated concentration  
NA = Not available. EPA Region 9 has not established PRGs for these compounds.  
mg/kg = Milligrams per kilogram  
PRG = Preliminary remediation goals (EPA 2002b).  
RFI = Resource Conservation and Recovery Act Facility Investigation  
S = Signal-to-noise ratio determined positive by analyst

**Indoor Air**

Because of the presence of VOCs in shallow groundwater at the facility, indoor air could be contaminated with organic vapors. However, the relatively low concentrations of VOCs in groundwater suggest that indoor air is not significantly contaminated at the JDWW facility.

Vapors from contaminated soil and groundwater may intrude into buildings at the facility through cracks in the foundation or through underground electrical conduits or plumbing. No indoor air sampling has been conducted at JDWW. However, EPA guidance can be used to determine if indoor air contamination is likely at the facility (EPA 2002c).

The first level of the EPA's indoor air screening consists of two criteria, both of which are met at the JDWW facility. First, environmental media at the site must be contaminated by constituents that are sufficiently volatile and

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sufficiently toxic. Groundwater at the facility contains several constituents that meet this standard, in particular: acetone, benzene, chloroethane, 1,1-dichloroethane (DCA), 1,2-DCA, 1,1-dichloroethene, ethylbenzene, methyl ethyl ketone, methyl isobutyl ketone, naphthalene, toluene, TCE, and vinyl chloride. Second, the contaminated media must be present under inhabited buildings. VOCs have been detected throughout the facility, and the facility remains operational. As a result, contaminated groundwater is found under occupied buildings

The next level of the EPA's indoor air screening compares the concentrations of contaminants to screening levels. The screening levels are based on concentrations needed to generate vapors in indoor air at levels that would exceed risk levels for ambient air. Concentrations of VOCs in groundwater at JDWW are not high enough to raise concerns about potential indoor air contamination.

**Outdoor Air**

Because confining features are absent, outdoor air probably is not contaminated with organic vapors. Because most of the facility is covered with buildings or paved surfaces (Weston 1994), the potential for contamination of indoor or outdoor air with soil particulates is minimal.

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3. Are there **complete pathways** between “contamination” and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

<b>Summary Exposure Pathway Evaluation Table</b> <b>Potential Human Receptors (Under Current Conditions)</b>							
“Contaminated” Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food <sup>3</sup>
Groundwater	-	N	-	Y	-	-	-
Air (indoors)	-	-	-	-	-	-	-
Soil (surface, e.g., <2 ft)	-	N	-	Y	-	-	-
Surface Water	-	N	-	Y	-	-	-
Sediment	-	N	-	Y	-	-	-
Soil (subsurface e.g., >2 ft)	-	N	-	Y	-	-	-
Air (outdoors)	-	-	-	-	-	-	-

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors’ spaces for Media which are not “contaminated”) as identified in #2 above.
2. enter “yes” or “no” for potential “completeness” under each “Contaminated” Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential “Contaminated” Media - Human Receptor combinations (Pathways) do not have check spaces (“\_\_\_”). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

- \_\_\_\_\_ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter “YE” status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).
- X   If yes (pathways are complete for any “Contaminated” Media - Human Receptor combination) - continue after providing supporting explanation.
- \_\_\_\_\_ If unknown (for any “Contaminated” Media - Human Receptor combination) - skip to #6 and enter “IN” status code

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<sup>3</sup>Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

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Rationale and Reference(s):

Two media – indoor and outdoor air – can be excluded from further consideration, because no evidence indicates that these media are contaminated at the JDWW facility. Five types of receptors – residents, day care, trespassers, recreational, and food – can also be excluded. The nearest residence is more than 0.25 mile from the facility, and there are no registered private wells downgradient of the facility (Weston 2001b; Iowa Department of Natural Resources [IDNR] 2004). The nearest school or church is about 0.4 mile southeast of the facility (Yellow Pages 2004), and any day care students are unlikely to have access to operational areas of the facility. Trespassers are unlikely because the entire facility is fenced and JD employs 24-hour security (Weston 1998). Although swimming beaches, fishing piers, and other recreational facilities are near the JDWW facility (Weston 1994), contaminated surface water and sediment does not seem to extend off JDWW property. No recreational facilities are located in contaminated areas on JDWW property. Because surface water and sediment off-property is not contaminated by JDWW activities, the only potential food receptors would be linked to production wells at adjacent facilities using contaminated groundwater. However, no registered wells with these uses are downgradient of the facility (IDNR 2004). Moreover, high-volume production wells appear to control groundwater gradients in the area of the facility (Weston 2004).

Two classes of receptors must be evaluated for potential exposure – facility workers and construction workers. JDWW is still operational, so facility workers must be considered. The facility has used contract construction labor for the expansion and demolition of buildings on facility property (Ries 1994; Earth Tech 2000; Weston 2001a, 2001b). Contract workers likely also would perform any on-site excavation, construction, or utility work, and this class of receptors must be considered.

