

Technical Justification for a Request to Reclassify the Former CCC/USDA Facility at Canada, Kansas

Environmental Science Division



United States Department of Agriculture

Work sponsored by Commodity Credit Corporation,
United States Department of Agriculture

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by
Applied Geosciences and Environmental Management Section
Environmental Science Division, Argonne National Laboratory

August 2007



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Notation

AMSL	above mean sea level
BER	Bureau of Environmental Remediation (KDHE)
BGL	below ground level
CCC	Commodity Credit Corporation
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CGS	Cooperative Grain and Supply
DCA	1,1-dichloroethane
EDB	ethylene dibromide
ft	foot (feet)
FSA	Farm Service Agency
gpm	gallon(s) per minute
IGA	Intergovernmental Agreement
ISL	Identified Sites List (KDHE)
KDHE	Kansas Department of Health and Environment
KGS	Kansas Geological Survey
µg/kg	microgram(s) per kilogram
µg/L	microgram(s) per liter
MCL	maximum contaminant level
mg/L	milligram(s) per liter
mi	mile(s)
MTBE	methyl <i>tert</i> -butyl ether
RWD	Rural Water District
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WWC-5	water well record form

Technical Justification for a Request to Reclassify the Former CCC/USDA Facility at Canada, Kansas

Executive Summary

Contamination in groundwater at Canada, Kansas, was discovered in 1997, during limited private well sampling near former grain storage facilities of the Commodity Credit Corporation, U.S. Department of Agriculture (CCC/USDA). Subsequent investigations by the Kansas Department of Health and Environment (KDHE) confirmed carbon tetrachloride and nitrate concentrations in groundwater above the respective maximum contaminant levels (MCLs) of 5.0 µg/L and 10.0 mg/L. The KDHE investigations identified both the former CCC/USDA grain storage facility and a private grain storage facility as likely sources for the carbon tetrachloride contamination. The CCC/USDA funded extension of a rural water district line to provide a permanent alternate water supply, and the KDHE has conducted long-term monitoring under the State Water Plan.

This document presents an analysis of the available information for the Canada site, acquired in previous investigations and the long-term KDHE monitoring. This analysis forms the technical justification for a request to reclassify the former CCC/USDA grain storage facility at Canada as a site requiring no further action under the Intergovernmental Agreement (IGA) between the KDHE and the USDA's Farm Service Agency.

The KDHE's long-term water level monitoring results indicate a consistent groundwater flow direction to the east-southeast. Consequently, the wells with the highest overall concentrations of carbon tetrachloride are downgradient from the private grain storage facility but not downgradient from the former CCC/USDA facility.

The KDHE criterion for reclassification of a site is that contamination there should not pose an unacceptable risk, on the basis of analytical results for four consecutive, equally timed, sequenced sampling episodes over a period of no less than two years. In seven KDHE sampling events over a period of six years (2001-2007), the concentrations of carbon tetrachloride in the monitoring well on the former CCC/USDA property at Canada have ranged from 0.63 µg/L to 2.9 µg/L. These seven results are all below the MCL of 5.0 µg/L, and they demonstrate that groundwater on the former CCC/USDA property has met the standard for carbon tetrachloride in drinking water since 2001 and does not pose a significant human health threat. Except for a two-year interval between sampling events in December 2003 and December 2005, the monitoring

occurred at approximately annual intervals. The results warrant a request for reclassification of the Canada site to *Resolved* status on the KDHE's Identified Sites List, under Section III (Other Considerations) of KDHE policy BER-RS-024, Rev. 2001.

1 Introduction

Contamination at the grain storage facility formerly operated by the Commodity Credit Corporation of the U.S. Department of Agriculture (CCC/USDA) at Canada, Kansas, was discovered in October 1997, during limited private well sampling in conjunction with an inventory of such facilities. The Kansas Department of Health and Environment (KDHE) conducted investigations at Canada in 1998–2001 and confirmed carbon tetrachloride and nitrate concentrations in groundwater above the respective maximum contaminant levels (MCLs) of 5.0 µg/L and 10 mg/L. The affected private lawn and garden wells are no longer used to supply drinking water, and carbon tetrachloride impacts above the MCL are localized.

The KDHE investigations identified both the former CCC/USDA grain bin location and a private grain storage facility as likely sources of the carbon tetrachloride contamination. After the identification of carbon tetrachloride and nitrate contamination at concentrations above the respective MCLs, the CCC/USDA funded extension of the Marion Rural Water District (RWD) #4 line to provide a permanent alternate water supply to affected residents.

Because of the limited exposure risk, the KDHE assigned the Canada site to long-term monitoring status under the State Water Plan. The site is presently classified under the Intergovernmental Agreement (IGA) between the USDA's Farm Service Agency (FSA) and the KDHE as a site that the FSA considers to require no further action on its part, but for which the KDHE has not yet made a determination.

This report presents an analysis of long-term monitoring results for 2001–2007 (KDHE 2007a) and results of prior site investigations. The analysis indicates that the former CCC/USDA grain storage facility in the southern portion of town is not the most plausible source of the carbon tetrachloride contamination at levels above the MCL. Rather, the analytical data and the associated groundwater flow direction data indicate that the private grain storage locations in the northern portion of town are the more likely source of the downgradient carbon tetrachloride contamination. The information presented here forms the technical justification for a request to reclassify the former CCC/USDA grain storage facility at Canada as a site requiring no further action under the IGA.

2 Background

2.1 Site Location and Description

Canada, Kansas, is a small, unincorporated rural community in Marion County, in central Kansas (Figure 2.1). Canada is located near U.S. Highway 56, approximately 5 mi east of Hillsboro (population 2,704) and 5 mi west of Marion (population 1,906). Wichita is about 40 mi to the south. Canada lies within Section 33, Township 19 South, Range 3 East, at approximate latitude 38°21'16" North and longitude 97°06'41" West (USGS 1985).

Canada has a population of approximately 24. The Canada facility of Cooperative Grain and Supply (CGS), Hillsboro, Kansas, currently occupies the co-op property in the central portion of the community and provides seasonal grain storage for area farmers (Figure 2.2). A spur of the Atchison, Topeka, and Santa Fe Railroad (now removed) was formerly located north of the co-op. The CCC/USDA formerly operated a grain storage facility on what is now the southern portion of the co-op property. Ten homes are adjacent to the co-op, to the east and west. A gasoline station and bait shop are west of the co-op.

Canada lies within the Cottonwood River drainage basin (Figure 2.1), approximately 1 mi west of the confluence of the North Cottonwood River (north of town) and the South Cottonwood River (south of town). An intermittent stream flows south-southeast through the town, discharging into the South Cottonwood River. No surface water targets were identified within the 15-mi downstream target distance limit (KDHE 1999a). Until the construction of Marion Lake, approximately 1 mi north of Canada, the town was within the 100-year floodplain of the river.

At Canada, screened intervals of domestic wells for which records are available (Appendix A) are in the range of 45–65 ft BGL (below ground level). One well (DW24 [Schroeder] Figure 2.2) is also screened in an upper zone at 25–35 ft BGL. Water is potentially produced from solution joints in the limestone units of the Permian Nolans Formation. The screened depths suggest that multiple water-bearing zones are present at Canada. A review of the geology of Marion County, Kansas, in the Canada area, is in Appendix B.

Evidence gathered from earlier interviews with local residents suggested a groundwater flow direction to the east-southeast (KDHE 1998). This flow direction is consistent with data

collected during the KDHE's long-term monitoring (2001-2007), as discussed in detail in Section 3.2. Topographic features in the area also support this interpretation. For example, a local flow direction to the southeast is consistent with the erosion by the South Cottonwood River of Permian rocks 1.25 mi southeast of Canada. Downcutting by the river extends to about 40–50 ft below the typical elevation of the ground surface at Canada. Another factor contributing to the southeasterly groundwater flow direction would be potential mounding of groundwater 1 mi north of Canada due to increased recharge from Marion Lake (Figure 2.1; Appendix B).

2.2 Grain Storage Operations and Property History

Grain storage operations at Canada have changed considerably since the CCC/USDA facility was in operation, in 1954 to 1974 (Figures 2.3, 2.4, and 2.5). Harry Helmer of Hillsboro, Kansas, purchased the CCC/USDA bins in 1974 and removed them to begin a private grain storage business elsewhere (FSA 1997). Subsequently, the co-op expanded southward and installed the storage structures now located on the former CCC/USDA property. Other co-op grain storage structures (now removed) were north of the former CCC/USDA facility. Understanding grain storage operations at Canada before and after the CCC/USDA's period of operation (1954-1974) is critical to evaluating the potential source areas for the carbon tetrachloride contamination. The available leases for the former CCC/USDA property are reproduced in Appendix C.

In 1954, to supplement the co-op's available grain storage capacity to the north, the CCC/USDA leased approximately 1 acre of land in the southern portion of the town from Aaron Burkholder. The leased property included Lots 7–18 on Block 11 (Figure 2.2; Figure C.1 in Appendix C). Fifteen circular steel bins with cement floors were erected (Figure 2.3). Each bin had a storage capacity of 3,200 bushels, for a total storage capacity of 48,000 bushels. This initial 1954 CCC/USDA lease of the property was for a period of ten years. In 1964 the lease was extended until 1974 (Figure C.2 in Appendix C).

In 1965, early in the second lease period, Burkholder sold the leased property on which the CCC/USDA was operating its facility to Canada Grain Company of Marion, Kansas (Figure C.3 in Appendix C). In the absence of a lease termination agreement (which has not been found), the CCC/USDA is assumed to have continued its operation on the leased property until 1974, when Harry Helmer purchased and removed the CCC/USDA bins.

With its 1965 purchase from Burkholder, the property owned by Canada Grain Company expanded to include the following (Figure 2.2):

- Block 3: Lots 1–6
- Block 4: Lots 1–6
- Block 6: Lots 1–2, Lots 7–12, the western half of Lots 13–15, Lots 16–18
- Block 11: Lots 7–18 (the former CCC/USDA facility)

Except for the eastern half of Lots 13–15 on Block 6, occupied by the Mueller residence garage, this land sale gave the Canada Grain Company title to the central portion of Canada, from Third Street north to the Atchison, Topeka, and Santa Fe Railroad spur. The capacity of the grain storage facility currently at this location is 416,811 bushels (CGS 2007).

Ownership of the grain storage operation changed several times in the years that followed. Ownership history for the property cited by the KDHE as part of its pre-CERCLIS site reconnaissance and evaluation (KDHE 1998) includes the following:

- Canada Grain — 1965–1977 (Figure C.3 in Appendix C)
- Cooperative Grain and Supply, Hillsboro — January 1977–May 1978 (Figure C.4 in Appendix C; property transferred included the former CCC/USDA facility)
- D&R Trucking/D&R Grain, Hillsboro — May 1978–October 1978 (Figure C.5 in Appendix C)
- Countryside Grain — October 1978–September 1985 (Figure C.5 in Appendix C)
- Daniel P. Janzen/Janzen Farm Service — September 1985–January 1991 (Figure C.6 in Appendix C)

- Cooperative Grain and Supply, Hillsboro — 1991–present (Figure C.6 in Appendix C)

Aerial photos showing the changing grain storage structures over the decades are as follows:

- A 1956 aerial photo (Figure 2.3) shows the former CCC/USDA grain storage facility as consisting of 15 circular bins in the southern portion of town. Large storage structures of unknown use are visible on the co-op property, just north of the former CCC/USDA facility. Wooden grain elevators are visible in the northern portion of the co-op property, immediately south of the former railroad.
- A 1991 aerial photo (Figure 2.4) shows co-op structures on the former CCC/USDA property (which the CCC/USDA vacated in 1974). Changes are also evident in 1991 (Figure 2.4) on the central portion of the co-op property. Two large storage structures of unknown use appearing just north of the former CCC/USDA property in 1956 (peach highlights in Figure 2.4) are absent in 1991 (compare to gray highlights in Figure 2.4). One circular storage bin and one circular bin foundation are visible in the 1991 photo (gray highlights in Figure 2.4) on the co-op property, just north of the former CCC/USDA property. The foundation of a flat storage building is seen farther north. The door of the flat storage building appears to have been at the southern end of the building. The photographs in Figures 2.3 and 2.4 demonstrate that this flat storage building was installed after 1956 and removed before 1991.
- The 2002 aerial photograph (Figure 2.5) shows the current configuration of the grain storage operations at Canada. Most of the structures visible in the 1991 photograph (Figure 2.4) remain.

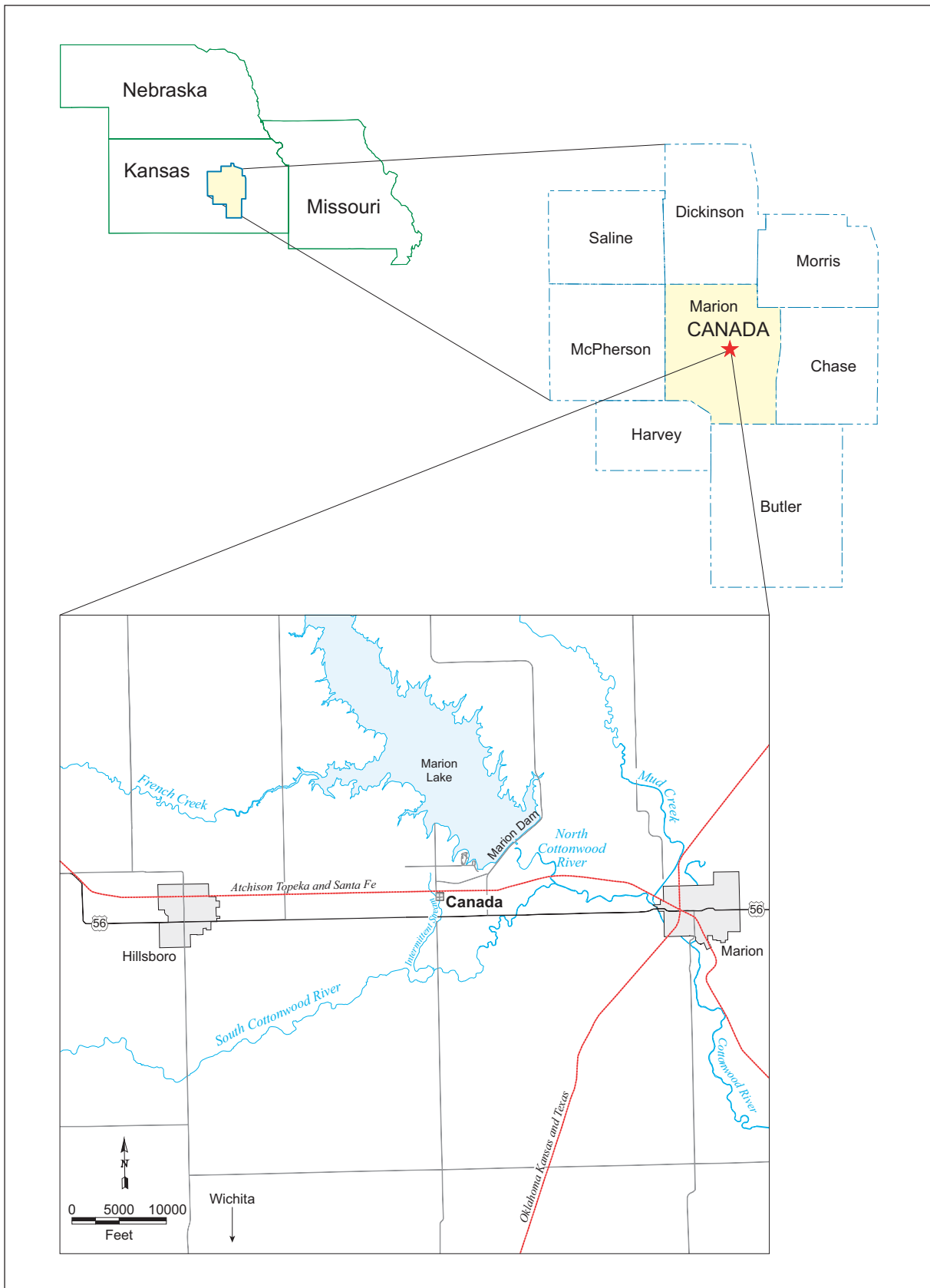


FIGURE 2.1 Location of Canada, Kansas.

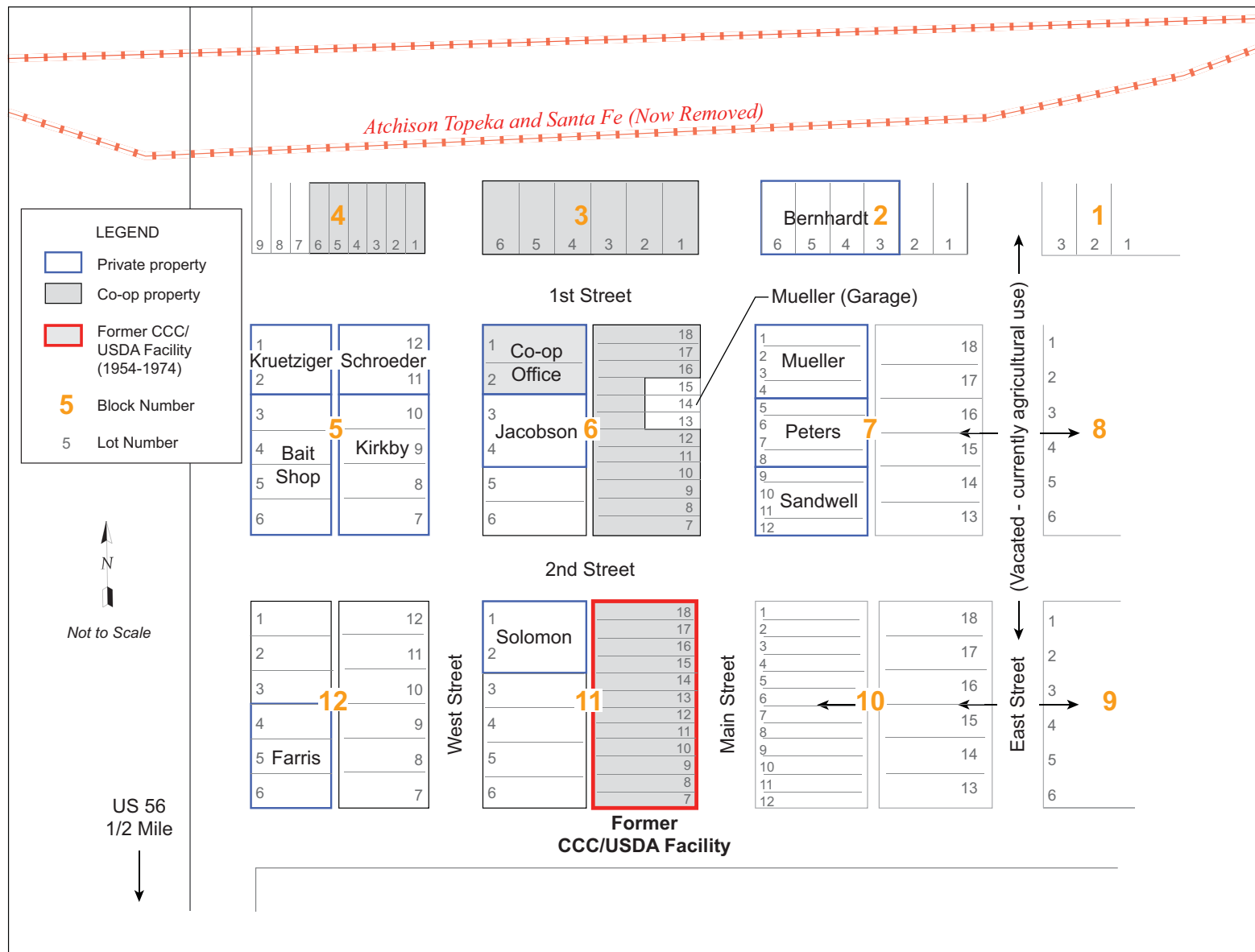


FIGURE 2.2 Plat of Canada, Kansas. Sources of data: State of Kansas (1883), KDHE (1998).

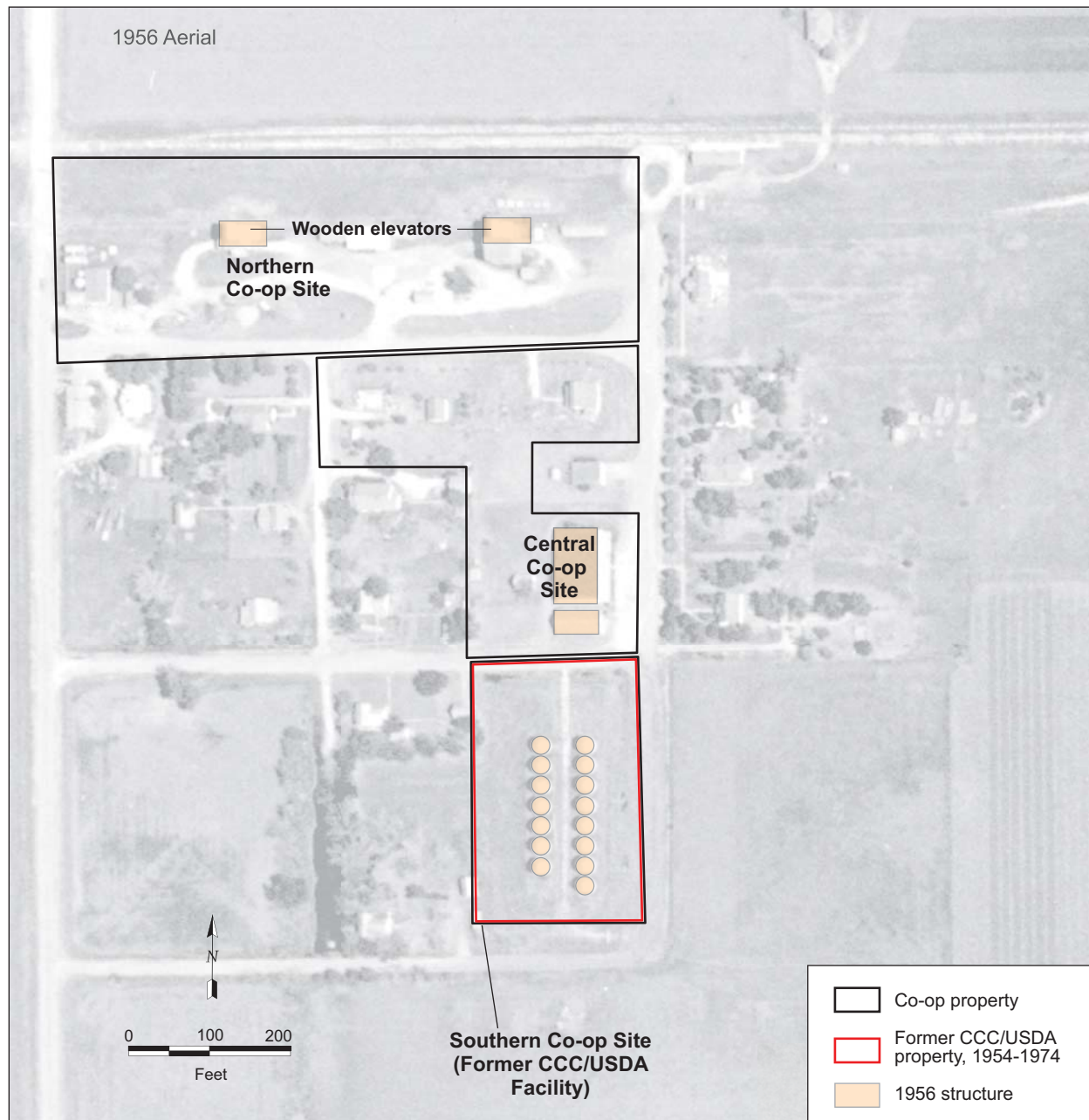


FIGURE 2.3 Grain storage structures at Canada in 1956, with property boundaries. Source of photograph: USDA (1956).

