LOWER NIOBRARA NATURAL RESOURCES DISTRICT

GROUNDWATER MANAGEMENT PLAN

2003

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I. Introduction

The Groundwater Management and Protection Act, as amended, required that each District shall amend its Groundwater Management Plan to identify to the extent possible the levels and sources of groundwater contamination within the area; groundwater goals, long-term solutions to reduce high levels sufficiently to eliminate health hazards, and practices recommended to stabilize, reduce, and prevent the occurrence, increase or spread of groundwater contamination. The Lower Niobrara NRD has, based on known available information, amended its groundwater management plan (originally approved on August 11, 1986) to address these requirements. This revision of the Lower Niobrara NRD's groundwater management plan will also provide direction to NRD Directors and Staff.

In the Lower Niobrara NRD's 1986 Groundwater Management Plan, the major concern was groundwater levels. That plan stated the District would begin to hold hearings to consider a groundwater management area if the District's monitoring program indicated the average water level had dropped below or equal to the low average recorded in 1981. The District's ongoing water level monitoring program indicated that point had nearly been reached by the fall of 1991. However, average water levels recorded in the fall of 1992, and subsequent monitoring, indicated that favorable rainfall has stabilized water level declines. Therefore, the revised plan will set out general criteria and actions for managing groundwater quantity concerns in the District, as described in Appendix B.

The 1986 plan indicated the District did not feel a management plan based on water quality concerns was necessary. Since that time, concerns have shifted from water quantity to water quality. In May of 1992, the LNNRD took action indicating its intent to include the entire NRD in a Groundwater Quality Management Area. The NRD's Groundwater Quality Management Area was established 7/1/1996 and the strategy for implementing this Management Area is included as Appendix A to this document.

II. Hydrogeologic Characterization

A. Physiography and Geology of the Lower Niobrara NRD

The Lower Niobrara NRD includes 2,641 square miles of central and eastern Keya Paha County, northern Holt County, western Knox County, Boyd County and northern Rock County (see Figure 2.1). The majority of the district lies in the high plains section of the Great Plains physiographic province. The area north and east of the Keya Paha River, including the Ponca Creek drainage, lies in the unglaciated Missouri Plateau section.

The Dakota-Nebraska Eroded Tablelands commences to the west of the District in northeastern Cherry County north of the Niobrara River with the Crookston Table, which is joined on the east by the Springview Table which extends into the District (see Figure 2.2).

The Naper Table is bounded by the Keya Paha River on the west and the Ponca Creek on the east. Most of the area drained by the Ponca Creek is known as the Rolling Pierre Shale Plains. Tablelands south of the Niobrara River start with the Ainsworth Table in central Brown County and extends eastward with the Long Pine and Holt Tables (See Figure 2.3).

The upland surface of most of these tables is nearly level to gently rolling. The surface is deeply entrenched by major tributaries.

The largest undissected surface is only a few thousand acres. Sandstones of the Ogallala Group underlie all of the Dakota-Nebraska Tablelands except the Rolling Plains and Hills, which are underlain by the Pierre Shale Formation.

B. Groundwater Supplies

Groundwater occurrence and extent varies widely within the District. There are two distinctively different groundwater reservoir areas. The Underground Water Areas map, compiled by E.C. Reed (1969), indicates the area generally north of the Niobrara River is in what is referred to as the North-Central Tableland Region. Included in this region are smooth to gently rolling lands, and the flood plains and adjacent terraces in the valley of the Niobrara River and its principal tributaries. Underlying the upland surface is the eastwardly thinning Ogallala Group which is a source of medium to moderately large supplies of good quality water, where the zone of saturation is thick. The lower lying rough rolling terrain was developed on shales of Cretaceous age. Throughout this area supplies of water are almost unavailable except by drilling several hundred feet to tap the Dakota Sandstone

Medium to moderately large supplies of good quality water can be obtained from thicker deposits of the Pleistocene sands and gravels underlying the flood plains. In some of the eastern areas of this region wells tapping the Dakota will flow at lower elevations. Dakota water often is highly mineralized and thus not desirable for some uses.

Much of the southern half of the district lies in what is referred to as the Sandhills Region. Much of this area, though now having yielded to farm development, includes sand covered dunes, some flat interdune meadows, and some areas of undefined drainage. As the sandy soils absorb precipitation and transmit it downward, very little runoff results.

Much of this southern half of the District is underlain by permeable water-bearing rock of Tertiary and Quaternary age. The O'Neill Unit, Lower Niobrara Division. Pick-Sloan Missouri River Basin Program, Nebraska, Final Environmental Statement Supplement No. 2 (Eggen, 1981), indicates there are two aquifers of importance to the O'Neill Unit's five county area: (1) the Ogallala Group of Tertiary age and (2) the overlying sand and gravel deposits of Pleistocene Age.

Although the two aquifers are in hydraulic connection with each other, the hydraulic characteristics are quite different. The Ogallala Group, which is the lower aquifer, is typically tighter and less permeable than the overlying Pleistocene deposits. When a well penetrates both aquifers a large part of the well's production may be derived from the upper formation because of its greater permeability. Permeabilities of the Ogallala Group generally range between 50 and 150 gallons per day per square foot, whereas the permeability of the Pleistocene sands and gravels

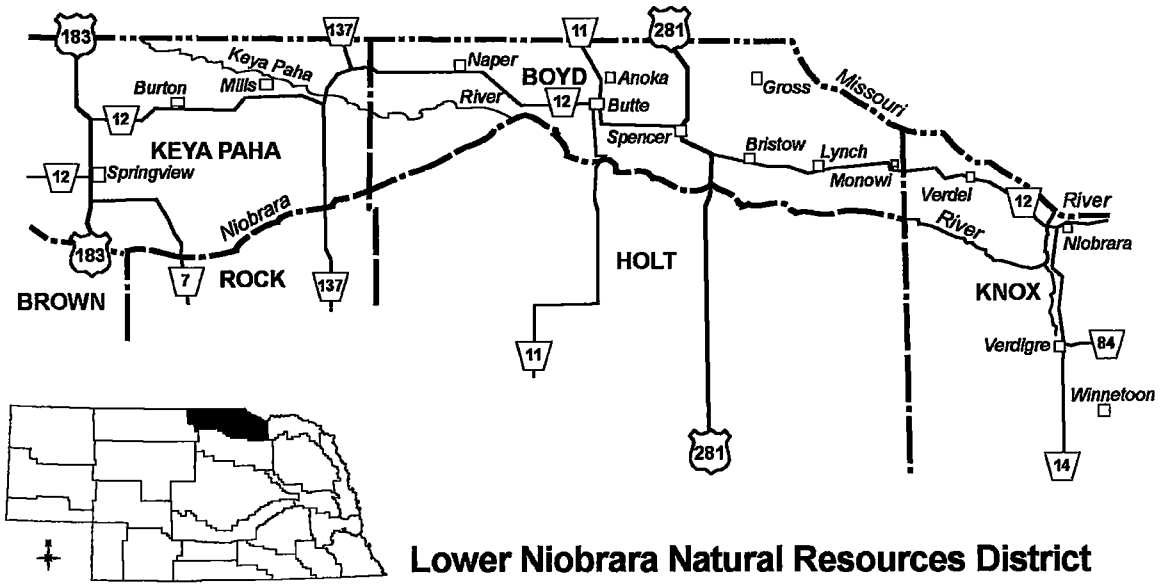


Figure 2.1 Lower Niobrara Natural Resources District Boundaries

(Department of Natural Resources)

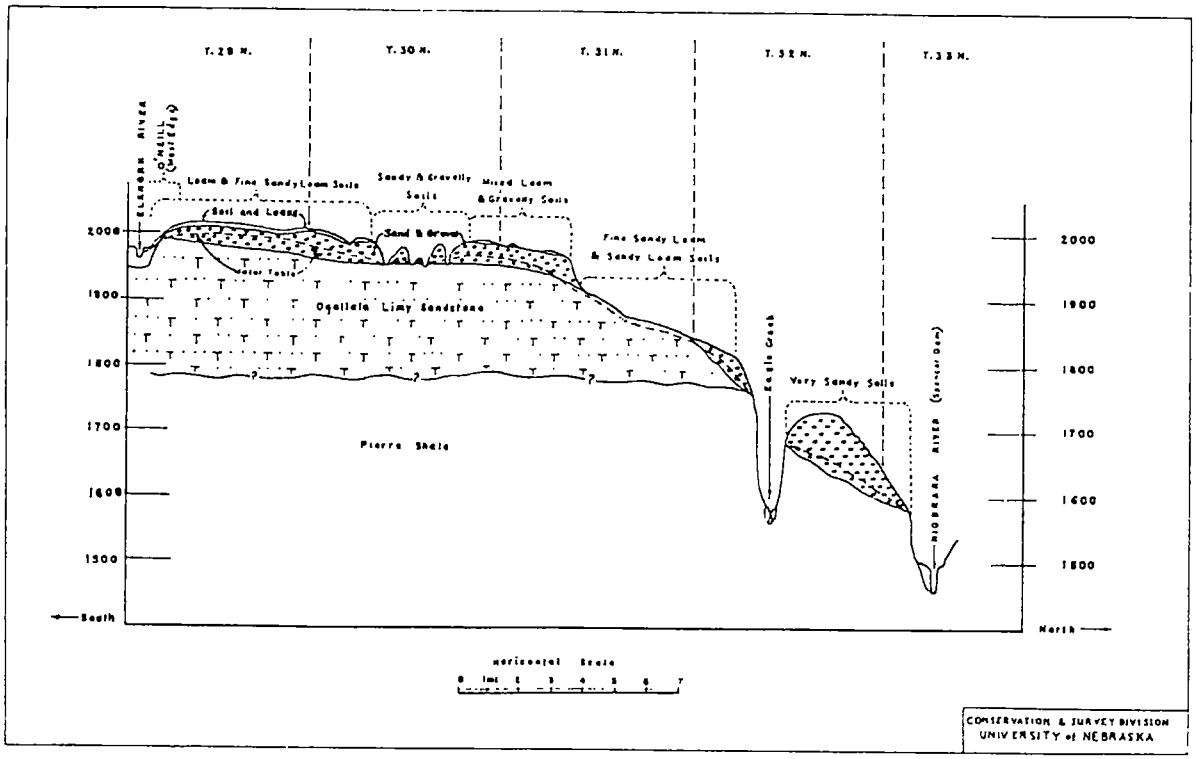


Figure 2.2 Generalized Geologic Profile Section from O'Neill to Niobrara River at Spencer Dam along U.S. Highway 281.

(Groundwater Survey of Area North of O'Neill, Holt County, Nebraska, Conservation and Survey Division, UNL, Dec 1944.)

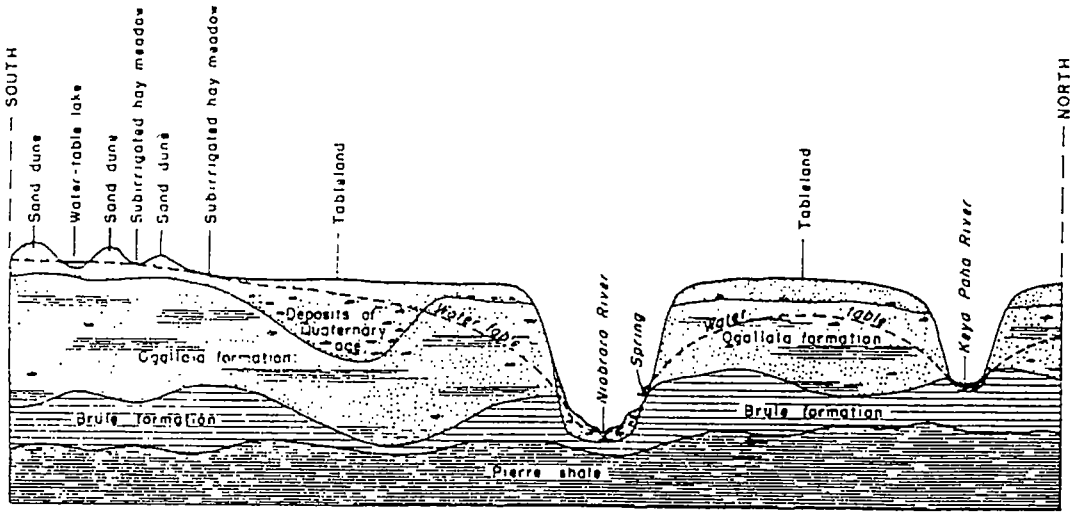


Figure 2.3 Schematic cross section of the lower Niobrara River basin a few miles east of the mouth of Minnechaduza Creek

(Groundwater Resources of the Lower Niobrara River and Ponca Creek Basins, Nebraska and South Dakota, USGS - Water Supply Paper 1460-G, Thomas G. Newport, 1959.)

range from 500 to over 2,000 gallons per day per square foot. Thus it is possible for 20 feet of saturated Pleistocene sands to produce as much as over 200 feet of saturated Ogallala Group . Groundwater from these formations is usually low in total dissolved solids.

C. Transmissivity and Saturated Thickness

Transmissivity, which is a rate which quantifies the ability of an aquifer to transmit water, differs considerably from area to area within the District (The Groundwater Atlas of Nebraska, 1998).

Transmissivity of the principal aquifer is generally in the range of 0 to 20,000 gallons per day per foot in the majority of the District. The exception to this is the O'Neill-Atkinson area of Holt County, where the range is in excess of 100,00 gallons per day per foot (see Figure 2.4).

The saturated thickness of the principal aquifer varies greatly across the District. It is thin or nearly absent in Boyd County and in portions of Knox and Keya Paha Counties. In portions of Holt, Keya Paha, Rock, and Knox Counties it ranges from 100 to 300 feet thick (see Figure 2.5). Areas in south central Knox County appear to have a good saturated thickness but, because of "tight" sands, transmissivity is poor and yields are lower than expected.

D. Vulnerability Description

A number of factors enter into the vulnerability of groundwater. The DRASTIC methodology takes into consideration the depth to water, recharge to the aquifer, aquifer media, soil media, topography, impact, and impact of vadose zone and conductivity. A relatively great potential for groundwater contamination exists along major tributaries of the Niobrara River and a portion of the Niobrara itself between Rock and Keya Paha Counties (see Figure 2.6).

Also at risk of contamination is an area beginning at the Elkhorn River that reaches several miles north in Holt County and extends across northern Rock County. Upland areas with greater depths to water and silty soils have relatively low potential for groundwater contamination.

Areas in which there is extensive irrigation and chemical use are also at risk. Much of the irrigated areas within the NRD including those areas in Holt, Rock, Knox, Keya Paha, and Boyd counties have some potential for groundwater contamination.

E. Depth to Groundwater Level

The depth to water map contained in The Groundwater Atlas of Nebraska (1998), indicates the depth to water in most areas of the District ranges from 0 to 50 feet. Scattered areas across the District are 50 to 100 feet. Areas in eastern Boyd County, northern Knox, and northwestern Holt County along either side of the lower reaches of the Noibrara River have a depth to water of 100 to 200 feet. In a small portion of that same area the depth to water may exceed 200 feet (see Figure 2.7).

Only general depths to groundwater can be described in this plan because topography and water tables vary from area to area. Reasonably accurate estimates of groundwater levels in a given location could be made by referring to recent test hole or well drilling logs, which are available at the NRD Office or the Nebraska Department of Natural Resources.

F. Recharge Characteristics and Rates

The groundwater reservoir is recharged by infiltrating precipitation. Base flows of the groundwater reservoir are generally constant from year to year, whereas infiltrating precipitation is affected by the amount, distribution, and intensity of the precipitation, amount of moisture in the soil; air temperature; vegetative cover; land slopes; and permeability of the soil at the site of infiltration. Recharge from precipitation is greatest where materials from the surface down to the water table are dune sand or other permeable mantle rock, less where there is loess or waterlaid silty clay, and least where there is cemented fine-grained rock.

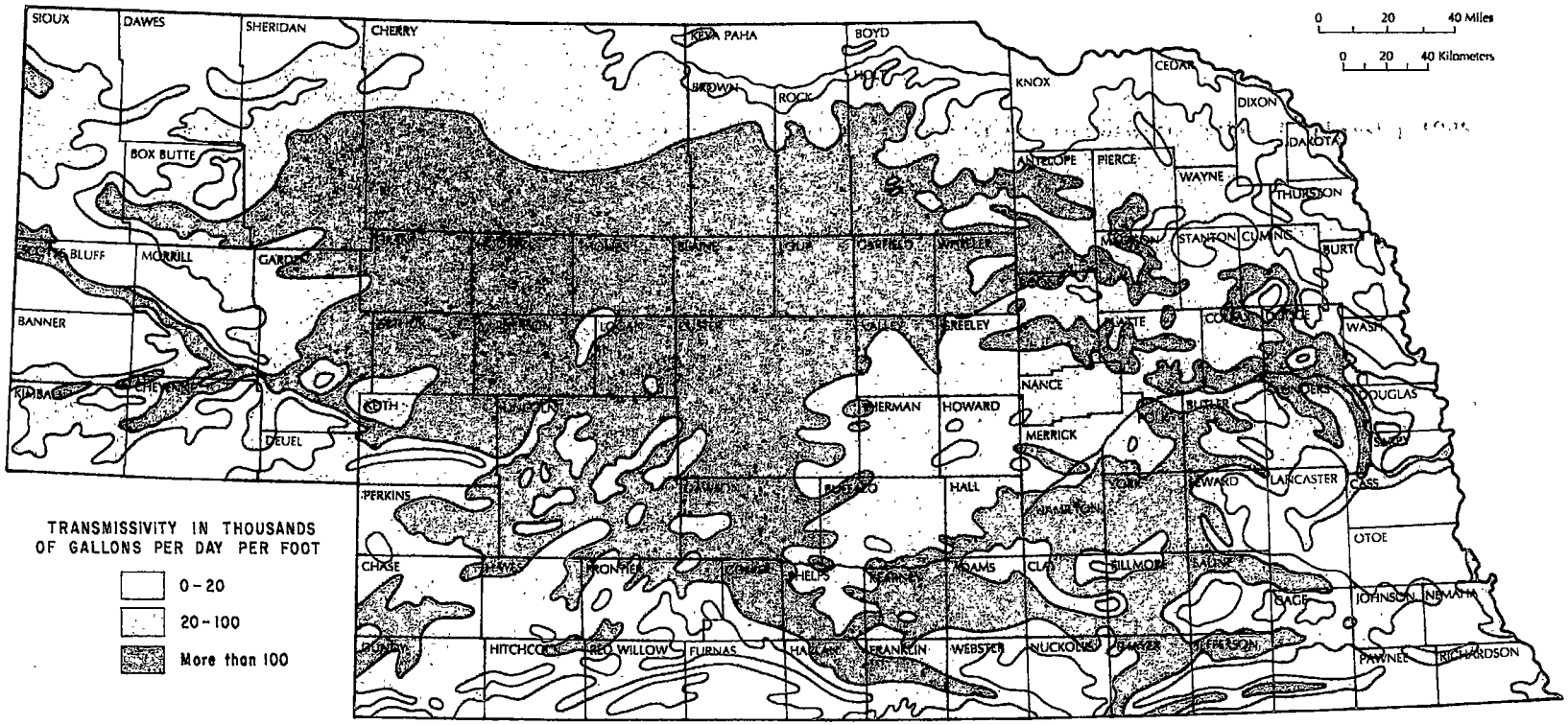


Figure 2.4 Transmissivity of the Principal Groundwater Reservoir (from The Groundwater Atlas of Nebraska, 1998)

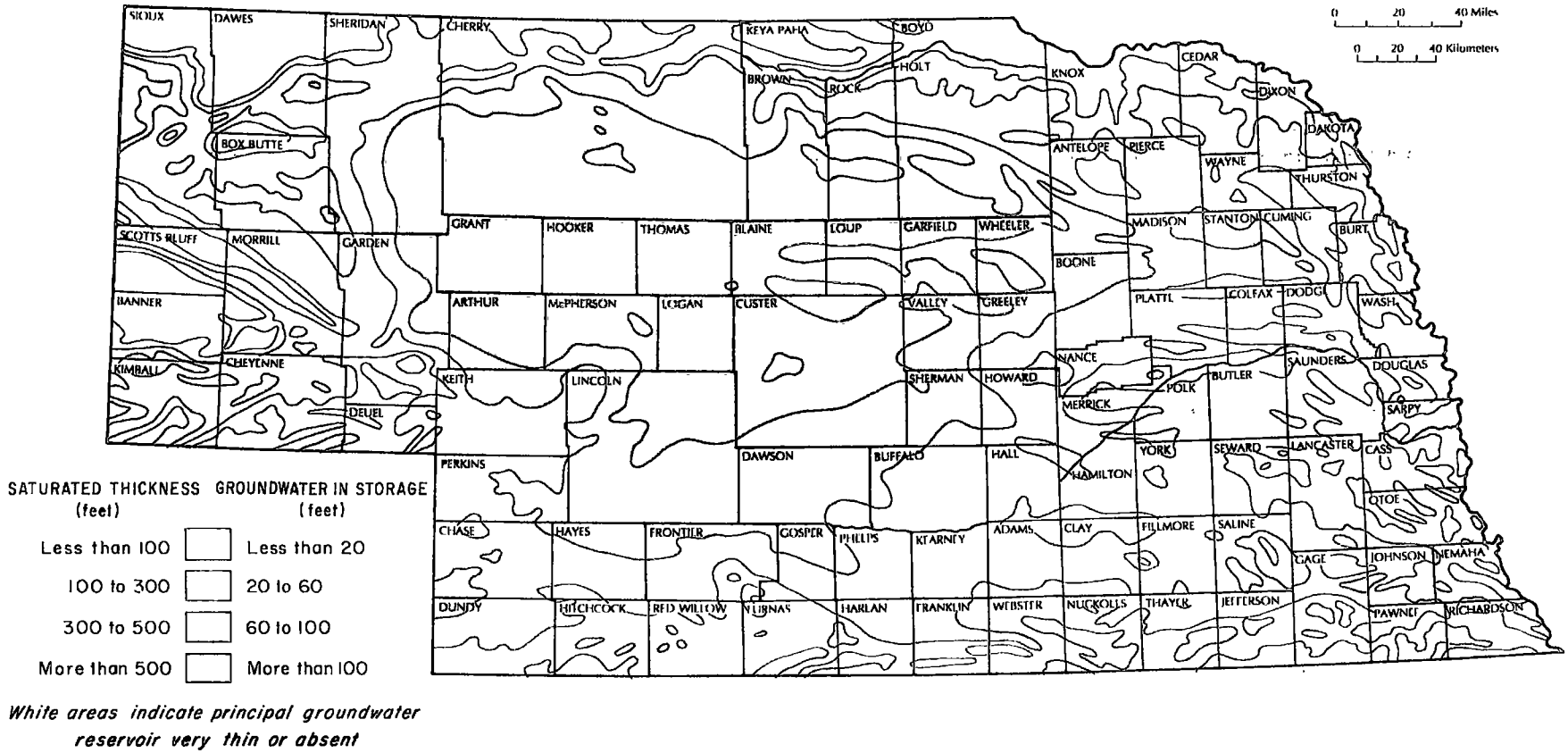


Figure 2.5 Saturated Thickness of the Principal Groundwater Reservoir (from The Groundwater Atlas of Nebraska, 1996)

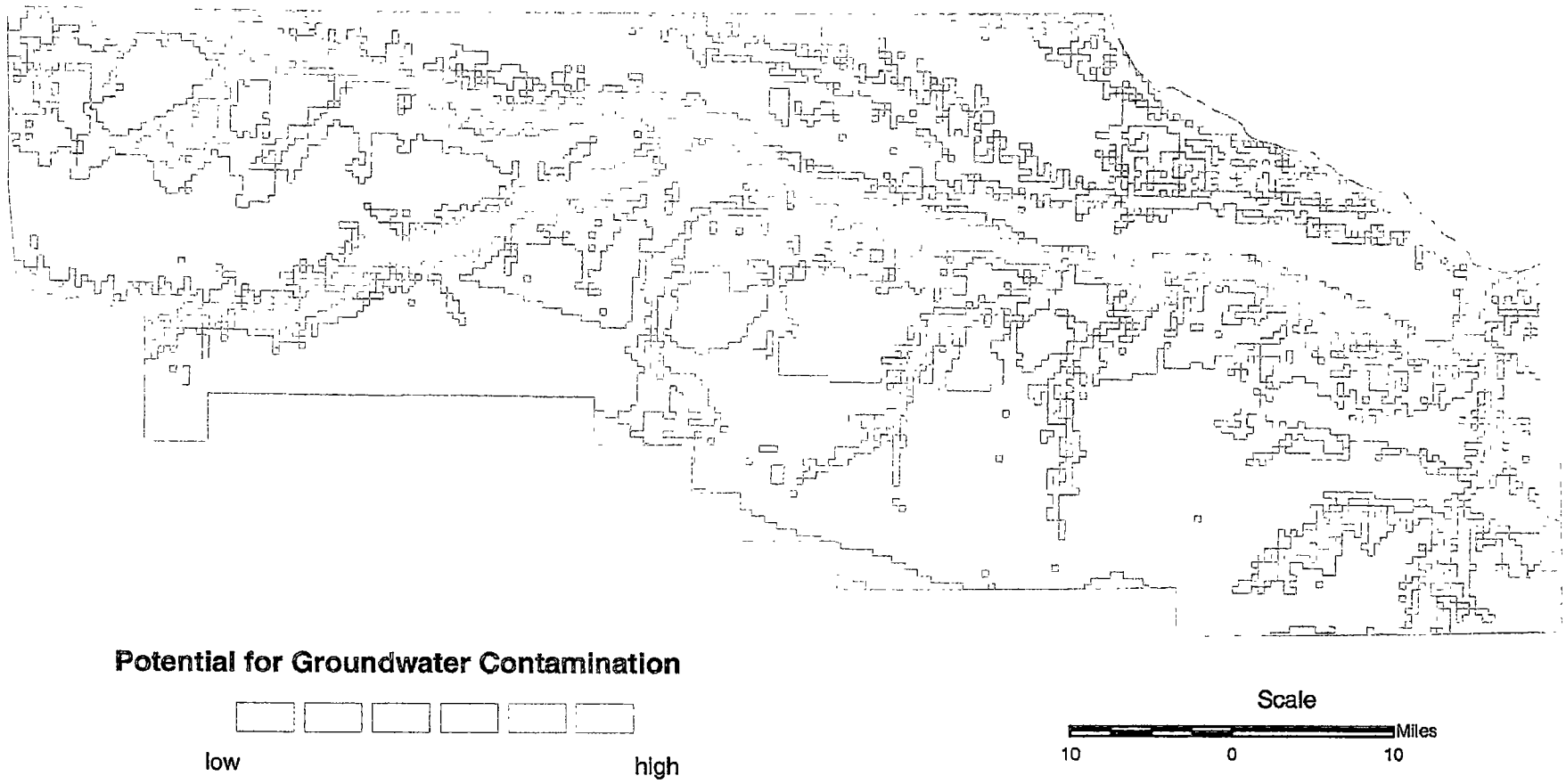


Figure 2.6 Groundwater Vulnerability to Contamination Using the DRASTIC Method within the Lower Niobrara NRD.

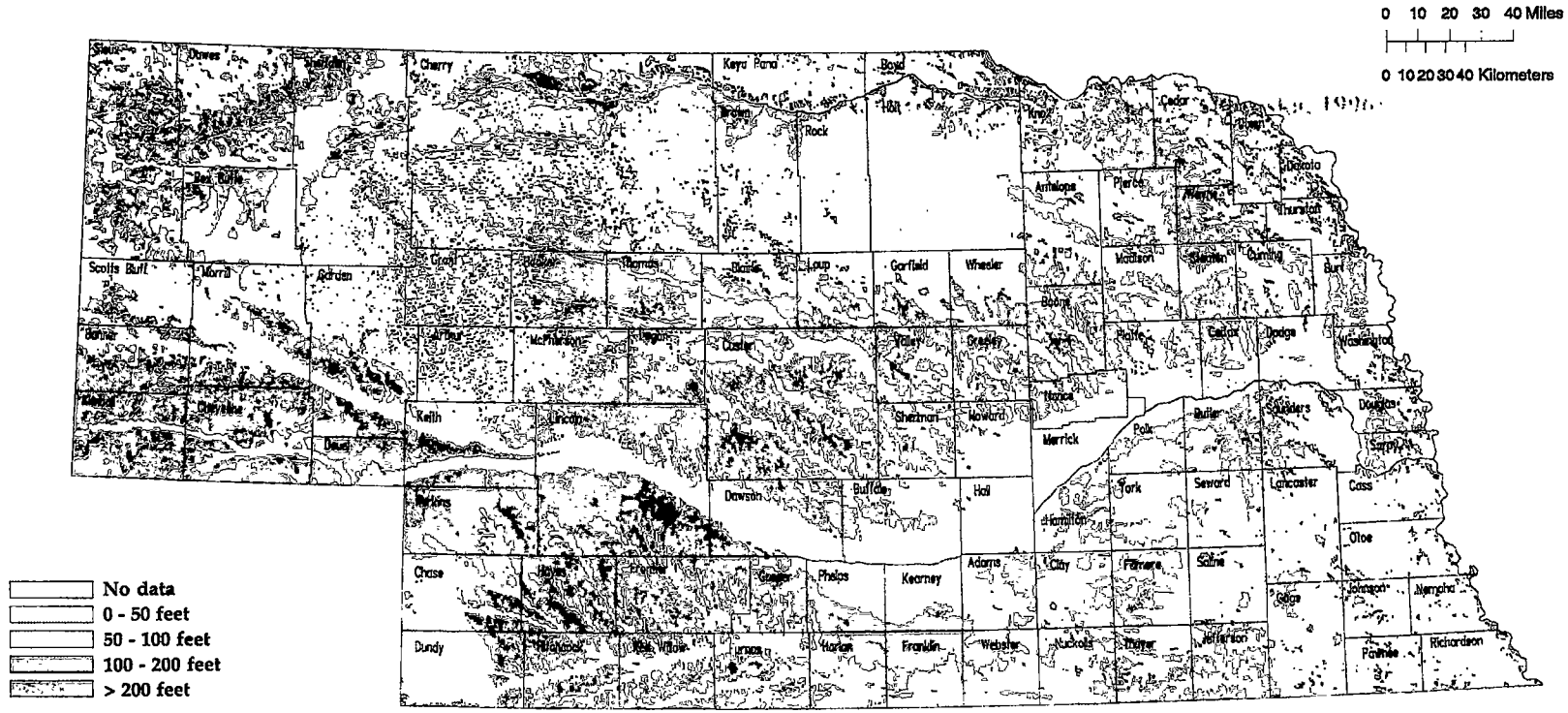


Figure 2.7 Depth to the Regional Water Table (from The Groundwater Atlas of Nebraska, 1996)

In areas of sand dunes, recharge from precipitation may be as great as 5.5 inches per year. In the loess-mantled areas the average recharge may be from 1 to 2 inches per year and where mortar beds of the Ogallala Group are at or close to the surface, recharge may be only a fraction of an inch. Precipitation, which is a substantial contributor to the recharge groundwater reservoir, ranges from an average annual rainfall of 20 inches in the western portion of the district to 26 inches in the east (see Figure 2.8). Approximately two thirds of the total annual precipitation falls during the growing season – May through September. Normal rainfall is highest in June and lowest in January (Wilhote, 1981).

