



LIBRARIES

UNIVERSITY OF WISCONSIN-MADISON

Plover area nitrate study 1986. [DNR-048] 1986

Bailey, Fred

Madison, Wisconsin: Wisconsin Department of Natural Resources,
1986

<https://digital.library.wisc.edu/1711.dl/WXU6A4UTUPZMM8W>

<http://rightsstatements.org/vocab/InC/1.0/>

For information on re-use see:

<http://digital.library.wisc.edu/1711.dl/Copyright>

The libraries provide public access to a wide range of material, including online exhibits, digitized collections, archival finding aids, our catalog, online articles, and a growing range of materials in many media.

When possible, we provide rights information in catalog records, finding aids, and other metadata that accompanies collections or items. However, it is always the user's obligation to evaluate copyright and rights issues in light of their own use.

050875

Wisconsin Groundwater Management Practice Monitoring Project No. 43

Water Resources Center
University of Wisconsin - MSN
1975 Willow Drive
Madison, WI 53706



Wisconsin Department of Natural Resources

GROUNDWATER
Wisconsin's
buried treasure



Water Resources Center
University of Wisconsin - MSN
1975 Willow Drive
Madison, WI 53706

Plover Area Nitrate Study 1986

By

Fred Bailey
Water Supply Manager
Wisconsin Rapids Area
North Central District
Wis. Department of Natural Resources

Forward

I wish to thank the Public Water Section of the Wis. Department of Natural Resources for their assistance in making this study a reality. I also wish to thank the Wis. Geological and Natural History Survey for their help with the test wells and Mr. John Bruce, Wis. DNR, for helping with the water sampling.

This report serves to complement the study work done by Mr. George Kraft on the west side of Plover. He is studying the nitrate and aldicarb concentrations there and the two watersheds overlap. He is a graduate student and some of his work was funded by the State of Wis.

This report also gives the Public Water Section much needed information on the many other-than-municipal (OTM) and noncommunity water systems present. On the basis of this report, variances from meeting the nitrate health limit will be applied for at two OTM water systems and one mobile home park was already asked to explore the possibility of a deeper well. Yet another mobile home park has already deepened their well when it became clear lower nitrate water was available at a deeper depth.

It also appears several restaurants will have to continue posting nitrate warning signs as better water is not available.

Most importantly, this report provides an insight into what is happening with this watershed and this report illustrates how having intense agriculture next to businesses serving water is not always compatible zoning.

TABLE OF CONTENTS

	<u>Page</u>
Purpose	1
Area Residents	3
Geology	3
Sampling	4
Results	12
Recommendations	15

Purpose

The purpose of this study was to investigate the nitrate content of the groundwater along highway 54 southeast of Plover, Wisconsin. Specifically a 3 mile corridor of road in Portage County was investigated located southeast of its junction with Highway B and northwest of its junction with Highway 51. This study was to be research of a pure nature and also of an applied nature. By this I mean an assessment was to be made of the groundwater to determine its present quality and to provide a benchmark for evaluating future changes. Also this data is to be supplied to the various community leaders in the area so they can use it in planning appropriate land use activity for the area and planning appropriate well construction.

The study area is located near Stevens Point, WI and is partially in the Village of Plover and partially in the Township of Plover (See Map 1). This corridor is an area where this Department has received numerous complaints about the drinking water having an elevated nitrate content.

The State of Wisconsin and the U.S. Environmental Protection Agency have set a nitrate nitrogen health limit of 10 parts per million (ppm) for consumption of this water by infants under six months of age. Water above this limit might tie up the hemoglobin in a babies bloodstream if consumed and cause the blue baby symptoms of suffocation. When the child becomes older than six months of age and his diet varies, the type of stomach bacteria present change and this health problem should no longer be a concern. Most of the nitrate the typical adult consumes comes from vegetables and cured meats and such a nitrate intake does not ordinarily pose any health problems.

NORTHEAST
PART
SOUTHEAST
PART

PLOVER
LINWOOD SOUTH HULL

T.23N.-R.8 E.

