

WHIRLPOOL CORP. AMANA APPLIANCE DIVISION, INC
(Middle Amana, Iowa)

GENERAL DESCRIPTION

The site has two separately identified disposal areas within the property owned by Maytag Corporation located immediately south of Middle Amana, Iowa. The 16.5-acre **Middle Amana Dump (MAD)** site is on the east-end of the Amana property, and the 14-acre **Process Well Field (PWF)** site is generally located from the central to the southern boundary of the Amana property. Both areas are in the SE 1/4 of Section 28, T81N, R9W, Iowa County, Iowa. The southern tip of the PWF site is in the NE 1/4 of Section 33, T81N, R9W.

SITE CLASSIFICATION

The site is classified "d" in accordance with 455B.427.3. The site is properly closed, but requires continued management. The site entered the Registry in 1993.

TYPE AND QUANTITY OF HAZARDOUS WASTE

- **Chlorinated Hydrocarbons: trichloroethylene (TCE) and 1,1,1-trichloroethane (TCE), 1,1,1-trichloroethane, trans-1,2-dichloroethylene, 1,1-dichloroethane, and 1,1-dichloroethylene**

The Amana Refrigeration manufacturing facility has been operating at the site since 1934. The facility manufactures refrigerators and other appliances. The manufacturing operation has included plating, painting, and degreasing activities. The degreasing solvents include trichloroethylene (TCE) and 1,1,1-trichloroethane. TCE was used as a degreasing solvent from 1956 to 1968.

The site contains an abandoned tailrace channel, which was used by Middle Amana as a municipal dump. Amana Refrigeration also used the dump for the disposal of hazardous wastes from 1956 until the dump was closed in 1970. The closed dump was covered with about three feet of dirt. An estimated 500 cubic yards of municipal and hazardous wastes were disposed in the dump. The hazardous wastes included TCE degreaser sludge, methylene chloride foam flush waste, paint wastes, and foam wastes. The site also contained a (former) ditch from which an undetermined volume of TCE or TCE waste may have been discharged from the plant, and is now covered by a plant building addition.

SUMMARY OF PUBLIC HEALTH AND ENVIRONMENTAL CONCERNS

- **An environmental concern exists for the protection of the surface waters and related flora and fauna of the Iowa River.**
- **A public health concern exists for the potential exposure to contaminated drinking water.**

Environmental Concern

The Amana Refrigeration facility is located within the flood plain of the Iowa River. The river is approximately 1/4 mile south of the facility. The river is within the headwaters of the Coralville Reservoir and is used for recreational and fishing activities. Two outflow ditches from the facility (#002 and #003) are monitored for total toxic organic compounds that are regulated by federal effluent guidelines that require TTO monitoring and effluent limits. The IDNR regulates the release of contaminants in the ditch through an NPDES permit.

Public Health Concern

In September 1982, a composite groundwater sample was taken from the seven wells used by Amana Refrigeration for process water and drinking water. The results showed TCE contamination at 135 ug/L. During a subsequent investigation by the USEPA TCE contamination was detected as high as 4,100 ug/L. Since that time the facility has obtained its drinking water from the city, while its own wells have been used exclusively for process water. In response to the apparent contamination, Amana Refrigeration initiated a series of groundwater investigations in 1983. These have included monthly to biannual monitoring of several process wells and monitoring wells. Currently the monitoring wells are sampled biannually.

The community of Middle Amana is one of several Amana colonies that receive drinking water from a system of several wells that blend water. The well nearest the site (#8) was abandoned on June 29, 2015. Amana Refrigeration also receives drinking water from the city. An Amana process well (#4) that had demonstrated the highest TCE contamination was shut down in July 1991. The level of contamination in this well varied from below detection limits to 1,800 PPB with the average contaminant level of approximately 500 PPB with no apparent trend.

Results from a monitoring well (WF-14S) located up-gradient from process well #4 indicates the former ditch (TCE degreaser location) may be another source area. Groundwater results from monitoring well (WF-14S) through 2017 continue to detect elevated levels of TCE.