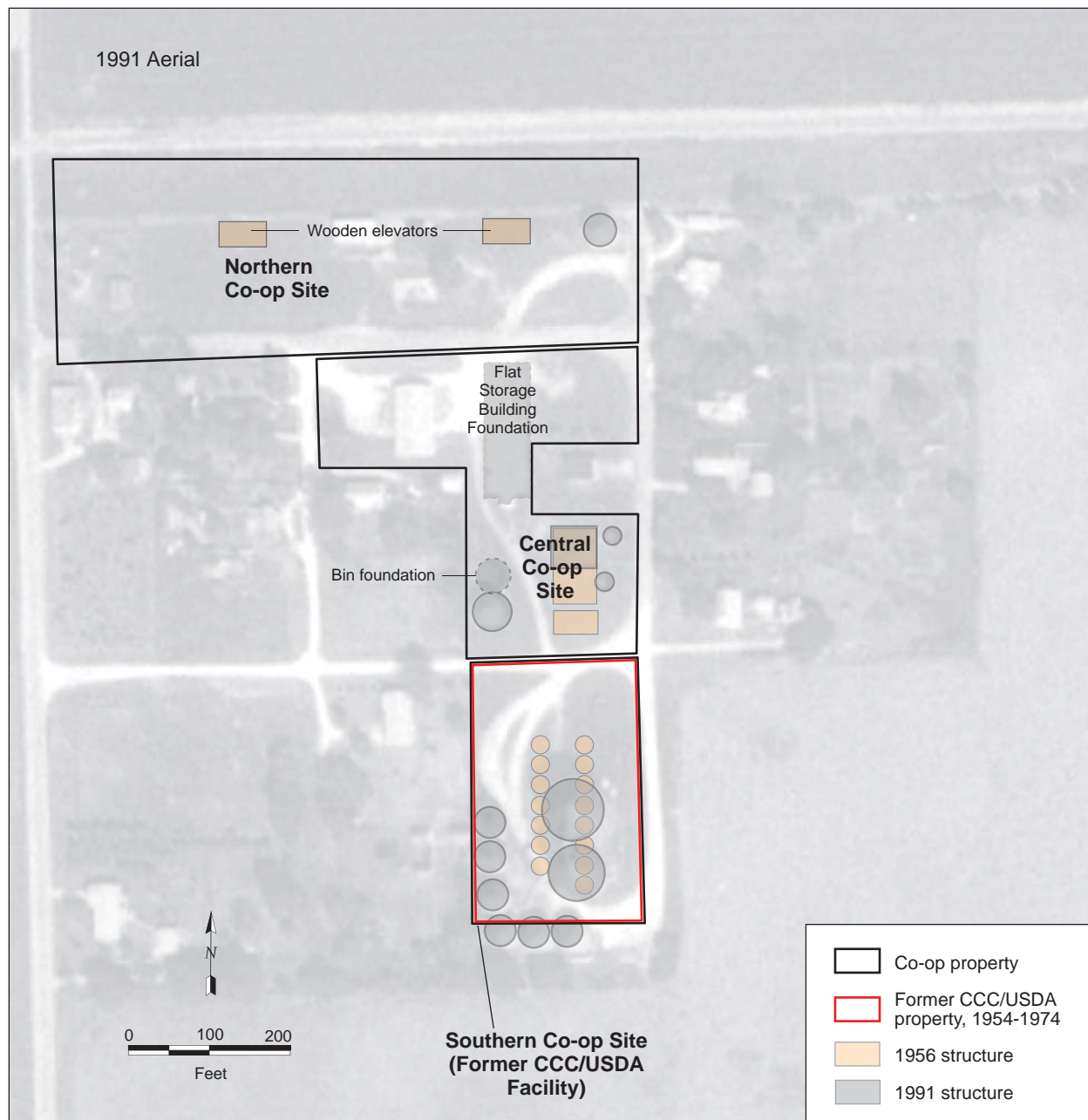


FIGURE 2.4 Grain storage structures at Canada in 1991, with locations of 1956 structures shown in Figure 2.3 and property boundaries. Source of photograph: USGS (1991).

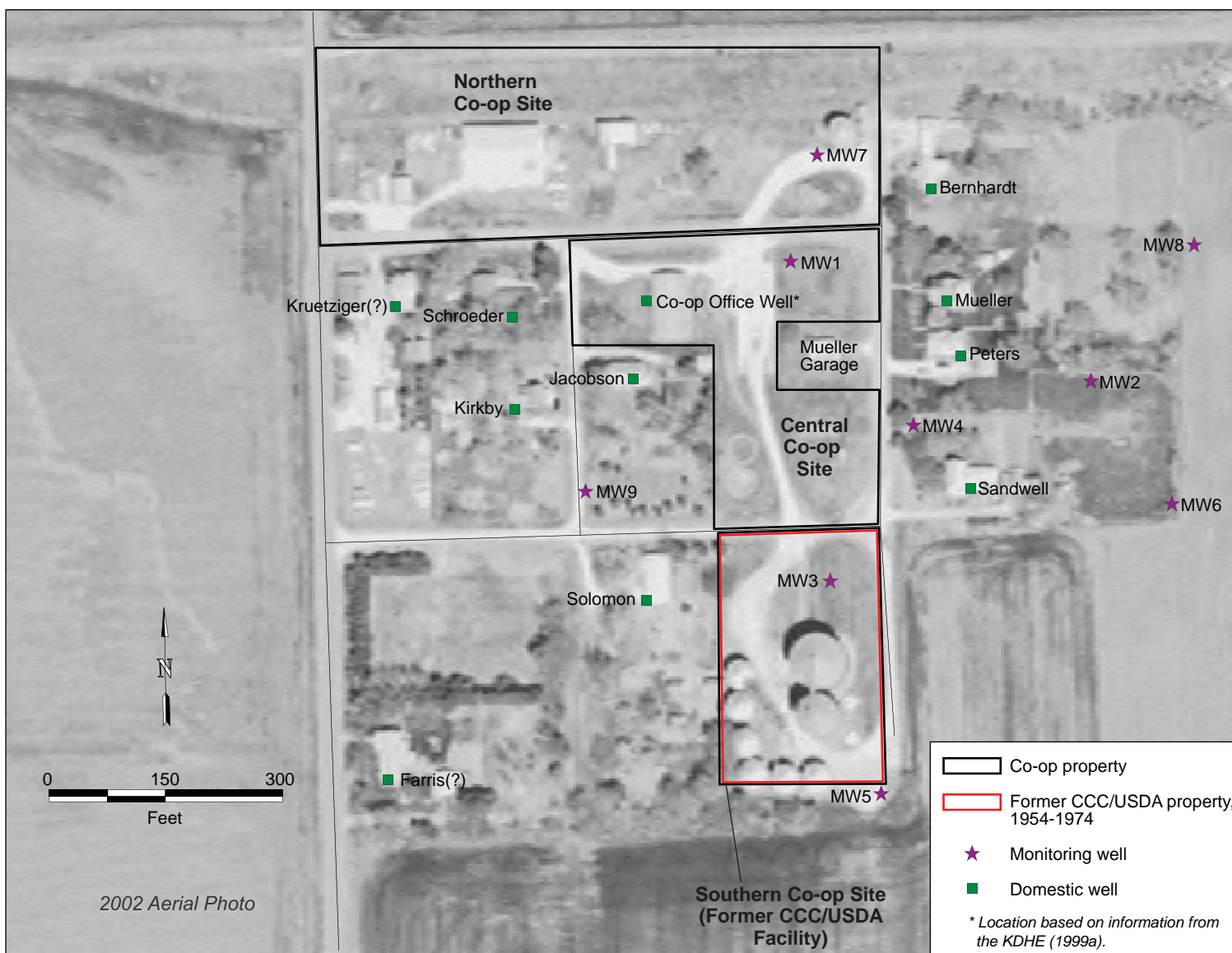


FIGURE 2.5 Current configuration of the Canada site. Source of photograph: USDA (2002).

3 Carbon Tetrachloride Contamination at Canada

3.1 Identification of Contamination and Removal Action

Carbon tetrachloride contamination was initially identified at Canada in October 1997 (KDHE 1997), in conjunction with the private well sampling program conducted by the KDHE at former CCC/USDA facilities. Contamination was detected in two of the four wells sampled (24.2 µg/L in the Mueller private well and 1.1 µg/L in the Cooperative Grain and Supply well; Table 3.1). In subsequent KDHE investigations, including a site reconnaissance and evaluation in 1997–1998 (KDHE 1998) and a preliminary assessment/screening site inspection in 1999 (KDHE 1999a), all private wells in Canada were sampled.

The Mueller well has continued to exhibit carbon tetrachloride at levels above the MCL of 5.0 µg/L. The Peters wells has also contained levels of carbon tetrachloride near and above the MCL. Both the Mueller and Peters wells are to the east of the co-op property. The results of the most recent sampling are in Figure 3.1.

In addition to the carbon tetrachloride contamination, pervasive nitrate contamination above the MCL of 10 mg/L has been present (Table 3.1). The nitrate contamination is not associated with activities of the CCC/USDA.

All residents of Canada formerly obtained their water from private wells. On the basis of the 1997–1999 KDHE results, the CCC/USDA instituted two removal actions to provide affected residents with alternate water supplies:

- The CCC/USDA provided a temporary alternate water supply of bottled water to the Mueller and Peters residences after the 1998 site reconnaissance and evaluation (KDHE 1999a). This action was in response to the detection of carbon tetrachloride in these residences' wells at concentrations above the MCL of 5.0 µg/L for drinking water.
- The Marion RWD #4 line was extended into Canada as a permanent whole-house alternate water supply in April 1999. The CCC/USDA provided funding to connect the Mueller residence to the RWD supply line (Shewey

1999). Mr. Peters elected to pay for the connection of his residence to the RWD water supply line.

The KDHE concluded in its preliminary removal site evaluation (KDHE 1999b) that no further removal site evaluation, removal response, or removal action in Canada was warranted, in view of the provision of the permanent alternate water supply.

3.2 Contaminant History and Previous Investigations

In 1999, the KDHE (1999a,c) conducted soil sampling to identify the source of the carbon tetrachloride contamination at Canada. Figure 3.2 shows the soil sample locations, plotted by using (x, y) measurements reported by the KDHE (1999a).

Samples collected at four of seven locations north of the former CCC/USDA bins contained carbon tetrachloride at 0.2 µg/kg (at location SP7), 0.3 µg/kg (at SP4 and SP8), and 0.9 µg/kg (at SP12) (Figure 3.2). Carbon tetrachloride was not detected at SP3, SP9, and SP10, also north of the former CCC/USDA bins. In contrast, carbon tetrachloride was found in only one of five soil samples collected between and adjacent to the former CCC/USDA bins (0.2 µg/kg at SP6); the contaminant was not detected in samples from locations SP1, SP2, SP5, and SP11, in this same area. This finding is significant, because contamination resulting from CCC/USDA activities would be most likely in the doorways and around foundations of CCC/USDA bins. Contamination elsewhere on the former CCC/USDA property could have resulted from either CCC/USDA or co-op activities. The co-op has occupied the property since at least 1974.

During a comprehensive investigation completed in 2001 (KDHE 2001), the KDHE installed nine monitoring wells. Since that time, the KDHE has conducted long-term monitoring of these wells and four private wells. A chronological summary of the analytical results for groundwater sampling at Canada is in Table 3.1. The carbon tetrachloride results for the KDHE's 2007 monitoring are displayed in Figure 3.1.

The KDHE's long-term water level measurements (Table 3.2) and reported survey coordinates (Table 3.3) were used to generate the maps of groundwater flow direction in

Figures 3.3–3.6. These figures indicate a consistent groundwater flow direction to the east or east-southeast during the 2001–2007 monitoring, though the water levels have fluctuated.

Table 3.4 shows the historical analytical results for carbon tetrachloride in individual wells. Carbon tetrachloride levels in the Mueller and Peters private wells have generally declined since 1997 (from 24.2 µg/L to 9.0 µg/L [2007] in the Mueller well and from 12.7 µg/L to 2.8 µg/L [2005] in the Peters well). In contrast, the absence of a declining trend in contaminant levels in MW2 (with values of 10.0–22.0 µg/L; Table 3.4) in 2001–2007 suggests an ongoing source in the vicinity of the co-op's former flat storage building, upgradient from this well (Figure 3.3). For comparison, the level of carbon tetrachloride in MW3, at the north end of the former CCC/USDA facility (east-southeast of the two circular co-op storage structures visible on the 1991 aerial photo in Figure 3.3) has varied between 0.63 µg/L and 2.9 µg/L in 2001–2007.

The fumigant compounds 1,2-dichloroethane, ethylene dibromide, and tetrachloroethylene have been detected at trace concentrations (Table 3.4) at monitoring locations MW4 (downgradient from the co-op's former flat storage building) and MW7 (downgradient from the former wooden elevators at the north end of the co-op property). These compounds have not been detected in monitoring wells MW3 and MW5, located on and downgradient from the former CCC/USDA property, respectively.

Fuel-related compounds (benzene, 1,1-dichloroethane [DCA], ethylbenzene, methyl *tert*-butyl ether [MTBE], *sec*-butylbenzene, trimethylbenzene, xylene) were identified at low concentrations in the Sandwell private well in 1998 and in monitoring wells MW1, MW4, and MW8 in 2003 and 2005 (Table 3.4). These wells lie east (downgradient) of the co-op (Figure 2.5). A documented release of diesel fuel occurred on May 28, 1991, on the northeast corner of the co-op (at that time the Janzen Farm Service), when a ten-year-old, 9,000-gal underground storage tank was being removed. A slight odor of diesel fuel was evident on a lower sidewall of the tank excavation, but no staining was observed. Contaminated soil was removed for aeration (KDHE 2007b).

The KDHE noted in an internal memorandum that the fuel-related compounds discussed above, plus ethylene dibromide [EDB], had been found in wells downgradient from the co-op. The memorandum (KDHE 2004) stated the following: "Benzene, DCA, *sec*-butylbenzene, MTBE, and EDB are contaminants associated with gasoline releases. EDB is also used as a grain fumigant. A closed [leaking underground storage tank] site is located within the subject area

[where long-term monitoring is being conducted] and EDB was detected downgradient of current and former grain storage locations; however, reported impacts associated with these contaminants appear to be highly localized, do not affect private wells, and do not exceed MCLs.” The 2003 results for ethylene dibromide to which the KDHE memorandum referred are in Table 3.4. None of the compounds mentioned have been detected in monitoring wells MW3 and MW5, located on and downgradient from the former CCC/USDA property, respectively.

TABLE 3.1 Chronological history of groundwater sampling and analysis at Canada.^a

Date	Location	Concentration (µg/L)				Nitrate Concentration (mg/L)	Other VOCs ^b
		Carbon Tetra- chloride	Chloro- form	1,2-Dichloro- ethane	Ethylene Dibromide		
10/21/97	Carr	< 0.5	< 0.5	< 0.5	< 0.01	NA ^c	
	Co-op	1.1	< 0.5	< 0.5	< 0.01	NA	
	Mueller	24.2	4.7	< 0.5	< 0.01	NA	
	Schroeder	< 0.5	< 0.5	< 0.5	< 0.01	NA	
11/14/97	Bernhardt	2.5	0.7	< 0.5	< 0.01	NA	
	Mueller	21.8	3.9	< 0.5	< 0.01	NA	
12/03/97	Farris	< 0.5	< 0.5	< 0.5	< 0.01	14.26	
	Jacobson	< 0.5	< 0.5	< 0.5	< 0.01	11.48	
	Kirby	< 0.5	< 0.5	< 0.5	< 0.01	12.42	
	Peters	12.7	8.2	0.5	< 0.01	66.8	
	Sandwell	1.7	< 0.5	< 0.5	< 0.01	15.79	
	Solomon	< 0.5	< 0.5	< 0.5	< 0.01	13.01	
04/21/98	Sandwell	2.0	0.6	< 0.5	< 0.01	NA	A
02/08/99	Bernhardt	< 0.5	< 0.5	< 0.5	< 0.01	19.1	
	Mueller	10.7	1.4	< 0.5	< 0.01	29.38	
	Peters	14.0	7.0	< 0.5	< 0.01	52.13	
01/05/01	MW1	< 1.0	< 1.0	< 1.0	< 1.0	NS ^d	
	MW2	10.0	3.8	< 1.0	< 1.0	NS	
	MW3	1.6	< 1.0	< 1.0	< 1.0	NS	
03/20/01	MW1	2.6	< 1.0	< 1.0	< 1.0	NS	
	MW2	22.0	6.4	< 1.0	< 1.0	NS	
	MW3	1.4	< 1.0	< 1.0	< 1.0	NS	
10/25/01	MW1	< 1.2	< 0.5	< 0.5	< 0.5	NS	
	MW2	15.0	5.1	< 0.5	< 0.5	NS	
	MW3	1.9	< 0.5	< 0.5	< 0.5	NS	
	MW4	3.8	1.9	0.57	< 0.5	NS	
	MW5	1.3	< 0.5	< 0.5	< 0.5	NS	
	MW6	4.3	0.63	< 0.5	< 0.5	NS	
	MW7	8.1	1.7	0.58	< 0.5	NS	
	MW8	7.0	1.7	< 0.5	< 0.5	NS	
	MW9	< 1.2	< 0.5	< 0.5	< 0.5	NS	
12/12/02	MW1	< 0.5	NR ^e	NR	NR	NS	
	MW2	21.0	NR	NR	NR	NS	
	MW3	2.9	NR	NR	NR	NS	
	MW4	7.6	NR	NR	NR	NS	
	MW5	NS	NS	NS	NS	NS	
	MW6	4.0	NR	NR	NR	NS	
	MW7	8.2	NR	NR	NR	NS	
	MW8	8.3	NR	NR	NR	NS	
	MW9	NS	NS	NS	NS	NS	
	Mueller	11.0	NR	NR	NR	NS	
	Peters	4.3	NR	NR	NR	NS	

TABLE 3.1 (Cont.)

Date	Location	Concentration (µg/L)				Nitrate Concentration (mg/L)	Other VOCs ^b
		Carbon Tetra- chloride	Chloro- form	1,2-Dichloro- ethane	Ethylene Dibromide		
12/29/03	MW1	< 0.5	< 0.5	< 0.5	< 0.01	NS	B
	MW2	15.0	5.5	< 0.5	< 0.01	NS	C
	MW3	1.9	< 0.5	< 0.5	< 0.01	NS	
	MW4	4.4	4.3	2.2	< 0.01	NS	D
	MW5	1.3	< 0.5	< 0.5	< 0.01	NS	
	MW6	3.7	< 0.5	< 0.5	< 0.01	NS	E
	MW7	8.0	1.4	< 0.5	0.022	NS	F
	MW8	6.9	1.5	< 0.5	< 0.01	NS	G
	MW9	NS	NS	NS	NS	NS	
	Bernhardt	2.0	< 0.5	< 0.5	< 0.01	12.0	H
	Mueller	10.0	1.0	< 0.5	< 0.01	19.0	
	Peters	4.7	0.84	< 0.5	< 0.01	20.0	
	Sandwell	1.1	< 0.5	< 0.5	< 0.01	16.0	
12/02/05	MW1	1.0	< 0.5	< 0.5	< 0.01	NS	
	MW2	13.0	4.4	< 0.5	< 0.01	NS	
	MW3	0.63	< 0.5	< 0.5	< 0.01	NS	
	MW4	5.6	2.0	1.4	< 0.01	NS	I
	MW5	NS	NS	NS	NS	NS	
	MW6	2.1	< 0.5	< 0.5	< 0.01	NS	
	MW7	4.0	0.92	< 0.5	0.022	NS	
	MW8	4.4	1.4	< 0.5	< 0.01	NS	J
	MW9	NS	NS	NS	NS	NS	
	Bernhardt	NS	NS	NS	NS	NS	
	Mueller	16.0	3.2	< 0.5	< 0.01	28	
	Peters	2.8	1.0	< 0.5	< 0.01	22.0	
	Sandwell	1.9	0.57	< 0.5	< 0.01	13.0	
02/20/07	MW1	< 0.5	< 0.5	< 0.5	< 0.01	NS	
	MW2	18	6.4	0.62	< 0.01	NS	
	MW3	1.1	< 0.5	< 0.5	< 0.01	NS	
	MW4	2.8	1.1	1.6	< 0.01	NS	
	MW5	NS	NS	NS	NS	NS	
	MW6	4.7	0.62	< 0.5	< 0.01	NS	
	MW7	6.2	1.0	< 0.5	< 0.01	NS	
	MW8	6.3	1.5	< 0.5	< 0.01	NS	
	MW9	NS	NS	NS	NS	NS	
	Bernhardt	2.1	0.71	< 0.5	< 0.01	12	K
	Mueller	9.0	1.9	< 0.5	< 0.01	20	
	Peters	NS	NS	NS	NS	NS	
	Sandwell	0.6	< 0.5	< 0.5	< 0.01	16	

TABLE 3.1 (Cont.)

^a Results are from off-site laboratories. Sources of data: Dallen 1998, 1999; KDHE 1997, 1998, 1999a, 2001, 2004, 2006, 2007a.

^b Codes for other volatile organic compounds (concentrations in µg/L):

A: 04/21/98, Sandwell: ethylbenzene = 1.0; xylene = 3.9; 1,3,5-trimethylbenzene = 0.5;
1,2,4-trimethylbenzene = 0.7.

B: 12/29/03, MW1: chloromethane = 12; sec-butylbenzene = 8.3; methyl *tert*-butyl ether = 6.4.

C: 12/29/03, MW2: chloromethane = 5.8; 1,1-dichloroethane = 0.75.

D: 12/29/03, MW4: benzene = 1.7; tetrachloroethylene = 0.57; chloromethane = 4.3.

E: 12/29/03, MW6: chloromethane = 1.6.

F: 12/29/03, MW7: chloromethane = 14.

G: 12/29/03, MW8: chloromethane = 7.5.

H: 12/29/03, Bernhardt: chloromethane = 0.72.

I: 12/02/05, MW4: benzene = 0.51.

J: 12/02/05, MW8: 1,1-dichloroethane = 0.52.

K: 02/20/07, Bernhardt: chloromethane = 0.71.

^c NA, not analyzed for this constituent.

^d NS, monitoring location not sampled for this constituent in this event.

^e NR, result not reported in the investigation reports on file.

TABLE 3.2 Water Level data for the Canada site. Source of data: KDHE (2001, 2004, 2006, 2007a).