25



Area Residents

Some of the families living along this strip have infants and some just fear they will have a harder time selling their property if it has a high nitrate well. Many of the public businesses such as restaurants object to posting warning signs on the wall to advise customers of the nitrate problem and landlords worry about scaring away tenants. Mobile home parks with high nitrate for example must distribute notices to their tenants advising them of the problem.

In spite of these worries, most of the local people have learned to cope quite easily with this elevated nitrate problem and the Plover area is one of the fastest growing areas in the state. Approximately a thousand people live or work in the study area and more growth is anticipated. This corridor includes four mobile home parks, six apartment buildings, three restaurants, two hotels, 11 small businesses, one state wayside and numerous private homes. The largest concentration of people living here is in the Plover Pine Village Mobile Home Park where over 600 people reside. The few people having infants and a well with high nitrate water usually just haul in drinking water for formula until the baby is six months old.

Geology

This area has about a 70 to 100 feet aquifer of coarse sand overlaying granite rock. All of the wells sampled were drawing water from this sand and gravel aquifer and were of varying depth. Groundwater is present at about 12 feet and is flowing in approximately a westward direction according to work done by the Wisconsin Geological and Natural History Survey. The aquifer produces abundant water and

there is a lot of irrigated agriculture on the east side of Highway 54. The enclosed maps indicate the groundwater gradient and also show the center pivot irrigation systems present on some of these nearby farmfields (See maps 2 and 3). The plainfield sand present is quite suitable for growing potatoes and snap beans.

