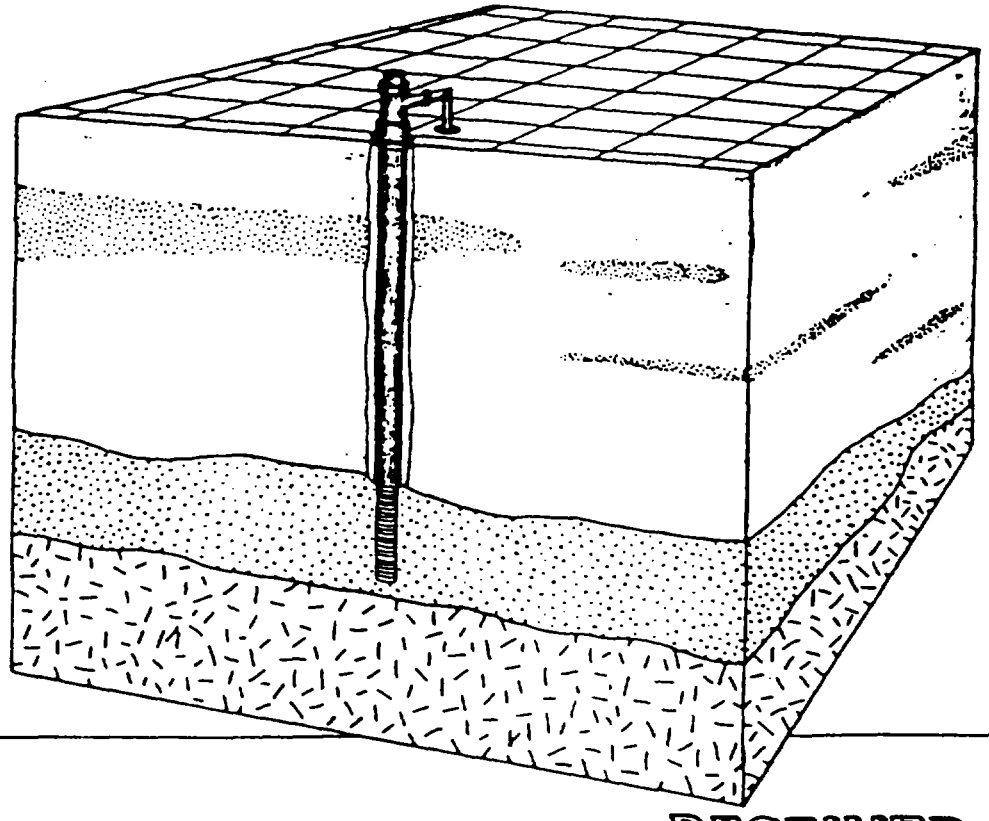
4/13/85

FEASIBILITY STUDY REPORT

ALTERNATIVE WATER SUPPLY INVESTIGATION

Long Prairie, Minnesota

MINNESOTA POLLUTION CONTROL AGENCY



BRUCE A. LIESCH ASSOCIATES, INC.

CONSULTING HYDROLOGISTS
PROFESSIONAL GEOLOGISTS • ENVIRONMENTAL SCIENTISTS

3131 Fernbrook Lane, Minneapolis, MN 55441 • 612-559-1423

LARSON-PETERSON & ASSOCIATES, INC.

CONSULTING MUNICIPAL ENGINEERS

FEASIBILITY STUDY REPORT

ALTERNATIVE WATER SUPPLY INVESTIGATION

LONG PRAIRIE, MINNESOTA

Prepared For

MINNESOTA POLLUTION CONTROL AGENCY

Prepared By

BRUCE A. LIESCH ASSOCIATES, INC.
3131 FERNBROOK LANE
PLYMOUTH, MN 55441
(612) 559-1423

And

LARSON-PETERSON & ASSOCIATES, INC.
522 W. MAIN STREET - BOX 150
DETROIT LAKES, MN 56501
(218) 847-5606

This report ws prepared by me
or under my direct supervision: April 15, 1985

Kenneth P. Olson
Hydrogeologist
Bruce A. Liesch Associates, Inc.

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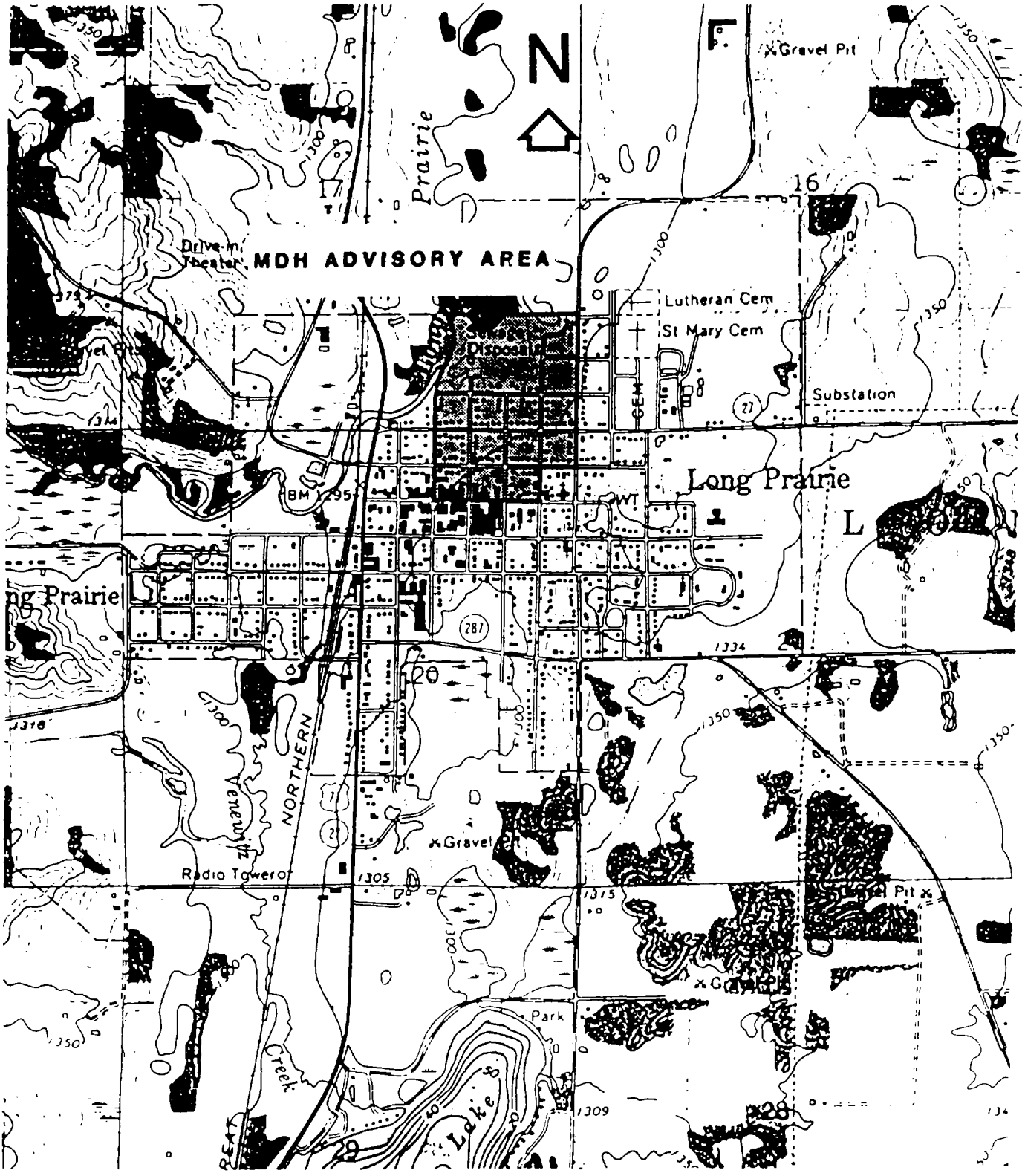
LONG PRAIRIE
TASK 9 REPORT

Introduction:

The work team of Bruce A. Liesch Associates, Inc. (BAL) and Larson-Peterson Associates, Inc. (LPA) was retained by the Minnesota Pollution Control Agency (MPCA) to conduct an Alternative Water Supply Investigation for the City of Long Prairie. The study was commissioned by the MPCA after volatile organic contaminants were identified in two of the five Long Prairie wells. The Minnesota Department of Health (MDH) ordered that use of wells 4 and 5 be discontinued owing to the high levels of organic contaminants. The MDH also identified an advisory area where the MDH recommended that domestic groundwater use be discontinued. The location of the contaminated area is shown on Figure 1 - Location Map. With the loss of two production wells, the City of Long Prairie could no longer provide the water needed to meet the peak demands for the summer of 1984.

The primary objective of the study is to develop a plan to provide water to the City of Long Prairie to meet the peak demands of the Summer of 1984. The following tasks will be completed under this study:

- Review and compilation of existing data concerning area geology, hydrology and contaminant conditions
- Review of historic municipal water demands
- Projection of water demands through at least the spring, summer, fall and winter of 1984 and the year 2000
- Review of capability of the existing municipal water system to supply noncontaminated water
- Projection of potential future contaminant migration and impact
- Identification of potential alternatives for supply of sufficient volumes of water during the spring and summer of 1984



MINN.

SCALE:

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

BASE FROM U.S.G.S. QUADRANGLES

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MPCA-CITY OF LONG PRAIRIE | MAR 84

LOCATION MAP | 1

- Review of potential alternatives including:
  - effectiveness of alternative as temporary, long term, and/or permanent solution
  - feasibility of alternative
  - cost of alternative, initial and continuing
  - construction schedule of alternative
  - effect of alternative on contaminant plume extent or shape
- Rating of potential alternatives
- Recommendation of alternative with justification of recommendation, estimated costs, schedules, and conceptual design
- Preparation of final designs, specifications, bidding documents and other materials as directed by State

Geologic Conditions:

The glacial terrain in the Long Prairie area is associated with at least two separate ice sheet advances. The upland areas to the east and west of Long Prairie are underlain with ground morainal deposits identified as the Alexandria Moraine of the Wadena Lobe Glaciation (Hobbs & Goebel, 1982). An outwash plain, which was developed during the Des Moines Lobe Glaciation, bisects the ground morainal terrain. The City of Long Prairie is located on the relatively level surface of the outwash plain and on the lower slopes of the moraine.

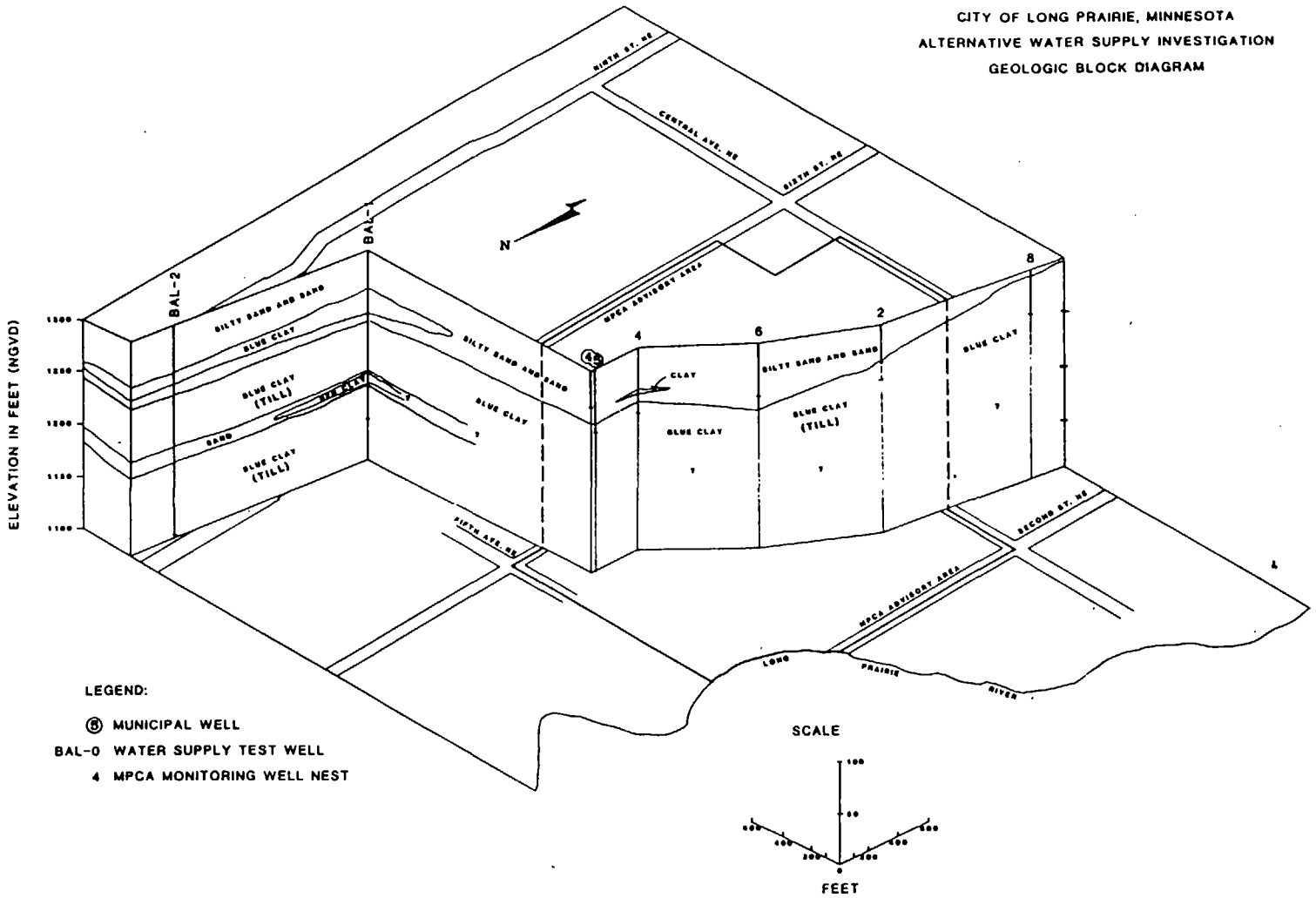
The organic contamination in the northeast portion of Long Prairie was initially identified in Wells 4 and 5 and subsequently in some residential wells which all are supplied by ground water in the shallow outwash deposits of the Des Moines Lobe Glaciation. The geologic block diagram (Figure 2) illustrates the configuration and relationship of the glacial units in the outwash deposits. The contaminated segments of the outwash deposits consist mainly of fine to medium grained silty sand and sand approximately 50 feet thick.

Logs of wells and soil borings in the area a indicate glacial till unit below the outwash sands at an approximate elevation of 1240 feet (NGVD). The till unit can be identified in the soil boring logs to the east of the contaminated areas (BAL-1, BAL-2, BAL-3) as well as in municipal well no. 5 and MPCA boring location 4 (Figure 3 - Monitoring Well/Production Well Location Map).

To the south of the contaminated areas (south of Central Avenue) till deposits are encountered from a depth of approximately seven feet to a depth of at least 43 feet. The shallow depth to the till suggest that the surface contact between the outwash deposits and the till lies to the east and south at slightly lighter elevations.

The test borings to the east of the contaminated area encountered sporadic sand deposits ranging from 1 to 13 feet in thickness below the blue till unit encountered at approximately 1240 feet (NGVD). Indications of continuity in

CITY OF LONG PRAIRIE, MINNESOTA
ALTERNATIVE WATER SUPPLY INVESTIGATION
GEOLOGIC BLOCK DIAGRAM



LEGEND:

- (5) MUNICIPAL WELL
- BAL-0 WATER SUPPLY TEST WELL
- 4 MPCA MONITORING WELL NEST

SCALE

FEET

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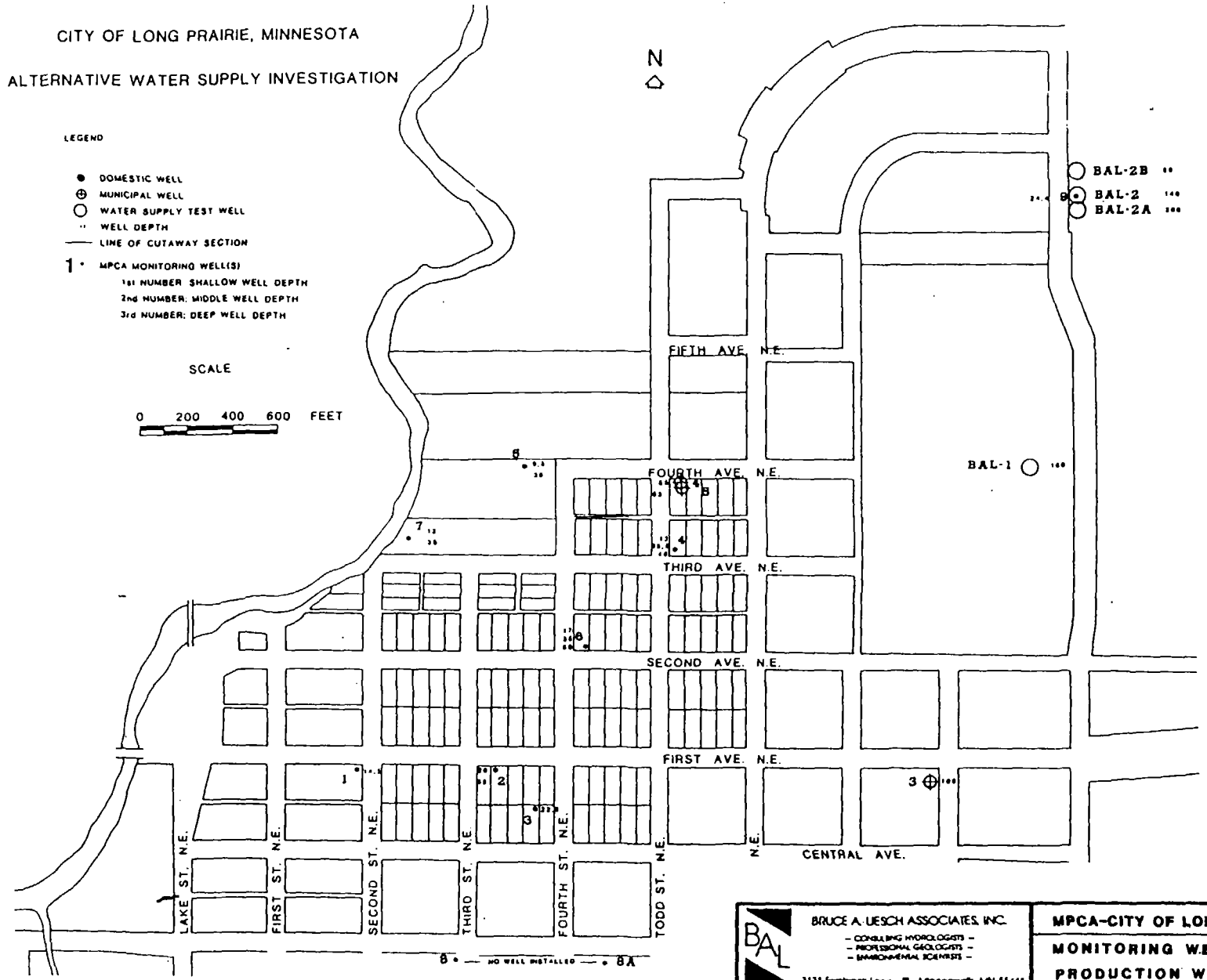
	GEOLOGIC BLOCK DIAGRAM	2

CITY OF LONG PRAIRIE, MINNESOTA

ALTERNATIVE WATER SUPPLY INVESTIGATION



1 of 3 remarks (dap)
see water level summary
177 mg June 84

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MONITORING WELL / PRODUCTION WELL LOCATION MAP

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the lower sand units is lacking. There is no information from the contaminated areas as to the geologic condition below the till units encountered at the elevation of 1240 feet (NGVD).

The glacial drift in the Long Prairie area is over 200 feet thick and overlies lower Precambrian metasedimentary rocks. The bedrock in the area does not represent a viable water supply source for municipal or domestic well development but rather acts as a barrier boundary to the movement of ground water.

Hydrologic Conditions:

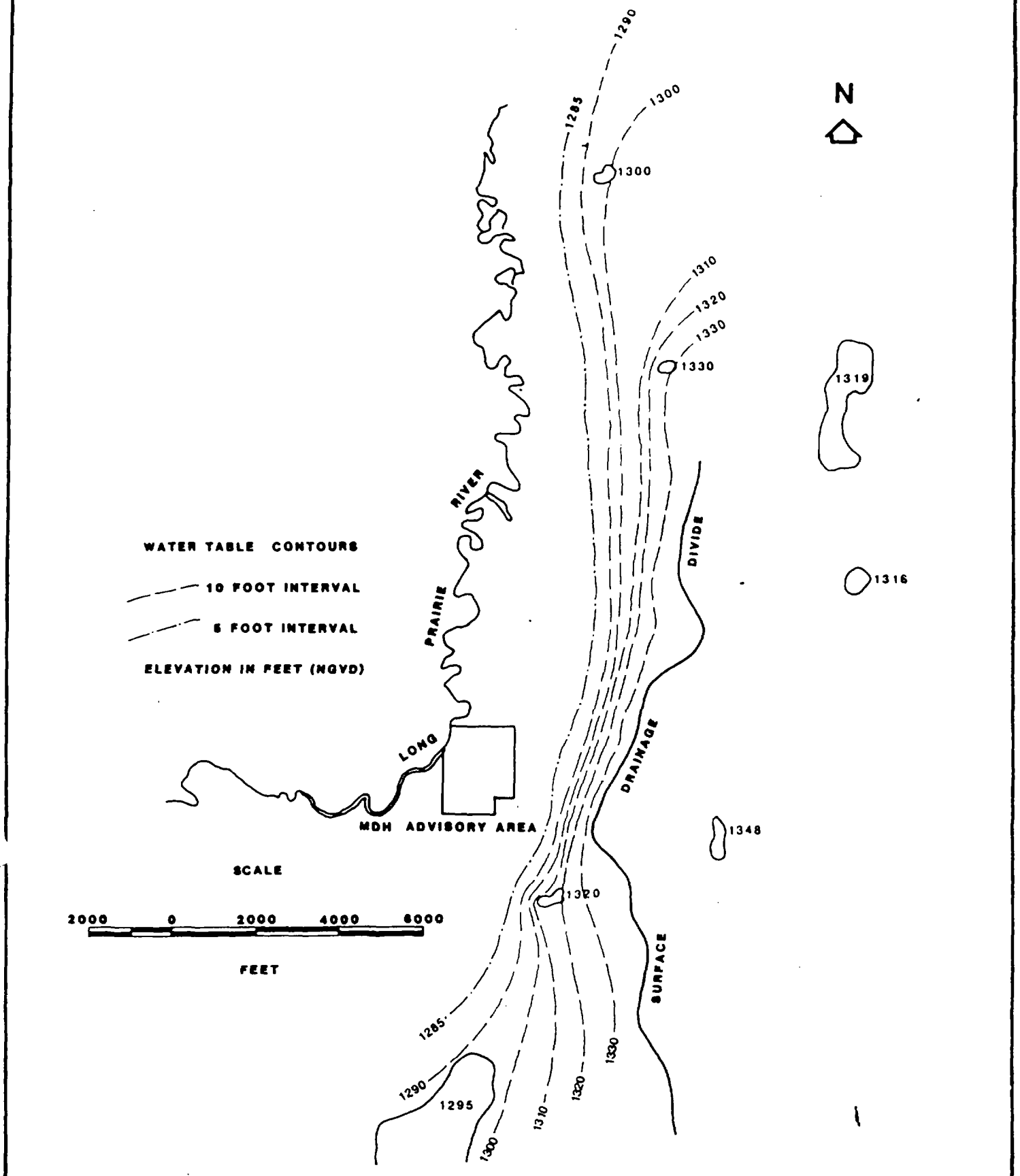
A review of the U.S.G.S. Hydrologic Atlas HA-380 and the topographic maps of the area indicates that the groundwater flow direction and the location of discharge areas are controlled by the Long Prairie River.

