

803208

2 copies

FINAL ENVIRONMENTAL IMPACT STATEMENT

**WOODLAKE SANITARY LANDFILL
PROPOSED EXPANSION AT
MEDINA, MINNESOTA**

OCTOBER 1980

LEGISLATIVE REFERENCE LIBRARY
STATE OF MINNESOTA

**Prepared by
Minnesota Pollution Control Agency**



TABLE OF CONTENTS

PAGE

LIST OF TABLES	iii
LIST OF FIGURES	iv
LIST OF APPENDICES	iv
1.0 EXECUTIVE SUMMARY	1
1.1 Identification of Document	1
1.2 Description of Proposed Action	1
1.3 Major Environmental Impacts	1
1.4 Alternatives to Proposed Action	4
2.0 INTRODUCTION	7
2.1 Background	7
2.2 Environmental Impact Statement Process	9
2.3 Permitting Process	13
3.0 DESCRIPTION OF EXISTING LANDFILL AND PROPOSED ACTION	14
3.1 Introduction	14
3.2 Areawide Solid Waste Service Conditions	14
3.3 Description of the Existing Landfill	28
3.4 Description of the Proposed Landfill	40
4.0 DESCRIPTION OF THE EXISTING ENVIRONMENT	47
4.1 Meteorology/Climatology, Air Quality and Noise	47
4.2 Water Quality	60
4.3 Terrestrial and Aquatic Ecology	70
4.4 Socio-Economics	76
4.5 Geology and Hydrology	97
4.6 Energy	105
4.7 Human Health	108
5.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION	116
5.1 Meteorology/Climatology, Air Quality and Noise	116
5.2 Water Quality	119
5.3 Terrestrial Ecology and Aquatic Ecology	127
5.4 Socio-Economics	131
5.5 Geology and Hydrology	138
5.6 Energy	140
5.7 Human Health	141

TABLE OF CONTENTS (cont. 'd)

	<u>PAGE</u>
6.0	MITIGATION MEASURES 144
6.1	Introduction 144
6.2	Leachate Controls 144
6.3	Surface Runoff and Erosion Controls 147
6.4	Methane and Odor Controls 147
6.5	Air Pollution Controls 149
6.6	Public Health Measures 150
6.7	Aesthetic Measures 152
6.8	Energy Conservation Measures 154
6.9	Ecological Protection Measures 155
6.10	Measures Designed to Reduce Cumulative Long-Term or Irreversible Impacts 155
7.0	UNAVOIDABLE ADVERSE IMPACTS 156
8.0	IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES . . 158
9.0	RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG- TERM PRODUCTIVITY 159
10.0	CUMULATIVE IMPACTS 160
11.0	ALTERNATIVES TO THE PROPOSED ACTION 162
11.1	Introduction 162
11.2	Proposed Action with Design/Operating Modifications 168
11.3	Proposed Action at a Different Site in the TCMA . . . 173
11.4	Different Actions at the Woodlake Site 174
11.5	Regional Actions Which Would Not Be Implemented by MPCA or BFI 180
11.6	No Action 183
12.0	COORDINATION OF EIS EFFORT WITH OTHER GOVERNMENT AGENCIES AND INTERESTED GROUPS 186
12.1	Impact on State Government of Any Federal Controls Associated with the Proposed Action 186
12.2	Multi-State Responsibilities Associated With the Proposed Action 188
12.3	Coordination Effort 188
REFERENCES	 192

LIST OF TABLES

		<u>PAGE</u>
3-1	Trends of Waste Generation in the TCMA (Tons Per Year)	15
3-2	Future Waste Generation Rates in the TCMA (Pounds Per Capital Per Day)	15
3-3	Solid Waste Composition for the TCMA (Percent)	16
3-4	Annual Waste Generation by Waste Type in the TCMA Through the Year 2000 (Tons)	18
3-5	TCMA Solid Waste Disposal System Capacity, 1972-1977 . . .	19
3-6	Annual Use Rates of TCMA Landfills Currently Utilized by Hennepin County	23
3-7	TCMA Counties Currently Served by Each TCMA Landfill . . .	24
3-8	Remaining Sanitary Landfill Capacity Serving the TCMA . . .	26
3-9	Monthly Waste Quantities Received at Woodlake, 1973 to 1979 (Cubic Yards)	32
3-10	Communities Served by Woodlake Sanitary Landfill, Their Populations, Haul Distances and Haul Routes	33
4-1	Estimates Noise-Level Statistics in the Vicinity of the Woodlake Sanitary Landfill	58
4-2	Mean Leachate Composition	65
4-3	Comparative Costs for Landfills in the TCMA (Dollars Per Cubic Yard)	82
4-4	TCMA Population Projections by County	86
4-5	Occupation of Western Hennepin County Residents, 1977 . . .	91
4-6	Site Soil Classifications	103
5-1	Available Average Watershed Dilution Ratios	122
5-2	Diluted Lake Independence Leachate Concentrations	124
5-3	Property Value Information for Properties Adjacent to the Site (\$)	134

LIST OF FIGURES

	<u>PAGE</u>
2-1 Woodlake Sanitary Landfill Site--Medina, Minnesota	8
2-2 Environmental Impact Statement Process	12
3-1 Transfer Stations, Landfills and Landfill Wasteshed Boundaries in Hennepin County	21
3-2 Land Disposal Facilities in the TCMA	22
3-3 Sanitary Landfill Site Selection Finalists in Hennepin County	27
3-4 Development Plan for Woodlake Sanitary Landfill	29
3-5 Woodlake Sanitary Landfill Proposed Expansion Final Contours	42
4-1 Noise Monitoring and Noise/Odor Sensitive Receptor Locations	56
4-2 Location of Local Water Supply Wells	61
4-3 Site Soils Map	102

LIST OF APPENDICES

APPENDIX I	Comments and Responses to Comments
APPENDIX II	Minn.Geological Survey Well Data
APPENDIX III	Ground Water Contours
APPENDIX IV	Archaeological Survey
APPENDIX V	Solid Waste Regulations
APPENDIX VI	Transcript

1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION

The Minnesota Pollution Control Agency (MPCA) has received a permit application for the construction and operation of a 40 acre expansion to an existing landfill in Hennepin County. The proposed project would involve construction and operation of a landfill disposing of municipal wastes over a ten year time period. The facility would continue to be owned and operated by Woodlake Sanitary Service, Inc., a subsidiary of Browning-Ferris, Inc. (BFI).

An Environmental Assessment Worksheet (EAW) prepared in early 1979 found that the proposed expansion was a major action with the potential for significant environmental effects. Consequently, the MPCA board ordered that an Environmental Impact Statement (EIS) be prepared. In November 1979, a Consultant Task Force was retained by MPCA to provide assistance in the preparation of the EIS and related background documents. Utilizing the best available information, MPCA and its consultants prepared this EIS.

1.2 PROPOSED ACTION

The proposed action involves the construction (primarily excavation) and operation (primarily waste placement, compaction and application of daily soil cover) of a proposed forty acre landfill expansion in Medina Township in Hennepin County. The site would process approximately 270 to 440 tons per day of municipal and commercial wastes. Hazardous wastes other than household quantities are not accepted at the site. Construction and operation would begin immediately upon approval of the permit application. Expected project life is approximately ten years.

1.3 ENVIRONMENTAL IMPACT

To date, public concern over the proposed action has focussed on the following issues: ground and surface water contamination, public health, terrestrial ecology, and local socio-economic conditions. The following sections provide additional detail on these and other environmental considerations.

Ground And Surface Water Quality

The effects of normal operations of the proposed project on both ground and surface quality should be minimal given the selection of appropriate design and operation procedures. While the potential for surface water contamination is high due to the immediate proximity of the site to two wetland areas and an unnamed creek, the actual potential for surface water contamination is dictated by design and operating conditions. Ground and surface water impacts should be minimal, given the highly impermeable sub-surface soils found on site.

Public Health

Numerous pathogens and toxics found in municipal waste streams are capable of causing disease in humans. However, pathogen survival in landfills is relatively brief and subsurface soil conditions preventing leachate migration should similarly reduce the potential for public health impacts.

Additional public health impacts relate to on-site accidents to workers and site visitors. While landfill sites do offer opportunities for this particular type of impact, landfill sites are not generally regarded as hazardous work areas, and only a minimum of effort is required to reduce accident rates to acceptable levels.

Ecology

Potential impacts due to construction and operation of the proposed expansion relate primarily to direct removal of terrestrial vegetation during construction operations. This includes approximately nine acres of mature basswood-maple overstory. However, given the extent of similar resources located throughout the area, actual impacts are expected to be insignificant.

Socio-economics

Landfill sites can result in reduction of land use values for adjacent properties since public reaction to the siting or operation of a sanitary landfill is generally negative. At the Woodlake site, it is possible that continued landfill operation would depress property values for adjacent land parcels. However, existing limited land use value data for properties adjacent to the existing site do not demonstrate this trend and, more importantly, adjacent properties are already sited next to an existing landfill. Thus, decreases in land value, if any, should already have been experienced.

Air Quality

The effects of normal operations of the proposed facilities on any federal or state ambient air quality standards would be negligible. Potential fugitive emissions, methane gas emissions, and odor emissions are expected to be minimal and the existing site has not demonstrated any substantive problems in these areas.

Energy

The impacts of the proposed action on areawide energy resources are negligible due to the small size of the proposed expansion in terms of total energy requirements.

Geology And Hydrology

The impact of the proposed action on areawide geology and hydrology resources is insignificant, due to the localized area of construction and operation. Actual impacts will be limited to soil movement (excavation, filling, final contouring) on a forty acre site.

1.4 ALTERNATIVES

The Proposed Action

The proposed action has been described in Section 3.0 and potential impacts in Sections 5.0, 7.0, 8.0, and 9.0.

The Proposed Action With Design/Operating Modifications

Based upon the description of potential impacts contained in Section 5.0, Section 6.0 defined a variety of mitigative measures which are available to ameliorate those impacts as required. Major modifications which can be considered include: utilization of a liner and/or leachate collection and treatment system, installation of vertical impermeable barriers along the wetland boundary, increasing the thirty to fifty foot separation distance from the landfill operation to the wetland, utilization of litter fences and increasing litter clean-up frequency, improving site security by installation of fences along property boundaries, submission of more detailed runoff control and monitoring plans, installation of a berm and/or a settling pond(s) at the base of the landfill slope adjacent to the wetland, increasing compaction ratios, utilization of composting for leaves or grass clippings, providing a row of trees for aesthetic purposes along Tomahawk Trail, or installation of a limited methane recovery system for on-site energy use.

Proposed Action At A Different Site

Section 11.0 also considered the possibility of a BFI operation at an alternative site. In summary, capacity is probably not available at the alternative BFI site and the siting of a new landfill facility in Hennepin County would be a difficult process, due to the level of citizen concern. In any case, a new site would transfer some of the same environmental impacts to a site currently unaltered by landfill operations and would likely result in higher disposal costs due to increased waste collection costs.

Different Action At The Woodlake Site

A variety of waste processing, materials recovery and energy recovery options were discussed in Section 11.0 for applicability to the Woodlake site. In general, due to the small quantity of incoming wastes, the site would not be economically attractive with respect to most of the above options. Since the site is a private venture, those particular types of decisions are primarily based upon economic analyses and as such final decisions are made by the site owners. In this case, the only option BFI has indicated any interest in pursuing is the provision of additional compaction equipment (i.e., a landfill compactor).

Regional Actions Which Would Not Be Implemented By BFI Or MPCA

Section 11.0 also discussed the impacts of the Woodlake site on regional plans for resource recovery and the impacts of regional resource recovery implementation on the Woodlake site.

In the first area, due to the size of the site and the required time frame for implementation at the regional level, no specific impacts could be expected in the short term, i.e., 0 to 5 years. At the same time, the TCMA, and particularly Hennepin County, has a demonstrated need for additional landfill capacity.

Similarly, in the second area, impacts on a Woodlake site due to construction of a regional resource recovery facility would be expected to be minimal in the short-time frame. However, in the long term, should a large regional facility be constructed, the issue of waste ownership and control will require resolution.

No Action

The no-action alternative would involve continued utilization of the current site primarily as open space use. This alternative would eliminate all adverse impacts of the proposed operation, while reducing available landfill capacity. Waste from the Woodlake watershed would have to be ac-

cepted at other sites reducing the life of those landfills and likely increasing energy use for transportation. No-action could also result in displacement of landfill site operating employees and several or all of BFI's forty-five employees operating trucks as part of BFI's waste collection service.

2.0 INTRODUCTION

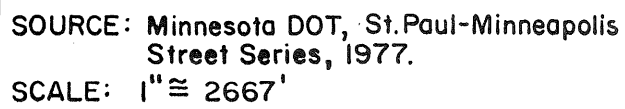
2.1 BACKGROUND

Woodlake Sanitary Service Inc., a subsidiary of Browning-Ferris Industries, Inc., has proposed a 40-acre expansion to its Medina, Minnesota landfill. The location had previously encompassed a 15-acre open dump, owned and operated by the Boyer Landfill Company. In 1971, the Boyer Sanitary Landfill Company was granted Permit No. SW-61 by the Minnesota Pollution Control Agency (MPCA) to construct and operate a 28-acre sanitary landfill on the site. Hennepin County and the City of Medina also licensed the Boyer facility at that time. The site was then purchased by Woodlake Sanitary Service, Inc., and a temporary operational plan was submitted to MPCA in August, 1973.

An amended operation plan involving a 40-acre expansion and a revised permit application were first considered in January, 1975 (see Figure 2-1). Corrective measures to the problems inherited from the Boyer operation were incorporated in the plan. The Minnesota Environmental Quality Council (now the Minnesota Environmental Quality Board--MEQB) ordered an environmental assessment (with the City of Medina as the responsible agency) and upon review, recommended that no EIS be required. However, this decision was reconsidered and an EIS (with MPCA as the responsible agency) was required in June, 1975. Browning-Ferris ultimately withdrew its expansion proposal in 1975 before beginning any EIS preparation and entered into a stipulation agreement with MPCA to implement mitigative measures to correct problems associated with the Boyer facility. The agreement included the submission of a hydrogeologic study to MPCA.

Browning-Ferris resubmitted their current expansion plan proposal to MPCA in 1979 and an Environmental Assessment Worksheet (EAW) was prepared. The EAW found that the expansion was a major action with the potential for significant environmental effects.

WOODLAKE SANITARY LANDFILL SITE -- MEDINA, MINNESOTA



2.2 THE WOODLAKE ENVIRONMENTAL IMPACT STATEMENT PROCESS

Under the provisions of the 1973 Minnesota Environmental Policy Act, (Minn. Stat. Chapter 116D) an environmental impact statement must be prepared when a proposed action is found to be a major action and has the potential for significant environmental effects.

The purpose and scope of an EIS is governed by the 1973 Minnesota Environmental Policy Act (Minn. Stat Chapter 116D) and MEQB rules (MEQC 1977):

The purpose of an Environmental Impact Statement is to provide information for agencies and private persons to evaluate proposed actions which have the potential for significant environmental effects, to consider alternatives to the proposed actions, and to institute methods for reducing adverse environmental effects. An Environmental Impact Statement is not a document to justify an action, nor shall indications of adverse environmental effects necessarily require that an action be disapproved. It is to be utilized as a guide on issuing, amending, and denying permits and carrying out the other responsibilities of public agencies to avoid or minimize adverse environmental effects and to restore or enhance environmental quality consistent with the Act (MEQC 1977).

As prescribed by the rules of the MEQB, Draft EIS contains the following information:

1. Summary. A summary sheet that describes the action, major environmental impacts (adverse and beneficial), reasonable alternatives, and the federal, state, and local permits outstanding. Also, federal, state, or local agencies, other organizations and private individuals consulted in the preparation of the EIS shall be identified.
2. Description. A regional and site- specific map should be included to assist in identification of the project.
3. Environmental impact of the proposed action. All phases of an action shall be considered when evaluating an action: planning, acquisition, operation, and conclusion of operation. Special consideration shall be given to pollution, impairment, or destruction of the air, water, land, or other natural resources located within

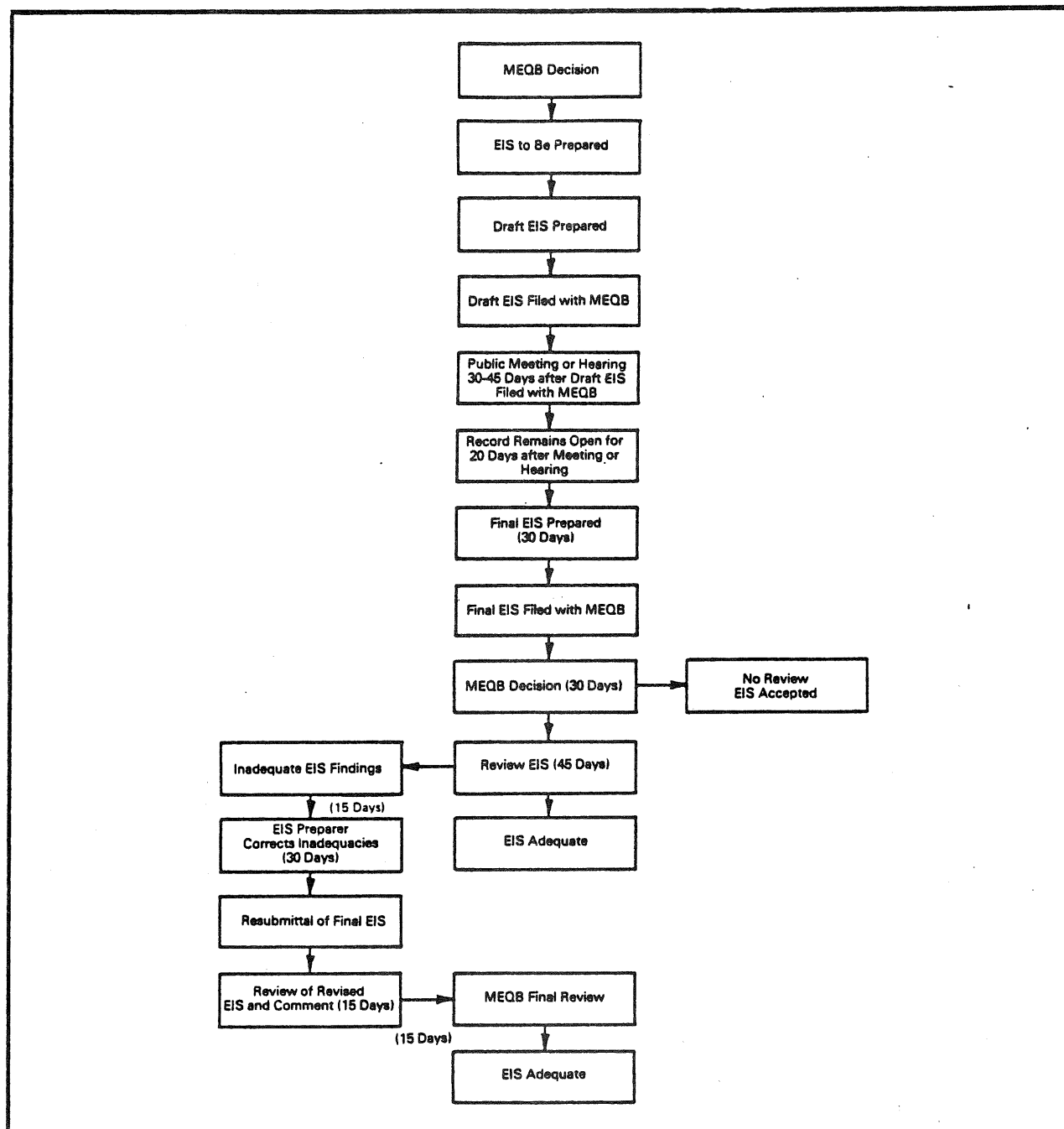
the State resulting from the proposed action. This discussion shall also include a description of all resources in the area and how they will be affected by the action, with emphasis placed on resources that are rare or unique to the region or that possess important historical, cultural, natural, ecological, or aesthetic values.

4. Any direct or indirect environmental, economic, energy, and employment effects that cannot be avoided if the proposed action is implemented. This discussion shall describe the adverse and beneficial environmental, economic, energy, and employment effects that will result directly from the action, as well as the effects that may be reasonably expected to result from the action. Mitigation measures that have been or may be incorporated into the action to reduce or minimize significant adverse environmental, economic, energy and employment effects shall be discussed.
5. Any irreversible and irretrievable commitments of resources that would be involved in the proposed action if it is implemented. This discussion shall include the proposed use of non-renewable resources, long-term or irreversible commitments of resources to a particular use and any irreversible and irretrievable damages that may result from the action.
6. The relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity, including the environmental impact of predictable increased further development of an area if the action is implemented. This discussion shall include the extent that the proposed action involves trade-offs between short-term environmental gains or losses versus long term gains or losses, including potential risks to health and safety, and the extent that the proposed action forecloses future options. The impact of predictable increased future development in the area that may be stimulated, directly or indirectly, by the proposed action shall be discussed.
7. Alternatives of the proposed action. An objective evaluation of all reasonable alternatives to the action and the environmental impact of each and the reasons for their rejection in favor of the recommended choice shall be made. Reasonable modifications of the proposed action that may avoid or reduce adverse environmental effects shall be discussed, including the expected benefits, costs, and effects of the objective of the proposed action.

8. The impact on state government of any federal controls associated with the proposed action. Federal actions pending which may affect the final outcome of the project should be discussed, including those actions which may result in the expenditure of additional state funds.
9. The multi-state responsibilities associated with the proposed action. Impacts of the proposed action upon multi-state responsibilities shall be discussed, including the environmental effects of the action upon adjacent states (MEQC 1977).

The EIS process is shown in simplified form in Figure 2-2. Between 30 and 45 days after the Draft EIS is filed, a public meeting is scheduled. A transcript of the meeting is made and the public record remains open for 20 days after the public meeting to allow the submission of additional information. The Responsible Agency has 30 days from the close of the public record to prepare and file the Final EIS.* The Final EIS consists of the Draft EIS, comments or summaries of comments received during public hearings and reviews, and MPCA responses to the comments. MEQB may review the Final EIS to ensure that EIS rules have been complied with. If MEQB determines that the Final EIS is inadequate, the Responsible Agency has 30 days to undertake required revisions, with an additional 15-day review period. Once the MEQB has determined that the EIS is adequate, the EIS process is concluded.

* MEQB may extend the time limitation upon written request showing good cause.



SOURCE: Minnesota Pollution Control Agency, 1980.

2.3 PERMITTING PROCESS

One major purpose of the EIS process is the generation of information that can assist governmental agencies in making decisions on permit applications. During the permitting process, the various agencies review the impacts and effects of the proposed facility on the environment to determine whether the facility will meet applicable environmental and safety standards. Public comment on these decisions is always solicited by the agencies and public hearings are sometimes held.

If the agencies determine from the available information that the proposed facility will comply with applicable standards, permits authorizing construction can be issued. If one or more of the permitting agencies determines that applicable standards will not be met, permits may be denied. The Applicant could also redesign the facility or abandon that proposal. No agency may make a final decision to approve the action until the Minnesota Environmental Quality Board (MEQB) has found the final EIS adequate.

The major approvals that Woodlake Sanitary Service Inc. (herein referred to as BFI) must obtain for its proposed expansion of the Woodlake Sanitary Landfill are listed below with the relevant agencies and the status of each approval:

Unit of Government (federal, state, regional, local)	Name or Type of Permit/ Approval or Federal Funding	Status
MPCA	Solid Waste Disposal Permit	Not applied for
Hennepin County	Landfill Permit	Have
Village of Medina	Landfill Permit	Not applied for
	Land Alteration Permit	Not applied for
	Rezoning	Not applied for
	Surface Water Permit (for culverts and berms)	Not applied for
Metropolitan Council	Approval	

3.0 DESCRIPTION OF THE EXISTING LANDFILL AND PROPOSED ACTION

3.1 INTRODUCTION

The objective of this section is to provide an overview of existing and future areawide solid waste service conditions as well as to describe the specifics of the existing and proposed landfill sites and operations at the Woodlake Sanitary Landfill. The information which is presented is based to some extent on studies and reports previously prepared on the Woodlake landfill. Areawide information was obtained through studies prepared by the Metropolitan Council (1975; 1979; and 1980), MPCA (Sept. 1979), Metropolitan Waste Control Commission (1977), and various private consultants (Pope-Reid Assoc., Inc., 1980; Ellerbe Assoc., Inc. and Camp, Dresser and McKee, Inc., 1979). The description of the proposed action has been supplemented by plans and discussions submitted by BFI to MPCA, and by a number of verbal discussions with BFI personnel. (Browning-Ferris Industries Inc., 1973; 1979; Minnesota Pollution Control Agency, March 1979; and National Biocentric, Inc., 1975; July 1975; and 1977; McKie and Assoc., Inc., 1974; and Minnesota Engineering Co., 1971.)

3.2 AREAWIDE SOLID WASTE SERVICE CONDITIONS

3.2.1 Solid Waste Sources, Quantities and Composition

Existing

Areawide. The Seven County Solid Waste Plan indicates that the Twin Cities Metropolitan Area (TCMA) generates approximately 1.95 million tons of refuse a year. Of this total quantity, 0.56 million tons is industrial and 1.40 million tons is residential and commercial waste. Projected generation increases have been estimated at 20,000 tons per year. Table 3-1 indicates waste generation trends for the seven counties. Table 3-2 projects future waste generation rates for the TCMA in pounds per capita per day.

Table 3-3 indicates percentages of different waste components for the TCMA. These estimates closely compare to those prepared for other metropolitan areas by the National Center for Resource Recovery.

TABLE 3-1

TRENDS OF WASTE GENERATION IN THE TMCA (TONS PER YEAR)

<u>Waste Source</u>	<u>1970</u>	<u>1975</u>	<u>1980</u>
Residential	917,200	977,850(e)	996,400
Commercial	310,300	357,136	388,800
Industrial	464,000	523,276	559,200
TOTAL	1,691,500	1,858,262	1,944,400

SOURCE: Pope-Reid Assoc., Inc., 1980.

TABLE 3-2

FUTURE WASTE GENERATION RATES IN THE TCMA
(POUNDS PER CAPITA PER DAY)

<u>Waste Source</u>	<u>1980</u>	<u>1985</u>	<u>1990</u>	<u>1995</u>	<u>2000</u>
Residential	2.69	2.69	2.69	2.69	2.71
Commercial	1.05	1.06	1.07	1.09	1.12
Industrial	1.51	1.52	1.53	1.54	1.54
TOTAL	5.24	5.27	5.29	5.32	5.38

SOURCE: Pope-Reid Assoc., Inc., 1980.

TABLE 3-3
SOLID WASTE COMPOSITION FOR THE TCMA (PERCENT)

<u>Waste Component</u>	<u>%</u>
Paper	44.5
Plastic	4.1
Wood	6.7
Textile	1.9
Yard Wastes	9.0
Food Waste	10.9
Glass	7.8
Metal	7.2
Other	<u>7.9</u>
TOTAL	100

SOURCE: Henningson, et. al., 1975.

Browning-Ferris Industries. BFI owns and operates two landfills in Hennepin County (Flying Cloud and Woodlake), and a transfer station in Ramsey County. Both counties are part of the TCMA's solid waste service area. BFI is the largest waste collection and disposal contractor in the Twin Cities area. Since BFI owns both Woodlake and Flying Cloud, the bulk of the quantities disposed at these locations are of Hennepin County origin and are collected by BFI. This refuse is of approximately the same composition as that collected in the Metropolitan Area in general.

Future

Areawide. The bases for estimating future waste generation rates are population growth and per capita waste generation increases over past years. Table 3-4 projects annual waste generation by waste type for the TCMA. If these generation rates are realized, the regional Solid and Hazardous Waste Management Plan (Metropolitan Council, 1979) estimates that approximately 65,000 acre-feet of space would be required to landfill the area's waste by the year 2000. This total is approximately five times the actual remaining space at the 11 landfills now in use (see Table 3-5). Actual total quantities and compositions of waste streams requiring disposal, however, will depend in large part on the extent of source separation and resource recovery programs.

Browning Ferris Industries. BFI, as a private enterprise, will continue to operate a solid waste collection and disposal service in the TCMA. Due to competitive market forces future anticipated growth by BFI cannot be quantified. However, for planning purposes, it would appear reasonable to assume that BFI's total market share would remain reasonably consistent with existing private enterprise collection service patterns.

TABLE 3-4

ANNUAL WASTE GENERATION BY WASTE TYPE IN THE
TCMA THROUGH YEAR 2000 (TONS)

<u>Waste Source</u>	<u>1980</u>	<u>1985</u>	<u>1990</u>	<u>1995</u>	<u>2000</u>
Residential	996,400	1,052,800	1,109,600	1,161,100	1,223,300
Commercial	388,800	415,100	441,400	472,800	504,000
Industrial	559,200	595,100	630,900	663,100	696,500
TOTAL	1,944,400	2,063,000	2,181,900	2,297,000	2,423,800

SOURCE: Pope-Reid Assoc., Inc., 1980.

TABLE 3-5
TCMA SOLID WASTE DISPOSAL SYSTEM CAPACITY, 1972-1977

Site Location	Permitted Capacity (acre-ft.)	Receiving Rate (tons/day) ^a						Average Receiving Rate	Present Use Rate (acre-ft./yr)	Remaining Capacity, Dec. 1977 (acre-ft.)	Yrs. Remaining at Present Use Rate (Dec. 1977)
		1972	1973	1974	1975	1976	1977				
Anoka County											
Anoka Municipal	2,259	313	268	312	454	638	570	426	264.5	1,182	4.5
Oak Grove	975	481	320	321	325	213	Temporarily closed	277	99.0 ^b	157	1.6
East Bethel	993	58	117	52	18	10	8	44	6.2	808	130.3
Waste Disposal Engineering	1,135	221	171	207	208	195	149	192	69.2	170	2.5
County Total	5,362	1,072	876	891	1,005	1,055	727	938	339.9	2,317	6.8
Dakota County											
Burnsville	5,703	577	579	503	300	353	345	443	160.0	4,592	28.7
Freeway	1,962	833	409	425	429	305	380	464	176.3	818	4.6
Dakhue	482	26	28	19	32	38	37	30	17.1	375	21.9
Pine Bend	7,173	481	758	1,071	1,253	1,272	1,240	1,013	575.6	4,450	7.7
American Systems	Closed	172	272	78	Closed	Closed	Closed	87			
County Total	15,320	2,090	2,046	2,096	2,014	1,969	2,001	2,036	929.0	10,235	11.0
Hennepin County											
Woodlake	800	208	159	229	258	249	260	227	120.9	176	1.5
Hopkins (closing 1979)	740	103	138	99	91	89	99	103	45.8	104	2.3
Flying Cloud	3,109	438	291	338	685	980	854	598	396.6	1,555	3.9
County Total	4,649	749	587	666	1,034	1,318	1,213	928	563.3	1,835	3.3
Scott County											
Louisville	1,800	84	58	75	70	81	108	79	50.2	1,588	31.6
Washington County											
Oakdale	Closed	601 est.	607	568	674	Closed	Closed	408			
Metropolitan Area Total/day	27,131	4,596	4,175	4,296	4,796	4,423	4,049	4,389	1,882.4	15,975	8.5
Metropolitan Area Total/yr		1,434,000	1,303,000	1,340,000	1,496,000	1,380,000	1,263,000	1,369,000			
lbs/capita/day - landfilled		4.11	3.70	3.77	4.19	3.85	3.50	3.85			

^a312 days/yr.; 4 cubic yds/ton

^b1976 data

SOURCE: Metropolitan Council, 1979.

3.2.2 Solid Waste Collection and Disposal Systems

Existing

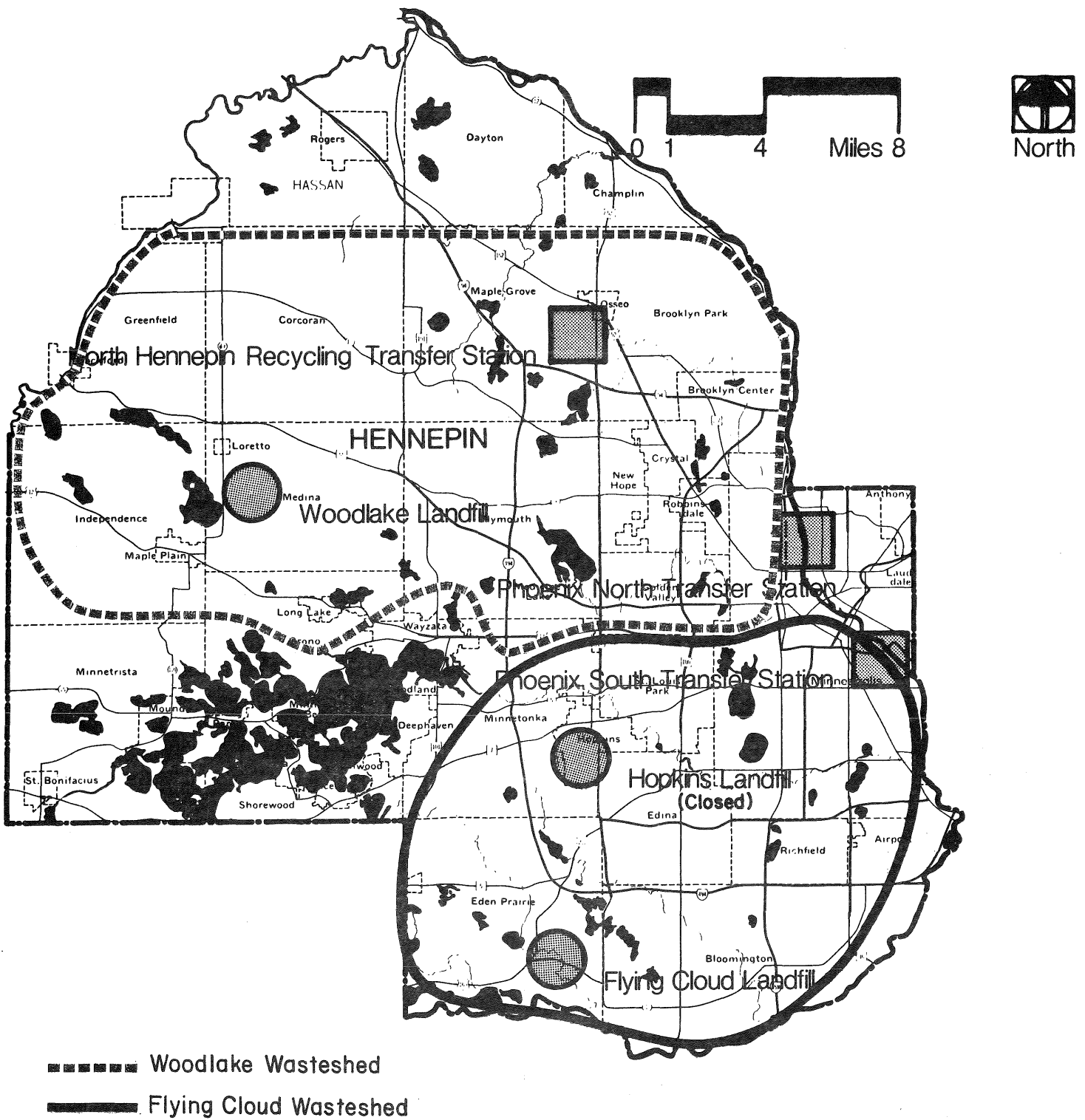
Areawide. Approximately 70 percent or 1.3 million tons of TCMA's solid waste is landfilled at the TCMA's 11 primary landfill disposal sites (see Table 3-5). The remaining quantity is either recovered, land applied in cases involving agricultural waste, or deposited outside the region. Ten of the 11 sanitary landfills are privately owned, and the one site owned by the City of Anoka is operated under contract with a private firm. The bulk of TCMA collection is by private haulers. Collection of refuse from commercial and industrial establishments is usually contracted on an individual basis with these private haulers. According to the Solid Waste Energy and Resource Recovery Study for Hennepin County, for example, the City of Minneapolis is currently contracted with approximately 47 private haulers, each having designated collection routes. The city also has municipal crews with designated routes; however, the level of operation is limited. Some cities in the County also have their own trucks and collect part of their waste in these municipal trucks. These cities include St. Louis Park, Deephaven, Robbinsdale, Tonka Bay, Excelsior, Medicine Lake, Osseo, Wayzata, Minnetonka and Minneapolis. Hopkins is the only municipality that collects all of its own waste in municipally owned trucks.

Figure 3-1 provides a map of Hennepin County identifying landfill locations, transfer station locations, and approximate landfill watershed boundaries. Figure 3-2 is a similar map identifying waste disposal facilities in the TCMA region. Table 3-6 provides annual use rate data for TCMA disposal facilities utilized by Hennepin County residents. Table 3-7 identifies the counties served by each of the landfills in the TCMA.

Browning-Ferris Industries. Of the three sanitary landfills indicated in Table 3-7 in Hennepin County, two are owned and operated by BFI. Hopkins Landfill closed its operation as projected on Table 3-5. As a result, BFI is the sole operator of landfills in Hennepin County. Given current waste projections, it is expected that the currently permitted Woodlake site will reach full capacity during 1980 and Flying Cloud could reach full capacity by 1981.

FIGURE 3-1

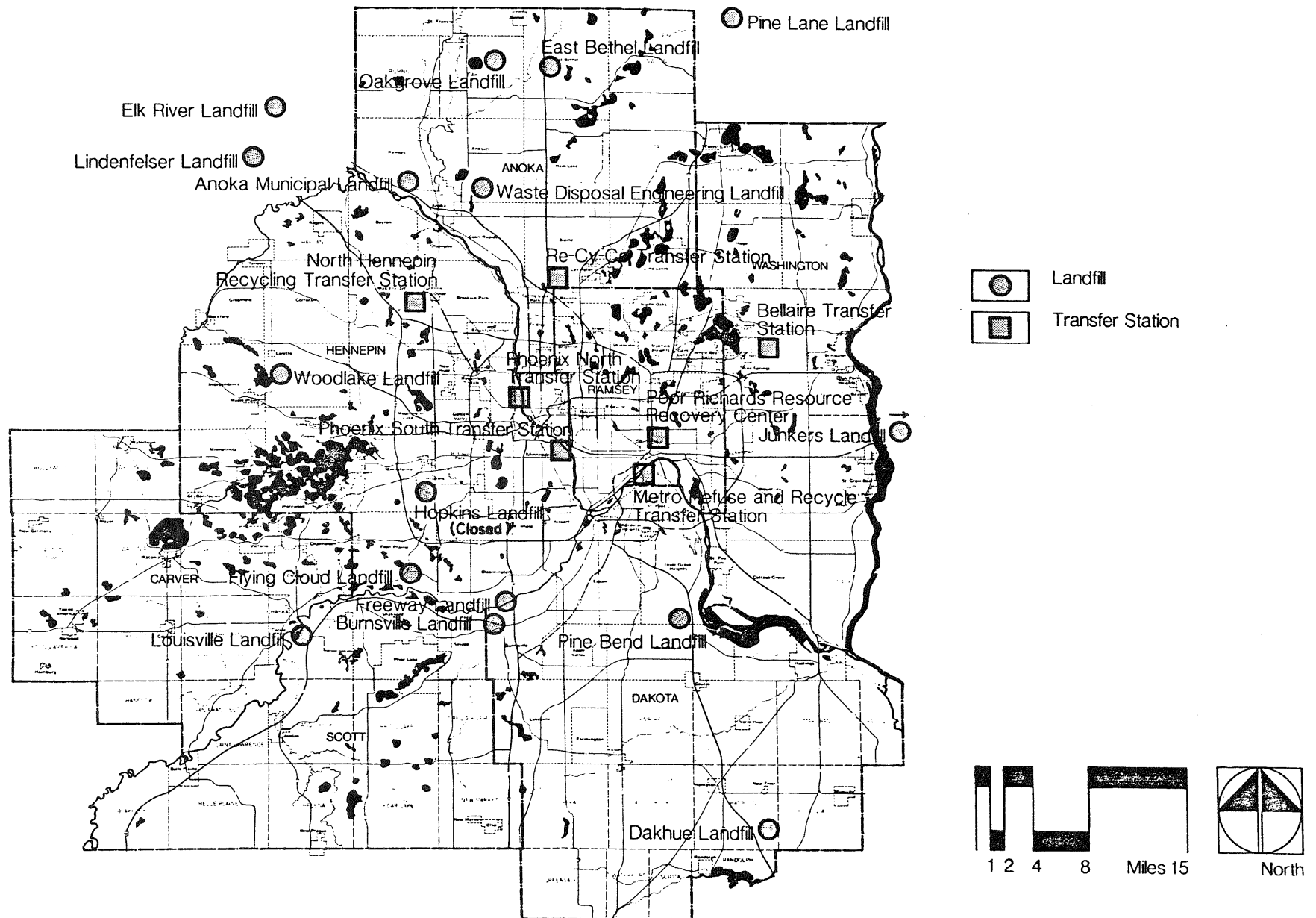
TRANSFER STATIONS, LANDFILLS AND LANDFILL WASTESHED
BOUNDARIES IN HENNEPIN COUNTY



Source: Pope-Reid Associates, Inc., 1980.

FIGURE 3-2

LAND DISPOSAL FACILITIES IN THE TCMA



SOURCE: Pope-Reid Assoc. Inc., 1980.

TABLE 3-6
ANNUAL USE RATES OF TCMA LANDFILLS CURRENTLY
 UTILIZED BY HENNEPIN COUNTY

<u>Landfill Location</u>	<u>1978 Use Rate (Acre-Feet/Year)^(a)</u>	<u>Remaining Life of Landfill (Years)</u>
Anoka County:		
Anoka Municipal	252.3	4.1
Dakota County:		
Burnsville	234.5	1.0
Freeway	119.4	5.9
Pine Bend	641.6	5.9
Hennepin County:		
Woodlake	121.0	0.45
Hopkins	43.3	1.4
Flying Cloud	442.0	2.5
Scott County:		
Louisville	61.3	25.0
Sherburne County:		
Elk River	20.7 ^(b)	427.0
Wright County:		
Lindenfelser	41.9 ^(b)	0.52

(a) Conversion from acre-feet/year to tons/year:

multiply $\frac{\text{ac-ft}}{\text{yr}} \times 672$

(b) 1977 use rate used.

(c) Closed

SOURCE: Poep-Reid Associates, Inc., 1980.

TABLE 3-7

TCMA COUNTIES CURRENTLY SERVED BY EACH TCMA LANDFILL

<u>County and Landfill</u>	<u>Landfill Wasteshed Includes</u>						<u>Washington</u>
	<u>Anoka</u>	<u>Carvel</u>	<u>Dakota</u>	<u>Hennepin</u>	<u>Ramsey</u>	<u>Scott</u>	
Anoka County:							
Anoka Municipal	X			X			
Oak Grove	X						
East Bethel	X						
Waste Disposal Engineering	X						
Dakota County:							
Burnsville	X		X	X	X		X
Freeway			X	X	X	X	X
Oakhue			X			X	
Pine Bend	X		X	X	X		X
Hennepin County:							
Woodlake				X			
Hopkins				X			
Flying Cloud				X			
Scott County:							
Louisville		X		X		X	
Extra Regional Landfills:							
Pine Lane					X		X
Junkers							X
Elk River				X			
Lindenfelser				X			

SOURCE: Pope-Reid Assoc., Inc., 1980.

Future

Areawide. Table 3-8 indicates projections for available disposal capacity in the TCMA. As noted, the bulk of the regional land disposal capacity will be exhausted by the year 1984 (Metropolitan Council, 1979). In Hennepin County, landfill disposal capacity, as currently permitted, will be exhausted by 1981. By the year 2000, Hennepin County, of the seven metropolitan counties, will require the most landfill space by far, or approximately 32,049 acre-feet (Metropolitan Council, 1979).

Given the lack of available disposal capacity and the regional concerns with environmental problems associated with improper disposal practices, the regional plan stresses disposal alternatives, including conservation and waste reduction. These measures are followed in order of preference by source separation, processing to recover materials and/or energy, and land disposal. The Solid and Hazardous Waste Management Plan further states that landfilling should be considered only after all other options have been eliminated or determined unfeasible. However, the plan does not rule out land disposal, but rather considers it a vital part of the region's solid waste management plan. As such, Hennepin County is currently evaluating potential landfill disposal sites throughout the county. In an effort to select an adequate site for future land disposal, Hennepin County has prepared a series of three reports addressing landfill site selection. As a result of this effort, nine finalist sites had been selected (see Figure 3-3).

The reports also present disposal alternatives to the nine landfill sites recommended at the public hearing on May 16, 1979. These alternatives include resource and/or energy recovery, recycling, land leasing, landfilling out of the County, and landfill of a "megasite." The mega-site landfill would be a single large landfill site intended to serve the County's long-term disposal needs. The total land required for such a site would be 1000-2000 acres. However, because of Hennepin County's growth patterns, such tracts of land are rare. At this time, the County is continuing to refine the original list of sites.

TABLE 3-8

REMAINING SANITARY LANDFILL CAPACITY SERVING THE TCMA

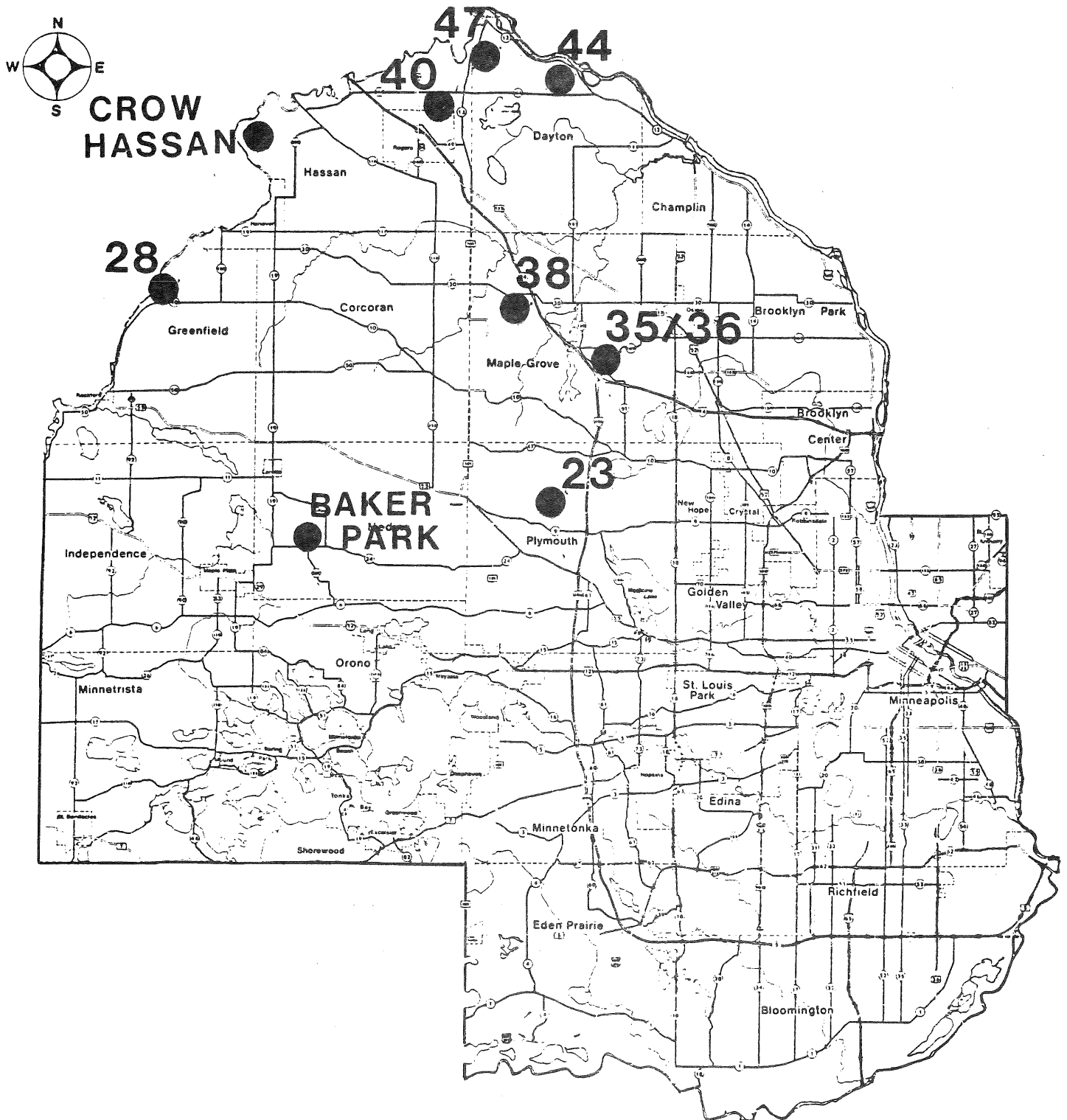
<u>County and Landfill</u>	<u>Permitted Capa- Acre-Ft.</u>	<u>1978 Current Use Rate Acre-Ft./Yr.</u>	<u>December 1978 Remaining Capa- city: Acre-Ft.</u>	<u>Remaining Life at Current Use Rate (Years)</u>
Hennepin				
Woodlake	800	121	55	0.45
Hopkins	740	43	61	-
Flying Cloud	3,109	442	1,113	2.5
Total	4,649	606	1,229	2.0
Anoka				
Anoka Municipal	2,246	252	1,038	4.1
Oak Grove (N.W.)	2,821	174	385	2.2
East Bethel	989	9	816	91
Waste Disposal Engineering	973	40	285	7.1
Total	6,929	475	2,524	5.3
Dakota				
Burnsville	5,703	235	254	1.0
Freeway	1,962	119	699	5.9
Oakhue	480	21	354	16.6
Pine Bend	7,173	642	3,808	5.9
Total	15,318	1,017	5,115	29.4
Scott				
Louisville	1,820	61	1,538	25.0
Chicago ^(a)				
Pine Lane	403	69	415	6.0
Sherburne ^(a)				
Elk River	8,927	21	8,839	427
Wright ^(a)				
Lindenfelser	267	42	22	0.52
St. Croix, WI ^(a)				
Junkers	620	56	423	7.5

(a) Using 1977 use rates.

SOURCE: Pope-Reid Assoc., Inc., 1980.

FIGURE 3-3

SANITARY LANDFILL SITE SELECTION FINALISTS IN HENNEPIN COUNTY



SOURCE: Hennepin County Department of Environment and Energy, August 1979.

Browning-Ferris Industries. Browning-Ferris Industries, Inc. as represented by Woodlake Sanitary Service, Inc. is a privately owned operation in the waste collection and disposal business in the TCMA. As such, it is expected that BFI will seek to continue its level of operations in Hennepin County, and in the seven-county region in general. At this time, however, it is not known whether BFI intends to develop another landfill site, or whether BFI intends to seek additional permits to extend operations at Flying Cloud beyond 1981 or at the Woodlake site beyond 1990.

3.3 DESCRIPTION OF EXISTING LANDFILL SITE

3.3.1 Existing Permits

The site is operating under Permit No. SW-61 granted on November 18, 1971 by the Minnesota Pollution Control Agency. The operation is classified as a Type I sanitary landfill, as defined in Subsection 2, Section II of Ordinance No. 1, Solid Waste Disposal Ordinance for Hennepin County.

3.3.2 Existing Site Location

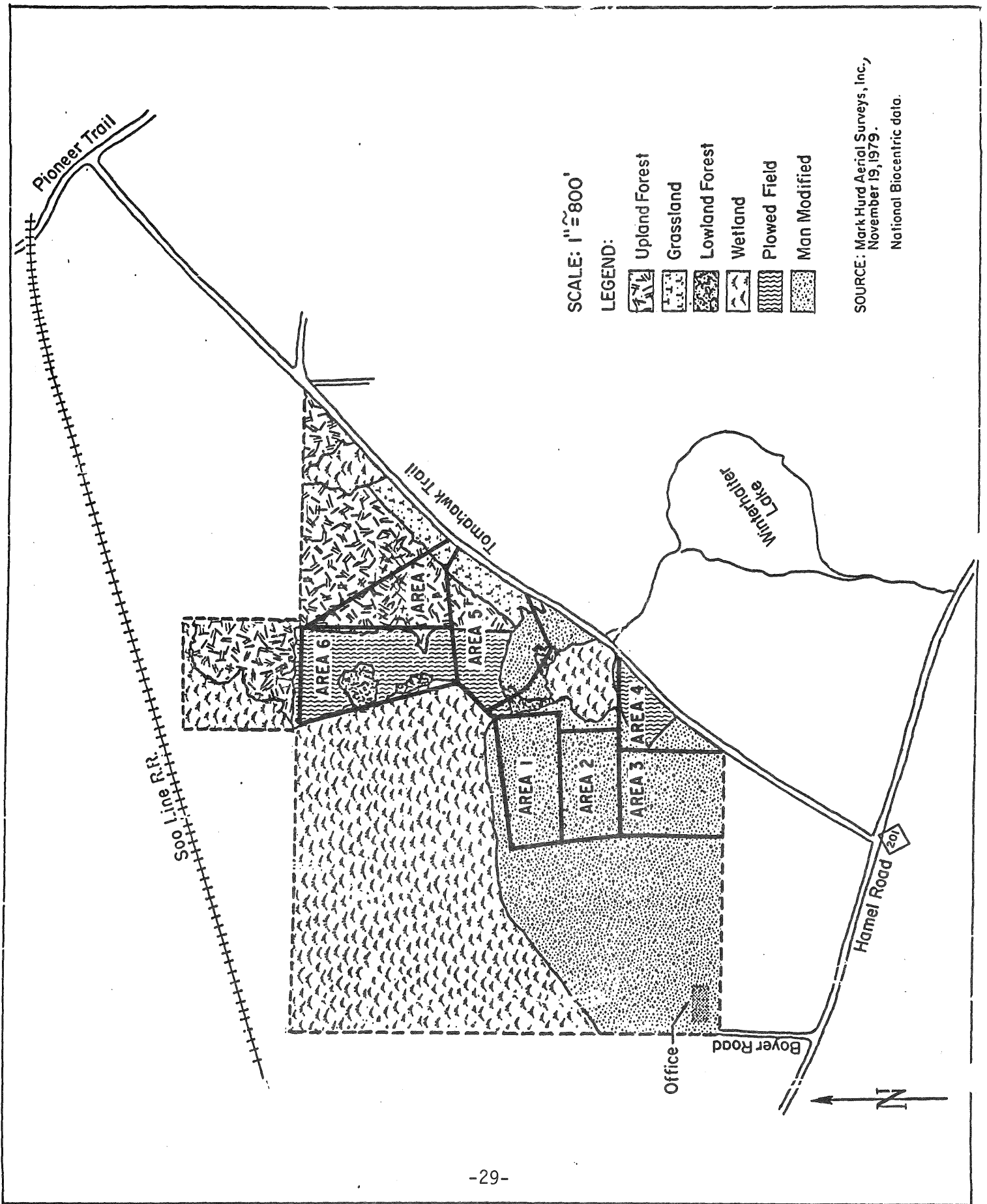
Woodlake Sanitary Landfill is located in the City of Medina, in the northern half of Section 8, Township 118, Range 23 West, Hennepin County, and is approximately 20 miles west of the Minneapolis-St. Paul metropolitan area and approximately one mile southeast of the Village of Loretto. Access to the site entrance itself, via Boyer Road, Hamel Road, Tomahawk Trail and Pioneer Trail, is from County Road 19, County Road 24 and State Highway 55.

Figure 3-4 indicates the existing and proposed landfill in Areas 1 and 2, and, upon completion, utilization of cover material from Area 3. To date, cover apparently has been obtained from both Areas 3 and 4.

To the south, the existing operation is bounded by the southerly property line and Area 3, and to the north, by the larger wetland area. The operation is bounded to the west by the entrance drive, parking area and main office. To the east, the existing operation is bounded by a small wetland area and Area 3.

FIGURE 3-4

DEVELOPMENT PLAN FOR WOODLAKE SANITARY LANDFILL



3.3.3 Existing Site Operation

Waste Sources, Quantities, and Composition

Refuse quantities received at Woodlake average approximately 27,500 cubic yards per month. This average load is expected to continue in the future, with 5 percent annual increases. Table 3-9 indicates recorded monthly waste quantities received at Woodlake from 1973 to 1979. These quantities verify the 27,500 cubic yards used for estimating future capacities.

The site was originally designed to achieve an ultimate capacity of 500 acre-feet. After almost 10 years of operation, Woodlake's capacity is nearly exhausted and as a result, restrictions have been placed on non-BFI incoming waste streams in the last several months.

The Woodlake site currently encompasses a service area with a 20-mile haul radius. Table 3-10 lists the communities normally served by Woodlake, along with their populations, haul distances and haul routes.

Woodlake's policy is to accept primary municipal and commercial wastes. Street cleanings, construction wastes, brush, trees, tires, and animal carcasses are also acceptable refuse. Previous studies have indicated that the site does not accept explosives, sewage sludge, septic tank cleanings or manures.

At one time, a designated area of the Woodlake Sanitary Landfill was set aside for the disposal of toxic and hazardous waste materials. This was a requirement for permitting by the MPCA. No toxic or hazardous waste materials were deposited in this designated area, nor are these materials currently accepted at the landfill except in expected household quantities. With the exception of obviously dangerous or hazardous wastes such as gasoline or paint cans, no specific waste pre-screening procedure is currently utilized.

TABLE 3-9

MONTHLY WASTE QUANTITIES RECORDED AT WOODLAKE, 1973 TO 1979 (CUBIC YARDS)

Month	Year						
	1979	1978	1977	1976	1975	1974	1973
January	21,337	21,788	22,659	21,698	22,739	15,542	16,285
February	18,587	20,102	20,799	18,594	20,831	17,820	14,922
March	22,619	23,709	24,600	22,050	21,187	19,648	16,311
April	31,312	28,008	35,548	32,463	27,545	24,810	18,329
May	34,931	34,040	29,630	27,297	35,804	29,275	21,300
June	32,187	31,743	-	28,297	29,528	26,016	19,406
July	31,999	32,402	27,541	28,139	31,267	27,638	-
August	31,383	31,509	28,549	27,755	30,586	27,610	15,880
September	25,169	25,141	26,408	29,951	27,109	21,713	14,254
October	*	26,398	29,193	25,928	30,214	26,248	14,804
November	*	26,751	26,822	25,063	22,436	25,620	-
December	*	22,397	23,880	23,193	22,769	23,854	13,361
Average	27,724	26,999	26,875	25,869	26,834	23,816	16,485

* Records do not indicate quantities for these months, although BFI has indicated that non-BFI waste is generally not accepted at the site due to limited remaining available capacity.

SOURCE: Minnesota Pollution Control Agency, 1979.

TABLE 3-10

COMMUNITIES SERVED BY WOODLAKE SANITARY LANDFILL,
THEIR POPULATIONS, HAUL DISTANCES, AND HAUL ROUTES

<u>Generation Area and 1970 Population</u>	<u>Haul Miles</u>	<u>Major Route To Site</u>
Brooklyn Center (35,173)	20	F.A.P.* 100- F.A.S. 9 - F.A.P. 55 - Co. 19.
Brooklyn Park (33,306)	18	Co. 18 -F.A.S.* 9 F.A.P. 55 - Co. 19
Champlin (7070)	25	F.A.P. 52 - F.A.S. 9 F.A.P. 55 - Co. 19
Crystal (30,925)	19	F.A.P. 52 - F.A.S. 9- F.A.P. 55 - Co. 19
Golden Valley (24,246)	16	Co. 18 - F.A.P. 55 - Co. 19
Hamel (Medina) (2396)	8	F.A.P. 55 - Co. 19
Independence (2383)	8	F.A.P. 12 - Co. 19
Long Lake (1506)	8	F.A.P. 12 - Co. 19
Maple Grove (8377)	18	RT. 94 - F.A.S. 9 F.A.P. 55 - Co. 19
Maple Plain (1169)	5	Co. 19
Medina (2660)	4	F.A.P. 12 - Co. 19
Minnetonka (35,776)	15	F.A.P. 12 - Co. 19
Mound (8817)	10	Co. 110 - Co. 19

TABLE 3-10

(continued)

COMMUNITIES SERVED BY WOODLAKE SANITARY LANDFILL,
THEIR POPULATIONS, HAUL DISTANCES, AND HAUL ROUTES

<u>Generation Area and 1970 Population</u>	<u>Haul Miles</u>	<u>Major Route To Site</u>
New Hope (23,180)	14	F.A.S. 9 - F.A.P. 55 - Co. 19
Orono (7264)	8	F.A.P. 12 - Co. 19
Osseo (2908)	20	Co. 18 - F.A.S. 9 - F.A.P. 55 - Co. 19
Plymouth (17,593)	11	F.A.P. 55 - Co. 19
Robbinsdale (16,845)	17	F.A.P. 55 - Co. 19
Spring Park (1549)	12	F.A.P. 15 - Co. 110 Co. 19
Wayzata (3700)	11	F.A.P. 12 - Co. 19

*F.A.P. - Federal Aid Primary Road.
F.A.S. - Federal Aid Secondary Road.
Co. - County Road.

SOURCE: McKie and Assoc., Inc., 1974.

General Method of Landfilling

Operating procedures are regulated by a site attendant present during operating hours. Upon acceptance of the refuse, the waste is unloaded at the assigned working face, spread, compacted and covered. The existing site was landfilled in general accordance with the operational plan developed by the Minnesota Engineering Co. in a report called "Report on Boyer Sanitary Landfill for Boyer Sanitary Landfill Company, Hamel, Minnesota," in May, 1971.

Previous studies indicate that the operation is a combination of the ramp and area fill methods. Unloading of the refuse takes place at either the top or bottom of the slope of the working face and is confined to the minimum practical area. The refuse is then pushed up or down the slope, spread and compacted in layers to a maximum depth of two feet. The slope does not exceed 30 degrees and the maximum height of any one lift is eight feet. Prior to daily shut-down, the refuse is scheduled to be covered with six inches of compacted soil. However, during winter, freezing conditions, cover availability and equipment maintenance problems could result in occurrences of less than six inches of daily cover.