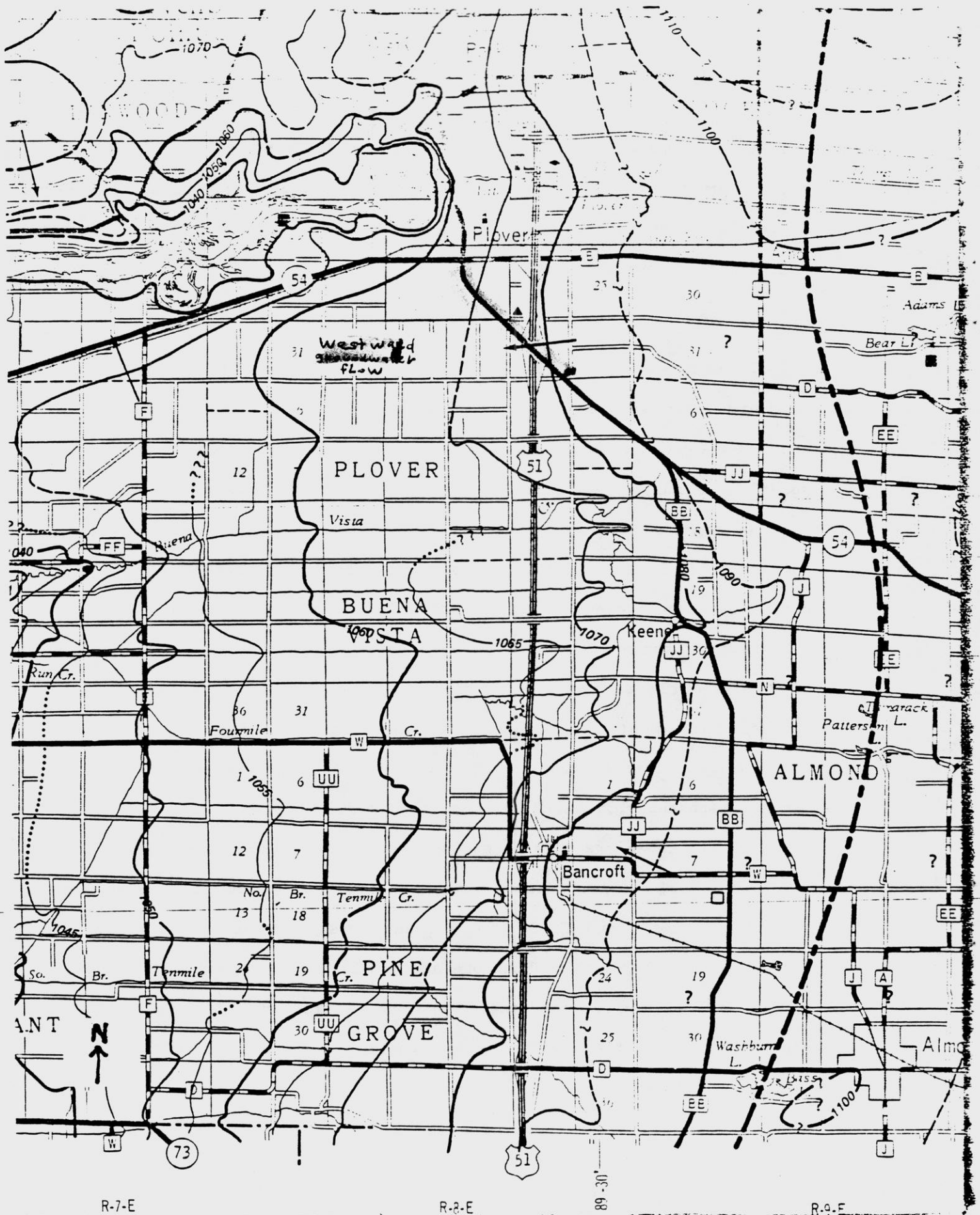
Sampling

In order to economically assess the quality of the groundwater present, water samples were collected at 55 wells serving local homes and businesses (See Map 4 and Table 1). Most of these wells are driven point wells and there are no construction reports on file for them since the law requires none. The owners were asked the depth of their wells and surprisingly some of them had pretty good records, although I do not claim 100 percent accuracy on the depth data listed.

Most of these water samples were collected during July and August of 1986 and all samples were analyzed by the State Lab of Hygiene in Madison. In most cases, only one day's testing is listed for a particular well even though many of the public businesses have been sampled repeatedly by the Department of Natural Resources

Nitrate concentrations in groundwater can fluctuate with changes in the water table and changes in nearby land usage, but in looking at several years of data I did not see any great fluctuation in nitrate concentrations (more than about one and a half parts per million). Most levels stayed quite constant. Shallow wells are more prone to fluctuation than deep wells because their water is usually recharged more locally.