Mapping of the lake level elevations from the U.S.G.S. topographic sheets (Figure 4) illustrates the apparent ground water gradients associated with the upland areas east of Long Prairie.

Surface water runoff flows to the east and west away from a local watershed divide just east of Long Prairie. The groundwater gradients identified through the topographic review appear to follow the topographic expression of the land surface with a groundwater divide located along the surface water drainage divide.

The site specific ground water flow in the vicinity of the contaminated zone is defined by using ground water levels measured at the two-inch diameter water table wells installed by MPCA to monitor water quality and water levels. The MPCA under separate contract installed 15 wells at eight monitoring sites in the contaminated area. Two of the sites consisted of a three well nest with wells at the water table (10 -20 feet), at an intermediate level (35 feet) and at a deeper level (50 feet). Three of the sites consisted of a two well nest with wells at the water table and intermediate positions. The remaining well sites consisted of a single water table well. The well locations and water table contours are shown on Figure 5, Ground Water Contour Map.

The configuration of the contours suggest that Well No. 4 & 5 have developed a trough shaped ground water sink over years of pumping that interrupted the natural flow toward the River and caused ground water to flow into the influence of the wells from all directions. As a result, recharge to the aquifer to replace the water pumped from the wells may be derived from the River as well as from regional flow toward the River and local precipitation. The development of the sink around Wells 4 and 5 probably accounts for the configuration of the contaminant plume as a narrow band, as shown on the



Developed by Dr. H. O. Pfannkuch

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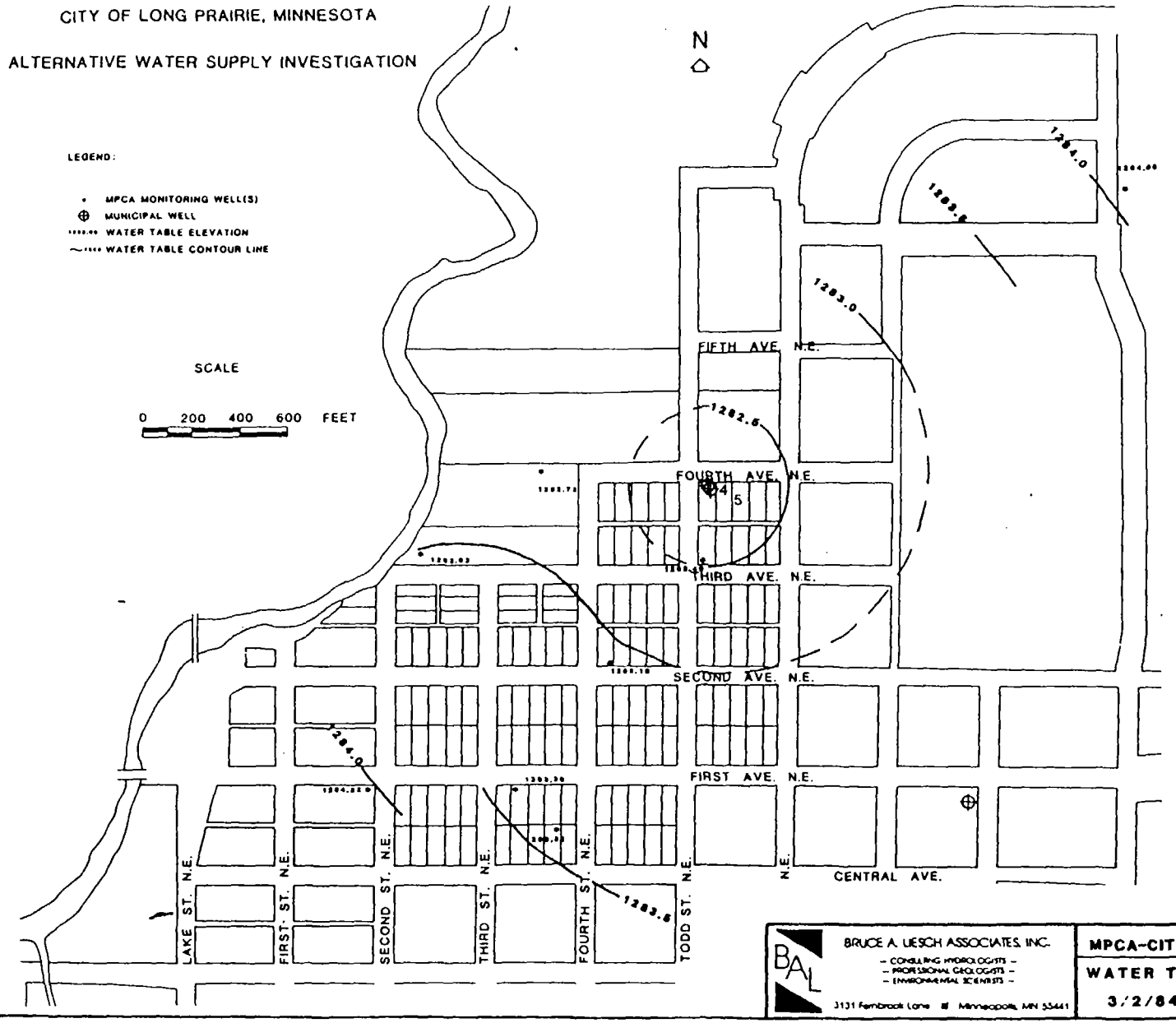
REGIONAL GROUNDWATER GRADIENT MAP | **4**

CITY OF LONG PRAIRIE, MINNESOTA

ALTERNATIVE WATER SUPPLY INVESTIGATION



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WATER TABLE CONTOUR MAP

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The development of the sink around Wells 4 and 5 probably accounts for the configuration of the contaminant plume as a narrow band, as shown on the water quality maps, rather than a broad plume migrating toward the River.

The water table depression in the vicinity of Wells 4 and 5 is most likely caused by the pumping at those wells along with the discharge from the private residential wells. Accordingly, the cessation of pumping at Wells 4 and 5 could cause a recovery of water levels and re-establishment of the groundwater flow direction and discharge to the Long Prairie River of greater quantities of ground water than while the wells are in use. Other reasons for the configuration of the contaminant plume could include geologic control such as:

The trough could be caused by an area of higher permeable material which focuses groundwater flow toward it.

Fine grained layers which confines groundwater flow and contaminant migration toward the Long Prairie River.

In the event that the groundwater depression is partially or totally induced by geologic factors then the cessation of pumping may have less of an effect on water levels than previously discussed. With the present level of information the actual cause of the groundwater trough and specific groundwater flow directions cannot be determined.

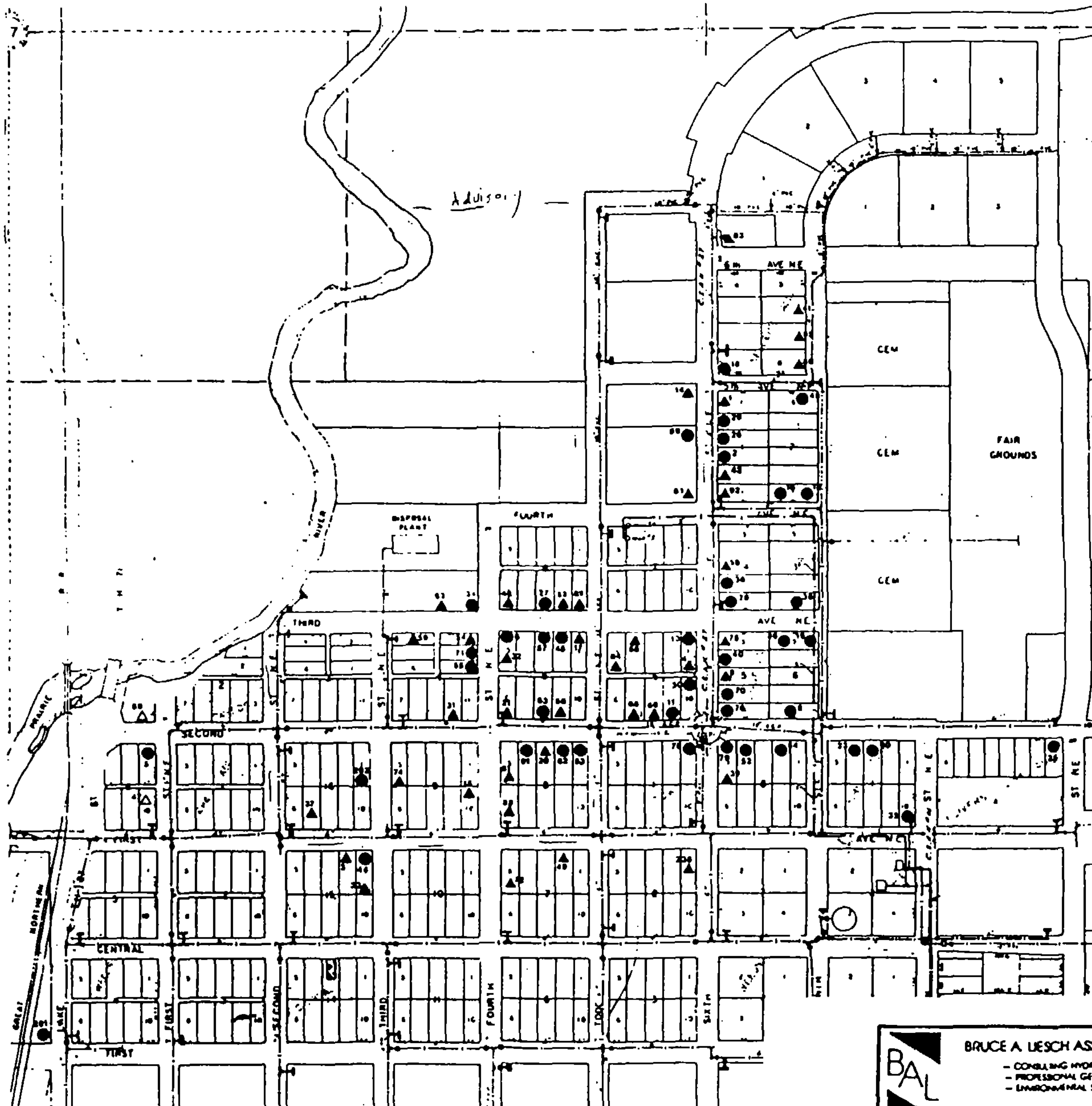
Area Domestic and Irrigation Ground Water Use:

The available water well information for the study area in Long Prairie was compiled and reviewed to determine the water use characteristics of the City. Information on domestic water use in the contaminated area was provided by the MPCA. This information included the location of households not connected to City water, well information from the well owner, and water quality information of samples collected by the MPCA. BAL reviewed the files of the Minnesota Geological Survey (MGS) and collected all geologic well logs and well information for the area in and around Long Prairie. BAL also reviewed the files of the Department of Natural Resources (DNR) to collect all available information on the irrigation wells of the area.

Well location maps of the study area domestic wells and of the area wells identified in the MGS and DNR files were presented in the City of Long Prairie - Alternative Water Supply Investigation - Deliverable Set No. 1 submitted to the MPCA on February 13, 1984. The maps have been updated and included in this report.

The Domestic Well Location Map - Contamination Area (Figure 6) shows all of the domestic water users in and near the contaminated area that do not have City water hook-ups. The information was provided by the MPCA with the household locations field checked by BAL personnel on February 8, 1984.

The map separates the households into three groups: The households not attached to the City system which have not been tested for organic contamination (solid circles), the households not attached to the system which have been tested for organic contamination and were found to be clean (solid triangles), and the households not attached to the City system which have been tested for organic contamination and have been found to be contaminated (open triangles). The identification numbers correspond to the identification numbers assigned by the MPCA.



● Domestic Wells - No water quality analysis

▲ Domestic Wells - With water quality analysis

△ Domestic Wells - With water quality analysis and <u>identified organics</u>

69 Well owner identification number

Base map from Larsen-Peterson Assoc., Inc.

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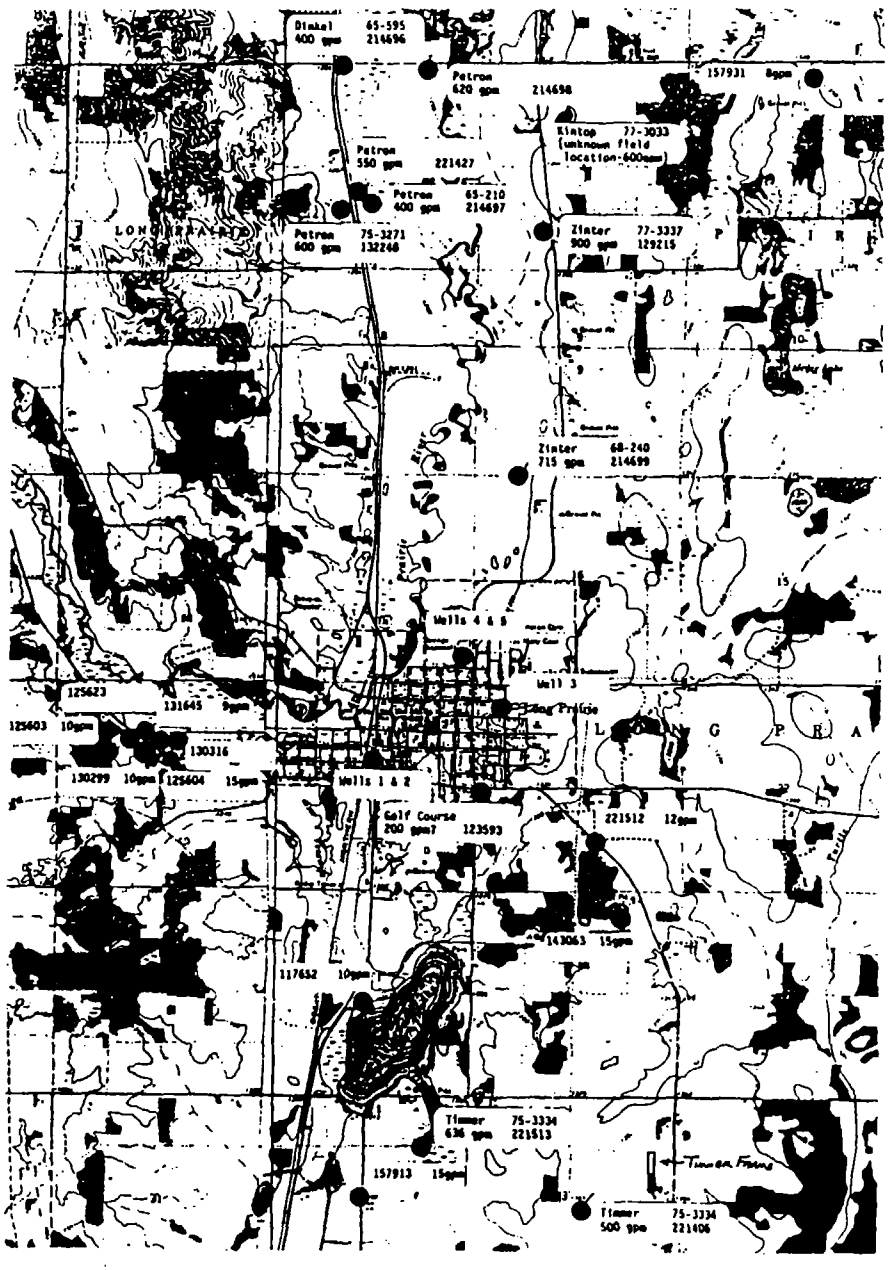
	DOMESTIC WELL LOCATION MAP – CONTAMINATED AREA	6

The Domestic and Irrigation Well Location Map (Figure 7) shows the location of the domestic and irrigation wells that are listed in the MGS and DNR files.

Well information presented on the map for the low capacity domestic wells is limited to the well identification number and the well yield. Information on the high capacity irrigation wells consists of the well owner, the well identification number, the DNR appropriations permit number, and the reported well yield. A list of the irrigation well characteristics and the Geologic Well Logs from the MGS files are provided in Appendix A.



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LEGEND

HIGH CAPACITY IRRIGATION WELLS

Well owner	DNR permit no.
Petron 600 gpm	75-3271 132248

Recorded well yield — MGS well log unique number

DOMESTIC WELLS

MGS well log unique number	Reported well yield
125604	10gpm

SCALE

CONTOUR INTERVAL 10 FEET

DATA BASE:

- MGS well log files
- DNR appropriations permit files

Base From U.S.G.S. Quadrangles

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Mobility of Organic Contaminants:

The mobility of the organic contaminants identified in the ground water at Long Prairie, Minnesota is dependent on many factors including the physical and chemical characteristics of the fluid as well as the hydrogeologic conditions in the study area. The fluid characteristics that can affect the migration of contaminants include density, viscosity, solubility, surface tension, and polarity (Schwille, 1981). The hydrogeologic condition that can effect contaminant migration include permeability, hydraulic gradient, hydraulic barriers, recharge boundaries and artificial alterations to the natural flow field (ie. pumping wells, tile systems).

The most important physical characteristics of the three hydrocarbons identified in Long Prairie are density and solubility in water.

The densities of the chlorinated hydrocarbons were abstracted from Handbook of Chemistry and Physics (1970). The solubilities of the hydrocarbons were taken from Schwille (1981) and Horvath (1982).

TABLE 1

DENSITY AND SOLUBILITY CHARACTERISTICS
OF THE CHLORINATED HYDROCARBONS IDENTIFIED IN
LONG PRAIRIE, MINNESOTA

Hydrocarbon	Density at 20°C. (g/ml)	Solubility at 10° C. (mg/kg)*	(wt. %)**
cis-1.2-Dichloroethylene	1.2837	-	.4000
Trichloroethylene	1.4642	1070	.1061
Tetrachloroethylene	1.6227	160	.01488
Water	1.0000	-	-

* Schwille, 1981

** Horvath, 1982

The foregoing physical characteristics of the hydrocarbons indicate that the hydrocarbons are heavier than water and as such should descend through a water column. This suggests that the hydrocarbon could sink to and be retained or retarded by a lower permeable bed. An illustration of this type of flow was presented by Schwille (1981) and is reproduced as Figure 8. As the illustration suggests, hydrocarbons sink to a lower permeability zone which either impedes or retards any further downward migration. These conditions lead to a situation where the heavier hydrocarbons could move down slope along a geologic boundary, against the natural groundwater gradient.

The solubility information indicates that the solubility of the identified hydrocarbons ranges from approximately .01-.1% to .4% to .8% solubility by weight. This does not appear to indicate that the hydrocarbons are very soluble, but in a groundwater flow field the identified concentration could easily be attained from the dissolution of a slug of contaminant.

It is unknown at present whether any free phase hydrocarbon is still present in the area.

The most significant unknown to the mobility of the organics in the Long Prairie flow field is the variation in the subsurface deposits of the area. The density contrasts between the organics and the ground water could account for the highest concentrations of the organics observed in the intermediate depth monitoring wells in the MPCA network. A lower permeability unit below the intermediate depth wells (silty sand vs. sand) may represent a boundary that alters the rate of vertical migration of the organics.

