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M. Smith

METROPOLITAN COUNCIL
Suite 300 Metro Square Building, St. Paul, Minnesota 55101

M E M O R A N D U M

February 26, 1981

TO: Physical Development Committee

FROM: Environmental Planning (Paul Smith)

SUBJECT: Filing of the Final Environmental Impact Statement (EIS)
on the Burnsville Sanitary Landfill Expansion
Metropolitan Council District No. 15
Metropolitan Council Referral File no. 7568-1

Attached is the Final EIS on the Burnsville Sanitary Landfill expansion. The EIS examines a broad range of environmental issues, including the impact of the expansion on air quality, surface water and groundwater, local drinking water supplies, wildlife, local geology and hydrology, aquatic ecology and wetlands. The EIS also discusses reasonable alternatives to the proposed action. A summary of the contents of the EIS is contained in the introductory section.

The Final EIS was prepared pursuant to Environmental Quality Board (EQB) regulations (MEQB 21 - MEOB 41). The Council is required to file the EIS with EQB in order that the EQB can review it for adequacy. Once determined adequate by EQB, the Council and other review authority can begin the permit and licensing processes to make final decisions on the project.

RECOMMENDATION

That the Metropolitan Council file with EQB the final EIS on the Burnsville Sanitary Landfill expansion.

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FINAL ENVIRONMENTAL IMPACT STATEMENT

BURNSVILLE SANITARY LANDFILL EXPANSION
BURNSVILLE, MINNESOTA

February 27, 1981

Metropolitan Council
Suite 300 Metro Square Building
Saint Paul, Minnesota 55101

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SECTION I

SUMMARY

IDENTIFICATION OF DOCUMENT

Preface

In 1979, Edward Kraemer and Sons, Inc., owner and operator of the Burnsville Sanitary Landfill in Burnsville, filed an application with the Minnesota Pollution Control Agency (MPCA) for a permit to expand the disposal area of the landfill. The MPCA received an environmental assessment worksheet (EAW) on the proposal and, based on information contained in the EAW, determined that an Environmental Impact Statement (EIS) should be prepared. On January 29, 1980, the MPCA board recommended to the Environmental Quality Board (EQB) that an environmental impact statement be prepared and that the Metropolitan Council prepare the EIS. The EQB concurred with the MPCA recommendations on February 21.

Organization of EIS

The EIS has 10 sections. Section Two briefly describes the existing landfill operations and the proposed action. Section Three describes the existing environment of the landfill and the surrounding area. It covers air quality, water quality, ecology, and socio-economic aspects. Section Four covers the environmental impacts of the proposed expansion. This section of the EIS describes the primary impacts of the proposed action, direct effects that cannot be avoided, irreversible and irretrievable resource commitments, the relationship between local short-term uses of the environment and long-term productivity and any cumulative impacts. Section Five describes mitigating measures that might be undertaken to alleviate any significant environmental impacts. Section Six discusses alternatives to the proposal including a "no action" alternative, site design alternatives, waste reduction, and materials and energy recovery. Section Seven describes the impacts of any federal controls associated with the proposed action on state government. Section Eight describes multi-state responsibilities associated with the proposed action. Sections Nine and Ten discuss, respectively, impacts on county solid waste planning efforts and impacts on the Metropolitan Council's regional solid waste plan.

PROPOSED ACTION

The landfill application is for a permit to expand the existing landfill which is in Section 32, T.27 N., R. 24.W in Burnsville, Dakota County, Minnesota. The landfill is an 85-acre site which has been in continual operation since the mid-1960s. The proposed expansion involves filling a 17-acre parcel located west of the existing landfill, and increasing the maximum permitted elevation of the landfill from 780 to 800 feet. These areas will be filled with general residential and commercial refuse. The existing landfill has a remaining permitted capacity of 806 acre-feet. At this capacity, the landfill has another two- to three-year "life" given normal receiving rates.

The proposed vertical and horizontal expansions would provide for an additional 2,418 acre-feet of space (3.9 million cubic yards), and will increase the estimated life of the landfill by six to seven years given a fill rate of about 300 acre-feet per year (40,000 cubic yards per month). If allowed to expand, the landfill could operate for another eight to 10 years given normal receiving rates.

MAJOR ENVIRONMENTAL IMPACTS

Air Quality and Noise

The construction, operation and closing of the proposed expansion areas will result in a minimum amount of fugitive dust, odors and methane gas. Current operational procedures at the landfill should be sufficient to handle the air emission problems associated with the proposed expansion areas. In addition, the surrounding topographic and land use features of the area should provide adequate protection from adverse impacts on local people and property.

The potential for adverse methane gas impacts will be increased by the proposed expansion areas. If buildings are constructed on the former fill area or near the perimeter of the landfill, there is potential for gas accumulation in these structures in explosive concentrations. It may be necessary prior to closure of the facility to install a gas monitoring system to evaluate any future requirements for on-site and perimeter gas control measures.

Water Quality

The primary impact on surface water quality from operations in the proposed expansion area would be an increased potential for minor leachate contamination of the Minnesota River, and contamination and siltation of nearby off-site ponds and wetlands. Results of the analysis to determine the impact of the proposed expansion on Minnesota River quality indicate that there is no significant impact from the expanded landfill. Most of the water quality parameters measured show no appreciable change due to the expansion of the landfill. The same is true for nearby off-site ponds and wetland areas.

The application and grading of daily and final cover material at the landfill will serve to direct on-site drainage to an adjacent drainageway. Surface leachate should rarely occur with continued cover soil placement, grading and seeding practices. Continued seeding will promote natural vegetative growth which will subsequently stabilize fill surface areas, prevent erosion and enhance the appearance of the site.

There is no potential for leachate contamination of nearby water supply wells, since none are located within the area of leachate influence identified at the landfill. However, a well owned by Cargill Inc. is located close to the landfill's identified leachate zone of influence and potentially could be impacted. Leachate control mitigative measures are discussed.

The proposed expansion may contribute additional leachate to the groundwater system, and subsequently the Minnesota River. The minor increase in leachate production is predicted to have only minimal impact on the river. Most pollutants will show no detectable change because of dilution within the river.

Terrestrial and Aquatic Ecology

Construction activities in the proposed expansion areas, particularly the excavation and fill procedure, will unavoidably eliminate vegetation on the areas involved. Reduction of vegetation will, in turn, decrease the habitat of wildlife populations. This action will have minimal effect on areawide predator populations faced with a decrease in food supply. While considerable time will lapse between replanting and full restoration of a vegetative cover and subsequent reintroduction of associated wildlife species, impacts are generally not substantive.

Filling activity in the expansion area will have one additional irreversible impact. A small wetland area, approximately .25 to .5 acre in size, on the expansion area will be filled. This wetland is privately-owned and has been classified as Types 2 and 6. It is therefore not within the jurisdiction of the Department of Natural Resources (DNR). This action will have minimal effect on the areawide wetland resources.

Operating activities in the proposed expansion area should have only negligible impacts on off-site ponds and wetlands. With daily cover and surface runoff controls (such as slope structure and seeding), potential impacts should be negligible.

Socio-Economics

The expansion of the landfill will delay use of the property for other purposes for about six years. Transportation-related impacts will not be new; rather, they will reflect existing impacts. Existing impacts have been identified as traffic congestion in the vicinity of the landfill, traffic operating deficiencies at the Interstate Highway 35W-Cliff Road interchange, and litter on local streets in the vicinity of the landfill.

Nearby homes that look directly on the landfill will be exposed to the operation of the facility during the expansion period. Visual impacts will be greater than at present, since the final elevation of the expansion areas will create an isolated mound 10 to 20 feet below the opposing bluff on the north side of the Minnesota River.

The expansion areas will add about 11 months of life to the metropolitan land disposal system. This will, in turn, lessen the need and expense for new landfills and the need for rerouting and/or additional fuel costs for area haulers. Filling of the expansion areas will, therefore, lessen the need to develop new landfills sooner, and help maintain present land disposal charges and collection rates.

REASONABLE ALTERNATIVES

The landfill, without expansion, will close in 1982. No resource recovery or new landfill facilities would likely be operating in time to represent reasonable alternatives to the proposed expansion. Disposal at nearby existing landfills represents the only land disposal alternative to this proposal.

Other alternatives to the proposed expansion include waste reduction and material recovery. Neither of these waste management methods could provide a reasonable alternative to the entire capacity proposed for expansion. Source separation and materials reuse and recovery methods do, however, provide cost-effective alternatives for a portion of the waste materials presently landfilled. Additional support for existing programs and stepped-up efforts to implement new programs could be deemed as reasonable and prudent alternatives to a portion of the proposed expansion.

FEDERAL, STATE AND LOCAL PERMITS OUTSTANDING

The applicant is required to obtain a modification of its existing solid waste disposal permit with the MPCA. The Metropolitan Council must approve the modification. The applicant is also required to obtain modification of its license with Dakota County and its conditional use permit with the City of Burnsville.

AGENCIES, ORGANIZATIONS AND INDIVIDUALS CONSULTED

The Council staff prepared this EIS. The MPCA's staff prepared Sections Seven and Eight and a portion of Section Six.

The following agencies, organizations and individuals were consulted during preparation of this EIS.

University of Minnesota	C. McJilton, F. Thompson, H. Paulus, J. Mulhansen
Minnesota Department of Health	P. Gutkowski, T. Bosman, M. Convey, J. Washburn, D. Anderson, G. England, R. Koch, M. Seliga
Minnesota Occupational Safety and Health Administration	D. Schilling, J. Berg, B. Bracht, W. Mergens
Minnesota State Planning Agency	P. Ashbrook
American Lung Association	B. Hughes
Dakota County	D. Gurney
Barr Engineering	A. Gebhard, D. Farb, L. Dalen

Dakota County Soil and Water
Conservation District

St. Paul Refuse Haulers Association

Minnesota Historical Society

Dakota County Historical Society

Minneapolis Refuse, Inc.

Lake Sanitation, White Bear Lake

City of St. Paul

Pope-Reid Associates

U.S. Corp of Engineers

Peterson Forage Seed Co., Savage

Minnesota Department of
Natural Resources

City of Minneapolis

Private Hauler

U.S. Fish and Wildlife Service

City of Burnsville

City of Bloomington

Northern States Power Company

Edward Kraemer and Sons, Inc.

Minnesota Pollution Control Agency

B. Christenson

F. Rauschnot

R. Fridley

F. Miller

C. Kutter, C. Baker

M. Ayde

F. Forsberg, R. Person

R. Reid, S. Smith

J. Esson

S. Peterson

T. Kucera, C. Henderson,
J. Davidson, K. Gill,
C. Cohen, R. Norrgard,
J. Dustrude

M. Enquist

L. Willman

K. Carr, M. Timmins

M. Falk, W. Johnson

J. Truax, G. Shirley

T. Williams, G. Kelly
J. Bechtoldt, L. Eberly

B. Miller

D. Korpela, G. Blaha

SECTION II

DESCRIPTION OF EXISTING LANDFILL AND PROPOSED ACTION

DESCRIPTION OF EXISTING LANDFILL

SITE LOCATION

Legal Description

The landfill permit application is for a horizontal expansion of the landfill to include an adjacent 17-acre parcel and for a vertical expansion of the existing landfill. The landfill is located in Section 32, T. 27N., R. 24W. in the City of Burnsville, Dakota County, Minnesota. The location and limits of the existing landfill property and the proposed 17-acre expansion area are shown in Figures II-1 and II-2. The legal description of the existing landfill property and the proposed horizontal expansion area are included in Appendix I.

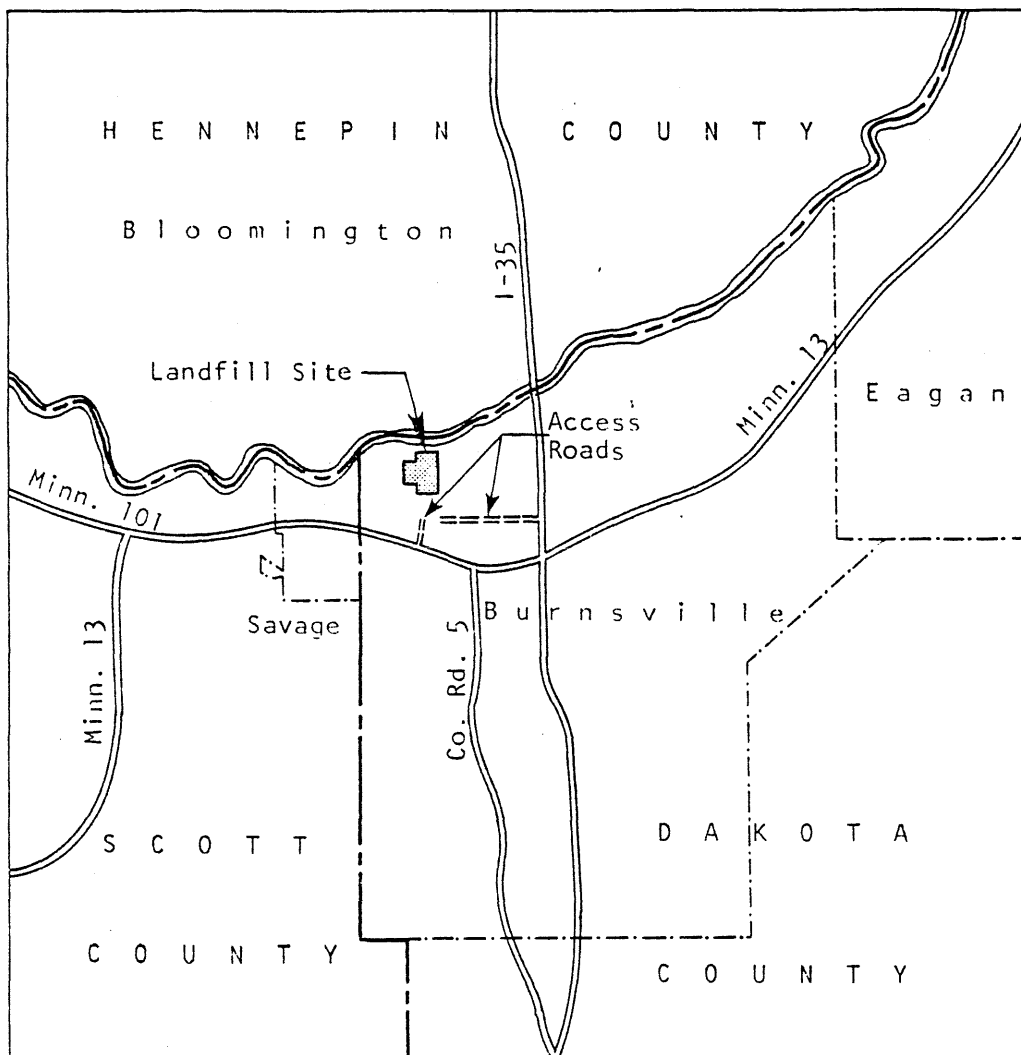
The Burnsville zoning map, dated November 1977, identifies the existing landfill and proposed expansion I-2, general industrial. The 1965 Burnsville Comprehensive Plan also identifies the site as general industry.

As Figures II-2 and II-3 illustrate, the existing land use in the vicinity of the landfill is industrial or open land. A dolomite quarry operated by Edward Kraemer and Sons is east of the landfill and to the west, owned by Cargill, is the site of a grain storage and barge loading terminal. The Minnesota River is approximately 950 feet north of the landfill.

The landfill is an existing permitted landfill (MPCA Permit No. SW-56) which has been in continual operation since the mid-1960s. Prior to being permitted in October 1971, the landfill had operated as an open dump. The landfill is operated under a conditional use permit with the City of Burnsville and a solid waste disposal license with Dakota County. The landfill occupies 85 acres and is owned and operated by Edward Kraemer & Sons, Inc. of Burnsville, Minnesota.

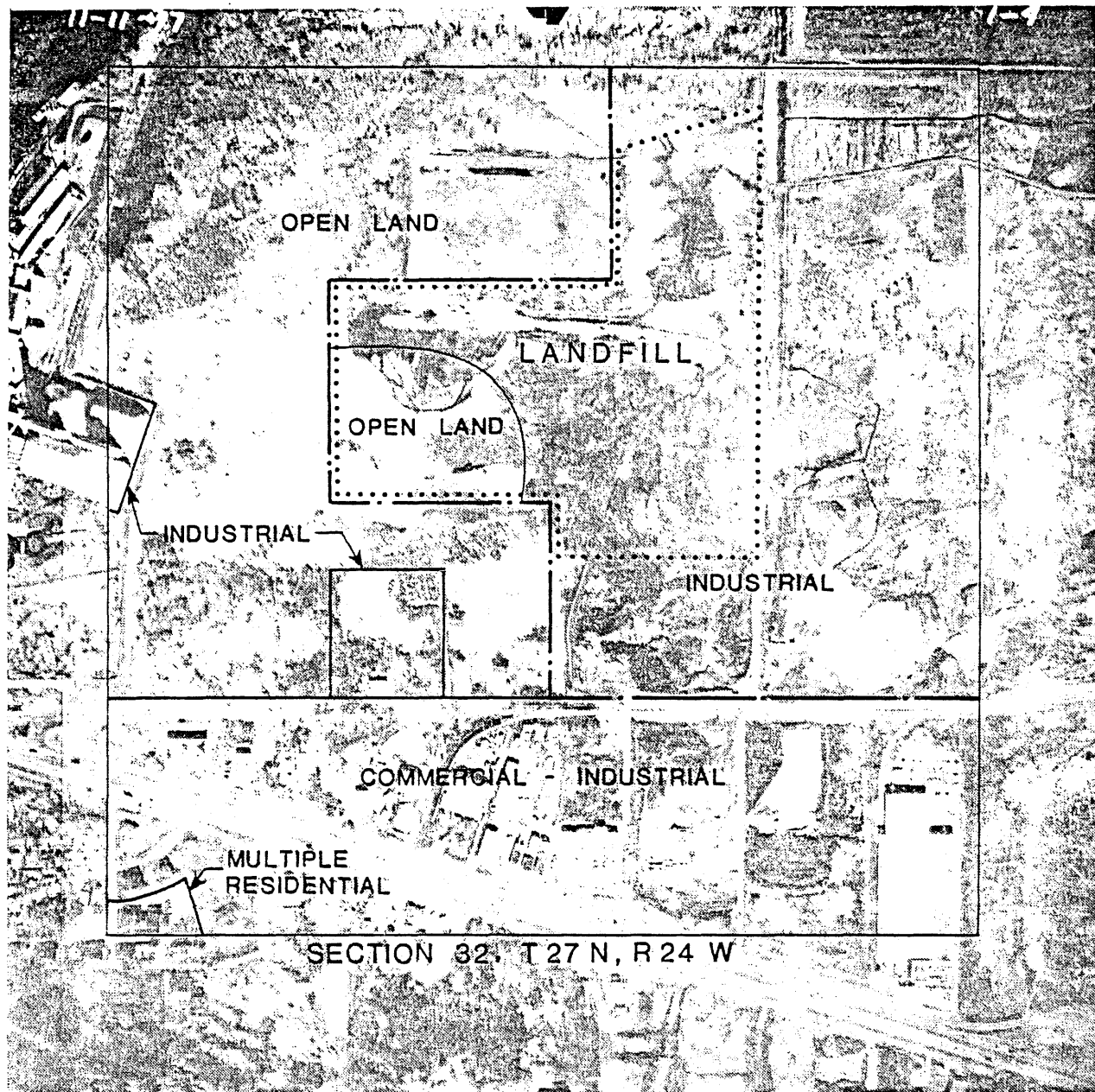
Major Access Roads

Solid waste is brought to the disposal site by commercial haulers or private individuals along the roads shown in Figure II-1. There are two all-weather, blacktop access roads to the landfill. The primary haul routes are Interstate Highway 35W with access at Cliff Road (formerly 122nd St), and Highway 13 with access at an unnamed road from a controlled intersection on Highway 13.



N
▲
1" = 2 Miles

FIGURE II-1
EXISTING HAUL ROADS
BURNSVILLE SANITARY LANDFILL



..... Limits of Landfill Expansion



1" = 1,000'

FIGURE II-2
EXISTING LAND USE
BURNSVILLE SANITARY LANDFILL

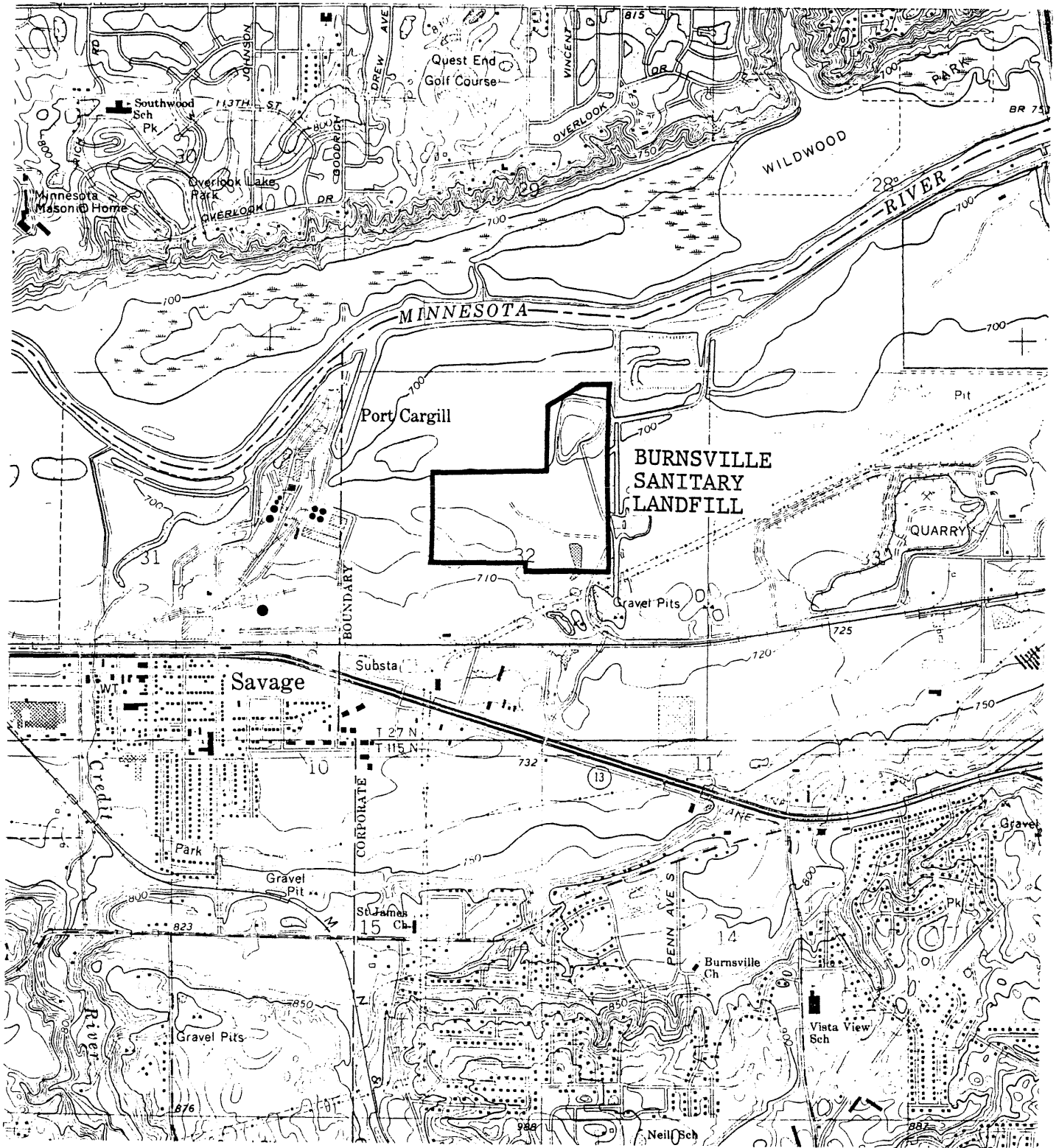


Figure II-3 Quad Map Excerpt

Scale 1" = 2000'

From: USGS Bloomington Quadrangle

SOLID WASTE SERVICE CONDITIONS

Areawide

For a description of areawide solid waste collection and disposal conditions see Section III, Socio-Economics-Collection and Management System costs.

Solid Waste Quantities and Composition

In 1979, the landfill received approximately 40,000 cubic yards a month of mixed municipal solid waste (with a peak monthly intake of nearly 90,000 cubic yards). Mixed municipal waste consists of solid waste that is collected from residential, commercial and industrial sources. No hazardous or liquid wastes are accepted at the landfill.

This volume dropped by nearly 75 percent when the landfill initially reduced hours, increased rates and took other actions to deal with its rapidly decreasing capacity and with the problems associated with the sudden rise in intake experienced during the summer of 1979. Monthly intake volumes have now gradually increased to approximately 20,000 to 25,000 cubic yards per month.

Collection-and Disposal System

The landfill wasteshed covers approximately 400 square miles and includes portions of Dakota, Scott and Hennepin Counties. Twelve municipalities, eight townships and the Fort Snelling area deposit refuse to varying degrees, at the landfill. As shown in Figure II-4, this landfill's wasteshed extends from the Minneapolis/Richfield boundary in the north to the southern tier of townships in Scott County and from Rosemount in the east to Jackson and Louisville Townships in the west.

The landfill was originally permitted by the MPCA at 9,546 acre-feet of capacity. In a normal year, it is estimated that 300 acre feet of capacity are used. It is further estimated that about two to three years of remaining life currently exists at the landfill, given normal receiving rates.

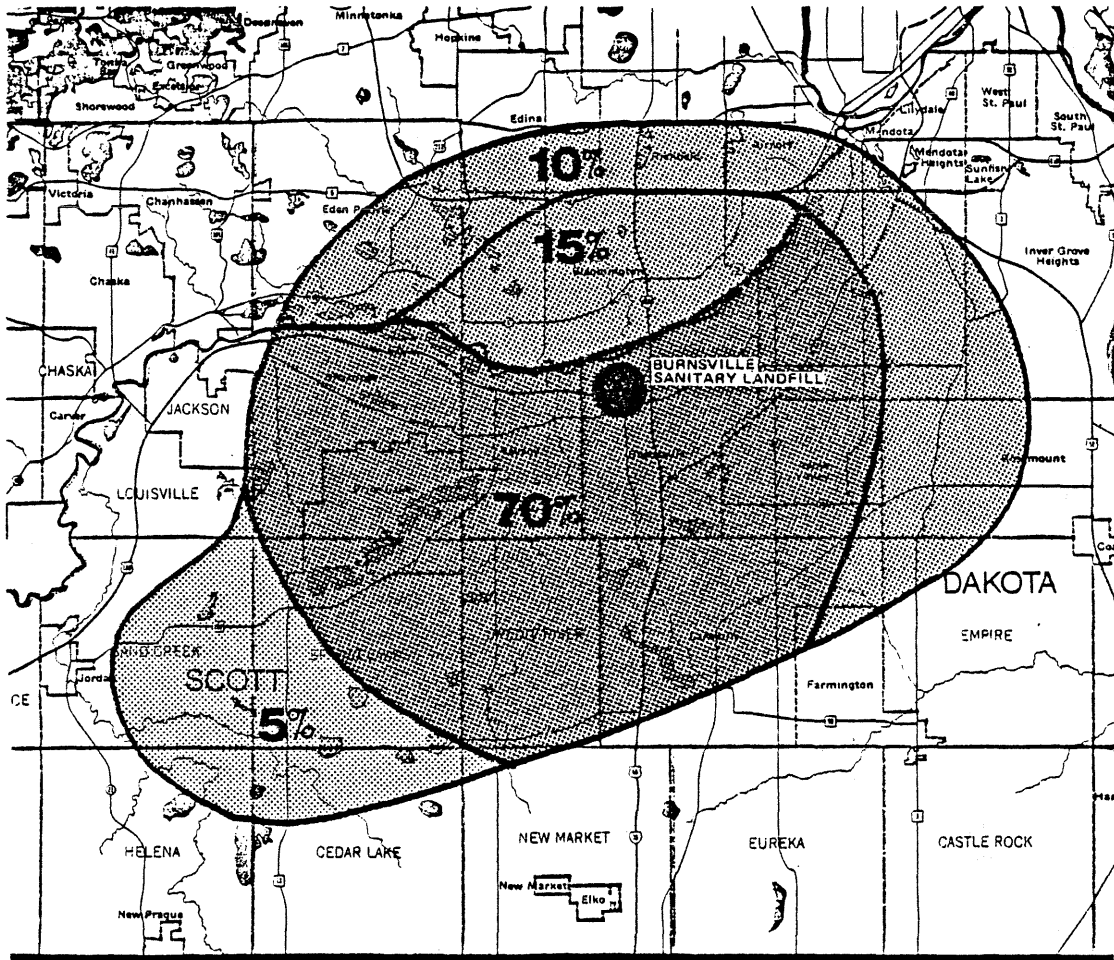
Waste is brought to the disposal site by commercial haulers or private individuals. Since most of the waste comes directly to the landfill without prior processing at transfer stations, the compaction within the packer trucks themselves represents the only compaction before disposal at the landfill.

SITE OPERATION

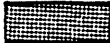
General Methods of Landfilling

The landfill contains an on-site temporary building which provides emergency shelter. The scale house is a permanent structure located at the entrance road to the landfill. A maintenance building is

BURNSVILLE SANITARY LANDFILL WASTESHED, 1980



% - Estimated Relative Contribution of Designated Wasteshed to Total Refuse Deposited at Burnsville Sanitary Landfill (200,000 tons/year)

-  Primary Source Area
-  Secondary Source Area
-  Tertiary Source Area

Sources: Edward Kramer & Sons, Inc./Minneapolis Refuse, Inc./
Minneapolis Suburban Refuse Removal Association/
Metropolitan Council

Figure 11-4

located approximately 2,000 feet north of the scale house. The permanent office building serving both the landfill and the quarry operations is located near the aggregate loading area east of the landfill.

The landfill is operated from 7 a.m. to 4:30 p.m., Monday through Friday and from 8 a.m. to 2 p.m. on Saturdays. The operating hours may be extended to 6 a.m. to 5 p.m. during 1980. An attendant is on duty at the scale house during operating hours; limiting access to the site, weighing each commercial vehicle, collecting dumping fees, and providing directions to the working face. Tables II-1 and II-2 show the equipment used at the landfill and the personnel needed to operate the facility at waste inflow rates of 40,000 cubic yards per month.

Filling Sequence -- Currently, solid waste is being placed in two lifts each consisting of nine cells as shown in Figure II-5. Demolition waste is being placed on top of the existing landfill to a height not to exceed four feet to provide access to the working face. Placement of demolition waste and refuse began with Cell A and will proceed through Cell G in the direction as indicated in Figure II-5. Each lift consists of maximum of four feet of demolition waste, approximately eight feet of refuse and appropriate cover. Upon completion of the first lift of Cell A through Cell G, a second pad of demolition material will be placed followed by a second lift of refuse. As each cell of the second lift reaches the final refuse elevation, cover will be placed over that cell. After the completion of Cell G, two lifts of refuse will be placed in Cell H, Cell I and the test section area in the same manner as Cell A through Cell G.

Compaction Procedure -- Refuse is unloaded at the working face from both commercial compactor trucks and private customers (uncompacted). Access to the working face is provided by a pad of demolition material with sufficient cover to permit access for commercial compactor trucks. The pad is a maximum of four feet thick. Refuse placed on the working face is compacted in eight-foot vertical lifts by two Caterpillar 816 compactors. A D8 Caterpillar tractor-dozzer is used to assist in moving the unloaded refuse to the working face and for placing cover over the working face.

The disposal of solid waste is confined to two faces. One face called the "working face" is used for the placement of refuse and a second face called the "demolition face" results from the placement of demolition material used for the access pad. The total area of the working face will vary from a minimum of 10,000 square feet to a maximum of 30,000 square feet depending on the amount of refuse being unloaded at any given time. A cross section showing the working face and the demolition face is shown in Figure II-6.

Cover Procedure - Cover material of soil taken from land owned by Kraemer and Sons, Inc. is placed over the refuse. Daily cover consists of six inches of cover material placed over the working face usually at the end of the working day. A "daily cover test section" is being constructed at the landfill to define the amount of material that constitutes "adequate daily cover." Intermediate cover consists of one foot of cover material placed over areas which will not

TABLE II-1

EQUIPMENT INVENTORY

Machine	FUNCTION				Number Of Units
	Excavation	Earth Moving	Spreading & Compacting	Other	
613 Scrapers	x	x			4
816 Compactors			x		2
Caterpillar 966 Loaders				x	3
Caterpillar D-8 Tractor/Dozers			x		2
Euclid Trucks (20 yards)		x			3
Dragline				x	1
Tandem Trucks				x	12
Pickup Truck				x	2
Watertaken Truck				x	1

TABLE II-2

LANDFILL SITE PERSONNEL

<u>Description</u>	<u>Number Employed</u>
Foreman	1
Weigh Master	3
Equipment Operator	7
Clerk	1
Mechanic	2
Welder	1

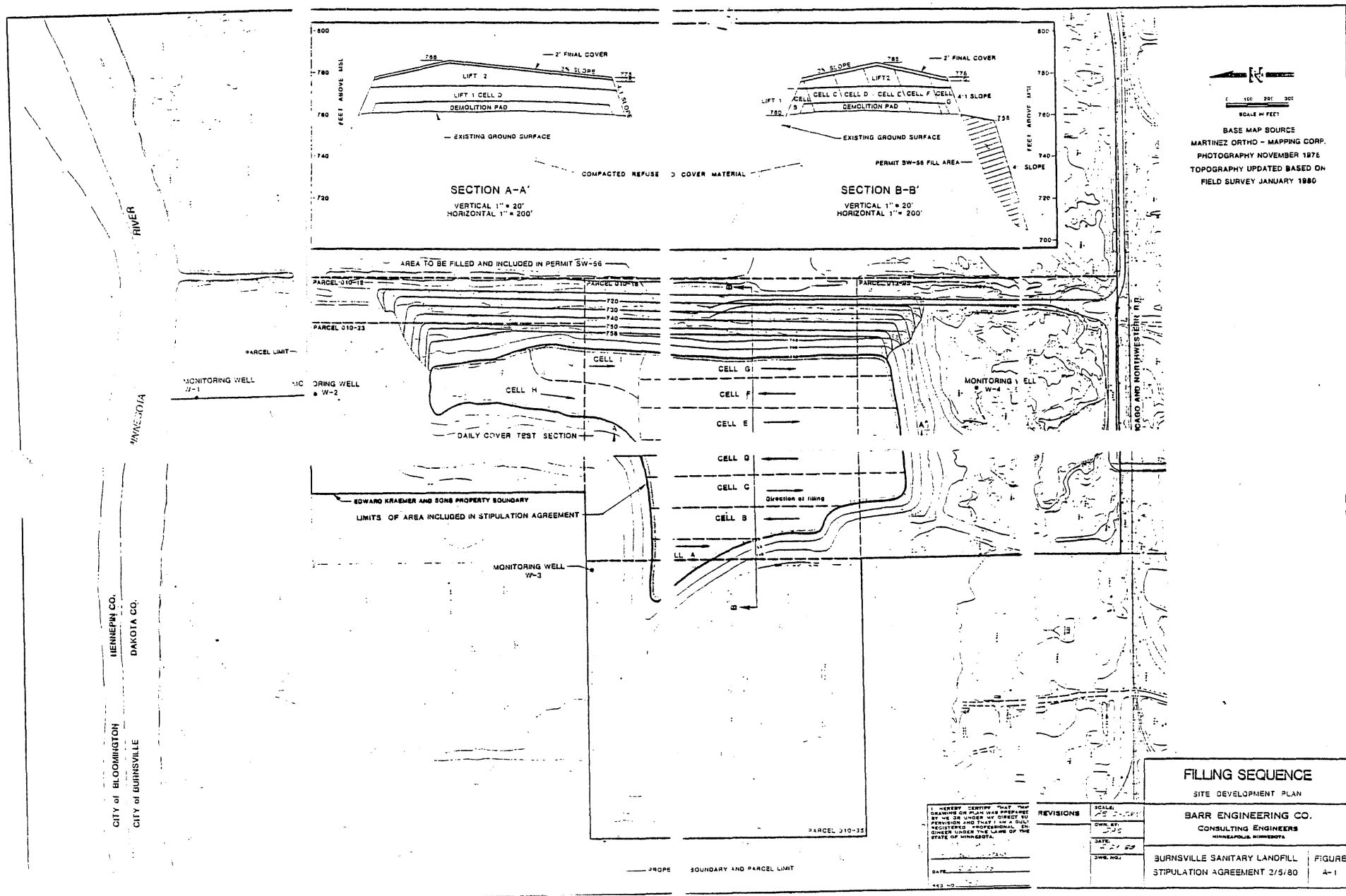
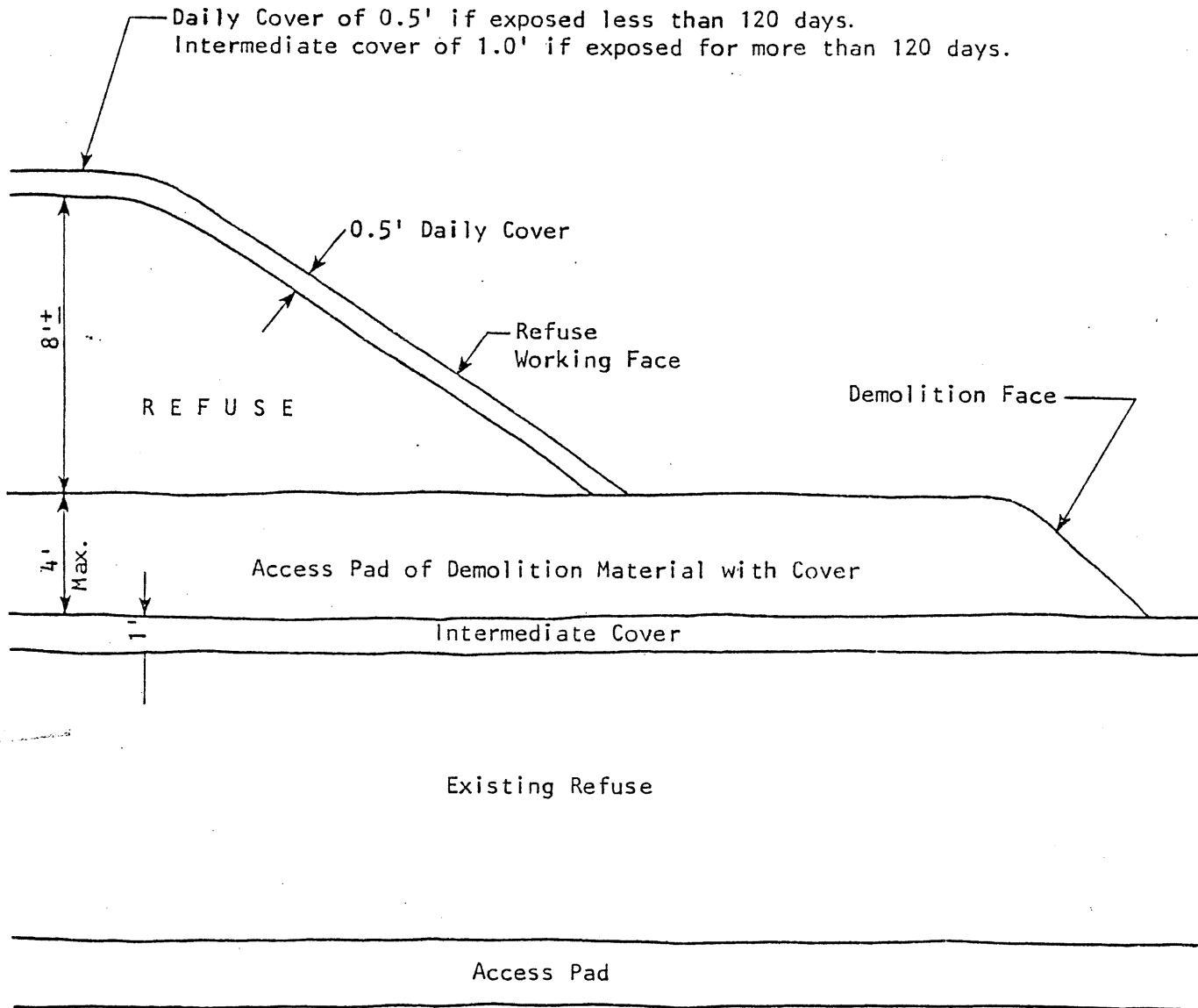


Figure II-5 Filling Sequence



TYPICAL REFUSE CELL SECTION

Not to Scale

Figure II-6

receive another refuse lift within 120 days. Final cover consists of two feet of cover material including sufficient topsoil to maintain vegetation. Final cover is placed on all areas brought to final contour (terminated areas). Fill areas terminated after April 15 and before October 1 are seeded to provide Crown Vetch or Cromak vegetation within 30 days after the application of cover and topsoil. Areas terminated between October 1 and April 15 of the following year are covered and seeded by May 15.

Site Inspections

Appendix II contains a chronology of significant events that have occurred at the landfill including MPCA site inspections. On February 5, 1980, the MPCA and the landfill operator entered into a stipulation agreement which allowed the landfill to operate in excess of permitted boundaries. The agreement also specified civil penalties for noncompliance with Minn. Rule SW-6 (2) as well as the completion of a daily cover test cell. Since approximately the fall of 1979, the landfill has shown great improvement in the routine operation of the site, and the site continues to be operated in substantial compliance with solid waste rules as of February 1981.

Environmental Controls

Leachate Control -- A small amount of leachate occurs along the southeastern toe of the refuse in the area shown in Figure II-7. A trench has been excavated in the area of the leachate seep. Crushed rock was placed in the base of the trench and the trench was filled with clean sand. As the sand becomes saturated with leachate, it is removed and deposited in the landfill. In the past, this has occurred approximately every two weeks during the frost-free months of April through October. The removed sand is then replaced with clean sand.

There is no leachate collection system under the landfill.

Groundwater Monitoring System -- The current monitoring plan includes sampling of groundwater wells for chemical oxygen demand, pH, chloride, ammonia, and specific conductance. The groundwater level is also measured in each well prior to sample collection. The locations of the wells are shown in Figure II-7. The drainage ditch located east of the landfill is monitored for the same parameters at two locations shown in Figure II-7. The wells and drainage ditch are sampled once every three months. All information is reported to the MPCA. At the time of closure, all water quality monitoring data will be reviewed to determine if post-closure monitoring is necessary. A post-closure monitoring plan will be submitted to the MPCA, as necessary, prior to final inspection on the site.

Surface Water Drainage -- Surface runoff from the landfill is controlled by uniformly grading and vegetating the side slopes to reduce the formation of gulleys. The surrounding area generally drains away from the landfill. The east and south side drain to a drainage ditch located east of the landfill, the north side of the landfill drains to the Minnesota River, and the west side drains west and north to the Minnesota River.

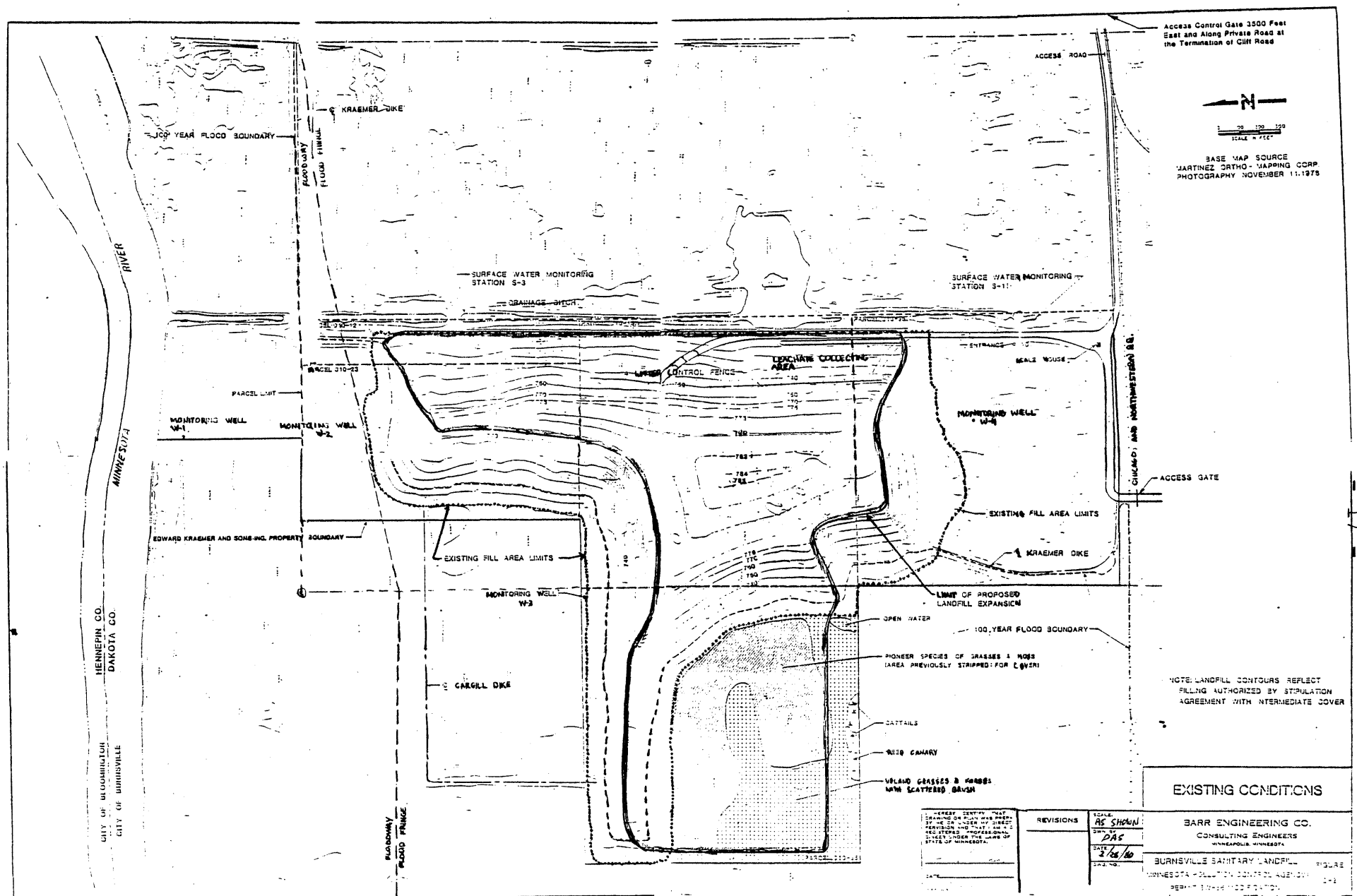


Figure II-7 Existing Conditions

Vector Control -- Inspections by MPCA personnel and landfill personnel have not detected the presence of vectors. If there is evidence of vector activity on the site, a qualified exterminator or pest control agency will be hired to perform necessary eradication and follow-up inspections. Vectors are apparently not a problem on the site.

Air Quality -- The landfill's operational procedures provide protection against fugitive dust emissions. The approach to the landfill and the main site road for routing trucks to the active fill area are paved. In addition, water from a fire truck is available to sprinkle on the dirt portions of the road if further dust control is necessary.

The existing landfill has not had problems with gas production or odors beyond the landfill site. The landfill has no special controls for handling gas produced within the refuse. There are no permanent buildings located on landfilled areas.

Noise Control -- The land use features surrounding the landfill site and the topographic features of the working area of the landfill provide physical barriers and buffer areas from noise generated by the landfill operation.

Litter Control -- Litter on the landfill site is controlled by litter control fences and a litter pickup crew. Two fences have been placed on the east edge of the landfill as shown in Figure II-7. One is located at the base of the refuse and the second is located at the top of the refuse. Beginning in the spring of 1980, a portable wind screen will be used near the working face to minimize the amount of windblown litter leaving the working face. Two attendants pick up paper and other litter that may be scattered on the site.

The landfill has been cited a number of times in the past by the MPCA for litter violations (see Appendix II). Recent inspections, however, show substantial improvement and compliance with State rules.

Security and Safety Procedures

Fire Protection -- A 1,000-gallon capacity water truck is available to control fires in compactor trucks or at the landfill. The water truck is equipped with a high pressure pump with a 1 1/2-inch diameter discharge hose. A 300-gallon per minute pumping system with 500 feet of aluminum pipe is available for obtaining water from the drainage ditch located along the east edge of the landfill. The drainage ditch located east of the landfill provides a high volume water source for fire protection. Stockpiles of cover material are maintained near the working face to assist in controlling fires. The Burnsville Fire Department has a fire station within five miles of the site and is aware of the existing operation and access points. Fire extinguishers are kept on all equipment and in all shelters.

