Health Consultation

Exposure Investigation Report

Drinking Water Sampling from Homes Near the
Kerr McGee Chemical Corporation

COLUMBUS, MISSISSIPPI

EPA FACILITY ID: MSD990866329

SEPTEMBER 22, 2008

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

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In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared by:

U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Exposure Investigation & Site Assessment Branch

Executive Summary

At the request of the community, in April 2008, ATSDR sampled drinking (tap) water in homes near a closed wood-treating plant in Columbus, MS – the former Kerr McGee Chemical Corporation. ATSDR took 16 total samples: 10 from homes where people reported that their tap water had frequent discoloration (e.g., staining, grease, and solids), putrid odors, and a foul taste; 4 from homes further away from the closed plant; and two from the city's water treatment plants.

The water was tested for chemicals typically found at wood treating plants including polycyclic aromatic hydrocarbons (PAHs), phenols (including pentachlorophenol (PCP)), and total petroleum hydrocarbons (TPH). Select samples were also tested for chlorinated dioxins and furans. Because people reported problems with their water, ATSDR also tested the water for things that typically discolor water or give it a bad odor or taste. Those tests included turbidity, pH, iron, manganese, sulfide, and residual chlorine.

We found no indication that chemicals associated with the former wood-treating plant are infiltrating the city's drinking water system. The results showed no PAHs, phenols (including PCP), or TPH in any of the 16 samples. Two of those samples were selected for further testing for chlorinated dioxins and furans. None were detected.

The discoloration, taste, and odor test results, also, did not exceed water quality standards. The turbidity, pH, manganese, sulfide, and residual chlorine levels were within the recommended ranges. Iron was detected as high as 68 µg/L – well below the Environmental Protection Agency's (EPA) secondary maximum contaminant level (SMCL) of 300 µg/L.

Although the iron levels in the city of Columbus water system have not been reported to exceed the EPA guideline, a review of the City's water data showed that iron levels occasionally have reached the taste threshold (metallic taste at 100 µg/L) and may approach staining levels.

ATSDR recommends the following:

1. People with iron overload or hemochromatosis should consider using bottled water for drinking or filtering their water to remove the iron.
2. To reduce iron spotting on clothes, consider using non-chlorine bleach when washing clothes
3. To remove the metallic taste from water, individuals should consider installing a whole-house iron filter.

Objectives and Rationale

The purpose of this Exposure Investigation (EI) was to determine if people living near a closed wood-treating plant in Columbus, MS – the former Kerr McGee Chemical Corporation – are being exposed to harmful levels of chemicals associated with the plant in their drinking (tap) water.

Background

Figure 1. Photograph of houses near ditch

ATSDR was asked to investigate whether people were being exposed to the contaminants from a closed wood-treating plant (the former Kerr-McGee Chemical Corporation) in Columbus, Mississippi. That request came in 2004 from a community member. The plant operated for approximately 75 years (1928-2003). While operational, Kerr-McGee manufactured pressure-treated railroad products such as wooden crossties, switch ties, and timbers. The production process at the plant used creosote and creosote coal tar solutions to produce pressure-treated railroad products. Creosote contains polycyclic aromatic hydrocarbons (PAHs) and is a complex mixture of different chemicals. The plant also used pentachlorophenol (PCP) for wood-treating from the 1950s until the mid-1970s (Dahlgren 2003). Technical grade PCP contains trace amounts of chlorinated dibenzo-dioxins and chlorinated dibenzo-furans (NIOSH 1983, ATSDR 2001).

Local residents were concerned that contaminants from the wood treating plant spilled into roadside ditches and washed into their yards (Figure 1). In 2000, blood samples from ten community members were tested and found to contain dioxin and dioxin-like compounds (Dahlgren 2003). The blood results did not identify an exposure source; most people have some measurable level of dioxin and dioxin-like compounds in their blood from multiple environmental sources.[1] Contaminants associated with the plant had been found in ditch sediments near the plant (3TM 2001). In November 2004, Kerr-McGee removed contamination from roadside ditches (ERM 2005).