The data appear to support this concept in that the highest contaminant levels are observed in the intermediate well depths at MPCA Sites No. 2 and 6 which are open to the sand unit which overlays a silty sand unit. The lower organic levels observed in the intermediate well at MPCA Site No. 4 may be caused by the location of the well, which is finished in the silty sand and is not open to the overlying sand deposits. Figure 9 shows a cross section through the MPCA multiple Well nests No. 2, 4 and 6 and municipal Wells No. 4 and 5. As the illustration shows, the highest concentration of

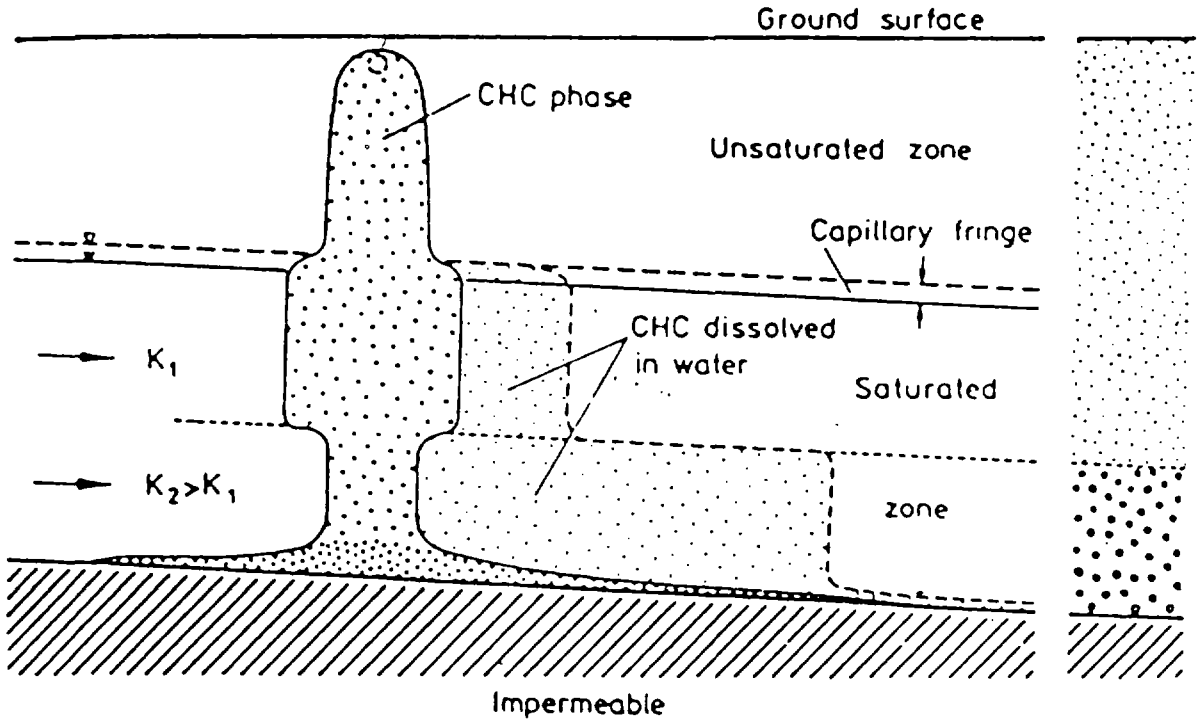

Fig. 4. Chlorohydrocarbon migration pattern

DIAGRAM FROM SCHWILLE (1981)

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	CONCEPTUAL MODEL OF CHLOROHYDROCARBON MIGRATION	**8**

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- PROFESSIONAL GEOLOGISTS -
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HYDROGEOLOGIC CROSS SECTION
THROUGH CONTAMINANT PLUME
9
MAR 84
SCREENED PORTIONS OF WELL OR WELL NEST WITH CONCENTRATION OF TETRACHLOROETHYLENE IN ug/l
WELL NEST 2
WELL NEST 6
WELL NEST 4
WELL 5
WELL 4
ELEVATION IN FEET (NGVD)
1300
1280
1270
1265
1260
1250
1240
160
1200
520
1200
330
1100
210
20
230
88
SAND
SILTY SAND
TILL

tetrachloroethylene are observed in the wells open to the sands at an elevation of approximately 1250 feet. The other hydrocarbons tested also show this same trend.

Owing to the paucity of data points in the intermediate and deeper well positions, the theory to the migration of hydrocarbons in the Long Prairie area is only speculation.

Area Organic Contaminant Concentration Maps

Tne MPCA has collected and tested numerous water samples from the domestic wells from the contaminated area in Long Prairie. The tests were used to delineate the area of contamination and to determine which domestic water supplies were safe to use and which should not be used.

Three organic constituents were present in the majority of the wells that showed signs of contamination. . The constituents are Cis-1, 2-Dichloroethylene, Trichloroethylene (TCE), and 1,1,2, 2-Tetrachloroethylene. The Environmental Protection Agency (EPA) has developed recommended limit criteria for maximum human consumption for TCE and tetrachloroethylene. No human health criteria have been developed for dichloroethylene owing to insufficient data.

Both TCE and tetrachloroethylene are listed as carcinogenic and thus have a recommended zero concentration for the maximum protection of human health (EPA, 1980). To assess the degree of risk to a population, the EPA has developed a range of risks to a population associated with certain concentrations in water. The 10^{-5} risk (1 additional case of cancer in a population of 100,000) for the identified contaminants are presented below (Sittig, 1981).

Hydrocarbon	10^{-5} Risk
Dichloroethylene	No criteria developed
Trichloroethylene	27 (ug/l)*
Tetrachloroethylene	8 (ug/l)*

*ug/l = parts per billion

Concentration gradient maps for the three contaminants are shown on Figures 10 - 12. All show a relatively narrow band of contaminants trending southwest-northeast.

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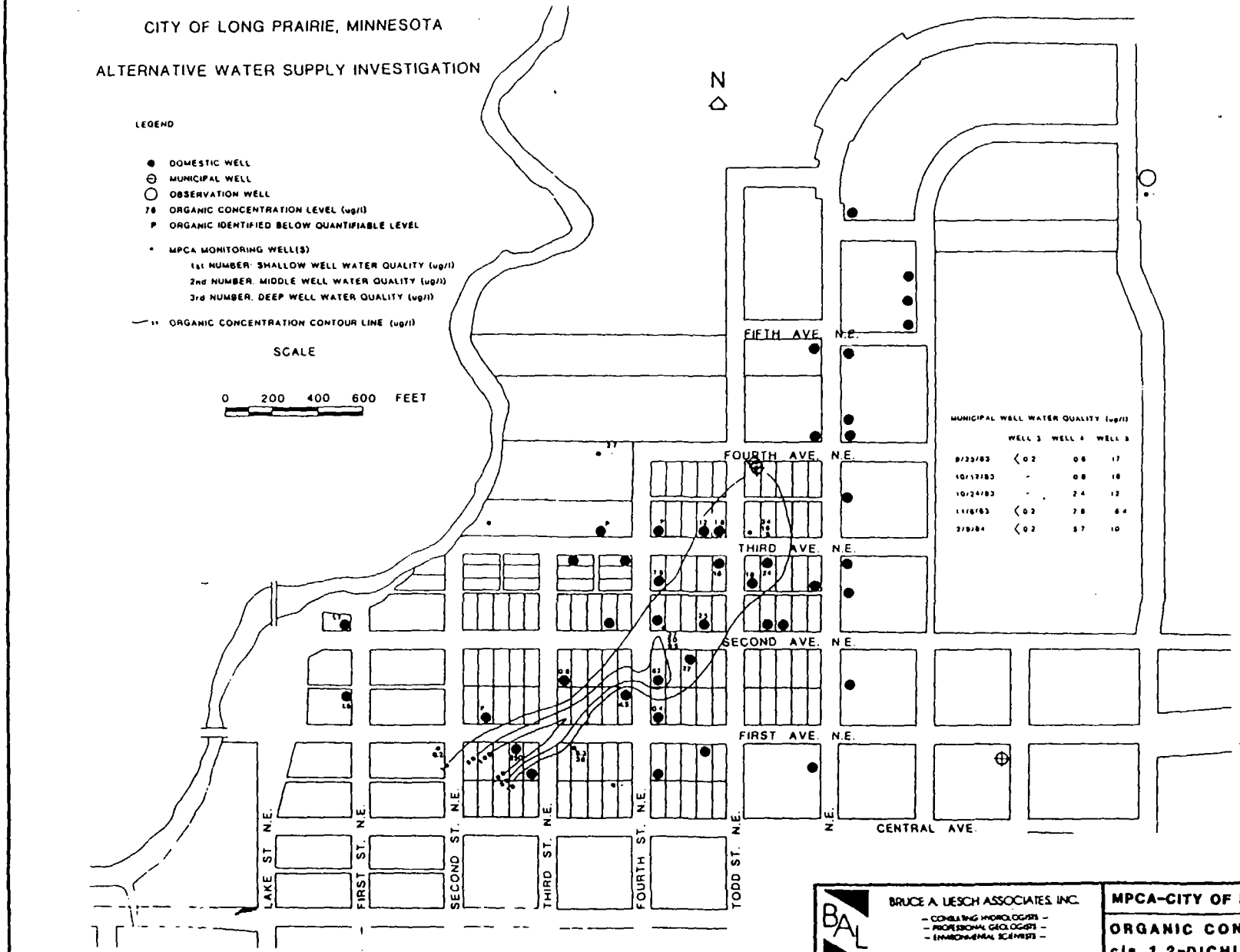

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ORGANIC CONCENTRATIONS
cis 1,2-DICHLOROETHYLENE

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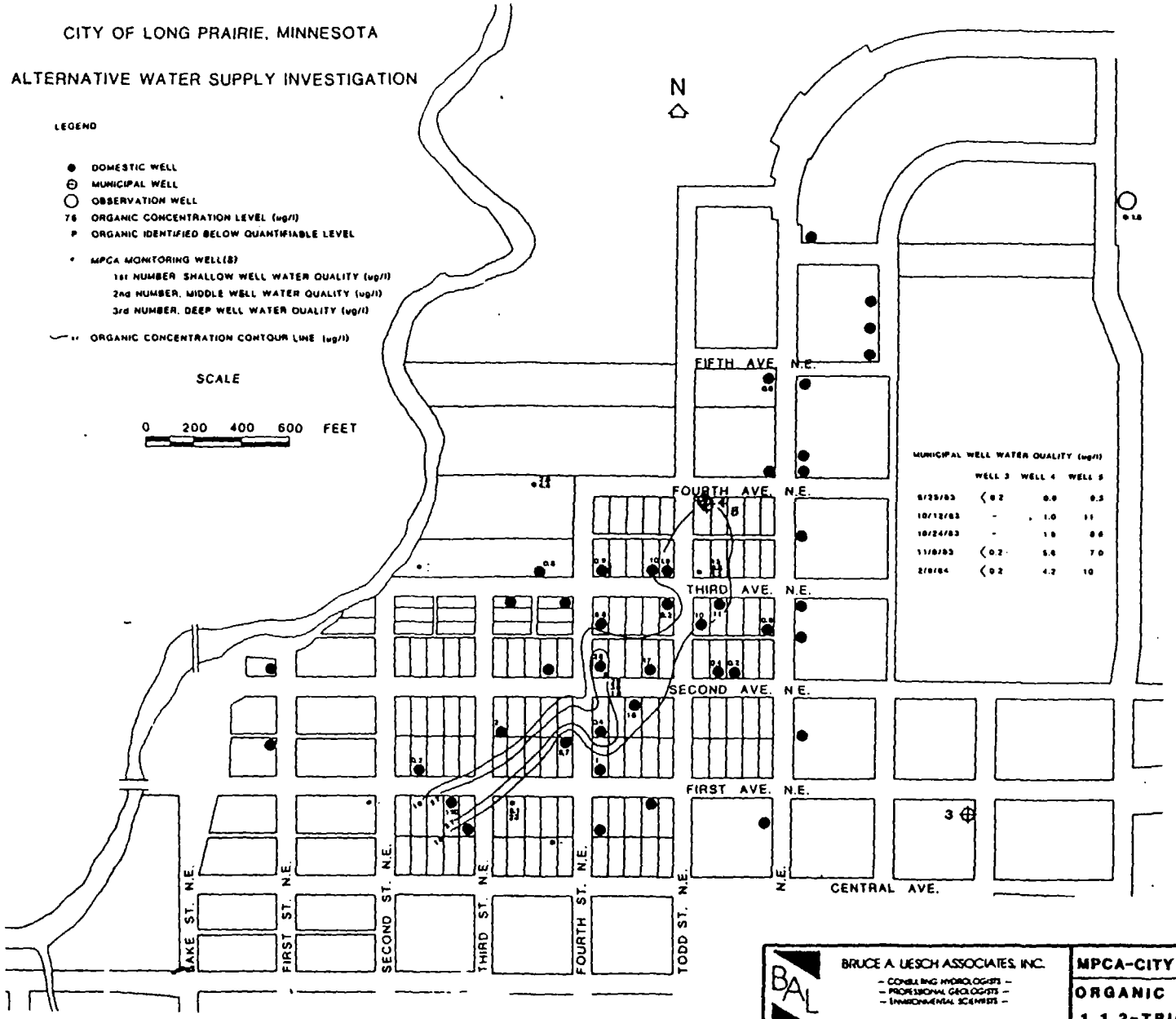
ALTERNATIVE WATER SUPPLY INVESTIGATION



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ORGANIC CONCENTRATIONS
1,1,2-TRICHLOROETHYLENE

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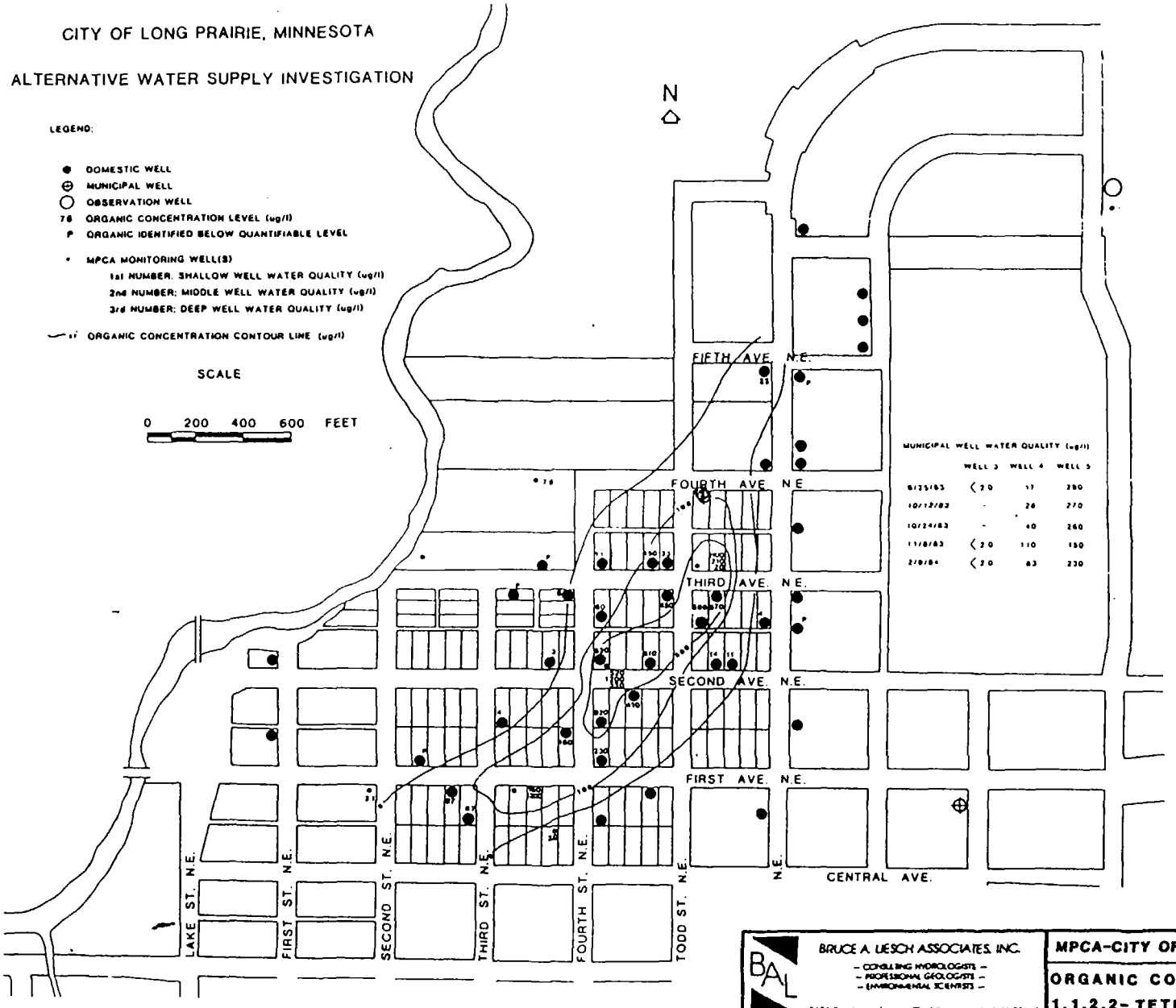
ALTERNATIVE WATER SUPPLY INVESTIGATION



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ORGANIC CONCENTRATIONS
1,1,2,2- TETRACHLOROETHYLENE

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It appears that the organic contaminants are moving toward the ground water depression discussed in the area hydrology section. This would suggest that the source of the contamination is southwest of Wells No. 4 and 5. The actual source of the contamination is unknown at present.

Task 8 Rating of Alternatives

BAL and LPA conducted a review of all potential alternatives to solve the Long Prairie water supply problem under Task 5 of the contract. During this review BAL and LPA identified all of the potential alternatives that were technically feasible and recommended four alternatives for additional investigation. The alternatives selected for further study were:

-Treatment of Contaminated Groundwater
-Installation of Well No. 6
-Hook-up to Existing Irrigation Wells
-Well Redevelopment

TREATMENT OF CONTAMINATED GROUNDWATER

FEASIBILITY: The feasibility of treatment of the water supply at Long Prairie as a short term solution to contamination by chlorinated solvents (tetrachloroethylene, trichloroethylene, dichloroethylene, and chloroform) is good. Either activated carbon treatment or air stripping in packed-bed, countercurrent columns separately, or in tandem, should provide excellent removal of these chemicals. From influent concentrations as high as 600 ug/l one could expect effluent quality $\leq$ 2.0 ug/l, well below drinking water criteria of 8.0 ug/l for tetrachloroethylene.

The treatment of contaminated ground water represents a short term solution and not a long term solution to the problem.

SUITABILITY OF ALTERNATIVE:

Air Stripping: Air stripping does not appear to be a suitable alternative for the treatment of the contaminated ground water in Long Prairie owing to the unavailability of lease/rental units. Of the three vendors surveyed during this study only one (Calgon) recommended air stripping. Calgon indicated that the air stripping units could only be purchased and were not available for lease.

Technically, air stripping with activated-carbon polishing is a suitable treatment alternative. The reason that air stripping works well for these trace organics is because they are quite volatile, with Henry's Law Constants in the range from 0.1 - 2.0 (mg/l air)/(mg/l water). Rates of gas transfer of these compounds from water to air are sufficiently rapid in packed-bed columns. Feasibility of air stripping has been demonstrated in a number of applications including: landfill leachate, wastewater treatment plants, aquifer reclamation, and for treatment of contaminated water supplies.

If a vendor proposed to use air stripping with activated carbon polishing and had units available for lease/rental, then air stripping would be a viable alternative.

Carbon Treatment: Carbon treatment represents a viable alternative to the treatment of the contaminated ground water in Long Prairie. All of the firms surveyed developed treatment plans and preliminary cost estimates for carbon treatment. The systems ranged from gravity fed carbon treatment with pre-treatment for iron and manganese to pressurized activated carbon systems.

Granular activated carbon treatment works well for removal of trace organics because they are rather hydrophobic, that is, they favor a more organic matrix (like activated carbon) than the polar water solution. While the capacity of activated carbon adsorption for these chemicals is not large (x/m of 0.001 - 0.010 gm chemical per gm carbon at these influent concentrations), it is sufficient to ensure a high quality effluent with consistent performance. It is because of the consistent effluent produced from activated carbon treatment that activated carbon should be considered as the preferred treatment strategy or as a polishing unit following air stripping. Activated carbon treatment has been demonstrated recently as effective treatment methods at New Brighton, Minnesota and Denver, Colorado.

COST: Cost and proposed designs were collected from three firms specializing in the emergency treatment of contaminated water. Each firm was provided the same background information and requested to provide estimates of mobilization and demobilization costs, lease/rental rates, carbon costs, and operating costs. The background information provided to the treatment firms is as follows:

	Concentration (ppb)	Criteria (ppb)
cis-1,2-dichloroethylene	6 to 8	-
1,1,2-trichloroethylene	6 to 7	27
1,1,2,2-tetrachloroethylene	100 to 280	8
chloroform	1 to 5	1.9

Iron concentration: 2 ppm
Manganese concentration: 0.2 ppm
Treatment volume: 300 gpm
Set-up: Must be pre-treatment plant

The proposed plans and projected costs are provided below. Each responding firm would incur similar installation costs to hook-up their system to the Long Prairie distribution system.

-Anticipated cost to hook-up to transmission line from well 4 & 5 to treatment plant no. 2	$6,000.00
-Anticipated costs of electrical drops for treatment system operation	$2,000.00
	$8,000.00

It is anticipated that it would take less than 1 week to provide access to the transmission line and the power drops.

CARBON SERVICES

The proposed system from Carbon Services consists of 2 gravity sand filters operating at 200 gpm each followed by 2 gravity carbon filters also operating at 200 gpm. The influent water would be aerated with a compressor to precipitate the iron and manganese from solution. Filtration through the gravity sand filters should bring the iron and manganese levels below the water quality criteria of 0.3 mg/l iron and 0.05 mg/l manganese. Lift pumps from the sand filters would lift the effluent into the carbon filters for organic removal. The effluent from the carbon filter system could bypass the water treatment plant and be pumped directly into distribution.

Maintenance of the system would consist of backwashing the sand filters approximately every 3 days to remove the iron and manganese precipitates.

The projected costs to operate the system for 3 month and 9 month periods are shown below.

Unit Costs

Mobilization:	Sand filter:	$3,000.00/unit/month
	Carbon filter:	$3,000.00/unit/month
Demobilization:	Sand filter:	$2,000.00/unit/month
	Carbon filter:	$2,000.00/unit/month
Lease Cost:	Sand filter:	$3,000.00/unit/month
	Carbon filter:	$3,000.00/unit/month
Carbon Costs		$0.60/lb.
Projected Electrical Costs		$25.00/day

Projected costs for 3 months of operation:

Mobilization:	$12,000.00
Demobilization:	$8,000.00
Lease:	$12,000.00
Carbon (9000 lbs.):	$5,400.00
Electric Costs:	$2,250.00
	$39,650.00

Projected costs for 9 months of operation:

Mobilization:	$12,000.00
Demobilization:	$8,000.00
Lease:	$36,000.00
Carbon (27000 lbs.):	$16,200.00
Electric Costs:	$6,750.00
	$78,950.00

O.H. MATERIALS

The system proposed by O.H. Materials consists of 2 pressure sand filters operating at 150 gpm each followed by 3 pressure activated carbon filters operating at 100 gpm each. The sand filters would be operated to remove any fine materials prior to carbon treatment. With the system under pressure, the majority of iron and manganese should stay in solution through the system. The effluent from the sand/carbon treatment would flow into treatment plant no. 2 for iron and manganese removal.

Maintenance of the system would consist of backwashing the units to clean the carbon and sand filters. The frequency of backwashing required is undetermined at present.