At various stages of cell construction, earth is piled on already filled areas for use as future cover. These stockpiles assist in the further compaction of the landfill area.

Inclement Weather Operations

Inclement weather does not hinder access to the site. Boyer Road is classified as an all-weather road, and offers ready access to the office and the landfill. The company gravels and grades the road periodically, and the town plows the snow in winter.

Inclement weather operations also include utilization of stockpiled cover material.

Personnel and Equipment

The labor category breakdown associated with the operation of the Woodlake landfill is as follows:

<u>Labor Category</u>	<u>Number</u>
Line Manager	1
Equipment Operator	2
Clerk	3
Truck Drivers	41
Mechanics	2
Office Manager	1

Of the above, the only personnel utilized for on-site landfill operations are the two equipment operators, with assistance from the two mechanics and three clerks (for maintenance and check-in procedures).

The following equipment on the site is used for spreading refuse in two-foot layers, compacting the waste and placing, spreading and compacting the cover material:

<u>Number</u>	<u>Model</u>
1	D-8H-46a Caterpillar (Bulldozer)
1	627 Caterpillar (Earthmover)
1	International Loader
1	Back-up Dozer

Access Control and Security

Roadway access to the site is from Boyer Road through a gate located adjacent to the office building. The gate is open during operating hours between 8:00 A.M. and 5:00 P.M., Monday through Friday, and between 8:00 A.M. and 2:00 P.M. on Saturday. An attendant is on duty at all times during operating hours. Upon closing, the gates are locked and access to the landfill is restricted. The landfill area is not fenced.

Recordkeeping and Reporting

The landfill office keeps a daily record of all waste delivered to the site. These records indicate the date, type and quantity of each delivery. The office provides a quarterly report of these records to the Minnesota Pollution Control Agency. Part of the reporting process is an annual report to Hennepin County, which in turn prepares an annual report to the Metropolitan Council. The reports indicate current rates for disposal as well as remaining capacities and general conditions at the landfill.

Surface Runoff Control

Site runoff follows natural contours generally in a northerly direction down-gradient to the marsh area bordering the sites northerly boundary of the site. Depending on the season and the levels of surface water in the swamp, the water is retained in the marshland for various lengths of time prior to discharge through a small stream crossing Tomahawk Trail.

Landfill operating methods tend to minimize infiltration into the landfill and include cover applications, surface grading, and proper sloping.

Leachate Control

There is no engineered landfill liner, leachate collection or leachate treatment system at the existing 28-acre landfill. The "Hydrogeologic and Chemical Report" for Woodlake Sanitary Landfill concluded that leachate is moving into the low-lying marsh section adjacent to the site. This is primarily due to the filling of a portion of the adjacent wetlands by the previous owners of the Woodlake site.

Gas Controls

No formal gas control system exists in the existing landfill. However no methane gas migration problems have been identified during the ten-year site operation period.

Fire, Vector and Litter Control

A water supply system is available at the site to control any fires that might occur on the landfill and, if required, the Loretto Fire Department is available on call. Cover material can also be used to extinguish any landfill fires. As indicated, fire extinguishers are also available on all equipment used on the site. To date, the operation has not experienced fire problems.

To minimize scavenging by rodents and other animals, daily cover is applied at the end of the day's operation. While there were complaints about rodents at the December 13, 1979 public meeting, according to the Hennepin County Department of Energy and Environment, vectors apparently have not been a problem at the site. Also, should rodent problems develop, a variety of effective rodenticides are available.

While several site visits did not reveal substantial quantities of litter off-site, enough uncontrolled litter exists on-site to present potential localized problems. Litter control is maintained by minimizing the working face area, cessation of operation on unusually windy days, and by employing (temporary) litter crews after excessive wind. Daily cover also reduces the potential for blowing refuse.

Buildings

The landfill office structure is approximately 3200 square feet inside and is located immediately adjacent to the entrance gate. The office structure has sanitary and lunch-room facilities. The area around the gate and office provide ample space for visitor parking as well as uninterrupted, through trucking. The road is of sufficient width to permit trucks to pass in opposite directions.

There is also an existing garage of approximately 2500 square feet which is used primarily for equipment storage and repairs. The maximum height of both structures is 20 feet.

Utilities

On-site utilities include a water supply system for potable and non-potable use, as well as a sanitary septic system. The water supply source is from on-site wells. Electricity and telephone service is also available in the office and the garage.

Monitoring

As required by MPCA, BFI set up a quarterly sampling program which continued for 3 years and provided quarterly reports to the MPCA. The program was initiated with five monitoring wells at the site. In 1977, additional borings and piezometers were installed by National Biosentric Inc. to provide more substantial data. TWP 4, Water Quality, contains more detailed monitoring data and a map of the well locations.

Closure

Two feet of final earth cover has been spread and compacted over all finished areas with the exception of Areas 1 and 2. The original plan called for final compaction and grading to minimize potential soil erosion and revegetation with grass the next step in the closure plan. Formal closure, monitored by MPCA, has not yet taken place.

Post-closure

The original plan calls for Woodlake Sanitary Landfill to be finished, graded and revegetated in accordance with MPCA regulations. The suggested ultimate land use plans were for tree and agricultural farming. While the closed site could provide useful open or recreational space, there is some question about the viability of utilizing landfill area for agricultural purposes, due to potential heavy metal contaminants, or for tree farming, due to the shallow depth of soil cover.

3.4 DESCRIPTION OF THE PROPOSED PROPOSED LANDFILL

3.4.1 Proposed Project Background

Expansion of the Woodlake Sanitary Landfill is under consideration to provide approximately 10 years of continued operation.

3.4.2 Proposed Site Location

The proposed expansion area is located immediately to the east of the existing operation and consists of Areas 3, 4, 5, 6 and 7.

As such, access will continue via Boyer Road, which runs north to the site from Hamel Road. The road is used in all weather conditions by trucks delivering refuse.

Figure 3-4 indicates the proposed expansion areas, specifically Areas 3, 4, 5, 6, and 7. The five areas encompass a total of 40 acres. The site is characterized by a small stream and a small peat bog separating Areas 3 and 4 from Areas 5, 6 and 7. The areas are bounded to the north by a larger peat bog and by an area of upland forest, to the east by Tomahawk Trail, to the west by the larger bog and the existing landfill and to the south by the small bog and the southerly property boundary.

3.4.3 Proposed Site Operation

Waste Sources, Quantities, and Composition

No major change in refuse characteristics is expected or proposed for the expansion area. The types of refuse will include primarily municipal and a limited quantity of commercial waste. Toxic and hazardous wastes will not be accepted at the landfill. The current rate of refuse acceptance estimated at 27,500 cubic yards per month, was utilized to estimate capacity requirements estimated at escalations at 5 percent per year. Actual waste generation rates will vary depending on total service population, changes in per capita generation rates, and changes in the private service collection

market. The availability of additional disposal pathways such as development of a regional landfill or resource recovery facility could also impact quantities of waste received at the site.

General Method of Landfilling

The proposed expansion will encompass those tracts designated as Areas 3, 4, 5, 6, and 7. The plan calls for placing fill in Area 3 utilizing cover from Area 4, until it is within two feet of final elevation. Then the filling operation would move to Area 4 and final cover would be placed in Area 3. This procedure would continue as such using cover from subsequent areas.

In Areas 5, 6, and 7, the proposed operational plan consists of excavation to elevation 970 feet above mean sea level, compaction of in-place soils and filling to within two feet of the planned final contours. Figure 3-5 provides a final plan for the projected site. As indicated, cover material would be procured from the subsequent fill area. Earthwork balance calculations provided by BFI indicate an excess of approximately 500,000 cubic yards of soil for Area 5 and 6. BFI also concludes that Area 7 will also yield excess cover material. Plans call for any topsoil to be stockpiled for future use as final cover material prior to revegetation.

The proposed action calls for continuation of existing operation methods. The site attendant will accept the refuse, record it and direct the truck to unload at the working face where the refuse will be spread, compacted and covered.

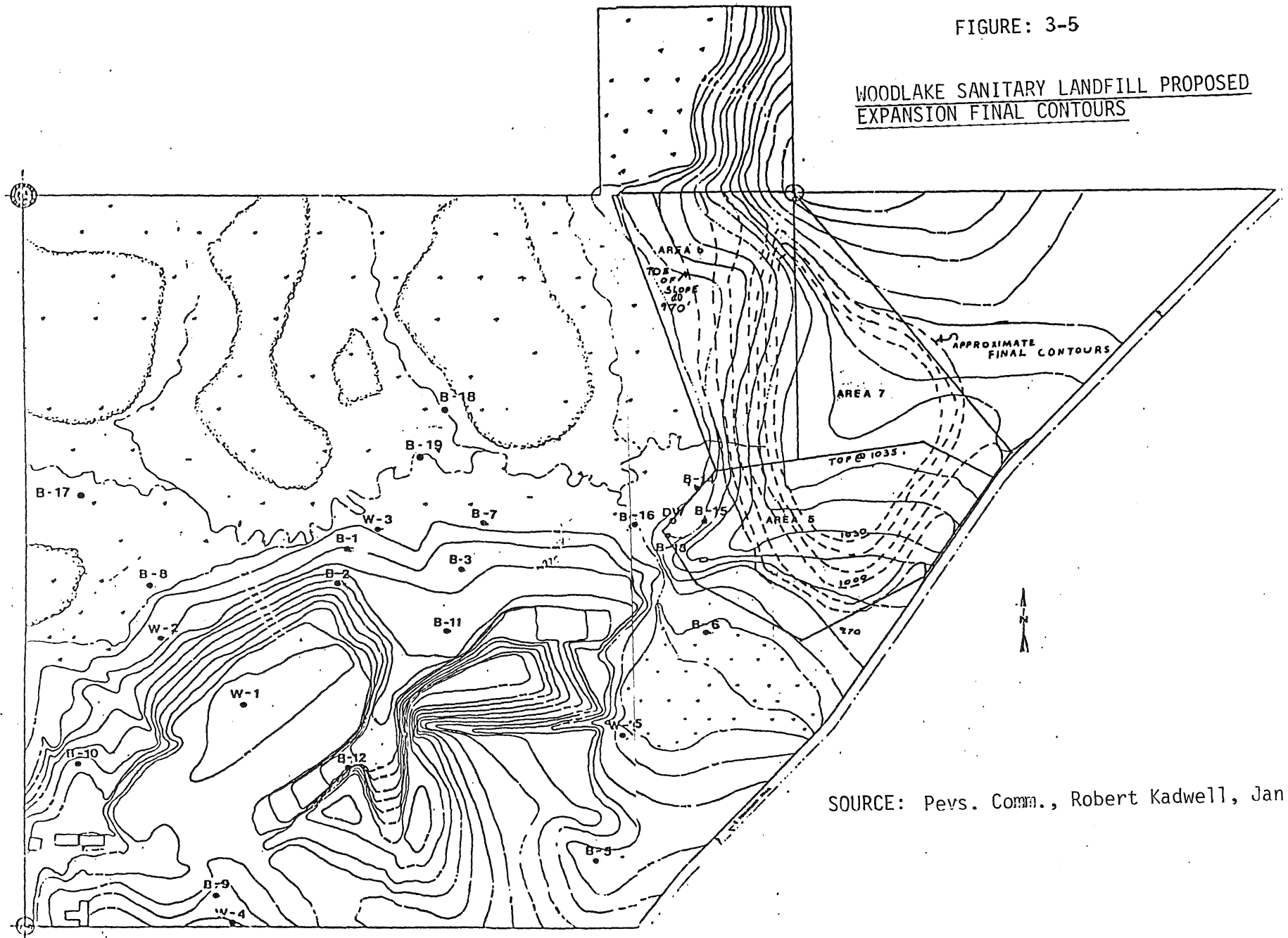
Inclement Weather Operations

Boyer Road is classified as an all-weather access road thus permitting continued waste delivery during severe weather conditions.

Winter operations will also include the utilization of a ripper attached to the Caterpillar to break frozen ground for cover. Stockpiling of cover material also will aid in providing cover during the winter months.

FIGURE: 3-5

WOODLAKE SANITARY LANDFILL PROPOSED
EXPANSION FINAL CONTOURS



SOURCE: Pevs. Comm., Robert Kadwell, Jan 10, 1980

Personnel and Equipment

No employee increases are anticipated for the expansion.

Existing equipment used on the site ranges from five to fifteen years in age. As part of its operation, BFI plans to replace equipment as necessary with comparable equipment and is currently investigating utilizing a landfill compactor, as well.

Access Control and Security

Access control and security provisions will remain unchanged from those used on the existing operation. However, under the proposed plan, Areas 4 and 5 are more conveniently located with respect to unauthorized access from Tomahawk Trail.

Recordkeeping and Reporting

Recordkeeping and reporting procedures will remain unchanged for the proposed expansion.

Surface Runoff Controls

Surface runoff control will be accomplished using several methods. The plan calls for proper grading to minimize flow rates and control flow direction. An adequate slope on the working face will be maintained to minimize infiltration but also minimize erosion due to surface run-off. Site drainage will follow the existing and proposed contours. The proposal also calls for the installation of concrete culverts with sealed joints between Areas 1 and 5. This culvert will allow uninterrupted drainage of the lowland areas northwest of the site.

Leachate Controls

A leachate control system has not been proposed by BFI. The proposed landfill will rely on the in-place natural soils, with permeabilities of 1×10^{-7} cm/sec, to prevent the migration of leachate.

Gas Controls

No specific gas controls systems have been proposed due to the absence of gas migration problems at the existing site. Should specific problems develop, BFI has indicated that a variety of mitigation measures could be employed. These, for instance, could include impermeable barriers, permeable trenches or other venting systems.

Fire, Vector and Litter Control

No change in existing fire, vector and litter control practices has been proposed.

Safety Practices, Contingency Plans and Emergency Procedures

No change in existing safety practices, contingency plans or emergency procedures has been indicated for the proposed expansion.

Buildings

In addition to the two existing units, a new maintenance shop has been proposed. The structure will provide an additional 2000 square feet of floor space. The location of the structure has not been indicated by BFI; however, it will be in close proximity to the existing structures and will not be located over previously filled areas.

Utilities

Existing utilities such as water and electricity will be extended to the new structure. No other utility extensions or modifications are proposed.

Monitoring

While a detailed plan has not yet been developed, BFI will provide a monitoring well system along the site perimeter to identify potential movement of landfill leachate. Sampling and reporting requirements are expected to be similar to existing monitoring requirements.

Closure

The expansion area will follow the same MPCA-approved closure procedures to be used on the existing landfill. Prior to seeding and revegetation, clay material will be spread and compacted in two-foot layers. Final contours for the expansion area are shown on Figure 3-5.

Post Closure

No specific post-closure activities have been proposed to date.

3.4.4 Proposed Construction

Construction Methods

Construction of the landfill will occur sequentially for Areas 3, 4, 5, 6 and 7. As any given area is being filled (e.g., Area 3), cover material will be secured from the next area (e.g., Area 4). Cover material would be excavated to the proposed baseline elevations, and, as necessary, additional soil not required for immediate cover purposes will be stockpiled for future use. Essentially, then, construction and operational phases will be occurring on site simultaneously over the life of the landfill.

Construction Costs

BFI indicates that construction costs will be approximately \$200,000. No cost breakdown has been provided by BFI.

Construction Scheduling

While no specific schedule has been provided, given projected fill rates, a construction schedule can be readily projected. Assuming that the proposed expansion receives all appropriate permits, construction would commence immediately in Area 3, given the limited remaining fill capacity on-site. Construction activities in subsequent expansion areas would commence approximately every two years over the life of the landfill. The following construction schedule can be projected:

<u>Fill Area</u>	<u>Construction Initiation</u>	<u>Final Cover</u>
3	1980	1982
4	1982	1984
5	1984	1986
6	1986	1988
7	1988	1990

4.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

4.1 METEOROLOGY/CLIMATOLOGY, AIR QUALITY AND NOISE

4.1.1 Introduction

The objective of this section is to describe the existing environment of the proposed Woodlake Sanitary Landfill expansion with regard to meteorology/climatology, air quality and noise.

4.1.2 Meteorology/Climatology

General

The climate of the Minneapolis-St. Paul area (based on U.S. Dept. of Commerce, 1973; 1978) is classified as a humid continental type. Due to its location close to the geographical center-line of North America, there exists a tendency to extremes in all climate features. For example, there are wide variations in temperature, plentiful summer rainfall and relatively little winter precipitation.

The temperature variation from season to season is quite large. Summers are warm though comfortable due to low daytime relative humidity, while winters are very cold. Approximately 65 percent of the annual rainfall occurs during the growing season (May through September). Occasionally, crop damage will occur from excessive rains, high winds, lightning and hail caused by severe thunderstorms. During the winter months, humidities are high and sunshine is at a minimum. Fog is infrequent and occurs generally during late fall, winter, and early spring.

The following sections will provide further details on the meteorological parameters that are of importance in sanitary landfill design and operation. The National Weather Service does not monitor meteorological conditions in Medina. Therefore, data from the Minneapolis-St. Paul Airport will generally be utilized in the climatic analyses. Where possible, data

from Maple Plain, the station in closest proximity to the site, will be presented.

Temperature

During January and February, maximum daytime readings average in the low to mid 20's, while minimum nighttime readings average 3 to 7°F. Temperatures of zero or below occur on the average 35 days per year. The maximum temperatures exceed 32°F (freezing) on only 26 percent of the days in December through February, with the average daily maximum at 25°F for these three months. In March, the mean daily maximum is only 4.9°F above freezing, although maximums above 32°F can be expected to occur on the average of 21 days. No maximums below 32°F normally occur during April through October. Maximum daytime temperatures during July and August average in the low 80's while nighttime temperatures average around 60°F. Maximum temperatures above 90°F occur on the average 15 times per year.

Precipitation

Precipitation amounts in the Minneapolis-St. Paul vicinity are small during winter and relatively high during the summer. Annual precipitation at Maple Plain averages 29.9 inches per year. The vast majority of precipitation during winter falls as snow. Winter snowfall can be heavy and averages more than 40 inches a season.

During the growing season (May through September), the normal rainfall averages 19.7 inches, approximately 66 percent of total annual precipitation. Thunderstorms are the primary source of rainfall during the growing season. Consequently, rainfall can be heavy, but is usually brief in duration. Severe thunderstorms occur occasionally and may produce excessive rains, high winds, lightning and hail.

Wind Factors

Wind data at the Minneapolis-St. Paul Airport indicate that wind velocities are moderate with the annual wind speed averaging 10.5 m.p.h. Prevailing winds are from the northwest during the winter, early spring and late fall. During the remainder of the year south or southeasterly winds predominate. Average wind speeds are highest during the cold portion of the year (12.3 m.p.h. in April), while the lowest values occur during the summer (9.1 m.p.h. in August).

Dispersion Characteristics

The overall dispersive ability of the atmosphere in this area of the country is quite good. The frequent passage of weather systems minimizes periods of air stagnation. Consequently, atmospheric conditions are usually favorable for the dispersion of pollutants and the area seldom encounters "extended periods of fog or high pollutant levels." The frequency of light winds (0-3 m.p.h.) at Minneapolis, which is indicative of the frequency of stagnation periods, is low, ranging from 11 to 14 percent of the time (MPCA, 1979). Pollutants are distributed through the atmosphere by the action of horizontal wind and vertical air currents. The frequent weather changes common to this section of the country inhibit prolonged inversion conditions so that adequate dispersion conditions generally prevail.

4.1.3 Air Quality*

Areawide

Major Emission Sources. Actual data on TCMA air pollution sources is available only for particulates and hydrocarbons. Most of the TCMA's major emission sources are situated in the immediate Minneapolis-St. Paul vicinity. No major sources of particulates or hydrocarbons are located in the vicinity of the proposed landfill expansion area.

*Based on MPCA, 1977; 1978; 1979; and 1980.

Ambient Air Quality. The State of Minnesota is divided into seven Air Quality Control Regions (AQCR) based on regional differences in meteorology, population density, pollutant emission density, and ambient air characteristics. The proposed expansion site is located in the Minneapolis-St. Paul AQCR which includes the following counties: Ramsey, Washington, Hennepin, Anoka, Carver, Scott, and Dakota. In order to determine compliance with National Ambient Air Quality Standards (NAAQS), the Minnesota Pollution Control Agency has established an ambient air monitoring network for the pollutants of concern including particulates, sulfur dioxide, nitrogen dioxide, carbon monoxide and ozone. The majority of the air quality monitors for the Minneapolis-St. Paul AQCR are situated in urban downtown Minneapolis-St. Paul. Hence, air quality data from this network is of limited value in directly assessing the air quality of the proposed expansion site because of the rural character of the project site. This monitoring data can, however, be used to make a general assessment of air quality in the TCMA.

Tables 6 through 9 of TWP 3 (Meteorology/Climatology, Air Quality and Noise) present ambient air quality data on particulates, sulfur dioxide, nitrogen dioxide and carbon monoxide for the monitoring stations in the TCMA. The data contained in these tables was compiled by the Minnesota Pollution Control Agency and is valuable in determining compliance or non-compliance with the applicable ambient air quality standards, as discussed below.

Regulatory Compliance. There are 28 stations throughout the TCMA which measure total suspended particulate concentrations. Monitoring data for 1978 indicated that 9 of these sites violated the annual primary state standard of 75 micrograms per meter, while 13 stations exceeded the secondary state standard of 60 micrograms per cubic meter. The 1978 annual average of all stations was 63 micrograms per cubic meter. Furthermore, 5 sites violated the 24-hour primary state standard, while 15 sites exceeded the 24-hour secondary state standard. In general, highest particulate concentrations were recorded in downtown sections of Minneapolis-St. Paul. It is possible that baseline particulate concentrations at the landfill are considerably below the levels reported in Minneapolis-St. Paul due to the

rural site area character and the lack of major sources. However, particulate concentrations in rural areas can be higher than those in urban areas due to wind erosion and dust entrainment resulting from routine agricultural activities. Particulate emissions from such activities are unavoidable and consequently, the "native soil" component of total suspended particulates is exempted in the determination of whether a particular locality exceeds ambient air quality standards. Consequently, most rural areas of the United States are classified as attainment areas (meeting the standards) for total suspended particulates. It should be noted that the U.S. Environmental Protection Agency (EPA) has designated the entire Twin Cities AQCR (which includes Hennepin County) as a nonattainment area for total suspended particulates.

TCMA has 23 sites which monitor sulfur dioxide concentrations. During 1978, five of these sites exceeded the annual primary state standard of 0.03 parts per million (ppm). Six sites exceeded the 24-hour primary state standard of 0.10 ppm, while 4 sites violated the 3-hour primary state standard of 0.25 ppm. Most of the sites which violated the sulfur dioxide standards are located in the St. Paul Park area.

Nitrogen dioxide concentrations are measured at 13 locations throughout the TCMA. During 1977, no violations of the annual state primary standard of 0.05 ppm were recorded. In fact, no areas in Minnesota currently violate nitrogen oxide standards.

In general, it is probable that the site-specific baseline ambient concentrations of sulfur dioxide and nitrogen dioxide in the study area are considerably below the levels reported in Minneapolis-St. Paul due to the lack of man-made sources of these pollutants. However, the U.S. EPA has designated the entire Twin Cities AQCR as a nonattainment area for sulfur dioxide.

The MPCA operates five carbon monoxide monitors in the TCMA. During 1978, no violations of the 1-hour primary state standard of 30 ppm was reported. However, 4 of the 5 monitoring sites recorded violations of the 8-hour primary state standard of 9 ppm. Carbon monoxide levels reported in

downtown Minneapolis-St. Paul are clearly unrepresentative of the study area due to the much lower traffic volumes experienced at the proposed expansion site compared to downtown levels (Metropolitan Council, 1974; 1978). Carbon monoxide levels in the study area should approximate rural background concentrations (that is, only several parts per million even under worst-case meteorological conditions). It should be noted that the U.S. EPA has designated the entire TCMA as nonattainment (violation of standards) for carbon monoxide.

The Minnesota Air Quality Reports for 1977 and 1978 contained no data for oxidant concentrations. However, the U.S. EPA has designated the entire Twin Cities AQCR a nonattainment area for oxidants.

In summary, although Hennepin County has been designated as a nonattainment area for particulates, sulfur dioxide, carbon monoxide and oxidants, it may be that the proposed site is actually an "attainment sub-area" (within a non-attainment area) for these pollutants. It is important to note that nonattainment designations were made on an areawide basis using available monitoring data and air quality modeling. A nonattainment classification does not necessarily mean that the entire area which is designated nonattainment is actually in violation of the air quality standards. Most of the monitoring stations in the Minneapolis-St. Paul AQCR are situated in urban and industrial areas and thus the data obtained from these stations are not representative of air quality at the proposed site. The proposed site is primarily an agricultural/residential area with a minimum of man-made pollution sources. Furthermore, the prevailing winds in this section of the county limit the transport of pollutants from the Minneapolis-St. Paul urban area to the proposed site.

On the basis of these facts, it is probable that air quality in the vicinity of the proposed site is in compliance with ambient air quality standards. A more precise assessment cannot be made without the availability of on-site monitoring data.

Existing Landfill Site

Emission Sources. Landfill activities such as landclearing, transporting heavy trucks and equipment over unpaved roads, excavation, grading, stockpiling, and the transport of cover material generate fugitive dust by wind action or by entrainment caused by mechanical means.

Dust is produced at the existing sanitary landfill by all of the above processes. However, fugitive dust impacts have not been a significant problem with the existing operation. Potential fugitive dust impacts have been minimized due to the type of soil cover, the type of landfill operation, and the limited number of sensitive receptors in the vicinity of the landfill. In addition, dust generation is usually at a minimum during the winter since the ground is frozen and snow-covered.

The primary carriers of traffic to the Woodlake Sanitary Landfill are Interstate Highway 94, State Highways 12, 52, 55, and 100, County Highways 9, 18, 19, and 24, and the Hamel Road (McKie and Assoc., Inc., 1974).

The access road to the site is Boyer Road, which runs north to the site from Hamel Road and is accessible from County Road 19.

At present, Woodlake Sanitary Landfill services 12 primary population centers. The villages and cities serviced by the landfill are listed in Table 10 of TWP 3, along with the major routes used to reach the site and the haul miles from the center of each community. Approximately 300 vehicular trips per day are generated by operation of the existing landfill. Transportation related emissions are primarily hydrocarbons and particulates from diesel engines (National Biocentric, Inc., 1975).

A major product of landfill organic waste decomposition is a gaseous mixture consisting of methane (averaging 55%), carbon dioxide (averaging 45%), with trace amounts of nitrogen, hydrogen, and oxygen and varying trace constituents such as carbon monoxide, ethylene, ammonia and water vapor.

The extent and rate of gas production depends primarily on landfill age; percent and type of waste organic materials; cover material type, permeability and thickness; and landfill temperature, waste density, and waste moisture content. Once generated, methane gas, being lighter than atmospheric air, migrates radially by diffusion and convection flow processes. A general rule-of-thumb utilized to predict the potential extent of methane migration is to assume that ten feet of horizontal migration may occur for each foot of landfill depth. The resulting value, however, is only a first-cut estimate since site-specific conditions such as impermeable cover or porous strata can result in methane migration over larger distances.

None of the problems such as explosive build-up or vegetation damage sometimes associated with methane gas have been reported at the existing sanitary landfill.

Odorous emissions may result from the operation of sanitary landfills. In general, there are a number of primary sources of odor at sanitary landfills:

1. the incoming refuse;
2. degradation of previously buried refuse resulting in the production of hydrogen sulfide, ammonia, and trace mercaptans, and
3. leachate which reaches the surface by seeps or from collection system operation.

In general, however, properly operated sanitary landfills do not have substantive odor problems. Prompt waste processing, application of daily cover, leachate and gas control measures, and exclusion of special wastes, as necessary, generally result in a relatively odor free operation.

The Woodlake Sanitary Landfill, as operated by BFI has not resulted in odor impacts to date. Odor generation and impacts have been minimized by operation of the site as a sanitary landfill.

Equipment used for the development and maintenance of the Woodlake Sanitary Landfill also generates low level air emissions. However, as these activities are conducted over an extended period and because a limited amount of activity is conducted at any one time, no significant air quality impact results from these operations at the existing sanitary landfill.

Sensitive Local Receptors. Sensitive receptors in the vicinity of the proposed expansion areas consist of widely separated residential homes and farm houses. Fewer than 10 residences are located within a half-mile radius of the proposed site. Figure 4-1 shows the distribution and distance of structures with respect to the proposed site. The final contour site plan (January 10, 1980) indicates that the two nearest receptors (residential homes) will be approximately 625 and 1200 feet away, respectively.

Regulatory Compliance. Based on available information, the existing sanitary landfill appears to be in compliance with regulations concerning potential air emissions from the landfill. There is no record of significant adverse odor impacts from the landfill. Furthermore, no significant adverse impacts from fugitive dust emissions and methane gas emissions have been reported.

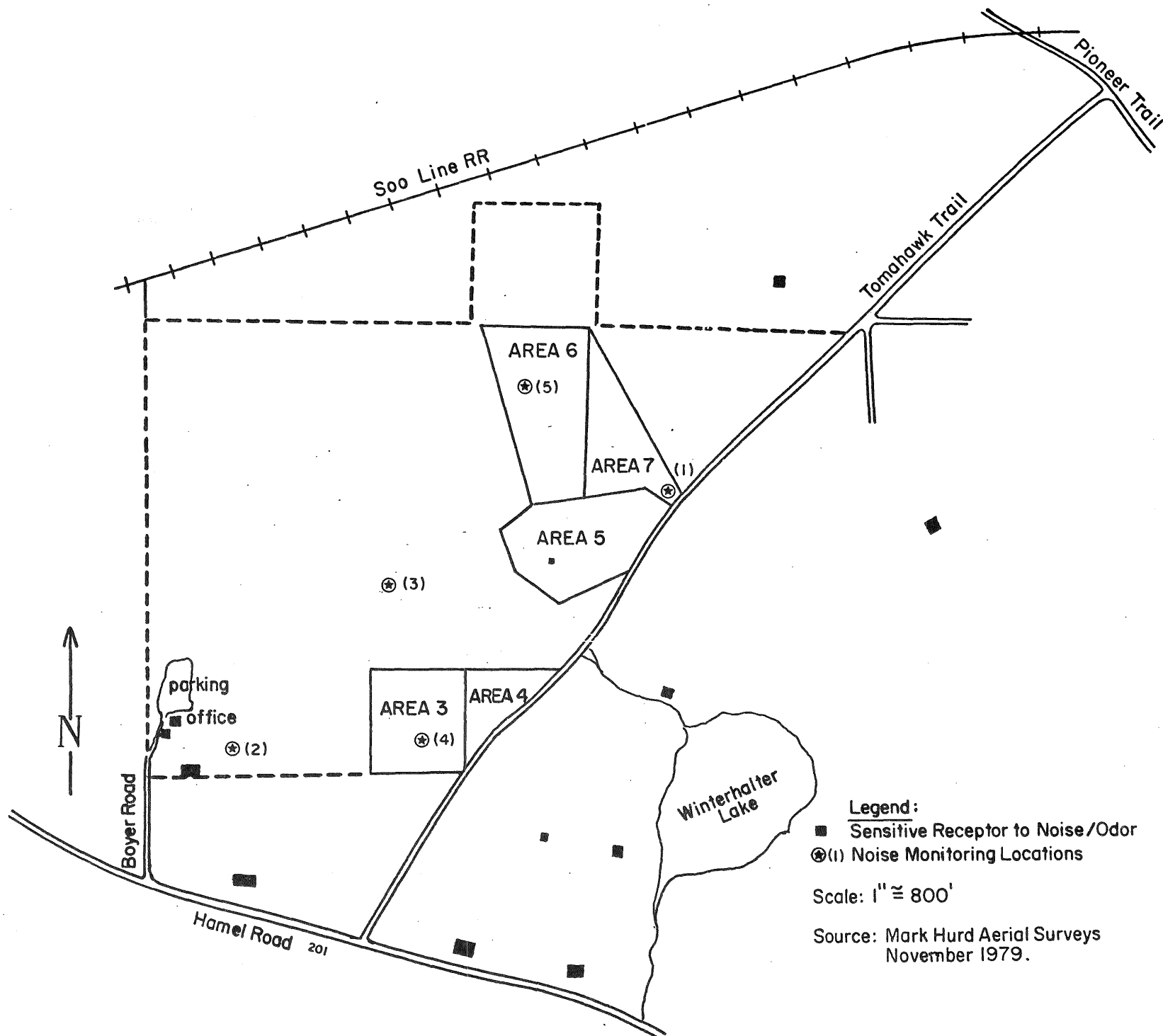
4.1.4 Noise

Sources and Levels

In brief, the ambient noise in any area is the background noise made up of all the natural and man-made noise generally considered to be contained within the acoustical environment of that general area. During operation of the facility, the primary generators of noise are equipment for landclearing and earth moving (bulldozers, etc.); and vehicular traffic entering and leaving the facility, as well as delivery trucks idling and discharging on the site. Natural phenomena such as weather (wind and rain) and wildlife (insects and birds) are additional sources of noise.

FIGURE 4-1

NOISE MONITORING AND NOISE/ODOR
SENSITIVE RECEPTOR LOCATIONS



Noise monitoring was conducted in the vicinity of the Woodlake Sanitary Landfill to assess the baseline noise levels. Measurements were made using a National Institute for Occupational Safety and Health (NIOSH) certified sound level meter set in accordance with 42 CFR 82. The noise monitoring was conducted on December 12, 1979 at selected locations in and around the landfill. To obtain a representative sample of operational on-site levels, readings were taken during the midday period. Additionally, measurements were made at the proposed expansion area to determine baseline noise levels.

Monitoring was conducted at the points indicated on Figure 4-1. For the on-site monitoring locations, L_{50} and L_{10} noise level statistics were computed from the collected data. Readings were made using the "A" weighting scale since it most closely resembles the frequency response for the human ear. The results of the noise monitoring are presented in Table 4-1.

Sound levels in and around the Woodlake Sanitary Landfill are generally quite low. The higher levels recorded within the landfill itself were due to bulldozers operating in the distance. Sound levels recorded along Tomahawk Trail and in the parking area were quite low, rising slightly with the occasional passing of a vehicle. Noise level measurements along the perimeter of the landfill were also relatively low, indicating that present operations of the landfill have no significant adverse noise impacts on the surrounding community.

Nighttime noise levels were estimated by using the ERT comparative land use approach (ERT, 1979). Estimated nighttime L_{50} and L_{10} statistics are 25 and 33 dBA, respectively. Depending on local noise conditions (traffic volumes, atmospheric conditions), it is estimated that there is a range of approximately plus or minus five decibels for the values listed above. Since the landfill is not operational during the night, areawide nighttime noise levels would not be expected to vary significantly.

Sensitive Local Receptors

Sensitive receptors in the vicinity of the proposed expansion areas consist of widely separated residential homes and farm houses. Fewer than

TABLE 4-1

ESTIMATED NOISE-LEVEL STATISTICS IN THE
VICINITY OF THE WOODLAKE SANITARY LANDFILL

<u>Location</u>	<u>Noise Level Statistics (dBA)</u>	
	<u>L₅₀</u>	<u>L₁₀</u>
1	36	42
2	33	38
3	40	46
4	32	38
5	31	40

Source: Fred C. Hart Associates, Inc.,
December 12, 1979 field measurements.

10 residences are located within a half-mile radius of the proposed site. Figure 4-1 shows the distribution and distance of structures with respect to the proposed site. The final contour site plan (January 10, 1980) indicates that the two nearest receptors (residential homes) will be approximately 625 and 1200 feet away.

Regulatory Compliance

The results of the noise monitoring program suggest that noise impacts from the existing landfill do not exceed the MPCA noise regulations. Noise levels in and around the site are generally quite low, except in the immediate vicinity of bulldozer operations.

In addition, noise levels generated at the existing landfill are well in compliance with the OSHA standards governing employee noise exposure levels.

4.2 WATER QUALITY

4.2.1 Background

Surface Water

Surface water in the vicinity of the Woodlake Sanitary Landfill consists of the upper portion of the Pioneer Creek watershed. The bodies of water potentially affected by the landfill operation are those downstream of the landfill site, which include Pioneer Creek (alternatively known as Spurzem Creek), Winterhalter Lake, Spurzem Lake, Half Moon Lake, and, ultimately, Lake Independence. The landfill site drains into this chain of lakes via an unnamed creek, which flows through the wetland areas Northwest of the site eventually draining into Winterhalter Lake (see Figure 2-1). The general direction of surface flow in the wetlands is to the southeast towards Spurzem Creek.

Groundwater

The major deep aquifers underlying the Pioneer Creek watershed are the Franconia Aquifer, and a portion of the Prairie du Chien Aquifer. Deep groundwater gradient is generally southwest towards Lake Independence (Metropolitan Council, 1978).

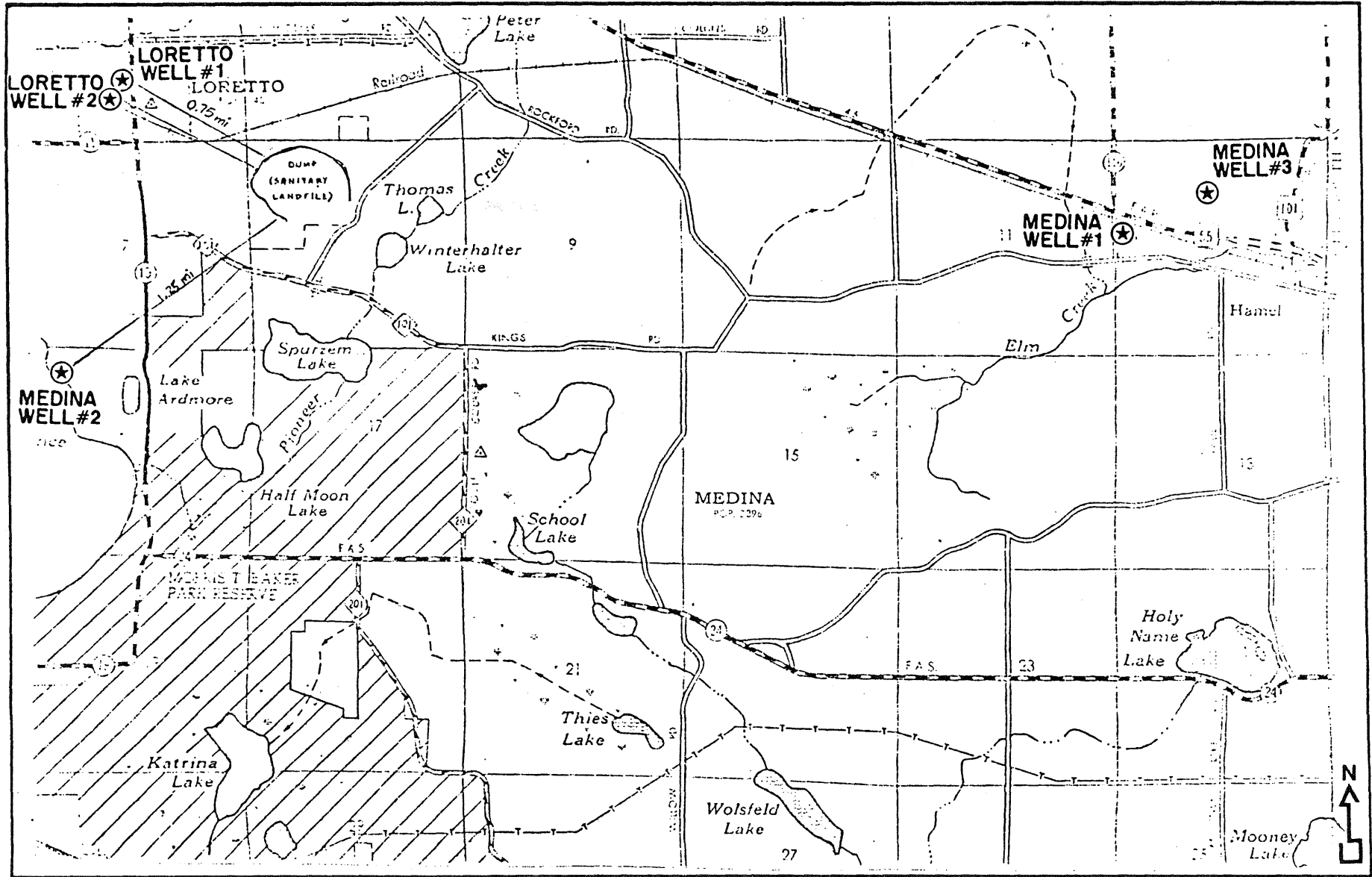
The shallow groundwater table beneath the proposed landfill is estimated to exist at 959 feet at its highest elevation based upon on-site borings. This groundwater table most likely consists of a perched water table resulting from water-bearing sand lenses lying within a relatively impermeable clay substrate.

Local Water Supply

The communities of Loretto and Medina are the closest towns in the vicinity of the Woodlake Sanitary Landfill. Both municipalities draw their water supplies from wells located within their respective boundaries. The well locations are shown in Figure 4-2. The two Loretto municipal wells and

FIGURE 4-2

LOCATION OF LOCAL WATER SUPPLY WELLS



Source: Department of Health, Hennepin County.

Scale 0 0.25 0.50 1.00 Mile

the No. 2 Medina well draw from the Franconia Aquifer, while the No. 1 and No. 3 Medina wells draw from the Prairie du Chien Aquifer. In addition to those wells, there are a number of private wells from which samples have been taken and data is available.

Major Pollution Sources

In order to determine the potential water quality impacts of the Woodlake Sanitary Landfill, this study has assessed water pollution contributions from all existing sources to the Pioneer Creek watershed.

Estimation of the contribution of non-point sources, such as urban storm-water and agricultural runoff and the extent of contributions from the sewage treatment plant and the existing landfill must be assessed before additional impacts from facility expansion can be predicted. Subsequent sections of this EIS will attempt to define the potential magnitude of each of those inputs, as well as define the potential impacts resulting from the proposed expansion.

4.2.2 Description of the Existing Environment

Surface Water Quality

Existing surface water quality is impacted by a variety of point and non-point sources. In the TCMA area, agricultural inputs accompanying runoff and sedimentation processes can result in the transport of both soil particles and a variety of pollutants, primarily phosphorous and nitrogen. Additional problems can result from the application of a variety of insecticides and fungicides for pest control purposes.

The wetland adjacent to the proposed expansion is also impacted by the Loretto Sewage Treatment Plant. The treatment facility was designed to treat an average flow of up to 120,000 gallons per day of domestic wastewater having a 5 day biochemical oxygen demand (BOD₅) loading of 250 pounds per day and a suspended solids loading of 250 pounds per day. Average flow measured for 1978-79 was 0.064 mgd (MPCA Monitoring Data). The 260-acre

wetland located southeast of the facility functions as a tertiary receiving basin for the discharge of the Loretto plant. Discharge to the wetland in the past has occurred via overflowing of the ponds, seepage through the pond bottom and sides and via direct pumped discharges. The secondary pond was originally designed to discharge solely through seepage. Inadequate seepage rates eventually led to the modification of permit to permit direct discharge to the wetland.

The facility, as originally designed, was not capable of meeting the original permit's no discharge and phosphorous limitations. The seepage pond has been reported to be meeting other constituent levels associated with secondary treatment, such as BOD, suspended solids, and fecal coliforms (MPCA Memo, McGuire to Breimhurst 1978). Actual data on the treatment facility effluent and wetland surface water quality is limited. Samples were taken from surface water points located at the facility and in close proximity to it during five separate investigations: Sept. 4, 1975; November 14, 1975; March 9, 1976; April 5, 1977 and November 13, 1978 (TWP 4).

Without adequate resources for facility improvements to meet all of the water quality standards, the City of Loretto requested permanent variances from both the phosphorous effluent limitation and the no discharge requirement. These conditions led to the completion of a phosphorous study, in which the impacts on the downstream water courses due to the Loretto seepage pond, were assessed (McCombs & Knutson Associates, Inc.). This study concluded that the phosphorous loading to the seepage pond, estimated to be 328 pounds per year, did not exceed the phosphorous limitation that would be achieved at design capacity (365 lbs./yr). Furthermore, the study stated that, "the slough is effectively filtering the nutrients," and that, "the overflow from the seepage pond is not adversely affecting the downstream watercourses." The conclusions drawn in this phosphorous study were qualified by data collected during March, 1976 by the MPCA. Although data for sampling points located at the seepage pond outfall, the middle of the larger wetland, and at the inlet of the small wetland indicated ongoing assimilative processes in the wetland, the agency reported "little likelihood of nutrient reduction during spring snowmelt periods and other high runoff events."

Upon reissuance of the facility's NPDES permit (11/22/78), revised effluent limitations were incorporated. Special requirements were also imposed permitting discharge during periods of low flow in the wetland and when the secondary cell is ice-free and in an aerobic state. The revised effluent limitations for the treatment facility discharge were based on a flow rate of 0.217 mgd and require a pH range of 6.5 to 8.5 . The limitations are as follows:

EFFLUENT CHARACTERISTICS

DISCHARGE LIMITATIONS

	Seven Consecutive <u>Day Average</u>	Continuous <u>Discharge</u> Thirty Consecutive <u>Day Average</u>
5-day Biochemical Oxygen Demand (BOD)	45 mg/l (81.4 lbs/day)	25 mg/l (45.2 lbs/day)
Total Suspended Solids	45 mg/l (81.4 lbs/day)	30 mg/l (54.3 lbs/day)
Fecal Coliform Bacteria	400 MPN/100 ml	200 MPN/100 ml
Turbidity	NA	25 JTU

The existing landfill site also continues to contaminate to some degree the adjacent wetland in the form of leachate percolating through the landfill and peat layer, and moving laterally into the wetland. The principal contaminants of concern in landfill leachates are heavy metals, BOD, COD, alkalinity, total dissolved solids, chlorides, microorganisms, hardness and organic compounds, such as oil and phenols (Metropolitan Council, March, 1978). Table 4-2 contains mean leachate composition values for a series of constituents which are characteristic of landfills containing municipal wastes. The data is based upon measured leachate characteristics from fifty-four landfill sites (Metropolitan Council, March, 1978).

TABLE 4-2

MEAN LEACHATE COMPOSITION
(milligrams/liter unless other units are given)

<u>Parameter</u>	<u>Mean Leachate</u>
Alk (CaCO_3)	2,062
$\text{NH}_3\text{-N}$	158
As	1.09
Ba	3.05
BOD	2,281
B	9.0
Cd	0.10
Ca	635
COD	7,996
Cl^{+6}	773
Cr	0.004
Cr (total)	0.58
Cu	25.2
CN	0.030
F	0.5
Hdns (CaCO_3)	2,332
Fe	697
Pb	0.43
Mg	260
Mn	27.5
Hg (ppb)	1.2
Ni	0.3
NO_3	0.46
Oil	24
pH (units)	6.8
Phenol	1.94
PO_4	5.16
K	270
Se	(undetected)
SiO_2	30
Ag^2	0.03
Na	276
SC(mmhos/cm)	20,540
SO	1,204
TDS ⁴	20,240
TSS	915
Zn	12.1

Source: Metropolitan Council, March, 1978.

In determining the pollution potential for the existing 28 acres of the landfill, ranges of annual leachate production of 1.20×10^6 and 2.65×10^6 gal/year for the Woodlake site were estimated utilizing water balance methodologies (TWP 7, and the Metropolitan Council, March 1978, respectively). A separate estimate of 5.02 acre-ft./year, or 1.64 million gallons per year, was also completed for the projected volume of leachate migration through the peat materials into the adjacent swamp from the existing fill (National Biocentric, Inc., 1977).

The above estimates indicate the potential range of leachate production for the existing site. Differences between the first two estimates largely relate to the lower degree of slope (as opposed to actual field conditions) assumed in the Metropolitan Council analysis. The third estimate, which falls mid-range between the water balance estimates are based on an alternative approach utilizing Darcy's Law, which relates rate of flow to soil permeability, hydraulic gradient and cross-sectional area.

Pollution problems due to the existing landfill have been investigated and analyzed both by a consultant of the landfill owners as well as the MPCA. Under a stipulation agreement between Woodlake Sanitary Landfill, Inc., and the MPCA, a detailed hydrogeologic study of the Woodlake site was undertaken to determine if water quality standards (WPC 22 or 14) were being violated. In conducting the study, 17 monitoring wells were installed in addition to the 5 wells already existing (National Biocentric, Inc., 1977). Based on the report and more recent on-site borings and permeability tests (April , 1980), the following conclusions were made with respect to surface water:

- . "Contaminants from leachate formation are diminished to acceptable levels as they migrate from the fill area as a result of soil attenuation, dispersion, dilution, oxidation/reduction processes and bacteria action."
- . Leachate movement is northwesterly towards the wetland area.

- . Once groundwater moves away from the landfill into the marsh, it becomes surface water and moves via surface drainage into Spurzem Creek.

Localized siltation impacts created by the existing landfill operation were also observed during the course of field investigations conducted in March 1976 by MPCA.

In assessing the possible water quality violations at the sanitary landfill, the MPCA Division of Water Quality identified a number of surface water violations based upon the data provided in the hydrogeologic study.

For several of the data points, chlorides, pH, specific conductance, ammonia, copper and chromium concentrations exceeded WPC 14 water quality standards (TWP 4).

This investigation has also included gathering available water quality data in down stream water courses including Spurzem Creek, Winterhalter Lake, Spurzem Lake, Half Moon Lake and Lake Independence. With the exception of Lake Independence, only very limited water quality data are available (TWP 4). Again, with the exception of Lake Independence, each of the aforementioned water bodies apparently supports limited warm water fisheries. With the exception of the wetland adjacent to the sewage treatment plant, substantive water quality problems have not been reported in the drainage area.

Lake Independence was recently surveyed in 1974. The lake's area is approximately 828 acres and has a maximum depth of 58 feet. The Lake is a major area recreational resource and supports an extensive warm water fishery. Water quality data, however, is limited and a determination of compliance with respect to WPC 14 standards cannot be completed. The Metropolitan Council working with Hennepin County, in conjunction with the MPCA, has scheduled a series of water quality analyses for this summer (1980).

Groundwater Quality

Existing groundwater quality is potentially impacted by a number of sources including agricultural inputs, the Loretto Sewage Treatment Plant and the existing Woodlake landfill.

However, given the nature of the highly impermeable surface soils, it is highly unlikely that substantive impacts on groundwater due to agricultural runoff is possible.

The contribution of the Loretto Sewage Treatment Plant to groundwater pollution has not been defined in detail. However, given the failure of the plant's secondary pond to function as a seepage pond, and given available information relating to subsurface soil conditions, it is likely that water quality impacts from the Loretto plant are largely surface water oriented. Groundwater sampling data, downgradient from the plant and upgradient from the existing landfill, is not available.

Groundwater contamination from the Woodlake Sanitary Landfill recognized to be a problem during its operation as Boyer Sanitary Landfill. In response to a problem, a hydrogeologic study of the site was requested of BFI by MPCA. The study suggested that the landfill was a contamination source for the adjacent wetland primarily via groundwater movement laterally rather than vertically, from the fill to the surface water of the marsh. Furthermore, the interpretation of bedrock geology asserted that the shallow groundwater system of the site was not hydrologically connected to the deep groundwater system in the bedrock. Additional on-site borings taken during the course of the preparation of this EIS tend to substantiate that conclusion.

During the course of the hydrological study, 17 monitoring wells were constructed in addition to five existing wells. Water quality data obtained during the course of the study is contained in TWP 4.

Conditions and Compliance

Based upon the Biocentric data and WPC water quality standards for Class 1A, the MPCA Division of Water Quality noted that a number of data points for manganese, iron and sulfates indicated concentration levels higher than applicable groundwater standards. It should be noted, however, that a number of data points represented samples of leachate rather than groundwater samples and test concentrations above water quality standards for iron and manganese may occur naturally in this area.

Local Water Supply Quality

Conditions and Compliance

Groundwater provides the drinking water source for the communities of Loretta and Medina. The municipal wells in the two towns are periodically sampled by the Minnesota Department of Health, Division of Environmental Health. The wells in each of the communities have been sampled directly from pump discharges at the wells as well as sink taps and hose bibs along the distribution lines. In Loretta, the two municipal wells pump into the same distribution system and samples taken along distribution lines reflect the water quality of the combined system. Medina's wells, on the other hand, have completely separate distribution systems, and sink tap and hose bibb samples are specific to individual wells. In assessing the Minnesota Department of Health data against the Class 1A potable water standards, excessive levels of iron were found among seven samples.

4.3 TERRESTRIAL AND AQUATIC ECOLOGY

4.3.1 Introduction

Terrestrial and aquatic ecology issues pertinent to the Proposed Action are discussed in this Chapter. A baseline description of the existing site environment is provided with regard to the following parameters: vegetation, wildlife, aquatic ecology, wetlands, and rare and endangered species. The primary information sources were existing data gathered from written publications, personal communications with various agencies, and a brief site survey conducted in November 1979.

4.3.2 Regional Setting

The proposed Woodlake Sanitary Landfill expansion site is located in a rural/residential setting in western Hennepin County, southeastern Minnesota. The surrounding landscape is referred to as the Loretto Highlands, an area of broad, deep marshes or swamps; steep, smooth-sided hills alongside marshes or lakes; and flat to undulating hill summits (Kennedy and Lueth 1976). This area was once predominated by dairy farming agriculture, but has shifted since the 1960's to accomodate estate homes, single family residences, and recreational land use activities.

In the immediate vicinity of the site is the 2500-acre, Morris T. Baker Park Reserve, an area of particular relevance to the proposed development site due to its proximity and wealth of natural resources. It is located just south of the landfill, bounded by Hamel Road to the north. The park supports a wide range of recreational activities and diverse natural areas including several lakes. Three of the lakes are in the drainage area of the site, Spurzem, Half Moon, and Independence.

4.3.3 Vegetation

The Woodlake site is located in a region of the U.S. referred to as the "Big Woods", which was once characterized by a dense hardwood forest dominated by the Maple-Basswood-Oak association on steeply rolling upland areas. While agricultural land use has brought about significant changes in local vegetative patterns, the climax mesic forest species specific to the area still include sugar maple (Acer saccharum), basswood (Tillia americana), American elm (Ulmus americana), red oak (Quercus rubra), and ironwood (eastern hophornbeam, Ostrya virginiana) (Weaver and Dyhr 1976).

A vegetation survey of the landfill project area was conducted on November 29 and 30, 1979. Attention was focused on the dominant species in the proposed development areas 3,4,5,6 and 7. A list of species identified on the site is presented in Appendix I of TWP5, Terrestrial Ecology and Aquatic Ecology. A schematic representation of the vegetative cover types occurring on the site is illustrated by Figure 3-4. These cover types correspond to those described in the Hennepin County Parks and were characterized from both field data and aerial photo interpretation (Weaver and Dyhr 1976; Mark Hurd Aerial Survey 1979).

The upland forest areas contain climax and intermediate species. A dense canopy is formed, composed of a number of important tree species including sugar maple (Acer saccharum), basswood (Tillia americana), American elm (Ulmus americana), red oak (Quercus rubra), bur oak (Quercus macrocarpa), trembling aspen (Populus tremuloides), bitternut hickory (Carya cordiformis), and ironwood (Ostrya virginiana). Along the edges of the upland areas, there are also clumps of coniferous species, shrubs, and herbaceous growth.

The grassland area at the eastern edge of the site along Tomahawk Trail is dominated by a variety of grasses and a number of common herbaceous species such as goldenrod (Solidago spp.) and aster (Aster sp.) and bordered by a stand of predominantly red pine (Pinus resinosa). These areas appear to be abandoned pastures and would eventually be invaded by pioneer shrubs and tree saplings.

Some of the moist lowland pockets on the site are characterized by tree growth and limited woody undergrowth. Species found in these areas include willow (Salix sp.), American elm (Ulmus americana), and green ash (Fraxinus pennsylvanica).

The large peat-based wetland adjacent to the site and the small wetland area in the southeastern portion of the site are characterized by typical regional wetland species. Shrub-carr, wet meadow, and emergent aquatic vegetation are found in these areas. These include such species as redosier dogwood (Cornus stolonifera), willow (Salix spp.), cattail (Typha latifolia), reed grass (Phragmites sp.), and sedge (Carex sp.).

4.3.4 Wildlife

Wildlife species potentially occurring in the range of the project region would include those species commonly associated with the regional plant communities found in Hennepin County. However, due to the limited size of the landfill expansion property, nearly all of the wildlife that would be found on the site and would be displaced could find adequate habitat in the surrounding area.

Species lists adapted from surveys of Hennepin County are presented in Appendix II of TWP 5 (Weaver and Dyhr 1976). These lists catalogue the range of species that could occupy the various trophic levels in each of the vegetative associations found on the project site. Note that additional animal species may occupy these habitat types in the spring and fall seasons and that, while they are not specifically identified, a number of insect species play a substantial role in the overall functioning of these ecosystems.

Wildlife observations made on the site visits in November and December, 1979 included gulls, crow, and pheasants. It has also been noted that brown rats and white-footed deer mice are common rodents associated with landfill sites in Minnesota (pers. comm., J. Kemp, December 19, 1979).

4.3.5 Aquatic Ecology

The drainage area of the proposed landfill expansion sites includes Winterhalter Lake, Spurzem Lake, Half Moon Lake, and Lake Independence. Connecting these water bodies is a narrow creek referred to as Spurzem Creek (or Pioneer Creek). Limited data from lake surveys is available, however no ecologic stream information has been recorded (pers. comm., T. Kucera, December 13, 1979).

Winterhalter Lake is southeast of the site and drains the narrow stream that emerges from the wetland at that location. Spurzem Creek drains into and out of the lake. The area of the lake is 16 acres and median depth is 10 feet (pers. comm., V. Reiner, MPCA, December 28, 1979). To date, no aquatic ecology data has been made available for Winterhalter Lake.

Spurzem Lake has one inlet and one outlet consisting of Spurzem Creek. The lake area is approximately 65 acres with a median depth of 12 feet. Lake biological characteristics recorded in 1960 are presented in Appendix III of TWP 5. The available information indicates that the lake bottom consists mainly of detritus mixed with muck, that cover is primarily cat-tails and, that there is only limited public access.

Spurzem Creek flows through Half Moon Lake and consequently functions as the lake's inlet and outlet. The lake's approximate size is 29 acres and median depth is 11 feet. The bottom of the lake is mostly muck. Shoreline cover has been designated as 60% pasture, 10% swampy lowland, 5% cropland, and 25% wooded with homesites. There is no designated public access. Lake survey biological data from 1961 is presented in Appendix III of TWP 5.

Lake Independence has one inlet and one outlet into Spurzem Creek which flows into the Crow River and ultimately to the Mississippi River. The area of the lake is approximately 828 acres and median depth is 15 feet (pers. Comm., V. Reiner, MPCA, December 28, 1979). Lake biological characteristics recorded in 1974 are noted in Appendix III of TWP 5. Shoreline bottom classifications are 5% rubble, 15% gravel, 70% sand, and 10% muck. Shoreline cover consists of 30% open parkland, 30% residential lawns, and 30%

cattail and bulrush fringe. County and village-owned public access is available on the east side of the lake.

4.3.6 Wetlands

Minnesota has a wealth of water-related natural resources, currently protected under the State's "Public Waters" regulations (Minnesota Statutes Chapter 105). A permit program is administered by the Minnesota Department of Natural Resources (MDNR), requiring the granting of a permit for certain activities affecting waters classified as "public waters" or "wetlands." The boundary of the regulated areas is defined as the "ordinary high water level" (MS 105.37 Subd. 14). Those wetlands which are under the jurisdiction of the Public Waters permit program are "limited to all type 3, 4 and 5 wetlands, as defined in U.S. Fish and Wildlife Service Circular No. 39 (Shaw and Fredine, 1971) not included within the definition of public waters, which are ten or more acres in size in unincorporated areas or 2½ or more acres in incorporated areas "(MS 105.37 Subd. 15.).

The Woodlake Sanitary Landfill site incorporates a wetland property within its boundary. The wetland in the northwest area of the site (approximately 126 acres) linked to a smaller wetland in the southeast (approximately 5.2 acres) along Tomahawk Trail, is currently listed and mapped by the DNR (pers. comm., T. Lempke December 13, 1979). Species identified on the wetlands are: cattail (Typha spp.), reed canary (Phalaris arundinacea), willow (Salix spp.) elm (Ulmus americana), and alder (Alnus spp., shrub).

The wetlands are also listed and identified (as one unit: 8-1) by the Hennepin County wetland survey as illustrated by Figure 4 and Table 5 of TWP 5 (Hennepin Soil and Water Conservation District 1976). Both are identified as Type 3 wetlands, a designation of the U.S. Fish and Wildlife Service that refers to an inland shallow fresh marsh.

4.3.7 Rare and Endangered Species

Minnesota has enacted a state law for the protection of threatened and endangered species (M.S.A. 97.488), and state listings of regulated species are presently being compiled. There is also a recently established natural heritage program within the state. According to present records, there are no listed species in the project area (pers. comm., C. Henderson, December 21, 1979).

There are several unusual species noted by the heritage program that occur in the area: Foster's tern, trumpeter swan, and ginseng. Trumpeter swan is currently considered a rare species and recent conservation efforts within the Baker Park Reserve and other portions of the Hennepin County Park Reserve District have restored this bird to its non-endangered status within the State (King and King, 1968; Moyle, 1975).