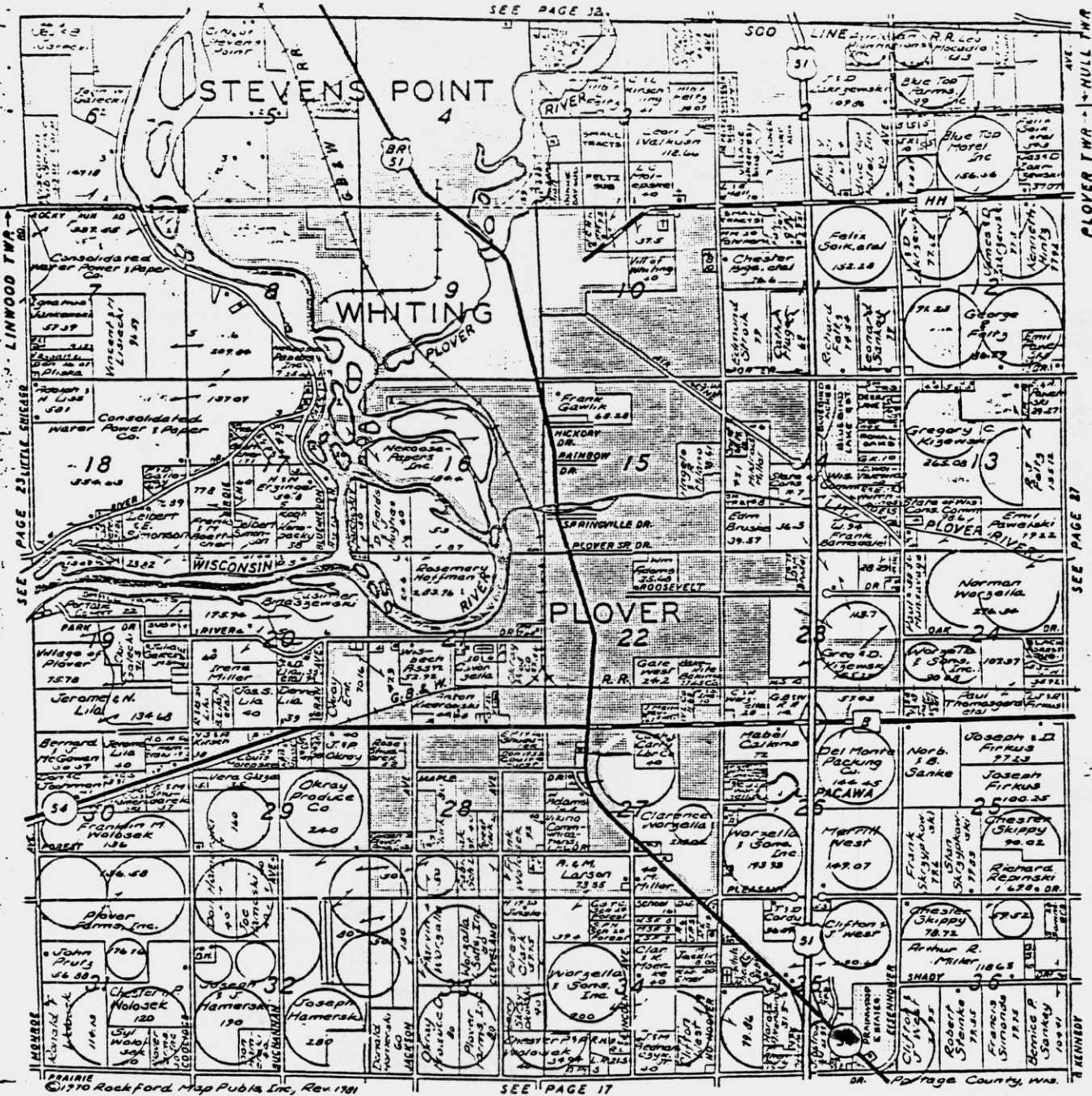
In order to get a complete evaluation of the water quality in the aquifer from top to bottom, I also needed some deep wells to supplement



NORTHEAST
PART
SOUTHEAST
PART

PLOVER
LINWOOD SOUTH HULL

T.23N.-R.8 E.