G. Water Level Monitoring

The District began a program of measuring static water levels in 1975. The District currently measures approximately 55 wells within its boundary twice annually to determine static water levels. Spring measurements are taken just prior to the irrigation pumping season. Fall measurements are taken in late fall usually in October or November. Information is kept on file in the NRD Office and is also submitted to the Conservation and Survey Division of the University of Nebraska, U.S. Geological Survey and the Department of Natural Resources.

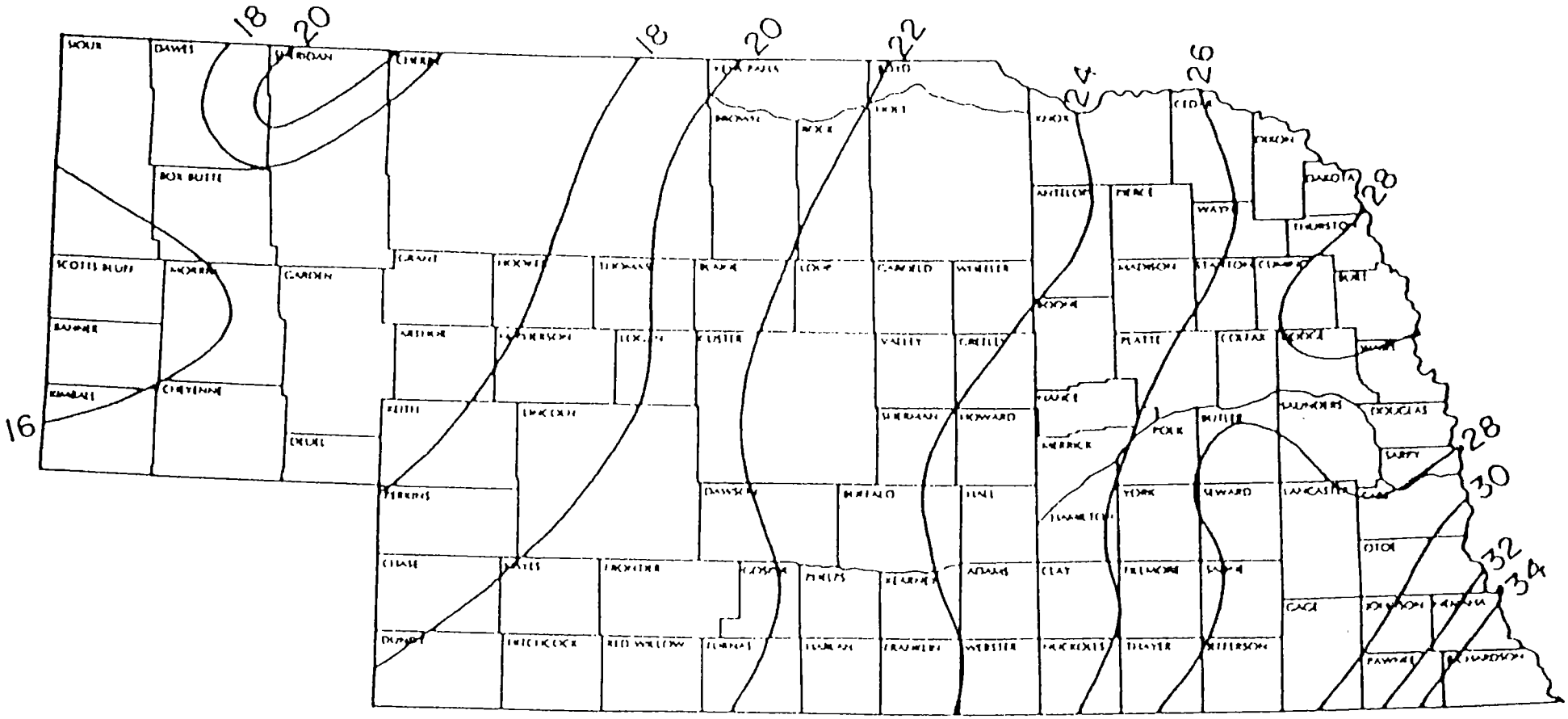


Figure 2.8 Mean Annual Precipitation (in inches) from 1900 to 1979 - from "An Analysis of Nebraska's Precipitation Climatology with Emphasis on Occurence of Dry Conditions", Agricultural Experiment Station, UN-L, Wilhite, D., 1981

III. Water Quality Inventory and Water Quality Monitoring

A. Water Quality Monitoring

To help characterize and understand ground water quality within the District, LNNRD has commissioned three separate but related studies by researchers from the University of Nebraska, taking place in 1976, 1990, and 1991. The LNNRD's first activity in water quality was the 1976 Baseline Survey of the Groundwater Chemistry in Holt County, Nebraska, prepared by Exner and Spalding. This report was prepared as a result of a cooperative agreement between the Upper Elkhorn NRD, the Lower Niobrara NRD and the Conservation & Survey Division of the University of Nebraska. During the summer of 1976, 308 wells in Holt County were sampled for chemical quality. The maximum contaminant level for nitrate is 10 ppm. Twenty percent of the wells had nitrate-nitrogen (NO_3-N) concentrations above 10 ppm. The majority of these wells were concentrated in the O'Neill and Atkinson areas. The average NO_3-N in this area was 11.3 ppm.

In 1990 the Lower Niobrara NRD contracted with the Nebraska Water Center, Institute of Agriculture and Natural Resources, to assist with a one year study in northern Holt County to: (1) evaluate the change in the areal extent of non-piont nitrate contamination in the irrigated area, (2) determine the impact of irrigated agriculture on nitrate, chloride and sulfate concentrations, (3) determine the rate of increase in the concentrations of these ions from the samplings in 1976, and (4) evaluate the extent of atrazine contamination in the irrigated areas (Spalding & Exner, 1991).

Water samples were collected from 49 irrigation wells in northern Holt County by the NRD in 1990. Nitrate concentrations in the 49 irrigation wells increased an average of .53 ppm NO_3-N per year in the fourteen year interval between the 1976 study and the 1990 assessment (see Figure 3.1 and Table 3.1). Of the fourteen resampled wells in the high nitrate zone north of Atkinson, the average concentration increased from 17.5 ppm in 1976 to 23.0 ppm in 1990, an average increase of 0.39 ppm/yr. The central zone of high nitrate groundwater expanded from 62,000 acres with an average of 17.5 ppm to an estimated area of 102,000 acres with an average concentration of 20.8 ppm. In the high nitrate zone northeast of O'Neill six wells were resampled. The average concentration in this area increased from 13.5 ppm to 22.9 ppm in 14 years, an average of 0.67 ppm per year.

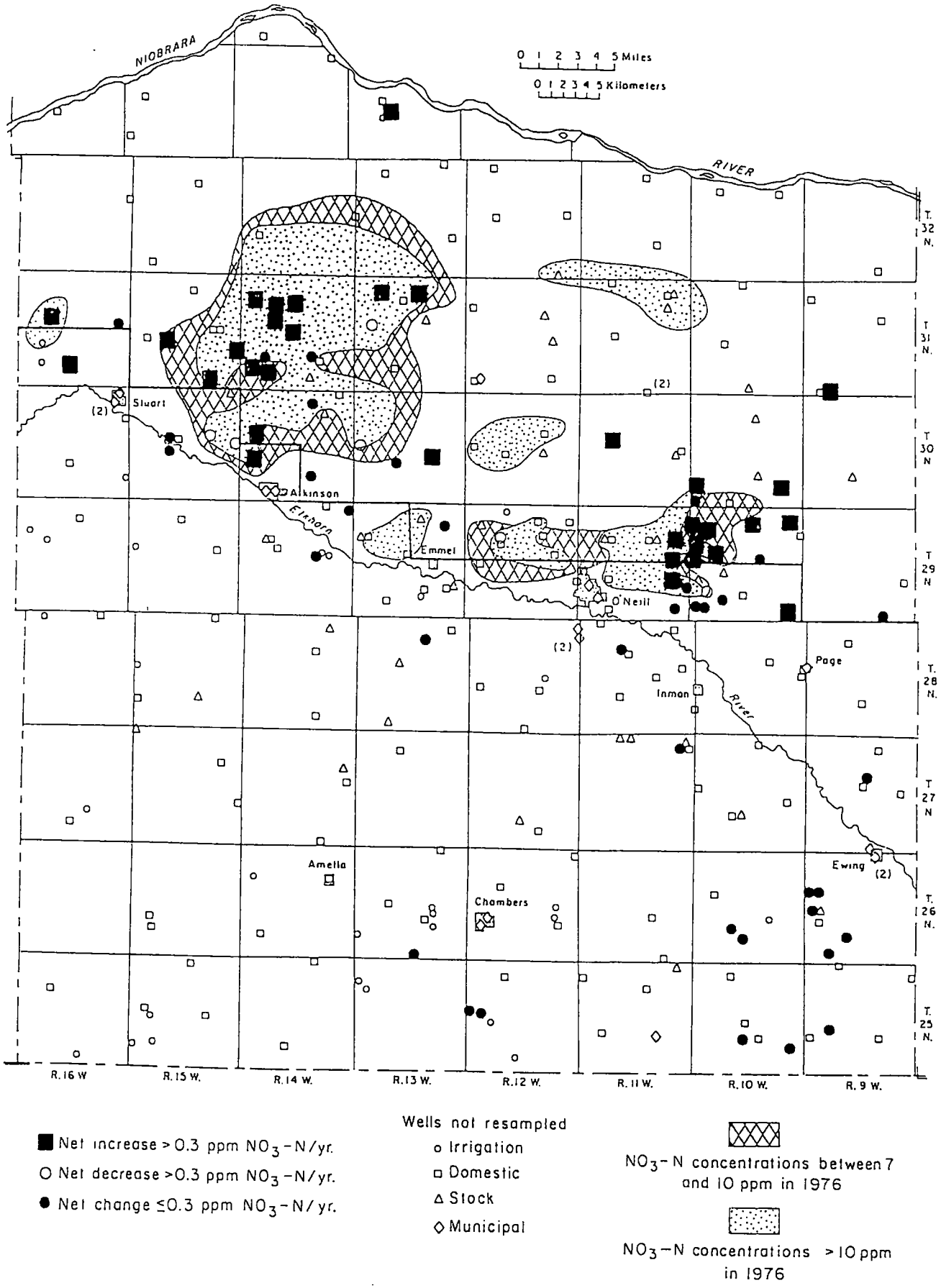
Atrazine was detected in nine of eleven wells tested for atrazine in the 1990 study. Detections were at trace levels – well below the MCL of 3 ppb.

In 1991 the NRD entered into an agreement with the Nebraska Water Center to do an analysis similar to what had been done in 1990 (Exner and Spalding, 1992). Water samples were collected from forty-nine irrigation wells in Boyd, Holt, Keya Paha, Knox and Rock counties from areas not included in the 1976 and 1990 studies. These were first time reading and thus show no trend, but provide baseline information (see Table 3.2).

Nitrate-nitrogen concentrations in the ten wells sampled in Keya Paha County in 1991 all were below 10 ppm. Concentrations ranged from 1.7 to 6.8 ppm. One of the nine wells sampled in Rock County exceeded 10 ppm. Concentrations in Rock County ranged from 1.6 to 10.1 ppm. In Boyd County six wells were sampled with the range of concentration being from 0.1 to 18.6 ppm. The three wells with nitrate concentrations above 10ppm were in the irrigated area between the Niobrara and Keya Paha Rivers. In Holt County fifteen wells were sampled in 1991 for nitrate levels. The nitrate levels ranged from 2.9 ppm to 39.6ppm, with twelve wells testing above 10ppm. In Knox County, eight wells were sampled with one well having 32.1 ppm. The remaining wells ranged from 1.2 ppm to 9.4 ppm. Of the six wells tested for atrazine in 1991, one sample indicated a concentration of .03ppb. This level is extremely low and 100 times lower than the 3 ppb maximum contaminant level for public water supplies.

Spalding and Exner, from UNL, concluded that nitrate contamination in Holt County groundwater resulted from leaching of agricultural fertilizers (Spalding, et. al., 1979). The continued association expressed in the 1990 correlation suggests that in those fourteen years there may have been relatively little change in the proportions of these ions in the leachates. This may suggest consistency in the amounts of potash, sulfamag, and nitrogen fertilizers applied.

The District purchased a HACH Kit in 1982, which allows rapid testing of water samples for nitrate contamination. This test detects the presence of nitrates by transmitting light through a reagent treated sample to a spectrophotometer. Since that time the District has provided free testing for nitrate levels (NO_3-N) when individuals



(Trend Analysis of Groundwater Quality in Holt County within the Lower Niobrara Natural Resources District, 1991)

Figure 3.1 Net changes in nitrate-nitrogen concentrations in irrigation wells between 1976 and 1990.

Table 3.1 1990 GROUNDWATER QUALITY DATA

LOCATION	DEPTH (FEET)	NO3-N (ppm) 1976	NO3-N (ppm) 1990	Cl- (ppm) 1976	Cl- (ppm) 1990	SO42- (ppm) 1976	SO42- (ppm) 1990	ATRAZINE (ppb) 1990
29N-9W-35CA	225	2.5	6.0	2.0	2.3	5.7	8.0	--
29N-10W-1C	224	5.0	20.6	2.7	9.2	7.8	13.5	--
29N-10W-3C	264	3.4	24.7	2.1	10.5	5.7	14.5	--
29N-10W-7A	282	8.5	14.7	--	6.2	--	10.1	--
29N-10W-7B	--	4.1	31.1	2.4	15.3	6.1	22.1	--
29N-10W-7C	280	16.0	30.2	12.7	29.8	8.7	16.5	--
29N-10W-15D	284	4.0	8.0	1.9	3.6	4.0	5.6	--
29N-10W-17B	290	16.0	30.9	10.3	10.6	7.8	13.6	--
29N-10W-18C	310	4.4	15.1	--	5.2	--	9.9	--
29N-11W-12C	278	12.0	19.5	--	7.2	--	12.4	--
29N-11W-13C	300	9.7	14.4	7.0	4.6	5.8	9.7	0.06
29N-12-4BD	222	1.4	--	1.3	--	2.3	--	--
29N-12W-8D	300	26.0	3.8	14.0	1.4	12.0	2.9	0.11
29N-13W-11AA	352	2.2	5.4	0.8	2.2	2.0	2.9	<0.05
30N-10W-26D	266	5.6	10.3	1.9	4.2	7.8	10.1	0.05
30N-10W-31B	--	12.0	26.7	4.5	11.7	9.0	20.0	--
30N-10W-31C	242	7.3	11.3	--	4.9	--	9.2	--
30N-11W-17AD	215	4.7	10.2	0.3	1.8	10.0	8.4	--
30N-13W-18C	285	37.5	31.7	--	13.1	--	27.0	0.65
30N-13W-21CC	300	6.8	7.8	2.0	3.2	4.3	6.6	0.07
30N-13W-23BC	261	1.4	12.0	0.9	4.4	4.6	4.6	--
30N-14W-3DD	92	18.9	21.3	6.5	10.3	15.9	20.3	--
30N-14W-18A	104	8.7	14.2	9.3	7.8	10.8	16.7	--
30N-14W-27D	321	3.3	1.4	1.5	1.1	9.4	7.0	--
31N-9W-32C	237	3.7	11.4	1.0	6.0	7.3	9.7	--
31N-13W-3C	185	15.8	25.6	5.3	11.7	9.4	22.8	0.81
31N-13W-5C	163	30.8	43.3	--	41.9	--	25.0	--
31N-13W-18AC	134	18.5	13.0	7.6	6.5	12.7	13.0	--
31N-14W-7A	130	20.1	42.8	--	12.5	--	25.5	--
31N-14W-8D	117	12.0	25.7	--	9.2	--	16.3	--
31N-14W-9A	91	7.9	20.8	4.8	10.7	10.0	14.8	--
31N-14W-16D	93	22.1	28.3	--	10.7	--	20.7	--
31N-14W-17A	156	6.4	19.2	11.0	7.1	6.3	14.9	--
31N-14W-27A	101	20.4	24.4	7.7	10.1	10.5	19.5	0.80
31N-14W-29B	90	11.1	15.2	--	5.8	--	15.4	--
31N-14W-29CA	120	9.5	13.8	4.5	6.4	8.9	13.5	--
31N-14W-30D	80	5.6	10.2	2.2	3.1	8.4	10.1	--
31N-15W-20A	160	7.1	15.6	4.2	7.0	7.5	14.7	--
31N-15W-24D	183	13.1	18.6	5.7	9.0	9.3	17.0	--
31N-15W-35B	93	12.0	16.4	6.9	7.7	11.6	16.2	--
31N-16W-13C	90	3.5	4.9	4.0	2.1	8.4	10.0	--
31N-16W-17A	100	16.0	21.7	12.3	13.7	12.7	19.3	--
33N-13W-20D	120	6.9	--	2.8	--	8.5	--	--
33N-13W-21BB	120	1.6	25.5	--	7.4	--	18.5	--
29N-9W-20D	--	--	14.1	--	4.8	--	12.8	--
30N-11W-32C	--	--	2.1	--	1.6	--	5.8	--
30N-12W-4D	--	--	3.9	--	1.7	--	6.0	--
31N-13W-29D	--	--	11.2	--	5.8	--	9.7	--
31N-15W-8B	--	--	8.7	--	5.1	--	13.9	--
32N-12W-21A	--	--	4.6	--	2.8	--	15.1	<0.05
32N-13W-20D	--	--	18.7	--	10.9	--	14.1	--

(Trend Analysis of Ground-Water Quality in Holt County within the Lower Niobrara Natural Resources District, 1991)

Table 3.2 1991 GROUNDWATER QUALITY DATA

LOCATION	NO3-N (ppm)	Cl - (ppm)	SO4 2- (ppm)	ATRAZINE (ppb)
		BOYD COUNTY		
34N-12W-19D	<0.1	116.0	655.0	--
34N-12W-27C	<0.1	22.0	212.0	--
34N-15W-27C	14.6	4.4	20.0	<0.01
34N-15W-29A	18.6	8.7	45.0	--
34N-16W-27D	13.2	5.1	14.0	--
34N-16W-35D	6.3	1.9	12.0	--
		HOLT COUNTY		
29N-9W-7B	24.3	9.7	13.0	--
29N-9W-10D	13.7	4.0	11.0	--
29N-9W-17A	23.1	12.0	15.0	--
29N-10W-14A	19.3	6.4	8.9	--
30N-9W-8B	20.8	10.0	15.0	--
30N-9W-10B	18.6	10.0	21.0	--
30N-9W-23A	27.7	13.0	16.0	--
32N-11W-12D	15.3	6.4	27.0	--
32N-11W-18A	37.9	24.0	16.0	--
32N-12W-4D	19.0	8.7	12.0	--
32N-12W-12A	--	--	--	<0.01
32N-12W-17A	16.0	4.5	10.0	--
32N-12W-23B	7.8	2.9	12.0	--
32N-13W-27C	9.6	3.0	6.7	--
32N-13W-31C	39.6	17.0	18.0	--
33N-12W-36A	2.9	1.9	15.0	--
		KEYA PAHA COUNTY		
33N-19W-22C	2.8	1.5	2.7	--
33N-19W-30B	2.0	1.7	2.4	--
33N-19W-34C	3.1	1.6	5.2	--
33N-20W-18B	1.7	1.2	2.3	<0.01
33N-20W-21D	4.1	2.2	4.2	--
33N-20W-27A	6.8	2.6	5.8	--
33N-20W-33B	2.9	1.5	3.4	--
33N-21W-18D	1.9	1.2	2.7	--
33N-21W-23D	3.5	2.2	4.2	--
34N-20W-30C	5.2	3.3	5.9	--
		KNOX COUNTY		
29N-7W-9C	2.5	2.0	6.4	--
29N-7W-18C	3.4	2.6	4.7	0.03
29N-7W-24A	1.5	1.6	3.6	--
29N-8W-27C	6.6	2.1	4.5	--
29N-8W-30B	1.2	2.4	3.4	--
30N-8W-18A	32.1	13.0	11.0	--
30N-8W-30B	4.1	2.1	4.9	--
31N-8W-31B	9.4	3.5	11.0	--
		ROCK COUNTY		
31N-17W-4C	1.8	2.4	6.4	--
31N-17W-17A	2.5	2.3	5.6	--
31N-18W-3D	7.9	3.9	7.9	--
31N-18W-8A	3.1	1.8	4.3	--
31N-18W-12A	10.1	3.0	9.8	--
31N-18W-17A	1.6	1.7	6.6	<0.01
31N-19W-14D	4.3	1.7	4.5	<0.01
31N-19W-15D	5.6	2.2	5.3	--
32N-17W-31B	8.0	4.1	8.7	--

(The Ground-Water Monitoring of Agrichemicals within the Lower Niobrara Natural Resources District, 1992)

bring water for analysis. Results of the tests have been retained on file. The District has done some follow-up on the wells analyzed in the 1976 study, collecting water samples from many of the irrigation wells, testing for NO_3-N with the HACH Kit, and recording the results. The district purchased a new HACH kit in 1999 and continues to offer free nitrate sampling.

B. Existing Water Quality Summary

Large yields of good quality water can generally be obtained in the southern half of the District from aquifers of Tertiary and Quaternary age. Yields are usually sufficient for irrigation and quality suitable for domestic use except in specific areas where nitrate levels are high, presumably because of excessive fertilization and leaching. This area is in the Sand Hills Groundwater Region.

In the North Central Tableland Groundwater Region portion of the District, floodplains and terraces of the Niobrara River and its tributaries overlie sands and gravel deposits that generally yield small to moderate amounts of water. The eastward thinning Ogallala Group locally yields moderate amounts of good quality water. This water is generally found in veins moving across shale. Where Pleistocene and Ogallala Group deposits have been eroded away groundwater is available only by drilling several hundred feet to tap sandstone of the Dakota Group. Water from the Dakota Group may contain high levels of minerals and is not desirable for domestic use.

Livestock poisoning due to selenium became a problem to farmers in Boyd County shortly after it was settled in the 1890's. An investigation began by Byers in 1993 showed 28 ppm selenium in soil at a depth of 54 inches near Lynch and 103 ppm in wild asters near Monowi (see Figure 3.2). Selenium occurs generally in all soils derived from Pierre Shale, but the amount varies widely from place to place. Twenty-seven wells and three springs were sampled for selenium concentrations in Boyd County. Concentrations as high as 480 ug/l were found. The maximum recommended selenium level according to Public Health Standards, is 10 ug/l.

The District currently analyzes data from approximately 455 wells throughout the District on a 2 year rotation. These wells have been analyzed since 1996. District wide, the results show that the average nitrate level is 11.6 ppm. Wells analyzed from northeast of O'Neill show an average nitrate level of 20.9ppm

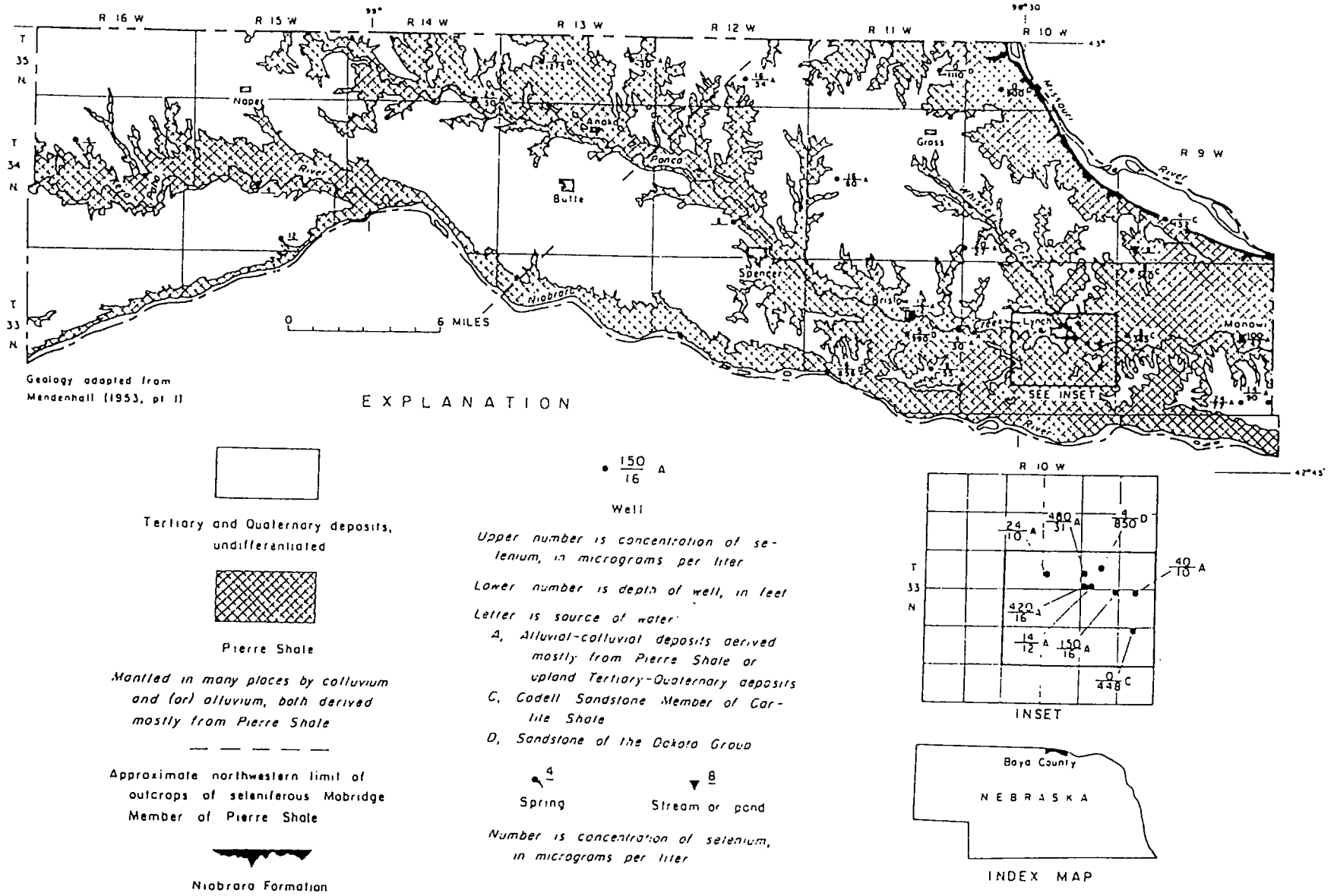


Figure 3.2 Generalizedareal geology and sampling sites for determination of selenium concentration in water, Boyd County, Nebraska.

IV. Land Use and Contamination Source Inventory

A. Land Capability Classification

The Natural Resources Conservation Service classifies all soils into eight classes based on their ability to produce crops without eroding. Class I land is the best land with no restrictions while Class VIII has the most restrictions for use (see Tables 4.1 and 4.2). Following is a brief description of each capability class (Soil Conservation Service, Multi-Year Plan, 1992):

I. These soils have few limitations that restrict their use. Class I land makes up 1 percent of the Lower Niobrara NRD.

II. These Soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices. Class II land makes up 12 percent of the NRD. This land can generally be protected with management practices.

III. These soils have severe limitations that reduce the choice of plants or that require special conservation practices. Class III land makes up 11 percent of the NRD. Fifty-five percent of this is cropland. Soils subject to wind erosion can generally be protected with management practices such as conservation tillage. Soils subject to water erosion may need structural practices, such as terraces and waterways, and management practices to provide adequate protection.

IV. These soils have very severe limitations that reduce the choice of plants and require special conservation practices. Class IV land makes up 27 percent of the NRD. Thirty-six percent of this is used for cropland and presents a serious erosion hazard. Conservation tillage is the main practice for controlling erosion. On the grassland that is Class IV land, good grass management will usually control erosion.

V. These soils are not likely to erode but have other limitations that are very impractical to remove. Class V land makes up 2 percent of the NRD. This land generally doesn't have any erosion problems.

VI. These soils have severe limitations that make them generally unsuitable for cultivation. Class VI land makes up 39 percent of the NRD. Eighty-six percent of this is in permanent vegetation. A concern is the non-irrigated cropland. Much of this should be reseeded to grass or other permanent cover.

VII. These soils have very severe limitations that make them unsuitable for cultivation. Class VII land makes up 5 percent of the NRD. This land is protected with permanent vegetation.

VIII. These soils have limitations that make them generally unsuitable for commercial use. Class VIII land makes up less than 1 percent of the NRD. This land is protected with permanent vegetation.

MISC This includes urban and built-up land, rural transportation land, and water areas. Miscellaneous land makes up 3 percent of the NRD.

B. Contamination Source Inventory

1. Non-Point Source

Natural Resources Districts are responsible for developing non-point source pollution regulations. Point source pollution regulations are the responsibility of the Nebraska Department of Environmental Quality. Agricultural chemicals, including fertilizers and pesticides are often believed to be major contributors to non-point source pollution. The Lower Niobrara NRD processes approximately 900 chemigation permits each year, which list Lorsban, Pounce and Liquid nitrogen as the products, most often applied through irrigation systems. While pesticides are manufactured and distributed by chemical industries and applied by farm operators, nitrates can originate from several sources including manure, leachates from septic tanks and sewage treatment lagoons, barnyards, and mineralization of organic matter.

Although there is almost no method available to calculate pollution from chemical use in towns in the District, lawn and garden chemical use is substantial. Over-application can occur when accurate calibration may not be considered important because of the small quantity of chemical needed for application on a small area. Contaminated runoff from the lawns may leave the villages through storm drains during intense rains.

2. Point Source

Information on point source pollution is included here solely to recognize that groundwater contamination can result from point source as well as non-point sources.

Table 4.1 LAND USE BY CAPABILITY CLASS

CAPABILITY CLASS	CROPLAND NON-IRRIG	CROPLAND IRRIGATED	PASTURE LAND	RANGELAND	FOREST LAND	OTHERLAND & MISC	TOTAL
I	11700	3100		100			14900
II	97900	27600	8700	55500	3000	8000	200700
III	72500	36600	16200	66000	1300	7200	199800
IV	74400	93600	26900	249700	10200	5600	460400
V	1400		2800	18600	4900	700	28400
VI	25300	11800	13200	576700	35000	4900	666900
VII				75200	9600		84800
VIII				1500			1500
MISC						57100	57100
TOTAL	283200	172700	67800	1043300	64000	83500	1714500

Table 4.2 CONSERVATION TREATMENT NEEDS

LAND USE	TOTAL ACRES	ADEQUATELY PROTECTED		TREATMENT UNFEASIBLE		TREATMENT NEEDED	
		ACRES	PERCENT	ACRES	PERCENT	ACRES	PERCENT
CROPLAND-NIRR	283200	232100	82			51100	18
CROPLAND-IRR	172700	141400	82			31300	18
PASTURE	67800	37000	55			30800	45
RANGELAND	1043300	544500	52	9400	1	489400	47
FOREST	64000	44400	69	9100	14	10500	17
OTHER	26400	26400	100				
MISCELLANEOUS	57100	57100	100				
TOTAL	1714500	1082900	63	18500	1	613100	36

(Multi-Year Plan Soil Conservation Service-Lower Niobrara Natural Resources District, 1992)

a. Solid Waste

Under State Law, after October 1, 1993, no one will be permitted to dump solid wastes, with certain specific exceptions, any place other than at an approved, licensed landfill. There are no approved licensed landfills in the Lower Niobrara NRD.