4.4 SOCIO-ECONOMICS

4.4.1 Present Land Use

Regional - Twin Cities Area

Land Use. In 1960, 14.1 percent (267,000 acres) of the Minneapolis-St. Paul metropolitan area's 3,000 square miles (1.9 million acres) could be categorized as urban land use. The breakdown by category was as follows:

Residential	5.0%		
Streets and Alleys	5.0%		
Public and Recreational	2.3%	Industrial	1.5%
Commercial	<u>0.3%</u>		
TOTAL	14.1%		

The remaining 85.9 percent of the metropolitan area's land consisted of vacant space, agricultural land or water bodies. In 1970, the percent of land in urban uses increased by 4.6 percent to 18.7 percent (355,000 acres). By 1975, this figure had grown to 21.6 percent. The breakdown by land use category for that year was as follows:

Residential	7.2%		
Streets and Alleys	6.0%		
Public and Recreational	5.8%	Industrial	2.0%
Commercial	<u>0.6%</u>		
TOTAL	21.6%		

The rest of the region was vacant, agricultural (73.5 percent), or water (4.9 percent). (Metropolitan Council, Oct. 1978)

Zoning. Of the seven counties in the Metropolitan area, Washington, Scott and Carver Counties have county-wide zoning with shoreland management provisions. Anoka and Dakota counties have no county-wide zoning but have shoreland management ordinances. Hennepin and Ramsey counties have no county-wide zoning but have shoreland management ordinances. Hennepin and Ramsey counties have no county-wide zoning or shore-land management ordinances. (Metropolitan Council, Oct. 1978)

Land Use Plans. The principal planning agency in the Metropolitan Area is the Metropolitan Council. Its task is two-fold. Firstly, the council is responsible for developing programs and making recommendations for legislative action to meet regional problems and long-range goals. Secondly, the Council provides a check on the programs and expenditures of regional and local agencies in the Metropolitan Area.

In 1976, the Metropolitan Land Planning Act was passed in order to strengthen local planning and achieve orderly local development within four metropolitan systems: airports, recreation and open space, land transportation and waste management. Under the Act, each community is required to prepare a comprehensive plan. This plan will basically contain three parts dealing with land use, public facilities and implementation. The comprehensive plan must be consistent with the plans of other communities, counties, school districts and the Metropolitan Council. (Metropolitan Council, Oct. 1978; Jan. 1979)

Hennepin County

Land Use. Between 1970 and 1975, nearly 12,000 acres of vacant or agricultural land were converted to urban uses. The two land-use categories of greatest growth were Residential and Public/Recreational, accounting for more than two-thirds of the nearly 12,000 acres converted from vacant or agricultural uses to urban uses. (Metropolitan Council, Oct. 1978)

Zoning. Hennepin County does not have any county-wide zoning ordinances. Zoning within the county is under the jurisdiction of individual municipalities. The western portion of Hennepin County -- Plymouth, Medina, Maple Grove, and Corcoran -- is principally zoned for vacant or agricultural land. Approximately one quarter of the city of Medina is zoned for parks and recreational areas; the rest is primarily zoned as agricultural or vacant land with some single-family housing. (Metropolitan Council, Oct. 1978)

Land Use Plans. Hennepin County presently has no definite land use or comprehensive plans.

The County does not have any legal authority for zoning or subdivision review. These are left to local municipalities. Both Medina and Loretto must prepare a comprehensive land use plan which must meet Metropolitan Council standards. (Metropolitan Council, Oct. 1978)

Medina and Loretto

Land use. The cities of Medina and Loretto are located in the rural outlying sector of the Twin Cities Metropolitan area. Nearly three-fourths of Medina consists of vacant and agricultural land. Approximately 15 percent of the land in the city is made up of parks and recreation areas. The remaining land is devoted to single-family housing, commercial retail and service, industrial (mainly manufacturing, wholesale, construction, gravel pits) and water.

Between 1970 and 1975, Loretto and Medina exhibited, by comparison to other county areas, high rates of industrial land consumption. During those years, these communities converted almost 200 acres of vacant or agricultural land to industrial uses. Most of the industrial land consumption in Medina and Loretto was dominated by extractive industries such as gravel operations. (Metropolitan Council, Oct. 1978)

Zoning. Along State Road 55 (see Figure 3), which cuts diagonally across the northeast corner of Medina, land on both sides of the road is zoned for: limited and general industrial and manufacturing uses, and general commercial or shopping center uses. The area south of Hamel Road, north of Route 24, east of Route 19, and west of Parkview Drive is zoned for public, open development, conservation, or reclamation uses. This area and the land south of Route 24, west of Route 201 and north of Routes 28 and 6 comprise Baker Park Reserve. Additional open space zoning exists for properties surrounding Wolsfeld Lake, Holy Name Lake and Kegan Lake. The area in the southwest corner of Medina, along both sides of Route 12, is zoned for limited industrial and manufacturing uses. Properties at the northwest

corner of Medina, at the intersection of Routes 19 and 55, are zoned for general commercial or shopping center uses. The landfill site is presently zoned for rural-agricultural uses. The existing site is a non-conforming but "grandfathered" use, since the facility was in operation prior to enactment of the present zoning regulations. The proposed site, Areas 3, 4, 5, 6 and 7, would also be non-conforming under existing zoning regulations. (Pers. Comm., W. Mills)

Land Use Plans. The City of Medina is currently developing a comprehensive land use plan, but details of its contents have not yet been made public. (Pers. comm., D. Ruhl)

4.4.2 Public Facilities and Services

Twin Cities Area

Water Supply and Sewerage. Water supplies throughout the region consist of regionalized water distribution systems, localized water distribution systems and private wells. In the seven county Metropolitan Area water is supplied by: 17 lakes; 40 rivers, streams, brooks, or creeks; 14 artificial or natural pits, ponds, swamps, or ditches; and 734 wells. (Metropolitan Council, Feb. 1977)

Emergency Services. Fire services throughout the area are provided by a combination of paid and volunteer fire services. Large municipalities and densely populated suburban areas generally have paid manned fire companies. Other suburbs and rural areas utilize volunteer services.

With respect to police protection, the region typifies police protection systems throughout the country. State police and local police networks provide services throughout the region. In 1978 the Metropolitan Council authorized distribution of more than \$1.7 million in federal Law Enforcement Assistance Administration grants to local police agencies.

The area's Emergency Medical Services (EMS) program completed its first year of activity in 1978. This system calls for plans for a regional EMS communications system for the radio dispatch of medical help to the scene of an emergency. (Metropolitan Council, Feb. 1977)

Health Care. With respect to medical facilities, the Metropolitan Area has 37 general acute care hospitals and medical centers, 3 speciality centers and 165 long-term care facilities. (Metropolitan Council, Feb. 1977)

Education. There are over 600 elementary and secondary schools in 50 public school districts in the Metropolitan Area. In addition, the University of Minnesota is at Minneapolis, Hamline University is at St. Paul, and St. Olaf College is at Northfield. (Minnesota State Planning Agency, Oct. 1979)

Recreation. There are 36 developed regional parks in the Twin Cities area. They average more than 1500 acres in size and total more than 53,000 acres. During the winter of 1980, between 1,000,000 and 1,500,000 visits to the parks are expected. (Metropolitan Council, Aug. 1979)

Hennepin County

Water Supply. The water supply in Hennepin County is from: 4 lakes; 12 rivers, streams, brooks, and creeks; 5 natural and artificial pits, ponds, swamps, sloughs, and ditches; and 246 wells. (Metropolitan Council, Feb. 1977)

Emergency Services. Emergency services (police, fire and ambulance) in Hennepin County are provided by various municipal police and fire departments, the Hennepin County Sheriff's office and the Hennepin County Medical Center. (Metropolitan Council, Feb. 1977)

Health Care. The County has 17 general acute-care hospitals and medical centers and 88 long-term facilities. (Metropolitan Council, Feb. 1977)

Education. About 110 public elementary and secondary schools are located in 16 school districts in Hennepin County. In addition, the University of Minneapolis is located in the County. (Metropolitan Council, 1979)

Recreation. Over 22,000 acres of parks and open space have been set aside by the Hennepin County Park Reserve District. The major components in this system are park reserves -- natural areas of 1000 to 5000 acres. Up to 20 percent of a park reserve is developed for active recreation, nature centers, picnic grounds, swimming beaches, camp grounds, hiking trails, bicycle paths, ski touring, horseback riding and snowmobile trails. The remaining 80 percent of a park reserve is kept in or has been restored to its natural state. (Hennepin County Park Reserve District)

Solid Waste Management. With respect to solid waste disposal services, there are approximately fifteen landfills potentially available for disposal of waste generated in the County. Table 4-3 presents cost data for each individual landfill. As the table illustrates, the predominant rate for loose refuse is approximately \$1.00 per cubic yard. Blanks under the categories (e.g., bulky items) indicates that this type of refuse is not usually handled at the landfill. (Pope-Reid Assoc., Inc., Jan. 1980)

Medina and Loretto

Water Supply and Sewerage. Most of the drinking water supply for Medina and Loretto comes from private wells. The more densely settled portions of both Medina and Loretto, however, are served by municipal water systems. Similarly, sewage disposal is primarily by on-site septic tanks. However, again in downtown more populated areas, sewage collection and treatment systems have been installed. (Pers. comm., D. Ruhl)

Emergency Services. Four volunteer fire companies serve the Medina area. They are:

TABLE 4-3

COMPARATIVE COSTS FOR LANDFILLS IN THE TCMA (DOLLARS PER CUBIC YARDS)

	<u>Loose Refuse</u>	<u>Compacted Refuse</u>	<u>Unclassified Refuse</u>	<u>Bulky Items</u>
<u>Hennepin County</u>				
Woodlake	1.60	2.00		5.00
Flying Cloud			1.25	5.00
<u>Anoka County</u>				
Oak Grove	1.00			5.00 minimum
East Bethel	7.50/load up to 30 cu. yds.			1.50 to 2.00
Waste Disposal Engineering	1.00	1.00		1.00
Anoka Municipal	1.05	1.05		
<u>Dakota County</u>				
Burnsville			1.00	2.00
Freeway	1.00	1.10	1.03	2.00
Pine Bend				2.50
Oakhue	1.00	1.10		1.00 to 3.00
<u>Scott County</u>				
Louisville		1.00		10.00 minimum
<u>Chicago County</u>				
Pine Lane	1.00	1.50		
<u>St. Croix County</u>				
Junkers			1.30	
<u>Wright County</u>				
Lindenfelser			3.00-4.00/load	
<u>Sherburne County</u>				
Elk River	1.10	1.60		1.00 to 2.50

SOURCE: Pope-Reid Associates, Inc., January 1980.

- . Maple Plain Fire Company;
- . Long Lake Fire Company;
- . Loretto Fire Company; and
- . Hamel Fire Company.

Police protection is provided by the Medina police force, which consists of four police officers and three vehicles. One additional vehicle is currently on order. Additional protection is provided by the County Sheriff's office.

Ambulance service is provided by the North Memorial Medical Center and the Hennepin County Medical Center. (Pers. comm., D. Ruhl)

Health Care. Neither Medina nor Loretto have hospitals, but both areas have ready access to North Memorial Medical Center, Hennepin County Medical Center and a hospital in Buffalo Minnesota. (Metropolitan Council, Feb. 1977)

Education. Residents of Medina belong to school district 278 and 284. District 278 is comprised of Orono Senior High School, Orono Middle School, Maple Plain Elementary School and Schuman Elementary School. Total enrollment in 1978 was 2576. District 284 is comprised of Wayzata Senior High School, Ridgemont Junior High School, Wayzata Junior High School, Beacon Heights Elementary School, Birchview Elementary School, Greenwood Elementary School, Oakwood Elementary School, Sunset Hills Elementary School, and Widsten Elementary School. Total enrollment for 1978 was 6,880. (Metropolitan Council, 1979)

Recreation. The Baker Park Reserve is accessible to residents of the cities Medina and Loretto. The Reserve, which is 2500 acres, contains picnic areas, beaches, a boat launch and campgrounds. (Hennepin County Park Reserve District)

Solid Waste Management. The most convenient waste disposal location available to Medina and Loretto residents is the Woodlake site. The site operated by Woodlake Sanitary Service, Inc. charges approximately 50 percent

higher than the average County disposal rates for loose and compacted refuse. These higher rates are, in part, a reflection of the private operation's attempts to conserve landfill capacity, since the bulk of the landfill's available capacity has been planned for final disposal of waste collected by BFI's regional collection operation. (Pope-Reid Assoc., Inc., Jan. 1980)

4.4.3 Transportation

Regional Roadway Network

Interstate Routes 94 and 35 are the principal highways serving the metropolitan area. Interstate 94 crosses the state diagonally from the southeast (Wisconsin) eventually leading into the northwest (South Dakota). Interstate 35, on the other hand, takes an almost direct north-south route connecting the Twin Cities with Iowa and the city of Duluth. Interstate 494 forms a ring around Minneapolis-St. Paul connecting interstate, state and county roads. In addition, U.S. Routes 52, 169, 10 and 12 provide access into the Twin Cities area. (Metropolitan Council)

Local Roadways

Hennepin County is served by Interstate Routes 494, 35, and 94. In addition, the County is served by State Routes 52 and 169, both of which extend radially to the northwest of Minneapolis, and Route 12, which crosses the County in an east-west direction. State Highway 55 -- Olson Memorial Highway -- connects downtown Minneapolis with northwestern Hennepin County, including the cities of Plymouth, Medina, Corcoran and Greenfield. (Metropolitan Council)

Primary Traffic Routes to and from Site

The principal routes through the city of Medina are State Road 55 and County Roads 24, 201, 19, 11, and 29. The landfill site, located just to the southeast of Loretto, is served by Tomahawk Trail, a county-operated road. (Metropolitan Council)

4.4.4 Areawide Aesthetics

Views from On-Site

The City of Loretto is visible from the upper elevations of the landfill. From the site, the most prominently visible structures are the Catholic Church steeple and village water tower. Between the landfill and the town are the three lagoons of a sewage treatment plant. To the south, a large densely wooded area can be seen. The rest of the view, particularly across Tomahawk Trail, encompasses gently rolling cultivated land. In addition, to the north, an inland shallow marsh is visible, with reed canary grass, cattails, willows, and other wetland vegetation. There are also houses on the hill overlooking the landfill. (Based on an on-site survey conducted by FCHA during February, 1980).

Views from Off-Site

From off-site, the top of the landfill (areas 1 and 2 see Figure 3-4) is clearly visible from Tomahawk Trail. Areas 5, 6, and 7 are at higher elevations than the rest of the landfill and are partially wooded with pine trees and other shrubs. Between Areas 4 and 5 is a small marshy area. A tributary of Spurzem (Pioneer) Creek runs through this marshy area and is visible only during flood conditions due to densely overhanging vegetation.

An abandoned farmhouse/barn on Areas 5 and 6 is also visible from Tomahawk Trail. This area was apparently once used as a corn field. (Based on an on-site survey conducted by FCHA during February, 1980).

4.4.5 Demographics

Regional -- Twin Cities Area

Population Characteristics. Table 4-4 presents current population estimates and projections for the Twin Cities Metropolitan Area by county. Approximately 40 percent of the State's population is expected to be living

TABLE 4-4

TCMA POPULATION PROJECTIONS BY COUNTY

<u>County</u>	(Census) 1970	(Estimate) 1975	<u>Projections</u>				
			1980	1985	1990	1995	2000
Anoka	11,400	12,400	13,600	14,100	14,600	15,100	15,400
Carver	28,300	33,500	37,300	40,700	43,600	45,900	47,800
Dakota	139,800	145,100	202,200	255,800	249,300	272,400	293,300
Hennepin	960,100	921,000	899,400	891,200	886,000	882,500	880,000
Ramsey	476,300	460,300	450,100	446,500	444,500	443,000	442,000
Scott	32,400	39,600	44,600	48,600	51,700	55,500	58,700
Washington	83,000	103,400	119,300	131,000	141,900	153,900	58,700
METROPOLITAN AREA	1,731,300	1,715,300	1,766,500	1,797,900	1,831,600	1,868,300	1,900,700
STATE	3,806,100	3,921,000	4,070,600	4,203,600	4,329,700	4,440,400	4,529,600

SOURCE: Minnesota State Planning Agency, May 1979.

in the Metropolitan Area by 1980. In that same year, the most populated county will be Hennepin, with nearly 900,000 people, followed by Ramsey and Dakota, with about 450,000 and 200,000 persons respectively. By the year 2000, the Metropolitan Area is expected to have a population of close to 2 million. In comparison, the State of Minnesota is projected to have a population of more than 4.5 million people by the year 2000. (Minnesota State Planning Agency, May 1979)

Household Characteristics. In 1975 there were approximately 640,000 families in the region. This represents a 12 percent increase since 1970. Female-headed households increased the most, by 27 percent, during those years. The average persons per household between 1970 and 1975 decreased by 14 percent to 2.83. (Minnesota State Planning Agency, November, 1978)

Income Characteristics. In 1976 the median income of husband-wife families in the State of Minnesota was approximately \$15,000. This represents an increase of 8 percent over the previous year's income. Residents of Washington and Dakota counties enjoyed the highest median income (about \$19,300) in the seven county metropolitan area. The median income for residents of Scott County increased the most (approximately 12 percent). (Minnesota State Planning Agency, Nov. 1978)

Employment Characteristics. In 1978, there were more than 45,700 establishments in the Twin Cities area employing nearly one million workers, with total wages of more than \$12 billion. The greatest number of establishments was for wholesale and retail trade (15,603) followed by the service industry (13,610). The manufacturing industries generated the largest amount of wages -- nearly \$4 billion. Federal, State and local governments employed about 140,000 persons and contributed \$2 billion in wages during 1978. (Minnesota Department of Economic Security, Aug. 1979)

Education Characteristics. The level of educational attainment in Minnesota is rising as a larger proportion of each generation graduates from high school and college. In 1977, 70 percent of all persons 25 years and over were high school graduates, as compared to 58 percent in 1970 and 44 percent in 1960. In addition, the proportion of persons with college degrees has more than doubled since 1960, from 8 percent to 17 percent in 1977. (Minnesota State Planning Agency, Oct. 1978)

Housing Characteristics. The State of Minnesota experienced a growth rate in year-round housing units of 15 percent during the years between 1970 and 1977. Housing in the region grew at a similar pace of about 14 percent. (Minnesota State Planning Agency, June, 1978)

Hennepin County

Population Characteristics. Hennepin County was one of the only two counties (Ramsey being the other) in the Metropolitan Area projected to decrease in population by the year 2000. Hennepin County is expected to have 80,000 fewer people in the year 2000 than in 1970, a decrease of 8.3 percent. However, both Hennepin and Ramsey Counties will continue to be the two most populous counties in the State through 2000. The estimated population decline between 1970 and 1980 was more than 6 percent. Between 1980 and 1990 the population in the County is expected to decline at a slower rate of 1.5 percent. In the last decade of the century, this decline is expected to be reduced by about half to 0.7 percent. (Minnesota State Planning Agency, May 1979)

Household Characteristics. The average size of the Metropolitan Area's households has been decreasing between 1970 and 1975. In 1970, the number of persons per occupied housing unit in Hennepin County ranged from below 3.0, in the City of Minneapolis, to about 4.4 for Medina and Corcoran. In 1976, the City of Minneapolis and a few surrounding municipalities (e.g., St. Louis Park, Edwin, Richfield) had less than 3.0 persons per occupied housing unit. (Minnesota State Planning Agency, May 1979)

Income Characteristics. The median income of husband-wife families in 1976 for Hennepin County was \$18,646. This represents an increase of 7.5 percent over the 1973 median income value of \$15,196. The County as a whole, ranked third in median income among all counties in Minnesota. This was nearly 18 percent above the state median of \$15,814. More than 72 percent of the County's residents had income contributed from both spouses. (Minnesota State Planning Agency, Nov. 1978)

Employment Characteristics. As of December 1978, wholesale and retail trade had the greatest number of establishments (8,026), along with the largest number of employees. The manufacturing sector paid the most in total wages, about \$480 million. In total for Hennepin County, there were nearly 24,000 establishments employing more than 574,000 persons at a total annual salary of almost \$2 billion. (Minnesota Dept. of Economic Security, 1978)

Educational Characteristics. Over 160,000 students were enrolled in 16 school districts in Hennepin County. The Minneapolis school district has the largest number of students (46,638) and Brooklyn Center the least (1,737). By the 1982-83 school year, most of the districts expect a decline in enrollment. Only Eden Prairie and Osseo expect enrollment increases (37 percent and 10 percent, respectively). (Minnesota State Planning Agency, Oct. 1978)

Housing Characteristics. In 1976 there were 65,023 housing units in northwest Minneapolis, which includes Hennepin County. By 1980, this figure is projected to be 68,000, a five percent increase. By the year 2000, in northwest Minneapolis the number of housing units is expected to increase by 60 percent to 104,000 units. Equivalent data for Medina and Hennepin County is not currently available. (Minnesota State Planning Agency, June 1978)

Medina and Loretta

Population Characteristics. In 1977, the total population of west Hennepin County, which includes Medina and Loretto, was 8693. The average age of the population was 27 years. The population was split equally between males and females. Over one-quarter of the residents were between 5 and 14

years of age. Approximately one-quarter was between the ages of 25 and 44. The ethnic composition of west Hennepin County was overwhelmingly white (99.6 percent). (Metropolitan Council, Feb. 1977)

Household Characteristics. Virtually all households in the Medina-Loretto area in 1977 consisted of both parents plus children. The median household size was 3.13 persons. Slightly more than 2 percent of the population lived in one-person households, while an even smaller percentage (0.73 percent) of the residents were involved in group living arrangements. (Metropolitan Council, Feb. 1977)

Income Characteristics. The median income of families in the Medina-Loretto area in 1977 was \$10,844. About one-third of all families (32 percent) earned between \$10,000 and \$14,999 that year. About 6 percent of the families earned more than \$25,000. About 8 percent of the families (or 546 persons) in west Hennepin County were below the federally established poverty level. (Metropolitan Council, Feb. 1977)

Employment Characteristics. The breakdown by occupational category is shown in Table 4-5. As shown, most persons in the labor force (41.1 percent) worked as craftsmen, operators or laborers. Sales/clerical and professional/managerial categories comprised the next greatest employment categories. (Metropolitan Council, Feb. 1977)

In 1977, approximately 40 percent of the female residents in the western Hennepin County area were employed. Nearly 84 percent of all male residents were gainfully employed, about 14 percent were not in the labor force and slightly more than 2 percent were unemployed.

Educational Characteristics. About 38 percent of the 25 year-old and older residents of the Medina-Loretto area have had at least 12 years of education. Almost 30 percent have had 0 to 8 years of education. Slightly more than 3 percent of 14 to 17 year-olds are not in school. Almost 80 percent of the persons between the ages of 18 and 24 have completed at least high school. The medial years of education for persons 25 years old or older is 12.2. (Metropolitan Council, Feb. 1977)

TABLE 4-5

OCCUPATION OF WESTERN HENNEPIN COUNTY RESIDENTS, 1977

<u>Occupation</u>	<u>Persons Employed</u>	<u>Percentage</u>
Professional/Managerial	573	17.0
Sales/Clerical	592	18.3
Craftsmen, Operators, Laborers	1,330	41.1
Farmers	253	7.8
Service Workers	393	12.1
Not Reported	<u>95</u>	<u>3.0</u>
TOTAL	3,236	100.0

SOURCE: Metropolitan Council, Feb. 1977.

Housing Characteristics. Most families (82 percent) own the housing they live in; 18 percent rent housing. The median home value in 1977 for the western Hennepin County area was \$21,334; the median contract rent was \$106 per month. About 90 percent were single family housing units; 5 percent were two-family units; and over 3 percent were multi-family units. Less than two percent were mobile homes. It is difficult to determine the changing housing characteristics (e.g., agricultural to residential) of the Medina-Loretto area since a local land use plan has not yet been released. (Metropolitan Council, Feb. 1977)

4.4.6 Fiscal Setting

Twin Cities Area

Total expenditures of local and regional governments were more than \$2.26 billion in 1975. Operating expenditures (e.g., salaries, maintenance) accounted for the biggest share, about \$1.5 billion. About one-half billion dollars was spent for capital outlay (e.g., buildings, major equipment), with the remaining one-quarter billion dollars allocated to debt service (payments on borrowing). Total governmental expenditures, expressed in constant 1975 dollars, rose each year in the first 12 years of the period 1960-1975, and then declined after 1972 by an average of about two percent per year. School districts accounted for the biggest share of governmental expenditures, 37 percent in 1975. Cities and townships had 31 percent; counties 21.5 percent; metropolitan agencies, 5.5 percent; and, special district, 5 percent.

The combined outstanding debts of jurisdictions within the Metropolitan Area increased from \$0.5 billion in 1960 (1960 dollars) to \$2.39 billion in 1975 (1975 dollars). Cities and townships accounted for the largest share of outstanding debts in 1975 - 41 percent; school districts, 31 percent; metropolitan agencies, 12 percent; special districts, 12 percent; and counties, 4 percent.

Revenues of all governments in the Metropolitan Area more than doubled in the 1960-75 period, from about \$0.9 billion in 1960 to \$1.99 billion in 1975 (dollars adjusted for inflation). Real estate taxes contributed one-third of all governmental revenue in the Metropolitan Area in 1975, down from 54 percent in 1960. Federal aid provided 11 percent of all governmental revenues in 1975, up from two percent in 1960. State aids to governments in the Metropolitan Area accounted for about 35 percent of all governmental revenue in the region in 1975; in 1960, it was about 25 percent. (Metropolitan Council, June 1979)

Hennepin County

On aggregate, counties in the metropolitan area increased disbursements by 71.6 percent from 1960 (\$433 per household) to 1975 (\$743 per household). Of the \$310 increase in per household disbursements between 1960 and 1975, almost 80 percent (about \$244) represents an increase in current expenditures, i.e., increased services in welfare, parks, financial administration and courts over the 16 year period. During this same period, counties were fairly active in terms of public works construction and equipment acquisition. From 1961 to 1974, counties doubled their share of per household capital outlay expenditures, and increased their share of per household debt service by 12 times.

With regard to revenues, about 50 percent of county revenues was raised regionally, mostly through real estate taxes, and other fees and service charges. The majority of the remainder came from intergovernmental transfers. (Metropolitan Council, June 1979)

Medina and Loretto

Residents of the City of Medina pay a mill tax rate of 20.665 per \$1000.00 of assessed valuation. Residents of Loretto pay 20.168 per \$1000.00 of assessed valuation. In addition to these municipal taxes, residents must pay county school and special fee taxes. Depending on what

municipality residents live in (Medina or Loretto), what school district they reside in (879, 284, or 278) and what Watershed District they belong to (1, 2, 3, 4 or 5), they will pay approximately 102 mills per \$1000.00 of assessed property value.

The area-wide mill rate which is applied to commercial, industrial and utilities property is \$114.365 per \$1000.000 of assessed valuation.

The total budget for the Village of Medina is \$519,533. The largest expenditures are streets, roads and police. Total receipts for Medina for 1980 are expected to be \$575,827. (Pers. comm., Hennepin County Assessor's Office, Feb. 1980)

4.4.7 HISTORICAL AND ARCHAEOLOGICAL FEATURES OF SITE AREA*

Prehistorical Features

The Woodlake Landfill expansion site, like the present fill area, is located on high ground flanking a lower swampy area. The higher ground is underlain by glacial till of the Gransburg Sublobe of the Des Moines Lobe of the Laurentide ice sheet. The lower former lake bottom area is composed of peat and other lacustrine sediments. The actual age of the lake is unknown but it post-dates the retreat of the ice in the region which is thought to have occurred ca. 12,000 B.P. (Sims and Morey, 1972)

Such lakes and their surroundings were a much utilized resource by prehistoric peoples, such as Native Americans, in Minnesota for a variety of purposes ranging from subsistence activities to burials (Johnson, 1978 and Winehell, 1911). In the absence of a known time period for the existence of the lake, it is safe only to assume it was present during at least part of the prehistoric period and may, thus, contain remains of archaeological significance.

*The cultural resources survey was conducted by Dr. John S. Kopper. His report appears as an Appendix to TWP6.

Figure locates by number, in bold numerals, known prehistoric sites in the vicinity of Loretto. Most of these sites were originally listed by Winchell and were subsequently inventoried and assessed in the early 1970's. Those sites closest to the landfill facility, No's. 70,72,73,93,71,81,82,83, and 84, are all burial mounds or mound groups. No contract archaeological surveying has been done nearby. Thus, all of our knowledge of aborigines here comes from these well-known and probably much looted sites.

In view of the foregoing, the Woodlake Sanitary Landfill extension site appears to be a good candidate for occupation by man at any time during the prehistoric period. Evidence of such occupation is likely to be well preserved as well for much of the site appears to have been undisturbed even by farming.

Historical Features

There is no indication, however, that special ecological or topographic features occur in the study area which make it especially desirable to man from adjacent lands. Its attractions are commonplace in the region.

It is probable that the Loretto area was settled in the early 1850's by groups of Americans from New York, New England or Pennsylvania. To these settlements were added immigrants from northern Europe in the next decade. Never densely populated, the area was certainly farmed from the time of the original settlement. The Historic Site Survey (1976, 1977), the Minnesota Outdoor Recreation Resources Commission (1963) and the Heritage Conservation and Recreation Service (1980) list no historic sites, structures or markers in the immediate vicinity. The nearest structure listed in the National Register of Historic Places (ibid) is the Burwell House in Minnetonka.

The fieldwork for this project was done during the week of February 3rd, 1980, when there was about 1 foot of snow cover on the ground and the temperatures were below freezing at the site. These conditions precluded any but limited surface surveying and confined investigations to existing subsurface exposures. Despite these limitations much was learned and one probable artifact was recovered. By examining sockets left by fallen trees,

railroad cuts, road and highway cuts, drainage system erosional faces, edges of cultivated fields and other natural and man-made exposures of the subsurface, stratigraphy could be recorded and cultural horizons searched for. Most productive were those cuts facing south, southeast or southwest where the winter sun had melted off the snow cover. But, in all cases these were selected to represent the subsurface in similar settings -- on high ground overlooking lakes, creeks or swampy areas.

It is estimated that over 500 feet of subsurface was investigated in this way at depths from 1 foot to 10 or more feet. The actual positions of these tests is shown with the corresponding stratigraphy in Appendix I of TWP 6. Soil horizons in all sections were poorly developed or not present as befits an homogenous glacial till. No cultural indications of the pre-historic period were present with the exception of the blade core earlier noted; i.e. no charcoal, bone, shell or other artifactual material was observed in the exposures.

4.5 GEOLOGY AND HYDROLOGY

4.5.1 Introduction

The Woodlake Sanitary Landfill is linked to natural ecosystems that extend beyond the site boundaries. Therefore, in order to provide a framework for evaluating potentially significant adverse impacts and possible measures to mitigate those impacts, the section defines both regional and site-specific aspects of the associated geology and hydrology.

The primary sources of information for this section were the Minnesota Geological Survey, Minnesota Pollution Control Agency, the Metropolitan Council, Hennepin County and Browning - Ferris Industries, Inc. The bulk of this information was in the form of data culled from existing written publications, open-file records, maps and aerial photos, and personal communications with the appropriate entities.

With regard to the description and discussion of subsurface conditions, extensive use was made of information contained in numerous well drilling and test boring logs from the files of Minnesota Geological Survey various reports by National Biocentric, Inc. (1977a, 1977b), and from recent test borings and analytical tests conducted by Soil Testing Services of Minnesota Inc. (1980).

In addition, available climatic data was utilized in calculating a site water budget to further clarify the associated hydrologic conditions.

4.5.2 Regional Setting

Structural Setting

In most areas of the State, PreCambrian basement rock is unconformably overlain by a series of strata of mainly Paleozoic and Mesozoic age. In addition, igneous activity resulted in an immense series of basalt flows that form the basic Keweenaw rocks. During the Paleozoic time, the southern areas of the state were alternately submerged and re-emerged, with the

resulting formation of sandstones, limestones, and shales. Long periods of emergence during the late Paleozoic and the Mesozoic produced weathering, erosion, and sedimentary deposition. The final recession of the sea during the late Cretaceous was followed by extensive glaciation during the Pleistocene epoch. Minnesota's present landscape is inherited mainly from the Pleistocene continental glaciation.

A number of important geologic features were formed during this past history. The southeastern section of the state is generally underlain by a large Paleozoic depositional lowland known as the Hollandale embayment. Associated smaller structures, as well as the larger embayment, did not become clearly defined until the Early Ordovician time. One of these smaller structures is now known as the Twin Cities Basin. Faulting during the PreCambrian resulted in the formation of a rough basin due to the greater relative downward movement of the fault blocks located towards the center of the basin. Later movement along these PreCambrian faults during the Middle Ordovician subsequently warped the Paleozoic rocks and further defined the basin (Sims. and Morey, 1972).

Regional Seismicity

Minnesota is considered one of the least seismically active states in the United States. During the last 120 years, ten (10) earthquakes have been recorded as having epicenters located within the state, ranging in magnitude from $m_b=2.6$ to 4.8 on the Richter Scale. However, no severe structural or earth damage was recorded as resulting from these events in the affected areas (Mooney, 1979).

While the proposed project site lies relatively close (from 50 to 225 miles) to the epicenters of several of these events, it is not known to overlie any major active faults.

The Uniform Building code assigns every location in the United States to a four-grade Seismic Risk Zone (0=least risk, 3=greatest risk). In general, the absence of major quakes and infrequency of seismic activity implies a low level of seismic risk for Minnesota overall. The Interna-

tional Conference of Building Officials rates Minnesota and most of north-central U.S. in Seismic Risk Zone 1, while the State Building Code has amended the Minnesota designation to Seismic Risk Zone 0.

Regional Glacial Geology

During the glacial period, Minnesota was covered by ice sheets several times. However, the surficial deposits and present landforms are mainly the result of the most recent period known as the Wisconsin glaciation.

Four major Wisconsin ice lobes, the Superior, Rainy, Wadena and Des Moines, have been recognized in Minnesota. One major phase of concurrent movement by more than one ice lobe occurred in the area under discussion. A lobe of ice from Lake Superior deposited a thin, discontinuous blanket of red clayey till over the southwestern end of Lake Superior Basin. The Grantsburg sublobe of the Des Moines subsequently overrode the Superior red till and created an intricately interlaminated red and buff mixture (Wright, 1972).

In post glacial time, since the final retreat of the ice sheets, erosion and fluvial deposition are the main factors effecting minimal, subtle changes in the Minnesota landscape.

Stratigraphy

The stratigraphic sequence of geologic units in the Minneapolis-St. Paul area consists of nine cycles of sedimentary deposition. Within this framework, the Paleozoic rocks in southeastern Minnesota show a gradual shift in sedimentary character from predominantly sandstone with some carbonates in the earlier cycles to predominantly carbonates with some sandstone in the latter cycles (Sims and Morey, 1972).

The Mt. Simon and Galesville Members of the Dresbach Formation, the Woodhill and Reno Members of the Franconia Formation, as well as the Jordan Sandstone can be generally characterized as medium to coarse-grained sandstones and represent regionally important aquifers. The Prairie du Chien Formation and the St. Peter sandstone also represent important aquifers in southeastern Minnesota (Kanivetsky, 1978).

Drainage Basin and Floodplains

The site under discussion is situated within the Pioneer Creek drainage basin. A 1979 Flood Hazard Study conducted by the Soil Conservation Service in conjunction with local Minnesota groups has defined the extent of the Pioneer Creek watershed 100-year floodplain. At its closest point the 100-year floodplain comes within approximately 300 feet of the site boundary. According to a survey of the area's flood history conducted for the Flood Hazard Study, past floods in the Pioneer Creek Basin have not caused significant damage in the area.

4.5.3 Site Hydrogeology

Topography

The existing and proposed project sites are situated on two steeply rising hills topped by fairly level summits. Site elevations range from approximately 960 feet to 1030 feet above mean sea level. The hills are flanked by two wetland areas to the northwest and southeast that are connected by a short drainage swale. The slopes at the site range from less than 1% near the wetlands to 20% on the steepest hillsides.

Bedrock Geology

Review of the bedrock geology of the region indicates that the site area is successively underlain by the St. Lawrence Formation and the Franconia Formation with the Prairie du Chien Formation underlying the area bordering the site to the east. This generalized picture has been confirmed by drilling logs from the area supplied by the Minnesota Geological Survey and in particular, by the log of the deep well drilled on site by National Biocentric, Inc. (1977). The first bedrock formation penetrated at this location was the St. Lawrence at an elevation of approximately 810 feet above mean sea level, followed by the Franconia Formation. The rocks were characterized as mainly dolomitic and glauconitic sandstones. The lower portion of the St. Lawrence Formation is fractured at this location (Personal communication, Robert Kadwell, Soil Testing Services of Minnesota, Inc.)

Glacial Geology

Additional borings in the area of the proposed expansion site were completed during the month of March, 1980. Information from these and previous borings (National Biocentric, Inc., 1977) indicates that the site is underlain by glacial deposits of the Grantsburg sublobe glaciation. The deposits are predominantly composed of clay till interspersed with apparently isolated layers of sand and sandy silt. The test borings reached a minimum elevation of 867 feet, indicating an overburden soil thickness of at least 100 feet.

Permeability tests were performed on samples taken on-site from depths ranging from near surface to 112 feet below ground surface. Three types of permeability determinations were made. The results indicate that permeabilities for fine-grained materials in undisturbed and remolded samples range from 1×10^{-7} to 9×10^{-9} cm/sec, which is generally considered impervious. Permeabilities estimated for sand samples, from grain size analyses, range from 1×10^{-2} to 4.5×10^{-5} cm/sec, which is generally considered low to moderately permeable.

The borings and permeability tests, in conjunction with the aquifer pumping test appear to indicate that there is, at most, a very limited hydraulic connection between the surface and deep aquifers from which most local water supplies are drawn.

Soils

Figure 4-3 and Table 4-6 present the location, classifications and characteristics respectively, of the dominant soil types at the Woodlake Sanitary Landfill site.

Site-Specific Water Budget

Previously, a site-specific water budget for the Woodlake Sanitary Landfill had been calculated by the Metropolitan Council (March, 1978) for inclusion in their study of Leachate Generation Potential from Landfills

SITE SOILS MAP



TABLE 4-6

SITE SOIL CLASSIFICATIONS

<u>Soil Series and Map Symbols</u>	<u>Slope Represented (%)</u>	<u>Classification</u>	<u>Characteristics</u>
Erin = ErC2	6-12	clay loam	moderately fine texture; deep, well-drained
ErD2	12-18	clay loam	formed in calcareous shaly till; high available moisture
EnD	12-18	loam	moderately slow permeability
Glencoe=Gc		silty clay loam	deep, poorly-drained; moderately slow permeability
Hamel=Ha	nearly level	loam	deep, poorly-drained; moderately slow permeability
Hayden=HcB2	2-6	clay loam	deep, well-drained; moderate permeability
HcD2	12-18	clay loam	formed in loamy glacial till; high available moisture
Lerdal=LmB	1-4	loam	deep, poorly-drained; moderately slow permeability
Marsh=Ma			shallow lakes & ponds
Peaty Muck=Pm		peaty muck over loam	wet soils, decomposed loams and organics

SOURCE: USDA Soil Conservation Service, 1974.

in the Twin Cities Metropolitan Area. For the purposes of comparison, a second water budget for the site was generated for this EIS using more site-specific information relating to area, slopes, cover materials, etc. (EPA, 1975).

Results of this comparison indicate that for the area of the proposed expansion, assuming a 40-acre area, the projected annual volume of leachate ranges from 1.65×10^6 gallons to 3.67×10^6 gallons, while the estimated time of maximum leachate generation ranges from 18 to 40 years.

Surface Water and Groundwater Hydrology

The proposed landfill site drains into the Pioneer Creek watershed via an unnamed creek which flows through the wetland areas northwest of the site and eventually drains into Winterhalter Lake. Bodies of water downstream of the Woodlake site include Pioneer Creek (Spurzem Creek), Winterhalter Lake, Spurzem Lake, Half Moon Lake and Lake Independence. Flow monitoring generally has not occurred in any of the watershed area.

The groundwater hydrology of the site consists of both shallow and deep groundwater systems. Under the present fill area a perched ground water mound exists overlying the clayey glacial till. Groundwater elevations ranging from 962 to 982 feet above mean sea level have been documented on the existing site. For the proposed site groundwater was incurred at elevations ranging from 933 to 959 feet above mean sea level. Given the existing site conditions, this also represents a perched water condition due to the impermeable structure of the clayey soil. This is in comparison to a wetland surface water elevation of 960 feet above mean sea level. Shallow groundwater movement under the site is radial in all directions away from the mounded area with most movement towards the wetland itself, while general deep groundwater movement is southwest towards Lake Independence.

4.6 ENERGY

4.6.1 Introduction

This section deals with the impact of the proposed action on site-specific energy requirements and areawide energy resources. This study will analyze present and future energy use at the site, and determine where and how alternatives have been or can be initiated.

4.6.2 Areawide

Energy Supply

The Minnesota Energy Agency (MEA) projects that based on current consumption and growth rates energy demand will overtake fossil fuel energy supplies after 1988. By 1995, fossil fuel energy supply will fall 13 percent short of projected demand (Minnesota Energy Agency, 1978).

Major Energy Consumers

The Minnesota Energy Agency separates the primary energy consumer sectors into four categories. The following shows these four categories and their consumption.

	Trillion <u>Btu</u>	<u>Percent</u>
Transportation	317.8	28.0
Industrial	332.0	29.2
Residential	297.8	26.0
Commercial	<u>190.9</u>	<u>16.8</u>
Total	1,138.5	100.0

The Metropolitan Waste Control Commission (1977) in its 201 Facility Study estimates that of the seven TCMA counties, Hennepin, containing Minneapolis, is the largest consumer of all forms of energy followed in size by Ramsey County, containing St. Paul.

Energy Management Plan

Existing energy policies for the TCMA are the responsibility of the Metropolitan Council which has prepared a comprehensive long range plan entitled the "Metropolitan Development Guide". While the guide does not outline a specific energy policy as such, it does address the energy issue implicitly. By providing policies in reference to transportation, housing, solid and hazardous waste management, and water quality, the Guide impacts energy use within the region. The Guide's chapter on solid and hazardous waste management, stresses waste reduction as its priority policy, followed by source separation for recovery of materials and energy, and land disposal as a last resort. By reducing and recycling as much waste as possible, most energy requirements for manufacturing would decrease substantially. The Guide indicates that energy recovery systems on a regional basis prove more economical than on an individual basis, and part of the plan for achieving the region's solid waste management goals. To date, the Metropolitan Council and the Commission have investigated a pyrolysis facility proposal to convert a mixture of a local sewage treatment plant sludge and refuse into combustible fuel. The City of St. Paul is also currently participating in a resource recovery feasibility study under the President's Urban Policy Program.

4.6.3 Existing Landfill Site

Electricity Use

Woodlake Sanitary Landfill uses an annual rate of 134,238 kw of electricity. The supplier of this power is Wright Hennepin Electric Co. under a firm contract. Due to the proposed maintenance building, electricity demand will increase. This increased demand can be estimated from the present

usage and existing floor space. The present use of 134,238 kw serves 5700 square feet of space. Proportionately, an additional floor space of 2000 feet will incur an additional electric demand of 47,000 kw. This represents a 35 percent increase in electric demand. No problems are anticipated with Wright Hennepin Electric's capacity to provide this additional demand.

Fuel Use

Woodlake uses three forms of petroleum-based fuel. There are diesel fuel at an estimated 203,000 gallons per year, fuel oil at 43,000 gallons per year and liquified natural gas (LNG) at 7,570 gallons per year. The three fuels are supplied to Woodlake by local contractors, under firm contracts. Storage facilities are available on-site for these fuels. There is an existing 500-gallon diesel fuel tank above ground, and a 5500-gallon diesel fuel tank below ground. There is also a 10,000-gallon gasoline storage tank below ground. The peak demand for LNG and fuel oil is during the winter months, primarily for heating, while gasoline usage is consistent throughout the year. LNG is currently consumed at a rate of 7570 gallons per year to heat the existing 5700-square foot structure, and will increase proportionately to a rate of 10,226 gallons per year to heat the proposed additional structure. This represents a 35% increase in heating fuel demand. No problems are anticipated with local available supplies. The diesel fuel stored on-site is used to operate the landfill equipment as well as to provide gas for landfill trucks. While the Woodlake operation will eventually require replacement of existing landfill equipment, total expected fuel use requirements are not expected to change substantially.

4.7 HUMAN HEALTH

4.7.1 Areawide Epidemiology

This section examines the existing health status of the population in the vicinity of the proposed expansion. The analysis is limited to Hennepin County as compared to Minnesota as a whole. Such a comparison, though not site-specific, will give some indication of the general health of area residents.

Based on data collected on a state and county level, two sets of health indicators have been chosen for analysis (Minn. Dept. of Health, 1977):

1. Comparisons of the rates by the leading causes of death. Rates of heart disease, cancer (malignant neoplasms) and cerebrovascular disease were examined for the years 1977 and 1978. Rates of heart and cerebrovascular disease are consistently lower in Hennepin County, while cancer rates are somewhat higher. The higher cancer rates can probably be attributed to the fact that approximately 40% of the county's residents are urbanized, i.e., live in Minneapolis. It has been known that densely populated and industrialized areas have higher cancer mortality rates.
2. Rates of diseases associated with rodent and insect vectors. The list is limited to diseases which are reportable to the Center for Disease Control. It is impossible to estimate the percentage of cases in which transmission by vectors plays a role.

Hennepin County rates for such diseases are lower than, or differ insignificantly from, rates for Minnesota as a whole. Overall, the epidemiological picture for Hennepin County is consistent with known demographic

factors such as age composition and urban-rural distribution. The county age distribution, with approximately 30 percent of the population over 45, is compatible with the observed rates of the three leading causes of death, as all three causes are chronic conditions associated with advancing age.

Since rates of vector-associated diseases, with the exception of tuberculosis, are so low, it is difficult to draw any conclusions regarding these figures. Based on the evidence, however, there is no reason to hypothesize either an effect attributable to the presence of the existing landfill or one resulting from the proposed expansion.

4.7.2 Localized Health Factors

Air Quality-Related Health Factors

Two potential sources of air-related health effects are inherent in the daily operation of a sanitary landfill:

1. Vehicle and Equipment Emissions. Operation of construction equipment, collection vehicles, and earth-moving machinery will generate low level emissions of carbon monoxide, nitrogen oxides, sulfur oxides, and hydrocarbons. At this time there is considerable controversy surrounding the role of these substance in human health problems. From a community health viewpoint, emissions at the present landfill are not cause for concern.

2. Gas Generation. The gases formed in a landfill represent some of the metabolic end products of solid waste decomposition. Methane and carbon dioxide are the chief constituents of landfill gas. Less significant quantities of nitrogen and hydrogen sulfide are also produced. Production of methane is the end product of continuous anaerobic refuse decomposition. Due to its combustibility, it is the most important gas from a health effects standpoint. Although methane is explosive where present in air at concentrations between 5 and 15 percent, there is no oxygen present in the landfill when this critical level is reached and thus, no danger of the fill

exploding. The major concern is the possibility of escaped methane gas accumulating in structures or other enclosed spaces and building up to explosive levels.

Build-up of methane gas is not anticipated at the Woodlake site due to the following:

1. The isolated location of the site provides few opportunities for gas migration and accumulation in nearby structures.
2. Since post-closure plans indicate a return to open land uses, there is no danger of accumulation in buildings which might otherwise be constructed atop the landfill site.

Water Quality-Related Health Factors

Water-related health concerns are primarily related to the production and migration of leachate. The two the major concerns stemming from leachate generation and migration, contamination of drinking and recreational surface waters, are discussed more fully in the following sections.

Drinking Water. Loretto and Medina draw water from municipal wells located within town boundaries. There are also a number of private wells. The present Woodlake Sanitary Landfill has, in the past, posed a groundwater contamination problem. A study has indicated that groundwater movement from the fill resulted in contamination of the adjacent wetland (National Biocentric Inc., 1977). However, the 1976 Municipal well sampling data compiled by the Minnesota Department of Health indicates compliance with most Environmental Protection Agency drinking water standards with the exception of those for iron and phenol. Elevated levels of iron and manganese often occur in the area. More recent well data is not available.

Recreational Surface Waters. The Landfill site drains into Pioneer (Spurzem) Creek, Winterhalter Lake, Spurzem Lake, HalfMoon and eventually into Lake Independence, via a small creek which traverses the wetland areas northwest of the site.

The major health concern is the extent to which adverse impacts extend to the Lake Independence watershed. The 992-acre lake is a major recreational facility for western Hennepin County and is used primarily for swimming and boating. There is little available data indicating the present level of compliance for water quality standards. The only existing information regarding the lake is a 1974 fisheries lake survey conducted by the Minnesota Department of Natural Resources. Nothing in the survey indicates a contamination problem arising from the present landfill (Minn. Dept. of Natural Resources, 1974).

Table 5-2 details the leachate constituents and concentrations of a typical sanitary landfill. The table gives annual average concentrations which would be expected in Lake Independence considering dilution alone. These are, in turn, compared with the applicable standards set for recreational surface waters. As is shown, these parameters do not exceed state criteria with the exception of copper. A number of other natural phenomena including plant uptake, soil filtration and absorption, and chemical precipitation would result in additional reduction of these constituents in the Lake Independence ecosystem.

Disease Transmission via Vectors and Pathogens

Rodent and Insect Vectors. In the past, open dumps often provided an environment for rats, mice, flies, and mosquitoes which posed health and nuisance problems for the surrounding communities. In a properly maintained sanitary landfill, however, vector problems are kept to a minimum. The predominant rodent species in Minnesota landfill areas are the Norway rat (Rattus norvegicus) and the white-footed deer mouse (Peromyscus leucopus). (J. Kett, personal communication, January 2, 1980). R. norvegicus burrows extensively, subsists on any food type, and can tolerate excessive cold and high population density. Both species have been implicated in the spread of various vector-related diseases.

The magnitude of the rodent problem in properly maintained landfill areas may be considerably less than commonly believed, a fact borne out by a 1978 study conducted at a Texas landfill, similar in some respects to Woodlake. The investigators tentatively concluded that (Schroeder, 1979):

1. Properly maintained sanitary landfills are not conducive to the harboring and breeding of Rattus populations.
2. Rats associated with nearby residential areas were not attracted to the landfill as a food source.

Reports from the existing Woodlake sanitary landfill are consistent with the above. When Browning-Ferris assumed control of the poorly-maintained Boyer landfill, they initiated rodent control practices, (i.e. primarily, daily cover operations). Since that time, no official rodent complaints have been filed regarding the facility (E. Monteleone, personal communication, September 7, 1979).

Flies and mosquitoes also transmit a variety of diseases. There are four factors essential to the control of fly infestations: soil which can be compacted, suitable soil compaction equipment, an adequate range of soil moisture, and adequate thickness of cover. Fly infestations at the site have not been a problem, due to utilization of daily cover.

Mosquitoes, also associated with open dumping, carry a wide range of diseases and breed within open containers and pooled liquids. These types of conditions generally do not occur on the Woodlake site and consequently mosquito problems associated with the landfill operation have not been reported.

Pathogens. In the past, considerable concern has been expressed regarding the role of the sanitary landfill as a breeding ground for pathogens, i.e., microbes and viruses which may cause adverse human health effects.

A recent study tested the two-year survival rate in decaying waste of three "indicator" bacteria organisms: fecal streptococcus, fecal coliform, and total coliform (Swartzbaugh et al.) In this analysis, a representative sample of municipal refuse was collected, shredded, and analyzed for microbiological activity. After two years of degradation, a second sample was extracted and analyzed. While the populations declined by approximately four orders of magnitude, significant numbers of indicator species still survived in the shredded waste after a period of two years. However, these organisms showed considerable decline as the simulated landfill environment changed from aerobic to anaerobic. Fecal Streptococcus, assumed to be more resistant to changes accompanying the transition, demonstrated a greater degree of survival within a leachate medium.

The investigators also performed virological assays to determine the survival of polio virus in paper, garden wastes, and diaper categories of municipal refuse. Serologically viable polio virus was detected in all these waste types for a period of 59-60 days. The viruses were found to have finite survival times ranging from several months at low temperature conditions (up to 19°C) to less than ten days at warmer temperatures (up to 28°C).

Overall, most bacteria and viruses eventually declined in number. The health significance of these findings relates to the possibility of migration of bacteria and viruses from the fill, primarily via leachate.

Occupational Safety and Health

With the exception of the logging industry, the sanitation industry has the highest overall injury rate of any studied occupation in the U.S. However, most definitive studies have been conducted on groups of individuals directly engaged in the collection of refuse, making it difficult to relate such studies to an assessment of impacts directly associated with landfilling. Overall, however, risks can be classified into the following, somewhat overlapping, categories:

1. Traffic-related Injuries. These may result from the rough dirt access roads which traverse landfill areas and contribute to vehicle overturning, as well as the presence of collection vehicles and earthmoving equipment on-site.
2. Air Quality-related Conditions. These include both fugitive dust and vehicle emissions. The latter have long been suspect in elevated rates of respiratory problems in certain occupational groups (i.e., truck drivers, auto mechanics). Thus far, however, definitive evidence to support such conclusions is lacking (Fraumeni, 1975).
3. Increased Risk of Infection. Landfills attract rodents, sea gulls, and pigeons, which are potential reservoirs of bacteria and fungi, as well as a variety of other pathogens. Workers on these sites, run an increased risk of infection. Avenues of transmission vary, but include hand-to-mouth contamination, food poisoning and infection through cuts or sores.
4. Accidental Injury. A study of New York City sanitation workers delineates a number of categorical areas wherein most accidents are likely to occur. These include equipment operation, physical loading and un-loading, maintenance activities. (Cimino, 1975).

Reports from the existing Woodlake Sanitary Landfill do not indicate a current problem with job-related injuries. Occupational Safety and Health Administration figures for the years 1975-1979 break down as follows:

<u>Year</u>	<u>Number of Accidents</u>	<u>Nature</u>	<u>Time Lost</u>
1975	0		0
1976	0		
1977	1	Back strain	0
1978	0		
1979	2	Concussion Bruised Tendon	2 Days

5.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

5.1 METEOROLOGY/CLIMATOLOGY, AIR QUALITY AND NOISE

5.1.1 Meteorology/Climatology

The construction, operation, and closure/post-closure activities on the new landfill areas will have no effect on large scale (macro-climate) meteorological processes, i.e., prevailing winds, air masses, and semi-permanent pressure centers, which basically determine the climate of the Minneapolis-St. Paul vicinity. In addition to large scale influences, local factors can affect the climate on a small scale (micro-climate). The construction of the facility could have a small impact on the microclimate due to changes in topography, the removal of vegetation, etc. However, this impact would be negligible, and the climate of the study area will remain essentially unaltered.

5.1.2 Air Quality

Construction

Construction, operation, and closure/post-closure related activities, such as landclearing, excavation, grading, stockpiling, moving heavy equipment over unpaved areas and the transport of fill material, will generate fugitive dust. However, dust impacts are expected to be minimal. Construction activities will be performed in stages and thus will represent only intermittent sources of particulates. The nature and level of dust generating activities at the new landfill will be similar to those of the existing operation. Furthermore, there are few sensitive receptors in the vicinity of the site.

The operation of landfill equipment will cause low levels of carbon monoxide, nitrogen oxides, sulfur oxides, and hydrocarbons to be emitted to the ambient air. However, total atmospheric input is expected to be very

small since on the average, only one to two pieces of equipment will be operating at any one time.

Operation

Operation of the proposed expanded landfill area has the potential for adverse odor and/or methane gas impacts. However, proper design and operation of a sanitary landfill usually minimizes odor and methane impacts to satisfactory levels (see Odor Control and Methane Control under Section 6.0, Mitigative Measures). The existing landfill has not demonstrated either odor or methane gas problems.

Implementation of the proposed landfill expansion will not cause short-term transportation-related emissions to vary significantly compared to existing levels, since no immediate increase in vehicular traffic utilizing the site will occur. At the present time, 300 vehicular trips per day (approximately 38 trips per hour based on an eight-hour work day) are generated by operation of the landfill.

Browning-Ferris Industries, in the calculation of future landfill capacity, assumed that the average load of refuse received at Woodlake will increase by 5 percent annually. The 5 percent increase in waste disposal may result in a corresponding 5 percent increase in vehicular truck traffic to the site. Based on that assumption, an average increase of 18 vehicular trips per day (approximately 2 vehicular trips per hour) can be expected each year over the life of the landfill (10-year life expectancy). By the tenth year of landfill operation, vehicular trips to the site will increase from the current level of 300 trips per day to 488 trips per day. While there is a potential for increased on-site vehicular emissions due to increased traffic to the site, significant adverse impacts to local air quality are not expected to occur since vehicle turnover, or the replacement of older trucks with newer, less polluting trucks will decrease the potential for adverse air quality impacts in future years (U.S. Environmental Protection Agency, 1978). Additionally, potential receptors are remote from the site.

On a regional basis, significant adverse air quality impacts will not occur, since the proposed expansion will result in only a very small increase in vehicular traffic on routes used to reach the landfill. The potential for increased vehicular emissions due to landfill-generated traffic will be insignificant in comparison to overall regional emissions.

5.1.3 Noise

A certain amount of noise is always produced during the construction and operation stage of most types of projects. Landfill noise is basically generated by the operation of earth moving equipment during construction and operation activities. Although noise emissions from these sources are transient in nature, levels can be relatively high. The exact level depends upon numerous factors, particularly the age and operating condition of the equipment and the proximity of the nearest receptors.

The primary generators of noise during routine landfill operations are vehicular traffic frequenting the site and landfill equipment (usually bulldozers). Implementation of the proposed landfill will not result in significant short-term transportation-related noise impacts over existing levels since an immediate increase in vehicular traffic utilizing the landfill will not occur (see discussion of Air Quality Impacts-Operation).

The impact of the noise level caused by the proposed action would be determined by the degree of increase and the number of people affected. On a yearly basis, the increase in noise emissions would barely be perceptible since only 2 additional vehicular trips per hour per year will be generated by the proposed expansion. Furthermore, noise emissions from vehicular traffic will be sporadic in nature, and thus will have little impact on hourly noise levels (Minnesota has established hourly noise standards). Potential noise impacts are further minimized since (1) the project vicinity has a low population density, and (2) most of the potential receptors are remote to the road and immediate access roads.

Landfill operations will also not affect nighttime noise levels since they will be confined to the daytime.

5.2 WATER QUALITY

5.21 Surface Water

Background

Prior to a discussion of the potential impacts of the proposed expansion it is necessary to define to the greatest extent possible, the existing pollution inputs to existing surface water supplies. As previously discussed, the major pollution inputs to the surface water systems include agricultural runoff, Loretto Sewage Treatment Plant effluent and the existing Woodlake landfill. Each of these inputs must be examined to determine the potential magnitude of their impact on existing surface water quality.

According to data from the Metropolitan Council, the cities of Medina and Loretto comprise 17,325 acres of which 12,443 acres are vacant or devoted to agriculture. Therefore, a maximum of 72% of the runoff from the area could potentially be contaminated by agricultural contributions, particularly phosphorus and nitrogen. Given the large percentage of land use in the area devoted to agriculture, it is evident that a large portion of surface runoff input into the local surface water systems could be contaminated by agricultural sources. Using averages of different estimates for nutrient loading made by the Metropolitan Council (1975), nitrogen inputs to surface waters from agricultural sources could be assumed to total approximately 9.1 tons per acre per year and phosphorus inputs 1.4 tons per acre per year.

The existing sewage treatment plant was designed to treat an average flow of 120,000 gallons per day. In a worst-case situation in which none of the flow would be discharged via seepage, 120,000 gallons per day would be discharged directly into the wetland. Therefore, maximum input of 0.120 mgd could be expected from the sewage treatment facility, although average flow measured for 1978-1979 was 0.064 mgd or 3.12 million cubic feet per year.

In comparison, surface runoff into the wetland from the existing landfill was estimated in a Metropolitan Council study to be 4.12 inches/year (0.34 ft/yr.) (Metropolitan Council, March, 1978). An additional estimate of 0.49 ft/yr. has also been prepared (Fred C. Hart Associates, Inc.,

TWP 7). Given an existing landfill area of 28 acres, total surfac runoff volume could range between 415,000 and 598,000 cu. ft/yr.

The McCombs-Knutsen phosphorous study also indicated that approximately 85 pounds per year of phosphorous enter the marsh from the Loretto Sewage Treatment Facility seepage pond. The study also indicated that the wetland area was effectively assimilating the added nutrients from the seepage pond overflow so downstream water courses were not adversely impacted. It is evident that the phosphorous loading to the Lake Independence watershed from the Loretto plant is rather small in comparison to the potential level of agricultural loading.

With respect to surface water inputs from leachate produced at the existing Woodlake landfill, the NBI study estimated the dilution effect of existing wetland flows on lateral movement of leachate from the fill areas to be an average ratio of 35.7 based on 4 inches of soil moisture storage (assuming clay and glacial till soils) and 24.7 based on 7 inches of soil moisture storage (assuming peat and clay loam soils). Since the watershed is comprised of surface mixture of both these types of soils, the actual quantity of water which is annually retained in the soil as soil moisture storage and which is unavailable as runoff, actually lies mdiway between the 4-inch and 7-inch valves. Thus the actual diluted ratio lies somewhere between the estimated 35.7 and 24.7 values. With the possible exception of copper, iron, manganese, phenol, and TDS, and based upon the ratios indicated above, simple dilution mechanisms would on the average result in water quality achieving both recreational and drinking water standards within the wetland area. The existing landfill is, however, causing some degradation of surface water quality in the adjacent wetland. This leachate contribution appears to be resulting from both the original placement of refuse in the wetland area prior to the acquisition of the property by Woodlake Sanitary Service, Inc., and by the on-going surface runoff and leachate migration pathways.

No visual evidence exists to show that pollutant contributions in the wetland area have resulted in impacts to the wetland ecosystem (TWP 5). However, while there is no substantial evidence of damage to the wetland

ecosystem, some localized vegetative stress along the landfill boundary has been documented by the Agency (Breimhurst, 3/1/78). In addition, water quality testing of the saturated zone of the existing fill has indicated a decrease in pollutant concentrations with migration away from the fill area (National Biocentric Inc., 1977).