1 It is now believed that incineration/combustion processes are the most important sources of chlorinated dioxins (CDDs) to the environment. Important incineration/combustion sources include: medical waste, municipal solid waste, hazardous waste, and sewage sludge incineration; industrial coal, oil, and wood burning; secondary metal smelting, cement kilns, diesel fuel combustion, and residential oil and wood burning. For the general population, more than 90% of the daily intake of CDDs, CDFs, and other dioxin-like compounds comes from food, primarily meat, dairy products, and fish (ATSDR 1998). http://www.atsdr.cdc.gov/toxprofiles/tp104-c5.pdf)

ATSDR has evaluated several exposure pathways from the plant, including exposure to contaminants in the roadside ditches, past air emissions from the plant, and fish from the Luxapalila Creek. Those documents were published in September 2008.

In addition to contaminant exposure from the roadside ditches, the community was concerned that the wood treating plant's contaminants could have infiltrated into the public water line or the connecting pipes that deliver water to their homes or that there are residues in the pipes. In this EI, we evaluate whether drinking water is an exposure pathway for plant-related contaminants.

Possibility for Drinking Water Contamination

In response to a questionnaire administered in the fall of 2007, nine residents described their poor drinking water quality as follows:

- looks like coffee
- has a greasy film
- oily
- cloudy after a rain
- dirty, murky
- rusty – leaves a black ring in the toilet
- stains clothes
- smells like a sewer
- bleach odor
- pungent

The primary chemicals associated with the wood-treating plant are polycyclic aromatic hydrocarbons (PAHs), phenols (including pentachlorophenol (PCP) and chlorinated dioxins and furans.

The drinking water supply for Columbus Mississippi comes from eight deep wells serving more than 10,000 customers (30,000 people) (Columbus Light and Water 2007). The community voiced concern that their drinking water may contain dioxin and dioxin-like compounds. Although testing was required in the past, the water company does not currently test the public water supply for dioxin and dioxin-like compounds.[2]

PAHs, phenols, and chlorinated dioxins and furans do not dissolve easily in water; however, they can collect onto soil and sediment particles or oils and be carried into the water. When dioxins are present in water, they have been detected almost exclusively in untreated surface waters, rather than in treated drinking water. This is not unexpected because chlorinated dioxins are hydrophobic, and the compounds tend to be adsorbed onto particulate matter in the water column. In general, conventional water treatment processes appear to be effective in removing the chlorinated dioxins along with the particulates (ATSDR 1998). The same is

2 Between 1993 and 1995, EPA required water suppliers to collect water samples every 3 months for one year and analyze them to find out if dioxin is present above 5 parts per trillion. If it was present above this level, the system must continue to monitor this contaminant (EPA 2008).

true for PAHs and phenols.

The drinking water in Columbus is delivered to the homes in piping that is under positive pressure (i.e., the water is pushing outward on the pipe).While water is flowing through the pipe, it is unlikely that contaminants could infiltrate the water line even if there were a crack or hole. When the stoppage of water occurs (e.g., during repairs or breaks in the water line or during nearby fire fighting), back-siphonage backflow can occur. Back-siphonage backflow is the reversal of normal flow in a system caused by negative pressure (a vacuum or partial vacuum) in the supply piping. The effect is similar to the sipping of an ice cream soda through a straw. The liquid is drawn into the low pressure (suction) area (Michigan State University 1993). At that time, soil contaminants in the vicinity of the broken line could enter the out of service line.

Methods

Target Population Demographic

In 2000, there were 3,783 housing units within a one mile radius of the former Kerr McGee Chemical Corporation housing 8,984 people. Twenty-three percent (23%) were white, 76% were black, and 1% other races.There were 1,031 (11%) children under age 6 and 1,188 (13%) people over age 65 (U.S. Census Bureau, 2000).

Exposure Investigation Design

Choosing the Sampling Locations

Drinking Water Survey

In December 2007, the community administered a simple drinking water questionnaire designed by ATSDR (Appendix A). Nine people living in homes near the former Kerr McGee Chemical Corporation provided answers. ATSDR used the responses in planning the EI.

Other Criteria

ATSDR collected samples near areas with contaminated soil, sediment, and groundwater (i.e., near the plant and the overflowing ditches, near historical contamination) and outside those contaminated areas for comparison. Additionally, ATSDR considered the following when deciding where to collect tap water samples:

- *Age of homes within a one mile radius of the plant* (as an indication of age of pipes):

  Most of the homes closest to the plant were built between 1969 and 1989 (U.S. Census Bureau, 2000). There are older and newer homes further from the plant. We targeted homes that were older or relatively the same age as those closest to the plant. The nine people surveyed live in the area where homes were built between 1969 and 1989.