circles and half circles indicate
center pivot irrigation systems

Map NO. 3

Source: Rockford Map Publishers Inc.
and Wis. DNR

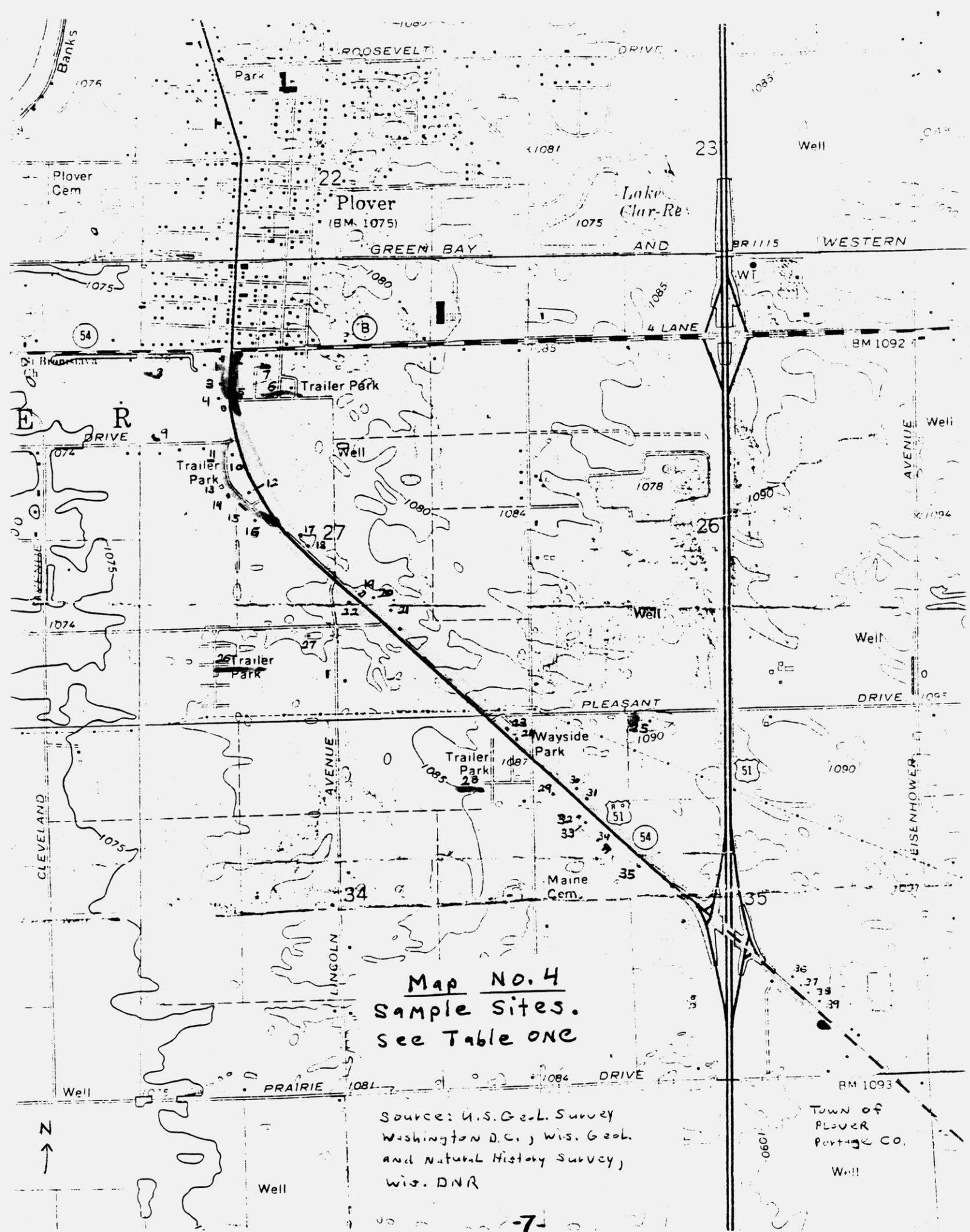


Table One

<u>Name and Map Number - see map #7</u>	<u>Well Type</u>	<u>Well Depth</u> in feet	<u>Sample Date</u>	<u>N-NO₃ in ppm</u>
1. Plover Bait & Sporting	Unk.	Unk.	8/08/86	11.0
2. Standard Station	Drilled	60	8/08/86	6.0
3. Plover Cafe	Driven	Unk.	9/18/85 10/01/86	11.2 12.9
4. Adams Service	Driven	30	7/21/86	27
5. Cecile Rutta	Driven	30	3/08/86	26.0
6. Newbys Mobile Park 1	Driven	63	2/28/86	6.8
2 (old)	Driven	25	7/21/86	16.5
2 (new)	Driven	55	8/13/86	5.7
3	Driven	64	2/28/86	6.0
4	Driven	55	5/27/86	6.0
7. Don Eckerson	Driven	40	7/21/86	8.9
8. Sunset Apts.	Drilled	cased to 56 65 tot. depth	2/28/86	7.3
9. Maple Crest Apts. 2204 Maple	Driven	45'	8/08/86	15.1
2206 Maple	Drilled	50'	8/08/86	18.2
1810 Rosalie	Driven	45'	8/08/86	22.0
10. Maple Ridge Park	Driven	55	7/15/86	18.3
11. Yellow Freight	Unk.	Unk.	7/15/86	16.8
12. Sunrise Restaurant	Driven	72	6/24/86	10.1
13. Jemco	Drilled	Unk.	7/15/86	11.6
14. Kramer and Kramer	Driven	Unk.	7/15/86	15.3
15. Gallenberg Equipment	Driven	25	7/15/86	9.0
16. Moodie Trucking	Driven	25	7/15/86	5.4
17. Fred Stroik	Unk.	Unk.	4/08/86	16.2
18. Jerzak Trucking	Unk.	Unk.	7/15/86	9.9
19. Wis. Ribstone Silo	Driven	29	7/15/86	6.2
20. George Peper	Driven	46	7/15/86	13.9