Security -- Access to the landfill is controlled by the attendant in the scale house during working hours and by locked gates during nonoperating hours. A night watchman is on duty when the landfill is closed. The landfill area, however, is not fenced and off-road access is possible.

Sanitary -- Sanitary facilities are supplied through "satellite" type facilities near the scale house. The main office serving the landfill and the adjacent quarrying and gravel washing operation has permanent sanitary facilities.

Emergency Communications -- A telephone is available for emergency communications during all operating hours in the weigh station.

Closure

The final permitted contours of the existing landfill are shown in Figure II-7. Within one month after any continuous area of approximately 10 acres or more is brought to final grade, the area will be covered with two feet of compacted cover material sloped to the final contours. The finished surface of the filled area will be seeded to provide Crown Vetch or Cromak vegetation within 30 days after application of cover material. Areas terminated between October 1 and April 15 will be covered and seeded by May 15. As set forth in the stipulation agreement between Edward Kraemer and Sons, Inc. and the MPCA, final cover will not be applied in areas included in the pending permit application.

Prior to termination of operations at the site, the MPCA and the Dakota County Engineer will be notified so a site inspection can be conducted before personnel and equipment are removed from the property.

Post Closure

A detailed description and a plan of the completed site will be recorded with the Dakota County Recorder's Office within one month after closure of the landfill. This description will give the general type and location of solid waste, the type and number of lifts, and original and final elevations of the completed sanitary landfill.

Post-closure land use for the landfill site will likely be open space. At the time of closure, all water quality monitoring data will be reviewed to determine if post-closure monitoring is necessary. A post-closure monitoring plan will be submitted to the MPCA, as necessary, prior to final inspection of the site.

On-Site Energy

The majority of the energy demand from operations of the landfill comes from the following on-site equipment: 4 scrapers, 2 compactors, 3 caterpillars, 2 tractor/dozers, 3 euclid trucks, 12 tandem trucks, 2 pickup trucks, and 1 watertank truck. Annual diesel fuel requirements are approximately 65,000 gallons. On-site fuel storage holds approximately 60,000 gallons of diesel fuel.

DESCRIPTION OF PROPOSED ACTION

PRESENT APPLICATION

The requested permit modification would allow the vertical expansion of the existing 85-acre landfill by increasing the maximum permitted elevation of the landfill from 785 to 800 feet (see Figure II-7). The proposed project would also allow the expansion of the existing boundaries of the landfill onto an adjacent 17-acre parcel located west of the existing landfill (see Figure II-7).

The existing landfill has a remaining permitted capacity of 806 acre-feet. At this capacity the landfill would continue to operate for approximately another two to three years given normal receiving rates.

The proposed vertical and horizontal expansion would provide for an additional 2,400 acre-feet of space (3.9 million cubic yards) and will increase the estimated life of the landfill by 6 to 7 years given waste inflow rates of about 300 acre-feet per year (40,000 cubic yards per month). Allowed the expansion, the landfill could dispose of solid waste for another eight to 10 years, given normal receiving rates.

SITE LOCATION

The proposed action is located within and adjacent to existing permitted boundaries of the landfill, in Section 32 T., 27N., R. 24W. in the city of Burnsville, Dakota County, Minnesota (see Figure II-7).

For a description of the surrounding land uses, refer to Section III, Socio-Economics.

LEGAL DESCRIPTION

For a legal description of the proposed expansion area, see Appendix I.

ANTICIPATED LIFE, REFUSE SUPPLY, CAPACITY

The 20-foot vertical addition and the 17-acre horizontal expansion to the 85 acre landfill will hold approximately 2,400 acre-feet of refuse. Given normal waste receiving rates of approximately 300 acre-feet per year, this additional capacity will extend the life of the landfill by six to seven years.

The type of refuse disposed and the collection area serviced for the proposed horizontal and vertical expansions will remain the same as that of the present operation.

MAJOR ACCESS ROADS

The major access roads for the proposed expansion areas are the same as that of the present operation (see Figure II-1).

PROPOSED OPERATION

GENERAL METHOD OF LANDFILLING

The proposed project does not change the current methods of operation at the landfill. The filling sequence for the landfill expansion has been divided into four phases, the limits of which are shown in Figure II-8. The filling sequence for each phase is outlined below.

Phase 1 -- Refuse will be placed in the Phase 1 area between the limits of the currently permitted landfill and elevation 800 in two lifts each containing five cells. The locations of the cells and the directions of filling are shown in Figure II-9.

Phase 2 -- Refuse will be placed in the 17-acre horizontal expansion area between elevation 708 and elevation 800. A demolition pad will be placed below elevation 708. Filling in Phase 1 will be carried out in a series of approximately eight lifts, with each lift made up of four or five cells. The location of the Phase 2 area, cell location and direction of filling are shown in Figure II-10. Figure II-10 also illustrates a cross section of the flood protection dike that will be used to remove the 17-acre horizontal expansion area from the flood fringe. The flood protection dike will be in place prior to any placement of refuse in Phase 2.

Phase 3 and Phase 4 -- Refuse will be placed on the east side of the landfill between the top of the refuse placed under the existing permit and the final contours shown in Figure II-8. A detailed plan for filling this area will be submitted to the MPCA before filling proceeds in this area.

ENVIRONMENTAL CONTROLS

The applicant proposes to install the following environmental controls. The landfill expansion will require the placement of two new water quality monitoring wells. The new monitoring wells will be constructed using the procedures used to place existing monitoring wells W-2, W-3 and W-4. The wells will be constructed of PVC pipe and screen. The annulus around the well screen will be backfilled with clean sand and sealed at the surface to prevent the direct movement of surface water to the well screen. Well screens will be placed five feet below the groundwater surface. The monitoring wells will be placed within two months after approval of landfill expansion unless approval comes during the period October 1 to April 1 in which case the new wells will be placed by June 1.

The location of litter control fences may be changed during the course of the landfill operation; however, a fence will remain in place along the east edge during the entire operation; Fencing will also be placed along the toe of the dike in the 17-acre horizontal expansion area.

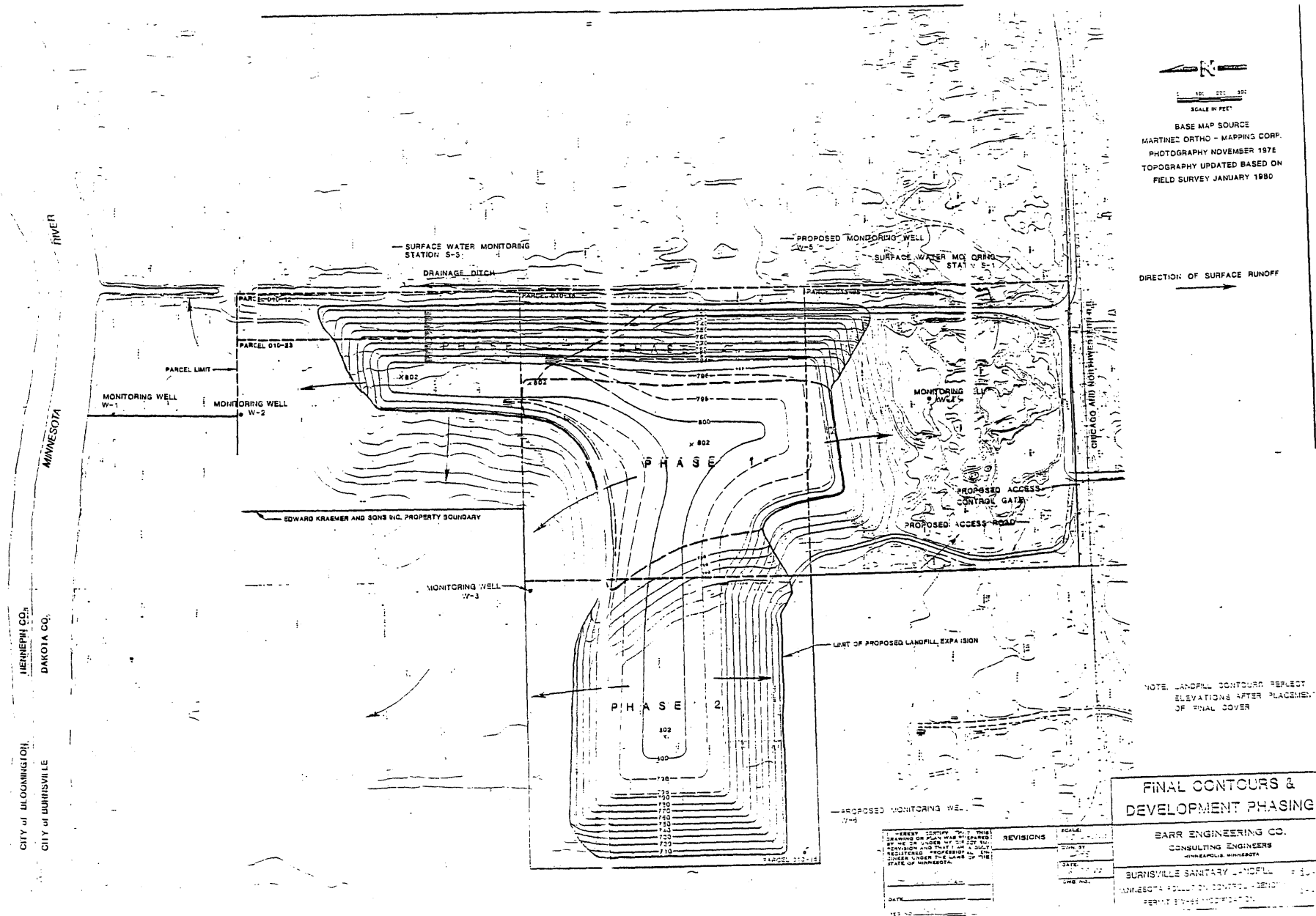
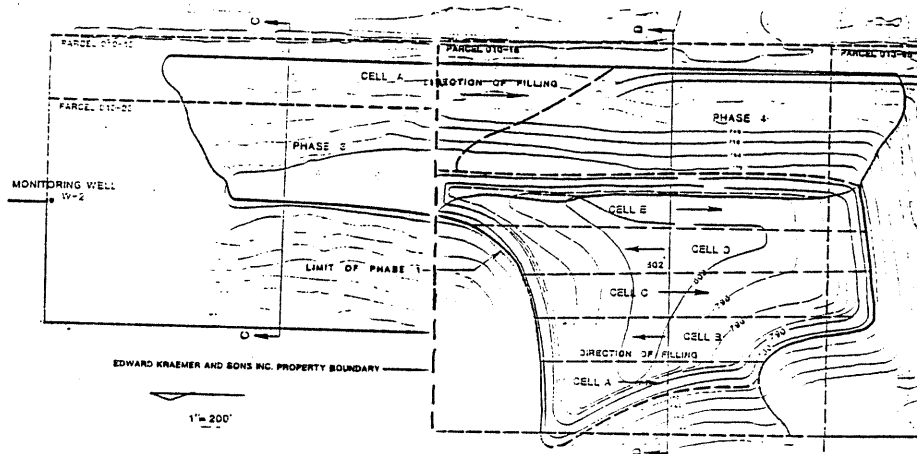
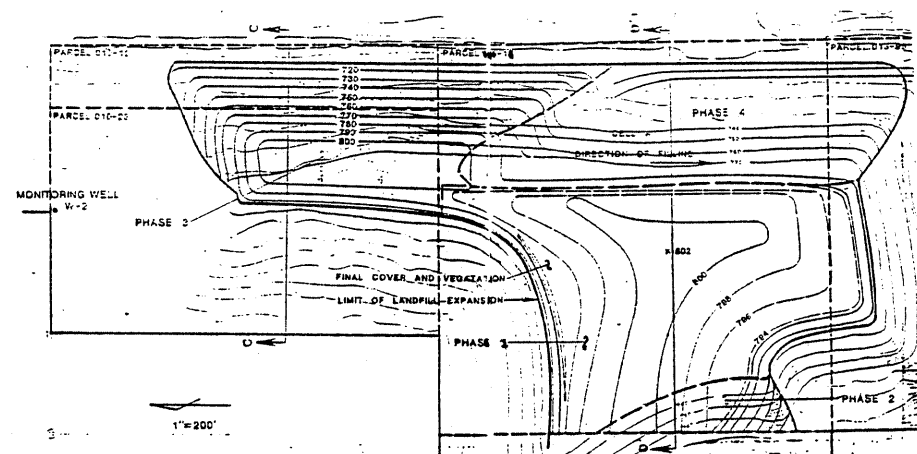


Figure II-8

Final Contours and Development Phasing



CELL LAYOUT - PHASE 1 & 3



CELL LAYOUT - PHASE 4

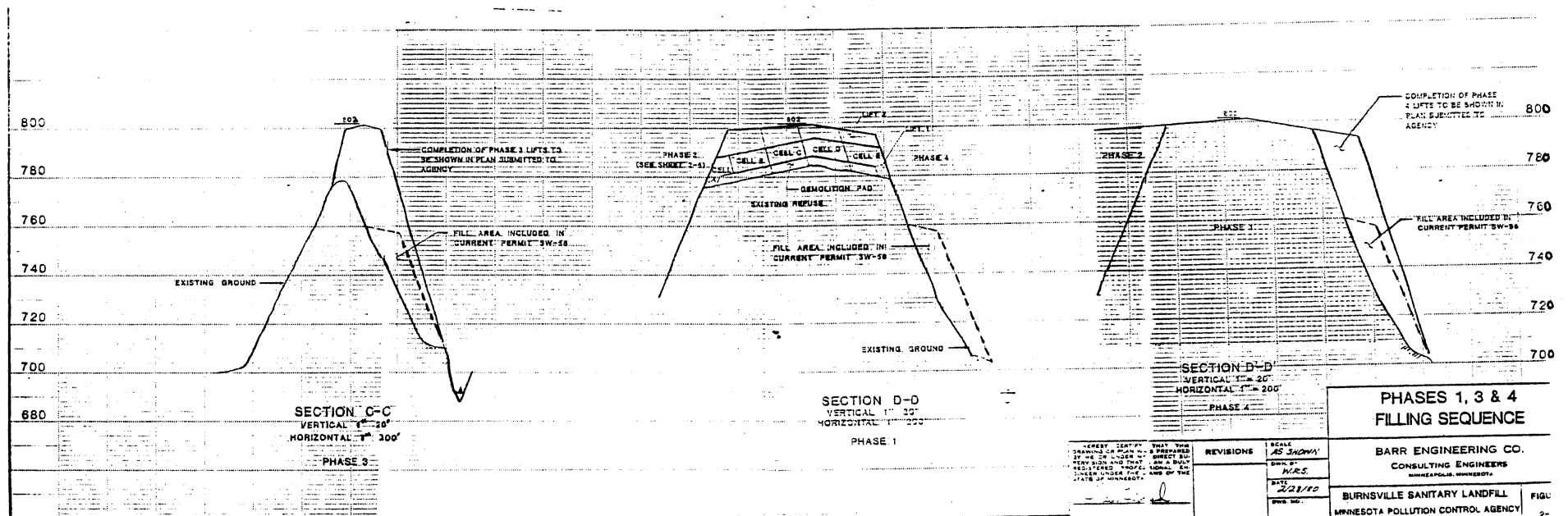


Figure II-9

Phases 1,3,4, Filling Sequence

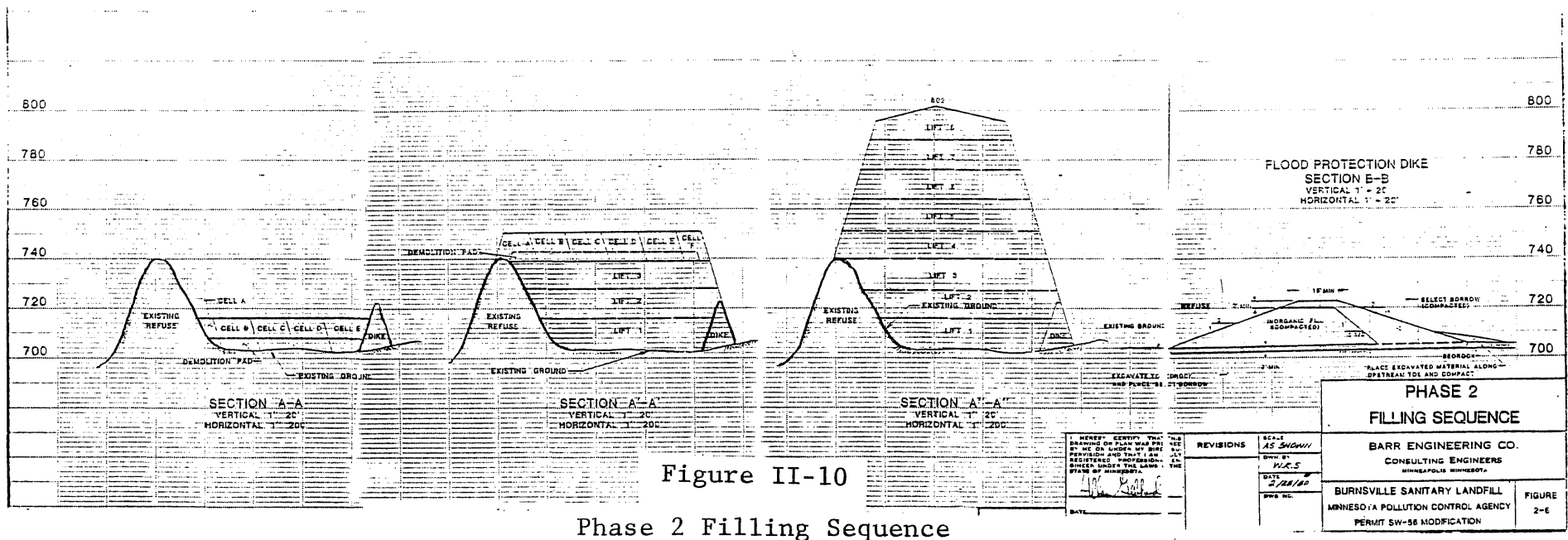
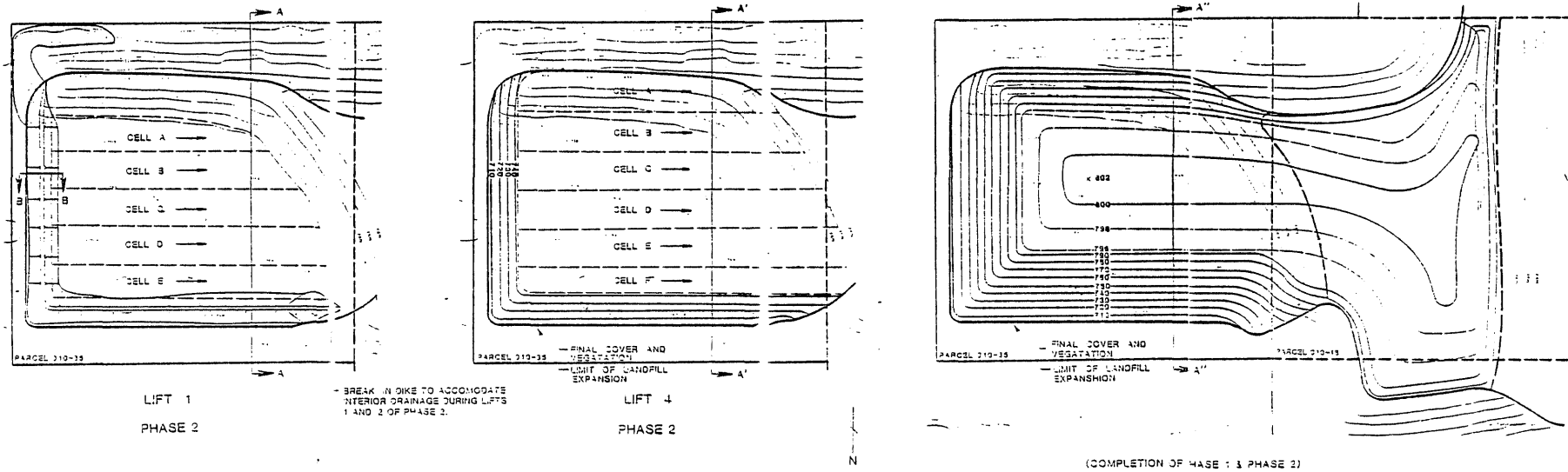


Figure II-10
Phase 2 Filling Sequence

SECURITY AND SAFETY PROCEDURES

Security and safety practices will remain the same as that of the present operation.

BUILDINGS

No new buildings are proposed for the landfill expansion.

ENERGY

Current energy requirements to operate the landfill are expected to continue with the addition of the expansion capacity.

PROPOSED CONSTRUCTION

The landfill expansion will require the construction of an access road to the horizontal expansion area in Phase 2 as shown in Figure II-8. The new access road will be constructed by Edward Kraemer and Sons, Inc. The road will be an all-weather road with a minimum width of 30 feet and a crushed rock surface.

The landfill expansion will also necessitate the construction of a flood protection dike around the horizontal expansion area. A typical cross section through the dike is shown in Figure II-10. The top of the dike will have a minimum width of 15 feet and an elevation of 722.5 MSL which allows three feet of freeboard above the regulatory floodplain level of 719.2 MSL. The 100-year frequency flood level is 718.2 MSL. The dike side slopes will be a minimum of 3 (horizontal) to 1 (vertical). The area beneath the dike will be excavated to bedrock. A minimum two-foot thick blanket of select borrow material will be placed below the dike and a 10-foot (minimum) thickness of select borrow material will be placed on the face as shown in Figure II-10. The sandy silt material excavated from beneath the dike will be placed along the toe of the dike. Since the dike is located in a backwater area of the Minnesota River, riprap will not be necessary to protect the slopes from erosion.

Until refuse is placed above the elevation of the top of the dike, approximately 50 feet of the flood control dike will remain open to allow surface runoff from the interior of the horizontal expansion area to drain out during non-flood periods. This portion of the flood control dike will be closed at least 48 hours prior to significant flooding on the Minnesota River. This should not be difficult since significant flooding on the Minnesota River has a lead time of between four and 10 days.

The new access road, access control gate and flood control dike will be constructed prior to the placement of refuse in the Phase 2 fill area.

SECTION III

DESCRIPTION OF EXISTING ENVIRONMENT

METEOROLOGY/CLIMATOLOGY, AIR QUALITY AND NOISE

METEOROLOGY/CLIMATOLOGY

General

The most significant meteorological parameters associated with sanitary landfill design and operation are wind speed, wind direction, atmospheric stability, temperature and precipitation. Prevailing winds are important in consideration of problems relating to odor, dust, and blowing debris. The advection and diffusion of odorant gases and particulates from the landfill to receptors in the impact area is largely determined by the wind speed, wind direction and atmospheric stability.

Ambient temperature governs such factors as the types and quantities of odorant emissions and probable (indoor versus outdoor) activities of persons (sensitive receptors) in the area. Freezing temperatures may also cause problems. Cover material may be difficult to obtain when the frost line is more than six inches below the ground surface. The stockpiling, transport and placement of off-site cover material may also be difficult during freezing conditions. It is important to note, however, the operating equipment available to the Burnsville landfill is adequate to handle these problems. There have been no problems identified concerning this matter at the landfill.

Precipitation (both rain and snow) is important in determining surface runoff, the design of an adequate drainage system for its control, the rate of waste decomposition, the generation and control of leachate, the feasibility of maintaining operations at all times at the site, the transport of equipment on the site, and access to and from the site. Loaded vehicles may experience difficulty on steep inclines and snow-covered roads. The combination of mild temperatures (thaw) and rainy conditions can make clayey soil conditions very muddy, thus limiting effective operations at the site. In certain areas, for example, it may be beneficial to construct a wet weather site where limited amounts of waste can be disposed of over short periods when weather conditions make access to the main site difficult.

The landfill, like the rest of the Metropolitan Area, is situated in the upper Mississippi River Valley on the borderline between the Humid Continental Warm Summer and Humid Continental Cool Summer Climates. The boundary between the milder and more severe cool-summer phase of the Continental Climates (Da and Db) is the 71.6°F. Isotherm for the warmest month. The normal monthly temperature at the Minneapolis-St. Paul International Airport for the warmest month (July) is 71.9°F.

Due to the Metropolitan Area's closeness to the geographical center-line of North America, there exists a tendency for extremes in all climate features. For example, there are wide variations in temperature; plentiful summer rainfall and relatively little winter precipitation.

Temperature

Temperatures in the Metropolitan Area tend to range widely during the course of the year. The coldest month is January with mean daily maximum and minimum temperatures of 22.4 and 2.4°F., respectively. July is the warmest month with mean daily maximum and minimum temperatures of 83.9 and 60.7°F., respectively. The normal monthly temperature is 44.1°F. The lowest recorded temperature was -34°F. in January of 1970; the highest recorded temperature was 104°F. in July of 1941. Extremely low temperatures during the long winter frequently combine with moderate to high winds to create "wind chill factors" which make outside activity extremely uncomfortable. Winds during the winter months (November to March) consistently average above 10 miles per hour.

Humidity and Precipitation

The Metropolitan Area experiences only a relative brief (May to September) growing season, but precipitation is ample and well distributed during the five month growing cycle (average for the five month growing cycle is 16.78 inches). The average annual precipitation is 25.94 inches, including an average annual snowfall of 40.3 inches. Thunderstorms are the primary source of rainfall during the growing season. Rainfall can be heavy, but is usually brief in duration. Severe thunderstorms occur occasionally and may produce excessive rains, high winds, lightning and hail.

Table III-1 shows mean humidity (recordings over a 15-year period) and mean precipitation (recordings over a 36-year period) for the Minneapolis-St. Paul area.

Table III-1.
MINNEAPOLIS-ST. PAUL MEAN HUMIDITY AND PRECIPITATION

<u>Month</u>	<u>Humidity (Percent)</u>				<u>Precipitation (inches)</u>
	<u>Midnight</u>	<u>6:00 a.m.</u>	<u>Noon</u>	<u>6:00 p.m.</u>	
January	72	73	67	68	0.73
February	73	74	65	65	0.84
March	73	77	64	63	1.68
April	70	76	55	54	2.04
May	70	77	54	52	3.37
June	74	80	55	53	3.94
July	77	82	55	54	3.69
August	78	85	56	56	3.05
September	81	87	60	62	2.73
October	76	83	60	63	1.78
November	79	82	67	71	1.20
December	<u>77</u>	<u>79</u>	<u>72</u>	<u>74</u>	<u>0.89</u>
Year	75	90	61	61	25.94

Source: Local Climatological Data, Annual Survey, 1974, Minneapolis,
St. Paul, Minnesota, U.S. Department of Commerce.

Table III-2
AVERAGE MONTHLY PRECIPITATION NEAR BURNSVILLE SANITARY LANDFILL

<u>Month</u>	<u>Inches</u>
January	0.7
February	0.8
March	1.6
April	2.2
May	4.3
June	5.2
July	4.2
August	3.4
September	3.0
October	1.9
November	1.2
December	<u>0.8</u>

Average Total Annual Precipitation 29.3 Inches

The annual precipitation at the Minneapolis/St. Paul Airport (seven miles from the landfill) averages 29.3 inches per year. Table III-2 summarizes the estimated average monthly precipitation at the landfill site. These averages were calculated from precipitation records (1949-1974) at the Chaska, Farmington, Jordan, Minneapolis and Montgomery weather stations.

As can be seen from Tables III-1 and III-2, precipitation amounts in the Metropolitan Area are small during winter and relatively high during the summer. The vast majority of precipitation during winter falls as snow. Annual precipitation near the landfill averages about 29 inches.

The Metropolitan Area is subject to periods of severe weather during both the summer and winter months. The vast majority of the severe weather during the summer months derives from either convective or frontal thunderstorm activity. During the winter months, passage of cold fronts can produce very high winds associated with blizzard conditions. The highest recorded wind for the Twin Cities area in the 36 years ending in 1974 was 92 miles per hour.

The State of Minnesota is on the northern edge of the national region of maximum tornado frequency. The state ranks sixteenth among the 50 states and District of Columbia in frequency of tornadoes based on the 49 years ending in 1964.

Wind

Wind data at the Minneapolis-St. Paul Airport indicate that wind velocities are moderate with the annual wind speed averaging 10.5 mph (Table III-3). 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 mph in April), while the lowest values occur during the summer (9.1 mph in August). The advance of cold air after the passage of a strong storm system is responsible for most of the high winds which occur in winter. High winds experienced in summer often result from the gustiness produced by strong thunderstorms.

Dispersion Characteristics

The overall dispersion 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 to 3 mph) 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. At times, atmospheric inversions tend to "clamp a lid" over an area, reducing the volume of air into which the pollutants can defuse. Inversions are commonly associated with stagnating, high pressure systems and are characterized by fog, light winds and very stable conditions. When inversions exist for a long period of time, pollutants are trapped near the ground and can build up to potentially harmful levels. The frequent weather changes common to this section of the country inhibit prolonged inversion conditions so that adequate dispersion conditions generally prevail.

AIR QUALITY

Federal and State Regulations

Since the passage of the federal Clean Air Act of 1970, and the 1977 amendments, each state must revise its clean air strategy to attain the ambient air standards by December 31, 1982. Portions of the Minnesota State Implementation Plan (SIP) were approved by the U.S. Environmental Protection Agency (EPA) in 1979. The plan defines how the state will reduce air pollution in areas where health standards are violated, and prevent deterioration of air quality elsewhere.

The Clean Air Act amendments require each state to identify all areas that meet healthy air standards and those that do not for five major pollutants: carbon monoxide (CO), ozone (O₃), particulates (dust and soot), sulfur dioxide (SO₂), and nitrogen oxides (NO_x). The EPA promulgated two levels of standards for each pollutant (National Ambient Air Quality Standards). Primary air quality standards were

Table III-3
WIND SPEED AND DIRECTION SUMMARY FOR MINNEAPOLIS-ST. PAUL, MINNESOTA
(1941-1970)

<u>Month</u>	<u>Mean Wind Speed (mph)</u>	<u>Prevailing Direction</u>	<u>Fastest Mile*</u>		
			<u>Speed (mph)</u>	<u>Direction</u>	<u>Year</u>
Jan	10.4	NW	40	SE	1956
Feb	10.5	NW	52	NW	1952
Mar	11.2	NW	47	E	1951
Apr	12.3	NW	52	WSW	1964
May	11.3	SE	61	NW	1964
June	10.5	SE	63	NW	1939
July	9.3	S	92	W	1951
Aug	9.1	SE	63	N	1967
Sep	9.8	S	47	N	1951
Oct	10.4	SE	73	S	1949
Nov	11.0	NW	60	SW	1958
Dec	<u>10.4</u>	<u>NW</u>	<u>52</u>	<u>W</u>	<u>1946</u>
Annual	10.5	NW	92	W July	1951

*Fastest Mile Wind - Speed is fastest observed 1-minute value when the direction is in tens of degrees.

Source: J.T. McLaughlin, T.D. Van Epp and W.K. Tusa, Environmental Impact Statement For Woodlake Sanitary Landfill Expansion, Technical Work Paper No. 3, Prepared for MPCA, Roseville, MN, 1980.

developed to protect public health while secondary standards were developed to prevent other deleterious effects of air pollution, i.e. injury to crops, livestock, transportation and nuisance problems. The primary standards for particulates and sulfur dioxide are more stringent than the secondary standards for these pollutants.

Since the establishment of the national ambient air quality standards each state has been faced with the responsibility of meeting the standards. The national standards are minimum requirements that must be met within a specified time table, but the states may establish more stringent standards as Minnesota has done in the case of sulfur oxides, peak-hour carbon monoxide, and photo-chemical oxidants.

Table III-4 presents a comparison between federal and Minnesota state standards. Two units describe the standards: (1) $\mu\text{g}/\text{m}^3$, micrograms/cubic meter, which refers to particulate matter; and (2) parts per million (ppm) which quantifies gaseous pollutants. The standards specify exposure periods for each pollutant based on scientific studies concerning possible adverse health effects. With the exception of nonmethane hydrocarbons, all of the pollutants listed in Table III-4 affect the human physiological system. Nonmethane hydrocarbons, along with nitrogen oxides, are of primary concern due to their role in the formation of photochemical smog.

As can be seen from Table III-4, there are significant differences between the federal and Minnesota air quality standards for certain pollutants. For example, the Minnesota annual and 24-hour primary standards for sulfur oxides are approximately one-third less than the federal standard and the state's three-hour secondary standard is only half of the national standard. It should also be noted that Minnesota has established standards for sulfur oxides where none currently exist at the federal level. Specifically, the state has established a three-hour primary standard for sulfur oxides, along with annual and 24-hour secondary standards. In addition, Minnesota's one-hour carbon monoxide standard (both primary and secondary) of 30 ppm is 5 ppm lower than the corresponding federal standards.

The National Ambient Air Quality Standards were to be met by June 1, 1975; although substantial improvements have been made in ambient air quality, the standards are not being met in all areas of Minnesota or the United States. Ambient air quality continues to be assessed by the primary and secondary standards.

With regard to the SIP for Minnesota, areas that violate standards are classified nonattainment for each pollutant exceeding the standard. Areas that do meet health standards are classified attainment. The MPCA is presently identifying the exact sources of pollutants in each area.

In nonattainment areas, industrial growth could occur until July 1, 1979, if the firm's potential pollutant emissions are less than 100 tons per year or the amount of pollution added by the new facility is offset somewhere else in the area and the firm attains the lowest achievable emission rate for its type of operation. After July 1, 1979, new sources must be permitted in accordance with the revised SIP.

Table III-4 COMPARISON BETWEEN NATIONAL AND MINNESOTA
AMBIENT AIR QUALITY STANDARDS

POLLUTANT	WORDING OF STANDARD	PRIMARY ^a STANDARD		SECONDARY ^b STANDARD	
		National	State	National	State
SUSPENDED PARTICULATE MATTER	Annual geometric mean conc. Maximum 24-hour concentration Not to be exceeded more than once per year	75 $\mu\text{g}/\text{m}^3$ 260 $\mu\text{g}/\text{m}^3$	75 $\mu\text{g}/\text{m}^3$ 260 $\mu\text{g}/\text{m}^3$	60 $\mu\text{g}/\text{m}^3$ 150 $\mu\text{g}/\text{m}^3$	60 $\mu\text{g}/\text{m}^3$ 150 $\mu\text{g}/\text{m}^3$
SULFUR OXIDES	Annual arithmetic avg. conc.	.03 ppm	.02 ppm		.02 ppm
	*Maximum 24-hour concentration Not to be exceeded more than once per year	.14 ppm	.10 ppm		.10 ppm
	*Maximum 3-hour concentration Not to be exceeded more than once per year		.25 ppm	.50 ppm	.25 ppm
CARBON MONOXIDE	*Maximum 8-hour concentration Not to be exceeded more than once per year	9 ppm	9 ppm	9 ppm	9 ppm
	*Maximum 1-hour concentration Not to be exceeded more than once per year	35 ppm	30 ppm	35 ppm	30 ppm
PHOTOCHEMICAL OXIDANTS	*Maximum 1-hour concentration Not to be exceeded more than once per year	.08 ppm	.07 ppm	.08 ppm	.07 ppm
HYDROCARBONS	*Maximum 3-hour concentration (6-9 a.m.) Not to be exceeded more than once per year	.24 ppm	.24 ppm	.24 ppm	.24 ppm
NITROGEN OXIDES	Annual arithmetic average concentration	.05 ppm	.05 ppm	.05 ppm	.05 ppm

FOOTNOTES: (a) Primary Standard: Protect Public Health
(b) Secondary Standard: Prevent all other adverse affects of air
pollutants

*Not to be exceeded more than once per year.

In addition to regulations for primary and secondary emissions, Minnesota has established a number of regulations and rules pertaining to the emission of odorous substances. Specifically, MPCA (APC) Rule 9 regulates odorous air pollution from various sources including sanitary landfills. APC 9 sets odor emission limits based on the specific type of source and the nature of the potential odor impact area (residential, industrial, and so on).

Areawide Compliance

The Twin Cities Metropolitan Area has been designated as a nonattainment area for particulates, sulfur dioxide, carbon monoxide and oxidants. It is important to note that nonattainment designations are on an areawide basis. Attainment areas (or pockets of clean air) can exist within a nonattainment area. It is probable that air quality, particularly in the rural portions of the Region, are in compliance with ambient air quality standards.

Burnsville Landfill Area

Existing land use in the vicinity of the landfill is industrial or open land. A dolomite quarry operated by Edward Kraemer and Sons is east of the landfill, and to the west, owned by Cargill is the site of a grain storage and barge loading terminal.

The MPCA has established three air monitoring stations (MPCA No.'s 0375, 0376, 0377) in the southern portion of Bloomington located approximately two to three miles from the landfill. Table III-5 shows the results of monitoring at these stations for particulates and sulfur dioxides.

Suspended Particulate Matter -- For total suspended particulate concentrations, air monitoring stations 0375, 0376, and 0377 recorded (out of 26, 26, and 33 observations respectively) in 1978 no violations of federal or state primary and secondary standards for maximum 24-hour concentrations. In 1979, air monitoring station number 0375 recorded (out of 39 observations) one violation of secondary standards and no violations of primary standards. Air monitoring station numbers 0376 and 0377 recorded (out of 22 and 47 observations respectively) no violations of federal or state primary and secondary standards for maximum 24-hour concentrations.

A list of the major point sources of particulates in the Metropolitan Area are shown in Table III-6 with the location of these sources shown in Figure III-1. Figure III-2 shows the areas in the Region impacted by particulate concentrations from these sources. As can be seen, NSP's Black Dog Electrical Generating Plant, Cargill's and Bunge's grain elevators are the main contributors of particulate concentrations near the landfill. The air quality at the landfill site may also be influenced by the adjacent quarry operation, by an adjacent asphalt plant and by transportation-related emissions from Interstate 35W and Minnesota Highway 13.

Table III-5

1978 Particulate Summary (Micrograms/Cubic Meter)

Location MPCA No.	State Rank	No. Obs	Geom Mean	Std Dev	Max Obs	2nd High	No. ³ 260u/m ³	No. ³ 150u/m ³
0375	50	26	56.5	1.6	128	120	0	
0376		27	26	40.9	1.5	101	83	0
0377		20	33	39.4	1.7	98	71	0

1979 Particulate Summary (Micrograms/Cubic Meter)

Location MPCA No.	State Rank	No. Obs	Geom Mean	Std Dev	Max Obs	2nd High	No. ³ 260u/m ³	No. ³ 150u/m ³
0375		39	55.6	1.6	153	105	0	1
0376		22	33.8	1.5	60	59	0	0
0377		47	38.3	1.8	124	92	0	0

1978 Sulfur Dioxide Summary (ppm)

Location MPCA No.	No. Obs.	Ari Mean	Std Dev	<u>3-Hour Average</u>			<u>24-Hour Average</u>		
				Max Obs	2nd High	No. Vio	Max Obs	2nd High	No. Vio
0375	8016	.009	.008	.102	.100	0	.030	.029	0

1979 Sulfur Dioxide Summary (ppm)

Location MPCA No.	No. Obs.	Ari Mean	Std Dev	<u>3-Hour Average</u>			<u>24-Hour Average</u>		
				Max Obs	2nd High	No. Vio	Max Obs	2nd High	No. Vio
0375	6134	.007	.009	.113	.061	0	.047	.038	0

Source: Minnesota Pollution Control Agency, 1979.

Table 111-6

TWIN CITIES METRO AREA

MAJOR POINT SOURCE EMISSIONS INVENTORY, 1977

Site	PARTICULATES		HYDROCARBONS	
	Tons/Year	Effective Stack Hgt.	Tons/Year	Effective Stack Hgt.
1. H&S Asphalt	n/a	n/a	-	-
2. NSP-Blackdog	5,866	289'	-	-
3. Koch Refining Co.	234	50'	11,593	60'
4. St. Paul Ammonia	105	45'	-	-
5. Williams Pipe Line Co.	-	-	105	48'
6. Minnesota Valley Surfacing	7,040	n/a	11,826	n/a
7. Agg Sinter, Coke	1,260	30'	-	-
8. Champion Packages Co.	-	-	358	40'
9. NSP-Riverside	503	335'	-	-
10. Fleischmann Malting	252	30'	-	-
11. Tonka Toys	-	-	181	25'
12. University of Minnesota	299	n/a	-	-
1. A D M nokomis Mill	178	60'	-	-
14. General Electric Service	-	-	175	25'
15. Honeymead Products	157	150'	-	-
16. Commutator Foundry	292	40'	-	-
17. Honeywell Inc.	-	-	119	n/a
18. Onan Div. of Onan Corp.	-	-	112	36'
19. Howe Incorporated	103	25'	-	-
20. 3M Company	-	-	42,919	n/a
21. Webb Publishing	-	-	17,273	43'
22. Mobil Oil Corporation	-	-	1,772	n/a
23. Ford Motor Company	-	-	1,008	50'
24. William Pipe Line	-	-	1,100	72'
25. American Can Co.	-	-	611	200'
26. Union Oil Co. of California	-	-	1,052	10'
27. Metro. Waste Control Commission	2,050	n/a	-	-
28. Hoerner Waldorf Corp.	-	-	463	58'
29. Koppers Co.	180	20'	300	20'
30. Whirlpool Corp.	-	-	266	68'
31. Total-Asphalt	257	36'	-	-
32. Fugta	355	n/a	-	-
33. Standard Oil	-	-	392	24'
34. Shell Oil Co.	-	-	604	48'
35. Texaco Inc.	-	-	194	n/a
36. Olympia Brewing Co.	184	n/a	-	-
37. NSP-Highbridge	290	570'	-	-
38. NSP-3rd Street Stream	136	258'	-	-
39. National Can	-	-	132	41'
40. Bryan Rock Products	1,439	20'	-	-
41. Bunge Corporation	1,292	n/a	-	-
42. Rahr Malting Co.	554	n/a	-	-

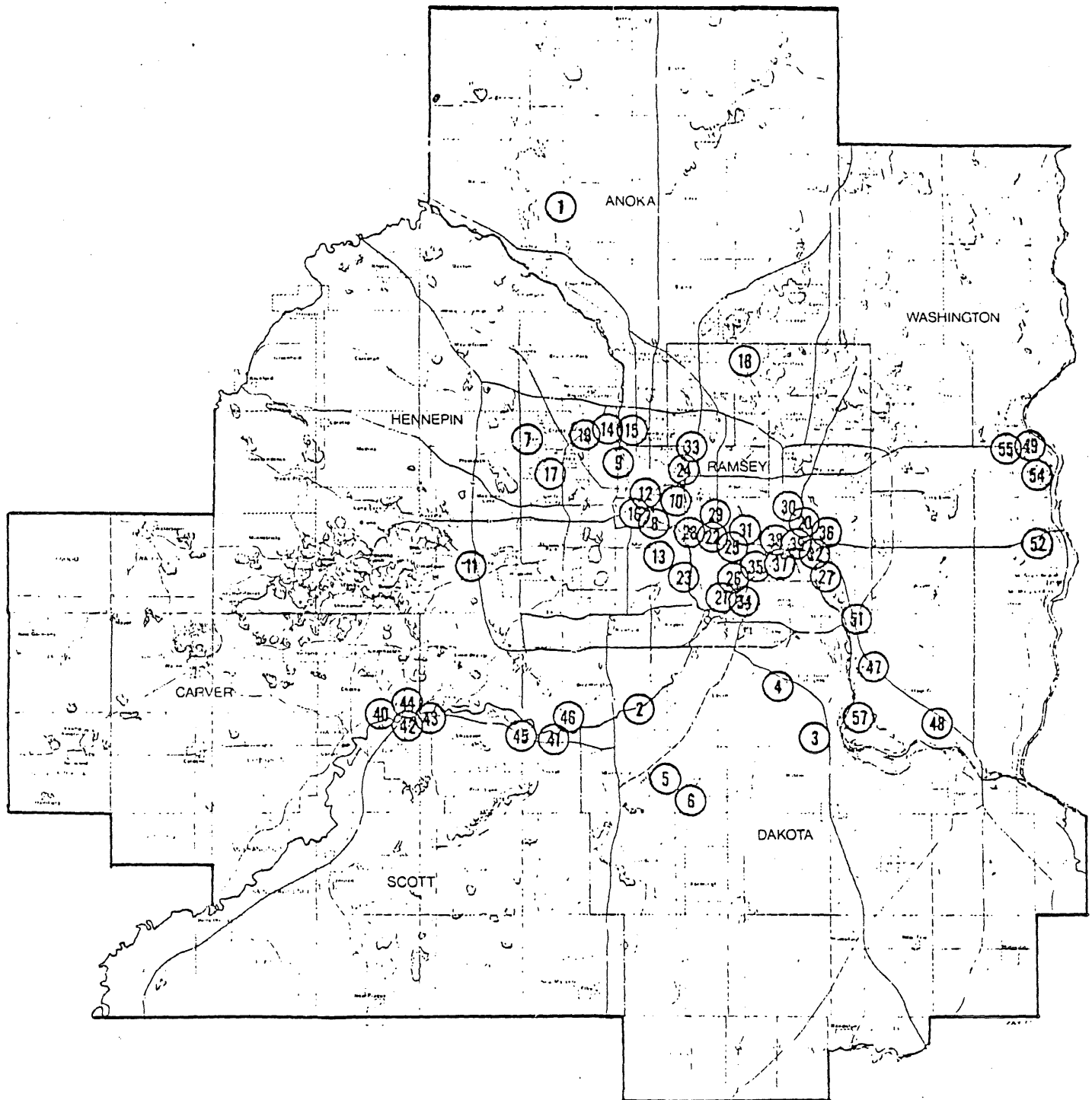
Table III-6 cont'd.

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43. J.L. Shiely Compan -Shakopee	500	n/a	-	-
44. Continental Grain Co.	448	20'	-	-
46. Cargill, Elev. C	147	n/a	-	-
47. Northwestern Refining Co.	-	-	7,720	53'
48. 3M Company-Cottage Grove	-	-	2,999	31'
49. NSP-King	659	785'	-	-
51. Erickson Petroleum Corp.	-	-	1,329	48'
52. Tower Asphalt Inc.	465	n/a	-	-
54. Anderson Corp.	-	-	511	25'
55. Minn. State Prison	397	110'	-	-
57. J.L. Shiely-Grey Cloud	325	10'	-	-

Source: Metropolitan Waste Control Commission, 1977.

