PRELIMINARY ASSESSMENT
CASTANA WATER SUPPLY
MONONA COUNTY, IOWA
TDD NO.

APRIL 15, 1992

IOWA DEPARTMENT OF NATURAL RESOURCES
WALLACE STATE OFFICE BUILDING
900 E. GRAND, DES MOINES, IOWA 50319

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Site: Castana Water Supply
Hwy 175 & County Rd. L20
Castana, Iowa 51510

EPA ID. No.

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1. INTRODUCTION

Under authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), the Iowa Department of Natural Resources (IDNR) in cooperation with, and under the authority of the U.S. Environmental Protection Agency, Region 7 conducted a Preliminary Assessment (PA) at the Castana Water Supply site in Monona County, Iowa. The purpose of this investigation was to collect information concerning conditions at the Castana Water Supply site sufficient to assess the threat posed to human health and the environment and to determine the need for additional CERCLA/SARA or other appropriate action. The scope of the investigation included review of available file information, a comprehensive target survey, an off-site and on-site reconnaissance (February 11, 1992).

2. SITE DESCRIPTION, OPERATIONAL HISTORY, AND WASTE CHARACTERISTICS

2.1 Location

Castana Municipal Water Supply is located on County Road L20 in a rural area of Monona County, Iowa (Figure 1). The geographic coordinates are 42° 04' 20" N latitude and 95° 54' 55" W longitude (Reference 24). To reach the site, travel south from Mapleton on Iowa Highway 175 until you get just past the town of Castana. Make a right turn at the intersection of Highway 175 and County Road L20. The site is on the north side of County Road L20, approximately 230 feet west of the intersection of Hwy 175 and County Road L20.

Monona County is situated in west-central Iowa and is characterized by hot summers and cold winters. The annual precipitation in the county is 29.93 inches of which 2.8 inches are due to snowfall. The mean January temperature is 17.3° F while the mean July temperature is 74.9° F . The normal daily maximum July temperature is 88° F. The normal daily minimum temperature in January is 12° F (Reference 4, Reference 22).

2.2 Site Description

The total area of the site is estimated to be 13 acres. The site area includes the spill area as well as suspected migration path to contaminated municipal wells. The site is adjacent a former fertilizer manufacturing, sales and/or storage facility. It is located on farmland. Grain elevators and a farm implement company are situated to the east of the site. To the north, south, and west is farmland (Figure 2). The Loess Hills can be seen less than 1/2 mile to the north, east and west. The city of Castana raw water line runs through the suspected spill area which lies 300 feet north of County Road L20 and adjacent to the former fertilizer business (Reference 14, Reference 19).

The site slopes gently (0 to 1% slope) to the southwest, toward Maple River. A ditch runs along the south side. The ditch carries the runoff from the site. It has also served as a channel for contaminated water pumped from city wells. The drain empties in to Maple River to the west of the site (Reference 19, Reference 21).

In 1990 the farm on which the site is located had soybean crop. At the time of the reconnaissance survey in February 1992 there was no crop. However, crop residues indicated that alfalfa was grown in 1991 (Reference 11, Reference 19).

2.3 Operational History and Waste Characteristics

Brunings' Inc. owned the fertilizer dealership that was suspected of spilling nitrogen fertilizer at the site. The owner of the farm is Michael Riley (Reference 6).

The exact date of the suspected spill is unknown. Information provided by the farmer seems to indicate the spill may have occurred between 1979 and 1980 (Reference 16). In June 1989 the Iowa Department of Natural Resources noticed that the city of Castana had reported levels of nitrate much above the action level of 10 milligrams per liter (mg/L) as elemental nitrogen or 45 mg/L as nitrate (Reference 18).

Reports to the IDNR showed that both municipal wells (west and east well also referred to as #2 well and #3 well, respectively) were contaminated by nitrates, sometimes as high as 190 mg/L (Reference 15). Because the contamination persisted for several months, IDNR

on August 4, 1989 issued an Administrative Order requiring the city to correct its Maximum Contaminant Level (MCL) nitrate violations (Reference 7).