The projected costs to operate the system for 3 month and 9 month periods is presented below:

Unit Costs

Mobilization-Demobilization:	$10,000.00
Lease costs:	
First 90 Days:	$800.00/day
Following 180 Days	$450.00/day
Carbon costs:	$1.00/lb.
Electrical Costs:	$25.00/day

Projected costs for 3 months of operation:

Mobilization-Demobilization:	$10,000.00
Lease:	$72,000.00
Carbon (13500 lbs.):	$13,500.00
Electrical costs:	$2,250.00
	$97,750.00

Projected costs for 9 months of operation:

Mobilization-Demobilization:	$10,000.00
Lease:	$153,000.00
Carbon (40500 lbs.):	$40,500.00
Electrical Costs:	$6,750.00
Carbon Disposal:	N/A
	$210,250.00

O.H. Materials indicated that the costs presented above represent very conservative cost estimates and that discounts and refinements could decrease the actual cost.

CALGON

The proposed system from Calgon consists of a single pressurized carbon treatment unit. The unit is approximately 10-feet in diameter and 10 feet high. With the system under pressure the majority of the iron and manganese should stay in solution. A lift pump would feed the system with a lift equal to the head loss through the system.

The system would need to be set on concrete footings or railroad ties. The system does not require backwashing.

The projected costs to operate the system for three months and nine months periods are presented below:

Unit Costs

Mobilization, set-up, supervision, 1 load carbon, 1st months lease	$31,000.00-$33,000.00
Teardown - Refurbishing	$14,000.00
Lease Cost:	$1,600.00/month
Carbon Costs: (1 truckload should last 4 to 5 months @ 300 ppb tetrachloroethylene)	$21,000/truck
Electrical Costs:	$10.00/day
Lift Pump Rental	$10.00/day

Projected Costs for Three Months of Operation:

Mobilization - 1st months lease	$31,000.00-$33,000.00
Lease	$ 3,200.00
Lift Pump Rental	$ 900.00
Teardown	$14,000.00
Electrical Costs	$ 900.00
	$50,000.00-$52,000.00

Projected Costs for Nine Months of Operation:

Mobilization - 1st months lease	$31,000.00-$33,000.00
Lease	$12,800.00
Lift Pump Rental	$ 2,700.00
Carbon	$21,000.00
Teardown	$14,000.00
Electrical Costs	$ 2,700.00
	$84,200.00-$86,200.00

These costs do not include the rental of a crane to remove treatment unit from flatbed trailer.

TABLE 2

CARBON TREATMENT COST CHART

	3 Months of Operation	9 Months of Operation
Carbon Services	$39,650.00	$78,950.00
Calgon	$50,000.00-$52,000.00	$84,800.00-$86,200.00
OH Materials	$97,750.00	$210,250.00

PERMANENT SOLUTION: Treatment of the contaminated groundwater does not represent a long term solution to the water supply needs of the City. Treatment of contaminated groundwater represent a short term solution to the problem which can provide water to the system until a new water supply source is established.

EFFECT ON PLUME: The continued pumping of Wells 4 and 5 would most likely continue to draw contaminated groundwater from the most highly concentrated areas southwest of the wells. It is anticipated that with continued pumping the levels of contaminants in the pumped water would increase.

SCHEDULING: All three firms specialize in the emergency treatment of groundwater. It is anticipated that systems could be installed and operating within two weeks of contract implementation.

WELL NO. 6 INSTALLATION

FEASIBILITY: Well 6 could provide up to 500 gpm on a continuous basis to water treatment plant No. 2. To meet peak demands Well No. 6 could provide up to 660,000 gpd (assuming 22 hours of pumping per day). This represents 64% of the peak demand of 1983. The preliminary work has been completed with regards to well location and potential yield (BAL report of 1983).

Test results from a pumping test at Well No. 3 on February 20, 1984 indicated that at a distance of less than 1500 feet there was no drawdown influence observed from the pumping of Well 3 at 300 gpm. This would suggest that the operation of Well No. 6 would not cause appreciable drawdown in the area of Wells 4 & 5 and thus could represent a suitable water supply source. The testing of Well No. 6 following its installation could confirm this hypothesis. The use of Well No. 6 as a new municipal water source is dependent on MDH approval.

An analysis of pumping conditions at an assumed well at Site No. 6 was conducted by Dr. H.O. Pfannkuch using procedures outlined by Bear (1979). The analytical procedures identified the theoretical stagnation point of a cone of depression down gradient from a pumping well. Dr. Pfannkuch used hydraulic coefficients from the 1983 BAL testing procedures at Site No. 6 and the identified ground water gradients of the area. Dr. Pfannkuch's analysis identified a radius to stagnation point of less than 1500 feet which agrees with the testing procedures at Well #3.

At present, all indications are that Well Site No. 6 may represent a suitable location for municipal well development.

SUITABILITY OF ALTERNATIVE: The development of additional wells in Long Prairie represent a viable solution to the long term water needs of the city. Well 6 could provide a usable water supply as long as the water quality of the well remained above safe drinking water standards. It appears that Well 6 represents a safer water supply than that provided at Well 3 owing to the relative distances of the wells from the contaminant plume.

COST: The following cost estimates were developed by Larson-Peterson Associates, Inc. and were presented in their December 1983 report titled Preliminary Engineering Report for Emergency Water System Improvements, Long Prairie, Minnesota.

Construction and testing of Well 6:	$14,455.00
*Pump rental for summer operation:	$ 2,400.00
Well pump:	$ 8,000.00
Well house and accessories:	$36,000.00
Construction contingency:	$ 2,925.00
Engineering, Legal and Fiscal:	$ 9,200.00
*Observe and Analyze pumping test:	$ 3,000.00
	$75,980.00

Transmission Line Construction

Construction costs:	$41,037.50
Engineering, Legal and Fiscal:	$ 6,162.50
	$47,200.00

* Costs developed by BAL

PERMANENT SOLUTION: The development of Well 6 represents a possible long term solution to the groundwater problems of Long Prairie. Well 6 could provide water to the City for as long as the well remains clean. Further testing as part of this study will identify the potential for the contamination of Well 6 from the identified plume. At present, Well 6 could provide the city with an additional water source. This water source would appear to be a safer supply than that provided by Well 3 as indicated by the distances to the contaminant plume. Well 6 would also represent a new, clean well which is at least 40 years newer than Wells 1 through 3.

EFFECT ON PLUME: Unknown until further testing. Preliminary results from the pumping test at Well No. 3 and analysis conducted by Dr. Pfannkuch suggest that Well 6 should have little observable drawdown interference in the identified area of the contaminant plume.

The ceasation of pumping at Wells 4 and 5, which would be part of this alternative, should cause water levels in the watertable aquifer to recover to their natural pumping condition

SCHEDULING: Well No. 6 could be drilled and developed within two weeks of issuance of a contract. Construction of the water main to feed water plant No. 2 could be completed in 20 working days. Construction of a pump house could delay use of the well for up to one month. To decrease the time frame of pumping, a submersible pump could be rented and installed for a six month period to provide water during the peak demand season. When demand declines a pump house could be installed with a line shaft turbine pump. It is anticipated that within two months of the issuance of a contract, Well 6 could be providing water to the water treatment plant No. 2. It is anticipated that Well 6 could provide water to treatment plant 2 by July 1, 1984.

HOOK-UP TO IRRIGATION WELLS

The preliminary alternative evaluation identified irrigation well owners who were interested in discussing access agreements to their irrigation wells for use during the summer of 1984. As part of the Task 7 Analysis, LPA visited Long Prairie and field inspected the well sites and reviewed the area for transmission line installation.

LPA concluded that above ground transmission line would be difficult to install, maintain, and secure. With the other feasible alternatives available to Long Prairie, LPA concluded that the use of irrigation wells would not represent a viable alternative to provide water to the City of Long Prairie.

REDEVELOPMENT OF WELL NO. 1

Redevelopment of Well No. 1 does not appear to be a viable alternative under this contract. Redevelopment of Well No. 1 could provide additional water to treatment plan No. 1 which could relieve some of the stress off Well No. 2 but this increase in yield would not represent a real increase in available water to the system.

Task 9 Recommendations

The work team of Bruce A. Liesch Associates, Inc. and Larson-Peterson Associates, Inc. propose the following recommendations to meet the short term and long term water supply needs of the City of Long Prairie. The proposed solution consists of short term treatment of contaminated groundwater until a permanent, new water supply source can be identified, constructed, tested, and approved for use by the Minnesota Department of Health.

The recommended system and projected costs for the recommendations are provided below. These costs were calculated by the individual treatment firms and represent their best estimate of the costs of operating the system each proposed. The results of our investigation indicates that the most technically suitable and cost competitive means of treating the groundwater for Wells 4 & 5 is through carbon treatment. Dr. Jerald Schnoor has further indicated that carbon treatment will provide the most consistent effluent quality, even with changing influent water quality.

Proposed Recommendation:

-Short term solution: The only short term solution that can provide additional water to the system to meet peak water use demands of 1984 is the treatment of the contaminated ground water at Wells No. 4 and 5. The proposed treatment system would consist of activated carbon treatment of up to 300 gpm of water from Wells 4 and 5.

A schematic of the proposed system is shown in Figure 13. The system would consist of an activated carbon treatment unit which would treat the contaminated ground water prior to water treatment plant 2. The system would be installed either at Wells 4 and 5 or at the treatment plant. Effluent from the carbon treatment system would be treated at treatment plant no. 2 for iron and manganese removal or placed directly into distribution dependent on the treatment system design.

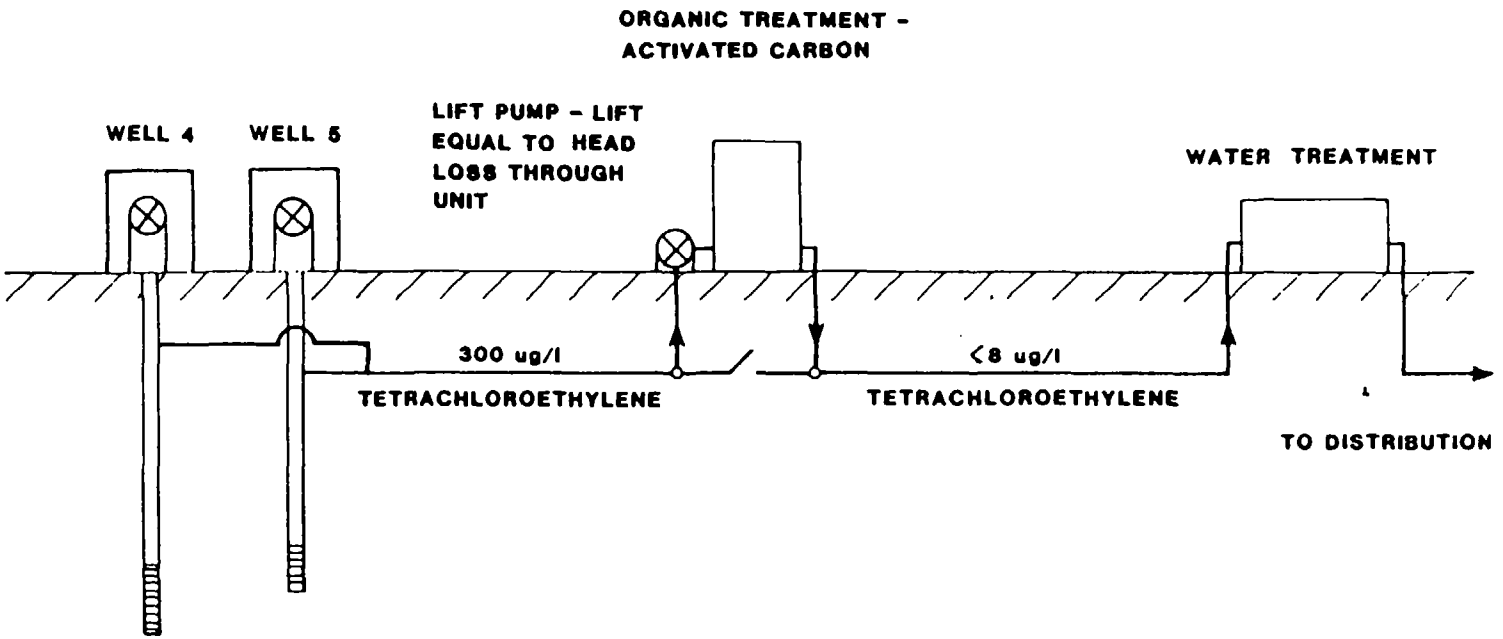
BRUCE A. UESCH ASSOCIATES, INC.
- CONSULTING HYDROLOGISTS -
- PROFESSIONAL GEOLOGISTS -
- ENVIRONMENTAL SCIENTISTS -
3131 Fernbrook Lane ■ Minneapolis, MN 55441

MPCA-CITY OF LONG PRAIRIE

CONCEPTUAL DESIGN -
ACTIVATED CARBON TREATMENT

13

MAR 84



The treatment alternative would be installed no later than June 1, 1984 and would operate until an alternate water supply is located, developed, tested and approved by the MDH.

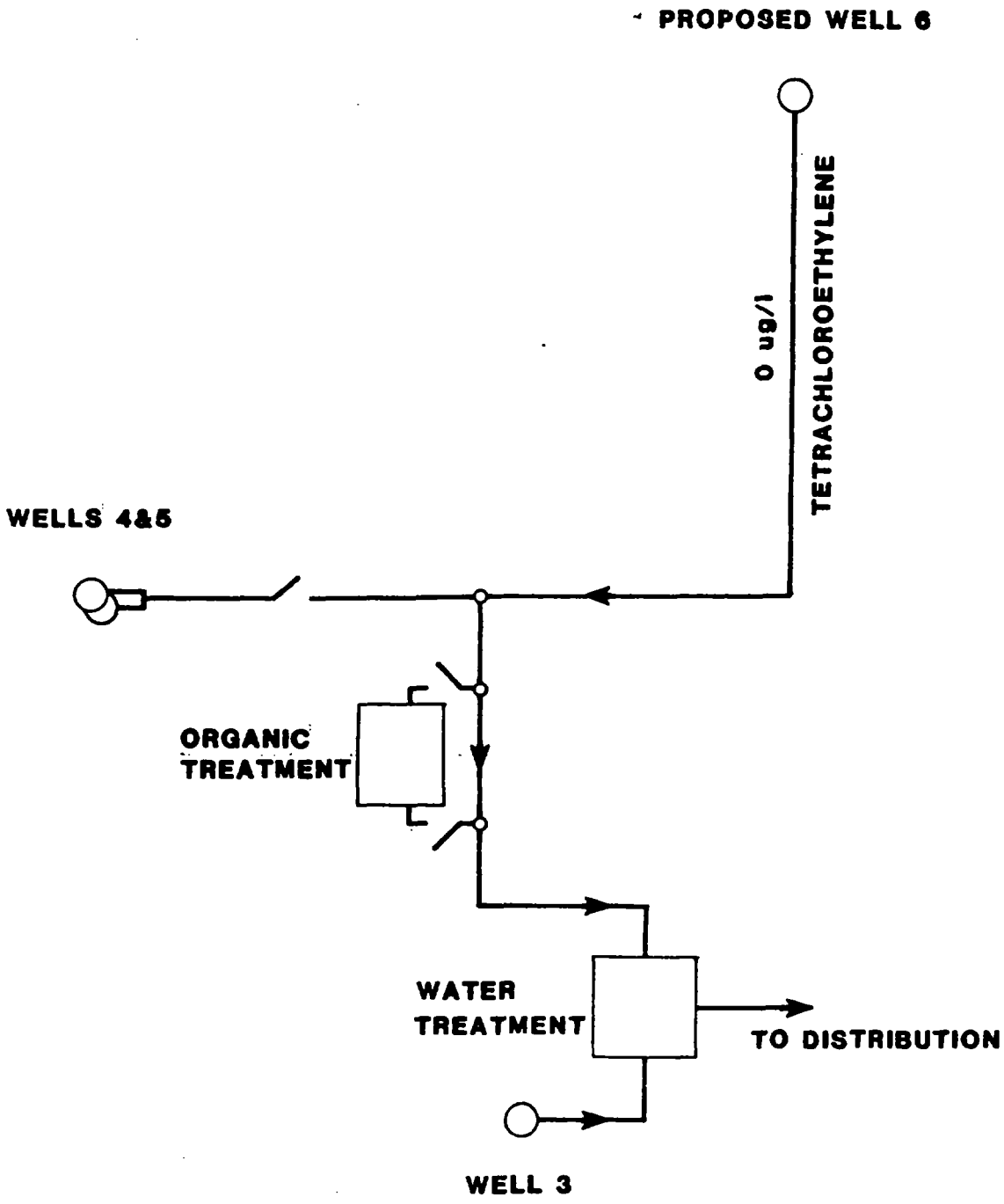
-Long term solution: The most cost effective and technically feasible long term solution is the development of (an) alternative water supply source(s). This consists of the location and development of (a) new well site(s) in Long Prairie. Two alternatives are available for the siting of new water supply wells, those being the development and testing of the Well No. 6 site and the exploration for new test well sites in areas distant form the identified contaminant plume.

Phase I: Well Construction and Testing Procedures at Well Site No. 6

The installation of Well No. 6 as a test production well is the first phase of an alternate water supply source investigation. Well 6 would be installed and tested to determine the suitability of the well site as a municipal water supply source.

It is anticipated that the well could be installed within 20 days of the issuance of a contract. Upon completion of the well, a pumping test of not less than 72 hours would be conducted to determine aquifer characteristics and areas of influence, and to detect possible water quality changes. An analysis of the data generated during the test will provide the information needed to determine site suitability.

If the testing procedure results indicate that Well No. 6 could produce uncontaminated water at an economic advantage over treatment, then well house and transmission line construction could commence. The system could be on line and ready for use no later than August 1, 1984 and could be on line as early as July 1, 1984. Once Well No. 6 is on line and producing water to the system, treatment of water for Wells 4 & 5 could be discontinued. The Schematic shown on Figure 14 illustrates this concept.



BRUCE A. LIESCH ASSOCIATES, INC. – CONSULTING HYDROLOGISTS – – PROFESSIONAL GEOLOGISTS – – ENVIRONMENTAL SCIENTISTS – 3131 Fernbrook Lane ■ Minneapolis, MN 55441	MPCA-CITY OF LONG PRAIRIE	MAR 84
	CONCEPTUAL DESIGN – WELL 6 INSTALLATION	14

Phase II: Investigation to Site and Develop a New Well Site

If the results of the testing procedures indicate that Well No. 6 is located in an unsuitable area, new proposed well sites will have to be located. An investigative program to locate new well sites in an area remote from the area of contamination should be initiated in 1984. The scheduling and scope of the initial phase of the investigation will depend on the results of testing at Well No. 6.

The recommended plan should provide the City of Long Prairie with a water supply capable of meeting the peak demands throughout the summer.

Project Costs for Recommendation:

3 months of treatment of contaminated groundwater:	$39,650.00-$97,750.00
Connection to system:	$8,000.00
Installation and testing of Well No. 6:	$75,980.00
Construction of transmission line:	$47,200.00
	$167,830.00-$225,930.00

Project Costs for Recommendation if Well 6 is Shown to be Unsuitable:

3 months of treatment of contaminated groundwater:	$39,650.00-$97,750.00
Connection to system:	$8,000.00
Installation and testing of Well No. 6	$26,500.00
6 additional months of treatment of contaminated groundwater	$39,300.00-$112,500.00
	$110,450.00-$241,750.00

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APPENDIX

IRRIGATION WELL SURVEY
LONG PRAIRIE, MINNESOTA

Location: T129 R33 Sec.4
Owner: [redacted].
Well log number: 129215
Well information: 1 well, 16" diameter, 55' deep, 900 gpm (tested)
Permit number: 77-3337
Availability: Only available for emergency use such as fire.

Location: T129 R33 Sec.4
Owner: [redacted]
Well log number: none
Well information: 1 well, 12" diameter, 120' deep, 600 gpm
Permit number: 77-3033
Availability: Could be available, may require a fee.

Location: T129 R33 Sec.5
Owner: [redacted]
Well log number: 214697
Well information: 1 well, 18" diameter, 51' deep, 400 gpm
Permit number: 65-210
Well log number: 132248
Well information: 1 well, 14" diameter, 60' deep, 600gpm
Permit number: 75-3271
Availability: [redacted] could not be reached prior to this report.

Location: T129 R33 Sec.5
Owner: [redacted]
Well log number: 214696
Well information: 1 well, 16" diameter, 40' deep, 400 gpm
Permit number: 65-595
Availability: Well is available free of charge. Any improvements to well must remain with well. Not used since 1972.

Location: T129 R33 Sec.16
Owner: [redacted]
Well log number: 214699
Well information: 1 well, 16" diameter, 42' deep, 715 gpm
Permit number: 68-240
Availability: Not available.

Location: T129 R33 Sec. 32
Owner: [redacted]
Well log number:221513
Well information: 1 well, 12" diameter, 79' deep, 636 gpm
Permit number: 75-3334
Availability: May be available. Fee may be required

Location: T129 R33 Sec. 33
Owner: [redacted]
Well log number: 221406
Well information: 1 well, 12" diameter, 51' deep, 500 gpm
Permit number: 75-3334
Availability: May be available. Fee may be required.

County Name: Todd (511)

WATER WELL RECORD

Minnesota Statutes 1345.01-.08

for Water Sample: 151931

Township Name: Long Prairie | Township Number: 129 | Range Number: 33 | Section No.: 3 | Fraction: - NW¼ NE¼

Distance and Direction from Road Intersections or Street Address and City of Well Location: CR 11 Grey Eagle

Show exact location of well in section grid with "X." Sketch map of well location.

Address Name | Block Number | Lot Number

1 mile

1. FORMATION LOG

FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Sand	Brown	Soft	0	18
Clay	Brown	Med	18	72
Sand	Gray	Soft	72	76
129-33-3ABBDCA				
Elev. 1334.5				
1960				

CODED

LOCATED BY
1 - ☐ Address Verification
2 - ☐ Name on Mailbox
3 - ☐ Lot-Block
4 - ☐ Plat Book
5 - ☑ Info. From Owner
6 - ☐ Info. From Neighbor
7 - ☐ Other
☐ Can't Locate State Why

Use a second sheet, if needed.

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.

MINN. GEOLOGICAL SURVEY COPY

3. PROPERTY OWNER

Address: [redacted]

Grey Eagle MN 56336

4. WELL DEPTH (completed)

76 ft. | Date of Completion: 10-19-78

5.