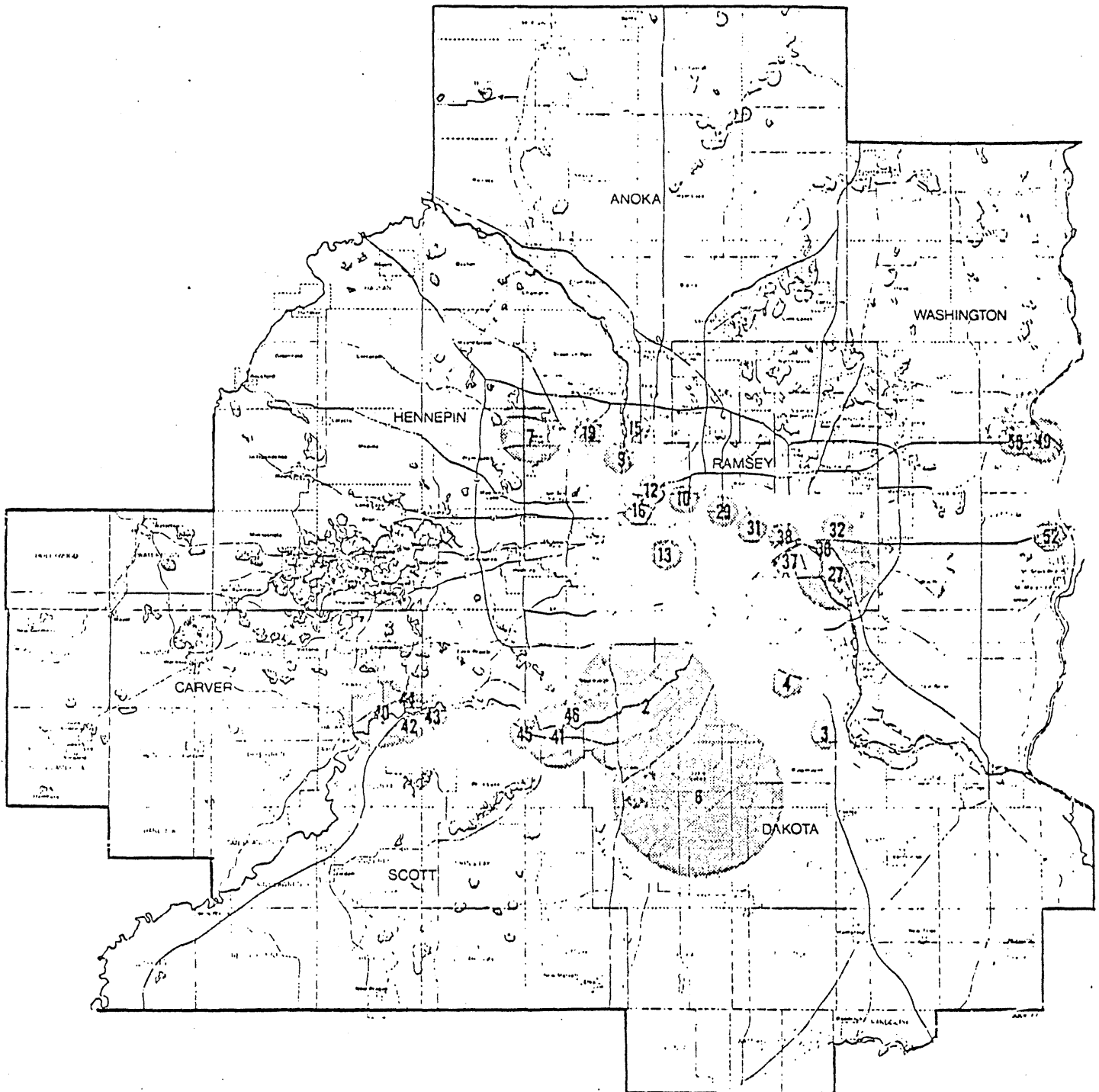
LOCATION OF MAJOR EMISSION SOURCES



SOURCE: Metropolitan Waste Control Commission, 1977

Figure III-2

METROPOLITAN AREAS IMPACTED BY PARTICULATES



SOURCE: Metropolitan Waste Control Commission, 1977

Sulfur Oxides -- In 1978 and 1979, air monitoring station number 0375 recorded no sulfur dioxide concentrations (out of 8,016 and 6,134 observations respectively) in violation of federal and state primary and secondary standards for maximum three-hour and 24-hour concentrations. In 1978 and 1979 the annual arithmetic average concentrations for sulfur dioxide recorded at station number 0375 did not exceed state primary and secondary standards. Also the federal primary standard was not exceeded.

Regulatory Compliance

The landfill area is not in violation of standards for suspended particulates and sulfur oxides.

Existing Landfill Site

The landfill is located in the northwest portion of the Burnsville Township. Given the geographic relationship to other industries in the area and the prevailing wind (from the southeast in the summer and the northwest in the winter), the air quality at the landfill site does change considerably from winter to summer.

Suspended Particulate Matter -- Particulates at the landfill site are generated, for the most part, by fugitive dust emissions. The engineering method of sanitary landfilling is by nature a construction activity, and as such, it produces fugitive emissions. Fugitive dust emissions are caused by activities such as the movement of refuse trucks to and from the working area of the landfill, the excavation, stockpiling and grading of cover material, the movement of heavy equipment and vehicles over unpaved areas, and the land clearing of future disposal areas on the site.

Fugitive dust has not been a significant problem with the existing operation. Fugitive dust has been minimized by the paving of access roads with asphalt or crushed rock, by the type of landfill cover being used, by vegetation of landfill slopes, and by the lack of sensitive receptors in the vicinity of the landfill. In addition, water from a fire truck is available for further dust control when conditions warrant its use.

The primary carriers of refuse traffic to the landfill are Interstate 35W and State Highway 13. Transportation-related emissions from the landfill are small in comparison to those generated by the general traffic flow in the area.

Sulfur Oxides -- Sulfur oxide emissions from the operation of the landfill itself are negligible.

Methane Gas -- Methane gas (CH_4) is a colorless, odorless gas produced by the anaerobic decomposition of refuse. Methane generation in a sanitary landfill depends on the waste composition, internal moisture content, temperature, and other environmental factors. In general, a mature landfill that has reached its maximum generation rate, estimated to occur between one to five years after completion, will produce gas at a high rate for about six to 10 years and will continue to produce gas at lesser rates for up to 100 years.

The composition of landfill gas based on field samples ranges from 45 to 65 percent methane with the most common values lying between 45 and 55 percent. The balance of the gas is carbon dioxide with smaller amounts of hydrogen, oxygen, nitrogen, and traces of other gases.

From a safety aspect, methane is only considered a problem when it is mixed with oxygen at concentrations greater than 15 percent. At such concentrations methane is explosive.

Generally, there is no danger of a methane explosion. Methane, being lighter than air, will naturally vent upwards through the cover material into the atmosphere, where the methane will be at concentrations much lower than 15 percent. If methane is prevented from venting upwards into the atmosphere, possibly by an impermeable cover over the refuse, the gas will migrate laterally beneath the surface until it reaches a permeable surface where it can escape into the atmosphere. If there are buildings with basements near the landfill and if the methane is prevented from venting upward through the cover material and therefore is forced to migrate laterally below the surface, there is a possibility that some methane may concentrate in a basement and be an explosion hazard.

The operational procedures at the landfill should provide adequate protection against any methane hazard. The rate of methane production in a landfill is increased according to the amount of moisture coming in contact with the refuse. Covering and grading practices by the landfill operator and subsequent surface water drainage pattern development should keep water in contact with the buried refuse at a minimum. The rate of refuse decomposition will, therefore, be slow, and as a result methane gas will be produced in small amounts over a long period of time. This low rate of methane production reduces the possibility of explosive concentrations being reached. In addition, the small amount of methane gas that is produced within the landfill should vent through the cover material and at the landfill perimeter, ultimately dissipating at harmless concentrations into the atmosphere.

No problems attributable to gas have been reported at the existing landfill. There are no permanent structures on the landfill. Temporary structures, including a maintenance building and working face shelter house allow sufficient air flow through their roofs, doors and windows to be considered as being vented. The permanent scale house is located 800 feet from the limit of the landfilled refuse. The closest structure not owned by Edward Kraemer and Sons, Inc. is located 1,200 feet south of the landfill.

Odor -- Odorous emissions may result from the operation of sanitary landfills. In general, there are a number of primary sources of odor at sanitary landfills. The most common is that which emanates directly from the incoming refuse. Odorous compounds can also result from the degradation of previously buried refuse. As previously discussed, gas is produced naturally when solid wastes decompose. The quantity generated in a landfill and its composition depend on the types of solid waste and on environmental factors such as temperature, and moisture content.

Some of the chemical compounds that are released during the decomposition process may include odorant gases. While methane and carbon dioxide are the major constituents of landfill decomposition gas, other gases produced may cause a repugnant odor. For example, hydrogen sulfide may be generated at a landfill, particularly if it contains a large amount of sulfate containing wastes or if brackish water infiltrates the solid waste. Other odorant gases which may be produced by the decomposition process include ammonia and trace mercaptans.

Another potential source of odor is leachate which reaches the surface from either seeps or from a collection system. Groundwater and infiltrating percolation in conjunction with landfill liquid wastes can result in leachate, a term denoting a solution consisting of dissolved and suspended solid matter and microbial waste products which results when water comes in contact with landfilled solid waste.

The specific nature and concentration of substances contained in the leachate depend on the composition of the refuse as well as its degradation stage. Odorants may be released into the air as a result of leachate formation, collection or treatment.

Special wastes being received at the landfill may also generate strong odors. Typical examples include manures, fermented grains, and food processing wastes. 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.

On May 14, 1980, Council staff conducted a walking survey of homes and businesses surrounding the Burnsville and Freeway Landfills. The purpose of the survey was to determine attitudes toward the landfills. A number of the residents directly across the Minnesota River in Bloomington (homes overlooking the river valley) stated that they noticed odors emanating occasionally from the landfills, particularly in the summer months when there was a south breeze. They could not, however, determine if both or one of the two landfills is the cause of the problem. It should be pointed out that the Freeway Landfill has violated daily cover requirements several times over the past years. This probably accounts for most of the odor problems that can be attributed to the landfill operations on-site inspections of the Burnsville Landfill have indicated no odor problems.

Regulatory Compliance -- Based on available information, the existing 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.

NOISE

Federal and State Regulations

MPCA regulations NPC-1 and NPC-2 govern acceptable noise levels throughout the state. NPC-1 contains relevant definitions and specifies provisions for obtaining a variance from MPCA noise pollution control regulations. Variances may be granted in certain cases involving practicality and feasibility of compliance with the standards. MPCA regulation NPC-2 instituted a three-tier noise area classification (NAC) scheme which limits L_{50} and L_{10} (hourly) exterior noise levels during both the daytime and nighttime periods. The L_{50} parameter is defined as the noise level that is exceeded 50 percent of the time and the L_{10} parameter is the noise level that is exceeded 10 percent of the time. Noise area classification 1, which contains the most restrictive noise standards, pertains to various types of human habitations ranging from single dwellings to camping areas and hotels. Nonresidential public area activity spaces (for example, commercial establishments) are represented by NAC-2. Manufacturing, industrial, and agricultural land uses are represented by NAC-3. Underdeveloped land is represented by NAC-4; however, no standards have been promulgated for this category. The MPCA noise standards are shown in Table III-7.

The Occupational Safety and Health Act (OSHA) of 1970 established maximum permissible noise exposures for persons working in noise environments. These noise standards are shown in Table III-8 and are intended to protect the hearing of people exposed on a daily basis to elevated noise levels over a lifetime of employment. Violations of the OSHA standards are not common in most work environments.

Existing Landfill Site

Noise monitoring has not been conducted at or near the vicinity of the landfill. It is, therefore, difficult to assess compliance with the above regulations.

During the operation of the landfill, the primary generators of noise are equipment for earth moving and compaction and vehicular traffic entering and leaving the facility. Table III-9 shows a range of dBA levels for typical equipment used at the landfill site.

Table III-9

<u>Machine</u>	<u>dBA Range</u> (measured at 50 ft.)
Scraper	89-95
Dozer	87-89
Motor Grader	77-87
Refuse Trucks	85-95

Table III-7

MINNESOTA POLLUTION CONTROL AGENCY NOISE STANDARDS (dBA)

NA C	Day (7:00 A.M. to 10:00 P.M.)		Night (10:00 P.M. to 7:00 A.M.)	
	<u>L</u> <u>50</u>	<u>L</u> <u>10</u>	<u>L</u> <u>50</u>	<u>L</u> <u>10</u>
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

Table III-8

OCCUPATIONAL SAFETY AND HEALTH ACT
MAXIMUM PERMISSABLE NOISE EXPOSURE
IN NOISE ENVIRONMENTS

<u>Duration per day, hours</u>	<u>Sound level (dBA)</u>
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

It has been determined that in a typical hour the following equipment is in use at the landfill during operating hours: one dozer, two compactors, three scrapers, and seven refuse trucks. The approximate cumulative ambient noise produced by this equipment is 102 dBA. The noise received by the nearest private dwelling (2,900 feet from the working area of the fill) is 67 dBA. This is a substantial reduction of noise; however, it does slightly exceed the MPCA NAC-1 daytime L10 standard of 65 dBA. This analysis does not assume topographical variations at the landfill which could dramatically change sound levels.

Noise generated by the above equipment and vehicles is mitigated at the existing landfill by the following considerations. Extensive buffer zones of industrial and commercial-industrial property lie between the landfill and residential areas. The sensitive receptors closest to the existing landfill and the proposed expansion include industrial and commercial businesses which operate at distances between 1,200 feet and 2,500 feet from the landfill. The proposed horizontal expansion area, Phase II, is approximately 2,900 feet from the nearest private dwelling.

Topographic features buffer the present working area of the landfill. The flood protection dike (see Figure II-10) will serve as a buffer for the horizontal expansion area until the lift height exceeds the dike's height of 722.5 feet. There will be no buffer during the construction period of Phase II (see Figure II-8). Phase II, upon completion will function as a buffer between the residences and work areas of Phases III and IV.

Operating hours at the site are from 7 a.m. to 4:30 p.m., Monday through Friday and from 8 a.m. to 2 p.m. on Saturdays. After those hours, no heavy equipment is in operation.

WATER QUALITY

CONTAMINATION FROM LANDFILLS

Leachate

The principal source of surface water and groundwater contamination from landfills is leachate. Leachate may be defined as liquid that has percolated through solid waste and has extracted dissolved or suspended materials from it. In most landfills the liquid portion of the leachate is composed of the liquid produced from the decomposition of the wastes and liquid that have entered the landfill from external sources, such as surface drainage, rainfall, groundwater, and water from underground springs.

When leachate percolates through solid wastes that are undergoing decomposition, both biological materials and chemical constituents are picked up. Representative data on the chemical characteristics of leachate, indicates that the range of concentration values for the various constituents is rather extreme. For this reason, no average value can be given for leachate.

In general, it has been found that the quantity of leachate is a direct function of the amount of external water entering the landfill. In fact, if a landfill is constructed properly, the production of measurable quantities of leachate can be eliminated. In some cases leachate treatment may be required.

Leachate Movement

Under ideal conditions, leachate should either be contained within the landfill or removed for treatment. Unfortunately, these conditions are found only in a few modern landfills, and so the movement of leachate from landfills is an important aspect of solid waste disposal.

Under normal conditions leachate is found in the bottom of landfills. From there its movement is through the underlying strata, although some lateral movement may also occur, depending on the characteristics of the surrounding material. As leachate percolates through the underlying strata, many of the chemical and biological constituents originally contained in it will be removed by the filtering and adsorptive action of the material composing the strata.

Control of Leachate Movement

Because of the potential risk involved in allowing leachate to percolate to the groundwater, best practice calls for its elimination or containment. To date, the use of clay has been the favored method of reducing or eliminating the percolation of leachate. Membrane liners have also been used, but they are expensive and require care so that they will not be damaged during the filling operation.

Surface Water Runoff

Equally important in controlling the movement of leachate is the elimination of surface water infiltration, which is the major contributor to the total volume of leachate. With the use of a relatively impermeable cover material, an appropriate surface slope, and adequate drainage, surface infiltration can be controlled effectively.

Improper surface runoff from a landfill can also result in erosion of the cover material. Erosion may lead to the discharge of suspended solids to streams and possible siltation of adjacent water bodies. Surface runoff diversion may be necessary including channeling and the construction of berms and dikes.

GEOLOGY AND HYDROLOGY OF THE BURNSVILLE LANDFILL AND SURROUNDING AREA

Geologic and hydrologic conditions are major considerations in determining the environmental acceptability and impacts on an area from a landfill operation. Data on these factors are necessary to assess the pollution potential of a landfill and to establish what must be done to ensure that the movement of leachate and surface water runoff from a landfill will not impair the quality of local groundwaters and surface waters.

The following discussion is presented for background purposes for the later assessment of water quality impacts from the existing operation and proposed expansion of the landfill.

Regional Setting

The Metropolitan Area has been glaciated several times. On each occasion, as the glaciers advanced and retreated, they deposited a highly complex mantle of glacial drift, ranging from highly permeable sands and gravels of outwash to highly impermeable clays of glacial lakes and tills. In addition, each period of glaciation altered the course of the rivers in the Region. The various rivers cut through the glacial drifts down into the bedrock in several areas and subsequently filled in by drift from a later period of glaciation.

The landfill is located in the Minnesota River Valley in the southern portion of the Twin Cities Structural Basin. This river valley was eroded by the Glacial River Warren through the St. Croix Moraine down to and into the subcropping Prairie du Chien Dolomite. The majority of the valley bottom is covered by a thin veneer of alluvial deposits with a maximum thickness of less than 80 feet.

One to two miles north of and paralleling the Minnesota River lies another buried valley eroded into bedrock. This valley is eroded into the Jordan Sandstone which underlies the Prairie du Chien Dolomite. The land surface overlying this valley is covered with ground moraine deposits of the Des Moines Lobe and alluvial terrace deposits of the early phase of the Glacial River Warren. The bluff lands south of the Minnesota River Valley are covered by morainal deposits of both the Des Moines and Superior Lobes.

Area Topography

Topographic relief within this area of the Minnesota River valley varies from the river water surface level of approximately 687.3 feet (MSL) to the height of the bluffs in Bloomington of about 820 feet (MSL). The presently existing surface elevations of the landfill site vary from Elevation 695 to Elevation 766. The topography of the site prior to any landfiling activity likely varied from about Elevation 696 to Elevation 705. The topography of the 17-acre horizontal expansion area varies from Elevation 702 to Elevation 710.

Site Geology

Bedrock -- The landfill is shallowly underlain by the Prairie du Chien Dolomite. Borings put down in the vicinity of the landfill indicate that the depth to bedrock varies from less than one foot to over 24 feet. The location of these borings are shown in Figure III-3. Data from the borings show that the bedrock surface contours in the area of the landfill are generally as shown in Figure III-4. The bedrock surface is irregular and drops off sharply to the north along the northern boundary of the landfill. This is an eroded valley underlying the river.

Well logs in the vicinity of the landfill indicate the Prairie du Chien Dolomite-Jordan sandstone contact is near Elevation 560 in the landfill vicinity. The thickness of the Jordan ranges from 80 to 100 feet. The Jordan is underlain by the St. Lawrence Formation which is considered to effectively separate the Prairie Du Chien-Jordan aquifer from deeper aquifers. A bedrock column for the site is shown in Figure III-5.

Glacial Geology -- The area has been subjected to several episodes of glaciation during the Pleistocene Epoch. The area in the vicinity of the landfill is considered to have been part of the St. Croix Moraine and subsequently overlain by ground morainal deposits from the Des Moines Lobe. However, during the latter phase of the last period of glaciation in this area, the Glacial River Warren began flowing through the area that is now the landfill. In time what is now the Minnesota River valley was eroded by the Glacial River Warren through the St. Croix Moraine and into the subcropping Prairie du Chien Dolomite. The bedrock surface under the landfill site was subsequently covered with alluvial deposits, ranging in thickness from one to about 24 feet.

Soils -- Bedrock in the vicinity of the landfill is covered by a thin layer of alluvial deposits of the Minnesota River, colluvial deposits, and organic soils. The natural soils are predominately organic and inorganic silty clays north of the landfill based on the available boring logs. The soils over a major portion of the 17-acre horizontal expansion area have been removed after the borings shown in Figure III-3 were placed.

SOIL BORINGS

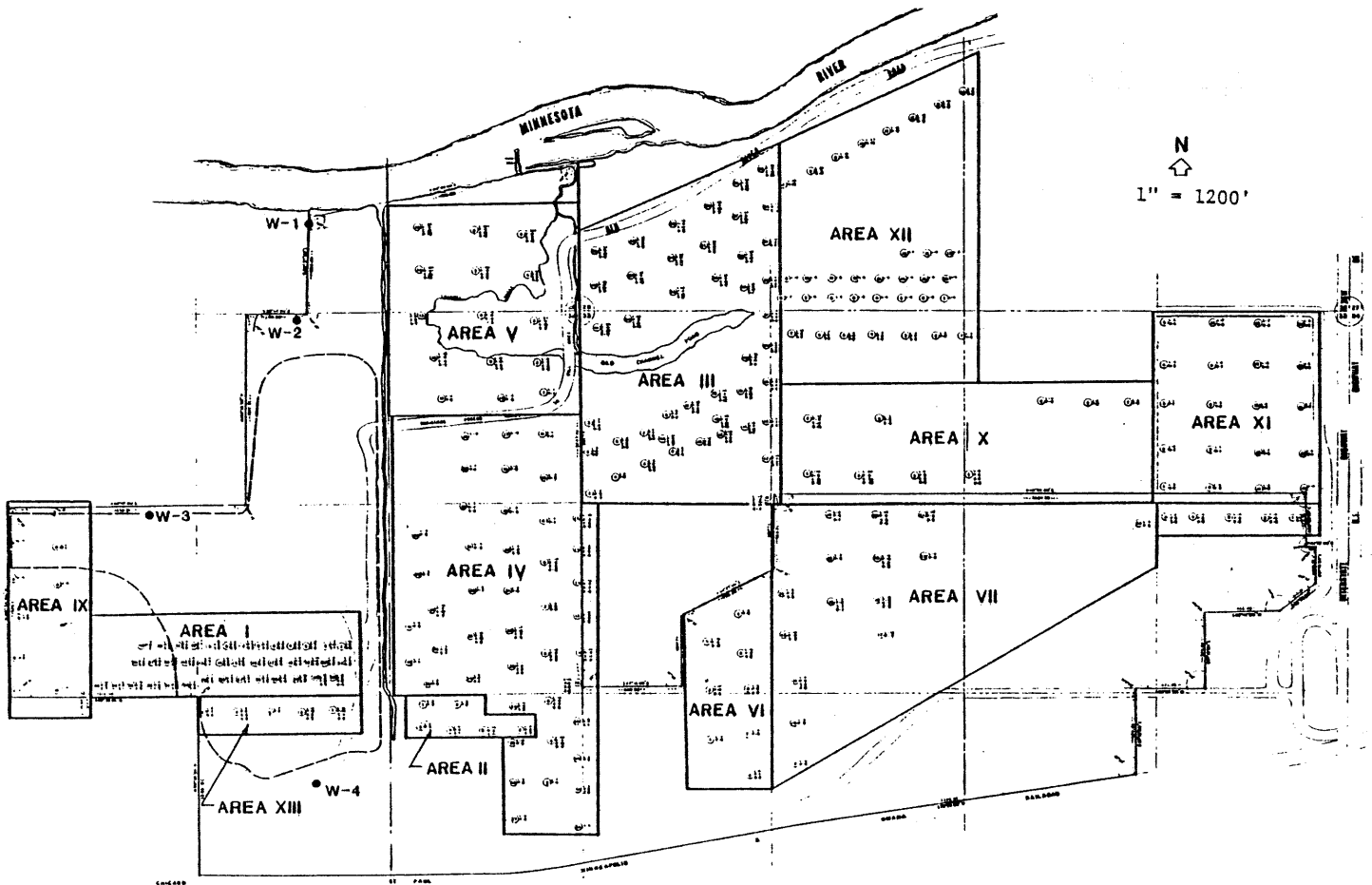


Figure III-3

BEDROCK CONTOURS

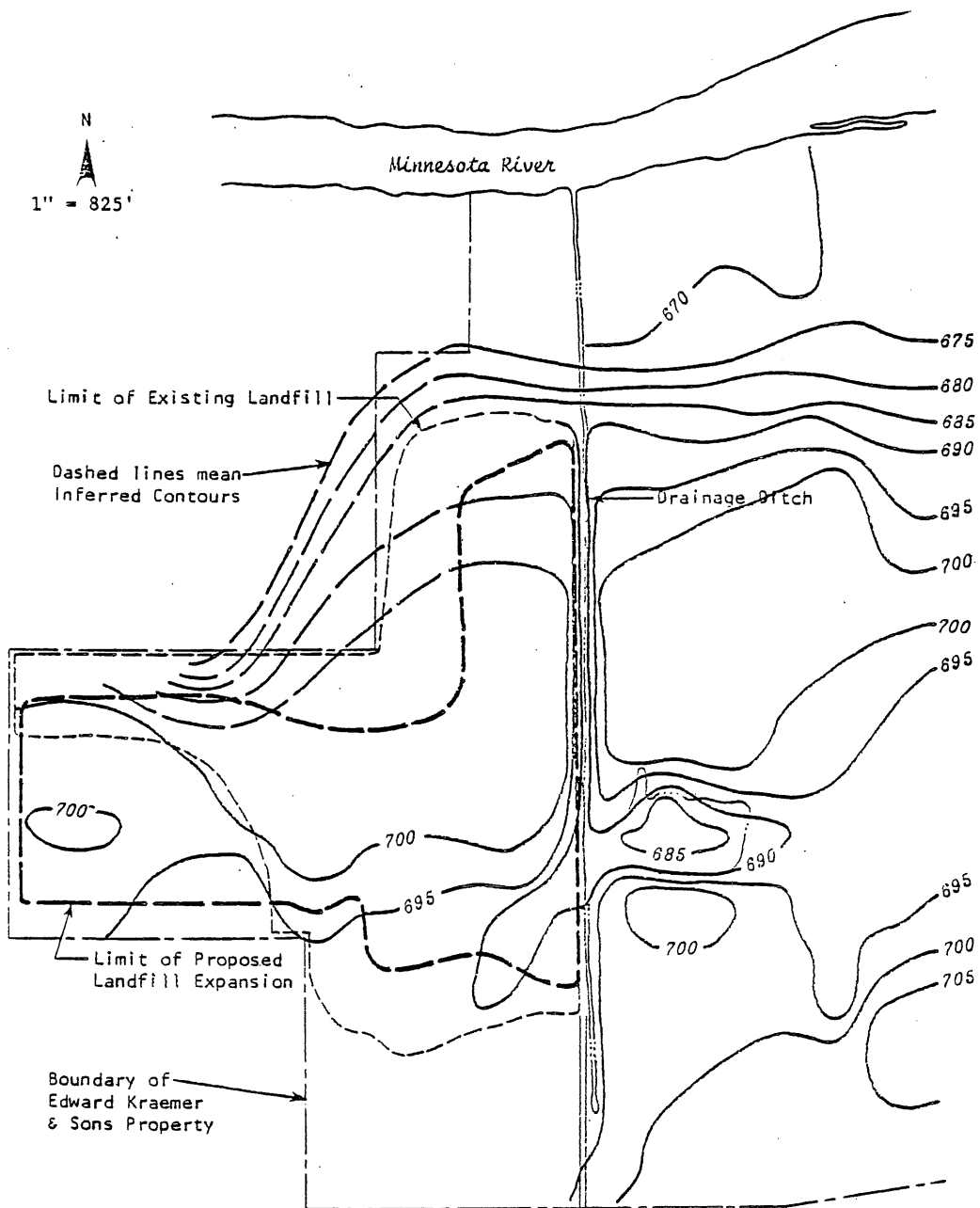


Figure III -4

GEOLOGIC COLUMN IN VICINITY OF BURNSVILLE LANDFILL

Period	Geologic Unit	Range in Thickness (ft.)
Quaternary	Alluvial & Colluvial Deposits (Qd)	Variable
Ordovician	Prairie du Chien Group (OpC)	150 ⁺
Cambrian	Jordan Sandstone (ϵ_j)	80-100
	St. Lawrence Formation (ϵ_{sl})	175-200
	Franconia Formation (ϵ_f)	
	Ironton Sandstone (ϵ_i)	60-65
	Gales Sandstone (ϵ_g)	
	Eau Claire Formation (ϵ_{ec})	85-90
	Mt. Simon Sandstone (ϵ_{ms})	over 200
Precambrian	Hinckley Sandstone (PE_h)	

Figure III -5

Groundwater Hydrology

Regional Setting -- The Twin Cities Structural Basin contains several aquifer systems. The aquifer systems which underlie the landfill are the Prairie du Chien-Jordan, Iron-ton-Galesville, and Mt. Simon-Hinckley. Their relative relationship and thickness are shown in Figure III-6. The St. Peter Sandstone overlies the Prairie du Chien aquifer in the upland areas north and south of the landfill but has been eroded and is not present beneath it. A north-south hydrogeologic cross section showing the regional patterns of groundwater flow in the aquifer systems is shown in Figure III-6. As shown, the Minnesota River and its valley serves as a regional discharge zone for groundwater in the Prairie du Chien-Jordan aquifer system and for groundwater in the glacial drift and St. Peter aquifers north and south of the valley. The aquifer systems beneath the Jordan aquifer do not appear to discharge into or to be influenced by the Jordan aquifer or the Minnesota River.

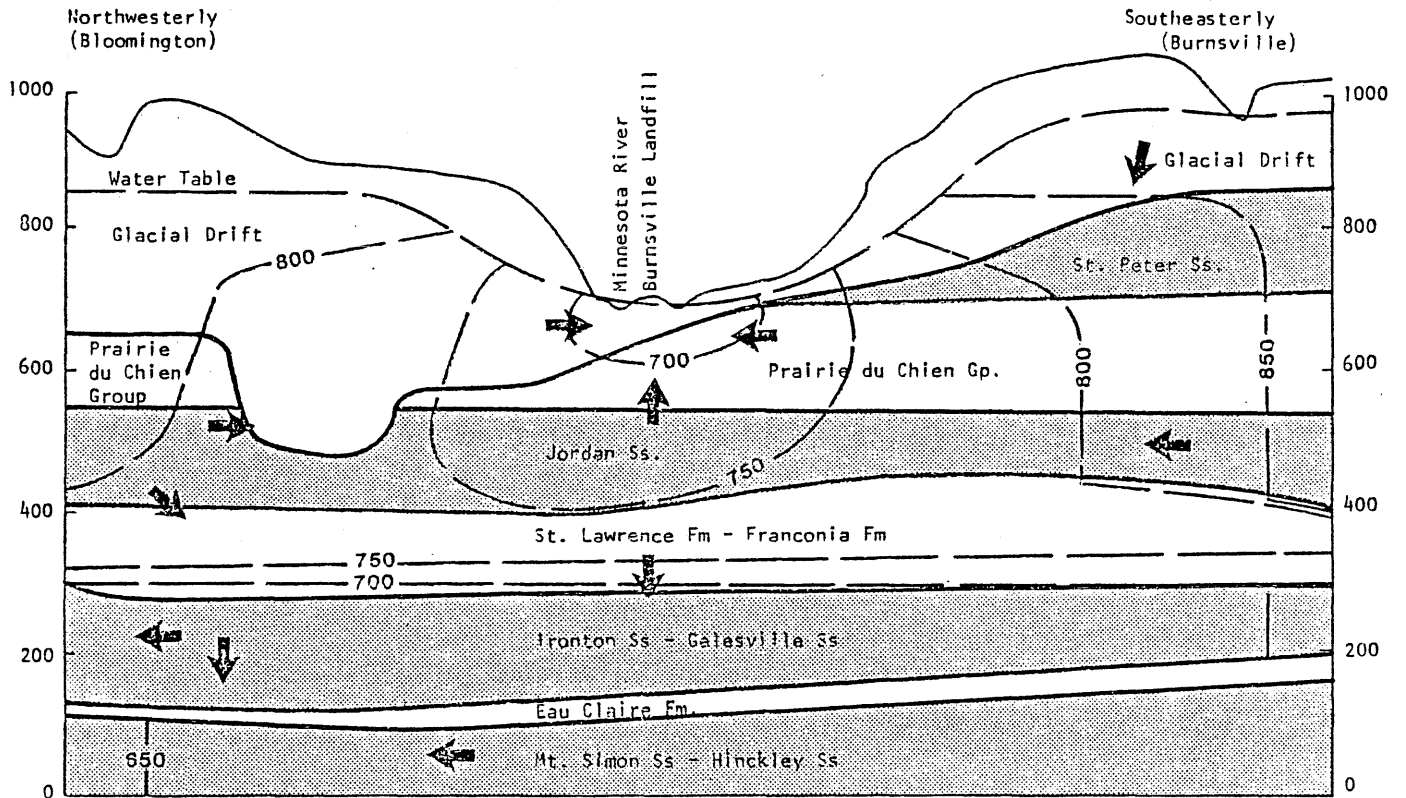
Since the landfill is located in the regional discharge zone for the Prairie du Chien-Jordan aquifer which immediately underlies the site, any water percolating through the existing landfill material will not penetrate significantly into the aquifer but will move to the Minnesota River.

Site Groundwater Hydrology -- During the summer of 1970, the water table configuration near the landfill was determined from the soil borings shown in Figure III-3. The water table configuration determined at that time is shown in Figure III-7. A comparison of the water table data in Figure III-7 and the bedrock surface data in Figure III-4 indicate that the water table was in the Prairie du Chien Dolomite at least beneath a portion of what is now the landfill. The average water table lies between five and 10 feet beneath the refuse buried in the landfill as determined from the soil borings.

Water table elevations measured in three observation wells installed in May 1978 and in a fourth well installed in the early 1970s adjacent to the Minnesota River are summarized in Table III-10. The locations of these wells and the water table elevations observed on May 25, 1979 and August 28, 1978 are shown in Figure II-8. During the monitoring period of May 1978 to December 1979, the lowest groundwater levels were observed in August 1978 and the highest levels were observed in May 1979.

Available groundwater data indicate that the surficial groundwater in the vicinity of the landfill is dominated by two controls. One is the wetland north of the landfill on Cargill property and the second is the drainage ditch east of the landfill. The wetland area, shown in Figure III-7, is enclosed by a dike with a regulated outlet. During 1979, the outlet was closed and water in this area was above Elevation 702. This water recharged the groundwater table causing water levels to rise in the landfill observation wells. Even during 1978 when the outlet was open and water levels were much lower in this area, the wetland seemed to serve as a groundwater recharge area. The drainage ditch along the east side of the landfill acts as

GENERALIZED REGIONAL CROSS-SECTION THROUGH BURNSVILLE LANDFILL



Vertical: 1" = 230'
Horizontal: 1" = 5750'

← Generalized Direction of Ground Water Flow

Figure III -6

WATER TABLE CONTOURS - AUGUST, 1970

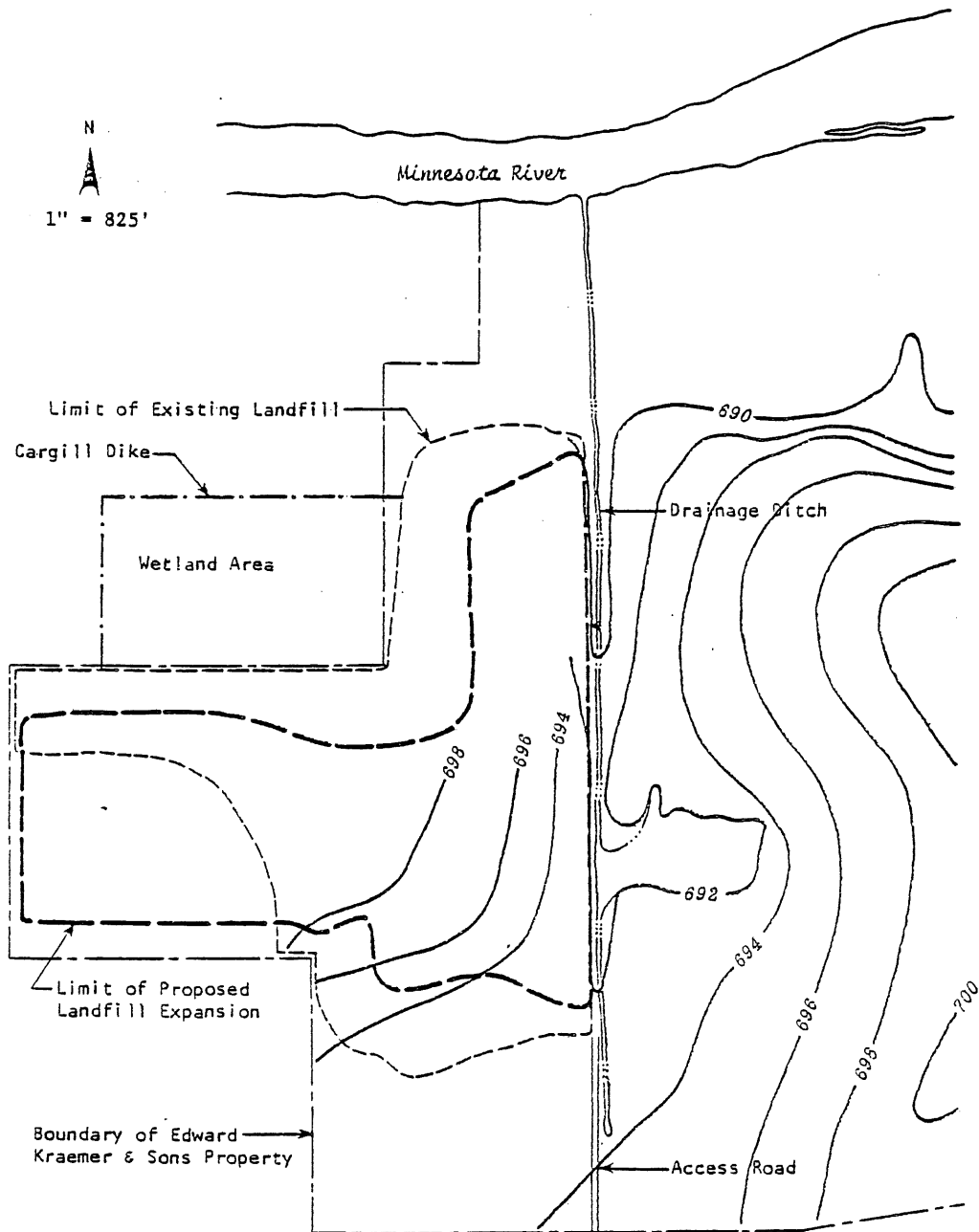


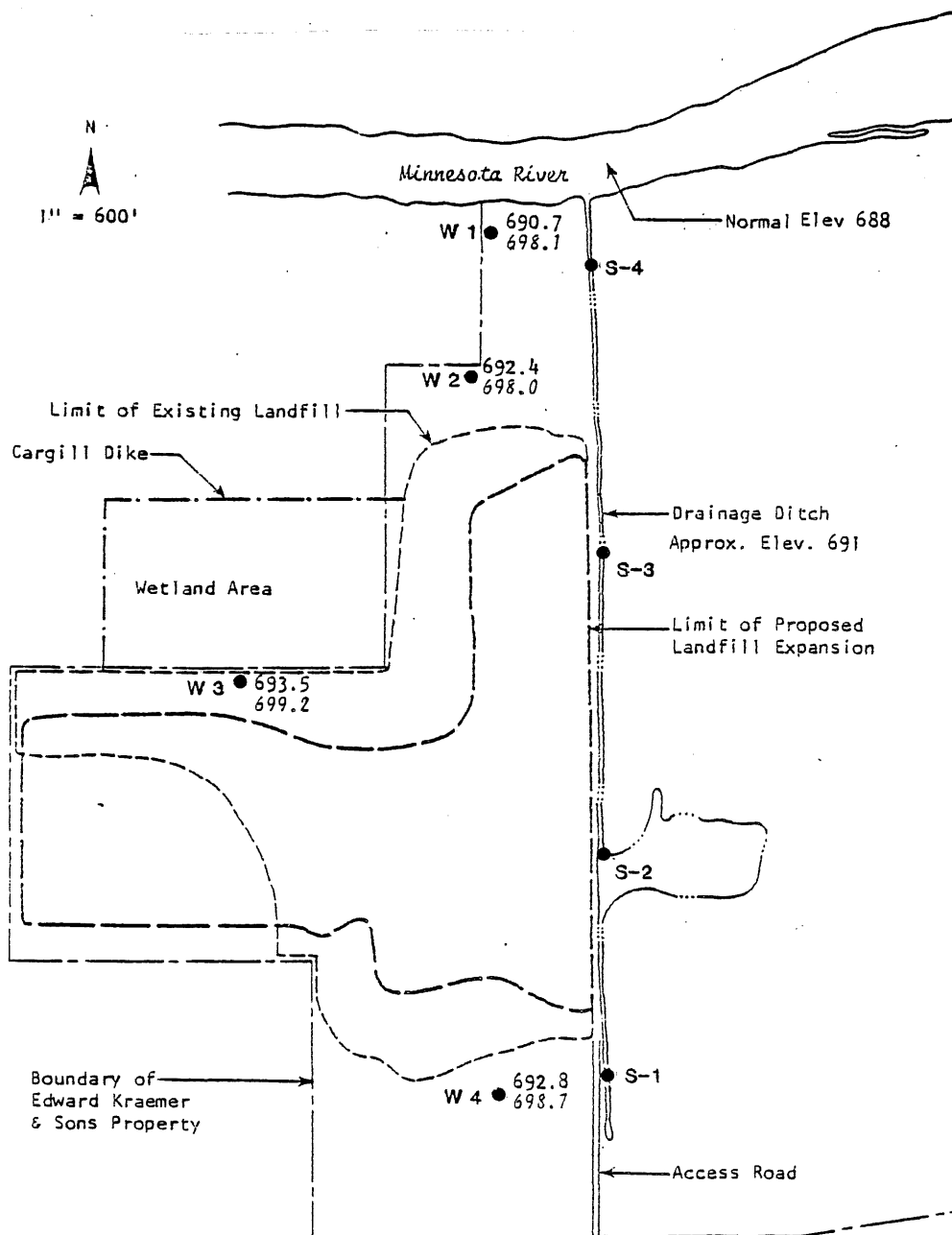
Figure III -7

LEVELS - OBSERVATION WELLS

Ground Water Elevation (MSL)							
<u>Well</u>	<u>5-24-78</u>	<u>7-6-78</u>	<u>8-8-78</u>	<u>5-25-79</u>	<u>7-19-79</u>	<u>10-4-79</u>	<u>1-23-80</u>
W-1	691.8	691.1	690.7	698.1	692.6	691.7	689.9
W-2	693.7	695.8	692.4	698.0	695.2	696.2	692.0
W-3	694.6	696.2	693.5	699.2	698.0	*	*
W-4	693.5	694.6	692.8	698.7	693.8	694.2	692.3
* Not Sampled; well covered with surface water							

Table III-10

WATER QUALITY MONITORING STATIONS and
HIGH & LOW WATER TABLE ELEVATIONS
(MAY 1978-DEC 1979)
BURNSVILLE SANITARY LANDFILL



690.7 = 8/28/78 Level (MSL)
698.1 = 5/25/79 Level (MSL)

W = monitoring well
S = surface water
monitoring station

Figure III-8

local groundwater discharge zone for the shallow groundwater beneath the landfill. As a result, the predominant flow pattern for the surficial groundwater beneath the landfill is from west to east which is from the wetland, beneath the landfill, and to the drainage ditch.

Because the landfill is in a regional discharge zone for the shallow regional groundwater aquifers beneath the site, groundwater in the underlying Prairie du Chien-Jordan aquifer has an upward component of flow caused by progressively higher piezometric levels with depth. Although there are no deep wells to confirm this on the landfill property, this upward gradient has been documented at Freeway Sanitary Landfill to the northeast. In addition, bedrock wells in the area show that piezometric levels in the Prairie du Chien-Jordan aquifer are above the level of the Minnesota River. Thus, any groundwater moving laterally and coming in contact with the existing refuse or vertically infiltrating to the water table through the existing refuse will remain in the uppermost portion of the shallow groundwater as it flows to the drainage ditch east of the landfill. The approximate limit of groundwater affected by leachate is shown in Figure III-9.

Surface Water Hydrology

Surface waters near the landfill include the Minnesota River and the drainage ditch east of the landfill shown in Figure III-8. In the addition, a small pool of water has been created east of the landfill by removing a small deposit of sand and gravel.

This section summarized the flow hydrology for both the Minnesota River and the eastern drainage ditch as determined by Barr Engineering (1980). Low flow hydrology is presented for the Minnesota River.

Information defining the surface water hydrology of the Minnesota River past the landfill is based primarily on the U. S. Geological Survey Gage 005330000 on the Minnesota River near Jordan. The period of record for this gage is 1935 through 1978. The gage is located at River Mile 39.4, approximately 27 miles upstream of the landfill. There are no major tributary streams which significantly influence flood flows between the Jordan gage and the landfill. Low flow in the Minnesota River is influenced by seepage into the river between the Jordan gage and the landfill.

Flood Hydrology for the Minnesota River

The greatest recorded flood on the Minnesota River adjacent to the landfill site occurred in April 1965 with an estimated peak discharge of 117,000 (cubic feet per second) and peak stage at approximately Elevation 718.6 at the landfill site. This flood had a recurrence interval of approximately 100 years. Information on the five largest floods on the Minnesota River past the landfill site is presented in Table III-11.

WATER SUPPLY WELLS WITHIN 1 MILE
OF BURNSVILLE LANDFILL BOUNDARY

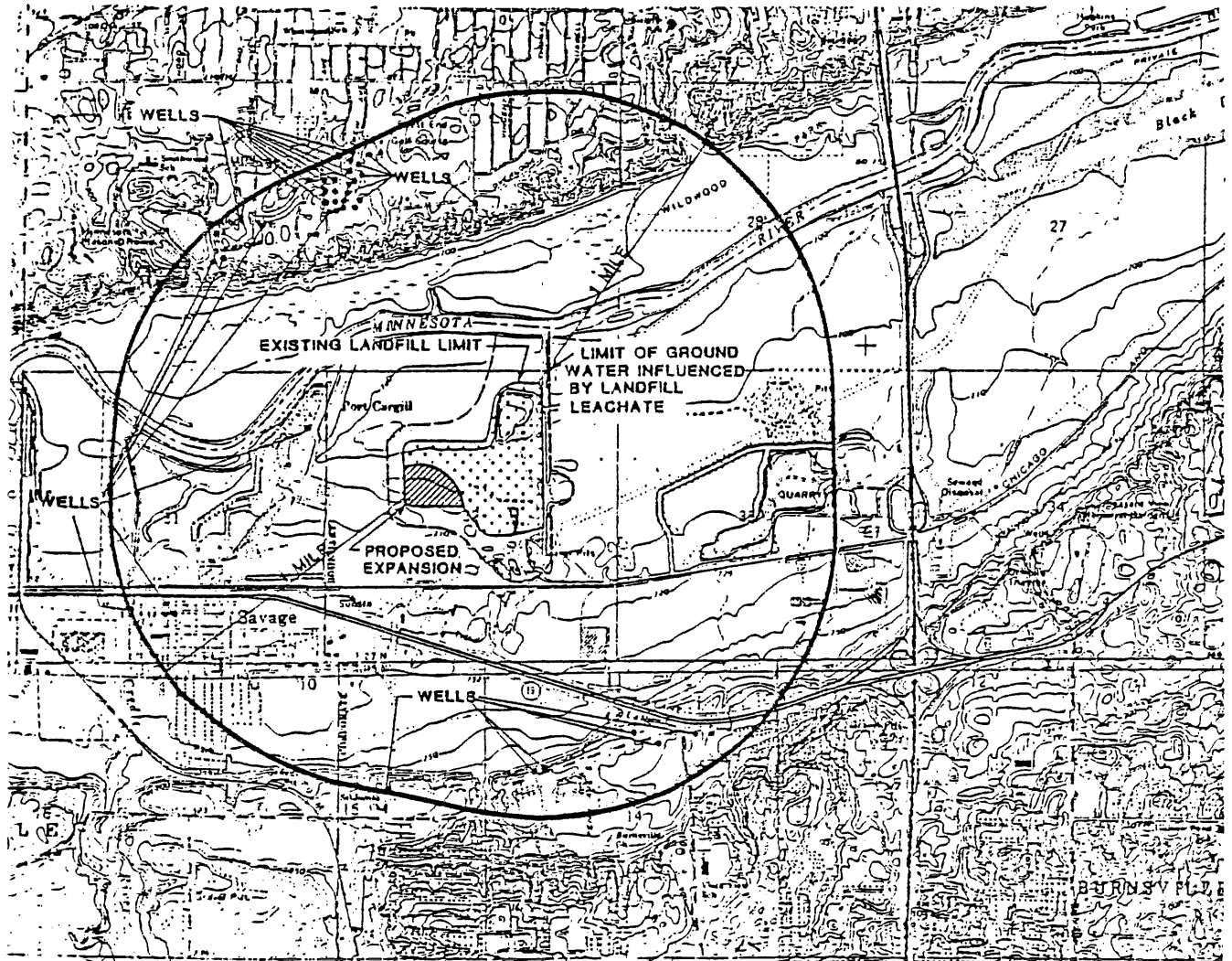


Figure III-9

LARGEST RECORDED
MINNESOTA RIVER FLOODS PAST
BURNSVILLE SANITARY LANDFILL

<u>Date</u>	<u>Discharge*</u> <u>(cubic feet per sec.)</u>	<u>Recurrence Interval</u>
April, 1965	117,000	101 years
April, 1969	84,600	40 years
April, 1951	64,100	19 years
April, 1952	60,600	16 years
June, 1957	40,800	7 years

* Department of the Interior, U.S. Geological Survey, Water Resources Data Gage 05330000, Minnesota River near Jordan, Minnesota, (period of record 1935-1978).

Table III-11

MINNESOTA RIVER FLOOD LEVELS
NEAR BURNSVILLE SANITARY LANDFILL

<u>Recurrence Interval</u>	<u>Discharge</u> <u>(cubic feet per second)</u>	<u>Flood Elevation</u> <u>at Landfill</u> <u>(1929 MSL Datum)</u>
10 year	48,400	708.1
100 year (without floodway)	115,000	718.2
100 year (with floodway)	115,000	718.3

Source: U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of Burnsville, Dakota County, Minnesota.