The above analyses have thus so far assessed pollution inputs from agriculture, the Loretto sewage treatment plant discharge, and leachate from the existing fill area to the surface water system of the adjacent wetland. This potentially contaminated surface water eventually moves via surface drainage into the Lake Independence watershed where there is potential for impacting a water resource utilized directly by humans. Lake Independence, in particular, is utilized as a recreational body of water receiving substantive human use (i.e. fishing, swimming, boating, etc.).

Previously estimated concentrations in the wetland are based upon dilution ratios available at that point in the drainage basin due to surface runoff contributions. Actual dilution ratios would be much higher in lower portions of the drainage basin due to additional quantities of surface runoff to the creek and other surface water bodies. Table 5-1 specifies average annual dilution ratios available for the existing landfill leachate contributions at various points in the watershed. The ratios were calculated by assuming that runoff rates throughout the watershed are similar to those utilized in developing dilution ratios at the wetland. Thus a doubling of drainage area would result in twice as much dilution of any given volume of leachate and would consequently result in a doubling of the available dilution factor. For example, assuming 4 inches of soil storage, at Lake Independence the leachate from the existing landfill would be diluted 269.5 times or approximately 10.9 times as much as the dilution effects in the wetland assuming 7 inches of soil storage since the drainage area and accompanying runoff volume is approximately 10.9 times as large. Since actual volumes of annual soil storage throughout the basin vary due to differing soil types, the actual dilution available at Lake Independence lies between 269.5 and 389.5.

TABLE 5-1
AVAILABLE AVERAGE WATERSHED DILUTION RATIOS

<u>Watershed Area</u>	<u>Watershed Acreage</u>	<u>Dilution Ratios</u>	
		<u>Assuming</u> <u>4" Soil Storage</u>	<u>Assuming</u> <u>7" Soil Storage</u>
Swamp Adjacent to			
Seepage Pond	880	34.7	24.7
Swamp Upstream of			
Winterhalter	360	14.6	10.1
Winterhalter Lake	1700	69.0	47.7
Spurzem	2370	96.1	66.5
Halfmoon Lake	2690	109.1	75.5
Lake Independence	9600	389.5	269.5

SOURCE: Fred C. Hart Associates, Inc., 1980.

Table 5-2 presents average leachate concentrations from the existing fill as diluted by watershed contributions upgradient from Lake Independence. As can be noted, with the exceptions of BOD and copper diluted concentrations are below applicable quality standards. In fact, dilution processes would be accompanied by a variety of attenuation processes which could potentially result in a further decrease in pollutant concentrations of up to several orders of magnitude.

The proposed landfill design differs significantly from the existing landfill primarily from a hydrogeologic perspective. The existing landfill,

while located over a relatively impervious strata, and constructed utilizing a clayey daily and final cover, is directly hydrogeologically connected to the adjacent wetland since filling operations extended into the marsh area. As a result, leachate generated inside the fill area is hydrogeologically free to migrate directly into the wetland area. The proposed landfill however, will not only have a relatively impermeable base and utilize clayey soil for cover operations, but also has been proposed to be hydrogeologically separated from the wetland surface water system. This will be accomplished by the maintenance of clay barrier between the fill and the marsh areas. Very low soil permeability rates, which are on the order of 1×10^{-7} cm/sec or less, would result in leachate movement on the order of approximately one foot per year. Consequently, leachate generated within the fill area should be largely contained within the fill mass. In addition, dilution and attenuation mechanisms would still be available within the watershed system to minimize any impacts should leachate eventually migrate out of the fill area. With this perspective in mind the following sections outline expected primary and secondary environmental impacts.

Impacts

Construction. The construction phase of the landfill consists of, for each new successive work area (i.e., Areas 3, 4, 5, etc.), clearing and grubbing, surface contouring, and concurrent cover excavation and stockpiling from the next succeeding work area. As a result, limited sedimentation may occur in adjacent water courses, particularly in the wetland area, during construction of Areas 4, 5, and 6. This poses the potential for minimal effects on surface water turbidity, color, and quantity of suspended and dissolved solids. However, the existing landfill construction has not evidenced apparent significant impacts on associated water bodies and as such, construction activities at the proposed landfill areas are not expected to have substantive impacts.

Operation. The operating phase of the landfill will consist of, for each successive work area, actual waste placement, cover placement and all other operations which occur after the construction phase and prior to placement of final cover (i.e., monitoring, dust control, litter control,

TABLE 5-2

DILUTED LAKE INDEPENDENCE LEACHATE CONCENTRATIONS*

<u>Characteristic Leachate Composition</u>		<u>Diluted Concentrations in Lake Independence</u>		
Constituents	(mg/l)	Diluted Concentrations at 4" Soil Moisture Storage	Diluted Concentrations at 7" Soil Moisture Storage	Most Stringent Water Quality Standard
Alk (CaCO ₃)	2,062	5.29	7.65	-
Ammonia	158	0.4	0.58	1.0
Arsenic	1.09	0.003	0.004	0.05
Barium	3.05	0.008	0.011	1.0
BOD	2,281	5.87	8.48	-
Boron	9.0	0.023	0.033	0.5
Cadmium	0.10	0.0002	0.0003	0.01
Calcium	635	1.63	2.36	-
COD	7,996	20.53	29.67	-
Chloride ⁺⁶	773	1.98	2.86	10.0
Chromium	0.004	0.000001	0.0000014	0.05
Chromium	0.58	0.0015	0.0021	0.05
Copper	25.2	0.064	0.092	0.01
Cyanide	0.03	0.00007	0.0001	0.02
Fluoride	0.5	0.0013	0.0018	1.5
Hardness	2.332	5.99	8.65	2.50
Iron	697	1.79	2.59	-
Lead	0.43	0.0011	0.0016	0.05
Magnesium	260	0.67	0.97	-
Manganese	27.5	0.07	0.10	-
Mercury	1.2	0.003	0.004	-
Nickel	0.3	0.0007	0.010	-
Nitrate	0.46	0.0012	0.0017	-
Oil	24	0.061	0.088	0.5
pH (units)	6.8	----	----	6.5-9.0
Phenol	1.94	0.005	0.007	0.01
Phosphate	5.16	0.013	0.019	-
Potassium	270	0.693	1.00	-
Selenium	(undetected)	----	----	-
SiO ₂	30	0.077	0.111	-
Silver	0.03	0.00007	0.0001	0.05
Sodium	276	0.708	1.023	60% total categories me/l
SC(mmhos/cm)	20,540	52.7	76.16	10.00
Sulfate	1,204	3.09	4.47	-
TDS	20,240	51.96	75.10	-
TSS	915	2.35	3.4	-
Zinc	12.1	0.031	0.045	-

* mg/l unless otherwise noted

etc.). Day-to-day operations will impinge primarily upon two site areas simultaneously, i.e., one area for cover procurement and one area for cell construction.

Operation of the proposed facility will have the potential for impacts on surface water quality primarily due to surface runoff and leachate contamination of the creek and wetland adjacent to the site and subsequently, on the downstream drainage system.

Since daily cover and surface runoff controls will be utilized on-site, impacts due to surface runoff contamination should be negligible although some minor sedimentation might occur.

Contamination of surface water due to leachate migration will depend on the extent of shallow groundwater contamination beneath the landfill area. Groundwater moves away from the landfill into the marsh and becomes surface water in the marsh. However, leachate produced in the fill will primarily be contained within the fill by an existing natural liner created by the surficial geology of the site. Essentially, the liner is comprised of 70 feet of bottom clay below the emplaced waste. In addition, there will be a clay barrier consisting of a minimum of 30 feet of in-place clay at the perimeter of the fill area adjacent to the wetland. In addition, all operations will be conducted with a setback of 300 feet to the on-site stream, in accordance with state regulations.

Closure and Post-Closure. The closure phase of the landfill will consist of, for each successive work area, final cover placement and revegetation activities. Post-closure activities consist of all site maintenance work including erosion control, revegetation efforts, monitoring, gas control, maintenance of final grades, etc. The closure period for each landfill area is relatively brief, and activities during the post-closure period are required only infrequently. Therefore, closure and post-closure activities will create only minimal impacts on surface water quality.

Leachate migration during this period would cause contamination of surface water quality in the same manner that leachate contamination could

occur during the operation phase. However, due to the existence of the natural clay liner on the fill bottom and sides, minimal seepage of leachate is expected, and no substantial impacts on water quality are foreseen.

5.2.2 Ground Water

Background

Before any discussion can be made of potential impacts to ground water quality from the proposed action, the existing pollution inputs to ground water supplies must be defined. As designated previously, the three major pollution sources to this hydrologic system are agricultural runoff, the Loretto Sewage Treatment Facility, and the Woodlake Sanitary Landfill.

Agricultural lands are potential sources of contamination to surface waters via surface runoff or subsurface leaching. Groundwater is rarely substantially affected by this source of pollution, particularly in areas which are not recharge zones or which have subsurface soil conditions exhibiting large quantities of clayey materials.

The Loretto Sewage Treatment Facility discharges directly into the surface water system via the seepage pond outfall and possibly indirectly into the groundwater system via the seepage pond itself. However, due to the relative impermeability of the subsurface soil conditions in the area, and the higher elevation of the seepage pond bottom relative to the surface of the wetland, contamination of the ground water is not expected to be a substantive problem.

The impermeability of the substrata which forms a natural clay liner at the existing landfill site would also generally preclude any major contamination of the groundwater system by providing on-site containment of leachate from the proposed Woodlake expansion. Furthermore, there is evidence provided by monitoring wells that leachate is being attenuated vertically by the underlying glacial till at the existing site. This attenuation process would also be expected to occur beneath the proposed landfill operation.

Impacts

Construction. Since all excavation and clearing during construction of the expanded area will occur in till soils located above maximum groundwater elevations, no impacts on groundwater quality are expected. Furthermore, the natural clay barrier lining the fill will provide further protection for the groundwater system.

Operation. During the landfill's operation, the groundwater system beneath the site will be protected by the natural clay liner described previously. Leachate will be contained primarily in the fill due to the low permeability of the surrounding soils.

Closure and Post-Closure. Leachate production and migration that might occur after the cessation of site operation would have minimal impact on the site's groundwater system due to the existence of the site's natural clay liner.

5.2.3 Local Water Supply

Impacts

No impacts on local water supplies are expected since both Loretto public water supply wells and two of the three Medina wells are hydrogeologically upgradient from the site. The third Medina well, while located downgradient from the site near Lake Independence, is approximately 1.25 miles from the fill and draws from the hydrogeologically distinct Franconia Aquifer.

5.3 TERRESTRIAL ECOLOGY AND AQUATIC ECOLOGY

5.3.1 Vegetation and Wildlife

Construction

During construction, all existing vegetation will be removed from each of the landfill work areas in succession throughout the projected life of the expansion area. This will eventually include the removal of approximately one acre of planted red pines and eight acres of mature upland hardwood forest in Area 7. Associated wildlife populations, generally consisting of quite limited populations (rodents, ground-nesting birds, etc.) will be forced to relocate. The movements of deer and other mammals presently using the area will also be restricted primarily during daylight hours.

Both the indigenous vegetation and associated wildlife species located on the proposed landfill expansion area are not unique to the project area. In addition, the total individual members of the affected populations are most likely very small in comparison to the total available areawide resources.

Operation

During landfill operation, the potential exists for more substantive impacts on terrestrial populations, and particularly terrestrial flora, due to biological processes inherent at a landfill site. Specifically, decomposition of landfilled organic materials results in or contributes to leachate generation and methane gas production. Both occurrences can have impacts on plant growth and survival. Methane gas production, particularly, has resulted in numerous cases in the creation of anoxic root zone conditions resulting in slow growth or die-off of many plant species near landfills. Potential impacts are generally unpredictable in practice, but are normally localized in extent. Given the elevated site topography, the relatively impermeable cover soil, the site history of no methane problems, and no identifiable impacts either on-site or off-site, no substantive impacts are expected for the proposed expansion.

Closure and Post-Closure. Since the closure period for each landfill area is relatively brief and since post-closure activities are required infrequently, actual closure and post-closure activities will have very

minimal negative impacts on terrestrial vegetation and wildlife. In practice, actual closure activities should result in re-establishment of vegetative cover and an associated wildlife community.

5.3.2 Aquatic Ecology

Construction

Limited sedimentation may occur in adjacent water-courses and wetland areas during construction of Areas 4, 5, and 6. This poses the potential for minimal adverse effects on associated aquatic flora and fauna. However, the existing landfill construction has not evidenced significant impacts on associated water bodies and as such, construction activities at the proposed landfill areas are not expected to have a substantive impact.

Operation

Operation of the proposed facility will potentially impact associated aquatic populations through surface runoff contamination of the creek running through the site and the downstream drainage system. However, since daily cover and surface runoff controls will be utilized on-site, potential impacts should be minimal.

Closure and Post-Closure

Activities related to closure and post-closure activities as described previously would not be expected to result in substantial impacts on aquatic resources.

5.3.3 Wetlands

Construction

The proposed action will adhere to all state regulations governing activities in wetlands and watercourses. All operations will be conducted upon the upland with setbacks of a minimum of 30 feet to the wetland and 300 feet to the on-site stream. As such, all excavation will occur in till soils with no direct encroachment on the wetland area. There is the potential for soil erosion during the process, with sediment potentially entering the wetland. However, with appropriate controls, the anticipated impact should be minimal.

Operation

Leachate and landfill gas production will occur during the landfill operation. Gas migration generally does not occur through saturated soil and, as such, there would be no expected impact on the wetlands via horizontal or vertical gas migration. In addition, the existing wetland west of Area 1 has had refuse placed directly in the peat wetland area, and no substantive evidence of vegetative stress has been noted.

The introduction of large quantities of landfill leachate into the wetland ecosystem could result in substantive vegetative stress. However, given that the proposed design includes surface runoff controls and maintenance of impermeable barriers (i.e., the clayey soil in the indicated setbacks), large volume leachate contamination of the wetlands area is not expected.

Closure and Post-closure

Primary impacts for the closure and post-closure period are essentially the same as those identified in the previous section. In addition, leachate generation, though it may persist for a number of years, should be reduced substantially by placement of the final cover.

5.3.4. Rare and Endangered Species

Construction

No on-site impacts on rare or endangered fauna will occur as there are none of these species associated with the site. In addition, the colony of Forster's terns nesting in the wetland which MDNR has identified as requiring protection are not expected to be affected by the expansion activity (Pers. Comm., Carol Henderson, MDNR, December 21, 1979).

Ginseng, another "unusual" species has been identified on the site. While this plant was not evident in a late fall site survey, it is possible that a survey in the spring or summer might reveal a limited amount of this species growing in the upland area. Construction activities would result in removal of this flora.

5.4 SOCIO-ECONOMICS

5.4.1 Land Use, Zoning, and Land Use Plans

Construction and Operation

The predominant land use in the Medina-Loretto area is agricultural and rural. On the site, Areas 3, 4, 5, 6 and 7 are primarily open or wooded land. Areas 3 and 4 have been previously modified to some extent by land-fill cover operations. Much of Area 5 and 6 was formerly a corn field.

The construction and generation phases of the operation basically will alter the physical character of the land. This will be in line with the present land use of the existing landfill. It should also be emphasized that the expansion will not cause a reduction in the amount of active farmland. Areas 4 through 7 have been vacant -- i.e., have not been used as cultivated farmland -- for a number of years. Therefore, no significant land use impacts are expected.

The land in the general vicinity of the Woodlake Sanitary Landfill is presently zoned for rural-agricultural uses. The existing landfill is non-conforming and has been "grandfathered in." This essentially means the landfill is exempt from present zoning regulations because of the number of years the area has been used as a landfill. The proposed area would also be non-conforming under existing and proposed zoning regulations.

There is presently no comprehensive land use plan for the Medina-Loretto area. A land use plan is currently being developed by the City of Medina and should be completed for the Metropolitan Council's review by this summer. Thus, at this time, impacts on land use plans cannot be determined.

Closure and Post-closure

The designated ultimate land use for the site as proposed in the project EAW is for three farming and agriculture. While there is some question relating to the feasibility of these operations, other open space alternatives would be compatible with prevalent land uses in the areas and therefore, no significant overall land use impacts are expected. However, restrictions on future use of the site will occur. These relate to construction of buildings on the previously landfilled area. Limited available bearing stress and potential build-up of methane gas generally would require specialized construction methods to allow building placement on-site.

5.4.2 Public Facilities and Services

No significant impacts on police protection, health care, education, fire protection and ambulance service, solid waste, and recreation services are expected on the regional, county or local level since the expanded facility essentially replaces the existing fill.

In addition, residents will benefit from the landfill expansion due to the increased solid waste disposal capacity at the local level.

5.4.3 Land Use Values

Construction and Operation

One of the major socioeconomic issues associated with the expansion of the Woodlake Sanitary Landfill is the effect it might have on surrounding property values. Before proceeding with this discussion, three caveats are in order. First, it should be emphasized that a landfill has already existed adjacent to the proposed site for a number of years. Most significant property devaluations, if any, would probably already have occurred. Secondly, a true, unbiased, and quantitative analysis of property valuation in the area is, in all probability, difficult if not impossible to obtain. Lastly, property assessment is a very subjective measure, albeit the only measure available.

Most of the properties near the site are active farms and single family homes. The majority of the farms consist of several structures -- the actual residence, a barn, and other storage buildings. A few single family homes are in the general vicinity of the landfill, with a greater concentration existing in the Loretto area.

In 1973, the real estate market in Hennepin County began increasing rapidly in property value. In order to relieve the property owner of the increased tax burden associated with this increase in real estate value, the County began using limited market value as a method of determining the property tax level. Table 5-3 presents historical property value information for properties immediately adjacent to the site. The data is organized by property identification number, and plat and parcel for the years 1973 through 1979. The figures in the table are for limited market value of the land plus any buildings on the property.

From 1973 through 1975, the estimated market value of properties was 5 percent greater than the limited market value. In 1976, this was increased to 10 percent, or to 25 percent of the difference between the limited and estimated market values. As such, a property owner's tax was determined at the lower limited value instead of the estimated market value. Presently, in 1980, this method of determining the property tax burden has been discontinued and another reorganization of the property assessment methodology is being developed.

As was stated above, the limited market value of properties is not the actual market value of the property, but is merely a reflection of that value. It would be safe to assume that an increasing trend in the estimated market value would bring a corresponding increased trend in the limited market value. It should also be noted again that these assessments are subjective in nature.

As Table 5-3 shows, all the limited market values of the properties have more or less steadily increased. The one exception was during 1977. During that year, the value decreased from the year before in 8 out of 11 properties. After that one-year decline, the limited market value of all

TABLE 5-3

PROPERTY VALUE INFORMATION FOR PROPERTIES ADJACENT TO THE SITE (\$)

<u>Property ID No.</u>	<u>PLAT</u>	<u>Parcel</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>
0511823330001	60005	4000	6354	6354	7002	12225	7878	8664	11700
0511823340001	60005	4500	2952	2952	3255	5634	3771	4143	6700
0511823340001	60005	5620	22032	28068	24969	39734	32826	36105	46100
0711823140001	60007	1000	28200	29610	31080	44268	35521	38772	50800
0711823320001	60007	2000	24750	25986	27285	34878	14322	19000	20000
0711823110002	60007	2520	5364	5364	5907	7941	6636	7299	9900
0811823110001	60008	0600	23385	24552	25779	32946	28771	31644	43400
0811823130001	60008	1025	17730	18615	19545	25533	23646	24783	34800
0711823410001	60070	3000	890	890	890	1030	1100	1300	2500
0711823410002	60070	6000	22890	24035	25235	27980	30930	33900	44400
0711823410003	60070	9000	1410	2800	2800	3200	3600	4200	4200

SOURCE: Hennepin County Assessor's Office, 1980.

properties continued to increase. A number of reasons could have caused the decline in limited market value, among the most probable being sub-divisions or property damage (e.g., fire). No satisfactory explanation for this decline in property value is presently available.

Traditionally, residential properties near landfills have often suffered in the market due to public concerns over landfill safety, aesthetics, etc. (see TWP 6). Impacts on non-residential properties are generally less evident. The data in Table 5-3 neither supports nor refutes this theory. What the data does show is that properties in the area have, on the whole, experienced a consistent increase in valuation.

In theory, the landfill expansion would cause some decline in market value for properties adjacent to or within view of the site since actual operations would occur for an additional ten years. However, it would be difficult to project substantive declines since the adjacent properties are already located on the boundary of an existing fill area.

Closure and Post-closure

Once closed, the landfill site will be revegetated and, to most casual observers, will appear to be open space. As such, the social stigma effect associated with landfill operation should be mitigated to some degree and rebounds in market values, should decreases actually occur, for adjacent properties could eventually be expected. This assumes that proper closure and post-closure procedures are implemented, and that the site does not become a future liability due to environmental concerns.

5.4.3 Transportation

Construction

Trucks and heavy equipment traffic will increase on local roads during the successive construction periods. However, these periods will be relatively brief in duration and spread out over the projected 10-year life of the landfill.

Operation

The gradual increase of vehicular traffic overtime as a result of the expansion will not have a significant impact on transportation in the area (See Air Quality Impacts).

Closure and Post-closure

No significant impacts are expected on transportation systems due to closure and post-closure activities.

5.4.5 Area-Wide Aesthetics

Construction

The construction phase will consist of clearing and grubbing the site of all trees, grasses and shrubs. A portion of the site is presently covered with a fairly mature Pine-Maple-Basswood-Oak overstory. Preparation of the site for landfilling will remove this view for a number of years (until after the site is closed and assuming revegetation succession occurred). While the site is visible from a number of locations in Loretto, it should be noted that, in general, the surrounding area is sparsely populated rural/agricultural land and that a landfill operation has existed at the site for a number of years.

Operation

Aesthetic impacts during the operation phase of the landfill will be basically the same as those for the construction phase.

Closure and Post-closure

The ultimate land use for the site will probably consist of open space uses. This essentially constitutes a return to the original aesthetics of the site and no significant negative aesthetic impacts are therefore expected.

5.4.6 Demographics

Construction and Operation

No additional employees will be hired for the proposed landfill operation. Therefore, other than the secondary effects of providing a continuing solid waste disposal service, the proposed expansion is not expected to have an impact on area population growth.

5.4.7 Historical and Archaeological Features of the Site Area

Construction

According to a literature search and the nature and proximity of nearby archaeological finds, the proposed Woodlake expansion site appears to be a good candidate for occupation by man at any time during the prehistoric period. Evidence of such occupation is likely to be well preserved, since much of the site seems to have been undisturbed even by farming. However, no cultural indications of the prehistoric period were discovered during the field survey with the exception of the "blade core" noted earlier in Section 4.4.

Due to the fertility and ease of tilling of the TCMA's glacial soils, the area was a prime attraction to European settlers during the historic period. Although there is a consequent high potential for the occurrence of cultural resources on the Woodlake expansion site, there is no indication that special ecological or topographic features occur in the study area which make it especially desirable to man compared to adjacent lands. Moreover, the Historic Site Survey (1976, 1977) the Minnesota Outdoor Recreation Resources Commission (1963) and the Heritage Conservation and Recreation Service (1980) list no historic sites, structures, or markers in the immediate vicinity (see Appendix I of TWP 6).

The landfill expansion will involve excavation of between 5 feet and 65 feet of overburden over most of the site. As discussed previously, most prehistoric and historic materials in upland areas will be located at the

surface or close to it. (Lowland areas are not threatened by landfill encroachment at Woodlake). Therefore the landfill expansion could cause the destruction of artifacts and/or formations - if they exist - of historical or archeological significance.

5.5 GEOLOGY AND HYDROLOGY

5.5.1 Topography

Construction of the proposed landfill will necessitate the sequential excavation of proposed expansion Areas 5, 6 and 7 from an original top elevation of 1040 feet to a base elevation of 970 feet above mean sea level. According to data available from the applicant, this excavation will remove approximately 426,000 cubic yards of native soil and subsoil materials from Area 5; 237,000 cubic yards from Area 6; and 269,000 cubic yards from Area 7. Approximately 40% of the excavated material will be utilized for daily and final cover, with the remaining material to be available for final contouring or use as fill material. This excavation, therefore, will significantly alter the original natural topography of each proposed expansion area by increasing maximum existing elevations from fifteen to thirty-five feet. In addition, the operation will result in an increase in the average degree of slope throughout the expansion areas.

5.5.2 Soils and Surficial Geology

As indicated in the previous section of topographic impacts, construction of the proposed landfill will result in the sequential excavation of substantive quantities of native soil and subsoil materials from expansion Areas 5, 6 and 7. This material will be stockpiled and gradually used as daily and final cover material as each expansion area is filled, in turn, with solid waste. Before solid waste filling occurs, however, the soil materials remaining at the planned base elevation of 970 feet above mean sea level will be compacted in place to improve their stability to contain percolating solid waste leachate.

The excavation during landfill construction, by removing or physically altering the surficial soil and subsoil materials, will result in an alteration of their physical properties relating to bearing capacity, agricultural suitability and drainage characteristics.

5.5.3 Bedrock Geology

Since excavation of the expansion areas during landfill construction will not reach below elevation 970 feet above mean sea levels, no short or long-term impacts on the local or regional bedrock geology are anticipated during any phase of the landfill's development.

5.5.4 Surface Water Hydrology

As indicated in the previous sections on topographic and soils impacts, all phases of the proposed landfill's development will result in some alterations from the existing topography and soils of the expansion areas. The primary hydrological impacts of these changes will be on the volume, rate, and direction of surface runoff flow. Actual quantitative impacts will vary depending on the specific landfill phase, however the total impact on the hydrology of the neighboring wetland drainage system will be negligible due to the very small portion of the drainage area affected by the facility.

The proposed landfill will also not impinge on any 100-year floodplain or regulatory floodway as designated under the National Flood Insurance Program. The nearest 100-year floodplain, that for Spurzem (or Pioneer) Creek, is approximately 300 feet southeast of the eastern boundary of the proposed landfill expansion.

5.5.5 Groundwater Hydrology

Construction and operation of the proposed landfill will not significantly affect the volume, rate or direction of groundwater flow in the deep aquifers below the proposed site. Some "mounding" of the shallow water table may occur below the landfill due to greater percolation in the vicinity of the landfill; however this effect is not anticipated to be signifi-

cant in the proposed case due to the relatively thick layer of impermeable clay soil. Excavation during landfill construction may also intercept or destroy some small and very localized perched groundwater within a lens of more permeable sandy material.

No sole source aquifer or its recharge area has been designated by the U.S. EPA under the Safe Drinking Water Act in the vicinity of the proposed site.

5.6 ENERGY

Construction

Construction activities will increase the current level of energy consumption, primarily by utilizing additional diesel fuel to operate landfill construction equipment. However, since the proposed landfill construction approach (clearing, grubbing, site grading, etc. of successive expansion areas) is identical to that used at the existing landfill, total energy requirements will not increase and areawide energy supplies will not be impacted.

Operation

The proposed action will require additional electrical and heating energy demands due to the scheduled construction and operation of a new maintenance building. However, since the total landfill operation is expected to operate at essentially the same level as the existing facility, no significant in-site additional energy impacts are expected.

Operation of the site, however, will result in loss of the potential for use of the combustibles in the waste stream as fuel. On average, approximately 4600 BTU/lb are available from municipal waste streams.

Continued operation of the Woodlake site as planned will also indirectly result in increased energy consumption. Replacement of many of the

materials contained in the waste stream, such as aluminum and steel containers, is generally acknowledged as more energy consumptive than recycling and reuse of those same containers.

5.7 HUMAN HEALTH EFFECTS

5.7.1 Air Quality-Related Health Effects

Some temporary impacts upon air quality may be expected during the construction and operation phases. Such impacts will derive from three main sources:

1. Fugitive dust will result from: the movement of construction equipment and vehicles over unpaved areas, and the excavation of cover materials for the purpose of installing a leachate collection system. No public health impacts would be expected.
2. Low level emissions of carbon monoxide, nitrogen oxide, sulfur oxides and hydrocarbons will result from the operation of construction equipment. However, the short duration and localized impact of these emissions will make them insignificant in a community health context.
3. Generation of landfill gas may occur, depending upon the various factors discussed in greater detail in TWP No. 9. Since there are few buildings or other enclosed spaces in which methane may accumulate, such gas production is not expected to constitute a safety or health problem.

5.7.2 Water Quality-Related Health Effects

Existing pollution sources for both ground and surface water contamination include agricultural lands, the Loretto Sewage Treatment Facility, and the Woodlake Sanitary Landfill. The potential contributions of each are discussed in more detail in TWP 4. In general, the effects of the present landfill and the proposed expansion are ameliorated by the following considerations:

- The possibility of groundwater pollution and subsequent contamination of local drinking water supplies is lessened by the natural clay layer which underlies the Woodlake Site. This clay is relatively impermeable, thus preventing the contamination of the bedrock aquifer from which local water supplies are drawn.
- Dilution and attenuation effects of the Lake Independence watershed act to reduce contaminate concentrations finding their way into Lake Independence to levels which should not adversely affect human health.

5.7.3 Disease Transmission Via Vectors and Pathogens

Construction

During construction, disturbance of the habitats of rodents occupying the planned site area may result in dispersion of this vector type into the surrounding environment. Due to the site's isolated location, and the small range areas of most rodents, it is unlikely that such dispersion will result in significant increased exposure risks to humans.

Operation

If procedures for sanitary landfill cover are not scrupulously followed, the proposed expansion may result in increased numbers of rodents, flies, and mosquitos on site and in the vicinity. It should be noted that the existing operation has not resulted in any documented public health problems.

Closure and Post-Closure

If the landfill is properly secured with adequate final cover, the rodent and insect vector problems should be minimized. Closure will also involve cessation of refuse delivery which will eliminate newly-delivered temporarily uncovered garbage as a source of food and harborage.

There exists the potential for continued leaching of pathogens from the site after closure. However the clay subsurface geology should result in containment of leachate on-site and, as a result, pathogens present in the buried waste should not escape into the surrounding environs.

5.7.4 Occupational Safety and Health

Construction

Major potential health impacts are connected with vehicle and machinery accidents, noise, air emissions and the risk of infection from vectors or pathogens. Existing data does not indicate any substantive public health problems for on-site waters and current data also indicates a low accident rate for existing landfill personnel.

6.0 MITIGATION MEASURES

6.1 INTRODUCTION

"Mitigation measures" are optional elements of landfill design, construction, operation, closure and post-closure activities which, if implemented, would ameliorate the adverse environmental impacts of the proposed action. Each of these measures is intended to reduce a specific impact or set of impacts. For instance, each leachate control measure directly impacts ground and surface water quality. The alternatives to the proposed action as discussed in Section 11.0 also have the potential to reduce many or all of the adverse impacts of the proposed action. Waste processing techniques, for example, by reducing the volumes of waste landfilled, may reduce a large variety of adverse environmental impacts. Moreover, "mitigation measures" can be initiated by either BFI or MPCA within the context of the present proposal. However, many of the "alternatives", whether initiated by BFI or MPCA, could be instituted only in the context of a substantially modified or new expansion proposal.

The intent of this section, then, is to identify those mitigative alternatives which are available to BFI or to the regulatory agency within the present permitting process. The following subsections describe several categories of mitigation measures.

6.2 LEACHATE CONTROLS

The magnitude and nature of landfill leachate generation and migration depend on a large number of factors. The control of leachate generation and migration, in turn, can be achieved by utilizing a variety of technological approaches. The most effective of these include use of liners, leachate collection systems, leachate treatment and/or recycling systems. These types of leachate controls, for the purposes of this EIS, are of such significance in terms of design changes and potential for environmental protection that they are treated as "alternatives" as well as mitigative measures. Thus, the reader is referred to the "alternatives" section for a fuller discussion of these three measures. A number of additional leachate control measures are described as follows:

1. A variety of surface runoff and erosion control measures are discussed in the next section which all contribute to reduction in leachate generation by reducing infiltration of moisture into the waste mass.
2. Increasing the proposed 30 to 50-foot separation distance from the landfill to the wetland area, and the proposed 300-foot setback from the landfill to the on-site stream.
3. Modifying the daily and final cover approach for control of leachate generation. Thicker, less permeable, or more frequent cover applications would result in decreased leachate generation. Less permeable cover can be achieved in a number of ways, including using additional compaction, increasing surface slope, mixing cover soil, blending in other soils, using chemical additives, or using a layered cover system.
4. Utilizing a thicker or less permeable final cover consisting of two feet of clay overlain by six inches of sandy loam topsoil to promote vegetative growth. Additional efforts relating to maintaining appropriate vegetative growth conditions include liming, fertilization, watering, insect control, and selection of a variety of plant species noted for potential adaptability to landfill conditions.
5. Increasing the emphasis on site maintenance primarily oriented towards maintaining cover integrity, including periodic regrading and reseeding of slopes, etc.
6. Maximizing the in-place natural clay's containment efficiency via compaction of chemical (bentonite) methods.

7. Installing a membrane or other constructed liner to prevent downward migration of leachate, and thus lessen the possibility of leachate contamination of groundwater. Liners may be constructed from a variety of materials, including:
 - admixed and asphaltic materials such as modified bentonite and soil, asphalt concrete, soil asphalt, soil cement, sprayed asphalt membranes, and bituminous seals (the properties of these liners depend on the materials used);
 - polymeric membranes, including a great number of commercially marketed synthetic materials; and
 - natural clay materials or specified clays, such as montmorillonite, illite and kaolinite.
8. Impermeable vertical barriers could potentially reduce migration of leachate and could be used in conjunction with liner systems. A variety of materials, including specialized clays, polymers, membranes, volclay panels, and sheet piling have been used to construct impermeable barriers.
9. Leachate collection and treatment systems may be employed to collect and treat leachate to remove potential contaminants. Collection systems include pipe grids, well points, permeable and impermeable trenches and pump systems. Treatment methodologies include various physical, biological, and chemical methodologies, and potentially, recirculation.

10. Developing a periodic surface water and ground water sampling program to indicate potential leachate contamination.
11. Increasing MPCA's inspection and enforcement activities.

6.3 SURFACE RUNOFF AND EROSION CONTROLS

Surface runoff controls are employed to minimize infiltration of precipitation into the landfill (while also maintaining cover integrity), and thus reduce consequent generation of leachate. Surface runoff and erosion control measures also are utilized to reduce overall soil loss and sedimentation of surface waters. Available approaches include:

1. Providing a system of surface runoff diversion structures including surfaced channels, natural drainage ditches, dikes, berms, collector pipe systems, pump installations, sedimentation ponds, etc.
2. Grading of surface slopes to encourage runoff and prevent pooling and infiltration of water into the fill.
3. Providing prompt initiation of seeding/revegetation procedures.
4. Providing prompt surface compaction of all disturbed soil surfaces.
5. Developing a more detailed excavation and soil use plan designed to minimize soil surface disturbance, and thus reduce erosional impacts.

6.4 METHANE AND ODOR CONTROLS

A variety of controls relating to both the prevention and control of

methane and odor generation and migrataion are available. These include:

1. Surface runoff controls (discussed above) help reduce methane and odor generation by reducing moisture infiltration into the waste mass.
2. Utilization of vertical impermeable barriers to impede methane gas movement (as described for leachate controls).
3. Utilization of permeable trenches to vent gas to the atmosphere. These can be used in combination with impermeable barriers.
4. Utilization of a gas collection system involving either individual well points or a combined well point grid system, and utilizing either an induced exhaust or recharge system.
5. Development of a methane monitoring program at regularly spaced intervals around the landfill perimeter and at any buildings or other enclosed structures on or immediately adjacent to the landfill site. Such sampling should be done on at least a quarterly basis, with more frequent monitoring performed when indicated, e.g. during periods of frozen cover.
6. Prompt processing of all incoming waste streams coupled with daily cover also generally reduces the potential for odor formation.

6.5 AIR POLLUTION CONTROLS

6.5.1 Dust Control

A variety of approaches are available to control fugitive dust emissions. These include:

1. Surface paving or road surface wetting with water or a deliquescent chemical such as calcium chloride.
2. Utilizing dust pallatives on soil stockpiles to reduce wind erosion.
3. Prompt initiation of revegetation procedures, including selection of plant species adaptable to landfill conditions.

6.5.2 Vehicle Emissions Control

1. Periodic maintenance of all vehicles and machinery reduce emissions from fuel burning.
2. Replacement of phased-out equipment with units appropriately suited to expected tasks, and providing higher degrees of pollutant removal efficiencies.
3. Development of an operating plan designed to remove vehicle travel and idling time.

6.6 PUBLIC HEALTH MEASURES

6.6.1 On-site Safety and Health

A variety of both operational and design alternatives to reduce potential risks to employee and public safety and health include:

1. Vehicle accidents can be minimized by providing correct and clear traffic directions, spotters where necessary, and adequate access roads. In addition, all landfill equipment should be fitted with roll-over protective cabs, which are completely enclosed to protect the employee from accidents, weather, and flying debris. Windows on such equipment should be of safety glass or unbreakable scratch-resistant plastic.
2. To reduce injuries, extra care should be taken during periods of adverse weather. A large percent of injuries are incurred by individuals who perform functions to which they are not specifically assigned. Caution indicates that a well-stocked first-aid kit be kept on-site and that employees be trained in emergency procedures. Safety and common sense dictate that at least two persons be on-site at all times. Employees should exercise normal precautions in the vicinity of heavy equipment.
3. Risk of infection. Danger of contracting disease from contact with pathogens or vectors can be reduced by minimizing direct contact with wastes as much as possible. Additional safety is provided by adequate cover which will reduce the landfill's attraction for rodent, bird, and insect vectors. In keeping with Minnesota Solid Waste Disposal Regulations, scavenging in landfill refuse cannot be permitted.

4. Additional leachate and runoff controls can also reduce potential health impacts due to contamination of adjacent ground and surface water supplies.

6.6.2 Vector Control

While existing practices have not demonstrated potential problems relating to vector population development and dispersal, a number of general mitigative measures are available:

1. Assuring prompt processing of incoming waste streams combined with daily application of six inches of suitable compacted cover soil.
2. Maintenance of a runoff control program which minimizes surface ponds and thus prevents propagation of mosquitoes and other insects.
3. Development of a periodic extermination program involving controlled application of rodenticides or insecticides.

6.6.3 Noise Control

A number of design and operating alternatives are available to reduce noise impacts on local receptors. These potentially include:

1. Restriction of equipment working hours in areas adjacent to the nearest receptors.

2. Utilization of noise barriers such as tree or shrub planting.
3. Utilization of more stringent equipment noise muffling devices.

6.7 AESTHETIC MEASURES

A variety of proposal modifications are available to reduce aesthetic impacts relating to the usual protection of amenities and the reduction of potential litter problems. These include the following:

6.7.1 Litter Control

1. In order to reduce the incidence of littering and dumping which may have been contributed to in part by Woodlake's pricing schedules, Woodlake could reduce its prices (once it receives approval for the expansion) to the level prevailing in the area, or to levels charged prior to the time restrictions were placed on non-BFI incoming waste flows.
2. Litter clean-up efforts could be instituted more frequently.
3. Portable litter fences could be emplaced at the active face.

6.7.2 Protection of Visual Amenities

1. In order to reduce any negative aesthetic impacts associated with the construction phase of the proposal, a

row of trees could be planted along Tomahawk Trail. This will block the expansion landfill operations to the east from view.

2. Improved revegetation and maintenance activities could improve existing views of the site from the west.

6.7.3 Protection of Archaeological and Historical Features

A number of options are available.

1. In order to mitigate any adverse impacts on archaeological or historical artifacts and formations, additional surveying could be completed. This could be in the form of bore or shovel hole tests spaced 30 to 50 meters apart. The survey could be restricted to the ground above 970 feet above MSL and could concentrate on the rising ground bordering the swamp on the west side of Areas 5 and 6 and the north side of Area 4. Area 7, the eastern third of Area 6, the eastern half of Area 5, all of Area 3, and the southern half of Area 4, are less important and could be appraised by surface survey (pedestrian search) with a boring or shovel test hole every 50 meters.
2. A more or less comprehensive survey could also be completed.
3. On-site inspection by a qualified archaeologist could be required during all excavation operations.

6.8 ENERGY CONSERVATION MEASURES

A number of options are available which could reduce energy expenditures at the proposed site. These include:

1. Selection of appropriate landfill equipment; i.e., utilization of larger landfill equipment could result in increased compaction, a decreased number of required passes over the deposited waste and decreased energy requirements per unit of disposed volume.
2. Frequent periodic maintenance operations relating to landfill equipment would reduce their energy consumption.
3. Conservation efforts in the office and maintenance buildings, particularly with regard to lighting and ambient temperature, could result in decreased fossil fuel and electrical energy consumption.
4. Maintenance of operation during wet weather by providing a wet weather disposal area and/or continued maintenance of on-site access routes would reduce equipment energy requirements during severe climatic operating conditions.
5. Proper sequencing of construction, operation and closure operations, particularly with regard to cover movement, could reduce energy requirements.
6. Use of special procedures to assure winter cover availability (i.e., stock piling, stockpile covering, use of ripper mechanisms, etc.) could reduce energy requirements associated with cover procurement during frozen conditions.
7. Minimizing the working face depth and width would reduce energy requirements associated with daily cover application.

8. Utilization of a methane gas recovery system would result in decreased site dependency on outside energy supplies.
9. Institution of resource recovery programs to reduce energy and resources required to manufacture products.

6.9 ECOLOGICAL PROTECTION MEASURES

A limited number of measures are also available to reduce impacts on site flora and fauna:

1. Avoiding equipment encroachment on non-landfill areas.
2. Modifying the proposed landfill area cell boundaries to avoid taking large individual woody plant specimens (i.e., over 6" in caliper).

6.10 MEASURES DESIGNED TO REDUCE CUMULATIVE, LONG TERM OR IRREVERSIBLE IMPACTS

A number of options previously not mentioned are available to reduce these types of impacts. These could potentially include:

1. Reconstruction of the berm along the existing landfill/wetland boundary.
2. Removal and redisposal of wastes previously filled in the peat wetland.

7.0 UNAVOIDABLE ADVERSE IMPACTS

The analysis of potential environmental impacts presented in Section 5.0 indicates that certain adverse effects would be associated with construction and operation of the proposed landfill expansion. Some of these impacts can be ameliorated to some degree by implementation of reasonable mitigating measures as discussed in Section 6.0. This section identifies the significant (only) adverse impacts that cannot be avoided if the proposed action is implemented.

- . The excavation entailed by the proposed construction will unavoidably result in changes in the sites elevations, relief and slopes.
- . Due to clearing, grubbing, excavation, etc., construction and operation of the proposed landfill expansion will unavoidably cause some additional surface runoff, soil erosion and consequent sedimentation of surface waters. This, in turn, will result in some soil loss, and minor adverse impacts on surface water quality and aquatic species.
- . Construction and operation of the proposed landfill expansion will unavoidably result in the complete removal of terrestrial vegetation and associated wildlife habitats from the expansion site. This, in turn, will cause the dislocation of resident wildlife species, particularly rodents and ground-nesting birds. These conditions will persist at least until revegetative succession occurs after closure of the expanded landfill.
- . During the operation, closure and post-closure periods of the proposed landfill expansion, organic waste decomposition will unavoidably lead to the generation and migration of leachate and methane gas. Both the generation and migration of leachate and gas are largely controllable due to on-site subsurface conditions.
- . Construction and operation of the proposed landfill expansion unavoidably will result in further degradation of the area's visual quality and will increase the total land area which does not conform to the predominant rural/agricultural land use pattern. These impacts, while unavoidable, are tempered to some degree by the fact that a landfill is and has been on the site for over ten years.
- . Construction and operation of the proposed landfill expansion will potentially result in a number of very minimal effects on public health and safety via: (1) transmission of disease through surface runoff, leachate migration and various vectors; (2) contamina-

tion of local air quality through fugitive dust, vehicle emissions and escaping methane; (3) onsite accidents or disease transmission via direct contact with wastes, rodents, etc.

8.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The analysis of potential environmental impacts presented in Section 5.0 indicates that certain irreversible and irretrievable commitments of resources will occur as a result of implementation of this proposed project. These include:

- . Groundwater supplies within the landfill and locally directly beneath the site will not be useable as a potable supply.
- . Energy consumption in the form of electricity, gas and oil utilized during the construction, operation and closure/post-closure periods is an irreversible resource commitment.
- . The energy resources represented by landfilling of carbonaceous waste materials may be considered irretrievable given the existing state-of-the-art of recovering such resources.
- . During construction, a nine acre portion of the native basswood-maple overstory will be removed. Since this overstory represents the climax vegetation for the site, it cannot be replaced within a relatively short time frame.
- . All work related injuries or illnesses can be considered an irreversible resource commitment.
- . All labor, raw materials, capital and operating expenditures associated with implementation of the proposed project can be considered an irreversible resource commitment.

9.0 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The analysis of potential environmental impacts presented in Section 5.0 discusses potential short and long term uses of the environment. These impacts related to a variety of areas and included air quality (dust, odors, methane, fugitive emissions), surface water quality (on and off-site), noise, aesthetics, public health, ecological resources (terrestrial and aquatic flora and fauna), energy, land use (patterns and property values), historical and archaeological features, etc. In general, these impacts are short-term in nature and the magnitude of such impacts will either immediately cease upon site closure or will steadily decrease as the site is returned to a natural state. These impacts, too, are largely offset by the fact that the site has the potential for the secure disposal of approximately 2,500,000 cubic yards of municipal wastes and would eliminate potential environmental problems associated with alternate disposal options. In addition, the TCMA is restricted in its available solid waste disposal capacity, including both landfill disposal and alternative approaches such as materials and/or energy recovery.

There will be, however, several changes in long-term productivity of the proposed landfill area. These include:

- . The production of largely site-contained quantities of leachate which will render shallow groundwater supplies on site unfit for potable use.
- . The decrease in site-bearing capacity thus largely restricting the site to open space uses.

10.0 CUMULATIVE IMPACTS

A number of cumulative environmental impacts may be experienced with respect to the proposed landfill expansion. This generally relates to the fact that a number of impacts from the existing landfill will continue to persist after the proposed landfill expansion is operating. These specifically relate to impacts not associated with day-to-day operational routines. That is, these impacts relate primarily to those caused by the continued presence of the existing landfill mass. The major areas of impact include leachate migration and consequent ground and surface water contamination, methane generation and consequent potential air pollution and public health impacts and socio-economic impacts relating potentially to depreciated values of adjacent properties which are already sited in close proximity to a landfill operation.

From a more traditional perspective, cumulative impacts could be considered those which would be generated by the proposed expansion and which would overlap those types of impacts currently imposed by the existing operation. These impacts could be both general in nature or related to specific day-to-day operations. The significant (only) cumulative impacts of each phase of development of the proposed landfill are described in the paragraphs below.

Construction of the proposed landfill will necessitate the complete removal of the existing natural vegetation and wildlife habitat which, in turn, will cause a temporary disruption of the site's terrestrial ecosystem. This may be considered a cumulative impact until post-closure revegetation of the existing landfill has progressed to a stage of maturity equivalent to that of the original vegetation.

As discussed previously, construction and operation of the proposed landfill may deleteriously impact aesthetics and nearby property values. The proposed landfill will also be out of character with existing land use patterns in the surrounding area, and similarly, will not conform to present zoning for the site. Until the ultimate post-closure land use plan is fully

and successfully implemented, all of these impacts will also be cumulative.

Additional operational impacts which could be considered cumulative include the continued use of the local transportation network for truck transport, the continued generation of noise over a longer time period, the continued site energy demand, and the continual potential for the displacement of on-site historical/archaeological features.

Operation of the proposed landfill will result in some generation of odors and methane gas. These adverse air quality and human health impacts will persist for some time into the post-closure period. Similarly, until organic waste decomposition is complete in the existing landfill, odor and methane generation will be occurring at both the existing and proposed landfills simultaneously and hence cumulative impacts may be evident to some degree.

Similarly, leachate generation and migration during the post-closure period at the existing landfill will be exacerbated by leachate generation and migration during the operation and post-closure periods at the proposed landfill. Leachate migration, therefore, may cause cumulative impacts on shallow groundwater and surface water quality and, in turn, on aquatic and wetland ecology and human health.

In general, however, it should be noted that due both to the proposed design of the site, and due to the fact that the proposed project is an expansion of an already existing landfill, the above cumulative impacts are not expected to be quantitatively significant. A number of impacts, however, will continue to be experienced for the additional ten years of site operations.

11.0 ALTERNATIVES

11.1 INTRODUCTION

11.1.1 General

This section identifies, describes and evaluates reasonable alternatives to the proposed action of expanding Woodlake Sanitary Landfill so that a comprehensive framework can be established for evaluating the project. The alternatives identified, therefore, include actions within and outside the control or authority of BFI, the MPCA or other governmental entities. Special emphasis, however, was placed on alternatives in which an imaginative and practical approach with less environmental impacts could be implemented while still meeting BFI's objectives.

The alternatives were identified, described and evaluated based on the general criteria cited above and the views of the public as they were stated at the Medina public meeting of December 13, 1979.

The overall process by which alternatives are identified, described and evaluated here consists of five sequential steps:

- (1) Outline for each major party-at-interest areas of concern and authority (objectives) relating to the proposed project.
- (2) Based on these relevant areas of concern and authority, list and describe the options logically available to each party-at-interest relating to the future of the proposed project.
- (3) From the separate lists of decision-making options available to each party-at-interest, list the major reasonable alternatives to the proposed project.

- (4) List and briefly describe the criteria by which each alternative is to be evaluated.
- (5) Apply the criteria developed above in evaluating each alternative to the proposed project in terms of its negative and positive impacts.

11.1.2 Areas of Concern and Authority for Each Major Party-At-Interest

BFI is proposing this project because there is a demand for landfill space in the TCMA. The goal for BFI is to meet this demand in an economical manner, ensuring the expected corporate return on investment. Consistent with this objective would be expansion at another existing landfill or development of a new landfill elsewhere. To be in the "best interests" of BFI, however this project or investment in some alternative means of solid waste disposal must also be consistent, environmentally and socially, with the best interests of the public.

MPCA's goal is to promote the public interest while adequately protecting our environmental resources. This requires that the project as proposed for Woodlake must meet acceptable criteria for environmental protection. Hennepin County and other governmental agencies are also responsible for providing economically and technically sound solid waste disposal within their respective political boundaries. In relationship to the Woodlake site, Hennepin County has been particularly active in the analysis of the feasibility of alternative landfill sites and alternative disposal technologies. The county's area of concern, other than for the proposed project's environmental adequacy, would relate to compatibility of the project with other regional plans and facilities to be developed by the County at a later date.

The citizens in the vicinity of Woodlake also expressed views relating to the adequacy of the Woodlake site at the December 13, 1979 public meeting.

11.1.3 Decision-Making Options Available
To Each Party-at-Interest

The following actions constitute the general options available to each major party-at-interest within the context of evaluating the Woodlake expansion proposal:

Browning-Ferris Industries (BFI)

1. Expand Woodlake Sanitary Landfill as currently proposed to MPCA.
2. Expand Woodlake, but modify the landfill design and/or operation proposal to address specific concerns raised by MPCA and/or the public.
3. Abandon this project at Woodlake, and repropose to MPCA some similar landfill project elsewhere in the TCMA capable of serving Hennepin County's solid waste disposal needs.
4. Abandon this type of project at Woodlake, and repropose to MPCA some other type of solid waste utilization or disposal project at Woodlake, such as recycling, composting or other resource recovery or disposal approaches.
5. Completely abandon this or any other solid waste disposal project at the Woodlake site or elsewhere in the TCMA.

Minnesota Pollution Control Agency (MPCA)

1. Approve the State Solid Waste Permit for the pro-

posed project as currently requested by BFI.

2. Approve only a State Solid Waste Permit modified voluntarily by BFI to include more stringent measures for environmental protection.
3. Approve only a State Solid Waste Permit with conditions included by MPCA which, by addressing the project's construction and operating aspects, would reduce its adverse environmental impacts.
4. Deny the State Solid Waste Permit to BFI due to unavoidable and significant adverse environmental impacts.

Hennepin County and Other Governmental Entities Including the
Metropolitan Council and Medina

1. Accept the project at Woodlake as currently proposed.
2. Accept the project at Woodlake only with modifications relating to more stringent measures for environmental protection.
3. Where permitting authorities are involved, reject the project at Woodlake due to unavoidable and significant adverse environmental impacts or due to basic technical or economic incompatibility with regional solid waste management plans.

11.1.4 Major Reasonable Alternatives
To The Proposed Action

Based on the above lists of decision-making options available to each

major party-at-interest, one concise list of reasonable alternatives to the proposed action can be formulated:

1. Proposed Action (evaluated in this DEIS)
2. Proposed Action with Design/Operating Modifications
 - a. Smaller landfill expansion
 - b. Natural clay liner, leachate collection system, and/or leachate treatment system
 - c. Other mitigative measures (described and evaluated in Section 6.0)
3. Proposed Action at a Different Site in the TCMA
 - a. Expand another existing BFI-owned landfill in the TCMA
 - b. Develop a new BFI landfill in the TCMA
4. Different Action at the Woodlake Site
 - a. Waste processing
 - i. baling
 - ii. shredding
 - iii. additional compacting
 - b. Materials recovery
 - i. ferrous metals

- ii. non-ferrous metals
 - iii. aluminium
 - iv. glass
 - v. paper
 - c. Energy recovery
 - i. waterwall combustion
 - ii. pyrolysis
 - iii. refuse - derived fuel (RDF)
 - iv. composting
 - v. methane recovery
- 5. Regional Actions Which Could be Implemented by Parties Other Than MPCA or BFI
 - a. Waste reduction
 - b. Alternative landfill Site(s)
 - c. Energy or Materials Resource Recovery
- 6. No Action (permit denial by MPCA or complete abandonment by BFI)

These alternatives to the proposed action are more fully described and evaluated in the subsections to follow. The next section, though, first sets out the criteria by which each alternative is evaluated.

11.1.5 Criteria For Alternatives Evaluation

The criteria followed in selecting a specific alternative for consideration included:

- . Federal, State or local statutes, regulations and standards. These included, but were not limited to, the Federal regulations such as the Clean Water Act, the Clean Air Act, the Toxic Substances Control Act, the Resource Conservation and Recovery Act, the Safe Drinking Water Act, and standards promulgated to implement the objectives of these acts.
- . Major adverse environmental impacts. A reasonable body of knowledge exists concerning the expected impacts of the proposed project. Using this knowledge, alternatives that would eliminate or minimize these potential impacts were considered.
- . Technological and engineering effectiveness. Alternatives may exist that better utilize the available technologies with respect to landfilling. Conversely, there may be serious reservations concerning the proposed application of selected technologies, related to their use in this project.
- . Economic feasibility. Proposed and potential alternatives will represent varying economic costs, both to the public and BFI. Alternatives should be proposed in view of the economic costs, but should not be eliminated on that basis only.

11.2 PROPOSED ACTION WITH DESIGN/OPERATING MODIFICATIONS

This alternative involves BFI modifying its proposed landfill design

and/or operation to address specific concerns raised by the MPCA and/or the public. Such modifications could be required by MPCA as permit conditions or could be proposed voluntarily by BFI. Major modifications relating to site design and operation might include:

1. Reducing the capacity of the landfill expansion;
2. Adding leachate controls such as a natural clay liner, leachate collection system, and/or leachate treatment system; and
3. Other mitigative measures (described and evaluated in Section 6.0).

11.2.1 Smaller Capacity Landfill

As concluded in TWP 2, Alternatives, BFI is applying for the maximum expansion acreage on the site. The smaller capacity landfill option can result in a decreased expansion area, anywhere from 1 to 39 acres. BFI's decision to apply for maximum expansion is based on anticipated available waste volumes, as well as potential cost savings associated with permit requirements, and to some degree unlimited capital costs.

Positive Impacts

1. A decrease in expansion size would result in a decreased landfill life projection. For example, a decreased expansion area of 20 acres would yield 5 years of landfill capacity as opposed to 10 years. Within this 5 year time period, regional solid waste management plans indicate that some alternate system of solid waste

disposal may have been implemented. As a result, solid waste intended for Woodlake could possibly be processed at a regional landfill or resource recovery plant.

2. Expansion size reduction would obviously result in decreased leachate generation, decreased land commitment, and decreased extent of other environmental impacts associated with solid waste landfilling.

Negative Impacts

1. Expansion size reduction would not provide complete utilization of the site area. Given increased generation rates in future years, BFI may desire to reapply for expansion to create additional disposal capacity. As such reapplication may require another EIS at some future date as well as renewed agency participation and site re-evaluation.
2. Hennepin County is very concerned about available space for landfilling. Although the County generates the most waste in the TCMA, their landfill capacity is nearly exhausted. Alternative solutions are being investigated by the County (i.e., mega-site, other sites, resource recovery) . However, anything less than maximum expansion at Woodland would further increase the burden on finding near-term solutions to the solid waste problems within the County.
3. Decreased expansion would invariably place some economic constraints on BFI's operation in future years. As a result any incurred increased costs would be passed on to service area customers.
4. Decreased expansion size would require earlier closing of Woodlake, and as a result place economic and social constraints on personnel presently employed at Woodlake.

5. In any case the existing site would continue to impact the local environment regardless of the eventual outcome of the Woodlake expansion proposal.

11.2.2 Leachate Control

Section 6.0 will discuss in more detail the advantages and disadvantages of a variety of design and operating alternatives, or "mitigative measures," which could be implemented in the proposed Woodlake project.

The proposed design and operation approach relating to leachate control consists of:

- (1) compaction of the base elevation subsoils, primarily by operation of landfill equipment during the final grading process;
- (2) maintenance of 30 to 50 feet of clay barrier between the wetland and the active landfill area;
- (3) maintenance of a 300-foot separation between the on-site creek and actual waste placement;
- (4) utilization of compacted daily cover;
- (5) two feet of final cover application;
- (6) implementation of surface runoff controls conducive to rapid runoff off-site and reduction of infiltration into the landfill mass.

Given the demonstrated low permeabilities of the subsurface soil and given that those same soils will be utilized for cover materials, the proposed site should result in the production of only limited quantities of leachate. More importantly, the site should also function hydrogeologically

to contain the leachate within the landfill mass, thus reducing substantially the potential for degradation of surface or groundwater supplies.

However, a number of alternatives are available which could increase the proposed level of protection. These include:

- (1) development of a more detailed runoff control plan providing an analysis of potential runoff considerations over time (since the site topography is gradually modified by the excavation and filling, processes). Additional options include berms along the wetland or stream designed to channel direct runoff away from these areas and/or one or more sedimentation ponds to reduce soil loss;
- (2) utilizing additional impermeable barriers along the wetland boundary to preclude horizontal leachate movement. Potential options include sheeting, grout curtains, slurry trenches, synthetic liners, etc.;
- (3) increasing the proposed 30 to 50 foot separation distance from the landfill to the wetland area;
- (4) maximizing natural clay base liner efficiency by providing additional compaction (requiring additional engineering and laboratory analysis to determine potential improvements in site soil permeability) or by chemical modification (i.e., bentonite addition);
- (5) installation of leachate collection and treatment facilities to remove generated leachate from the landfill mass;
- (6) development of a more detailed surface and/or

groundwater monitoring program designed to indicate potential leachate movement; and

- (7) utilization of a more stringent closure plan consisting of thicker or more impermeable final cover, continued operation of leachate collection/treatment facilities, continued surface and groundwater monitoring, and development of a more definitive post-closure plan.

Essentially each of these potential alternative leachate control approaches would reduce either the quantity of leachate generated or the potential for the escape of leachate and subsequent degradation of ground or surface waters. The disadvantages associated with implementing any of these options relates to substantial economic costs which could be involved, and to the diminishing benefit of more leachate control measures due primarily to the general suitability of existing site sub-soil conditions.

11.3 PROPOSED ACTION AT DIFFERENT SITE IN THE TCMA

Section 11.6, No Action, discusses the implications of not expanding Woodlake as proposed, on the area's existing landfills. Hennepin County's waste stream would most likely be redistributed in the short-term to the Flying Cloud landfill in Eden Prairie and the Waste Disposal Engineering landfill in Anoka County. No Action, therefore, evaluates the impacts on these other sites in terms of using their existing capacity at a greater rate, with no expansion of existing landfill capacity.

Section 11.5, Regional Actions Outside the Direct Control or Authority of MPCA or BFI, discusses the feasibility and impacts of selecting and developing new TCMA landfill sites capable of serving Hennepin County's waste disposal needs. That discussion evaluates both ongoing and anticipated TCMA and Hennepin County site-selection processes.

The discussion contained within this section would involve BFI abandoning the proposed project at Woodlake, either voluntarily or as a result of MPCA permit denials, and reproposing some similar landfill project elsewhere in the TCMA. This alternative landfill site, depending on its location, would be capable of serving as great a portion of Hennepin County's solid waste disposal needs as the proposed Woodlake expansion. The alternative landfill project could entail either the expansion of another existing BFI-owned landfill, or the acquisition and development of a new landfill in the TCMA (or the acquisition and expansion of another existing TCMA landfill not owned by BFI).

At the present time, BFI has shown no interest in the above options. First, BFI owns only one other landfill in the TCMA, namely the Flying Cloud landfill in the Eden Prairie area of Hennepin County. This site has less than two years of capacity remaining at its existing incoming waste volumes. Even if significant expansion were possible, it is important to point out that such expansion would result in: (1) higher average waste collection costs for previous Woodlake users, due to greater average waste haul distances; and (2) transfer many of the environmental impacts associated with Woodlake to the Flying Cloud site.

The options of BFI acquiring and developing a new site or the acquisition and expansion of another existing TCMA landfill not owned by BFI would be equally difficult due to economic and political obstacles. As Section 3.0 points out, past and present new landfill site selection processes in the TCMA, and in Hennepin County in particular, have met with public resistance. Even if it were possible for BFI to develop a new landfill site capable of serving Hennepin County's solid waste disposal needs, it could result in: (1) substantially higher average waste disposal costs, due to the high capital investment required to acquire and construct a new site, and due to higher collection costs; and (2) transfer of several of the environmental impacts associated with the proposed Woodlake expansion to the new site.