1☐ Cable tool | 4☐ Rotary | 7☐ Driven | 10☐ Dug
2☐ Hydraulic rotary | 5☐ Air | 8☐ Bored | 11☐
3☒ Rotary | 6☐ Jetted | 9☐ Power Auger

6. USE

1☐ Domestic | 4☐ Public Supply | 7☐ Industry
2☐ Irrigation | 5☐ Municipal | 8☐ Commercial
3☐ Test Well | 6☐ Air Conditioning | 9☐

7. CASING

HEIGHT: Above/Below

1☐ Black | 2☒ Threaded | Surface 1 ft.
3☐ Galv. | 5☐ Welded
4☐ | 6☐ | Drive Shoe? Yes ☐ No ☒

4 in. to 72 ft. Weight 11.89 lbs./ft.
in. to ft. Weight lbs./ft.
in. to ft. Weight lbs./ft.

HOLE DIAM
in. to ft.
in. to ft.
in. to ft.

8. SCREEN

Make: Johnson | Open hole: From ft. to ft.
Type: Stainless Steel | Dia.
Slot/Gauge: 012 | Length | FITTINGS:
Set between 72 ft. and 76 ft.
ft. and ft.
ft. and ft.

9. STATIC WATER LEVEL

12 ft. ☐ below land surface ☐ above | Date Measured 10-19-78

10. PUMPING LEVEL (below land surface)

35 ft. after 1 hrs. pumping 8-10 G.P.M.
ft. after hrs. pumping G.P.M.

11. WELL HEAD COMPLETION

1☐ Pitless adapter | 2☐ Basement offset | 3☒ At least 12" above grade

12. Well grouted?

☐ Yes ☒ No | Cu. Yds.
1☐ Neat Cement | 2☐ Bentonite | 3☐
Depth: from ft. to ft.
from ft. to ft.

13. Nearest source of possible contamination

70 feet | W direction | Septic System
Well disinfected upon completion? Yes ☒ No ☐

14. PUMP

Date Installed
☐ Not Installed
Manufacturer's Name
Model Number | HP | Volts
Length of drop pipe | ft. capacity | G.P.M.
Material of drop pipe
Type: 1☐ Submersible | 2☐ L. S. Turbine | 3☐ Reciprocating
4☐ Jet | 5☐ Centrifugal | 6☐

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

North Side Drilling, Inc. 1/1032
Licensee Business Name | Licensee No.

Address: Box 23 Tyler, MN

Signed: [signature] Date: 11-13-78
Authorized Representative

Melvin Brickner Date: 11-13-78
Name of Driller

5/74 3086

DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 1961, 103I.01-.08

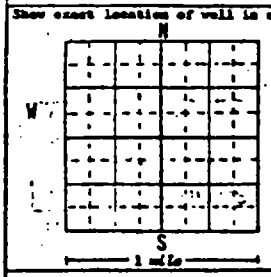
MINNESOTA UNIQUE WELL NO. for Water Sample: 129215

1. LOCATION OF WELL

County Name	Fraction	Section Number	Township Number	Range Number
Todd	SW NE SW	4	E. or S.	E. or W.

Distance and Direction from Road Intersections or Street Address and City of Well Location

Show exact location of well in section grid with "X." Sketch map of well location.



Date completed

PA 77-3337

3. PROPERTY OWNER'S NAME [redacted]

Address Long Prairie, Mn.

4. WELL DEPTH (completed) 55 ft. **Date of Completion** 6-17-76

5. [X] 1 Cable tool [ ] 4 Reverse [ ] 7 Driven [ ] 10 Dug
[ ] 2 Hollow rod [ ] 5 Air [ ] 8 Bored [ ] 11 _____
[ ] 3 Rotary [ ] 6 Jetted [ ] 9 Power Auger

6. USE

[ ] 1 Domestic [ ] 4 Public Supply [ ] 7 Industry
[X] 2 Irrigation [ ] 5 Air Conditioning [ ] 8 Commercial
[ ] 3 Test Well [ ] 6 _____

7. CASING DIAM. Threaded [ ] 1 Welded [X] 2
Black [ ] 2 Galv. [ ] 4
16 in. to 35 ft. depth
_____ in. to _____ ft. depth
_____ in. to _____ ft. depth

HEIGHT: Above/Below
Surface _____ ft.
Weight 62.58 lbs./ft.
Drive Shoe? Yes [X] No [ ]

8. SCREEN Or open hole from _____ ft. to _____ ft.
Make Johnson
Type Irrigator Dia. 12"
Slot/Gauge 125 Length 20' 4" FITTINGS:
Set between 35 ft. and 55 ft. 16 x 12 Hacker
_____ ft. and _____ ft.
_____ ft. and _____ ft. Flat Bottom

9. STATIC WATER LEVEL 16 ft. [X] below [ ] above land surface Date Measured 6-17-76

10. PUMPING LEVEL (below land surface)
30 ft. after 2 hrs. pumping 900 g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

11. WELL HEAD COMPLETION
[ ] 1 Pitless adapter [ ] 2 Basement offset [X] 3 At least 12" above grade

12. Well grouted? [ ] Yes [X] No Cu. Yds. _____
[ ] 1 Neat cement [ ] 2 Bentonite [ ] 3 _____
Depth: from _____ ft. to _____ ft.
from _____ ft. to _____ ft.

13. Nearest source of possible contamination
_____ feet _____ direction _____ type
Well disinfected upon completion? Yes [X] No [ ]

14. PUMP
Date installed _____
[ ] Not installed
Manufacturer's Name _____
Model Number _____ HP _____ Volts _____
Length of drop pipe _____ ft. Capacity _____ g.p.m.
Material of drop pipe _____
Type: [ ] 1 Submersible [ ] 3 L.S. Turbine [ ] 5 Reciprocating
[ ] 2 Jet [ ] 4 Centrifugal [ ] 6 _____

15. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Hydro Env., Inc. 10516
Licensee Business Name License No.

Address Young America, Mn.

Signed _____ Date 6-22-76
Authorized Representative

Darrell Owen

FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Fine Sand	Grey	Soft	0	14
Coarse Sand/	"	"	—	—
Some Gravel	"	"	14	55
129-33-4CBDDDC				
Elev: 1288 ± 5'				
1960				

CODED

Use a second sheet, if needed.

12. REMARKS, ELEVATION, SOURCE OF DATA, etc.

BROWERVILLE QUAD

1960

MINN. GEOLOGICAL SURVEY COPY

RECEIVED (1d)
JUN 4 1955
DIVISION OF WATERS

MINNESOTA CONSERVATION DEPARTMENT
DIVISION OF WATERS

WELL LOG STATEMENT

Mail Report Promptly To Director, Division Of Waters, Centennial Office Bldg., St. Paul 1, Minn.

Director	
Publ.	✓
Ground W.	

Told County well log
Well No. 1

Location of Well (address) PA 65-0595

Todd County, Long Prairie, Minn.
County, City or Town

#71
Describe Further by Lot, Block, Nearest Highway.

PA65-595G

#214696 No longer resident

Locate Well on Plat of Section

Sec. 5 b 129

Twp. Long Prairie

Range 33 W

Drilled for: [redacted] Driller Sanford Irrigation Co.

Address Long Prairie, Minn. Address Elbow Lake, Minn.
R.R. Sanford

Date of Completion May 20, 1955

Type of well Dug, Driven, Bored, Drilled Depth 40' Duration of Test 5 Hrs. Min. Date May 20 1955

Casing diameter 16 inch, from 0 to 2' Rate of Pumping 400 GPM

inch, from to Static Water Level 4 Ft. Above / Below land surface

inch, from to Water Level While Pumping 15 Ft.

Screen: Length 20' Diameter 16" Slot size 250/1000 Use: Domestic ☐ Industrial ☐ Irrigation ☒

Pump: Type Horsepower Public supply ☐ Commercial ☐ Stock ☐

WELL LOG

Geologic Formations Kind, Color, Hard or Soft	Depth in Feet From	To	Geologic Formations Kind, Color, Hard or Soft	Depth in Feet From	To
Top Soil Black, Soft	0'	2'			
Sub Soil, Brown, "	2'	4'			
Static water level at 4' (on this date) (may be less by)					
Sand, yellow, Soft	4'	12'			
Sand, Gray, "	12'	40'			

129-33-5BABBBB
Elev. 1283.5'
1960

LOCATED BY
1 - ☐ Address Verification
2 - ☐ Name on Mailbox
3 - ☐ Lot-Block
4 - ☐ Plat Book
5 - ☑ Info. From Owner 3586
6 - ☐ Info. From Neighbor
7 - ☐ Other
☐ Can't Locate State Why

Food

Township Name: Long Prairie | Township Number: 129N | Range Number: 33W | Section No.: 5 | Fraction: NE SW NW

Distance and Direction from Road Intersection or Street Address and City of Well Location: ¼ mile West of Hwy. 71

Show exact location of well in section grid with "X". Give Road No. if known. Sketch map of well location.

N / W / E / S; T wnd.; 1 mile

Address Name | Block Number: 23 | Lot Number: Econ

Sample: Rt. by House

FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Top Soil	Elevation taken from		0	1
Sand	Brown		1	25
Clay	Gray		25	30
Sand	Gray	Med.	30	62
PA 75-3271				
129-33-5 CACBAD				
Elev. 1291±5'				
1960				

CODED

Use a second sheet, if needed.

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.

BROWERVILLE QUAD
1960

MINN. GEOLOGICAL SURVEY COPY

3. PROPERTY OWNER'S NAME: [redacted] 1

Address: Long Prairie, MN 56437

4. WELL DEPTH (completed): 62 ft. | Date of Completion: 10-17-77

Type: (1) Cable tool (2) Reverse (3) Driven (10) Dug; (4) Hollow rod (5) Air (8) Bored (11) ; (7) Rotary (6) Jetted (9) Power Auger

6. USE: (2) Irrigation; (1) Domestic (4) Public Supply (7) Industry; (3) Test Well (5) Municipal (8) Commercial; (6) Air Conditioning (9)

7. CASING: (1) Black (2) Threaded; (3) Galv. (4) Welded; Height: Above Ground; Surface 1 ft.; Drive Shoe? Yes X No

Diameter	From	To	Weight	Hole Diam.
16 in.	42 ft.		62.5 lbs./ft.	in. to ft.
in.	to ft.		lbs./ft.	in. to ft.
in.	to ft.		lbs./ft.	in. to ft.

8. SCREEN: Make Johnson; Type Irrigator; Dia. 12"; Slot/Gauge 150; Length 20'; Set between 42 ft. and 62 ft.; Open Hole: from ft. to ft.

FITTINGS: Lead Packer Top, Plate Bottom

9. STATIC WATER LEVEL: 10 ft. (1) below land surface (2) above; Date Measured 10-17-77

10. PUMPING LEVEL (below land surface): 40 ft. after 5 hrs. pumping 550 g.p.m.; ft. after hrs. pumping g.p.m.

11. WELL HEAD COMPLETION: (1) Pitless adapter (2) Basement offset (3) At least 12" above grade

12. Was grout used? (1) Yes (2) No; Cu. Yds.; (1) Bentonite (2) Cement (3) ; Depth: ft. to ft.; from ft. to ft.

13. Nearest source of possible contamination: 100 feet North direction ft.; Well disinfected upon completion? Yes X No

14. PUMP: Date Installed; (1) Not Installed

Manufacturer's Name; Model Number; HP; Volts; Length of drop pipe ft.; capacity g.p.m.; Material of drop pipe

Type: (1) Submersible (2) L.S. Turbine (3) Reciprocating; (4) Jet (5) Centrifugal (6)

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Hydro Engineering, Inc. 10318
Licensee Business Name — License No.

Address: Young America, Minnesota 55397

Signed: Austin Huffman 3-24-; Date
Authorized Representative

Jerome Zigan Date 10-17-77
Name of Driller

5/74 3M
7/76 3M

MINNESOTA CONSERVATION DEPARTMENT
DIVISION OF WATERS

WELL LOG STATEMENT

Mail Report Promptly To Director, Division Of Waters, Centennial Office Bldg., St. Paul 1, Minn.

Director	
✓ Publ.	47
Ground W.	2814

Federal Loan Application
Well No. 129-33-5cAD

FEB 25 1965

650210

DIVISION OF WATERS Todd

Location of Well (address) PA65-0210

Todd County, Long Prairie, Minn. City or Town

500' East of Hwy #71

Describe Further by Lot, Block, Nearest Highway. PA65-2106

#214697

Locate Well on Plat of Section

Sec. 5

Twp. 129

Range 33

Drilled for: [redacted] Driller Sanford Irrigation

Address Long Prairie Minn. Address Elbow Lake, Minn.

ACROSS RAILROAD R.R. Sanford

Date of Completion Sept. 27, 1964

REPORT OF FINAL PUMPING TEST

Type of well Bored Depth 51' Duration of Test 30 Hrs. Min. Date Sept 27,
Dug, Driven, Bored, Drilled

Casing diameter 18 inch, from 0' to 51' Rate of Pumping 400 GPM

inch, from to Static Water Level 4 Ft. ~~above~~ Below land surface

inch, from to Water Level While Pumping 15 Ft.

Screen: Length 2' Diameter 18" Slot size 3/8" Use: Domestic ☐ Industrial ☐ Irrigation ☑

Pump: Type Horsepower Public supply ☐ Commercial ☐ Stock ☐

COPIED

WELL LOG

Geologic Formations Kind, Color, Hard or Soft	Depth in Feet From	Depth in Feet To	Geologic Formations Kind	Depth in Feet From	Depth in Feet To
Top Soil, Black, Soft	0'	2'			
Sandy Clay, yellow, "	2'	4'			
Static water level at	4'				
Sandy Clay, yellow, Soft	4'	18'			
Fine sand, Gray, "	18'	38'			
very fine sand, gray, "	38'	49'	(Rich Sand)		
Clay, Blue, Hard	49'	51'	→ ??		

LOCATED BY
Address Verification
2 - ☐ Name on Mailbox
3 - ☐ Lot Block
4 - ☐ Plat Book
5 - ☐ Info. From Owner
6 - ☐ Info. From Neighbor
7 - ☐ Other
☐ Can't Locate State Why

129-33 5CADACA
Elev. 1142 ± 5
3:30
1960

HYDRO ENGINEERING, INC.

BOX 98 — Young America, Minnesota 55397

WELL DRILLING AND REPAIR – PUMP SALES AND SERVICE — 612-467-3100

#11610

WELL LOG AND CONSTRUCTION RECORD

Date March 15, 19 74

TO [redacted] B 1 Mile N.E. TOWN

ADDRESS

CITY Long Prairie STATE Minnesota

LOG OF FORMATIONS

				SWL					SWL
0	to 28	sand and gravel				to			
28	to 38	gray fine sand				to			
38	to 40	clay				to			
40	to 62	medium gray sand				to			
	to					to			
	to					to			
	to					to			
	to					to			
	to					to	129-33-5ABABDD		

LOCATED BY
1 - ☐ Address Verification
2 - ☐ Name on Map
3 - ☐ Let Check
4 - ☐ Plat Book
5 - ☐ Info. From Owner
6 - ☐ Info. From Neighbor
7 - ☐ Other
☐ Can't Locate State Why

CODED

WELL DESIGN

Elev. 1290±5'

pth measured from top of casing

SCREEN WELL DATA

Make of Screen Johnson Irrigator

Size: Diam. 12 in. Length 20 ft. Slot Size 70#

Location in Well 42' to 62' Screen Metal low carbon steel

Fittings: Top lead packer

Bottom plate

Other Screen Data

ROCK WELL DATA

Open borehole diam. to ft.

WELL TEST DATA

620 gpm. Static Water Level 16 Pumping Water Level 39

6 hours of pumping (Drawdown ft.)

PUMP DATA

Make Worthington Type oil lube turbine

Model Serial Number Size 8ST 10 m 52

HP 20 Drop Pipe Size 6 " & Length 40 Shaft Size & Length 2x1 1/4

GPM Head ' RPM

Motor: 3AD 20 1:1 Volts Phase Cycles

Well Seal

Water Analysis: Hardness ppm. Iron ppm.

1606 Discharge Head

Signed

CASING STRINGS

1. 1960 to 42'
ID OD
Wt. lbs. per ft.
Thrd. & Cpld.
Welded
Drive Shoe
Cemented

2.
to
ID OD
Wt. lbs. per ft.
Thrd. & Cpld.
Welded
Drive Shoe
Cemented

3.
to
ID OD
Wt. lbs. per ft.
Thrd. & Cpld.
Welded
Drive Shoe
Cemented

HYDRO ENGINEERING, INC. BOX 98 221427 Young America, Minnesota 55397

WELL DRILLING AND REPAIR – PUMP SALES AND SERVICE 612-467-3100

WELL LOG AND CONSTRUCTION RECORD

Date November 9 19 83

TO [redacted]

ADDRESS A

No Pump

CITY Long Prairie STATE Minnesota

TOPO

LOG OF FORMATIONS

	SWL		SWL
0 to 49 fine sand		to	
to		to	
to		to	
to (GRAVEL PACK)		to	
to		to	
to		to	
to		to	
to		to	
to		to	

CODED

LOCATED BY
1 - ☐ Address Verification
2 - ☐ Name on Mailbox
3 - ☐ [illegible]
4 - ☐ [illegible]
5 - ☑ Info. From Owner
6 - ☐ Info. From Neighbor
7 - ☐ Other
☐ Can't Locate State Why

129-35-5CADAC4

Elev. 1583±3

WELL DESIGN

Depth measured from top of casing

SCREEN WELL DATA

Make of Screen Johnson Irrigator

Size: Diam. 12 in. Length 20 ft. Slot Size 45# 1960

Location in Well 29' to 49'. Screen Metal L.C.S.

Fittings: Top

Bottom

Other Screen Data

ROCK WELL DATA

Open borehole diam. to ft.

WELL TEST DATA

550 gpm. Static Water Level 41' Pumping Water Level 341'

4 hours of pumping (Drawdown ft.)

PUMP DATA

Make Type

Model Serial Number Size

HP Drop Pipe Size " & Length Shaft Size & Length

GPM Head ' RPM

Motor : Volts Phase Cycles

Well Seal

Water Analysis: Hardness ppm. Iron ppm.

CASING STRINGS

1. 0 to 29
Wt. 12 ID 12 5/8 OD
Thrd. & Cpld.
Welded
Drive Shoe
Cemented

2.
to
ID OD
Wt. lbs. per ft.
Thrd. & Cpld.
Welded
Drive Shoe
Cemented

3.
to
ID OD
Wt. lbs. per ft.
Thrd. & Cpld.
Welded
Drive Shoe
Cemented

Signed

WATER WELL RECORD — Minnesota Statutes 156A.01-.06

County Name: Todd

Township Name: [illegible] | Township Number: 129 N | Range Number: 32 W | Section No.: 14 | Fraction: [illegible]

Distance and Direction from Road Intersections or Street Address and City of Well Location: 3½ mi. East of Long Prairie

Show exact location of well in section grid with "X". Sketch map of well location.

Addition Name: [illegible] | Block Number: [illegible] | Lot Number: Rec

Sketch map of well location: [illegible] located

1. PROPERTY OWNER'S NAME: [redacted] 139

Long Praitie, Mn. 56347 [redacted]

4. WELL DEPTH (completed): 134 ft. | Date of Completion: 6-3-1977

5. (1) Cable tool (2) Hollow rod (3) Rotary (4) Reverse (5) Air (6) Jetted (7) Driven (8) Bored (9) Dug (10) [illegible] (11) [illegible]

6. USE: (1) Domestic (2) Irrigation (3) Test Well (4) Public Supply (5) Municipal (6) Air Conditioning (7) Industry (8) Commercial (9) [illegible]

7. CASING: (1) Black (2) Threaded (3) Galv. (4) Welded (5) [illegible] (6) [illegible]
Height: Above/Below — Surface 1 ft. — Drive Shoe? Yes ___ No X
6 in. to 126 ft. Weight 20' lbs./ft. — ___ in. to ___ ft. Weight ___ lbs./ft. — ___ in. to ___ ft. Weight ___ lbs./ft.
Hole Diam: ___ in. to ___ ft. — ___ in. to ___ ft. — ___ in. to ___ ft.

8. SCREEN: Make Johnson — Type stainless steel — Dia. 4" — Slot/Gauge 20 — Length 2 (4") — Set between 126 ft. and 130 ft. .40 slot; 130 ft. and 134 ft. .20 slot — ___ ft. and ___ ft.
Or open hole: from ___ ft. to ___ ft.
FITTINGS:

9. STATIC WATER LEVEL: 45 ft. (1) below land surface (2) above — Date Measured 6-3-77

10. PUMPING LEVEL (below land surface): ___ ft. after ___ hrs. pumping 30 G.P.M.; ___ ft. after ___ hrs. pumping ___ G.P.M.

11. WELL HEAD COMPLETION: (1) Pitless adapter (2) Basement offset (3) At least 11" above grade

12. Well grouted? (1) Yes (2) No — Cu. Yds. ___
(1) Neat Cement (2) Bentonite (3) [illegible]
Depths: from ___ ft. to ___ ft.; from ___ ft. to ___ ft.

13. Nearest source of possible contamination: ___ feet ___ direction ___ type
Well disinfected upon completion? Yes X No

14. PUMP: Ron — Date Installed 8-17-77 — (1) Not Installed
Manufacturer's Name: Dempster
Model Number: HP 3-50 — HP ½ — Volts 230
Length of drop pipe: 84 ft. — Capacity: 10 G.P.M.
Material of drop pipe: 1" galvanized steel
Type: (1) Submersible (2) L. S. Turbine (3) Reciprocating (4) Jet (5) Centrifugal (6) [illegible]

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay	Brown		0	33
Clay	Gray		33	127
Sand			127	129
Slate			129	133
Sand	Gray		133	
New House				
129-33-13 DDD DCC				
Elev. 1372.5'				
178A				
NOT IN PLAT BOOK				

CODED

Use a second sheet, if needed.

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.
LONG PRAIRIE QUAD
178A

16. WATER WELL CONTRACTOR'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Traut Wells Inc. — License Business Name — 73157 License No.
Address Rt #4 St. Cloud, Minn. 56301
Signed [signature] Authorized Representative — Date 8-17-77
Fred (John Claude) — Name of Driller — Date 6-3-77

MINN. GEOLOGICAL SURVEY COPY

5/74 30M
7/76 30M

WATER WELL RECORD

Minnesota Statutes 156A.01-.04

For Water Supply: 154141

County Name: Todd.

Township Name	Township Number	Range Number	Section No.	Fraction
Long Prairie	129 N	33 W	13	N½SW

Distance and direction from Road Intersections or Street Address and City of Well Location

Show exact location of well in section grid with "X". Sketch map of well location.