- *Distance from the plant:*

  To determine if the soil or groundwater contamination is infiltrating into the distribution pipes, samples were collected near the plant (areas of contamination). Samples were also collected in areas with no known soil and shallow groundwater contamination. Homes southeast of the plant were compared with homes north and west of the plant since the groundwater flow moves to the southeast.

- *Distance of homes to city well fields and water treatment plants:*

  The city of Columbus uses water from two clusters of deep wells (four in each; all greater than 800 feet deep) and has two water treatment plants. One cluster is on Waterworks Road east of the plant (Figure 1 in Appendix B) and the other cluster is roughly three miles south of the plant near the airport. According to the utilities manager, when the Waterworks Road well field is operational (e.g., no scheduled maintenance or unplanned shutdowns), people nearer to the plant get their drinking water from that well cluster (ATSDR 2007).

  We collected samples from both water treatment plants to determine if there is a problem with contaminant infiltration or general water quality due to the age of the distribution lines. If infiltration or the age of piping was a problem, the water should be cleaner as it leaves the water treatment plant and more polluted nearer to the wood-treating plant.

- *Distance from other possible sources of groundwater contamination*

  There are many underground storage tanks in the Columbus area. Some have reported leaks (See Figure 2 in Appendix B). We collected samples away from those areas to avoid interference with our objective to determine if contaminants from the former Kerr McGee plant have infiltrated the local piping network.

- *Severity of the respondents drinking water complaints*

  Residents southeast of the plant had more complaints of rusty brown water with a rotten egg odor than residents north of the plant who described their water as cloudy with a bleach odor. Samples were collected from both areas.

Choosing the Sampling Parameters

The drinking water (specifically tap water) was analyzed for polycyclic aromatic hydrocarbons (PAHs), phenols (including pentachlorophenol (PCP) and chlorinated dioxins and furans because those compounds are associated with plant and are the primary contaminants of concern. We also tested for total petroleum hydrocarbons (TPH) and because people reported problems with their water, ATSDR also tested the water for things that typically discolor water or give it a bad odor or taste. Those tests included turbidity, pH, iron, manganese, sulfide, and residual chlorine.

Environmental Sampling

Data Collection/Sampling Procedures

ATSDR spent 2½ days in the Columbus area assessing the proposed sampling locations, talking to residents about the project, explaining the sampling procedures, and getting consent for sampling. After they consented, we collected the PAH, phenol, and dioxin samples and field tested the water for residual chlorine, turbidity, and pH.

We then asked residents to collect a "first draw" sample on April 24th because they had reported that their water is worse when they first turn it on after not using it for a while. We provided containers, coolers, and ice (if requested) for sample collection. They collected "first draw" samples for TPH, iron & manganese, and sulfur and were asked to put the samples in coolers or their refrigerator. ATSDR gathered those samples from the residents the morning of April 24th. The contractor transported all samples to their laboratory in Mobile, Alabama for analysis.

Sampling Locations

ATSDR collected tap water samples at 16 different locations and from both water treatment plants. Those included the following:

- 6 north, northeast of the plant (1 for pH, turbidity, and free chlorine only)
- 6 south, southeast of the plant (1 for pH, turbidity, and free chlorine only)
- 1 west of the plant (within one mile, likely outside the area of susceptibility)
- 1 east of the plant (within one mile, likely outside the area of susceptibility)
- 2 far south of the plant (both closer to the 2nd city well field)
- 1 from the Waterworks Road water treatment plant (east of the wood-treating plant)
- 1 from the water treatment plant near airport

Laboratory Analytic Procedures

- **PAHs and phenols**: All samples sent to the laboratory were analyzed for PAHs and phenols.

- **Total Petroleum Hydrocarbon (TPH)**: Both creosote and PCP have hydrocarbons associated with their mixtures. Coal tar creosote is a thick, oily liquid and PCP is a solid that is dissolved in a solvent such as mineral spirits, No. 2 fuel oil, or kerosene before being used to treat wood products (ATSDR 2001). We tested all samples sent to the laboratory for the presence of TPH as a screening for which samples to select for chlorinated dioxins and furans analysis.

- **Dioxins**: Dioxin and furan samples were collected from all locations, but only two samples were selected for analysis. We used the test results from the PAHs, phenols, TPH, turbidity and pH (*see below*) as well as the distance to the plant or known contamination areas to determine which samples should be analyzed.