Table III-12

In Minnesota, the regulated floodplain is defined by the limit of flooding from a flood with a one percent change of occurrence in any given year. This flood is commonly referred to as a flood with a 100-year frequency recurrence interval. The U. S. Geological Survey (USGS) conducted a statistical analysis of data collected at the Jordan gage to determine the frequency of various flood discharges on the Minnesota River and also carried out a computerized analysis to determine flood stages associated with various flood discharges. The results of the USGS's hydrologic and hydraulic studies are included in the Flood Insurance Study for the City of Burnsville (FEMA 1972). Floodplain elevations at the landfill associated with various flooding events are summarized in Table III-12.

Encroachments into the floodplain such as fills or buildings reduce the capacity of the floodplain to carry flood water. The decrease in capacity will increase the flood heights which will increase flood hazards in areas upstream of the encroachment. The Flood Insurance Study for the City of Burnsville separated the area inundated by the 100-year frequency flood into a "floodway" and a "flood fringe." The floodway is made up of the river channel plus any adjacent floodplain area that must be kept free of encroachment so the 100-year frequency flood can be carried without a significant increase (0.5 feet in any reach) in flood height. The flood fringe makes up the remainder of the floodplain and is the area that can be filled or otherwise encroached upon without causing a substantial increase in flood height. The location of the floodway and the flood fringe adjacent to the landfill as defined by the Burnsville Flood Insurance Study and the Burnsville Floodplain Ordinance is shown in Figure II-7. Although placement of refuse in the existing landfill predates the floodplain studies in the area, a portion of the existing landfill is technically located in the flood fringe, however, filling has extended well above the flood level.

The east and part of the south faces of the existing landfill are protected from the 100-year frequency flood by dikes owned by Edward Kraemer and Sons, Inc. located as shown in Figure II-7. The north face of the existing landfill is protected from about a 10-year frequency flood by dike owned by Cargill and by a dike owned by Edward Kraemer and Sons, Inc. which connects the Cargill dike to the 100-year frequency Kraemer dike system as shown in Figure II-7.

Flood Hydrology for the Easterly Drainage Ditch -- The drainage ditch located east of the landfill has a drainage area of approximately three square miles. The Burnsville Drainage Plan (Barr 1966) indicates that, under ultimate development conditions, the 100-year frequency discharge in the drainage ditch near the landfill scale house will be between 2,000 and 3,000 cfs. Storm water currently enters the ditch from the tributary area south of the landfill access road through two storm sewers located under the access road. The elevation of flood water in the area adjacent to the landfill under 100-year frequency flooding will be between Elevation 704 and Elevation 706. Under these conditions, less than 0.5 acre of the existing landfill will be inundated and the inundation is expected to last for less than 12 hours.

Low-Flow Hydrology -- The USGS has conducted a statistical analysis of the low flow in the Minnesota River at the gage near Jordan. The results of this analysis indicate that the seven consecutive day low flow with an average recurrence interval of 10 years is 168 cfs and the seven consecutive day low flow with an average recurrence of two years is 350 cfs.

The low flow in the Minnesota River between the Jordan gage at River Mile 39 and the landfill site at River Mile 12 is influenced by groundwater seepage to the river. Studies conducted by Barr Engineering Co. in 1964 and 1968 for the Burnsville-Eagan-Bloomington Sanitary District indicate that groundwater seepage to this reach of the river under 10-year frequency low flow conditions is on the order of 47 cfs. Therefore, the seven-day duration, 10-year frequency low flow at the landfill site has been assumed to be 215 cfs. The average annual low flow for a seven consecutive day, two year return frequency at the landfill site is estimated to be 450 cfs.

The MPCA has used 180 cfs as the seven day duration, 10-year frequency low flow for the lower Minnesota River.

Local Water Supply

All water supplies in the area south of the Minnesota River are obtained from wells, either central municipal wells or private wells on the property of the water user. Existing wells within one mile of the landfill boundaries were located and the areas influenced by these wells were defined to help assess the impact of the landfill on these wells. Existing wells within one mile of the landfill finished in the Prairie du Chien-Jordan or shallowed aquifers were identified by Barr (1980) from the files of the Minnesota Geological Survey. These files contain logs for 27 wells (likely used only for nonpotable purposes) north of the Minnesota River within one mile of the landfill, and nine wells and one quarry (which acts as a large well) within one mile of the landfill south of the Minnesota River. The locations of the wells within one mile of the landfill are shown in Figure III-9 and pertinent data about each well are summarized in Table III-13.

Groundwater flow patterns to these wells were determined by an analytical groundwater flow model developed by Barr Engineering (1980) in accordance with Polubarinova-Kochina (1962) and Verruyt (1970). For the model, a single potentiometric function was derived which took into account the regional Prairie du Chien-Jordan aquifer flow to the Minnesota River, the drainage ditch adjacent to the landfill, the quarry east of the landfill, and all wells within one mile of the landfill. This function was used to determine the distribution of the potentiometric surface for the upper portion of the Prairie du Chien-Jordan aquifer in the area surrounding the landfill.

The distribution of the potentiometric surface in the Prairie du Chien-Jordan aquifer was used to determine the boundaries of groundwater flow that is intercepted by each well. The boundaries of the areas intercepted by each well are shown in Figure III-10.

DATA FOR WELLS WITHIN ONE MILE OF LANDFILL^b

Minnesota Unique Number	Township, Range & Section Number	Approximate Ground Surface Elevation (NSL)	Well Depth (ft.)	Static Water Elevation (NSL)	Daily Average Pumping Rate (gpm)
205500	T.27,R.24,S.29	830	476	715	.3 ^a
205504	T.27,R.24,S.30	825	110	775	.3 ^a
205535	T.27,R.24,S.29	830	128	745	.3 ^a
205536	T.27,R.24,S.29	820	148	-	.3 ^a
205537	T.27,R.24,S.29	815	135	-	.3 ^a
205538	T.27,R.24,S.29	820	138	718	.3 ^a
205542	T.27,R.24,S.29	820	141	730	.3 ^a
205543	T.27,R.24,S.29	830	140	738	.3 ^a
205544	T.27,R.24,S.29	820	143	-	.3 ^a
205545	T.27,R.24,S.29	830	142	745	.3 ^a
205546	T.27,R.24,S.29	830	143	730	.3 ^a
205547	T.27,R.24,S.29	830	194	760	.3 ^a
205548	T.27,R.24,S.29	825	314	715	.3 ^a
205549	T.27,R.24,S.29	830	168	-	.3 ^a
205550	T.27,R.24,S.29	825	322	715	.3 ^a
205552	T.27,R.24,S.29	830	150	-	.3 ^a
205553	T.27,R.24,S.29	830	104	778	.3 ^a
205554	T.27,R.24,S.29	827	153	-	.3 ^a
205555	T.27,R.24,S.29	835	150	739	.3 ^a
205556	T.27,R.24,S.29	826	143	744	.3 ^a
205557	T.27,R.24,S.29	825	131	-	.3 ^a
205558	T.27,R.24,S.29	825	296	-	.3 ^a
205560	T.27,R.24,S.29	825	102	-	.3 ^a
205566	T.27,R.24,S.30	820	349	755	.3 ^a
205567	T.27,R.24,S.30	810	106	747	.3 ^a
205570	T.27,R.24,S.30	822	132	717	.3 ^a
205571	T.27,R.24,S.30	832	153	717	.3 ^a
205838	T.115,R.21,S.14	805	140	700	.3 ^a
205839	T.115,R.21,S.15	805	103	760	.3 ^a
207056	T.115,R.21,S.14	790	81	750	20
207061	T.27,R.24,S.31	725	143	623	.3 ^a
207059	T.115,R.24,S.14	805	140	693	.3 ^a
207689	T.27,R.24,S.33	722	240	702	1040
207691	T.115,R.21,S.14	796	257	749	200
211808	T.115,R.21,S.14	800	300	620	.7 ^a
Cargill	T.27,R.24,S.31	710	232	-	300
Savage Well #1	T.27,R.24,S.31	-	-	-	600

^aEstimated daily average consumption rate

^bFrom well logs filed at Minnesota Geological Survey

Table III-13

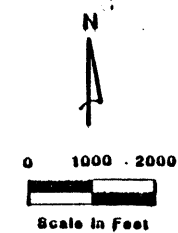
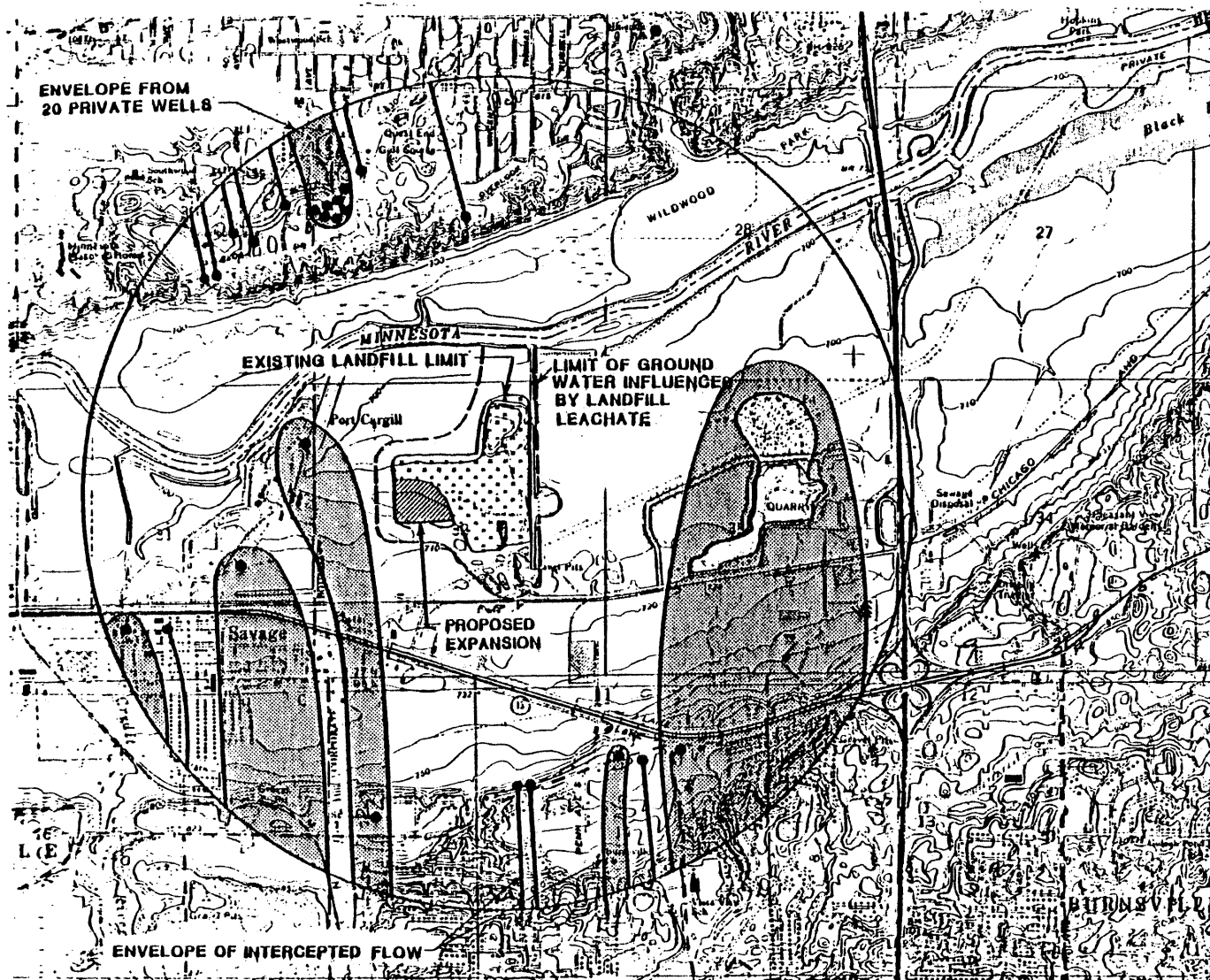


Figure III-10

Envelopes Of Intercepted Flow
To Wells Located Within 1 Mile Of
Burnsville Landfill Boundary
(Revised To Include Second
Cargill Well)

Because the Minnesota River is the regional groundwater discharge zone for the Prairie du Chien-Jordan aquifer, groundwater moving through the aquifer north of the river does not interact with the groundwater in this aquifer south of the river. Thus, all of the wells north of the river intercept groundwater flowing to the river from the north. Likewise, wells south of the river intercept groundwater flowing to the river from the south.

The wells closest to the landfill are located at the Port Cargill facilities west of the landfill. These wells are finished in the Jordan aquifer and have an estimated pumping rate of 300 gpm and 700 gpm for drinking and processing purposes. Because the piezometric level in the Jordan aquifer is distinctly higher than the piezometric level in the Prairie du Chien aquifer in this vicinity, pumping the Port Cargill wells will cause only minimal interference in the overlying Prairie du Chien aquifer. As shown in Figure III-10, the Port Cargill well drawdowns do not directly intercept any area potentially affected by leachate from the landfill.

As shown in Figure III-10, the quarry operated by Edward Kraemer and Sons, Inc. east of the landfill has a broad envelope of intercepted flow. Since the quarry is dewatered at a rate of approximately 1000 gpm (1.5 MGD), it functions as a shallow, wide well. This configuration concentrates its drawdown effects in the upper portion of the aquifer. Consequently while the quarry is intercepting a wide band of groundwater flowing in the upper portion of the aquifer, there is still groundwater flowing under the quarry to the river in the lower portion of the aquifer.

The groundwater flow model confirmed that groundwater in the upper aquifer in the immediate vicinity of the landfill flows generally eastward to the drainage ditch east of the landfill. The exact configuration of the flow under the landfill is determined, in part, by the water elevation in the diked wetland on the adjoining Cargill property and, in part, by flow in the Prairie du Chien aquifer from the south.

The municipal wells for Burnsville are situated east of I-35W. They cannot be affected by the existing landfill since the Burnsville wells have envelopes of flow similar to those shown in Figure III-10. The actual configuration of their flow envelopes is dependent on the local piezometric gradients in the uppermost portion of the Prairie du Chien aquifer, the zone of the aquifer complex that the wells are completed in, and their pumping rates. The quarry dewatering that exists between the landfill and the municipal wells represents a second level of protection by intercepting any flow that could otherwise possibly occur between the landfill and the wells. Appendix III contains an analysis of Burnsville's water supply expansion program and impact on the landfill. This analysis verifies the findings of the EIS.

The only locations where a well could be influenced by the landfill would be between the landfill and the river or drainage ditch and immediately south or west of the landfill. Because there are no water supply wells presently between the landfill and the Minnesota

River and because development is prohibited in this area by the floodway zoning designation, groundwater between the landfill and the river will not be used for water supply purposes. There is a small parcel of land to the west of the existing landfill and north of the horizontal expansion area which is not within the floodway and is owned by Cargill. Discussions with Cargill have indicated that there is no potential for development of this small parcel of land. The area immediately south of the landfill is either owned by Edward Kraemer and Sons, Inc. or is served by the municipal water system.

We recognize that there are wells located more than one mile from the landfill. The influence of these wells, which are located principally to the south of the landfill, was taken into account through the boundary conditions used in the model. Pumping from wells south of the landfill could lower the piezometric levels between the wells and the Minnesota River. To check the validity of southern boundary conditions used in our model, we contacted Mike Schoenberg of the USGS to determine the static water levels measured by the USGS in the Northwestern Bell substation well located at 115-21-14 abc. This well is approximately 4,000 feet southeast of the landfill and is near the southern boundary of the area considered in the model. According to Mr. Schoenberg, the water level in the well varied between Elevations 732 and 734 based on spot measurements taken in August 1977 and February 1978 and 1980. Piezometric levels predicted for the Northwestern Bell substation well by the model used in the groundwater analysis of the landfill varied from Elevations 732 to 733 depending on the pumping rates used in the model. The good comparison between the predicted groundwater levels and the levels actually measured in the Northwestern Bell well indicates that the effect of wells to the south of the landfill outside the one mile radius area were adequately considered in the boundary conditions used in the model. In addition, we contacted representatives of the Cities of Burnsville and Savage and the areas along 130th Street (Dakota County Road 34) that are served by municipal water. Most of the residential wells in the area are probably not used for potable supply purposes.

Site Specific Water Budget

The water balance for the landfill has been determined by Barr Engineering (1980) for existing conditions using a method similar to the one used in the report, "Leachate Generation Potential from Landfills in the Twin Cities Metropolitan Area," dated March 1978, prepared by the Metropolitan Council. This method uses average annual precipitation and evaporation, transpiration and runoff losses, to estimate the infiltration into the landfill. The infiltration is an estimate of leachate release once the moisture content of the refuse reaches field capacity. It is generally assumed that refuse has an initial moisture content of approximately 15 percent and a field capacity of approximately 30 percent by weight.

The site specific water balance was determined using average monthly precipitation, evaporation, runoff and transpiration along with the following assumptions:

- 1) Sufficient precipitation is available to satisfy the land evaporation potential on an average monthly basis.
- 2) Runoff is based on the assumption that one rainfall event per month will produce runoff for the months of April through October and that snowmelt runoff will occur in March. The amount of runoff is a function of the amount of excess (i.e., precipitation minus land evaporation) monthly precipitation.
- 3) For vegetated areas, transpiration potential is applied to the amount of water remaining after applying monthly evaporation and runoff losses to the precipitation.
- 4) The estimated infiltration is equal to the precipitation minus land evaporation, runoff and transpiration.

The estimated average annual infiltration rate for the existing permitted area before and after final closure is 5.0 and 3.0 inches per year, respectively. Table III-14 summarizes the site specific water balance for the landfill under existing conditions (before and after final closure). The infiltration rates for vegetated and nonvegetated areas of three and 30 percent slope are also shown in Table III-14. For the current operation, the estimated annual surface runoff is 4.3 inches per year. For turfed areas, the average annual land evaporation and transpiration is 13.9 inches and 9.0 inches, respectively.

The cover materials presently used on the landfill consist of silty loam from the quarry stripping operation. For water balance calculations, it was assumed that the peat in the final cover will cause the soil to have a very high moisture content and field capacity and that the sand in the cover material will cause the soil to have a moderately high infiltration capacity. Water balance calculations indicate that the site will have a low percolation rate and a low average annual leachate production, because the high moisture storage capacity of the cover soil enhances evapotranspiration effects during the summer.

Results of the Council 1978 study using the water balance method indicate that the average annual percolation at landfill will be 2.67 inches and the time required for maximum leachate production will be 34 years from the beginning of landfill operation. Barr Engineering used the infiltration rate after final closure of 3.0 inches per year as the potential leachate production rate.

SURFACE WATER QUALITY

State Regulations

The MPCA has established surface water quality standards based on water use classifications for all interstate and intrastate waters in Minnesota. The water use classifications are described and defined in WPC 14 and WPC 15.

SITE SPECIFIC WATER BALANCE
EXISTING LANDFILL

<u>LANDFILL CONDITION</u>	<u>Estimated Average Annual Infiltration Rate</u>
Existing Conditions (During Operation)	5.0"/yr.
Existing Conditions (After Closure)	3.0"/yr.
 <u>SUB-AREA CONDITIONS</u>	
Vegetation - Landfill top (Slope Less than 3%).	4.5"/yr.
Vegetation - Landfill Side (Slope of 30%)	2.5"/yr.
No Vegetation - Landfill Top (Slope Less than 3%)	13.3"/yr.
No Vegetation - Landfill Sides (Slope of 30%)	9.8"/yr.

Table III-14

All rivers of the state have been assigned one or more water use classifications as listed in WPC 24 and WPC 25. That portion of the Minnesota River of concern with respect to the Burnsville area, from Carver Rapids to its confluence with the Mississippi River, has been assigned WPC use classifications 2C and 3B. The regulation that classifies State receiving waters also states that all receiving waters are classified 3C (industrial consumption--cooling and materials transport), 4A and 4B (agriculture and wildlife), 5 (navigation and waste disposal), and 6 (other uses) where such uses are possible. In addition, receiving waters in the 3B classification must be generally comparable to waters classified as 1D (domestic consumption--high degree of treatment) with the exception that the 1D standards for chloride, hardness, pH and fecal coliform need not be met. In summary, classifications applicable to the reach of the river potentially impacted by the existing landfill include: 1D, 2C, 3B, 4A, 4B, 5 and 6. Standards applicable to these classifications are summarized in Table III-15. These standards are applicable at all river flows equal to and greater than the seven-day duration, 10-year frequency low flow.

All other surface waters in the landfill area are included under WPC use classifications 2B, 2C, 3B, 3C, 4A, 4B, 5 and 6 for intrastate waters. This would include the wetland areas around the landfill which are classified as Type III, IV, or V.

The state solid waste regulations require that the fill and trench areas of a sanitary landfill be at least 1,000 feet from the normal high water mark of a lake, pond, or flowage and at least 300 feet from a stream (SW 6(1)). The Minnesota River is not located within 300 feet of the northern boundary of the landfill and is not subject to this regulation.

State solid waste regulations also require that sanitary landfills be constructed and cover material graded so as to promote surface water runoff without excessive erosion and that surface water drainage be diverted around and away from the landfill operating area (SW 6(2)). Finally, the solid waste regulations require that a water monitoring program be constructed and operated to determine leachate impacts on surface water and that a leachate collection and treatment system be installed where required to protect surface waters (SW 6(2)).

Regulatory Compliance

Minnesota River -- This section estimates the impact of sanitary landfill leachate on Minnesota River water quality at the seven-day duration, 10-year frequency low flow and at the seven day duration, two-year frequency low flow and compares the estimated Minnesota River water quality to state water quality standards for this reach of the river.

The quality of the Minnesota River has been monitored for many years. In recent years, a computerized data system has been developed to maintain information in a more organized and accessible form. The State and federal agencies involved in monitoring the quality of the river include the USGS, the Metropolitan Waste Control Commission (MWCC) and the MPCA.

STANDARDS FOR MINNESOTA RIVER IN VICINITY OF BURNSVILLE LANDFILL

<u>Parameter</u>	<u>MPCA Water Quality Standard</u>	<u>Limiting Classification</u>
Copper	10 µg/l	2C
Turbidity	25 NTU	2C
Conductivity	1000 µmhos/cm @ 25°C	4A
Chloride	100 mg/l	3B
pH	6.5-8.6	4A
Ammonia	1.5 mg/l as N	2C
Dissolved Oxygen	5 mg/l ⁽¹⁾	2C
Total Dissolved Solids	700 mg/l	4A
Total Alkalinity	250 mg/l as CaCO ₃	4A
Sulfate	10 mg/l as SO ₄	4A
Total Hardness	250 mg/l as CaCO ₃	3B
Sodium	60% of total cations in meq/l	4A
Cadmium	10 µg/l	1D
Lead	50 µg/l	1D
Arsenic	50 µg/l	1D
Selenium	10 µg/l	1D
Fluoride	1.5 mg/l	1D
Phenols	0.1 mg/l	2C
Chromium	0.05 mg/l	2C
Barium	1 mg/l	1D
Boron	0.5 mg/l	4A
Cyanide	0.02 mg/l	2C
Silver	50 µg/l	1D

(1) 4 mg/l during the period December 1 through March 31

Since 1972, the MWCC and the USGS have been cooperating in a program to monitor the quality of the river. The cooperative program was designed to provide information on the mass transfer of water quality constituents through the Twin Cities Metropolitan Area. From 1972 through 1977, this network was made up of the MWCC Water Quality Sampling Program, an MWCC-USGS Cooperative Water Quality Surveillance Program and the MPCA Routine Water Quality Monitoring Program.

The MWCC program consisted of weekly and monthly grab sampling. The samples were analyzed by the MWCC laboratory at the Metropolitan Wastewater Treatment Plant. The MWCC-USGS Cooperative Program consisted of grab sampling and automatic monitoring of the Minnesota River. Analyses were performed at the USGS laboratory and included such parameters as dissolved oxygen, temperature, chloride, phosphorus, hardness, heavy metals, radio-chemical parameters and biological organisms.

The MPCA's Routine Water Quality Monitoring Program has been operating since 1952. Sampling stations are located throughout the State, and since 1968 have been sampled on a monthly basis. Many of the stations are located below significant point discharges which exert a major influence on water quality. In the fall of 1977, the MPCA discontinued their sampling program on the lower Minnesota River because of a duplication of effort with the USGS and MWCC programs.

The water quality sampling station nearest the landfill is the MWCC station located at River Mile 14.3 approximately two miles upstream of the landfill. However, only some of the parameters of interest are routinely monitored at this station. The nearest water quality station at which almost all the parameters of interest were monitored is the former MPCA water quality station at River Mile 7, approximately five miles downstream of the landfill.

Various reaches of the major rivers and streams in the State have been classified by the MPCA as either "water quality limited" or "effluent limited." If a reach is classified as water quality limited, it has been determined that the quality does not meet applicable water quality standards and/or is not expected to meet standards in the future even if secondary treatment of municipal discharges and best practicable treatment of industrial discharges are used. Effluent limited segments are those where it has been determined that water quality standards are being met and where, with secondary or best practicable treatment, water quality standards will be met in the future.

The reach of the Minnesota River past the landfill is classified as water quality limited indicating that, even with secondary or best practicable levels of treatment, the river is not expected to meet stream standards.

Several parameters exceed water quality standards for the lower Minnesota River on a regular basis. These parameters include:

- o Turbidity
- o Conductivity

- o Ammonia
- o Dissolved oxygen
- o Copper
- o Total dissolved solids
- o Bicarbonates (or M-Alkalinity)
- o Sulfate
- o Hardness
- o Temperature

Available data indicate that turbidity exceeded the applicable water quality standards almost half the time at the River Mile 7 monitoring station. Elevated turbidity levels appear to be seasonal in nature with the highest turbidities occurring during the summer months.

Specific conductance exceeded State standards twice during the period 1975-1977 at the River Mile 7 station. The high values occurred during January and February 1977. During this period, the flow in the river was very low and runoff containing deicing chemicals used on streets and roads probably contributed to the elevated specific conductance. This conclusion is supported by the fact that the highest chloride concentrations also occurred during January and February 1977. The low flow condition during January and February, 1977 also resulted in ammonia concentrations which exceeded the stream standards.

Once during the summer of 1974 and once during the summer of 1976 the reported dissolved oxygen concentration in the Minnesota River dipped below the standard.

Seven of the copper concentrations exceeded State stream standards for this section of the river. A major problem with the available copper data is that the stream standard is the same as the detection limit of the technique used in the analysis. Normal analytical variation may have produced many of the apparent violations of the standard.

The total dissolved solids concentration in the river exceeded State standards twice and the alkalinity values exceeded the standard several times. Sulfate and hardness both periodically exceeded water quality standards on a continuing basis. The sulfate standard, however, is based on the production of wild rice and is probably not applicable to this reach of the Minnesota River.

During major rainfall events and during snowmelt in the spring, surface runoff leaves the landfill site. The amount of runoff and its quality is influenced by the slope, vegetal cover, and the rainfall intensity and duration. During the growing season, side slopes and finished areas of the landfill are vegetated soon after

completion. Of the 85-acre existing landfill, only about 20 acres are not vegetated. The surface runoff quality, therefore, is generally similar to runoff from open grass areas and from areas of exposed soil.

Given the large size of the watershed tributary to the Minnesota River, it can be concluded that the surface runoff from 60 acres of grassland and 20 acres of exposed soil will have a negligible impact of the quality of the river.

The Minnesota River is governed by State water quality standards and may potentially be impacted by leachate from the landfill. The primary release of potential pollutants to the river from the landfill may occur from the discharge of leachate affected ground water to the river or to the drainage ditch east of the landfill.

Barr Engineering (1980) assessed the impact of leachate on river quality using a simple dilution model to predict the change in river quality caused by the landfill leachate. The amount of leachate reaching the river was determined by the water balance of the landfill. Average annual leachate production was estimated to be 3.0 inches per year (0.029 cfs from the 85 acres of existing landfill) for the landfill.

Information on the quality of leachate was obtained from two sources. In May 1979, the MPCA sampled a leachate seep at the landfill. Data obtained from that sample is contained in Table III-16 and was used to help define leachate quality. Not all of the parameters of interest were analyzed on this sample. For parameters not analyzed on the leachate sample, literature values based on median leachate concentrations were used in the analysis. These concentrations are presented in Table III-16. Although leachate attenuation and biodegradation are important processes and likely act to reduce the strength of the leachate reaching the river from the landfill, their effect was assumed to be negligible for purposes of this impact analysis. The landfill monitoring data could not be used due to difficulties in accurately determining the amount of ground water flow reaching the easterly drainage ditch and the river. Accurate measurements of flow in the eastern drainage ditch also were not available.

The loading of potential pollutants to the river as predicted by Barr's leachate loading model can be expressed as follows:

$$L = C_{LL} \times Q_L \times 5.4$$

where

L = loading of the potential pollutant to the Minnesota River from the Burnsville Landfill (lbs/day)

C_{LL} = concentration of potential pollutant in landfill leachate (mg/l)

Q_L = rate of leachate production from the landfill (cfs)

DATA DESCRIBING LANDFILL⁷³ LEACHATE QUALITY

<u>Parameter</u>	<u>Literature¹ Concentration</u>	<u>Measured² Concentration</u>
Ammonia	82 mg/l as N	350 mg/l as N
Cyanide	0.028 mg/l as CN	-
Oil	24 mg/l	-
Phenol	0.77 mg/l	-
Bicarbonate (Alkalinity)	1225 mg/l as CaCO ₃	-
Boron	4.7 mg/l	3.0 mg/l
Specific Conductance	6100 μ mhos/cm @ 25°C.	-
pH	6.8	6.0
Chromium	0.05 mg/l	-
Copper	0.05 mg/l	-
Arsenic	Not Detectable (0.00 mg/l)	-
Barium	2.25 mg/l	-
Cadmium	0.03 mg/l	-
Chloride	562 mg/l	1610 mg/l
Hardness	1600 mg/l as CaCO ₃	-
Fluoride	0.4 mg/l	-
Lead	0.10 mg/l	-
Selenium	Not Detectable (0.00 mg/l)	-
Total Dissolved Solids	5346 mg/l	-
Total Organic Carbon	-	7200 mg/l
Turbidity	-	130 NTU
Sodium	357 mg/l	-
Sulfate	153 mg/l as SO ₄	1080 mg/l as SO ₄
Silver	0.01 mg/l	-
Zinc	-	12 mg/l
BOD ₅	1500 mg/l	-
COD	4490 mg/l	-

¹Median Values from Data in Thomas Clark and Rauf Pisking, Environmental Geology, Vol. 1, page 329, 1977.

²Measured by MPCA on Toe Leachate Sample Collected from Southeast Corner of Burnsville Landfill on May 3, 1979.

The impact of the loading of each potential pollutant on river quality can be calculated using the following formula:

$$C_{DS} = \frac{L + 5.4(Q_R C_{US})}{5.4(Q_R + Q_L)}$$

where

C_{DS} = concentration of potential pollutant in mixing zone of the river downstream of the landfill (mg/l)

L = loading of potential pollutant to the Minnesota River from the Burnsville Landfill (lbs/day)

Q_R = flow in the mixing zone of the river (cfs) -- for modeling purposes 25 percent of the river's flow was assumed available for mixing

C_{US} = concentration of potential pollutant in the river upstream of the landfill

Q_L = flow of leachate into the river (cfs)

For the impact analysis, the river quality upstream of the landfill was based on averages from samples taken at River Mile 7, River Mile 3 and River Mile 36 sampling stations. The quality of the river based on the averages is summarized in Table III-17. During the drought of 1976, a flow about equal to the 7-day duration, 10-year frequency low flow occurred during September. Water quality data measured on river samples collected in September, 1976, were compared with the average river quality data shown in Table III-17 to check for any obvious differences between the average values and values actually measured during low flow conditions of September, 1976. Barr (1980) concluded that the river concentrations in Table III-17 are representative concentrations for low flow conditions. Although much of the data were collected downstream of the landfill, it was assumed that it was representative of conditions upstream. This leads to a "worst case" analysis, in that higher concentrations will be predicted downstream of the landfill.

The influence of landfill leachate at the 7-day duration, 10-year frequency low flow was evaluated. The 7-day duration, 10-year frequency low flow for the Minnesota River at the landfill has been estimated to be 215 cfs. The calculated influence of the landfill on the quality of the Minnesota River at the 7-day duration, 10-year frequency low flow is summarized in Table III-18.

In most cases, the impact of the existing landfill on the quality of the Minnesota River at the 7-day, 10-year low flow are not analytically discernable. The concentration of most parameters in the river upstream of the landfill is essentially the same as it is downstream of the site. The four parameters predicted to result in the greatest increase are ammonia, BOD, COD and chloride. All other parameters result in less than a two percent increase. Even with increases of 0.19 mg/l (as N) for ammonia (27 percent increase) and

ASSUMED BACKGROUND QUALITY OF
MINNESOTA RIVER DURING LOW FLOWS

<u>Parameter</u>	<u>Low Flow Quality</u>
Copper	12 µg/l
Turbidity	76.6 NTU
Conductivity	730 µmhos/cm @ 25°C
Chloride	45 mg/l
pH	8.1
Ammonia	0.70 mg/l as N
Total Dissolved Solids	573 mg/l
Total Alkalinity	258 mg/l as CaCO ₃
Sulfate	123 mg/l as SO ₄
Total Hardness	369 mg/l as CaCO ₃
Sodium	34.3 mg/l
Cadmium	10 µg/l
Lead	11 µg/l
Arsenic	8.6 µg/l
Selenium	2.8 µg/l
Fluoride	0.32 mg/l
Phenols	0.004 mg/l
Chromium	0.007 mg/l
Barium	0.16 mg/l
Boron	0.16 mg/l
Cyanide	0.4 mg/l
Silver	<10 mg/l
BOD ₅	5.3 mg/l
COD	42.5 mg/l

Table III-17

IMPACT OF EXISTING LANDFILL ON MINNESOTA RIVER QUALITY 7 DAY DURATION - 10 YEAR FREQUENCY LOW FLOW

PARAMETER	Minnesota River		Burnsville Landfill		Minnesota River	
	UPSTREAM CONCENTRATION	LOADING AT 7-DAY 10 YEAR LOW FLOW LBS./DAY	LEACHATE CONCENTRATION	LANDFILL LOADING LBS./DAY	DOWNSTREAM CONCENTRATION	HPCA WATER QUALITY STANDARD
Copper µg/l	12	3.409 ³	50	0.008	12.0	10
Turbidity NTU	76.6	21754 ³	130 ⁶	20	76.7 ³	25
Conductivity µhos/cm @ 25 deg. C.	730 ²	134758	6100 ²	618	733	1000
Chloride mg/l as Cl	45	12780	1610 ⁶	251	45.9	100
pH	8.1	-	6.0 ⁶	-	-	6.5-8.5
Ammonia mg/l as N	0.70	199	350 ⁶	54.6	0.89	1.5
Total Dissolved Solids mg/l	573	162732	5346	834	575.9	700
Total Alkalinity mg/l as CaCO ₃	258	73272	1225	191	258.7	250
Sulfate mg/l as SO ₄	123	34932	1080	168	123.6	10
Total Hardness mg/l as SO ₄ CaCO ₃	368	104512	1600	250	368.9	250 ⁴
Sodium µg/l as Na	34.3	9741	357	56	34.5	122 ⁴
Cadmium µg/l as C	10	2.840	30	0.0005	10.0	10
Lead µg/l as Pb	11	3.124	100	0.016	11.0	50
Arsenic µg/l as As	8.6	2.442	ND	-	8.6	50
Selenium µg/l as Se	2.8	0.795	ND	-	2.8	10
Fluoride mg/l as F	0.32	90.88	0.4	0.06	0.320	1.5
Phenols mg/l	0.004	1.136	0.77	0.120	0.0044	0.1
Chromium mg/l as Cr	0.007	1.988	0.05	0.008	0.0070	0.05
Barium mg/l as Ba	0.16	45.44	2.25	0.35	0.161	1
Boron mg/l as B	0.16	45.44	3.0 ⁶	0.47	0.162	0.5
Cyanide mg/l as CN	0.4	113.6	0.028	0.004	0.40	0.02
Silver µg/l as Ag	<10	0.284	10	0.0016	10	50
BOD ₅ mg/l	5.3	1505	1500	234	6.1	--
COD ₅ mg/l	42.5	12070	4490	700	45	--

1. Median values from data in Clark & Piskins, Environmental Geology. Volume 1, 1977, unless otherwise noted.

2. $0.65 \times \text{specific conductance} = \text{total dissolved solids (mg/l)}$.

3. Turbidity is assumed to be a linear function, this value may be considered to be a loading number, of one NTU is assumed equal to one mg/l.

4. HPCA standard is based on sodium being less than 60% of the total equivalent of cation. To calculate the standard, the hardness was assumed to be the other major cation source, and all of the hardness was assumed to be calcium ions.

5. Not detectable.

6. Burnsville Landfill seepage concentration May 3, 1979.

Table III-18

0.9 mg/l (as Cl) for chloride (two percent increase), the modeled downstream concentrations are well below the MPCA standards for the river. BOD and COD are predicted to increase 15 and 6 percent respectively. However, there are no standards governing these two parameters for the River.

A flow rate of 450 cfs was used to represent flow conditions in the lower Minnesota River at the seven-day duration, two-year frequency low flow past the landfill site. Modeled impacts of the existing landfill on the Minnesota River under the flow conditions are presented in Table III-19. At the seven-day duration, two-year frequency low flow, the impact of landfill leachate is reduced. For these low flow conditions, the calculated ammonia concentration in the mixing zone increases by 0.09 mg/l (13 percent), BOD increases by 0.4 mg/l (eight percent), COD increases by 1.2 mg/l (three percent), and chloride increases by 0.5 mg/l (one percent) due to landfill leachate. Again, the modeled downstream concentrations for ammonia and chloride are well below the standards. All other parameters increase by one percent or less, usually with no detectable change.

In summary, the leachate impact model shows that Minnesota River quality is influenced only minimally by leachate from the existing Lurnsville Landfill because of attenuation by dilution. The parameters which show the greatest increase are ammonia, BOD, COD and chlorides in that order. No increases due to landfill leachate cause violations of the MPCA water quality standards.

Other Surface Waters In The Landfill Area -- Wetlands are defined as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas". The landfill has a small wetland area on the proposed expansion site and several wetland areas adjacent to its borders.

Wetlands classified as Type III, IV, or V, are considered intrastrate water as defined within WPC-24 and shall be classified as 2B, 2C, 3B, 3C, 4A, 4B, 5 and 6 unless deletion of any one or all of such designations is recommended by the Minnesota Department of Natural Resources on the basis of information available as to its actual or potential suitability for given uses. Therefore, the wetlands located within the area of potential leachate influence are subject to the same water quality standards as the Minnesota River excluding classification 1D, with the exception of the Type 2 and 6 wetland in the expansion area.

There is presently no water quality information available on these wetlands, except the groundwater monitoring data from the landfill. Water monitoring data shows that all of the groundwater monitoring wells exceed some water quality standards. Well 1 exceeds standards with respect to ammonia, copper, and specific conductance. Well 2 exceeds standards with respect to ammonia, chloride, and specific conductance. Wells 3 and 4 both exceed the standard for ammonia and in addition well 4 exceeds the standard for specific conductance.

IMPACT OF EXISTING LANDFILL ON MINNESOTA RIVER QUALITY 7 DAY DURATION - 2 YEAR FREQUENCY LOW FLOW

PARAMETER	Minnesota River		Burnsville Landfill		Minnesota River	
	UPSTREAM CONCENTRATION	LOADING AT 7 DAY-2 YEAR LOW FLOW LBS./DAY	LEACHATE CONCENTRATION ¹	LOADING LBS./DAY	DOWNSTREAM CONCENTRATION	MPCA WATER QUALITY STANDARD
Copper ug/l as Cu	12	7.128	50	0.008	12.0	10
Turbidity NTU	76.6	45500 ³	130 ⁶	20	76.63	25
Conductivity umhos/cm @ 25 deg. C.	730 ²	281853	6100 ²	618	732	1000
Chloride mg/l as Cl	45	26730	1610 ⁶	251	45.5	100
pH	8.1	-	6.0 ⁶	-	8.1	6.5-8.5
Ammonia mg/l as N	0.70	415.8	350 ⁶	54.6	0.79	1.5
Total Dissolved Solids mg/l	573	340362	5346	834	574	700
Total Alkalinity mg/l as CaCO ₃	258	153252	1225 ⁶	191	258.3	250
Sulfate mg/l as SO ₄	123	73062	1080 ⁶	168	123.3	10
Total Hardness mg/l as CaCO ₃	368	218592	1600	250	368.4	250
Sodium mg/l as Na	343	20374.4	357	56	34.4	122 ⁴
Cadmium ug/l as Cd	10	5.94	30	0.0005	10.0	10
Lead ug/l as Pb	11	6.534	100	0.016	11.0	50
Arsenic ug/l as As	8.6	5108.4	ND ⁵	-	8.6	50
Selenium ug/l as Se	2.8	1663.2	ND ⁵	-	2.8	10
Fluoride mg/l as F	0.32	190.09	0.4	0.06	0.320	1.5
Phenols mg/l	0.004	2.376	0.77	0.120	0.0042	0.1
Chromium mg/l as Cr	0.007	4.158	0.05	0.008	0.0070	0.05
Barium mg/l as Ba	0.16	95.04	2.25	0.35	0.161	1
Boron mg/l as B	0.16	95.04	3.0 ⁶	0.47	0.161	0.5
Cyanide mg/l	0.4	237.6	0.028	0.004	0.40	0.02
Silver ug/l as Ag	<10	5.94	10	0.0016	<10.0	50
BOD ₅ mg/l	5.3	3148	1500	234	5.7	--
COD mg/l	42.5	25245	4490	700	43.7	--

1. Median values from data in Clark & Piskins Environmental Geology, Volume 1, 1977, unless otherwise noted.

2. $0.65 \times \text{specific conductance} = \text{total dissolved solids (mg/l)}$.

3. Turbidity is assumed to be a linear function, this value may be considered to be a loading number, if one NTU is assumed equal to one mg/l.

4. MPCA standard is based on sodium being less than 60% of the total equivalents of cations. To calculate the standard, the hardness was assumed to be the other major cation source and all of the hardness was assumed to be calcium ions.

5. Not detectable.

6. Burnsville Landfill seepage concentration May 3, 1979.

Since groundwater has a direct effect on wetland areas, it is probable that the wetlands adjacent to the landfill expansion area have much the same water quality and are in violation of some of the water quality parameters.

Wetlands in the landfill area are not used for agricultural or recreational purposes.

GROUNDWATER QUALITY

State Regulations

The MPCA has established groundwater standards that would be applicable to operation of the landfill. Perhaps the most stringent standard is WPC 22. This standard states that wastes shall be controlled as may be necessary to ensure that to the maximum practicable extent the underground waters of the state are maintained at their natural quality. This standard, then, is essentially a non-degradation standard. WPC 14 also applies to groundwaters. Where differences exist between WPC 14 and WPC 22, the more stringent conditions may be applied.

Other standards that would apply include those under SW6. SW6 states that solid wastes shall not be deposited in such a manner that material or leachings therefrom may cause pollution of underground or surface water. SW6 also states that the proposed separation between the lowest portion of the landfill and the high water table elevation shall be a minimum of five feet. Finally, SW6 provides that 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 and that an approved leachate collection and treatment system shall be used where required.

From a practical standpoint, the location of the groundwater potentially influenced by the landfill limits the potential use of the groundwater. The landfill is located adjacent to the Minnesota River and the groundwater potentially influenced by landfill leachate discharges naturally to the river. Some of the area between the landfill and the river is zoned as floodway and cannot be developed. Cargill owns the remaining strip of land between the landfill and the river but has no plans to develop that parcel.

The limited value of the groundwater under the landfill has been recognized by the MPCA. In a February 4, 1980 internal Agency memorandum, the Director of the Water Quality Division indicates that the impact of the landfill leachate should be considered as it potentially may influence the quality of the Minnesota River (Schade 1980).

Regulatory Compliance

The quality of ground water in the vicinity of the landfill has been monitored since 1972. Beginning in 1972, a shallow well (W-1) on Figure III-8, located between the landfill and the river, was monitored. In 1978, three additional wells (W-2, W-3, and W-4) were installed around the landfill. The locations of these wells are also shown in Figure III-8. Typical values of monitoring data collected from the groundwater stations near the landfill are presented in Table III-20.

Groundwater quality in nearby areas not affected by the landfill has not been monitored by the landfill monitoring program. Water quality data are available for the dewatering of the nearby quarry; however, this groundwater is indicative of groundwater in the Shakopee-Oneota Dolomite and is not necessarily indicative of groundwater in the overlying alluvium. Water quality data from the quarry dewatering are summarized in Table III-20.

A comparison of the groundwater monitoring test results with WPC 14 (see Table III-15) shows that standards were exceeded for ammonia, chloride and specific conductance for Well 2 and for ammonia, copper and specific conductance for Well 1. Leachate that is produced from the landfill may percolate through the peat relatively unattenuated, but in some places the existence of clay layers may either cause high attenuation or laterally divert the percolation to the surface, causing leachate springs to occur at the edge of the fill. If leachate enters the bedrock aquifer, it will flow very rapidly through fractures and channels in the dolomite, and discharge into the Minnesota River, where attenuation will occur by dilution.

The location of the site within a floodplain and near a surface of highly permeable bedrock may cause leachate formation by flooding. Although the site has been diked to prevent floodwaters from entering the site, it has been reported that a moderate amount of seepage into the site has occurred through the highly permeable bedrock. Seepage of floodwaters into the solid waste rapidly adds moisture to the base of the landfill and may produce large volumes of leachate. As mentioned in the Site Specific Water Balance section, Barr Engineering Co. (1980) estimated the leachate production rate to be 3.0 inches per year after closure.

As discussed earlier, due to the groundwater flow characteristics the potential extent of landfill leachate on groundwater quality is limited to the area between the landfill and the river, between the landfill and the drainage ditch east of the landfill, and immediately south and west of the landfill. The principal impact of the leachate is the effect it has on the quality of the river. Notwithstanding, because of the close distance between drawdown at the Cargill wells and the existing landfill's identified zone of influence, precautionary measures should be taken to provide for an increased level of protection for this area west of the landfill.

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GROUND WATER QUALITY IN VICINITY OF LANDFILL
(Average of Available Data)

	Landfill Monitoring Wells				Quarry Dewatering
	W-1	W-2	W-3	W-4	
COD, mg/l	493	113	61	114	-
COD (Filtered), mg/l	33	143	86	105	-
BOD ₅ , mg/l	12	16	21	81	3
BOD ₅ (Filtered), mg/l	9	16	21	84	<3
pH (lab) ¹	7.0	6.8	7.4	7.2	7.8
pH (field) ¹	7.3	6.8	7.6	7.6	-
Chloride, mg/l as Cl	33	500	16	50	45
Ammonia, mg/l as N	2.6	4.4	1.1	1.1	0.86
Total Chromium, µg/l as Cr	32	26	27	27	-
Total Chromium (Filtered), µg/l as Cr	19	23	3.1	8.1	2.1
Copper, µg/l as Cu	16	0.8	1.5	0.6	-
Copper (Filtered), µg/l as Cu	2.8	1.9	2.2	0.3	1.2
Specific Conductance, µmhos/cm @ 25° C (Lab)	1,010	2,330	580	843	628
Specific Conductance, µmhos/cm @ 25° C (Field)	1,580	2,860	590	826	-

¹Median Value

Table III-20

LOCAL WATER SUPPLY QUALITY

State Regulations

As previously discussed, adjacent properties to the landfill use individual wells for water supply. The MPCA standards in WPC 14 apply to individual water supply wells. Table III-21 shows WPC 14 standards that apply to domestic consumption. Class A standards apply to drinking water without treatment of any kind while the other classes require various degrees of treatment. Other uses of water from individual supply wells would be covered by the WPC 14 standards shown in Table III-15.

The Minnesota Department of Health (MDOH) has also promulgated standards for drinking water; however, for public water supplies only. There are no MDOH standards for drinking water from individual wells. Table III-22 shows the MDOH maximum contaminant levels for inorganic and organic chemicals contained in public water supplies.

Regulatory Compliance

Figure III-11 shows the approximate location of a number of wells that have been sampled recently that are located in the landfill area. As can be seen, the parameters (Table III-23) tested met most of the applicable standards contained in Table-21 and all of the applicable standards contained in Table III-22. Some of the wells exceeded WPC 14 standards for iron and manganese. The Portland Cement and U. S. Salt company wells exceeded standards for phenols.

None of the parameters measured, including those exceeding standards, would indicate the presence of leachate in the ground water system. Practically all of the parameters measured were considerably below or below typical low value ranges for leachate. Notwithstanding, these wells should be periodically tested in the future.