Addition Name: [illegible] corporated

Block Number:

Lot Number: [illegible]

1 mile

1. PROPERTY OWNER'S NAME: [redacted]

Address: [redacted]

Long Prairie MN 56347

4. WELL DEPTH (completed): 33 ft. Date of Completion: 9-19-78

5. [X] Rotary

6. USE: [X] Domestic

7. CASING: [X] Black [X] Threaded; Height: Above/Below Surface 1 ft.; Drive Shoe? Yes ___ No X

4 in. to 29 ft. Weight 10.89 lbs./ft.

8. SCREEN: Make Johnson; Type Stainless Steel; Dia. 4"; Slot/Gauge 012; Length 4'; Set between 29 ft. and 33 ft.

9. STATIC WATER LEVEL: 10 ft. [X] below land surface; Date Measured 9-19-78

10. PUMPING LEVEL (below land surface): 12 hrs. pumping

11. WELL HEAD COMPLETION: [X] At least 12" above grade

12. Well grouted? No

13. Nearest source of possible contamination: 90 ft. West direction Septic type

Well disinfected upon completion? Yes X No

14. PUMP: [X] Not installed

Formation Log	Color	Material of Formation	From	To
Clay	Brn	Mxd	0	29
Sand	Brn	Sd	29	33
			1319	1378

129-33-13CB (CBA

Elev. 1346±5

178A

CODED

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.

LONG PRAIRIE QUAD

178A

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NORTH STAR DRILLING, INC 41038

License Business Name — License No.

Address Box 23 Isle, MN

Signed [signature] Authorized Representative — Date 10/1/78

Steve Nelson — Name of Driller — Date 9-19-78

MINN. GEOLOGICAL SURVEY COPY

3/74 30M

County Name: Todd

WATER WELL RECORD

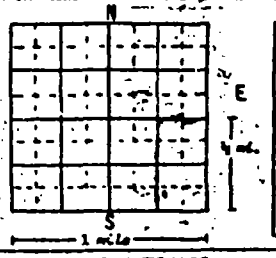
Minnesota Statutes 1364.01-.88

for Water Sample: 131340

Township Name: GRELLY — Township Number: 131 N — Range Number: 34 W — Section No.: 17 — Fraction: — Location: —

Distance and Direction from Road Intersections or Street Address and City of Work Location

Show exact location of well in section grid with "X". Sketch map of well location.



Subdivision Name: WILDWOOD HILLS 1ST ADDITION — Block Number: 1 — Lot Number: 1

1. PROPERTY OWNER'S NAME: [redacted]

Address: LONG PRAIRIE

4. WELL DEPTH (completed): 89' ft. — Date of Completion:

5. [X] Cable tool [ ] Reverse [ ] Driven [ ] Dug [ ] Hydraulic rotary [ ] Air [ ] Bored [ ] _____ [ ] Rotary [ ] Jetted [ ] Power Auger

6. USE: [X] Domestic [ ] Public Supply [ ] Industrial [ ] Irrigation [ ] Municipal [ ] Uncompleted [ ] Test Well [ ] Air Conditioning [ ]

7. CASING: [X] Black [X] Threaded [ ] Galv. [ ] Welded — HEIGHT: Above/Below Surface _____ ft. — [ ] [ ] Drive Shoe? Yes [X] No [ ]

4 in. to +7' ft. Weight 11 lbs./ft. — HOLE DIAM.

_____ in. to _____ ft. Weight _____ lbs./ft. — _____ in. to _____ ft.

_____ in. to _____ ft. Weight _____ lbs./ft. — _____ in. to _____ ft.

8. SCREEN: Make TUBULAR — [ ] Open hole from _____ ft. to _____ ft.

Type STAINLESS — Dia. 4"

Slot/Gauge _____ Length _____ — FITTINGS:

Set between 79 ft. and 89 ft.

_____ ft. and _____ ft.

_____ ft. and _____ ft.

9. STATIC WATER LEVEL: _____ ft. [X] below land surface [ ] above — Date Measured _____

10. PUMPING LEVEL (below land surface): 79 ft. after _____ hrs. pumping 1/2 g.p.m.

_____ ft. after _____ hrs. pumping _____ g.p.m.

11. WELL HEAD COMPLETION: [X] Pitless adapter [ ] Basement offset [ ] At least 12" above grade

12. Well grouted? [ ] Yes [X] No — Cu. Yds. _____

[ ] Neat Cement [ ] Bentonite [ ] _____

Depth: from _____ ft. to _____ ft.

from _____ ft. to _____ ft.

13. Nearest source of possible contamination: _____ feet — 21 direction — LINE 4 type

Well disinfected upon completion? [X] Yes [ ] No

14. PUMP: Date Installed _____ [ ] Not Installed

Manufacturer's Name: FLINT & WALLING

Model Number _____ HP 1/2 Volts 230

Length of drop pipe _____ ft. capacity _____ g.p.m.

Material of drop pipe _____

Type: [X] Submersible [ ] L.S. Turbine [ ] Reciprocating [ ] Jet [ ] Centrifugal [ ] _____

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
	YELLOW	S		7
CLAY	BLUE			
SAND				
			85	92
E on 27				
129-33-13 DDCDDC				
Elev 1381 ± 5'				
178A				

CODED

Use a second sheet, if needed.

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.

LONG PRAIRIE QUAD

178A

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

ANDREASEN WELL DRILLING — License No. _____

Address _____

Signed _____ Date _____

Authorized Representative

_____ Date _____

Name of Driller

MINN. GEOLOGICAL SURVEY COPY

5/74 30M
7/76 30M

MINNESOTA CONSERVATION DEPARTMENT
DIVISION OF WATERS

125

WELL LOG STATEMENT

Mail Report Promptly To Director, Division Of Waters, Centennial Office Bldg., St. Paul 1, Minn.

Publ.	
Ground W.	

Well No. 1

Location of Well (address) #214699

Todd County — Long Prairie City or Town

Describe Further by Lot, Block, Nearest Highway.

Locate Well on Plat of Section

Sec. 8, 9, 16, 17

Twp. 129

Range 33

Pg 68-240

Drilled for: [redacted] Driller Minnesota Rock Wells

Address Long Prairie, Minn. Address 1 Carlson, Minn.

Date of Completion 7/17/58

REPORT OF FINAL PUMPING TEST

Type of well Drilled (Dug, Driven, Bored, Drilled) Depth 42' Duration of Test 1 Hrs. ____ Min. Date 5/16/58

sing diameter 16" inch, from 0 to 36' Rate of Pumping 715 GPM

____ inch, from ____ to ____ Static Water Level 11 Ft. Above / Below land surface

____ inch, from ____ to ____ Water Level While Pumping 32' Ft.

Screen: Length 16' Diameter 14" Slot size 100 Use: Domestic ☐ Industrial ☐ Irrigation ☒

Pump: Type Turbine Horsepower 10 Public supply ☐ Commercial ☐ Stock ☐

WELL LOG

Geologic Formations Kind, Color, Hard or Soft	Depth in Feet From	Depth in Feet To	Geologic Formations Kind, Color, Hard or Soft	Depth in Feet From	Depth in Feet To
Sand & Gravel	0	42'			
129-33-16 BBABAB					
Elev. 1294.5'					
178A					

CODED

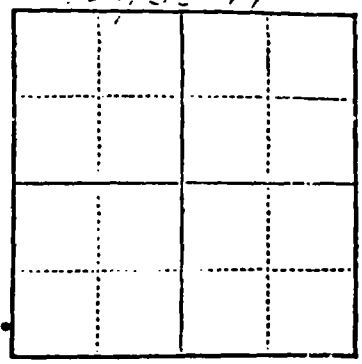
LOCATED BY

1 - ☐ Address Verification
2 - ☐ Name on Mailbox
3 - ☐ Lot-Block
4 - ☐ Plat Book
5 - ☐ Info. From Owner
6 - ☑ Info. From Neighbor
7 - ☐ Other
☐ Can't Locate State Why

AD 6—235
(Jan. 1927)
1937

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

129-33-17



• Locate well on plat of section.

RECORD OF WELL

1. Location: State Minnesota County Todd
Nearest P. O. Long Prairie Direction from P. O. NW
Distance from P. O. 3/4 miles; ____ ¼ sec. 17, T. 129 N., R. 33 W.
~~If in city, give street and number~~ on west side of road from Long Prairie to Browerville.

2. Owner: [redacted] Address Long Prairie, Minn.
Driller: Abe Peterson Address Long Prairie, Minn.

3. Situation: Is well on upland, in valley, or on hillside? Steep hillside

4. Elevation of top of well: ____ ft. (Above or below) the level of ____ (Sea, depot, lake, or stream)

5. Type of well: ____ (Dug, driven, bored, or drilled); kind of drilling rig used ____ (Solid tool, jetting, rotary, etc.)

6. Depth of well: ____ ft.; year in which well was finished ____
Does well enter rock? ____; if so, at what depth? ____ ft.; kind of rock ____

7. Diameter: At top ____ inches; at bottom ____ inches.

8. Principal water bed: ____ (Gravel, sand, clay, or rock. If rock, state kind)
Depth to principal water bed ____ ft.; thickness of bed ____ ft.
If other water supplies were found, give depth to each ____

9. Casings: Kind ____; size ____; length ____ ft.; between depths of ____ and ____ ft.
Kind ____; size ____; length ____ ft.; between depths of ____ and ____ ft.
Kind ____; size ____; length ____ ft.; between depths of ____ and ____ ft.
Packers (if any): Depth at which packers were used ____; kind ____
Screen or Strainer: Was well finished with screen? ____; kind of screen ____;
length of screen ____ ft.; diameter ____ inches; size of openings ____

10. Head: Does well at present overflow without pumping? yes; did it overflow when new? ____;
if flowing, give pressure ____ lb. per sq. inch; or height water will rise in a pipe 8 ft. above surface;
original pressure or head ____; if not flowing, give water level in well ____ ft. below surface.

11. Pump: Is the well pumped? ____; kind of pump ____;
size or capacity of pump ____; kind of power ____

12. Yield: Natural flow at present (if any) ____ gallons per minute; original flow ____ gallons per minute;
well has been pumped at ____ gallons per minute continuously for ____ hours;
quantity of water ordinarily obtained from well ____ gallons per day.

13. Use: For what purpose is the water used? ____

14. Quality of the water: ____ (Hard or soft, fresh or salty, etc.); is there an analysis? yes TS

15. Cost of well, not including pump: ____ Temperature of water ____° F.

Name of person filling blank ____

Date ____ Address ____

6—9442

On the back of this sheet give the record of the beds through which the well passes and any other facts not given above.

LOG OF WELL

KIND OF ROCK OR OTHER MATERIAL (Give color and tell whether hard or soft)	DEPTH, IN FEET		THICKNESS, IN FEET	REMARKS (Especially information as to water found)
	From—	To—		
Yellow clay and sand streaks.				
Data obtained by I. S. Allison.				
Source of data: Files of Minnesota Geol. Survey.				

STATE OF MINNESOTA
DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 156A.01-.08

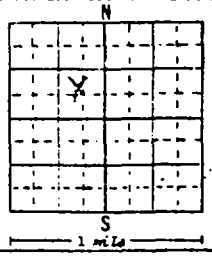
MINNESOTA UNIQUE WELL NO. 125603

1. LOCATION OF WELL

County Name	Fraction	Section Number	Township Number	Range Number
Todd	NE¼ NW¼	19	129 N. or S.	33 E. or W.

Distance and Direction from Road Intersections or Street Address and City of Well Location

Show exact location of well in section grid with "X." Sketch map of well location.



129-33-19 BCADAA
Elev. 1348.5'
178B

3. PROPERTY OWNER
Name [redacted]
Address [redacted]
Long Prairie, Minn 56347

4. WELL DEPTH (completed) 232 ft. | Date of Completion 3-16-76

5. 1 [X] Cable tool 4 [ ] Reverse 7 [ ] Driven 10 [ ] Dug
2 [ ] Hollow rod 5 [ ] Air 8 [ ] Bored 11 [ ]
3 [X] Rotary 6 [ ] Jetted 9 [ ] Power Auger

6. USE
1 [X] Domestic 4 [ ] Public Supply 7 [ ] Industry
2 [ ] Irrigation 5 [ ] Air Conditioning 8 [ ] Commercial
3 [ ] Test Well 6 [ ]

7. CASING DIAM.
Threaded [X] 1 Welded [ ] 3
Black [X] 2 Galv. [ ] 4
4 in. to 224 ft. depth
in. to ft. depth
in. to ft. depth
HEIGHT: Above/Below
Surface 1 ft.
Weight 12.89 lbs./ft.
Drive Shoe? Yes ___ No X

8. SCREEN
Make Johnson
Type Stainless steel Dia. 2"
Slot/Gauge .012 Length 20'
Set between 224 ft. and 232 ft.
ft. and ft.
ft. and ft.
Or open hole from ft. to ft.
FITTINGS: K. Packer

9. STATIC WATER LEVEL
15 ft. [ ] below land surface [ ] above Date Measured 3-16-76

10. PUMPING LEVEL (below land surface)
45 ft. after 1 hrs. pumping 15 g.p.m.
ft. after hrs. pumping g.p.m.

11. WELL HEAD COMPLETION
1 [X] Pitless adapter 2 [ ] Basement offset 3 [ ] At least 12" above grade

12. Well grouted? [ ] Yes [X] No Cu. Yds.
1 [ ] Neat cement 2 [ ] Bentonite 3 [ ]
Depth: from ft. to ft.
from ft. to ft.

13. Nearest source of possible contamination
100 feet W direction Septic type
Well disinfected upon completion? Yes [X] No [ ]

14. PUMP
Date installed 4-19-76
Not installed [ ]
Manufacturer's Name Reda
Model Number 4DSM5S1 HP ½ Volts 230
Length of drop pipe 120 ft. capacity g.p.m.
Material of drop pipe PVC
Type: 1 [X] Submersible 3 [ ] L.S. Turbine 5 [ ] Reciprocating
2 [ ] Jet 4 [ ] Centrifugal 6 [ ]

2. FORMATION LOG

FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay	Brown	Mud	0	27
Clay	Gray	Mud	27	55
Clay, Mark	Dk Gray	Soft	55	124
Clay	Blue	Mud/Rock	124	184
Sand			184	192
			192	196
			196	206
			206	216
			216	226
			226	232

#41 IS YOUK ONLY - 232'
ALTERNATIVE TO ALL
THESE
LOGGED
SEE
ALSO A
MENT. PLEASE
LOCATE AS MANY
AS POSSIBLE.
(THESE ARE IN
ORDER OF DEPTH)
McGrath has since died.
Info obtained from former employer - Prairie Packing

Use a second sheet, if needed.

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.
ROUND PRAIRIE QUAD
1788

16. WATER WELL CONTRACTOR'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

North Star Well Drilling 8938
License Business Name License No.
Address [illegible]
Signed [signature] Date 5/6/76
Authorized Representative
Steve Nelson
Name of Driller

MINN. GEOLOGICAL SURVEY COPY

7/74 30M

STATE OF MINNESOTA
DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 156A.01-.08

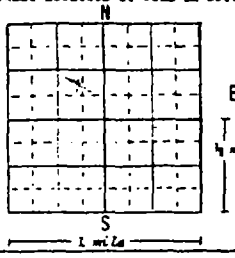
125604

1. LOCATION OF WELL

County Name	Fraction	Section Number	Township Number	Range Number
Todd	SE NW	19	129 N. or S.	33 E. or W.

Distance and Direction from Road Intersections or Street Address and City of Well Location

Show exact location of well in section grid with "X." Sketch map of well location.



3. PROPERTY OWNER

Address [redacted] Long Prairie, Minn. 56347

4. WELL DEPTH (completed) 85 ft. Date of Completion 4-19-76

5. 1 ☐ Cable tool 4 ☐ Reverse 7 ☐ Driven 10 ☐ Dug
7 ☐ Hollow rod 5 ☐ Air 8 ☐ Bored 11 ☐ _____
3 ☒ Rotary 6 ☐ Jetted 9 ☐ Power Auger

6. USE
1 ☒ Domestic 4 ☐ Public Supply 7 ☐ Industry
2 ☐ Irrigation 5 ☐ Air Conditioning 8 ☐ Commercial
3 ☐ Test Well 6 ☐ _____

7. CASING DIAM.
Threaded ☒ 1 Welded ☐ 3
Black ☒ 2 Galv. ☐ 4
4 in. to 17 ft. depth
_____ in. to _____ ft. depth
_____ in. to _____ ft. depth

HEIGHT: Above/Below
Surface 1 ft.
Weight 10.89 lbs./ft.
Drive Shoe? Yes ___ No X

8. SCREEN
Make Johnson
Type Stainless steel Dia. 4"
Slot/Gauze .010 Length 5'
Set between 77 ft. and 85 ft.
_____ ft. and _____ ft.
_____ ft. and _____ ft.
Or open hole from _____ ft. to _____ ft.
FITTINGS: K-packer

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay	Brown	Hard	0	16
Clay	Gray	Hard	16	77
Fine sand and Clay	Gray	Soft	77	85
			BHC	1258
129-33-19 BDA			B.D.D.	
Elev. 1343±5'				
178B				

CODED

9. STATIC WATER LEVEL
16 ft. ☒ below land surface ☐ above Date Measured 4-19-76

10. PUMPING LEVEL (below land surface)
20 ft. after 1 hrs. pumping 15 g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

11. WELL HEAD COMPLETION
1 ☒ Pitless adapter 2 ☐ Basement offset 3 ☐ At least 12" above grade

12. Well grouted?
☐ Yes ☒ No Cu. Yds. _____
1 ☐ Neat cement 2 ☐ Bentonite 3 ☐ _____
Depth: from _____ ft. to _____ ft.
from _____ ft. to _____ ft.

13. Nearest source of possible contamination
1000 feet E direction Septic type
Well disinfected upon completion? Yes ☒ No ☐

14. PUMP
Date installed 4-20-76
☐ Not installed
Manufacturer's Name Reda
Model Number 5 inch 10 SI HP 5 Volts 230
Length of drop pipe 160 ft. capacity 5 g.p.m.
Material of drop pipe PVC
Type: 1 ☒ Submersible 3 ☐ L.S. Turbine 5 ☐ Reciprocating
2 ☐ Jet 4 ☐ Centrifugal 6 ☐ _____

Use a second sheet, if needed.

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.
ROUND PRAIRIE QUAD
178B

16. WATER WELL CONTRACTOR'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

North Star Well Drilling 4883
License Business Name License No.
Address Rt 2 Box 23 Isle Minn. 56342
Signed _____ Date 5/4/76
Authorized Representative
Steve Nelson
Type or Print

MINN. GEOLOGICAL SURVEY COPY

WATER WELL RECORD

Minnesota Statutes 1345.01-.08

1-3031b

Name: [redacted]

Township Number	Range Number	Section No.	Fraction
129 N/S	33 E/W	19	

Address: Long Prairie, Minn. 56347

Well Depth (completed): 133 ft. — Date of Completion: 9-21-76

Sketch map of well location: F 205 Ft of w 305 Ft

Addition Name: — Block Number: — Lot Number:

1 mile

FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
			0	
				121
			121	1178
			1178	1166

129-33-19ACBABC

Elev. 1299±5'

178B

CODED

Use a second sheet, if needed.

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.

From above shut down 4½ hrs by 4" x 6" reducer to 4" spool

ROUND PRAIRIE QUAD

178B

MINN. GEOLOGICAL SURVEY COPY

3. PROPERTY OWNER

4. WELL DEPTH (completed): 133 ft. — Date of Completion: 9-21-76

5. [X] Rotary — 1 Cable tool, 2 Hollow rod, 3 Jetted, 4 Reverse, 5 Air, 6 Driven, 7 Bored, 8 Power Auger, 9 Dug, 10 [ ], 11 [ ]

6. USE: [X] 1 Domestic; 2 Irrigation; 3 Test Well; 4 Public Supply; 5 Municipal; 6 Air Conditioning; 7 Industry; 8 Commercial; 9 [ ]

7. CASING: [X] 1 Black, [X] 4 Threaded; 2 Galv., 5 Welded; 3 [ ], 6 [ ]. Height: Above/Below Surface 1 ft. Drive Shoe? Yes ___ No X

6¼ in. to 121 ft. Weight 18.97 lbs./ft. — Hole Diam 12 in. to 121 ft.

___ in. to ___ ft. Weight ___ lbs./ft. — ___ in. to ___ ft.

___ in. to ___ ft. Weight ___ lbs./ft. — ___ in. to ___ ft.

8. SCREEN: Make [ ] Type Stainless Steel Dia. 7" Slot/Gauge [ ] Length 10'

Set between ___ ft. and 133 ft.

___ ft. and ___ ft.

___ ft. and ___ ft.

Or open hole from ___ ft. to ___ ft.

FITTINGS: Reducer Assembly

9. STATIC WATER LEVEL: ___ ft. [ ] below [ ] above land surface — Date Measured 9-21

10. PUMPING LEVEL (below land surface)

___ ft. after ___ hrs. pumping ___ g.p.m.

___ ft. after ___ hrs. pumping ___ g.p.m.

11. WELL HEAD COMPLETION: 1 [ ] Pitless adapter; 2 [ ] Basement offset; [X] 3 At least 12" above grade

12. Well grouted? [ ] Yes [X] No — Cu. Yds. ___

1 [ ] Neat Cement; 2 [ ] Bentonite; 3 [ ] ___

Depth: from ___ ft. to ___ ft.

from ___ ft. to ___ ft.

13. Nearest source of possible contamination: ___ feet ___ direction ___ ft.

Well disinfected upon completion? Yes [X] No [ ]

14. PUMP — Date Installed 9-23-76 — [ ] Not Installed

Manufacturer's Name Deep

Model Number 4DS2050 HP 5 Volts 115

Length of drop pipe 25 ft. capacity ___ g.p.m.

Material of drop pipe PVC

Type: [X] 1 Submersible; 2 Jet; 3 [ ] Turbine; 4 [ ] Centrifugal; 5 [ ] Reciprocating; 6 [ ] ___

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Northstar Well [illegible] — License Business Name — License No.