- **Standard drinking water quality parameters:**

    - *Turbidity &, pH:* We used physical tests such as turbidity (cloudiness in water), and pH to field screen more samples and determine areas with more likelihood for contamination. For example, if the sample is more cloudy (turbid) or of abnormal pH, it is more likely that there could be a break in the water line. We also used these tests to help screen samples (i.e., more turbid, abnormal pH) for dioxin analysis.

    - *Iron, manganese, sulfide, and residual chlorine:* People reported discoloration, bleach and rotten egg odors, and grease in their tap water (Appendix C lists recommended tests for key water quality issues). This could indicate a problem with the water lines or water supply. Based on the reported water quality, there could be a problem with a high iron content, iron bacteria, and/or over-chlorination.

Table 1 lists the sampling parameters and analytic methods.

Table 1. Sampling parameters and methods

SAMPLE TEST PARAMETER	# SAMPLES
Residual Chlorine (done in field)	16
Turbidity (done in field)	16
pH (done in field)	16
Total Petroleum Hydrocarbons (TPH); EPA* Method 8015 (DRO)	16
Iron and Manganese; EPA Method 200.8	16
Sulfur, H2S; EPA Method 376.2	16
PAHs; EPA Method 625[1]	16
Pentachlorophenol; EPA Method 625[1]	16
Chlorinated Dioxins and Furans, 2,3,7,8-TCDD/TCDF; EPA Method 1613[1]	2

* EPA Methods specify the required detection limits

[1]Since the samples are from a municipal water system that uses chlorine, as recommended by EPA, we dechlorinated the phenol, PAH, and dioxin samples before analysis.

Most of the sample parameters in Table 1 have a drinking water standard to protect public health by limiting the levels of contaminants. Those standards, promulgated by EPA, are called Maximum Contaminant Levels (MCLs) or Secondary Maximum Contaminant Levels (SMCLs). Those standards, as well as other health comparisons, are listed in Table 2.

Results

No harmful levels of chemicals were found in the water. The results showed no PAHs, phenols (including PCP), or TPH in any of the 16 samples. Two samples were selected for further testing for chlorinated dioxins and furans. Those compounds were not detected.

The discoloration, taste, and odor tests, also, did not exceed water quality standards. The turbidity, pH, manganese, sulfide, and residual chlorine levels were generally within the recommended ranges. Although low levels of iron were detected, it was well below the Environmental Protection Agency's (EPA) secondary drinking water standard and ATSDR's health comparison value.

Table 2 lists the summary results and the comparison values.

Discussion

Although the samples were collected at one point in time, there is no indication that chemicals associated with the former wood-treating plant are infiltrating the city's drinking water system. We believe it is unlikely that the wood-treating chemical could have infiltrated the drinking water system now or in the past for the following reasons:

1. *Drinking water sample results near and far from the former Kerr McGee plant were similar* – Results from homes southeast had similar results to those north and west of the plant indicating no infiltration to the piping.
2. *The current drinking water comes from very deep wells* – The city of Columbus uses water from two clusters of deep wells – four in each; all greater than 800 feet deep in the Coker formation, which is a deep aquifer. The groundwater contamination is localized near the former Kerr McGee plant and has not penetrated into the deepest aquifer. The 2005 Corrective Action report on groundwater indicates that the areas of groundwater contamination at the plant are in the alluvial and Eutaw formations (Kerr McGee 2005).
3. *The drinking water piping is usually under positive pressure* (i.e., the water is pushing outward on the pipe) – Because of positive pressure while water is flowing through the pipe, it is unlikely that contaminants could infiltrate the water line even if there were a crack or hole.
4. *Notifications of loss of water pressure & flushing lines* – During normal repairs or minor breaks – when pressure is maintained – Columbus Light and Water isolates the break, makes repairs, rechlorinates the line, and flushes the isolated line in accordance with the MS Department of Health guidelines. According to Columbus Light and Water, most breaks are repaired without lowering the pressure in the line. In cases where pressure is lost, Columbus Light and Water notifies the MS Department of Health and the local media to issue a boil water notice and follows the steps listed above including bacteriological sampling (Columbus Light and Water 2008b).
5. *Previous drinking water intake was upstream of Kerr McGee plant* – The city of Columbus began using the deep wells in the late 1970s to early 1980s. Prior to that time, the drinking water for Columbus came from Luxapalila Creek. Review of topographic maps shows that the drinking water intake was close to one mile upstream of the former Kerr McGee wood-treating plant (i.e., above where runoff could enter the creek).