11.4 DIFFERENT ACTION AT THE WOODLAKE SITE

This option would involve BFI abandoning, voluntarily or on the recom-

mendation of MPCA, the landfill option (only) at Woodlake, and reproposing to MPCA some other scheme for solid waste disposal at the Woodlake site which would be capable of serving Hennepin County's disposal needs. A variety of possible actions, other than landfilling by itself, could be implemented which would conceivably result in fewer adverse environmental impacts, or which would result in a transfer of the environmental media to which impacts would be diverted (i.e., an incinerator would result in air impacts vs. groundwater impacts for a landfill operation). A number of variations of these options include waste processing, materials recovery, and energy recovery. However, all of these options would still require landfilling to some degree for disposal of final processing residues.

These same options may be implemented in Hennepin County and the TCMA by entities other than BFI. This possibility is discussed more fully in TWP 2, Alternatives, and in Section 11.5.

11.4.1 Waste Processing

Shredding

Shredding is a viable technical option at the Woodlake site. However, the decision to implement a shredder system would be an investment decision on BFI's part which would weigh the advantages associated primarily with decreased waste disposal volume requirements against the disadvantages of increased landfill capital and operating costs. The potential positive impacts of incorporating a shredding facility at the Woodlake site includes the following:

1. Shredded solid waste reduces disposal volumes and minimizes land requirements.
2. Vector and other health related problems are minimized as are the risks of landfill fires and safety hazards.

3. Shredded waste presents fewer odor and litter problems.
4. Shredded fill promotes rapid landfill stabilization by accelerating waste decomposition because of an increased waste surface area to volume water.
5. The more densely filled landfill has a higher capacity for structural support.

To date, BFI has not proposed a shredder system as part of the Woodlake expansion.

Baling

Baling exhibits similar advantages and disadvantages as shredding. As with shredding, implementing baling would be a private investment decision by BFI. To date, baling has not been proposed by BFI as part of the Woodlake expansion.

Additional Compaction

Additional compaction offers the same advantages and disadvantages as indicated above for the two other compaction technologies. BFI is currently considering the acquisition of another piece of landfill equipment by which additional landfill compaction would be achieved.

11.4.2 Materials Recovery

Ferrous Metals

Ferrous metals recovery is a process that requires an extensive capital investment base. For this reason, such processes have been limited to large scale landfills or resource recovery plants which experience a large waste generation rate on the range of 100 tons per day or greater. Woodlake

receives approximately 270 tons per day or less which would make such a large capital investment unjustifiable. From the point of view of potential environmental impacts, installation of a ferrous recovery system would not significantly reduce project impacts on the environment. In addition, BFI has not indicated any interest in developing an on-site ferrous recovery system.

Non-Ferrous Metals

Non-ferrous metals recovery is labeled as an "experimental technology" because it is currently being tested in pilot plants and laboratories, and data with regard to technical and economic feasibility is insufficient (Congress of the United States, Office of Technology Assessment, 1979). As such, this alternative does not apply to the Woodlake site.

Aluminum

Aluminum is a difficult material to recover because of its unique physical characteristics, making it hard to isolate or extract from a municipal waste stream (Congress of the United States, Office of Technology, 1979). However, technologies have been developed to recover aluminum because of its competitive resale value, but capital and operating costs are high. Also, aluminum, in a typical waste stream, is approximately 1% or less by weight (U.S. EPA, 1976). As a result, small waste streams such as that experienced at Woodlake cannot justify large capital investments. Essentially, the decision relating to incorporation of an aluminum recovery process at Woodlake is a private investment decision and BFI has not indicated such an interest. Similarly, total environmental impacts would not be reduced by implementation of an aluminum recovery system.

Glass

Glass, as a waste material, has a relatively low resale value but because it represents a high percentage (9%) in municipal waste, recovery is often more economically attractive (U.S. EPA, 1976). A number of processes for glass recovery are available but are considered "developmental techno-

logies" because of the lack of commercial utilization. Because the systems are highly technical, capital costs are high. As with most recovery technologies, the alternative cannot be economically justified at Woodlake. Additionally, project environmental impacts would not be significantly reduced.

Paper

Paper recovery is possible using either a wet or dry process. Paper fiber recovery by wet separation is an alternative with a proven commercial history and is used extensively at various locations. Recovery utilizing dry processes are at an experimental stage with no proven commercial performance success (Office of Technology, 1979). Either process requires extensive mechanical equipment installation, and, as a result, high capital investments. The marketability of recovered paper is also questionable because the product is usually of poor quality, and, as such, has a limited market.

BFI has not expressed interest in providing any type of material recovery at the Woodlake site.

11.4.3 Energy Recovery

Incineration

Incineration is a energy recovery process which is applicable to a wide range of incoming waste quantities. Commercially available incinerators with energy recovery options are available for quantities in the order of as little as 10 tons per day. As such, incineration as a disposal approach is a technically acceptable alternative at the Woodlake site. However, the economic viability of incineration as a disposal approach is usually keyed to cost recovery achieved through marketing of the available waste energy content, i.e., most commonly by the sale of steam to adjacent users. The local marketability of recovered energy within the adjacent Woodlake area is very limited. Unless a a potential energy market could be developed this

alternative is unfeasible due to its high cost in comparison to landfilling costs. In addition, incinerator residue and air pollution control residues would still require landfill disposal.

Pyrolysis

Pyrolysis is a high technology system which produces recoverable energy supplies. While marketing the recovered gaseous or liquid fuels would be less difficult than marketing steam from an incinerator, in all likelihood the costs relating to pyrolysis of incoming waste streams would be substantially higher than landfilling costs. A number of impacts relating to discharge to both the air and water media would also be experienced and landfilling of process residues would also be required.

Refuse-Derived Fuel

Refuse-derived fuel processes are also expensive and require high technology systems. An economic justification of such a process at Woodlake is very unlikely. Also a local market for such fuel in the Woodlake area is currently non-existent. In addition, economical RDF production requires a large waste stream somewhere on the order of a minimum of 1000 tons per day.

Composting

Composting (with the exception of land availability) is not as sensitive to incoming waste quantities as many of the other recovery technologies. Approximately one-half dozen existing leaf composting projects are currently operating in Minnesota. Specific markets include mines, nurseries, golf courses, sod farms, forestry and recreational areas, state parks, flower growers, county fairs, highway departments, general contractors and private residences. Operations generally include separate leaf collection programs, and design and operation of a compost area for each 5000 to 7000 cubic yards of leaves collected (Weisberg, 1979). Continual environmental impacts would also affect both the air and water media.

Methane Gas Recovery

Methane gas recovery at sanitary landfills has received wide attention and shows good promise for development as an energy recovery alternative. A number of design requirements associated with the economic feasibility of a methane gas system include the presence of rather large waste quantities to produce sufficient quantities of gas. The Woodlake site in this respect does not warrant a full-scale system because incoming waste quantities are very low. However, a limited system installed on site could be used economically to supplement space heating requirements for buildings located on site. BFI has not indicated any interest to date in providing such a system.

11.5 REGIONAL ACTIONS WHICH WOULD NOT BE IMPLEMENTED BY MPCA OR BFI

Twp 2, Alternatives, discussed in detail the potential impacts of the proposed expansion on regional plans, and the potential impacts of large-scale alternative disposal technology on the viability of the proposed Woodlake site. The following sections are intended to summarize those "regional" actions and their potential impacts.

11.5.1 Waste Reduction

Waste reduction is defined as a method of controlling and minimizing quantities of generated refuse by altering product design, consumer awareness, and/or by initiation of cost incentives in industrial, commercial or residential sectors. Waste reduction in any form can often result in reduced production costs, reduced solid waste management costs, reduced natural resource consumption, and reduced environmental impacts. Although approaches to achieve waste reduction are numerous, this subsection will consider three primary options which can be initiated on a regional basis to assist in reducing future waste generation in the TCMA. These particular

approaches would include bottling bills, packaging reduction bills and source separation. As a result of implementing any of these approaches by federal, state or local entities, waste quantities landfilled at Woodlake, as well as at other landfills in the region, could be reduced.

In general, however, only minimal impacts on Woodlake operations would be experienced. Both packaging reduction and bottle bill legislation would result only in small reductions in waste quantity generation. Source separation programs, while having the potential for much larger reductions in disposal waste volume, require high levels of program coordination and voluntary cooperation, and also require reliable material markets. As such source separation activities would not be expected to substantially impact incoming waste quantities at the Woodlake site in the short-term. In any case, reduction of incoming waste quantities to the Woodlake facility would generally serve to increase the potential site operation period, but would not serve to substantially reduce overall environmental impacts.

11.5.2 Alternate Landfill Site(s)

Hennepin County, as well as other counties in the TCMA, is currently investigating alternative landfill sites. Investigation, to date, has resulted in the preliminary selection of a number of smaller landfill sites as well as a large regional mega-site for further study. When considering the impacts of the proposed expansion or the potential development of a regional landfill(s), or vice versa, the most important consideration relates to available waste quantities. In other words, continued operation of the Woodlake site circumvent a large enough portion of the regional waste volume to make an alternative regional site economically unacceptable? Or alternatively, would operation of a regional facility, or facilities, reduce the incoming waste streams to the Woodlake site resulting in the private venture becoming unprofitable?

In general, the impacts of the development of a regional landfill on the Woodlake operation are expected to be minimal. Due to the high level of public opposition to the siting of new facilities, it is unlikely that a

regional landfill facility will be available in the TCMA/Woodlake service region within the short-term. Because of this time lag, it is safe to assume that Woodlake will have utilized a large portion of its available capacity prior to the potential start-up of a regional landfill(s). In any case, should incoming waste stream quantities fall below those levels required to maintain an economically profitable landfill operation, Woodlake Sanitary Service, Inc., would likely proceed with closure operations on already opened site areas. In addition, it is clear given the existing lack of disposal capacity in the region and in Hennepin County, that regional planning should actively include consideration of the Woodlake site as a viable alternate to the separate development of regional capacity.

11.5.3 Energy and Materials Resource Recovery

A number of regional studies have also examined the feasibility of implementing materials and/or energy recovery facilities. Similarly the major concerns related to available waste quantities. However, as with a regional landfill facility, a regional materials and/or facility, will also be subject to a substantial time lag, and, as such, would only potentially impact the Woodlake in its later years of operation. Woodlake's waste stream accounts for approximately 5 percent of the total metropolitan waste generated (Metropolitan Council, 1978), and, as a result, any large-scale resource recovery facility would not be greatly affected by Woodlake maintaining its landfill operation at current incoming wastes rates.

While resource recovery economics generally dictate large scale designs (due to economy-of-scale effects), there has also been some consideration of smaller modular waste-to-energy systems for the TCMA region. However, in all likelihood, these systems would not be significantly impacted due to their decentralized location with respect to Woodlake's service area.

With the implementation of a regional facility, the TCMA as a whole will also have to address the questions of waste ownership and the role of

public authority in requiring all waste to be delivered to such a regional facility. Presently no waste ownership legislation exists in the TCMA region.

11.6 NO ACTION

"No Action" would involve either: (1) a complete abandonment for the present time by BFI of this or any alternative solid waste disposal project at the Woodlake site or elsewhere in the TCMA; or (2) a denial by MPCA of the State Solid Waste Permit, or disapproval and/or denial of local permits by the Metropolitan Council, Hennepin County, or Medina.

In this situation, BFI would be required to complete closure and implement approved ultimate land use plans at the existing Woodlake site.

"No Action" would produce the following implications and impacts:

1. The TCMA Regional Solid and Hazardous Waste Management Plan states in its major new policy that waste reduction is the preferred method of solid waste management followed, "in order of preference, by source separation, processing to recover materials and/or energy, and land disposal." Therefore, no action in the long run would help stimulate earlier waste reduction and resource recovery in the TCMA. TWP 2, Alternatives, discusses the pros and cons of these alternatives more fully.
2. Existing water quality at the Woodlake site would not be further aggravated by the initiation of the proposed action (see TWP 4, Water Quality). Further, air, noise, ecologic, hydrogeologic, energy use, and human health impacts would also be prevented.

3. Earlier site closure would reduce the time frame of potential economic impacts relating to the value of adjacent properties.

Negative Impacts

1. Although regional policy considers landfilling the last alternative in solid waste management, no specific regional materials or energy recovery systems are planned for the immediate future as a specific replacement for the Woodlake site.
2. The entire metropolitan solid waste disposal system can provide only 8.5 more years of total landfill capacity based on present waste generation rates. Sanitary landfill capacity within Hennepin County is more critical than in the TCMA region in general. The Hopkins Landfill reached maximum capacity and closed in 1979, leaving in Hennepin County only Flying Cloud with less than two years of operating life and Woodlake with less than one year. The No Action alternative would accelerate the exhaustion of capacity of the remaining landfills serving Hennepin County (namely, Flying Cloud and Waste Disposal Engineering in Anoka County). The total tonnage requiring alternate disposal capacity is approximately 270 tons/day based on 1979 receiving rates at Woodlake. This, in turn, may place additional pressures on the other existing landfills (and MPCA) to expand capacity where possible, or on Hennepin County to complete its on-going site selection process. TWP 2, Alternatives, presents a fuller discussion of the implications of redistributing Woodlake's waste load to Flying Cloud, Waste Disposal Engineering, a combination of the two, or to Hennepin County's prospective "mega-site".

3. Denial of the proposed action would place economic constraints on collection service companies in Hennepin County, including BFI, because of increased haul distances and consequently increased energy costs. Alternate landfills within Hennepin County are limited to Flying Cloud since Hopkins has already closed. Surrounding landfills would have to increase their respective watershed areas to handle the load intended for landfilling at Woodlake. Collection and disposal costs will invariably rise as haul distances and user rates at alternate sites increase. These costs would be passed on to the public through increased service charges.
4. Air, water, and groundwater pollution impacts could conceivably be transferred to other replacement sites.
5. Another impact associated with the "No Action" alternative is the displacement of up to 45 BFI employees because of redefined landfill wastesheds. Displacement would result in substantial personal and economic burdens on these employees.
6. Denial of the proposed expansion creates the potential for future illegal open dumping at the existing or other sites once the landfill is closed by BFI. This could possibly be aggravated by potential increases in disposal costs at other landfill sites.

12.0 COORDINATION OF EIS EFFORT WITH OTHER GOVERNMENT AGENCIES AND INTERESTED GROUPS

12.1 IMPACT ON STATE GOVERNMENT OF ANY FEDERAL CONTROLS ASSOCIATED WITH PROPOSED ACTION

The Federal Resource Conservation and Recovery Act (RCRA) Sections 1008 and 4004 address the problems of defining environmentally acceptable solid waste disposal. Section 4004 required EPA to establish criteria for determining which solid waste disposal facilities shall be classified as having no reasonable probability of adverse effects on health or the environment.

The criteria for classification of solid waste disposal facilities and practices include whether or not:

1. facilities or practices in floodplains restrict the flow of the base flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste;
2. contribute to the taking of any endangered or threatened species, or resulted in the destruction or adverse modification of their critical habitats;
3. cause a discharge of pollutants or dredged materials into U.S. waters in violation of Clean Water Act Sections 402 and 404, respectively, or cause non-point discharge to U.S. waters which would violate water quality management plans under Section 208 of the Act;
4. contaminate an underground drinking water source beyond the solid waste (or some alternative) boundary;

5. minimize the on-site population of disease vectors through periodic application of cover materials or use of other techniques to protect the public health;
6. engage in open burning of solid waste, or violate any provisions of a State Implementation Plan for air quality under Section 110 of the Clean Air Act; and
7. abide by a number of safety provisions relating to explosive gases, fires, bird hazards to aircraft, and access control.

Each of the States must complete an open dump inventory and either upgrade or close identified open dumps within five years. In this respect, state government may be impacted by a Federal control within the context of the proposed action.

As directed by Section 1008(a) of RCRA, EPA has also published "Proposed Guidelines for the Landfill Disposal of Solid Waste." In keeping with the stated goals and objectives of the Act, the scope of those guidelines encompasses several areas as listed below:

<u>Section</u>	<u>Topic</u>
241.200	Site Selection
241.201	Design
241.202	Leachate Control
241.203	Gas Control
241.204	Runoff Control
241.205	Operation
241.206	Monitoring

The Guidelines identify a variety of approaches and technologies which may be implemented, on a site-specific basis, to provide or maintain the required levels of environmental protection.

Although the Guidelines recommend a number of methods to satisfy the "Criteria for Classification of Solid Waste Disposal Facilities," they are not intended to be "exclusive or discourage or preclude the development or use of equally effective and economical technologies." In effect, the Guidelines provide a set of technologies which may be available for incorporation into landfill operations for a variety of waste types and environmental settings. Since the primary objective is adequate protection of the environment, which is generally achievable by providing the necessary air, groundwater, and surface water controls, the actual technologies required at any one location are highly site-specific.

12.2 MULTISTATE RESPONSIBILITIES ASSOCIATED WITH PROPOSED ACTION

Since the proposed landfill expansion site is located well within Minnesota's borders, there are no formal multi-state responsibilities associated with the proposed action. There are also no general multi-state implications of the proposed action, since the proposal's environmental, economic and social consequences will not reach beyond Minnesota's borders to any significant degree.

12.3 COORDINATION EFFORT

The following groups and individuals were consulted on the development of the Draft EIS:

12.3.1 State Agencies

Minnesota Department of Natural Resources:

Kent Lokkesmoe - Regional Hydrologist
Terry Lempke - Metro Region Waters
Tom Kucera - Division of Fish & Wildlife

Ken Wald, Charlotte Cohn, Tom Bolcom - Environmental Review
Carrol Henderson - Nongame Supervisor, Section of Wildlife
Dale Trippler - State Planning Agency
Steve Greenwood - Department of Health
Linda Reddin - Publications, Minnesota Nuclear Regulatory Commission
Peter McSwiggen - Assistant Scientist, Minnesota Geological Survey
Minnesota Natural Heritage Program
Dorothy Hozza - Project Manager, Minnesota Energy Council

12.3.2 County and Local Agencies

David K. Weaver - Director, Hennepin County Park Reserve District
Timothy M. Dyhr - Natural Resources Specialist, Hennepin County Park Reserve District
James Kemp - County Extension Director, Agricultural Extension Service
Luther Nelson - Director, Hennepin County Department of Environment and Energy
Tom May - Hennepin County Assessor
Rolf Ericson - Medina Assessor
Donnal Rohel - Town Clerk, Medina
Dave Jacobs - City Clerk, Loretto

12.3.3 Federal Agencies

Robert Landreth - Project Officer, Environmental Protection Agency

12.3.4 Miscellaneous Agencies

12.3.5 Interested Groups

12.3.6 Interested Persons

Robert Kadwell, P.E. - Principal Engineer, Soil Testing Services
of Minnesota, Inc.

Rodney B. Kager - Operations Manager, BFI

Fred C. Hart Associates, Inc. Personnel

Wayne Tusa - Project Manager
Timothy Van Epp - Assistant Project Manager
Kathy Brody
Celia Chen
Rick Dorrlor
Sylvia Holman
Frank Lorincz
Mary Machuzak
Nick Maniaci
Mary Manto
Joseph McLaughlin
Barbara Wong

Minnesota Pollution Control Agency Personnel

Dale McMichael - Past Director, Environmental Planning
and Review Unit
Janet Cain - Acting Director, Environmental Planning and
Review Unit
Tom Clark - Chief of Enforcement, Solid Waste
Sandra Forrest
Don Kyser
Ed Pryzina
Virginia Reiner

REFERENCES

- Browning-Ferris Industries, Inc. 1979 Annual Report. 56 pp.
- Browning-Ferris Industries, Inc. Temporary operational plan for Boyer Sanitary Landfill. September 28, 1973. Unpaged.
- Cimino, J. A. Health and safety in the solid waste industry. American Journal of Public Health. January 1975. 9 pp.
- Congress of the United States, Office of Technology Assessment. Materials and energy from municipal waste. July 1979. 284 pp.
- Environmental Research and Technology. Land use: related actions EIS on confined swine facilities; TWP 8. 1979.
- Fraumeni, J. F. Respiratory carcinogenesis: an epidemiologic appraisal. Journal of the National Cancer Institute. November 1975. 8 pp.
- Hennepin County Department of Environment and Energy. Sanitary landfill site selection, phase III. August 1979. 20 pp.
- Hennepin County Department of Environment and Energy. Sanitary landfill site selection, phase II. February 1979. 18 pp. plus Appendixes.
- Hennepin County Department of Environment and Energy. Sanitary landfill site selection, phase I. October 1977. 28 pp. plus Appendixes.
- Henningson, Durham and Richardson. Solid waste energy and resource recovery study for Hennepin County, Minnesota. December 1975. 209 pp. plus Appendixes.
- Mark Hurd Aerial Surveys, Inc. Site Photos. Minneapolis, Minnesota. November 19, 1979.
- Kadwell, J., P.E. Final contours and calculations for proposed expansion. Pers. comm. January 10, 1980. 5 pp. plus drawing.
- Kanivetsky, R. Hydrogeologic map of Minnesota, bedrock hydrogeology, scale 1:500,000. Minnesota Geological Survey. 1978. 2 sheets plus text.
- Kemp, J.C., County Extension Director, Agricultural Extension Service. Pers. comm. December 19, 1979.
- Kennedy, P.N. and R.A. Lueth. Landscapes of Hennepin County; a guide to use of land. U.S. Soil Conservation Service. 1976. 108 pp.

- King, F.E. and M. King. Trumpeters in Minnesota. Nautralist, Vol. 19, No. 1, Spring 1968. pp. 11-13.
- Kucera, Wildlife Biologist, Ecological Services Section, Minnesota Department of Natural Resources. Pers. comm. December 13, 1979.
- Lempke, Metro Region Waters, Minnesota Department of Natural Resources. Pers. comm. December 13, 1979.
- McCombs and Knutson Assoc., Inc. Loretto wastewater treatment plant phosphorous study.
- McGuire, J.F., Minnesota Pollution Control Agency. Memo on assessment of Loretto effluent standards to L.J. Breimhurst. Pers. comm., May 11, 1976.
- McKie and Assoc., Inc. Report on amendment to plan for Woodlake Sanitary Landfill. November, 1974. 33 pp. plus Appendixes.
- Metropolitan Council. Regional recreation open space - major policy issues. August 1979. 9 pp.
- Metropolitan Council. Solid and hazardous waste management, development guide/policy plan. June 1, 1979. 56 pp.
- Metropolitan Council. Metropolitan Council 1978 annual report to the Minnesota State Legislature. January 1979. 50 pp.
- Metropolitan Council. Land use in the Twin Cities Metropolitan Area, 1960-1975. October 1978. 73 pp.
- Metropolitan Council. Transportation systems management plan, supplement number 1 to transportation guide/policy plan. September, 1978.
- Metropolitan Council. Leachate generation potential from landfills in the Twin Cities Metropolitan Area. St. Paul, Minnesota. March 1978. 154 pp.
- Metropolitan Council. State of the region. February 1977. 170 pp.
- Metropolitan Council. Study of solid waste management and resource recovery in the Twin Cities Metropolitan Area: summary, conclusions, and recommendations. March 1975. 24 pp.
- Metropolitan Council. A summary report of travel in the Twin Cities Metropolitan Area. April 1974.
- Metropolitan Waste Control Commission. Baseline environmental inventory: Twin Cities Metropolitan Area 201 facility study. December 1977. 339 pp. plus Appendixes.

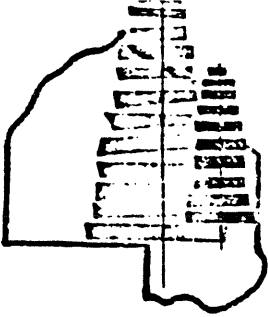
- Mills, W.T., Engr., Village of Medina. Official district map, Village of Medina. Pers. comm. 1980.
- Minnesota Department of Economic Security, Research and Statistical Services Office. Average covered employment and wages by economic region for the calendar year 1978 by two digits of industry. August 1979. 45 pp.
- Minnesota Department of Economic Security, Research and Statistical Services Office. Minnesota employment and wages by county, 1st quarter, 1978. 112 pp.
- Minnesota Department of Health, Center for Health Statistics. Minnesota health statistics. 1977. 71 pp.
- Minnesota Engineering Co. Report on Boyer Sanitary Landfill, Hamel, Minnesota. Boyer Sanitary Landfill Company. May 1971. Unpaged.
- Minnesota Environmental Quality Council. Minnesota code of agency rules, Section 3.021, Environmental Review Program. 1977.
- Minnesota Pollution Control Agency. 1978 annual summary of ambient TCMA sulfur dioxide and particulate levels. Pers. comm., J.M. Cain. 1980.
- Minnesota Pollution Control Agency. Monthly records of waste quantities received at Woodlake Sanitary Landfill, 1972-1979. Pers. comm., J.M. Cain. 1980.
- Minnesota Pollution Control Agency. Minnesota resource recovery plan; volumes 1 and 2. September 1979.
- Minnesota Pollution Control Agency. Draft related actions environmental impact statement - Penz Farms Company Darwin Schroeder Hilltop Pork Producers confined swine facilities. May 1979.
- Minnesota Pollution Control Agency. Minnesota air quality - 1977. May 1979.
- Minnesota Pollution Control Agency. Environmental Assessment Worksheet Woodlake Sanitary Landfill. March 27, 1979. Unpaged.
- Minnesota Pollution Control Agency. Air quality violation report, 1978.
- Minnesota Pollution Control Agency. Minnesota air quality 1971-1976 1977.
- Minnesota Pollution Control Agency. Noise regulations NPC-1 and NPC-2. 1974.
- Minnesota State Planning Agency, Office of State Demographer. Revised population projections for Minnesota counties. May 1979. 37 pp.

- Minnesota State Planning Agency, Office of State Demographer. Minnesota family income, 1976. May 1979. 32 pp.
- Minnesota Department of Natural Resources, Division of Game and Fish. Lake survey summary, Independence. 1974. Unpaged.
- Minnesota State Planning Agency, Office of State Demographer. Housing in Minnesota, 1977. June 1978. 21 pp.
- Minnesota State Planning Agency, Office of State Demographer. Minnesota household characteristics, 1977. November 1978. 33 pp.
- Minnesota State Planning Agency, Office of State Demographer. Educational attainment in Minnesota, 1977. October 1978. 21 pp.
- Minnesota Air Pollution Control Regulations 9 and 10.
- Minnesota Statutes. Chapter 105, pertaining to public waters.
- Mooney, H.M. Earthquake history of Minnesota. University of Minnesota, St. Paul, Minnesota. 1979. 20 pp.
- Moyle, J.B. . . .the uncommon ones. Minnesota Department of Natural Resources. October 1975. 32 pp.
- M.S.A. 97.488. Protection of Threatened and Endangered Species.
- NPDES Permit No. MN0023990. Nov. 22, 1978.
- National Biocentric, Inc. Addendum to Woodlake hydrologic and chemical report. St. Paul, Minnesota, Minnesota Pollution Control Agency. May 15, 1978. Unpaged.
- National Biocentric, Inc. Hydrogeologic and chemical report, Woodlake Sanitary Landfill. St. Paul, Minnesota, Minnesota Pollution Control Agency. April 18, 1977. Unpaged.
- National Biocentric, Inc. Technical assistance for preparation of an Environmental Impact Statement on the Woodlake Sanitary Landfill. Minnesota Pollution Control Agency. July 21, 1975. 17 pp. plus Appendixes.
- National Biocentric, Inc. Environmental assessment-Woodlake Sanitary Landfill. Medina, Minnesota. Undated. 33 pp.
- Pope-Reid Assoc., Inc. Interim summary I, seven county solid waste plan. Metropolitan Inter-County Council. January 10, 1980. 82 pp. plus Appendixes.
- Reiner, V., Hydrologist. Minnesota Pollution Control Agency. Pers. comm. December 28, 1979.

- Ruhl, D., Clerk, Village of Medina. Pers. comm. 1980.
- Resource Conservation and Recovery Act of 1976.
- Schroeder, G. D. and M. Hulse. Survey of rodent population associated with an urban landfill. American Journal of Public Health, July, 1979. 3 pp.
- Shaw, S.P. and C.G. Fredine. Wetlands of the United States; their extent and their value to waterfowl and other wildlife. Circular 39. U.S. Fish and Wildlife Service. 1971. 67 pp.
- Sims, P.K. and G.B. Morey. Resume of geology of Minnesota, chap. I, geology of Minnesota. 1972.
- Soil Testing Services of Minnesota, Inc. Pers. comm., R. Kadwell. 1980.
- Swartzbaugh, J. T., R. L. Hentrich, and G. Sabel. Evaluation of land-filled municipal and industrial solid wastes. Cincinnati, U.S. Environmental Protection Agency. 129 pp.
- U.S. Department of Agriculture, Soil Conservation Service. Soil survey, Hennepin County, Minnesota. Washington, D.C., U.S. Government Printing Office. April 1974. 159 pp.
- U.S. Department of Commerce. Local climatological data - Minneapolis-St. Paul, Minnesota. Asheville, National Climatic Center. 1978.
- U.S. Department of Commerce. Monthly normals of temperature, precipitation, and heating and cooling degree-days, 1941-70. Asheville, National Climatic Center. August 1973.
- U.S. Environmental Protection Agency. Waste management technology and resource and energy recovery. 1976. 382 pp.
- Weaver, D.K. and T.M. Dyhr. Plant communities of Hennepin County and associated resident wildlife species. Hennepin County Park Reserve District. May 1976. 6 pp.
- Weisberg, M. Municipal leaf composting. Minnesota Pollution Control Agency. November, 1979.
- Wright, H.E. Tn. Quaternary history of Minnesota, chap. VII, geology of Minnesota, P.K. Sims and G.B. Morey, eds. 1972.

APPENDIX I

COMMENTS AND RESPONSES TO COMMENTS



HENNEPIN COUNTY PARK RESERVE DISTRICT

P.O. BOX 296

MAPLE PLAIN, MINNESOTA 55359

TELEPHONE 473-4693

8 September 1980

BOARD OF COMMISSIONERS

DONALD C. RINGHAM
CHAIRMAN
MINNEAPOLIS

WILLIAM BARBEAU
VICE CHAIRMAN
ST. LOUIS PARK

JUDITH S. ANDERSON
BLOOMINGTON

SHIRLEY A. BONINE
MAPLE PLAIN

AMELIA M. DeMUSE
MINNEAPOLIS

WILLIAM E. GENTRY
NEW HOPE

AND HANNAH
BOND

JUNE HEGSTROM
MINNEAPOLIS

CHARLES R. PHELPS
ORONO

RAYMOND N. SEAGREN
MINNEAPOLIS

ANNE-MARIE SOLENSKY
MINNEAPOLIS

...

CLIFTON E. FRENCH
SUPERINTENDENT

Janet M. Cain
Environmental Planning & Review Unit
Minnesota Pollution Control Agency
1935 West County Road B2
Roseville, Minnesota 55113

Dear Ms. Cain:

The Hennepin County Park Reserve District generally finds acceptable the Draft Environment Impact Statement for Woodlake Sanitary Landfill proposed expansion at Medina, Minnesota.

There are a few statements of minor importance within the EIS that are misleading and ought to be corrected:

a) page 72 section 4.3.4 Wildlife: sentence two of paragraph one reads, "However, due to the limited size of the landfill expansion property, nearly all of the wildlife that would be found on the site at any one time would most likely be transient." This statement would lead one to believe that there are few if any resident wildlife in the proposed impacted area. Has there been a population survey of the affected woods and grasslands? I submit that there are quite a few resident animals present in the area.

b) page 156 section 7.0 Unavoidable Adverse Impacts: sentence two of paragraph four should include tree-nesting birds, considering the impact on the upland forest community within the proposed expansion.

c) page 160 section 10.0 Cumulative Impacts: paragraph three is misleading with the use of the words "temporary disruption." In fact, it will take better than 100 years "until post-closure re-vegetation of the existing landfill has progressed to a stage of maturity equivalent to that of the original vegetation" when referring to a mature upland forest community. What is meant by "temporary?"

All told, it would appear that the impact on the environment of the proposed landfill expansion will be somewhat less than the current operation's impact. For that, we will be very thankful.

Sincerely yours,

David K. Weaver
David K. Weaver, Deputy Director
Department of Outdoor Recreation
and Natural Resources

DKW:af

RECEIVED
SEP 11 1980
MINN. POLLUTION
CONTROL AGENCY

HENNEPIN COUNTY PARK RESERVE DISTRICT

1. David Weaver of the Hennepin County Park Reserve District commented that it would be misleading unless a site specific population survey had been prepared for the expansion area to support the statement that nearly all the wildlife in the area would be transient. (DEIS 72)

AGENCY RESPONSE:

A general site survey was conducted at the expansion area by ecologists; however, a more accurate statement would be, "However, due to the limited size of the landfill expansion property nearly all wildlife that would be found on the site which would be displaced could find adequate habitat in areas surrounding the landfill. The text on page 72 has been revised.

2. David Weaver indicated that tree nesting birds should be added to the ground nesting birds and rodents which would have habitat permanently removed until sufficient revegetation occurs to again provide habitat.

AGENCY RESPONSE:

The MPCA agrees that there will be an unavoidable impact on tree nesting birds in the area. The text on page 156 has been revised. The plantings proposed by Browning Ferris along the Tomahawk Trail will provide some habitat during operation of the landfill.

3. David Weaver raises the issue that the word "temporary" (page 160) is misleading since it will take more than 100 years to revegetate the area to approximate the existing habitat.

AGENCY RESPONSE:

The Agency agrees with this comment. The text on page 60 has been revised.

City of Medina

2052 County Road 24
Hamel, Minnesota 55340

September 3, 1980

Ms. Janet Cain
Commissioner
Minnesota Pollution
Control Agency

Dear Ms. Cain:

Two representatives of the Medina City Council attended the public hearing held at the Medina City Hall on August 20, 1980 on the topic of the proposed expansion of the Wood Lake sanitary land fill.

The City Council is generally familiar with the environmental impact statement which was the subject of the hearing.

I believe that it is appropriate that the City of Medina express its concerns on any proposed expansion of the existing land fill. The concerns are as follows:

1. Irrespective of how well run a land fill is, there is a certain amount of waste which remains in Medina indirectly associated with the land fill. For example, particularly noticeable in the spring is the refuse which has blown off of vehicles on route to the land fill. Further, an occasional disgruntled customer will leave wastes intended for the land fill in other places in Medina if the land fill is not open or for other reasons.
2. We acknowledge that county roads have been designed to bring users to the land fill. Notwithstanding such designs, however, roads maintained by Medina do suffer from customer use by trucks and other vehicles on route to the land fill. As a result, road maintenance costs of Medina are increased without any compensation from the land fill or other related parties.
3. Medina is relatively sparsely populated. The proposal of a community water system serving the areas adjacent to Wood Lake in the foreseeable future is dim. Accordingly, the effect on the water supply is a critical element in our decision making process. The effect on Lake Independence, as noted at the hearing, is also important.
4. The environmental impact statement indicates that by the end of 1981 Wood Lake will be the primary land fill area.

in Hennepin County. If such is the case, we can anticipate expanded usage of this facility. Can Medina be assured that, if such is the case, there will be some controls on the usage?

5. If Medina is the sole land fill in Hennepin County, how can Medina be assured that it will not be expanded beyond the area now proposed? The Council does not find the prospect of future hearings soothing given the possibility that, at a future date, expansion for land fill purposes may be subject to condemnation.

6. Given our concerns, some form of long term bond or indemnification from a responsible party is necessary. For example, the costs of installing a municipal well to serve residents with contaminated water might be a start in setting the amount.

7. Without being specific, some form of compensation to Medina is appropriate given the items noted above. While a license fee for operating the land fill is required, such a fee does not approach covering the damage to the roads. Much of the refuse comes from other cities including Plymouth and Maple Grove.

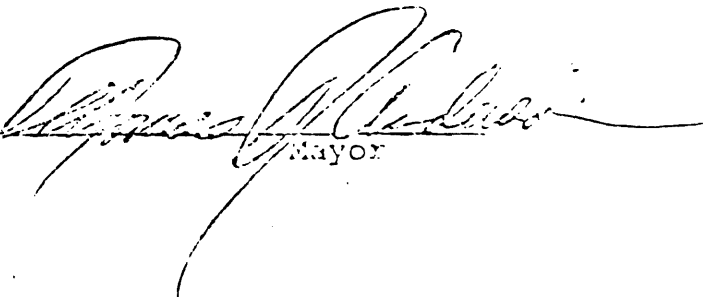
8. We would want assurances that the property would remain on the tax roles after closing, and that other land fill sites would not appear in Medina. I believe you are aware of our objections to the proposed site in Baker Park.

9. Finally, some controls over the operation of the land fill are necessary. Presently, Medina has little if any say in operational matters. For example, should all trucks be covered? Are the rates excessive or too low?

While the Medina City Council has not been approached to license the expansion and, accordingly, has not formally considered the expansion, we believe it is appropriate that you have our comments and concerns on this matter.

Very truly yours,

CITY OF MEDINA

By  Mayor

CITY OF MEDINA

1. Tom Anderson, Mayor of Medina raised several issues of local concern including litter and dumping problems (1), damage to roads due to traffic related to landfill use (2), controlled use of the landfill (4) and the issue of vehicles being covered if they are carrying refuse (9).

AGENCY RESPONSE:

The landfill must have Medina's approval before it can operate. The city could explore the options it has for establishing a conditional use permit to control issues of local concern. The city also has the authority to pass ordinances such as one requiring private vehicles to cover refuse being hauled to the landfill. The city also has authority to adopt and enforce existing MPCA rules such as SW 3 & SW 6 (Solid Waste) which requires commercial vehicles to be leak proof and covered. The city as a part of a conditional use permit might require a bond.

2. Mayor Anderson indicated the critical nature of the drinking water supply and the water quality of Lake Independence.

AGENCY RESPONSE:

The MPCA agrees with the concerns expressed by Mayor Anderson. The MPCA Board ordered an EIS prepared on this project primarily because of these issues. The information gathered during the EIS process which confirmed the extensive clay layer underlying the expansion in conjunction with a 30-50 foot set back from the wetland provides adequate protection against groundwater and surface water contamination.

3. Mayor Anderson asked if the city could be assured that the Landfill would not expand further than the present proposal.

AGENCY RESPONSE:

The proposed expansion will use the remaining land owned by Browning-Ferris Industries. Further expansion would require an additional purchase of land in the area. If there are willing sellers Browning-Ferris could buy land with the intent of developing it as a landfill. Local units of government have authority over rezoning of land which would be necessary in order to develop the land for refuse disposal. No landfill can operate without the local unit of government's approval.

4. Mayor Anderson wanted assurances that the landfill would remain on the tax roles after closure.

AGENCY RESPONSE:

There can be no assurance that the landfill will perpetually remain on the tax roles.



minnesota department of health

717 s.e. delaware st. minneapolis 55440

(612 295 5221)

September 8, 1980

Ms. Janet M. Cain
Environmental Planning & Review Unit
Minnesota Pollution Control Agency
1935 West County Road B2
Roseville, Minnesota 55113

Dear Ms. Cain:

The staff of the Division of Environmental Health has reviewed the Draft Environmental Impact Statement and the accompanying Technical Work Papers for the proposed expansion of Woodlake Sanitary Landfill (dated August, 1980) and offers the following comments and information for inclusion in the final Environmental Impact Statement.

Throughout the Draft EIS and Technical Work Papers 4 and 9 (Water Quality and Human Health Effects respectively), conclusions are reached stating no impacts on local water supplies by landfill leachate. However, the identification, location, and description (including depth) of private wells in the vicinity of the Woodlake Landfill are lacking, particularly for the ten (10) residences within one-half mile of the facility. The only water supplies discussed in the Draft EIS and the Technical Work Papers are the Loretto and Medina municipal supplies. Information on private wells is even more critical since most drinking water for the Medina-Loretto area is obtained from private wells (Draft EIS, p. 81). Until this information is obtained and evaluated, it is difficult to conclude there are no local impacts on water supplies.

The Draft EIS indicates that the Franconia and the Prairie du Chien aquifers, underlying the Woodlake Landfill, are important aquifers (Draft EIS, p. 99). The Prairie du Chien aquifer is indeed extremely important since it supplies 75-80% of the groundwater utilized in the metropolitan area. The general area where the Prairie du Chien is a subcropping formation may potentially be the recharge zone of the aquifer. As a result, introduction of contaminants at this point should be prevented in order to protect the aquifer.

The general geologic setting of the landfill site, with over 100 feet of relatively impermeable natural clay, appears to be adequate. This would appear to be effective in attenuating leachate migration. However, the existing landfill is causing degradation of the adjacent wetland due to lateral migration of leachate. Leachate concentrations may potentially be diluted by only an order of magnitude before entering the landfill (Draft EIS, p. 120). This impact has also resulted in visible and substantial vegetative stress in the wetland (Draft EIS, p. 127). In addition, levels of BOD, copper, lead, and TDS entering Lake Independence from leachate may potentially exceed various water quality standards (Draft EIS, p. 114). This condition could lead to increased lake pollution and some measures should be implemented to reduce these impacts.

In developing projected leachate production rates, the Draft EIS states that Darcy's Law was utilized (Draft EIS, p. 60). Since most of the existing facility and all of the proposed expansion are above the watertable, conditions in the landfill should generally remain unsaturated and the use of Darcy's Law is inappropriate unless the specific capacities and relative permeabilities are known.

In the Technical Work Paper #7 (Geology and Hydrology), it states there is a "limited" hydraulic connection between surface and deep aquifers, based on pump test data (Draft EIS, p. 24). The inclusion of the test data in the Work Paper would be useful in evaluating the extent and magnitude of this connection.

Various alternatives are outlined in the Draft EIS which would improve the operation of the facility and reduce the potential impacts. The Department of Health believes it is extremely important that the integrity of an adequate final cover must be maintained in order to minimize the infiltration of surface waters and the production of leachate. Along this line, it is also important to develop surface runoff control plans for both the operating facility and the closed areas of the landfill. These plans, once implemented, would minimize leachate production.

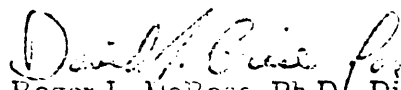
Secondly, it is imperative that a groundwater and surface water sampling program be developed and implemented to ensure adequate protection of the environment and the public health. A detailed plan for monitoring has yet to be developed (Draft EIS, p. 44), and definitely should be required before a permit is issued for expansion.

For the existing problem of leachate migration into the wetland and eventually into Lake Independence, removal of the waste currently disposed in the peat area of the northern edge of the facility may be necessary. If this is not successful in reducing lateral leachate migration into the wetland, a vertical impermeable barrier or a leachate interception system may be necessary.

Finally, in Technical Work Paper #4 (p. 10), it states that several State authorities have an active role in examining water quality impacts associated with the proposed expansion of the Woodlake Landfill. They include: the MPCA, Division of Water Quality; the MPCA, Division of Solid Waste; the Minnesota Department of Natural Resources; and the Minnesota Geological Survey. The Minnesota Department of Health should definitely be included in this listing as it is responsible for monitoring drinking water supplies of the State. Any water quality impacts from landfill facilities would deeply concern this Department.

We appreciate your consideration of the points discussed in this letter. Please feel free to contact Mike Convery (296-5297) of my staff if you wish to discuss these matters.

Sincerely,


Roger L. DeRosa, Ph.D., Director
Division of Environmental Health

cc: Dale Wilcox, MPCA
Dennis Quan, DNR
Paul, Smith, Metro Council

MINNESOTA DEPARTMENT OF HEALTH

1. Minnesota Department of Health requested additional information on private wells near the landfill.

AGENCY RESPONSE:

Appendix I contains the available well data for private wells near the site. The soils data confirms that an extensive clay layer exists in the area which would protect water pumped from the aquifer below it.

2. Minnesota Department of Health identified the Prairie du Chien and Franconia aquifers as extremely important in supplying 75%-80% of the metropolitan area's groundwater use and that special care should be taken to prevent contaminants reaching the aquifer.

AGENCY RESPONSE:

The Minnesota Pollution Control Agency agrees with the concern expressed by the Minnesota Department of Health.

3. The Minnesota Department of Health indicated that the Draft Environmental Impact Statement reported visible and substantial vegetative stress in the wetland on page 127.

AGENCY RESPONSE:

Minnesota Pollution Control Agency clarified this point with the Minnesota Department of Health. Vegetative stress has been identified at the site, localized along the boundary of the existing landfill. The proposed landfill will be designed to prevent leachate from entering the wetland consequently there is even less probability for impacts on vegetation.

4. The Minnesota Department of Health indicated that the table on page 124 showed potential water quality violations.

AGENCY RESPONSE:

In an errata addition to the Draft Environmental Impact Statement, a corrected table of Water Quality Standards was provided. The corrected table deleted values for BOD and TDS as these parameters are not applicable Water Quality Standards as defined in WPC 14 & 15. BOD is an effluent standard that varies and is assigned

to point source discharges. TDS (Total Dissolved Solids) is a water quality standard restricted to underground waters. The lead standard is 50 times greater than the expected dilution concentrations so there is no predicted violation. The copper standard of .01 mg/l will be exceeded at both the proposed dilution ratios. This does not pose a problem for human consumption. For aquatic life, the toxicity of copper is dependent on alkalinity, pH and organic compounds. Recent data indicated that Lake Independence is moderately alkaline (alkalinity = 119 mg/l, pH = 8.9). At such alkalinity, copper is generally less toxic to aquatic life.

5. Minnesota Department of Health indicates that Darcy's law was used inappropriately in estimating leachate production rates.

AGENCY RESPONSE:

The Draft Environmental Impact Statement reported 3 estimates for leachate generation using 3 methods for calculating pollution potential. The estimate using Darcy's Law falls mid way between the two other estimates. The worst case estimate (2.65×10^6 gal/yr) was the Metropolitan Council's estimate using a water balance methodology. This worst case estimate should be used in making decisions regarding potential pollution problems associated with this landfill.

6. The Minnesota Department of Health requested pump test data which led to the conclusion that there is limited if any connection between surface and deep aquifers.

AGENCY RESPONSE:

The pump test data is contained in the report Preliminary Hydrogeologic and Chemical Report for Woodlake Sanitary Landfill, National Biocentrics; Section I Hydrogeology, Pumping Test Methodology and Pumping Test Results, and Appendix A, Pumping Test Data Results of Laboratory Permeability Test. This report has been made available to the Minnesota Department of Health.

7. The Minnesota Department of Health discussed the importance of adequate final cover and an effective runoff control plan.

AGENCY RESPONSE:

The MPCA agrees with the Minnesota Department of Health and will address both issues in its permit. Detailed Plans and Specifications will be submitted as a part of the permit application.

8. The Minnesota Department of Health identifies the necessity of developing an adequate surface and groundwater sampling program prior to allowing expansion of the facility.

AGENCY RESPONSE:

The MPCA agrees with the Minnesota Department of Health a detailed monitoring program will be a part of the MPCA permit. The MPCA will contact the Minnesota Department of Health when the proposed plan is developed.

9. The Minnesota Department of Health indicated that removal of waste deposited by the previous owner from the wetland, an impermeable barrier or leachate interception system may be necessary to eliminate leachate migration into the wetland.

AGENCY RESPONSE:

This issue of measures necessary to correct the leachate problem at the existing landfill are currently under review by the MPCA. All suggestions of the Minnesota Department of Health will be considered.

10. The Minnesota Department of Health indicated that it should be included as an Agency which has an active role in examining water quality impacts.

AGENCY RESPONSE:

The MPCA agrees with this statement.



Minnesota
Department of Transportation
Transportation Building
St. Paul, Minnesota 55155

Phone 296-1638

August 21, 1980

Ms. Janet M. Cain
Environmental Planning and Review Unit
Minnesota Pollution Control Agency
1935 West County Road B2
Roseville, Minnesota 55113

RECEIVED
AUG 25 1980
MINN. POLLUTION
CONTROL AGENCY

In Reply Refer to: 702
Woodlake Sanitary Landfill
Draft Environmental Impact Statement

Dear Ms. Cain:

The Minnesota Department of Transportation (Mn/DOT) has reviewed the above referenced document. It is anticipated that the proposed development will not have an adverse impact on highway facilities in the area.

If you need any additional information from Mn/DOT, please feel free to contact Robert Morast, Transportation Analyst Engineer, at Mn/DOT's District Office in Golden Valley, phone number 545-3701.

Sincerely,

Merritt Linzie
Director
Office of Transportation Studies

MINNESOTA DEPARTMENT OF TRANSPORTATION

1. Minnesota Department of Transportation indicated that the project would not have an adverse impact on highway facilities in the area.

AGENCY RESPONSE:

No response required.



DEPARTMENT OF NATURAL RESOURCES
CENTENNIAL OFFICE BUILDING • ST. PAUL, MINNESOTA • 55155

September 30, 1980

Ms. Janet M. Cain
Environmental Planning and Review Unit
Minnesota Pollution Control Agency
1935 West County Road B2
Roseville, MN 55113

RECEIVED
OCT 1 1980
MINN. POLLUTION
CONTROL AGENCY

RE: Woodlake Sanitary Landfill
Draft Environmental Impact Statement

Dear Ms. Cain:

The Department of Natural Resources staff has reviewed the above referenced document and offers the following comments.

Our major concerns with this project relate to the potential impacts on water resources in the area. Our comments address the impacts on local public waters and wetlands and the need for more information on certain aspects of the project.

We were not able to determine from the document whether or not wetland basin #499 on the northwestern border of the project will be affected by fill in area #6. It is not clear whether or not a berm will be constructed to retain the landfill along this interface. Because we are uncertain of the need for a water resources permit based on the information in the DEIS, you should contact Regional Hydrologist Kent Lokkesmoe (296-7523) to determine what permits, if any, may be required.

We feel that the DEIS should have included additional information on the potential groundwater impacts. In particular, we would like the following items to be addressed:

- 1) A groundwater monitoring plan should be developed.
- 2) The "perched" water tables referred to on page 60 should have been described in terms of the depth to groundwater and direction of flow.
- 3) Information on private wells in the area including their locations, pumping rates, water levels, and depths should have been included.

- 4) Some evaluation of whether or not the phenol problem in the Medina wells described on page 69 was caused by the landfill should have been included.
- 5) The issue of landfill operator liability for groundwater contamination or flow alteration should have been addressed.
- 6) Data used as the basis for conclusions stated in the document (e.g. technical papers by F.C. Hart) should have been included as an aid to review.

We support the mitigation measures described on page 144 and following and urge their implementation if the project does proceed. As with all similar projects we recognize that sanitary landfills are only a short term solution to the solid waste disposal problem. Consequently, the waste reduction and resource recovery alternatives merit serious consideration.

Thank you for the opportunity to comment on this project.

Sincerely,



for Thomas W. Balcom
Environmental Review Coordinator

TWB:DB:mp

cc: Karen Loechler
Ron Harnack
Earl Huber

MINNESOTA DEPARTMENT OF NATURAL RESOURCES

1. The DNR questioned whether the wetland would be affected by fill in area 6.

AGENCY RESPONSE:

A 30-50 foot set back from the wetland is proposed for all areas. This set back should ensure that the wetland is protected.

The MPCA will contact the DNR regional hydrologist when specific design plans are available.

2. The DNR indicated a groundwater monitoring plan should be developed.

AGENCY RESPONSE:

A plan will be developed as a part of the permitting process (See attached Solid Waste rules.). The conditions of monitoring including frequency and the analysis of monitoring samples shall be determined by the Director and may be changed at his/her discretion. See also response to Metropolitan Council comment #11.

3. The DNR requested the depth to groundwater and direction of flow of the "perched" water table.

AGENCY RESPONSE:

The ground water hydrology of the site consists of both shallow and deep ground water systems. Under the present fill area a perched ground water mound exists overlying the clayey glacial till. Groundwater elevations ranging from 962 to 982 MSL have been documented on site. This is in comparison to a wetland surface water elevation of 960 feet above MSL. Shallow groundwater movement is radially in all directions away from the mounded area with some movement towards the wetland itself, where it subsequently becomes surface water generally moving southwest towards Lake Independence.

For the proposed site ground water was encountered at elevations ranging from 933 to 959 feet above sea level. Given the existing site conditions, this also represents a perched water condition due to the impermeable structure of the clayey soil.

Underlying both the existing and proposed area are the St. Lawrence and Franconia Formations. Bed rock exists under the site at approximately 810 feet above MSL. Both formations are hydrologically separated from the perched shallow water systems due to the impermeability of the glacial tills. Groundwater movement is generally southwest towards Lake Independence.

4. The DNR requested information about private wells in the area.

AGENCY RESPONSE:

Locations, depths and soil conditions are included in Appendix II. See also the response to Metropolitan Council comment #5.

5. The DNR requested additional information on the phenol problem described on page 69.

AGENCY RESPONSE:

High phenol levels were erroneously reported in the draft EIS. The Department of Health has indicated (10/17/80) that both the Loretto and Medina municipal wells have levels of phenols <.002 mg/L. .002 mg/L is the detection limit for phenols.

6. The DNR requested information on liability related to possible impacts from the landfill.

AGENCY RESPONSE:

During operation of the landfill Hennepin County requires a bond from the landfill owners (TR 29-32). The Metropolitan Council developed the following discussion on liability which is applicable to Landfills in general.

Liability

Under present law, the allocation of liability for contamination of wells by solid waste disposal facilities, including landfills, is governed by the common law of negligence and of nuisance. Either theory could be utilized by a property owner ("owner") in a suit against the landfill owner and others to recover damages for pollution of a well on his property.

In order to hold a defendant liable, the owner of the polluted well must prove that the defendant owed the owner a duty of care, that the defendant failed to exercise the care required, that the defendant's action or inaction caused the pollution of the well, and the amount of damages, expressed monetarily.

It is likely that landfill operators owe the owners of surrounding property the duty of care. A more difficult problem would be establishing whether the landfill operator exercised the amount or type of care required. This is the problem of establishing a standard against which the operator's procedures and actions would be measured. The standard of care would probably be defined by the use of experts in the field of landfill operations. If the operator has conducted landfill operations in a manner based upon the current state of the art, the operator is not liable, even if the owner's well is polluted.

The owner must prove a causal link between the landfill operator's actions or inaction and the damage caused to the well. Such a link could pose expensive and perhaps insurmountable proof problems. The land owner must show that the pollution was caused more likely than not by the operation of the landfill, not merely that the landfill could have caused the pollution. The defendant would attempt to show that the actions of others were responsible for the pollution, especially in a situation arising subsequent to the closing of the landfill.

Finally, the owner must establish the dollar amount of his damages, generally consisting of his expenses incurred to repair the damage or replace the water source.

In a nuisance suit, the land owner need only show that the operator's actions constituted a nuisance which interfered with the owner's right to use and enjoyment of his property, including his well. The courts do not presume that landfills are always nuisances. Liability will be imposed only where there is proof that a substance, which is unnatural to the land and which has a natural tendency to cause harm if it escapes, has escaped and harmed another's land. Negligent or careless operation need not be proved, nor does proof of nonnegligent operation excuse the defendant. The measure of damages in a nuisance suit is the depreciation in the market value of the owner's property, because of the pollution.

Either a public or private landfill operator could be held liable for damages in a negligence or nuisance suit. A problem with a private defendant might be that he or his assets cannot be found or that he is without sufficient assets to satisfy the judgment. The negligence liability of political

subdivisions is limited in terms of dollars by statute. This limitation may or may not apply to nuisance suits. The liability probably persists even after the land has been transferred to another person or entity.

If a landowner could preliminarily show substantial damage being caused by a currently operating landfill, a court might temporarily enjoin the continued operation of the landfill pending a liability determination or permanently enjoin its operation, unless the operator can comply with the terms of the injunction. Compliance with the terms of an injunction could be very expensive. Such an injunction suit could be brought pursuant to the common law, or to the Environmental Rights Act, Minn. Stat. 116B (1978). In case of the latter, a citizens' suit could be maintained even though no damages are claimed. Minnesota law also provides for the imposition of criminal and civil penalties for violation of the state's Water Pollution Control Act and the Act establishing the Pollution Control Agency.

The issues of the period of time after a landfill is closed during which an operator may remain liable and of liability upon sale or reuse of used landfill sites have not been addressed.

If the private defendant is found to be liable, but is either unavailable or without assets, the owner is essentially left remediless. If the pollution problem is severe or widespread and is causing a threat to the public health, the taxpayers will likely bear the burden of the cleanup by default. If the city's water supply has been polluted and no solvent defendant is available, the taxpayers again will have to bear the financial burden of the cleanup. Plainly, as in the case with closure and post-closure liability for pollution caused by hazardous waste facility owners, the situation regarding solid waste site operator liability could appropriately be addressed by legislation providing for financial assurance of closure and post-closure care on the part of the operators. The Waste Management Act of 1980, Laws 1980, Ch. 564, Art. X, Subd. 2C requires the Council to report to the legislative commission on the problem of compensating localities for the risks associated with solid waste disposal facilities. Thus, the legislature has recognized the limitations of existing law with regard to the problem of paying for the cleanup of pollution caused by defendants who are unavailable or without assets. (Pine Bend Final EIS)

7. The DNR indicated that data used as the basis for conclusions should have been included in the DEIS.

AGENCY RESPONSE:

The MPCA, in using the technical work paper concept, has tried to balance the potential need for a large amount of technical information with an effort to make a relatively short readable,

usable document. Technical work papers have been made available to the City of Media , Hennepin County, the Health Department and the DNR.



Metropolitan Council
300 Metro Square Building
Seventh Street and Robert Street
Saint Paul, Minnesota 55107

Telephone (612) 291-6453

Office of the Chairman

August 28, 1980

Ms. Terry Hoffman
Executive Director
Minnesota Pollution Control Agency
1935 West County Road B-2
Roseville, Minnesota 55113

Dear Terry:

The Metropolitan Council has reviewed the draft Environmental Impact Statement (EIS) for Woodlake Sanitary Landfill expansion and offers the following comments for your consideration.

The water quality sections of the draft EIS leave some issues unaddressed. It would be useful to determine whether there is a chance of groundwater reversal to Loretto Municipal Well Nos. 1 and 2. It would also be helpful to know whether either Loretto or Medina are planning to expand their well fields in the future.

In order to evaluate this document meaningfully concerning water quality, more information is required. The following information would be useful.

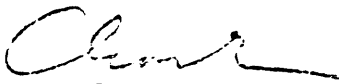
1. Data tables which include the parameters which exceed WPC 14 surface water quality standards.
2. The existing sampling program, locations and depths of the 12 monitoring wells.
3. Locations, depths, and water quality data available for private wells near the landfill, with a conclusion with respect to potential leachate contamination.
4. A figure which illustrates the unnamed creek and wetlands and one which outlines groundwater flow in relation to municipal, private and monitoring wells.
5. The evidence (data) for the lateral and vertical leachate attenuation mentioned on pages 66 and 120 of the draft EIS.

Major concerns with regard to the alternatives section are the "Smaller Capacity" option and "Additional Leachate Control" alternatives. MPCA should discuss the positive and negative aspects

of permitting Woodlake Sanitary Landfill until a Hennepin County master plan is adopted which potentially could phase out the present generation of landfills in the county to be replaced by new and more environmentally acceptable landfills and recovery facilities. More information is required in this document describing the expected degree of leachate control achieved by alternatives 4, 5 and 7 (pp. 172-173), with regard to volume reduction of leachate or effects on quality of leachate. The conclusion on p. 173, paragraph 2 is inadequate, especially in light of the low weight placed on the "Economic Feasibility" criteria (p. 166). More is needed on the value of additional monitoring. The benefits here are not relative to "the general suitability of existing sub-soil conditions." Specifically, how could monitoring be improved?

Please contact Paul Smith (291-6408) or Dan Krivit (291-6546) of our Solid Waste Program if you should have any questions regarding our comments.

Sincerely,



Charles Weaver
Chairman

CW:sa

METROPOLITAN COUNCIL

1. The Metropolitan Council raised the issue of the potential for groundwater reversal due to pumping to Loretto Municipal Well Nos 1 and 2.

AGENCY RESPONSE:

The proposed landfill is underlain by at least 60 feet of clay which has a permeability of 1×10^{-6} . The municipal wells are located in a deep aquifer. It is extremely unlikely that the pumping rate of the municipal wells would draw water from the clay layer. Pumping rates for the Loretto wells are 500 gal/min and 100 gal/min.

2. The Metropolitan Council requested information concerning the possible expansion of the well fields in the future.

AGENCY RESPONSE:

The draft Loretto Comprehensive Plan currently under Metropolitan Council review indicates that there is a need for an orderly extension of sewer and water services restricted to areas adjacent to currently developed area where sewer and water already exist. (p. 22) Analysis for the comprehensive plan indicated a present need for additional water and a projected greater need for water supply wells. (pp 88-89) The plan further suggests that Loretto should initiate a comprehensive water supply plan to forecast the water requirements for the ensuing twenty year period; discuss the adequacy of the present system; determine the needs to meet future requirements; and develop a time frame for implementation. (p. 89)

The Medina comprehensive plan is currently in a preliminary draft form. The area near Woodlake Sanitary Landfill which is not parkland is zoned rural residential. Any residential development in the area would be on a minimum of two acre lots. There are no plans to extend sewer and water to this area. (Charles Reisenberg - Planner in charge of Medina Comprehensive Plan) There are no plans at this time to expand Medina's well field.

3. The Metropolitan Council requested data tables which include parameters which exceed WPC 14 water quality standards.

AGENCY RESPONSE:

The DEIS page 124 provides this information. See also the response to Health Department comment #4.

4. The Metropolitan Council requested a description of the existing water sampling program, locations and depths of wells.

AGENCY RESPONSE:

Draft Environmental Impact Statement page 42 shows the locations of all monitoring wells.

The existing monitoring program consists of the submission of quarterly reports, except for the deep well which is monitored annually, to the Minnesota Pollution Control Agency. The data is reviewed for any change in trends which have occurred.