On December 15, 1989, IDNR issued a permit to the city of Castana to construct a new well (well #4) (Reference 5). The construction of the new well was completed and placed in service in January 1992 (Reference 19). The new well appears to have been completed in the same aquifer as the old wells although upgradient from the suspected spill and the old wells (Reference 5).

Following a request from the city of Castana, IDNR issued a National Pollutant Discharge Elimination System (NPDES) permit #6715001 on May 8, 1990 which allowed the city to pump and discharge contaminated water from well #2 and well #3 into the Maple River. The wastewater from the wells was pumped into the open ditch south of the site and eventually discharged into the river (Reference 9, Reference 19).

The report to IDNR indicated pumping the contaminated wells to waste decreased the nitrate level below the MCL. The city applied for a permit to resume using the previously-contaminated wells and the permit was issued on September 13, 1991 (Reference 10).

Some soil samples were taken for analysis during the construction of a new raw water line from well #4 to an existing line in 1990. A sample from the suspected spill area showed nitrate concentration of 1,135 milligram per kilogram (mg/kg) or parts per million (ppm) (Reference 17).

IDNR did a preliminary groundwater sampling in July 1991. Nitrate levels as high as 680 mg/L as nitrate were found in groundwater taken from suspected spill area. In addition, low levels of pesticides were also detected. However, it is not clear whether the pesticides originated from the agricultural chemical dealership or from use at the farm (Reference 11).

3. GROUNDWATER PATHWAY

3.1 Hydrogeologic Setting

Castana is situated in the Loess Hills of western Iowa. The Loess Hills extend in a narrow band that borders the full length of the Missouri River in western Iowa. The thickness of the loess in the Loess Hills of western Iowa is generally over 60 feet, and depths of 150 to 200 feet have been recorded from water-well drilling and outcrops (Reference 20).

Loess is wind-deposited silt (often including some sand and clay) composed predominantly of closely-packed grains of quartz. The deposition of loess was a wide-spread Pleicestocene glacial activity. The loess deposits in western Iowa are porous,

lightweight, and easily eroded if not properly vegetated (Reference 20).

Deposits of glacial drift, including beds of sand and gravel, are frequently seen within Loess Hill (Reference 20). The aquifer at the Castana site is a sand and gravel deposit which lies between 32 and 42 feet below ground surface. The sand and gravel deposit is protected by a low permeability material consisting of clay and loess from approximately 5 feet to 32 feet below ground surface (Reference 14).

The very broad valley of the Missouri River along northern third of the loess region in western Iowa is underlain by Cretaceous-age rocks consisting primarily of easily-eroded shales and chalky limestone (Reference 20). At the Castana site the bedrock probably belongs to the Marmaton Group of the Des Moines Series. These rocks are of the Pennsylvanian-Age limestones (Reference 13). The Marmaton Group consists of alternating shale and limestone, with some sandstone and coal (Reference 13).

The direction of the surficial groundwater flow has not been determined. However, it is presumed to be west toward the Maple River.

The soil at the site is Kennebec silt loam with 0 to 1% slope, medium-textured bottomland and colluvial silt loams, subject to flooding (Reference 21).

3.2 Groundwater Targets

There is only one municipal water supply within a 4-mile radius of the site. The Castana Municipal Water Supply provides the residents of the city of Castana with drinking water. The water is taken from well #4 and one standby well (well #3). The water from the wells is blended (Reference 19). The population of Castana is 159 (Reference 3).

The nearest private well is 1,650 feet west of the source (Reference 19). A search in the IDNR Geographic Information System revealed several water permits. The private wells and other water permits are shown in Figure 3.

3.3 Groundwater Conclusions

Because of the high water solubility and mobility of nitrate and the fairly high conductivity of the loess soil in the area, the potential for groundwater contamination from suspected fertilizer spill is very high. Nitrate contamination of groundwater has been documented. Analytical reports of the water from the delivery system in Castana showed high nitrate contamination. Also, preliminary groundwater investigation by IDNR revealed very high nitrate concentration in groundwater at the site. The 159

residents of the city of Castana are the primary target population .