Table 2. Drinking Water Results and Comparison Values for Homes near the Former Kerr McGee Chemical Corp, Columbus, MS

SAMPLE TEST PARAMETER	AVERAGE/MEDIAN VALUE	RANGE	EPA MCL†	EPA SMCL‡	ATSDR CV§	OTHER
Residual Chlorine	0.84/1.06 mg/L	0.09-1.48 mg/L				4 MRDL[¥]
Turbidity	0.39/0.33* (NTUs)	0.22-1.23*(NTUs)	5 NTUs[1]			
pH	8.33/8.47	6.97-8.8		6.5-8.5		
Total Petroleum Hydrocarbons (TPH)	ND (DL 300 µg/L)	ND				None available
Iron	42.2/42 µg/L	<25-68** µg/L		300 µg/L	26,000 µg/L	
Manganese	ND (DL 2.5 µg/L)	ND		50 µg/L	500 µg/L (Intermediate RMEG, child)	
Sulfide	ND (DL 100 µg/L)	ND				500 to <10,000[2]
PAHs (Benzo(a)pyrene)[3]	ND (DL 0.2 µg/L)	ND	0.2 µg/L			
Pentachlorophenol	ND (DL 1.0 µg/L)	ND	1 µg/L			
Chlorinated Dioxins and Furans	ND (DL 0.0000096 µg/L 0.000005 µg/L)	ND	0.00000000003 µg/L		.00001 µg/L (Chronic EMEG, child)	

†MCL: Maximum Contaminant Level - Legally enforceable standards that apply to public water systems. Primary standards protect public health by limiting the levels of contaminants in drinking water.

‡SMCL: Secondary Maximum Contaminant Level - Non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. http://www.epa.gov/safewater/contaminants/index.html#listmcl

§CV: Comparison Value - Screening tools used to evaluate environmental data. RMEG - Reference Dose Media Evaluation Guide, EMEG - Environmental Media Evaluation Guide

ND – Not detected**, DL –** detection limit

[¥] **MRDL**: Maximum Residual Disinfectant Level – the highest level of a disinfectant allowed in drinking water.

*****This data excludes one sample that was extremely turbid. The sample was drawn from a tub faucet rarely used. The first draw sample the following morning showed normal (0.27) results.

******The iron content in city water plant #1(North Plant) was <25; city water plant #2 (South Plant near the airport) was 39.

[1]Turbidity: (Note: This is only for drinking water systems using or influenced by surface water) - At no time can turbidity (cloudiness of water) go above 5 nephelolometric turbidity units (NTU); systems that filter must ensure that the turbidity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95% of the daily samples in any month. As of January 1, 2002, turbidity may never exceed 1 NTU, and must not exceed 0.3 NTU in 95% of daily samples in any month.

[2]Hydrogen sulfide is not regulated because a concentration high enough to be a drinking water health hazard also makes the water unpalatable. The odor of water with as little as 500 µg/L of hydrogen sulfide concentration is detectable by most people. Concentrations less than 1000 µg/L give the water a "musty" or "swampy" odor. A 1000 -2000 µg/L hydrogen sulfide concentration gives water a "rotten egg" odor and makes the water very corrosive to plumbing. Generally, hydrogen sulfide levels are less than 10,000 µg/L, but have been reported as high as 50,000 to 75,000 µg/L in drinking water systems. http://www.water-research.net/sulfate.htm#test

[3] PAHs are not specifically listed but are listed as Benzo(a)pyrene.

Iron

People in Columbus have reported that their tap water has frequent discoloration (e.g., staining, grease, and solids), putrid odors, and a foul taste. ATSDR did not notice any water discoloration or odor while we were sampling in Columbus. However, during our sampling in April 2008, ATSDR detected iron in one home as high as 68 µg/L; the city water treatment plants had levels <25 and 39 µg/L respectively. Those levels are <u>not</u> above an EPA guideline.