Address [illegible]

Signed [ ] — Authorized Representative — Date 11-16-76

[illegible] — Name of Driller — Date 9-21-76

5/74 30M

7/76 30M

STATE OF MINNESOTA
DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 156A.01-.08

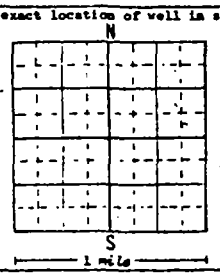
125623

1. LOCATION OF WELL

County	Fraction	Section Number	Township Number	Range Number
Todd	SE¼NW	19	129 N. or S.	33 E. or W.

Distance and Direction from Road Intersections or Street Address and City of Well Location

Show exact location of well in section grid with "X." Sketch map of well location.



by: Fred Lemke

3. PROP[redacted]
Addr[redacted]
Lona Prairie Rt. 56347

4. WELL DEPTH (completed) 186 ft. | Date of Completion 4-20-76

5. 1 ☐ Cable tool 4 ☐ Reverse 7 ☐ Driven 10 ☐ Dug
2 ☐ Hollow rod 5 ☐ Air 8 ☐ Bored 11 ☐ _____
3 ☒ Rotary 6 ☐ Jetted 9 ☐ Power Auger

6. USE
1 ☒ Domestic 4 ☐ Public Supply 7 ☐ Industry
2 ☐ Irrigation 5 ☐ Air Conditioning 8 ☐ Commercial
3 ☐ Test Well 6 ☐ _____

7. CASING DIAM.
Threaded ☒ 1 Welded ☐ 3
Black ☒ 2 Galv. ☐ 4
4 in. to 174 ft. depth
_____ in. to _____ ft. depth
_____ in. to _____ ft. depth
HEIGHT: Above/Below
Surface 1 ft.
Weight 10.99 lbs./ft.
Drive Shoe? Yes ___ No ☒

8. SCREEN
Make Johnson
Type Stainless Steel Dia. 4"
Slot/Gauge .012 Length 12'
Set between 174 ft. and 186 ft.
_____ ft. and _____ ft.
_____ ft. and _____ ft.
Or open hole from _____ ft. to _____ ft.
FITTINGS: 3" x 2" Reducer
3" x 4" Reducer

9. STATIC WATER LEVEL
40 ft. ☒ below land surface ☐ above Date Measured 4-20-76

10. PUMPING LEVEL (below land surface)
_____ ft. after _____ hrs. pumping _____ g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

11. WELL HEAD COMPLETION
1 ☐ Pitless adapter 2 ☐ Basement offset 3 ☒ At least 12" above grade

12. Well grouted? ☐ Yes ☐ No Cu. Yds. _____
1 ☐ Neat cement 2 ☐ Bentonite 3 ☐ _____
Depth: from _____ ft. to _____ ft.
from _____ ft. to _____ ft.

13. Nearest source of possible contamination
_____ feet _____ direction _____ type
Well disinfected upon completion? Yes ☒ No ☐

14. PUMP
Date Installed _____
☒ Not Installed
Manufacturer's Name _____
Model Number _____ HP _____ Volts _____
Length of drop pipe _____ ft. capacity _____ g.p.m.
Material of drop pipe _____
Type: 1 ☐ Submersible 3 ☐ L.S. Turbine 5 ☐ Reciprocating
2 ☐ Jet 4 ☐ Centrifugal 6 ☐ _____

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay	Brown	Med	0	37
Clay	Gray	Med	37	121
Fine Sand	Gray	Soft	121	156
			156	164
129-33-19 BD BAAC				
Elev. 1330±5'				
178B				
CODED				
Info from baby sitter				

Use a second sheet, if needed.

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.
ROUND PRAIRIE QUAD
178B

16. WATER WELL CONTRACTOR'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

North Star Well Drilling 43038
License Business Name License No.
Address 3102 Isle Rt. Isle 56342
Signed _____ Date 6-6-76
Authorized Representative
Steve Nelson
Name of Driller

MINN. GEOLOGICAL SURVEY COPY

WATER WELL RECORD

Minnesota Statutes Chapter 103I

for Water Sample

130299

County Name: Todd

Township Name | Township Number: 129 N/S | Range Number: 33 E/W | Section No.: 19 | Fraction: E SE NW

Distance and Direction from Road Intersections or Street Address and City of Well Location

744.5 Ft S & 265 Ft E of Long Prairie

Show exact location of well in section grid with "X"

Sketch map of well location.

N / W / E / S; 1 mile; ½ mi.

Addition Name

Block Number

Lot Number

3. PROPERTY OWNER: [redacted]

Address: New Princeton Rd 55112

4. WELL DEPTH (completed): 224 ft. | Date of Completion: 11-26-74

5. 1☐ Cable tool 4☐ Reverse 7☐ Driven 10☐ Dug
2☐ Hollow rod 5☐ Air 8☐ Bored 11☐ _____
3☒ Rotary 6☐ Jetted 9☐ Power Auger

6. USE
1☒ Domestic 4☐ Public Supply 7☐ Industry
2☐ Irrigation 5☐ Municipal 8☐ Commercial
3☐ Test Well 6☐ Air Conditioning 9☐

7. CASING
1☒ Black 4☒ Threaded
2☐ Galv. 5☐ Welded
3☐ 6☐
HEIGHT: Above/Below
Surface 1 ft.
Drive Shoe? Yes ___ No X
4 in. to 216 ft. Weight 10.89 lbs./ft.
___ in. to ___ ft. Weight ___ lbs./ft.
___ in. to ___ ft. Weight ___ lbs./ft.
HOLE DIAM: 4 in. to 216 ft.; ___ in. to ___ ft.; ___ in. to ___ ft.

8. SCREEN
Make Johnson
Type Stainless Steel Dia. 2"
Slot/Gauze .012 Length 8'
Set between 216 ft. and 224 ft.
___ ft. and ___ ft.
___ ft. and ___ ft.
Or open hole from ___ ft. to ___ ft.
FITTINGS: K-Packer

9. STATIC WATER LEVEL
80 ft. ☒ below ☐ above land surface. Date Measured 11-26-74

10. PUMPING LEVEL (below land surface)
130 ft. after 1 hrs. pumping 10 g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

11. WELL HEAD COMPLETION
1☐ Pitless adapter 2☐ Basement offset 3☒ At least 12" above grade

12. Well grouted? ☐ Yes ☒ No Cu. Yds. ___
1☐ Neat Cement 2☐ Bentonite 3☐ ___
Depth: from ___ ft. to ___ ft.
from ___ ft. to ___ ft.

13. Nearest source of possible contamination
75 feet ___ direction Drain Sick
Well disinfected upon completion? Yes☒ No☐

14. PUMP
Date Installed ___
☒ Not installed
Manufacturer's Name ___
Model Number ___ HP ___ Volts ___
Length of drop pipe ___ ft. capacity ___ g.p.m.
Material of drop pipe ___
Type: 1☐ Submersible 3☐ L.S. Turbine 5☐ Reciprocating
2☐ Jet 4☐ Centrifugal 6☐ ___

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay	Brown	Med	0	23
Clay	Gray	Med	23	168
Clay	LtGray	Varies	168	88
Sand, Clay	Gray	Soft	88	98
Clay	Dark Gray	Med	98	216
Fine Sand	Gray	Soft	216	224

Use a second sheet, if needed.

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

North Star Well Drilling — License Business Name — 48038 License No.

Address Box 23, Isle, Mn.

Signed [signature] Authorized Representative Date 12/7/74

Steve Nelson Name of Driller Date ___

MINN. DEPT. OF NATURAL RESOURCES COPY

5/74 30M
7/78 30M

Township Name	Township Number	Range	Section No.	Fraction
Long Prairie	129 N	33 E	19	NW

Distance and Direction from Road Intersection or Street Address and City of Well Location

2K W Long Prairie

Show exact location of well on section grid with "X"

Sketch map of well location.

Addition Name

Block Number

Lot Number

1 mile

½ mi.

1. PROPERTY OWNER'S NAME [redacted] 131645 (A)

Address [redacted]

Long Prairie MN 56347

4. WELL DEPTH (completed) 154 ft. Date of Completion 4-21-77

5. 1☐ Cable tool 4☐ Reverse 7☐ Driven 10☐ Dug
2☐ Jetting rod 5☐ Air 8☐ Bored 11☐
3☒ Rotary 6☐ Jetted 9☐ Power Auger

6. USE
1☒ Domestic 4☐ Public Supply 7☐ Industry
2☐ Irrigation 5☐ Municipal 8☐ Commercial
3☐ Test Well 6☐ Air Conditioning 9☐

7. CASING
1☒ Black 4☒ Threaded
2☐ Galv. 5☐ Welded
3☐ 6☐
HEIGHT: Above/Below
Surface 1 ft.
Drive Shoe? Yes ___ No X
4 in. to 141 ft. Weight 10.79 lbs./ft.
___ in. to ___ ft. Weight ___ lbs./ft.
___ in. to ___ ft. Weight ___ lbs./ft.
HOLE DIAM
___ in. to ___ ft.
___ in. to ___ ft.
___ in. to ___ ft.

8. SCREEN
Make Johnson
Type T. L. ST 1 Dia. 4"
Slot/Gauge .012 Length 12"
Set between 142 ft. and 154 ft.
___ ft. and ___ ft.
___ ft. and ___ ft.
Or open hole from ___ ft. to ___ ft.
FITTINGS: K-packer

9. STATIC WATER LEVEL
5 ft. ☒ below land surface ☐ above Date Measured 4-21-77

10. PUMPING LEVEL (below land surface)
___ ft. after ___ hrs. pumping ___ g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

11. WELL HEAD COMPLETION
1☐ Pitless adapter 2☐ Basement offset 3☒ At least 12" above grade

12. Well grouted?
☐ Yes ☒ No Cu. Yds. ___
1☐ Neat Cement 2☐ Bentonite 3☐ ___
Depth: from ___ ft. to ___ ft.
from ___ ft. to ___ ft.

13. Nearest sources of possible contamination
___ feet NE direction S type
Well disinfected upon completion? Yes☒ No☐

14. PUMP
Date Installed 5-3-77
☐ Not Installed
Manufacturer's Name Berkley
Model Number Sniper 1 HP ½ Volts 115
Length of drop pipe 140 ft. capacity ___ g.p.m.
Material of drop pipe Pipe
Type: 1☒ Submersible 3☐ L. S. Turbine 5☐ Reciprocating
2☐ Jet 4☐ Centrifugal 6☐ ___

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
[illegible]	D[illegible]	Hard	[illegible]	55
Clay	Gray	Hard	55	1170
[illegible]	Gray	Soft to Hard	1170	1185
129-33-19 BD	ABBD			
Elev. 1319±5'				
1788				

CODED

LOCATED BY
1 - ☐ Address Verification
2 - ☐ Name on Mailbox
3 - ☐ Lot-Block
4 - ☐ Plat Book
5 - ☐ Info. From Owner
6 - ☐ Info. From Neighbor
7 - ☒ Other Sheriff
☐ Can't Locate State Why
Use a second sheet, if needed.

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.

16. WATER WELL CONTRACTOR'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
[illegible] 4/6/77
Licensee Business Name License No.
Address Box 73 Isle MN 56342
Signed ___ Date ___
Authorized Representative
[illegible] Date 5-3-77
Name of Driller

MINN. GEOLOGICAL SURVEY COPY

P. C. BETTENBURG & COMPANY
REGISTERED
ARCHITECTS AND ENGINEERS
1437 MARSHALL AVENUE
SAINT PAUL, MINNESOTA
NESTOR 6191

233028

75-328/

Well no. 3

TEST HOLE DATA
for
NEW WELL AT LONG PRAIRIE, MINN.

Data by Jack Schultz
Hole started Jan. 3, 1942

Location	Material
Ground to 12 ft.	Dry sand.
12 ft. to 21 ft.	Fine sand and gravel
21 ft. to 62 ft.	Coarse sand and gravel
62 ft. to 83 ft.	Very fine sand, little clay
83 ft. to 106 ft.	Gravel

Notes: Water struck at 12 ft. below ground. The water level rose 2 ft. to a point 10 ft. below grade when sinking test hole between 83 ft. level and 87 ft. Between 87 ft. level and 95 ft. level it dropped 1 ft. to a point 11 ft. below grade. At 95 ft. level it returned to normal level of 12 ft. below grade, where it remained constant for the balance of the test hole survey.

Water samples were taken at the 40 ft., 60 ft., 80 ft., and 100 ft. levels.

- -

GRAVEL PACK WELL DATA
for
NEW WELL AT LONG PRAIRIE, MINN.

Data by McCarthy Well Co.

Well was completed June 9th, 1942.

The final test on this well revealed the following results. The depth to water at rest was 12 feet. While pumping at the rate of 550 gallons per minute the water level became stabilized at a depth of 25 feet. In other words, there was a 13 foot drawdown below static level which, converted to specific capacity of the well, gives a figure of 42.3 gallons of water per minute per foot of drawdown.

DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 156A.01-.08

for Water Supply

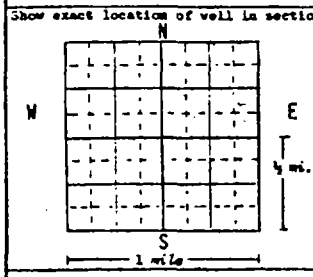
123593

1. LOCATION OF WELL

County Name	Fraction	Section Number	Township Number	Range Number
Todd	NW¼ SW¼	21	129 N. or S.	33 E. of W.

Distance and Direction from Road Intersections or Street Address and City of Well Location

Show exact location of well in section grid with "X." Sketch map of well location.



3. PROPERTY OWNER'S NAME

Address Long Prairie Golf Club
Long Prairie, Minn 56347

4. WELL DEPTH (completed) 90 ft. Date of Completion 9-17-76

5. ☐ 1 Cable tool ☐ 4 Reverse ☐ 7 Driven ☐ 10 Dug
☐ 2 Hollow rod ☐ 5 Air ☐ 8 Bored ☐ 11 _____
☒ Rotary ☐ 6 Jetted ☐ 9 Power Auger

6. USE
☐ 1 Domestic ☐ 4 Public Supply ☐ 7 Industry
☒ 2 Irrigation ☐ 5 Air Conditioning ☒ Commercial
☐ 3 Test Well ☐ 6 _____

7. CASING DIAM.
Threaded ☒ 1 Welded ☐ 3
Black ☒ 2 Galv. ☐ 4
6 in. to 90 ft. depth
_____ in. to _____ ft. depth
_____ in. to _____ ft. depth
HEIGHT: Above/Below
Surface 1 ft.
Weight 3.24 lbs./ft.
Drive Shoe? Yes ___ No X

8. SCREEN
Make Johnson
Type Stainless Steel Dia. 6"
Slot/Gauze .060 Length 10'
Set between 80 ft. and 90 ft.
_____ ft. and _____ ft.
_____ ft. and _____ ft.
Or open hole from _____ ft. to _____ ft.
FITTINGS:

9. STATIC WATER LEVEL
41½ ft. ☒ below land surface ☐ above Date Measured 9-17-76

10. PUMPING LEVEL (below land surface)
90 ft. after 2 hrs. pumping 211.64 g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

11. WELL HEAD COMPLETION
☐ 1 Pitless adapter ☐ 2 Basement offset ☒ 3 At least 12" above grade

12. Well grouted?
☐ Yes ☒ No Cu. Yds. _____
☐ 1 Neat cement ☐ 2 Bentonite ☐ 3 _____
Depth: from _____ ft. to _____ ft.
from _____ ft. to _____ ft.

13. Nearest source of possible contamination
_____ feet _____ direction _____ type
Well disinfected upon completion? Yes ☒ No ☐

14. PUMP
Date Installed 9-17-76
☐ Not Installed
Manufacturer's Name Sta-Rite
Model Number _____ HP 7½ Volts 230
Length of drop pipe 80 ft. capacity 5.7 g.p.m.
Material of drop pipe PVC
Type: ☒ 1 Submersible ☐ 3 L.S. Turbine ☐ 5 Reciprocating
☐ 2 Jet ☐ 4 Centrifugal ☐ 6 _____

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay	Brown	Mud	1	18'
Clay & rocks	Brown	Hard	18	114'
Sand	Brown	Soft	1242 114	1276 190'
Clay	Brown	Med	60	71'
Sandy	Dirty Clay	Soft	1265 71	91'
Sand	Clay	Soft Fine	91	91' 1245
129-33-21	CBB	BBB		
Elev. 1336.5				
178A				

COPIED

Use a second sheet, if needed.

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

North Star Well Drilling 15038
Licensee Business Name License No.

Address Box 93 Isle Minn

Signed _____ Date _____
Authorized Representative

_____
Name of Driller

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.

LONG PRAIRIE QUAD
178A

MINN. GEOLOGICAL SURVEY COPY

FORM 9-1642 (1-68)

Well No. 129.33.21.dba

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

Record by C. Kurets Source of data Driller Date 8/23/70 Map Long Prairie 7½

State Minnesota 27 County (or town) Todd Co. 77

Latitude: 45 58 08 N Longitude: 094 50 30 Sequential number: 1

Lat-long accuracy: 4 T. 129 N. R. 33 W. Sec. 21 ¼ NE ¼ NW ¼ SE ¼ 5th B & M

Local well number: 129N33W21DBA Other number:

Local use: WETSEL Owner or name: Marion Peterson

Owner or name: M. PETERSON Address: Long Prairie, Minn.

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist — P

Use of water: (A) Air cond, (B) Boiling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (I) Dom, (M) Irr, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other — H

Use of well: (A) Anode, (D) Drain, (G) Geoth, (H) Heat Rec, (O) Obs, (Q) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed. — W

DATA AVAILABLE: Well data 6 Freq. W/L meas.: 0 Field aquifer char.

Hyd. Tab. data: Info. From Owner — 129-33-21 DCBAD

Qual. water data: Info. From Neighbor — Elev. 1391 ES

Pumpage inventory: yes (no) period: 0

Aperture cards: yes

Log data:

LOCATED BY: Address Verification or Map Lot Block Location Stake Why 178A

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 129½ ft 129 Meas. spc accuracy 3

Depth cased: (first perf.) 126½ ft 126 Casing type: Diam. 4 in 4

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (Q) open end, (P) perf., screen, (T) sd. pt., (W) shored, (X) open hole, (Z) other — S

Method Drilled: (A) air rot., (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other — C

Date Drilled: July 15, 1960 950 Pump intake setting: ft

Driller: W. Wiese Alexandria, Minn.

Lift (type): (W) air, (B) bucket, (C) cent. (J) multiple (centr.), (M) multiple (subm.), (N) none, (P) piston, (Z) other, (S) submerg, (T) turb, (Z) other — Deep / Shallow

Power (type): diesel, elect, gas, gasoline, hand, gas, wind; H.P.

Trans. or meter no.

Describe MP

Alt. LSD: 1350 above / below LSD, Alt. MP 1350 (source) — 4

Water Level: 20 above / below LSD 1272 Accuracy: — 0

Date meas: 7 60 Yield: 12 gpm 1223 Method determined

Drawdown: 0 ft 0 Accuracy: 3 Pumping period 1 hrs 1 1220

QUALITY OF WATER DATA: Iron ppm Sulfate ppm Chloride ppm Hard. ppm <1220

Sp. Conduct x 10⁶ Temp. °F Date sampled

Taste, color, etc.

Well No. 129.33.21.dba

STATE OF MINNESOTA
DEPARTMENT OF HEALTH

178-1

WATER WELL RECORD [redacted]

Minnesota Statutes 1961, 31.38

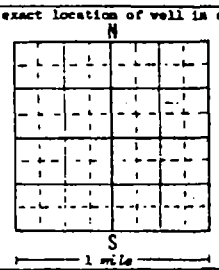
109016

1. LOCATION OF WELL

County	Section Number	Township Number	Range Number
Todd	25	33 N. or S.	35 E. or W.

Distance and Direction from Road Intersections or Street Address and City of Well Location

Show exact location of well in section grid with "X." Sketch map of well location.



Lot # 159
Long Prairie Twp.

3. PROPERTY OWNER'S NAME [redacted]

Address [redacted]

Long Prairie Minn. 56347

4. WELL DEPTH (completed) 178 ft. Date of Completion 10-2-75

5. 1 ☐ Cable tool 4 ☐ Reverse 7 ☐ Driven 10 ☐ Dug
2 ☐ Hollow rod 5 ☐ Air 8 ☐ Bored 11 ☐ _____
3 ☒ Rotary 6 ☐ Jetted 9 ☐ Power Auger

6. USE
☒ 1 Domestic 4 ☐ Public Supply 7 ☐ Industry
2 ☐ Irrigation 5 ☐ Air Conditioning 8 ☐ Commercial
3 ☐ Test Well 6 ☐ _____

7. CASING DIAM.
Threaded ☒ 1 Welded ☐ 3
Black ☒ 2 Galv. ☐ 4
4 in. to 170 ft. depth
_____ in. to _____ ft. depth
_____ in. to _____ ft. depth
HEIGHT: Above/Below
Surface 1 ft.
Weight 10.89 lbs./ft.
Drive Shoe? Yes ☐ No ☒

8. SCREEN
Or open hole from _____ ft. to _____ ft.
Mark Johnson
Type Stainless Steel Dia. 2"
Slot/Gauge .012 Length 8'
Set between 170 ft. and 178 ft.
_____ ft. and _____ ft.
_____ ft. and _____ ft.
FITTINGS: K-packer

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay	Brown	Med	0	15
Clay	Gray	Med	15	170
Sand	Gray	Soft	170	179
			179	181
129-33-25 CCBCCB				
ELEV 1349±5				

9. STATIC WATER LEVEL
30 ft. ☒ below land surface ☐ above Date Measured 10-2-75

10. PUMPING LEVEL (below land surface)
120 ft. after 1 hrs. pumping 7 g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

11. WELL HEAD COMPLETION
☒ 1 Pitless adapter 2 ☐ Basement offset 3 ☐ At least 12" above grade

12. Well grouted?
☐ Yes ☒ No Cu. Yds. _____
1 ☐ Neat cement 2 ☐ Bentonite 3 ☐ _____
Depth: from _____ ft. to _____ ft.
from _____ ft. to _____ ft.

13. Nearest source of possible contamination
_____ feet _____ direction _____ type
Well disinfected upon completion? Yes ☒ No ☐

14. PUMP
Date Installed 10-10-75
☐ Not installed
Manufacturer's Name Reda
Model Number 11SPC5-1 HP ½ Volts 220
Length of drop pipe 120 ft. capacity _____ g.p.m.
Material of drop pipe PVC
Type: 1 ☒ Submersible 3 ☐ T.S. Turbine 5 ☐ Reciprocating
2 ☐ Jet 4 ☐ Centrifugal 6 ☐ _____

Use a second sheet, if needed.