4. SURFACE WATER PATHWAY

4.1 Hydrologic Setting

Overland drainage from suspected spill area flows into a ditch south of the site. Drainage water from the ditch flows into the Maple River, approximately 1,300 feet west of the suspected spill area. The ditch is about a foot deep (Reference 19). The Maple River flows southwesterly approximately for 6 1/2 miles before joining the Little Sioux River (Reference 19).

4.2 Surface Water Targets

There are no drinking water intakes within 15 downstream miles of the site. However, within the 4-mile radius of the site there are twenty-two water use permits. These water use permits include surface water from farm ponds.

There are no wetlands located along the 15 downstream mile of the site. However, the Maple River provides a fishery for channel catfish and bullhead. The Little Sioux River has an important fishery for channel catfish, bullhead, and walleye (Reference 2).

The Maple River valley is bordered on the east and west by the Loess Hills. Within the site area the Loess Hills are approximately 1625 feet west and 1625 feet east of the river. The Loess Hills Wildlife Area is located to the west of the site and is 2725 acres in size (Reference 2).

4.3 Surface Water Conclusions

There is no evidence of contaminant migration from the spill area to the Maple River. However, contaminated water was discharged in the river when the municipal wells were pumped to waste. This action was permitted (Reference 9). There are no wetlands in the target area. Secondary fishery targets include fisheries in the Maple River and the Little Sioux River.

5. SOIL EXPOSURE AND AIR PATHWAYS

5.1 Physical Conditions

The site is on a cropped farmland. It lies on a floodplain (Figure 3). There is a low chain fence, less than 3 feet high, on the east side of the site. This fence demarcates the farmland from the businesses adjacent to it.

5.2 Soil and Air Targets

There are no residents on site, but businesses are located to the east of the farmland. The businesses include grain elevators and farm implements (Figure 2).

The nearest residence is situated about 250 feet northeast of the new well. The nearest residence downgradient is situated approximately 1850 feet from the spill area. This residence is on the west bank of the Maple River. Eighty people live within 1\4 mile and 150 people within 1\2 mile of the site. Using a county average population of 2.2 per residence, it is calculated that 445 people live within a 4-mile radius of the site (Reference 3, Reference 24).

There is a possibility that farm workers could be exposed to the contaminant through dermal contact. There are no sensitive environments nearby to be affected by the high nitrate level.

5.3 Soil Exposure and Air Pathway Conclusions

The soil exposure pathway poses little danger to farm workers. Since the site is flat, little erosion is anticipated. Any soil erosion would transport the contaminant to the Maple River. There are no nearby sensitive environments. A release to the air would be through soil blow. However, it is not expected that this would be a major problem since the site is covered by vegetation or crop residue most of the year and the contaminant is not volatile.

6. SUMMARY AND CONCLUSIONS

The city of Castana experienced a sudden rise in nitrate level in their water supply in 1989. It is suspected that the high nitrate concentration was due to a fertilizer spill that occurred 500 feet from the city wells. Brunings' Inc. owned the fertilizer plant that spilled the contaminant. The spill site is on a farmland adjacent to Brunings' Inc. facility. The owner of the farm estimated that the spill occurred sometime in the late 1970s.

The nitrate-contaminated wells were pumped to waste in 1991. The pumping reduced the nitrate level below the MCL. The city reapplied for and was granted a permit to reuse the previously contaminated wells. In addition to the two previously contaminated wells, the city constructed a new well (Well #4) which is active. A NPDES permit was obtained prior to purging of the previously contaminated wells. The contaminated water was discharged into the Maple River.

There is minimal danger from this contaminant to the environment but there is a potential threat to human health from ingesting water. The contaminant plume has not been properly defined. Therefore it is not clear whether the pump-to-waste result achieved is a temporary situation.
Flooding could result in increased leaching of the nitrate into

groundwater.

It is recommended that a detailed soil and groundwater sampling be conducted in the vicinity of the spill.

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