EPA has not set maximum contaminant levels (MCL) for iron in the National Primary Drinking Water Regulations. Secondary maximum contaminant levels (SMCL) recommended in the National Secondary Drinking Water Regulations are set for aesthetic reasons (e.g., color, taste, odor) and are not enforceable by EPA, but are intended as guides to the states. The SMCL for iron is 300 µg/L. States may adopt SMCLs as guidelines or enforce them as contaminants (U.S. Department of Agriculture 1999). Mississippi uses the SMCL as a guideline.

High levels iron can result in discolored water, stained plumbing fixtures, laundry spotting (made worse by the use of chlorine bleach (Ohio State University Extension, University of Idaho 1991), and an unpleasant metallic taste to the water. Iron's metallic taste may be objectionable to some at 100 µg/L (for ferrous iron) and 200 µg/L (for ferric iron) (Kentucky Division of Water 2006).

ATSDR reviewed the iron levels for the past 7 years from the city of Columbus' water treatment plants. Iron from the city's eight deep wells was typically 10,000 µg/L in the raw (untreated) water and 80 µg/L in the treated water. At times, iron in the treated water delivered to the community has been as high as 250 µg/L (North plant, January 2006) and recently 180 µg/L (North plant, January). According to Columbus Light and Water, the high iron levels typically occur when they are flushing the system or when the water is needed for emergencies such as fire protection (Columbus Light and Water 2008b). For the month of April 2008, the average treated water concentration for both the North and South treatment plants was 60 µg/L (Columbus Light and Water 2008a). Some of the iron levels were close to the metallic taste level of 100 µg/L.

Although not above the EPA guideline, it appears that occasionally the iron levels in this system could reach the taste threshold and approach staining levels. Besides the water supply, iron can come from older piping in the home and/or the piping in the City's distribution system. According to Columbus Light and Water, they are replacing older piping in the system when they are making repairs, but the system still has a lot of older pipes (ATSDR 2007).

There is a health condition for which too much iron can be dangerous. Iron overload or hemochromatosis occurs when the body absorbs too much iron from foods (and other sources such as vitamins containing iron). Although hemochromatosis can have other causes, in the United States the disease is usually caused by a genetic defect. The genetic defect is inherited from both parents and is present at birth, but symptoms rarely appear before adulthood. The iron overload associated with hemochromatosis can be detected through two blood tests. Treatment consists of periodically taking blood from the arm, much like giving blood (CDC 2008).

Iron can be removed from the water supply. The common iron removal methods include deionization, oxidation, and filtration. Whole-house iron filters are advertised from under $100 to over $4,000.

Limitations

Although the samples were collected at one point in time, we don't believe the results would be different if we continued to collect samples (see discussion).

Child Health Considerations

The many physical differences between children and adults demand special emphasis when children are exposed to hazardous substances. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. For that reason, ATSDR uses health comparison values that are protective of children.

ATSDR did not detect any chemicals associated with the former wood-treating plant in the tap water of the homes tested. Additionally, the turbidity, pH, iron, manganese, sulfide, and residual chlorine levels were generally within the recommended ranges.

If a child in Columbus is diagnosed with iron overload or hemochromatosis (i.e., when the body absorbs too much iron), ATSDR is recommending that they do not drink the water from the city system or that they filter the water to remove the iron before drinking.

Conclusions

1. There is no indication that chemicals associated with the former wood-treating plant are infiltrating the city's drinking water system.
2. Although the iron levels in the city of Columbus water system have not been reported to exceed the EPA SMCL guideline of 300 µg/L, it appears that occasionally the iron levels have reached the taste threshold (metallic taste at 100 µg/L) and may approach staining levels.

Recommendations

1. People with iron overload or hemochromatosis should consider using bottled water for drinking or filtering their water to remove the iron.
2. To reduce iron spotting on clothes, consider using non-chlorine bleach when washing clothes.
3. To remove the metallic taste from water, individuals should consider installing a whole-house iron filter.

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APPENDICES

Appendix A. Drinking Water Questionnaire

Appendix B. Environmental Factors near the former Kerr McGee Chemical Corp, Columbus, MS

Appendix C. Recommended Tests in Response to Key Water Quality Issues

Appendix A. Drinking Water Questionnaire

1. When there is a problem with the water, what does it water look like?
2. Does it have an odor? If so, what does it smell like?
3. If it has a noticeably different taste, what is that taste?
4. How often does the water event happen?
5. Do you still have the problem?
6. When was the last time this happened?
7. Does any event precede it, like rain?
8. Is there a time of day or week it is worse? (e.g., with first use of water in the morning, noon, evening, during the weekend, weekdays)?