This means that all solid wastes must be collected and shipped outside the NRD for proper disposal. At this time, a universally available collection system is not in place for the entire District, particularly for rural areas.

Information available to the District indicates all towns and villages in the District have closed their solid waste facilities and have contracted for solid waste disposal pickup service. These pickup services transport waste to a licensed facility outside the District. It is imperative that DEQ report the status of solid waste disposal within the District and properly inspect and enforce dumping if the District is to adequately manage the quality of groundwater.

b. Chemical and Petroleum

Groundwater contamination is frequently blamed on the use of chemicals, especially agricultural chemicals, and not on the improper handling, storage, transportation, or disposal of the hazardous chemicals. Chemical container and waste oil collection sites are made through commercial and extension efforts annually, at varied locations within the district. These sites may vary in location

c. Water Treatment Facilities

There are a number of waste treatment facilities and water treatment facilities within the NRD. In Boyd County, Bristow, Lynch, and Naper have facilities which are exempt from permits, while Butte has a continuous discharge lagoon, and Spencer has an activated sludge treatment system. In Knox County, Niobrara has a continuous discharge lagoon and Verdigre a trickling filter.

d. Pits

Other unlined excavated area such as reuse pits, borrow areas, gravel pits and dugouts also have potential for providing an access for contaminants entering the groundwater.

e. Abandoned Wells

Abandoned wells can provide direct access to groundwater. Under current state regulation (Title 178, Nebraska Health and Human Services System), unused wells must be properly decommissioned in order to prevent groundwater pollution. A partial inventory of abandoned wells exists within the district. It may become important to identify these in the future.

f. Feedlots

Livestock facilities must be permitted by NDEQ. There are currently 247 permitted feedlots in the Lower Niobrara. More information is available on the NDEQ website. (www.ndeq.state.ne.us)

g. Low Level Radioactive Waste Storage

A proposed site is under license application for the storage of low level radioactive waste in the NRD. The site is three miles northwest of Butte. The legal description of the property is the E1/2 Section 13, Township 34, Range 14, Boyd County. The site was selected by US Ecology from three preliminary locations in the state.

Concern about the geological makeup of the area has been raised. The presence of wetlands (approximately 43 acres), the generally poor drainage, the high water level and fluctuating water tables, the presence of near surface aquifers (rubble zones), a very complex hydrological structure, nearby streams and springs, and general soil structures are among concerns which have been raised. Additionally, there are concerns about geological faults, earthquake potential, potential for flooding, annual rainfall, prevailing winds in relationship to population centers, and the performance record of the developer, US Ecology.

The NRD also is concerned about the licensing process as it is being carried out by the Nebraska Department of Environmental Quality.

The NRD has tried to stay abreast of the activities through its two appointed members who serve on the local Monitoring Committee.

The NRD must be given a more meaningful role if we are to be responsible for a comprehensive groundwater management program. This will require that additional resources be made available.

After public hearings in 1998, the Nebraska Department of Environmental Quality denied US Ecology's license to build a Low Level Radioactive Waste Facility in Boyd County, Nebraska. The denial was based on technical information that the site was not suitable because of the high water table, and US Ecology's financial condition

The Central Interstate Compact Commission then sued the State of Nebraska in Federal District Court, claiming the license decision was politically influenced. A Federal Judge in Lincoln ruled in favor of the Compact in the Fall of 2002, allowing monetary damages of $51 million. The State appealed the decision in the 8th District Court of Appeals, which will consider the issue in late 2003.

The NRD's policy statement adopted on May 6, 1991 is as follows:

NATURAL RESOURCES DISTRICT RESOLUTION ON PROPOSED LOW LEVEL NUCLEAR AND HAZARDOUS WASTE DIPOSAL SITE IN BOYD COUNTY

We, the members of the Lower Niobrara Natural Resources Board, are elected to protect and improve the environment in our District.

Because of the natural characteristics of the proposed site, this NRD Board is seriously concerned about the environmental impact. Therefore, we issue the following statement:

WHEREAS, The proposed site contains numerous wetlands; and

WHEREAS, The site has a history of severe ponding problems; and

WHEREAS, The license application concedes there is a 100 year floodplain within the boundaries of the sites; and

WHEREAS, The Nuclear Regulatory Commission guidelines state and the NRD believes "a prospective site must be well-drained and free of flooding or frequent ponding," and

WHEREAS, The developer's answer to these site characteristics which do not meet NRC guidelines has been to propose an engineered system;and

WHEREAS, NRC documents state engineered structures and barriers should not be viewed as a planned substitute for a suitable site; and

WHEREAS, Congress and NRC have held that an unacceptable site cannot be rehabilitated by an engineered system; and

WHEREAS, The site has a high water table; and

WHEREAS, NRC documents state "areas with a known high water table should be avoided;" and

WHEREAS, The NRC views the siting requirements as minimum requirements for any near-surface disposal method whether or not engineering enhancements are used; and

THEREFORE BE IT RESOLVED, Because of these major site deficiencies, the Lower Niobrara NRD is opposed to the placement and licensing of a low-level nuclear and hazardous waste facility on the proposed site; and

WHEREAS, The Monitoring Board appointed to oversee the siting process of the low-level nuclear waste disposal facility has not functioned. Many tests and studies have not been completed. Many questions have not been answered and many more questions need to be asked; and

WHEREAS, If the Monitoring Board does not function and do the job mandated by law, then it becomes necessary for the NRD to oversee, study and ask questions concerning this facility; and

WHEREAS, The NRD does not have the funds to perform the duties of the Monitoring Board as mandated by law;

THEREFORE BE IT FURTHER RESOLVED, As a result of these Monitoring Board failures, we are opposed to the licensing and placement of this facility within our NRD boundaries; and

WHEREAS, The NRD Board is aware of the potential liabilities and is cognizant of all the ramifications of the above, it would be irresponsible for this board to ignore the facts surrounding the siting and licensing of this facility; and

THERFORE BE IT FINALLY RESOLVED; Because of the potential liability problems, we oppose the siting and licensing of this facility in Boyd County.

h. Other

A new era of cooperation must be developed between DEQ and the NRDs of the State. All too often licensing and permit issuing actions of the DEQ are viewed in the context of community economic development vs. anti-development. In this context, the important environmental issues are frequently lost in the process. Our NRD will continue to work for a more cooperative relationship with DEQ and do all in its power and its resources to develop and implement a meaningful groundwater management program.

V. Groundwater Use

Groundwater supplies in the District are primarily used for irrigation, municipal water supplies, rural domestic, livestock, and crop use.

A. Agriculture

Irrigation and livestock are the primary users of groundwater in the District. Crop water use varies seasonally depending on temperature, relative humidity, wind, isolation, length of growing season and other factors influencing evapotranspiration from the crop and soil. The common consumptive water use range in Nebraska for corn is 24 to 26 inches; for soybeans, 22 to 23 inches; and for sorghum, 22 inches.

The Nebraska Irrigation Guide indicated the net irrigation needed to raise a maximum corn crop 10 out of 20 years varies from 14 to 12 inches per year. That amount decreases generally from west to east, because of increasing precipitation. For sorghum, the amount varies from 12 to 10 inches. Again, the need decreases from west to east across the District.

B. Domestic

Domestic water requirements are small in comparison to irrigation use in the District. The towns of Springview, Naper, Butte, Bristow, Verdel, and Niobrara all rely on their own wells for water. Spencer, Lynch, Verdigre and Winnetoon purchase water from one of the three rural water systems in the District. There are several smaller villages with a population less than twenty-five.

All farms not on rural water systems have their own wells. Testing for nitrates with the District's HACH Kit as well as testing done by labs, indicates many private wells have high nitrate levels. Much of the high nitrate levels could be attributed to age of the facility, poor well construction, proximity to barnyard waste and septic systems and agricultural waste.

Proper well construction and location should be utilized to prevent potential contamination. The District currently has cost share programs available to assist producers in developing a high quality water source as well as closing abandoned wells.

Water for livestock, though difficult to quantify, is important because the high inventory of cattle and hogs in the District. The three rural water systems within the District have been important assets in providing a stable quantity of high quality water for farmsteads in areas in Boyd and Knox County where desirable wells were not possible.

There are several large livestock facilities whose needs are substantial. There is some concern that these facilities have the potential of contributing to groundwater contamination.

C. Industrial

Very little industry exists in the District and water demands are insignificant compared to other uses of groundwater in the District.

D. Fish, Wildlife and Recreation

Many streams and rivers are fed by groundwater and a significant drawdown can threaten fish habitat and drinking water supplies for wildlife. Currently, declining groundwater and surface water levels are not a problem in the District. However if problems do arise the District will take steps to address the situation as described in Appendix B.

The District is aware that endangered and threatened species exist within the NRD. According to the Nebraska Game and Parks Commission there are state threatened fish within the District as well as potential habitat for the Western Prairie-Fringed Orchid. The Western Prairie-Fringed Orchid has not been found in the LNNRD. Willow Creek in Rock County contains the Northern Redbelly Dace. In Keya Paha County, the Blacknose Shiner, the

Northern Redbelly Dace, Pearl Dace and Finescale Dace are found. These fish are found in small cool prairie streams with low turbidity.

The habitat for the Western Prairie-Fringed Orchid is native tall grass meadows and mesic tallgrass prairies. Typical habitat areas are moderate to high quality meadows which have not been subjected to large scale disturbances, but which may have had a history of light activity such as haying or grazing.

Preliminary indications are that current groundwater activities do not have a significant impact on endangered or threatened species. Management activities will be considered upon identification of need as described in Appendices A and B. The District will continue to cooperate with the Nebraska Game and Parks Commission in wildlife programs.

VI. Identification of Critical Areas for Protection

A. Impact of Existing Land Use on Groundwater Quality

An assessment of water quality data, study results and other information reveals there are several areas of concern with the LNNRD. The DRASTIC map (figure 2.6) indicates that the most vulnerable areas for groundwater contamination in the District generally would be areas immediately adjacent to streams and rivers. Areas in Holt and Rock Counties, where soils are generally sandy also have some potential for contamination particularly when irrigated cropping is practiced in these areas

The DRASTIC assessment only indicates vulnerability and not measured results. However, studies indicate that many of these same areas are experiencing contamination problems, particularly in the Atkinson and O'Neill areas. This finding was true for all of the studies including the District's own groundwater sampling program.

Results have identified two primary areas of concern: (1) an area northeast of O'Neill and (2) an area north of Atkinson. These areas will be the focus of remediation and intensive monitoring for the LNNRD. However, the entire District will continue to be monitored for groundwater quality.

The DRASTIC methodology has identified several areas of high groundwater contamination vulnerability. Although not all of these areas are currently experiencing contamination problems, the potential still remains for future problems. Special attention will be paid to high vulnerability areas in addition to the two primary targeted areas. The LNNRD will continue to encourage the implementation of management plans and best management practices throughout the District through implementation of its Groundwater Management Area (See figures 6.0 – 6.12 and Appendix A).

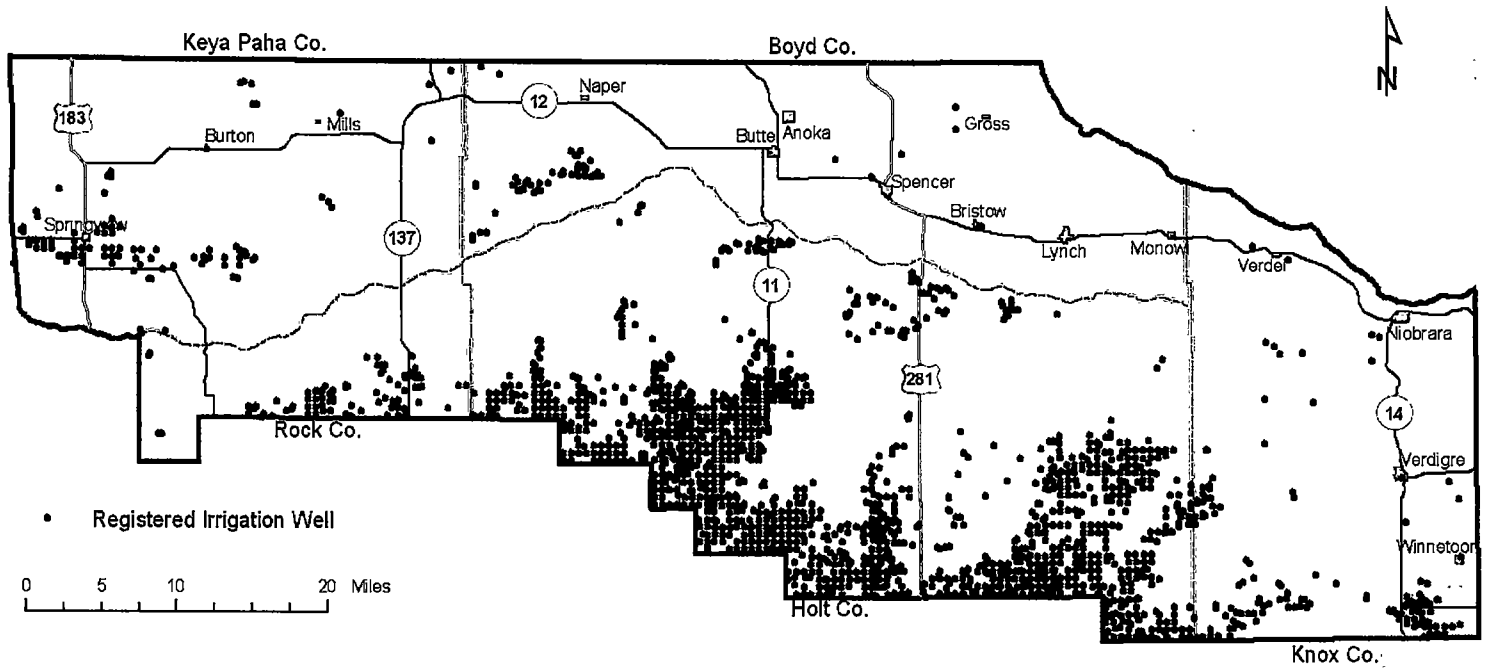


Figure 6.0 Registered Irrigation Wells 2002

Data provided by Nebraska Department of Natural Resources.
For regional planning purposes only.

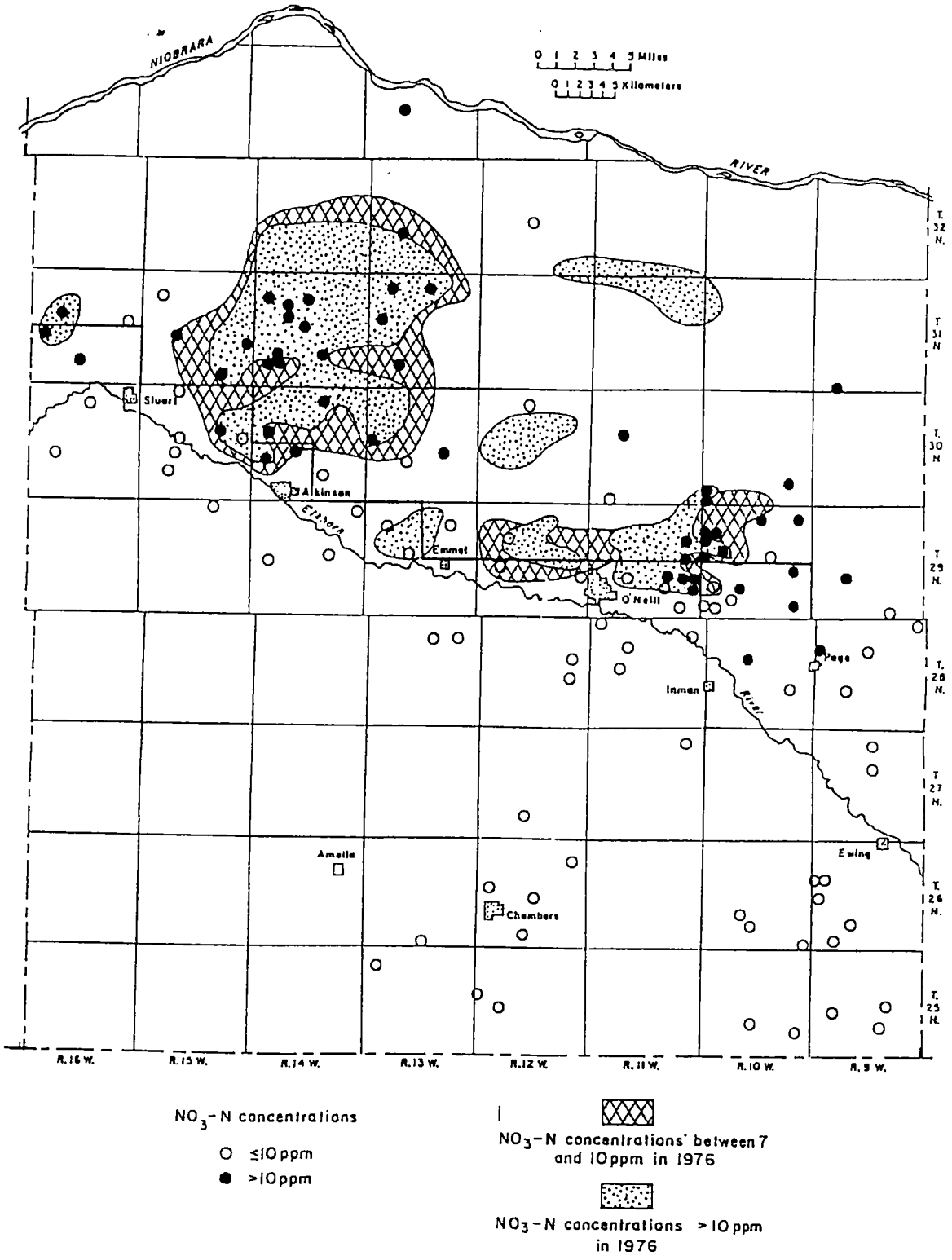


Figure 6.1 Nitrate-nitrogen concentrations in irrigation wells in 1990 relative to the maximum contaminant level. (Trend Analysis of Ground-Water Quality in Holt County within the Lower Niobrara Natural Resources District, 1991)

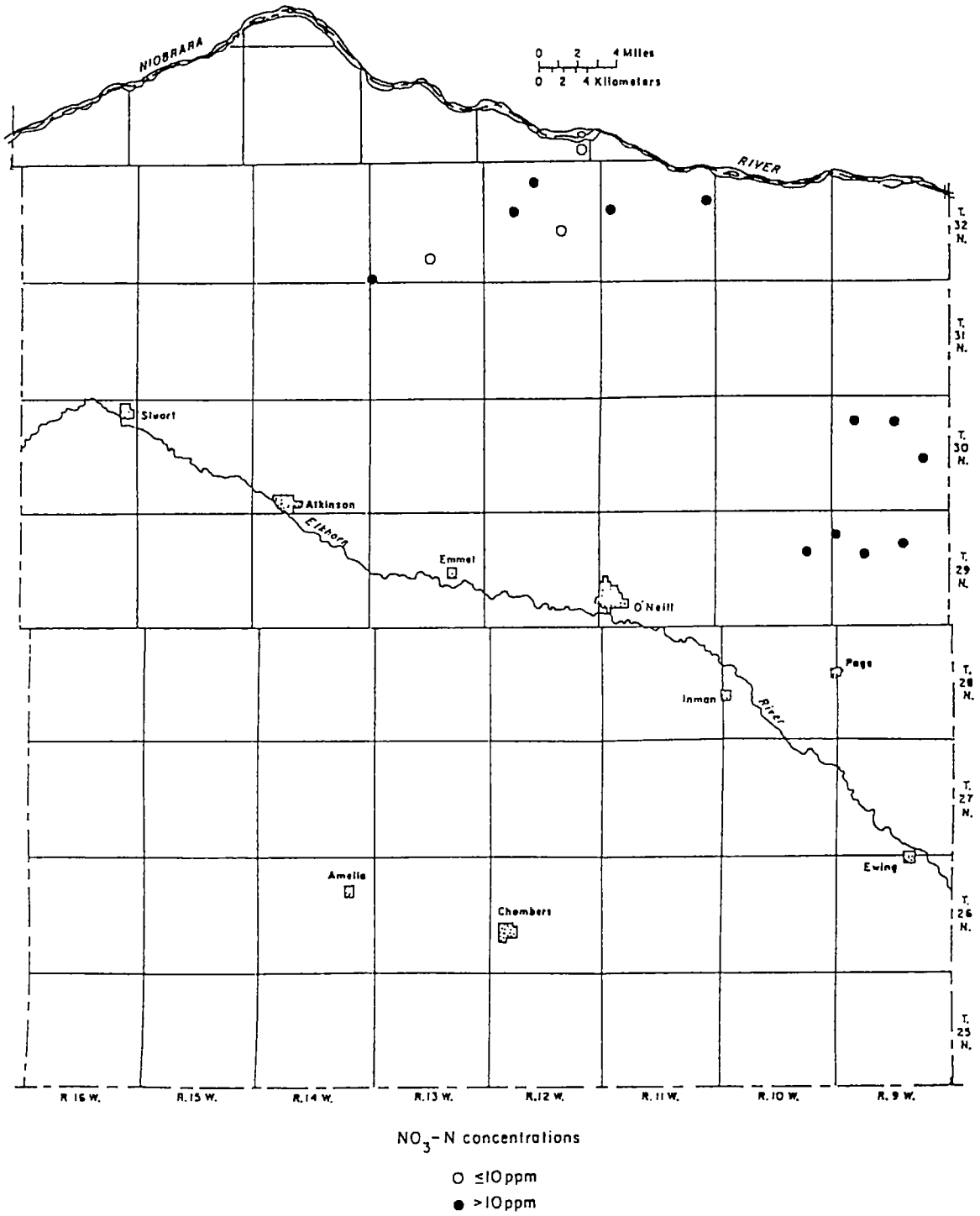


Figure 6.2 Nitrate-nitrogen concentrations relative to the maximum contaminant level in irrigation wells in Holt County in 1991. (Ground-Water Monitoring for Agrichemicals within the Lower Niobrara Natural Resources District, 1992)

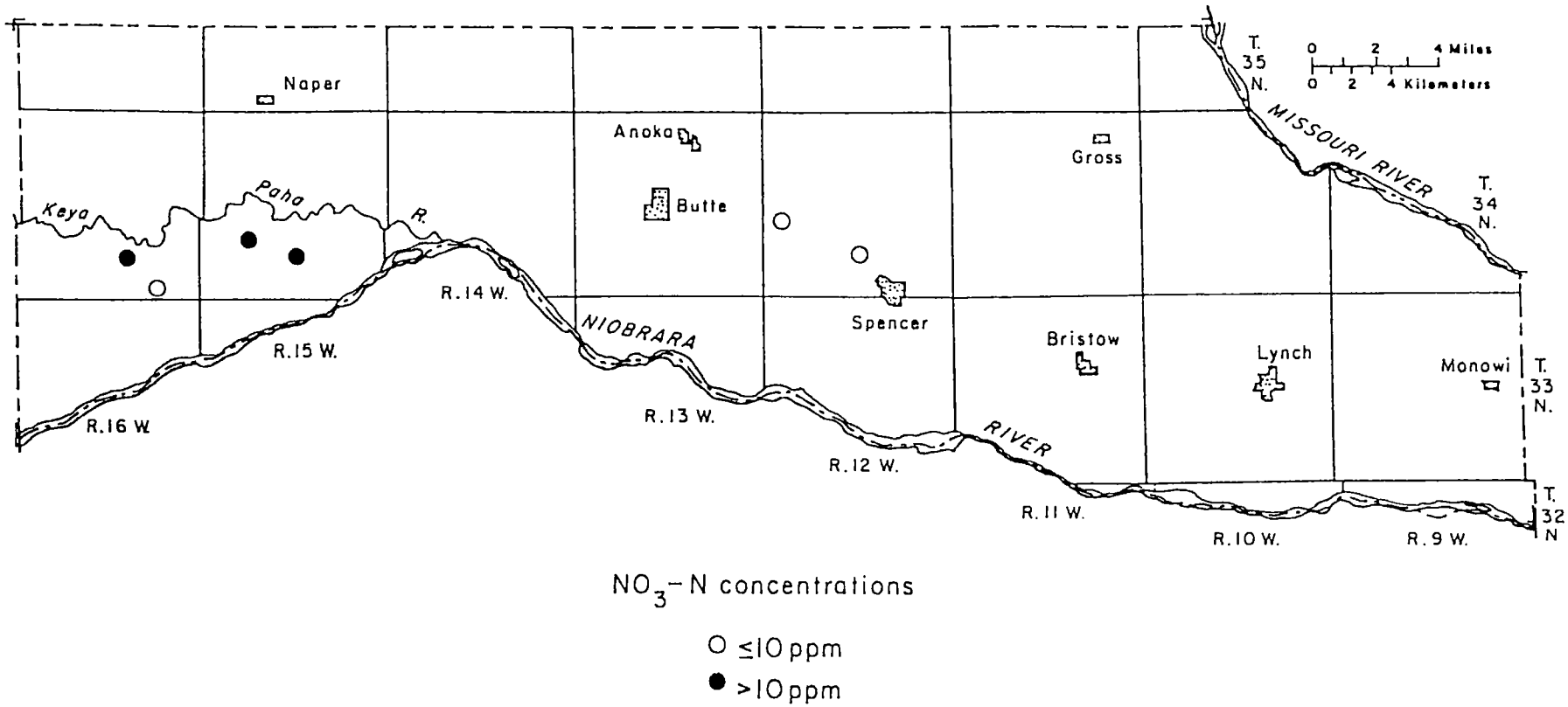


Figure 6.3 Nitrate-nitrogen concentrations relative to the maximum contaminant level in irrigation wells in Boyd County in 1991. (Ground-Water Monitoring for Agrichemicals within the Lower Niobrara Natural Resources District, 1992)

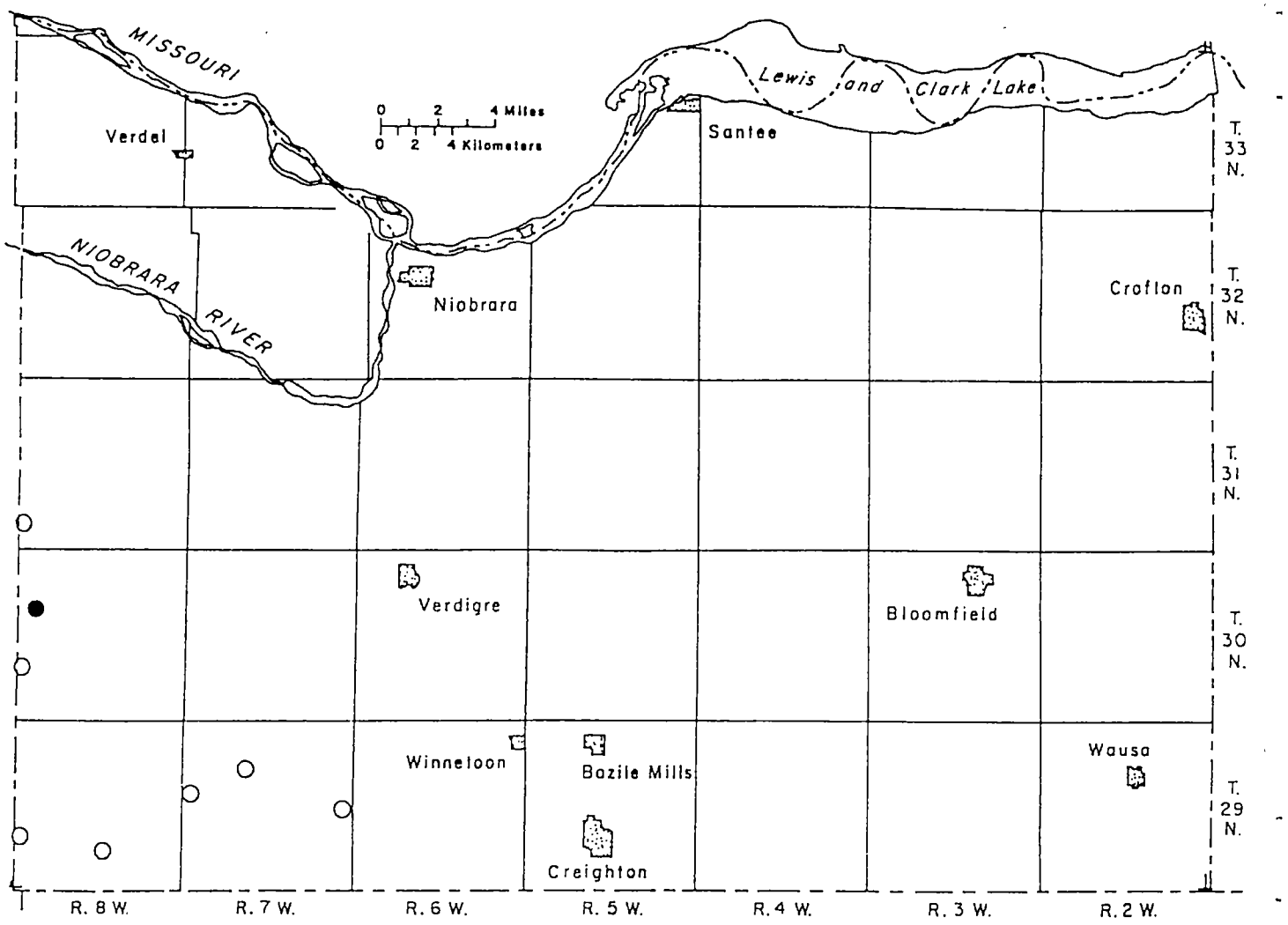


Figure 6.4 Nitrate-nitrogen concentrations relative to the maximum contaminant level in irrigation wells in Knox County in 1991. (Ground-Water Monitoring for Agrichemicals within the Lower Niobrara Natural Resources District, 1992)