EIS p42 <u>MAP#</u>	<u>SCREEN DEPTH</u>	<u>INITIAL DEPTH TO H₂O</u>	<u>AVERAGE DEPTH 1st 3 QUARTERS 1980</u>
S-23	-	-	surface
W-3,Northwest			0
W-5,East		6.5'	3.5'
B-15	55'	51'	14'
B-1A	63'		34.9'
B-7	6'		4.3'
B-8	5'		4.2'
B-16	8'		4.5'
B-19			3.3'
Deep well	111'		43.1'
B-2			11'
B-3			13.4'
B-6			7.0'

5. The Metropolitan Council requested location depths and water quality from nearby private wells.

AGENCY RESPONSE:

Appendix II contains location, depths and soil characteristics encountered in drilling private wells in the area. No water quality problems in private wells have been reported in the area. Because of the extensive clay layer beneath the landfill, it is unlikely that any wells in the area would be contaminated due to leachate from the landfill.

6. The Metropolitan Council requested a map which illustrates the unnamed creek and wetlands.

AGENCY RESPONSE:

The creek and wetlands are illustrated on page 42 of the Environmental Impact Statement.

7. The Metropolitan Council requested a map which shows groundwater flow in relation to municipal, private and monitoring wells.

AGENCY RESPONSE:

Appendix III contains the groundwater map. See DNR comment #3.

8. The Metropolitan Council requested data verifying attenuation discussed on page 66 and 126 in the Draft Environmental Impact Statement.

AGENCY RESPONSE:

A preliminary Hydrogeologic and Chemical Report was prepared for Woodlake Sanitary Landfill by National Biocentric in 1977. Pump test data supports the conclusions identified on page 66 and 126 in the Draft EIS. A more complete description of the the conclusion follows.

Conclusions

The data supports the fact that contaminants from leachate formation are diminished to acceptable levels as they migrate from the fill area as a result of soil attenuation, dispersion, dilution, oxidation/reduction processes, and bacterial action.

It is also apparent from the isocon maps and the previous hydrologic data that contaminants will, for the most part, be contained in the immediate area of the landfill. During periods of snowmelt and runoff, removal of more soluble constituents (i.e., chlorides) will occur. However, as shown previously, chlorides and other constituents will be diluted by a factor of 24 times (assuming a 7" storage). Therefore, assuming the maximum chloride concentration is approximately 1,000 ppm (as reported for 11/7/73), the amount of chlorides leaving the area would be approximately 42 ppm due to the landfill alone.

It is evident from the initial chemical analysis and estimated discharge of 37 acre feet/year that the Loretto treatment plant is a major source of chlorides and dissolved solids in comparison to the calculated discharge from the landfill mass of 5.02 acre feet/year. Probably the most accurate differentiation between these sources is demonstrated by the isocon map for manganese and the correlation of manganese to iron. These metals are primarily the result of leachate formation and movement from the fill area (discussed earlier) and are relatively independent of the influence of sewage effluent. (BFI, 1977)

Based on the above chemical considerations, leachate is attenuated by glacial tills to a greater extent than in organic peat soils. The processes of ion exchange, dispersion, dilution and leachate migration can be predicted with greater accuracy in clay versus peat soils from the preliminary equations given in Table IV. This is particularly evident for the parameters of pH, conductivity, COD, and ammonia. Since concentrations of COD and nitrate are highly dependent upon the soil match (clay versus organic soils), they are not viable parameters for tracing leachate movement under the existing geologic conditions. (BFI, 1977)

Leachate is being attenuated vertically by the underlying glacial tills, based on the analysis of samples collected from monitoring wells B-1, B-1A, B-1B, B-1C, and B-2A. A comparison of values from B-1C to B-1 indicates there has been an influence of leachate on the glacial tills immediately below the peat strata which has not affected B-1 (see Figure 5). The affect on B-1C may be due to the change in soil type (peat to clay) and continual compaction of the overlying clay berm. The chemical data also support the hydrologic conclusion that leachate movement is horizontal through the more permeable peat layer at the northwest edge of the fill area. (BFI, 1977)

9. The Metropolitan Council requested a discussion of the positive and negative effects resulting from continuing the permit for Woodlake Sanitary Landfill until a Hennepin County Masterplan is adopted for solid waste disposal which may lead to phasing out of existing landfills.

AGENCY RESPONSE:

From an environmental perspective Woodlake has many characteristics which lead to safe disposal of solid waste at the site such as extensive clay underlining the proposed expansion. When compared to other landfills in the area Woodlake appears to be the most environmentally sound disposal site when considering containment of leachate within the landfill. Woodlake is currently being operated in an acceptable manner and the expansion will be operated in a similar manner. If Woodlake were not permitted, refuse from the area would have to be hauled greater distances, increasing energy use, to a less environmentally acceptable landfill. From a local perspective the closure of Woodlake at this time may lead to more indiscriminate dumping in the Medina/Loretto area by people who are unwilling to drive long distances to dispose of refuse. The local units of government would lose a portion of their tax base which is currently being provided by Browning-Ferris.

The closure of Woodlake at this time may create additional pressure to implement more environmentally acceptable methods for refuse reduction and disposal such as incineration or source separation.

10. The Metropolitan Council requested information on the benefits of additional leachate control versus the cost of implementation.

AGENCY RESPONSE:

All mitigative measures identified represent a continuum in the reduction of potential for leachate migration. The Agency is currently investigating the effectiveness of alternative methods for control, however, until plans and specifications are available through the permitting process, site specific costs can not be made. The most extensive control would be leachate collection and treatment. As working numbers, the following nationwide cost estimates could be used.

Cost in 1980 dollars for a synthethic liner -	\$1.90/ton
collection system -	.35/ton
treatment system -	.60/ton

Since Woodlake has been operating at a reduced level during the last few years in order to preserve existing space, their 1978-79 tonnage figures, approximately 85,000 tons/year, represent artificially low volumes; the expansion should permit handling of increased tonnage/year.

Thus, an estimate of \$100,000+ for the installation of a collection and treatment system is probably reasonable for Woodlake. The use of a synthetic liner would increase the cost to \$300,000.

11. The Metropolitan Council requested information on how additional monitoring at Woodlake could be improved.

AGENCY RESPONSE:

Water Quality monitoring at Woodlake Sanitary Landfill will be improved by analyzing the existing record of information submitted over the past years and selecting a few key surface and groundwater points to actively monitor.

The emphasis of the water quality monitoring system at Woodlake Sanitary Landfill should be shifted to include more surface water stations and fewer groundwater wells. The expanded system of surface water monitoring would be used to determine whether the landfill may be impacting downstream water bodies such as Lake Independence. Groundwater monitoring should include an upgradient well, a downgradient well already showing contamination, two yet unaffected downgradient wells and periodic (yearly) monitoring of the deeper downgradient well.

The specific well locations would be located in the design process of the landfill and will be evaluated during the permitting process.

1. Mr. Leonard Leuer requested a synopsis of the findings of the soil borings (TR 6).

AGENCY RESPONSE: This information is discussed in the transcript (TR) pages 6-7 and is also summarized in the EIS.

2. Mr. Leonard Leuer wanted to know if there was any way of knowing for sure what had been put in the landfill (TR 11).

AGENCY RESPONSE: TR 11.

3. Mr. Leonard Leuer asked if Browning-Ferris had indicated the type of waste to be disposed of at Woodlake (TR 8).

AGENCY RESPONSE: TR 8.

4. Mr. Kermit Dietrich asked when the landfill would reach maximum leachate production (TR 12).

AGENCY RESPONSE: TR 12.

5. Mr. Kermit Dietrich and Mr. Leonard Leuer expressed concern that leachate could contaminate water at maximum leachate production in about twenty years (TR 13, 14).

AGENCY RESPONSE: TR 13.

6. Mr. Kermit Dietrich asked whether leachate collection and liners had been considered.

AGENCY RESPONSE: Alternatives and mitigation measures including leachate collection and liners were considered in the EIS on pages 144-155 and 162-183. See also Metropolitan Council comments #10.

7. Tom Anderson identified local problems associated with having a landfill (TR 16-18).

AGENCY RESPONSE: TR 18-27. See also Mayor Anderson's written comments and Agency responses.

8. Mr. Leonard Leuer (TR 30 and TR 49) and Mr. Robert Franklin (TR 45) inquired about bonding and liability of landfills.

AGENCY RESPONSE: TR 30-33. See also response to DNR comment #5.

9. Mr. Crosby expressed concern that there would be additional pressure to further expand the landfill when the proposed expansion is filled (TR 33).

AGENCY RESPONSE: TR 34-35.

10. Mr. Robert Franklin raised the issue of high phenols in a municipal well (TR 35).

AGENCY RESPONSE: See response to DNR comment #5.

11. Mr. Robert Franklin reconfirmed the importance of Lake Independence as a recreational resource (TR 39) and the necessity of protecting the quality of its water.

AGENCY RESPONSE: TR 39-44.

12. Mr. Franklin identified an error in the EIS on page 67 which indicated that Lake Independence was 992 acres rather than 828 acres (TR 39).

AGENCY RESPONSE: The text on page 67 has been revised.

13. Mr. Robert Franklin expressed concern with the closed landfill being removed from the tax roles.

AGENCY RESPONSE: No response is required.

14. Mr. Kermit Dietrich asked whether the study which predicted agricultural runoff to Lake Independence was specific to the area near the Woodlake site (TR 46).

AGENCY RESPONSE: TR 46-47.

15. Mr. Nistler commented on the necessity for landfill sites to dispose of waste.

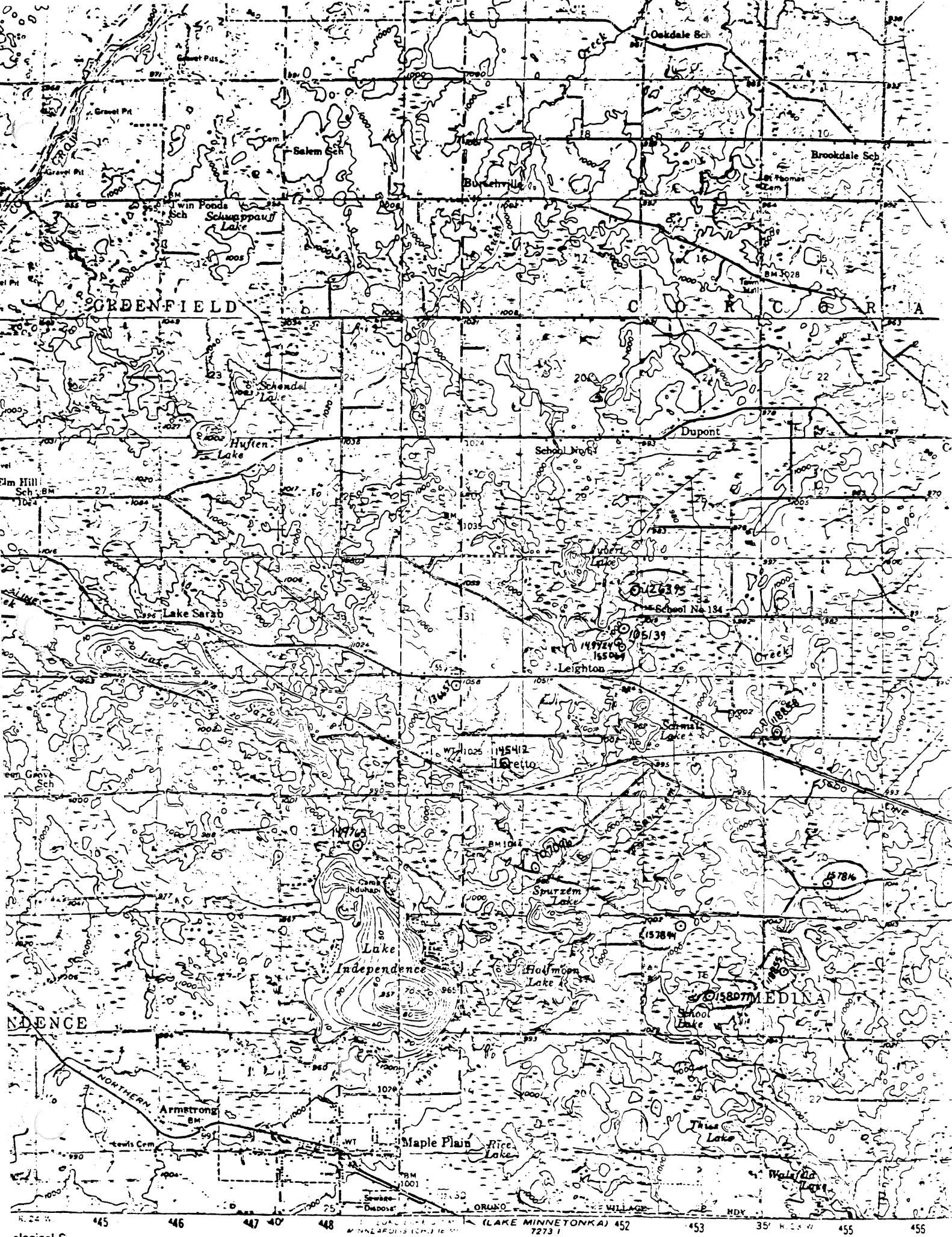
AGENCY RESPONSE: No response required.

16. Mr. Monteleone commented that Hennepin County's concerns were adequately addressed by the EIS and commented on the wind blown litter problems which occasionally occur at the site (TR 47, 48).

AGENCY RESPONSE: No response required.

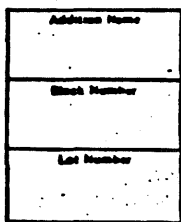
APPENDIX II

MN GEOLOGICAL SURVEY WELL DATA



MINNEAPOLIS, MN

Sketch map of well location



4. WELL DEPTH (completed) 220 ft. Date of Completion 7-27-78

5. ☐ Cable seal ☒ Reverse ☐ Return M ☐ Dog
☐ Hollow rod ☐ Air ☐ Sand H ☐
☒ Jetting ☐ Jetted ☐ Power Auger

6. USE
☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigative ☐ Municipal ☐ Commercial
☐ Test Well ☐ Air Conditioning ☐

7. CASING HEIGHT: Above/Below
☒ Black ☒ Threaded Surface 1 ft.
☐ Galv. ☐ Welded Drive Shaw? Yes ☒ No ☐
4 in. to 216 ft. Weight 11 lbs./ft. 3 1/2" ID
in. to _____ ft. Weight _____ lbs./ft. 1 1/2" ID
in. to _____ ft. Weight _____ lbs./ft. 1 1/8" ID

8. SCREEN Or open hole
MESH JOHNSON From X ft. to _____ ft.
Type STAINLESS STEEL Length 4 1/2 ft. FITTINGS:
Slot/Course 15 Sert between 216 ft. and 220 ft. LEAD PACK
_____ ft. and _____ ft. W/LEADER
_____ ft. and _____ ft.

9. STATIC WATER LEVEL
95 ft. ☒ Below surface ☐ above Date Measured 7-27-78

10. PUMPING LEVEL (below land surface)
109 ft. after 4 hrs. pumping 35 min.
_____ ft. after _____ hrs. pumping _____ min.

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

12. Well grouted? ☒ Yes ☐ No Ca. Yds. _____
☐ Neat Cement ☒ Groutability ☐ BACKFILL
Depth: from 0 ft. to 216 ft. U/C A/F
from _____ ft. to _____ ft. IN

13. Nearest source of possible contamination
50+ feet NW direction SEPTIC SYSTEM
Well disinfected upon completion? ☒ Yes ☐ No

14. PUMP Date Installed 8-1-78
☐ Not Installed
Manufacturer's Name MCCORMICK
Model Number 11-75633 HP 1 Volts 220
Length of drop pipe 138 ft. capacity 16 gal.
Material of drop pipe PVC
Type: ☒ Submersible ☐ L.S. Turbine ☐ Reciprocating
☐ Jet ☐ Crossflow ☐

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.

H. Pappertson 27-126
License Number

Address *PRI / AMEL* 27-126

W. B. Pappertson 5-30-7
Signature

W. B. Pappertson 7-27-7
Date

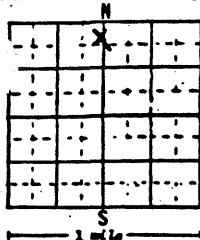
8/74 30M
7/76 30M

Township Name: 118 Range Number: 23 Section No.: 6 Fraction: NE "NE" NW

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

View exact location of well on section grid with "X."

Sketch map of well location.



E
1 mi.

Address Name
Block Number
Lot Number

2. FORMATION LOG	COLOR	THICKNESS OF FORMATION	FROM	TO
Topsail			0	4
Clay	Yellow		4	14
Clay	Blue		14	85
Clay & coarse gravel	Blue		85	103
Tight Clay	dk gray		103	112
Clay, sandy	Gray	loose	112	116
Clay	Gray		116	115
Clay & gravel	Red		115	116.4
Clay	Red		116.4	178
Boulders			178	180
Gravel	Dark	Hard	180	188
Clay, sandy	Red	loose	188	196
Clay, tight	lt brown		196	205
Sand coarse	green	loose	205	207
Sand, tight w/ hard seams	brown & yellow		207	227
Shale	white		227	231

Use a second sheet, if needed.

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

3. PROPERTY OWNER'S NAME: Atchafalaya Storage (Ebert County)
Address: C. Rd 19 & Mn 55

4. WELL DEPTH (completed): 227 Date of Completion: 8-31-77

5. ☐ Cable tool ☐ Reverse ☐ Flare ☐ Day
☐ Hollow rod ☐ Air ☐ Band ☐ 11
☒ Rotary ☐ Jetted ☐ Power Auger

6. USE: ☐ Domestic ☐ Public Supply ☒ Industry ☐ Irrigation ☐ Municipal ☐ Commercial
☐ Test Well ☐ Air Conditioning

7. CASING: ☒ Black ☒ Threaded ☐ Welded ☐ Surface ☐ Drive Shafts? Yes ☒ No
In. to ft. Weight lbs./ft. HOLE DIAM. 4 in. to ft.
In. to ft. Weight lbs./ft. In. to ft.
In. to ft. Weight lbs./ft. In. to ft.

8. SCREEN: Make Johnson Or open hole from ft. to ft. Type standard Dia. 4
Slot/Coarse 1/2" slot Length 8 FITTINGS:
Set between ft. and ft. ft. and ft. ft. and ft.

9. STATIC WATER LEVEL: 136 ft. below land surface ☐ above Date Measured 8-31-77

10. PUMPING LEVEL (below land surface):
ft. after hrs. pumping 50 g.p.m.
ft. after hrs. pumping g.p.m.

11. WELL HEAD COMPLETION: ☒ Pressure adapter ☐ Backsight effort ☐ At least 12" above grade

12. Well grouted? ☐ Yes ☐ No Co. Yds. ☐ Next Cement ☐ Breakwater ☐
Depth: from ft. to ft. from ft. to ft.

13. Nearest source of possible contamination: legals direction 77°
Well disinfected upon completion? Yes ☒ No ☐

14. PUMP: Date installed ☐ Not installed
Manufacturer's Name Deerpeter
Model Number 04 75 HP 764 Volts 270
Length of drop pipe 1417 ft. capacity g.p.m.
Material of drop pipe Steel
Type: ☐ Submersible ☐ L.S. Turbine ☐ Reciprocating
☐ Jet ☐ Centrifugal ☐

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.
Steven W. Dyer Co. Inc. 27154
License Number
Name W. H. Plavin Mn 55359
Signed W. H. Plavin Date 8-31-77
Authorized Representative
Steven W. Dyer Name of Owner
Date

Township Name Cassion	Township Number 119 N or S	Range Number 23 E or W	Section No. 32	P sec. Area NESE
--------------------------	--	------------------------------------	-------------------	---------------------

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

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

Sketch map of well location.

W

N

E

1/4 mi.

S

1 mile

Address Name

Block Number

Lot Number

[illegible]

Use a second sheet, if needed.

3. PROPERTY OWNER'S NAME
 Address
 63241 1/2 Kershaw Blvd

4. WELL DEPTH (completed) 303 Date of Completion 9-9-77

5. ☐ Cable tool ☐ Reverse ☐ Drive ☐ Dig
☐ Hollow rod ☐ Air ☐ Bored ☐
☒ Rotary ☐ Jetted ☐ Power Auger

6. USE
☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Municipal ☐ Commercial
☐ Test Well ☐ Air Conditioning ☐

7. CASING HEIGHT: Above/below
☐ Steel ☒ Threaded Surface _____ ft.
☐ Galv. ☐ Welded Drive Shells? Yes _____ No _____
 4 in. to 198 ft. Weight _____ lbs./ft.
 _____ in. to _____ ft. Weight _____ lbs./ft.
 _____ in. to _____ ft. Weight _____ lbs./ft.

8. SCREEN Or open hole
 Make _____ From _____ ft. to _____ ft.
 Type _____ Dia. 4"
 Slot/Groove _____ Length _____
 Bar between _____ ft. and _____ ft. FITTINGS:
 _____ ft. and _____ ft.
 _____ ft. and _____ ft.

9. STATIC WATER LEVEL
 110 ft. below land surface ☐ below ☐ above Date Measured _____

10. PUMPING LEVEL (below land surface)
 100 ft. after 3 hrs. pumping 20 g.p.m.
 _____ ft. after _____ hrs. pumping _____ g.p.m.

11. WELL HEAD COMPLETION
☐ Bitum adaptor ☐ Basement effort ☐ At least 12" above grade

12. Well grouted?
☒ Yes ☐ No Co. Yds. _____
☐ Neat Cement ☐ Grout mix ☐
 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 9-10-78
☐ Not Installed
 Manufacturer's Name Alexander
 Model Number _____ HP 3/4 Vols _____
 Length of drop pipe 144 ft. capacity _____ g.p.m.
 Material of drop pipe PVC
 Type: ☒ Submersible ☐ L.S. Turbine ☐ Reciprocating
☐ Jet ☐ Centrifugal ☐

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.

Thompson & Son, Inc. 77056
Licensee Business Name License No.

Rockford, Ill.
Address

Michael J. Thompson 5-15
Signed Authorized Representative Date

Michael J. Thompson
Name of Driller

5-15
Date

Sketch map of well location.



4. WELL DEPTH (completed) 208 ft. Date of Completion 8-11-77

5. ☐ Cable tool ☐ Reverse ☐ Driven ☐ Dig
☐ Soller rod ☐ Air ☐ Sored ☐
☒ Rotary ☐ Jetted ☐ Power Auger

6. USE
☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐

7. CASING
DIAM. 4 Threaded ☐ Welded ☐
Black ☒ Galv. ☐
4 in. to 203 ft. depth Surface ft.
 in. to ft. depth Weight lbs./ft.
 in. to ft. depth Drive Shoes? Yes No

8. SCREEN
Make Johnson Or open hole from 203 ft. to 208 ft.
Type 5" Steel Dia. 2"
Slot/Gauge Length FITTINGS:
Set between ft. and ft.
 ft. and ft.
 ft. and ft.

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

10. PUMPING LEVEL (below land surface)
105 ft. after 3 hrs. pumping 20 g.p.m.
 ft. after hrs. pumping g.p.m.

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

12. Well grouted?
☐ Yes ☐ No Cu. Yds.
☐ Best cement ☐ Bentonite ☐
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 11-15-77
☐ Not installed
Manufacturer's Name
Model Number HP 1/2 Volts
Length of drop pipe 126 ft. capacity g.p.m.
Material of drop pipe Galvanized
Type: ☒ Submersible ☐ U.S. Turbine ☐ Reciprocating
☐ Jet ☐ Centrifugal ☐

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.

Terrace Hill Co 27056
Licensee Business Name License No.
Rt 7 Hickford MA
Address
Signed: [Signature] Date: 11-1-74
Authorizing Representative
Name of Driller 7/74 JO

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

MINN. GEOLOGICAL SURVEY COPY

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.

PUMARLO WELL 27023
Licensee Business Name License No.

Address 6421 CTY RD 116 HARRIS

Signed Francis Pumarlo Date 12/10/17
Authorized Representative

Francis Pumarlo
Name of Driller

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

MINN. GEOLOGICAL SURVEY COPY

11-71-01

1. PROPERTY OWNER'S NAME
Ebert Construction Co. 157816
 Address **Hamel Elk Lake Farm**

4. WELL DEPTH (completed) **339** ft. Date of Completion **11/7/78**

5. ☐ Cable tool ☐ Reverse ☐ Flare ☐ Day
☐ Hollow rod ☐ Air ☐ Bored ☐ 11" _____
☒ Rotary ☐ Jetted ☐ Power Auger

6. USE
☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Municipal ☐ Commercial
☐ Test Well ☐ Air Conditioning ☐ _____

7. CASING
☒ Steel ☐ Threaded HEIGHT: Above/Below _____ MOLE DIAM _____
☐ Galv. ☐ Welded Surface _____ ft.
☐ 4 ☐ 270 Drive Shoes? Yes ☒ No _____
 in. to _____ ft. Weight _____ lbs./ft. **6 3/4" 270**
 in. to _____ ft. Weight _____ lbs./ft. **5 7/8" 339**
 in. to _____ ft. Weight _____ lbs./ft. _____ in. to _____ ft.

8. SCREEN
 Make _____ Or open hole from **270** ft. to **339** ft.
 Type _____ Dia. _____
 Slot/Groove _____ Length _____
 Set between _____ ft. and _____ ft. FITTINGS:
 _____ ft. and _____ ft.
 _____ ft. and _____ ft.

9. STATIC WATER LEVEL
124 ft. ☒ Above land surface ☐ Below Date Measured **11/7/78**

10. PUMPING LEVEL (Below land surface)
 _____ ft. after _____ hrs. pumping **50** p.p.m.
 _____ ft. after _____ hrs. pumping _____ p.p.m.

11. WELL HEAD COMPLETION
☒ Flare adapter ☐ Basement effort ☐ At least 12" above grade

12. Well grouted?
☐ Yes ☒ No Co. Yds. _____
☐ Neat Cement ☐ Brownmud ☐ _____
 Depth: from _____ ft. to _____ ft.
 from _____ ft. to _____ ft.

13. NEAREST SOURCES OF POSSIBLE CONTAMINATION
Legal fact _____ direction _____ type _____
 Well disinfected upon completion? Yes ☒ No ☐

14. PUMP
 Date Installed **12/4/78**
☐ Not installed
 Manufacturer's Name **HF3-100-S2 Dempster**
 Model Number **144** HP **1** Volts **230**
 Length of drop pipe **galv.** ft. capacity _____ p.p.m.
 Material of drop pipe _____
 Type: ☒ Submersible ☐ L.S. Turbine ☐ Reciprocating
☐ Jet ☐ Centrifugal ☐ _____

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.
Stevens Well Drilling Co. 27194
 License Business Name _____ License No. _____
 Address **Maple Plain MN55359**
 Signed **James Stevens** Date **12/8/78**
 Authorized Representative _____
 Name of Driller _____ Date _____

5/74 30M

Medina 118N 23W 16 ne ne sw

Distance and direction from road, intersection or street address and City of Well Location

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

Check map of well location.

Address Name

Block Number

Lot Number

FORMATION LOG	COLOR	MARKINGS OF FORMATION	FROM	TO
yellow			0	33
red clay & gravel-loose			33	40
red clay & gravel			40	63
blue			63	70
blue & coarse gravel-tight			70	81
dark loose gravel			81	89
pink clay & gravel			89	101
gray clay-stoney			101	103
coarse gravel			103	121
ite clay			121	123
gravel			123	126
gray clay			126	145
soft yellow sand (washed)			145	151
gray clay			151	164
tight gray clay			164	187
red clay & sand			187	202
aqua clay			202	216
light green shale-loose			216	225
red hard rock			225	226
pink to gray rock w/layers of shale			226	230
layers-soft shale & rock			230	265
hard shale & gray-green rock/bk spks			265	273
set casing			273	273
rock-seamy			273	328

REMARKS, ELEVATION, SOURCE OF DATA, etc.

CEV3327

STEVE SVON

MINN. GEOLOGICAL SURVEY COPY

Bob Barbarossa
Address **Medina**

4. WELL DEPTH (completed) **328** Date of Completion **4/20/78**

5. ☐ Casing tool ☐ Reverse ☐ Driven ☐ Dig
☐ Mudflow end ☐ Air ☐ Drilled ☐
☒ Rotary ☐ Jammed ☐ Power Auger

6. USE
☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigative ☐ Municipal ☐ Commercial
☐ Test Well ☐ Air Conditioning ☐

7. CASING
☒ Black ☐ Threaded ☐ Welded
☐ Galv. ☐ Drive Shoe? Yes ☒ No ☐
6 in. to **273** ft. Weight **19** lbs./ft. **1-18-273**
 in. to ft. Weight lbs./ft. **7-18-328**
 in. to ft. Weight lbs./ft.

8. SCREEN
 Or open hole from **273** ft. to **328** ft.
 Type _____ Dia. _____
 Slot/Screen _____ Length _____ FITTINGS:
 Set between _____ ft. and _____ 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 **60** p.p.m.
 _____ ft. after _____ hrs. pumping p.p.m.

11. WELL HEAD COMPLETION
☒ Pressure adapter ☐ Basement offset ☐ At least 12" above grade

12. Well grouted?
☐ Yes ☒ No Cn. Yds. _____
☐ Neat Cement ☐ Bestmixture ☐
 Depth: from _____ ft. to _____ ft.
 from _____ ft. to _____ ft.

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

14. PUMP
 Date installed **8/31/78**
☐ Not installed
 Manufacturer's Name **Dempster**
 Model Number **HF3-150-82** HP **1 1/2** Vols **230**
90 Length of drop pipe ft. capacity **24** p.p.m.
galv. Material of drop pipe
 Type: ☒ Submersible ☐ L. S. Turbine ☐ Reciprocating
☐ Jet ☐ Centrifugal ☐

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.
Stevens Well Drilling Co. 27194
 Licensee Business Name Licensee No.
 Address **Maple Plain MN 55359**
 Signed **James Stevens** Date **11/21/78**
 Authorized Representative
James Stevens Date _____
 Name of Driller

Township Name **Medina** Township Number **118-N** Range Number **23-W** Section No. **16** Fraction **nw** "no" "nw"

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.

W

E

S

N

1 mi.

1 mi.

Addition Name

Block Number

Lot Number

FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Yellow Clay			0	34
Blue Clay			34	77
Blue Sandy Clay			77	89
Dirty Gravel			89	96
Blue Sticky Clay			96	153
Red Clay			153	157
Black Clay			157	159
Coarse Tight Gravel			159	163
Light Grey Clay			163	168
Blue Clay			168	176
Brown Sandy Clay			176	181
Blue Soupy Sandy Clay			181	203
Broken up Red Rocks & Gravel			203	237
Shale			237	241
Hard Rock			241	251

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

MINN. GEOLOGICAL SURVEY COPY

3. PROPERTY OWNER'S NAME
Address **Bartlett McCarthy**
3003 Hamel Road
Medina

4. WELL DEPTH (completed) **251** ft. Date of Completion **1/20/79**

5. ☐ Casing ☐ Reverse ☐ Filter ☐ Plug
☐ Mudline seal ☐ Air ☐ Sealed ☐
☐ Rusty ☐ Jetted ☐ Power Auger

6. USE
☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Municipal ☐ Commercial
☐ Test Well ☐ Air Conditioning

7. CASING
☒ Black ☒ Threaded
☐ Galv. ☐ Welded
Surface ☐ ft.
Drive Shoe? Yes ☐ No ☐
4 in. to 241 ft. Weight 11 lbs./ft. 6 3/4 in. to 241 ft.
in. to ft. Weight lbs./ft. 3 7/8 in. to 251 ft.
in. to ft. Weight lbs./ft.

8. SCREEN
Make ☐ Or open hole from 241 ft. to 251 ft.
Type ☐ Dia. ☐
Slot/Groove Length ☐ FITTINGS
Set between ft. and ft.
ft. and ft.
ft. and ft.

9. STATIC WATER LEVEL
128 ft. ☐ below ☐ above ☐ surface Date Measured **1/20/79**

10. PUMPING LEVEL (below land surface)
ft. after hrs. pumping 25 p.p.m.
ft. after hrs. pumping p.p.m.

11. WELL HEAD COMPLETION
☐ Pressure adapter ☐ Measurement offset ☐ At least 12" above grade

12. Well grouted?
☐ Yes ☒ No Co. Yds. ☐
☐ Neat Cement ☒ Seabionic ☐
Depth: from ft. to ft.
from ft. to ft.

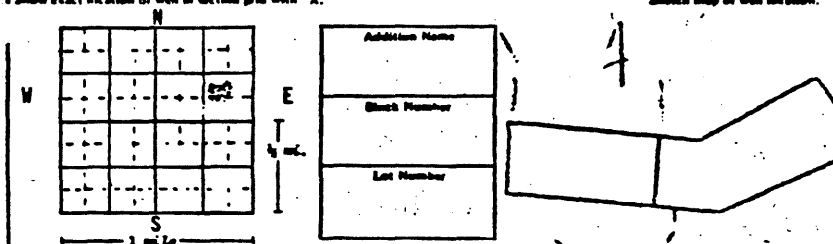
13. Nearest sources of possible contamination
legal direction type
Well dewatered upon completion? Yes ☒ No ☐

14. PUMP
Date Installed **2/13/79**
☐ Not Installed
Manufacturer's Name **Dempster**
Model Number **HP3-100-S2** HP **1** Volts **230**
Length of drop pipe **147** ft. capacity **18** p.p.m.
Material of drop pipe **galv.**
Type: ☒ Submersible ☐ L.S. Turbine ☐ Reciprocating
☐ Jet ☐ Centrifugal ☐

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.

Stevens Well Drilling Co. 27194
Address **Maple Plain MN55359**
Signed **B. McCarthy** 3/2/79
John Dvorak Date
Name of Driller

Indubani Trail - Independence, Mo.



FORMATION LOG	COLOR	THICKNESS OF FORMATION	FROM	TO
Clay & Gravel	Yellow		0	7
Gravel	Dark		17	13
Clay & Gravel	Yellow		13	37
Clay & Gravel	Red		37	60
Sand	Brown		60	82
Clay	Yellow		82	102
Clay & Gravel	Red		102	114
Gravel	Dark		114	140
Clay & Gravel	Red		140	168
Sand & Gravel	Dark		168	172
Sand	Brown		172	235
Gravel	Dark		235	274

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

MINN. GEOLOGICAL SURVEY COPY

Address 6233 Baker Road Eden Prairie, MN

4. WELL DEPTH (completed) 274' Date of Completion 12-22-77

5. ☐ Cable tool ☐ Reverse ☐ Driven ☐ Dig
☐ Mudflow mud ☐ Air ☐ Shovel ☐
☐ Rotary ☐ Jetted ☐ Power Auger

6. USE
☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Municipal ☐ Commercial
☐ Test Well ☐ Air Conditioning ☐

7. CASING HEIGHT: Above/Below
☒ Black ☒ Threaded Surface 1 ft.
☐ Galv. ☐ Welded Drive Shoes? Yes No X
4 in. to 270 ft. Weight 10.73 lbs./ft.
in. to ft. Weight lbs./ft.
in. to ft. Weight lbs./ft.

8. SCREEN Make Johnson Or open hole from ft. to ft.
Type Stainless Steel Dia. 4
Slot/Groove 15 Length 3
Set between 268 ft. and 274 ft. FITTINGS:
ft. and ft.
ft. and ft.

9. STATIC WATER LEVEL 110 ft. below land surface Date Measured 12-22-77

10. PUMPING LEVEL (below land surface)
ft. after 3 hrs. pumping 20 air p.p.m.
ft. after hrs. pumping p.p.m.

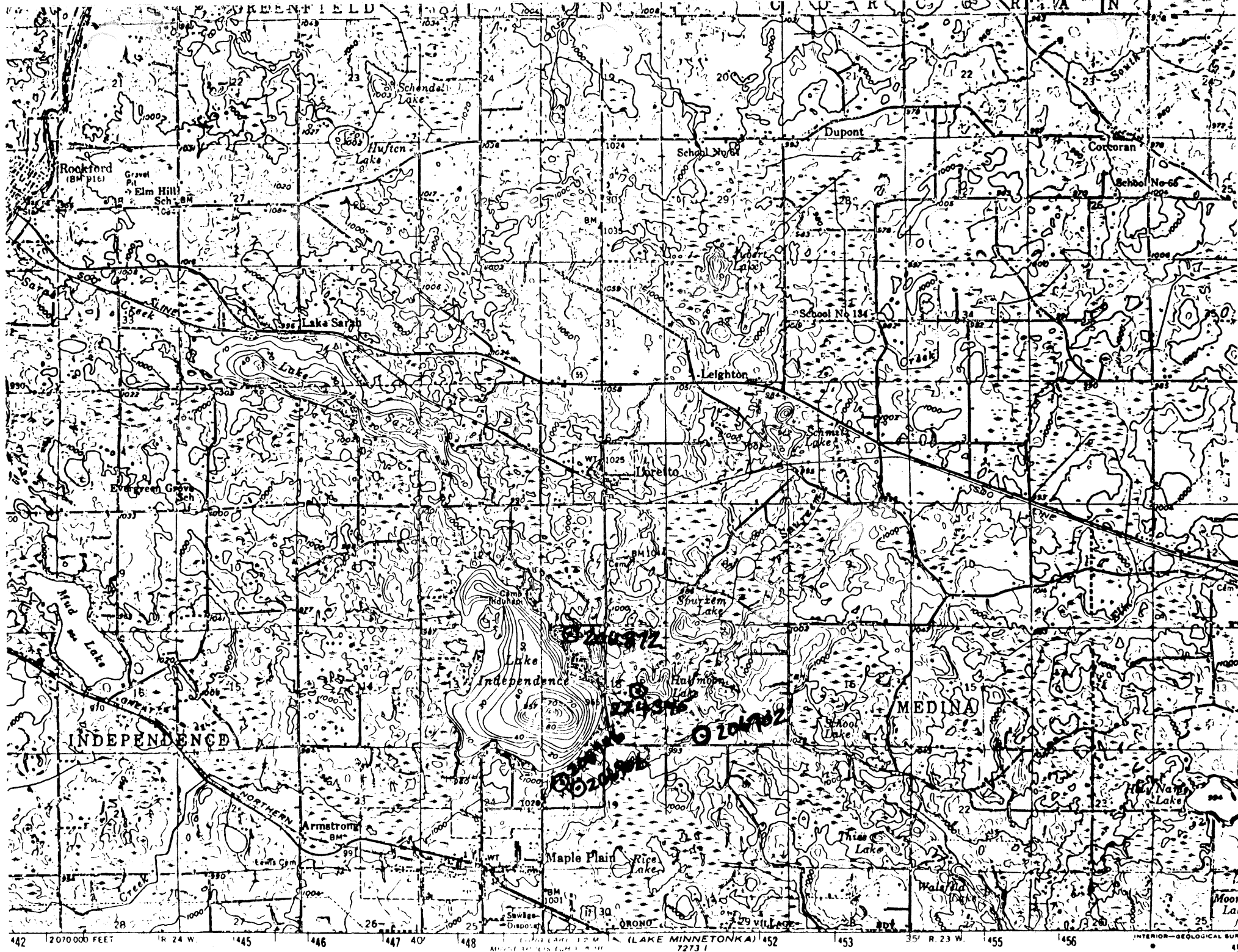
11. WELL HEAD COMPLETION
☒ Screen adapter ☐ Basement offset ☐ At least 12" above grade

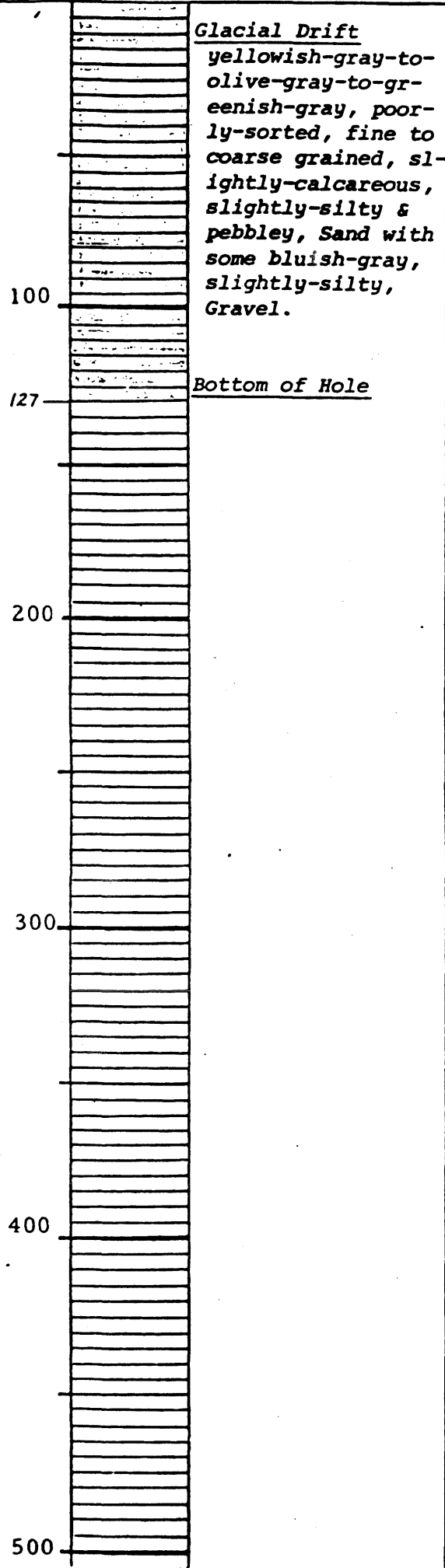
12. Well grouted? ☒ Yes ☐ No Co. Yds.
☐ Neat Cement ☒ Gravel ☐
Depth: from ft. to ft.
from ft. to ft.

13. Nearest sources of possible contamination
ft. direction type
Well disinfected upon completion? Yes ☒ No ☐

14. PUMP Date installed 5-1-78
Not installed ☐
Manufacturer's Name Jacuzzi
Model Number 154M HP 1 230
Length of drop pipe 126 ft. capacity 12 p.p.m.
Material of drop pipe 1 1/4 galv.
Type: ☒ Submersible ☐ L.S. Turbine ☐ Reciprocating
☐ Jet ☐ Centrifugal ☐

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.
E. H. Renner & Sons, Inc. 27015
License Business Name License No.
Address 6300 Industry Ave. NW Anoka, MN 55301
Signature Dave Black Date 5-15-78
Name of Driller Date 5-15-78
5/74 JOM
7/76 JOM





Minnesota Geological Survey Minneapolis, Minnesota		
Name Dan Cochran Well		State Minnesota
Town -----	County Hennepin	Loc.
Contractor Driller W. D. Stevens Well Drilling		Sec. 18 dab
Drilling Dates completed October, 1970		T. N., R. W 118 23
Casing Record		
S.W.L. G.P.M. D.D.		
Remarks Well drilled for the Henn. Co.		Elev. 960±10'
Park Reserve.	M.G.S. drillers log made only.	T.D. 127'
Logged by D. B. Milles		M.G.S. No. 615

Explanation
of Colors

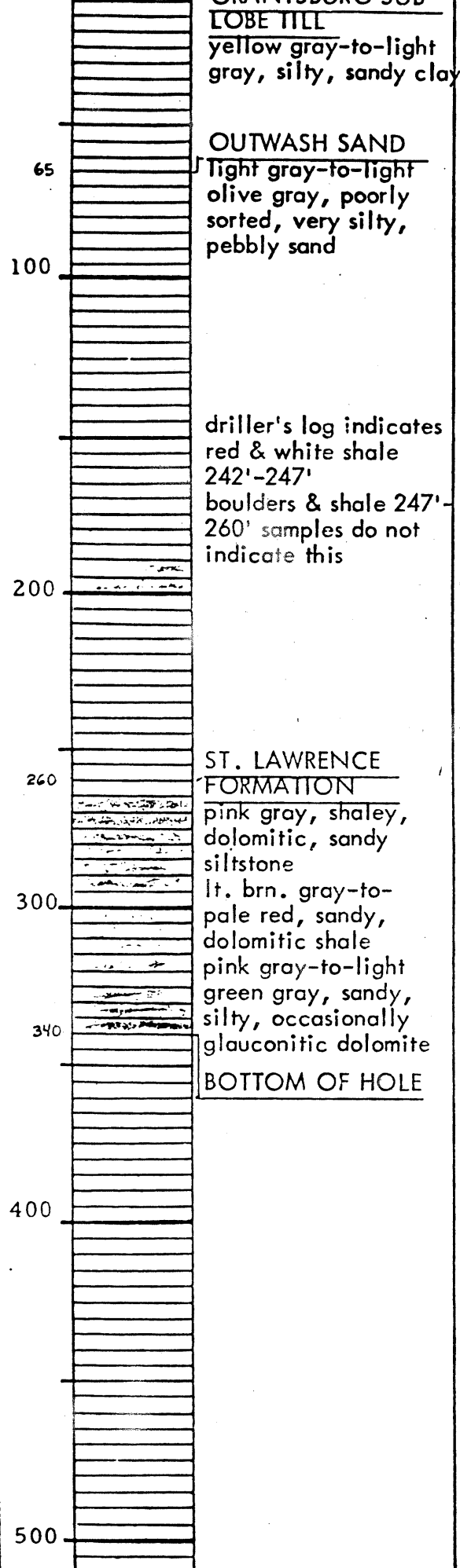
- Soil
- Silt
- Sand & Gravel
- Shale
- Sandstone
- Limestone
- Dolomite
- Clay
- No. Samples

SAMPLE ANALYSIS

Footage	Dominant Lithology	Color	Grain or Xl size	Modified by	Lithol unit
0-5	S	10YR 6/2 YEL-brn	F-M grn	(SRT), ANG-subang, Q ₃ + th Fld; w/ SLT	Soil
5-10	"	"	"	Qs above; (calc)	GLACI DRIFT
10-15	"	"	"	Qs above; w/ th Pbl Gr	
15-20	"	"	F-Crs grn	Qs above	
20-25	S	5Y 7/2 YEL-GY	F-Crs grn	(SRT), subang-subrdd, Q ₃ + (FLD); w/ th alt; (calc)	
25-30	"	"	"	Qs above; w/ th Pbl Ba + Gr	
30-35	"	5Y 6/1 OLV-GY	"	Qs above; w/ (GRAN) SLTST, (Ba) + (Gr)	
35-40	"	"	F-M grn	Qs above; w/ (SLT)	
40-45	"	"	"	Qs above; w/ (Pbl + GRAN) Dol + (Ig) rx	
45-50	"	5GY 6/1 GN-GY	"	Qs above; w/ th Pbl Gr + SLTST; w/o GRAN Dol + Ig rx	
50-55	"	"	"	Qs above	
55-60	"	"	"	Qs above; w/ (GRAN) Dol + Q ₃	
60-65	"	"	F-Crs grn	Qs above; w/ (Pbl + GRAN) Dol + (Ig) rx	
65-70	"	"	F-M grn	Qs above; w/ th Pbl + GRAN Dol + (Ig) rx	
70-75	"	5Y 6/1 OLV-GY	F grn	Qs above; w/o Pbl or GRAN Dol + Ig rx; w/ SLT	
75-80	"	"	F-Crs grn	Qs above; w/ (Pbl) Ig rx, Q ₃ + (Dol); w/ (SLT)	
80-88	"	5GY 6/1 GN-GY	"	Qs above	
88-90	"	5Y 6/1 OLV-GY	"	Qs above; w/ th Pbl Ig rx, Q ₃ + (Dol)	

MGS

[illegible]



Minnesota Geological Survey
Minneapolis, Minnesota

Name Henn. Co. Park Board		State Minnesota
Town	County Hennepin	Loc.
Contractor Driller Don Rogers Well Co.		Sec. <u>CDCBCC</u> 17 cdcc
Drilling Dates completed Oct., 1971		T. N., R. W 118 23
Casing Record		
S.W.L. G.P.M. D.D.		
Remarks mica used 210-250'		Elev. <u>940±10</u> 1040±5
		T.D. 340'
Logged by B. Olsen		M.G.S. No. 713

Explanation
of Colors

- Soil
- Silt
- Drift
- Sand & Gravel
- Shale
- Sandstone
- Limestone
- Dolomite
- Clay
- Siltstone
- No. Samples

DONALD A. ROGERS

WELL LOG and CONSTRUCTION RECORD

PHONE 935-2727

17555 DUCK LAKE TRAIL
EDEN PRAIRIE, MINN. 55345

DONALD A. ROGERS

Well Drilling and Repairs

m.g.s # 713

Owner Henn Co. Park Reserve Dist.

Location Hdqt's, Bldgs. Date Oct-12, 1971

LOG OF FORMATIONS

SWL

SWL

0	to	20	Yellow Clay	247	to	260	Boulders Shale
20	to	80	Blue Clay	260	to	265	Sandstone
80	to	135	Sandy Clay	265	to	290	Red Shale (hard)
135	to	195	Blue Clay	290	to	340	Shale (dolomitic hard)
195	to	242	Sand		to		
242	to	247	Red White Shale		to		

Well Design

Depth measured from _____

Screen Well Data

Make of Screen None

Size: Diam. _____ Length _____ Ft.

Slot size(s) _____

Location in well _____ to _____

Screen metal _____

Fittings: Top _____

Bottom _____

Other Screen data _____

Rock Well Data

Open borehole 6 "diam. 265 to 340

Well Test Data

{ 150 gpm } Static Water Level 118
{ _____ gph } Pumping Level 122 after
4 hours of pumping. (Drawdown ft.)

CASING STRINGS

Scale: 1" = _____ ft.

1.

0 to 265

6 "ID 6 7/8 "OD

Wt. _____ lbs. per ft.

Thrd. & Cpld. L

Welded _____

Drive Shoe L

Cemented L

Copper 20 ft.

2.

_____ to _____

_____ "ID _____ "OD

Wt. _____ lbs. per ft.

Thrd. & Cpld. _____

Welded _____

Drive Shoe _____

Cemented _____

3.

_____ to _____

_____ "ID _____ "OD

Sierra Co. Park Reserve

SAMPLE ANALYSIS

Footage	Dominant Lithology	Color	Grain or Xl size	Modified by	Lithol unit
0-5	Cl	slt gr vel gy	Cl	slt; w/ Fgm - Gmn Qz, Ig, Sh, Lst; w/ Pbl of same; calc s	
5-10	Cl	"	Cl	slt, w/ Fgm Gmn Qz, Ig, Lst, Sh, w/ (Pbl) Lst, Sh, (Ig); s; calc	
10-15	"	"	"	As above; w/ Pbl	
15-20	"	"	"	As above; w/ Pbl; s; slt	
20-25	"	nt very lt gy	"	slt; w/ Fgm - Gmn Qz, Ig, Lst, Sh, w/ Pbl Sh, Lst, (Ig); s; calc	
25-30	"	"	"	As above	
30-35	S	"	Fgm - Gmn	(slt), Ang-rdd Qz, Sh, Ig, Lst; w/ Pbl Ig, Sh; slt; Cl	
35-40	Cl	"	Cl	slt; w/ Fgm - Gmn Qz, Sh, Ig, Lst; w/ Pbl of same; s; calc	
40-45	"	"	"	As above	
45-50	"	"	"	As above	
50-55	"	"	"	As above	
55-60	"	nt lt gy	"	As above	
60-65	"	"	"	As above	
65-70	S	"	Fgm - Gmn	(slt), Ang-rdd Qz, Sh, Lst, (Ig); w/ Pbl Sh, Ig; slt; Cl; calc	
70-75	"	"	"	As above	
75-80	"	"	"	As above	
80-85	"	"	"	As above	

Henn. Co. Park Reserve

SAMPLE ANALYSIS

Footage	Dominant Lithology	Color	Grain or Xl size	Modified by	Litholo unit
85-90	S	^{N7} lt gy	Crsgn-Gran	srt, subang-rndd Q ₂ , Sh, Lst, Ig; w/(Pbl) Ig, Lst, Sh, srt, alc w/tr F-M gr S	
90-95	"	"	"	As Above	
95-100	"	"	"	As Above	
100-105	"	"	Fgr-Gran	(srt), Ang-rndd Q ₂ , Sh, Lst, Ig; w/Pbl Lst, Ig, Sh, srt; alc	
105-110	"	"	"	As Above	
110-115	"	"	"	As Above; w/(Pbl)	
115-120	"	"	"	As Above; w/(Pbl)	
120-125	"	"	"	As Above	
125-130	"	"	"	As Above	
130-135	"	"	"	As Above	
135-140	"	"	"	As Above; w/(Pbl)	
140-145	"	"	"	As Above; w/(Pbl)	
145-150	"	"	"	As Above; w/tr Pbl	
150-155	"	"	"	As Above	
155-160	"	"	"	As Above	
160-165	"	"	"	As Above; w/tr Pbl	
165-170	"	"	"	As Above; no Pbl	

Henn. Co. Park Board

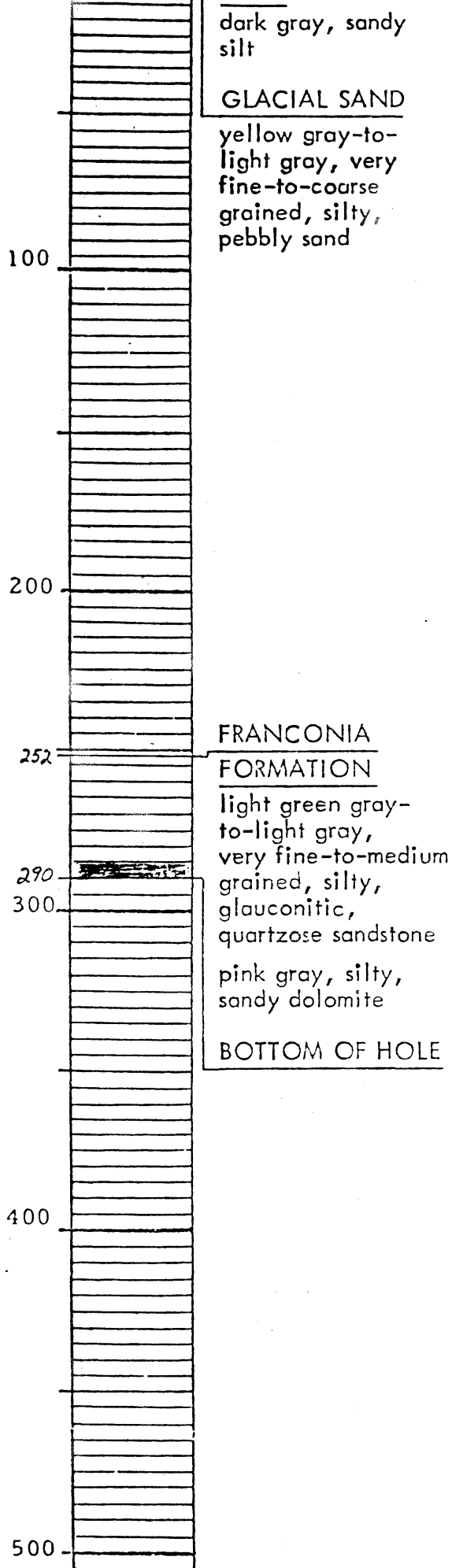
SA. PLE ANALYSIS

Footage	Dominant Lithology	Color	Grain or Xl size	Modified by	Litho uni
170-175	S	N7 H gy	Fgn-Gran	(srt), Ang-sub-mdd Qz, Sh, Ig, Lst, w/tr Pbl Sh, Ig, <u>slt</u> , calc	
175-180	"	"	"	As Above w/ Pbl Ig, Lst, Sh	
180-185	"	"	"	As Above	
185-190	"	"	"	As Above, w/ (Pbl) Lst	
190-195	Sl+	"	Sl+	srt, w/ Fgn-Gran Qz, Ig, Sh, Lst, w/tr Pbl Sh, <u>s</u>	
195-200	"	"	"	As Above, w/ (Pbl)	
200-205	S	"	Fgn-Gran	(srt), Ang-rndd Qz, Lst, Ig, Sh, w/ Pbl Lst, Sh, tr Ig, <u>slt</u> , calc	
205-210	"	"	"	As Above	
210-215	"	Sx G/I sh/gy	Fgn-Gran	(srt), Ang-rndd Qz, Sh, Lst Ig, <u>slt</u> , calc; mica used sample is difficult to analyze	
215-220	"	"	"	As Above, w/tr Pbl Ig, Lst	
220-225	"	"	"	As Above	
225-230	"	"	"	As Above, w/ Pbl Ig, Lst	
230-235	"	"	"	As Above, w/ Pbl Ig, Lst	
235-240	"	N7 H gy	"	(srt), Ang-rndd Qz, Sh, Lst, Ig, w/ Pbl Ig, Lst, Sh, tr Srt, <u>slt</u> , calc	
240-245	"	"	"	As Above; from 242-247' driller's log indicates red; white shale	
245-250	"	"	"	As Above from 247-260' driller's log indicates boulders; shale	
250-255	—	—	—	No sample	N 1

Henn Co. Park Board

SAMPLE ANALYSIS

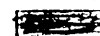
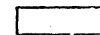
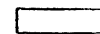
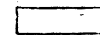
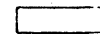
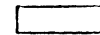
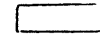
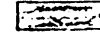
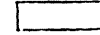
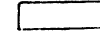
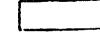
Footage	Dominant Lithology	Color	Grain or Xl size	Modified by	Lithologi unit
260-265	SHst	5YR 7/1 lt. brn	Sl+	slt; w/lt grn. qz brn Sh; dol; w/Fgrn Q ₂ ; s	
265-270	Sh	pale red light brn	Cl	slt; w/Fgrn Q ₂ ; s; dol	
		to lt grn			
270-275	"	"	"	As Above	
275-280	Dol	5YR 7/1 lt. ph brn gy	F xln	Sh; slt; w/tr Fgrn Q ₂	
280-285	Dol	pale red to very lt gy	F-M xln	slt; w/E-Fgrn Q ₂ ; s; w/tr lt grn Cl	
285-290	Dol	5YR 7/1 med lt grn gy	E-F xln	w/(E-Fgrn Q ₂); (S); w/tr lt grn Sh; slt	
290-295	"	"	"	w/E-Fgrn Q ₂ ; s; w/lt grn sltst; Cl; w/tr F-Mgrn Glc	
295-300	Slst	5Y 7/1 med lt grn gy	Sl+	w/E-Fgrn Q ₂ ; s; w/lt grn Cl; dol	
300-305	Dol	lt gy to very lt gy	E-F xln	w/E-Fgrn Q ₂ ; s; w/F-Mgrn Glc; w/(yellow stain); slt; tr Cl	
305-310	"	"	"	As Above; w/o yel sin	
310-315	"	n8 very lt gy	"	As Above; w/o yel sin	
315-320	"	pk gy to lt grn gy	"	w/E-Fgrn Q ₂ ; s; w/(F-Mgrn Glc); w/tr Cl; slt	
320-325	"	"	"	As Above	
325-330	"	very lt gy to pk gy	E-M xln	As above	
330-335	"	n8 very lt gy	E-F xln	As Above; s	
335-340	"	pale red to med lt grn gy	E-M xln	As Above; s	



Minneapolis, Minnesota

Name Morris T. Baker Park #1		State Minnesota																
Town	County Hennepin	Loc.																
Contractor Driller Stevens Well Co.		Sec. 19 bcabed																
Drilling Dates Completed 1973-74		T. N., R. W. 118 23																
Casing Record		<table border="1"> <tr><td></td><td></td><td></td><td></td></tr> <tr><td>0</td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> </table>					0											
0																		
S.W.L. G.P.M. D.D.																		
Remarks Bedrock contact is difficult to place because of drift contamination		Elev. 1000+10'																
Logged by B. Bloomgren		T. D. 290'																
		M.G.S. No. 948																

Explanation of Colors

-  Soil
-  Loess, Silt on Siltstone
-  Drift
-  Sand & Gravel
-  Shale
-  Sandstone
-  Limestone
-  Dolomite
-  Clay
- 
- 
-  No. Samples

2069 6 KOCKFORD QUAD 121 WELL RECORD 118-23-19BCABCD 1.1000±10

OUR NUMBER: W-21 APPROPRIATION NUMBER: 74-5112 PERMIT NUMBER: 74-5112

WELL LOCATION: 206906
 PARK BAKER WELL NO. 1
 CITY, VILLAGE, TOWNSHIP MEDINA
 SECTION 19
 TOWNSHIP 118
 RANGE 23
 LAT. 60019
 PARCEL 5569
 FORMER OWNER NEW WELL

WELL INFORMATION: Elev. 1000±10
 CASING SIZE 4" Ø (289 Fr.) DEPTH OF WELL (FROM GRADE) 323 FEET
 ROCK OPEN HOLE SIZE CEMENTED UPPER FEET STATIC WATER LEVEL 122
 TESTED AT 75 G.P.M. FOR 26 HOURS PUMPING WATER LEVEL FEET DRAWDOWN OF
 PUMP INFORMATION: HAND PUMP w/ BUBBLER
 MAKE H.P. TYPE TANK SIZE & PRESSURE
 MOTOR SERIAL NUMBER PUMP SERIAL NUMBER
 DROP PIPE SIZE CAPACITY OF PUMP GALLONS PER MINUTE
 SIZE DATE INSTALLED

COMMENTS:
 M.G.S. # 948

SCREEN INFORMATION: None
 SIZE MAKE SLOT OR GUAGE NUMBER
 LOCATION IN WELL TO SCREEN METAL FITTINGS: TOP BOTTOM

RECORD OF TEST PUMPING (DATE:)
 STATIC WATER LEVEL G.P.M. HOURS PUMPING LEVEL
 STATIC WATER LEVEL G.P.M. HOURS PUMPING LEVEL
 STATIC WATER LEVEL G.P.M. HOURS PUMPING LEVEL
 STATIC WATER LEVEL G.P.M. HOURS PUMPING LEVEL
 STATIC WATER LEVEL G.P.M. HOURS PUMPING LEVEL
 STATIC WATER LEVEL G.P.M. HOURS PUMPING LEVEL
 STATIC WATER LEVEL G.P.M. HOURS PUMPING LEVEL
 STATIC WATER LEVEL G.P.M. HOURS PUMPING LEVEL

BACTERIOLOGY REPORT (DATE 5/10/74) (ANALYZED BY HICKOX & ASS.)