Most production wells at the facility utilize the upper sand and gravel aquifer for water supply. The general direction of groundwater movement in the alluvial aquifer is south towards the nearby Iowa River. The TCE contamination plume appears to be captured by

the draw down of the process wells. Monitoring wells south of the process wells indicate little or no contamination is leaving the site. Prior to its abandonment, samples have been collected from the Middle Amana municipal well #8 for volatile organic analyses. The results were below detection limits for all compounds, including the contaminants in the process well field.

STATUS OF ASSESSMENT, MONITORING OR REMEDIAL ACTIONS

The state is the lead agency for the site.

Amana Refrigeration proposed remedial actions for the MAD site in August 1987. The department reviewed and approved the remedial plan in September 1989. The remedial actions were completed in July 1990. Afterwards the surface was black topped for use as a parking lot. The remedial actions included the following:

- Construction of slurry barrier walls on the east and west ends of the dump to prevent the migration along the former tailrace channel.
- Construction of an impervious cap to prevent infiltration into the waste materials.
 - Installation and operation of a monitoring system to ensure the integrity of the containment system.

Amana has been conducting groundwater monitoring at the site since April 1984. The plant process wells are capturing most of the contaminated groundwater, which is discharged at surface water (outfall # 001).

Groundwater Response Action Plan submitted to IDNR to address commingled BTEX and chlorinated hydrocarbon plume. The former solid waste dumpsite located on the Amana property was formerly closed with concurrence with Solid Waste Section of IDNR and no further assessment actions or remediation of the waste dump is required.

Biannual groundwater monitoring is conducted to assure the continued effectiveness of the groundwater contamination plume containment and the progress of natural attenuation. The facility conducted sub-slab vapor and indoor air sampling in both November 2018 and February 2019. The Iowa DNR received a potential vapor intrusion evaluation on March 20, 2019. Upon review, no further vapor intrusion investigation was required at that time.

2021: The most current groundwater monitoring report was received March 16, 2021 and was reviewed by the Iowa DNR. Groundwater sampling and plume evaluation will continue through biannual monitoring. In an attempt to establish a known source area and better address groundwater contamination, Whirlpool has begun an investigation to evaluate the suspected cVOC source area. The source area investigation is ongoing.

2022: Activities Completed

- DNR approval of 2021 Annual Site Monitoring report
- Phase II Groundwater contamination Source Investigation Work Plan

2023: Submission of the 2022 Annual Monitoring Report and approval by Iowa DNR. Additionally, a Remedial Design Source Investigation was submitted and approved by the DNR.

2024: Submission of the 2023 Annual Monitoring Report and approval by Iowa DNR. Source area remedial options are still being investigated.

2025: Submission of the 2024 Annual Monitoring Report which was approved by the Iowa DNR. Submission of the Groundwater Response Action Work Plan which proposed in-situ thermal remediation in unsaturated contaminant zone and in-situ bioremediation and chemical reduction injections in the saturated zone. The Iowa DNR approved the Work Plan and proposed performance monitoring.

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- Well Sampled May 2009
- Well Sampled May and October 2009
- Well Not Sampled
- c-VOC Groundwater Exceedances
- c-VOC Groundwater Detections



Feet
100 0 100 200

Meters
50 0 50 100

Figure 12

Groundwater Quality Data
Chlorinated VOCs
May and October 2009
Amana Refrigeration
Middle Amana, Iowa



- ◆ Well Sampled May 2009
- ◆ Well Sampled May and October 2009
- Well Not Sampled
- BTEX Groundwater Exceedances
- BTEX Groundwater Detections

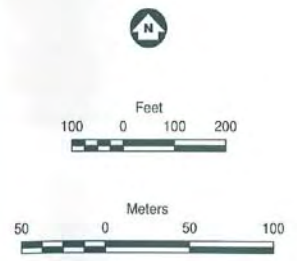


Figure 13
Groundwater Quality Data
BTEX
May and October 2009
Amana Refrigeration
Middle Amana, Iowa