Well	Top of Casing Elevation (ft AMSL)	Water Surface Depth or Elevation in Year Indicated							
		2007		2005		2003		2001	
		Depth (ft BGL)	Elevation (ft AMSL)	Depth (ft BGL)	Elevation (ft AMSL)	Depth (ft BGL)	Elevation (ft AMSL)	Depth (ft BGL)	Elevation (ft AMSL)
MW1	1363.05	20.85	1342.2	15.34	1347.71	17.71	1345.34	17.10	1345.95
MW2	1361.55	19.71	1341.84	14.74	1346.81	16.84	1344.71	16.18	1345.37
MW3	1360.33	18.13	1342.2	12.14	1348.19	15.04	1345.29	14.31	1346.02
MW4	1362.44	20.45	1341.99	15.28	1347.16	17.55	1344.89	16.88	1345.56
MW5	1360.65	NS ^a	NS	NS ^a		15.33	1345.32	14.65	1346.00
MW6	1360.32	18.5	1341.82	13.65	1346.67	15.65	1344.67	15.00	1345.32
MW7	1364.54	21.55	1342.99	16.36	1348.18	18.44	1346.10	17.87	1346.67
MW8	1361.01	19.2	1341.81	14.30	1346.71	16.36	1344.65	15.67	1345.34
MW9	1358.01	NS	NS	NS		NS		11.00	1347.01

^a NS, not sampled.

TABLE 3.3 Survey data for the Canada site. Source of data: KDHE (2001).

Location	North ^a	West ^a	Latitude ^b	Longitude ^b
MW1	2348.84	4707.25	38-21-17	97-06-42
MW2	2235.35	4306.89	38-21-15	97-06-38
MW3	1953.59	4665.80	38-21-12	97-06-41
MW4	2174.83	4575.79	38-21-15	97-06-39
MW5	1659.27	4601.71	38-21-10	97-06-39
MW6	2035.95	4239.72	38-21-14	97-06-36
MW7	2509.07	4672.34	38-21-18	97-06-41
MW8	2400.49	4207.03	38-21-16	97-06-36
MW9	2059.19	4971.87	38-21-15	97-06-44

^a The Canada site is located in Section 33, Township 19 South, Range 3 East of the Sixth Principal Meridian, Marion County, Kansas. The southeast corner of Section 33 was assigned coordinates of 00.00 North and 00.00 West.

^b Latitude and longitude were scaled from a 7.5-minute quadrangle map (USGS 1985).

TABLE 3.4 Historical results of groundwater sampling and analysis for individual wells at Canada.^a

Location	Date	Concentration (µg/L)				Nitrate Concentration (mg/L)	Other VOCs ^b
		Carbon Tetra- chloride	Chloro- form	1,2-Dichloro- ethane	Ethylene Dibromide		
Bernhardt	11/14/97	2.5	0.7	< 0.5	< 0.01	NA ^c	
	02/08/99	< 0.5	< 0.5	< 0.5	< 0.01	19.1	
	12/29/03	2.0	< 0.5	< 0.5	< 0.01	12.0	A
	12/02/05	NS ^d	NS	NS	NS	NS	
	02/20/07	2.1	0.71	< 0.5	< 0.01	12	B
Carr	10/21/97	< 0.5	< 0.5	< 0.5	< 0.01	NA	
Co-op	10/21/97	1.1	< 0.5	< 0.5	< 0.01	NA	
Farris	12/03/97	< 0.5	< 0.5	< 0.5	< 0.01	14.26	
Jacobson	12/03/97	< 0.5	< 0.5	< 0.5	< 0.01	11.48	
Kirby	12/03/97	< 0.5	< 0.5	< 0.5	< 0.01	12.42	
Mueller	10/21/97	24.2	4.7	< 0.5	< 0.01	NA	
	11/14/97	21.8	3.9	< 0.5	< 0.01	NA	
	02/08/99	10.7	1.4	< 0.5	< 0.01	29.38	
	12/12/02	11.0	NR ^e	NR	NR	NS	
	12/29/03	10.0	1.0	< 0.5	< 0.01	19.0	
	12/02/05	16.0	3.2	< 0.5	< 0.01	28	
	02/20/07	9.0	1.9	< 0.5	< 0.01	20	
Peters	12/03/97	12.7	8.2	0.5	< 0.01	66.8	
	02/08/99	14.0	7.0	< 0.5	< 0.01	52.13	
	12/12/02	4.3	NR	NR	NR	NS	
	12/29/03	4.7	0.84	< 0.5	< 0.01	20.0	
	12/02/05	2.8	1.0	< 0.5	< 0.01	22.0	
	02/20/07	NS	NS	NS	NS	NS	
Sandwell	12/03/97	1.7	< 0.5	< 0.5	< 0.01	15.79	
	04/21/98	2.0	0.6	< 0.5	< 0.01	NA	C
	12/29/03	1.1	< 0.5	< 0.5	< 0.01	16.0	
	12/02/05	1.9	0.57	< 0.5	< 0.01	13.0	
	02/20/07	0.6	< 0.5	< 0.5	< 0.01	16	
Schroeder	10/21/97	< 0.5	< 0.5	< 0.5	< 0.01	NA	
Solomon	12/03/97	< 0.5	< 0.5	< 0.5	< 0.01	13.01	
MW1	01/05/01	< 1.0	< 1.0	< 1.0	< 1.0	NS	
	03/20/01	2.6	< 1.0	< 1.0	< 1.0	NS	
	10/25/01	< 1.2	< 0.5	< 0.5	< 0.5	NS	
	12/12/02	< 0.5	NR	NR	NR	NS	
	12/29/03	< 0.5	< 0.5	< 0.5	< 0.01	NS	D
	12/02/05	1.0	< 0.5	< 0.5	< 0.01	NS	
	02/20/07	< 0.5	< 0.5	< 0.5	< 0.01	NS	

TABLE 3.4 (Cont.)

Location	Date	Concentration (µg/L)				Nitrate Concentration (mg/L)	Other VOCs ^b
		Carbon Tetra- chloride	Chloro- form	1,2-Dichloro- ethane	Ethylene Dibromide		
MW2	01/05/01	10.0	3.8	< 1.0	< 1.0	NS	E
	03/20/01	22.0	6.4	< 1.0	< 1.0	NS	
	10/25/01	15.0	5.1	< 0.5	< 0.5	NS	
	12/12/02	21.0	NR	NR	NR	NS	
	12/29/03	15.0	5.5	< 0.5	< 0.01	NS	
	12/02/05	13.0	4.4	< 0.5	< 0.01	NS	
	02/20/07	18.0	6.4	0.62	< 0.01	NS	
MW3	01/05/01	1.6	< 1.0	< 1.0	< 1.0	NS	
	03/20/01	1.4	< 1.0	< 1.0	< 1.0	NS	
	10/25/01	1.9	< 0.5	< 0.5	< 0.5	NS	
	12/12/02	2.9	NR	NR	NR	NS	
	12/29/03	1.9	< 0.5	< 0.5	< 0.01	NS	
	12/02/05	0.63	< 0.5	< 0.5	< 0.01	NS	
	02/20/07	1.1	< 0.5	< 0.5	< 0.01	NS	
MW4	10/25/01	3.8	1.9	0.57	< 0.5	NS	F G
	12/12/02	7.6	NR	NR	NR	NS	
	12/29/03	4.4	4.3	2.2	< 0.01	NS	
	12/02/05	5.6	2.0	1.4	< 0.01	NS	
	02/20/07	2.8	1.1	1.6	< 0.01	NS	
MW5	10/25/01	1.3	< 0.5	< 0.5	< 0.5	NS	
	12/12/02	NS	NS	NS	NS	NS	
	12/29/03	1.3	< 0.5	< 0.5	< 0.01	NS	
	12/02/05	NS	NS	NS	NS	NS	
	02/20/07	NS	NS	NS	NS	NS	
MW6	10/25/01	4.3	0.63	< 0.5	< 0.5	NS	H
	12/12/02	4.0	NR	NR	NR	NS	
	12/29/03	3.7	< 0.5	< 0.5	< 0.01	NS	
	12/02/05	2.1	< 0.5	< 0.5	< 0.01	NS	
	02/20/07	4.7	0.62	< 0.5	< 0.01	NS	
MW7	10/25/01	8.1	1.7	0.58	< 0.5	NS	I
	12/12/02	8.2	NR	NR	NR	NS	
	12/29/03	8.0	1.4	< 0.5	0.022	NS	
	12/02/05	4.0	0.92	< 0.5	0.022	NS	
	02/20/07	6.2	1.0	< 0.5	< 0.01	NS	
MW8	10/25/01	7.0	1.7	< 0.5	< 0.5	NS	J K
	12/12/02	8.3	NR	NR	NR	NS	
	12/29/03	6.9	1.5	< 0.5	< 0.01	NS	
	12/02/05	4.4	1.4	< 0.5	< 0.01	NS	
	02/20/07	6.3	1.5	< 0.5	< 0.01	NS	
MW9	10/25/01	< 1.2	< 0.5	< 0.5	< 0.5	NS	
	12/12/02	NS	NS	NS	NS	NS	
	12/29/03	NS	NS	NS	NS	NS	
	12/02/05	NS	NS	NS	NS	NS	
	02/20/07	NS	NS	NS	NS	NS	

TABLE 3.4 (Cont.)

^a Results are from off-site laboratories. Sources of data: Dallen 1998, 1999; KDHE 1997, 1998, 1999a, 2001, 2004, 2006, 2007a.

^b Codes for other volatile organic compounds (concentrations in µg/L):

A: 12/29/03, Bernhardt: chloromethane = 0.72.

B: 02/20/07, Bernhardt: chloromethane = 0.71.

C: 04/21/98, Sandwell: ethylbenzene = 1.0; xylene = 3.9; 1,3,5-trimethylbenzene = 0.5;
1,2,4-trimethylbenzene = 0.7.

D: 12/29/03, MW1: chloromethane = 12; *sec*-butylbenzene = 8.3; methyl *tert*-butyl ether = 6.4.

E: 12/29/03, MW2: chloromethane = 5.8; 1,1-dichloroethane = 0.75.

F: 12/29/03, MW4: benzene = 1.7; tetrachloroethylene = 0.57; chloromethane = 4.3.

G: 12/02/05, MW4: benzene = 0.51.

H: 12/29/03, MW6: chloromethane = 1.6.

I: 12/29/03, MW7: chloromethane = 14.

J: 12/29/03, MW8: chloromethane = 7.5.

K: 12/02/05, MW8: 1,1-dichloroethane = 0.52.

^c NA, not analyzed for this constituent.

^d NS, monitoring location not sampled for this constituent in this event.

^e NR, result not reported in the investigation reports on file.

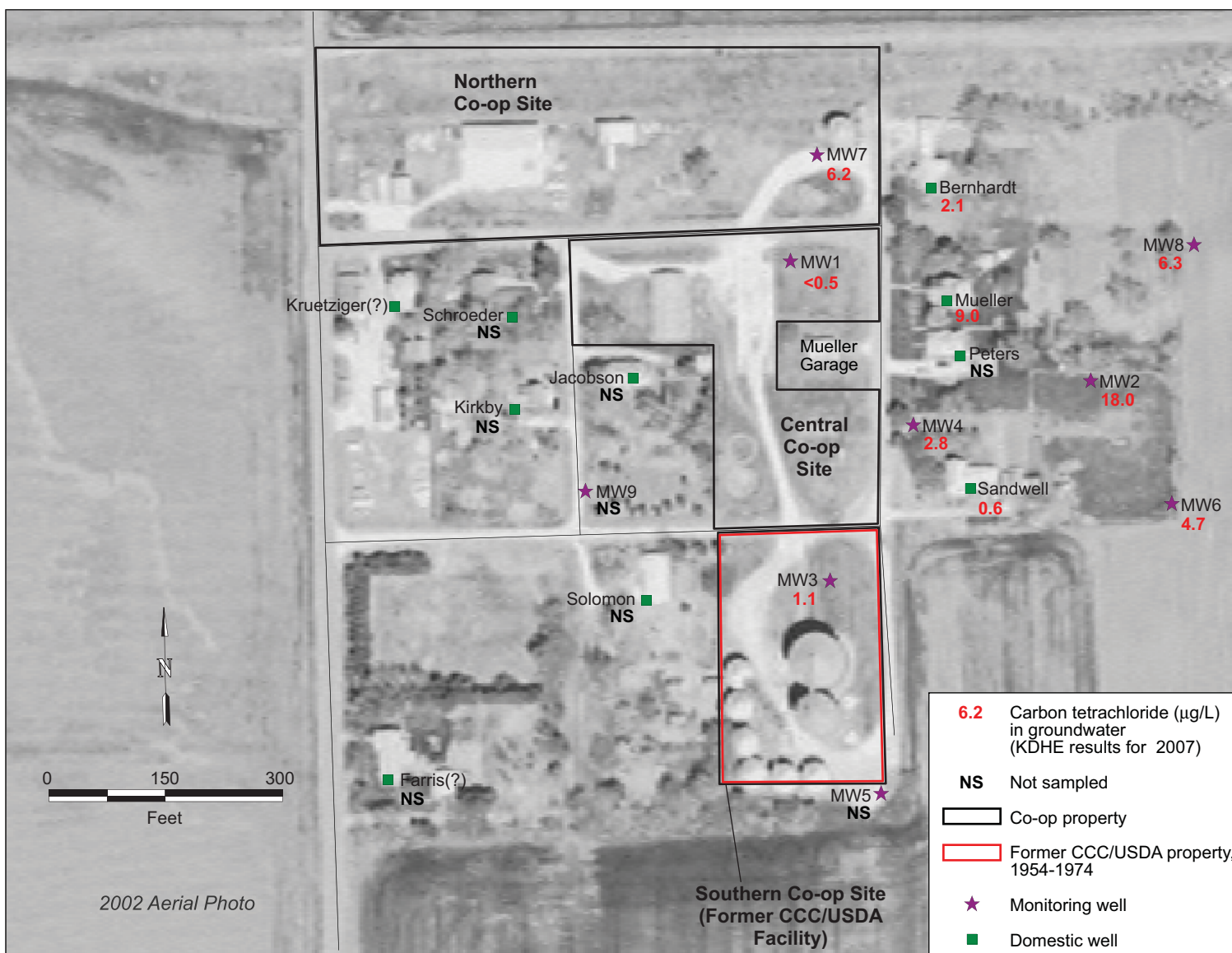


FIGURE 3.1 Analytical results for carbon tetrachloride in groundwater samples collected in 2007. Well locations are approximate. Source of data: KDHE (2007a). Source of photograph: USDA (2002).

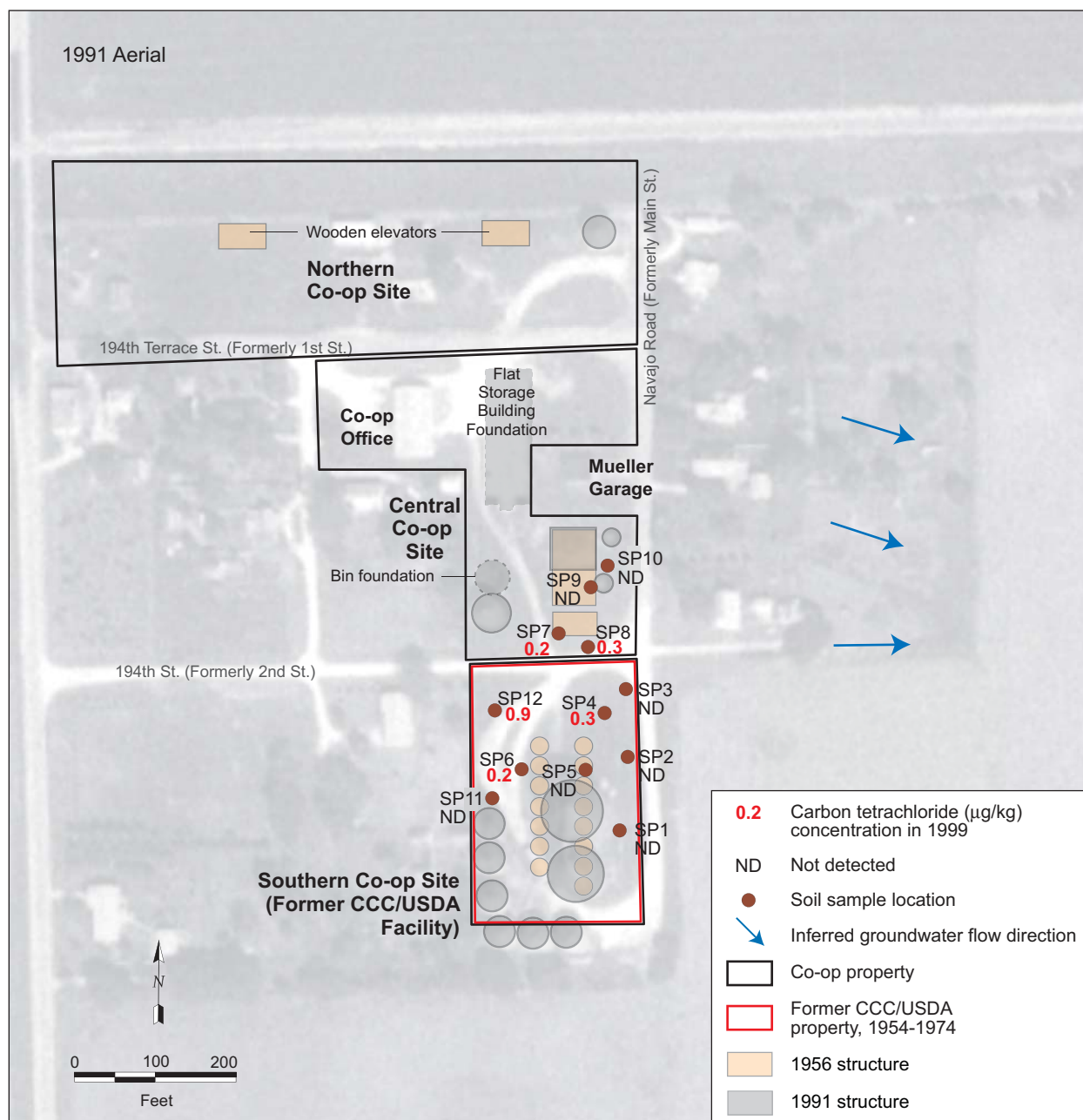


FIGURE 3.2 Analytical results for soil samples collected in November 1999. Source of data: KDHE (1999c). Source of photograph: USGS (1991).

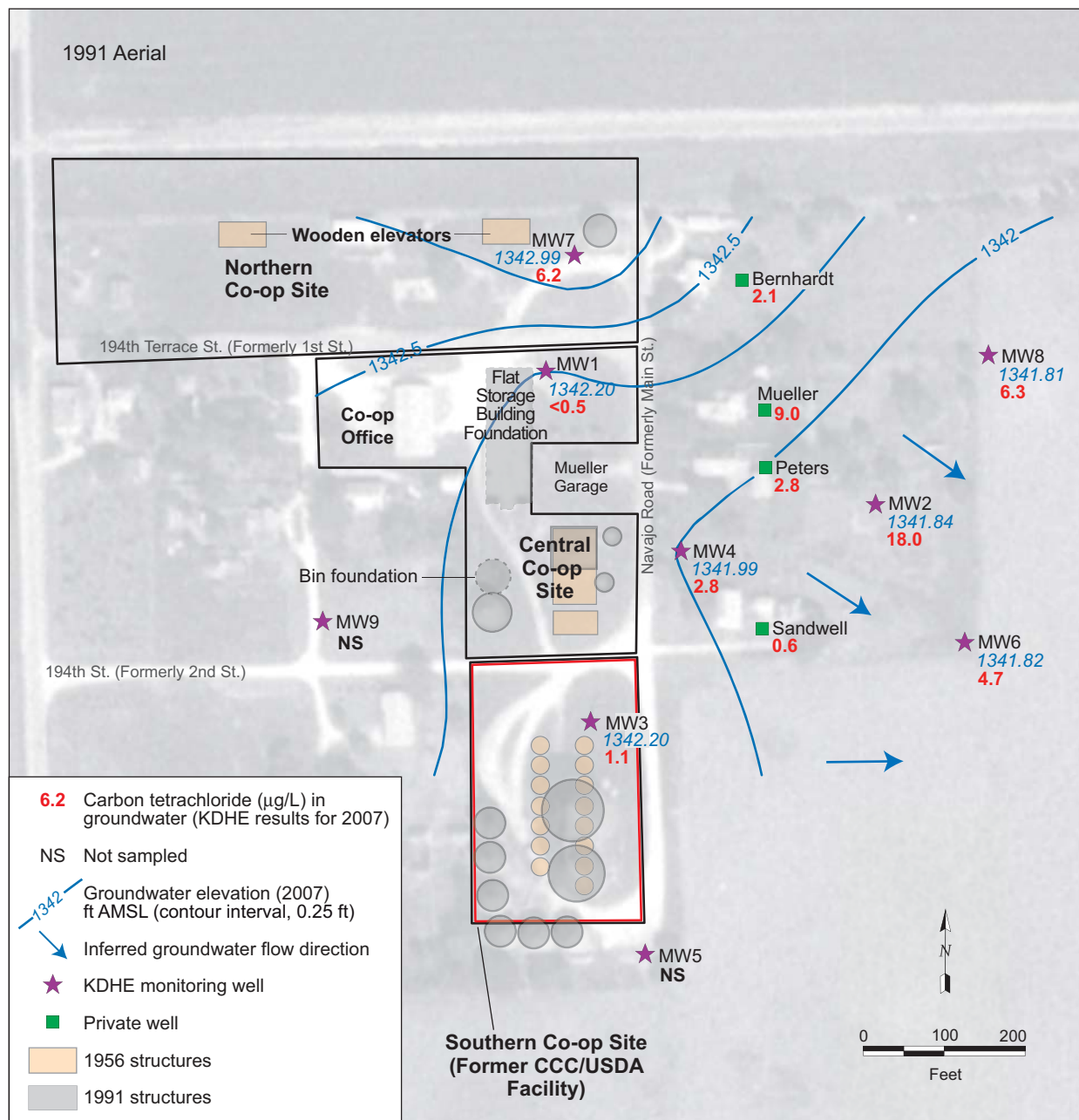


FIGURE 3.3 Structures at the Canada site, 2007 groundwater elevations with interpreted flow direction, and approximate locations of KDHE monitoring wells and private wells with 2007 monitoring results. Source of data: KDHE (2007a). Source of photograph: USGS (1991).