Refer to Appendix III for a discussion of the landfill's impact on Burnsville's water supply well field. Distance alone between the landfill and well field appears to be a sufficient mitigating measure. In addition, the quarry dewatering operation that exists between the landfill and well field represents a second level of protection by intercepting any groundwater flow that could otherwise possibly occur between the landfill and the wells.

WATER QUALITY STANDARDS IN REGULATIONS WPC 14
OF THE MINNESOTA POLLUTION CONTROL AGENCY
WPC CLASSIFICATION - DOMESTIC CONSUMPTION

Substance or Characteristic	Class A Limit or Range	Class B Limit or Range	Class C Limit or Range	Class D Limit or Range
Total coliform organisms	1 most probable number per 100 milliliters	10 most probable number per 100 milliliters	200 most probable number per 100 milliliters	200 most probable number per 100 milliliters
Turbidity value	5		25	
Color value	15			
Threshold odor number	3			
Methylene blue active substance (MBAS)	0.5 milligram per liter			
Arsenic (As)	0.01 milligrams per liter			0.05 milligram per liter
Chlorides (Cl)	250 milligrams per liter			
Copper (Cu)	1 milligram per liter			
Carbon Chloroform extract	0.2 milligrams per liter			
Cyanides (CN)	0.01 milligrams per liter			0.2 milligrams per liter
Fluorides (F)	1.5 milligrams per liter			1.5 milligrams per liter
Iron (Fe)	0.3 milligrams per liter			
Manganese (Mn)	0.05 milligrams per liter			
Nitrates (NO ₃)	45 milligrams per liter			
Phenol	0.001 milligram per liter			
Sulfates (SO ₄)	250 milligrams per liter			
Total dissolved solids	500 milligrams per liter			
Zinc (Zn)	5 milligrams per liter			
Barium (Ba)	1 milligram per liter			1 milligram per liter
Cadmium (Cd)	0.01 milligram per liter			0.01 milligram per liter
Chromium (Hexavalent, Cr)	0.05 milligram per liter			0.05 milligram per liter
Lead (Pb)	0.05 milligram per liter			0.05 milligram per liter
Selenium (Se)	0.01 milligram per liter			0.01 milligram per liter
Silver (Ag)	0.05 milligram per liter			0.05 milligram per liter
Radioactive material	Not to exceed the lowest concentra- tions permitted to be discharged to an uncontrolled environment as pre- scribed by the appropriate authority having control over their use.			Not to exceed the lowest concentra- tions permitted to be discharged to an uncontrolled environment as prescribed by the appropriate au- thority having control over their use.

Table III-21

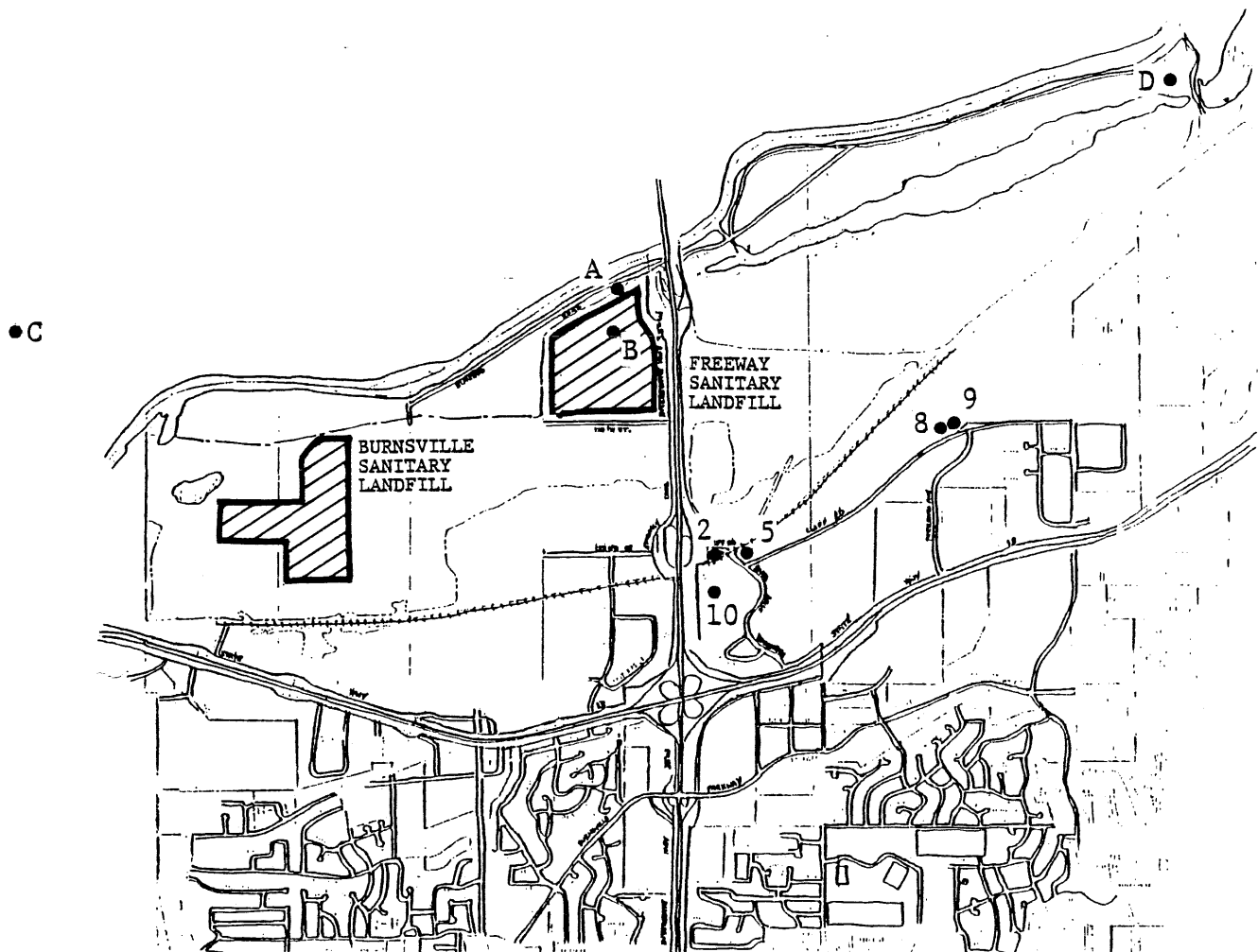
1978 PUBLIC WATER SUPPLY STANDARDS
MINNESOTA DEPARTMENT OF HEALTH

Maximum Contaminant Levels for Inorganic and Organic Chemicals

<u>Inorganic Chemicals</u>	<u>mg/l</u>
Arsenic	0.05
Barium	1.0
Cadmium	1.010
Chromium	0.05
Fluoride	2.4
Lead	0.05
Mercury	0.002
Nitrate	10
Selenium	0.01
Silver	0.05
<u>Organic Chemicals</u>	
Endrin	0.0002
Lindane	0.004
Methoxychlor	0.1
Toxaphene	0.005
Chlorophenoxys	0.1
Silvex	0.01

Table III-22

Location of Municipal and Private Wells
Tested By MnDoH



- A U.S. Salt Well
- B Freeway Landfill Truck Shed Well
- C Minnesota Masonic Home Well
- D NSP Black Dog Plant Well
- 2 Burnsville Municipal Well
- 5 Burnsville Municipal Well
- 8 Burnsville Municipal Well
- 9 Burnsville Municipal Well
- 10 Burnsville Municipal Well

Figure III -11

Analytical Data - Various Water Supply Wells, Burnsville Area 1979

Private Wells in Burnsville & Bloomington	NSP Blackdog Plant. Wellwater before Demineral- ization	US Portland Cement, Well. S.T.	Freeway Landfill Truck Shed S.T.	US Salt Well	Minnesota Masonic Home	Well #10 Municipal Well	Well #9 Municipal Well	Well # 2,5,8,11 Municipal Wells
Sample Number	27667	3943	28084	28083	3105	8096	8097	8098, 8099 8100, 8101
Date	6/11/79	8/2/79	7/3/79	7/3/79	9/20/77	12/6/79	12/6/79	12/6/79
Coliform Group MPN/100 ml Organisms	<2.2	<2.2	<2.2	<2.2	0	0	0	0
Total Solids mg/l	240	320	300	290		300	290	
Total Hardness mg/l as CaCO ₃	290	290	279	264		270	260	
Alkalinity as CaCO ₃	290	300	270	270		280	270	
pH	7.7	7.7	7.7	7.7		7.5	7.4	
Iron mg/l	.09	1.1	.08	.65		.25	.38	
Manganese mg/l	.08	.06	.48	.03		.06	.04	
Chloride mg/l	.68	1.4	.08	1.1		.19	.08	
Sulfate mg/l	15	7.3	11	12		19	21	
Fluoride		.10	.22	.22	.19	.27	.25	
Calcium mg/l as CaCO ₃	170	190	180	170		170	170	
Sodium mg/l	2.7	4	4.1	4.0		3.1	3.8	
Potassium mg/l	1.6	2	2.1	2.0		2.5	4.0	
Specific Conductance @ 25 µmho/cm	490	540	500	4800		500	500	
Phenols µg/l	<2.0	3.0	<2.0	2.6				
Total Kjeldahl Nitrogen mg/l	<.4	<.4	<.4	<.4	<.5	<.4	<.4	
Manganese as CaCO ₃ mg/l	130	100	99	94				
Arsenic µg/l	<50	<50			<50			
Barium µg/l	<1000	<1000			<1000			
Chromium µg/l	<50	<50			<50			
Cadmium µg/l	<10	<10			<10			
Lead µg/l	<50	<.1			<50			
Mercury µg/l	.20	<.1			<.1			
Selenium µg/l	<10	<10			<10			
Silver µg/l	<50	<50			<50			
Ammonia mg/l		.34						
Total Organic Carbon mg/l	.14	1.6	<1.0	2.9				

Table III-23

TERRESTRIAL AND AQUATIC ECOLOGY

VEGETATION

The landfill area is located in the Lower Minnesota River Valley. The River Valley is classified as a northern floodplain forest plant community. Located in a prairie-forest plant transition zone, the valley is influenced by the maple basswood forest and the oak savannah community.

The existing landfill is covered by silty clay loam in the area of current operation and pioneer grass and weeds in other areas. Sixteen acres of the expansion area is open land. Topsoil from most of the open land has been stripped and used as cover material for the existing landfill operation. The 12 acres which have been stripped within the last two years are now covered with pioneer species of grasses and moss. The remaining open land of the expansion area is covered by upland grasses, forbs, scattered brush, and occasional groves of trembling aspen.

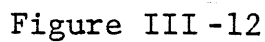
The undeveloped area to the south of the landfill is open meadowland with some open water areas. To the west is a grain storage and bargeloading terminal owned by Cargill which is on a wet meadowland area. To the north is the Minnesota River. To the southeast is a dolomite quarry owned by Edward Kraemer and Sons Inc. surrounded by meadowland area and occasional large stands of mixed trees (See Figure III-12).

Vegetation surveys by Council staff of the landfill and adjacent land were conducted on February 21 and May 1, 1980. The objective of these surveys was to identify the major plant communities, as characterized by dominant or conspicuous species, found on the existing landfill and on the proposed horizontal expansion area in order to determine vegetation and habitat impacts.

Three general cover types are present on the landfill. Intermediate shrubs, grassland and barren graded soil. Two additional cover types are found on the proposed horizontal expansion area and the adjacent surrounding area: mixed tree stands and wetlands.

Intermediate Shrubs and Forbs

Intermediate shrubs and forbs are scattered throughout the landfill and expansion area. Dominant species found on the landfill are indicative of disturbed areas such as mullein (Verbascum sp.), dogwood (Cornus sp.), wild rose (Rosa sp.), and willow (Salix sp.). Forbs sighted on the landfill include sunflower (Helianthus giganteus), goldenrod (Solidago sp.), field thistle (Cirsium discolor), clover (Melilotus officinalis), aster (Chrysopsis sp.) evening primrose (Oenothera biennis), and Canada thistle (Cirsium arvense).



Grassland

Grassland areas which exist on the landfill and the expansion area are vegetated by a variety of grasses and herbacious species such as brome grass (Bromus sp.), field clover (Petalostemum sp.), dock (Rumex sp.), vetch (Vicia sp.), cord grass (Spartina pectinata), horsetail, moss, smartweed (Polygonum sp.), cocklebur (Xanthium chinense), ragweed (Ambrosia artemisiifolia), wild pink (Silene caroliniana), mustard (Cruciferae sp.), and violet (Violaceae sp.). Completed areas of the landfill have been seeded and are covered with pioneer species of grasses and short dry forbs, such as listed above. Species are very similar on the expansion area and on completed landfill areas because the expansion area has been stripped for cover.

Barren Graded Soil

The remainder of the landfill area has no vegetative cover due to excavation operations where the soil is scraped for daily cover material, and to the landfiling procedure at the working face of the landfill.

Sparse-Mixed Tree Stands

Infrequent stands of mixed cottonwood/willow/aspen are found on the expansion area and adjacent to the landfill dominated by quaking aspen (Populus tremuloides) and willow (Salix sp.), and including elm (Ulmus americana), and wild plum (Prunus sp.).

Wetland

Wetland areas exist on the horizontal expansion area and adjacent areas to the landfill. These areas are characterized by typical wetland species. Shrub-carr, wet meadow, and emergent aquatic vegetation are found in this type of area, including species such as dogwood (Cornus sp.), willow (Salix sp.), cattail (Typha latifolia), reed grass (Phragmites sp.), and floating algae. There is a small wetland area on the horizontal expansion area that will be filled in if the expansion is approved.

WILDLIFE

Wildlife species which are likely to be found within the landfill area would include those species commonly associated with the previously described plant communities. Figure III-12 shows the location of the general plant communities on and near the landfill and expansion area. The following species of mammals, birds, amphibians and reptiles were actually sited on the landfill: deer (Odocoileus virginianus), raccoon (Procyon lotor), gopher (Geomys sp.), woodchuck (Marmota monax), mourning doves (Zenaidura macroura), blue-winged teals (Anas discors), killdeer (Charadrius vociferus), robins (Turdus migratorius), grackles (Quiscalus quiscula), pheasants (Phasianus colchicus), finches (Carpodacus sp.), red-winged blackbirds (Agelaius phoeniceus), brown-headed cowbirds (Molothrus ater), mallards (Anas platyrhynchos), warbler (Dendroica sp.), garter snake (Thamnophis sirtalis sirtalis).

This survey was not an extensive one and is intended to indicate the type of animal species found in the Lower Minnesota River Basin. For an extensive list of species found in the Lower Minnesota River Basin, see Warner 1979 Wildlife Inventory of the Lower Minnesota River Valley. While not specifically identified, insects at the landfill are a primary unit in the site's ecosystem as a basic link in the food web.

AQUATIC ECOLOGY

Minnesota River

The major emphasis aquatic ecology systems and impact analysis was on the Minnesota River. All available information collected to data on the various biological communities within the river was reviewed to provide a description of the current status of population diversity, composition and abundance. Summaries of the results of this literature review describing plankton, phyton, benthos and fisheries populations within the lower Minnesota River are available from the Council.

The effects of leachate pollution from the presently permitted landfill on the aquatic ecology of the Minnesota River will probably be minimal because of diluted concentrations. Most fish and other mobile organisms are able to avoid or escape elevated levels of pollution from point source discharges. The aquatic communities that have the greatest potential for adverse impact are the phyton and benthic organisms. Any rooted plants or sensitive benthos in the area of leachate discharge may be susceptible to damage. However no aquatic plant or animal life of these types were identified in the area of the landfill. Most sensitive organisms have already been eliminated or reduced in this stretch of the river due to high turbidity, maintenance dredging, nutrient enrichment, fluctuating water levels, scouring action of moving bottom materials and depressed dissolved oxygen concentrations. Channel dredging in this area of the river has had and will continue to have a significant, adverse impact on the organisms sensitive to turbidity and nutrient enrichment. Additional stress on aquatic populations due to leachate from the existing landfill will be relatively minor in comparison.

Other Surface Waters

Other surface waters in the vicinity of the landfill include a pond attached to the easterly drainage ditch, and two open water ponds south of the landfill. The pond is a man-made depression from the adjacent quarry operations. No aquatic ecology information is available on any of these ponds. The impact of leachate from the existing landfill is unknown.

For information regarding wetlands refer to Wetlands section.

WETLANDS

Wetlands, in general, play a vital role in the retention and release of water. During periods of flooding, wetlands act as storage basins by impounding water in open ponds and storing water in their organic soils. Wetlands have many valuable ecological functions, including wildlife inhabitation, water storage and water recharge potential, and pollutant filtration capability.

There are several wetland areas adjacent to the landfill. These wetland areas would probably be classified as Type 2, 3, 6 or 7 according to USDI Fish and Wildlife Service definitions (see Figure III-12). Representative plants of inland fresh meadows (Type 2) include corex, rushes, redtop, reedgrasses, mannagrasses, prairie cordgrass, and mints. Representative plants of Inland Fresh Marshes (Type 3) are grasses, bulrushes, and various other marsh plants such as cattails, arrowheads and smartweeds. Soils in Inland Fresh Marshes are usually waterlogged and often covered by as much as six inches or more of water. Representative plants of shrub swamps (Type 6) include alders, willows, buttonbrush, dogwood and swamp privet. Wooded swamps (Type 7) are typically waterlogged to within a few inches of surface and are often covered with up to 1 foot of water. These swamps frequently support beds of duckweeds, smartweeds, and other herbs.

There is one wetland area located in the horizontal expansion area. This wetland would probably be classified as Type 2, and 6, according to USDI Fish and Wildlife Service definitions (see Figure III-12). If the landfill expansion is approved, this wetland will be filled in.

RARE AND ENDANGERED SPECIES

Minnesota has enacted a law for the protection of threatened and endangered species (M.S.A. 97.488), and state listings of regulated species are presently being compiled. According to DNR records, there are no rare or endangered species in the landfill area, with the exception of some bald eagle sitings in the Minnesota River Basin area.

There are no endangered species of fish in the lower Minnesota River. The Higgin's eye mussel is recognized as an endangered species by the federal government and did occur in the lower Minnesota River in the late 1940's. The Minnesota River from Shakopee to the mouth is presently devoid of mussel life according to the U. S. Fish and Wildlife Service. The recent loss of Higgin's eye mussels in the lower Minnesota River has been attributed to organic loadings and the use of biacides. The Minnesota River discharges into the Mississippi River and consequently adversely affects the Higgin's eye located downstream in the Mississippi River.

SOCIO-ECONOMICS

LAND USE, ZONING

Land Use

The landfill is located in the City of Burnsville. It is located approximately .25 mile east of the City of Savage. Directly north, approximately 950 feet, is the Minnesota River.

Figure III-13 shows the land use surrounding the landfill area. Directly north of the landfill is open, undeveloped land. Further north, across the Minnesota River, is the Minnesota Valley National Wildlife Refuge and Recreation Area. Northeast is the Freeway Sanitary Landfill. Directly east is undeveloped, open land. Further east is a dolomite quarry operated by Edward Kraemer and Sons, a mining and processing firm.

Directly south is open, undeveloped land. Further south are several commercial and retail establishments including the following: Furniture World, House of Wood, Menards, Cub Foods, Conn-Co. Shoes Inc., Burnsville Sports Center, Midwest Golf Car, a Buick car dealership and Vermeer Sales and Services. Southeast is Our Own Hardware's warehouse and along Highway 13, east of County Road 5, is a variety of commercial enterprises.

Directly west are grain storage facilities and a barge loading terminal owned and operated by Cargill, Inc. Southwest is open, undeveloped land.

Zoning

Figure III-14 shows zoning for the areas adjacent to and in the general area of the landfill. As can be seen, land immediately surrounding the landfill is zoned for general industrial use. Other zoning in the landfill area includes areas designated for such uses as limited industrial, general business, and residential.

Regional Development Framework Plan

The Council has adopted a Development Framework plan to guide present and future decision making in the seven county region. This plan designates general areas for future urban and rural services and provides standards for making decisions with respect to these services. The Pine Bend Sanitary Landfill Environmental Impact Statement describes the various urban and rural use classifications contained in the plan.

The Burnsville area, including the Burnsville Sanitary Landfill, is located within the Metropolitan Urban Service Area. This area is provided with metropolitan services including highways, transit, and interceptor sewers. Burnsville is considered a developing suburban community according to the Council's Development Framework.

GENERALIZED LAND USE BURNSVILLE AREA

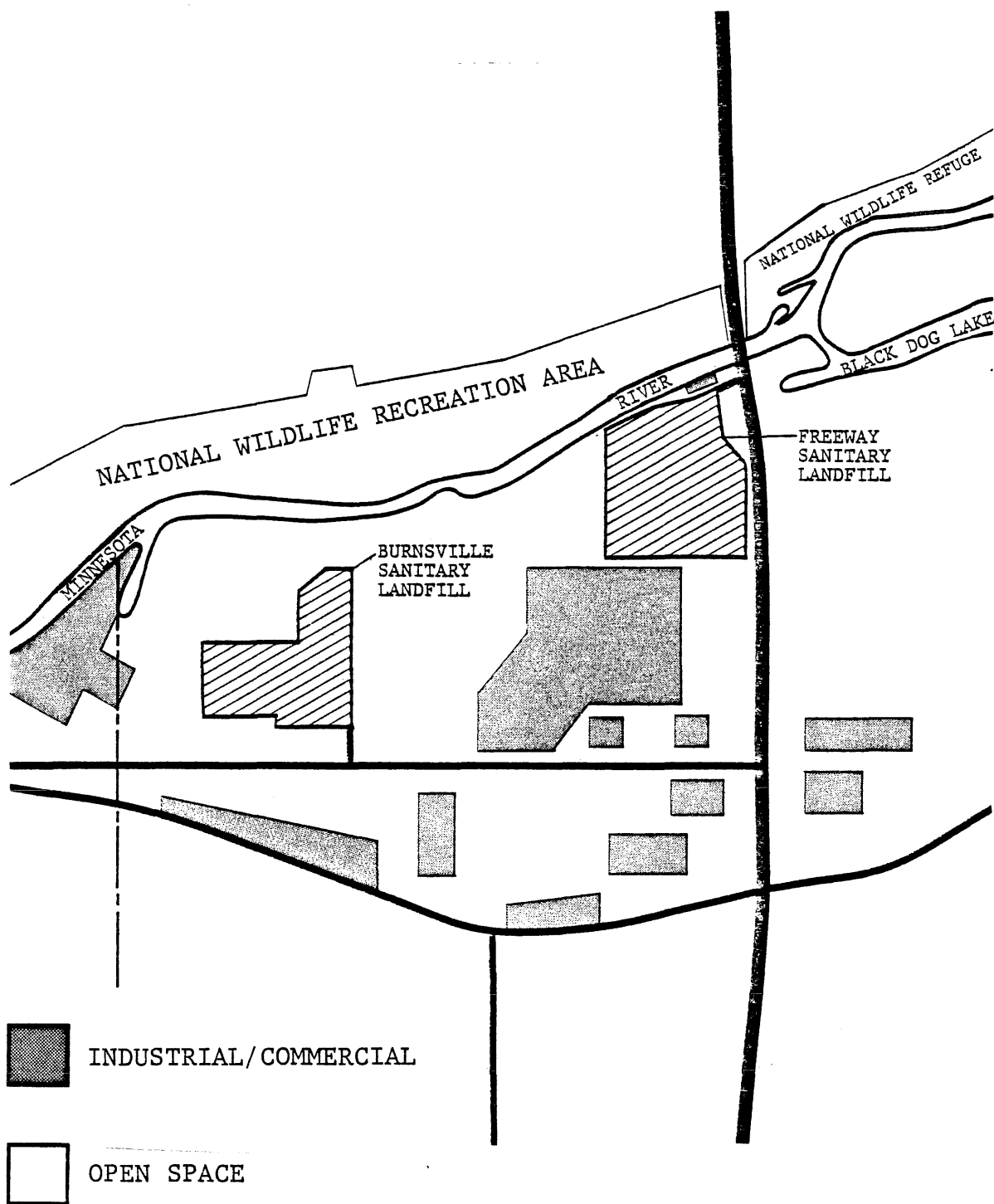
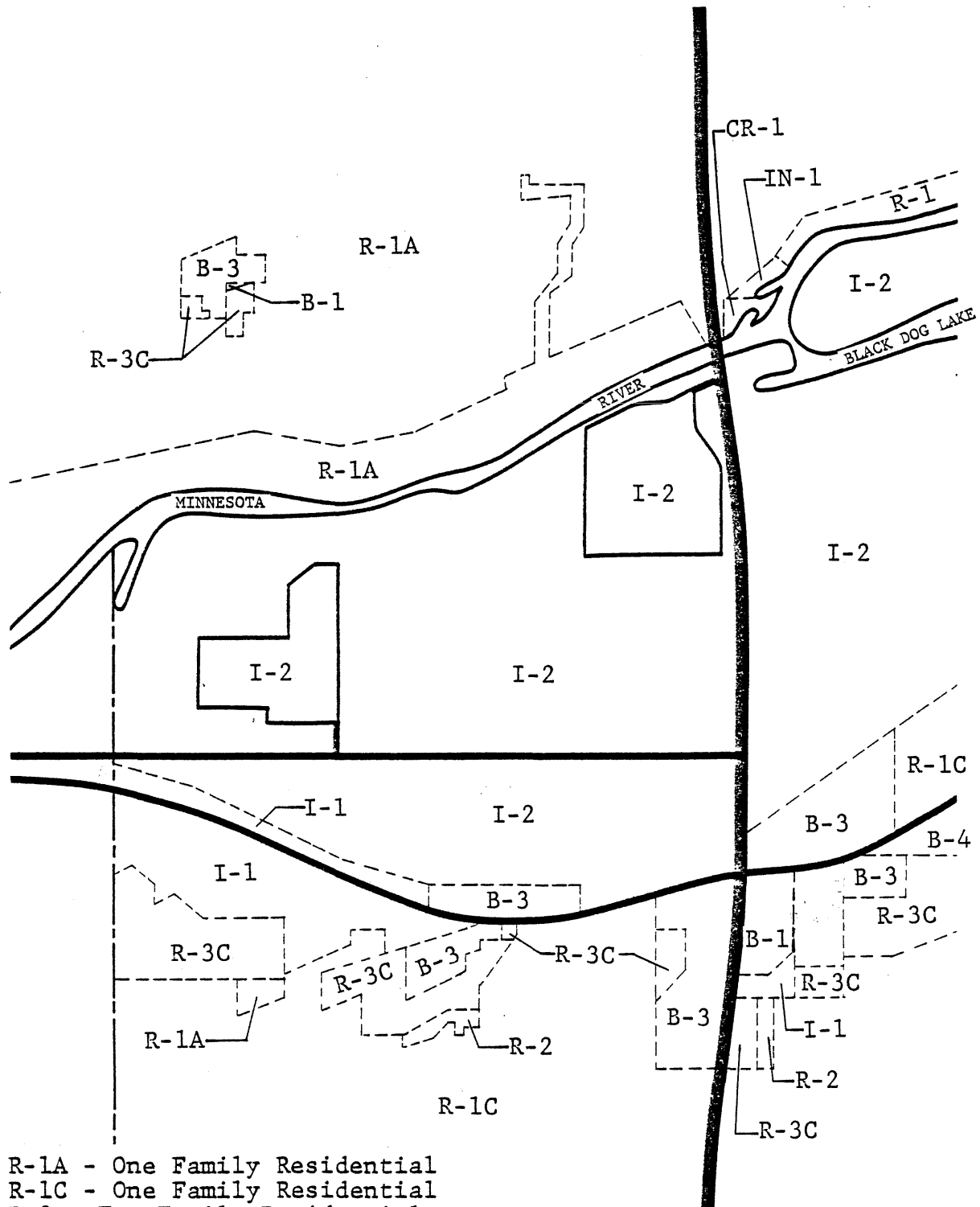


Figure III-13

ZONING MAP

BURNSVILLE — BLOOMINGTON



- R-1A - One Family Residential
- R-1C - One Family Residential
- R-2 - Two Family Residential
- R-3C - Multiple Residential
- B-1 - Limited Business
- B-3 - General Business
- B-4 - Shopping Business
- I-1 - Limited Industrial
- I-2 - General Industrial
- CR-1 - Commercial Recreation
- IN-1 - Institutional

Figure III-14

PUBLIC FACILITIES AND SERVICES

Fire Services

There are two fire stations in Burnsville which could respond in the event of a fire at the landfill. One is located north of County Road 42, just east of Burnhaven Drive. The other is located on Cliff Road, just east of the intersection with Portland Avenue. There are also six fire stations in Bloomington which could respond to a fire at the landfill.

Storm Sewer Services

The City of Burnsville adopted an overall drainage plan in early stages of the community's development. By planning ahead, the direction of drainage was established throughout the entire City which determined the direction in which all streets and storm sewers should direct storm water. The system has been in place for several years and is performing satisfactorily.

The landfill area, however, is not serviced by a storm sewer system. The natural drainage pattern within the City has been disturbed to some extent by man's improvements. Generally, the City's natural drainage pattern can be approximately equated to the present drainage pattern.

Park and Recreation Open Space Facilities

Currently, there are 26 developed park facilities in Burnsville. The closest city parkland to the landfill consists of approximately 1330 acres of the Minnesota River Valley Floor east of I-35W and west of NSP's Black Dog Power Plant (see shaded portion of Figure III-15). The U. S. Department of Fisheries and Wildlife is currently in the process of acquiring fee title and easements for this area which will become a portion of the Minnesota Valley National Wildlife Refuge and Recreation Area.

In 1976, a law was passed which established the Minnesota Valley National Wildlife Refuge and the National Recreation Area. This enabling legislation allowed the U. S. Fish and Wildlife Service, the State of Minnesota, counties and municipalities to protect and preserve approximately 17,500 acres of the Minnesota River floodplain from Fort Snelling State Park to Jordan, Minnesota. It will be a nature oriented outdoor recreational facility providing valuable habitat for both migratory birds and residential wildlife.

Bloomington has four city parks located along the Minnesota River: Welters Wildwood, Anderson, Hopkins, and Mounds Springs. Welters Wildwood and Anderson are city-owned parks located within the National Wildlife Recreation Area across from the Burnsville and Freeway Sanitary Landfills. Hopkins and Mound Springs Parks are presently owned by Bloomington and are located within the National Wildlife Refuge.

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EXISTING PARKLAND NEAR BURNSVILLE SANITARY LANDFILL

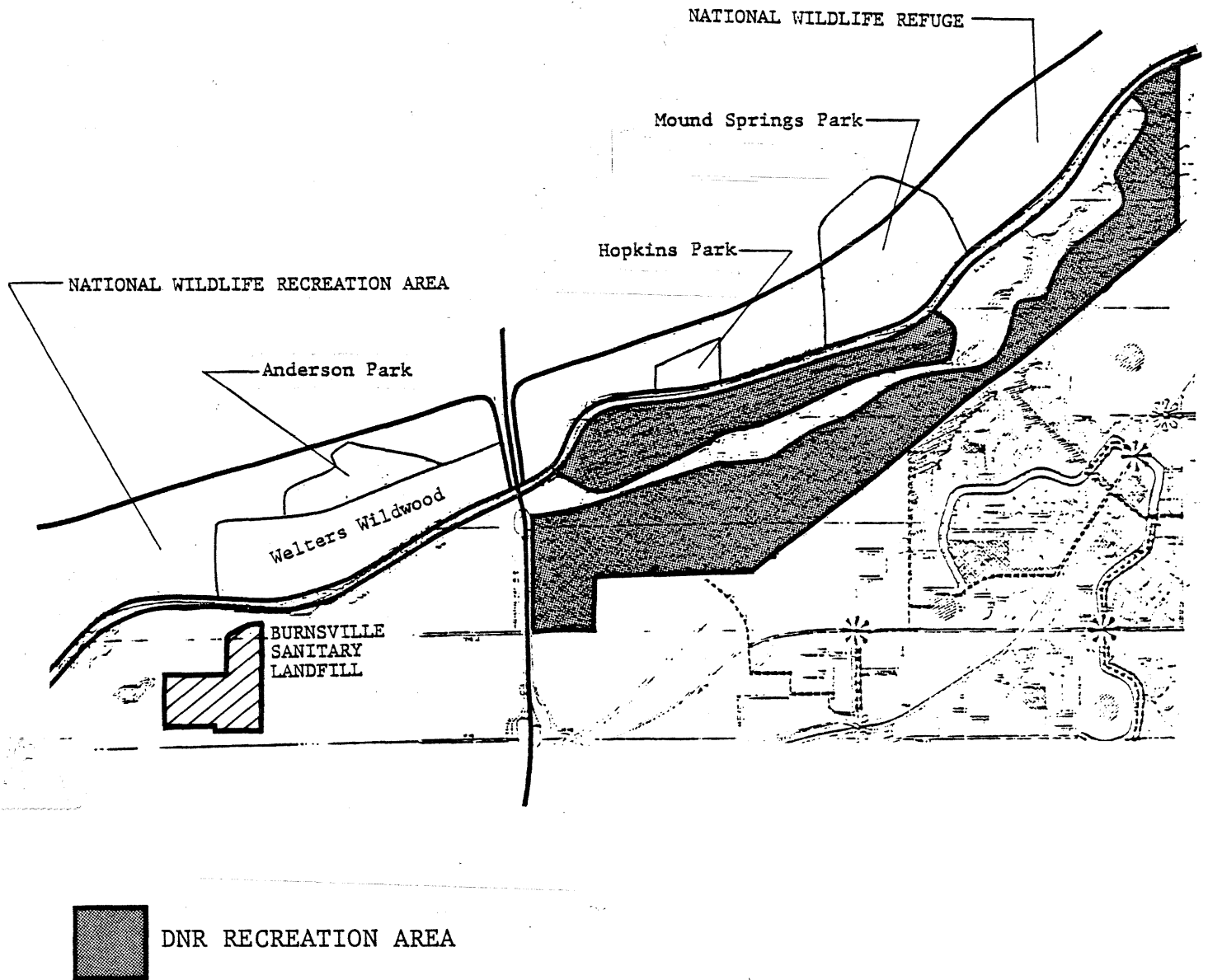


Figure III -15

Easements, or title, to all land within the Bloomington portion of the Minnesota River Floodplain are expected to be acquired for the wildlife refuge and recreation area. Mound Springs Park is the only developed park. Developed recreation facilities include 2.7 miles of pedestrian paths, limited parking area, 17 permanent picnic tables and eight picnic grills. The park is also one of the three-day camp sites in the City's recreation program. Within Welters Wildwood is a hiking and cross-country skiing trail, unofficially referred to as Nine Mile Creek Trail. Welters Wildwood, Anderson Park, and Hopkins Park are undeveloped, natural areas.

The Minnesota DNR has plans to develop a continuous recreational trail system, the Minnesota Valley State Trail, between Fort Snelling State Park and LeSueur, Minnesota. The trail system, approved by the 1969 Minnesota Legislature, consists of a series of state parks and waysides joined by municipal, private and industrial lands. Camping and access areas along the route will accommodate canoeists and other boaters on the rivers. The State is pursuing the possibility of developing the Minnesota Valley State Trail on both sides of the Minnesota River. The south trail is likely to be open to hikers, horsemen, skiers, and snowmobilers. The trail on the north side of the river will probably be restricted to hikers, skiers, and bicyclers. Currently only minor links in the trail system have been completed and no state trails are in the vicinity of the landfill.

COMMERCIAL AND RECREATIONAL USE OF THE MINNESOTA RIVER

The lower Minnesota River is one of the major waterways in the Upper Midwest. The river is used for navigation, recreation, industrial water supply, and assimilation of storm water and industrial and municipal wastewater effluents. The major transportation use of the river is commercial barge traffic. The average shipping season on the Minnesota River is approximately 239 days from mid-March through mid-November. During the 1976 shipping season there were 874 vessel round trips. The approximate barge traffic is 2,500 barges. The peak of the shipping season occurs in June. This peak month accounts for 15 percent of the barge activity on the lower Minnesota River. The Corp of Engineers projects that commercial barge traffic will double by the year 2000 to 6,600,000 tons. Water taken from the river is used for sewage treatment or cooling for industrial purposes. Four waste treatment facilities and eight industrial facilities located between Shakopee and Fort Snelling return water to the Minnesota River.

Recreational uses of the Minnesota River include boating, canoeing and fishing. The following rough fish comprise approximately 93 percent of all the fish caught in the vicinity of the landfill: Carp, Gizzard Shad and River Carpsucker. Game fish account for the remaining seven percent which are comprised of Smallmouth Bass, Walleye, and Sauger. The majority of the future recreational use of the Minnesota River in the landfill's vicinity will probably occur east of I-35W adjacent to the National Wildlife Refuge Area.

Two main uses of the Minnesota River are commercial and recreation. Recreation is the least important of the two uses. Barges are occasionally moored along the south side of the Minnesota River by the landfill. The state is pursuing the possibility of using land adjacent to the river and landfill for recreation purposes.

TRANSPORTATION

General

The landfill watershed covers approximately 400 square miles and includes portions of Dakota, Scott and Hennepin Counties. Twelve municipalities, eight townships and the Fort Snelling area deposit refuse to varying degrees, at the landfill. As shown in Figure III-16, this landfill's watershed extends from the Minneapolis/Richfield boundary in the north to the southern tier of townships in Scott County and from Rosemount in the east to Jackson and Louisville Townships in the west. Approximately 80 percent of the 200,000 tons of refuse annually deposited at the landfill is generated in Dakota and Scott Counties. The principal contributing municipalities are Shakopee, Prior Lake, Savage, Burnsville and Lakeville. The remaining 20 percent originates mainly from Bloomington with minor amounts originating in Eden Prairie, Edina, Richfield and the Fort Snelling area.

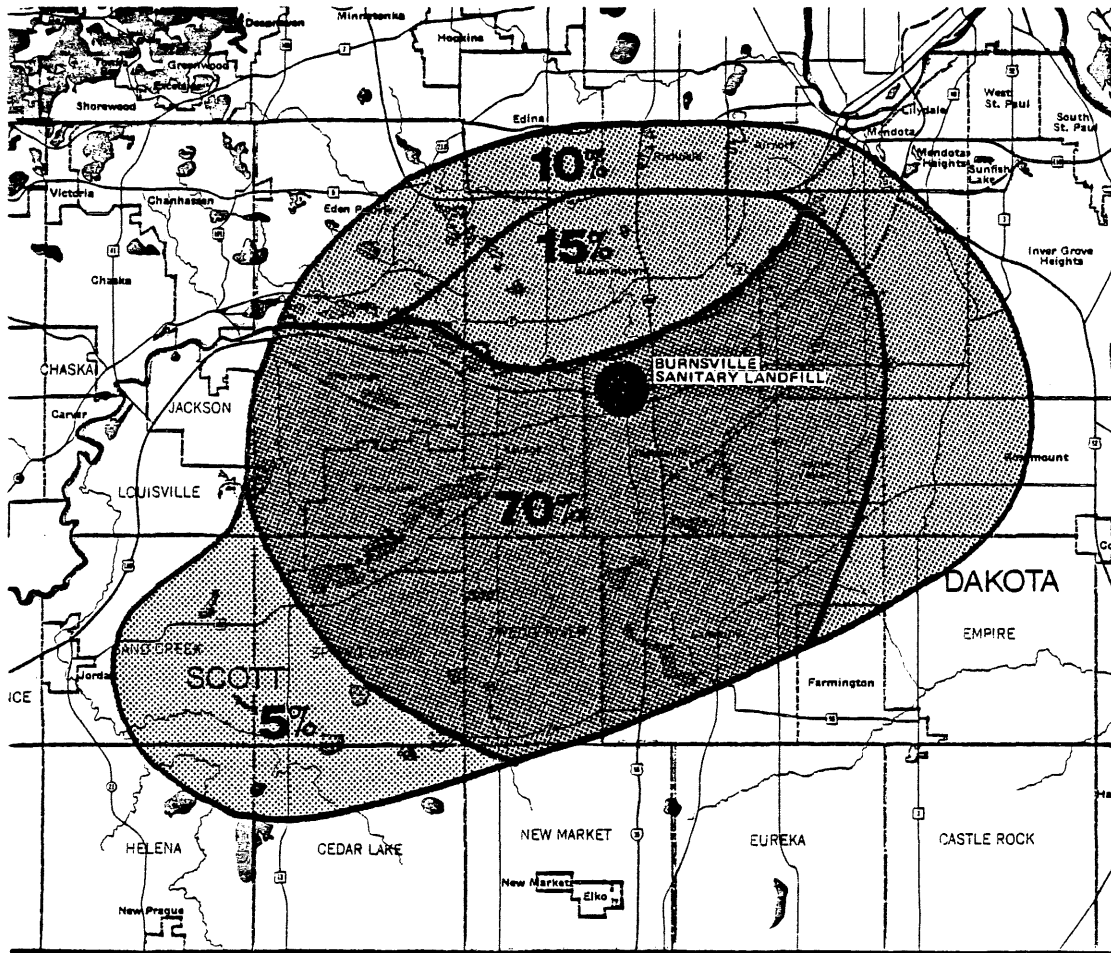
Principal Haul Routes

The principal haul routes to the landfill extend in the four cardinal directions from this site as shown in Figure III-17. The principal north-south haul route is I-35W. This route provides excellent direct access to the landfill from Bloomington, Burnsville and Lakeville. The principal haul route for the communities located east of this landfill site is TH 13/Cliff Road. For communities west of the landfill TH 101/TH 13/ Dupont Avenue South is the principal haul route. Approximately 38 percent of annual total refuse deposited at the landfill is hauled on I-35W and 60 percent on TH 101 and TH 13. The existing functional classification of both principal haul routes is shown in Figure III-18.

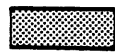
Existing Traffic Volumes in the Vicinity of Burnsville Sanitary Landfill

The landfill is located near I-35W (one of the heaviest traveled highways in the Metropolitan Area) and TH 101. Figure III-19 shows the 1978 average daily vehicle and truck trips on the principal haul routes located in the vicinity of the landfill. Approximately 70,000 average daily vehicle trips occur at both the I-35W/Cliff Road and I-35W/TH 13 interchanges and approximately 30,000 average daily trips occur at the TH 13/Dupont Avenue South intersection. Average daily truck trips in the vicinity of the landfill range from 3,650 on TH 13 to 4,500 on I-35W. The present 220 average daily truck trips generated by the landfill represent from only five to six percent of the total truck trips and less than one percent of total vehicle trips on the principal haul routes.

- 99 -
BURNSVILLE SANITARY LANDFILL WASTESHED, 1980



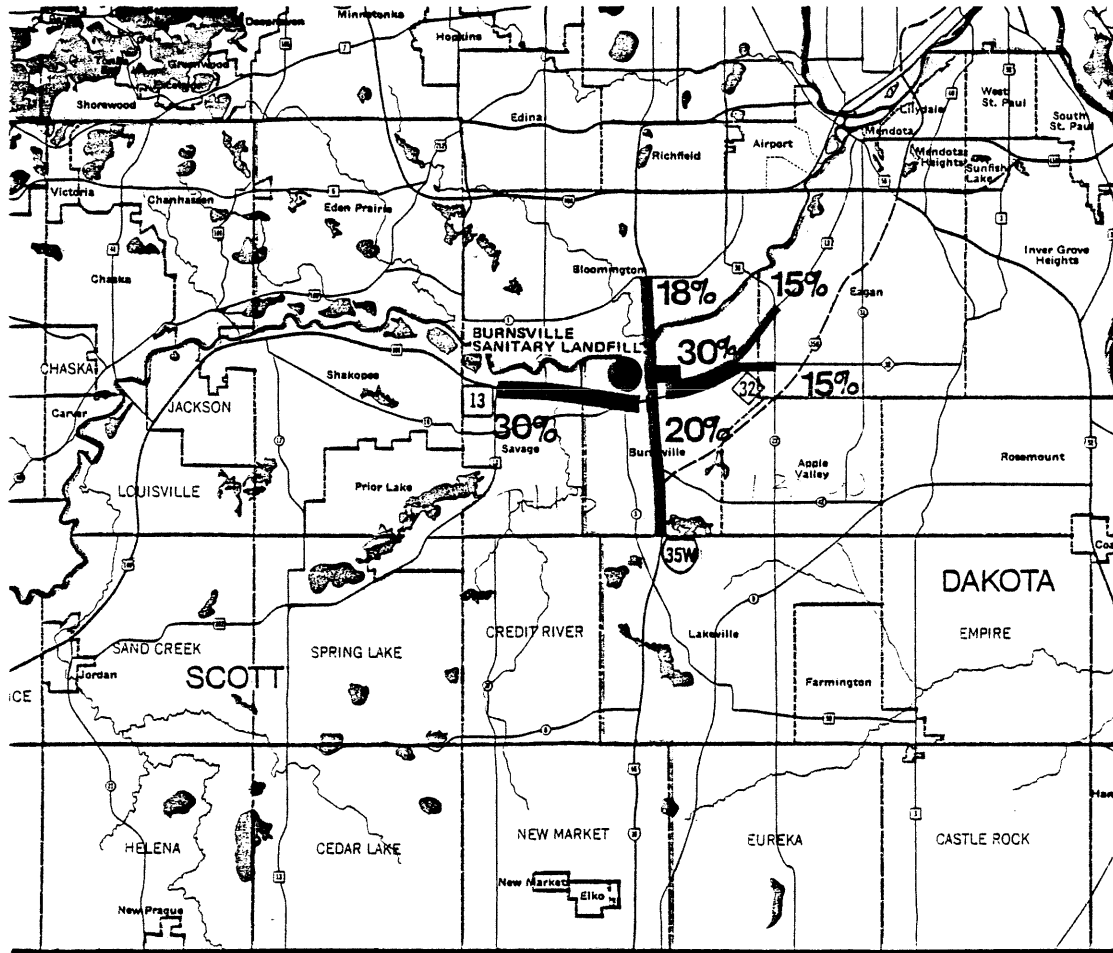
% - Estimated Relative Contribution of Designated Wasteshed to Total Refuse Deposited at Burnsville Sanitary Landfill (200,000 tons/year)

-  Primary Source Area
-  Secondary Source Area
-  Tertiary Source Area

Sources: Edward Kramer & Sons, Inc./Minneapolis Refuse, Inc./
Minneapolis Suburban Refuse Removal Association/
Metropolitan Council

Figure III -16

- 100 -
 PRINCIPAL HAUL ROUTES TO BURNSVILLE SANITARY LANDFILL



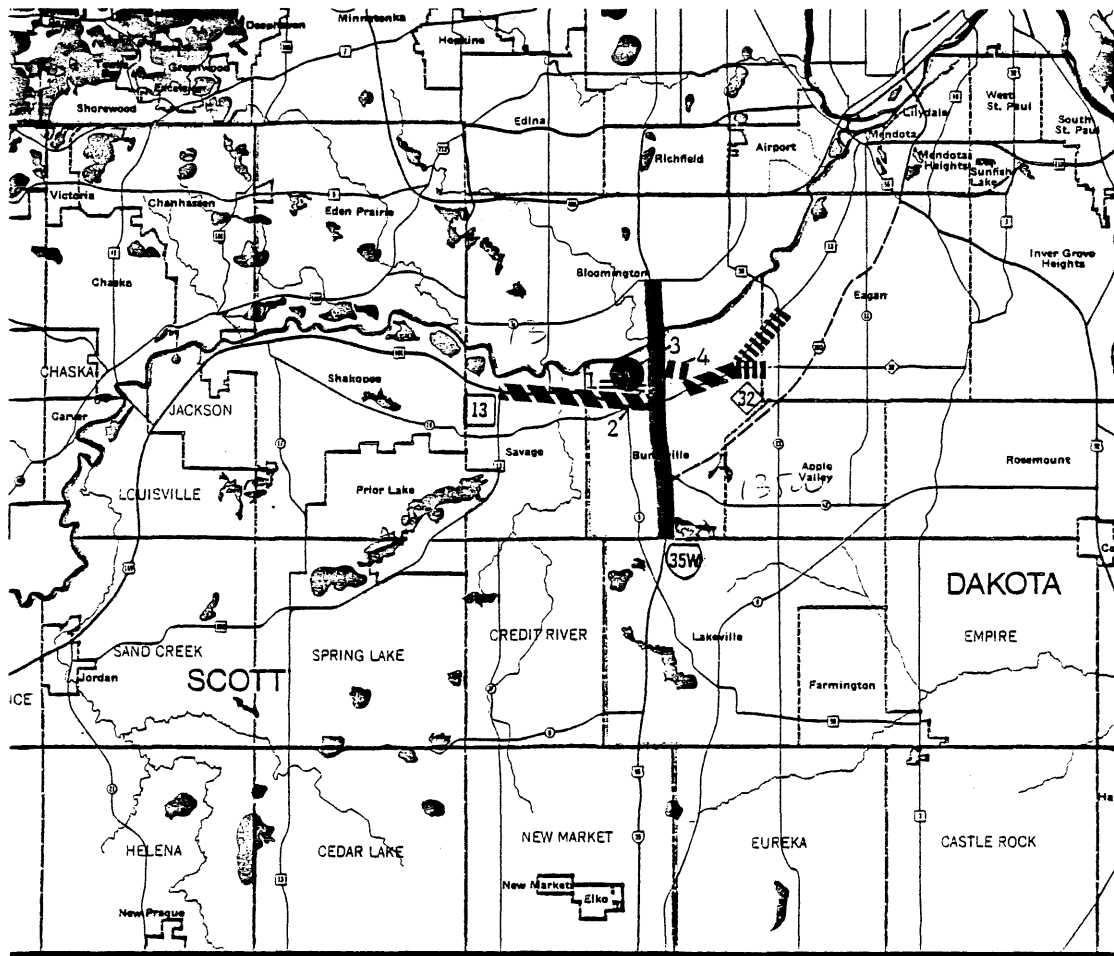
Principal Haul Route
 (Haul Routes Show Percentage of Annual Total Refuse
 Deposited at Burnsville Sanitary Landfill)

% - Estimated Percentage of Annual Total
 Refuse Deposited at Burnsville Sanitary
 Landfill by Principal Haul Routes

Source: Edward Kramer & Sons/Metropolitan Council

Figure III -17

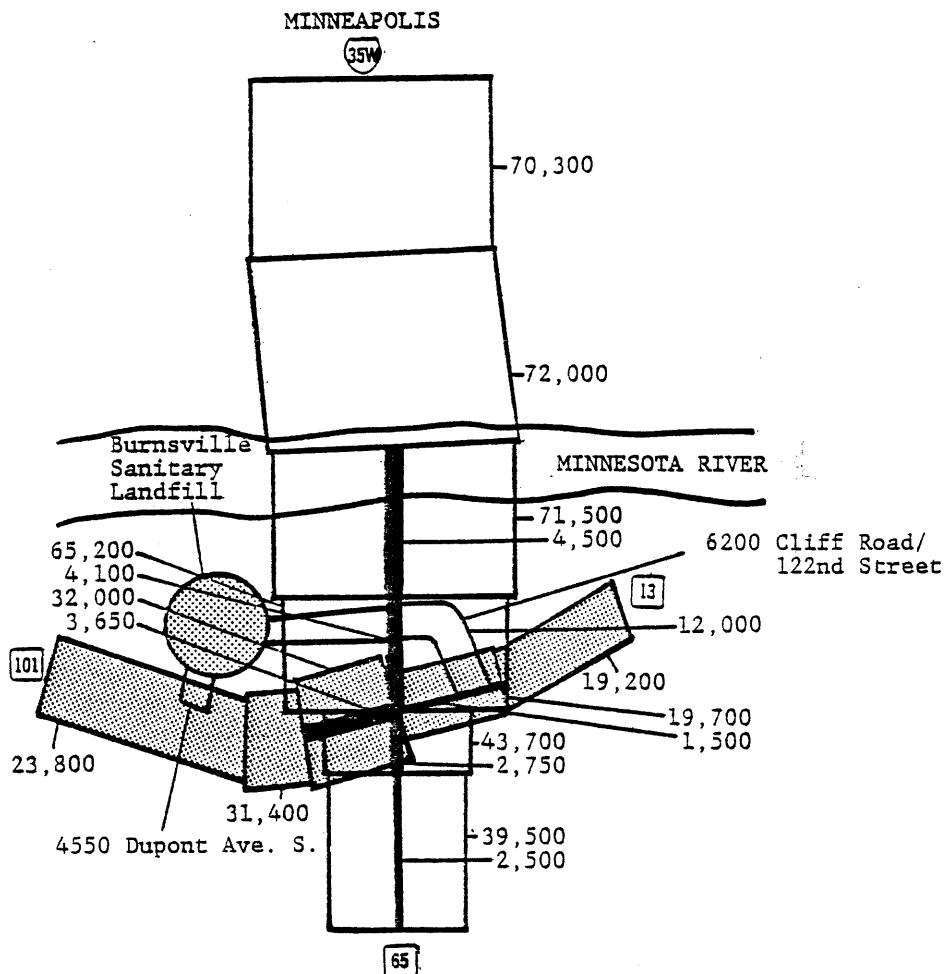
FUNCTIONAL CLASSIFICATION OF
PRINCIPAL HAUL ROUTES TO BURNSVILLE
SANITARY LANDFILL



Principal Arterial
Intermediate Arterial
Minor Arterial
Collector (1. Undesignated Street, 2. Dupont Ave So.
3. 122nd Street, 4. Cliff Road)
Source: Metropolitan Council

Figure III -18

AVERAGE DAILY TOTAL VEHICLE
AND TRUCK TRIPS IN VICINITY
OF BURNSVILLE SANITARY LANDFILL,
1978



Source: MnDOT

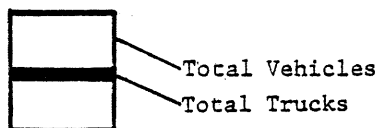


Figure III -19

Types and Number of Trucks Hauling to Burnsville Sanitary Landfill

Four types of trucks are used to haul refuse to the landfill. Their identification and capacities are given in Table III-24.