Appendix B. Environmental Factors near the former Kerr McGee Chemical Corp, Columbus, MS

Figure 1. City of Columbus Drinking Water Well Locations

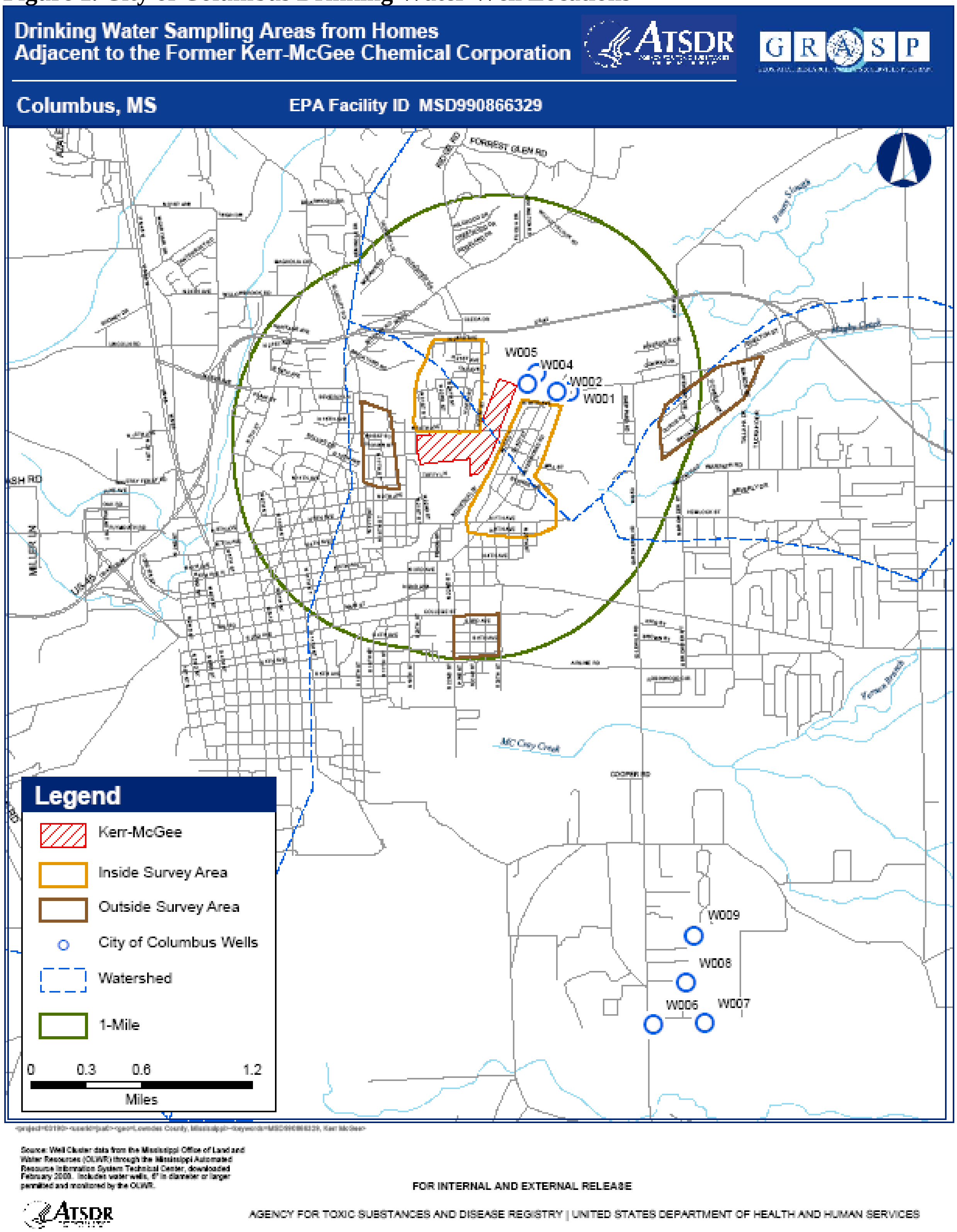
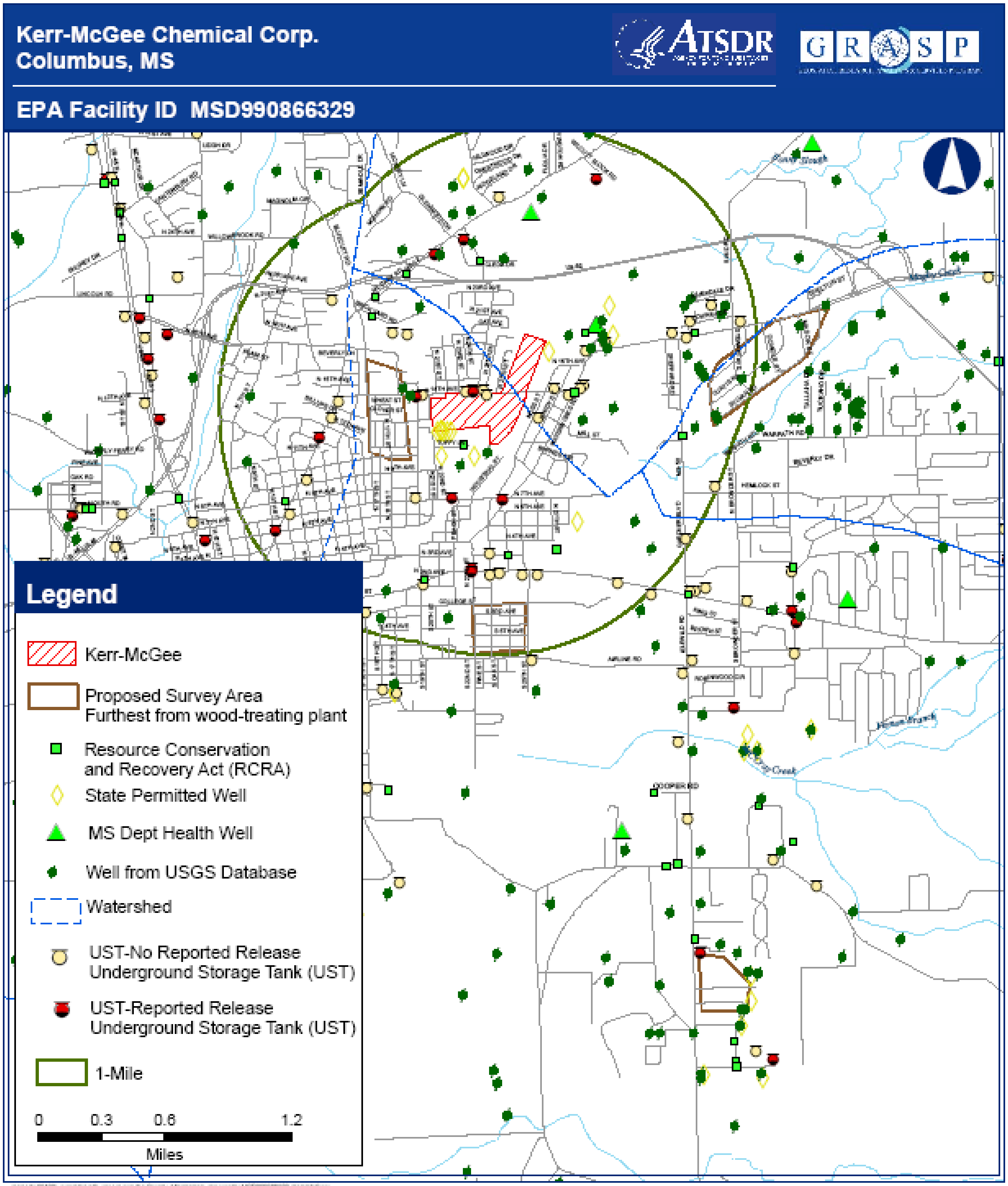


Figure 2. Underground Storage Tank Locations (USTs) near Kerr McGee, Columbus, MS



Appendix C. Recommended tests in response to key water quality issues

Table C1. Recommended tests in response to key water quality issues*

Issue	**Recommended Test**
Corrosion of pipes, plumbing	pH, alkalinity, lead, copper
Stained plumbing fixtures, laundry	Copper, iron, manganese
Objectionable taste or smell	Hydrogen sulfide, ammonia, metals algae in source water

*Source: http://www.moh.govt.nz/moh.nsf/pagesmh/6886/$File/sampling-monitoring-small-drinking-water-supplies.pdf