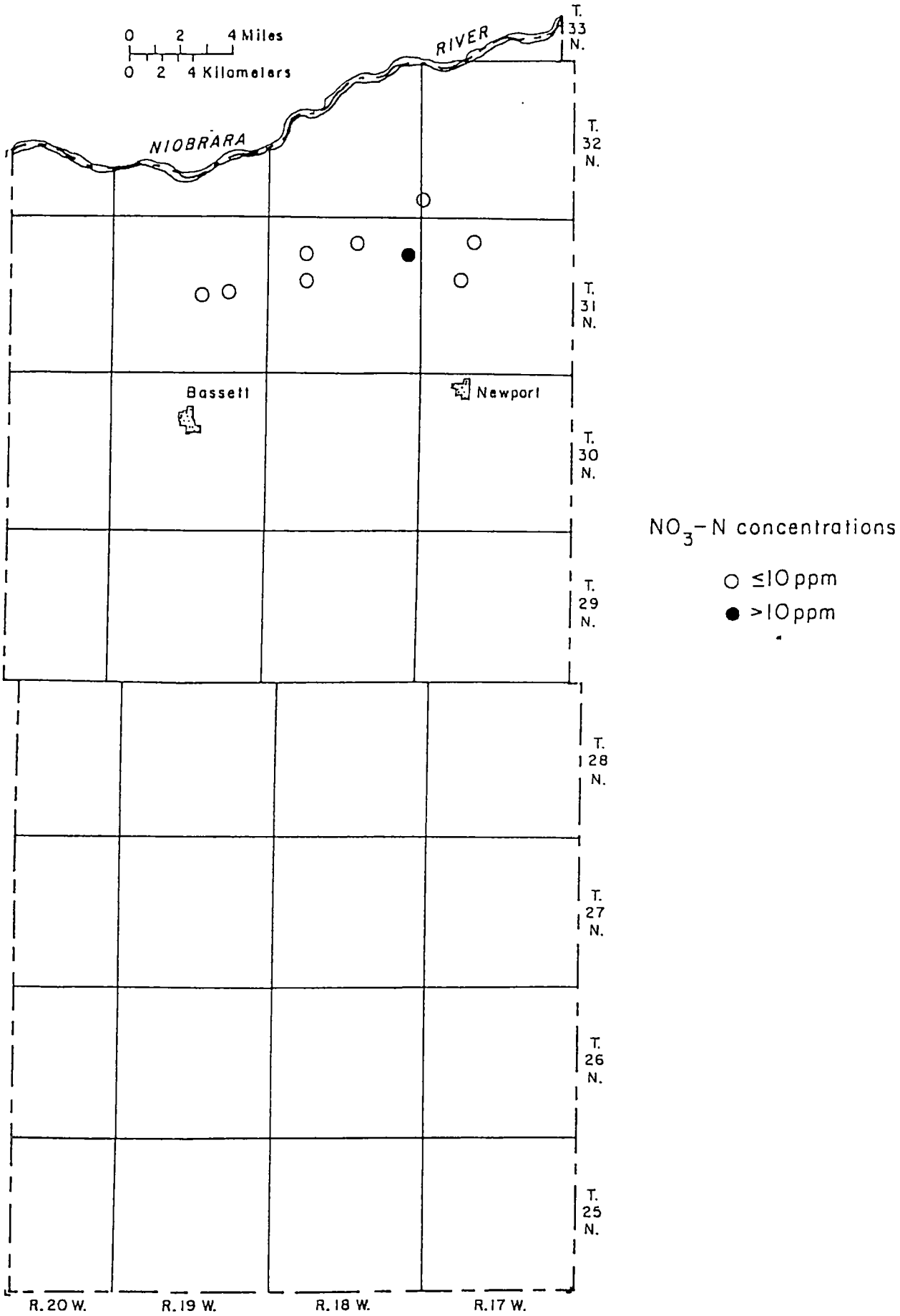


Figure 6.5 Nitrate-nitrogen concentrations relative to the maximum contaminant level in irrigation wells in Rock County in 1991. (Ground-Water Monitoring for Agrichemicals within the Lower Niobrara Natural Resources District, 1992)

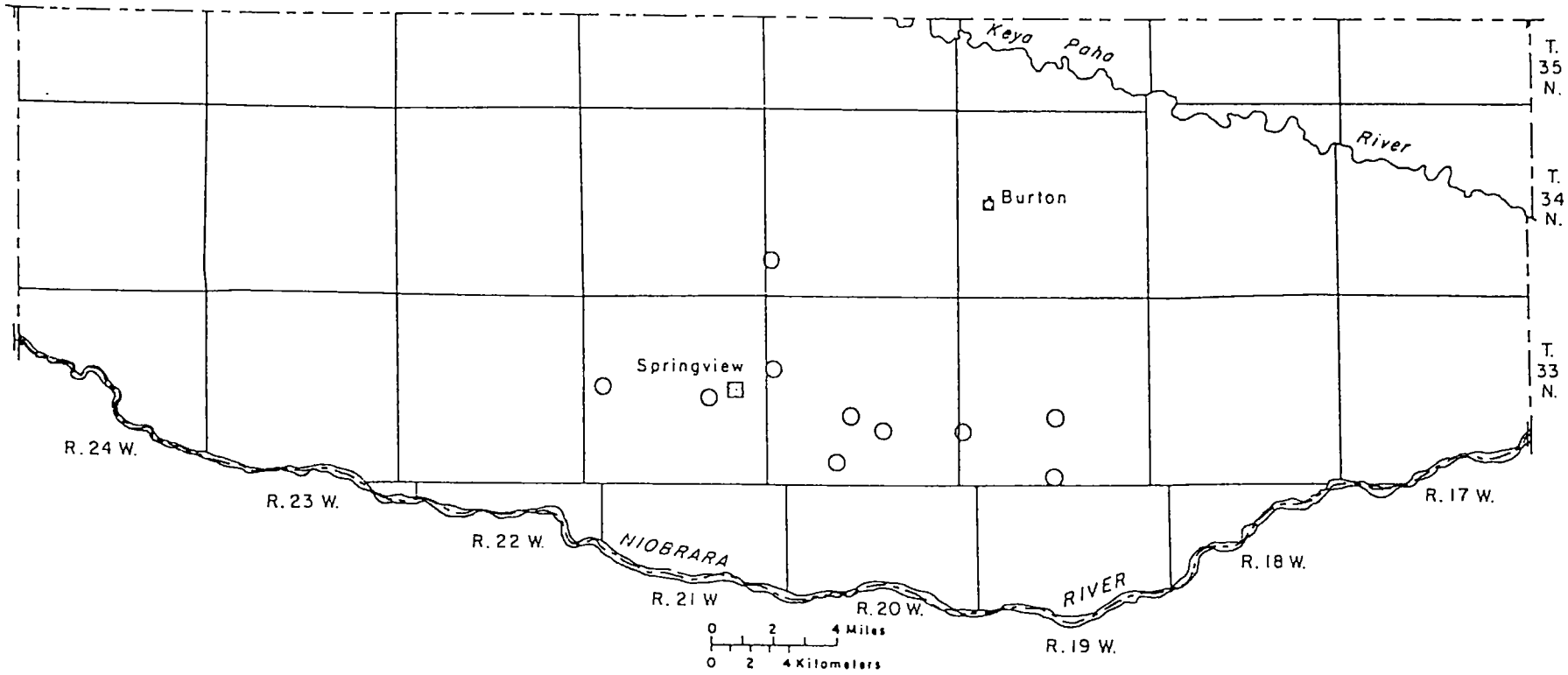


Figure 6.6 Nitrate-nitrogen concentrations relative to the maximum contaminant level in irrigation wells in Keya Paha County in 1991. (Ground-Water Monitoring for Agrichemicals within the Lower Niobrara Natural Resources District, 1992)

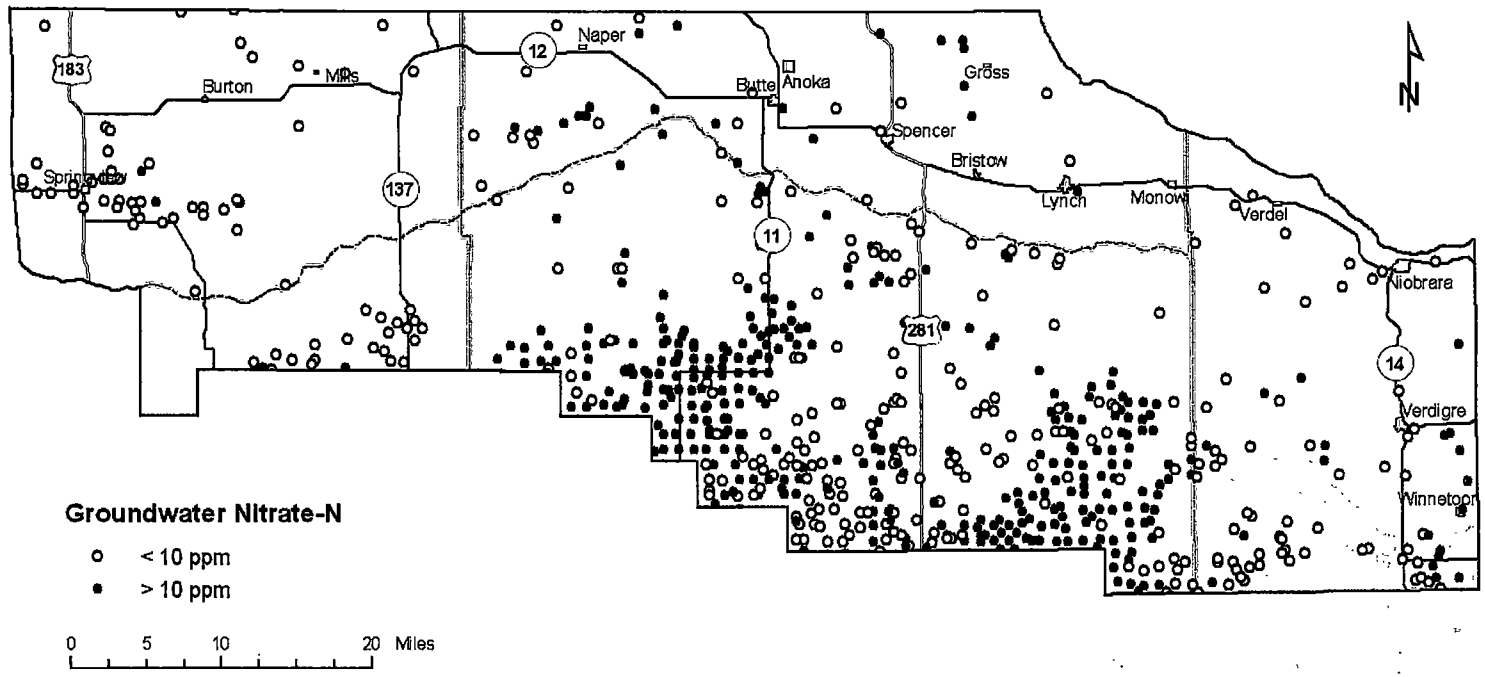


Figure 6.7 Nitrate Levels in Lower Niobrara NRD 2002

(Lower Niobrara Groundwater Monitoring Program)

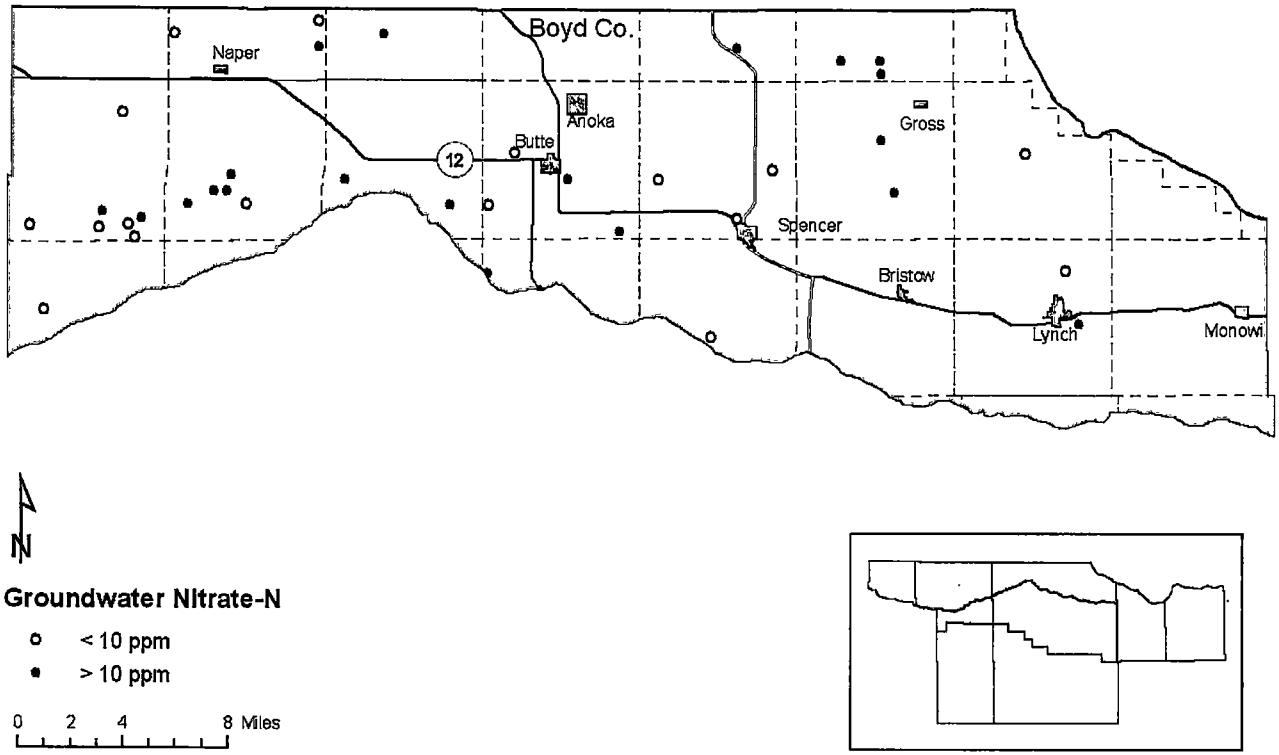


Figure 6.8 Nitrate Levels in Boyd County 2002
(Lower Niobrara Groundwater Monitoring Program)

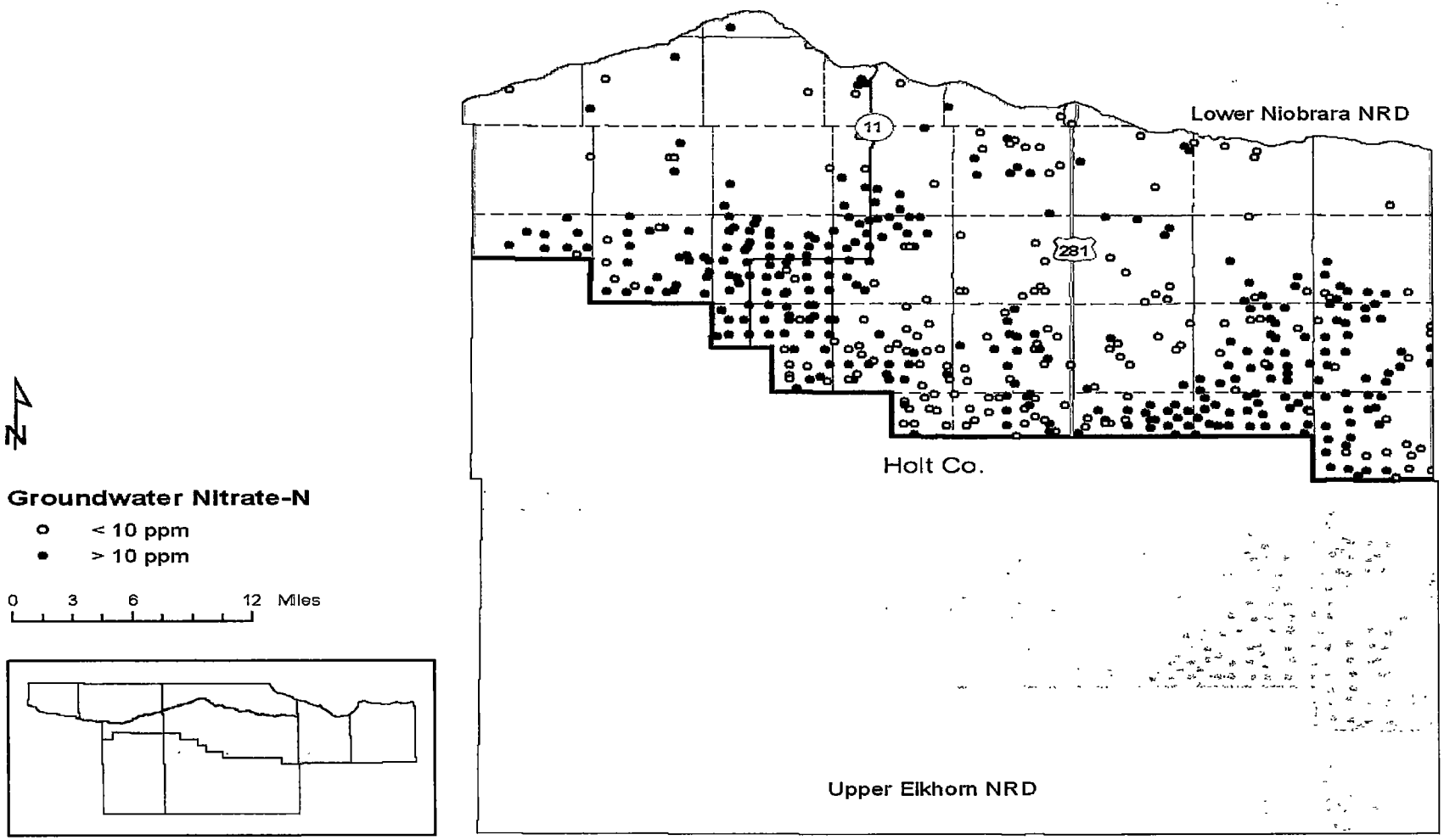


Figure 6.9 Nitrate Levels in Holt County 2002
(Lower Niobrara Groundwater Monitoring Program)

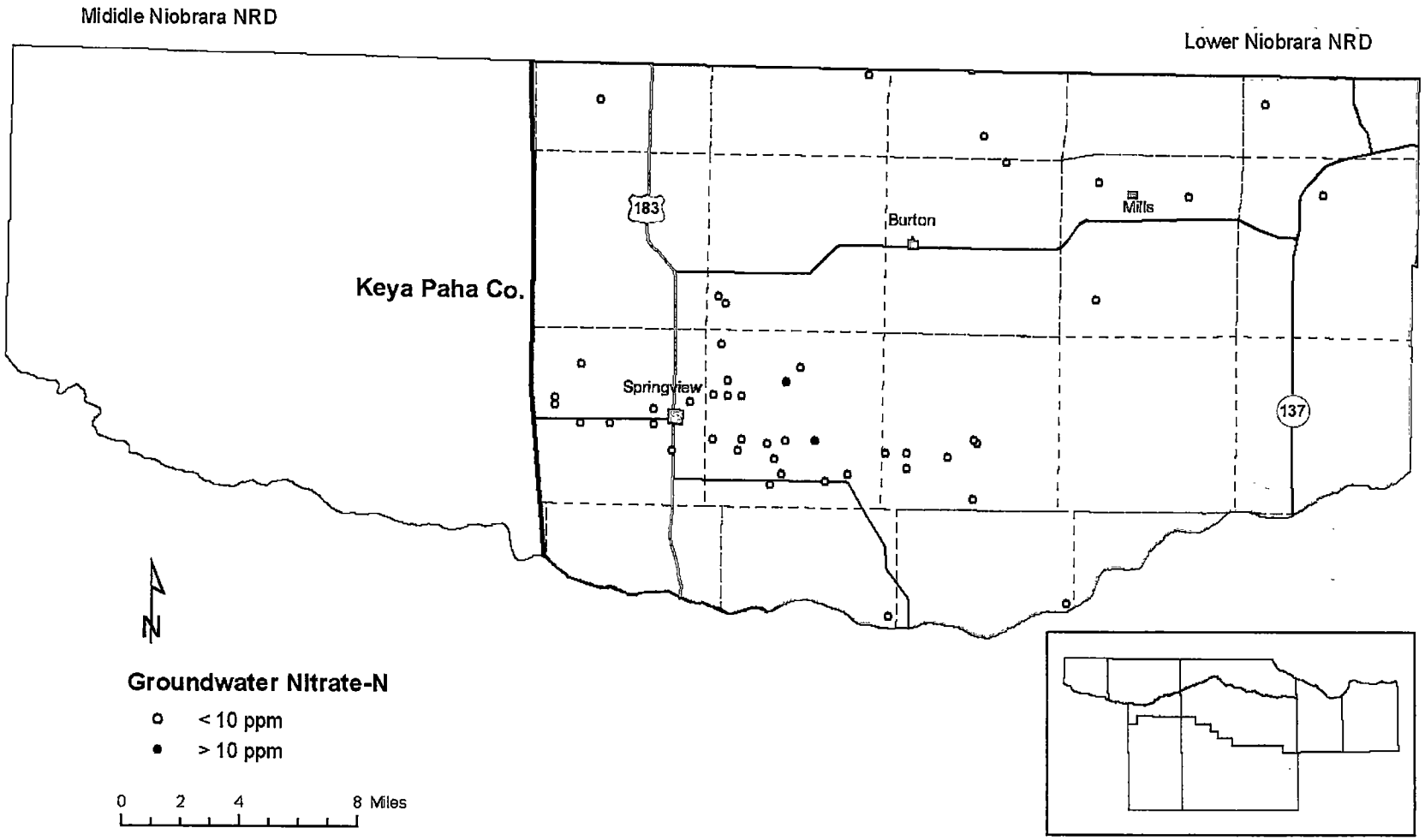


Figure 6.10 Nitrate Levels in Keya Paha County 2002
(Lower Niobrara Groundwater Monitoring Program)

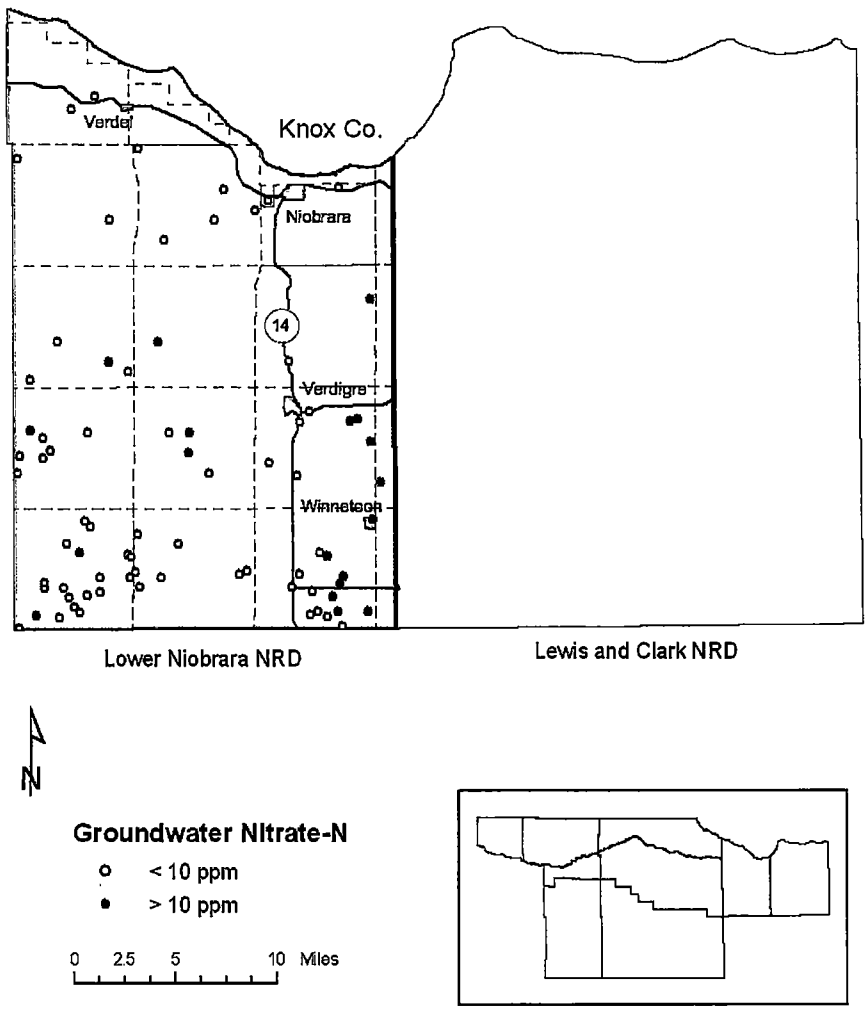


Figure 6.11 Nitrate Levels in Knox County
(Lower Niobrara Groundwater Monitoring Program)

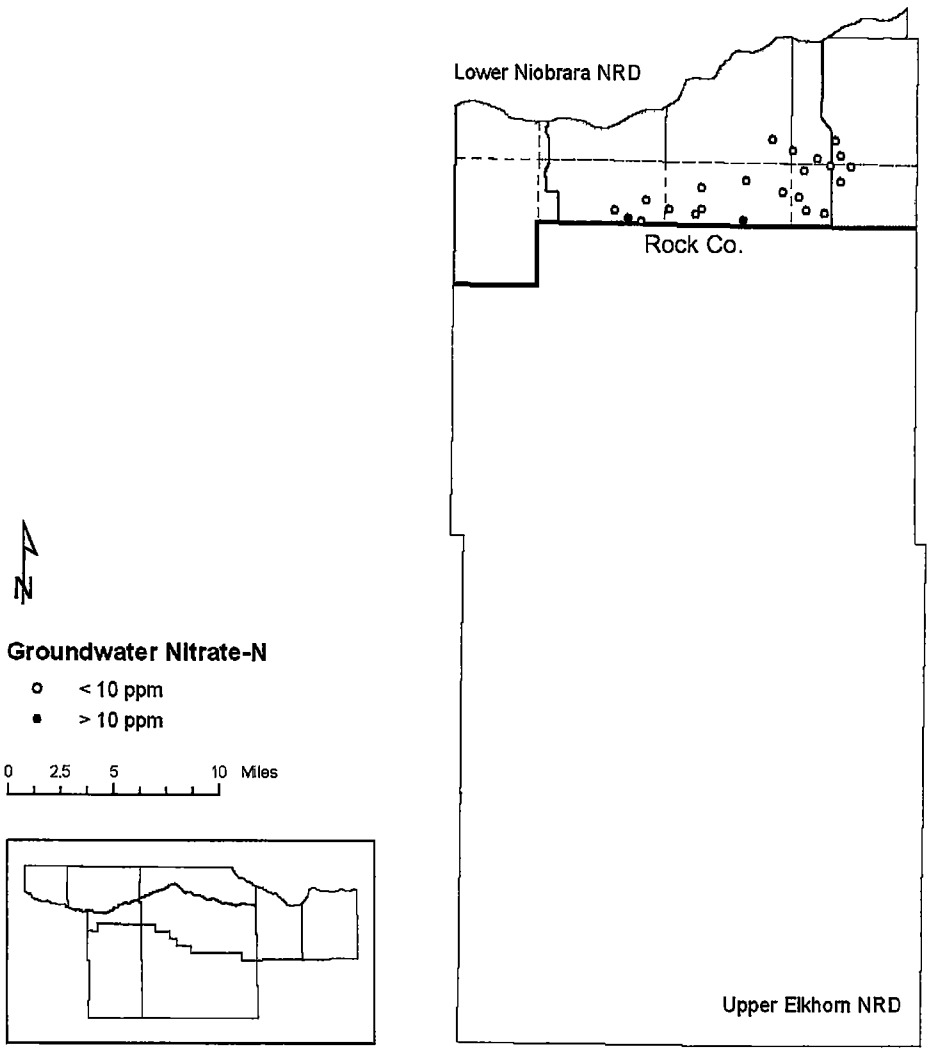


Figure 6.12 Nitrate Levels in Rock County
(Lower Niobrara Groundwater Monitoring Program)

VII. Groundwater Quality and Quantity Goals & Objectives

A. Goal

The goal of the Lower Niobrara NRD's Groundwater Management Plan is to provide forever to its people an adequate quantity of high quality water for human consumption, health services, sanitation, recreation, livestock consumption, fire control, irrigation and wildlife.

B. Groundwater Quality Objectives

1. Designate and implement a Groundwater Quality Management Area.

The LNNRD has designated the entire District as a Groundwater Quality Management Area (see Appendix A). The Directors have approved a plan designed to make citizens more responsible for water and water conservation. We will strive to make operations more efficient and environmentally safe in the use of nutrients, pesticides, and water by educating all residents and encouraging operators to use Best Management Practices.

2. Identify actual and possible contaminants of concern.

The primary contaminant of concern in the District is nitrate. However, a variety of constituents have been identified as possible groundwater contaminants (see Table 7.1).

Table 7.1 Groundwater Contaminants

Inorganics:

Name	MCL (ppm)
Nitrate-nitrogen	10
Selenium	0.01

Pesticides:

Common Name	Trade Name	MCL (ppb)
Alachlor	Lasso	2
Atrazine	Aatrex	3
Cyanazine	Bladex	1
Simazine	Princep	4

3. Monitor and manage nitrate-nitrogen

For nitrate, the District will monitor one irrigation well per section up to 50% of the registered irrigation wells in each township. The District will monitor one half of these wells each year, so that all monitoring wells are sampled once in a two-year period. If irrigation wells are concentrated in only one part of a township, the District will divide that township into a fourth or a half for Phase designation and monitoring schedule. In townships with nine or fewer registered irrigation wells, the District will monitor all such wells and work with producers managing those wells on an independent basis. All portions of subdivided townships are subject to appropriate Phase regulations.

The District will implement its Groundwater Quality Management Area program for nitrate by utilizing various Phases (see Appendix A). Those Phases are defined as follows:

Phase I: Areas where at least 50% of the District's monitoring wells indicate nitrate-nitrogen levels from 0 to 75% of the MCL, **OR** the entire District until Phase II or Phase III Areas are established. The entire area will be in Phase I for a minimum of two monitoring periods (4 years).

Phase II: Areas where at least 50% of the District's monitoring wells indicate nitrate-nitrogen levels greater than 75% but less than 95% of the MCL. In most cases, Phase II areas will be designated on a

township (36 square miles) basis, but sub-townships may be designated based on the criteria described in Appendix A. An area will remain in Phase II for a minimum of two monitoring periods (4 years) before progressing to Phase III.

Phase III: Areas where at least 50% of the District's monitoring wells indicate nitrate-nitrogen levels greater than 95% of the MCL. Again, Phase III areas will normally be designated on a township (36 square miles) basis, but sub-townships may be designated based on the criteria described in Appendix A. An area will remain in Phase III for a minimum of two monitoring periods (4 years) before changing Phase designations.

4. Monitor and manage other contaminants:

For the other constituents listed in Table 7.1, the District will analyze one sample from a designated irrigation well in each township once each monitoring period. A monitoring period is 2 years.

This process will occur in conjunction with sampling for nitrate nitrogen, and similar processes for township subdivision and townships with fewer than nine wells will be followed.

If any of these contaminants in Table 7.1 are detected above 75 percent of their respective MCL, the District will notify the Nebraska Department of Agriculture and/or the Nebraska Department of Environmental Quality in order to:

1) Obtain guidelines for further sampling strategy to determine if the contamination is from a point or non-point source.

2) Outline appropriate actions for remediation of the problem.

Within the legal authority granted the District by Nebraska Law, the District will implement practices and actions recommended by the Nebraska Department of Agriculture and/or the Nebraska Department of Environmental Quality to manage contamination caused by the listed pesticides. Selenium, however, is a naturally occurring element and groundwater contaminant, and thus land management practices may not be effective in dealing with contamination. The District will, in those areas where high levels of selenium are found in the water, provide educational information to residents affected by that water regarding possible health risks, and work with the residents and state and federal agencies to develop appropriate responses.

The objective of these goals is to protect our public and private water systems from further contamination.

B. Groundwater Quantity Objectives

1. Establish criteria for designating a Groundwater Quantity Management Area

Groundwater quantity is not now or anticipated to be a major concern of the District in the foreseeable future. However, if a significant decline in groundwater levels occurs, the District will develop control areas based on triggering mechanisms as specified in Appendix B (See Appendix D for static water levels in the Lower Niobrara NRD).

Triggering mechanisms for a Quantity Management Area are set to take action when an unacceptable decline in water levels occurs in the Districts monitoring wells over a five year period. This can be an actual decline of 10 feet or a percentage of 15% of the yearly average static water level from the District's monitoring wells.

To reduce the possibility of significant groundwater level changes, the District will continue to improve conservation management of municipal, industrial and irrigation systems and promote Best Management Practices. Management actions and possible BMPs are listed in Appendix B.