Table III-24
TYPES AND CAPACITIES OF HAUL TRUCKS TO BURNSVILLE SANITARY LANDFILL

<u>Type</u>	<u>Capacity (Cubic yards)</u>	<u>Percent of Daily Truck Trips</u>
Open top semi	100	0
Roll-off	10 to 40	10
Tandem	25 to 35	5
Front-end loader	25 to 35	0
Packer	17 to 18	80
Dump	5 to 15	5

Source: Edward Kraemer & Sons, Inc.

The majority (80 percent) of daily truck trips to the landfill are made by 17-18 cubic yard packers followed by 10-40 cubic yard roll-off (10 percent); 25-35 cubic yard tandems (5 percent) and 5-15 cubic yard dump trucks (5 percent). The total number of average daily truck trips to the landfill is 110. Cars and pick up trucks account for an additional 10 trips per day.

Identified Issues Relating to Refuse Hauling to Burnsville Sanitary Landfill

A telephone survey of the municipalities located on the principal haul routes to the landfill was conducted to identify issues relating to the hauling of refuse through their communities. The three major issues identified are:

1. Traffic congestion in vicinity of landfill.
2. Traffic operations deficiency at I-35W/Cliff Road Interchange.
3. Litter on local streets in vicinity of landfill.

Table III-25 summarizes the findings of this survey.

Transportation-related emissions and noise from vehicles using the landfill are not considered to be significant problems due to the relatively few vehicles involved, the extended spacing of trips (approximately 20 "in/out" trips per hour) and compatible adjoining land uses. Regional access to the landfill could be interrupted from the north via I-35W due to periodic 100-year floods on the Minnesota

IDENTIFIED ISSUES RELATING TO REFUSE HAULING
TO BURNSVILLE SANITARY LANDFILL

Municipality	Issue	Interviewee
Bloomington	None	Russell Langseth Director of Public Works
Richfield	None	Thomas Morgan Public Safety Director
Burnsville	Traffic congestion at T.H. 13/ Dupont Ave. South intersection resulting partly from landfill hauling	Charles Siggerud City Engineer
	Traffic operational deficiency at I-35W/Cliff Road Interchange	
	Litter on local streets (i.e., Dupont Avenue, 122nd Street & nondesignated street at west entrance to landfill)	
Lakeville	None	James Robinette Director of Public Works

River. However, as shown in Figure III-19, a large majority of refuse hauled to the landfill is generated south of the Minnesota River thereby not being affected by major Minnesota River flows.

COLLECTION AND MANAGEMENT SYSTEM COSTS

Service Area Determination

Figure III-16 of the transportation section, shows the approximate service area or "wasteshed" for the landfill. Within this area, at least a portion of the solid waste generated is disposed of at the landfill. Solid waste generated outside of this area would be disposed of generally at other landfill facilities. The service area determination is based on conversations with the landfill manager, private haulers and transfer station operators.

The Metropolitan Area relies on 11 sanitary landfills for disposal of its solid waste. Service area configurations for these landfills are based on decisions to use any one of a number of these sites by collection firms, individual haulers and municipal collection departments. These decisions are the result of a number of interdependent variables, the basis of which cannot easily be determined or generalized. Moreover, once a particular landfill has been selected as the final disposal place, that decision will ultimately be reflected in generator collection charges.

Some of the variables that will result in a decision to use a particular landfill include haul distance, fuel costs, disposal or tipping charges, condition and restrictions of access roads, operating hours, location of competing disposal facilities, governmental regulations and the landfill owner's individual management policies.

HISTORIC/ARCHAEOLOGICAL

Upon reviewing the landfill location, the Minnesota Historical Society concluded the site contains no historic, architectural, cultural or archaeological significance. There are no sites in the area which are on the National Register or eligible for inclusion on the National Register.

AESTHETICS

General

Aesthetic concerns are generally more related to the collection of solid waste rather than its disposal, simply because solid waste disposal sites are usually located in out of the way, remote locations. However, where disposal sites are located near communities, residential areas, or heavily traveled roads, visual appearance will often affect human emotional reactions more so than perhaps other impacts that might be associated with a particular site. Other miscellaneous environmental effects associated with the aesthetics of a site include fugitive dust, litter, noise and odors.

Visual

Metropolitan Council staff visited several homes overlooking the Minnesota River Valley in Bloomington. The purpose was to determine whether the landfill was visible and if any adverse environmental effects were noticeable from the landfill. Residents did state that on hot, windy days an odor could be detected emanating from one or both of the landfills (see Air Quality, Section III). Some residents have a partial view of the landfill, however, the majority do not. Most residents did not find the landfill objectionable from a visual point of view.

Council staff also walked along the north side of the Minnesota River to determine the visual impacts of the landfill from this area. No view of the landfill was possible due to extensive vegetative growth along the south bank of the river. A limited view of the landfill is possible while driving along Highway 13 north of the landfill area.

For a discussion of impacts from fugitive dust, litter, and noise odors, refer to Air Quality, Sections III, IV and V.

SECTION IV

ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

METEOROLOGY/CLIMATOLOGY, AIR QUALITY AND NOISE

METEOROLOGY/CLIMATOLOGY

Primary Impacts

The construction and operation of the vertical and horizontal expansion areas at the landfill will have no effect on the large scale (macro-climate) meteorological processes (that is, prevailing winds, air masses, semi-permanent pressure centers) which basically determine the climate of the Minneapolis-St. Paul vicinity. Local factors, however, can affect the climate on a small scale (micro-climate). The construction and operation of the expansion areas could have a small but essentially undetectable impact on the micro-climate since virtually all human activity influences the micro-climate to a certain degree. Routine maintenance, closure and post-closure activities associated with the proposed new expansions will have no significant impact on the existing climate of the area.

Direct or Indirect Effects That Cannot Be Avoided

The construction, operation, maintenance, closure and post-closure activities associated with the proposed expansions will have no direct or indirect effects on meteorology/climatology.

Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of resources associated with meteorology/climatology will result from the construction, operation, maintenance, closure and post-closure activities of the proposed expansion areas.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The construction, operation, maintenance, closure and post-closure activities associated with the proposed expansions will have no impact on short-term uses of man's environment and the relationship between maintenance and enhancement of long-term productivity.

Cumulative Impacts

The construction, operation, maintenance, closure and post-closure activities associated with the proposed expansions will have no cumulative impacts.

AIR QUALITY

Primary Impacts

Fugitive Dust -- The construction, operation, maintenance, closure and post-closure activities associated with the proposed expansions will generate fugitive dust. Activities such as landclearing, excavation, grading, stockpiling, moving heavy equipment over unpaved areas, the transport of cover materials, and the movement and unloading of refuse trucks will generate fugitive dust.

The dust impacts from the new expansions will not vary significantly in magnitude from those resulting from the existing landfill since the nature and level of dust generating activities will be similar to existing conditions. The potential impact zone may shift somewhat when filling the horizontal expansion area because the area of dust emissions will be moved to this area.

No significant adverse dust impacts are expected.

Methane Gas -- The proposed expansion area has the potential for adverse methane gas impacts. Since an additional 1.6 million tons of refuse are being proposed for the disposal in the expansion areas, the increase in methane production will correspond accordingly. Based on lysimeter and full-scale landfill tests it appears that typical generation rates of .2 to .75 std. cu. ft. of methane/lb. can be expected from the landfill. Given that generation rate, an approximate gross production of 2.2 billion cu. ft. of methane gas can be expected from the landfill including the proposed expansion areas. If structures are placed on the former fill area or near the perimeter of the landfill, there exists the potential for gas to accumulate in these structures to explosive concentrations.

Proper operation of the landfill should, however, minimize potential methane impacts to satisfactory levels. Methane gas that is produced within the landfill will be vented through the cover material and at the landfill perimeter, ultimately dissipating at harmless concentrations into the atmosphere.

The existing landfill has not demonstrated methane gas problems.

Odors -- The proposed new expansion areas has the potential for adverse odor impacts. However, proper design and operation of the landfill should minimize odor impacts to satisfactory levels.

The existing landfill has not demonstrated odor problems.

Other Air Pollutants -- The operation of equipment and the movement of refuse trucks into the expansion areas will cause low levels of carbon monoxide, nitrogen oxides, sulfur oxides, and hydrocarbons to be emitted to the ambient air. However, these activities should not cause significant adverse impacts other than that occurring at the existing landfill. The proposed expansions will not increase the number of vehicular trips to the landfill or the operation of on-site equipment.

Direct or Indirect Effects That Cannot Be Avoided

No significant direct or indirect effects associated with the proposed expansions are anticipated to occur in the area of air quality.

Fugitive Dust -- Fugitive emissions from a landfill are an effect that cannot be avoided. However, state-of-the-art engineered operational procedures, can minimize a large percentage of the fugitive emissions.

Construction-related activities associated with the proposed expansions such as landclearing, excavation, grading, stockpiling, moving heavy equipment over unpaved areas and the transport of fill material will unavoidably generate fugitive dust for relatively short periods of time. However, dust impacts from construction activities will be minimal.

Routine operational and maintenance activities associated with the proposed expansion areas will also generate fugitive dust in similar quantities to that produced by the existing landfill. Such activities in the past have not produced any serious fugitive dust problems. Therefore, no significant impact on the existing environment by these activities will result from fugitive dust emissions.

No significant adverse impacts regarding transportation-related emissions will occur since the proposed expansion will not generate any increase in vehicular traffic to the site.

Some fugitive dust will be generated by activities associated with closure of the landfill including the proposed expansion area. However, these impacts will be minimal. In the long run, dust emissions from the landfill will be reduced by revegetation.

Methane Gas -- The potential for adverse methane gas impacts will be increased by the proposed expansion areas. The impact that methane gas generation has had on the environment at other landfills has generally been minimal. In some instances, methane gas has killed vegetation and trees at landfill sites. What appears to have happened in those instances is that methane has vented through fissures and eroded portions of the cover material in concentrations high enough to be toxic to vegetation. Operational practices employed at the landfill should prevent such impacts from occurring at the site.

Odors -- The potential for adverse odor impacts will be increased by the proposed expansion. However, no significant adverse impacts are anticipated. The placement of cover material should minimize the emission of odorants into the air to satisfactory levels.

Other Air Pollutants -- Low levels of carbon monoxide, nitrogen oxides, sulfur oxides, and hydrocarbons will be emitted into the air by construction and operational activities associated with the proposed expansion area. The impacts from these pollutants should be negligible.

Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of air resources will result from the activities associated with the proposed expansion areas.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The short-term impacts due to construction of the proposed expansion areas will involve potential fugitive dust and transportation-related emissions. No significant adverse air quality impacts on the maintenance and enhancement of the long-term productivity of the existing environment will result from the construction activities.

Short-term impacts due to operation of the proposed expansion areas involve potential fugitive dust emissions, odor and methane emissions, and transportation-related emissions. Air quality impacts on the maintenance and enhancement of the long-term productivity of the existing environment from these operations will be minimal.

Short-term impacts due to closure and post-closure activities of the proposed expansion areas involve potential fugitive dust and transportation-related emissions. Adverse air quality impacts on the maintenance and enhancement of the long-term productivity of the existing environment from these operations will be minimal. Revegetation will actually reduce dust emission from the landfill in the long-term.

Cumulative Impacts

Fugitive Dust -- Fugitive dust will be generated by construction activities. However, construction activities will be performed in stages and will only be an intermittent source of dust. Consequently, no cumulative impacts are expected to occur.

Methane Gas -- The potential for cumulative impacts of methane will increase with the expansion of the landfill. However, the total cumulative effects are not expected to be significant.

Other Air Pollutants -- Cumulative impacts are not expected to result from the emission of other air pollutants by the proposed expansion area.

NOISE

Primary Impacts

The construction, operation and closure of the proposed expansion areas are activities that will produce noise. Noise will be generated by equipment used at the proposed expansion areas for hauling, compacting and covering the refuse. The level of noise generated, however, by activities at the proposed expansion areas should not be any greater than that of the current landfill operation.

The closest sensitive receptor (home) to the proposed expansion areas is located approximately 2,900 feet from the southern border of the proposed expansion areas. As a general rule, sound from an essentially localized source spreads out uniformly as it travels away from the source, and the sound level drops off at the rate of 6 dBA for each doubling of distance. Assuming that a bulldozer producing 88 dBA measured at 50 feet is operated at the proposed expansion areas for an hour, noise levels at the receptor would be approximately 53 dBA. This is within the MPCA NAC-1 daytime hourly noise standard of 65 dBA. The preceding analysis does not take into account topographical variations which would further reduce noise at the receptor.

Activities associated with the proposed expansion areas will not affect nighttime noise levels since the landfill is not operational during the night.

Direct or Indirect Effects That Cannot Be Avoided

The generation of noise from the operation of a landfill is an effect that cannot be avoided. However, proper operation of the proposed expansion areas should reduce noise impacts to satisfactory levels.

There have been no adverse noise impacts associated with the existing landfill operation.

Irreversible and Irretrievable Commitments of Resources

No irreversible or irretrievable commitments of resources with regards to noise generating activities will occur from the proposed expansion areas.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

Short-term impacts due to construction, operation and closure of the proposed expansion areas will involve potential noise emissions. The major long-term benefit of the proposed action will be to provide an environmentally acceptable outlet for the regional disposal of solid waste.

Cumulative Impacts

Cumulative noise impacts are not expected to result from the proposed expansion areas.

WATER QUALITY

GROUNDWATER QUALITY

Primary Impacts

The average annual rate that leachate will be generated from the proposed expansion facility was estimated by Barr (1980) in the same manner as for existing conditions in Section III. The average annual infiltration rate for the proposed expansion is estimated to be 5.9 inches per year during operation and at 3.2 inches per year after closure. These estimates are based on the proposed operating procedures, final contours, cover, and vegetation which will exist during operation and after closure of the expanded facility. Table IV-1 summarizes the average annual infiltration rate for the proposed facility. The infiltration rates in Table IV-1 indicate that there will be about a 10 to 20 percent increase in the average rate of leachate generation from the proposed expansion as compared to the existing facility.

Since refuse in the expanded landfill will not reach field capacity until after closure, the maximum leachate production rate from the expanded facility is estimated at 3.2 inches per year which is equivalent to 27.2 acre-feet per year or 0.037 cubic feet per second from the 102-acre expanded site.

The construction, operation, closure or post-closure of the proposed expansion will have no significant impact on the groundwater hydrology of the landfill site. Groundwater gradients and the movement of groundwater beneath the site are not expected to change significantly from what they are under existing conditions.

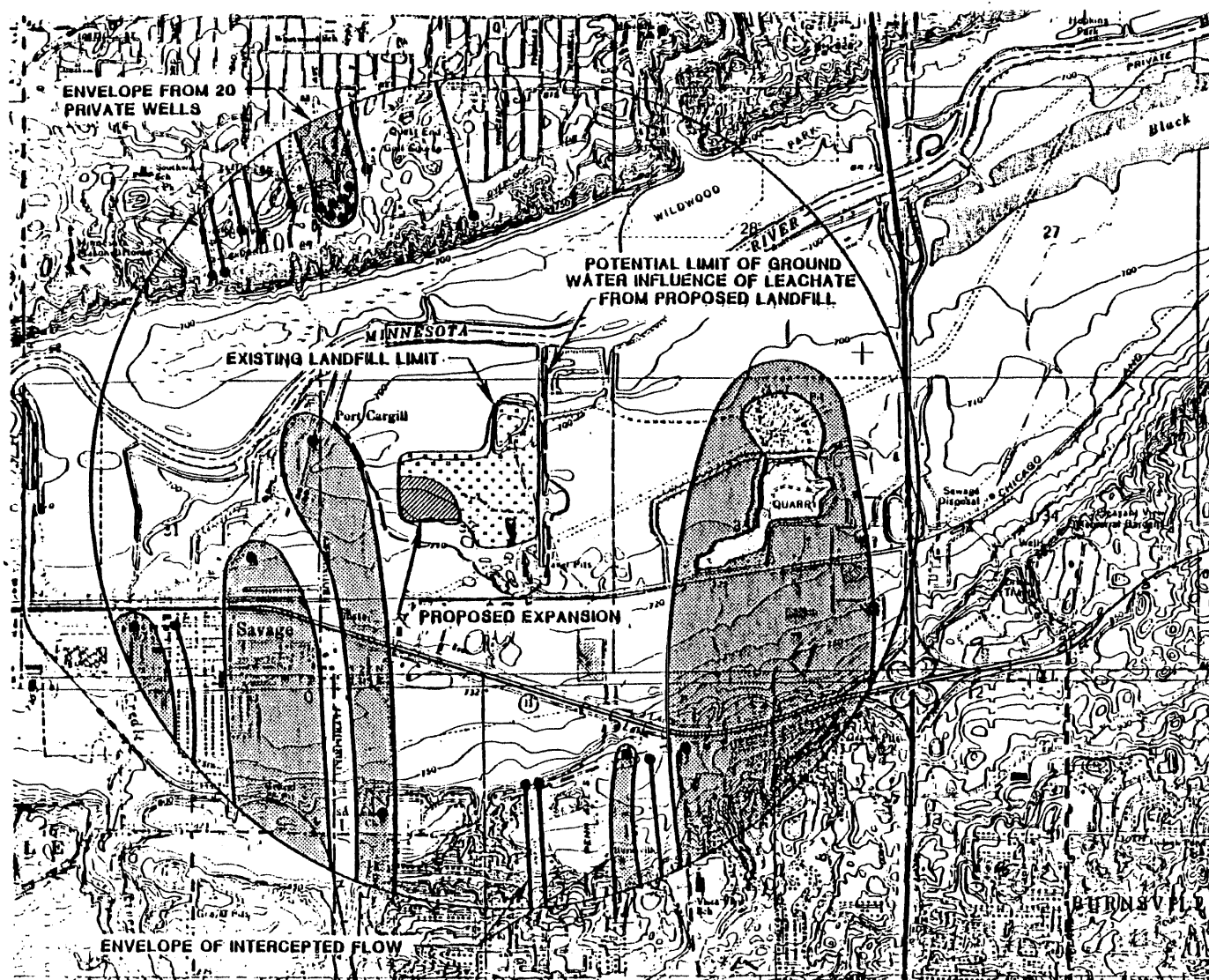
The primary groundwater impact from the proposed expansion will be the effect of leachate on surrounding groundwater quality. Based on present gradients, the area of groundwater potentially influenced by leachate from the existing landfill is shown in Figure III-10. The groundwater potentially influenced by leachate from the proposed landfill expansion is shown in Figure IV-1. The movement of leachate northwest of the landfill is controlled by the water level in the parcel north of the 17-acre expansion area that is owned by Cargill. The northwestern limits of the groundwater impact area shown in Figure IV-1 is based on the "worst case" assumption that water will not be allowed to accumulate in the Cargill area north of the 17-acre expansion area.

Refuse in the existing landfill has likely not reached field capacity. It is estimated that once the existing landfill reaches field capacity, the average leachate production potential will be 21 acre-feet per year with an estimated quality shown on Table III-20. The proposed expansion is anticipated to increase the average annual production of leachate by approximately 30 percent to an estimated rate of 27 acre-feet per year. This increase in leachate production will increase the mass loading of potential pollutants to the local ground water system.

SITE SPECIFIC WATER BALANCE Proposed Landfill Expansion

<u>LANDFILL CONDITION</u>	<u>Estimated Average Annual Infiltration Rate</u>
Proposed Expansion (During Operation)	5.9"/yr.
Proposed Expansion (After Closure)	3.2"/yr.
<u>SUB-AREA CONDITIONS</u>	
Vegetation - Landfill Top (Slope Less than 3%)	4.5"/yr.
Vegetation - Landfill Side (Slope of 30%)	2.5"/yr.
No Vegetation - Landfill Top (Slope Less than 3%)	13.3"/yr.
No Vegetation - Landfill Sides (Slope of 30%)	9.8"/yr.

Table IV-1.



NOTE: Envelopes of intercepted flow to wells located within 1 mile of Burnsville Landfill boundary.

Figure IV-1

Potential Groundwater Impact Area
And Area Influenced By Area Wells
Proposed Expansion Landfill

Revised To Include Second
(Cargill Well)

Direct or Indirect Effects Which Cannot be Avoided

If the existing landfill is closed after the permitted capacity is reached, it has the potential to impact the groundwater in the area shown in Figure IV-1. If water does not accumulate in the Cargill area north of the west arm of the existing landfill, the area potentially impacted by the existing landfill is essentially the same as the area potentially impacted by the proposed expansion under the same assumptions. The landfill will produce leachate which will affect local ground water quality unless leachate is completely cut off by an impervious seal and leachate is collected over the entire landfill site.

Irreversible and Irretrievable Commitment of Resources

The presence of the landfill restricts the use of the groundwater as a water supply in the vicinity of the landfill in the potential impact area shown in Figure IV-1. The use of the groundwater as a water supply in this area is also precluded by the fact that the major portion of this potential impact area is designated as a floodway which precludes any type of development. Municipal water serves the potential impact area to the south. The potential impact area between the landfill and the river that is not in the floodway is owned by Cargill. Cargill has no plans to develop this area.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The proposed action will not significantly change the impact of the existing landfill on groundwater quality. The potential limit of groundwater impacted by leachate will shift to the area immediately west and northwest of the landfill. The expansion will allow the landfill to operate for an additional 6 to 7 years and provide a method for safely disposing of municipal refuse and other refuse currently deposited in the landfill.

Cumulative Impacts

There are no cumulative impacts from the leachate on the groundwater. Impacts on the groundwater on the Minnesota River are discussed in the next section.

SURFACE WATER QUALITY

Primary Impacts

The construction, operation, closure or post-closure of the proposed expansion will not significantly impact the flood hydrology or low flow hydrology of the Minnesota River, or the hydrology of the drainage ditch east of the landfill. The vertical expansion is well above the 100-year frequency flood level and will not affect flooding on the Minnesota River. The 17-acre horizontal expansion area of the proposed facility is located in the 100-year frequency flood fringe and will remove approximately 260 acre-feet of flood storage from the flood fringe of the Minnesota River. According to the Burnsville

Floodplain Ordinance, this flood fringe area can be filled or otherwise encroached upon without causing a significant increase in flood levels. Upstream flood protection levels have been based on the assumption that the flood fringe including the proposed horizontal expansion area will eventually be filled.

A flood control dike will protect the 17-acre horizontal expansion area from the 100-year frequency flood. The flood protection dike will be located as shown in Figure II-10. The proposed dike will have a minimum top width of 15 feet with 3 (horizontal) to 1 (vertical) side slopes and a top at Elevation 722.5. This provides approximately four feet of freeboard above the actual 100-year frequency flood elevation and three feet of freeboard above the regulatory flood level. The flood control dike will effectively remove the horizontal expansion area from the 100-year frequency floodplain and will protect refuse from being carried downstream by flood water.

The groundwater influenced by the leachate from the landfill can potentially affect the quality of the Minnesota River. The method used for quantifying the effect of the expanded landfill on the Minnesota River is the same as the method used in Section III to quantify the impact of the present landfill on the Minnesota River. Tables IV-2 and IV-3 summarize the results of the analysis used to determine the impact of the proposed landfill expansion on Minnesota River quality. The results indicate that concentrations of ammonia, BOD, phenols, COD and barium are predicted to increase the most, in that order, due to the expansion. None of the parameters are expected to increase measurably above levels of the existing landfill. Even using this "worst case" dilution model, the added quantity of leachate should not cause violations of any water quality standards. Even the levels of ammonia in the River are increased by only 0.06 mg/l (seven percent) over previous concentrations attributable to the permitted landfill.

In summary, there is no significant impact from the expanded landfill on Minnesota River quality. Most parameters show no appreciable change from the impact of the existing landfill calculated in Section III.

The 17-acre landfill expansion would have two direct impacts on wetlands in the area. Since it is probable that there is some leachate contamination of wetland areas presently, any horizontal expansion would increase the amount of leachate seeping from the landfill, therefore, increasing wetland area contamination. The second impact is that the .25 to .50 acre wetland area WI, located on the expansion area will be filled in. Any wetland habitats supported by WI will be eliminated when WI is filled in.

Direct or Indirect Effects That Cannot be Avoided

As a result of the proposed expansion there may be a minor increase in the rate of leachate discharge to the Minnesota River, a direct effect that cannot be avoided. The steady-state discharge of leachate to the river should not occur for a number of years, at least until after the landfill has reached holding capacity. Given

Table -2
IMPACT OF PROPOSED LANDFILL ON MINNESOTA RIVER QUALITY
7-Day Duration - 10-Year Frequency Low Flow

PARAMETER	Minnesota River		Burnsville Landfill		Minnesota River	
	UPSTREAM CONCENTRATION	LOADING AT 7-DAY 10 YEAR LOW FLOW LBS./DAY	LEACHATE CONCENTRATION ¹	LANDFILL LOADING LBS./DAY	DOWNSTREAM CONCENTRATION	MPCA WATER QUALITY STANDARD
Copper µg/l as Cu	12	3,409	50	0.010	12.0	10
Turbidity NTU	76.6	21754 ³	130 ⁶	26 ³	76.7	25
Conductivity µmhos/cm @25 deg. C.	730 ²	134758	6100 ²	789	734	1000
Chloride mg/l as Cl	45	12780	1610 ⁶	320	46.1	100
Ammonia mg/l as N	8.1	--	6.0 ⁶	8.1	8.1	6.5-8.5
	0.70	199	350 ⁶	70	0.95	1.5
Total Dissolved Solids mg/l	573	162732	5346	1063	576	700
Total Alkalinity mg/l as CaCO ₃	258	73272	1225	244	258.8	305
Sulfate mg/l as SO ₄	123	34932	1080 ⁶	214	123.7	10
Total Hardness mg/l as CaCO ₃	368	104512	1600	318	369.1	250
Sodium mg/l as Na	34.3	9741	357	71	34.55	122 ⁴
Cadmium mg/l as Cd	10	2.840	30	0.006	10.0	10
Lead µg/l as Pb	11	3,124	100	0.020	11.1	50
Arsenic µg/l as As	8.6	2,442	ND ⁵	--	8.6	50
Selenium µg/l as Se	2.8	0.795	ND ⁵	--	2.8	10
Fluoride mg/l as F	0.32	90.88	0.4	0.08	0.320	1.5
Phenols mg/l	0.004	1,136	0.77	0.153	0.0045	0.1
Chromium mg/l as Cr	0.007	1,988	0.05	0.010	0.0070	0.05
Barium mg/l as Ba	0.16	45.44	2.25	0.45	0.163	1
Boron mg/l as B	0.16	45.44	3.0 ⁶	0.60	0.162	0.5
Cyanide mg/l as CN	0.4	113.6	0.028	0.006	0.40	0.02
Silver µg/l as Ag	<10	0.284	10	0.0002	<10	50
OD, mg/l	5.3	1505	1500	298	6.3	--
OD, mg/l	42.5	12070	4490	892	45.6	--

- Median values from data in Clark & Piskins, Environmental Geology, Volume 1, 1977, unless otherwise noted.
- 0.65 x specific conductance = total dissolved solids (mg/l).
- Turbidity is assumed to be a linear function, this value may be considered to be a loading number if one NTU is assumed to equal one mg/l.
- MPCA standard is based on sodium being less than 60% of the total equivalents of cations. To calculate the standard, the hardness was assumed to be the other major cation source, and all of the hardness was assumed to be calcium ions.
- Not detectable.
- Burnsville Landfill seepage concentration May 3, 1979.

Table IV-3
IMPACT OF PROPOSED LANDFILL ON MINNESOTA RIVER QUALITY
7-Day Duration - 2-Year Frequency Low Flow

PARAMETER	Minnesota River		Burnsville Landfill		Minnesota River	
	UPSTREAM CONCENTRATION	LOADING AT 7 DAY, 2 YEAR LOW FLOW LBS./DAY	LEACHATE CONCENTRATION ¹	LANDFILL LOADING LBS./DAY	DOWNSTREAM CONCENTRATION	MPCA WATER QUALITY STANDARD
Copper µg/l as Cu	12	7.128 ₃	50 ₆	0.010	12.0	10
Turbidity NTU	76.6	45500	130 ⁶	26 ³	76.64	25
Conductivity µmhos/cm @ 25 Deg. C.	730 ²	281853	6100 ²	789	732	1000
Chloride mg/l as Cl	45	26730	1610 ⁶	320	45.5	100
pH	8.1	-----	6.0 ⁶	-----	8.1	6.5-8.5
Ammonia mg/l as N	0.70	415.8	350 ⁶	70	0.82	1.5
Total Dissolved Solids mg/l	573	340362	5346	1063	575	
Total Alkalinity mg/l as CaCO ₃	258	153252	1225	244	258.4	700 305
Sulfate mg/l as SO ₄	123	73062	1080 ⁶	214	123.4	
Total Hardness mg/l CaCO ₃	368	218592	1600	318	368.5	10 250
Sodium mg/l as Na	34.3	20374.4	357	71	34.4	122 ⁴
Cadmium µg/l as Cd	10	5.94	30	0.006	10.0	10
Lead µg/l as Pb	11	6.534	100	0.020	11.0	50
Arsenic µg/l as As	8.6	5108.4	ND ₅	-----	8.6	50
Selenium µg/l as Se	2.8	1663.2	ND	-----	2.8	10
Fluoride mg/l as F	0.32	190.08	0.4	0.08	0.320	1.5
Phenols mg/l	0.004	2.376	0.77	0.153	0.0042	0.1
Chromium mg/l as Cr	0.007	4.158	0.05	0.010	0.0070	0.05
Barium mg/l as Ba	0.16	95.04	2.25	0.45	0.161	1
Boron mg/l as B	0.16	95.04	3.0 ⁶	0.60	0.161	0.5
Cyanide mg/l as CN	0.4	237.6	0.028	0.006	0.40	0.02
Silver µg/l as Ag	<10	5.94	10	0.0002	<10.0	50
BOD ₅ , mg/l	5.3	3148	1500	298	5.8	--
COD, mg/l	42.5	25245	4490	892	44.0	--

1. Median values from data in Clark and Piskins, Environmental Geology, Volume 1, 1977, unless otherwise noted.
2. $0.65 \times \text{specific conductance} = \text{total dissolved solids (mg/l)}$,
3. Turbidity is assumed to be a linear function, this value may be considered to be a loading number if one NTU is assumed to be equal to one mg/l.
4. MPCA standard is based on sodium being less than 60% of the total equivalents of cations. To calculate the standard, the hardness was assumed to be the other major cation source and all of the hardness was assumed to be calcium ions.
5. Not detectable.
6. Burnsville Landfill seepage concentration May 3, 1970.

tenuation of the leachate by dilution in the river, the effect of leachate on the river, including minor increases in its rate of discharge, will be negligible.

The river and adjacent wetlands will receive additional sediment as a result of filling the expansion, a direct effect that cannot be avoided. Sanitary landfilling by its very nature is a construction activity; surface runoff, particularly over fill areas yet to receive final cover and attain vegetative growth, will carry minor amounts of suspended solids to nearby receiving areas. Implementation of current operational procedures while filling the expansion should be sufficient to mitigate major erosion of these areas and sediment discharge to the pond areas. Although minor increases of sedimentation of the river and wetlands will occur as a result of the proposed actions, the net effect should be negligible.

Irreversible and Irretrievable Commitment of Resources

Minor leachate seeps and erosion of the landfill surface may degrade the adjacent wetlands to some degree. These areas may further degrade from operations associated with the filling of the expansion area. The net effect, however, of the proposed actions should be negligible since these wetlands are not within the area of proposed construction.

No other significant irreversible or irretrievable commitments of surface water resources are associated with the proposed filling and construction activities.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The long-term use of the adjacent wetlands may be impacted by the filling activities of the landfill operation, including those associated with the filling of the proposed expansion area. Depending on their use, the wetlands should be carefully monitored after closure of the landfill. Particular attention should be given to leachate seeps that might occur and flow to these areas. Future use of the wetlands should be carefully determined. Other long-term impacts on surface water resources should not result from the activities of the landfill including those associated with the proposed actions.

Cumulative Impacts

There will be some minor cumulative impacts on the water quality of the Minnesota River due to very small added pollutant loadings from the expansion. However, due to the overall poor quality of the River and the relatively insignificant contribution of the expansion, no substantial cumulative impacts are predicted.

There are no other cumulative impacts on surface water resources resulting from activities associated with the proposed expansion.

LOCAL WATER SUPPLY QUALITY

Primary Impacts

The groundwater intercepted by existing water supply wells as well as the groundwater predicted to be potentially influenced by the expanded landfill are shown in Figure IV-1. There will be no direct impacts on local water supplies from the proposed expansion since the groundwater potentially impacted by the landfill expansion does not intersect the envelopes of flow intercepted by water supply wells. Notwithstanding, the drawdown effect of the Cargill wells is close to the identified zone of leachate influence and secondary protection levels of control could be provided.

The area potentially impacted by leachate from the expanded landfill is currently restricted from use by two factors. Most of the area between the landfill and the river is designated as floodway. No development in the floodway is allowed and therefore no wells will be placed in this area. In addition, commercial and industrial areas to the south are served by municipal water supplies which are taken from deep wells located between Cliff Road and Burnsville Parkway east of Interstate 35W and within the downtown area of Savage. The expansion of the Burnsville water supply wells is planned to occur east of Interstate 35W and Savage has no plans for expanding its water supply system. No impact on Burnsville's existing well field should occur because of the distance between the expanded landfill's identified zone of leachate influence and the identified drawdown from the well field. The existence and operation of the quarry dewatering facility midway between the landfill and well field provides a secondary level of protection by intercepting any groundwater movement from the two areas. The area between the river and the landfill that is not in the floodway is owned by Cargill and there are no plans to develop this area.

The proposed expansion will not impact any existing water supply wells at their current pumping rates. The potential does exist for impacting water supply wells if wells of sufficiently high capacity are placed close enough to the landfill. The likelihood for placing such wells is limited since the major portion of the area is in the floodway, the area to the south is served by municipal water supply systems and the area between the landfill and the river that is not in the floodway is owned by Cargill and no development is expected.

Direct or Indirect Effects Which Cannot be Avoided

The existing landfill and the proposed landfill expansion have the potential to impact the local groundwater in the vicinity of the landfill as shown on Figure IV-1. This portion of the groundwater aquifer, therefore, is precluded from being used as a water supply.

Irreversible and Irretrievable Commitment of Resources

The area impacted by leachate from the landfill will be precluded for use as a local water supply.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

Precluding the use of the area shown on Figure IV-1 from use as water supply will allow the safe disposal of refuse at this location for six to seven years.

Cumulative Impacts

There are no cumulative impacts on the local water supply from the proposed action.

TERRESTRIAL AND AQUATIC ECOLOGY

VEGETATION AND WILDLIFE

Primary Impacts

Construction activities associated with the proposed actions include preparing the expansion areas (horizontal and vertical) for refuse disposal, construction of an access road to the horizontal expansion area, and the construction of a flood protection dike around the horizontal expansion area. In effect, all existing vegetation in the proposed horizontal expansion area and revegetated portions of the existing landfill will be removed by these activities. This will eventually include the removal in the horizontal expansion area of approximately one-fourth to one-half acre of wetland, one-half to one acre of mixed trees and 15 acres of intermediate shrubs/grassland. This compares to 85 acres of vegetation already removed by the existing landfill operation. Some of this area, however, has been revegetated.

Wildlife populations associated with area plant communities are likely supported by vegetative cover on revegetated portions of the existing permitted landfill, the horizontal expansion area and surrounding area. Vegetation provides a limited food source for deer and rodents and nesting areas for a variety of small song birds. These and other species utilizing the horizontal expansion area and revegetated portions of the existing landfill will be displaced during the construction stage of the proposed actions. The movements of deer, fox, weasels and other mammals will also be restricted during construction activities, primarily during daylight hours.

The indigenous vegetation and associated wildlife species located on the proposed expansion areas are not unique to these areas. The total individual members of the affected populations are very small in comparison to the total available areawide resources. In effect, the proposed horizontal and vertical expansions will not result in significant direct impacts on terrestrial populations.

The operating phase of the landfill with respect to the proposed expansion areas will consist of, for each successive work area, actual waste placement, cover placement, and environmental control

operations (that is, litter control, dust control, and so on). Day-to-day operations will affect a larger area than the active face area due to refuse truck and landfill equipment traffic on the access points. Wildlife populations, which have presumably adjusted to existing landfill activities, will not be additionally affected by the horizontal and vertical expansion area operations.

The closure phase of the horizontal and vertical expansion areas will consist of, for each successive work area, final cover placement and revegetation activities. Since the closure period is relatively brief, such activities have only very minimal impacts on terrestrial vegetation and wildlife.

The potential, however, exists for more substantive impacts on terrestrial populations, and particularly terrestrial flora, due to biological processes inherent at a landfill site during the post-closure period. Specifically, decomposition of landfilled organic materials results in or contributes to leachate generation and methane gas production. For surface-oriented flora and fauna, leachate generation would not be expected to have significant impacts. Methane gas production, on the other hand, has resulted in numerous cases in the creation of anoxic root zone conditions resulting in slow growth or die-off of associated plant species. Potential impacts are generally unpredictable in practice, as well as, generally localized in extent. Given the site topography (elevated), type of cover soil (relatively impermeable) and site history (no evidence of methane problems) no substantial impacts are expected either on or off-site. Should substantial vegetative stresses develop, a number of mitigative measures are available (see Section V.)

Direct or Indirect Effects That Cannot Be Avoided

Construction activities associated with the proposed horizontal and vertical expansion area, particularly the excavation and fill procedure, will unavoidably eliminate vegetation on the areas involved. Reduction of vegetation will, in turn, decrease the habitat of associated wildlife populations. This action will also have a minimal effect on areawide predator populations faced with a decrease in their food supply. While considerable time will lapse between replanting and full restoration of a vegetative cover, and consequent reintroduction of associated wildlife species, impacts are generally not substantial.

Filling of the horizontal expansion area will have an additional direct impact; it will eliminate the lowland topography which currently exists and create a highland topography. This will in turn eliminate some wildlife populations which currently exist in the lowland from this area permanently.

Irreversible and Irretrievable Commitments of Resources

During construction activities, various tree stands, intermediate shrubs and grassland areas will be removed mostly in the horizontal expansion area. Mixed stands consisting of aspen, willow, elm and poplars represent the climax vegetation for the site. A climax

population is not replaceable in a short amount of time. Elimination of these stands would not, however, be a significant impact upon the area's vegetative resources.

No significant irreversible or irretrievable commitments of vegetation or wildlife resources are associated with the operational, closure and post-closure phases of the proposed horizontal and vertical expansions.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The primary short-term impact associated with the proposed expansion activities will be the removal of vegetation from the horizontal expansion area and vegetation on previously completed areas of the landfill. In the long-term, revegetation of the site would occur. However, normal plant successional growth patterns could potentially be modified due to the combined earth/decomposing waste substrata available for plant growth.

Filling of the proposed horizontal expansion area eliminates approximately 17 acres from natural ecological production. Operation of the facility with both the horizontal and vertical expansion, however, should result in secure disposal of an additional 2,400 acre-feet of refuse over a period of six to seven years.

No significant short-term impacts are expected due to closure and post-closure activities of the horizontal and vertical expansions. Beneficial long-term impacts would include the designation of approximately 107 acres for open space and light industrial purposes after the facility's closure.

Cumulative Impacts

The proposed horizontal expansion will add 17 acres to an existing acre landfill. Although the horizontal expansion area contains several types of habitat communities, the relative impact will be minimal compared to destruction of the surrounding vegetation that has already occurred on existing permitted areas of the landfill. Essentially, both habitat and feeding areas for most mammals and some birds will be eliminated.

No significant cumulative impacts are expected from operation of the horizontal and vertical expansion areas or during the closure and post-closure periods associated with the expansion areas.

AQUATIC ECOLOGY

Primary Impacts

The most significant water body which might be affected by leachate from the proposed expansion is the Minnesota River. The impact analysis calculations from the dilution model indicated that levels of ammonia, BOD, phenols, COD and barium may increase slightly due to the leachate from the expansion. However the relative increase from the leachate will not cause violations of the water quality standards. The greatest increase is by ammonia which may change by as much as seven percent during "worst case," low flow conditions.

Most fish and other mobile organisms should be able to avoid the area near the drainage ditch discharge and thereby escape any potentially harmful effects of elevated levels of the leachate constituents. Attached and rooted phyton and sensitive benthos were not identified near the shoreline in the area of leachate influence and therefore there should be no primary impacts on these organisms.

There is no aquatic ecology data on the small ponds adjacent to landfill to determine if any primary impacts will occur in these oppn water bodies.

Direct or Indirect Effects Which Cannot Be Avoided

The most significant effect of the expansion on aquatic ecology is leachate contamination of the river.

Irreversible and Irretrievable Commitments of Resources

There are no irreversible commitments of resources since any river system has the potential to recover from point source inputs, especially considering the low amount of increased loadings from the expansion and the finite nature of the landfill's field capacity.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

There will be a certain minimal risk to the long term aquatic ecology of the river associated with the expansion. Although only very minor increases in pollutant levels are predicted due to the expansion, this continued leachate pollution into the river will only slightly hamper the general effort to improve the river's water quality. The beneficial aspects of a means of disposal of municipal solid water is also a long-term advantage of the expansion.

Cumlulative Impacts

Any impacts on organisms in the river resulting from the proposed expansion would be in addition to those impacts currently experienced due to leachate from the permitted landfill. Also any impacts of the expansion would be in addition to impacts caused by other pollution sources along the river.

WETLANDS

Primary Impacts

The .25 to .50 acre wetland area located in the horizontal expansion area will be eliminated with the filling of that area. The wetland areas surrounding the landfill (see Figure III-13) will be maintained according to present plans. There is the potential for soil erosion from the activities of the proposed horizontal and vertical expansions; however, the impact on surrounding wetlands appears to be negligible.

Leachate and landfill gas production will occur during operation, closure and post-closure activities associated with the proposed horizontal and vertical expansions. Gas migration cannot occur through saturated soil and, as such, there would be no expected impact on the wetlands via horizontal or vertical gas migration. Although leachate production may occur for a number of years, final cover should substantially reduce leachate quantities.

Direct or Indirect Effects that Cannot be Avoided

The wetland area in the horizontal expansion area will be filled in if the expansion is approved, a direct effect that cannot be avoided. However, elimination of this small wetland area would not have a significant impact on the areas. The size of this wetland is small in comparison to the total available wetland resources in the area.

Irreversible and Irretrievable Commitments of Resources

The wetland area in the horizontal expansion area will be filled in if the proposed expansion is approved, an irreversible commitment of a wetland resource. Wetlands play a vital role in retention and release of water and stabilization of streamflow and lake levels. During periods of flooding, wetlands act as storage basins by impounding water in open ponds and storing water in their organic soils. Wetlands also play a role in upgrading runoff water quality acting as a soil filter; nutrients absorbed by the organic soils are then assimilated by the highly productive vegetation. These nutrients are retained as production exceeds decomposition in a wetland. Finally wetlands function as a settling system by remaining suspended matter from runoff.

As discussed above, elimination of the small wetland in the horizontal expansion area would not have a significant impact on wetland resources. The size of this wetland is very small in comparison to the total available wetland resources in the area.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

In the short term, the wetland area in the horizontal expansion area will be minimally stressed by activities of the proposed expansion before it is filled in. The use of appropriate mitigative measures will limit short-term and long-term impacts on the surrounding wetlands. No significant adverse impacts are expected.