Contract workers may be exposed to contaminated soil. Because 90 percent of the ground surface at the facility is covered with asphalt, concrete, or buildings (Weston 2004), JDWW workers likely are not exposed to contaminated surface soil. However, any excavation workers might be exposed to contaminated soils and sediments; health and safety plans developed by the facility's contractors acknowledge this possibility (Weston 2001a, 2001b).

Only contract excavation workers likely are exposed to contaminated subsurface soils. Facility workers do not come into contact with soils deeper than 2 feet bgs.

No receptors likely are exposed to contaminated groundwater by ingestion. The facility's drinking water is supplied by the Waterloo Water Works (Weston 1994). All municipal wells are located more than 1 mile from the facility, and the high-volume wells at the facility control groundwater gradients at the facility (Weston 2004).

Groundwater exposure pathways also may be completed by dermal contact. Wells used by the JDWW facility are used for noncontact process cooling, as a result, it is unlikely that facility workers would be exposed to contaminated groundwater through dermal contact. However, because the water table at the site is as shallow as 5 feet bgs, contract excavation workers may come into dermal contact with contaminated groundwater.

Construction workers may be exposed to contaminated sediment or surface water. The only surface water bodies at the facility are three man-made ponds. Two ponds are now only intermittently flooded and are no longer in use (Weston 1994). The other receives cooling water and stormwater runoff. It is unlikely that facility workers would have regular contact with surface water or sediment at the facility. However, contract construction, excavation, or utility workers may be exposed to surface water or sediment when maintaining or repairing the facility's permitted outfall or retaining ponds.

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4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **“significant”**<sup>4</sup> (i.e., potentially “unacceptable” because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable “levels” (used to identify the “contamination”); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable “levels”) could result in greater than acceptable risks)?

  X   If no (exposures can not be reasonably expected to be significant (i.e., potentially “unacceptable”) for any complete exposure pathway) - skip to #6 and enter “YE” status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”

\_\_\_\_\_ If yes (exposures could be reasonably expected to be “significant” (i.e., potentially “unacceptable”) for any complete exposure pathway) - continue after providing a description (of each potentially “unacceptable” exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”

\_\_\_\_\_ If unknown (for any complete pathway) - skip to #6 and enter “IN” status code

Rationale and Reference(s):

Exposures can be considered significant if the duration or intensity of exposure to contaminated materials exceeds calculated screening levels or if the level of contamination substantially exceeds screening levels. Completed exposure pathways at JDWW are those linking contract construction workers to groundwater, surface soil, subsurface soil, surface water, and sediment

While repairing or installing utilities or other excavation work, contract construction workers and utility workers would be exposed to contaminated groundwater, surface soil, subsurface soil, surface water, and sediment with concentrations of contaminants that exceed EPA MCLs or Region 9 PRGs. However, because they are not full-time employees on site, their exposure is limited in duration and intensity. For example, EPA Region 9 industrial PRGs for soil are calculated based on assumptions of 25 years, 250 days per year, of exposure (EPA 2002b). Because of the limited period of contact, exposure of contract construction workers to hazardous constituents in soil or sediment likely is not significant. Target concentrations for water are based predominantly on ingestion of water and are not applicable to dermal contact alone. The level of exposure of contract construction and utility workers to hazardous constituents in groundwater or surface water likely is not significant. Use of personal protective equipment (PPE) also limits the intensity of contact. Health and safety plans for the facility specify PPE to be used to reduce risk to contract environmental and construction workers (Weston 2001a, 2001b).

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<sup>4</sup>If there is any question on whether the identified exposures are “significant” (i.e., potentially “unacceptable”) consult a human health Risk Assessment specialist with appropriate education, training and experience.

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5. Can the “significant” **exposures** (identified in #4) be shown to be within **acceptable** limits?

\_\_\_\_\_ If yes (all “significant” exposures have been shown to be within acceptable limits) - continue and enter “YE” after summarizing and referencing documentation justifying why all “significant” exposures to “contamination” are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

\_\_\_\_\_ If no (there are current exposures that can be reasonably expected to be “unacceptable”)- continue and enter “NO” status code after providing a description of each potentially “unacceptable” exposure.

\_\_\_\_\_ If unknown (for any potentially “unacceptable” exposure) - continue and enter “IN” status code

Rationale and Reference(s):

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6. Check the appropriate RCRA Info status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

  X   YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the John Deere Waterloo Works facility, EPA ID #IAD005289806, located at 400 Westfield Ave., Waterloo, IA, under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

       NO - "Current Human Exposures" are NOT "Under Control."

       IN - More information is needed to make a determination.

Completed by \_\_\_\_\_ Date 9/30/04  
(signature)  
Wray Rohrman  
Project Manager, RCRA Corrective Action & Permits Branch  
EPA Region 7

Supervisor \_\_\_\_\_ Date 9/30/04  
(signature)  
Jody Hudson,  
Associate Director of RCRA  
EPA Region 7

Locations where References may be found:

EPA Region 7 Headquarters  
RCRA Files  
901 North 5<sup>th</sup> Street  
Kansas City, Kansas 66101

Contact telephone and e-mail numbers

Wray Rohrman  
(913) 551-7543  
[rohrman.wray@epa.gov](mailto:rohrman.wray@epa.gov)

**FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.**

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**FIGURES**

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