2. Monitor groundwater levels

To adequately monitor groundwater levels, the District will continue to measure spring and fall levels in approximately 55 irrigation wells spread throughout the District (see Appendix D). Records from these wells will provide the basis for determining groundwater quantity management actions discussed above.

VIII. Groundwater Quality and Quantity Programs and Practices

A. Groundwater Quality

1. Holt County Groundwater Education Program

An EPA Section 319 Clean Water Act project cosponsored by the Upper Elkhorn NRD, the Lower Niobrara NRD, UNL-Northeast Research and Extension center, Holt County Extension Service, Conservation & Survey, and the Holt County NRCS has been completed. The goal of the project was and continues to be protecting groundwater by increasing the use of nitrogen and irrigation Best Management Practices. The four specific objectives for the project were:

a) Increase by 20% cropland acres where nitrogen management BMPs are utilized. Initial data collected in FY94 will be compared with final data collected in FY96.
b) Increase by 20% cropland acres where irrigation management BMPs are utilized. Initial data collected in FY94 will be compared with final data collected in FY96.
c) Inform and educate city residents, farmers, other rural residents, and schoolchildren about water quality and NPS pollution issues. Thirty percent of area residents sampled will indicate an increase in knowledge of water quality and NPS pollution issues.
d) Improve communications between agriculture, city residents, and government on water quality and NPS issues. Records will be kept documenting attendance at all educational events and numbers of informational inquires.

The report, Agricultural Management Practices and the Groundwater System of Northern Holt County, Nebraska, for this project has been published. In the report summary, the University of Nebraska concluded that their nitrogen recommendation system produced profitable yields compared to lower and higher application rates and that ground water quality was altered by human activities. Chemicals placed on the land can move down through the vadose zone into an aquifer.

2. Cost Share Assistance Programs

The district offers several cost share programs. These programs include but are not limited to Automatic Drip Oiler, Nitrogen Management, Livestock Manure Analysis, Domestic Well, Well Abandonment and Soil Probe. Cost share funding is available by contacting the District office and filling out an application form. Cost share payments will be based on availability of water quality funding and identified District priorities (See Appendix E for cost share descriptions).

3. Nitrate Testing

The District tests water samples brought to the NRD for nitrate-nitrogen levels. The District uses its own HACH Kit and makes no charge for the testing. The HACH Kit is also taken to County Fairs or other special events and, periodically, to locations within the NRD where people are invited to bring water samples for testing.

4. Information and Education

Public meetings, news articles, brochures, newsletters and demonstrations are used on an ongoing basis to make the public aware of water quality issues, and as support for the various Phase certification requirements described in Appendix A. Water quality education for children and adults is coordinated and presented by District staff. The District will continue to administer and expand current programs as well as add new programs and projects. We will also cooperate with other NRDs and conservation partners in their programs and projects.

5. Chemigation Permit and Inspection Program

In cooperation with the Nebraska Department of Environmental Quality, the NRD administers a chemigation permitting and inspection program. Approximately 900 locations are permitted each year. All new application sites and approximately 50% of all renewals are inspected to assure all required equipment is in place and functioning properly to prevent backflow of chemicals into groundwater.

6. Rural Water Distribution Projects

The District currently operates one rural water district distribution system for public water supply. This system addresses the quantity and quality water needs of nearly 200 rural hookups and the villages of Verdigre and Winnetoon. Two additional Rural Water Systems operate independent of the NRD. Similar Special Improvement Project areas would be considered if the need and support were demonstrated. The District encourages the use of Wellhead Protection and Source Water Protection concepts in all public water supply areas, and maintains contact with appropriate state and federal agencies to ensure proper coordination.

7. Regulatory Programs

We recognize that it may be several years before effects of improved management will result in better groundwater quality. Therefore, the District is proceeding with a regulatory action plan. The Upper Elkhorn and Lower Niobrara NRDs have discussed possible groundwater management activities for areas which cross District boundaries. The result is a Groundwater Quality Management Area (see Appendix A).

B. Groundwater Quantity

1. Static Groundwater Level Monitoring Program

The District measures static water levels in approximately 55 wells biannually. This program was started in 1975. Water level data is recorded and reports reviewed after each measurement period.

Well registration information is kept on file in the District office. The Department of Natural Resources provide copies of the registration. These documents provide information such as location, static water levels, depth of well, purpose of well, pumpage rate and well logs. As new wells are drilled, copies of the registration are forwarded to the NRD.

The District provides information to the public about the importance of conserving water. This is accomplished through news releases and articles and presentation to school children and adults.

2. Cost Share Program

The district offers Automatic Rain Gauge Shut off as one of its cost share programs to address groundwater quantity. Cost share funding is available by contacting the District office and filling out an application form. Cost share payments will be based on availability of water quality funding and identified District priorities (see Appendix E for cost share descriptions).

3. Information & Education

Public meetings, news articles, brochures, newsletters and demonstrations are used on an ongoing basis to make the public aware of water quantity issues. Water quality education for children and adults is coordinated and presented by District staff. The District will continue to administer and expand current programs as well as add new programs and projects. We will also cooperate with other NRDs and conservation partners in their programs and projects.

4. Regulatory Program

The District will take action to establish a management or control area when water levels decline to an unacceptable level (see appendix B).

IX. Plan Evaluation and Assessment

LNNRD's emphasis in its Groundwater Management Plan will continue to be groundwater quality, although groundwater quantity issues will be addressed as necessary as previously outlined. In order to adequately document, evaluate, and assess the effect of implementation of the plan, the District will employ the following methods:

1. Documentation of water quality sampling results from the District's Hach kit analyses as well as from public and private laboratories. These results will be maintained as a database at the District offices to document changes in water quality over time as a result of implementation of the groundwater quality portions of the Plan. In addition, this information will be submitted to the Agrichemical Clearinghouse for use in regional and statewide analysis of groundwater quality.

2. Collection of information from consultants, local fertilizer and agri-chemical dealers and farm operators. This information will show evidence of changes in fertilizer and agri-chemical usage over time as a result of implementation of District programs and indicate the adoption of various BMPs, including number of acres scouted for both fertilizer and pesticide requirements, acres using irrigation scheduling, and the location of soil samples taken. This will be voluntary in Phase I Areas, but will become mandatory in Phase II and III Areas. If and when Phase II and III Areas are designated, reporting of such information will be a requirement of all farm operators, and will provide a comprehensive data source to evaluate BMP adoption and implementation, and effectiveness of the District's Groundwater Management Plan. (see Appendix A).

3. Documentation of static groundwater levels throughout the District. As already described, the District will continue to take regular measurements from approximately 55 wells throughout the NRD to evaluate changes in groundwater levels. Although no serious groundwater declines are foreseen at this time, this information will be evaluated on an annual basis to determine if groundwater quantity measures need to be implemented (see Appendix B), and whether or not those measures are adequate.

All of these activities can be indicators of successful avenues to be used by the District. This data will be used to proceed with activities to achieve groundwater quantity and quality goals. Programs that are successful will continue to be instituted and as new technology and ideas develop the District will expand its programs. The District will enlist the help of other organizations and public to achieve its goals. The District does not intend to wait for results of other programs, but will proceed with activities which the Board feels are productive and acceptable to residents of the NRD.

The Plan will be informally reviewed at least once each year by the NRD staff to ensure that it is consistent with new legislation and issues which might arise. A formal, comprehensive review of the Plan will completed by the NRD staff and board at least once every five years to ensure that it adequately addresses groundwater concerns in the District. The results of these reviews will be used to determine if the Plan requires formal revision as allowed in Nebraska statute.

PHASE I

The Phase I Area is all of the land in the District where 50% of the District's monitoring wells indicate nitrate-nitrogen levels are from 0 to 75% of MCL, or the entire NRD until Phase II or Phase III Areas are established. The entire area will be in Phase I for a minimum of two monitoring periods (4 years).

Phase I Regulations

1. Nitrogen Management

   Certification in Nitrogen Management is required once every four years and will be accomplished by attending a workshop established by the District and developed with the assistance of the University of Nebraska Extension, University of Nebraska research personnel, and others. For operators who also farm land in adjacent Districts with Groundwater Management Areas, certification from those Districts will be accepted as meeting the LNNRD requirements.

   The person or persons responsible for making decisions on any type of application of nitrogen fertilizer on an area larger than one acre and applying more than 50 pounds per acre per year on any agricultural land within the LNNRD, either commercially or privately, must be certified by the District once every four years. The person or persons will be considered the certified operator(s).

2. Fall (September 23 to December 20) and winter (December 21 to March 1) application of commercial nitrogen fertilizer is discouraged until after March 1 on any soil type. This request does not apply to applications of less than 20 pounds of nitrogen per acre on fall or spring seeded crops.

3. All new wells will be permitted according to 46-659.29 of the Nebraska Groundwater Management and Protection Act.

4. A voluntary water analysis for all irrigation, domestic, and stock wells is encouraged.

5. Deep soil sampling and analysis is encouraged.

PHASE II

Phase II Areas will be designated when concentrations in 50% of the District's monitoring wells within a township (36 square miles) or sub-township indicate nitrate-nitrogen levels greater than 75% of the MCL.

In townships with nine or fewer registered irrigation wells, the District will monitor all such wells and work with operators managing those wells on an independent basis. If those wells are concentrated in one part of a township, the District may subdivide that township for Phase designation and monitoring. All portions of subdivided townships are subject to appropriate Phase regulations.

An area will remain in Phase II for a minimum of two monitoring periods (4 years), after which time the evaluation of data will enable the District to determine the Phase designation for the following two monitoring periods.

Phase II Regulations

1. Continue requirement of permitting all wells . (Phase I, #4)

2. Continue to encourage voluntary water analysis for all domestic and stock wells. (Phase I, #5)

3. Continue Nitrogen Management Certification requirement. (Phase I, #1)

4. Fall application of commercial nitrogen fertilizer is not allowed until after November 1 and is discouraged until March 1 on any soil type. Exceptions will be allowed for application rates of less than 20 pounds/acre of actual nitrogen on fall or spring seeded crops. Spring (March 1 to June 20) applications of commercial fertilizer greater than 100 pounds of actual nitrogen per acre will be encouraged through split applications (i.e. pre-plant, pesticide applications, starters, pivot applications, and side-dress).

5. Deep soil sampling and nitrate analysis on fields of at least 40 acres is required when applying more than 50 pounds/acre/year of actual nitrogen. Samples must be taken to a minimum of two feet, while up to a three-foot sample is encouraged. Each sample should represent an area no larger than 40 acres. (see NebGuide #G91-1000-A, Guidelines for Soil Sampling.)

6. Operators must submit a report to the Lower Niobrara NRD by December 31, following each crop year, on a form provided by the District. A separate form must be filed for each field of at least 40 acres. This annual Crop Report Form will include:

    a. Results of water nitrate analysis for each irrigation well. Results must be samples analyzed in the last four years.

    b. The crop planted and the expected yield.

    c. Nitrogen fertilizer recommendations (crop need assessment). Operators will be required to include fertilizer application rates based on UNL recommendations.

    d. Actual nitrogen fertilizer (commercial and organic) and pesticides applied.

    e. Actual yield achieved.

    f. An estimated amount of irrigation water applied in inches. (The District can take measurements with an ultrasonic flowmeter to determine the volume of water applied through the irrigation system.)

g. Results of deep soil analysis. (Some fields may not require sampling and analysis. See Phase II, #5)

7. Residents of towns within a Phase II Area who apply fertilizers or pesticides are encouraged to attend a workshop developed by the District to aid in proper application of lawn and garden chemicals.

8. Animal waste and municipality waste must be properly applied and accounted for to avoid surface and groundwater contamination.

   a. All livestock facilities requiring a permit, must be properly permitted by the State of Nebraska, and filed with the Lower Niobrara NRD.

   b. Nitrogen application including waste (solid or effluent) should not exceed crop need. Waste effluent pumped from a lagoon or waste pit, applied to the ground by an irrigation system, knifed into the ground or surface applied, must be properly accounted for and made a part of the total crop need assessment. The District recommends that the waste be analyzed at a lab. Please contract the District for help in finding a lab to perform the test.

   c. Discourage spreading of waste on frozen or snow covered ground. If waste is spread on frozen ground it will be limited to land where slopes are 4% or less or have adequate erosion control practices.

   d. Waste will not be spread on land subject to frequent flooding (subject to flooding more than once in a 10 year period).

   e. Waste will not be spread within 200 feet of, and draining into, adjacent water bodies.

   f. Discourage waste disposal on tilled ground with greater than 10% slopes unless adequate erosion control practices are present.

PHASE III

Phase III areas will be designated when concentrations in 50 percent of the District's monitoring wells within a township (36 square miles) or sub-township indicate a nitrate-nitrogen level greater than 95 percent of the MCL. An area will be in Phase II for two monitoring periods (or 4 years) before going into Phase III.

In townships with nine or fewer registered irrigation wells, the District will monitor all such wells and work with producers managing those wells on an independent basis. If those wells are concentrated in one part of a township, the District will subdivide that township into ¼ or ½ for Phase III designation and monitoring. All portions of subdivided townships are subject to appropriate Phase regulations.

An area will remain in Phase III for a minimum of two monitoring periods (4 years), after which evaluation of data will enable the District to determine the Phase designation for the following two monitoring periods.

Phase III Regulations:

1. All Phase II regulations will remain in effect except for the following:

2. Application of commercial nitrate-nitrogen fertilizer is prohibited on all soils until after March 1. Exceptions will be allowed for application rates less than 20 pounds of actual nitrogen per acre on fall or spring seeded crops. Spring (March 1 to June 20) application of actual nitrogen over 100 pounds of actual nitrogen will require split application (i.e. pre-plant, pesticide applications, starters, pivot applications, and side-dress).

3. Irrigation scheduling, rain sensors, or other approved water monitoring devices will be required. Actual water used is required on all annual reports, as is the method by which it is determined. The District will require one monitoring device per field of at least 40 acres.

4. Implement and maintain 2 additional Best Management Practices from the following list. Use of these BMPs must be documented on the Annual Crop Report Form

5. A water sample from irrigation wells analyzed within the last 2 years is required on the Annual Crop Report Form.

Best Management Practices

Best Management Practices (BMPs) provide logical and practical methods of working towards improving groundwater quality. Best Management Practices are schedules of activities and maintenance procedures, and other management practices designed to prevent or reduce groundwater contamination. Best Management Practices include:

1. Crop Nutrient Management
2. Proper rate of fertilizer application
    a) Monitors on application equipment
    b) UNL fertilizer recommended rate
3. Use of nitrification inhibitors
4. Proper timing of fertilizer application
    a) Chlorophyll meter
    b) Crop growth
    c) Infrared sensors
5. Test plot - approximately 3-4 acres demonstrating:
    a) reduced nitrogen rates
    b) different nitrogen application timing than routinely practiced
    c) use of inhibitors
    d) any other Nitrogen Best Management Practices
6. Proper timing/rate of pesticide application
7. Integrated Pest Management
8. Irrigation scheduling
    a) Tensiometers
    b) Electrical resistance blocks
    c) "Feel" method

9. Annual water analysis

10. Irrigation water application monitoring

    a) rain gauge

    b) flow meter

    c) rain shut-off

11. Pump efficiency test

12. Crop rotation

APPENDIX A

IMPLEMENTATION OF A GROUNDWATER QUALITY MANAGEMENT AREA

On July 1, 1996, the Lower Niobrara Natural Resources District designated the entire District in Phase I of the Groundwater Quality Management Area. Phase I has emphasized largely mandatory informational and educational programs designed to stimulate awareness of options to reduce the hazard of nitrate contamination of groundwater.

Within six months of approval of Plan revisions, the District will hold public hearings to designate Phase II areas and create additional areas as needed. The target date for these hearings will be January 1, 2004. These areas will be designated by township or partial township, as monitoring data warrants. Phase III areas will be designated as data monitoring indicates the need for these areas. If data indicates that Phase III area triggers are already being met upon initial Phase II designations, those areas will remain in Phase II for no more than two monitoring periods (4 years) as previously specified in order to give the District time to work with producers and develop adequate materials and resources to implement Phase III.

If the triggering mechanism is met, possible controls are to educate all citizens in the District through workshops and news articles about soil and water conservation and Best Management Practices to make them more responsible for groundwater quality, take steps to specifically reduce and control nitrate contamination in all areas of the LNNRD, work with other agencies to determine how surface water relates to groundwater levels and utilize regulatory authority under the Groundwater Management and Protection Act. Best Management Practices recommended for implementation include but are not limited to deep soil testing, use of crop consultants, expanded education programs, demonstration site evaluation, alternative cropping practices, chemigation, and animal waste accountability.

The program's goal is to encourage farmers to apply only the amount of commercial fertilizer that is necessary after calculating the nitrogen already available to the crop in the soil and irrigation water.

The implementation of this Groundwater Quality Management Area will reduce nitrate leaching through the soil, lower nitrate concentration in the groundwater, and increase the quality of our precious groundwater supply.

If groundwater contamination from pesticides or other compounds is identified, the District will use the mechanisms previously specified to deal with that contamination.

MONITORING SCHEDULE

For management of nitrate contamination, the district will monitor one irrigation well per section up to 50% of the registered irrigation wells in each township. The District will monitor one half of these wells each year, so that all monitoring wells are sampled once in a two-year period.

In townships with nine or fewer registered irrigation wells, the District will monitor all such wells and work with producers managing those wells on an independent basis. If those wells are concentrated in one part of a township, the District will subdivide that township into ¼ or ½ for Phase designation and monitoring. All portions of subdivided townships are subject to appropriate Phase regulations.

APPENDIX B

IMPLEMENTATION OF A GROUNDWATER QUANTITY MANAGEMENT AREA

Triggering mechanisms for a Quantity Management Area are set to take action when an unacceptable decline in water levels occurs in the Districts monitoring wells over a five year period. This can be an actual decline of 10 feet or a percentage of 15% of the yearly average static water level from the District's monitoring wells. If this trigger is met, the District will take steps to establish a management or control area sufficient to deal with the portion of the District affected by the declines in water levels. Areas where is has been determined that a continuous and reliable source of recharge is maintaining groundwater levels, will not be designated as management or control areas.

Possible actions would be to educate all citizens in the District through workshop and news articles about water and soil conservation and Best Management Practices to make them more responsible for groundwater quality and quantity; increase cost share for water quantity programs; work with other agencies to determine how surface water relates to groundwater levels; and utilize regulatory authority under Nebraska Groundwater management and Protection Act when necessary.

MONITORING SCHEDULE

For groundwater quantity management, LNNRD will continue to collect static water level readings twice annually (spring and fall) from approximately 55 irrigation wells spread throughout the District. Results of this monitoring will be used to support implementation of the quantity management activities described above.

Lower Niobrara NRD
Nitrate Results

Legal	1996-HACH		1997-LAB Res		1998-LAB Res		1999-LAB Res		2000-LAB Res		2001-LAB Res		2002-LAB Res	
BOYD CO.	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3
NESW Sec 17, T33, R16			8/22/97	2.4			7/29/99	2.2			8/13/01	1.8		
SE Sec 19, T 34, R 12			8/20/97	<0.1			8/18/99	<0.1			8/17/01	<0.1		
SWNW Sec 24, T33, R 12				<0.1			8/18/99	<0.1			8/17/01	<0.1		
SWSE Sec21, T 34, R 15	8/30/96	28.0			7/10/98	29.9			9/6/00	33.5			7/11/02	25.5
NWSW Sec 27, T34, R15	8/15/96	14.8			7/10/98	1.6			9/6/00	1.3			7/11/02	1.3
NENW Sec 28, T34, R 15	8/30/96	29.5			7/17/98	29.6			9/6/00	29.9			7/11/02	27.5
NENE Sec 29, T34, R 15	8/30/96	20.5			7/13/98	13.6			9/6/00	16.1			7/11/02	20.4
NESE Sec 30, T34, R15	8/30/96	9.3			7/13/98	11.0			9/6/00	13.2			7/11/02	14.1
SWSE Sec 27, T34, R16			8/22/97	13.7			7/29/99	12.2			8/13/01	12.4		
SENE Sec 31. T34, R16			8/7/97	0.5			7/29/99	0.5			8/13/01	0.5		
NENE Sec 34, T34, R16			8/29/97	6.6			7/29/99	7.0			8/13/01	7.3		
SWNE Sec 35, T34, R16			8/7/97	10.2			7/29/99	12.1			7/31/01	5.2		
NW Sec 34, T34, R16			8/7/97	14.1			7/29/99	18.9			8/13/01	21.0		
Yearly Average		20.4		9.0		17.1		10.1		18.8		9.3		17.8

Lower Niobrara NRD
Nitrate Results

Legal	1996-HACH		1997-LAB Res		1998-LAB Res		1999-LAB Res		2000-LAB Res		2001-LAB Res		2002-LAB Res	
HOLT CO.	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3
SE NW Sec 3, T 29, R 9	8/8/96	24.0			7/30/98	27.5			9/8/00	28.3			8/2/02	27.1
NE Sec 4, T 29, R 9					7/15/98	24.0							9/5/02	24.1
NW NE Sec 5, T 29, R 9	7/26/96	12.1			8/12/98	10.7			7/25/00	12.0			8/23/02	13.4
SW NE Sec 6, T 29, R 9					8/12/98	23.6			8/15/00	28.5			9/4/02	30.3
NE Sec 8, T 29, R 9	7/24/96	14.1			8/12/98	19.8			8/15/00	20.5			8/23/02	18.7
NE Sec 9, T 29, R 9					7/15/98	30.6								
NW NW Sec 10, T 29, R 9	7/26/96	22.3			7/15/98	27.0			8/23/00	33.7			8/2/02	34.1
NW Sec. 15, T 29, R 9					8/12/98	21.3			8/23/00	22.6				
NE NE Sec 17, T 29, R 9	8/14/96	22.0			7/15/98	27.1			9/11/00	30.9			8/2/02	31.2
SW NE Sec 18, T 29, R 9	8/7/96	30+			7/14/98	40.1			9/5/00	36.9			8/2/02	33.9
NE Sec 19, T 29, R 9	8/7/96	30.0			8/12/98	30.1			7/21/00	34.6			8/5/02	31.1
NE Sec 20, T 29, R 9	7/30/96	21.0			7/15/98	21.4			8/3/00	25.7			7/29/02	25.1
NW SE Sec 23, T 29, R 9					7/29/98	4.1			8/18/00	5.6			8/2/02	6.2
SW NE Sec 26, T 29, R 9	8/7/96	6.5			7/15/98	2.1			8/15/00	2.3			7/29/02	9.9
NW NE Sec 27, T 29, R 9	8/14/96	20.3			7/15/98	19.3			8/15/00	8.0			7/30/02	7.8
SW NE Sec 28, T 29, R 9					8/12/98	22.7			8/15/00	9.3			9/4/02	10.1
NW NE Sec 29, T 29, R 9	7/30/96	13.3			8/3/98	14.5			8/3/00	2.1			9/18/02	17.4
NW NE Sec 30, T 29, R 9					8/25/98	28.6			7/21/00	32.6			8/2/02	31.4
NE NE Sec 31, T 29, R 9	7/30/96	12.2			7/15/98	13.4			8/3/00	15.4			8/5/02	15.8
NE Sec 32, T 29, R 9	7/24/96	11.0			7/28/98	12.7			8/18/00	14.9			8/5/02	13.6
SW NE Sec 33, T 29, R 9	7/30/96	19.5			7/15/98	22.0			8/15/00	22.3			9/5/02	22.7
SW NE Sec 34, T 29, R 9	7/24/96	18.2			8/12/98	25.3			8/23/00	24.7			8/2/02	21.8
NE Sec 35, T 29, R 9	8/20/96	4.6			8/19/98	1.9			8/15/00	1.4			8/2/02	6.1
SE NE Sec 36, T 29, R 9	8/2/96	5.7			8/19/98	2.4			8/22/00	1.8			8/2/02	7.8
NE Sec 1, T 29, R 10			6/27/97	32.0			7/29/99	30.9			8/7/01	31.8		
SW NE Sec 2, T 29, R 10				21.2			10/28/99	17.5			8/7/01	21.5		
NW NW Sec 3, T 29, R 10				41.9			7/30/99	49.2			8/28/01	48.3		
NE Sec 4, T 29, R 10				35.5			7/30/99	36.7			8/28/01	41.0		
SW SW Sec 5, T 29, R 10			8/8/97	49.1			8/23/99	45.0			8/7/01	46.4		
SW NE Sec 6, T 29, R 10			8/5/97	27.3			8/3/99	24.2			7/30/01	27.3		
NW NE Sec 7, T 29, R 10				17.6			8/3/99	44.2			7/30/01	51.8		
SE NE Sec 8, T 29, R 10				54.5			8/2/99	53.3			8/7/01	51.5		
NE Sec 9, T 29, R 10			6/27/97	70.0			7/29/99	62.4			8/7/01	63.8		
NE Sec 10, T 29, R 10			8/20/97	9.7			8/23/99	17.6			8/7/01	10.6		
NE NE Sec 11, T 29, R 10				21.2			7/16/99	25.8			8/7/01	31.2		
NE Sec 12, T 29, R 10				31.7			8/23/99	32.7			7/30/01	34.3		
NE Sec 13, T 29, R 10				26.7			7/30/99	29.0			8/7/01	30.1		
SW NE Sec 14, T 29, R 10			8/8/97	21.6			8/23/99	27.2			8/7/01	20.3		
SW NE Sec 15, T 29, R 10			8/8/97	24.2			8/23/99	29.0			8/7/01	27.2		
SE NE Sec 16, T 29, R 10			8/8/97	10.4			8/23/99	10.1			8/7/01	11.1		

Lower Niobrara NRD
Nitrate Results

Legal	1996-HACH		1997-LAB Res		1998-LAB Res		1999-LAB Res		2000-LAB Res		2001-LAB Res		2002-LAB Res	
HOLT CO.	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3
NE Sec 17, T 29, R 10			7/3//97	9.6			7/29/99	15.0			7/30/01	11.2		
NE NE Sec 18, T 29, R 10			7/30/97	31.7			8/23/99	47.0			7/30/01	47.0		
SW SW Sec1, T 29, R 11	7/25/96	18.4			7/24/98	12.1			8/10/00	23.3			7/11/02	19.4
SE SE Sec 3, T 29, R 11	8/8/96	28.0	7/24/98	26.2	7/29/98	22.6			8/24/00	19.5			8/29/02	20.4
SE Sec 7, T 29, R 11					7/24/98	5.1			8/18/00	3.3			8/23/02	4.2
NW Sec 8, T 29, R 11	7/24/96	13.8			8/10/98	14.3			8/4/00	17.3			8/2/02	2.4
NE Sec 9, T 29, R 11	7/24/96	25.0			8/12/98	37.9			8/4/00	11.7			8/19/02	8.9
SW NE Sec 10, T 29, R 11					7/24/98	15.9			8/4/00	13.5			8/2/02	30.4
NE Sec 11, T 29, R 11	7/25/96	27.0			7/24/98	24.6			8/10/00	12.7			7/11/02	10.5
NE Sec 12, T 29, R 11	7/25/96	28.0			7/24/98	17.5			8/10/00	16.1			8/30/02	16.1
NE Sec 13, T 29, R 11	7/25/96	25.1			7/24/98	28.3			8/10/00	27.6			7/11/02	28.7
NE Sec 14, T 29, R 11	7/25/96	30.1			7/24/98	31.2			8/10/00	25.0			7/11/02	27.7
SE NE Sec 15, T 29, R 11					7/24/98	14.2	8/21/00	12.5	8/24/00	12.1				
NE Sec 16, T 29, R 11	7/30/96	11.8			8/10/98	17.1			8/4/00	17.3			8/19/02	25
NE NE Sec 17, T 29, R 11	7/30/96	15.2			8/10/98	21.8			8/4/00	6.6			8/19/02	7.8
SW NE Sec 18, T 29, R 11					8/10/98	8.8			8/18/00	4.5			9/5/02	27.6
SW NW Sec 2, T 29, R 12			8/5/97	2.3			8/25/99	2.5			8/7/01	2.9		
NE NE Sec 3, T 29, R 12				12.4			7/28/99	9.2			8/7/01	18.1		
NE Sec 4, T 29, R 12			8/27/97	7.9			8/24/99	6.6			8/7/01	12.1		
SE NE Sec 5, T 29, R 12			8/6/97	3.6			07/06/99	4.5			8/23/01	4.1		
NW NW Sec 6, T 29, R 12				6.7			7/30/99	7.0						
NE NE Sec 7, T 29, R 12			8/6/97	6.7			07/06/99	7.3			8/7/01	7.9		
SE NW Sec 8, T 29, R 12			8/6/97	5.5			07/06/99	5.4			8/7/01	5.7		
NE Sec 9, T 29, R 12			8/20/97	13.5			8/12/99	14.2			8/7/01	14.0		
NW NE Sec 10, T 29, R 12			8/6/97	2.0			8/31/99	1.8						
SE Sec 11, T 29, R 12											6/29/01	9.6		
NW SW Sec 13, T 29, R 12			8/6/97	3.2			8/24/99	3.6			8/7/01	6.9		
NE NE Sec 14, T 29, R 12							07/29/99	73.6			6/29/01	74.3		
NW NE Sec 15, T 29, R 12			8/6/97	1.9			8/12/99	2.2			8/7/01	2.6		
NE Sec 16, T 29, R 12				10.3			7/23/99	12.1			8/7/01	12.7		
NE Sec 18, T 29, R 12				1.6			7/30/99	1.9			8/7/01	2.0		
NW NW Sec 1, T 29, R 13	8/21/96	1.8			7/21/98	6.6			8/24/00	2.4				
SW NE Sec 2, T 29, R 13	7/31/96	15.4			7/14/98	7.0			7/28/00	8.2			9/3/02	8.8
NW SE Sec 3, T 29, R 13					7/21/98	6.0			8/24/00	6.0			7/15/02	6.3
NE NE Sec 10, T 29, R 13	8/15/96	7.9			7/21/98	9.3			8/24/00	9.6			9/9/02	9.9
NE NE Sec 11, T 29, R 13	8/21/96	6.3			8/12/98	6.8			8/7/00	7.9			8/21/02	7.9
NW Sec 12, T 29, R 13	8/22/96	7.6			8/10/98	8.5			8/9/00	9.6			7/15/02	10.2
NE Sec 13, T 29, R 13	8/21/96	2.8			7/23/98	3.4			8/8/00	3.4			7/15.02	3.3
NW NW Sec 14, T 29, R 13	8/21/96	7.4			7/21/98	8.2			7/19/00	8.1			8/20/02	8.5
NW NE Sec 15, T 29, R 13	8/21/96	3.1			7/21/98	3.6			8/7/00	4.0			8/20/02	3.9