Cumulative Impacts

The proposed horizontal expansion will extend the landfill area adjacent to the wetland area WII (see Figure III-13). Surface water runoff from this expansion area would drain into WII. However, some surface drainage from the present landfill operation already drains to this area. The lack of significant impacts of this area by the existing landfill operation is apparent from the abundant productivity of wetland WII. Additional impacts from the horizontal expansion would not be significant.

RARE AND ENDANGERED SPECIES

Primary Impacts

There are no rare or endangered species in the landfill area, with the exception of some bald eagle and peregrine falcon sitings in the Minnesota River Basin area. No significant impacts will occur on-site or in the surrounding area as no bald eagles or peregrine falcons have been sited on or very close to the landfill area.

Direct or Indirect Effects That Cannot be Avoided

There are no bald eagles or endangered species associated directly with the landfill area; therefore, no impacts on such populations will occur.

Irreversible and Irretrievable Commitments of Resources

No bald eagles or rare or endangered species are associated with the landfill area; therefore, no commitments of such resources will be involved with the proposed actions.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

No significant adverse impacts on neighboring populations of rare, endangered, or "unusual" species are expected.

Cumulative Impacts

No cumulative impacts on rare or endangered species are predicted.

SOCIO-ECONOMICS

LAND USE, ZONING

Primary Impacts

A significant impact of the proposed action on future land use is the delay of Burnsville's plan to utilize the land for other purposes such as general industrial purposes. If the expansion is granted, the City will have to delay any development by approximately six years. The proposed actions are consistent with present land use and zoning for the area.

The only potential significant impact of the landfill on the Minnesota Valley National Wildlife Refuge and Recreation Area would be increased water quality degradation caused by leachate contamination. Analysis of the existing landfill conditions indicates that dilution in the river will be sufficient to reduce any significant threat of leachate pollution even during low flow conditions.

For a further discussion, see Surface Water Quality, Section III.

Direct or Indirect Effects that Cannot be Avoided

The only direct or indirect effect of the expansions on land use will be the delay in developing the land for other purposes.

Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of resources relating to land use or zoning will result from the proposed action.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The filling of the proposed horizontal and vertical expansion areas will have no significant impact on the short-term uses of man's environment. Upon the landfill's closure, the site could be used for light industrial or open space recreational purposes which will enhance the long-term productivity of the area.

Cumulative Impacts

The proposed actions will not result in any cumulative impacts that are related to land use or zoning in the area.

PUBLIC FACILITIES AND SERVICES

Primary Impacts

There are no significant primary impacts related to public facilities that will result from the filling of the vertical and horizontal expansion areas at the landfill.

The only potential significant impact of the landfill on the Minnesota Valley National Wildlife Refuge and Recreation Area would be increased water quality degradation caused by leachate contamination. Analysis of the existing landfill conditions indicates that dilution in the river will be sufficient to reduce any significant threat of leachate pollution even during low flow conditions.

For a further discussion, see Surface Water Quality, Section III.

Direct or Indirect Effects that Cannot be Avoided

There are no significant direct or indirect effects relating to public facilities that will result from the expansion of the landfill.

Irreversible and Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitment of resources related to public facilities that will result from the expansion of the landfill.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The proposed expansion of the landfill would have the short-term benefits of the secure disposal of an additional 6.5 million cubic yards of municipal refuse and thereby eliminate the need for alternative disposal methods.

Cumulative Impacts

The proposed actions will not result in any cumulative impacts that are related to public facilities in the area.

TRANSPORTATION

Primary Impacts

The proposal expansion will result in extending the use span of the landfill rather than to accommodate greater annual volumes of refuse. Also, the existing watershed boundaries of this landfill are not anticipated to change significantly as the result of the proposed action. Consequently, transportation-related impacts associated with the proposed action will reflect existing rather than new additional impacts. The existing impacts have been identified as:

- 1) Traffic congestion in vicinity of landfill,
- 2) Traffic operations deficiency at I-35W/Cliff Road interchange,
- 3) Litter on local streets in vicinity of landfill.

Direct or Indirect Effects that Cannot be Avoided

The proposed action will extend the existing principal haul routes by approximately six years.

Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable commitment of resources associated with the hauling of refuse to the landfill will be petroleum consumed for transport.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The six-year extended use of the established haul routes will have no significant impact on short-term uses of man's environment and the relationship between maintenance and enhancement of long-term productivity.

Cumulative Impacts

The six-year extended use of the established haul routes resulting from the proposed action will have no significant cumulative impact.

COLLECTION AND MANAGEMENT SYSTEM COSTS

Primary Impacts

Filling of the proposed expansion area will extend the life of the landfill by about six years. Area haulers that normally use this site can continue to do so for the additional time period. Area customers serviced by haulers using the landfill will continue to be charged collection fees based in part on the disposal charges set at Burnsville. Disposal charges presently at the landfill are higher than surrounding competing landfills.

Filling of the proposed expansion area will also extend the timeframe for the need to develop new landfills in the Region. Hennepin County (1979) found, for example, that it will cost between \$3.5 and \$4 million to develop a 120-acre parcel that could handle 500 tons of refuse per day. When legal, administrative and engineering expenses are added, landfill development costs could reach \$4.2 and \$5.6 million. Landfill development costs are reflected in disposal charges and ultimately in generator collection rates. Minimal development is necessary to use the Burnsville expansion area; filling of this area will, therefore, help to maintain present collection rates in the Region by avoiding costs of developing new land disposal areas.

There are no adverse primary impacts on collection and management system costs that can be attributed to filling the proposed expansion areas.

Direct or Indirect Effects that Cannot be Avoided

Filling of the proposed expansion areas will extend the life of the Burnsville Landfill and subsequently provide additional capacity for area haulers. This will, in turn, lessen the need and expense for new landfills and changes in routing and additional fuel costs for area haulers. Filling of the proposed expansion areas will, therefore, help meet future regional land disposal capacity needs and help keep collection rates down.

There are no adverse direct or indirect effects on collection and management system costs that can be attributed to the proposed actions.

Irreversible and Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitment of resources with respect to collection and management system costs that can be attributed to the proposed actions.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The proposed actions will not result in any impacts on collection and management system costs that would adversely affect either short-term or long-term uses of the site for land disposal or the long-term productivity of the surrounding environment.

Cumulative Impacts

The most significant cumulative impact of continued disposal at Burnsville as a result of using the expansion areas, is the extension of the Metropolitan Area's landfill capacity. The expansion will add about 11 months of life to the metropolitan disposal system. Filling the expansion areas will, therefore, lessen the need to develop new landfills sooner and help to maintain present land disposal charges and collection rates.

HISTORICAL/ARCHAEOLOGICAL

Primary Impacts

No historical or archaeological impacts are associated with the present site. The proposed actions are contained within the perimeter of the landfill property. Therefore, no historical or archaeological impacts will be associated with the expansion of the present site.

Direct or Indirect Effects that Cannot be Avoided

The present site contains no historical or archaeological significance, therefore, no historical or archaeological impacts will occur due to the proposed actions.

Irreversible and Irretrievable Commitment of Resources

No irreversible and irretrievable commitment of resources with respect to historical and archaeological impacts of the facility will occur as a result of the proposed actions.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

There are no historical and archaeological impacts associated with the proposed actions that will adversely affect the maintenance and enhancement of the long-term productivity of the area.

Cumulative Impacts

No cumulative impacts relating to historical and archaeological significance are predicted.

AESTHETICS

Primary Impacts

Filling of the proposed expansion areas will result in the landfill operating about six years longer. Nearby homes that look direct upon the landfill will be exposed to the operation of the facility for these additional years and any subsequent visual impacts. Such impacts will be greater than those already present since the final vertical elevation of the expansions will create an isolated mound virtually level with the opposing bluff top in Bloomington.

Direct or Indirect Effects that Cannot Be Avoided

Visual impacts from operation of the landfill will occur for a long time period as a result of the filling of the expansion areas, a direct effect that cannot be avoided.

Irreversible and Irretrievable Commitment of Resources

No irreversible and irretrievable commitment of resources with respect to visual impacts of the facility will occur as a result of the proposed actions.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

There are no significant aesthetic impacts associated with the proposed action that will adversely affect the maintenance and enhancement of the long-term productivity of the existing surrounding environment. As portions of the landfill reach final fill elevations they will receive final cover material and be seeded for vegetation purposes. This should help to lessen the adverse visual impacts associated with operation of the facility.

Cumulative Impacts

Cumulative impacts are possible for those homes that overlook both the Burnsville and Freeway landfills. Approving expansions to both landfills will expose the operation of both facilities to some area receptors for a longer time period.

SECTION V

MITIGATION MEASURES TO REDUCE OR MINIMIZE SIGNIFICANT ADVERSE EFFECTS

METEOROLOGY/CLIMATOLOGY, AIR QUALITY AND NOISE

METEOROLOGY/CLIMATOLOGY

The activities associated with the construction, operation and closure of the proposed expansion areas will not produce any significant adverse effects on the existing climate. Consequently, no mitigative measures are necessary.

AIR QUALITY

As noted in Section IV, the construction, operation and closure of the proposed expansion area will result in minimal production of fugitive dust, odors, and methane gas.

Current operational procedures used at the existing landfill should be sufficient to handle most of the air emission problems associated with the proposed expansion areas. In addition, the surrounding topographic and land use features of the area should provide adequate protection from adverse impacts on local receptors.

It was found that there is a potential for adverse impacts from methane gas after closure of the landfill, if gas should accumulate, in new structures on the property because of the additional gas production in the proposed expansion areas. It may be necessary, prior to closure of the facilities to install a gas monitoring system to evaluate any future requirements for on-site and perimeter gas control measures. Such a monitoring program will also help determine future use of the property and whether new structures should be placed on the property.

The following are other mitigative measures that might be undertaken to further reduce potential impacts from air pollutants.

- Provision of dust control via surface paving
- Reduction of dust generation via prompt revegetation
- Utilization of dust retardants and/or water to minimize dust from temporary dirt roads or other exposed areas.

Methane gas is presently naturally vented through the existing cover material at the site. If leachate controls, such as a tighter cover material, are implemented at the site, methane buildup could become a problem. In such instances, the following mitigative measures could be employed:

- 1) Utilization of permeable trenches to vent gas to the atmosphere. These can be used in combination with impermeable barriers.

- 2) 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.
- 3) 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, for example, during periods of frozen cover.

NOISE

As noted in Section IV, the construction, operation, and closure of the proposed expansion area will not produce any adverse noise impacts. Consequently, no mitigative measures are necessary.

WATER QUALITY

GROUNDWATER QUALITY

Groundwater monitoring since 1971 has shown some degradation of groundwater immediately underneath the landfill. However, ultimate discharge of ground water is to the Minnesota River, which has not shown measurable contamination that can be attributed to the landfill.

A liner and leachate collection system could be installed under the proposed expansion area of the landfill, however, the benefits to the Minnesota River would most likely be minimal.

The expansion of the landfill will result in the production and generation of more leachate by the facility. Because of the expansion, the limit of groundwater impact from leachate will shift immediately west and northwest of the facility (see Figure IV-1). One or more of the following leachate controls could be employed to minimize these groundwater impacts and provide a second level of protection at the facility.

- 1) Improving surface water runoff to minimize infiltration of precipitation into the landfill and, thus, reduce the consequent generation of leachate. Such controls include grading of the final surface of the landfill to encourage runoff and prevent pooling and infiltration, providing prompt surface compaction of all disturbed soil surfaces, and providing prompt initiation of seeding and revegetation procedures.
- 2) Modifying the daily and final cover approach. 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 and blending in other less permeable soils.

- 3) Utilizing a thicker or less permeable final cover consisting of clay overlain by six inches of sandy loam topsoil to promote vegetative growth.
- 4) Increasing the emphasis on site maintenance primarily oriented towards maintaining cover integrity, including periodic regrading and reseeding of slopes.
- 5) Installing a membrane or other constructed liner to prevent the downward migration of leachate, and thus lessen the possibility of leachate contamination of groundwater. Liners may be constructed from a variety of materials, including synthetic materials and natural clay materials or specified clays such as montmorillonite, illite and kaolinite.
- 6) 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, vinyl panels and sheet piling have been used to construct impermeable barriers.
- 7) 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.
- 8) Developing a more detailed surface water and groundwater sampling program to indicate potential leachate contamination.
- 9) Increasing MPCA's inspection and enforcement activities.
- 10) Utilization of a more stringent closure plan consisting of thicker or more impermeable final cover and development of a more definitive post-closure plan.

SURFACE WATER QUALITY

Surface water monitoring has shown seasonal degradation of water quality in the drainage ditch east of the landfill. However, analyses of the impact of expansion on the surface water quality, including the drainage ditch area, revealed only minimal changes in routine parameters and no measurable change in the other parameters. It is important to note that the extent to which leachate from the landfill has contributed in the degradation of the drainage ditch is unknown. Degradation of the drainage could be attributed to upstream impacts.

A leachate treatment system could be installed at the end of the drainage ditch just before the river. However, the benefits to the Minnesota River would most likely be minimal and the additional cost to the project would be prohibitive. It should also be pointed out, that the drainage ditch serves approximately 3,000 acres of Burnsville and any treatment facility installed in the drainage ditch would treat nearly 100 percent storm water.

Surface leachate in the form of toe seeps has been a problem. Mitigative measures for this problem have been practiced by the landfill operator. A trench has been constructed in the area of the seeps. Gravel is placed at the bottom of the trench, then the trench is filled with sand. As the sand becomes saturated with leachate, it is removed and deposited in the landfill and is replaced with clean sand. This is a bi-weekly occurrence during the 7 frost free months, April through October.

Another method of mitigating the surface toe seeps is to promote better surface runoff conditions and to minimize percolation. This procedure is already being implemented at the landfill and will continue.

LOCAL WATER SUPPLY QUALITY

There is little potential for contamination of most local water supply due to the expansion because of the distance to any local well. In addition, development is prohibited within the area of potential leachate influence between the landfill and the Minnesota River due to floodway designation. Therefore, no mitigative measures are recommended.

The drawdown of the Cargill wells is close to the identified zones of leachate influence for the existing and expanded landfill. Secondary levels and protection could be provided to minimize the potential for impacts. Levels of controls that could be employed include those discussed above under groundwater and the following:

- 1) Installation of monitoring wells west of the landfill and monitoring of the Cargill wells, and
- 2) Reducing the pumpage rate of the Cargill wells.

The operation of the dewatering well at the quarry provides a secondary level of protection by intercepting groundwater movement between the landfill area and the City of Burnsville's water supply well field area. Continued operation of this facility could provide a long-term secondary mitigation of any potential groundwater impacts in the vicinity of the well field.

TERRESTRIAL AND AQUATIC ECOLOGY

CONSTRUCTION

The two major impacts associated with the construction phase of the vertical and horizontal expansions are sedimentation that would occur in surface water runoff and removal of vegetation. Sanitary land-filling is by its very nature a construction activity and these impacts would be difficult to avoid. The construction activities of the proposed expansion should, however, avoid equipment encroachment on nonlandfill areas.

OPERATION

Impacts associated with operation of the proposed horizontal and vertical expansion areas include impacts on vegetation, wildlife, and aquatic ecology as caused by surface runoff, leachate to production and methane gas migration. A potential mitigative measure might include utilization of a leachate treatment system at the end of the easterly drainage ditch before discharging to the river. Aquatic impacts due to proposed expansion should be negligible and therefore the benefit of this costly treatment system on aquatic ecology may not be noticable.

CLOSURE AND POST-CLOSURE

Impacts associated with the final phases of landfill operation are essentially identical to those experienced during the operational phase. Additional mitigative measures which could be implemented include:

1. Utilization of a final cover consisting of two feet of clay overlain by six inches of sandy loam topsoil to promote vegetative growth. Additional effects relating to maintaining appropriate vegetative growth conditions such as liming, fertilization, watering, insect control could be considered.
2. Selection of a variety of plant species noted for potential adaptability to landfill conditions.

SOCIO-ECONOMICS

LAND USE, ZONING

The activities associated with the construction, operation and closure of the proposed expansion areas will not produce any significant adverse effects on the existing land use or zoning. The expansions will, however, delay use of the facility for other purposes. Under the new Waste Management Act of 1980, municipalities can now tax solid waste land disposal facilities. They are no longer exempt as pollution control facilities. Burnsville, therefore, can now realize the landfill as a source of revenue.

PUBLIC FACILITIES

The proposed actions will have no impact on public facilities in the landfill area. No mitigative measures are, therefore, necessary.

TRANSPORTATION

Only one (Burnsville) of the six municipalities most directly affected from the hauling of refuse to the landfill has identified existing adverse effects that might continue under the proposed action. These adverse effects and suggested mitigative measures are given in Table V-1.

Table V-1
IDENTIFIED ADVERSE EFFECTS AND MITIGATIVE MEASURES
RELATING TO THE HAULING OF REFUSE TO BURNSVILLE SANITARY LANDFILL

<u>Identified Adverse Effect</u>	<u>Suggested Mitigative Measure</u>
Traffic congestion at TH 13/ Dupont Avenue South inter- section resulting in part from landfill hauling.	Recommend to City of Burnsville to study the general vehicle circulation pattern in the vicinity of the landfill and the continued need for three separate direct-access links (via city streets) to the landfill. Develop a haul truck routing plan.
Traffic operations deficiency at I-35W/Cliff Road inter- change.	Recommend to the Minnesota Department of Transportation to study the traffic opera- tions and safety factors at the I-35W/Cliff Road interchange. Identify and enforce use restrictions as necessary until identified.
Litter on local streets in vicinity of landfill.	Appropriate citation for inade- quately covered refuse trucks.

COLLECTION AND MANAGEMENT SYSTEM COSTS

The proposed actions will have no adverse effects on collection and management system costs in the Metropolitan Area. No mitigative measures are, therefore, recommended.

HISTORICAL/ARCHAEOLOGICAL

Since the present site contains no historical or archaeological significance, the activities associated with the construction, operation and closure of the proposed expansion areas cannot have any influence on historical or archaeological considerations. Therefore, no mitigative measures are necessary.

AESTHETICS

The proposed actions will result in greater adverse visual impacts to off-site receptors than those that have occurred with previously filled areas of the landfill.

A suggested mitigative measure would be to seed portions of the landfill as soon as possible in order to facilitate vegetative growth. Screening, such as the planting of high growth shrubs should also be investigated.

SECTION VI

ALTERNATIVES TO PROPOSED ACTION

BACKGROUND INFORMATION

The following alternatives analyses are based on estimated closing dates of the existing sanitary landfills derived by projecting the continuing use rates and remaining capacities. These projections must necessarily be based on a set of data and assumptions. Because of the number of variables involved in the Regional landfill system during the next 10 years, the resulting closing dates are predictions to be used for general planning purposes only and are subject to change.

Table VI-1 summarizes the base data for the Regional landfill system including the predicted closing dates. The following assumptions were used in this analysis:

1. Presently remaining and expansion volumes, as given in acre-feet as of January 1980 reflect the remaining air space volume only. Cubic yard conversions are based on the definition of acre-feet: 1613 cubic yards (CY) per acre-foot (AF).
2. Presently remaining volume for Burnsville Sanitary Landfill is based on the recent stipulation agreement with the Minnesota Pollution Control Agency. This agreement essentially trades side-slope space for vertical space allowing 700,000 CY (434 AF) to be used on top of the existing refuse. Added to the previously existing space of 600,000 CY (372 AF) brings the total existing volume of Burnsville Sanitary Landfill to 1.3 million CY (806 AF).
3. 1980 use rates are calculated by using the best available receiving rate data (County and MPCA recorded data and/or landfill operators) and then converting to acre-feet using the conversion constant of 672 tons received through the gate per acre-foot in place in the landfill.
4. Use rates are assumed to increase somewhere within a range of 0.0 to 1.3 percent per year. Reported closing dates reflect the median use rate increase of 0.65 percent per year.
5. The closing dates reflect projections based on the interrelated nature of solid waste flow within the Regional landfill system. When the first landfill closes, the landfill's last use rate (AF/Yr) is dispersed evenly between the remaining "neighboring" landfills depending on relative proximity.
6. A subregional scenario was used to predict effects of other landfills' closing on Burnsville Sanitary Landfill. Louisville, Flying Cloud, Freeway and Pine Bend were determined to have the greatest impact on Burnsville's use rate due to proximity and overlapping wastesheds. Therefore, the use rates of these neighboring landfills were dispersed among the remaining landfills when closed.

Table VI-1

Base Data For Regional Landfill System

Landfill	(A) Presently Remaining Volume (As of 1/80)	(B) Expansion Volume	Total Available Volume (A + B)	1980 Use Rate
Pine Bend	5952	2790	8742	792
Freeway	951	1860	2811	158
Burnsville	806	2418	3224	237
Flying Cloud	1046	0	1046	607
Louisville	1500	496	1996	79
Dakhue	333	0	333	27
Woodlake	67	1550	1617	150
Anoka Municipal	786	0	786	340
Oak Grove	211	0	211	174
East Bethel	807	0	807	11
WDE	<u>245</u>	<u>0</u>	<u>245</u>	<u>40</u>
7-County Region Total	12,704	9,114	21,818	2,611

Results of this analysis are as follows. If all landfills, including Burnsville, are granted expansions, then Burnsville landfill will close in 1988. If Burnsville landfill is not granted the expansion, it will close in late 1982, approximately six years earlier. Figure VI-1 represents this subregional system in reference to Burnsville landfill. The shaded area illustrates different projected closing dates depending on whether neighboring landfill expansions are granted or not granted.

NO ACTION ALTERNATIVE

SOCIO-ECONOMIC IMPACTS

If the proposed expansion to Burnsville Sanitary Landfill is not granted, three elements of the Regional solid waste management system would be affected directly: refuse haulers, neighboring landfills, and County and Regional government charged with siting new landfills. The general population served will be affected either directly or indirectly through secondary effects of changes in the solid waste management system. Finally, the City of Burnsville would also be affected by an earlier closing date.

As noted earlier, if Burnsville is not granted the expansion, it will close in late 1982. The haulers using Burnsville Sanitary Landfill will then have to dump their loads at other landfills which are still open. This may result in increased nonproductive driving time for some haulers. Both labor and fuel costs for these haulers may increase resulting in increased collection fees to the residents. Also new haul routes may have to be established resulting in increased wear and nuisance problems (e.g., litter, noise, fugitive dust, etc.).

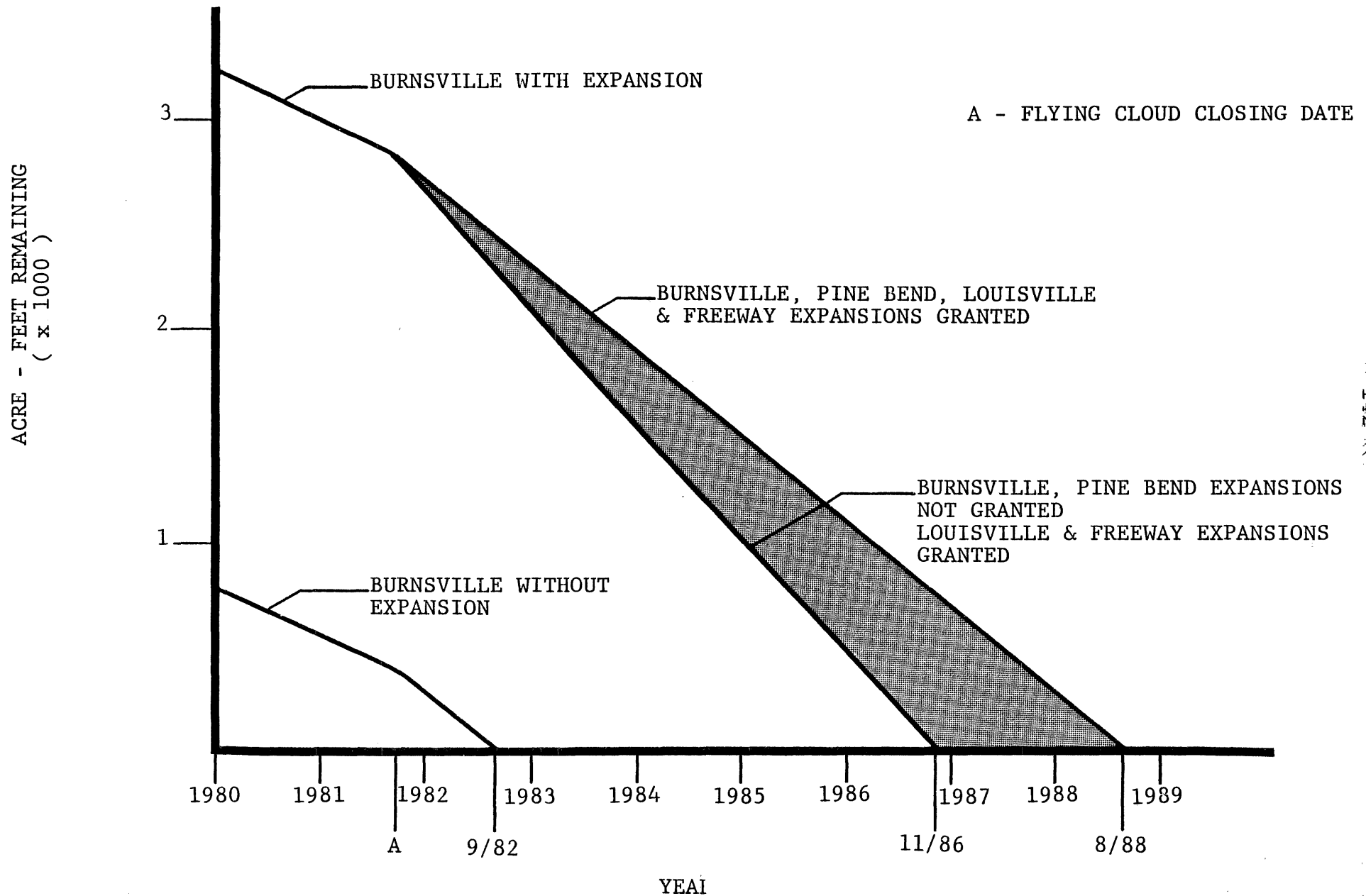
The increased receiving rates at other landfills may result in increased operational expenses in order to handle the additional volume. This may result in higher disposal charges which may, in turn, result in higher collection fees to residents.

The proposed expansion represents 2418 acre-feet of new landfill capacity. If not granted, it is reasonable to consider this capacity as part of that required by any new landfill serving the area. Developing a new landfill involves three phases or elements of work. These are preliminary planning, siting and site preparation, and operation. Generally the first two phases include assessment of need, alternatives analysis, site inventory, site selection and acquisition, environmental impact statement, hearings, permit applications, and construction and site preparation. Operation is an immediate occurrence following the first two phases.

The first phase in the development of a new site will be landfill base preparation which will involve grubbing, excavation and overburden material, grading, and the emplacement of lining material. Leachate collection and treatment system costs will vary depending on site conditions. Additional costs may include sedimentation basins and drainage facilities. To prevent scavenging,

Figure VI - 1

BURNSVILLE DISPOSAL CAPACITY PROJECTION



vandalism, and unauthorized dumping, a 10-foot high heavy gauge chain-link fence is usually erected. Additional cost factors include the construction of an access road, buildings for site personnel and equipment storage, landfill equipment and monitoring facilities.

If the entire site (120 acres) is developed initially, the estimated total construction costs would be about \$3,500,000 to \$4,000,000. Contingencies, legal, administrative and engineering costs can increase this amount by 20 to 40 percent, depending upon the complexities of the project. Thus, total estimated construction cost would approximate \$4,200,000 to \$5,600,000 to fully develop the site. Annual operation and maintenance costs, cover material, and site closure are not included in the above example.

If the expansion is not granted, a new landfill facility will have to be sited at least one year sooner. The planning, development and operation phases of landfill siting and construction for a new facility to serve the Region would have to be accelerated accordingly. The proposed expansion of Burnsville Sanitary Landfill represents about five percent of the Region's landfill capacity needs without any expansions through the year 2000.

ENVIRONMENTAL IMPACTS

The expansion represents 2418 acre-feet of additional refuse material. This added quantity of refuse will increase the total leaching potential of Burnsville Sanitary Landfill. The amount of leachate any landfill generates is a direct function of the amount of refuse buried (see Water Quality Section). If the expansion is not granted, the leaching potential would not be increased when considering volume of refuse only.

SITE SPECIFIC DESIGN ALTERNATIVES

SURFACE WATER RUNOFF CONTROL

Surface water runoff control at a sanitary landfill is achieved by grading the final slopes to promote runoff and to minimize percolation, and by vegetating the side slopes to prevent soil erosion.

At the landfill, natural drainage is generally away from the fill. The drainage ditch to the east of the site carries surface water from the east and south sides of the fill to the Minnesota River. The west and north sides of the landfill drain directly to the Minnesota River.

The proposed project will expand the existing facility by 17 acres to the west and south. The drainage pattern already established by landfilling will not be appreciably affected by the proposed expansion.

No additional or alternative surface runoff controls other than those in the proposed site development plans would be necessary.

LEACHATE CONTROL

The landfill was converted from an existing dump site when permitted in 1971. At that time a determination was made that a liner beneath the refuse would not have to be installed. Groundwater and surface water monitoring since 1971 have shown degradation of groundwater and some seasonal degradation of surface water quality in the drainage ditch east of the landfill. The extent to which leachate from the landfill has degraded the drainage ditch is unknown. The elevated parameters noticed could be the result of upstream impacts away from the landfill. The ultimate discharge of both groundwater and surface water is to the Minnesota River, which has not shown measurable contamination that can be attributed to the landfill. Land use between the landfill and the Minnesota River is severely limited due to the floodway designation of the land.

A liner and leachate collection system could be installed under the proposed expansion area of the landfill, however, the benefits to the Minnesota River would most likely not be visible and the additional cost to the project could be prohibitive.

Any leachate treatment system will vary depending on site conditions which influence flows and pollutant loadings. Capital costs for treatment facilities can vary from an estimated \$85,000 (for leachate with low strength pollutant loadings) to \$600,000 (for leachate with high strength pollutant loadings). An alternative to no liner and leachate control is continued extensive monitoring of ground water for possible effects during the active filling period and postmonitoring for a period (as yet unspecified) following final closure of the landfill. Other site-design alternatives are discussed in Section V.

Surface leachate in the form of toe seeps has been a problem. Mitigative measures for this problem have been practiced by the landfill operator. A trench has been constructed in the area of the seeps. Gravel is placed at the bottom of the trench, then the trench is filled with sand. As the sand becomes saturated with leachate, it is removed and deposited in the landfill and is replaced with clean sand. This is a bi-weekly occurrence during the seven frost-free months, April through October.

Another method of mitigating the surface toe seeps is to promote better surface runoff conditions and to minimize percolation. This alternative is already being implemented at the landfill and will continue.

GAS CONTROL

The existing landfill has no special gas control system installed, nor does the proposed lateral expansion contain a provision for such control. The landfill, to date, has had no problems with gas or odor problems beyond the landfill site and no such problems are anticipated with the expansion. In addition, no permanent buildings are located on or near the landfill which would pose a problem due to landfill gas accumulation.

The landfill has not proposed installation of a methane gas recovery system in conjunction with the lateral and vertical expansion of the landfill. Such a system, if determined economically feasible, could provide for an energy resource from a waste source and supply methane gas to industrial facilities located nearby for an appreciable period of time.

SHREDDING AND BALING

Shredding and baling as volume reduction techniques also have additional benefits for potential reduction of leachate contamination. By increasing the density of the refuse material the moisture absorption process may be slowed considerably. Infiltration within shreddfills is usually decreased due to reduced permeability of the refuse. However, there is at least a potential for increased infiltration within balefills through voids between stacks. Although the volume of leachate may increase, preliminary research has indicated balefills result in reduced leachate concentrations relative to a standard landfill. A secondary benefit from shredding includes the possibility for recovery of certain materials before landfilling.

WASTE REDUCTION

SUMMARY

Although a maximum of 15 percent of the total waste stream could potentially be reduced through full implementation of a comprehensive waste reduction program, a more realistic estimate of the impact of such a program is around four to five percent reduction of the waste stream.

MATERIALS RECOVERY

Although materials recovery is not a permanent alternative for all of the waste that will potentially be buried in the landfill expansion, materials recovery is definitely a viable alternative to immediate expansion. Additionally, materials constitute a long-term alternative for approximately 33 percent of the waste to be disposed in the expansion. It is also apparent from the beneficial environmental impacts that a material recovery program should be strongly considered in conjunction with the proposed landfill expansion.

b
Encompassed within the analysis of materials recovery alternatives to the proposed action is a more general consideration of alternatives to land disposal of specific materials. Some of the methods analyzed for implementing a materials recovery program probably fall outside the scope of the permitting process for the landfill expansion.

SYSTEM TYPES

Recycling Centers

This type of material recovery system is presently widespread throughout the Metropolitan Area. Recycling centers are either operated as drop-off depositories, taking in one or more types of recyclable material, or as redemption centers where cash is paid for the more valuable materials such as aluminum or corrugated cardboard. Typically the neighborhood drop-off centers are organized and operated by non-profit civic or church groups. Redemption centers are combined with existing metal salvaging facilities, private hauling firms or actual secondary materials markets and are operated as profit-making businesses. Recently there has been an emergence of new aluminum redemption facilities in the Region due to the increasing market price and intent of the beverage container industry to provide an alternative to potential mandatory deposit legislation.

There are currently 135 recycling centers in the Region as listed in the Metropolitan Council's May 1980 edition of the "Recycle It!" directory. Approximately 70 percent of these are operated by non-profit organizations. There is no reliable data concerning the total quantity of materials processed by these facilities. However, it is reasonable to assume that the vast majority of materials recycled from municipal waste in the Region are handled by recycling centers. The balance is accounted for by personal reuse, used furniture and clothes exchanges, and other similar recycling systems.

Source Separation

Source separation is defined as the separating of materials for individual storage at the source of generation for later pick-up and processing or reuse. Source separation is a very meritorious materials recovery system because of its inherent flexibility and cost-effectiveness. It differs from most other forms of solid waste processing in that it is decentralized and relies heavily on the continuous participation of the individual generator.

There are many types of source separation including: office paper recycling programs, mandatory or voluntary "curb-side" pick-up of recyclables complementing mixed municipal refuse collection, leaf pick-up (see composting) and other commercial and industrial programs aimed at specific materials. There are

currently several aggressive but relatively limited source separation programs in the Region. Several paper processing firms have on-going office paper recycling campaigns aimed at capturing the higher quality white office bond grade material. Four non-profit recycling centers also provide curb-side pick-up service for recyclables on a voluntary basis. One independent hauler has combined his refuse removal service with a newspaper pick-up service for his customers and may expand to include other materials in the near future. One independent scrap processor/redemption center provides a curb-side pick-up service for all recyclable materials in five neighborhoods in Minneapolis on a voluntary basis.

Picking

Picking is the process of removing valuable materials from the mixed waste stream for later sale or reuse. Picking is typically an unstructured materials recovery system that can occur at any point along the collection and disposal route. Frequency of picking activities and recovery rates directly correspond to the materials market prices.

Picking is a common practice throughout the collection and disposal industry. However, organized programs are rare because of the cost of labor and complex and fragmented structure of the Region's solid waste management system. Picking is often used in combination with mechanical separation technologies at the front end of refuse-to-energy facilities. Some transfer stations and landfills currently pick out materials on a more random basis. In California, large scale picking crews are employed at sanitary landfills as mixed refuse is dumped. Valuable items are retrieved using a conveyor system before the refuse is buried.

Mechanical Separation

Mechanical separation methods capable of segregating solid waste into valuable components have developed based on techniques used in mining and paper industries. Although still somewhat experimental, there are two basic approaches to mechanical material separation: wet processing and dry processing. Both approaches utilize a series process that begins with size reduction using a shredder (see SITE SPECIFIC DESIGN ALTERNATIVES: Shredding and Bailing), then classifies the stream into light and heavy fractions, and final processing to recover marketable materials using magnetic separators and other equipment. Mechanical separation often precedes incineration within refuse-to-energy facilities. Ferrous-aluminum magnetic separators are used throughout the Region at larger scale recycling centers and scrap metal processors, and at material market facilities. In general, only ferrous metal recovery is currently technically and economically feasible in terms of a mechanical separation technology.

Biological Treatment and Recovery

Research and demonstrations of anearobic and aerobic treatment of solid waste have increased substantially in the last five years. Anearobic treatment produces methane gas and humus. Aerobic treatment produces a sterilized humus or compost. These biological treatment methods can reduce the weight of solid waste by 50 percent. Aerobic treatment or composting can be applied to several different kinds of solid waste including leaf waste, source separated organics such as food waste, and mixed waste. The cost of curbside leaf collection and composting through the windrow method can vary between \$4.75 to \$7.35 per ton. Since collection and land disposal costs in the Twin Cities vary between \$20.00 and \$35.00 per ton, leaf composting has a substantial net benefit to society.

Source separated organics can be collected from citizens that separate solid wastes and nonrecyclable paper from other components of solid waste. Source separated organics provide an excellent feed stock for composting since the material is relatively free of glass, metal and plastics which reduce the value of the final compost product. Approximately 8,000 people in Portland, Oregon currently participate in such a program. Residents place food waste and other organics in plastic pails with sealable tops. The pails are then taken to a site where the organics are composted. When the compost is ready, area citizens use the compost for gardening. In August, 1980, a similar program may begin in neighborhoods of Columbia Heights, Minnesota.

Composting of mixed waste is also feasible as an alternative to the land disposal. Altoona, Pennsylvania and about ten other cities in the United States currently compost mixed waste. Mixed waste includes not only food wastes and yard wastes but undesirable materials such as glass, metal and plastic. Mixed waste and source separated organics are both suitable for composting with sewage sludge. Solid waste is a good bulking agent for sludge and the sludge enhances the overall nutrient value of compost.

There are several examples of successful composting operations currently in progress within the Region. Hennepin County and St. Paul operate leaf composting sites as a free service to the public. Leaves and lawn trimmings are deposited in the fall and compost mulch is available for pick-up in the spring. The City of Roseville provides free leaf, curb-side pick-up service for their residents using specialized vacuum trucks. Their municipal composting site is also available for drop-off and pick-up similar to the St. Paul and Hennepin operations. The Metropolitan Waste Contral Commission has also been windrowing filter cake sewage sludge from their Metro plant and reports excellent success and more than adequate market demand for the compost product. In general, composting has excellent potential as an alternative to landfilling organic wastes. Yard waste typically represents 14 percent of the total waste stream by volume, and food waste 15 percent and wood and paper up to 45 percent by weight.

Existing systems for biological treatment and recovery of solid waste include the following technologies:

Windrowing -- A biological process of composting on aerobic decomposition through frequent turning of the long rows of organic material. Windrow turning can be accomplished through a variety of methods utilizing special machinery.

Aerobic Chambers -- A variety of aerobic chambers are used throughout Europe to compost solid waste. While this compost technology is more capital intensive than windrowing, aerobic chambers speed up material processing because moisture, oxygen and temperature levels can be controlled. Two of the most notable processes are the Dano drum process developed in Europe and the Metro Process developed in Texas.

Clay Digester -- This technology requires shredding of all solid waste. The shredded wastes are placed in a clay lined cell that is designed to hold one year's worth of waste. The bottom of the cell is sloped to one end so that leachate can be easily collected. A clay cap is placed on the waste to prevent oxygen from entering the cell. Perforated paper is placed in the cells and pumps are used to extract methane and carbon dioxide from the waste material. Water pipes are also placed in the cell to increase moisture content and increase methane yield. After ten years of methane recovery, the material in the cell could be aerated and then distributed as a humus. With such a management practice, cells could be reused and would provide an alternative to landfill expansions.

Landfill Methane Recovery -- This technology is similar to the clay digester except that shredding and landfill design are not as important. Seven landfills in the United States are currently recovering methane. Landfill methane recovery is not an alternative to landfill expansion unless shredding is employed or if humus is recovered from the landfill.

Tree Waste Utilization

The disposal of diseased shade tree waste in the Region has historically been an additional burden on the landfills. In the past two to three years, however, landfill operators have purposely raised the drop charge for tree waste to the point that it is now prohibitively expensive. Also, the recovery rate of this valuable wood resource has increased through the use of tree chippers and sawmills and firewood production. Still, small amounts of wood waste are being landfilled which could be potentially utilized.

CURRENT MARKET CONDITIONS

The condition of the secondary materials markets vary depending on the specific material, its demand and other related factors such as current stability of the overall economy. Newsprint and ferrous markets have been subject to substantial fluctuations while aluminum, copper, brass, glass, office paper and corrugated markets, especially in this Region, are relatively stable.

There are some indications that at least some of the materials markets have begun to stabilize. There are, however, some contrary indications that the current recession is causing a slight decline in even the supposedly stable market prices such as aluminum. Energy economics and demand for virgin materials have profound influences on secondary materials markets. Secondary materials processing enjoys the advantage of significantly higher efficiencies over processing raw materials. Geographic location of markets plays a key role in materials recovery economics because of limiting transportation costs.

The following summaries describe current materials market conditions in the Twin Cities area.

Waste Paper

The newsprint market has had a poor record of extreme price fluctuations. Many recycling programs died out after the market peak and subsequent drop in 1974 due to economic recession. Since then, many new paper recovery efforts have been established and have been operating somewhat more consistently. The cellulose insulation industry has been very active after a slump from two years ago due to bad publicity concerning fire hazards, although the present building slowdown is having some effect. Also, the U.S. Department of Agriculture projects that wood fiber demand within the next five years will exceed timber production. Regional demand for waste paper from a new newsprint mill in Ontario may also be favorably influencing the Twin Cities market. So, even though the current newsprint market in this Region is unstable with only moderate demand, there are indications for improvement, especially if a new newsprint mill were to locate in this area.

The Region's corrugated and office paper markets are excellent. Hoerner Waldorf, Division of Champion International, estimated that 70 percent of the corrugated generated in the Metro Area is presently being recovered. Also, the demand for office paper from the Wisconsin mills is far in excess of what the midwest region generates.

Glass

Market prices for waste glass on a national level have remained relatively stable since 1970. In the Twin Cities, the two large glass manufacturing firms provide excellent market conditions

for cullet. Midland and Brockway Glass Companies could essentially double their processing volumes without adding new capacity.

Aluminum

Aluminum prices have also remained stable since 1970 and have recently shown slight increases. Aluminum markets in the Twin City area are considered to be excellent.

Ferrous

Ferrous markets in the Region are generally good but subject to price fluctuations. Little data is available on the market capacity.

Compost

Compost a secondary material is form of a soil enhancer and fertilizer-like material. It serves as a carbon source to plants and supplies moderate quantities of nitrogen, phosphorous and potassium. The existing compost markets include mines, nurseries, golf courses, sod farms, forestry and recreational areas, state parks, flower growers, county fairs, highway departments, and general contractors. At the present time, composted materials are not available to satisfy market demand. Market demand is now being satisfied by a somewhat nonrenewable black dirt resource. A recent MPCA study has identified over 250 individual markets in the seven county area.

Other Materials

Currently the market situation for tree waste products is very good and improving. Wood chip boilers and pelletizing plants provide a more than adequate demand.

The market for tires is uncertain. Experiments are continuing to determine the suitability of shredded tires as an alternate fuel.

There is presently a few markets available for waste plastics.

ENVIRONMENTAL IMPACTS FROM INCREASED MATERIALS RECOVERY

When recyclable resources such as aluminum, glass, ferrous, and paper are buried rather than used by primary industries, virgin raw materials are refined and processed to replace the buried secondary materials. Material recycling processes reduce environmental impacts more than virgin material manufacturing processes because recycling generally uses less energy and less raw materials while generating less solid waste, air pollution and water pollution.)

SECONDARY IMPACTS OF INCREASED MATERIALS RECOVERY

In addition to environmental benefits realized by these material recovery systems, there are several secondary benefits to the community. These benefits include conserved materials resources, conserved energy, increased public awareness of solid waste management problems and a potential increase in employment. The most important benefit may indeed be saved landfill space.

METHODS OF IMPLEMENTING SOURCE SEPARATION PROGRAMS

There are several various methods by which source separation and recycling programs can be implemented. The results of the materials recovery analysis clearly indicate that source separation provides an existing reasonable and prudent alternative to land disposal of recoverable materials. However, some of the methods analyzed for implementing a materials recovery program probably fall outside the scope of the permitting process for the landfill expansion.

This section of the materials recovery alternative analysis provides an exhaustive list of potential implementation mechanisms. Once the criteria for permit conditions and recommendations are established during the permit review process, the following discussion can provide a list of potential implementation mechanisms to be evaluated.

Differential Disposal Rates Charged at the Landfill Gate

BurnsvilleSanitary Landfill, in cooperation with the government sector could establish a differential disposal rate schedule that would adjust the individual hauler's tipping fee according to the level of source separation service provided to his/her customers. Lower drop charges would apply to those haulers who participate in some form of source separation program. It is possible that each county could be required to periodically assess the recycling efforts by haulers within their county. This assessment would be published and submitted to Burnsville landfill who would adjust the drop fees accordingly.

This method of financial incentive would directly support source separation. Implementation could be phased in over the next two to three years and also allowing time for a shakedown period.

Legislative Mandate

The state, regional, county or municipal level of government could adopt a policy or law that would require all recyclable materials which have established markets to be recovered through source separation programs. Mandatory source separation would have to be phased in over a period of time to allow the haulers and other businesses to develop their service. Materials covered under this method would have to be restricted to marketable materials.

Mandatory source separation programs across the country have shown much higher participation rates than voluntary programs.

Direct Subsidies

The government could directly subsidize materials recovery organizations through a grant and loan program. This subsidy would best be administered at the state, regional, or county level. The potential sources of revenue for the subsidy program include the following:

General Revenue -- Appropriations from the state's general fund or from the Metropolitan Council's newly established leading authority.

Waste Charge -- Direct tax on all landfills.

Manufacture's Production Charge -- Tax applied to any industry manufacturing products which are ultimately land-filled.

Pollution Enforcement Fines -- Revenue from air, land and water pollution fines returned to a non-polluting recycling program within the affected community.

Secondary Materials Price Support

The state or federal government could supplement the revenue recyclers receive from markets through direct price supports similar to milk supports.

Handicapped Labor and Employment Subsidies

Human services could be emphasized as the funding priority while assisting recycling efforts at the same time. Handicapped workers, sheltered workshops, and youth employment programs could be provided with additional subsidies to stimulate recycling programs.

Increased Public Education

All governmental units could be required to step up their public education programs in support of existing and potential recycling efforts. The objective would be to increase recovery rates through more public participation on a voluntary basis.

Ban on Land Disposal of All Recoverable Materials

If methods and markets exist for recovery of materials being landfilled, these specific materials could be banned from all landfills. One specific type of material that would most easily be banned from landfills is yard waste. There are presently several alternative methods of disposal including composting, mulching of grass rather than collecting it in bags, and chipping of brush and tree trimmings. This type of ban has been considered in various parts of the country and could potentially result in a seven to fourteen percent savings in landfill space.

SECTION VII

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

GENERAL STATEMENT

Minnesota and federal laws and regulations relating to the landfill expansion interact in many areas. However, there does not appear to be any significant areas of conflict between the two sets of laws and regulations.

FEDERAL VERSUS MINNESOTA ENVIRONMENTAL IMPACT STATEMENT

The federal agency most directly involved with sanitary landfills is the U.S. EPA. The National Environmental Policy Act PL 91-190 requires that for any "...major federal actions significantly affecting the quality of the human environment, a detailed statement...on the environmental impact of the proposed action..." be prepared.

The landfill expansion is not a federal project nor does it involve federal funding of any type. Therefore, the EPA will not draft a federal EIS regarding the proposed action.

EFFECTS OF FEDERAL AIR, WATER, SOLID WASTE AND NOISE POLLUTION LAWS AND REGULATIONS UPON COMPARABLE MINNESOTA LAWS AND REGULATIONS

The federal authority over air, water and noise pollution derives primarily from the commerce clause of the U. S. Constitution. In theory, this power is limited to activities affecting commerce among the states. In practice, however, the power touches nearly every aspect of the U.S. economy including the externalities of environmental contaminants. The federal authority over air, water and noise pollution is not, however, plenary. Minnesota's authority to regulate air, water and noise pollution derives from the Minnesota Constitution and from the powers reserved to all states by Amendment X of the U.S Constitution.