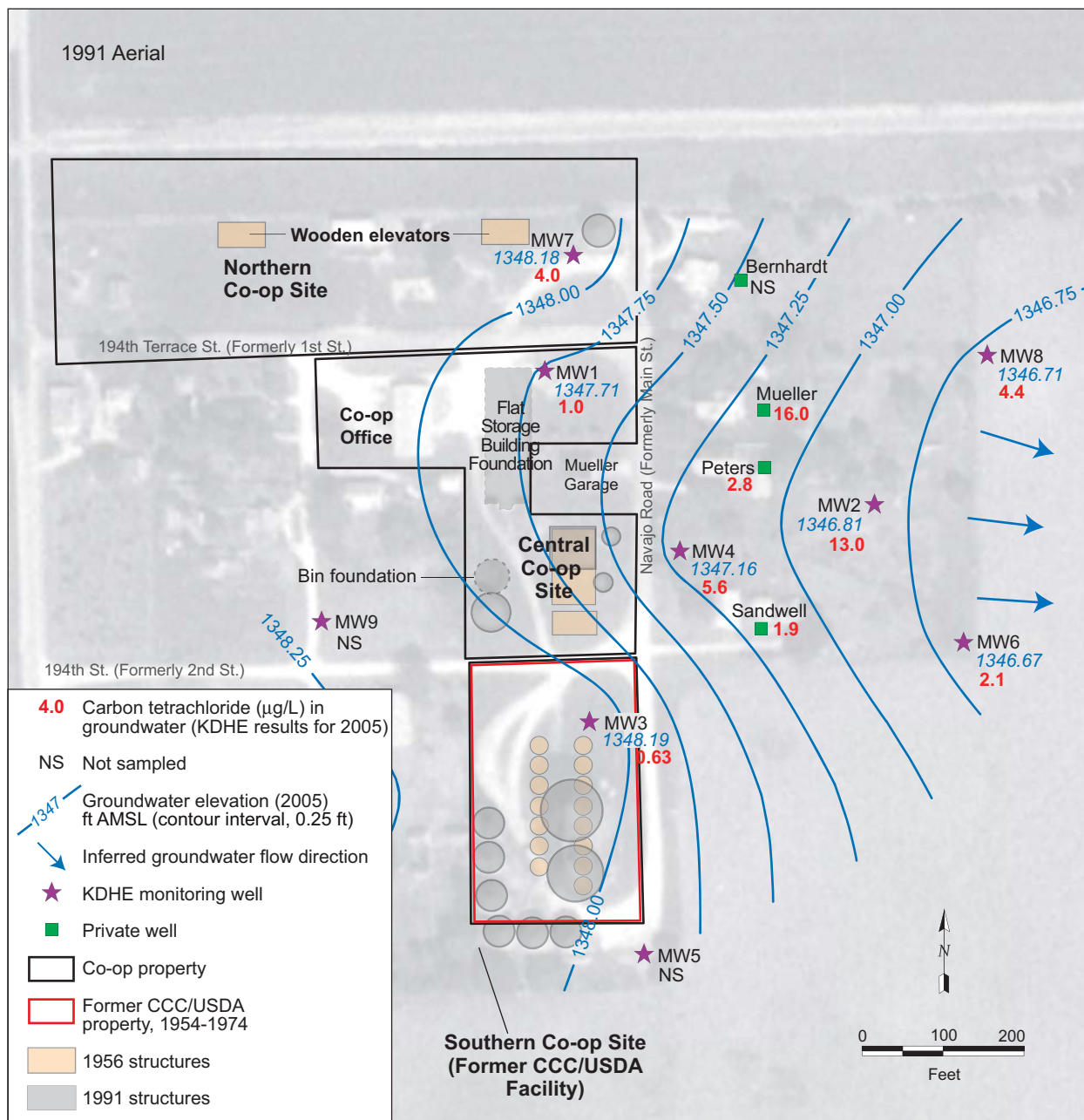


FIGURE 3.4 Structures at the Canada site, 2005 groundwater elevations with interpreted flow direction, and approximate locations of KDHE monitoring wells and private wells with 2005 monitoring results. Source of data: KDHE (2006). Source of photograph: USGS (1991).

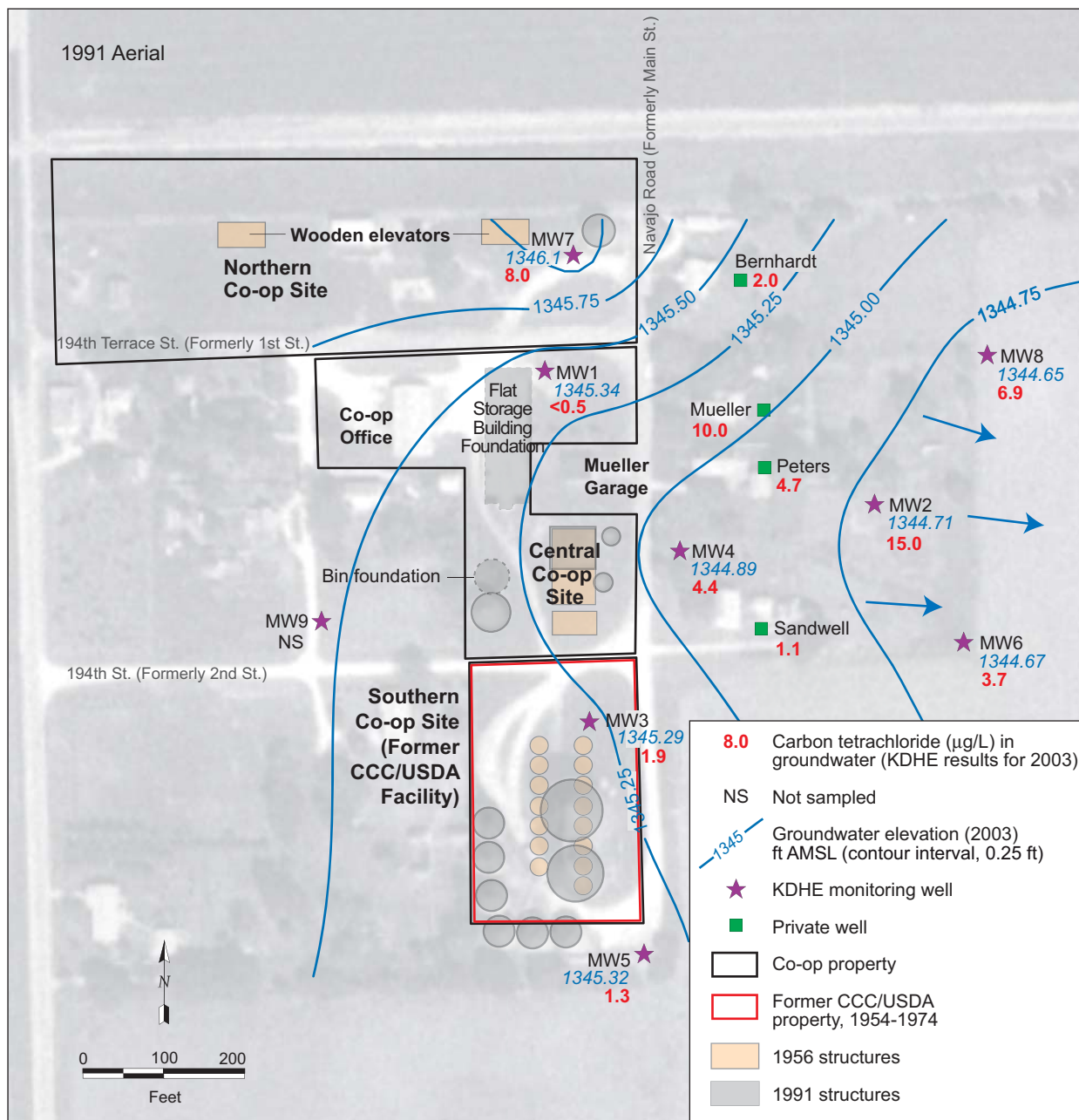


FIGURE 3.5 Structures at the Canada site, 2003 groundwater elevations with interpreted flow direction, and approximate locations of KDHE monitoring wells and private wells with 2003 monitoring results. Source of data: KDHE (2004). Source of photograph: USGS (1991).

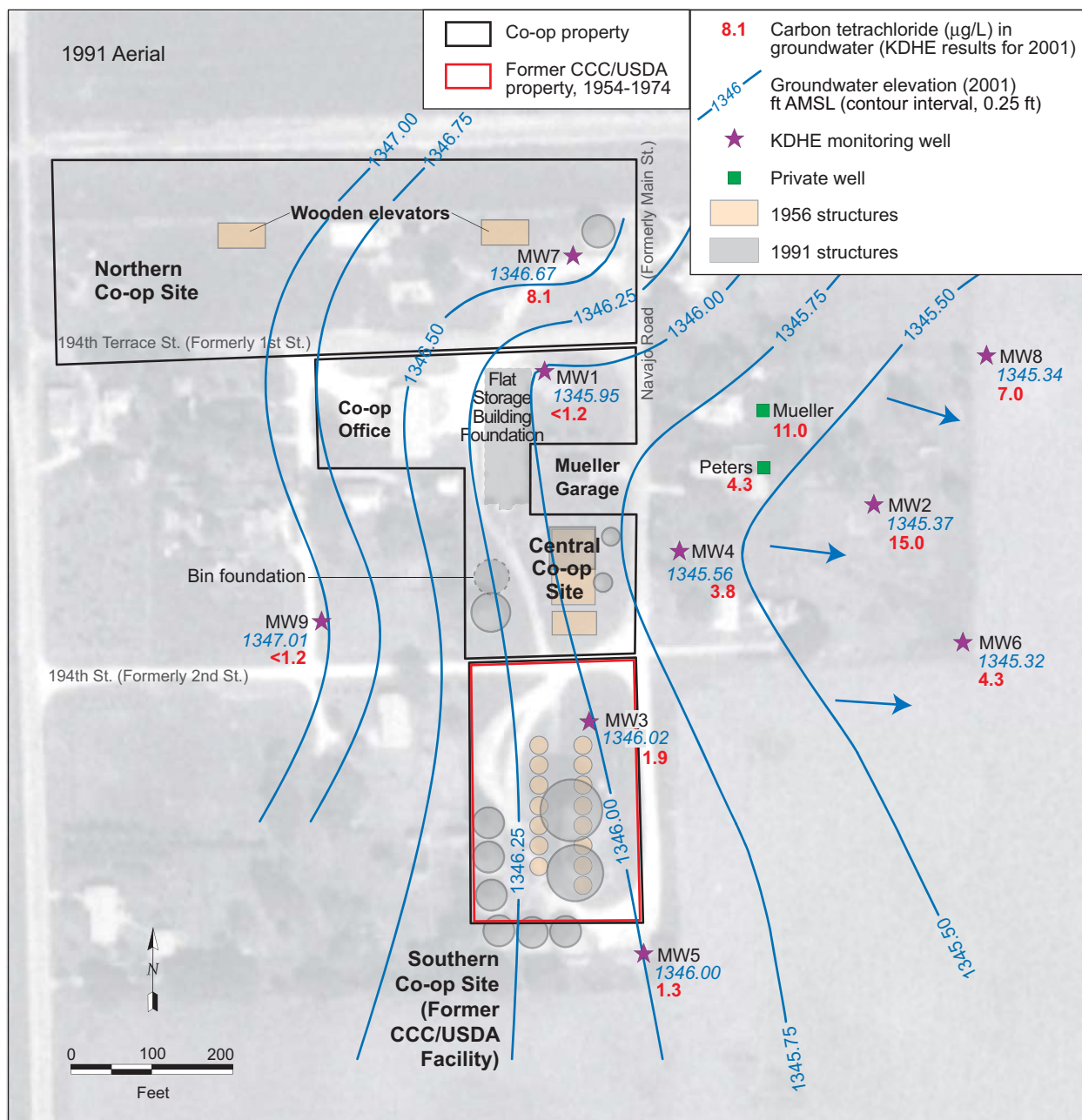


FIGURE 3.6 Structures at the Canada site, 2001 groundwater elevations with interpreted flow direction, and approximate locations of KDHE monitoring wells and private wells with 2001 monitoring results. Source of data: KDHE (2001). Source of photograph: USGS (1991).

4 Conclusions

This evaluation of the KDHE's long-term monitoring data for the period 2001–2007, along with prior investigational data, indicates that the former CCC/USDA facility is an unlikely source for the carbon tetrachloride contamination persistently detected at levels above the MCL at the Canada site. This conclusion is based on the following findings:

- The groundwater flow direction has been persistently measured by the KDHE (2001–2007) as being to the east or east-southeast. This flow direction places the wells with the overall highest concentrations of carbon tetrachloride (e.g., the Mueller and Peters private wells and monitoring wells MW2, MW7, and MW8) downgradient from the northern and central co-op sites, but not downgradient from the former CCC/USDA property. (See Figures 3.3–3.6.)
- During the KDHE's six-year monitoring period (2001–2007), the contaminant level in MW3 (on the former CCC/USDA property) remained well below the MCL of 5.0 µg/L, with a concentration of 1.1 µg/L measured in the most recent sampling in February 2007.
- In KDHE soil sampling in 1999, carbon tetrachloride was detected in only one of five soil samples collected between and next to the rows of former CCC/USDA grain bins, at the very low level of 0.2 µg/kg (the method detection limit). Contamination around bin doorways and foundations would most likely be due to CCC/USDA activities. The absence of such a contamination pattern suggests a different source. Carbon tetrachloride was identified with greater frequency (in four of seven samples) and at higher levels (0.2, 0.3, 0.3, and 0.9 µg/kg) in soil samples collected north of the former CCC/USDA grain bin array. The co-op has occupied the property to the north of the former CCC/USDA property for an extended period and has occupied the former CCC/USDA property since at least 1974.
- The relatively stable levels of carbon tetrachloride in monitoring wells MW2, MW4, and MW8, downgradient from the flat storage building formerly on the co-op property, suggest the presence of a soil source in the vicinity of that building.

- The fumigant compounds 1,2-dichloroethane, ethylene dibromide, and tetrachloroethylene were detected in wells downgradient from the central co-op grain storage structures (specifically the now-demolished flat storage building), but not on or downgradient from the former CCC/USDA property. The distribution of these compounds is consistent with a contaminant source other than the former CCC/USDA facility.
- The unique detection of the fumigant compound ethylene dibromide, found only in well MW7 in the KDHE's 2003 and 2005 sampling (Table 3.4), is a potentially significant finding. Well MW7 is downgradient from the former wooden elevators on the northern co-op site, but it is not downgradient from the co-op's former flat storage building or from the former CCC/USDA property (Figures 3.3-3.6). The relatively stable levels of carbon tetrachloride at MW7 (Table 3.4) suggest the presence of a soil source in the vicinity of the former wooden elevators. The presence of ethylene dibromide *at only this location* further suggests that a different fumigant mixture was used at the former wooden elevators than was used subsequently at the former flat storage building.
- Fuel-related compounds identified at trace levels in the Sandwell private well in 1998 and in monitoring wells MW1, MW4, and MW7 in 2003 and 2005 could be related to a documented release from an underground storage tank at the co-op in 1991 (KDHE 2004, 2007b). Such a connection would demonstrate the viability of a contaminant migration pathway from the co-op to wells to the east.
- KDHE policy BER-RS-024, Rev. 2001, Section I (Groundwater and Surface Water Criteria), indicates the following: "Status reclassification may be granted after monitoring demonstrates cleanup goals have been achieved and maintained for four (4) consecutive, equally time-sequenced sampling episodes conducted under KDHE oversight over a period of no less than two (2) years. . . ." The KDHE policy, Section III (Other Considerations), further provides the following: "If the above six (6) criteria do not apply to a site, the PRP may elect to submit to KDHE/BER a Reclassification Petition, including a Reclassification Report as outlined below, that identifies and justifies a

rationale for reclassifying the site to *Resolved* status on the ISL despite failure to satisfy the criteria identified above. KDHE will make the final determination concerning reclassification of the site on the ISL and will document that decision accordingly.”

The KDHE has conducted seven sampling events at the Canada site over a period of six years, at approximately annual intervals (except for the two-year gap between the December 2003 and December 2005 events). In this KDHE sampling, monitoring well MW3, on the former CCC/USDA property, has exhibited the following carbon tetrachloride concentrations:

1.6 µg/L (January 5, 2001)

1.4 µg/L (March 20, 2001)

1.9 µg/L (October 25, 2001)

2.9 µg/L (December 12, 2002)

1.9 µg/L (December 29, 2003)

0.63 µg/L (December 2, 2005)

1.1 µg/L (February 20, 2007)

These results, which are all well below the MCL of 5.0 µg/L, demonstrate that groundwater on the former CCC/USDA property at Canada has met the standard for carbon tetrachloride in drinking water since 2001 and does not pose a significant human health threat. The results warrant a request for reclassification of the Canada site to *Resolved* status on the KDHE's Identified Sites List, under Section III (Other Considerations) of KDHE policy BER-RS-024, Rev. 2001.

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Appendix A:

Well Registration Forms and Drilling Records for Canada Area Wells

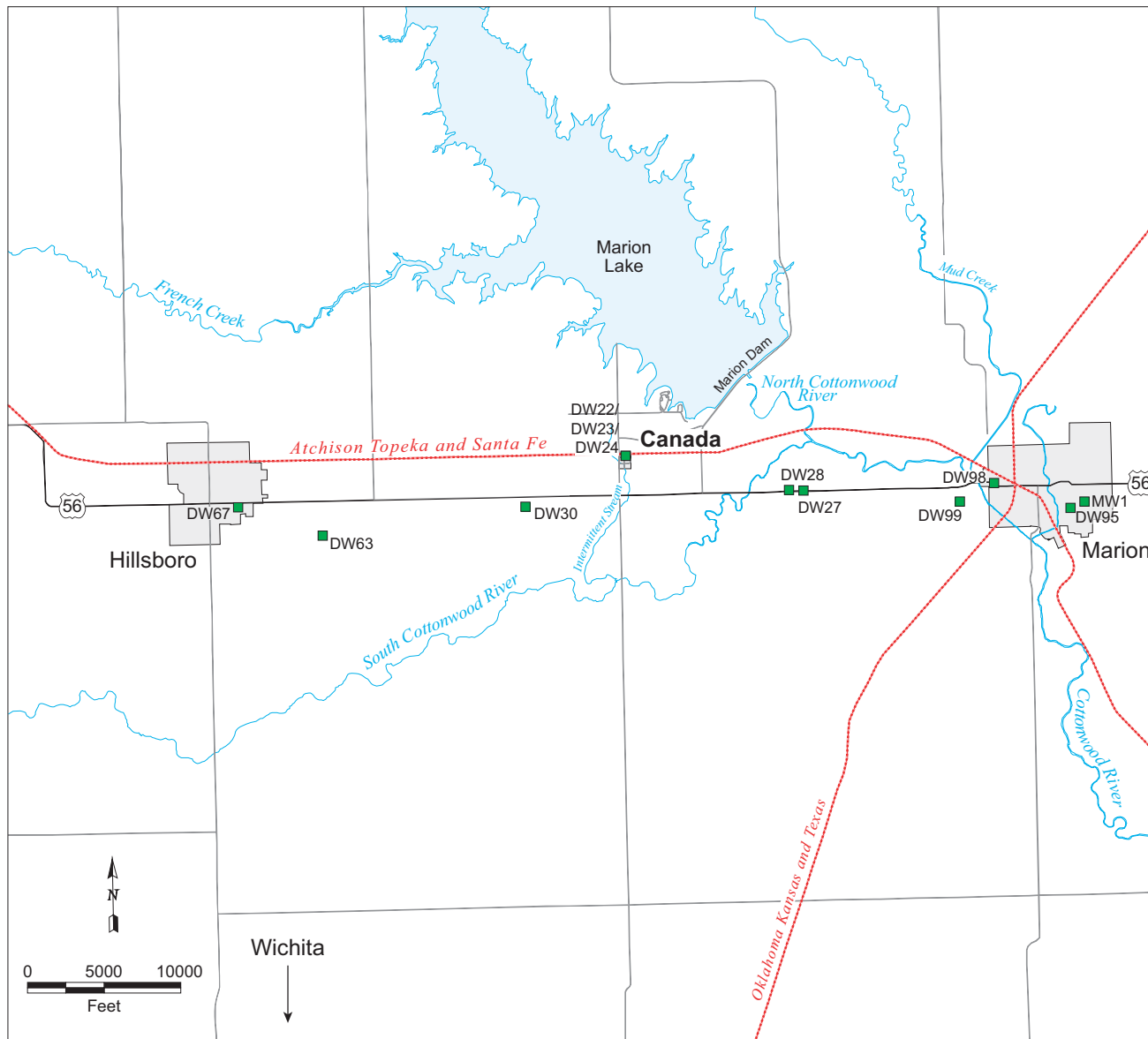


FIGURE A.1 Locations of registered wells in the Canada area.

USE TYPEWRITER OR BALL
POINT PEN-PRESS FIRMLY,
PRINT CLEARLY.

WATER WELL RECORD
KSA 82a-1201-1215

DW22

Kansas Department of Health and
Environment-Division of Environment
(Water well Contractors)
Topeka, Kansas 66620

1. Location of well:		County Marion	Fraction SW 1/4 SW 1/4 NW 1/4	Section number 33	Township number T 19 S R 3 E 2	Range number
2. Distance and direction from nearest town or city:		SE 1/2 N		3. Owner of well: George Gulliant		
Street address of well location if in city:		Hillsboro		R.R. or street: BR		
				City, state, zip code: Marion, Mo.		
4. Locate with "X" in section below:		Sketch map:		6. Bore hole dia. _____ in. Completion date _____		
				Well depth 60 ft. 10-16-72		
				7. <input checked="" type="checkbox"/> Cable tool _____ Rotary _____ Driven _____ Dug _____ _____ Hollow rod _____ Jetted _____ Bored _____ Reverse rotary _____		
				8. Use: <input checked="" type="checkbox"/> Domestic _____ Public supply _____ Industry _____ _____ Irrigation _____ Air conditioning _____ Stock _____ _____ Lawn _____ Oil field water _____ Other _____		
				9. Casing: Material Stycast Above _____ Below _____ Threaded _____ Welded _____ Surface _____ in. RMP _____ PVC _____ Weight _____ lbs./ft. Dia. 5 in. to 60 ft. depth Wall thickness: inches or Dia. _____ in. to _____ ft. depth Gage No. 200 wall		
5. Type and color of material		From	To	10. Screen: Manufacturer's name _____		
Top Soil		0	2	Type Stycast Dia. 5 in.		
Yellow clay		2	11	Slot/gauze 10 Length 15 ft.		
Yellow Shale + clay		11	33	Set between 5.5 ft. and 60 ft.		
Some water		33	36	Gravel pack? <input checked="" type="checkbox"/> Size range of material 1/4 to 1/2 in.		
Blue Shale		36	57	11. Static water level: _____ mo./day/yr. Date 10-16-72		
Water		57	58	12. Pumping level below land surfaces: _____ ft. after _____ hrs. pumping _____ g.p.m. _____ ft. after _____ hrs. pumping _____ g.p.m. Estimated maximum yield _____ g.p.m.		
Blue Shale		58	60	13. Water sample submitted: _____ mo./day/yr. _____ Yes <input checked="" type="checkbox"/> No _____ Date _____		
				14. Well head completion: <input checked="" type="checkbox"/> Pitless adapter _____ inches above grade		
				15. Well grouted? _____ With: <input checked="" type="checkbox"/> Neoprene _____ Bentonite _____ Concrete _____ Depth: From 3 ft. to 13 ft.		
				16. Nearest source of possible contamination: Sept. tank ft. 72 Direction NE Type Sept. tank Well disinfected upon completion? <input checked="" type="checkbox"/> Yes _____ No _____		
				17. Pump: _____ Not installed Manufacturer's name _____ Model number _____ HP _____ Volts _____ Length of drop pipe _____ ft. capacity _____ g.p.m. Type: _____ Submersible _____ Turbine _____ Jet _____ Reciprocating _____ Centrifugal _____ Other _____		
		(Use a second sheet if needed)				
18. Elevation:		19. Remarks:		20. Water well contractor's certification: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. Backhus Drg 12 Business name _____ License No. _____ Address Marion, Mo. Signed Paul Backhus Date 10-16-72 Authorized representative		
Topography: _____ Hill _____ Slope <input checked="" type="checkbox"/> Upland _____ Valley						

Forward the white, blue and pink copies to the Department of Health and Environment

Form WWC-5

USE TYPEWRITER OR BALL
POINT PEN-PRESS FIRMLY,
PRINT CLEARLY.