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Legal	1996-HACH		1997-LAB Res		1998-LAB Res		1999-LAB Res		2000-LAB Res		2001-LAB Res		2002-LAB Res	
HOLT CO.	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3
NW NW Sec 3, T 30, R 9	8/16/96	22.0			8/18/98	26.8			8/21/00	30.1				
SW NE Sec 4, T 30, R 9					8/18/98	28.1			8/21/00	30.3			7/25/02	31.4
NE Sec 5, T 30, R 9	8/2/96	24.0			8/12/98	24.0			8/29/00	26.4				
NE NE Sec 6, T 30, R 9					7/13/98	19.0			7/13/00	18.5			7/19/02	17.6
NW Sec 7, T 30, R 9	8/21/96	9.9			7/13/98	7.9			7/13/00	6.7			7/19/02	8.6
SW NE Sec 8, T 30, R 9	8/16/96	26.0			7/14/98	25.8							8/2/02	28.7
NW NE Sec 9, T 30, R 9	8/13/96	23.0			8/18/98	28.1			8/21/00	31.9			9/6/02	30.9
NE NW Sec 10, T 30, R 9	8/13/96	20.0			8/12/98	30.7			8/22/00	31.2			9/5/02	31.6
NE SE Sec 12, T 30, R 9	8/19/96	2.3			9/2/98	7.0			9/5/00	2.2				
NE NE Sec 13, T 30, R 9	8/13/96	4.0			8/13/98	4.2			8/18/00	4.8				
NE Sec 17, T 30, R 9	7/24/96	21.0			7/28/98	22.5			8/2/00	26.1			7/29/02	26.6
SW NE Sec 18, T 30, R 9					7/14/98	21.6			8/23/00	23.4			9/4/02	22.3
SW NE Sec 19, T 30, R 9	7/31/96	29.0	8/19/98	19.9	8/19/98	20.1			8/21/00	21.8			9/4/02	23.2
SW NE Sec 20, T 30, R 9					8/19/98	13.4			8/15/00	16.1			9/4/02	20.5
SE NW Sec 23, T 30, R 9	8/13/96	22.0	8/12/98	49.7	9/2/98	47.8			8/21/00	45.8				
NE NE Sec 24, T 30, R 9	8/13/96	6.8			8/12/98	14.3			8/18/00	12.7			9/4/02	2.5
NE NE Sec 25, T 30, R 9	8/13/96	11.9	8/12/98	28.2	9/2/98	17.6			8/18/00	24.1			7/19/02	33
SE NW Sec 26, T 30, R 9					7/13/98	36.7			8/23/00	34.4			7/19/02	16.8
SE Sec 27, T 30, R 9	8/19/96	18.5			7/13/98	24.1			8/15/00	24.7			8/2/02	25.1
SW NW Sec 29, T 30, R 9	8/7/96	4.4			8/24/98	5.5			8/15/00	6.5			9/4/02	7.8
NE Sec 30, T 30, R 9	7/24/96	14.6			7/28/98	14.5			8/2/00	17.1			8/2/02	14.6
NW Sec 31, T 30, R 9	7/30/96	10.2			8/12/98	9.7			8/15/00	11.0			8/2/02	11.4
NW NE Sec 33, T 30, R 9					7/13/98	16.9			8/18/00	17.9			7/19/02	18.6
SW NE Sec 34, T 30, R 9					7/13/98	24.1			8/18/00	25.4			8/2/02	28.3
SW NE Sec 2, T 30, R 10							7/28/99	19.4			8/1/01	17.1		
NE Sec 3, T 30, R10				13.6			7/28/99	12.6			8/6/01	12.5		
SE NE Sec 4, T 30, R 10			6/8/97	32.3			7/28/99	14.2			8/6/01	16.9		
SW NE Sec 8, T 30, R 10			6/8/97	5.6			8/23/99	6.5			8/6/01	7.7		
NE NE Sec 9, T 30, R 10			6/8/97	8.0			8/23/99	8.0			8/6/01	8.8		
NE NE Sec 10, T 30, R 10			6/8/97	16.4			8/23/99	16.6			8/6/01	15.4		
SW NW Sec 11, T 30, R 10			6/27/97	23.0			7/28/99	29.2			8/6/01	29.9		
SW Sec 12, T 30, R 10			8/8/97	5.2										
SW NE Sec 13, T 30, R 10			8/8/97	12.1			9/2/99	9.3			8/6/01	11.0		
SW NW Sec 14, T 30, R10				0.8			7/28/99	8.4			8/6/01	11.4		
NE NE Sec 15, T 30, R 10			8/8/97	26.0			7/28/99	28.2			8/1/01	29.4		
NE SE Sec 17, T 30, R 10			8/21/97	21.5			8/23/99	38.8			8/1/01	27		
SE NW Sec 20, T 30, R 10			8/8/97	7.8			8/23/99	3.5			8/20/01	9.7		
NE Sec 21, T 30, R 10				14.1			8/5/99	21.2			8/6/01	18.0		
NE Sec 22, T 30, R 10				12.3			7/28/99	14.2			8/6/01	15.6		
SW NE Sec 23, T 30, R 10				17.6			7/28/99	21.1			8/6/01	26.4		

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Legal	1996-HACH		1997-LAB Res		1998-LAB Res		1999-LAB Res		2000-LAB Res		2001-LAB Res		2002-LAB Res	
HOLT CO.	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3
NE NE Sec 25, T 30, R 10				25.9			8/4/99	29.0			8/20/01	28.0		
NE Sec 26, T 30, R 10			8/8/97	11.2			8/4/99	12.6			8/7/01	15.7		
NE Sec 27, T 30, R 10				10.5			7/28/99	10.9			8/7/01	14.6		
SE NE Sec 28, T 30, R 10			8/8/97	14.8							8/7/01	18.1		
NE Sec 29, T 30, R 10			8/8/97	9.5			8/23/99	31.9			7/20/01	35.6		
NE NW Sec 31, T 30, R 10				35.7			7/29/99	36.4			7/30/01	33.8		
SE NW Sec 32, T 30, R 10			8/5/97	16.7			8/3/99	34.6			7/31/01	25.1		
NW NW Sec 33, T 30, R 10			8/7/97	28.6			8/25/99	26.8			7/31/01	25.9		
NE NE Sec 34, T 30, R 10			8/7/97	35.7			8/25/99	37.0			7/31/01	39.5		
NE Sec 35, T 30, R 10			6/27/97	22.0			8/4/99	21.9			813/01	23.2		
SE NE Sec 12, T 30, R 11	8/16/96	4.3			8/18/98	3.7								
NW Sec 14, T 30, R 11	7/29/96	15.2			7/24/98	4.9			8/17/00	7.4			8/23/02	8.1
SE NE Sec 17, T 30, R 11					8/11/98	14.5			8/18/00	17.0			8/30/02	6.3
NE NE Sec 20, T 30, R 11	7/31/96	8.4			7/14/98	9.0			7/28/00	7.2			8/30/02	4.7
NE SW Sec 21, T 30, R 11	8/23/96	12.6			7/24/98	7.5			8/1/00	9.2			7/23/02	7.2
NE NE Sec 28, T 30, R 11	7/31/96	6.8			7/14/98	6.6			7/28/00	4.5			8/30/02	3.0
NW SW Sec 32, T 30, R 11	8/8/96	15.8			7/24/98	1.3			8/22/00	2.8			7/23/02	3.0
SW NW Sec 3, T 30, R 12			6/27/97	8.7			8/6/99	8.6			7/9/01	18.0		
NW SE Sec 4, T 30, R 12			8/6/97	6.0			8/24/99	6.8			8/1/01	7.6		
NE Sec 9, T 30, R 12				10.3			8/12/99	11.4			8/7/01	11.1		
SE Sec 11, T 30, R 12			8/6/97	4.9			07/07/99	15.8			8/7/01	6.5		
NW Sec 13, T 30, R 12			8/6/97	3.4			8/12/99	4.0			8/20/01	4.9		
SW Sec 14, T 30, R 12				11.1			8/12/99	3.0			8/9/01	3.0		
NW Sec 15, T 30, R 12			8/6/97	16.9			8/12/99	18.6			7/9/01	17.6		
NE NE Sec 16, T 30, R 12				8.8			7/23/99	6.2			8/7/01	10.2		
NW Sec 22, T 30, R 12				19.0			7/23/99	17.3			8/7/01	19.9		
NE NW Sec 23, T 30, R 12				1.9			7/30/99	2.3			8/20/01	12.5		
NE NE Sec 25, T 30, R 12			8/6/97	2.8			8/12/99	2.8						
NW NE Sec 26, T 30, R 12			8/6/97	6.6			8/12/99	7.4			8/9/01	7.9		
NE NE Sec 27, T 30, R 12				9.9			8/12/99	11.9			7/9/01	13.0		
NE Sec 28, T 30, R 12				4.2			7/23/99	24.0			7/27/01	22.7		
SW NE Sec 30, T 30, R 12			8/20/97	2.1			8/12/99	2.2			8/17/01	2.2		
NE Sec 31, T 30, R 12				2.1			8/12/99	4.1			8/7/01	5.4		
NE NE Sec 33, T 30, R 12				5.4			7/23/99	5.8			7/27/01	6.6		
SW NW Sec 34, T 30, R 12				29.3			7/23/99	46.8			7/27/01	26.6		
NW NW Sec 7, T 30, R 13	8/26/96	22.0			7/27/98	26.9			8/25/00	13.8			9/3/02	14.1
NW NE Sec 8, T 30, R 13	7/28/97	1.0			8/12/98	1.1			7/19/00	1.3			7/10/02	1.4
SE Sec 10, T 30, R 13					8/10/98	3.6			8/9/00	4.1			8/20/02	4
SE NE Sec 11, T 30, R 13	8/27/96	3.5			7/21/98	4.5			8/22/00	4.0			8/2/02	4.5
NW Sec 14, T 30, R 13	8/5/96	2.1			8/10/98	2.2			9/8/00	2.2			9/3/02	2.7

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Legal	1996-HACH		1997-LAB Res		1998-LAB Res		1999-LAB Res		2000-LAB Res		2001-LAB Res		2002-LAB Res	
HOLT CO.	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3
SW Sec 15, T 30, R 13	8/26/96	4.2			7/27/98	5.4			8/25/00	4.8			8/22/02	5.4
NE NW Sec 16, T 30, R 13	8/29/96	9.2			7/27/98	10.0			8/9/00	10.7			9/3/02	30.9
SE SW Sec 17, T 30, R 13					7/27/98	4.9			8/25/00	2.9				
NW SW Sec 18, T 30, R 13	8/8/96	30+			7/27/98	15.3			8/25/00	6.0				
NE NE Sec 19, T 30, R 13	8/29/96	2.4			8/10/98	2.8			7/20/00	2.5			9/3/02	4.9
SE Sec 20, T 30, R 13	8/6/96	23.6			8/10/98	20.8			8/29/00	5.8			8/2/02	6.3
NE NE Sec 21, T 30, R 13	8/26/96	9.6			7/27/98	10.7			8/9/00	10.0				
NE Sec 22, T 30, R 13	8/5/96	5.8							8/29/00	6.2			9/3/02	5
NE Sec 23, T 30, R 13					7/21/98	2.5			8/25/00	2.6			7/10/02	2.8
NE NW Sec 24, T 30, R 13					7/21/98	7.2			9/11/00	6.5			8/8/02	7.8
NE Sec 25, T 30, R 13	7/18/96	9.2			8/12/98	6.9			8/24/00	6.5			7/22/02	7.2
NW Sec 26, T 30, R 13					7/21/98	7.9			8/29/00	6.1			8/8/02	5.5
NE NE Sec 27, T 30, R 13	8/5/96	13.9			8/10/98	4.9			9/13/00	21.4				
NE NE Sec 28, T 30, R 13					8/10/98	47.9			8/29/00	30.2				
NE NE Sec 29, T 30, R 13	8/6/96	36.0			8/10/98	46.9			8/29/00	10.5			7/30/02	11.6
NE NE Sec 30, T 30, R 13					8/10/98	20.3			7/20/00	24.6			9/5/02	14.8
NE NE Sec 31, T 30, R 13	8/26/96	9.1			8/10/98	7.8			7/20/00	8.9			9/3/02	3.3
NW NW Sec 32, T 30, R 13					7/27/98	35.3			7/28/00	15.7			9/3/02	14.3
NE NE Sec 33, T 30, R 13	7/24/96	10.1			7/27/98	13.1			7/28/00	12.2			9/3/02	11
NW NE Sec 34, T 30, R 13	7/31/96	9.4			7/14/98	10.2			7/28/00	10.5			8/20/02	10.2
SE SE Sec 35, T 30, R 13					7/21/98	2.2			8/24/00	1.6			9/30/02	2.2
NE NE Sec 36, T 30, R 13					8/12/98	9.0			8/29/00	9.3			9/3/02	9.4
SW SW Sec 1, T 30, R 14				30.2			07/13/99	37.1			8/14/01	33.4		
NE NE Sec 2, T 30, R 14				29.2			07/13/99	34.6			8/29/01	37.0		
NE Sec 3, T 30, R 14				33.2			07/13/99	32.3			8/8/01	32.3		
NE NE Sec 4, T 30, R 14				21.5			07/07/99	28.9			8/17/01	26.3		
NE NE Sec 5, T 30, R 14			8/26/97	21.5			8/12/99	22.1			8/17/01	21.5		
NE Sec 6, T 30, R 14				23.0			07/12/99	24.0			8/8/01	26.2		
NE NE Sec 7, T 30, R 14			8/18/97	28.3			7/26/99	28.9			8/8/01	29.8		
NW NE Sec 8, T 30, R 14			8/18/97	25.7			8/12/99	30.4						
NW NE Sec 9, T 30, R 14			7/28/97	42.8			8/12/99	43.3			8/8/01	38.7		
NE NE Sec 10, T 30, R 14				30.2			07/06/99	27.1			8/14/01	31.1		
NE NE Sec 11, T 30, R 14				34.4			07/13/99	34.7			7/31/01	33.0		
NE NE Sec 12, T 30, R 14			8/14/97	33.3			07/15/99	32.7						
SW NE Sec 13, T 30, R 14			8/19/97	29.9			8/11/99	39.7			8/8/01	37.6		
NE NE Sec 14, T 30, R 14			8/14/97	32.1			07/15/99	34.4			7/31/01	37.9		
NW NE Sec 15, T 30, R 14			7/28/97	41.4			7/26/99	40.8			8/8/01	35.7		
NE NE Sec 16, T 30, R 14			7/28/97	26.1			7/26/99	28.9			8/8/01	26.5		
NE NE Sec 17, T 30, R 14			7/28/97	25.8			07/06/99	22.7			8/17/01	24.2		
NE NE Sec 18, T 30, R 14			8/19/97	26.5			7/26/99	23.9			8/14/01	26.7		

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Legal	1996-HACH		1997-LAB Res		1998-LAB Res		1999-LAB Res		2000-LAB Res		2001-LAB Res		2002-LAB Res	
HOLT CO.	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3
NW NE Sec 22, T 30, R 14			8/14/97	32.4			07/15/99	6.2			7/31/01	6.0		
NW NW Sec 23, T 30, R 14			8/14/97	16.3			7/26/99	17.8			8/14/01	15.3		
NW NE Sec 24, T 30, R 14			7/28/97	27.7			07/14/99	29.4			8/8/01	25.8		
NE NE Sec 25, T 30, R 14			729/97	20.2			07/15/99	21.4			7/31/01	19.9		
NE Sec 26, T 30, R 14			7/29/97	2.2			8/11/99	2.9			8/8/01	2.9		
NE NE Sec 27, T 30, R 14			8/6/97	1.7			07/08/99	1.8			8/8/01	1.9		
NE NE Sec 34, T 30, R 14			8/6/97	1.3			8/31/99	1.7			7/31/01	1.1		
NE NE Sec 35, T 30, R 14			8/6/97	16.9			8/31/99	19.8			7/30/01	20.7		
NE Sec 36, T 30, R 14			7/29/97	2.7			07/07/99	5.8			7/31/01	2.1		
NE Sec 19, T 31, R 9	8/21/96	20.0			8/18/98	18.1			8/11/00	18.5				
SE SW Sec 29, T 31, R 9	8/19/96	14.1			8/12/98	11.2			7/21/00	12.7				
NW NE Sec 30, T 31, R 9	8/21/96	20.5							8/15/00	19.6				
SW NE Sec 31, T 31, R 9					8/18/98	3.9			7/21/00	3.7				
NE Sec 32, T 31, R 9	8/21/96	22.0			8/13/98	23.2			7/21/00	25.6				
NE Sec 33, T 31, R 9	8/2/96	21.0			8/12/98	24.0			8/29/00	26.0			9/4/02	27.7
SW NE Sec 34, T 31, R 9	7/29/96	20.5			8/24/98	20.8			8/22/00	26.2			9/4/02	30.5
NE Sec 35, T 31, T 9	8/21/96	30+			8/18/98	9.5			8/23/00	8.8			9/3/02	2.2
NW Sec 25, T 31, R 10				18.9			7/28/99	19.9			7/11/01	15.9		
NE SE Sec 28, T 31, R 10			8/21/97	20.2			7/28/99	24.2			8/1/01	24.3		
SW SE Sec 33, T 31, R 10				10.0			8/25/99	11.4			8/6/01	11.2		
NW Sec 34, T 31, R 10			8/21/97	13.1			8/23/99	21.4			8/23/01	10.2		
NW Sec 35, T31, R 10											7/11/01	8.6		
NE Sec 36, T 31, R 10				20.1			8/25/99	15.0			8/6/01	6.3		
SW Sec 21, T 31, R 11	8/21/96	2.5			7/24/98	2.4			8/18/00	2.3			7/23/02	2.9
SE Sec 26, T 31, R 11					8/13/98	5.2			8/18/00	5.5			7/29/02	6.1
SE SE Sec 26, T 31, R 11	8/23/96	2.1			8/11/98	3.2			8/18/00	2.9			8/2/02	1.9
SE SW Sec 26, T 31, R 12			8/6/97	2.4			8/12/99	4.1			8/3/01	1.4		
NW SW Sec 34, T 31, R 12				4.6			8/6/99	5.3			7/9/01	5.3		
NW NW Sec 35, T 31, R 12			6/27/97	3.2			8/24/99	3.0			8/3/01	3.8		
NE NW Sec 2, T 31, R 13	8/23/96	17.1			7/17/98	15.6			7/26/00	12.8			7/12/02	12.9
NE NE Sec 3, T 31, R 13	8/26/96	30+			7/24/98	50.5			8/2/00	45.1			7/16/02	44.9
NE NE Sec 4, T 31, R 13	8/15/96	17.2			7/17/98	20.4			8/2/00	14.4			8/20/.02	17.3
SE NE Sec 5, T 31, R 13	8/23/96	30+			7/17/98	38.2			7/25/00	42.1			8/22/02	43.8
NE NE Sec 6, T 31, R 13	8/1/96	31.5			8/12/98	41.6			8/18/00	43.3			7/18/02	51.1
NW NW Sec 7, T 31, R 13	8/30/96	32.5			7/24/98	33.3			7/31/00	37.1			7/29/02	36.6
NE Sec 8, T 31, R 13	8/26/96	93.8			7/24/98	22.5			8/7/00	16.5			8/5/02	12.4
NW NE Sec 9, T 31, R 13					7/17/98	39.8			8/2/00	27.8			7/16/02	34.6
NE Sec 10, T 31, R 13	8/23/96	29.8			7/17/98	24.9			8/2/00	29.4			7/16/02	30.3
NE Sec 11, T 31, R 13	8/16/96	20.6			7/17/98	28.0			8/4/00	28.0			9/5/02	28.8
NW NW Sec 14, T 31, R 13					8/18/98	14.4			8/2/00	11.2			8/22/02	8.3

Lower Niobrara NRD
Nitrate Results

Legal	1996-HACH		1997-LAB Res		1998-LAB Res		1999-LAB Res		2000-LAB Res		2001-LAB Res		2002-LAB Res	
HOLT CO.	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3
NW NE Sec 15, T 31, R 13	8/23/96	6.4			8/10/98	4.7			8/2/00	5.7			8/22/02	6.8
NE NE Sec 17, T 31, R 13					8/10/98	42.1			7/25/00	13.2			8/22/02	9.2
NE Sec 18, T 31, R 13	8/1/96	28.0			7/22/98	28.4			8/18/00	27.6			7/18/02	31.2
NE NE Sec 19, T 31, R 13	8/26/96	30+			7/20/98	29.1			7/31/00	31.9			8/22/02	31.2
NE NE Sec 20, T 31, R 13	8/23/96	27.0			7/20/98	29.1			7/20/00	27.9			7/12/02	25.6
SW Sec 29, T 31, R 13	8/5/96	26.5			7/21/98	13.2			7/20/00	11.4			7/29/02	26.3
NE Sec 30, T 31, R 13	8/8/96	27.0			7/21/98	30.1			8/22/00	28.9			8/2/02	28.4
NW NE Sec 31, T 31, R 13					7/24/98	38.4			7/20/00	40.5			7/12/02	40.5
NW NE Sec 32, T 31, R 13	8/5/96	32.5			7/21/98	33.7			7/20/00	32.5			7/29/02	31.3
NW SW Sec 4, T 31, R 14			8/21/97	29.0			7/30/99	37.7			8/6/01	33.3		
SW SW Sec 5, T 31, R 14			8/19/97	37.9			7/30/99	29.7			8/6/01	30.4		
NE NE Sec 6, T 31, R 14			8/18/97	30.7			7/26/99	31.6			8/6/01	31.1		
NE NE Sec 7, T 31, R 14			8/18/97	63.7			8/31/99	54.7			8/8/01	57.9		
NE NE Sec 8, T 31, R 14				37.0			07/08/99	40.6			8/6/01	35.7		
NE NE Sec 9, T 31, R 14				39.3			7/30/99	31.8			8/14/01	35.1		
SE NE Sec 11, T 31, R 14			8/27/97	48.5			07/09/99	48.6			7/31/01	47.1		
NW SW Sec 12, T 31, R 14			6/27/97	33.0			07/12/99	35.3			7/31/01	34.9		
NE NE Sec 13, T 31, R 14			8/18/97	37.4			07/15/99	34.0			8/6/01	34.4		
NE NE Sec 14, T 31, R 14			8/18/97	37.3			7/30/99	39.6			8/6/01	37.4		
NE NE Sec 15, T 31, R 14				32.5			7/14/99	52.4			8/8/01	36.7		
NE NE Sec 16, T 31, R 14			8/14/97	28.0			07/08/99	37.7			7/26/01	32.6		
NE Sec 17, T 31, R 14			8/14/97	34.2			07/08/99	35.1			8/8/01	27.3		
NE Sec 18, T 31, R 14			8/6/97	14.3			8/19/99	25.8						
NW NE Sec 19, T 31, R 14			8/20/97	32.3			7/26/99	30.5			8/6/01	30.0		
NE Sec 20, T 31, R 14				28.6			07/12/99	26.6			8/6/01	26.2		
SE NE Sec 21, T 31, R 14				29.4			07/08/99	29.4			8/8/01	30.5		
NE Sec 22, T 31, R 14				30.0			07/08/99	30.6						
NE Sec 23, T 31, R 14				34.9			07/30/99	37.0						
NE NE Sec 24, T 31, R 14			7/29/97	31.5			07/06/99	36.6			8/6/01	36.8		
NE NE Sec 25, T 31, R 14				41.8			07/13/99	40.8			8/6/01	38.7		
NE Sec 26, T 31, R 14				41.2			07/08/99	42.9						
NE NW Sec 27, T 31, R 14			8/19/97	28.0			7/26/99	27.8						
NE Sec 28, T 31, R 14				24.3			07/08/99	26.6			8/14/01	24.9		
NE NE Sec 29, T 31, R 14				23.7			07/12/99	29.9			8/8/01	30.3		
NE NE Sec 30, T 31, R 14			8/14/97	25.7			7/26/99	26.5			8/8/01	25.5		
NE NE Sec 31, T 31, R 14			8/28/97	23.1			7/26/99	22.6			8/6/01	26.0		
NE Sec 33, T 31, R 14				25.5			07/12/99	26.3			8/8/01	27.5		
NE Sec 34, T 31, R 14				25.1			07/13/99	30.0			8/8/01	30.5		
NE NE Sec 35, T 31, R 14			8/6/97	26.7			07/23/99	32.5			8/6/01	25.2		
NE NE Sec 36, T 31, R 14			8/6/97	42.8			07/23/99	42.8			8/6/01	41.7		

Lower Niobrara NRD
Nitrate Results

Legal	1996-HACH		1997-LAB Res		1998-LAB Res		1999-LAB Res		2000-LAB Res		2001-LAB Res		2002-LAB Res	
HOLT CO.	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3
SW SE Sec 3, T 31, R 15	8/28/96	21.8			7/20/98	21.2			7/18/00	22.3			7/17/02	22.6
NE NE Sec 5, T 31, R 15	8/28/96	15.0			7/20/98	13.9			7/18/00	14.4			7/17/02	13.7
SE Sec 7, T 31, R 15					7/20/98	10.1			8/1/00	9.6			8/21/02	11.1
NE Sec 8, T 31, R 15	8/13/96	17.0			7/20/98	12.3			8/7/00	12.4			8/21/02	11.7
NE NE Sec 9, T 31, R 15	8/14/96	19.4			7/20/98	20.9			8/1/00	17.7			8/21/02	17.8
NE NE Sec 11, T 31, R 15	8/28/96	18.7			7/17/98	14.1			7/18/00	14.7			8/21/02	14
SW SE Sec 13, T 31, R 15	8/29/96	42.0			7/20/98	55.0			9/11/00	56.8			8/30/02	45.1
SE Sec 14, T 31, R 15	8/29/96	27.5			7/17/98	24.5			8/29/00	27.1			8/21/02	31.5
NE NE Sec 17, T 31, R 15	8/20/96	17.9			7/20/98	15.1			8/8/00	14.4			7/12/02	13.8
NE Sec 19, T 31, R 15	8/8/96	5.3			7/20/98	5.7			8/30/00	7.8			8/2/02	8.7
NE Sec 20, T 31, R 15	8/28/96	14.2			7/20/98	15.1			8/1/00	15.9			7/12/02	16
NE NE Sec 23, T 31, R 15	8/29/96	32.0			7/17/98	29.1			8/29/00	27.9			8/21/02	9.7
NE NE Sec 24, T 31, R 15					7/20/98	56.4			8/8/00	51.4			7/21/02	52.1
NE Sec 25, T 31, R 15	8/29/96	23.0			7/20/98	22.8			8/7/00	23.8			8/2/02	23.7
SW Sec 26, T 31, R 15	8/29/96	20.5			7/20/98	15.2			8/8/00	16.7			7/15/02	16.8
NW Sec 27, T 31, R 15	8/28/96	16.5			7/20/98	18.0			8/8/00	17.4			7/15/02	17.4
SW SW Sec 28, T 31, R 15	8/20/96	9.1			7/20/98	10.4			8/8/00	9.9			7/12/02	10
SW NW Sec 29, T 31, R 15	8/28/96	7.9			7/21/98	7.7			7/26/00	9.5			8/21/02	11.2
NE Sec 31, T 31, R 15	8/22/96	13.0			7/21/98	14.9			8/1/00	15.7			7/16/02	21
NE Sec 32, T 31, R 15					7/20/98	8.9			8/8/00	10.5			7/15/02	11.6
NE NE Sec 33, T 31, R 15	8/28/96	14.4			7/20/98	15.4			8/7/00	16.0			8/21/02	15.2
NE Sec 34, T 31, R 15	8/29/96	17.4			7/20/98	15.9			8/8/00	18.6			7/15/02	18.4
NW NW Sec 35, T 31, R 15	8/29/96	23.7			7/20/98	25.6			8/7/00	25.9			7/29/02	25.5
SW NE Sec 36, T 31, R 15	8/29/96	16.5			7/20/98	16.6			7/11/00	18.5			8/21/02	18.4
SE Sec 2, T 31, R 16				13.6			8/11/99	9.5			7/24/01	11.6		
NE Sec 9, T 31, R 16				17.4			8/2/99	20.7			7/24/01	20.3		
SW NE Sec 10, T 31, R 16				19.9			8/2/99	21.7			7/12/01	20.2		
NW Sec 12, T 31, R 16				12.3			8/2/99	16.2			7/24/01	17.6		
NE Sec 13, T 31, R 16			8/18/97	10.2										
NE Sec 14, T 31, R 16				12.9			8/2/99	13.8			7/24/01	15.2		
SW NE Sec 15, T 31, R 16				22.7			8/11/99	20.4			7/12/01	20.8		
NE NE Sec 17, T 31, R 16			8/4/97	32.6			7/14/99	32.0			7/6/01	26.8		
SW Sec 7, T 32, R 10			8/13/97	4.6			8/23/99	4.8			7/31/01	5.8		
NW NW Sec 15, T 32, R 10			8/27/97	3.4			7/27/99	4.2			7/31/01	3.2		
SW NE Sec 12, T 32, R 11	8/16/96	17.8			8/11/98	19.2			9/11/00	20.8			9/4/02	18.6
SE NW Sec 18, T 32, R 11	8/21/96	30+	9/3/98	41.3	9/3/98	41.4			8/21/00	40.5				
SW SW Sec 3, T 32, R 12			6/27/97	3.9			8/23/99	4.1			8/3/01	4.9		
SE Sec 4, T 32, R 12			7/25/97	27.2			7/27/99	26.0			8/9/01	28.3		
NE SE Sec 5, T 32, R 12			7/24/97	5.0			8/23/99	7.0			8/6/01	8.1		
NE NE Sec 8, T 32, R 12				12.2			07/09/99	9.2			8/3/01	9.9		

Lower Niobrara NRD
Nitrate Results

Legal	1996-HACH		1997-LAB Res		1998-LAB Res		1999-LAB Res		2000-LAB Res		2001-LAB Res		2002-LAB Res	
HOLT CO.	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3
NE NE Sec 9, T 32, R 12			7/24/97	6.2			07/09/99	6.8			8/3/01	6.3		
SW NE Sec 10, T 32, R 12			6/12/97	3.6										
SE NW Sec 11, T 32, R 12			612/97	3.0										
SW Sec 15, T 32, R 12			7/25/97	14.9			7/27/99	13.5			8/6/01	14.7		
NW NW Sec 17, T 32, R 12			7/24/97	18.7			07/09/99	22.2			8/9/01	23.2		
NE SW Sec 20, T 32, R 12							8/25/99	17.7			8/3/01	15.8		
NE NE Sec 21, T 32, R 12			7/25/97	10.8			7/27/99	14.6			8/3/01	14.2		
NE NE Sec 22, T 32, R 12			7/25/97	10.7			7/26/99	10.4			8/3/01	13.6		
NE NE Sec 23, T 32, R 12			7/25/97	8.3			7/26/99	3.1			8/6/01	6.9		
NE NE Sec 19, T 32, R 13	8/23/96	27.5			8/10/98	24.0			7/26/00	30.6			8/22/02	22.0
NE SW Sec 27, T 32, R 13	8/26/96	29.5			7/17/98	17.4			7/31/00	16.2				
NW Sec 28, T 32, R 13	8/23/96	30+			7/17/98	30.6			7/25/00	31.4			8/23/02	30
NW NE Sec 29, T 32, R 13	8/16/96	28.5			7/17/98	26.1	9/15/00	19.3	7/26/00	22.6			7/22/02	16.7
SW NE Sec 31, T 32, R 13	8/30/96	11.0			7/22/98	14.9			8/29/00	12.1			7/23/02	16.9
NW NW Sec 33, T 32, R 13	8/23/96	24.0			7/17/98	24.7			7/26/00	22.5			8/22/02	21.6
NE SW Sec 34, T 32, R 13	8/23/96	22.7			7/17/98	51.0			7/26/00	23.2			7/30/02	20.9
SW NE Sec 31, T 32, R 14			8/29/97	16.1			07/09/99	23			8/6/01	22.7		
NE NW Sec 11, T 32, R 15	8/28/96	17.9			7/17/98	15.9			8/1/00	16.4			8/21/02	17.8
NW NW Sec 14, T 32, R 15					7/17/98	4.8			8/1/00	5.8			8/21/02	4.2
NE NE Sec 15, T 32, R 15	8/28/96	5.9			7/17/98	4.2			8/1/00	5.4			8/21/02	5.4
NW NW Sec 23, T 32, R 15	8/28/96	17.1			7/17/98	10.8			8/1/00	14.3			8/21/02	6.0
SE SW Sec 31, T 33, R 11	8/21/96	2.0	7/24/98	1.6	8/11/98	1.8			8/15/00	1.3				
SE NE Sec 36, T 33, R 12			6/27/97	2.9			8/16/99	2.5			8/9/01	3.5		
SE SE Sec 17, T 33, R 13	8/26/96	26.0			8/24/98	25.0			8/4/00	26.8			9/3/02	24.7
NE Sec 20, T 33, R 13					7/21/98	3.9			8/4/00	19.2			8/21/02	17.7
NE NE Sec 22, T 33, R 13					7/13/98	4.4			7/26/00	5.9			9/5/02	11.9
NW SW Sec 6, T 33, R 14							7/30/99	6.6						
SW Sec 24, T 33, R 14			8/11/97	2.1			7/30/99	4.9			8/2/01	4.3		
SE SE Sec 1, T 33, R 15	8/29/96	22.6			7/17/98	22.9			9/5/00	13.9	8/2/01	19.6	8/21/02	17.3
SW NE Sec 11, T 33, R 15	8/29/96	19.0			7/13/98	20.1							8/21/002	0.8
NE NE Sec 12, T 33, R 15	8/29/96	6.7			7/17/98	4.8			9/5/00	4.8			8/21/02	2.6
Yearly Average		17.1		20.0		18.0		21.9		16.9		21.5		17.0