21. R. J. Ogurish	Driven	25	7/15/86	22.0
22. Gene Berndt	Driven	30	7/15/86	13.9
23. Wayside Handpump	Driven	23½	5/20/86	7.7
24. Test well 70 at wayside	Driven	70	7/15/86	13.9
Test well 103 at wayside	Driven	103.5	7/15/86	5.7
			9/25/86	5.5
Test well unknown soldier at wayside	Driven	19.6	9/25/86	2.5
25. Tom Cordy Rental	Driven	45	2/05/87	8.7
26. Plover Pine Village 1	Driven	31	11/12/85	2.9
2	Driven	46	11/12/85	3.7
3	Driven	46	11/12/85	5.0
4	Driven	32	11/12/85	3.7
5	Driven	27	11/12/85	2.5
6	Driven	46	11/12/85	2.7
7	Driven	42		
		27	11/12/85	3.8
8	Driven	30	11/12/85	6.0
9	Driven	30	11/12/85	0.7
10	Drilled	Cased to 63	12/15/86	11.6
		72 Tot. Depth		
27. Test well 69	Driven	69.3	7/15/86	11.8
28. Plover Pointe Manor 1	Driven	45	9/25/86	5.9
2	Driven	45	9/25/86	10.8
29. Plover Town Building/Garage	Driven	Unk.	7/15/86	3.4
30. Clifton West	Drilled	Unk.	8/08/86	1.4
31. Dawn Firkus	Unk.	Unk.	7/15/86	9.5
32. James Jisko	Unk.	Unk.	8/13/86	3.6
33. Leroy Simonis	Driven	30	7/15/86	9/8
34. Gilbert Higgens	Driven	25	7/15/86	12.9
35. E. Ann Buck - Home	Driven	19	8/13/86	3.8
E. Ann Buck - Kennel	Driven	Unk.	8/13/86	8.1
36. Elizabeth Inn	Drilled	Cased to 65	7/29/85	8.2
		85 Tot. Depth		
37. Captains Table	Drilled	60	7/31/85	7.6

<u>Name and Map Number</u> (See Map No. 4)	<u>Well Type</u>	<u>Well Depth</u> (in feet)	<u>Sample Date</u>	<u>N-NO₃ in ppm</u>
38. J.T.'s Little Store and Conoco	Driven	About 25	9/18/85	2.8
39. Mid-Wisconsin Inn	Drilled	Cased to 70 85 Tot. Depth	8/02/85	3.7

the data from the predominately shallow wells already present. The Wisconsin Geological and Natural History Survey was hired to install three deep test wells in the study area. These wells had three and one half foot steel drive points on the end and were constructed of one and one quarter inch steel. They were protected from vandalism by setting four inch well casing over them and padlocking down a removeable top. The wells were vigorously bailed by using a pitcher pump.

Two wells were installed on the state highway wayside. One of these was 103 feet deep and believed to be close to the granite and the other was 70 feet deep. Besides the waysides existing handpump a forgotten driven point well from some other researcher was also found. This one and one quarter inch well was 19.6 feet deep and dubbed the "Unknown Soldier". It too was pressed into service for a nitrate sample.

The third test well was installed just off Forest Avenue and it was sixty nine feet deep. The WGNHS felt they definitely hit granite when constructing this well after examining the drill cuttings recovered. We now believe the well serving Plover Pine Village System No. 10 also terminates just above the granite as it is nearby.

Another deep well chosen for this study is the one serving Sunrise Restaurant. A new two inch well was constructed there during the summer of 1986 to try and avoid the nitrate problem. This well is 72 feet deep and the contractor felt he was definitely stopped from driving further because he hit the granite. Since this area has few large rocks, we encountered none, he is probably right. Water samples were also collected at the deep wells serving Sunset Terrace Apartments and Mid Wis. Inn.