WATER WELL RECORD
KSA 82a-1201-1215

DW23

Kansas Department of Health and
Environment-Division of Environment
(Water well Contractors)
Topeka, Kansas 66620

1. Location of well:		County <u>Marion</u>	Fraction <u>SW 1/4 Sec 14</u>	Section number <u>33</u>	Township number <u>T 19 S</u>	Range number <u>R 3 E</u>																					
2. Distance and direction from nearest town or city: Street address of well location if in city:		<u>5 E 1/2 N</u> <u>Hillsboro</u> City, state, zip code: <u>Hillsboro, KS.</u>																									
4. Locate with "X" in section below:		Sketch map: 																									
5. Type and color of material		<table border="1"> <thead> <tr> <th></th> <th>From</th> <th>To</th> </tr> </thead> <tbody> <tr> <td><u>Top Soil</u></td> <td><u>0</u></td> <td><u>2</u></td> </tr> <tr> <td><u>Yellow Clay + Shale</u></td> <td><u>2</u></td> <td><u>34</u></td> </tr> <tr> <td><u>Some Water</u></td> <td><u>34</u></td> <td><u>35</u></td> </tr> <tr> <td><u>Blue Shale</u></td> <td><u>35</u></td> <td><u>62</u></td> </tr> <tr> <td><u>Water</u></td> <td><u>62</u></td> <td><u>63</u></td> </tr> <tr> <td><u>Rock</u></td> <td><u>63</u></td> <td><u>64</u></td> </tr> </tbody> </table>						From	To	<u>Top Soil</u>	<u>0</u>	<u>2</u>	<u>Yellow Clay + Shale</u>	<u>2</u>	<u>34</u>	<u>Some Water</u>	<u>34</u>	<u>35</u>	<u>Blue Shale</u>	<u>35</u>	<u>62</u>	<u>Water</u>	<u>62</u>	<u>63</u>	<u>Rock</u>	<u>63</u>	<u>64</u>
	From	To																									
<u>Top Soil</u>	<u>0</u>	<u>2</u>																									
<u>Yellow Clay + Shale</u>	<u>2</u>	<u>34</u>																									
<u>Some Water</u>	<u>34</u>	<u>35</u>																									
<u>Blue Shale</u>	<u>35</u>	<u>62</u>																									
<u>Water</u>	<u>62</u>	<u>63</u>																									
<u>Rock</u>	<u>63</u>	<u>64</u>																									
18. Elevation:		19. Remarks: Topography: <input type="checkbox"/> Hill <input type="checkbox"/> Slope <input checked="" type="checkbox"/> Upland <input type="checkbox"/> Valley																									
20. Water well contractor's certification:		This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. <u>Backhus Drilling</u> Business name: <u>Backhus Drilling</u> License No.: <u>180</u> Address: <u>Jampa, KS</u> Signed: <u>Paul Backhus</u> Date: <u>10-16-2007</u> Authorized representative																									

Forward the white, blue and pink copies to the Department of Health and Environment

Form WWC-5

WATER WELL RECORD Form WWC-5 KSA 82a-1212				DW24
LOCATION OF WATER WELL		Fraction	Section Number	Township Number
County: <u>Marion</u>		<u>SW 1/4 SW 1/4 NW 1/4</u>	<u>33</u>	T <u>19</u> S
State and direction from nearest town or city?		Range Number <u>R 3 E 1/4</u>		
WATER WELL OWNER: <u>Jay Dean Schroder</u>		Board of Agriculture, Division of Water Resources		
R#, St. Address, Box # : <u>RR 4</u>		Application Number:		
City, State, ZIP Code : <u>Marion, KS 66861</u>				
DEPTH OF COMPLETED WELL: <u>64</u> ft. Bore Hole Diameter: <u>9</u> in. to <u>15</u> in. to <u>7</u> in. to <u>68</u> ft.				
Well Water to be used as:		<input type="checkbox"/> 5 Public water supply <input type="checkbox"/> 8 Air conditioning <input type="checkbox"/> 11 Injection well <input checked="" type="checkbox"/> 1 Domestic <input type="checkbox"/> 3 Feedlot <input type="checkbox"/> 6 Oil field water supply <input type="checkbox"/> 9 Dewatering <input type="checkbox"/> 12 Other (Specify below) <input type="checkbox"/> 2 Irrigation <input type="checkbox"/> 4 Industrial <input checked="" type="checkbox"/> 7 Lawn and garden only <input type="checkbox"/> 10 Observation well		
Well's static water level: <u>15</u> ft. below land surface measured on <u>10</u> month <u>6</u> day <u>79</u> year				
Pump Test Data: Well water was _____ ft. after _____ hours pumping _____ gpm				
St. Yield: <u>40</u> gpm: Well water was _____ ft. after _____ hours pumping _____ gpm				
TYPE OF BLANK CASING USED:		Casing Joints: Glued <input checked="" type="checkbox"/> Clamped _____		
<input type="checkbox"/> 1 Steel <input type="checkbox"/> 3 RMP (SR) <input type="checkbox"/> 6 Asbestos-Cement <input type="checkbox"/> 9 Other (specify below) <input type="checkbox"/> Welded <input type="checkbox"/> 2 PVC <input type="checkbox"/> 4 ABS <input type="checkbox"/> 7 Fiberglass <input checked="" type="checkbox"/> Styrene <input type="checkbox"/> Threaded				
Casing dia: <u>5</u> in. to <u>2.5</u> in. Dia: <u>5</u> in. to <u>5.0</u> ft. Dia _____ in. to _____ ft.				
Casing height above land surface: <u>13</u> in. weight <u>1.2</u> lbs./ft. Wall thickness or gauge No. <u>200 wall</u>				
TYPE OF SCREEN OR PERFORATION MATERIAL:		<input type="checkbox"/> 7 PVC <input type="checkbox"/> 10 Asbestos-cement <input type="checkbox"/> 1 Steel <input type="checkbox"/> 3 Stainless steel <input type="checkbox"/> 5 Fiberglass <input type="checkbox"/> 8 RMP (SR) <input checked="" type="checkbox"/> Styrene <input type="checkbox"/> 2 Brass <input type="checkbox"/> 4 Galvanized steel <input type="checkbox"/> 6 Concrete tile <input type="checkbox"/> 9 ABS <input type="checkbox"/> 12 None used (open hole)		
Screen or Perforation Openings Are:		<input type="checkbox"/> 5 Gauzed wrapped <input type="checkbox"/> 8 Saw cut <input type="checkbox"/> 11 None (open hole) <input type="checkbox"/> 1 Continuous slot <input type="checkbox"/> 3 Mill slot <input type="checkbox"/> 6 Wire wrapped <input type="checkbox"/> 9 Drilled holes <input type="checkbox"/> 2 Louvered shutter <input type="checkbox"/> 4 Key punched <input type="checkbox"/> 7 Torch cut <input type="checkbox"/> 10 Other (specify)		
Screen-Perforation Dia: <u>5</u> in. to _____ ft. Dia _____ in. to _____ ft.				
Screen-Perforated Intervals: From <u>2.5</u> ft. to <u>3.5</u> ft. From _____ ft. to _____ ft.				
From <u>3.0</u> ft. to <u>6.4</u> ft. From _____ ft. to _____ ft.				
Gravel Pack Intervals: From <u>14</u> ft. to <u>64</u> ft. From _____ ft. to _____ ft.				
GROUT MATERIAL:		<input type="checkbox"/> 1 Neat cement <input type="checkbox"/> 2 Cement grout <input type="checkbox"/> 3 Bentonite <input type="checkbox"/> 4 Other		
Grouted Intervals: From <u>4</u> ft. to <u>14</u> ft. From _____ ft. to _____ ft.				
What is the nearest source of possible contamination:		<input type="checkbox"/> 10 Fuel storage <input type="checkbox"/> 14 Abandoned water well <input type="checkbox"/> 1 Septic tank <input type="checkbox"/> 4 Cess pool <input type="checkbox"/> 7 Sewage lagoon <input type="checkbox"/> 11 Fertilizer storage <input type="checkbox"/> 15 Oil well/Gas well <input type="checkbox"/> 2 Sewer lines <input type="checkbox"/> 5 Seepage pit <input type="checkbox"/> 8 Feed yard <input type="checkbox"/> 12 Insecticide storage <input type="checkbox"/> 16 Other (specify below) <input type="checkbox"/> 3 Lateral lines <input type="checkbox"/> 6 Pit privy <input type="checkbox"/> 9 Livestock pens <input type="checkbox"/> 13 Watertight sewer lines		
Direction from well: <u>SW</u> How many feet: <u>50</u> ft. ? Water Well Disinfected? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>				
Was a chemical/bacteriological sample submitted to Department? Yes _____ No <input checked="" type="checkbox"/> If yes, date sample submitted _____ month _____ day _____ year: Pump Installed? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>				
Yes: Pump Manufacturer's name _____ Model No. _____ HP _____ Volts _____				
Depth of Pump Intake _____ ft. Pumps Capacity rated at _____ gal./min.				
Type of pump: <input type="checkbox"/> 1 Submersible <input type="checkbox"/> 2 Turbine <input type="checkbox"/> 3 Jet <input type="checkbox"/> 4 Centrifugal <input type="checkbox"/> 5 Reciprocating <input type="checkbox"/> 6 Other				
CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on <u>10</u> month <u>6</u> day <u>79</u> year				
and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. <u>100</u>				
his Water Well Record was completed on <u>10</u> month <u>15</u> day <u>79</u> year under the business name of <u>Backhus Drilling</u> by (signature) <u>Paul Backhus</u>				
LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:		LITHOLOGIC LOG		
		FROM	TO	LITHOLOGIC LOG
		0	3	Top Soil
		3	22	Yellow Clay
		22	23	Some water
		23	35	Blue Shale
		35	56	Water
56	64	Blue Shale		
ELEVATION:				
Depth(s) Groundwater Encountered		(Use a second sheet if needed)		
1. _____ ft. 2. _____ ft. 3. _____ ft. 4. _____ ft.				

INSTRUCTIONS: Use typewriter or ball point pen, please press firmly and PRINT clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Environment, Water Well Contractors, Topeka, KS 66620. Send one to WATER WELL OWNER and retain one for your records.

INSTRUCTIONS: Use typewriter or ball point pen. PLEASE PRESS FIRMLY and PRINT clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water Protection, Topeka, Kansas 66620-7320. Telephone: 913-296-5514. Send one to WATER WELL OWNER and retain one for your records.

WATER WELL RECORD Form WWC-5 KSA 82a-1212				DW28
LOCATION OF WATER WELL:		Fraction	Section Number	Township Number
County: <u>Marion</u>		<u>NW 1/4 NW 1/4 NW 1/4</u>	<u>2</u>	T <u>20</u> S <u>3</u> R <u>3</u> <u>SW</u>
Distance and direction from nearest town or city street address of well if located within city? <u>3 W & S Marion</u>				
WATER WELL OWNER:		Board of Agriculture, Division of Water Resources		
R#, St. Address, Box # :		Application Number:		
City, State, ZIP Code :				
LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:		4 DEPTH OF COMPLETED WELL: <u>65</u> ft. ELEVATION:		
		Depth(s) Groundwater Encountered 1. <u>40</u> ft. 2. <u>40</u> ft. 3. <u>40</u> ft.		
		WELL'S STATIC WATER LEVEL <u>40</u> ft. below land surface measured on mo/day/yr <u>P-10-21</u>		
		Pump test data: Well water was <u>23</u> ft. after <u>9</u> hours pumping <u>15</u> gpm		
		Est. Yield <u>23</u> gpm Well water was <u>15</u> ft. after <u>7</u> hours pumping <u>65</u> gpm		
Bore Hole Diameter <u>9</u> in. to <u>15</u> in. ft. and <u>65</u> ft.		WELL WATER TO BE USED AS:		
1 Domestic 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below)		5 Public water supply 8 Air conditioning 11 Injection well		
2 Irrigation 4 Industrial 7 Lawn and garden only 10 Observation well				
Was a chemical/bacteriological sample submitted to Department? Yes <u>X</u> No <u>X</u> If yes, mo/day/yr sample was submitted				
Water Well Disinfected? Yes <u>X</u> No <u>X</u>				
TYPE OF BLANK CASING USED:				
1 Steel 3 RMP (SR) 6 Asbestos-Cement 9 Other (specify below) Welded				
2 PVC 4 ABS 7 Fiberglass Threaded				
Blank casing diameter <u>5</u> in. to <u>45</u> in. Dia. <u>12</u> in. weight <u>160</u> lbs./ft. Wall thickness or gauge No. <u>160</u>				
TYPE OF SCREEN OR PERFORATION MATERIAL:				
1 Steel 3 Stainless steel 5 Fiberglass 8 RMP (SR) 11 Other (specify)				
2 Brass 4 Galvanized steel 6 Concrete tile 9 ABS 12 None used (open hole)				
SCREEN OR PERFORATION OPENINGS ARE:				
1 Continuous slot 3 Mill slot 5 Gauzed wrapped 8 Saw cut 11 None (open hole)				
2 Louvered shutter 4 Key punched 6 Wire wrapped 9 Drilled holes				
3 Torch cut 10 Other (specify)				
SCREEN-PERFORATED INTERVALS: From <u>45</u> ft. to <u>65</u> ft. From <u>45</u> ft. to <u>65</u> ft.				
GRAVEL PACK INTERVALS: From <u>10</u> ft. to <u>65</u> ft. From <u>10</u> ft. to <u>65</u> ft.				
GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other				
Grout intervals: From <u>0</u> ft. to <u>10</u> ft. From <u>10</u> ft. to <u>65</u> ft.				
What is the nearest source of possible contamination:				
1 Septic tank 4 Lateral lines 7 Pit privy 10 Livestock pens 14 Abandoned water well				
2 Sewer lines 5 Cess pool 8 Sewage lagoon 11 Fuel storage 15 Oil well/Gas well				
3 Watertight sewer lines 6 Seepage pit 9 Feedyard 12 Fertilizer storage 16 Other (specify below)				
13 Insecticide storage <u>In Pressure</u>				
How many feet?				
LITHOLOGIC LOG				
FROM	TO	LITHOLOGIC LOG		
<u>0</u>	<u>4</u>	<u>Clay</u>		
<u>4</u>	<u>22</u>	<u>Rock</u>		
<u>22</u>	<u>45</u>	<u>Yellow Shale</u>		
<u>45</u>	<u>55</u>	<u>Red Shale</u>		
<u>55</u>	<u>56</u>	<u>Water</u>		
<u>56</u>	<u>65</u>	<u>Red Shale</u>		
CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) <u>constructed</u> , (2) <u>reconstructed</u> , or (3) <u>plugged</u> under my jurisdiction and was completed on (mo/day/year) <u>P-10-21</u> and this record is true to the best of my knowledge and belief. Kansas				
Water Well Contractor's License No. <u>180</u> This Water Well Record was completed on (mo/day/yr) <u>P-10-21</u>				
Under the business name of <u>Backhoe Drilling</u> by (signature) <u>Paul Goeth</u>				
INSTRUCTIONS: Use typewriter or ball point pen, PLEASE PRESS FIRMLY and PRINT clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Environment, Environmental Geology Section, Topeka, KS 66620. Send one to WATER WELL OWNER and retain one for your records.				

INSTRUCTIONS: Use typewriter or ball point pen. PLEASE PRESS FIRMLY and PRINT clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone: 913-296-5545. Send one to WATER WELL OWNER and retain one for your records.

USE TYPEWRITER OR BALL
POINT PEN-PRESS FIRMLY,
PRINT CLEARLY.

WATER WELL RECORD
KSA 82a-1201-1215

DW63

Kansas Department of Health and
Environment-Division of Environment
(Water well Contractors)
Topeka, Kansas 66620

1. Location of well:		County Marion	Fraction SE 1/4 NW 1/4 NW 1/4	Section number 2	Township number T 20 S R 2 E	Range number 2
2. Distance and direction from nearest town or city: Street address of well location if in city:		1 mile east of Hillboro		3. Owner of well: R.R. or street: City, state, zip code: Clark Weibe R.R. 2 Hillsboro, Kansas		
4. Locate with "X" in section below: N W E S 1 Mile		Sketch map: 		6. Bore hole dia. 24 in. Completion date 10/24/77 Well depth 98 ft.		
				7. <input type="checkbox"/> Cable tool <input type="checkbox"/> Rotary <input type="checkbox"/> Driven <input type="checkbox"/> Dug <input type="checkbox"/> Hollow rod <input type="checkbox"/> Jetted <input type="checkbox"/> Bored <input checked="" type="checkbox"/> Reverse rotary		
				8. Use: <input type="checkbox"/> Domestic <input type="checkbox"/> Public supply <input type="checkbox"/> Industry <input checked="" type="checkbox"/> Irrigation <input type="checkbox"/> Air conditioning <input type="checkbox"/> Stock <input type="checkbox"/> Lawn <input type="checkbox"/> Oil field water <input type="checkbox"/> Other		
				9. Casing: Material transit bands Height: Above or below surface 12 in. Threaded <input type="checkbox"/> Welded <input type="checkbox"/> RMP <input type="checkbox"/> PVC <input type="checkbox"/> Weight 34 lbs./ft. Dia. 16 in. to 16 ft. depth Wall Thickness: inches or 3/4 in. Dia. 16 in. to 16 ft. depth gage No. 3/4		
5. Type and color of material		From	To	10. Screen: Manufacturer's name Johnson Well Casing Type 16 Dia. 16 Slot/gauze 1/8 Length 10' Set between 88 ft. and 98 ft. Gravel pack? Yes Size range of material 1" to 2"		
Top soil		0	6	11. Static water level: 24 ft. below land surface Date 10/24/77		
Brown clay		6	35	12. Pumping level below land surfaces: ft. after 1 hrs. pumping 340 g.p.m. ft. after 1 hrs. pumping 340 g.p.m. Estimated maximum yield 340 g.p.m.		
Buff clay and blue shale		35	93	13. Water sample submitted: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Date 10/24/77		
Gypsum rock (solid)		96	98	14. Well head completion: 12 inches above grade		
				15. Well grouted? Yes With: <input checked="" type="checkbox"/> Neat cement <input type="checkbox"/> Bentonite <input type="checkbox"/> Concrete Depth: From 0 ft. to 10 ft.		
				16. Nearest source of possible contamination: ft. 200' Direction east Type corral Well disinfected upon completion? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		
				17. Pump: <input checked="" type="checkbox"/> Not installed Manufacturer's name Rader Model number 194 HP 1/4 Volts 115 Length of drop pipe 10 ft. capacity 10 g.p.m. Type: <input type="checkbox"/> Submersible <input type="checkbox"/> Turbine <input type="checkbox"/> Jet <input type="checkbox"/> Reciprocating <input type="checkbox"/> Centrifugal <input type="checkbox"/> Other		
(Use a second sheet if needed)				20. Water well contractor's certification: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. Rader Drilling Co. 194 Business name License No. 67429 Address Carlton, Kansas Signed Brant E. Rader Date 10/24/77 Authorized representative		
18. Elevation:	19. Remarks:		20. Water well contractor's certification: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. Rader Drilling Co. 194 Business name License No. 67429 Address Carlton, Kansas Signed Brant E. Rader Date 10/24/77 Authorized representative			
Topography: <input checked="" type="checkbox"/> Hill <input type="checkbox"/> Slope <input type="checkbox"/> Upland <input type="checkbox"/> Valley						

Forward the white, blue and pink copies to the Department of Health and Environment

Form WWC-5

WATER WELL RECORD
Form WWC-5
KSA 82a-1212
DW67

LOCATION OF WATER WELL	Fraction	Section Number	Township Number	Range Number
ounty: MARION	NE 1/4 NW 1/4 NW 1/4	3	T 20 S	R 2 E

istance and direction from nearest town or city? **In Hillsboro** Street address of well if located within city?

WATER WELL OWNER: **TABOR COLLEGE**

R#, St. Address, Box # :
ity, State, ZIP Code : **Hillsboro, Kas**

Board of Agriculture, Division of Water Resources
Application Number:

DEPTH OF COMPLETED WELL: **94** ft. Bore Hole Diameter: **12 1/2** in. to **94** ft., and in. to ft.

Well Water to be used as:

1 Domestic	3 Feedlot	5 Public water supply	8 Air conditioning	11 Injection well
2 Irrigation	4 Industrial	6 Oil field water supply	9 Dewatering	12 Other (Specify below)
		7 Lawn and garden only	Football Field	10 Observation well

Well's static water level: **37** ft. below land surface measured on **6** month **30** day **81** year

Pump Test Data: Well water was **40** ft. after **3** hours pumping **40** gpm

Test Yield: gpm: Well water was ft. after hours pumping gpm

TYPE OF BLANK CASING USED:

1 Steel	3 RMP (SR)	5 Wrought iron	8 Concrete tile	Casing Joints: Glued <input checked="" type="checkbox"/> Clamped
2 PVC	4 ABS	6 Asbestos-Cement	9 Other (specify below)	Welded
		7 Fiberglass	Threaded	

Blank casing dia: **8** in. to **48/94** ft. Dia in. to ft. Dia in. to ft.

Casing height above land surface: **18** in. weight lbs./ft. Wall thickness or gauge No

TYPE OF SCREEN OR PERFORATION MATERIAL:

1 Steel	3 Stainless steel	5 Fiberglass	8 RMP (SR)	11 Other (specify)
2 Brass	4 Galvanized steel	6 Concrete tile	9 ABS	12 None used (open hole)

Screen or Perforation Openings Are:

1 Continuous slot	3 Mill slot	5 Gauzed wrapped	8 Saw cut	11 None (open hole)
2 Louvered shutter	4 Key punched	6 Wire wrapped	9 Drilled holes	
		7 Torch cut	10 Other (specify)	

Screen-Perforation Dia: **8** in. to **88** ft. Dia in. to ft. Dia in. to ft.

Screen-Perforated Intervals: From **48** ft. to **88** ft. From ft. to ft. From ft. to ft. From ft. to ft. From ft. to ft.

Travel Pack Intervals: From **10** ft. to **94** ft. From ft. to ft. From ft. to ft. From ft. to ft.

GROUT MATERIAL:

1 Neat cement	2 Cement grout	3 Bentonite	4 Other
---------------	----------------	--------------------	---------

Grouted Intervals: From **0** ft. to **10** ft. From ft. to ft. From ft. to ft. From ft. to ft.