Lower Niobrara NRD
Nitrate Results

LEGAL	1996-HACH		1997-LAB Res		1998 LAB Res		1999-LAB Res		2000-LAB Res		2001-LAB Res		2002 LAB Res	
KEYA PAHA CO.	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3
NW SW Sec 22, T33 R19	9/4/96	3.5			7/16/98	1.6			8/31/00	4.6			8/8/02	4.6
NW Sec 28, T33 R19	9/5/96	7.9			7/16/98	7.3			8/31/00	9.6			8/8/02	102
SE Sec 30, T33 R19	9/4/96	2.6			7/16/98	2.5			8/31/00	2.4			8/8/02	2.4
NW SW Sec 34, T33 R19	9/5/96	3.3			7/16/98	4.0			8/30/00	4.5			8/8/02	5.1
NW NW Sec 6, T33 R20			8/29/97	5.9							8/10/01	7.5		
SE Sec 7, T33 R20			8/7/97	1.7			7/29/99	1.7			8/10/01	1.6		
NW Sec 17, T33 R20			8/7/97	3.8			8/13/99	4.1			8/10/01	4.6		
NE Sec 18, T33 R20			8/22/97	5.8			8/13/99	2.4			8/10/01	2.9		
SW Sec 19, T33 R20			8/7/97	1.4							8/10/01	5.7		
SW Sec 20, T33 R20			8/7/97	4.8							8/10/01	5.8		
SW SW Sec 21, T33 R20			8/7/97	4.5			7/29/99	5.9			8/10/01	7.4		
SE Sec 22, T33 R20			8/7/97	4.2			7/29/99	10.7			8/13/01	11.5		
SE SE Sec 26, T33 R20			8/29/97	1.1			8/13/99	1.3						
SW SE Sec 28, T33 R20			8/7/97	3.9			7/29/99	4.5			8/10/01	5.7		
NW NW Sec 29, T33 R20			8/7/97	6.4							8/10/01	6.7		
NW Sec 33, T33 R20			8/29/97	3.1			7/29/99	3.6			8/10/01	4.2		
NW NW Sec 35, T33 R20			8/7/97	1.4			7/29/99	4.8			8/10/01	5.0		
NE Sec 8, T33 R21	8/12/96	3.8			7/16/98	2.6			8/31/00	3.4			7/26/02	3.8
NE SE Sec 13 T33 R21					7/16/98	4.3			8/31/00	4.8			7/26/02	9.7
SW Sec 14, T33 R21					7/17/98	5.6			8/31/00	7.8			7/26/02	7.9
SE NE Sec 18, T33 R21	9/5/96	2.3			7/16/98	2.3							7/26/02	2.7
NE Sec 20, T33 R21	9/5/96	4.7			7/16/98	5.7			8/31/00	4.9			7/26/02	5.1
NE Sec 21, T33 R21	9/5/96	2.2			7/16/98	2.9			8/31/00	3.2			7/26/02	3.6
NW Sec 23, T33 R21	8/12/96	4.6			7/16/98	5.6			8/31/00	7.3			7/26/02	8.4
NE NE Sec 26, T33 R21	9/5/96	2.4			7/16/98	2.6			8/31/00	3.0			7/26/02	3.3
NW NW Sec 2, T34 R19									9/14/00	0.9			8/5/02	1.3
SE SW Sec 30, T34 R20			8/7/97	5.1			7/29/99	6.8			8/21/01	8.6		
NW NE Sec 31, T34 R20			8/22/97	2.1			7/29/99	3.1			8/21/01	2.7		
SW SE Sec 27, T35 R17														
Yearly Average		3.7		3.7		3.9		4.4		4.7		5.7		12.3

Lower Niobrara NRD
Nitrate Results

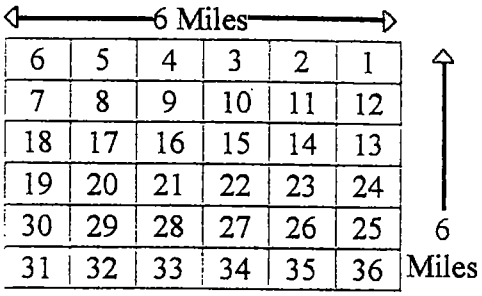
Legal	1996-HACH		1997-LAB Res		1998-LAB Res		1999-LAB Res		2000-LAB Res		2001-LAB Res		2002-LAB Res	
KNOX CO.	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3
NE SE Sec 1, T29 R6				58.8							8/17/01	50.1		
SW NE Sec 15, T29 R6				9.7							8/13/01	11.6		
NW Sec 21, T29 R6				2.6			8/10/99	3.7			8/10/01	6.0		
NW Sec 22, T29 R6			8/25/97	5.3							8/10/01	11.8		
SE NW Sec 23, T29 R6			8/14/97	12.3			8/10/99	13.1			8/22/01	13.0		
SE NE Sec 27, T29 R6			8/14/97	19.2			8/4/99	21.4			8/24/01	22.8		
NE NE Sec 28, T29 R6				12.7			8/10/99	3.7			8/13/01	4.9		
NE Sec 33, T29 R6				5.0			8/5/99	5.7			8/10/01	7.3		
SW NE Sec 34, T29 R6			8/14/97	4.3			8/4/99	4.9			8/10/01	5.2		
NW NW Sec 35, T29 R6				16.9			8/4/99	16.7			8/10/01	17.1		
NW NE Sec 36, T29 R6				20.4			9/2/99	20.4						
NW NW Sec 19, T29 R07	9/9/96	0.9			8/12/98	4.0			8/11/00	4.0				
SE SW Sec 19, T29 R07	9/9/96	0.7			8/12/98	1.6			8/11/00	2.1			8/8/02	8.9
SE NW Sec 20, T 29 R07	9/9/96	3.3			8/25/98	7.0					8/22/01	6.7		
NW NE Sec 24, T29 R07	9/9/96	0.7			8/19/98	1.7			8/11/00	1.3				
SE SE Sec 3, T29 R8			8/20/97	3.5			9/2/99	3.5			8/13/01	6.6		
NE Sec 13, T29 R8			8/20/97	3.1			8/20/99	2.1			8/20/01	3.4		
NE NW Sec 15, T29 R8			8/20/97	15.3			8/20/99	16.1			8/13/01	17.9		
SW SE Sec 20 T29 R8			8/21/97	2.1			8/16/99	2.4			8/13/01	3.6		
SW SE Sec 21, T29 R8			8/21/97	3.4			8/4/99	3.7			8/22/01	3.7		
SE NW Sec 23, T29 R8				11.3			8/5/99	7.2			8/20/01	6.0		
SE NE Sec 24, T29 R8			8/20/97	1.9			8/20/99	2.3			8/13/01	1.9		
NE NW Sec 26, T29 R8			8/25/97	3.5			8/4/99	3.4			8/13/01	4.5		
NE Sec 27, T29 R8			8/21/97	3.1			8/20/99	3.6			8/13/01	4.3		
SE NE Sec 28, T29 R8				3.9			8/20/99	4.3			8/13/01	5.0		
SE SW Sec 29, T29 R8				3.7			8/5/99	2.1			8/20/01	1.2		
NW Sec 32, T29 R8				6.8			8/20/99	8.5			8/13/01	16.8		
SE NW Sec 33, T29 R8			8/25/97	2.3			8/20/99	2.6			8/13/01	2.7		
NE NW Sec 34, T29 R8			8/25/97	3.0			8/4/99	3.0			8/20/01	3.1		
NW SW Sec 12, T30 R8			8/14/97	11.1			8/10/99	10.3			8/24/01	10.5		
SE Sec 13, T30 R8			8/25/97	7.5			8/10/99	10.7			8/10/01	12.0		
NE NW Sec 8, T30 R8				6.2			8/5/99	9.4			8/2/01	7.0		
SW NW Sec 17, T30 R8			8/20/97	4.8			8/5/99	5.6			8/2/01	6.5		
NE NE Sec 18, T30 R8			8/20/97	9.3			8/5/99	10.2			8/2/01	11.2		
SE NW Sec 19, T30 R8			8/20/97	6.9			8/10/99	8.3			8/13/01	9.1		
CT Sec 20, T30 R8				7.8			9/2/99	5.2			8/13/01	5.4		
NW Sec 30 T30 R8			8/20/97	5.9			8/10/99	9.9						
NE SE Sec 31, T31 R8			8/14/97	6.8			8/16/99	8.5			8/13/01	8.0		
NE SW Sec 23, T33 R8			8/14/97	6.8			8/10/99	<0.1			8/17/01	0.2		
Yearly Average		1.4		8.8		3.6		7.5		2.5		9.0		8.9

Lower Niobrara NRD
Nitrate Results

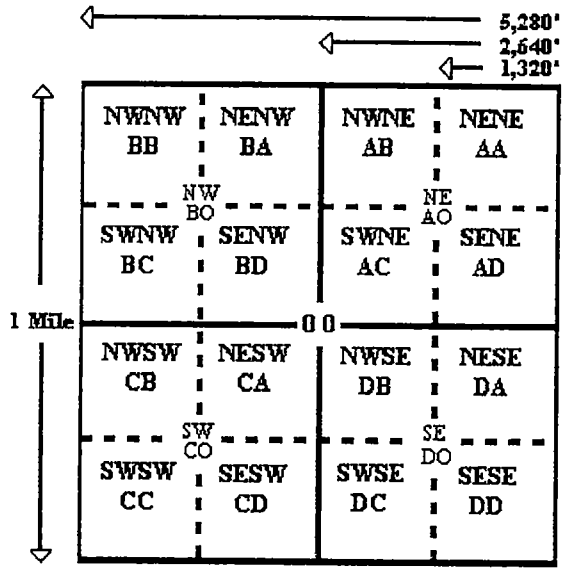
Legal	1996-HACH		1997-LAB Res		1998-LAB Res		1999-LAB Res		2000-LAB Res		2001-LAB Res		2002-Lab Res	
ROCK CO.	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3	DATE	NO3
NE NE Sec 4 T31 R17	9/3/1996	20.5			8/10/98	8.8			8/30/00	3.6				
NE NE Sec 5 T31 R17	9/3/1996	10.2			8/19/98	7.5			8/30/00	6.6			8/22/03	3.3
SW NE Sec 6 T31 R17	9/3/1996	3.4			8/10/98	4.2			8/30/00	4.7			8/22/03	5.2
NE SW Sec 7 T31 R17	8/12/1996	7.0			8/10/98	6.2			8/30/00	7.6				
NE Sec 8 T31 R17	9/3/1996	2.7			8/10/98	1.8			8/30/00	1.9				
SE SE Sec 3 T31 R18			7/22/1997	9.6			8/11/99	9.9			37132.0	9.5		
NE Sec 8 T31 R18			8/19/1997	5.1			8/11/99	5.8			8/10/01	6.0		
SW NE Sec 12 T31 R18			7/22/1997	30.3			8/11/99	10.2			8/29/01	9.0		
SE Sec 15 T31 R18							8/11/99	5.8			8/10/01	17.7		
SE Sec 17 T31 R18			8/19/1997	1.7			8/11/99	2.0			8/10/01	3.1		
NW Sec 18 T31 R18			8/4/1997	5.5			8/11/99	3.6			8/10/01	3.5		
SW SW Sec 12 T31 R19	9/3/1996	5.3			8/10/98	3.9					8/10/01	4.2	7/10/02	4.2
SW Sec 14 T31 R19	8/9/1996	6.1			7/23/98	7.2			8/30/00	19.1			7/10/02	21.3
SW NE Sec 15 T31 R19	8/9/1996	4.5			8/10/98	7.1			8/30/00	7.4			7/10/02	11.5
SW SW Sec 28 T32 R17	9/4/1996	3.3												
SW NW Sec 31 T32 R17	9/4/1996	1.7			8/10/98	4.4			8/30/00	6.6			8/22/03	13.2
NE SW Sec 33 T32 R17					8/10/98	2.4			8/30/00	2.5			8/22/03	4.2
SW SW Sec 25 T32 R18			8/19/1997	10.6			8/11/99	9.1			8/10/01	8.7		
Yearly Average		6.5		10.5		5.4		6.6		6.7		7.7		9.0

Definition of Abbreviations in the ¼ Section Column

Sub Section Examples:
AA = NE 1/4 of NE 1/4
AB = NW 1/4 of NE 1/4
AC = SW 1/4 of NE 1/4
AD = SE 1/4 of NE 1/4
AO = Center of NE 1/4
BA = NE 1/4 of NW 1/4
BB = NW 1/4 of NW 1/4
BC = SW 1/4 of NW 1/4
BD = SE 1/4 of NW 1/4
BO = Center of NW 1/4
CA = NE 1/4 of SW 1/4
CB = NW 1/4 of SW 1/4
CC = SW 1/4 of SW 1/4
CD = SE 1/4 of SW 1/4
CO = Center of SW 1/4
DA = NE 1/4 of SE 1/4
DB = NW 1/4 of SE 1/4
DC = SW 1/4 of SE 1/4
DD = SE 1/4 of SE 1/4
DO = Center of SE 1/4
OO = Center of the Section



6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36



Lower Niobrara NRD
Static Water Levels

TWP RGE SEC	Fall 75	Spr 76	Fall 76	Spr 77	Fall 77	Spr 78	Fall 78	Spr 79	Fall 79	Spr 80	Fall 80
BOYD COUNTY											
34 11 09 DD											
34 11 11											
34 16 27 DC				66.0	66.9	65.9	66.9	65.6	67.2	66.2	68.8
34 12 19 DD								159.5	159.6	161.2	162.1
34 16 35 DO	60..0		62.2		61.2	59.6	61.8	60.0	62.2	60.2	63.2
34 16 35 DO											
Seasonal Average	60.0	N/A	62.2	66.0	64.1	62.8	64.4	95.0	96.3	95.9	98.0
Yearly Average		62.2		65.0		63.6		95.7		97.0	

Appendix D
Static Water Levels of Monitored Sites Within the LNRND

Lower Niobrara NRD
Static Water Levels

TWP RGE SEC	Spr 81	Fall 81	Spr 82	Fall 82	Spr 83	Fall 83	Spr 84	Fall 84	Spr 85	Fall 85	Spr 86	Fall 86
BOYD COUNTY												
34 11 09 DD			232.6	234.0	233.3	233.6	233.2	233.5	233.6	234.9	234.3	234.4
34 11 11			248.5	249.7	248.9	249.9	248.8	249.8	249.7	250.9	260.0	250.9
34 16 27 DC	68.6	68.6	68.0	69.0	68.0	66.6	64.0	64.6	64.0	65.7	64.6	66.5
34 12 19 DD		162.9	162.8	163.5	162.4	163.9	163.1	164.1	164.7	165.0	165.4	165.1
34 16 35 DO	61.3	64.6	62.3	64.6	62.0	59.9	58.2	59.5	57.5	60.3	58.3	60.9
34 16 35 DO												
Seasonal Average	65.0	98.7	154.8	156.2	154.9	154.8	153.5	154.3	153.9	155.4	156.5	155.6
Yearly Average	81.8		155.5		154.9		153.9		154.6		156.0	

Lower Niobrara NRD
Static Water Levels

TWP	RGE	SEC		Spr 87	Fall 87	Spr 88	Fall 88	Spr 89	Fall 89	Spr 90	Fall 90	Spr 91	Fall 91	Spr 92	Fall 92
BOYD COUNTY															
34	11	09	DD	234.9	234.4	235.6	236.5	236.0	237.9	236.8	238.2	236.9	237.8	237.1	237.9
34	11	11		258.2	251.5	251.6	252.7	252.2	254.2						
34	16	27	DC	65.2	65.8	65.3	66.6		67.6	65.6	68.3	66.0	67.8	66.2	65.5
34	12	19	DD	165.6	165.6	165.6	160.3	167.6	165.0	168.1	168.9	168.5	169.2	168.6	169.1
34	16	35	DO	58.0	59.9	57.5	61.7	57.5	61.7	59.1	62.7	59.6	61.4	59.7	59.3
34	16	35	DO												
Seasonal Average				156.4	155.4	155.1	155.6	178.3	157.3	132.4	134.5	132.8	134.1	132.9	133.0
Yearly Average				155.9		155.3		167.8		133.5		133.4		132.9	

Lower Niobrara NRD
Static Water Levels

TWP RGE SEC	Spr 93	Fall 93	Spr 94	Fall 94	Spr 95	Fall 95	Spr 96	Fall 96	Spr 97	Fall 97	Spr 98	Fall 98
BOYD COUNTY												
34 11 09 DD	237.0	237.3				238.7	241.0	238.2	238.5	240.0	238.8	240.8
34 11 11												
34 16 27 DC	64.3	64.3	169.1	169.4	169.0	169.7	60.4	63.0	60.1	61.9	60.0	62.0
34 12 19 DD	168.5						169.4	173.6	169.2		170.4	
34 16 35 DO	58.5	60.2		58.3	56.1	57.7	60.4	57.2	53.5	56.3	53.5	55.3
34 16 35 DO												
Seasonal Average	132.1	120.6	169.1	113.9	112.6	155.4	132.8	133.0	130.3	119.4	130.7	119.4
Yearly Average	126.3		141.5		134.0		132.9		124.9		125.0	

Lower Niobrara NRD
Static Water Levels

TWP RGE SEC	Spr 99	Fall 99	Spr 00	Fall 00	Spr 01	Fall 01	Spr 02	Fall 02
BOYD COUNTY								
34 11 09 DD		240.1	239.3	241.3	242.4	242.7	241.4	241.3
34 11 11								
34 16 27 DC	59.8		58.7	62.3	61.0	63.2	60.5	63.8
34 12 19 DD								
34 16 35 DO	52.8	54.5	51.6	55.8	54.0	56.4	54.1	
34 16 35 DO								58.3
Seasonal Average	56.3	147.3	116.5	119.8	119.1	120.8	118.7	121.1
Yearly Average	101.8		118.2		120.0		119.9	

Lower Ni[illegible]a NRD
Static Wa[illegible] Levels

TWP	RGE	SEC		Fall 75	Spr 76	Fall 76	Spr 77	Fall 77	Spr 78	Fall 78	Spr 79	Fall 79	Spr 80	Fall 80
HOLT COUNTY														
29	09	09	BO		40.5		41.9	42.5	42.2	42.2	42.4	43.1		44.5
29	09	30	DO		60.0		62.0	63.3	62.6	64.4	63.2	64.4	63.7	66.2
29	11	12	DO											
29	12	08	BO											
29	13	14	CO		43.5		44.1	43.2	42.6	43.5	42.7	43.9	42.1	44.8
30	09	08	BO		75.5		77.0	78.4	76.6	78.5	76.7	79.1		80.9
30	09	23	DD		62.0		63.1	63.7	63.3	64.2	63.4	64.5	64.6	65.8
30	09	30	AO		10.0		12.4	12.2	11.3	12.3	11.3	12.9	12.2	13.7
30	10	35	DO		35.7		38.2	38.9	33.7	38.9	37.2	39.0	38.6	41.1
30	13	18	CB		27.0		28.4	27.3	26.2	27.6		27.1	26.3	28.3
30	13	29	DA		45.0		47.2	50.2	40.0	42.8	43.4	45.5	41.7	46.3
30	13	29	DA											
30	13	29	DA											
30	14	05	DC		38.0		39.5	39.1	38.2	37.9	36.9	37.1	35.7	38.3
30	14	05	DC											
30	14	15	CO		44.5		45.9	46.8	44.7	45.0	43.8	44.2	42.8	45.4
31	10	32	AA		87.1		88.9	90.5	89.3	90.8	89.3	90.7	89.8	92.0
31	09	32	AO											
31	09	34	BO		87.3		88.9	90.2	89.4	90.6	89.2	90.4	89.9	91.5
31	10	25	BO											
31	13	10	BB		54.6		52.5	54.6	56.2	52.8	52.8	53.2	51.6	55.3
31	13	32	BO		40.0		41.5	40.3	41.2	39.9	39.4	38.4	37.4	39.4
31	14	12	DA											
31	14	12	BD		34.1		35.3	34.4	32.9	33.6	32.4	32.3	30.7	33.9
31	14	19	DO		40.2		42.0	42.3	40.4	40.7	39.0	39.5	38.1	40.2
31	15	05	AB	22.0		23.1	22.3	20.2	18.2	18.2	17.8	17.8	17.2	21.0
31	15	11	AD	7.5		8.2		6.4	3.8	5.8	4.2	5.1	3.1	7.1
31	15	20	BO											
31	15	20	BD	15.8		16.9	15.3	14.8	11.0	13.1	10.9	12.2	11.0	15.5
32	09	34	DD		38.9		38.5	40.0	40.4	40.7	40.4	40.8	41.1	41.5
32	12	08	CD											
32	12	13	DD		33.0		34.6	36.0	35.4	35.5	34.2	35.4	34.6	36.4
32	12	17	BB											
32	13	29	AB		68.5		70.0	67.1	63.9	69.7	65.7	66.4	65.6	68.1
32	13	29	AC		65.0		66.7	70.6	70.0	70.3	69.4	70.1	69.3	71.8
32	16	12												
32	16	26	AC	14.5		15.1	13.6	10.2	9.6	9.3	7.3	8.3	7.5	10.2
33	12	36	DC		22.7		22.7	22.1	21.5	21.4	20.8	22.2		22.5
33	13	21	CO											
33	13	21	CC	69.0		69.9		70.8	69.4	70.0	67.8	70.6	69.0	71.8
Seasonal Average				25.8	47.9	26.6	45.3	45.0	43.5	44.4	43.9	44.2	42.7	45.7
Yearly Average					37.3		45.2		44.0		44.1		44.2	

Lower N[illegible]ra NRD
Static Water Levels

TWP	RGE	SEC		Spr 81	Fall 81	Spr 82	Fall 82	Spr 83	Fall 83	Spr 84	Fall 84	Spr 85	Fall 85	Spr 86	Fall 86
HOLT COUNTY															
29	09	09	BO		45.4	45.7	44.1	40.4	40.1	37.6	38.3	38.7	40.5	40.0	37.0
29	09	30	DO	65.5	67.2	73.6	67.1	72.8	64.7	63.1	63.4	61.9	64.2	62.9	64.0
29	11	12	DO				33.6	31.2	26.9	22.7	24.2	24.6	24.7	24.6	24.3
29	12	08	BO				40.5	38.5	38.7	33.8	34.8	32.2	35.7	32.2	34.2
29	13	14	CO	44.3	46.2	44.3	45.3	43.4	42.4	39.4	40.9	40.2	42.2	40.5	41.7
30	09	08	BO	78.2	82.7	80.6	82.5	80.2	79.1	74.8	75.5	75.6	77.0	73.6	76.0
30	09	23	DD	64.6	66.9	65.6	66.0	64.4	61.6	59.4	59.4	58.9	61.4	60.7	62.2
30	09	30	AO	14.4	15.7	14.4	14.0	13.9	10.8	5.7	8.6	7.9	10.5	7.8	8.4
30	10	35	DO	42.4	42.4	42.5	42.8	40.9	37.4	33.2	34.6	33.8	36.6	35.5	25.2
30	13	18	CB	28.4	29.3	18.2	28.0	26.3	24.2	21.8	24.7	24.4	25.8	24.6	24.2
30	13	29	DA	49.2	61.3	52.5	60.1	47.9	52.6	42.3	39.3	38.3	40.0	38.8	39.6
30	13	29	DA												
30	13	29	DA												
30	14	05	DC	37.7	39.7	38.7	40.1	38.1	36.2	32.2	33.7	32.8	34.8	34.2	34.4
30	14	05	DC												
30	14	15	CO	44.5	46.5	45.6	46.3	44.6	41.4	39.1	40.3	39.5	41.2	40.7	40.8
31	10	32	AA	96.4	93.2	92.4	93.6	92.1	90.6	88.4	88.3	85.6	87.8	97.2	91.5
31	09	32	AO												
31	09	34	BO	92.4	92.6	92.0	93.0	92.1	90.8	87.9	87.6	85.0	87.1	86.3	87.7
31	10	25	BO												
31	13	10	BB	61.2	57.6	60.2	54.8	54.9	49.0	43.7	44.3	43.6	57.2	52.5	57.5
31	13	32	BO	40.3	40.6	40.1	39.9	39.8	36.6	34.0	34.8	35.1	37.0	36.8	37.0
31	14	12	DA												
31	14	12	BD	33.7	35.4	34.0	35.1	33.3	32.0	27.9	29.5	28.9	32.0	30.9	31.9
31	14	19	DO	39.8	41.8	37.9	42.0	40.6	38.8	35.2	36.1		36.8	34.5	37.8
31	15	05	AB	21.7	22.6	22.1	20.4	19.4	17.7	14.1	16.1	17.0	18.7	18.6	16.3
31	15	11	AD	6.5	7.9	4.5	7.1	3.6	6.1	3.2	3.9	3.8	5.5	3.8	4.2
31	15	20	BO												
31	15	20	BD	15.2	16.8	14.7	15.9	13.3	11.3	7.7	10.5	9.6	12.9	10.9	10.2
32	09	34	DD	42.0	43.0	43.8	43.7	43.5	40.3	38.2	34.1	34.4	35.0	36.0	36.0
32	12	08	CD												
32	12	13	DD	35.6	37.9	37.3	38.0	36.8	34.3						
32	12	17	BB												
32	13	29	AB	66.9	69.3	71.7	69.4	70.4	65.5	67.2	64.0	66.4	66.5	64.6	65.5
32	13	29	AC	71.9	73.1	72.2	73.1	71.5	69.2	63.7	67.9	62.9	69.1	74.0	69.5
32	16	12				321.3	321.3	325.0	325.0	322.0	322.2				323.4
32	16	26	AC	10.6	12.7	11.8	11.1	9.5	6.5	6.3	5.2	5.7	8.6	7.5	6.3
33	12	36	DC	24.7	23.5	25.8	23.0	20.2	21.4	19.2	19.8	19.5		20.6	20.7
33	13	21	CO												
33	13	21	CC	70.8	73.4	71.9	73.7	72.1	72.2	68.7	69.1	66.2	68.8	67.0	68.3
Seasonal Average				46.1	47.6	56.3	55.5	54.0	52.1	49.4	50.0	39.7	42.9	41.3	50.9
Yearly Average				46.8		55.9		53.1		49.7		41.3		46.1	

Lower Ni ra NRD
Static Water Levels

TWP	RGE	SEC		Spr 87	Fall 87	Spr 88	Fall 88	Spr 89	Fall 89	Spr 90	Fall 90	Spr 91	Fall 91	Spr 92	Fall 92
HOLT COUNTY															
29	09	09	BO	39.8	39.3		41.1	41.2	44.2	43.9	45.2	44.6	47.2	45.6	45.3
29	09	30	DO	62.6	69.4	63.2	64.1		66.2	65.8	68.2	66.7	69.8	68.7	69.0
29	11	12	DO	23.6	24.7	23.9	25.9		29.2	28.5	30.0	29.3	34.2	32.1	33.1
29	12	08	BO	32.6	34.6	32.6	35.8	33.0	37.4	35.2	38.8	36.3	41.2	41.9	40.1
29	13	14	CO	38.5	40.6	38.2	41.9		43.7	42.9	44.3	42.7	45.7	43.8	44.4
30	09	08	BO	69.2	74.8	38.1	74.8	72.7	78.5	76.3	79.8	77.5	82.8	79.1	81.7
30	09	23	DD	62.0	62.3	62.3	61.9	64.9	64.1	63.7	65.6	64.6	66.9	65.3	65.9
30	09	30	AO	8.7	9.7	8.6	10.4	11.0	13.6	13.3	14.6	14.1	15.6	13.9	13.9
30	10	35	DO	34.6	35.4	34.1	36.0	36.6	40.7	39.6	43.0	40.9	44.1	42.5	42.6
30	13	18	CB	23.1	24.1	23.6	25.4	26.7	26.7	27.1	26.9	26.2	29.7	29.6	28.9
30	13	29	DA	44.0	39.5	44.5	40.0		40.9	42.8	43.0	43.0	42.8	43.5	44.0
30	13	29	DA												
30	13	29	DA												
30	14	05	DC	33.4	34.7	32.8	34.9	34.4	35.8	35.7	38.0	37.2	40.0	38.6	38.5
30	14	05	DC												
30	14	15	CO	39.1	40.3	39.1	41.5	40.8	43.8	42.7	44.9	43.2	47.1	44.8	45.5
31	10	32	AA	85.6	88.4	82.8	86.0	86.4	87.5	86.6	89.9	88.0	91.6	90.0	90.7
31	09	32	AO												
31	09	34	BO	86.6	97.9	86.3	86.1		87.4	87.4	89.7	88.9	91.0	90.1	90.8
31	10	25	BO												
31	13	10	BB	51.5	55.8	52.9		56.0		57.7	64.2	59.7	67.7	62.2	65.0
31	13	32	BO	32.5	36.3	36.0	37.4		44.5	39.6	40.8	40.3	42.7		41.8
31	14	12	DA												
31	14	12	BD	30.7	31.1	29.9	32.6	31.2	34.6	33.6	35.8	34.5	36.9	35.4	34.6
31	14	19	DO	36.1	33.3	36.3	37.5	36.6	39.1	38.2	40.7	39.5	42.4	40.7	41.3
31	15	05	AB	17.0	16.0	18.2	18.1		20.2	20.4	20.6	20.2	20.5	19.6	17.5
31	15	11	AD	3.5	6.0	2.8	6.4		7.3	3.9	7.7	4.4	8.0		5.8
31	15	20	BO												
31	15	20	BD	10.3	11.8	10.3	11.3	12.4	14.5	14.2	14.6	13.1	15.4	13.6	12.1
32	09	34	DD	36.2	38.9	36.5	34.2	35.2	36.0	37.8	39.2	40.3	41.3	41.6	41.7
32	12	08	CD											68.4	61.8
32	12	13	DD												
32	12	17	BB												81.0
32	13	29	AB	68.3	65.0	63.7	66.2	65.0	68.4	67.2	69.7	68.4	72.3	71.1	71.0
32	13	29	AC		67.8	74.2	70.0	69.1	72.1	70.8	73.6	72.1	76.1	73.9	74.8
32	16	12			224.3	324.0	324.5								
32	16	26	AC	6.8	6.6	3.9	5.9	7.4	8.7	9.4	9.4	8.9	8.3	7.4	5.5
33	12	36	DC	20.7	20.9	20.2	21.6	21.3	22.3	22.0	23.1	22.4	23.6	22.6	22.2
33	13	21	CO												
33	13	21	CC	66.1	65.8	64.3	65.2	64.5	65.7	66.1	67.0	67.5	68.2	68.1	68.2
Seasonal Average				39.4	48.1	49.4	51.3	42.3	43.4	43.3	45.3	44.1	46.9	47.9	47.3
Yearly Average				43.7		50.4		42.9		44.3		45.5		47.6	