COLIFORM BACTERIA	NITRITE NITROGEN	NITRATE NITROGEN	SURFACTANTS	ABS
NEGATIVE	0.009 MG/L	0.79 MG/L	0.01 MG/L	

DEPTH LOG	(DRILLING DATES: START 4/24/74 FINISH 4/25/74)	(DRILLED BY STEVENS WELL CO.)	GREEN SHALE & GRAVEL	GREEN SHALE	HARD ROCK
BLACK DIRT	YELLOW CLAY	BLUE CLAY	BLUE CLAY	GRAVEL	GRAVEL
25	75	100	100	125	125

orris T. Barker Park #1

118-23-196CAB.d Elev. 1010±10'

Footage	Dominant Lithology	Color	Grain or Xl size	Modified by	Litho uni
0-5	Slt	N4 Med. DK gy	Slt-CI	to Calc; w/E-Crg-m, Qz, Ig, (Dol); w/S; w/tr Grn; Ig; w/tr Pl; Ig, w/tr Pl; Ig, (Dol)	Soil
5-10	S	5Y 7/2 yel gy	(E) F-Crg-m	(ext); Aug-Rnd; Qz, Ig, (Lst) (Dol); Slt; Calc; w/tr Grn; Ig, (Dol); w/Lgy Slt	
10-15	"	N7 Lgy	(E) "	As Above	
15-20	"	"	(E) "	As Above; w/(Grn)	
20-25	"	"	(E) "	As Above; w/(Grn)	
25-30	"	"	(E) "	As Above; w/(Grn)	
30-35	"	"	(E) "	As Above; w/(Grn)	
35-40	"	"	(E) "	As Above; w/(Grn)	
40-45	"	"	(E) "	As Above; w/(Grn)	
45-50	"	"	(E) "	As Above; w/(Grn)	
50-55	"	"	(E) "	As Above; w/(Grn)	
55-60	"	"	(E) "	As Above; w/(Grn)	
60-65	"	"	(E) "	As Above; w/(Grn)	
65-70	"	"	(E) "	As Above; w/(Grn)	
70-75	"	"	(E) "	As Above; w/(Grn)	
75-80	"	"	(E) "	As Above; w/(Grn)	
80-85	"	"	(E) "	As Above; w/(Grn)	
85-90	"	"	(E) "	(ext); Aug-Rnd; Qz, Ig, (Lst) (Dol); Slt; Calc; w/(Grn) Ig, Qz, (Dol); w/tr Pl; w/Lgy silt chunks	

M.T. Baker Park #1

SAMPLE ANALYSIS

Footage	Dominant Lithology	Color	Grain or Xl size	Modified by	Litholog unit
90-95	S	N7 ltgy	(F) E - Grgs	(srt); Ang-Rnd; Qz, Ig, (Dol), (St); Cals; w/ltgy Slt chunks	
95-100	"	"	(F) "	As Above	
100-105	"	"	(F) "	As Above	
105-110	"	"	(F) "	As Above	
110-115	"	"	(F) "	As Above	
115-120	"	"	(F) "	As Above	
120-125	"	"	(F) "	As Above	
125-130	"	"	(F) "	(srt); Ang-Rnd; Qz, Ig, (Dol); (SH); Cals; w/ltgy Slt chunks w/Grn, Ig, Qz, (Dol); w/lt Pbl	
130-135	"	"	(F) "	As Above; w/lt Pbl	
135-140	"	"	(F & Cvs) "	As Above; w/lt Pbl; w/ltgy Slt chunks; w/Grn	
140-145	"	"	(F & Cvs) "	(srt); Ang-Rnd; Qz, Ig, (Dol); (SH); Cals; w/ltgy Slt chunks w/Grn, Ig, Qz, (Dol); w/lt Pbl	
145-150	"	"	(F) "	As Above; Slt	
150-155	"	"	(F & Cvs) "	As Above; Slt	
155-160	"	"	(F & Cvs) "	As Above; Slt	
160-165	"	"	(F) "	As Above; Slt	
165-170	"	"	(F & Cvs) "	As Above; Slt	
170-175	"	"	(F & Cvs) "	As Above; Slt	
175-180	"	"	(F) "	As Above; Slt	

206705

SAMPLE ANALYSIS

Y.T. Baker Park #1

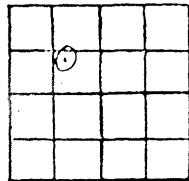
Footage	Dominant Lithology	Color	Grain or Xl size	Modified by	Litho uni
180-195	S	N7 ltgy	(F-M) F-Lvsgrn	(set); Aug-Rud; Qtz, Ig, (Dol)(Lst); Sit; Calc; w/(Grn) Ig, Qtz, Dol; w/(Pb)	Q.
195-190	"	"	(F&Cvs)	(set); Aug-Rud; Qtz, Ig, (Dol)(Lst); (Sit); (Calc); w/(Grn) Ig, Qtz, Dol; w/tr, w/ltgy Sit chunks	Pbl, I.
190-195	"	"	(F&Cvs)	As Above; w/(Pbl); Sit	
195-200	"	"	(F&Cvs)	As Above; w/(Pbl); w/tr pyr	
200-205	"	"	(F&Cvs)	As Above	
205-210	"	"	(F&Cvs)	As Above; w/(Pbl)	
210-215	"	"	(F&Cvs)	As Above; w/(Pbl)	
215-220	"	"	(F&Cvs)	As Above; w/(Pbl)	
220-225	"	"	(F-Cvs)	As Above; Sit; w/tr pyr	
225-230	"	"	(F-Cvs)	As Above	
230-235	"	"	(F-Cvs)	As Above; Sit	
235-240	"	"	(F-Cvs)	As Above; Sit; w/tr pyr	
240-245	"	"	(F-Cvs)	As Above; Sit; w/tr pyr	
245-250	"	"	(F-Cvs)	As Above; Sit	
250-255	Sst	50Y6/1 grngy	(F) F-Lign	(set); Aug-Rud; Pros Qtz; (SH); (Dol); w/(Glc); w/drift cementation	252?
255-260	"	"	(F)	As Above; w/tr Glc	
260-265	"	N7 ltgy	(F)	As Above; w/tr Glc	
265-270	"	"	(F)	As Above; dol; w/tr Glc	

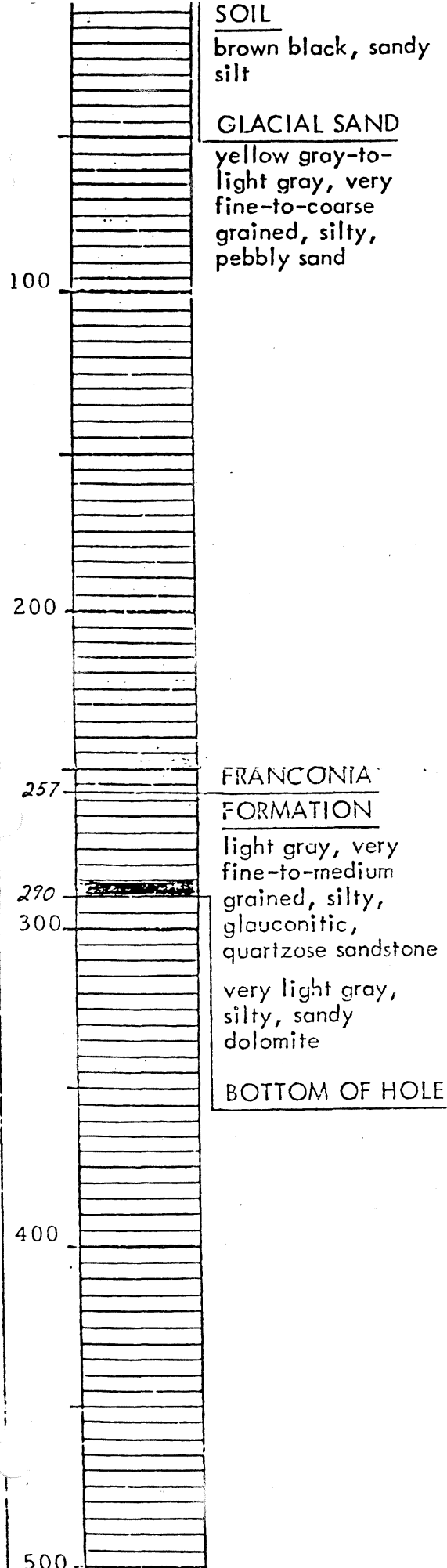
SAMPLE ANALYSIS

M.T. Baker Park #1

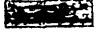
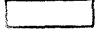
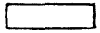
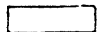
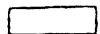
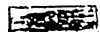
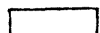
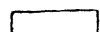
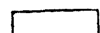
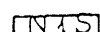
[illegible]

Minnesota Geological Survey
Minneapolis, Minnesota

Name Morris T. Baker Park #2		State Minnesota
Town	County Hennepin	Loc.
Contractor Driller Stevens Well Co.		Sec. BDE AB 19 1st
Drilling Dates Completed 1973-74		T. N. R. W 118 23
Casing Record		
S.W.L. G.P.M. D.D.		
Remarks Bedrock contact is difficult to place because of drift contamination		Elev. 1030 1031.0 1010 290'
Logged by B. Bloomgren		M.G.S. No. 949



Explanation
of Colors

-  Soil
-  Loess, Silt on Siltstone
-  Drift
-  Sand & Gravel
-  Shale
-  Sandstone
-  Limestone
-  Dolomite
-  Clay
- 
- 
-  No. Samples

JR NUMBER: W-20
 WELL LOCATION: 206903
 NAME: BAKER WELL NO. 2
 COUNTY, VILLAGE, TOWNSHIP: MEDINA
 SECTION: 19
 TOWNSHIP: 118
 RANGE: 23
 LOT: 60019
 PARCEL: 5569
 FORMER OWNER: NEW WELL

COMMENTS:
 M.G.S. # 949

APPROPRIATION NUMBER: 74-5112 PERMIT NUMBER: 74-5112
 WELL INFORMATION: Elev. 1030 ± 10
 CASING SIZE: 4" φ (287 Feet) DEPTH OF WELL (FROM GRADE): 306 FEET
 ROCK OPEN HOLE SIZE: CEMENTED UPPER: FEET STATIC WATER LEVEL: 10
 TESTED AT: 50 G.P.M. FOR 10 HOURS PUMPING WATER LEVEL: FEET DRAWDOWN OF:
 PUMP INFORMATION: HAND PUMP w/ BOOBLER
 MAKE: H.P. TYPE: TANK SIZE & PRESSURE:
 MOTOR SERIAL NUMBER: PUMP SERIAL NUMBER:
 DROP PIPE SIZE: CAPACITY OF PUMP: GALLONS PER MINUTE
 SIZE: DATE INSTALLED: 5/10/74
 SCREEN INFORMATION: NONE
 SIZE: MAKE: SLOT OR GAUGE: NUMBER:
 LOCATION IN WELL: TO: SCREEN METAL: FITTINGS: TOP: BOTTOM:

RECORD OF TEST PUMPING (DATE:)

STATIC WATER LEVEL	G.P.M.	HOURS	PUMPING LEVEL

BACTERIOLOGY REPORT (DATE 5/10/74) (ANALYZED BY HICKOK & ASS.)

UNIFORM BACTERIA	NITRITE NITROGEN	NITRATE NITROGEN	SURFACTANTS	A B S
NEGATIVE	0.011 MG/L	0.48 MG/L	0.01 MG/L	

PTH LOG (DRILLING DATES: START 4/18/74 FINISH 4/19/74) (DRILLED BY STEVENS WELL CO.)

PTH LOG	YELLOW CLAY	BLUE CLAY & GRAVEL	GRAVEL	BLUE CLAY 6" 3L & GRAVEL	BLUE CLAY & GRAVEL	GRAVEL (LITTLE CLAY)	BLUE CLAY & GRAVEL	GRAVEL	RED	GREEN
ACK DIRT										

GREEN HARD
 28 TO 30

WELL LOG

	WELL #1 - H.C.P.R.D.
(	DEPTH - 324'
	CASING 289'
	OPEN HOLE 35'
0-3'	BLACK DIRT
3-25	YELLOW CLAY & GRAVEL
25-45	BLUE CLAY & LITTLE GRAVEL
45-100	BLUE CLAY W/LARGE AMTS OF GRAVEL
100-120	GRAVEL
120-130	BLUE CLAY & GRAVEL
130-175	GRAVEL
175-185	BLUE CLAY - (GUMMY)
185-215	GRAVEL
215-225	BLUE CLAY
225-255	GRAVEL
255-282	LAYERS OF GREEN SHALE & GRAVEL
282-289	GREEN SHALE
289-324	HARD ROCK
	CAPACITY - 75 GPM
	NO. 10
	NO. 10

Elev. 1010±10'



Lake Independence

#1 118-23-19 b c a b c d

#2 118-23-19 b d b b a d

CTY RD 24

CTY RD 19

Well No. 1 MGS # 948
Well No. 2 MGS # 949

MAPLE PLAIN

CTY RD 19

206703

H. N. Co.
PLE ANALYSIS

118-23-196dh bnd Elev. 1010±10'

Morris T. Baker Park #2

Footage	Dominant Lithology	Color	Grain or Xl size	Modified by	Lith u
				W/Plt Remains	Sci.
0-5	Slt	5YR2/1 brn blk	Slt-CI	to Calc; w/E-Cryst; R., Ig. (Dol); w/(S); w/Gr. (Dol); Ig.	
5-10	S	5Y6/2 yel gy	(F) F-Cryst	(Slt); Rng-Rnd; R., Ig. (Dol); Slt; Calc; w/(Gr. (Dol); Ig. (Dol); w/Plt; Ig.	
10-15	"	"	(F)	As Above	
15-20	"	yel brn gy	(F)	As Above	
20-25	"	"	(F)	As Above	
25-30	"	N7 lt gy	(F-M)	(Slt); Rng-Rnd; R., Ig. (Dol); Slt; Calc; w/Gr. (Dol); Ig. (Dol); w/Plt; Ig.	
30-35	"	"	(F-M)	As Above; w/(Gr. (Dol))	
35-40	"	"	(F-M)	As Above; w/(Gr. (Dol))	
40-45	"	"	(F-M)	As Above; w/(Gr. (Dol))	
45-50	"	"	(F-M)	As Above; w/(Gr. (Dol))	
50-55	"	"	(F-M)	As Above; w/(Gr. (Dol))	
55-60	"	"	(F-M)	As Above; w/(Gr. (Dol)); w/Plt; Calc	
60-65	"	"	(F-M)	As Above; w/(Gr. (Dol))	
65-70	"	N6 Med Hgy	(F-M)	As Above; w/(Gr. (Dol))	
70-75	"	N7 lt gy	(F-M)	As Above; w/(Gr. (Dol))	
75-80	"	"	(F-M)	As Above; w/(Gr. (Dol))	
80-85	"	"	(F-M)	As Above; w/(Gr. (Dol))	
85-90	"	"	(F-M)	As Above; w/(Gr. (Dol)); w/Plt	

M.T. Baker Park #2

SAMPLE ANALYSIS

Footage	Dominant Lithology	Color	Grain or Xl size	Modified by	Lithology unit
90-95	S	N7 ltgy	(F & Crs) F-Crs	(set); Aug-Rad; Qz, Ig (set & Pbl); silt (Alg; w/ (Grn) Ig, Pz, Pbl; w/ (Pbl) Ig) w/ (ltgy silt chunks)	
95-100	"	"	"	As Above; (silt)	
100-105	"	"	"	As Above; (silt); w/ Pbl; w/ tr pyx	
105-110	"	"	"	As Above; (silt); w/ Grn	
110-115	"	"	"	As Above; w/ Grn	
115-120	"	"	"	As Above; (silt); w/ Grn	
120-125	"	"	"	As Above; (silt)	
125-130	"	"	"	As Above; (silt)	
130-135	"	"	"	As Above; (silt); w/ tr pyx; w/ Grn; w/ tr Pbl	
135-140	"	"	"	As Above; (silt); w/ tr Pbl	
140-145	"	"	"	As Above; w/ tr Pbl	
145-150	"	"	"	As Above; w/ Grn; (silt)	
150-155	"	"	"	As Above; (silt); w/ tr Pbl	
155-160	"	"	"	As Above; w/ tr Pbl; (silt)	
160-165	"	"	"	As Above; (silt); w/ tr Pbl	
165-170	"	"	"	As Above; (silt); w/ tr Pbl; w/ ltgy silt chunks	
170-175	"	"	"	As Above; (silt); w/ tr pyx	
175-18"	"	"	"	As Above; tr Pbl; w/ ltgy silt chunks	

M. T. Baker Park #2

SA LE ANALYSIS

Footage	Dominant Lithology	Color	Grain or Xl size	Modified by	Lithol unit
180-185	S	N7 ltgy	(F-M) F-Crsgrn	(Set); Ang-Rud; Qc, To, (Dol) (Slt); Slt; Ck; w/(Grn) Ig, Oz, Dol; w/(Pb) Ig, Oz	
185-190	"	"	(F-GS) "	As Above; w/tr pyr; w/ltgy silt chunks; (Slt)	
190-195	"	"	(F-GS) "	As Above; w/tr pyr; (Slt)	
195-200	"	"	(F-GS) "	As Above; (Slt); w/tr Pb	
200-205	"	"	(F-M) "	As Above; (Slt)	
205-210	"	"	(F-GS) "	As Above; (Slt)	
210-215	"	"	(F-GS) "	As Above; (Slt); w/tr Pb; w/tr pyr	
215-220	"	"	(F-GS) "	As Above; (Slt); w/tr pyr	
220-225	"	"	(H-GS) "	As Above; (Slt); w/tr Pb	
225-230	"	"	(H-GS) "	As Above; (Slt); w/Grn	
230-235	"	"	(M-GS) "	As Above; (Slt); w/Grn	
235-240	"	"	(Crs) "	As Above; (Slt); w/Grn	
240-245	"	"	(M-GS) "	As Above; (Slt)	
245-250	"	"	(H-GS) "	As Above; (Slt)	
250-255	"	"	(Crs) "	As Above; (Slt); w/tr pyr	
255-260	Sst	"	(F) E-Mgrn	Set-Ang-Rud, Pros Qz; (Slt); (dol); w/(Ck) w/drift contains mica	125764
260-265	"	"	(F) "	As Above; dol	
265-270	"	"	(F) "	As Above; dol	

SAMPLE ANALYSIS

M.T. Baker Park #2

[illegible]

100

200

262

267

300

400

500

GLACIAL SILT,
SAND, AND GRAVEL
yellow brown-to-
pale gray red,
sandy silt

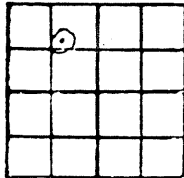
brown gray-to-yellow
brown, very fine-
to-coarse grained,
silty, pebbly
sand

MT. SIMON
FORMATION

light yellow orange,
very fine-to-
coarse grained,
silty, quartzose
sandstone

BOTTOM OF HOLE

Minnesota Geological Survey Minneapolis, Minnesota

Name Medina Test Well		State Minnesota
Town Medina	County Hennepin	Loc. 185ac
Contractor Driller E.H. Renner Well Co.		Sec. <u>BBADDD</u> 185ac
Drilling Dates 6/3/75 - 6/6/75		T. N., R. W 118 . 23 W
Casing Record		
S.W.L. G.P.M. D.D.		
Remarks Rotary drilled; samples		
at irregular intervals		
Logged by B. Bloomgren		Elev. 990±5'
		T.D. 267'
		M.G.S. No. 1087

Explanation of Colors

-  Soil
-   Silt 
-  Drift
-  Sand & Gravel
-  Shale
-  Sandstone
-  Limestone
-  Dolomite
-  Clay
- 
- 
-  NIS No. Samples

M.G.S.
#1087

WELL LOG

MAP CODE P-39

Date Started 3 June 19 75 Date Completed 6 June 19 75

Owner or Contractor McCombs & Knutson Address 12805 Olson Memorial Hwy

Job Location City of Medina TEST WELL Test Hole for 15" Well

Along Lake Ind.

Lot _____ Block _____ City Medina County Henn State of Minnesota

Well: _____ Cable Tool ☒ Rotary _____ Driven _____ Driller: Ray Renner Paul Walters

Cased with _____ inch _____ PE _____ T&C _____ - 0 Ft. Total Depth of Well 252 Ft. from grade

Feet of Open Hole N/A Finished in Gravel Static Water Level N/A Ft.

Tested at _____ gallons per min.

Drawn down of _____ feet.

Electro-log

Screen:

Size _____ dia. _____ ft. Make _____ Slot or Gauge _____

Pump:

Make -0- _____ HP. _____ Volts _____ Phase _____ Type _____ Tank _____

Motor Serial No. _____ Pump Serial No. _____ Drop Pipe _____ feet

Size _____ Capacity of pump _____ G.P.M. Date Installed _____

Pitless Adapter: Make _____ Offset _____ ft. Material _____ - Size _____ inch

Kind of Formation	Color of Formation	Started Depth	Ended Depth	Total Thickness of Formation	Remarks
CLAY	BROWN	0	57	57	STICKY
GRAVEL & CLAY	DARK	57	75	18	
GRAVEL & CLAY	GRAY	75	114	39	SOFT
CLAY	YELLOW	114	148	34	SOFT
SAND	DARK	148	178	30	
GRAVEL & CLAY	GRAY	178	198	20	
GRAVEL	DARK	198	252	54	LOTS OF WATER

Indiana Test Well 206872

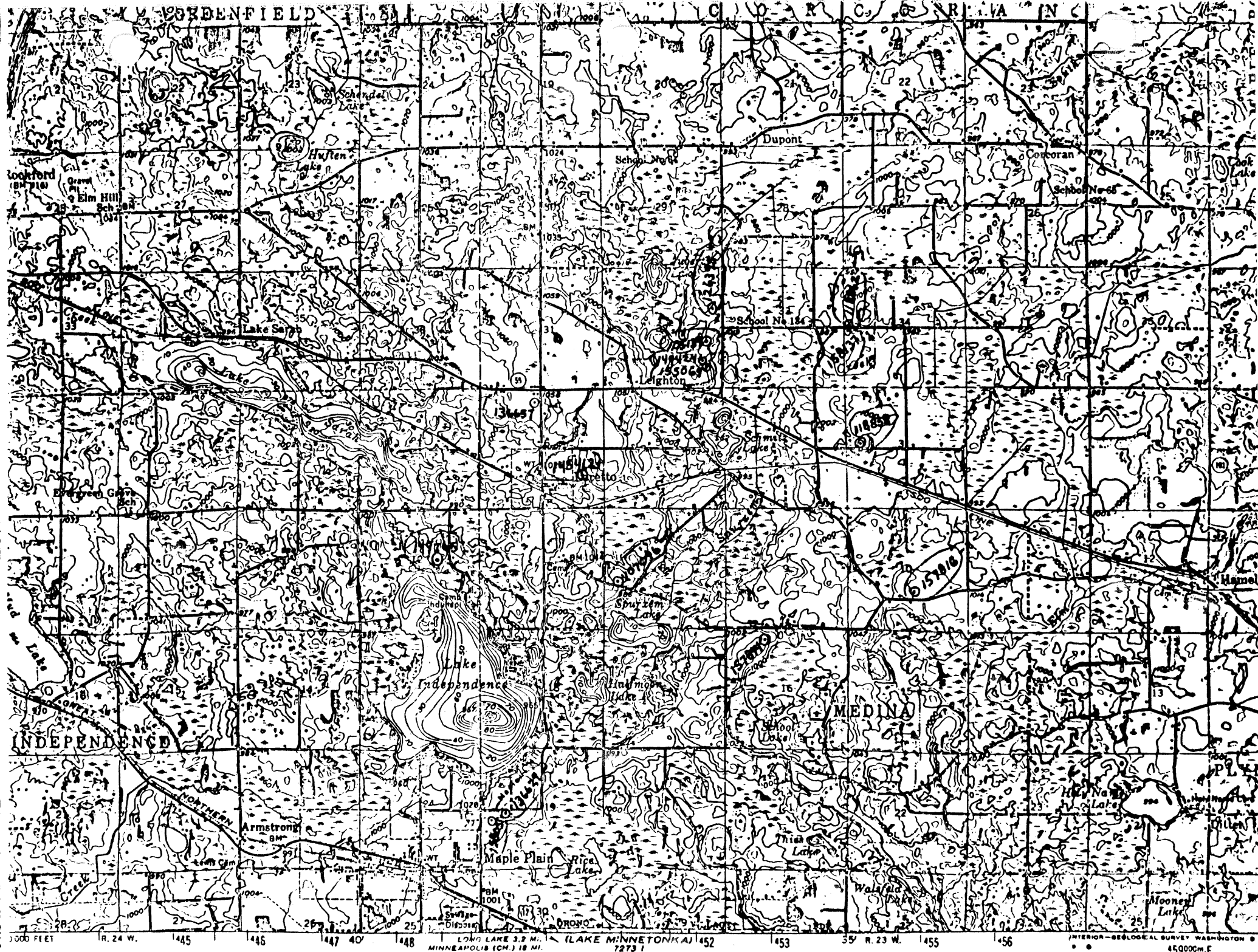
H. J. Pin Co
SA - LE ANALYSIS

118-23-18 bnc Elev. 970±5'

Footage	Dominant Lithology	Color	Grain or Xl size	Modified by	Litho. uni
0-10	SH	vy Pale yel brn	SH-Gl	Calc; w/E-Cr. gran; Qz; Ig. (Dol) (Lst); w/S; w/tr. Gran; Ig. Qz, Dol; w/tr. Phl.	
10-20	"	"	"	As Above	
20-30	"	"	"	As Above	
30-40	"	5Y 7/10 yel gy	"	As Above; w/o Phl	
40-50	"	"	"	As Above; w/o Phl	
50-60	S	brngy, crn, wh yel	(Ers) F-Cr. gran	(Lst); Ang-Rud; Qz, Ig. (Dol) (Lst); SH; Calc; w/Gran; Ig. Qz, Dol; w/tr. Phl.	
60-70	Gran	"	Phl	(Lst); Ang-Rud; Ig. Qz, (Dol); (SH); (Calc); w/E-gran-Gran; Ig. Qz, (Dol) (Lst)	
70-80	S	lt brn, gy, crn yel, wh	(F d Crs) F-Cr. gran	(Lst); Ang-Rud; Qz, Ig. (Dol) (Lst); SH; (Calc); w/Gran; Ig. Qz, Dol; w/tr. Phl; Ig.	
80-90	"	"	"	As Above	
90-100	SH	Pale gy Rd	SH-Gl	(Calc); w/E-Cr. gran; Qz, Ig. (Dol) (Lst); w/S; w/tr. Gran; Ig. Qz, Dol; w/tr. Phl.	
100-110	S	lt brngy	(F-H) F-Cr. gran	(Lst); Ang-Rud; Qz, Ig. (Dol) (Lst); SH; (Calc); w/Gran; Ig. Qz, Dol; w/tr. Phl.	
110-120	"	Pale yel gy brn	"	As Above; SH	
120-130	"	brngy yel gran	(F-H) "	As Above; w/tr. Gran	
130-140	"	"	(F) "	As Above	
140	"	lt gy, rd wh, brn brn, dgy	(Ers) F-gran-Gran	(Lst); Ang-Rud; Qz, Ig. (Dol) (Lst); (SH); (Calc); w/Phl; Ig. Qz, Lst	
210	Gran	"	Phl-Gran	(Lst); Ang-Rud; Ig. Qz, (Dol); (SH); (Calc); w/F-Cr. gran; Qz, Ig. (Dol) (Lst);	
220	"	"	"	As Above	
230	"	"	"	As Above	

SAMPLE ANALYSIS

[illegible]



ished by the Geological Survey

LONG LAKE 3.2 MI. (LAKE MINNETONKA) 452
MINNEAPOLIS (CN.) 18 MI.

SCALE 1:62500

INTERIOR-GEOLOGICAL SURVEY WASHINGTON
459000m. E.

County: Hennepin Fraction: NE 1/4 Section Number: 32 Township Number: 119 Range Number: 23
 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.

FORMATION LOG	COLOR	THICKNESS OF FORMATION	FROM	TO
Clay QTUG-clay	Blue		0	20
Clay QTUB-clay	Yellow		20	30
Clay QTUG-clay	Blue		30	150
Sand QTUB-SAND	Brown		150	180
Clay QTUG-clay	Blue		180	190
Water Sand	Brown		190	205
→ QFUB-SAND				
Field Check: As per: QUBA				
119-23-32 DAB DCA QBAA				
Elev. 1038				
Rocked at SE 121 D				

3. PROPERTY OWNER'S NAME: Ann Hetland
 Address: Horseshoe Bend, MN 55119

4. WELL DEPTH (completed): 205 ft. Date of Completion: 5-3-76

5. ☐ Cable tool ☐ Reverse ☐ Driven ☐ Dig
☐ Hollow rod ☐ Air ☐ Bored ☐ _____
☒ Rotary ☐ Jetted ☐ Power Auger

6. USE: ☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐ _____

7. CASING DIAM. Threaded ☐ Welded ☐ Surface _____ ft.
4" Black ☒ Galv. ☐ Weight _____ lbs./ft.
 in. to _____ ft. depth in. to _____ ft. depth in. to _____ ft. depth
 Drive Shoe? Yes ☐ No ☐

8. SCREEN Make Johnson Or open hole from _____ ft. to _____ ft.
 Type 5 Steel Dia. _____
 Slot/Gauge _____ Length _____ FITTINGS:
 Set between _____ ft. and _____ ft. _____ ft. and _____ ft. _____ ft. and _____ ft.

9. STATIC WATER LEVEL 150 ft. ☐ below ☐ above land surface Date Measured _____

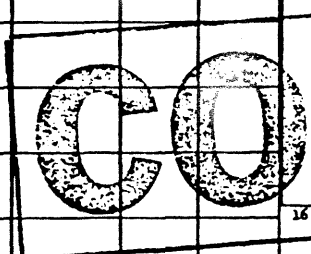
10. PUMPING LEVEL (below land surface) 160 ft. after 3 hrs. pumping 20 g.p.m.
 _____ ft. after _____ hrs. pumping _____ g.p.m.

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

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

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

14. PUMP Date installed _____
☐ Not installed
 Manufacturer's Name Johnson Model Number 319 HP _____ Volts _____
 Length of drop pipe 157 ft. capacity _____ g.p.m.
 Material of drop pipe Galv
☐ Submersible ☐ U.S. Turbine ☐ Reciprocating
☐ Centrifugal ☐ _____



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

MINN. GEOLOGICAL SURVEY COPY

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.

Torgerson Well Co. 3705
 Licensee Business Name License No. _____
 Address Rockford, Ill.
 Signed Bob Torgerson Date 5-11-76
 Authorized Representative
 Name of Driller _____ 7/74 30*

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

2212 CHIPPANAWA RD
Sketch map of well location.
R-23-W
NW 1/4
SW 1/8
1 mile

FORMATION LOG	COLOR	HANDNESS OF FORMATION	FROM	TO
TOP SOIL	2000-SOIL		0	4
HARD CLAY	QTUB-CLAY BLACK		4	23
YELLOW CLAY	QTUB-CLAY		23	85
BLUE CLAY	QTUG-CLAY HARD		85	121
CLAY	QTUG-CLAY GRAY		121	193
SHALE	CSLF-SHOS, SHLE WHITE		193	221
Rock SAND ROCK	SSLF		221	261

Agulien	CSLF-CSUF			
Field check				
11-23-3	REDCCB			
Elev. 1012				
Rock (791)	121 D			

MINN. GEOLOGICAL SURVEY COPY

2212 CHIPPANAWA RD HANDEL

4. WELL DEPTH (completed) 261' Date of Completion 5/13/77

5. ☒ Cable tool ☐ Reverse ☐ Driven ☐ Dig
☐ Hollow rod ☐ Air ☐ Bored ☐
☐ Rotary ☐ Jetted ☐ Power Auger

6. USE
☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐

7. CASING DIAM. Threaded ☒ 1 Welded ☐
Black ☐ 2 Galv. ☐
in. to 22 ft. depth Weight lbs./ft.
in. to ft. depth Drive Shoe? Yes ☒ No ☐
in. to ft. depth

8. SCREEN Make 113 ALE Or open hole from 221 ft. to 261 ft.
Type Dia.
Slot/Gauge Length FITTINGS:
Set between ft. and ft.
ft. and ft.
ft. and ft.

9. STATIC WATER LEVEL 80' ft. ☒ below ☐ above land surface Date Measured 5/13/77

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

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

12. Well grouted? ☐ Yes ☒ No Cu. Yds.
☐ Seal cement ☐ Bentonite ☐
Depth: from ft. to ft.
from ft. to ft.

13. Nearest source of possible contamination 70 feet direction type
Well disinfected upon completion? Yes ☐ No ☐

14. PUMP Date installed 6/10/77
☐ Not installed
Manufacturer's Name RED JACKET
Model Number HP 3/4 Volts 230
Length of drop pipe 123 ft. capacity 10 g.p.m.
Material of drop pipe STEEL
Type: ☒ Submersible ☐ L.S. Turbine ☐ Reciprocating
☐ Jet ☐ Centrifugal ☐

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.
PUMARKO WELL 27023
Licensee Business Name License No.
Address 6421 CITY RD 116 HANDEL
Signed Francis Pumarko Date 12/6/76
Authorized Representative
Francis Pumarko
Name of Driller
7/76 30M

County Name HEMN Fraction 34 Township Number T119.11 Range Number R23W

Distance and Direction from Road Intersections or Street Address and City of Well Location
21404 HORSE TRAIL HANNAH

Sketch map of well location.

R-23-W
S-W 1/4
S-44 VP

FORMATION LOG	COLOR	THICKNESS OF FORMATION	FROM	TO
OTUO-CLAY, SAND			0	90
CLAY SOFT SAND				
QUOUB-SAND, SILT			90	101
CANISY SANDY, BROWN				
ROCK S QUOU-VOBL			101	105
QUUG-CLAY, SAND				
CLAY SAND BLUE			105	129
SHAIL QUOUB-SAND			129	190
CSLF SANDS				
SOFT SAND ROCK DURIN			190	225
CSLF-SHLS				
HALEN SHALE GREEN			225	248
CSLF-SHLS				
HARD SHALE WHITE			248	277
SAND ROCK WHITE			277	327
REGLE-SANDS				
Field checked				
119-23-34	BCCCD B			
Flw. 1002				
Popl. SE 121D				
1002				
277				
723				

REMARKS, ELEVATION, SOURCE OF DATA, etc.
0.31 0.2020

MINN. GEOLOGICAL SURVEY COPY

3. PROPERTY OWNER'S NAME JOE BRAUN
 Address 21404 HORSE TRAIL HANNAH

1. WELL DEPTH (completed) 327 n. Date of Completion 12/11/77

2. ☒ Cable tool ☐ Reverse ☐ Driven ☐ Dig
☐ Hollow rod ☐ Air ☐ Bored ☐ 11
☐ Rotary ☐ Jetted ☐ Power Auger

6. USE ☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐

7. CASING DIAM. 4 Threaded ☐ Welded ☐ Surface 1 ft.
 Black ☒ Galv. ☐
 in. to 2 1/8 ft. depth Weight 1 No./ft.
 in. to _____ ft. depth
 in. to _____ ft. depth Drive Shot? Yes 4 No

8. SCREEN Make ALDIL Or open hole 80 ft. to 248 n.
 Type _____ Dia. _____
 Slot/Gauge _____ Length _____ FITTINGS:
 Set between _____ ft. and _____ ft.
 _____ ft. and _____ ft.
 _____ ft. and _____ ft.

9. STATIC WATER LEVEL 90 ft. ☐ below ☐ above land surface Date Measured 2/1/77

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

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

12. Well grouted? ☐ Yes ☒ No Cu. Yds. _____
☐ Seal cement ☐ Bentonite ☐ _____
 Depth: from _____ ft. to _____ ft.
 from _____ ft. to _____ ft.

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

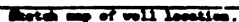
14. PUMP Date installed 1/2/77
☐ Not installed
 Manufacturer's Name JACK
 Model Number _____ HP 3/4 Volts 230
 Length of drop pipe 126 ft. capacity 10 g.p.m.
 Material of drop pipe 7/8" L
 Type: ☒ Submersible ☐ L.S. Turbine ☐ Reciprocating
☐ Jet ☐ Centrifugal ☐

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.

PUMARL WELLS 27023
 Licensee Business Name License No. _____
 Address 6421 CIV RD 114 HANNAH
 Signed James Brown Date 11/15/73
 Authorized Representative
 Name of Driller _____

7/74 504

Sketch map of well location.



4. WELL DEPTH (completed) 208 ft. Date of Completion 8-11-77

5. ☐ Cable tool ☒ Reverse ☒ Driven ☐ Dig
☐ Hollow rod ☐ Air ☐ Bored ☐
☒ Rotary ☐ Jetted ☐ Power Auger

6. USE ☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐

7. CASING
DIAM. 4 Threaded ☒ Welded ☐
Blank ☒ Galv. ☐
4 in. to 203 ft. depth Weight lbs./ft.
 in. to ft. depth Drive Shoes? Yes ☐ No ☐
 in. to ft. depth

8. SCREEN
Make Johnson Or open hole from 203 ft. to 208 ft.
Type 5" Steel Dia. 2"
Slot/Groove Length FITTINGS:
Set between ft. and ft.
 ft. and ft.
 ft. and ft.

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

10. PUMPING LEVEL (below land surface)
105 ft. after 3 hrs. pumping 20 g.p.m.
 ft. after hrs. pumping g.p.m.

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

12. Well grouted? ☐ Yes ☐ No Cs. Yds.
☐ Best cement ☐ Bentonite ☐
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 11-15-77
☐ Not installed
Manufacturer's Name
Model Number HP 1/2 Volts
Length of drop pipe 126 ft. capacity g.p.m.
Material of drop pipe Galvanized Steel
Type: ☒ Gasoline/Electric ☐ U.S. Turbine ☐ Reciprocating
☐ Jet ☐ Centrifugal ☐

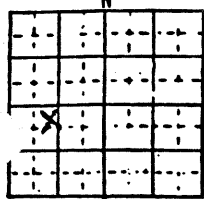
15. WATER WELL CONTRACTOR'S CERTIFICATION
 This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Name William Eugene Row License No.
 Address 815 Rockford Ma
 Signed W. Eugene Row Date 10-10-50
 Authorizing Representative

2028 CO-23-19
MAPLE PLAIN, MN

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

Sketch map of well location.



Additional Name
Block Number
Lot Number

FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Topsoil	Brown		0	2
Clay Quag	Yellow		2	21
Clay Quag	Gray		21	85
Gravel coarse	Yellow	loose	85	120
Clay Quag	dk blue		120	150
Gravel in clay	Gray	loose	150	162
Clay Quag	Dark gray		162	168
Sand dirty Quag	Dark	loose	168	180
Clay Quag	Gray		180	212
Clay Quag	Red	loose	212	221
Gravel (Sandstone?)	Gray	Soft	221	238
Clay Quag	Gray		238	241
Gravel coarse	dk	Hard	241	258
Rock & Shale	CSLF - DNT, SH		258	260
Rock & Shale	CSLF - DNT, SH		260	275
Rock & Shale	CSLF - DNT, SAND		275	297
Rock CSLF - SAND	DNT	Hard	297	307
Gravel Cherted	Ag - Sand	CSLF -		
118-23-19 CBANAC		CSLF		
Elev. 1045				
Rockford SW	121			

5. REMARKS, ELEVATION, SOURCE OF DATA, ETC.

10 US
258
787

MINN. GEOLOGICAL SURVEY COPY

4. WELL DEPTH (completed) 307		Date of Completion 5-16-77
5. ☐ Cable tool ☐ Reverse ☐ Driven ☐ Dig ☐ Hollow rod ☐ Air ☐ Bored ☐ _____ ☐ Rotary ☐ Jetted ☐ Power Auger		
6. USE ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Municipal ☐ Commercial ☐ Test Well ☐ Air Conditioning ☐ _____		
7. CASING ☐ Galv. ☐ Threaded ☐ Welded 4" in. to 24.0 ft. Weight _____ lbs./ft. HOLE DIAM. _____ ft. Drive Shoe? Yes ☒ No ☐ _____ in. to _____ ft. Weight _____ lbs./ft. _____ ft. to _____ ft. _____ in. to _____ ft. Weight _____ lbs./ft. _____ ft. to _____ ft.		8. SCREEN Make <u>_____</u> Or open hole from <u>21.0</u> ft. to <u>21.7</u> ft. Type <u>_____</u> Dia. <u>4"</u> Slot/Groove _____ Length _____ FITTINGS Set between _____ ft. and _____ ft. _____ ft. and _____ ft. _____ ft. and _____ ft.
9. STATIC WATER LEVEL <u>125</u> ft. below land surface ☐ above land surface ☐ 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 ☐ Well adapter ☐ Basement offset ☐ At least 12" above grade		
12. Well grouted? ☐ Yes ☒ No Cu. Yds. _____ ☐ Neat Cement ☐ Benitic ☐ _____ Depth: from _____ ft. to _____ ft. from _____ ft. to _____ ft.		
13. Nearest sources of possible contamination <u>787</u> <u>Shoreline</u> Direction _____ Type _____ Well disinfected upon completion? ☐ Yes ☒ No		
14. PUMP Manufacturer's Name _____ Date installed _____ Model Number _____ Not installed ☐ Length of drop pipe _____ ft. capacity _____ g.p.m. Material of drop pipe _____ Type: ☐ Submersible ☒ A.C. Turbine ☐ Reciprocating ☐ Jet ☒ Centrifugal ☐ _____		

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.

Thomas J. L. Co. 27194
 License Number _____ License No. _____
 Address Maple Plain, Minn.
 Signed Thomas J. L. Co. Date 5-17-77
 Authorized Representative
 Name of Driller _____ Date 5-17-77

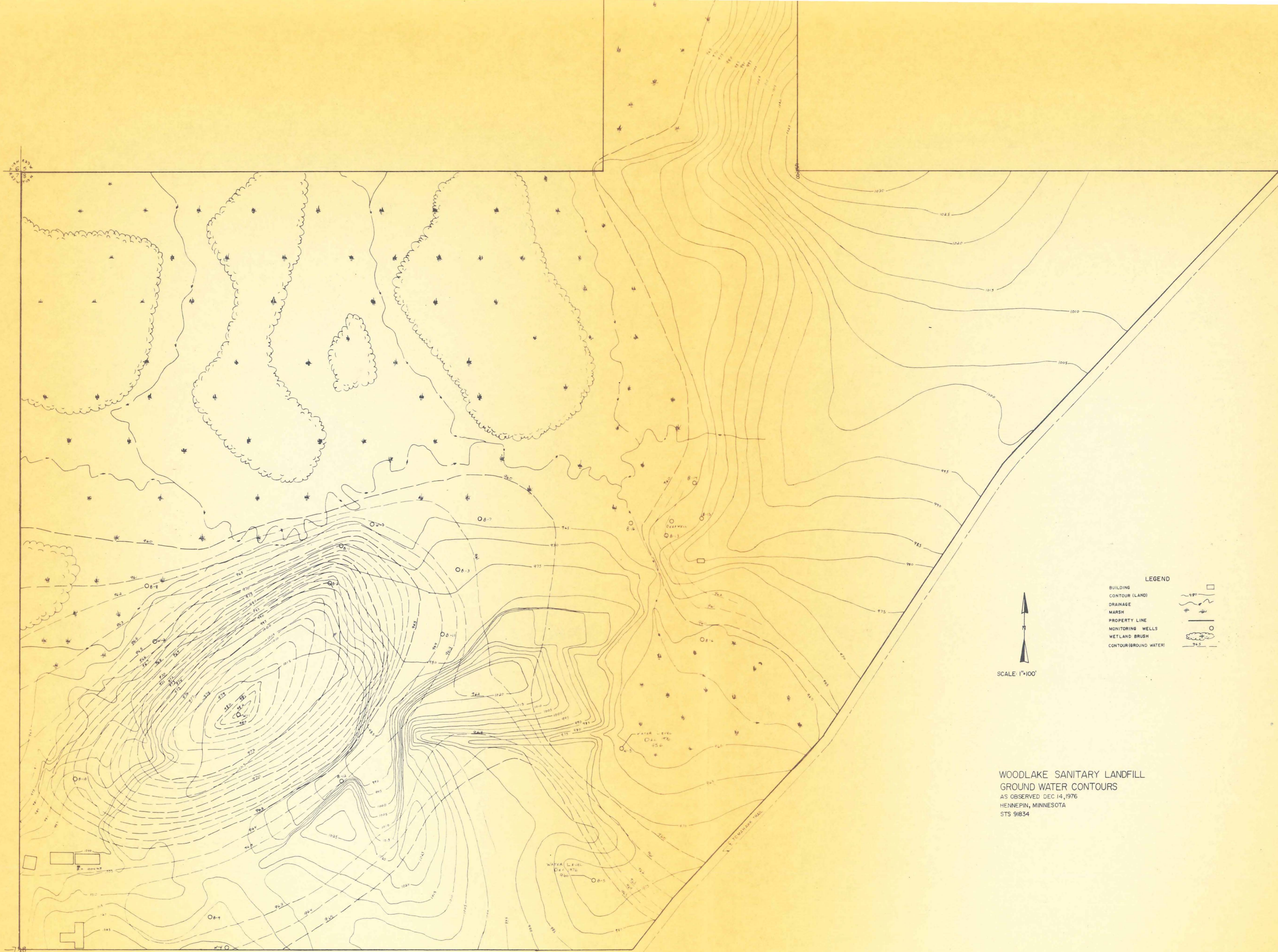
8/74 304
 9/76 304

WATER QUALITY IN SELECTED WELLS NEAR WOODLAKE SANITARY LANDFILL

	<u>#107096</u>	<u>#145412</u>	<u>#149765</u>
Tested	6/21/78	7/26/79	4/20/79
Coliform	<2.2 mpn	20 mpn <u>retested</u> <2.2 mpn	<2.2
Nitrate	<.4 mg/L	<.4 mg/L	<.4 mg/L

APPENDIX III

GROUND WATER CONTOURS



LEGEND

- | | |
|------------------------|---|
| BUILDING |  |
| CONTOUR (LAND) |  |
| DRAINAGE |  |
| MARSH |  |
| PROPERTY LINE |  |
| MONITORING WELLS |  |
| WETLAND BRUSH |  |
| CONTOUR (GROUND WATER) |  |



SCALE: 1"=100'

WOODLAKE SANITARY LANDFILL
GROUND WATER CONTOURS
AS OBSERVED DEC 14, 1976
HENNEPIN, MINNESOTA
STS 91834

APPENDIX IV

ARCHAEOLOGICAL SURVEY

September 10, 1980

SOIL TESTING SERVICES OF MINNESOTA, INC.

2405 ANNAPOLIS LANE SUITE 280
MINNEAPOLIS, MINNESOTA 55441 PHONE 612-559-1900

Ms. Janet Cain
Environmental Review
Minnesota Pollution Control Agency
1935 W. County Road B2
St. Paul, Minnesota 55113

RECEIVED
OCT 22 1980
MINN. POLLUTION
CONTROL AGENCY

STS Job No. 91834

RE: Completed Archaeological Survey of the proposed expansion area,
Wood Lake Sanitary Landfill, Medina, Minnesota.

Dear Ms. Kane:

Attached is a copy of the Archaeological Survey completed by Mr. Vern Hellmen. Mr. Hellmen was selected from a list of Archaeologists approved by the Minnesota State Historical Society. It is our understanding that the methods used for performing this archaeological survey are approved by the Minnesota State Historical Society.

Completion of this historic and archaeological survey fulfills the recommendations that the site be surveyed by the State Historical Society. Since no historic or archaeological sites were found on the proposed site, we understand no further evaluations are necessary.

If you have any questions regarding the survey, or information contained in this letter, please do not hesitate to contact our office.

Sincerely,

SOIL TESTING SERVICES OF MINNESOTA, INC.

Robert J. Kadwell

Robert J. Kadwell, P.E., CPGS

RJK/dn cc: Mr. Bud Kager

Enclosure

Archaeological Survey
of the
Woodlake Sanitary Landfill Expansion Site.

THE AREA

An archaeological survey of the land that is proposed as the expansion site of the Woodlake Sanitary Landfill was conducted on July 21 and 22, 1980. This survey covered a triangular shaped plot located in the NW $\frac{1}{4}$ of the NE $\frac{1}{4}$ of Section 8, T 116 N, R 23 W, Medina Township, Hennepin County, Minnesota. The whole western edge of the area surveyed is bordered by a marsh. Eastward from this marsh are slopes of from 6 to 18 percent consisting of a shaly till which belongs to the Dalbo and Erin soil series. The eastern boundary of the area surveyed is marked by Tomahawk Trail and is bordered by second growth mixed hardwood forest and a small pine plantation.

The slopes between the marsh on the western border of the survey area and the woodland along Tomahawk Trail are cultivated and are at present planted in corn. While weed growth has been extensive in some parts of the corn field, the ground surface could, generally, be easily seen and examined.

THE SURVEY

On-site survey consisted of both a walking surface survey and sub-surface shovel testing. The interval between transects of the walking surface survey was determined by the crop rows in the corn field, where every second row was walked to assure a thorough examination of the ground surface. In the wooded portions of the area surveyed, transects were walked at a five to eight meter interval.

Shovel testing was done on all level and gently sloping surfaces. All soil removed from shovel test holes was screened through a $\frac{1}{2}$ inch

screen and the residue remaining on the screen examined for any kind of evidence of occupation that might be present below the ground surface.

A search of the pertinent literature was also made to check for the existence of any previously published material that reported either prehistoric or early historic features from within or immediately adjacent to the survey area.

RESULTS

The surface survey demonstrated that the area examined was composed of a glacial till with rather significant relief, including nearby pot-hole lakes and lake remnants, which are now marshy areas. The till contains numerous small stones but few large boulders. As would be expected, some crypto-crystalline stones were present in the till, but in all of the surface survey, only one chert 'flake' was recovered that could possibly be the product of human activity. No fire-cracked rock was noted, nor was there any other indication of prehistoric occupation.

On the high ground at the southern-most portion of the survey area, the remains of a farmstead site were noted. All that remains are several poured concrete foundations, a foundation hole, a well hole, and a small decaying garage. All remaining evidence indicates that these structural remains date from the late 19th and early 20th Century and are not of significant historic interest.

Sub-surface shovel testing revealed a fairly uniform profile. In the cultivated fields, a plow zone was present at an average of 22 cm. depth. Below this plow zone was undisturbed clay-loam till. The depth of the plow zone varied with the percent of slope of the land surface on which the shovel test was made, with a deeper plow zone being found on the more level parts of the field.

Within the wooded portions of the survey area, a developed humus layer of approximately 10 cm. depth was encountered, below which was undisturbed till with some root penetration apparent, but no other form of disturbance.

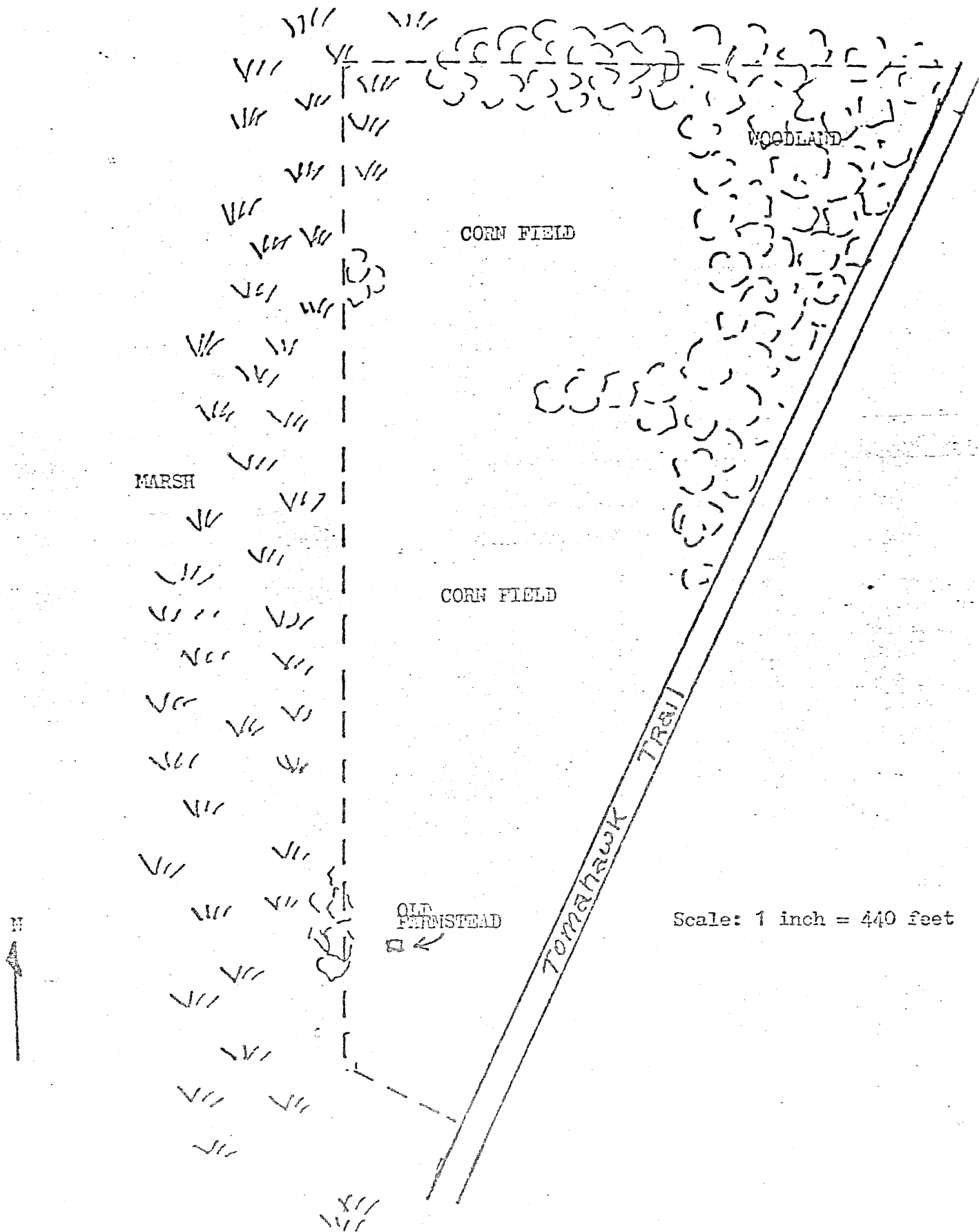
The literature search revealed that the nearest reported prehistoric features were located on the Camp Tduhapi property, a mile and a half southwest of the survey area along the northeast shore of Lake Independence; and in the Maple Hill Park district at the southeast end of Lake Independence on the high ground separating that lake from the marshy remnant of what is now called Rice Lake, but which was identified as Lake Katrina by Lewis in The Aborigines of Minnesota, p. 259.

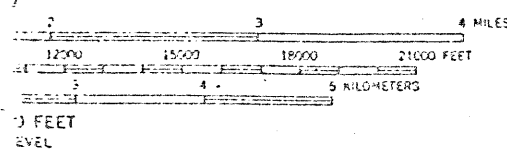
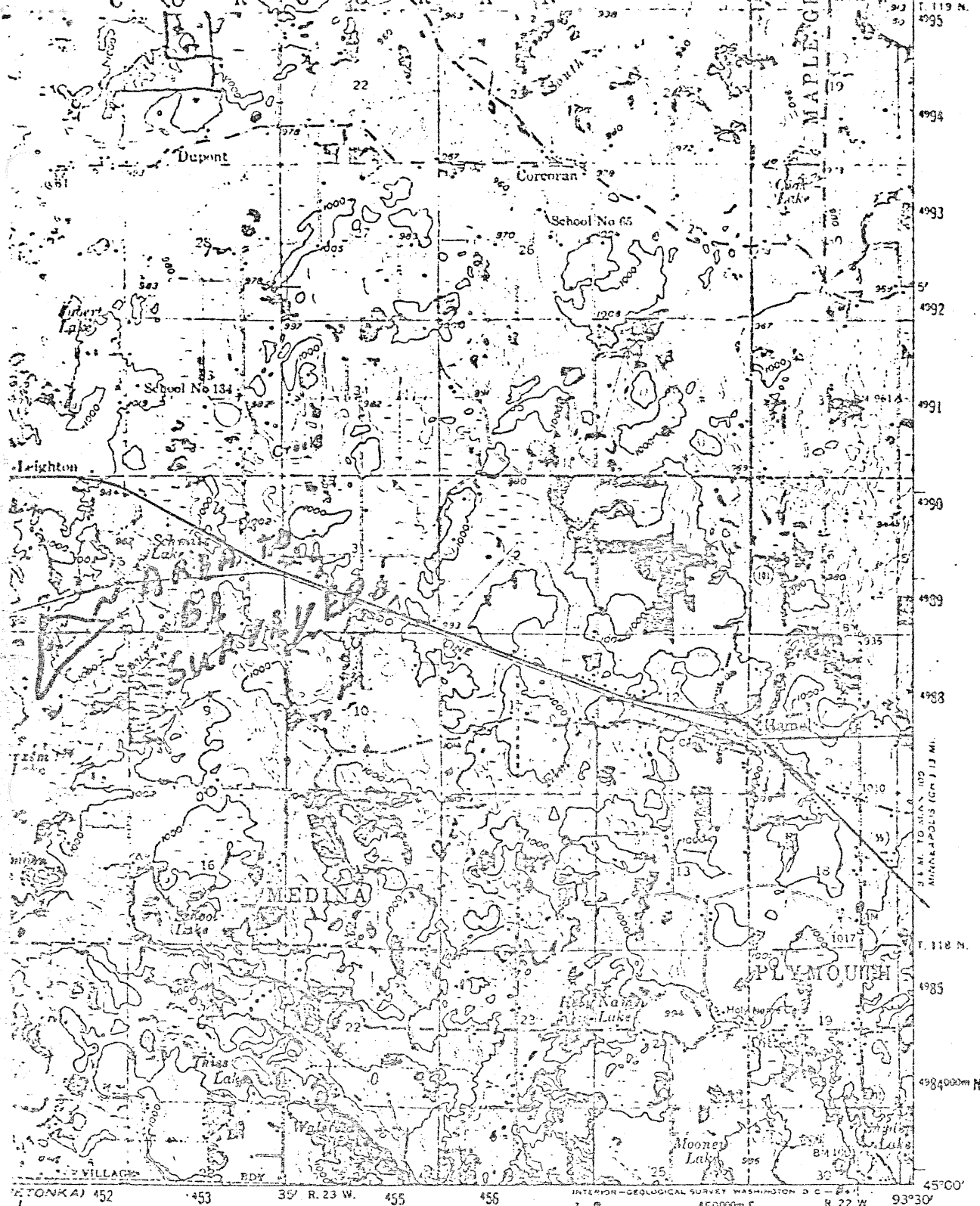
RECOMMENDATIONS

In light of the survey method employed, it is my opinion that no adverse archaeological impact will be made if the proposed expansion of the sanitary land fill is permitted. It is always possible that a deeply buried feature may exist which would not have been detected during this survey, and it would be wise to alert any construction crews engaged in earth moving activity to be alert for such features. While the existence of earthworks of prehistoric origin nearby indicates the utilization of the area by a prehistoric population, the evidence of the survey would indicate that the area within the survey boundary was not used as a habitation site, although it was probably occasionally used as a hunting-gathering hinterland by local prehistoric populations.

Vernon R. Helmen
23 July 1980

ARCHAEOLOGICAL
FIELD SKETCH MAP
WOOLLAKE SANITARY LANDFILL





QUADRANGLE LOCATION

ROAD CLASSIFICATION

- | | |
|-------------|-----------------|
| Heavy-duty | Light-duty |
| Medium-duty | Unimproved dirt |
| U.S. Route | State Route |

URACY STANDARDS
 ARADO 50225, OR WASHINGTON, D.C. 20242
 SYMBOLS IS AVAILABLE ON REQUEST

ROCKFORD, MINN.
 N4500--W9330/15

1558

AMS 7274 II--SERIES V772

121

APPENDIX V

SOLID WASTE REGULATIONS GOVERNING SANITARY LANDFILLS

(Delete pages 19-21 in 1970 Edition and insert SW 6)

SW 6 Sanitary Landfill

The sanitary landfill method shall be used for all final disposal of solid waste.

(1) The fill and trench areas of sanitary landfill sites are prohibited within the following areas, as existing at the time of receipt of the permit application by the Agency:

(a) 1,000 feet from the normal high water mark of a lake, pond or flowage.

(b) 300 feet from a stream.

(c) A regional flood plain (100 year flood).

(d) Wetlands.

(e) Within 1,000 feet of the nearest edge of the right-of-way of any state, federal or interstate highway or of the boundary of a public park or of an occupied dwelling. Permission may be granted under this subsection, without these distance requirements, at the discretion of the Director, taking into consideration such factors as noise, dust, litter and other aesthetic and environmental considerations.

(f) Locations considered hazardous because of the proximity of airports.

(g) An area which is unsuitable because of reasons of topography, geology, hydrology or soils.

(2) Any person who maintains or operates a sanitary landfill site or permits the use of property for such, shall maintain and operate the site in conformance with the following practices unless otherwise allowed by the Agency in issuing the required permit:

(a) Open burning shall be prohibited.

(b) Solid waste shall not be deposited in such a manner that material or leachings therefrom may cause pollution of underground or surface water.

Proposed separation between the lowest portion of the landfill and the high water table elevation shall be a minimum of five feet. This requirement shall not be construed to render inoperative any other requirements specified herein and additional ground water protection shall be provided if needed.

(c) Dumping of solid waste shall be confined to as small an area as practicable and with appropriate facilities to confine possible wind-blown material within the area. At the conclusion of each day of operation, all wind-blown material resulting from the operation shall be collected and returned to the area by the owner or operator.