What is the nearest source of possible contamination:

1 Septic tank	4 Cess pool	7 Sewage lagoon	11 Fuel storage	14 Abandoned water well
2 Sewer lines	5 Seepage pit	8 Feed yard	12 Fertilizer storage	15 Oil well/Gas well
3 Lateral lines	6 Pit privy	9 Livestock pens	13 Insecticide storage	16 Other (specify below)

Direction from well: **EAST** How many feet: **450'** Water Well Disinfected? Yes No

Has a chemical/bacteriological sample submitted to Department? Yes No If Yes, date sample submitted month day year Pump Installed? Yes No

Yes: Pump Manufacturer's name Model No. HP Volts

Depth of Pump Intake ft. Pumps Capacity rated at gal./min

Type of pump: 1 Submersible 2 Turbine 3 Jet 4 Centrifugal 5 Reciprocating 6 Other

CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was **1** constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on **7** month **5** day **81** year

and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. **175**

This Water Well Record was completed on **8** month **25** day **81** year under the business name of **Pouls Inc.** by (signature)

LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:	FROM	TO	LITHOLOGIC LOG	FROM	TO	LITHOLOGIC LOG
	0	5	LOAM TO CLAY			
	5	10	YELL - TAN CLAY			
	10	25	BR - LIGHT CLAY			
	25	35	SOFT - GRAY - GREY SHALE			
	35	40	SOFT SHALE - GRAY			
	40	50	SOFT GRAY - SHINY CLAY SHALE			
	50	56	DARK WASHINGTON SHALE			
	56	58	FAULTS			
	58	65	WASHINGTON SHALE - CLAY LENSES			
	65	75	"			
75	85	WASHINGTON SHALE				

ELEVATION: (Faulted from 75' to 85')

Depth(s) Groundwater Encountered 1. ft. 2. ft. 3. ft. 4. ft. (Use a second sheet if needed)

INSTRUCTIONS: Use typewriter or ball point pen, please press firmly and PRINT clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Environment, Water Well Contractors, Topeka, KS 66620. Send one to WATER WELL OWNER and retain one for your records.

INSTRUCTIONS: Use typewriter or ball point pen. PLEASE PRESS FIRMLY and PRINT clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone: 913-296-5545. Send one to WATER WELL OWNER and retain one for your records.

USE TYPEWRITER OR BALL
POINT PEN-PRESS FIRMLY,
PRINT CLEARLY.

DW98

WATER WELL RECORD
KSA 82a-1201-1215

Kansas Department of Health and
Environment-Division of Environment
(Water well Contractors)
Topeka, Kansas 66620

1. Location of well:		County <u>Marion</u>	Fraction <u>NW 1/4 NW 1/4 NE 1/4</u>	Section number <u>6</u>	Township number <u>T 20</u>	Range number <u>S R 4</u>	<u>QW</u>
2. Distance and direction from nearest town or city: <u>in city</u>				3. Owner of well: <u>Henry Skienam</u>			
Street address of well location if in city: <u>Marion</u>				R.R. or street: <u>404 Arbor</u> City, state, zip code: <u>Marion Ks. 66861</u>			
4. Locate with "X" in section below:		Sketch map:		6. Bore hole dia. <u>9</u> in. Completion date <u>4-12-77</u> Well depth <u>60</u> ft.			
				7. <input checked="" type="checkbox"/> Cable tool <input checked="" type="checkbox"/> Rotary <input type="checkbox"/> Driven <input type="checkbox"/> Dug <input type="checkbox"/> Hollow rod <input type="checkbox"/> Jetted <input type="checkbox"/> Bored <input type="checkbox"/> Reverse rotary			
				8. Use: <input type="checkbox"/> Domestic <input type="checkbox"/> Public supply <input type="checkbox"/> Industry <input type="checkbox"/> Irrigation <input type="checkbox"/> Air conditioning <input type="checkbox"/> Stock <input checked="" type="checkbox"/> Lawn <input type="checkbox"/> Oil field water <input type="checkbox"/> Other			
				9. Casing: Material <u>PVC</u> Height: <u>above</u> or below Threaded <input type="checkbox"/> Welded <input checked="" type="checkbox"/> Surface <u>TP</u> in. RMP <u>PVC</u> <input checked="" type="checkbox"/> Weight <u>Sch 40</u> lbs./ft. Dia. <u>5</u> in. to <u>60</u> ft. depth Wall Thickness: <u>inches</u> or Dia. <u>in.</u> to <u>ft.</u> depth Gauge No. <u>1258</u>			
5. Type and color of material		From	To	10. Screen: Manufacturer's name <u>APM</u> Type <u>PVC</u> Dia. <u>5"</u> Slot/gauze <u>1/8</u> Length <u>10'</u> Set between <u>30</u> ft. and <u>60</u> ft. Gravel pack? <input checked="" type="checkbox"/> Size range of material <u>30</u>			
<u>Top Soil</u>		<u>0</u>	<u>2</u>	11. Static water level: <u>23</u> ft. below land surface Date <u>4-12-77</u>			
<u>Yellow Clay</u>		<u>2</u>	<u>30</u>	12. Pumping level below land surfaces: ft. after <u> </u> hrs. pumping <u> </u> g.p.m. ft. after <u> </u> hrs. pumping <u> </u> g.p.m. Estimated maximum yield <u> </u> g.p.m.			
<u>fine Sand</u>		<u>30</u>	<u>42</u>	13. Water sample submitted: <u> </u> mo./day/yr. Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Date <u> </u>			
<u>White Rock</u>		<u>42</u>	<u>46</u>	14. Well head completion: <input checked="" type="checkbox"/> Pitless adapter <u> </u> inches above grade			
<u>Red Clay</u>		<u>46</u>	<u>53</u>	15. Well grouted? <input checked="" type="checkbox"/> With: <u> </u> Neat cement <u> </u> Bentonite <input checked="" type="checkbox"/> Concrete <u> </u> Depth: From <u>0</u> ft. to <u>10</u> ft.			
<u>Medium Sand</u>		<u>53</u>	<u>57</u>	16. Nearest source of possible contamination: <u>city</u> ft. <u>70</u> Direction <u>S</u> Type <u>sewer line</u> Well disinfected upon completion? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			
<u>Shale</u>		<u>57</u>	<u>60</u>	17. Pump: <input checked="" type="checkbox"/> Not installed Manufacturer's name <u> </u> Model number <u> </u> HP <u> </u> Volts <u> </u> Length of drop pipe <u> </u> ft. capacity <u> </u> g.p.m. Type: <input type="checkbox"/> Submersible <input type="checkbox"/> Turbine <input type="checkbox"/> Jet <input type="checkbox"/> Reciprocating <input type="checkbox"/> Centrifugal <input type="checkbox"/> Other			
(Use a second sheet if needed)							
18. Elevation:		19. Remarks:		20. Water well contractor's certification: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. <u>Backhus Drgl. 180</u> Business name <u>Backhus</u> License No. <u> </u> Address <u>Topeka Ks.</u> Signed <u>Paul Backhus</u> Date <u>4-12-77</u> Authorized representative			
Topography: <input type="checkbox"/> Hill <input type="checkbox"/> Slope <input type="checkbox"/> Upland <input checked="" type="checkbox"/> Valley							

Forward the white, blue and pink copies to the Department of Health and Environment

Form WWC-5

WATER WELL RECORD Form WWC-5 KSA 82a-1212				DW99
1 LOCATION OF WATER WELL:		Fraction	Section Number	Township Number
County: <u>Marion</u>		<u>SW 1/4 NW 1/4 NW 1/4</u>	<u>6</u>	T <u>20</u> S <u>4</u> E
Distance and direction from nearest town or city street address of well if located within city? <u>6 W 3/4 N Florence</u>				
2 WATER WELL OWNER: <u>Rodney Just</u>		Board of Agriculture, Division of Water Resources		
RR#, St. Address, Box #: <u>RR1</u>		Application Number:		
City, State, ZIP Code: <u>Marion, KS 66861</u>				
3 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:		4 DEPTH OF COMPLETED WELL: <u>76</u> ft. ELEVATION:		
		Depth(s) Groundwater Encountered: <u>1</u> ft. <u>2</u> ft. <u>3</u> ft.		
		WELL'S STATIC WATER LEVEL: <u>30</u> ft. below land surface measured on mo/day/yr <u>6-5-97</u>		
		Pump test data: Well water was _____ ft. after _____ hours pumping _____ gpm		
		Est. Yield: <u>20</u> gpm; Well water was _____ ft. after _____ hours pumping _____ gpm		
		Bore Hole Diameter: <u>8.5</u> in. to <u>7.6</u> ft. and _____ in. to _____ ft.		
		WELL WATER TO BE USED AS:		
		1 Domestic 3 Feedlot 5 Public water supply 8 Air conditioning 11 Injection well		
		2 Irrigation 4 Industrial 6 Oil field water supply 9 Dewatering 12 Other (Specify below)		
		7 Lawn and garden only 10 Monitoring well		
		Was a chemical/bacteriological sample submitted to Department? Yes _____ No <u>X</u> ; If yes, mo/day/yr sample was submitted _____		
5 TYPE OF BLANK CASING USED:		Water Well Disinfected? Yes <u>X</u> No _____		
1 Steel 3 RMP (SR) 5 Wrought iron 8 Concrete tile		CASING JOINTS: Glued <u>X</u> Clamped _____		
2 PVC 4 ABS 6 Asbestos-Cement 9 Other (specify below)		Welded _____		
Blank casing diameter: <u>5</u> in. to <u>5.6</u> ft. Dia _____ in. to _____ ft. Dia _____ in. to _____ ft.		Threaded _____		
Casing height above land surface: <u>12</u> in., weight <u>CLASP 160</u> lbs./ft. Wall thickness or gauge No. <u>219</u>				
TYPE OF SCREEN OR PERFORATION MATERIAL:		7 PVC 10 Asbestos-cement		
1 Steel 3 Stainless steel 5 Fiberglass 8 RMP (SR) 11 Other (specify) _____		12 None used (open hole)		
2 Brass 4 Galvanized steel 6 Concrete tile 9 ABS				
SCREEN OR PERFORATION OPENINGS ARE:		8 Saw cut 11 None (open hole)		
1 Continuous slot 3 Mill slot 5 Gauzed wrapped 9 Drilled holes		10 Other (specify) _____		
2 Louvered shutter 4 Key punched 7 Torch cut				
SCREEN-PERFORATED INTERVALS: From <u>56</u> ft. to <u>76</u> ft. From _____ ft. to _____ ft.				
GRAVEL PACK INTERVALS: From <u>22</u> ft. to <u>76</u> ft. From _____ ft. to _____ ft.				
6 GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other _____				
Grout Intervals: From <u>0</u> ft. to <u>22</u> ft. From _____ ft. to _____ ft.				
What is the nearest source of possible contamination:		10 Livestock pens 14 Abandoned water well		
1 Septic tank 4 Lateral lines 7 Pit privy 11 Fuel storage 15 Oil well/Gas well		12 Fertilizer storage 16 Other (specify below)		
2 Sewer lines 5 Cess pool 8 Sewage lagoon		13 Insecticide storage		
3 Watertight sewer lines 6 Seepage pit 9 Feedyard		How many feet? <u>100 +</u>		
Direction from well? <u>E</u>				
FROM	TO	LITHOLOGIC LOG	FROM	TO
<u>0</u>	<u>6</u>	<u>Lime Rock</u>		
<u>6</u>	<u>21</u>	<u>Yellow Shale</u>		
<u>21</u>	<u>35</u>	<u>Lime</u>		
<u>35</u>	<u>45</u>	<u>Yellow Shale</u>		
<u>45</u>	<u>62</u>	<u>Red "</u>		
<u>62</u>	<u>72</u>	<u>Lime</u>		
<u>72</u>	<u>73</u>	<u>Water</u>		
<u>73</u>	<u>76</u>	<u>Gray Rock</u>		
7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) <u>constructed</u> (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/yr) <u>6-5-97</u> and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. <u>128</u> This Water Well Record was completed on (mo/day/yr) <u>6-12-97</u> under the business name of <u>Backhus Drilling</u> by (signature) <u>Paul Backhus</u>				
INSTRUCTIONS: Use typewriter or ball point pen. PLEASE PRESS FIRMLY and PRINT clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone: 913-296-5545. Send one to WATER WELL OWNER and retain one for your records.				

WATER WELL RECORD Form WWC-5 KSA 82a-1212				MW-1 Page 1
1 LOCATION OF WATER WELL:		Fraction	Section Number	Township Number
County: <u>Marion</u>		<u>NE 1/4 SW 1/4 NE 1/4</u>	<u>5</u>	<u>T 20 S</u>
Range Number <u>R 4</u>				
Distance and direction from nearest town or city street address of well if located within city?				
2 WATER WELL OWNER: <u>St. Luke's Hospital</u>				
RR#, St. Address, Box # : <u>1014 East Melvin</u>				
City, State, ZIP Code : <u>Marion, KS 67114</u>				
Board of Agriculture, Division of Water Resources Application Number:				
3 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:		4 DEPTH OF COMPLETED WELL: <u>58.5</u> ft. ELEVATION:		
		Depth(s) Groundwater Encountered 1. ft. 2. ft. 3. ft.		
		WELL'S STATIC WATER LEVEL ft. below land surface measured on mo/day/yr		
		Pump test data: Well water was ft. after hours pumping		
		Est. Yield gpm: Well water was ft. after hours pumping		
		Bore Hole Diameter in. to ft., and in. to		
		WELL WATER TO BE USED AS:		
		1 Domestic 3 Feedlot 5 Public water supply 8 Air conditioning 11 Injection well 2 Irrigation 4 Industrial 7 Lawn and garden only 10 Monitoring well 12 Other (Specify below)		
		Was a chemical/bacteriological sample submitted to Department? Yes.....No.....; If yes, mo/day/yr sample was submitted		
		Water Well Disinfected? Yes.....No.....		
5 TYPE OF BLANK CASING USED:				
1 Steel 3 RMP (SR) 5 Wrought iron 8 Concrete tile CASING JOINTS: Glued.....Clamped..... 2 PVC 4 ABS 6 Asbestos-Cement 9 Other (specify below) Welded..... 7 Fiberglass Threaded.....				
Blank casing diameter in. to ft., Dia in. to ft., Dia in. to				
Casing height above land surface in., weight lbs./ft. Wall thickness or gauge No. <u>Sch. 40</u>				
TYPE OF SCREEN OR PERFORATION MATERIAL:				
1 Steel 3 Stainless steel 5 Fiberglass 7 PVC 10 Asbestos-cement 2 Brass 4 Galvanized steel 6 Concrete tile 8 RMP (SR) 11 Other (specify)..... 9 ABS 12 None used (open hole)				
SCREEN OR PERFORATION OPENINGS ARE:				
1 Continuous slot 3 Mill slot 5 Gauzed wrapped 8 Saw cut 11 None (open hole) 2 Louvered shutter 4 Key punched 6 Wire wrapped 9 Drilled holes 7 Torch cut 10 Other (specify).....				
SCREEN-PERFORATED INTERVALS:				
From ft. to ft., From ft. to ft., From ft. to				
GRAVEL PACK INTERVALS:				
From ft. to ft., From ft. to ft., From ft. to				
6 GROUT MATERIAL:				
1 Neat cement 2 Cement grout 3 Bentonite 4 Other Grout Intervals: From (3) ft. to ft., From (2) ft. to ft., From ft. to ft.				
What is the nearest source of possible contamination:				
1 Septic tank 4 Lateral lines 7 Pit privy 10 Livestock pens 14 Abandoned water well 2 Sewer lines 5 Cess pool 8 Sewage lagoon 11 Fuel storage 15 Oil well/Gas well 3 Watertight sewer lines 6 Seepage pit 9 Feedyard 12 Fertilizer storage 16 Other (specify below) 13 Insecticide storage				
Direction from well? FROM TO LITHOLOGIC LOG FROM TO PLUGGING INTERVALS				
00 5.5 Clay - Brown, Tight, Stiff, low plasticity, dry, no odor 5.5 10.5 Clay - Brown to lt. brown, tight, dry, very stiff, no odor 10.5 12.0 Clay - Lt. brown, very stiff, dry, no odor, limestone fragments 12.0 16.5 Limestone - Lt. Grey, highly weathered, grading, intermixed with clay, dry 16.5 21.0 Shale - Tan, Medium hardness, mod. weathered, dry, no odor 21.0 23.0 Alt. Limestone & Shale, very thin layers, limestone-grey, hard, dry, Shale - tan 23.0 30.0 Shale - Tan, highly weathered, soft, dry, no odor 30.0 31.0 Shale - Lt. tan, moderately weathered, med. hardness, dry, no odor 31.0 35.0 Shale - tan, highly weathered, very soft, dry no odor 35.0 35.5 Limestone - Grey, Mod. Weathered, Dry 35.5 40.0 Shale - Tan, highly weathered, soft, dry, no odor 40.0 42.0 Shale - Lt. tan, mod. weathered, med. hardness, dry, no odor 42.0 48.5 Shale - Tan, highly weathered, soft, dry, small limestone fragments 48.5 50.0 Shale - Lt. Brown, highly weathered, soft, slightly moist, no odor				
7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and completed on (mo/day/year) <u>10/12/95</u> and this record is true to the best of my knowledge and belief. Ks Water Well Contractor's License No. <u>549</u> This Water Well Record was completed on (mo/day/yr) <u>4/30/96</u> under the business name of <u>J & R Drilling Services Inc.</u> by (signature) <u>[Signature]</u>				
INSTRUCTIONS: Use typewriter or ball point pen. PLEASE PRESS FIRMLY and PRINT clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone: 913-296-5545. Send one to WATER WELL OWNER and retain one for your records.				

LITHOLOGIC LOG CONTINUED ON PAGE XX 2

INSTRUCTIONS: Use typewriter or ball point pen. PLEASE PRESS FIRMLY and PRINT clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone: 913-296-5545. Send one to WATER WELL OWNER and retain one for your records.

Appendix B:

Geology of the Canada Area, Marion County

Appendix B:

Geology of the Canada Area, Marion County

B.1 Geologic Data

Subsurface geologic data are generally sought from well registration forms and drilling records of test holes and irrigation, domestic, monitoring, and municipal wells. Irrigation is not a general farming practice in the region, and the Kansas Geologic Survey (KGS) has not drilled test holes in the study area. Therefore, the only available lithologic logs are in records of domestic, municipal, and monitoring wells. The water well record (WWC-5 form) is a standard form that all licensed water well contractors are required to complete for each water well drilled in Kansas. The available water well log data were examined critically for completeness and consistency. Most log descriptions were too brief to determine the lithologic units accurately. Although several lithologic logs from WWC-5 forms exist for water wells in Canada and the surrounding area, their inconsistent quality makes interpretation and correlation of the geologic units difficult, if not impossible. A lack of consistency in the quality of lithologic logs in Marion County is a recognized problem (Chaffee 1988). In addition, well locations are described in general terms (township and range) and persistently identify the individual domestic wells within the town inadequately. No well records exist for most domestic wells, and the names and addresses of the original listed owners frequently do not match those of any current well owner.

Documents consulted include reports published by the U.S. Geological Survey (USGS) and the USDA Soil Conservation Service, open-file reports of the KGS, and an environmental impact statement from the U.S. Army Corps of Engineers (USACE). Information on the regional geology and physiography was also obtained directly from the KGS World Wide Web site at <http://www.kgs.ukans.edu>. Because of the absence of reliable geologic logs of boreholes in central Marion County, the surface geologic maps generated by the USGS (Byrne et al. 1959) provided the only reliable source of geologic data. This information was used to extrapolate the subsurface geology. The established stratigraphic column (giving the sequence and thicknesses of the shales and limestones) was extrapolated from the nearest outcropping geologic sequence by using a regional dip and strike computed from the intersection of the contact with the topography. The computed apparent dip in the direction of each segment of the cross section was then used to extend the surface outcrop section to the location and depth of the drillers' logs. Because the log descriptions bear little resemblance to the actual lithologies, validation of the

interpretive geologic sections relied on correlation between (1) the locations of changes in major lithologic type as described in the drillers' logs and (2) the locations of stratigraphic contacts predicted from the USGS surface geology (Figure B.1; Byrne et al. 1959).

B.2 Geologic Setting

Marion County is largely within the Flint Hills region of east central Kansas. The county includes a small area of the Smoky Hills region in the northwest and the Wellington-McPherson Lowlands in the southwest. The eastern portion of the county is characteristic of the Flint Hills region, with well-dissected topography, deeply incised valleys, thin soils, and many limestone outcrops. The western part of the county is predominantly shale beds containing a few relatively thin, soft limestones. Such units tend to form a gently rolling to nearly flat topography that is amenable to agriculture. Few good natural rock outcrops are present in this area. The major drainage from Marion County is southeastward via the Cottonwood River, forming the upper reaches of the Neosho River drainage basin. The Cottonwood River was dammed in 1968 to form Marion Lake in the central part of the county (for location see Figure B.2). The 10,800-acre lake is used for flood control, water quality control, water supply, recreation, and fish and wildlife conservation (Jordan and Hart 1985).

The surface geology of Marion County has been described by Byrne et al. (1959). Figure B.2 illustrates the generalized surface geology. The bedrock of Marion County is largely Lower Permian shale with interbedded chalky and cherty limestone. These beds dip gently westward with a slope of about 15-20 ft/mi (O'Connor and Chaffee 1992). Limestones and shales of the Chase Group, exposed throughout the eastern part of the county, are the oldest Lower Permian rocks present. In Marion County, the Chase Group is overlain by about 450 ft of Wellington Formation shales, part of the Lower Permian Sumner Group. Lower Cretaceous shale and sandstone unconformably overlie Permian strata in the northwest corner of the county. Unconsolidated Cenozoic sediments of late Tertiary and Pleistocene age also unconformably overlie the Permian beds in the southwest part of the county (Figure B.2).

The oldest rocks that outcrop in the central part of Marion County in the vicinity of Canada are from the Lower Permian Chase Group, made up of about 300 ft of limestone and dolomitic limestone alternating with shale in repetitive sequences called cyclotherms (Terman and Aber 1994). These cyclotherms are the products of repeated transgressions and regressions by shallow seas over a nearly flat depositional surface in the early Permian. Younger Wellington

Formation shales of the Sumner Group conformably overlie the Chase Group and outcrop throughout the central and western region of the county, including the area surrounding the town of Canada. These rocks represent a change to more continental, extremely arid conditions during the Permian. The shale is variously colored gray, green, and red and contains thin beds of limestone and gypsum.

The Quaternary system is represented in the vicinity of Canada by scattered thin silt and sand deposits that may be erosional remnants of an eastward extension of the Early Pleistocene McPherson valley alluvium. Byrne et al. (1959) called these deposits the Sanborn Formation. Younger Pleistocene terrace deposits occur along major streams, and the valley floors are filled with Recent alluvium. Alluvial deposits are thickest in the valleys of the larger streams and are known to exceed a thickness of 30 ft on the Cottonwood River at the town of Marion (USACE 1974). Soils in the central part of the county are derived from the weathering of limestone, cherty limestone, calcareous and noncalcareous shale, alluvium, and colluvium.