Lower Nio a NRD
Static Wa Levels

TWP	RGE	SEC		Spr 93	Fall 93	Spr 94	Fall 94	Spr 95	Fall 95	Spr 96	Fall 96	Spr 97	Fall 97	Spr 98	Fall 98
HOLT COUNTY															
29	09	09	BO	43.8	39.9	40.3	39.2	39.0	36.1	34.8	36.3	36.3	39.4	38.5	37.9
29	09	30	DO	67.1	65.1	64.4	64.4	61.7	60.5	57.4	59.2	57.7	61.0	60.0	59.2
29	11	12	DO	30.7	27.2		26.6		23.7	20.8	23.6	23.1	27.8	26.3	26.5
29	12	08	BO	38.9	37.6	40.8	36.3	32.6	36.0	30.1	35.7	30.5	36.5	33.1	34.7
29	13	14	CO	42.5	40.9		40.5	38.9	40.0	38.3	40.7	39.0	43.0	40.8	41.2
30	09	08	BO	77.4	77.3	74.6	75.2	73.0	73.3	66.8	72.1	68.8	74.3	71.0	71.5
30	09	23	DD	64.0	61.9	61.9	61.0	60.1	59.1	56.5	58.8	62.6	60.0	60.3	60.3
30	09	30	AO	11.2	8.4	9.2	9.6	6.7	5.4	6.7	8.1	7.6	9.9	9.6	8.3
30	10	35	DO	40.4	36.8	36.9	36.0	33.7	30.3	29.2	30.8	29.6	33.9		32.0
30	13	18	CB	27.9	24.9		25.3	23.0	25.1	24.5	25.2	24.0	26.8	26.0	26.6
30	13	29	DA	42.4	41.2		38.7	39.2	38.9	37.6	39.1	39.1	44.4	41.3	
30	13	29	DA												51.9
30	13	29	DA												
30	14	05	DC	37.1	33.3	32.2	31.7	29.7	31.5	29.6	30.2	30.0	31.6	31.1	31.7
30	14	05	DC												
30	14	15	CO	43.7	39.8		39.0	37.9	38.7	36.5	38.8	37.3	39.4	38.2	39.2
31	10	32	AA	89.0	88.8	85.4	91.0	90.7	90.4	86.1		85.5	88.1	87.1	87.5
31	09	32	AO				87.0	85.5	86.1	81.0	83.6	80.8	83.9	82.6	83.3
31	09	34	BO	89.4	88.9	86.5	86.8	86.1	86.9	82.1	84.1	82.0	84.4	83.7	84.2
31	10	25	BO			90.2	91.0	90.7	90.4	86.1		85.8	88.1	87.1	87.5
31	13	10	BB	59.9	57.1		56.8	58.3	52.6	52.5	57.4	52.9	60.0	53.8	59.5
31	13	32	BO	40.7	37.1		36.0	34.9	35.3	34.1	35.6	35.2	37.0	36.3	38.0
31	14	12	DA									38.8	31.0	30.1	30.2
31	14	12	BD	33.2	30.5										
31	14	19	DO	39.3	36.6		34.8	33.9	34.1	32.5	34.0	32.7	34.2	33.4	33.8
31	15	05	AB	17.8	15.2		16.2	13.8	15.3	16.6	15.6	16.4	17.6	17.4	16.7
31	15	11	AD	3.8	3.9		4.9	2.5	3.4	3.2	3.9	2.9	5.9	3.1	4.8
31	15	20	BO										12.1		10.4
31	15	20	BD	10.6	8.9	10.0									
32	09	34	DD	41.1	37.1	36.8	39.3	35.6	32.1	31.3	30.2	31.1	31.7	33.0	32.5
32	12	08	CD	62.4			62.6	66.2	65.4	54.1	65.6	52.5	62.6	55.4	62.0
32	12	13	DD												25.8
32	12	17	BB	74.8	75.9		74.5	69.6	78.4	67.9	74.3	66.3	74.4	69.3	75.4
32	13	29	AB	69.1	68.1		66.8	65.8	66.3	63.3	66.1	64.0	66.7	65.3	66.2
32	13	29	AC	72.9	71.5		70.6	69.6	70.1	67.1	69.8	67.8	70.5	69.0	70.0
32	16	12													
32	16	26	AC	5.1	4.9	5.2	5.7	2.4	4.7	6.3	4.8	4.1	6.4	7.5	5.6
33	12	36	DC	20.7	18.6	24.7	21.4	21.6	21.0	19.5	20.1	19.5	21.6	20.6	20.8
33	13	21	CO											60.9	62.6
33	13	21	CC	67.3	65.0		48.8	47.8	46.0	45.2	47.1	45.2	47.5		
Seasonal Average				45.5	42.8	46.6	47.3	46.6	45.9	43.3	42.5	43.5	45.4	45.7	44.8
Yearly Average				44.2		46.9		46.2		42.9		44.4		45.3	

Lower Nir ta NRD
Static Wa.. Levels

TWP	RGE	SEC		Spr 99	Fall 99	Spr 00	Fall 00	Spr 01	Fall 01	Spr 02	Fall 02
HOLT COUNTY											
29	09	09	BO	37.1	36.7	36.5	40.4	39.4	39.5	39.4	42.7
29	09	30	DO	57.4	58.0	57.3	60.3	59.4	59.6	58.5	
29	11	12	DO	25.0	24.4	24.3	30.6	28.5	29.7	27.5	33.4
29	12	08	BO	30.6	34.5	30.7	38.7	36.2	38.1	34.3	41.9
29	13	14	CO	39.5	42.5	41.0	45.1	43.3	43.8	42.4	46.6
30	09	08	BO	68.4	70.8	68.2	75.0	71.9	74.1	70.9	77.5
30	09	23	DD	60.6	59.0	58.2	62.6	61.2	62.4	61.1	64.4
30	09	30	AO	7.3	7.9	8.0	11.3	7.6	9.2	8.7	12.4
30	10	35	DO	30.5	29.7	29.8	34.7	32.6	33.0	32.2	38.1
30	13	18	CB	24.7	26.5	25.8	29.0	27.3	26.1	26.1	30.1
30	13	29	DA	42.0		42.1		48.3		45.2	
30	13	29	DA		52.5						
30	13	29	DA				63.5		56.0		68.7
30	14	05	DC	29.8	30.5	30.2	34.8	34.0	33.1	32.1	
30	14	05	DC								34.1
30	14	15	CO	37.1	38.7	37.8	42.6	41.1	40.1	39.1	45.0
31	10	32	AA								
31	09	32	AO	81.0	82.8	80.6	83.8	83.2	84.7	83.5	86.8
31	09	34	BO	83.0	83.4	82.2	84.4	84.2	85.4	84.6	85.0
31	10	25	BO	86.1	88.4	85.4	88.4	87.9	88.8	88.2	90.5
31	13	10	BB	53.7	59.5	54.2	64.0	57.3	57.5	54.5	66.4
31	13	32	BO	34.5	36.0	35.5	39.2	38.0	36.4	35.8	41.9
31	14	12	DA	28.0	29.7	28.9	33.0	31.5	29.9	28.9	34.2
31	14	12	BD								
31	14	19	DO	31.8	32.2	31.8	36.3	35.5	34.9	32.7	37.9
31	15	05	AB	16.0	16.3	17.7	21.1	19.7	16.5	17.6	22.9
31	15	11	AD	1.8	4.7	3.5	7.0	3.1	4.2	2.8	7.5
31	15	20	BO	10.5	11.3	13.0	15.7	1.8	10.5	10.8	15.5
31	15	20	BD								
32	09	34	DD	33.0	32.6	33.6	35.1	36.7	36.6	37.4	38.7
32	12	08	CD	52.9	60.1	52.0	65.2	57.7	64.2	54.5	67.2
32	12	13	DD	26.1	27.1	27.3	29.8	30.0	29.7	29.3	32.2
32	12	17	BB	66.9	74.0	65.9	78.5	71.2	77.6	68.3	82.1
32	13	29	AB	64.2	66.4	64.4	68.7	67.1	66.6	65.3	69.6
32	13	29	AC	68.0	70.1	68.1	72.5	70.9	70.4	69.1	73.4
32	16	12									
32	16	26	AC	5.6	5.6	7.3	8.6	6.0	5.3	6.6	8.3
33	12	36	DC	20.4	21.3	21.2	23.3	22.7	22.7	22.1	25.3
33	13	21	CO	61.5	62.6	61.3	65.1	64.3	64.4	62.6	66.6
33	13	21	CC								
Seasonal Average				41.1	43.0	41.4	46.5	43.7	44.7	42.9	48.0
Yearly Average				42.0		43.9		44.2		45.4	

Lower Niobrara NRD
Static Water Levels

TWP RGE SEC	Fall 75	Spr 76	Fall 76	Spr 77	Fall 77	Spr 78	Fall 78	Spr 79	Fall 79	Spr 80	Fall 80
KEYA PAHA											
33 18 03 CB	9.0		9.5		7.9	5.9	8.7	6.5	8.8	6.9	9.2
33 19 22 CB	24.0		25.6		20.3	13.3	21.0	16.9	20.3	18.8	22.8
33 20 21 CA	75.6		77.0		76.0	72.3	73.6	70.7	73.5	71.5	72.3
33 21 23 BO											
33 21 23 BC											
34 18 10											
34 20 30 CD	25.6		26.6		23.3	20.9	22.6	20.8	22.8	22.0	26.9
35 17 27 DC	16.4		16.8		15.5	13.8	14.9	14.5	14.9	15.1	15.4
35 19 35											
Seasonal Average	30.1	N/A	31.1	N/A	28.6	25.2	28.2	25.9	28.1	26.9	29.3
Yearly Average		31.1		28.6		26.7		27.0		28.1	

Lower Niobrara NRD
Static Water Levels

TWP RGE SEC	Spr 81	Fall 81	Spr 82	Fall 82	Spr 83	Fall 83	Spr 84	Fall 84	Spr 85	Fall 85	Spr 86	Fall 86
KEYA PAHA												
33 18 03 CB	9.1	9.5	7.3	7.6	6.0	7.3	4.1	5.6	5.5	7.1	4.7	6.4
33 19 22 CB	20.6	24.5	20.4	21.9	18.4	16.1	11.6	15.8	16.2	18.0	15.4	18.0
33 20 21 CA	70.8	71.0	72.9	74.4	73.2	71.6	69.1	68.9	68.3	69.9	68.8	70.4
33 21 23 BO												
33 21 23 BC				78.5	77.1	75.3	72.6	74.1	71.8	72.9	71.5	73.4
34 18 10				132.5	129.9	127.4	125.1	123.4	121.9	121.0	119.5	118.9
34 20 30 CD	25.6	26.6	24.3	24.7	23.7	19.5	17.1	21.0	20.7	22.6	20.8	21.8
35 17 27 DC	15.6	15.9	15.1	14.5	14.4	13.3	11.5	12.8	13.4	13.7	13.0	13.3
35 19 35			251.4	255.2	255.0	245.6	244.3	245.1	244.5	244.5	243.5	244.3
Seasonal Average	28.3	29.5	65.2	76.2	74.7	72.0	69.4	70.8	70.3	71.2	69.7	70.8
Yearly Average	28.9		70.7		73.4		70.1		70.8		70.2	

Lower Niobrara NRD
Static Water Levels

TWP RGE SEC	Spr 87	Fall 87	Spr 88	Fall 88	Spr 89	Fall 89	Spr 90	Fall 90	Spr 91	Fall 91	Spr 92	Fall 92
KEYA PAHA												
33 18 03 CB	4.0	7.2	3.7	7.0	6.3	8.0	6.0	7.5	5.7	7.6	5.8	6.1
33 19 22 CB	15.7	17.7	14.9	16.8	15.3	19.6	17.5	20.3	17.8	20.9	18.2	17.0
33 20 21 CA	69.3	71.2	69.3	72.4	68.4	72.6		70.9	69.6	71.5	70.1	71.7
33 21 23 BO												
33 21 23 BC	72.5	72.1	72.8	71.5	67.4	71.8	69.9	71.7	70.6	73.8	71.5	71.6
34 18 10	118.3	117.3	115.7	116.1	115.6		114.5	114.5	114.9	113.8	113.5	113.1
34 20 30 CD	20.7	21.9	20.2	20.7	20.2	24.6	22.9	24.7	23.2	25.7	23.4	22.0
35 17 27 DC	13.2	12.8	12.1	12.8	12.9	13.7	13.4	14.2	13.9	14.4	13.8	13.5
35 19 35	243.8	243.8	244.6	242.7	242.2	244.6	244.6	244.8	246.1	245.6	245.7	245.6
Seasonal Average	69.7	70.5	69.2	70.0	68.5	65.0	69.8	71.1	70.2	71.7	70.3	70.1
Yearly Average	70.1		69.6		66.8		70.5		70.9		70.2	

Lower Niobrara NRD
Static Water Levels

TWP	RGE	SEC		Spr 93	Fall 93	Spr 94	Fall 94	Spr 95	Fall 95	Spr 96	Fall 96	Spr 97	Fall 97	Spr 98	Fall 98
KEYA PAHA															
33	18	03	CB	4.1	4.7	5.7	5.7	3.5	4.2	3.9	4.2	3.5	5.8	3.8	4.5
33	19	22	CB	15.2	15.7	14.9	14.9	9.5	12.2	8.7	12.5	10.3	12.5	11.5	11.5
33	20	21	CA	70.1	70.9	70.9	70.9	68.7	67.6	65.0	67.0	63.9	65.9	63.3	64.7
33	21	23	BO												
33	21	23	BC	71.2	72.8	78.7	78.7	70.4	70.1	66.3	74.6	65.8	69.0	65.4	67.9
34	18	10		112.9	112.3	111.6	111.6	111.4	110.7	110.4	108.2	108.6	106.1	106.1	104.1
34	20	30	CD	21.2	22.3	21.7	21.7	25.2	25.0	17.6	19.6	17.2	18.8	18.2	19.3
35	17	27	DC	13.6	11.9	14.0	14.0	13.1	12.5	12.4	12.1	11.7	12.4	12.3	12.5
35	19	35		245.7	245.4									246.3	246.1
Seasonal Average				69.3	69.5	45.4	45.4	43.1	43.2	40.6	42.6	40.1	41.5	65.9	66.3
Yearly Average				69.4		45.4		43.2		41.6		40.8		66.1	

Lower Niobrara NRD
Static Water Levels

TWP	RGE	SEC		Spr 99	Fall 99	Spr 00	Fall 00	Spr 01	Fall 01	Spr 02	Fall 02
KEYA PAHA											
33	18	03	CB	3.5	5.9	4.0	6.2	3.6	5.3	3.6	5.3
33	19	22	CB	9.8	12.2	11.6	15.4	12.4	13.6	12.5	16.0
33	20	21	CA	62.6	64.3	61.4	64.3	62.7	64.3	61.9	65.0
33	21	23	BO		65.7	63.0	66.6	64.4	66.6	64.0	68.6
33	21	23	BC	64.9							
34	18	10									
34	20	30	CD	18.0	16.7	18.0	22.2	19.6	20.0	19.4	23.4
35	17	27	DC	12.0	11.7	11.9	13.3	11.8	12.0	11.9	12.8
35	19	35		246.6	246.1	248.6	248.1	246.3	246.5	246.2	247.4
Seasonal Average				59.6	60.4	59.8	62.3	60.1	61.2	59.9	62.6
Yearly Average				60.0		61.0		60.7		61.3	

Lower Niobrara NRD
Static Water Levels

TWP RGE SEC	Fall 75	Spr 76	Fall 76	Spr 77	Fall 77	Spr 78	Fall 78	Spr 79	Fall 79	Spr 80	Fall 80
KNOX COUNTY											
29 06 29 BA					104.4	104.5	107.7	104.8	105.8	105.0	106.9
29 06 29 AC	118.0		121.0		121.2	119.3	121.1	120.0	121.1	120.2	122.0
29 07 18 CO											
29 07 18 CD				34.2	36.2	34.9	38.0	35.8	37.2	38.3	38.1
29 07 19 BO											
29 07 19 BB	54.0		55.5		54.6	53.2	56.1	54.3	55.9	54.7	57.0
29 08 30 BC											
29 08 30 B											
30 07 18 AA											
30 07 18 AD	68.8		70.3		70.8	69.9	70.1	69.6	71.5	70.9	71.2
30 08 18 AO											
30 08 18 AA	89.0		90.7		91.4	89.4	92.6	90.0	93.3	91.3	95.7
31 08 32 BC	41.0		40.2		40.2	38.8	39.7	38.4	40.6	39.3	41.0
31 08 32 BC											
32 08 26 AA	7.6		7.9		6.5	1.2	6.9	2.3	7.3	2.5	7.8
Seasonal Average	63.1	N/A	64.3	34.2	65.7	63.9	66.5	64.4	66.6	65.3	67.5
Yearly Average		64.3		49.9		65.2		65.5		66.4	

Lower Niobrara NRD
Static Water Levels

TWP RGE SEC	Spr 81	Fall 81	Spr 82	Fall 82	Spr 83	Fall 83	Spr 84	Fall 84	Spr 85	Fall 85	Spr 86	Fall 86
KNOX COUNTY												
29 06 29 BA	109.7											
29 06 29 AC	122.7											
29 07 18 CO												
29 07 18 CD	39.4	38.3	37.4	38.2	36.3	36.3	52.6	32.9	31.4	31.9	29.4	32.0
29 07 19 BO												
29 07 19 BB	54.3	57.3	56.6	57.4	55.8	55.8	32.4	52.6	49.7	51.1	49.2	51.2
29 08 30 BC												
29 08 30 B				90.4	88.7	90.9	86.2	80.8	84.1	86.1	83.6	85.8
30 07 18 AA												
30 07 18 AD	71.4	71.4	71.6	71.6	71.2	69.7	68.2	66.6				66.1
30 08 18 AO												
30 08 18 AA		97.6	96.1	98.8	96.9	96.3	90.5	91.9	83.5	90.5	87.8	91.7
31 08 32 BC	40.0	42.0	40.8	40.5	38.9	37.1	36.2	32.2	35.8	37.3	36.3	37.3
31 08 32 BC												
32 08 26 AA	6.7	8.5	3.8	6.1	2.2	6.3	1.6	2.4	2.0	3.9	2.7	3.3
Seasonal Average	63.5	52.5	51.1	57.6	55.7	56.1	52.5	51.3	47.8	50.1	48.2	52.5
Yearly Average	58.0		54.3		55.9		51.9		48.9		50.3	

Lower Niobrara NRD
Static Water Levels

TWP RGE SEC	Spr 87	Fall 87	Spr 88	Fall 88	Spr 89	Fall 89	Spr 90	Fall 90	Spr 91	Fall 91	Spr 92	Fall 92
KNOX COUNTY												
29 06 29 BA												
29 06 29 AC												
29 07 18 CO												
29 07 18 CD	32.3	30.4	34.1	31.2	30.4	32.9	31.6	34.8	31.9	36.9	34.3	33.2
29 07 19 BO												
29 07 19 BB	50.2	56.0	51.3	55.0.	48.4	51.6	49.9	53.3	51.4	56.2	52.9	52.5
29 08 30 BC												
29 08 30 B	81.7	85.5	82.4	86.7			85.9	89.8		94.8	89.4	90.7
30 07 18 AA												
30 07 18 AD		65.2		65.0	65.4	65.5	66.1	66.5	67.5	68.2	68.1	68.6
30 08 18 AO												
30 08 18 AA	89.5	90.7	89.7	91.5		95.5	91.6	96.2	93.3	99.1	96.3	98.0
31 08 32 BC	37.6	36.9	37.0	37.2	37.9	39.8	38.4	40.0	38.8	41.6	39.5	39.8
31 08 32 BC												
32 08 26 AA	3.4	4.5	2.7	4.8	4.4	7.6	4.1	7.6	5.4	8.0	5.3	3.9
Seasonal Average	49.1	52.7	49.5	52.7	37.3	48.8	52.5	55.5	48.1	57.8	55.1	55.2
Yearly Average	50.9		51.1		43.1		54.0		52.9		55.2	

Lower Niobrara NRD
Static Water Levels

TWP RGE SEC	Spr 93	Fall 93	Spr 94	Fall 94	Spr 95	Fall 95	Spr 96	Fall 96	Spr 97	Fall 97	Spr 98	Fall 98
KNOX COUNTY												
29 06 29 BA												
29 06 29 AC												
29 07 18 CO				29.1	27.7	25.6	25.0	24.9	23.3	26.5	24.4	23.9
29 07 18 CD	32.2	30.2										
29 07 19 BO				47.8	46.5	45.7	41.8	42.9	40.8	44.5	41.9	41.6
29 07 19 BB	50.9	49.7										
29 08 30 BC				86.0	83.6	85.0	79.2	81.5	77.3	83.4	78.3	79.7
29 08 30 B	88.4	87.8										
30 07 18 AA										31.7		36.8
30 07 18 AD	68.5	67.4		65.0								
30 08 18 AO				92.2		91.4	84.1	87.7	83.1	88.4	84.2	86.1
30 08 18 AA	95.6	95.2										
31 08 32 BC	38.3	36.4		41.4	40.9	35.6	33.8	40.1	33.9	36.6	35.0	34.8
31 08 32 BC												
32 08 26 AA	2.3	3.3		3.0	2.3	3.1	2.5	3.7	3.2	4.1	2.7	2.8
Seasonal Average	53.7	52.9	N/A	52.1	40.2	47.7	44.4	46.8	43.6	45.0	44.4	43.7
Yearly Average	53.3		52.1		44.0		45.6		44.3		44.0	

Lower Niobrara NRD
Static Water Levels

TWP	RGE	SEC		Spr 99	Fall 99	Spr 00	Fall 00	Spr 01	Fall 01	Spr 02	Fall 02
KNOX COUNTY											
29	06	29	BA								
29	06	29	AC								
29	07	18	CO	22.5	23.7	22.7	25.8	23.4	25.2	23.9	26.3
29	07	18	CD								
29	07	19	BO	39.5	40.7	39.1	42.9	40.8	42.2	40.9	43.2
29	07	19	BB								
29	08	30	BC	75.9	78.0	74.3	81.8	76.9	80.5	77.4	82.9
29	08	30	B								
30	07	18	AA	33.9	34.4	32.3	37.6	33.8	36.3	33.8	38.0
30	07	18	AD		57.8	56.3	56.8	57.2	56.5	56.4	57.3
30	08	18	AO	81.4	84.9	80.1	85.6	82.0	85.8		87.7
30	08	18	AA								
31	08	32	BC	33.9				35.3	36.0	35.0	37.6
31	08	32	BC		38.2	38.9	41.8	40.0	40.7	39.7	43.2
32	08	26	AA	2.9	3.5	3.1	4.0	1.6	3.5	2.6	4.0
Seasonal Average				41.4	45.2	43.4	47.0	43.4	45.2	38.7	46.7
Yearly Average				43.3		45.2		44.3		42.7	

Lower Niobrara NRD
Static Water Levels

TWP RGE SEC	Fall 75	Spr 76	Fall 76	Spr 77	Fall 77	Spr 78	Fall 78	Spr 79	Fall 79	Spr 80	Fall 80
ROCK COUNTY											
31 18 08 AO											
31 18 08 AD	13.6		14.3		8.8	7.6	9.3	7.5	9.8	7.4	12.3
31 18 12 AO											
31 18 12 AC	13.5		14.7		13.5	12.3	11.2	10.6	10.9	10.3	11.7
31 19 15 CO											
Seasonal Average	13.6	N/A	14.5	N/A	11.2	10.0	10.3	9.1	10.4	8.9	12.0
Yearly Average		14.5		11.2		10.1		9.7		10.4	

Lower Niobrara NRD
Static Water Levels

TWP RGE SEC	Spr 81	Fall 81	Spr 82	Fall 82	Spr 83	Fall 83	Spr 84	Fall 84	Spr 85	Fall 85	Spr 86	Fall 86
ROCK COUNTY												
31 18 08 AO		15.6										
31 18 08 AD		15.6	13.3	14.3	12.1	9.0	5.7	8.2	9.2	11.3	8.6	8.0
31 18 12 AO												
31 18 12 AC	13.0	14.2	14.2	14.3	14.7	10.2	7.0	8.7	9.3	11.1	11.2	10.3
31 19 15 CO				37.9	37.1	34.7	32.2	31.4	27.6	33.6	33.5	33.3
Seasonal Average	13.0	15.1	13.8	22.2	21.3	18.0	15.0	16.1	15.4	18.7	17.8	17.2
Yearly Average	14.1		18.0		19.6		15.5		17.0		17.5	

Lower Niobrara NRD
Static Water Levels

TWP RGE SEC	Spr 87	Fall 87	Spr 88	Fall 88	Spr 89	Fall 89	Spr 90	Fall 90	Spr 91	Fall 91
ROCK COUNTY										
31 18 08 AO										
31 18 08 AD		9.5	8.3	9.0	5.2	12.2		13.7	12.4	15.6
31 18 12 AO										
31 18 12 AC		10.2	10.3	10.1	10.8	12.6	13.3	13.5	13.7	12.6
31 19 15 CO		32.7	32.4	32.2	32.8	34.9	34.9	36.1	35.7	36.9
Seasonal Average	N/A	17.5	17.0	17.1	16.3	19.9	24.1	21.1	20.6	21.7
Yearly Average	17.5		17.1		18.1		22.6		21.2	

Lower Niobrara NRD
Static Water Levels

TWP RGE SEC	Spr 92	Fall 92	Spr 93	Fall 93	Spr 94	Fall 94	Spr 95	Fall 95	Spr 96	Fall 96	Spr 97	Fall 97
ROCK COUNTY												
31 18 08 AO						8.2	5.3	7.1	7.7	8.6	8.1	9.3
31 18 08 AD	11.6	10.5	8.3	8.0								
31 18 12 AO						8.5	6.0	7.8	8.5	8.9	9.0	9.6
31 18 12 AC	12.3	10.3	9.9	8.1								
31 19 15 CO	35.9	34.0	33.3	31.2		29.9	28.5	27.3	27.3	28.3	28.2	30.1
Seasonal Average	19.9	18.3	17.2	15.8	N/A	15.5	13.3	14.1	14.5	15.3	15.1	16.3
Yearly Average	19.1		16.5		15.5		13.7		14.9		15.7	

Lower Niobrara NRD
Static Water Levels

TWP RGE SEC	Spr 98	Fall 98	Spr 99	Fall 99	Spr 00	Fall 00	Spr 01	Fall 01	Spr 02	Fall 02
ROCK COUNTY										
31 18 08 AO	9.4	8.8		9.6		13.5	12.0	9.0	9.3	13.6
31 18 08 AD										
31 18 12 AO	10.2	9.4		9.2		12.4	12.5	8.7	9.7	12.2
31 18 12 AC										
31 19 15 CO	29.6	30.7		31.1		34.2	33.9	32.9	33.0	36.2
Seasonal Average	16.4	16.3	N/A	16.6	N/A	20.0	19.5	16.9	17.3	20.7
Yearly Average	16.4		16.6		20.0		18.2		19.0	

Appendix E
Lower Niobrara NRD Water Quality Cost Share Programs

Automatic Rain Gauge Shut Off – The District will cost share 65% on the purchase of a rain gauge shut off for an irrigation system. Cost share will not exceed $135 per shut off and is limited to 5 units/cooperator/year.

Automatic Drip Oiler – The District will cost share 65% on the purchase of a drip oiler, including the 4-gallon poly tank, for an irrigation pump. Cost share will not exceed $130 per oiler and is limited to 5 units/cooperator/year.

Nitrogen Management – The purpose of this program is to encourage producers to manage fertilizer application by knowing the fertilizer potential in the crop root zone and in the irrigation water. Cost share is made at 75% of actual costs, not to exceed $1.50/acre. The maximum cost share for each cooperator per year is $200. The cooperator is required to fill out the Annual Crop Report Form.

Livestock Manure Analysis – This program provides cost share for the shipping and analysis of livestock manure samples. Cost share is set at 65%, with a maximum of $200/cooperator/year.

Domestic Well – The purpose of this program is to provide assistance to private well owners whose water for residential use has nitrate levels that exceed 10 ppm. Assistance will be for technical assessment and design, and where necessary for well replacement, filter purification systems, and pipelines. The District will provide 65% cost share, not exceeding $800 on permanent well construction, $500 on necessary pipeline for an existing water system (this includes hookup to a rural system) and $800 on filtration or purification systems.

Well Abandonment – This program provides assistance for water wells abandoned in the district. The NRD will pay 65% of materials and labor. A licensed well driller or pump installer must seal the well. Maximum cost share is $500 per well and is based on well dimensions. Annual cost share per cooperator will not exceed $1,500.

Soil Sampling Probe - The Lower Niobrara NRD has purchased soil sampling probes for resale through the District office. The District will absorb 50% of the cost for producers in the LNNRD. The cost to the cooperator will be approximately $30. There will be a limit of one per producer at this price. Producers outside the District can purchase the probe at cost. A soil sampling probe is a valuable tool for collecting soil samples for nutrient or moisture analysis. The analysis results can be very helpful in making fertilizer and irrigation management decisions.

Crop Production Planner - The Lower Niobrara NRD produces and distributes a crop production planner handbook. The booklet is provided to producers in the District at no charge. The planner is designed to organize record keeping on individual fields throughout the growing season. One page (field records and map) can be used for each field in an operation. The booklet includes formulas, example problems, tables of values, and conversion factors.

Ultrasonic Flowmeter - The Lower Niobrara NRD has used Natural Resource Enhancement Funds to purchase a portable ultrasonic flowmeter. The flowmeter is a non-intrusive way of measuring water flow in a full-flowing pipe. Irrigators interested in measuring the volume of water applied through their irrigation system or checking the accuracy of an existing flowmeter, can call the office to make arrangements. An NRD representative will bring the flowmeter out to the site and meet the operator to take the measurements. Multiple sites can be measured if desired.

Water Testing - The Lower Niobrara NRD will perform a free nitrate-nitrogen test on water samples brought to the office in Butte. This service has been provided for over 18 years. The West Knox Rural Water System in Verdigre now has a bacteria testing kit. They can test water samples for bacteria at a cost of $4 per sample to pay for the bottles. Containers are available at no charge at the NRD office in Butte, if you would like to send your sample to a certified lab at your own expense.

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