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

North Star Well Drilling 49038
Licensee Business Name Licensee No.

Address Box 23 Isle, Minn. 56342

Signed _____ Date 10-15-75
Authorized Representative

Ervin Rathmacher

DEPARTMENT OF HEALTH

(418A)

WATER WELL RECORD

Minnesota Statutes 156A.01-.09

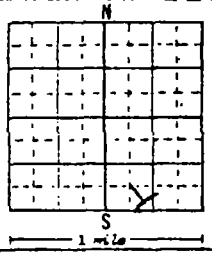
MINNESOTA UNIQUE WELL NO. 109028

1. LOCATION OF WELL

County Name	Fraction	Section Number	Township Number	Range Number
Todd		26	129 N or S.	E. or W.

Distance and Direction from Road Intersections or Street Address and City of Well Location

Show exact location of well in section grid with "X." Sketch map of well location.



S 91.17 ac SE¼
Long Prairie Twp.
602223

3. PROPOSED USE [redacted]

Address [redacted]
Long Prairie Minn. 56347

4. WELL DEPTH (completed) 56 ft. Date of Completion 10-10-75

5. [1] Cable tool [4] Reverse [7] Driven [10] Dug
[2] Hollow rod [5] Air [8] Bored [11] _____
[3] Rotary [6] Jetted [9] Power Auger

6. USE
[1] Domestic [4] Public Supply [7] Industry
[2] Irrigation [5] Air Conditioning [8] Commercial
[3] Test Well [6] _____

7. CASING DIAM. Threaded [1] Welded [3] Black [2] Galv. [4]
4 in. to 52 ft. depth
_____ in. to _____ ft. depth
_____ in. to _____ ft. depth
HEIGHT: Above/Below Surface 1 ft.
Weight 10.57 lbs./ft.
Drive Shoe? Yes ___ No X

8. SCREEN Or open hole from _____ ft. to _____ ft.
Make Johnson
Type Stainless Steel Dia. 2"
Slot/Gauge .017 Length 4'
Set between 52 ft. and 56 ft.
_____ ft. and _____ ft.
_____ ft. and _____ ft.
FITTINGS: K-packer

9. STATIC WATER LEVEL 25 ft. [X] below land surface [ ] above Date Measured 10-11-75

10. PUMPING LEVEL (below land surface)
_____ ft. after _____ hrs. pumping _____ g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

11. WELL HEAD COMPLETION
[1] Pitless adapter [2] Basement offset [3] [X] At least 12" above grade

12. Well grouted? [ ] Yes [ ] No Cu. Yds. _____
[1] Neat cement [2] [X] Bentonite [3] _____
Depth: from 7 ft. to 20 ft.
from _____ ft. to _____ ft.

13. Nearest source of possible contamination
_____ feet _____ direction _____ type
Well disinfected upon completion? Yes [X] No [ ]

14. PUMP Date installed [illegible]
[X] Not installed
Manufacturer's Name _____
Model Number _____ HP _____ Volts _____
Length of drop pipe _____ ft. capacity _____ g.p.m.
Material of drop pipe _____
Type: [1] Submersible [3] L.S. Turbine [5] Reciprocating
[2] Jet [4] Centrifugal [6] _____

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay	Brown	Med	0	7
Clay & Rock	Gray	Med	7	29
Clay	Dk Gray	Med	29	52
Sand	Gray	Soft	52	56
			1290	1286
129-33-26DDD				DB
ELEV	1314	± 5		
RIGHT OF THIS				
AREA				

Use a second sheet, if needed.

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

North Star Well Drilling [illegible]
Licensee Business Name License No.

Address Box 23 Eagle Bend

Signed [signature] Date [illegible]
Authorized Representative

Steve Nelson & Erling Erlandson
Name of Driller

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.

MINN. GEOLOGICAL SURVEY COPY

WATER WELL RECORD [redacted] 143063

Minnesota Statutes 156A.01-.08

County Name: Todd

Township Name: [illegible] | Township Number: 126 N/S | Range Number: [illegible] E/W | Section No. | Fraction

Distance and Direction from Road Intersection or Street Address and City of Well Location

Show exact location of well in section grid with "X." Sketch map of well location.

Addition Name | Block Number | Lot Number

1 mile

1. PROPERTY OWNER'S NAME [redacted] 141

Address [redacted] Long Prairie, MN 56347

4. WELL DEPTH (completed) 124 ft. | Date of Completion 3-11-78

5. 1 Cable tool 2 Hollow rod 3 Rotary 4 Reverse 5 Air 6 Jetted 7 Driven 8 Bored 9 Dug 10 [illegible] 11 [illegible]

6. USE 1 Domestic 2 Irrigation 3 Test Well 4 Public Supply 5 Municipal 6 Air Conditioning 7 Industry 8 Commercial 9 [illegible]

7. CASING 1 Black 2 Galv. 3 [illegible] 4 Threaded 5 Welded 6 [illegible] | HEIGHT: Above/Below | Drive Shoe? Yes No

4 in. to 124 ft. Weight 10.79 lbs./ft. | HOLE DIAM in. to ft.

in. to ft. Weight lbs./ft. | in. to ft.

in. to ft. Weight lbs./ft. | in. to ft.

8. SCREEN Make T | Or open hole from ft. to ft.

Type | Dia. | Slot/Gauge | Length | FITTINGS:

Set between 111 ft. and 124 ft.

ft. and ft.

ft. and ft.

9. STATIC WATER LEVEL ft. below land surface above | Date Measured

10. PUMPING LEVEL (below land surface)

ft. after hrs. pumping g.p.m.

ft. after hrs. pumping g.p.m.

11. WELL HEAD COMPLETION 1 Pitless adapter 2 Basement offset 3 At least 12" above grade

12. Well grouted? Yes No | Cu. Yds.

1 Neat Cement 2 Bentonite 3 [illegible]

Depth: from ft. to ft.

from ft. to ft.

13. Nearest sources of possible contamination feet direction type

Well disinfected upon completion? Yes No

14. PUMP Date Installed | Not Installed

Manufacturer's Name

Model Number | HP | Volts

Length of drop pipe ft. | capacity g.p.m.

Material of drop pipe

Type: 1 Submersible 2 Jet 3 L. S. Turbine 4 Centrifugal 5 Reciprocating 6 [illegible]

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

License Business Name | License No.

Address

Signed | Date

Authorized Representative

Name of Driller | Date

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay	Brown	Soft	0	2
Clay	Gray	Soft	2	11
Sand	Gray	Fine	11	124
129-33-28AB			OA 1242	AC 1258
Elev. 1382±5'				
178A				
COPIED				
IF NOT HERE, CHECK				
SW SECTION OF				
25				

Use a second sheet, if needed.

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.

LONG PRAIRIE QUAD
178A

MINN. GEOLOGICAL SURVEY COPY

5/74 30M
7/76 30M

DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 156A.01-.08

for Water Sample

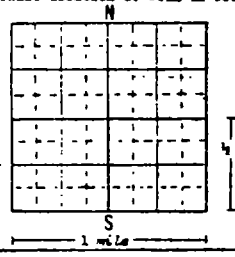
117652

1. LOCATION OF WELL

County Name	Fraction	Section Number	Township Number	Range Number
TODD		29	129 N. or S.	33 E. or W.

Distance and Direction from Road Intersections or Street Address and City of Well Location

Show exact location of well in section grid with "X." Sketch map of well location.



3. PROPERTY OWNER'S NAME [redacted]

Address Long Prairie

4. WELL DEPTH (completed) 45 ft. Date of Completion

5. 1 [X] Cable tool 4 [ ] Reverse 7 [ ] Driven 10 [ ] Dug
2 [ ] Hollow rod 5 [ ] Air 8 [ ] Bored 11 [ ]
3 [ ] Rotary 6 [ ] Jetted 9 [ ] Power Auger

6. USE
1 [ ] Domestic 4 [X] Public Supply 7 [ ] Industry
2 [ ] Irrigation 5 [ ] Air Conditioning 8 [ ] Commercial
3 [ ] Test Well 6 [ ]

7. CASING DIAM. HEIGHT: Above/Below
Threaded [X] 1 Welded [ ] 3 Surface ft.
Black [ ] 2 Galv. [ ] 4
4" in. to 41 ft. depth Weight 11 lbs./ft.
in. to ft. depth
in. to ft. depth Drive Shoe? Yes X No

8. SCREEN Or open hole
Make Smith from ft. to ft.
Type Dia. 4"
Slot/Gauge 20 slot Length 4'
Set between 41 ft. and 45 ft. FITTINGS: STO
ft. and ft.
ft. and ft.

9. STATIC WATER LEVEL
6 ft. [ ] below land surface [ ] above Date Measured

10. PUMPING LEVEL (below land surface)
10 ft. after hrs. pumping g.p.m.
ft. after hrs. pumping g.p.m.

11. WELL HEAD COMPLETION
1 [X] Pitless adapter 2 [ ] Basement offset 3 [X] At least 12" above grade

12. Well grouted? [ ] Yes [X] No Cu. Yds.
1 [ ] Neat cement 2 [ ] Bentonite 3 [ ]
Depth: from ft. to ft.
from ft. to ft.

13. Nearest source of possible contamination
100 feet S direction Septic ta
Well disinfected upon completion? Yes [X] No [ ]

15. PUMP
½ h.p. Date installed 6/6/75
Flint, Walling [ ] Not installed
Manufacturer's Name Goulds
Model Number 10EJ HP ½ Volts 220
Length of drop pipe 20 ft. capacity 10 g.p.m.
Material of drop pipe plastic
Type: 1 [X] Submersible 3 [ ] L.S. Turbine 5 [ ] Reciprocating
2 [ ] Jet 4 [ ] Centrifugal 6 [ ]

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Sand	yellow		1	45
Stagecoach				
on Charlotte				
129-33-29 CAADBB				
Elev. 1298 ± 5'				
178A				

CODED

Use a second sheet, if needed.

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.
LONG PRAIRIE QUAD
178A

16. WATER WELL CONTRACTOR'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Anderson Well Drilling 7/20/
Address Clarisse, Minn.
Signed Date
Authorized Representative
Name of Driller

MINN. GEOLOGICAL SURVEY COPY

7/74 30M

Minnesota Statutes 1976 Ch. 104

131910

Township Name: Long Prairie | Township Number: 129 N | Range Number: 33 W | Section No.: 32 | Fraction: ¼ ¼ ¼

Distance and Direction from Road Intersections or Street Address and City of Well Location

Show exact location of well in section grid with "X." Sketch map of well location.

Addition Name | Block Number | Lot Number

1 mile × ½ mile

1. PROPERTY OWNER'S NAME: [redacted]
Address: Long Prairie MN 56347

4. WELL DEPTH (completed): 55 ft. | Date of Completion: 5-9-78

5. [X] Rotary | 1 Cable tool | 2 Hollow rod | 3 Jetted | 4 Reverse | 5 Air | 6 Driven | 7 Bored | 8 Dug | 9 Power Auger | 10 | 11

6. USE: [X] 1 Domestic | 2 Irrigation | 3 Test Well | 4 Public Supply | 5 Municipal | 6 Air Conditioning | 7 Industry | 8 Commercial | 9

7. CASING: [X] 1 Black | [X] 4 Threaded | 2 Galv. | 5 Welded | 3 | 6 | HEIGHT: Above/Below | Surface 1 ft. | Drive Shoe? Yes ___ No [X]
4 in. to 51 ft. Weight 10.89 lbs./ft.
___ in. to ___ ft. Weight ___ lbs./ft.
___ in. to ___ ft. Weight ___ lbs./ft.
HOLE DIAM: ___ in. to ___ ft. | ___ in. to ___ ft. | ___ in. to ___ ft.

8. SCREEN: Make Johnson | Type Stainless Steel | Slot/Gauze .012 | Set between 51 ft. and 71 ft. | ___ ft. and ___ ft. | ___ ft. and ___ ft.
Or open hole from ___ ft. to ___ ft.
Dia. ___ | Length ___ | FITTINGS:

9. STATIC WATER LEVEL: 11 ft. [X] below land surface [ ] above | Date Measured 5-9-78

10. PUMPING LEVEL (below land surface): ___ ft. after 1 hrs. pumping 15 g.p.m. | ___ ft. after ___ hrs. pumping ___ g.p.m.

11. WELL HEAD COMPLETION: [X] 1 Pitless adapter | 2 Basement offset | 3 At least 12" above grade

12. Well grouted? [ ] Yes [X] No | Cu. Yds. ___
1 Neat Cement | 2 Bentonite | 3 ___
Depths: from ___ ft. to ___ ft. | from ___ ft. to ___ ft.

13. Nearest sources of possible contamination: 75 feet E direction Septic type
Well disinfected upon completion? Yes [X] No [ ]

14. PUMP: ___ | Date Installed ___ | [ ] Not Installed
Manufacturer's Name ___
Model Number ___ HP ___ Volts ___
Length of drop pipe ___ ft. capacity ___ g.p.m.
Material of drop pipe ___
Type: 1 Submersible | 2 Jet | 3 L. S. Turbine | 4 Centrifugal | 5 Reciprocating | 6 ___

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
[illegible]	Brn	Med	0	12
[illegible]	Gry	Med	12	51
[illegible]	Gry	Soft	51	125
[illegible]	Gry		125	125½

129-33-32BDDDC
Elev. 1307±5
178A

CODED

LOCATED BY
1 - [ ] Address Verification
2 - [X] Name on Mailbox
3 - [ ] Lot-Block
4 - [ ] Plat Book
5 - [ ] Info. From Owner
6 - [ ] Info. From Neighbor
7 - [ ] Other ___
[ ] Can't Locate State Why

Use a second sheet if needed.

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.

16. WATER WELL CONTRACTOR'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
North Star Drilling Inc 418038
Licensee Business Name | License No.
Address Box 33 Isle, MN
Signed ___ Date 4/[illegible]
Authorized Representative
Melvin Borkowski Date 5-9-78
Name of Driller

MINN. GEOLOGICAL SURVEY COPY

5/76 30M
7/76 30M

Cont. 22151B

HYDRO ENGINEERING, INC. BOX 98 Young America, Minnesota 55397
WELL DRILLING AND REPAIR – PUMP SALES AND SERVICE 612-467-3100

WELL LOG AND CONSTRUCTION RECORD

75-3334

Ray Timmer Date 8-22 19 74

TO [redacted]

irrig. ADDRESS small property listed TODT

CITY Long Prairie STATE Minn. 129-33-32

LOG OF FORMATIONS

Ray Timmer Land

			SWL				SWL
0	to 25	Medium Gravel			to		
25	to 50	Coarse "			to		
50	to 60	Fine Sand			to		
60	to 69	Coarse Sand			to		
69	to 79	" "			to		
	to				to		
	to	129-33-32 ACCEL			to		
	to	Elev. 1315 ±5'			to		
	to	1781			to		

LOCATED BY
1 - ☐ Address Verification
2 - ☐ [illegible]
3 - ☐ [illegible]
4 - ☐ [illegible]
5 - ☑ [illegible]
6 - ☐ Info. From Neighbor
7 - ☐ Other
☐ Can't Locate State Why

WELL DESIGN

Depth measured from Top of Casing

SCREEN WELL DATA

Make of Screen Johnson Irrigation

Size: Diam. 12 in. Length 20 ft. Slot Size 150-50

Location in Well 59 to 79 Screen Metal L.C.S.

Fittings: Top 16x12 Lead Packer

Bottom Welded Bottom

Other Screen Data

ROCK WELL DATA

Open borehole diam. to ft.

WELL TEST DATA

636 gpm. Static Water Level 20 Pumping Water Level 60'

hours of pumping (Drawdown 40' ft.) 15.9 Gal. Per Ft.

PUMP DATA

Make Worthington Type Oil Lube Turbine

Model Serial Number 9 Stage Size 10M50

HP 80 Drop Pipe Size 6" & Length 60 Shaft Size & Length 2"x1"

M Head ' RPM

~~Motor~~ MD 80 HP Ratio 1:1 Phase Cycles

Well Seal

Water Analysis: Hardness ppm. Iron ppm.

CASING STRINGS

0 to 59

15½ ID 16 OD

Wt. lbs. per ft.

Thrd. & Cpld.

Welded X

Drive Shoe X

Cemented

2.

to

ID OD

Wt. lbs. per ft.

Thrd. & Cpld.

Welded

Drive Shoe

Cemented

3.

to

ID OD

Wt. lbs. per ft.

Thrd. & Cpld.

Welded

Drive Shoe

Cemented

Signed

HYDRO ENGINEERING, INC.

BOX 98

Young America, Minnesota 55397

WELL DRILLING AND REPAIR – PUMP SALES AND SERVICE

612-467-3100

(#1)

WELL LOG AND CONSTRUCTION RECORD

Date Nov 21, 1974 19

TO [redacted]

221406

ADDRESS Long Prairie

CITY STATE

129-33-33 DBBDAB

Elev. 1377 1784

PA753334

LOG OF FORMATIONS

			SWL				SWL
0	to 35	Coarse Sand			to		
35	to 51	Fine Sand			to		
	to				to		
	to				to		
	to				to		
	to				to		
	to				to		
	to				to		
	to				to		

CODED

LOCATED BY
1 - ☐ Address Verification
2 - ☑ Name on Mailbox
3 - ☐ Lot Block
4 - ☐ Plat Book
5 - ☐ Info. From Owner
6 - ☐ Info. From Neighbor
7 - ☐ Other
☐ Can't Locate State Why

WELL DESIGN

Depth measured from Top of casing

SCREEN WELL DATA

Make of Screen Johnson Irrigator

Size: Diam. 12 in. Length 25'-9" ft. Slot Size 10' of 30 # 15' of 15 #

Location in Well 25' to 51'. Screen Metal Steel

Fittings: Top Lead packer

Bottom plate

Other Screen Data

ROCK WELL DATA

Open borehole diam. to ft.

WELL TEST DATA

500 gpm. Static Water Level 5 Pumping Water Level 44'

5 hours of pumping (Drawdown 39 ft.) 12.8 GPF.

PUMP DATA

Make Worthington Type Oil Lube Turbine

Model Serial Number Size 8ST-10-150

HP 60 Drop Pipe Size 6 " & Length 40 Shaft Size & Length 2x1¼

GPM Head ' RPM

Motor: 60 HAD 60-1/2 Volts Phase Cycles

Well Seal

Water Analysis: Hardness ppm. Iron ppm.

1606

Signed Darrell Crone

CASING STRINGS

to

ID OD

Wt. lbs. per ft.

Thrd. & Cpld.

Welded

Drive Shoe

Cemented

2.

to

ID OD

Wt. lbs. per ft.

Thrd. & Cpld.

Welded

Drive Shoe

Cemented

3.

to

ID OD

Wt. lbs. per ft.

Thrd. & Cpld.

Welded

Drive Shoe

Cemented

STATE OF MINNESOTA
DEPARTMENT OF HEALTH

178B

WATER WELL RECORD

Minnesota Statutes 1961, 103I.01-.08

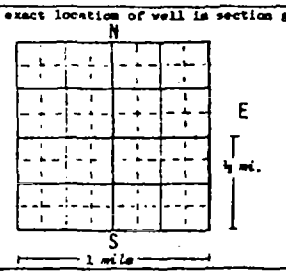
MINNESOTA UNIQUE WELL NO. 107381

1. LOCATION OF WELL

County Name	Section	Section Number	Township Number	Range Number
Todd		24	129 N or S.	34 E. or W.

Distance and Direction from Road Intersections or Street Address and City of Well Location

Show exact location of well in section grid with "X." Sketch map of well location.



Reynolds Twp.

Sec 24

1. PROPERTY OWNER [redacted]

Address [redacted] Long Prairie, Minn. 56347

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay	Brn	Soft		
Sand	Brn	Soft	154	180
129-34-24 BADBCR				
ELEV 1410±5				
ONLY WELL IN CIRCLE				

Use a second sheet, if needed.

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.

6. WELL DEPTH (completed) 60 ft. Date of Completion 3-8-76

5. 1 Cable tool 2 Hollow rod 3 X Rotary 4 Reverse 5 Air 6 Jetted 7 Driven 8 Bored 9 Power Auger 10 Dug 11 ____

6. USE 1 X Domestic 2 Irrigation 3 Test Well 4 Public Supply 5 Air Conditioning 6 ____ 7 Industry 8 Commercial

7. CASING DIAM. Threaded 1 X Welded 2 Black 1 X Galv. 2 4 in. to 56 ft. depth ____ in. to ____ ft. depth ____ in. to ____ ft. depth

HEIGHT: Above/Below Surface 1 ft. Weight 10.37 lbs./ft. Drive Shoe? Yes ____ No X

8. SCREEN Make Johnson Type Stainless Steel Dia. 2" Slot/Gauge .012 Length 4' Set between 56 ft. and 60 ft. ____ ft. and ____ ft. ____ ft. and ____ ft.

Or open hole from ____ ft. to ____ ft.

FITTINGS: 5" x 4" K-Packer

9. STATIC WATER LEVEL 25 ft. X below land surface ____ above Date Measured 3-8-76

10. PUMPING LEVEL (below land surface) ____ ft. after 1 hrs. pumping 15 g.p.m. ____ ft. after ____ hrs. pumping ____ g.p.m.

11. WELL HEAD COMPLETION 1 Pitless adapter 2 Basement offset 3 X At least 12" above grade

12. Well grouted? Yes No X Cu. Yds. ____ 1 Neat cement 2 Bentonite 3 ____ Depth: from ____ ft. to ____ ft. from ____ ft. to ____ ft.

13. Nearest source of possible contamination ____ feet ____ direction ____ type Well disinfected upon completion? Yes X No

14. PUMP Date installed ____ X Not installed Manufacturer's Name ____ Model Number ____ HP ____ Volts ____ Length of drop pipe ____ ft. capacity ____ g.p.m. Material of drop pipe ____ Type: 1 Submersible 2 Jet 3 T.S. Turbine 4 Centrifugal 5 Reciprocating 6 ____

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

North Star Well Drilling 48033
Licensee Business Name License No.

Address Box 23 Esko Minn. 55733

Signed ____ Date ____
Authorized Representative

Steve Nelson
Name of Driller

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