The location of an interpretive regional cross section passing through Canada is shown in Figure B.3. Stratigraphic relationships within the shallow bedrock, the elevation of the ground surface, and relief on the bedrock surface are illustrated schematically in west-to-east section A-A' (Figure B.4). Copies of the drillers' logs from which this section was constructed are in Appendix A.

Cross section A-A' (Figure B.4) shows that the Permian formations dip from east to west. The strike and dip can be computed by transposing the geologic contacts from the geologic map (Byrne et al. 1959) to the 1:24,000-scale topographic base (USGS 1985) and measuring the elevation of a single stratigraphic horizon at three locations. On the basis of the intersection of the top of the Nolans limestone with the topography, the beds strike N 30° W and dip S 60° W at an angle of 0.2° (about 17 ft/mi) in central Marion County. Note that the vertical exaggeration of the cross section (1) makes the westward slope of the bedrock strata appear to be far steeper than the shallow angle actually observed in the field and (2) enhances subtle changes in the surface topography. This reconstruction indicates that the shallow geologic section at Canada should be composed of soil 2-3 ft thick, developed from loess and weathered shale at the surface and overlying weathered Wellington shale. The shale weathers to clay that has been variously recorded in drillers' logs to depths of 11-42 ft BGL. The top of the Nolans Formation (Herington limestone member) is projected to occur at a depth of approximately 25 ft BGL. This unit is routinely described as "blue shale" in drillers' logs at this depth. However, the KDHE reported

refusal of the conductivity probe at a hard layer postulated to be limestone at 13 ft BGL (KDHE 1999a). The stratigraphic data available suggest that this postulated limestone might be one of the relatively thin dolomitic limestones known to occur within the Pearl shale member at the base of the Wellington Formation. The top of the underlying Odell shale, projected from outcrop and drill holes to the east, should occur at about 65 ft BGL.

B.3 Hydrogeology

The principal aquifers in the Flint Hills are the Nolans, Winfield, and Barneston limestones of the Lower Permian Chase Group. The Nolans and Winfield limestones are shown on cross section A-A' (Figure B.4). Sinkholes are common where these limestones crop out in the uplands, and springs emerge where the aquifers are exposed in valleys and stream channels. Most wells produce from 10 to 100 gpm, with some producing as much as 500 gpm (Terman and Aber 1994). Relatively impermeable shale units separate the bedrock aquifers, setting up confined conditions in which each aquifer might have a different hydraulic head.

Where the Wellington Formation overlies the Chase Group limestones to the west of the Flint Hills, groundwater is also produced from fractured shale and several thin beds of impure limestone within the Wellington. The formation yields small quantities of highly mineralized water to many stock and domestic wells. Moderately large water supplies of highly mineralized but usable groundwater are available from solution zones in gypsum beds.

Groundwater generally flows from east to west in the limestone aquifers. Recharge takes place where the aquifers outcrop to the east, and water moves down the regional bedrock dip toward the west. However, local variations in the regional groundwater flow direction are common because of lowering of the potentiometric surface in the limestone aquifers by seepage along valleys and stream channels (O'Connor and Chaffee 1992). The multiple aquifers, the absence of monitoring wells, and the many local topographic effects preclude construction of meaningful regional potentiometric surfaces from available data for any of the identifiable aquifers. The KGS hydrogeologic database as of 1999 contained no water levels for Marion County.

At Canada, screened intervals for domestic wells for which records are available are 45-60 ft BGL and 54-64 ft BGL in DW22 and DW23, respectively, and an upper zone at 25-35 ft

BGL and a lower zone at 50-64 ft BGL in DW24 (Figure B.4). Logs for DW22, DW23, and DW24 are in Appendix A. Water is generally produced from solution-jointed limestone units of the Nolans Formation, and the screened depths suggest that more than one of these water-bearing zones are present at Canada. Anecdotal evidence gathered from interviews with local residents suggests that groundwater flows to the east-southeast (KDHE 1998). Topographic features in the area support this conclusion. For example, a local flow direction to the southeast is consistent with the fact that the South Cottonwood River has eroded the Permian rocks to a level of about 1,310–1,320 ft above mean sea level (AMSL) 1.25 mi southeast of Canada, 40–50 ft below the elevation of the ground at Canada. Static water levels recorded when the wells were installed in 1978 and 1979 were 15–18 ft BGL (1,345–1,343 ft AMSL), substantially above the base level (1,310–1,320 ft AMSL) at the South Cottonwood River. Another factor contributing to the southeasterly groundwater flow direction would be mounding of groundwater 1 mi to the north of Canada due to recharge from Marion Lake.

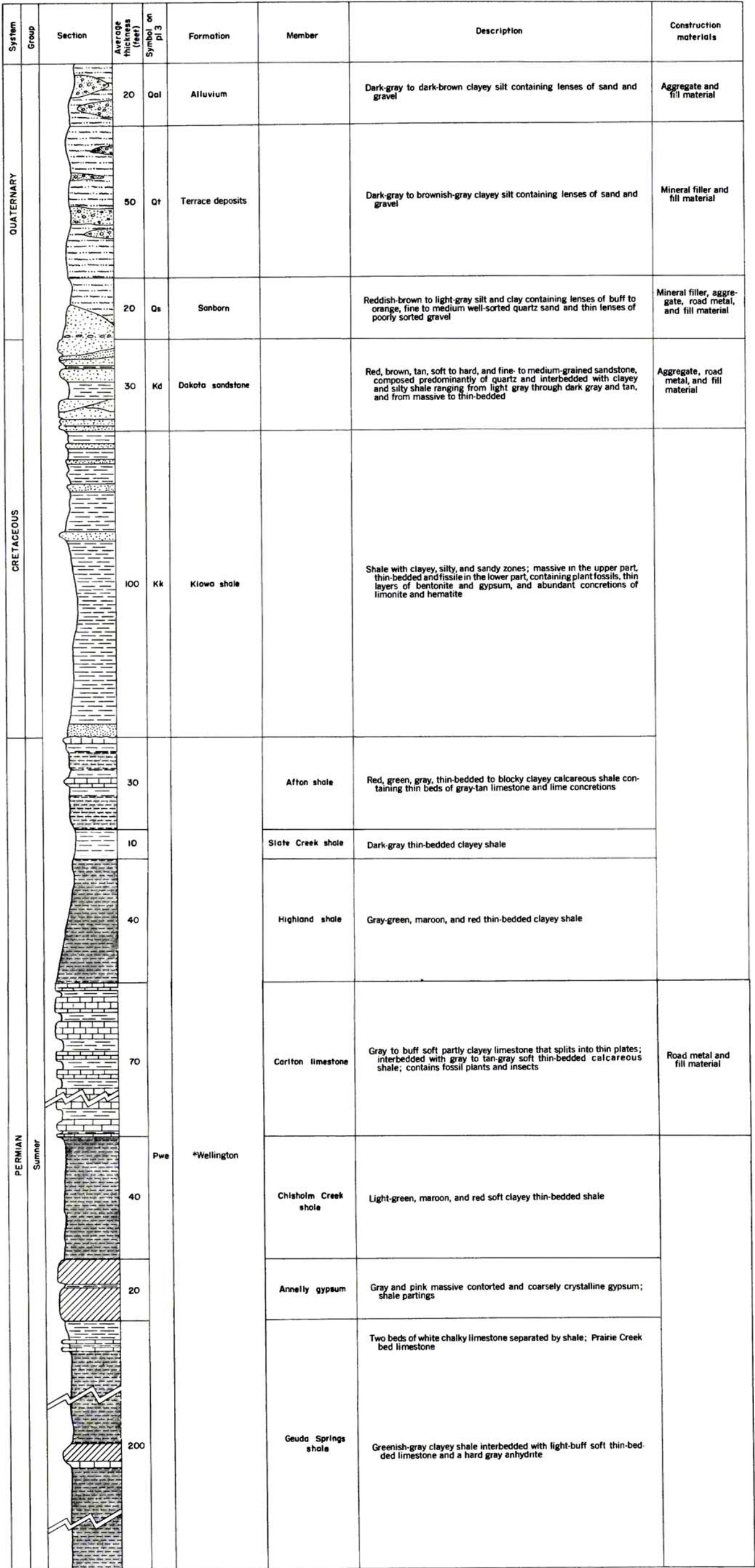


FIGURE B.1 Stratigraphic units that crop out in Marion County, Kansas, and the construction materials of each. Source: Byrne et al. (1959).

System	Group	Section	Average thickness (feet)	Symbol on pl 3	Formation	Member	Description	Construction materials
PERMIAN	Sumner		8	Pwe	*Wellington	Hollenberg limestone	Tan-gray cellular coarsely crystalline limestone with dolomitic zones	Road metal and fill material
			40			Pearl shale	Light tan-gray to faintly varicolored thin-bedded calcareous clayey shale with limy concretions and some thin tan-gray crystalline dolomitic limestone	
	Chase		18	Pn	Nolans limestone	Herington limestone	Tan to gray fairly hard massive thick-bedded fossiliferous dolomitic limestone with geodes locally abundant	Structural stone, road metal, aggregate, and riprap
			10			Paddock shale	Tan to gray thin-bedded to blocky calcareous shale with fossils locally abundant	
			2			Krider limestone	Tan to gray soft clayey limestone	
			30	Po	Odell shale	Gray, tan, and green blocky silty and clayey shale with thin limy zones; a red zone near the top	Fill material	
			28	Pw	Winfield limestone	Cresswell limestone	Gray to buff locally soft and dolomitic fossiliferous limestone with abundant geodes: platy and thin bedded in upper part, massive and thick bedded in lower part	Structural stone, road metal, aggregate, riprap, and fill material
			10			Grant shale	Gray to tan silty calcareous fossiliferous shale	
			2			Stovall limestone	Hard gray massive cherty fossiliferous limestone	
			45	Pd	Doyle shale	Gage shale	Thin-bedded to massive fossiliferous shale; greenish gray to tan and calcareous in upper part, and green, maroon, and clayey in lower part	Fill material
			10			Towanda limestone	Hard tan to gray platy to blocky limestone	Structural stone, road metal, aggregate, riprap, and fill material
			25			Holmesville shale	Greenish-gray silty clayey and partly calcareous shale with a thin reddish bed and local lenses of limestone	Fill material
			39	Pb	Borneston limestone	Fort Riley limestone	Gray to tan fairly hard fossiliferous limestone with thin shale partings; thin bedded at top, massive beds in middle and near base; lower massive bed is called "rimrock"	Structural stone, road metal, aggregate, riprap, and fill material
			2			Oketo shale	Gray calcareous fossiliferous silty shale	Fill material
			39			Florence limestone	Gray to tan thick-bedded fossiliferous limestone with many beds and nodules of chert and a thin shale parting	Structural stone, road metal, aggregate, riprap, and fill material
			35	Pm	Matfield shale	Blue Springs shale	Banded maroon, gray, and green, massive to blocky clayey silty poorly exposed shale	Fill material
			5			Kinney limestone	Tan to gray hard massive fossiliferous limestone with few good outcrops	
			30			Wymore shale	Tan, green, and maroon, thin-bedded to blocky silty and calcareous shale	
			10			Pwr	Wreford limestone	Schroyer limestone

* Subdivisions of Wellington formation modified from Ver Wiebe (1937, p 4 and 5)

FIGURE B.1 (Cont.)

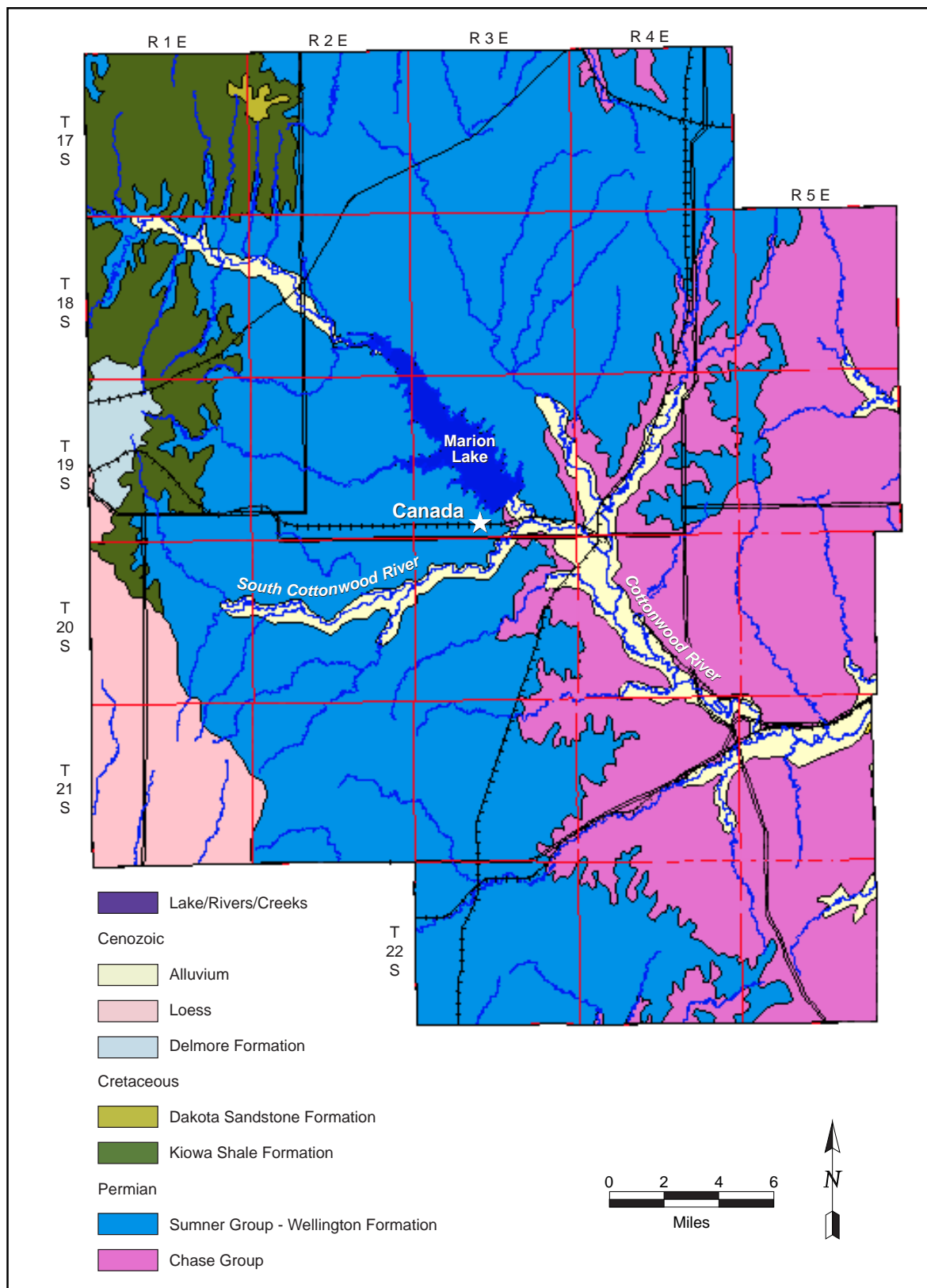


FIGURE B.2 Generalized surface geologic map of Marion County, showing the location of the town of Canada. Source: Byrne et al. (1959).

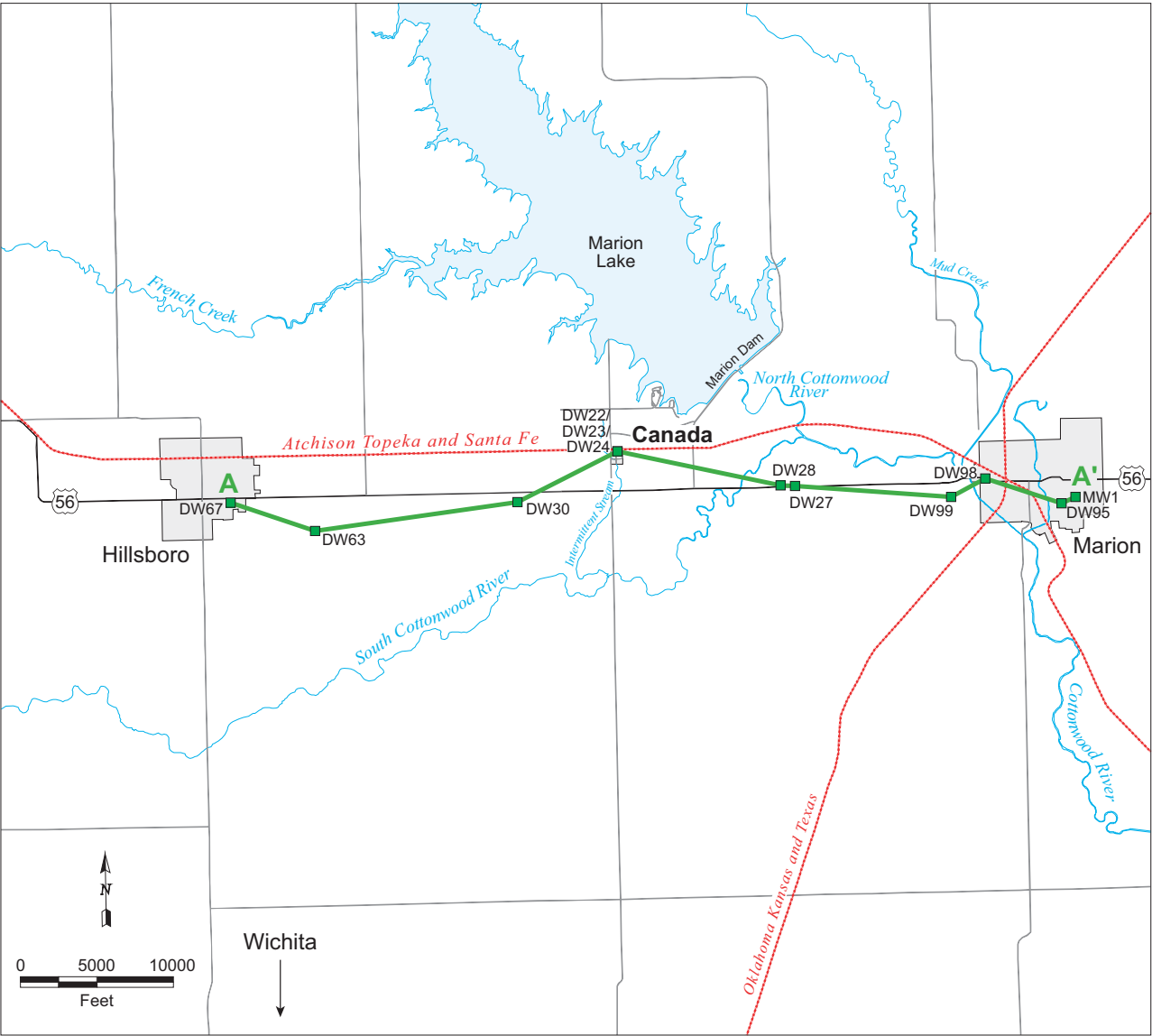


FIGURE B.3 Location of geologic cross section A-A' in central Marion County.

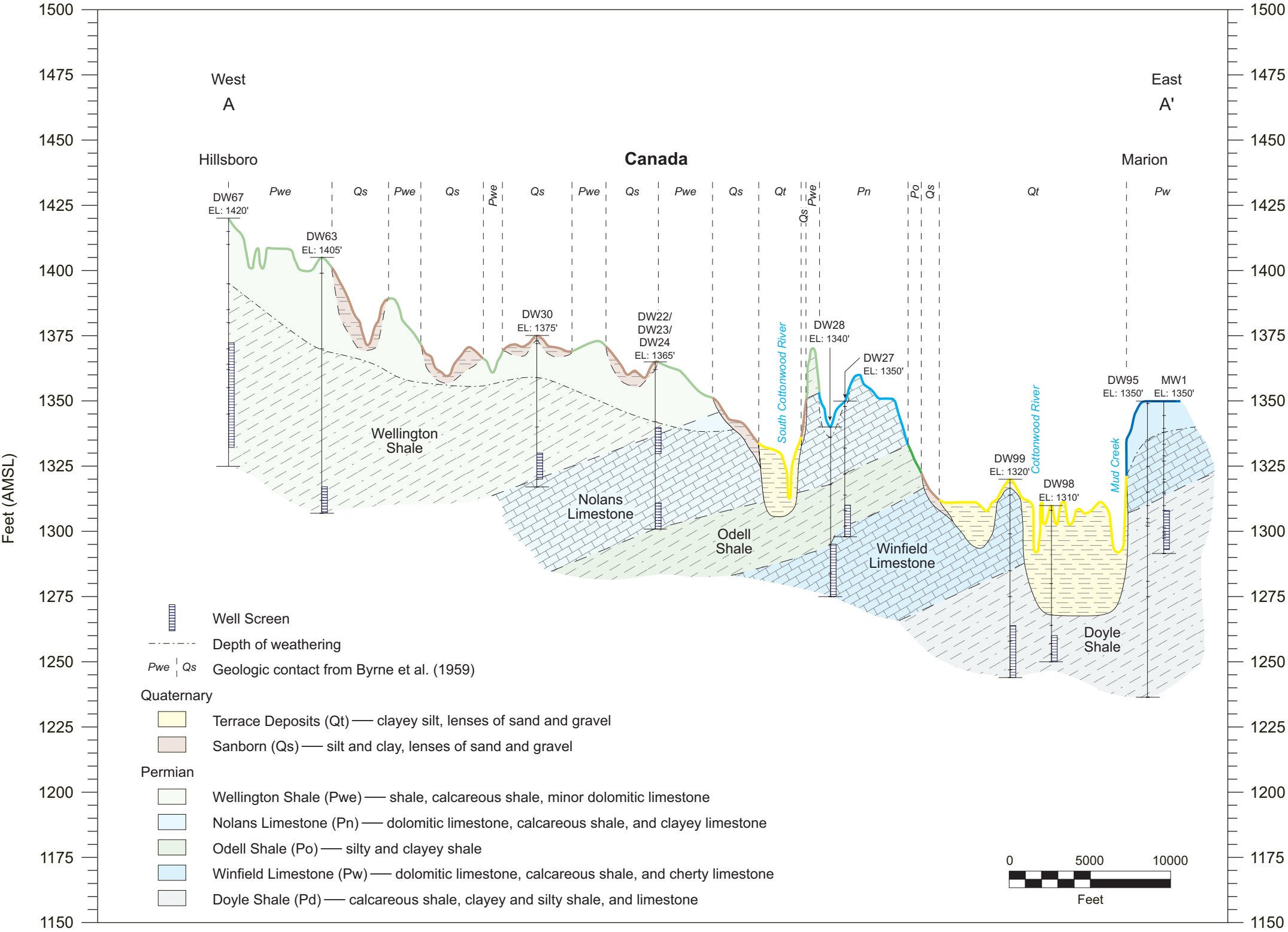


FIGURE B.4 Interpretive west-to-east geologic cross section A-A' (vertically exaggerated), Marion County, Kansas. Source of geologic contacts: Byrne et al. (1959).