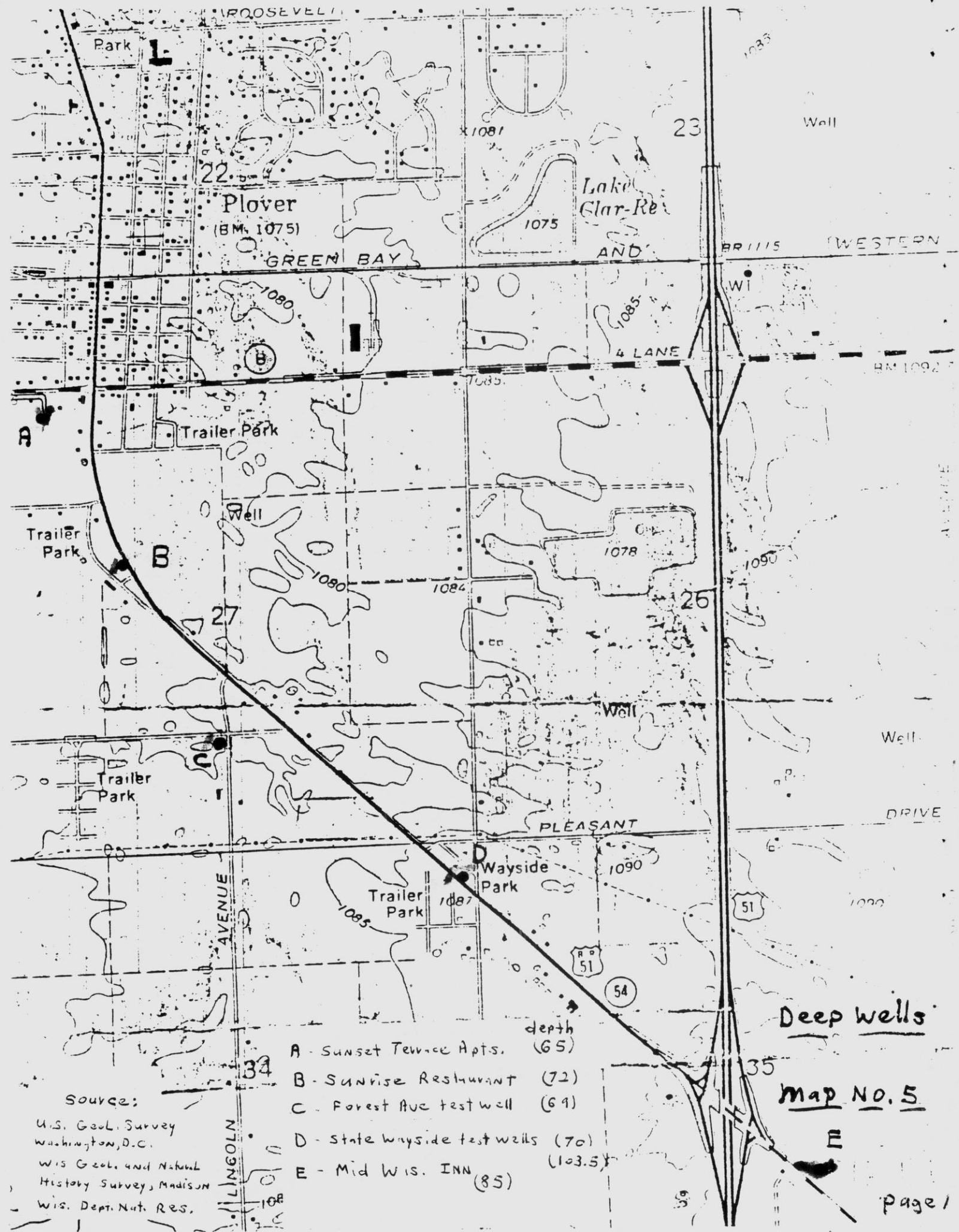
By sampling these deep well sites, as shown on Map No. 5, I was able to get data from several deep wells located fairly equidistant along the Highway 54 corridor. The amount of sand and gravel overburden above the granite lessened as one drove closer to the Wisconsin River

Results

From looking at table one, you can see most of the area wells had an elevated nitrate nitrogen content in their water. Thirty one of the fifty five wells sampled showed an elevated nitrate content above eight parts per million (ppm). There were a number of wells with nine to ten ppm nitrate and these might easily exceed the health limit of 10 ppm under certain conditions. Twenty two of the wells sampled were actually above the 10 ppm health limit for nitrate and four of these wells were above 20 ppm. The highest value reported being 27 ppm nitrate nitrogen.