(d)(i) Solid waste shall be compacted as densely as practicable and covered after each day of operation, or as specified by the Director, with a compacted layer of at least six inches of suitable cover material. All previously filled areas shall be maintained with at least six inches of suitable cover material.

(ii) If refuse cells will be exposed to the elements for a period of 120 days or longer, an intermediate cover totalling at least twelve inches of compacted, suitable cover material shall be provided and maintained.

(iii) There shall be an available supply of suitable cover material, which, if necessary, shall be stockpiled and protected for winter operation.

(iv) The sanitary landfill shall be constructed and cover material graded so as to promote surface water runoff without excessive erosion.

(e) Surface water drainage shall be diverted around and away from the landfill operating area.

(f) A minimum separating distance of 20 feet, or greater as specified by the Director, shall be maintained between the disposal operation and the adjacent property line.

(g) Effective means shall be taken if necessary to control flies, rodents and other insects or vermin.

(h) The approach road to the disposal site and the access road on the site shall be of all-weather construction and maintained in good condition so that they will be passable at all times for any vehicle using the site.

(i) Adequate dust control on the site shall be provided.

(j) Equipment shall be available for adequate operation of the site. The equipment shall be provided with adequate safety devices and adequate noise control devices.

(k) Equipment shall be provided and kept at the site during the hours of operation to control accidental fires and arrangements made with the local fire protection agency to immediately acquire their services when needed.

(l) Adequate communication facilities shall be provided for emergency purposes.

(m) Sanitary facilities and shelter shall be available for site personnel.

(n) Scavenging shall be prohibited to avoid injury and prevent interference with operations.

(o) The site shall be adequately screened by existing or provided means.

(p) There shall be qualified personnel for general direction and operation of the site on duty at all times while it is open for public use.

(q) Access to the site shall be controlled. A gate shall be provided at the entrance to the site and kept locked when an attendant is not on duty.

(r) A permanent sign, identifying the operation and showing the permit number of the site, and indicating the hours and days the site is open for public use, rates, hazardous wastes information, the penalty for nonconforming dumping, and other pertinent information, shall be posted at the site entrance.

(s) A water monitoring program shall be constructed and operated to determine whether or not solid waste or leachate therefrom is causing pollution of underground or surface water. The drilling and construction of all site wells, including those used for monitoring purposes, shall be done in compliance with Minnesota Statutes 1973, Chapter 747.

The conditions of monitoring, including the frequency and the analysis of water monitoring samples, shall be determined by the Director and may be changed at his discretion.

(t) Approved leachate collection and treatment systems shall be used where required to protect underground and surface water.

(u) Decomposition gases shall not be allowed to migrate laterally from the sanitary landfill. They shall be vented into the atmosphere directly through the cover material, or into cut-off trenches, or into the atmosphere by forced ventilation, or by other means approved by the Director so that explosive concentrations are prevented.

(v) The following shall not be acceptable for deposit in sanitary landfills except in amounts normal in household waste:

(i) Liquids

(ii) Any of the following: digested sewage sludges, lime sludges, grit chamber cleanings, bar screenings and other sludges, unless approved by the Director. Approval will be based on consideration of such factors as chemical composition, free moisture content and workability.

(iii) In no case will raw sewage sludge, raw animal manure or septic tank pumpings be acceptable.

(iv) Hazardous wastes, as identified by the Agency.

(v) Other substances that may be deemed unacceptable by the Agency.

(w) A storage area for hazardous wastes shall be provided at the sanitary landfill.

(x) Dead animals shall be transported and disposed of in accordance with Minnesota Statutes 1971, Chapter 35. When received at a sanitary landfill, household pet animal carcasses should be buried along with other refuse. Larger animal carcasses may be buried in the fill and trench area under other refuse, but the carcass itself must first be completely covered separately with at least twelve inches of earth material. Animal carcasses may be buried in a separate area of the landfill site at a depth of at least three feet.

(y) When disposed of at a sanitary landfill, certain demolition and construction type wastes may be disposed of in a separate area, as specified by the Director.

(z) The permittee shall properly complete the Agency operational report form and submit it monthly to the Agency, whether or not the permitted landfill is yet constructed or whether or not it is in operation.

(aa)(i) Within one month after final termination of a site, or a major part thereof, the area shall be covered with at least two feet of compacted earth material, graded to a minimum 2 percent slope to promote surface water runoff without excessive erosion.

(ii) The finished surface of the filled area shall be covered and maintained with adequate top soil and seeded to provide suitable vegetation immediately upon completion, or immediately in the spring on areas termi-

nated during winter conditions. If necessary, seeded slopes shall be covered with straw or similar material to prevent erosion.

(iii) Prior to completion of a sanitary landfill site, the Agency shall be notified in order that a site investigation may be conducted by the Agency staff before earth moving equipment is removed from the property.

(iv) After completion of a sanitary landfill site, a detailed description, including a plat, shall be recorded with the county register of deeds. The description shall include general types and location of wastes, depth of fill, and other information of interest to future land owners.

(v) If the completed site is to be cultivated, the integrity of the finished surface shall not be disturbed by agricultural cultivation activities. If cultivated, a sufficient depth of cover material to allow cultivation and to support vegetation shall be maintained.

(3) Plans, including a permit application, report and drawings shall be prepared by a registered engineer of Minnesota. Three complete sets of the plans shall be submitted to the Agency. The submitted plans shall include the following:

(a) A completed permit application form.

(b) An engineering report including:

(i) General information.

(ii) Site analysis including consideration of each item in SW 6 (1) along with data and supplementary reports, including soil boring data and a hydrogeologic study. Attention to this requirement must include consideration of surface features, underground formations, soil boring data from soil borings of which at least one is to a minimum depth of 50 feet below proposed excavation and lowest elevation of the site, water table profile, direction of underground water flow, initial quality of water resources in the potential zone of influence of the landfill, use of water resources in the potential zone of influence of the landfill, need and availability of cover material, and existing refuse deposits. Also considered shall be climate, average rates of precipitation based on average monthly rates from records of rain gauge stations, evapotranspiration, runoff and infiltration.

(iii) Proposed operating procedures including consideration of each item in SW 6 (2).

(iv) Equipment to be used for operation of the site.

(c) Drawings, folded to 8½ by 11 inch size, including:

(i) An Existing Conditions Plan of the area showing land use and zoning within ¼ mile of the proposed solid waste disposal site. The plan shall show all buildings, lakes, ponds, watercourses, wetlands, sinkholes, rock outcroppings, roads, public parks and other applicable details and shall indicate the general topography with contours and drainage patterns. An on-site bench mark shall be indicated and a north arrow drawn. A location insert map and a U.S.G.S. topographic map of the area shall be included. The scale of the existing conditions plan shall not be greater than 300 feet per inch.

(ii) A Development Plan of the site and immediately adjacent area showing dimensions, contours, at contour intervals of two feet or less, soil boring locations with surface elevations and present and planned pertinent features, including but not limited to roads, screening, buffer zone, fencing, gate, shelter and equipment buildings, surface water diversion and drainage, water monitoring system and the hazardous wastes storage area. The development plan shall show progressive development of trench and/or area fills and any phase construction. The scale of the development plan shall not be greater than 200 feet per inch.

The development plan shall include consideration of the ultimate land use, for example, pre-planned building islands, not to be used for landfilling of refuse.

(iii) Cross Sections Plan including a minimum of two cross sections of each phase, perpendicular to one another, showing existing grade, excavation grade, final grade, any additional ground water protection, high water table profile and profile of a separation line five feet above, profile and identity of soils and profile and identity of bedrock.

(iv) An Ultimate Land Use Plan showing the land use after the site is completed, final contours, at contour intervals of two feet or less, and surface water drainage. Consideration shall be given in the design of an ultimate land use plan to gas control, erosion and differential settlements. The scale of the ultimate land use plan shall not be greater than 200 feet per inch.

(4) A sanitary landfill shall not be opened or placed into operation until:

(a) An Agency permit has been issued.

(b) A construction certification has been approved by the Director. The certification, signed by the project engineer, shall certify, with any exceptions listed, that the construction has been completed in accordance with the plans and Agency permit. It shall be certified that an Agency-approved water monitoring system is functional and includes an analysis of initial water monitoring samples.

If any construction has been scheduled in the plans for phase development subsequent to the initial operation, then a similar certification shall be approved for each phase before it shall be operated.

(c) The site is consistent with the county solid waste management system plan.

(5) These regulations shall be effective as to the construction of permitted sanitary landfills when the permit applications and final plans are received after the date these regulations are filed with the Commissioner of Administration; provided, however, the Agency reserves the right to require compliance with any provision of these regulations in order to abate pollution.

*Filed with Secretary of State and Commissioner of Administration
September 26, 1973*

SW 3 Collection and Transportation of Solid Waste

(1) The owner and occupant of any premises, business establishment or industry and/or the refuse collection service shall be responsible for the satisfactory collection and transportation of all solid waste accumulated at a premise, business establishment or industry to a solid waste disposal site or facility, for which a permit has been issued by the Agency unless otherwise provided in these regulations.

(2) Vehicles or containers used for the collection and transportation of garbage and similar putrescible wastes, or refuse containing such materials, shall be covered, leakproof, durable and of easily cleanable construction. These shall be cleaned to prevent nuisances, pollution or insect breeding, and shall be maintained in good repair.

(3) Vehicles or containers used for the collection and transportation of any solid waste shall be loaded and moved in such a manner that the contents will not fall, leak or spill therefrom, and shall be covered when necessary to prevent blowing of material. Where spillage does occur, the material shall be picked up immediately by the collector or transporter and returned to the vehicle or container and the area properly cleaned.

(4) Vehicles and containers used for the collection and transportation of toxic or hazardous wastes shall be durable, enclosed and leakproof and shall be constructed, loaded, moved and unloaded in a safe manner and in compliance with the regulations of federal, state and local governments and their regulatory agencies.

APPENDIX VI

TRANSCRIPT

ORIGINAL COPY

2

MINNESOTA POLLUTION CONTROL AGENCY
ENVIRONMENTAL PLANNING AND REVIEW UNIT
1935 WEST COUNTY ROAD B2
ROSEVILLE, MINNESOTA 55113

Woodlake Sanitary Landfill Proposed
Expansion at Medina, Minnesota

Transcript of proceedings had in the above-
captioned matter on Wednesday, the 20th day of August, 1980,
commencing at approximately 7:00 o'clock in the evening, in the
public meeting room in the Medina City Offices located at 2052
County Road 24, in the City of Medina, Minnesota.

APPEARANCES:

MR. ROBERT HAMILTON, CHAIRMAN

MS. JANET M. CAIN

MR. TIMOTHY D. VANEPP

MR. WAYNE K. TUSA

WHEREUPON, the following proceedings were duly had: --

MR. HAMILTON: Ladies and gentlemen, we are
meeting here tonight for the purpose of soliciting
comments on the Draft EIS for the Woodlake
Landfill. By way of introduction my name is
Bob Hamilton. I am with the Pollution Control
Agency and I will chair the meeting tonight.
It's my intention that we run an orderly meeting,
one that everyone has a chance to speak their
mind and comment on the question at hand. And
I would ask that you raise your hand and be
recognized and state your name and spell it for
the court reporter so that we have an adequate
record and state your comments, questions, what-
ever to the assembled technical staff that we
have here for you. That's generally how I
propose to run my end of it. Janet Cain of our
office of Environmental Analysis will introduce
the people that she has with her to fill you in
on specifics and any other introductions that
are necessary. Jan?

MS. CAIN: As Bob said, my name is Janet

1 Cain and we do have some other staff from the
2 Pollution Control Agency here and also our
3 consultants from F. C. Hart Associates in New
4 York who prepared the Environmental Impact
5 Statement. I would like to introduce those people
6 right now. On the end is Tim Van Epp who
7 assisted with the preparation and Wayne Tusa
8 who is the project manager for this document.
9 Over here we have Virginia Reiner who is with
10 the Division of Water Quality and Sandra Forrest
11 who is also with the Division of Water Quality
12 recently transferred from the Division of Solid
13 Waste. And back in the audience is Doug Hall who
14 has recently been appointed to head of the
15 Environmental Impact Statement Unit at the PCA
16 and is coming to see how some of our meetings
17 function. To give you a little background, if
18 any of you remember, back in December we came out
19 to this area and asked you what some of the issues
20 were that you were concerned about having addressed
21 in the Environmental Impact Statement. The PCA
22 had determined that an Environmental Impact
23 Statement was needed on this project at that time,
24 but we also wanted to get what feelings you had
25 as far as the issues which should be addressed.

1 During the past few months we have proceeded in
2 the preparation, and just some of the highlights,
3 I guess, were that we did have soil borings taken
4 right on the site. So we do have a good idea
5 what the soil is like which is a very important
6 aspect as far as looking at the impact that this
7 facility might have. The process we used was to
8 prepare technical work papers on each of these
9 sections which the EIS has to address. And then
10 the draft itself is a synopsis of the information
11 that was in those technical work papers. The
12 process from now on is to get your comments tonight
13 And the Environmental Impact Statement has been
14 distributed for 30 days to the public and to State
15 agencies, local units of government, and interested
16 persons. After tonight we will leave the record
17 open for 20 more days. So people who don't feel
18 like they want to give any comment tonight, or
19 prefer to just submit them in writing can do that,
20 and those should be sent to the Pollution Control
21 Agency, and the address is on the letter which
22 was sent with this, but I will give it for you
23 also. Those should be addressed to me, Janet
24 Cain, Pollution Control Agency, 1935 West County
25 Road B, as in boy, 2, and that's Roseville,

1 Minnesota, 55113. At the end of the 20 days we
2 will be responding to public comments and to
3 comments from agencies and environmental groups
4 and the proposer or whoever submits comments.
5 Then we have 30 days in which to send that to the
6 Environmental Quality Board. Before that it goes
7 to our PCA Board, Pollution Control Agency Board.
8 So there are some other opportunities for the
9 public to get involved, both at our meeting in
10 front of the PCA and also at the Environmental
11 Quality Board meeting, but this is really the
12 place where you should make your comments and
13 they go into the record and we can respond to
14 them and that becomes a part of the final
15 Environmental Impact Statement. So everything
16 you say tonight will appear in the final
17 Environmental Impact Statement and the responses
18 of the agency to that. At this time I guess we
19 would like to proceed. If there are any questions,
20 I will be happy to answer them. Otherwise we
21 will just proceed and ask you for your comments
22 on the Draft. Are there any questions as to
23 procedure or what you might expect in the future
24 as far as how to proceed or when to proceed?

25 (No response.)

1 MS. CAIN: Okay. Anyone who has some
2 comments on the Draft is welcome to state their
3 concerns or bring up anything which they feel
4 should be further addressed. There is always
5 this long silence. Someone has to go first.

6 MR. HAMILTON: What we have to do is seed
7 the audience. We have got to bring one guy that
8 starts.

9 MR. LEONARD LEUER: My name is Leonard
10 Leuer, L-E-U-E-R. I guess what I would like
11 here is for one of the people here that were
12 instrumental in drafting this if they could
13 just give us a short synopsis or overview of
14 what the soil boring findings were from the site
15 out there and how they relate to the business of
16 the Sanitary Landfill.

17 MS. CAIN: I think Wayne Tusa as project
18 manager probably could respond to that best.

19 MR. TUSA: Okay. That happened to be a
20 major question on what eventually happened on
21 finally deciding what may be the final design
22 for the site. BFI decided to go out and do a
23 series of six borings on site to determine what
24 types of soil and how deep they were underneath
25 the proposed expansion area. Essentially it

1 turned out that the materials are a clay type of
2 soil. They are rather deep, common for this area.
3 We have very low permeability of, say, ten minus
4 seven or ten minus eight centimeters per second
5 which, in layman's terms, means water may move
6 through it at a rate of about a foot per year.

7 MR. HAMILTON: This data is all contained
8 in the work papers?

9 MR. TUSA: The data is contained in the
10 work papers and summarized in the Environmental
11 Impact Statement.

12 MR. LEONARD LEUER: Do I acknowledge you
13 every time I ask you now?

14 MR. HAMILTON: No, we will just say more
15 questions from --

16 MR. LEONARD LEUER: When the soil borings
17 were taken was BFI paying for the company that
18 was taking the samples and the borings?

19 MR. TUSA: That's correct.

20 MR. LEONARD LEUER: What company was it
21 that was taking the borings?

22 MS. CAIN: Soil Testing Service.

23 MR. LEONARD LEUER: Located here in the
24 state?

25 MS. CAIN: Yes.

1 MR. LEONARD LEUER: As BFI indicated what
2 type of refuse is going to be disposed of in
3 the Sanitary Landfill site?

4 MR. TUSA: It's primarily municipal waste
5 with a minimum amount of commercial waste.

6 MR. LEONARD LEUER: Did you say the minimum
7 amount of commercial waste?

8 MR. TUSA: With the minimal amount of
9 commercial waste, yes.

10 MR. LEONARD LEUER: Okay. I have been
11 noticing as of lately how many dumpsters that
12 I have been seeing with the BFI name on it,
13 and I am rather suspicious when I see that name
14 when they are sitting here in Hennepin County
15 that those dumpsters probably end up at the
16 Woodlake Sanitary Landfill. Am I correct in
17 assuming that?

18 MS. CAIN: Mr. Kager who is a representa-
19 tive of Browning-Ferris --

20 MR. KAGER: The commercial company dumps
21 basically at the Flying Cloud in Eden Prairie.
22 Very seldom do they ever dump a load of trash up
23 here. Donny Johnson can attest to that -- he's
24 the outside manager -- that the number of BFI
25 commercial trucks that utilize that facility is

1 minimal.

2 MR. HAMILTON: Excuse me, sir. We didn't
3 get your name for the record.

4 MR. KAGER: Rodney Kager.

5 MR. HAMILTON: How do you spell that?

6 MR. KAGER: K-A-G-E-R.

7 MR. HAMILTON: Any other comments,
8 questions?

9 MR. LEONARD LEUER: I guess I would have
10 some questions that I would want to direct a
11 little bit to Rodney. Are you familiar with
12 the state implementation plans that are going
13 into effect for hazardous waste disposal?

14 MR. KAGER: Are you referring to the
15 legislation that was passed earlier this year?

16 MR. LEONARD LEUER: Yes. Are you aware
17 there are a lot of companies that are scrambling
18 to get into compliance with some of these laws
19 and regulations?

20 MR. KAGER: Are you referring to the
21 hazardous waste regulations as far as identifi-
22 cation?

23 MR. LEONARD LEUER: Yes.

24 MR. KAGER: I am not aware that there are
25 a lot of companies. There possibly is as far as

1 the hauling of hazardous waste, the identification
2 that you do haul hazardous waste, where you
3 dispose of the hazardous waste. Is that what
4 your reference is?

5 MR. LEONARD LEUER: Yes.

6 MR. HAMILTON: Before we get too far afield
7 I want to admonish you a little bit to try to stay
8 on the subject of the Draft EIS. You are starting
9 to get off on a tangent now. The purpose of the
10 meeting is to solicit comments on the EIS. Granted
11 what you say is of valid concern but one not
12 grist for tonight's meeting, as I understand.

13 MS. CAIN: Correct. Woodlake Sanitary
14 Landfill is only permitted to accept municipal
15 refuse, non-hazardous waste. In the EIS they do
16 discuss that some wastes of household quantities
17 may go into the landfill, and also it discussed
18 about the fact that there is some -- I don't know --
19 checking of whether hazardous waste goes in but
20 only the most obvious kinds like gasoline, I think
21 you mentioned, and some of these things. But I
22 think that maybe what you are getting at is could
23 possibly hazardous waste go into this landfill,
24 and as far as we know hazardous waste has never
25 been put into this landfill, nor has there ever

1 been any report of hazardous waste by error going
2 in there. So it is only permitted as a municipal
3 refuse site. Any, I guess, talk about potential
4 hazardous waste would just be speculation.

5 MR. LEONARD LEUER: As of this date we have
6 really no way of knowing for sure what has been
7 put in that disposal site there.

8 MS. CAIN: In the past prior to Browning-
9 Ferris taking over, that is correct. That was
10 run as a dump, and there was no real screening
11 of any material that went in there prior to their
12 taking it over and converting it into a landfill.
13 I think it was converted to a landfill prior to
14 that, but it was grandfathered in and it was just
15 an open dump at one time. And prior to that you're
16 right. There was no screening. You do not know
17 what went in there before. The EIS is addressing
18 the new expansion and not the old area. What is
19 in there now, as you indicate, we don't know all
20 of it, but what we are addressing in this
21 Environmental Impact Statement is what could happen
22 in the future, the expansion area.

23 MR. TUSA: Incidentally BFI's taking over
24 the operation as a sanitary landfill was in 1971.

25 MR. KAGER: I would like to clarify that.

1 What did you say?

2 MR. TUSA: I suggested that your taking over
3 the old dump site and converting it to a sanitary
4 landfill was '71.

5 MR. KAGER: '73, August of '73.

6 MR. DIETRICH: My name is Kermit Dietrich.
7 I have got a question on a leachate from a 28
8 report done by Metro Council. They have an
9 annual volume of 5 million gallons and the time
10 required for maximum leachate production, 19
11 years. That's from the existing landfill, and in
12 the drafted EIS I didn't see any estimate or at
13 least if there was one there, I missed it. When
14 will it reach its maximum leachate production
15 and will it be producing its maximum at the
16 same time the old landfill will be?

17 MR. TUSA: We did separate estimates based
18 on the existing landfill and on the new landfill
19 site. For the existing landfill our estimate
20 was approximately 1.2 times 10 to the 6th million
21 gallons per year. We had a concentration period
22 maximum leachate generation of approximately 20
23 years. That number differs from Met Council's
24 estimate because Met Council assumed different
25 slope configurations for the existing landfill

1 and assumed a much flatter slope. And we also
 2 did estimates for the new proposed expansion. It
 3 was 50 percent greater than that or about 1.8
 4 million gallons per year for the same period for
 5 maximum leachate generation. It was a little over
 6 20 years, as I recall.

7 MR. DIETRICH: Aren't you building a time
 8 bomb that is going to go off 20 years from now
 9 or is it going to be -- do you know what the
 10 leachate production will be at the end of the
 11 20-year period?

12 MR. TUSA: Well, what is important is not
 13 the production rate itself but whether there is
 14 any containment built into the site design. And
 15 that's why the discussion of what the clay
 16 properties were and soil properties were is so
 17 important because with the clay where that's
 18 impermeable with very low leakage rate. But
 19 essentially you don't get escape of that leachate
 20 if you have got an appropriate design into the
 21 ground water system. So naturally you would
 22 produce some leachate, but it is basically
 23 contained on site. Whatever effect it has will
 24 occur in the soils underneath the site.

25 MR. LEONARD LEUER: When you talk about the

1 clay and substructure being rather impervious
 2 that's not to say that they will permanently
 3 retain all the leachate?

4 MR. TUSA: That's correct.

5 MR. LEONARD LEUER: His statement of being
 6 a potential time bomb is probably stating it very
 7 concisely and precisely?

8 MR. TUSA: No, the process is actually much
 9 more complex than that. It is not a simple escape
 10 of leachate through a sponge kind of thing.
 11 Leachate changes character. Leachate itself
 12 contains a lot of biological organic compounds
 13 that break down slowly with time. Leachate also
 14 contains a number of other constituents, metals,
 15 for example, that don't do that. However, since
 16 you do have a clay substrata you get a sieve
 17 effect in terms of its going through a very fine --
 18 it's a filtering media kind of effect. So
 19 naturally over time the leachate quality slowly
 20 improves because of the biological decomposition
 21 processes that are occurring and at the same time
 22 because we have a clay substrata that is very
 23 tight even though you eventually lose some
 24 quantities of leachate through that at a very
 25 slow rate. You have got the diffusion processes

1 and you have got the absorption processes going
2 on at the same time. Eventually there is some
3 escape, some small, relatively innocuous escape
4 because of the specific site conditions that we
5 have on site.

6 MR. HAMILTON: Other comments, please?

7 MS. CAIN: For some of you that have come
8 in since we started maybe I can just back up for
9 one second. We are taking down public comment at
10 this time and we are making a record which ^{will} appear
11 in the final Environmental Impact Statement, and
12 this is the time for people that have some
13 concerns to speak so that we can address these.
14 We may not be able to answer all the questions
15 here. We would like to answer those as much as
16 possible, but if we can't answer them now, we
17 will take the information that you are concerned
18 about back and the agency will work on it and
19 Tim and Wayne will look at it and be able to come
20 up with what we hope is a fair explanation of
21 your concerns or addressing your concerns. So I
22 just want to encourage you that if you do have
23 anything you want to say that you should say it
24 now. I know sometimes people get nervous talking
25 in front of a court reporter. I do myself, but

1 now is the time to do it. So speak up.

2 MR. ANDERSON: Tom Anderson, Mayor of Medina.
3 I have read through your -- quickly read through
4 your report and it appears to be very pro-landfill
5 and maybe justifiably so, but we still have a
6 few concerns, subsurface and surface water,
7 leachates, and those problems especially dealing
8 with two city wells, one in Loretto, one in
9 Independence Beach which could be affected by
10 water impurities. And those populations are
11 about 800 people in total. There are also
12 several wells in the area belonging to private
13 citizens that we have some concern about. There
14 is also a lot of talk about rodent and wind-borne
15 debris in and around the area that we would like
16 to make sure is taken care of. Your report says
17 that there isn't too much of this, but I think
18 in past testimony you have heard that there was.
19 The other thing that creates a problem for us is
20 a lot of heavy truck traffic, both by the regular
21 haulers and the private citizens over our city
22 roads. They deteriorate our roads. A lot of
23 the private haulers are finding out what the
24 costs are, leave without dumping their product
25 at the landfill but leave it on our roadsides.

1 So we have some problems with those. If the land-
 2 fill were to be expanded, I would want it to
 3 be a private enterprise, however. And once the
 4 landfill is closed down, whether it's this year
 5 or ten years from now, we would also expect it to
 6 remain in private hands. We have lost a lot of
 7 property to the county parks and so forth, and
 8 so we would not want it to leave our tax rolls.
 9 I know some of these things are not addressed
 10 directly to the subject.

11 MS. CAIN: For the sake of getting some
 12 continuity could we start with some of your first
 13 questions and respond to those?

14 MR. ANDERSON: Why don't I continue and
 15 then you can.

16 MS. CAIN: Okay. Sure.

17 MR. ANDERSON: The only other thing that I
 18 want to say is it's our understanding that if the
 19 Council does not want this landfill expanded that
 20 you cannot overrule this by condemnation, and
 21 before we would want to consider it we would want
 22 to talk to the Council and would want to talk to
 23 both you people and the county commissioners for
 24 a better understanding of what you are going to
 25 do. And lastly there is a lot of alternative

1 solutions given at one section in your report,
 2 and I think we would like to see quite a few of
 3 those adopted if possible, not all of them but a
 4 lot of them.

5 MR. HAMILTON: Wayne, can you respond to
 6 those questions which are directly applicable to
 7 the report? A number of your questions go, of
 8 course, to the Pollution Control's permitting
 9 authority and general regulatory powers which are
 10 not again grist for tonight's hearing. Maybe
 11 Janet or some of the staff would wish to respond
 12 to those later. It doesn't matter, but, Wayne,
 13 if you will answer the Mayor's questions regarding
 14 ground water wells and so forth that are in the
 15 report.

16 MR. TUSA: Okay. Let's take them one at a
 17 time and if I miss any, just yell right up. Water
 18 supply -- in one of the technical work papers we
 19 mapped out all the public water wells in the area
 20 trying to figure out whether there could be any
 21 possible impacts. Our conclusion was no for two
 22 reasons, one, they were too far away from the site
 23 and two, that again this whole containment issue
 24 of keeping the leachate inside the landfill would
 25 itself prevent it from escaping into any of the

1 other ground water supplies. The third and
2 perhaps the most important reason is that all the
3 public wells draw from rather deep aquifers.
4 Again they are separated from the surface aquifers
5 which this site might contaminate if it were ever
6 to contaminate by some other deeper layers of
7 clay. So we didn't have any problem with that
8 particular issue. As far as private wells there
9 is relatively -- we got quite a few borings, well
10 borings. We didn't think there was any particular
11 problem for pretty much the same reasons, the
12 containment reason, that even though there are
13 some wells that are closer to the site than the
14 public wells, we basically think the leachate is
15 going to be contained on site because of the
16 natural soil conditions that exist for that
17 particular site. Okay. Rodents -- that
18 particular concern was voiced by several people
19 at the initial public hearing we had. We have
20 been out here five or six times now with an
21 assortment of six or seven different personnel,
22 and all of them have made one or several trips to
23 the site with that in mind because we did a
24 summary of the public meeting, distributed it to
25 all the staff and had several key points for them

1 to look for. And we haven't found any evidence
2 of a rodent problem. We didn't see any. And
3 normally that kind of problem only exists for a
4 sanitary landfill operation that isn't a sanitary
5 landfill operation, one that doesn't put daily
6 cover on. That's basically the cure to a rodent
7 problem. If there were a rodent problem -- and
8 we found no evidence of that -- there are rodenti-
9 cides similar to insecticides that very effectively
10 control rat populations, but again we didn't find
11 any evidence of that kind of problem on the site.
12 Windblown debris -- we took two to three walks
13 around, just wandering around the site, driving
14 the roads looking for potential windblown debris
15 problems. There was some debris. Most of it was
16 confined to the site. It would be along the
17 roadside ditches or on the site itself. The
18 operation itself in comparison to many of the
19 landfills is rather clean. There are a number
20 of continuing operational activities that relate
21 to crew people going around and picking up debris
22 every so often, particularly after windstorms.
23 It seems to be fairly effective. One of the
24 measures we did suggest as an alternative to the
25 existing site operation is using some -- what are

essentially windfences around the active area of the landfill. And whether or not that particular mitigative measure will or will not be adopted depends on the permitting process. And maybe when we get to the end of this you can talk a bit about how a landfill gets permitted after it goes through an EIS process. Okay. Heavy truck traffic -- part of the comparison part of the analysis of the proposed landfill was gee, how does it impact -- how does it change conditions over the existing landfill, and the numbers that we generated for truck traffic strictly related to operation of that landfill and operation of the BFI trucks was that over the course of the ten-year site life if BFI site projections in terms of volume of waste are correct, ten years from now we might have 50 percent more trucks than there are today on the road which is still a pretty low number per hour for just a landfill operation, but there would be an increase.

MR. ANDERSON: My problem is not so much -- well, there is the increase that you talk about, but there is also the truck traffic that we have that -- you know, we have to take care of the roads and what we are virtually doing is taking

Care of roads for Minneapolis or northern suburbs, whatever the area is.

MR. TUSA: Right. Right.

MR. ANDERSON: That's part of our concern.

MR. TUSA: That's a social impact of continued operation and would be an impact in any case unless the site closed. It's unavoidable, that is, if the site continues to operate. Okay. Indiscriminate dumping -- I'm not really sure what to say about that. The landfill has active operating hours. It's not inaccessible to people, but BFI as an operator of that landfill has no active control over indiscriminate dumping whether it does or doesn't happen. I don't know if that's a particularly pertinent issue.

MR. ANDERSON: That really relates to the same thing as the trucks. It is a factor having the landfill here that this is the logical place for them to dump the debris if they don't want to pay those fees. They will dump them someplace on our roads, Medina's roads.

MR. HAMILTON: I might interject at this point in time, Mr. Mayor, that you as the agent of the city have police powers to enforce, as well

1 as the county, as well as the state. We can all
2 point fingers at each other on that one.

3 MR. ANDERSON: You have got to admit that
4 one man per shift is not going to spend all day
5 trying to find that when he has got some 30 square
6 miles to patrol.

7 MR. HAMILTON: That's true. It's been my
8 experience that you don't catch them in the act
9 of dumping. You go through the garbage and find
10 a letter addressed to Joe Dokes and you go hit
11 Joe Dokes. That gets their attention.

12 MS. CAIN: Regardless of that it seems that
13 that is another unavoidable impact if the landfill
14 continues to operate.

15 MR. ANDERSON: I agree.

16 MR. HAMILTON: I don't feel it's really
17 germane to that.

18 MS. CAIN: I think it was touched on in the
19 Environmental Impact Statement, wasn't it?

20 MR. TUSA: We did talk about off-site litter.

21 MS. CAIN: That was an issue which was brought
22 up at the public meeting in December and so again
23 it's restated in the EIS so that everyone who
24 reviews this document and has to use it in a
25 permitting way as a reference knows that that's

1 an issue.

2 MR. ANDERSON: It's pertinent to our
3 decision as to whether the landfill will remain.

4 MS. CAIN: That's correct. That's right.
5 That's what the EIS is for, to provide information
6 for people to make decisions, and that's an
7 unavoidable result of that. Did we get through
8 all of that?

9 MR. TUSA: There were just two others. One
10 is your question about the tax base relating to
11 the BFI property remaining in private hands.
12 BFI has made no indications to us either way.

13 MR. ANDERSON: We don't have any reason to
14 think so either, but I wanted to make this
15 statement.

16 MR. TUSA: The only other thing was the
17 alternative solutions, and essentially what we
18 did is in each of the areas where there might be
19 some level of impact we defined a number of
20 alternative approaches to operating or designing
21 a landfill, and maybe you can take it from there
22 and explain how the agency goes about considering
23 those alternatives.

24 MS. CAIN: Okay. I think that we all know
25 that the whole solid waste issue or arena is

1 really undergoing a lot of change right now.
 2 There are lots of different alternatives. When
 3 we looked at the alternatives for Woodlake, many
 4 of the alternatives like resource recovery and
 5 incineration and those kinds of things were
 6 determined to be not feasible on site because of
 7 the low volume of refuse which was going to that
 8 site. And that is what Browning-Ferris has
 9 control over or what we could in some way suggest
 10 as a more feasible and prudent alternative than
 11 a landfill, but if there is not enough refuse to
 12 make it economically feasible, you aren't going
 13 to have a private company doing that. We also
 14 looked at alternatives over which we or Browning-
 15 Ferris doesn't have control nor the Pollution
 16 Control Agency and some of the regional kinds of
 17 plans that are going on now, and those really
 18 aren't under our authority to dictate. They are
 19 larger scale plans that are going on in the
 20 Metropolitan area and so forth. So I think that
 21 what the agency would do is look at the proposal
 22 that Browning-Ferris would submit for an
 23 application and consider whether some of those
 24 other alternatives on site, perhaps like
 25 compaction, shredding, those kinds of things that

1 are kind of technical sorts of things that they
 2 could do would be a good approach, but as far as
 3 the incineration and some of those larger scale --
 4 I think that those since they are not economically
 5 feasible for the company would not be recommended in
 6 the permit. Do you have any comment? This is
 7 Sandra Forrest who used to be in Solid Waste.
 8 Maybe you can talk more about permitting in
 9 general. I guess I am not asking you to address
 10 whether you had asked for something other than
 11 the proposal, but maybe just the permitting
 12 process.

13 MS. FORREST: All right. The first thing
 14 that the Solid Waste Division would need is an
 15 application for an expansion of landfill. We
 16 don't have that yet. The EIS is finished first
 17 to see what all the alternatives are and then
 18 the company will consider those alternatives
 19 when they put in their application as they
 20 understand it, design alternatives and possibly
 21 the shredding and all of that other stuff. I am
 22 not sure what they are considering at this point,
 23 but they do have that option to look at all of
 24 these before they even commit themselves to sending
 25 in an application. With the application comes the

1 proposed design for the landfill. We don't have
 2 that yet either. This is all still in the EIS
 3 mode. We don't have anything to react to yet.
 4 And after that we look at the design and see if
 5 it's feasible. We send out a public notice of our
 6 intent to permit or deny the application, and then
 7 there is another time period for the public to
 8 input into the landfill design. And then the
 9 permit is either issued or denied.

10 MS. CAIN: Within the permitting process
 11 there are special conditions which could be
 12 added. There is monitoring that could be
 13 instituted. There are other kinds of operations
 14 that could be -- well, not recommended. It could
 15 be ordered as a part of the permit. Some of the
 16 things Wayne mentioned, the wind fences could be
 17 a part of the special conditions. So there are
 18 lots of things that the agency can put into
 19 a permit which can help mitigate some of the
 20 impacts that we are talking about.

21 MR. DIETRICH: Has the agency considered
 22 liners and leachate collection basins and treat-
 23 ment facilities for the leachate?

24 MS. CAIN: One of the alternatives that was
 25 looked at in the Environmental Impact Statement

1 was leachate collection and treatment, and that
 2 is something which the agency can look at and
 3 will look at and could order.

4 MR. LEO LEUER: I am Leo Leuer. I am the
 5 property owner to the north, the full width of
 6 the expansion, and I am quite concerned. I am
 7 not in favor of this whatsoever. What bond is
 8 going to be posted to assure us that we are going
 9 to have water to drink within the next lifetime
 10 that is going to follow me, the next generation?
 11 What assurance? Are they going to put up a half
 12 a million dollar bond or a million dollar bond
 13 to assure the next lifetime that they won't
 14 pollute the water with this garbage dump that is
 15 going in there?

16 MS. CAIN: To my knowledge no bond will be
 17 posted.

18 MR. LEO LEUER: No bond. That gives us no
 19 assurance of --

20 MS. CAIN: Mr. Monteleone?

21 MR. MONTELEONE: Excuse me. Hennepin County
 22 requires a bond as part of their licensing
 23 procedure.

24 MS. CAIN: Thank you. Maybe you want to
 25 introduce yourself.

1 MR. MONTELEONE: I am Edward Monteleone of
2 Hennepin County Department of Environment and
3 Energy, and I review the plans that are submitted
4 on sanitary landfills before they are submitted
5 to the County Board.

6 MR. LEO LEUER: They can come in with a big
7 operation and not post a bond?

8 MR. HAMILTON: That is not what he said.

9 MR. LEO LEUER: I couldn't follow him
10 completely.

11 MR. HAMILTON: Excuse me. Let me see if I
12 can't shed some light. There are two permits
13 required, one from the State which is Cain, one
14 from the County which is Ed. While the state does
15 not require a bond, the county does. Actually
16 it's kind of like playing five-card stud poker.
17 You have to have all five cards to play. Anyone
18 operating this landfill, in effect, has to have
19 at least three cards, that of the state, the
20 county, and, as Mayor Anderson said, the Council
21 must also approve it. So, in effect, any
22 expansion that goes in there would be reviewed.
23 The information in the EIS is used to provide a
24 basis for review. That's the purpose of the
25 meeting tonight, to make sure that we have touched

1 on all of the concerns and all of the factors
2 which may influence these bodies, the state, the
3 county, and the municipality. To answer your
4 question there is one of them that does require
5 a bond. That's the county. The state doesn't
6 and I don't think the town does.

7 MR. LEO LEUER: That's why I am concerned
8 about polluting the water on the adjoining
9 property. I have got nice building sites and
10 nice woods. It'll be for the birds if the water
11 is polluted. I think you would have objections
12 if you was a property owner right next to it.
13 I have been there all my life and it looks like
14 I will be forced to move away.

15 MR. HAMILTON: Well, I want to assure you
16 that that is the reason for the meeting tonight,
17 to make sure that everything humanly possible
18 can be done to protect the water. That's why we
19 are all in business. So let's hope that it works
20 that way.

21 MR. CROSBY: My name is Thomas Crosby and
22 I have a question to the Hennepin County man about
23 the bond. Does that kind of bond solve long-term
24 problems? Is not that kind of bond commonly to
25 make sure that they pick up loose paper if they

1 don't? In other words, is that kind of bond apt
2 to be standing 30 years after the day it is
3 posted?

4 MR. MONTELEONE: The bond is for ongoing
5 problems, not litter. If there was a leachate
6 problem and it was to be corrected, that bond
7 would be used to see that that problem was
8 corrected, the funds in that bond.

9 MR. CROSBY: What is the usual term of such
10 a bond?

11 MR. MONTELEONE: Usually the bond ends at
12 the life of the landfill.

13 MR. CROSBY: Which would be four years or so?

14 MR. MONTELEONE: When the landfill is up the
15 bond is no longer in existence. It's just for
16 ongoing problems.

17 MR. LEO LEUER: That's what I am concerned
18 about. After the landfill they are gone and
19 we're still there. Who is going to suffer the
20 consequences? The property owners adjoining to
21 it. Right? And that's where I will be suffering.

22 MR. MONTELEONE: Theoretically the landfill
23 is supposed to be designed so that shouldn't
24 occur.

25 MR. LEO LEUER: They go bankrupt and what are

1 you going to do?

2 MR. MONTELEONE: Well, if they go bankrupt
3 the bond is still in effect. Do you follow me?

4 MR. LEO LEUER: Just for the landfill but
5 not --

6 MR. MONTELEONE: The detailed design of the
7 landfill is to be such that a ground water
8 pollution problem is not to be encountered. That's
9 the way -- the purpose of it, the designed landfill
10 And we will try to insure it from being polluted.

11 MR. LEO LEUER: I have seen plenty of that
12 landfill since it started. I have seen that
13 landfill start since it first started. I've
14 been there all my life. So you can't give me
15 much information on how it's been run and every-
16 thing.

17 MR. MONTELEONE: But you know what type of
18 operation it was. It was just dumping and
19 burning. It wasn't a sanitary landfill. It was
20 just an open garbage dump.

21 MR. LEO LEUER: I didn't hear you.

22 MR. MONTELEONE: You know what type of
23 operation Mrs. Boyer had. She just dumped it out
24 on the wetland and burned it, and she did not
25 operate it in a proper manner. When EIS came in

1 they put that operation in order within one week.
 2 That's what a difference it was and the problem
 3 that exists from the leachate was the old problem
 4 before of the licensing. That is not allowed any
 5 more, that type of operation.

6 MR. LEO LEUER: Well, your pictures shown
 7 here the last time do not correspond with the way
 8 the dump has been at all times. I will tell you
 9 that.

10 MR. HAMILTON: I was not here so I don't
 11 know.

12 MR. CROSBY: In the report, as I read it,
 13 it appears that by the middle of 1981 the Woodlake
 14 site would be the only solid waste disposal site
 15 in Hennepin County. That's assuming that the
 16 Hopkins is, in fact, closed in 1979. And Flying
 17 Cloud had 3.9 years from 1977. If one were
 18 concerned about permitting this expansion and
 19 ending up with the only active site in Hennepin
 20 County and if one were concerned, as I am, with
 21 the added use of the roads, how can we be
 22 assured that pressures one way or another will
 23 not be exerted on Medina to increase the landfill
 24 after the end of the life of this expansion?
 25 In other words, in effect, we are the only game

1 in the county. I agree that the plans for the
 2 overall problem have been delayed, and I think
 3 that solution is a long way off. Now how can we
 4 maintain control if Medina chooses to permit it
 5 now?

6 MR. HAMILTON: I might hopefully answer
 7 that with a very -- in that any further expansion
 8 would have to go through the same sort of permitting
 9 process as this one would go through and the public
 10 input would be solicited at that point in time.

11 MS. CAIN: One point to make here is that
 12 when we prepare an Environmental Impact Statement
 13 we are looking at the environmental concerns, and
 14 certainly what you are talking about could be a
 15 very real problem. There is no way that we can
 16 assure that there won't be pressure put on Medina
 17 to expand that. That's just a fact that that may
 18 happen. There are, as you know, other siting
 19 processes that are being implemented now.
 20 However, whether those will be available in 1981 --
 21 it certainly would look that way, but pressure may
 22 come to bear -- there is no denying that -- to
 23 further expand the landfill, and then that would
 24 be the case of Medina making that decision and
 25 whether people are willing to sell around it.

1 So that could be a very real fact.

2 MR. CROSBY: The interesting factor is that
3 now, as I understand the law, Medina can prohibit
4 it. Unless the law were changed and one assumes
5 that in the intervening period the law is changed
6 to permit condemnation over City Council action.
7 You put Medina in a position of really having to
8 protect its long-term interests even if this
9 works out because it's really the only alternative
10 two or three years from now.

11 MR. HAMILTON: Other comments?

12 MR. FRANKLIN: My name is Robert Franklin.
13 I speak from the prospective of having lived on
14 Lake Independence for 14 years and being a former
15 member of the Medina City Council where I served
16 for six years. I have three concerns and I would
17 like you to interrupt me with the answers to the
18 questions I have. One has to do with drinking
19 water. The EIS suggested that there would not be
20 a problem for the municipal well, but it already
21 has apparently an overload of phenols, which for
22 some reason in my mind I associate with the
23 carcinogenic process. Maybe that is erroneous,
24 but that kind of contamination would have to come
25 from someplace, and I am wondering from where

1 if not from the present landfill and if there is
2 a problem with the municipal well a mile and a
3 quarter from the landfill site, what problems
4 might there be for private wells which would be
5 much closer?

6 MR. TUSA: Okay. We talked about this a
7 little bit before. The numbers that you see in
8 the EIS that relate to phenol concentrations in
9 Lake Independence were based on an analysis
10 completed by us that started out with the premise
11 that suppose we did have a leachate escape problem
12 for the proposed landfill. If there were a
13 leachate contamination problem from the proposed
14 landfill and it got into Pioneer Creek and
15 eventually worked its way down into Lake
16 Independence, what would be the concentrations
17 in Lake Independence as a result of that. In
18 order to do that we took leachate volumes that
19 were estimated to be escaping from the existing
20 landfill because there was dumping in the wetland
21 itself. So there is no impermeable barrier for
22 that section of the landfill. We took leachate
23 volumes from the existing landfill and calculated
24 what those new concentrations would be assuming
25 average mixing in the watershed in Lake

Independence, and phenols, as you mentioned, was a contaminant that was there in higher concentrations than what the new stringent water quality standard was for the watershed. Now what that said to us was two things. One, there was a potential for the existing landfill to be a downstream contaminant and a pollution problem in Lake Independence from a strictly mathematical viewpoint of simple dilution. Unfortunately or perhaps fortunately, in this case, there are a number of other processes that go on in any natural ecosystem that are perhaps more important than natural dilution processes, and due to natural decomposition processes which does occur with phenol, for example, due to simple deposition processes, sedimentation, filtration processes, uptake from various plants, benthic organisms we suspected that even the simple dilution processes suggested that phenol might be in a higher concentration in Lake Independence. In actuality concentrations in Lake Independence because of these other processes that I mentioned would be much lower than that, perhaps by several orders of magnitude. So let me back up a minute. We suggested, number one, that the existing

landfill without an impermeable barrier at the wetland base wasn't a problem in Lake Independence, and the existing landfill leaks leachate into the surface water system. Now if you compare that to the new landfill which is what we are looking at in this EIS which does have an impermeable barrier, both along the sides and along the bottom, then if the old landfill wasn't a problem in the downstream watershed at Lake Independence, then the new one which has a much better design shouldn't be a problem either, and that's what those numbers are trying to say. That same answer relates to your question about local private wells. Because we are saying that that clay is impermeable, that essentially what we will have is the leachate being contained on the site and not escaping into the surface water systems or the ground water systems. Unless you located a well very close to the site, there shouldn't be any problems with leachate contamination of a private well for the very same reason because we are building a landfill that's got an impermeable base and impermeable sides, impermeable meaning it doesn't leak very fast. It leaks very slowly.

1 MR. FRANKLIN: My second comment has to do
 2 with the lake. If it's impermeable and if there
 3 is no chance of pollution in Lake Independence,
 4 that is fine, but I would like to stress the
 5 importance of that for two reasons. One is the
 6 lake is a valuable resource. The EIS can't make
 7 up its mind whether it's 992 acres or 828. It is
 8 828, but it talks about it as a major recreational
 9 facility used primarily for swimming and boating.
 10 It's also a major fishing lake. It's been stocked
 11 in the last few years with both muskies and
 12 walleyes. It also has northerns, crappies,
 13 sunfish, and bass. At the risk of precipitating
 14 a rush to the lake a fellow from the DNR told me
 15 today that he landed a 22-pound muskie last
 16 spring. When you get fish of that size I suspect
 17 that you have a potential for a significant
 18 build-up of any kind of contaminant in fish.
 19 That's important.

20 MS. CAIN: Could I just say one thing at
 21 this point and that is that the Pollution
 22 Control Agency couldn't agree with you more.
 23 Now this Environmental Impact Statement was
 24 ordered by our board. It was not the result of
 25 citizen petition or anything. And the things

1 that you are saying are the things that I was
 2 saying, why we should not permit this site without
 3 taking a close look at this through the Environ-
 4 mental Impact Statement process and for the
 5 reasons we are talking about. This is near a
 6 recreation area and we do look at the value of
 7 those lakes and not just Lake Independence but
 8 all of those interim lakes right up to the wetland
 9 that is in the landfill area. So I totally agree
 10 with you, and that's really what precipitated
 11 this Environmental Impact Statement. And I
 12 appreciate your drawing our attention to some
 13 of the additional fish and the correction of the
 14 size and so forth. So that's why this was done
 15 and we hope with the additional comments we get
 16 tonight there will be a fair representation of
 17 the importance of this resource.

18 MR. FRANKLIN: Thank you. I want to
 19 reinforce that, not just for the purpose of the
 20 study but for the purposes of the control of the
 21 leachate or whatever other methods. The other
 22 thing is that the lake is really not in all that
 23 great of shape right now as it is. The EIS
 24 suggested somewhat of a dearth of information
 25 about the lake. The PCA's own citizen lake

1 monitoring program in which I participated last
2 year did give us a couple of benchmarks. And
3 they showed that the phosphorous content of the
4 water is 0.82. Would it be milligrams per liter
5 of phosphorous, whereas the mean for the region
6 is 0.56. So you are 50 percent higher there.
7 For nitrogen the mean in Lake Independence is
8 1.99 which is almost double the mean for the
9 region of 1.1. It ranged up to 2.36. The
10 transparency readings had a mean of about three
11 feet which puts Independence in the bottom 30
12 percentile of lakes in Minnesota, and it's --
13 that makes it only about two thirds of the clarity
14 of lakes in this region. In addition, as the
15 report noted, half of the lake is less than 15
16 feet deep which lends itself to a lot of bottom
17 stirring and it gets it with a park that has
18 200,000 visitors a year, many of them in motor-
19 boats.

20 MS. CAIN: Could I just interrupt you for a
21 moment?

22 MR. FRANKLIN: Sure.

23 MS. CAIN: Virginia, could you just discuss
24 some of the ongoing work that is being done now
25 to sample Lake Independence and where we are on

1 that?

2 MS. REINER: Okay. The agency, as I again
3 want to reiterate, has been very concerned with
4 the effects on Lake Independence, not only for
5 the reasons you stated but also because the lake
6 doesn't have a good flushing action. Anything
7 that drains into this whole chain of lakes ends
8 up in Lake Independence. There is no good way
9 to clean the lake out if it gets contaminated.
10 So we have been looking at sampling the lake and
11 in this summer while we haven't had much data
12 before this -- this summer we have been collecting
13 a lot of data. Hennepin County is doing four
14 sampling runs and they will be doing the
15 traditional set of parameters such as dissolved
16 oxygen, temperature, phosphorous readings,
17 etcetera on the lake and they will also do one
18 set of heavy metals sampling. I believe now that
19 is to be conducted this month. I do not know
20 if that has been done already, but as soon as
21 they get the data which is going to be run by
22 the Metropolitan Waste Control Commission lab,
23 we will get a copy of it. Now we have our own
24 lakes classification team in the agency which has
25 sampled Lake Independence by airplane already,

1 and I believe that was in the first part of July. 1
 2 So we have taken samples and after reading through 2
 3 the EIS we have taken the sample for phenols and 3
 4 we will be running that as a parameter and we will 4
 5 be running all the heavy metals as well plus the 5
 6 usual nitrogen, phosphorous, dissolved oxygen. 6
 7 So our samples went to the health lab for analysis 7
 8 and we expect to receive that analysis in maybe 8
 9 another four to six weeks. So we feel that having 9
 10 this set of data -- and we possibly could sample 10
 11 depending upon the weather Lake Independence one 11
 12 more time with our agency crew, but we feel that 12
 13 by the end of this fall we certainly will have a 13
 14 comprehensive understanding of what is going on 14
 15 in that lake. We will know if there is a problem 15
 16 that exists there now and if that lake is being 16
 17 impacted, we feel that we will have enough time 17
 18 to address that question in the permitting 18
 19 process for the landfill should that come up 19
 20 because, as we said earlier, they have not 20
 21 applied for a permit yet and the permitting 21
 22 process itself takes several weeks. So we hope 22
 23 that we are addressing the concerns about the 23
 24 lake adequately by gathering all of this 24
 25 additional data. 25

MR. FRANKLIN: Thank you.

MR. TUSA: I think there is a little more we
 can add to that. There was a technical work paper
 separately on water quality, completed separately,
 and that document tried to put in perspective
 inputs to the watershed including agricultural
 and septic inputs. As you probably know, the
 Loretto Sewage Treatment Plant discharges what
 is essentially a secondary affluent to the stream
 and wetland above the landfill site. Basic
 conclusions that we made is that at least from a
 volumetric point of view agricultural run-off
 and the sewer treatment plant run-off were much
 larger than the leachate contributions from the
 existing landfill that doesn't have the impermeable
 barrier system. Also note that nitrogen and
 phosphorous loadings are not common from leachate.
 They are much more common from septic systems and
 they are much more common from particularly
 agricultural run-offs.

MR. FRANKLIN: It suggests to me if we have
 a problem from agricultural run-offs and from
 the Loretto sewage plant that we ought to be
 doubly certain not to add to them from another
 source. The last comment I wanted to make has

1 to do with the future of the landfill after it
 2 goes out of business, and I know that the city
 3 council took a position several years ago when I
 4 was a member that it should remain a taxable
 5 property. With about 2,000 acres of Hennepin
 6 County park reserve off the tax rolls it behooves
 7 the city not to lose a great deal more land and
 8 not to create a pressure where the city would be
 9 tempted to make otherwise unfortunate or unwise
 10 planning decisions in an attempt to counter that
 11 type of loss. By the same token there needs to
 12 be some kind of assurance, and I would guess a
 13 type of ongoing bond would be the most effective
 14 that would insure that the possibility of pollution
 15 after the thing goes out of business would be dealt
 16 with. We are all familiar with what happened
 17 in St. Louis Park with the creosote problem and
 18 we don't need any more of those. By the same
 19 token we don't need property like this to be
 20 abandoned and go off the tax rolls as tax forfeit
 21 after it's used up as a landfill. The Council
 22 specifically several years ago rejected the idea
 23 that the property ought to become an extension
 24 of the park reserve district. I guess that's all
 25 I have to say.

1 MS. CAIN: Thank you. We appreciate your
 2 comments. I always like it when someone agrees
 3 with my point of view.

4 MR. DIETRICH: In your Draft Environmental
 5 Impact Statement you mentioned agricultural
 6 pollution into Lake Independence. I happen to
 7 farm in the watershed area. Do you have
 8 documentation of this area or are you taking some
 9 area that's continuous crop farmed in Iowa? Our
 10 agriculture is different than some of the agri-
 11 cultural production or run-off data that you may
 12 have. We have a different type of agriculture
 13 and we just don't have a whole lot of agriculture
 14 in the Lake Independence watershed.

15 MR. TUSA: The information -- as I recall,
 16 the source of information we used was done in
 17 conjunction with defining permit rights for the
 18 Loretto plant. So it was local, and the numbers
 19 that we were using were something on the order of
 20 70 percent of the drainage area to this particular
 21 wetland was agricultural.

22 MS. REINER: That was done by a local
 23 consultant called McCombs-Knutson who did a
 24 phosphorous study on the influx into the wetland
 25 with respect to whether the Loretto plant was an

1 overdo contributor.

2 MR. DIETRICH: It was done locally then?

3 MS. REINER: Yes, it was.

4 MR. HAMILTON: Any other comments?

5 (No response.)

6 MR. HAMILTON: Do you want to take a ten-
7 minute recess to put your heads together and then
8 we will reconvene and see if we can't tie up any
9 loose ends and take it from there?

10 (At this time a brief recess was taken.)

11 MR. HAMILTON: We will try to wrap it up
12 in 15 or 20 minutes unless somebody has a crying
13 need to expand on a particular item. Has anybody
14 else come up with additional questions for the
15 staff or the consultants at this time?

16 MR. NISTLER: I am a hauler. We have got
17 to have a dump somewhere and quick or you're
18 going to have stuff laying all over the country
19 because we are getting to a point where you can't
20 dump. There's no place to dump.

21 MR. HAMILTON: Any other comments? Ed, do
22 you have any comments from the county's point of
23 view? I hate to put you on the spot.

24 MR. MONTELEONE: All the county's concerns
25 were addressed in the Environmental Impact

1 Statement as to the leachate existing and keeping
2 it away and the alternatives of making sure there
3 was a berm between the solid wastes and areas like
4 that. Like I say, it was addressed to the health
5 and welfare and safety of the public, but there
6 is one thing that I must mention which the local
7 people know and which Wayne doesn't is the litter
8 problem. It's an unusual situation. What happens
9 there is the -- due to the type of landfill
10 operation every once in awhile you will get an
11 uplift with the wind and when a compactor opens
12 the back of the truck paper just goes up into the
13 air and flies over the barriers that are there
14 and it's unavoidable, but it happens occasionally
15 and in the spring when the ground is wet the land-
16 fill operators do get a bunch of people, but they
17 can't go out there and pick it up because the
18 ground is too wet. It lays around for a couple of
19 days, but that is the concern that I know these
20 local people have. It's unavoidable. It just
21 happens occasionally and it takes time to take
22 care of.

23 MR. HAMILTON: Thank you, Ed. Mr. Mayor,
24 would you care to add a final comment?

25 MR. ANDERSON: The only thing that I would

1 like to say again is we have some concerns. We
 2 would like to have some further meetings. As I
 3 was explaining during the break that I would like
 4 to see some good monitoring and we are concerned
 5 also about the future after the landfill is closed
 6 down, some kind of safeguards along that line.
 7 If the power is to be to create recovery sources
 8 downtown, I think it would be a boon to everybody.

9 MR. HAMILTON: Thank you, Mr. Mayor. Anybody
 10 else over in this section? Mr. Kager, do you have
 11 anything?

12 MR. KAGER: No, I don't.

13 MR. HAMILTON: Anybody over in this section?
 14 Mr. Franklin?

15 MR. LEONARD LEUER: Just to reiterate what
 16 was spoken several times is after the dump is --
 17 the ten years are up, the business of the bonds
 18 being there or even the private land owners could
 19 start possibly having trouble with ground water
 20 and ground water contamination. What is their
 21 course of action? What is their recourse? Do
 22 they stand the cost of putting in their own
 23 private water treatment facilities so they have
 24 potable water? Long-term bonds, long-term
 25 responsibilities in this situation.

1 MR. HAMILTON: Your concerns are well taken.
 2 Any other questions or comments in this section?

3 MS. CAIN: I have a comment in this section.
 4 I neglected to put up a sign-up sheet when you
 5 all came in. Would you please put your name,
 6 address, correct mailing address, and we will send
 7 you the final Environmental Impact Statement which
 8 will consist of what you have in your hand, the
 9 draft, plus the record that's being prepared
 10 tonight and the agency's responses. We will be
 11 looking through this. I think most of the
 12 questions were answered tonight, but we will look
 13 them over and further expand on them if we feel
 14 that there is some additional information we
 15 could provide and also -- I have forgotten. It
 16 does make you nervous to be in front of a court
 17 reporter. And also -- oh, I do remember. As I
 18 mentioned before, we do have these technical work
 19 papers, and I would like to send a set to the
 20 City Offices. Would that be possible to keep a
 21 set in the City Offices? We don't have enough
 22 copies to send to individuals, but I will make
 23 sure a set is here in your Medina offices and if
 24 you come in, there is a separate one on energy
 25 and all of the different areas that we looked at

1 in the EIS. The meat of the project, of course,
2 is in the EIS, but this is further documentation
3 and there may be more calculations, how they got
4 to a certain point to report what was in the EIS.
5 So I will be sure one of those is sent. And again
6 if you have any comments you want to send in
7 writing, you should send those to me and I guess
8 that then we will notice you on the opportunities
9 to speak if you want to come to the PCA Board
10 meeting and the EQB meeting. And we will be using
11 this mailing list and the mailing list of those
12 of you who came to the December 13th meeting.
13 So please if you want to continue to be involved
14 in this process, sign up and put your correct
15 mailing address and only one for each family.
16 We don't have to inundate you with paper. I hear
17 you have plenty of paper around here.

18 MR. HAMILTON: It will all end up blowing
19 around.

20 MS. CAIN: We won't mail any more to you
21 than we have to. So I want to thank --

22 MR. LEO LEUER: I just hope that if this
23 ever goes through that it is going to be a little
24 bit better than what Pigseye is. As I have been
25 observing Lake Pepin in the last couple of years --

1 I was about six or seven hours on it just a few
2 weeks ago, and I must say it was a lot worse than
3 a few years ago. I hope the garbage isn't going
4 to be compared to the sewer --

5 MS. CAIN: I don't think it will.

6 MR. LEO LEUER: If you are acquainted with
7 Pigseye, no use going there.

8 MS. CAIN: I have heard about it. I don't
9 even have to go near it. Well, I want to thank
10 you all for coming tonight and again if you want
11 to call me, I will leave my telephone number at
12 the top here. If you want to copy that down, I
13 will be glad to talk to you or make whatever
14 effort we can make to make sure that your
15 concerns are addressed. Thank you all for
16 coming.

17 * * *

1 REPORTER'S CERTIFICATE

2
3
4 I hereby certify and state that I recorded
5 in shorthand the proceedings had on August 20, 1980, in the
6 City of Medina, Minnesota;

7
8 That thereafter I caused the same to be
9 transcribed into typewriting, consisting of the preceding
10 52 pages;

11
12 That the said transcript of such recorded
13 proceedings is true and correct to the best of my ability;

14
15
16
17 DATED: August 28, 1980.

18
19 

20
21 LINDA SKILLE
22 Court Reporter
23
24
25