Appendix C:

Property Records Related to the Former CCC/USDA Facility at Canada

CL Form-58 (4-2-54) U. S. DEPARTMENT OF AGRICULTURE AGRICULTURE STABILIZATION AND CONSERVATION COMMODITY CREDIT CORPORATION

State of Kansas, Marion Co. This instrument was filed for record on the 4th day of May, 1954, at 4 o'clock P.M. and duly recorded in book on page 360. *William Pierce* REGISTER OF DEEDS

LEASE OF PROPERTY

THIS LEASE, made and entered into this 4th day of May, 1954, by and between Aaron S. Burkholder of Canada, Kansas, Lessor, and Commodity Credit Corporation, Lessee.

WITNESSETH THAT:

1. The Lessor leases to the Lessee, and the Lessee hereby leases from the Lessor, upon the terms and conditions hereinafter stated, the following described real estate (hereinafter called "property") situated in the County of Marion and state of Kansas:
Lots 7 to 18 inclusive on Block 11 in Canada, Kansas
containing 1 acres, more or less.
2. The term of the lease shall be for a period of 10 years, commencing the 4th day of May, 1954, and ending the 4th day of May, 1964, with the right of the Lessee, during such term or any extension thereof, to terminate said lease, and liability for any further rent, on the 4th day of May of any year, by giving 30 days' previous notice in writing to the Lessor.
3. As rent for said property, the Lessee shall pay the Lessor Ninety and 00/100th parts (\$90.00) per year, such rent to be payable in advance, but to be apportionable in the event the lease is terminated as provided in paragraph 2 hereof:
4. The Lessor warrants that he is the owner of the property, has the right to give the Lessee possession under this lease, and will, so long as this lease remains in effect, warrant and defend the Lessee's possession against any and all persons whomsoever.
5. The Lessee shall have the right, during this lease, to erect storage structures, or facilities, make alterations, install scales, fences, or signs, in or upon the premises hereby leased and, at the expiration of said lease or any renewal or extension thereof or at any time this lease is in effect, may remove said storage structures, facilities, scales, fences, or signs or any part thereof, whether or not such structures, facilities, scales, fences or signs have become legally a fixture.
6. The Lessee shall not assign this lease without the written consent of the Lessor. The Lessee, may, however, sublet the structures on the premises leased hereunder, or any one or more of them for the term of the lease or any part thereof upon such terms and conditions as Lessee may wish to so sublet.
7. The Lessee, if required by the Lessor, shall upon the expiration of this lease, or renewal thereof, restore the premises to the same condition as that existing at the time of entering upon the same under this lease, reasonable and ordinary wear and tear and damages by the elements or by circumstances over which the Lessee has no control excepted. Provided, however, That if the Lessor requires such restoration, the Lessor shall give written notice thereof to the Lessee 30 days before the termination of the lease.

3-31-54

FIGURE C.1 CCC/USDA lease, 1954 to 1964.

552.

CL Form - 58 (Reverse)
(4-2-54)

LEASE OF PROPERTY

8. The Lessor grants and gives the Lessee the option as a consideration of this lease and for the further consideration of one dollar, the receipt of which is hereby acknowledged, to renew said lease for a period of _____ years from the Lessor, his heirs, executors, administrators, and assigns, for the sum of _____ Dollars (\$ _____) per year.

9. As a consideration of this lease and for the further consideration of one dollar, the receipt of which is hereby acknowledged, the Lessor grants and gives the Lessee the option, at any time while this lease is in effect, to purchase said property from the Lessor, his heirs, executors, administrators, and assigns, for the sum of _____ Dollars (\$ _____). In the event the Lessee shall exercise this option to purchase said property, the Lessor agrees to furnish at his own expense an abstract of title, certificate of title or other evidence of title satisfactory to CCC and to execute a good and sufficient warranty deed conveying fee simple title to said property free and clear of all taxes, liens, or encumbrances except for the following, and no others.

10. In the event any increased tax assessment is made against the Lessor or the property by virtue of the erection of storage structures and facilities thereon by the Lessee, the Lessor agrees to cooperate fully in any contest of such increased assessment which the Lessee feels should be made. The Lessee agrees that the rental hereunder shall be adjusted upward by the amount of any such increased tax assessment which the Lessor and Lessee mutually agree to be proper or which is determined to be legally valid in court proceedings.

11. No member of or Delegate to Congress or Resident Commissioner, shall be admitted to any share or part of this lease or purchase or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this lease or purchase if made with a corporation for its general benefit.

12. The Lessor warrants that he has not employed any person to solicit or secure this lease upon any agreement for a commission, percentage, brokerage, or contingent fee and that no such consideration or payment has been or will be made. Breach of this warranty shall give CCC the right to annul the lease, or, in its discretion, to deduct from the rental or purchase price the amount of such commission, percentage, brokerage or contingent fees. This warranty shall not apply to commissions payable by the Lessor if the lease is secured or made through a bona-fide agent maintained by the Lessor for the purpose of leasing or selling his property.

(Seal) Arnon S. Burkholder LESSOR COMMODITY CREDIT CORPORATION, LESSEE

(Seal) Elmer E. Burkholder LESSOR By Arnon S. Burkholder

(Seal) _____, LESSOR



State of Kansas
Marion County

Vice -Chairman, Marion County
ASC Committee

Subscribed and sworn to before me this 4th day of May, 1954
(To be reproduced in ASC State Office)

Erna Rele Notary Public
My Comm. expires Jan. 14-1958

FIGURE C.1 (Cont.)

77141 463

FORM CCC GRAIN-19
(6-10-59)

U.S. DEPARTMENT OF AGRICULTURE
COMMODITY STABILIZATION SERVICE
COMMODITY CREDIT CORPORATION

LEASE OF PROPERTY

THIS LEASE, made and entered into this 9th day of September, 19 63, by and between Aaron S. Burkholder of Canada, Kansas (hereinafter called the "Lessor"), and Commodity Credit Corporation, (hereinafter called the "Lessee").

WITNESSETH THAT:

1. The Lessor leases to the Lessee, and the Lessee hereby leases from the Lessor, upon the terms and conditions hereinafter stated, the following described real estate (hereinafter called "property") situated in the County of Marion and State of Kansas
(Enter here a complete legal description of the site)

6-163 Lots 7 to 18 inclusive on Block 11 in Canada, Kansas

State of Kansas, Marion County, ss.
This instrument, designed for record, was
the 10th day of Sept., 1963
at 6 o'clock P.M. and duly recorded
in book 5313 page 375

Alma Wiebe
5313 375

containing 1 acres, more or less.

2. The term of the lease shall be for a period of 10 years, commencing the 5th day of May, 1964 and ending the 4th day of May, 1974, with the right of the Lessee, during such term or any extension thereof, to terminate said lease, and liability for any further rent, on the 4th day of May of any year, by giving 60 days' previous notice in writing to the Lessor.

3. As rent for said property, the Lessee shall pay the Lessor One Hundred & no/100 Dollars (\$ 100.00) per year, such rent to be payable in advance, but to be apportionable in the event the lease is terminated as provided in paragraph 2 hereof.

4. The Lessor warrants that he is the owner of the property, has the right to give the Lessee possession under this lease, and will, so long as this lease remains in effect, warrant and defend the Lessee's possession against any and all persons whomsoever.

5. The Lessee shall have the right, during this lease, to erect storage structures or facilities, make alterations, install scales, fences, or signs, in or upon the premises hereby leased and, at the expiration of said lease or any renewal or extension thereof or at any time this lease is in effect, may remove said storage structures, facilities, scales, fences or signs or any part thereof, whether or not such structures, facilities, scales, fences or signs have become legally a fixture.

6. The Lessee shall not assign this lease without the written consent of the Lessor. The Lessee, may, however, sublet the structures on the premises leased hereunder, or any one or more of them for the term of the lease or any part thereof upon such terms and conditions as Lessee may wish to so sublet.

7. The Lessee, if required by the Lessor, shall upon the expiration of this lease, restore the premises to the same condition as that existing at the time of entering upon the same under this lease, reasonable and ordinary wear and tear and damages by the elements or by circumstances over which the Lessee has no control excepted: Provided, however, That if the Lessor requires such restoration, the Lessor shall give written notice thereof to the Lessee 60 days before the termination of the Lease.

8. The Lessor grants and gives the Lessee the option as a consideration of this lease and for the further consideration of one dollar, the receipt of which is hereby acknowledged, to renew said lease for a period of 5 years from the Lessor, his heirs, executors, administrators, and assigns, for the sum of One Hundred and no/100 Dollars (\$ 100.00) per year.

9. As a consideration of this lease and for the further consideration of one dollar, the receipt of which is hereby acknowledged, the Lessor grants and gives the Lessee the option, at any time while this lease is in effect, to purchase said property from the Lessor, his heirs, executors, administrators, and assigns, for the sum of One Thousand Dollars (\$ 1,000.00). In the event the Lessee shall exercise this option to purchase said property, the Lessor agrees to furnish at his own expense an abstract of title, certificate of title, or other evidence of title satisfactory to CCC and to execute a good and sufficient warranty deed conveying fee simple title to said property free and clear of all taxes, liens, or encumbrances except for the following, and no others.

FIGURE C.2 CCC/USDA lease, 1964 to 1974.

454

T

FORM CCC GRAIN-13 (REVERSE)

10. In the event any increased tax assessment is made against the Lessor or the property by virtue of the erection of storage structures and facilities thereon by the Lessee, the Lessor agrees to cooperate fully in any contest of such increased assessment which the Lessee feels should be made. The Lessee agrees that the rental hereunder shall be adjusted upward by the amount of any such increased tax assessment which the Lessor and Lessee mutually agree to be proper or which is determined to be legally valid in court proceedings.

11. No member of or Delegate to Congress or Resident Commissioner, shall be admitted to any share or part of this lease or purchase or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this lease or purchase if made with a corporation for its general benefit.

12. The Lessor warrants that he has not employed any person to solicit or secure this lease upon any agreement for a commission, percentage, brokerage, or contingent fee and that no such consideration or payment has been or will be made. Breach of this warranty shall give CCC the right to annul the lease, or, in its discretion, to deduct from the rental or purchase price the amount of such commission, percentage, brokerage, or contingent fees. This warranty shall not apply to commissions payable by the Lessor if the lease is secured or made through a bona-fide agent maintained by the Lessor for the purpose of leasing or selling his property.

(Seal) Edna E. Burkholder LESSOR
(Seal) Edna E. Burkholder LESSOR
_____. WITNESS

COMMODITY CREDIT CORPORATION, LESSEE
By Warren R. Mueller
Chairman, Warren ASC County Committee
Contracting Officer

ACKNOWLEDGMENT

I, Sherry E. Williamson, do hereby certify that Mr. and Mrs. Aaron Burkholder to me known to be the person (or persons) who executed the foregoing instrument, personally appeared before me and acknowledged that he (she or they) executed the same as his (her or their) free act and deed and, in case said instrument was executed on behalf of a corporation, that he (she or they) as _____ (insert name of officer(s) and his (her or their) official title(s)) _____ was (were) duly authorized by the Board _____ (Name of Corporation) of Directors of said corporation to execute the said instrument on behalf of said corporation and to affix the corporate seal thereto. Given under my official hand and seal this day of September 2, 1963. My commission expires September 24, 1966.

Sherry E. Williamson
Notary Public

CERTIFICATION OF TRUE COPY

The undersigned hereby certifies that the foregoing Lease of Property is true, correct and authentic copy of an original lease duly executed by the lessor as above set forth.

Recording Official or Notary Public

RECEIPT OF COUNTY RECORDING OFFICIAL

The above Lease of Property or a true copy thereof was recorded or filed for record on _____, 19____, in _____, Volume _____ (Chattel Mortgage or real estate records, or other) Page _____ No. _____ (If Filed) State of _____, County of _____

County Recording Official


MRS. R. R. O'FARRELL, JR.

FIGURE C.2 (Cont.)

DEED—Quitclaim 331-2.T.W. Chase & Co., Stationery, Office Outfitters, Legal Blanks, etc., Kansas

THIS INDENTURE, Made this 3th day of June, 1965, between
Aaron Burkholder, and Elba E. Burkholder, his wife,
of Marion County, in the State of Kansas, of the first part, and
Canada Grain Company, Inc,
Marion, Kansas.
of Marion County, in the State of Kansas, of the second part,
WITNESSETH, That said parties of the first part, in consideration of the sum of
nine hundred ----- and 100 DOLLARS,
the receipt of which is hereby acknowledged, do by these presents, REMISE, RELEASE AND QUIT-
CLAIM, unto said parties of the second part, its heirs and assigns, all the following-described
REAL ESTATE, situated in the County of Marion
and State of Kansas, to wit:

Lot 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18,
in Block 11, in the City of Canada Kansas, according to the plat thereof.



TO HAVE AND TO HOLD THE SAME, Together with all and singular the tenements, hereditaments
and appurtenances thereunto belonging, or in any wise appertaining, forever.
IN WITNESS WHEREOF, The said parties of the first part have hereunto set their hand s,
the day and year first above written.
Executed and delivered in presence of
Aaron Burkholder,

FIGURE C.3 Sale of property by Burkholder to Canada Grain Co., 1965.

STATE OF Kansas Marion COUNTY, ss.

BE IT REMEMBERED, That on this 16th day of June, A. D. 19 65

before me, the undersigned, a Notary Public in and for the County and State

aforesaid, came Aaron Burkholder, and Elba E. Burkholder, his wife,

who are personally known to me to be the same persons who executed

the within instrument of writing, and such persons duly acknowl-

edged the execution of the same.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my

notarial seal, the day and year last above written.

Leta Rees
Notary Public.

(Term expires August 27, 1967.)

Leta Rees
Notary Public.

DEED

FROM

TO

Entered in Transfer Record in my office, this 16th day of June, A. D. 19 66.

STATE OF Kansas Marion COUNTY, ss.

This instrument was filed for record on the 16th day of June, A. D. 19 66.

at 11:00 A.M., and duly recorded in

Book on page 342.

Fee \$4.20

31-217-28-6314 - Grant & Co. Inc. 1963

FIGURE C.3 (Cont.)

Entered in Transfer Record in my office
Date 15 day of March A.D. 1976
Richard L. Haly County Clerk
his instrument was filed for record on 15 day of March 1976
at 3:00 clock P.M. and duly recorded in book 327 page 140
8115
Alma Jean Wicks
By Ellen Hansen Deputy
DA na Deputy

UNITED STATES MARSHAL'S DEED

KNOW ALL MEN BY THESE PRESENTS, That

WHEREAS, on the 21st day of May, 1976, in the United States District Court for the District of Kansas, in a certain action then pending in said court, numbered 76-27-C6, wherein the United States of America was plaintiff, and Canada Grain, et al., were defendants, a Journal Entry of Judgment and Foreclosure was rendered in said court foreclosing the mortgage in favor of the plaintiff, United States of America, in and upon the property hereinafter described; and it was further ordered that said property be sold by the United States Marshal for the payment of said judgment and costs, according to law, and that no parties were entitled to or granted rights of redemption in said property; and

WHEREAS, afterward, there was issued by the Clerk, an Order of Sale pursuant to said judgment, and in accordance with law, directed to the United States Marshal for the District of Kansas, commanding him to advertise and sell said property according to law, and that the proceeds thereof be applied as follows:

1. To the costs of this action and said sale;
2. All taxes unpaid and matured, and special assessments levied against said land and real estate that are due and unpaid at the date of sale and that have priority over the mortgage herein being foreclosed;
3. The expenses, interest and indebtedness found heretofore to be owing from the defendants Canada Grain Co., Inc., Harry Helmer, Frances Helmer, Elmer E. Rempel and Edith Rempel, to the plaintiff and also found to be a lien upon the property in question;
4. The balance thereof, if any, be brought into the court to await its further order.

and that he make return of the Order of Sale within sixty (60) days from the date thereof, with his proceedings endorsed thereon, which Order of Sale was delivered to and received by the said United States Marshal on June 7, 1976, and the said United States Marshal by virtue thereof, then advertised said property for sale

FIGURE C.4 Foreclosure on Canada Grain Co., 1976. The property includes the former CCC/USDA facility.

by causing a notice that he would on the 13th day of July, 1976, at the front door of the Marion County Courthouse, Marion, Kansas, offer said lands and tenements at public sale, and sell the same to the highest bidder at the time of sale, the said notice being published in a newspaper printed in Marion County, Kansas, and of general circulation in said county, the Marion County Record, which said newspaper has been continuously and uninterruptedly published in said county during the period of fifty-two (52) consecutive weeks immediately prior to the first publication of the Notice of this sale, said notice being published for more than thirty (30) days immediately prior to the date of said sale; and

WHEREAS, on the date so named in said notice and at the time designated therein, the United States Marshal did publicly offer for sale and sell the hereinafter described real estate, tenements and fixtures thereon, to Cooperative Grain and Supply, Hillsboro, Kansas, for the price of \$2,000.00, to wit:

- Item 17: Lots 7-12 inclusive and Lots 16-18 inclusive, all in Block 6, Canada, Kansas (Marion County);
- Item 18: Lots 7-18 inclusive in Block 11 in the City of Canada, Kansas, according to the plat thereof. (Marion County);
- Item 19: Lots 1-6 inclusive of Block 3 and Lots 1-6 inclusive of Block 4 in Original Town of Canada, Kansas. (Marion County);
- Item 20: Lots 1 and 2 and the West 1/2 of Lots 13, 14 and 15, Block 6, Canada, Kansas. (Marion County).

and

WHEREAS, the said United States Marshal duly returned said Order of Sale to said court, with his proceedings thereunder endorsed thereon, and thereafter, and on the 21st day of January, 1978, the Court duly confirmed said sale as having been made in all respects

FIGURE C.4 (Cont.)

Corporation Deed (General Warranty)

STATE OF KANSAS, } *4423*
Marion County, } ss.
 This instrument was filed for record
 on the *21* day of *Oct*, A.D.
 197*8*, at *4* o'clock *P*. M., and
 duly recorded in Book *327* of Deeds,
 at page *231*.

Anna Jane Welch
 Register of Deeds.
 By *Angela Moore* Deputy.

FEES
 Register of Deeds,
 for recording, \$
 County Clerk, for Transfer
 Total, \$

Entered in Transfer Record
 in my office, this *27*
 day of *October*, A.D., 197*8*.
Arthur D. Gentry
 County Clerk.

THIS INDENTURE, Made this *23rd* day of *October*
 A.D., 197*8*, between
D & R Grain, Inc.
 a corporation duly organized, incorporated and existing under and by virtue
 of the laws of the State of *Kansas* and having its principal
 place of business at *Hillsboro* in
 the State of *Kansas* of the first part, and
Countryside Grain, Inc.
 of *Marion* County, in the State
 of *Kansas* of the second part:

WITNESSETH, That said part *Y* of the first part, in consideration of
 the sum of *One* and *00* DOLLARS
 the receipt of which is hereby acknowledged, do *CS* by these presents,
 Grant, Bargain, Sell, and convey unto said part *Y* of the second part,
 its heirs and assigns, all the following-described real estate, situated
 in *Marion* County and State of *Kansas*, to wit:

*Lots 7-12 inclusive and Lots 16-18 inclusive, all
 in Block 6, Canada, Kansas;
 Lots 7-18 inclusive in Block 11 in the City of Canada,
 Kansas;
 Lots 1-6 inclusive in Block 3 and Lots 1-6 inclusive
 in Block 4, Original Town of Canada, Kansas;
 Lots 1 and 2 and the west 1/4 of Lots 13, 14 and 15,
 Block 6, Canada, Kansas.*

TO HAVE AND TO HOLD THE SAME, Together with all and singular the tenements, hereditaments and appurtenances thereunto belonging or in anywise appertaining, forever

And said grantor for itself, its successors and assigns, does hereby covenant, promise and agree, to and with said part *Y* of the second part, that at the delivery of these presents it is lawfully seized in its own right, of an absolute and indefeasible estate of inheritance, in fee simple, of and in all and singular the above granted and described premises, with the appurtenances; that the same are free, clear, discharged and unincumbered of and from all former and other grants, titles, charges, estates, judgments, taxes, assessments and incumbrances, of what nature or kind soever;


and that it will warrant and forever defend the same unto said part *Y* of the second part, its heirs and assigns, against said party of the first part, its successors and assigns, and all and every person or persons whomsoever, lawfully claiming or to claim the same

IN WITNESS WHEREOF, the said party of the first part has hereunto caused this Deed to be signed on its behalf by its _____ President thereunto duly authorized so to do, and has caused its corporate seal to be hereunto affixed the day and year first above written

D & R GRAIN, INC.
 By *Raymond Chas. ...*
 President

(Corporate Seal)

Original compared with record
 8-7846-423-1-41



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FIGURE C.5 Warranty deed, D&R Grain to Countryside Grain, 1978.

WARRANTY DEED (Kansas Statutory Form)

<p>Entered in Transfer Record in my office, this 18th day of <u>June</u>, A.D., 19<u>91</u> <u>Myraquette Caliste</u> County Clerk.</p>	<p>DANIEL P. JANZEN and SUSAN A. JANZEN, husband and wife</p> <p>CONVEY AND WARRANT TO COOPERATIVE GRAIN & SUPPLY Hillsboro, Kansas all the following described REAL ESTATE in the County of Marion and the State of Kansas, to-wit:</p> <p>Lots 1 to 6, both inclusive, Block 3; Lots 1 to 6, both inclusive, Block 4; Lots 1 and 2, and Lots 7 to 12, both inclusive, Lots 16, 17 and 18, and West 1/2 of Lots 13, 14 and 15, Block 6; Lots 7 to 18, both inclusive, Block 11, all in Original Town, Canada, Kansas.</p> <p>for the sum of One (\$1.00) Dollar and Other Valuable Consideration</p> <p>EXCEPT AND SUBJECT TO: Easements and Rights of Way of record, if any.</p> <p>Dated: <u>June 18</u>, 19<u>91</u> STATE OF KANSAS, <u>MARION</u> COUNTY, ss</p> <p>BE IT REMEMBERED, That on this <u>18th</u> day of A.D. 19<u>91</u>, before me, the undersigned, a notary public in and for the County and State aforesaid, came Daniel P. Janzen and Susan A. Janzen, husband and wife,</p> <p>who <u>are</u> personally known to me to be the same person <u>S</u> who executed the within instrument of writing and such person <u>S</u> duly acknowledged the execution of the same.</p> <p>IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal, the day and year last above written.</p> <div style="display: flex; align-items: center;"><div style="border: 1px solid black; padding: 5px; text-align: center;"><p>LYLE K. LEPPER Notary Public State of Kansas</p><p>My Appt. Expires <u>June 18, 1992</u></p></div><div style="margin-left: 20px;"><p><u>[Signature]</u> Notary Public.</p></div></div> <div style="text-align: center; margin-top: 10px;"><p>SEAL NOTARY PUBLIC MARION COUNTY, KANSAS</p></div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"><p>STATE OF <u>KANSAS</u> County, <u>Marion</u></p><p>This instrument was filed for record on the <u>18</u> day of <u>June</u>, A.D., 19<u>91</u> at <u>11:00</u> o'clock <u>A</u>.M., and duly recorded in book <u>54-1</u> of <u>18626</u> at page <u>137</u> <u>[Signature]</u> Register of Deeds.</p><p>Fees: \$ <u>6.00</u> Deputy.</p></div>
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FIGURE C.6 Warranty deed, Janzen Farm Service to Cooperative Grain and Supply, 1991.



Environmental Science Division

Argonne National Laboratory

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