The area most affected by the nitrate problem is the strip between Adams Service, plotted as site number 4 on map No. 4, and Ribstone Silo, plotted as site number 19. Most of the wells in this area had an extremely elevated nitrate content and high nitrate water is still present just above the granite, although not as high. As you go further southeast, the sand and gravel overburden increases and it appears one could drill a deep well to get beneath the problem. This idea is best illustrated by the work done on the state wayside. At 70 feet the nitrate level was 13.9 ppm but at 103 feet the nitrate level had dropped off to just 5.5 ppm nitrate.

The wayside itself is an interesting study area. It is literally surrounded by irrigated agriculture yet the 23 foot deep handpump tested



out at only 7.7 ppm nitrate. In looking across the potato field one can see that Tom Cordy owns a 40 acre parcel nearby and it is likely some of the recharge for this well is coming from this wooded forty. It does appear this wayside handpump could be easily affected by local farming practices such as usage of fertilizers and pesticides. I discussed this concern with the State Highway Department and they may switch to the 103 foot deep steel test well for their water.

The predominant source of the elevated nitrate in the study area is from the vast number of farm fields located upgradient of these wells. Potatoes in particular require a lot of nitrogen in order to grow a good crop. The soil is so coarse it is easy for a small amount of this fertilizer to leach into the groundwater after a heavy rain rather than be taken up by the plants. Since groundwater moves so slowly it takes a long time for such a problem to flush through and it is extremely difficult to completely eliminate some leaching from again occurring. Any overfertilizing and overwatering of crops in this area should be avoided.

Since much of the study area is inside the Village of Plover and this area is served by the village sewer system, nitrogen loading from human waste should not be a major factor. There are some private septic systems on the south end of the study and they would contribute some nitrate but they are not very dense. Because this is not an area of fancy lawns and shrubbery, it being more commercial, I also doubt excessive use of lawn fertilizer contributes much to the nitrate problem.

Much of this area has been sampled for various pesticides and herbicides over the years. While problems from such products have not

been very acute, isolated detections have served to heighten overall concern among area residents. This matter is not discussed in this paper because it is a large topic just in itself.

Throughout this study, I was struck by how very fragile this area really is. People with shallow wells are probably getting their well water recharged from a very close area. The importance of good land use practices and compatible zoning cannot be underestimated.

Recommendations

- 1.) Since much of this narrow strip has an elevated nitrate content it is advisable the village and township not allow a lot of "water serving" businesses such as restaurants or apartment buildings be constructed here. The present environmental problems seems most compatible with development by small shops, service garages and continued agricultural use. Businesses serving water and residential developments would again run into the stumbling block of having wells with an elevated nitrate content.
- 2.) The Village of Plover should continue with its efforts to obtain a municipal water supply for its residents. I realize it will take a number of years and a terrific cost for the village to obtain such a supply and install the water mains. Such an installation is the only way for Plover to avoid the type of conflicts discussed in this study.
- 3.) Every effort should be made by local farmers to use no more nitrogen based fertilizer than necessary and to not over-irrigate their crops. A good rotation of crops is helpful in this matter as

some need less nitrogen than others and there is less likelihood of insect infestations.

- 4.) The area again be sampled in three years to see if the nitrate levels in the groundwater are increasing or decreasing.

89072241813



b89072241813a

050875- Plover Area Nitrate
Study, 1986

Water Resources Center
University of Wisconsin - MSN
1975 Willow Drive
Madison, WI 53706

89072241813



B89072241813A