AIR QUALITY LAWS AND REGULATIONS

The EPA's authority over air pollution generally takes the form of approval and supervisory control. The EPA ambient air quality standards (AAQS) and emission regulations set maximum levels which are to be met nationwide within certain time limits. The states retain the authority to establish regulations more restrictive, but they cannot cause the relaxation of the federal regulations.

The initial efforts of the EPA under the Clean Air Act Amendments of 1970 were directed toward establishment of the AAQS. Many regions of the Country, and, more specifically, the Twin Cities Metropolitan Area, are not yet in compliance with the AAQS. In Minnesota, the AAQSS and most other air pollution control programs are implemented and enforced by the MPCA. Therefore, noncompliance is a problem

primarily to be corrected by MPCA action. For example, the EPA has had no direct involvement in the formulation of the Air Quality Agreements between the MPCA and companies with emission sources which do not meet the allowable emission levels.

In severe cases of air pollution where state control schemes are ineffective, the EPA can assume direct control, place the major emitters on compliance schedules and monitor the progress. This has not been done in Minnesota.

The program for the regulation of emissions from new stationary sources, such as the emissions from the alternative of burning solid waste in a resource recovery facility, was implemented pursuant to the Clean Air Act to bring air pollution within the concentrations established by the AAQS. The EPA has promulgated emission regulations, New Source Performance Standards (NSPS), for 19 categories of stationary sources. The MPCA has adopted most of these verbatim. Consequently, the NSPS which apply to some of the alternatives to the proposed project will be enforced by the MPCA and will require no federal involvement. The MPCA prohibits open burning as do federal regulations. The emissions from fugitive dust and vehicle traffic do not fall under the NSPS rules as a major source. Therefore, federal rules do not apply to emissions resulting from the proposed action.

As a result of a recent lawsuit, the EPA is now required to ensure that air, which is currently less polluted than the levels established by the AAQS, remains at that "pristine" level of purity. The Prevention of Significant Deterioration (PSD) program has been adopted and delegated to the MPCA. The PSD regulations create the requirement that implementation of the alternative of combustion of solid waste at a resource recovery facility would require submittal of information to the MPCA from which the EPA can determine whether the emissions will significantly deteriorate the air quality in the vicinity of the resource recovery facility. Based on the information, the EPA would grant or deny the PSD permit for a resource recovery facility.

WATER QUALITY LAWS AND REGULATIONS

Minnesota agencies have had water pollution control powers over a longer period of time than have federal agencies. The Federal Water Pollution Control Act (FWPCA) of 1972 has, however, established a uniform, nationwide scheme within which the MPCA programs now operate. Once again, the MPCA administers the program while the EPA retains approval and supervisory control.

The FWPCA established a 1983 goal of swimmable and fishable waters and a 1985 goal of zero discharge. The MPCA has encoded these goals into water quality standards which limit the concentrations or ranges of various compounds or characteristics. The EPA has little involvement in this program, except to review MPCA water quality inventory reports (MPCA 1976) and other indications of progress toward the FWPCA goals.

The principal mechanism used to achieve the water quality goals is to reduce the discharge of pollutants by new and existing point sources. This program, called the National Pollutant Discharge Elimination System (NPDES), is administered in Minnesota by the MPCA. The program establishes the requirement of an NPDES permit for every major source of polluted effluents. The NPDES permits are issued by the MPCA, with the EPA retaining a veto authority over each permit. There is no point source discharge proposed at the Burnville Landfill. The discharge of wastes into groundwater are controlled by Minnesota Rule WPC 22.

SOLID WASTE LAWS AND REGULATIONS

Federal rules promulgated under the Resource Conservation and Recovery Act of 1976 (RCRA) relate to the classification of solid waste disposal systems. The criteria require that solid waste disposal systems that are determined to be open dumps are subject to closure or upgrading. A specific site can be determined to be an open dump based on several criteria, the most significant being groundwater considerations. The criteria specify that the facility or solid waste disposal practices shall not contaminate underground drinking water sources beyond the solid waste boundary or beyond a boundary established by the state (MPCA). Provisions of WPC 22 are at least as stringent as the federal criteria, thus the state rule is controlling.

The Burnsville landfill was given a "pass" rating under the state open dump survey that was completed in December 1980. The MPCA examined past quality monitoring and operational reports of the landfill, and on the basis of these reports, determined that the landfill was in compliance with the federal land disposal criteria and state regulations.

NOISE CONTROL LAWS AND REGULATIONS

Noise emitted by stationary sources is a transient phenomenon which seldom causes interstate problems. Consequently, the federal government's role in controlling noise is limited to noise emissions from transportation-related sources and from new products moved through interstate commerce. EPA has also recently published rules for the allowable level of noise from solid waste collection vehicles. These rules should lessen the noise impacts from the operation of collection vehicles at the site.

The noise levels allowable at receptors adjacent to transportation-related sources of noise are more stringent in state rules than in federal rules. Therefore, the authority over noise emitted from transportation-related sources of the proposed action and its alternatives are under the regulation of the state.

SECTION VIII

MULTISTATE RESPONSIBILITIES ASSOCIATED WITH THE PROPOSED ACTION

GENERAL STATEMENT

The landfill and the proposed expansion and construction areas lie well within Minnesota borders, and because of this, there are no formal multistate responsibilities associated with the proposed actions. There are, however, many multistate implications, as discussed below.

ENERGY

The fuel consumed in filling the proposed expansion area will come from outside the state since Minnesota is an importer of energy products. Current energy requirements to operate the landfill would continue with implementation of the proposed actions.

WATER QUALITY

All leachate seepage entering the groundwater system will eventually reach the Minnesota River and impact it accordingly. The Minnesota River is an interstate water body used as a water supply, fishery and for recreation by other states. As previously shown, the impact of leachate seepage into the river from the landfill, and that resulting from filling the proposed expansion area, will be negligible. There would, therefore, be no impact on the quality of the river in other states. However, the cumulative impacts of leachate from landfills and other sources of pollution in the Metropolitan Area will have a significant impacts on the quality of the river in other states.

SECTION IX

IMPACTS ON COUNTY PLANNING

AUTHORITY

In 1976, the Minnesota legislature enacted the metropolitan Solid Waste Act. This act significantly increased the responsibilities of the seven metropolitan counties and the Council for solid waste management. The law required the Council to prepare a policy plan and the seven counties to implement that plan through the preparation of their own plans. Once the county plans are completed and approved by the Council, they will provide the framework for the Council's approval of future solid waste facilities.

In February 1979, the Council adopted a new regional solid waste policy plan, meeting its responsibilities under the 1976 Act. The seven metropolitan counties are presently preparing master plans that implement the Council's plan. The counties have, through the Metropolitan Inter-County Association, hired a consultant to prepare background information for their plans and as a resource to inform and educate public officials and the interested public. The county master plans will not however, be completed until the end of 1980.

COUNTY MASTER PLAN CONTENT REQUIREMENTS

Each county master plan, as per requirements of the Council's solid waste plan, must contain, among other elements:

- 1) A statement of goals and objectives for solid waste management in the county, including quantities and composition of solid waste or be managed from 1979 to 2000;
- 2) A description of existing or proposed waste facilities together with schedules regarding the extent to which such facilities will implement the Council's plan;
- 3) An implementation program that identifies public programs, fiscal devices and other specific actions planned to implement the master plan; and
- 4) The feasibility of initiating waste reduction and source separation recycling programs. In addition, the counties are required to identify and acquire land disposal areas with sufficient capacities to satisfy regional land disposal needs for the next 20 years.

The solid waste planning undertaken by the counties has recently been strengthened with the recent passage of the Metropolitan Solid Waste Act of 1980. This act provides the counties with new authorities, including local zoning override, in order to further the planning and development of new solid waste disposal facilities (see Section X, Metropolitan Solid Waste Act of 1980).

COMPLIANCE WITH COUNTY MASTER PLANS

As previously mentioned, the county master plans are in the process of being prepared. Several land disposal, waste recovery and waste reduction scenarios have been developed by the counties as background information for their plans and these scenarios were used for discussion purposes in the alternatives analysis section (Section VI) of the EIS. However, until these plans are completed and approved by the Council, their compatibility with the proposals at Burnsville cannot be determined.

Perhaps most important, once completed and adopted by county boards, the master plans will represent a number of policy positions that the counties have taken with respect to the future land disposal and recovery of solid waste. Expanding the landfill will represent an increase in remaining disposal capacity in Dakota County, a county that is already disposing of about 50 percent of the solid waste generated in the Region. Quite clearly, decisions with respect to expanding the landfill must not preclude or adversely affect the county planning and decision-making process, particularly Dakota County's.

SECTION X

IMPACTS ON REGIONAL PLAN

METROPOLITAN SOLID WASTE PLAN

COMPLIANCE WITH REGIONAL PLAN

The following discussion concerns the proposed action's compliance with the policy framework and pertinent review criteria contained in the Council's regional solid waste policy plan.

Policy Framework

The Council's solid waste plan states that the siting and development of new landfills and increasing the capacity of existing sites must begin soon to meet the Region's disposal needs. The proposed filling of the expansion area at the landfill is certainly consistent with this objective. The proposal, however, must be balanced against the availability of present or future waste recovery or reduction methods for the Region's solid waste stream.

Review Criteria

Criterion 2c -- This criterion states that the development of proposed solid waste management facilities should be compatible with the Region's growth forecasts, the need to replace existing facilities and county schedules for implementing new waste facilities.

The proposed expansion of the landfill will add to the life of the metropolitan land disposal system. The proposed expansion is consistent with the Council's determination that the siting of new landfills and expansion of existing landfills needs to be undertaken soon. However, the seven metropolitan counties are in the process of developing their solid waste master plans. These plans, along with the work required under the new Metropolitan Solid Waste Act, will provide development schedules for new land disposal, recovery and waste reduction facilities in the Region. Until this work is completed, it is difficult to determine the compatibility of the proposed expansion with other major planning efforts as required by this criterion.

Criterion 4b -- This criterion states that sites should be accessible year round by highways that have adequate capacity. In addition, this criterion states that roads used for hauling must meet safety standards of the governmental units having jurisdiction over them and that access to the site should not depend on the use of local and collector streets through residential areas.

Access to the Landfill is good.

Solid waste is brought to the disposal site by commercial haulers or private individuals along the roads shown in Figure II-1. There are two all-weather, blacktop access roads to the landfill. The primary haul routes are Interstate Highway 35W with access at Cliff Road (formerly 122nd St.), and Highway 13 with access at an unnamed road from a controlled intersection on Highway 13.

The landfill expansion will require the construction of an access road to the horizontal expansion area in Phase 2 as shown in Figure II-8. The new access road will be an all-weather road with a minimum width of 30 feet and a crushed rock surface.

Access to the landfill does not depend on the use of local and collector streets through residential areas.

Criterion 4d -- This criterion states that, where possible, sites should be visually compatible with adjacent property or development. This criterion further states that residential and other nonindustrial land uses are considered compatible only if there are barriers to reduce noise and obscure public view.

The landfill, including the expansion area, is compatible with the adjacent land uses in the area. The property surrounding the landfill is zoned for general industrial uses (see Section III, Socio-Economics).

Filling of the proposed expansion areas will result in the landfill operating 6 years longer. A few nearby homes (in the Bloomington area) that look directly upon the landfill will be exposed to the operation of the facility for these additional years and any subsequent visual impacts. Such impacts will be greater than those already present since the final vertical elevation of the expansions will create an isolated mound virtually level with the opposing bluff in Bloomington.

Criterion 5a -- This criterion states that the site selection process for land disposal facilities should include an evaluation of the site's capacity to assimilate waste and its constituents.

Groundwater monitoring since 1971 has shown some degradation of groundwater immediately underneath the landfill. However, ultimate discharge of ground water is to the Minnesota River, which has not shown measureable contamination that can be attributed to the landfill. Dilution within the river appears sufficient to mitigate any potential adverse impacts from leachate produced by the landfill.

Criterion 5b -- This criterion provides that applicants should ensure that environmental monitoring will be conducted when the facility is operating, and should include evaluations of air and water quality.

The water quality portion of Section III discusses in detail the water monitoring program at the landfill. The current monitoring plan includes sampling of groundwater wells for chemical oxygen demand, pH, chloride, ammonia, and specific conductance. The groundwater level is also measured in each well prior to sample collection. The drainage ditch located east of the landfill is

monitored for the same parameters at two locations shown in Figure II-7 wells and drainage ditch are sampled once every three months. All information is reported to the MPCA.

The landfill expansion will require the placement of two new water quality monitoring wells. The new monitoring wells will be constructed using the procedures used to place existing monitoring wells W-2, W-3 and W-4. The wells will be constructed of PVC pipe and screen. The annulus around the well screen will be backfilled with clean sand and sealed at the surface to prevent the direct movement of surface water to the well screen. Well screens will be placed five feet below the groundwater surface. The monitoring wells will be placed within two months after approval of landfill expansion unless approval comes during the period October 1 to April 1 in which case the new wells will be placed by June 1.

Operation of the landfill has not resulted in any reported air quality problems at the facility itself or the surrounding area. There appears to be adequate measures to contain fugitive dust and other emissions generated by operations of the landfill (see Air Quality, Section III). Environmental monitoring for air quality related problems doesn't appear necessary at the site.

Criterion 5g -- This criterion states that the grounds of solid waste facilities should be landscaped wherever possible. The criterion further states that those areas where waste is dumped or salvaged should be screened from public view and routine measures should be instituted to control dust, blowing litter, odors and other potential nuisances.

Litter on the landfill site is controlled by litter control fences and a litter pickup crew. Two fences have been placed on the east edge of the landfill as shown in Figure II-7. One is located at the base of the refuse and the second is located at the top of the refuse. Beginning in the spring of 1980, a portable wind screen will be used near the working face to minimize the amount of windblown litter leaving the working face. Two attendants pick up paper and other litter that may be scattered on the site.

The landfill has been cited a number of times by the MPCA for litter violations. Since approximately the fall of 1979, the landfill has shown great improvement in the routine operation of the site, and the site continues to be operated in substantial compliance with the solid waste rules as of February 1981 (see Appendix II).

The location of litter control fences may be changed during the course of the landfill operation; however, a fence will remain in place along the east edge during the entire operation. Fencing will also be placed along the toe of the dike in the 17-acre horizontal expansion area.

Refer to Criterion 4d for a discussion on visual impacts.

Criterion 6c -- This criterion states that proposed solid waste management facilities should have controlled access to prevent entry or unauthorized disposal during nonoperational hours.

Access to the landfill is controlled by the attendant in the scale house during working hours and by locked gates during nonoperating hours. A night watchman is on duty when the landfill is closed. The landfill area, however, is not fenced and off-road access is possible.

METROPOLITAN SOLID WASTE ACT OF 1980

PURPOSE

This new law sets forth a major land disposal siting process in the Metropolitan Area. It is an unusual siting process, in that it places heavy emphasis on reducing the need for land disposal in the Region. Important policy decisions are required under the law by a number of participants that may affect all or a portion of the solid waste going to Burnsville, given its expansion.

SITING PROCESS

Each of the seven metropolitan counties is required by June 1, 1981 to identify four eligible land disposal sites that will handle municipal solid waste. These sites are then reviewed and approved by the Metropolitan Council and adopted as part of a metropolitan inventory of eligible land disposal sites. The Council and counties will then undertake an abatement process to reduce the need for land disposal in the Metropolitan Area. Technologies and processes will be identified to recover and reduce the amount of solid waste generated in the Region. The timeframe for the implementation of these abatement strategies will also be determined. Once this process is completed, the final selection of needed landfill sites will take place. Land disposal sites will be acquired in fee for those scheduled for development as a facility through the year 1990; development rights will be acquired for those sites scheduled for development from 1991 through the year 2000. The entire site selection process is required by law to be completed by 1984.

THE NEW ACT AND EXPANSION OF THE BURNSVILLE LANDFILL

Expanding the landfill will certainly reduce the need for land disposal space that would require to be identified under the new law. Moreover, expansion of an existing landfill is socially and economically much more acceptable than the difficult, time consuming, expensive and controversial process of finding a new site. Expanding the landfill, therefore will lessen the apprehension and tension associated with what is becoming a major public issue in the Metropolitan Area, the disposal of refuse.

It is important to point out, however, that expansion of the landfill will satisfy only a fraction of the Metropolitan Area's future land disposal needs. Expansion of this site alone will not contribute greatly to the future land disposal needs of the Region.

A major portion of the new law requires the identification of a schedule for abating the land disposal of solid waste in the Metropolitan Area. This schedule of achievable abatement procedures is required to be implemented by the metropolitan counties as per direction provided by Council land disposal abatement plan. This

process is crucial with respect to Burnsville and should provide the necessary information to determine approximately what portion of the solid waste going to Burnsville can be recovered or reduced.

Presently, the landfill has a remaining permitted capacity of about 806 acre-feet, or about two years of life at the facility. Given the expansion, the landfill will have a remaining capacity of about 3,000 acre-feet, or 8 to 10 years of life. Both of these timeframes extend a number of years beyond completion of the metropolitan landfill siting-abatement process required under the new solid waste law. It is possible that a decision could be made to delay expansion of the site until the landfill siting-abatement process is completed; or perhaps a time limit is imposed on the permit or a trade-off made with respect to other permitted areas of the landfill until the siting abatement process is completed. It is important that decisions, with respect to expansion of the landfill, take into account information that will be gained in the future concerning the reduction and recovery of waste going to the site.

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APPENDIX I

Legal Descriptions

Legal Description

Existing Fill Area

Section 32 of Township 27 North, Range 24 West,

<u>$\frac{1}{4}, \frac{1}{4}$ Sections</u>	<u>Parcel Numbers</u>	<u>Landfill Area (Acres)</u>
SE $\frac{1}{4}$ of NW $\frac{1}{4}$	02-03210-010-35	16.6
SW $\frac{1}{4}$ of NE $\frac{1}{4}$	02-03210-010-18	37.4
NW $\frac{1}{4}$ of NE $\frac{1}{4}$	02-03210-010-12	15.1
NW $\frac{1}{4}$ of NE $\frac{1}{4}$	02-03210-010-23	3.4
NW $\frac{1}{4}$ of SE $\frac{1}{4}$	02-03210-013-95	<u>11.7</u>
		84.2

Legal Description
Proposed Fill Area

Section 32 of Township 27 North, Range 24 West

<u>40-Acre Tracts</u>	<u>Parcel Numbers</u>	<u>Landfill Area (Acres)</u>
SE $\frac{1}{4}$ of NW $\frac{1}{4}$	02-03210-010-35	28.1
SW $\frac{1}{4}$ of NE $\frac{1}{4}$	02-03210-010-18	31.4
NW $\frac{1}{4}$ of NE $\frac{1}{4}$	02-03210-010-12	5.6
NW $\frac{1}{4}$ of NE $\frac{1}{4}$	02-03210-010-23	3.2
NW $\frac{1}{4}$ of SE $\frac{1}{4}$	02-03210-013-95	<u>3.1</u>
		71.4

APPENDIX II

Chronology of Significant Events

MPCA Site Inspections

BURNSVILLE LANDFILL

- July 9, 1969 - Letter from the Department of Conservation stating they did not have the authority to permit a landfill in a floodplain.
- October 7, 1969 - Prior to this date, the Lower Minnesota River Watershed issued a permit for a landfill.
- April 19, 1971 - Dakota County Commissioners question MPCA for allowing landfills in the floodplain.
- June 4, 1971 - Burnsville Environmental Council letter opposing landfills in a floodplain.
- June 8, 1971 - State Attorney General letter--Burnsville Landfill as proposed will violate SW Regulations 4 and 6.
- October 19, 1971 - Dakota County issued temporary permit for the operation of the Burnsville Landfill.
- October 19, 1971 - MPCA issued SW 56, a limited permit for the operation of the Burnsville Sanitary Landfill with a variance for municipal wells. This permit will expire on October 14, 1973.
- December 8, 1971 - Violation--dump area too large
--toxic waste handling improper
--poor operation
- March 17, 1972 - Violation--litter
--no toxic waste
- May 19, 1972 - Violation--dump is too large
--litter
--surface drainage poor
--daily cover
--poor compaction
--erosion
- June 6, 1972 - Violation--drainage from face
--daily cover
--working face too large
- July 10, 1972 - Violation--final cover
- September 22, 1972 - Violation--litter
--salvaging
--compaction
--surface drainage

October 6, 1972	-	Violation--salvaging --working face too large --surface drainage --poor operation
March 6, 1973	-	Department of Natural Resources letter to MPCA requesting suspension of the requirement for landfills in floodplains be protected against flooding until a detailed study of Lower Minnesota River floodplain is complete.
April 24, 1973	-	Violation--daily cover --litter --erosion --salvaging --dikes being constructed
June 6, 1973	-	Violation--working face too large --salvaging
November 13, 1973	-	Violation--burning brush --daily cover --litter --site maintenance
April 27, 1974	-	Violation--litter --site maintenance
July 22, 1974	-	Violation--litter --intermediate cover --monitoring reports late
September 17, 1974	-	Violation--litter
November 21, 1974	-	Permit modification to allow for an additional 20 feet of fill, elevation to 760.
January 15, 1975	-	Violation--litter
January 30, 1975	-	Violation--litter
April 8, 1975	-	Violation--litter
May 12, 1975	-	Violation--daily cover --burning --salvaging --litter
June 25, 1975	-	Violation--daily cover --tires in the wetlands
July 14, 1975	-	Letter from the U.S. Fish and Wildlife Service. Objected to the digging of the ditch and filling in a wetland.
July 28, 1975	-	Violation--monthly reports not in.

August 8, 1975	-	Letter from MPCA to U.S. Fish and Wildlife Service answering these concerns: only demolition material is to be placed in the wetlands and then covered; water in the wetlands appears to be flood waters from the Minnesota River.
November 5, 1975	-	Violation--litter
January 30, 1976	-	Left height will be limited to eight feet, not 30 feet.
March 16, 1976	-	Violation (concerns) --final cover --hazardous wastes storage room not locked properly
April 14, 1976	-	Violation--litter --daily cover
May 26, 1976	-	Violation--daily cover --litter control --monthly reports
February 1, 1977	-	Violation--daily cover --litter --burning --two working faces
April 15, 1977	-	Violation--burning --litter --terminal cover
May 8, 1977	-	Violation--daily cover --litter --final cover --salvaging
May 9, 1977	-	Violation--daily cover --working face too large --ready-mix placed in ponds to the east --vegetation
July 11, 1977	-	Violation--daily cover --surface drainage --plan compliance
August 4, 1977	-	Violation--daily cover --working face too large --intermediate cover --salvaging
September 26, 1977	-	Violation--terminal cover --operating reports --plan compliance

October 21, 1977	-	Violation--litter --daily cover --plan compliance
November 9, 1977	-	MPCA approves plans for the dike construction.
July 19, 1978	-	Corps of Engineers approves permit to construct the dike.
December 26, 1978	-	Violation--daily cover --working face too large
January 17, 1979	-	Violation--working face too large
May 7, 1979	-	Operational reports are one and one-half years behind.
April 20, 1979	-	Violation--litter --cover --leachate
May 3, 1979	-	Violation--leachate --working face too large --daily cover --final cover
June 1, 1979	-	Violation--leachate --working face --daily cover --intermediate cover
July 2, 1979	-	Violation--daily cover --intermediate cover --final cover --leachate
August 1, 1979	-	Violation--leachate --daily cover --final cover
September 5, 1979	-	Violation--leachate --daily cover --intermediate cover --final cover --vegetation
October 3, 1979	-	Violation--leachate --daily cover --intermediate cover --final cover
November 5, 1979	-	Violation--leachate --daily cover

December 3, 1979-		Violation--leachate --working face too large --daily cover --final cover --vegetation
December 14, 1979	-	Violation--leachate --working face too large --daily cover --intermediate cover --final cover
January 22, 1980	-	No violations
February 5, 1980	-	Stipulation Agreement with MPCA
February 12, 1980	-	No violations
March 3, 1980	-	Operational reports were not submitted
April 11, 1980	-	No violations
May 5, 1980	-	Violation of stipulation agreement --test cell not completed
June 10, 1980	-	Violation--test cell
July 9, 1980	-	Violation--test cell
August 15, 1980	-	No violations
September 18, 1980	-	No violations
October 10, 1980	-	No violations
November 7, 1980	-	No violations
December 15, 1980	-	No violations
January 22, 1981	-	No violations

SA3382

APPENDIX III

**SUPPLEMENT TO
DRAFT ENVIRONMENTAL IMPACT STATEMENT
BURNSVILLE SANITARY LANDFILL EXPANSION
BURNSVILLE, MINNESOTA**

January 20, 1981

**Metropolitan Council
Suite 300 Metro Square Building
St. Paul, Minnesota 55101**

INTRODUCTION

In August 1980, the Minnesota Environmental Quality Board granted the Metropolitan Council an extension of time to complete the environmental impact statement (EIS) on the Burnsville Sanitary Landfill expansion. The extension of time was necessary to await the results of a report being prepared for the City of Burnsville on its water supply well field expansion. The City's well field is located about a 1.5 miles east of the Landfill. The Council felt the City's report would provide further definition on the groundwater hydrology in the vicinity of the Landfill and any impacts that might occur to the groundwater and City's well field as a result of the Landfill's expansion.

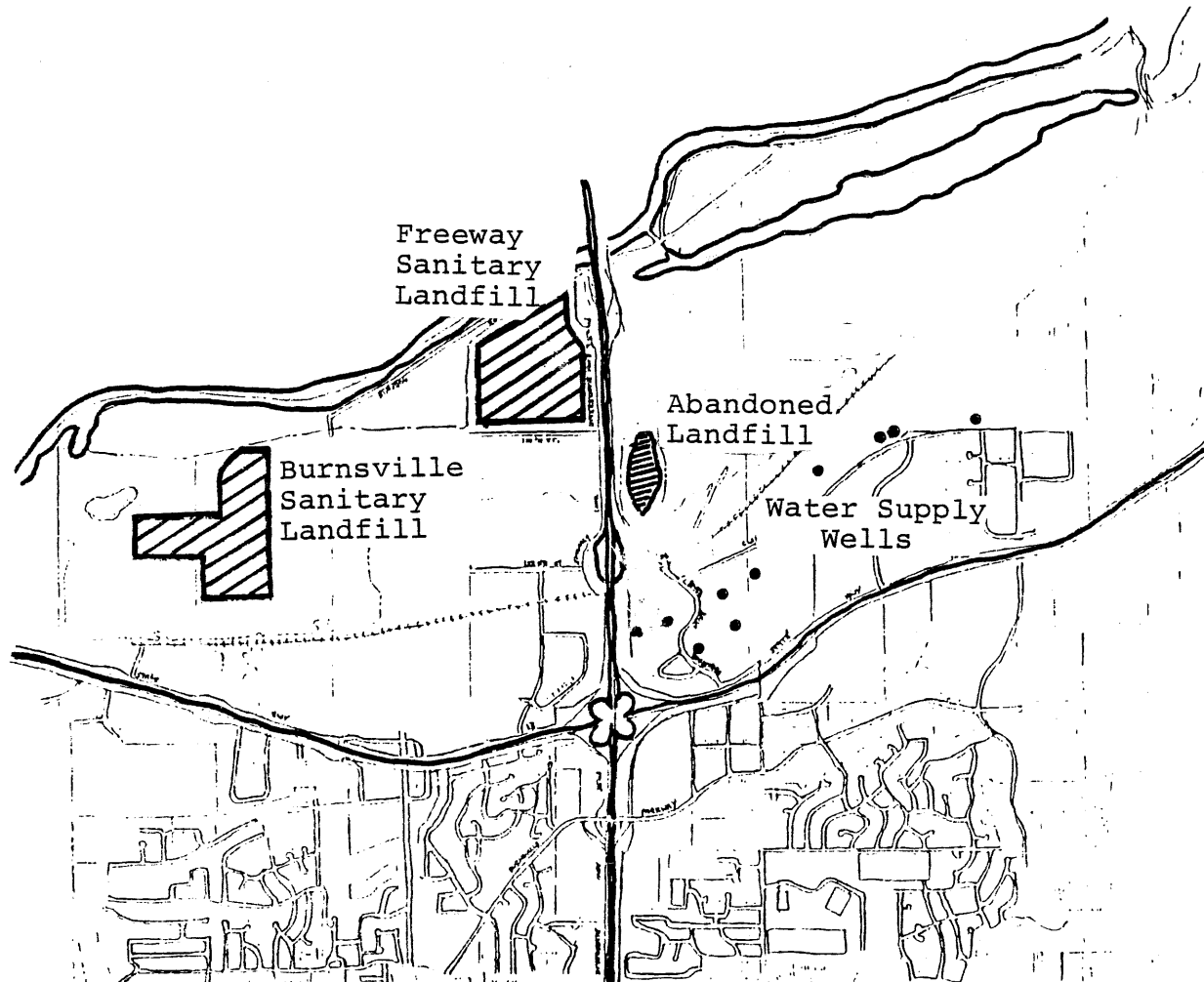
The City's report on its water supply well field expansion was completed in December 1980. The following analyses of the City's report will supplement the draft EIS on the Landfill expansion.

WELL FIELD TESTING PROGRAM

Well field testing procedures, starting in March 1980, were conducted as part of Burnsville's continuing municipal water well development program. The well field testing program was undertaken in response to conclusions presented in a report regarding groundwater investigations in 1978 which identified a condition that posed a potential contamination threat to the Jordan aquifer in the well field area. According to the 1978 report, observed interference water level fluctuations indicated the possibility of groundwater gradient reversals extending beneath the Minnesota River floodplain.

The proximity of the City's water supply well field to the Landfill is shown in Figure 1. As can be seen, the Landfill is about 8,000 feet to the west of the well field. In addition, Figure 1 shows the location of the Freeway Sanitary Landfill and an abandoned landfill north and slightly west of the well field. The immediate location of the abandoned landfill to the well field was the major reason for the City to undertake the 1980 study. The possibility of leachate from this landfill descending to the Jordan aquifer during periods of pumping at the wells that produce the gradient reversal represented the most immediate potential threat.

The implementation of the well field testing procedures required as a basic minimum, one observation well in Jordan sandstone and one observation well in the Shakopee dolomite. Accordingly, the existing Jordan aquifer well located at the former site of the City's sewage treatment facility was modified for water level instrumentation and a new well was constructed in the Shakopee dolomite approximately 48 feet south of the Jordan aquifer well.



Burnsville's Water Supply Well Field

Figure-1

Water samples were collected weekly starting on July 1, 1980 and continuous water level recorders were installed at the Jordan and Shakopee observation wells on July 17, 1980. Pumping tests were then run at the City's water supply wells number 2, 3, 4, 6, 7, 8 and 10 during the month of August (see Figure 2). The tests consisted of pumping an individual well for two hours while the other wells remained off. The closest wells to the pumping well were used as observation wells. Water level fluctuations were also recorded at the Jordan and Shakopee observation wells.

HYDROLOGY

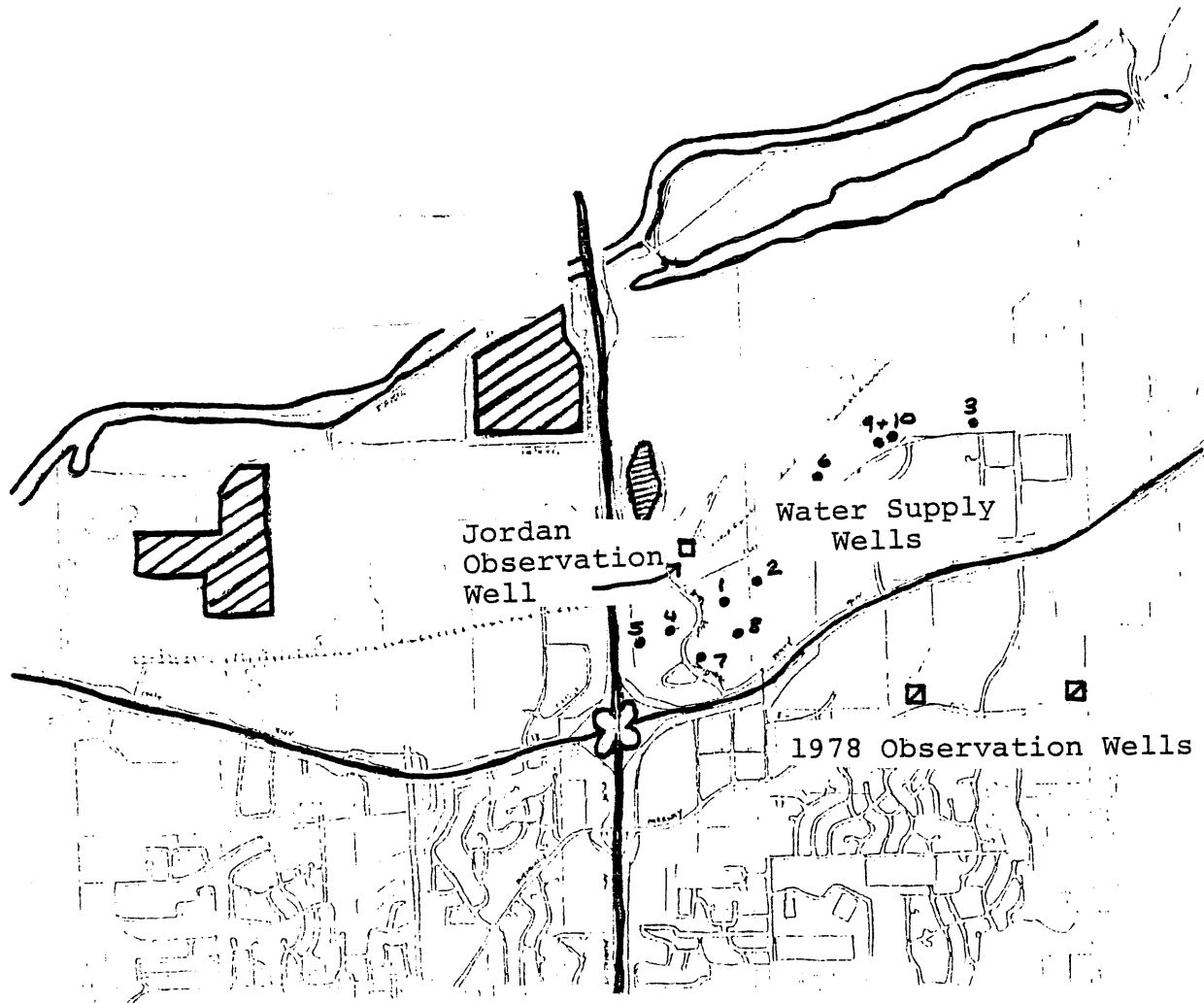
In evaluating an aquifer that is selected as a source of water supply, the recharge and discharge relationship with underlying and overlying aquifers must be considered. Under natural conditions the water in the Jordan sandstone was in a state of equilibrium. Although the water level fluctuated from season to season and year to year in response to changes in recharge and discharge, over long periods of time the average discharge was equal to the average recharge and the fluctuation occurred through a relatively narrow zone.

Prior to the development of groundwater supplies or other works of man that disturbed the natural flow of groundwater, recharge to the Jordan aquifer occurred mainly beneath the upland areas remote from the major stream valleys and discharge occurred through the overlying geologic units to the major streams and lakes located in the floodplains. At Burnsville, the natural groundwater discharge was concentrated in the Minnesota River Valley and ultimately, the groundwater left the area as stream flow or evapotranspiration.

A potentiometric surface map based on available water levels in Jordan wells is shown on Figure 3.

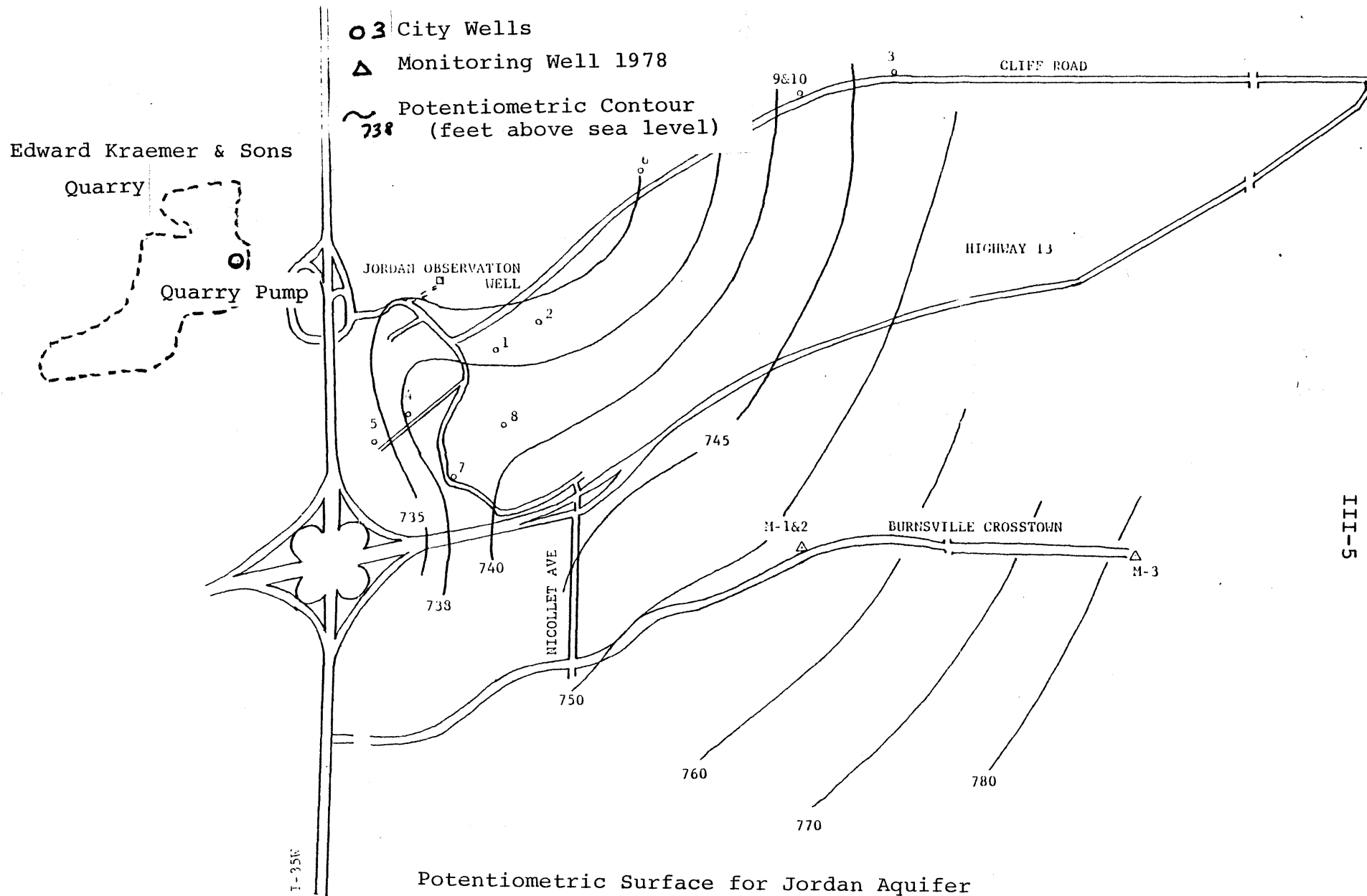
The installation of wells in the Jordan aquifer and development of a quarry in the overlying Shakopee-Oneota dolomites approximately 3,000 feet west (see Figure 3) of the observation wells tends to modify the natural equilibrium and distort the flow patterns within each unit as well as the groundwater transfer between the units. Dewatering operations at the quarry, which is in an area of natural groundwater discharge, created a cone of depression, increased the vertical gradient from the Jordan aquifer and consequently also increased the transfer of water from the Jordan. In contrast, the new wells open only to the Jordan aquifer, tend to reduce the vertical gradient in the areas of natural discharge and in heavily pumped areas cause a transfer of water from the dolomite to the sandstone.

The geologic cross sections shown on Figures 4 and 5 represent the stratigraphy of the Burnsville area and indicate the general direction of groundwater flow. In a natural condition the hydraulic gradient is from the south to the north, flowing towards the river. Under the influence of pumping of the city wells, this gradient is reversed in the area north of the well field, such that groundwater moves to the south towards the well field. Along with the reversal of the groundwater flow there is leakage from the Shakopee dolomite into the underlying Jordan sandstone.



Well Field Testing Program

Figure 2

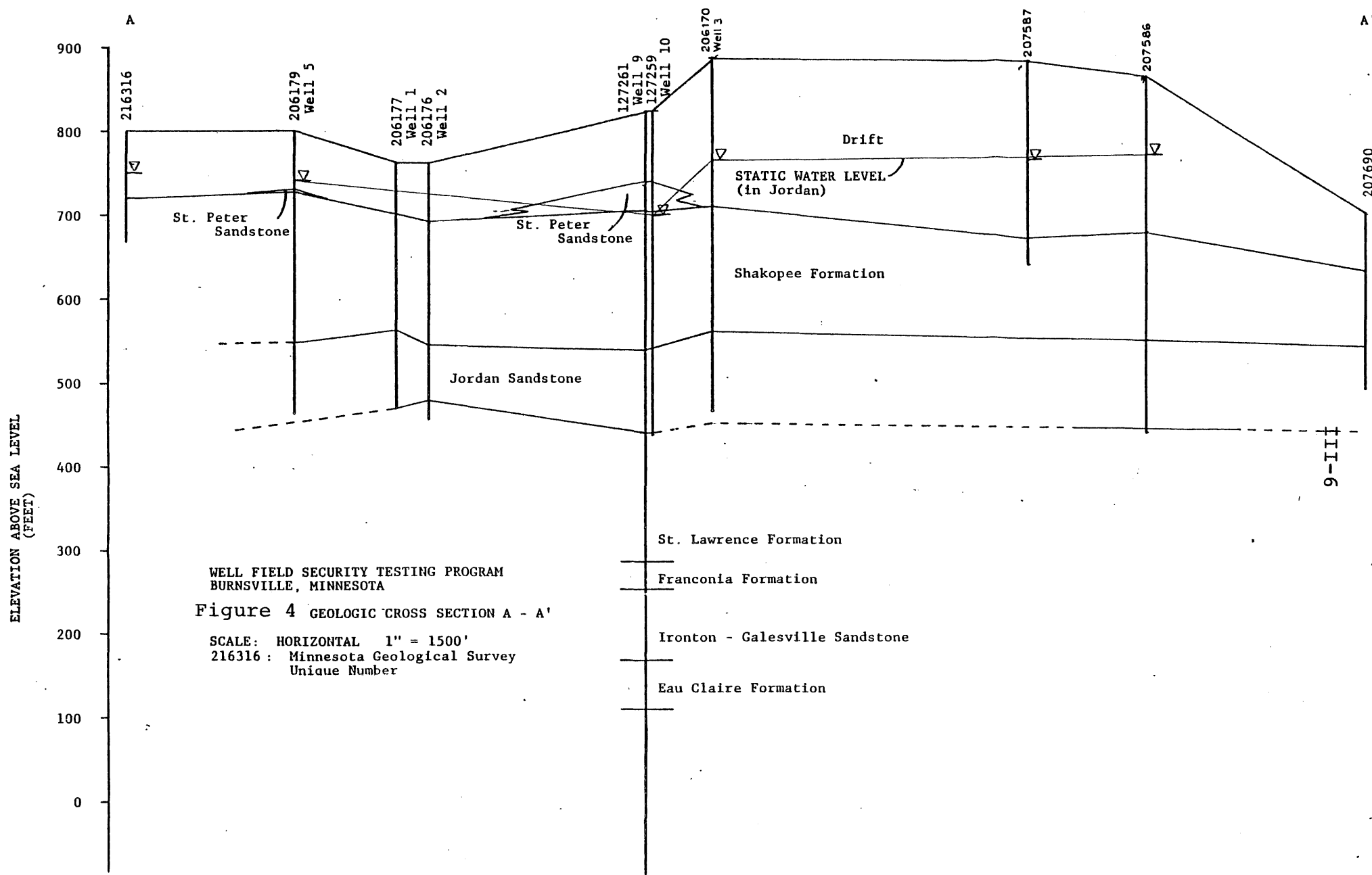


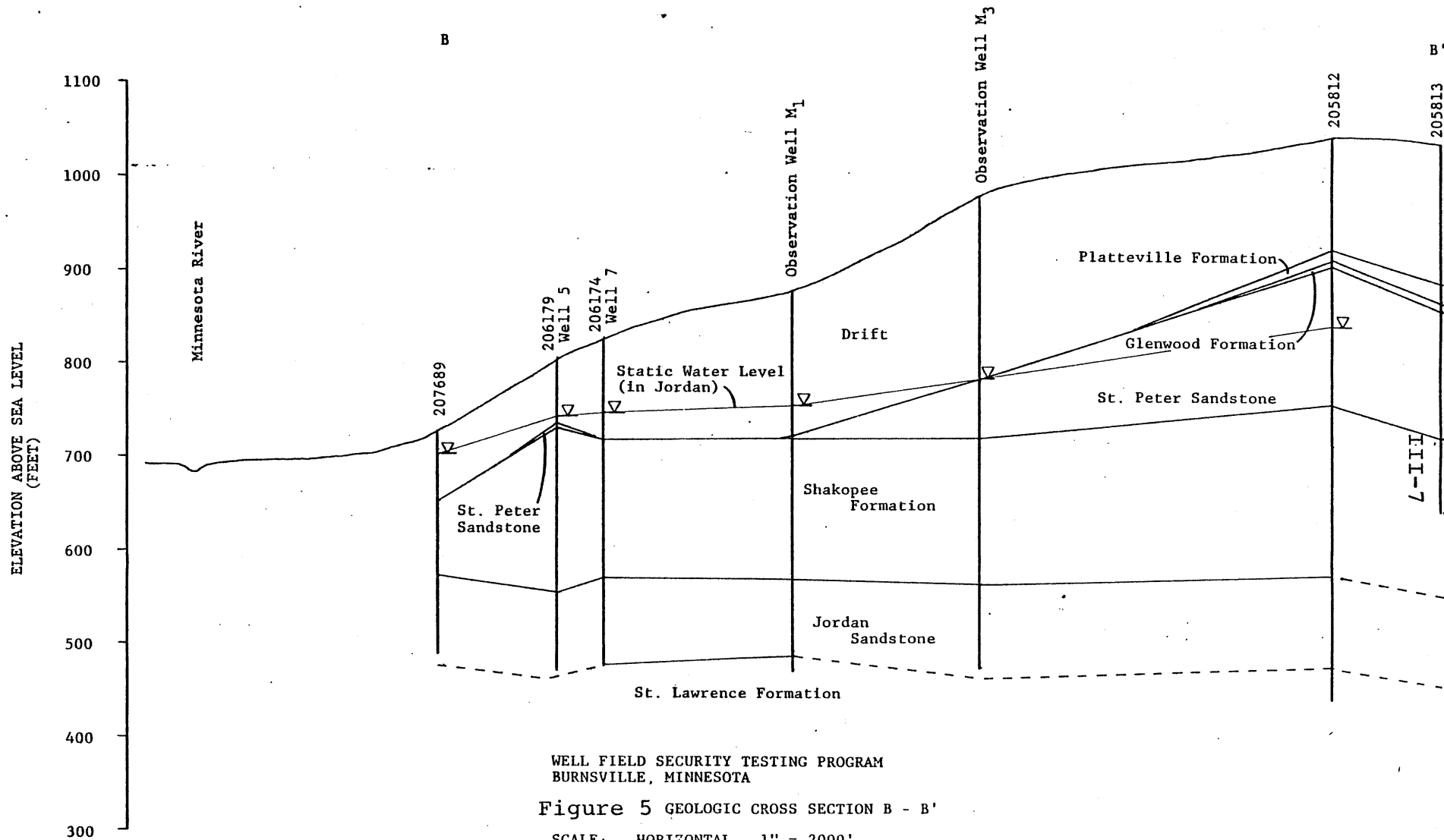
P. S. 1-35W

Potentiometric Surface for Jordan Aquifer

Prepared by Bruce Liesch Associates for City of Burnsville

Figure 3





WELL FIELD SECURITY TESTING PROGRAM
BURNSVILLE, MINNESOTA

Figure 5 GEOLOGIC CROSS SECTION B - B'

SCALE: HORIZONTAL 1" = 2000'

207689: Minnesota Geological Survey
Unique Number

This reversal of the groundwater flow takes place during part of the pumping cycle and during part of the recovery cycle. Reversal of flow is known to be noncontinuous because after the pumping of all the city wells, the Jordan observation well recovers to the point where it is discharging at the surface while the Shakopee well has a water level 8 to 9 feet below the surface. This indicates that the Jordan is leaking into the overlying Shakopee and flow into the Jordan from above cannot take place.

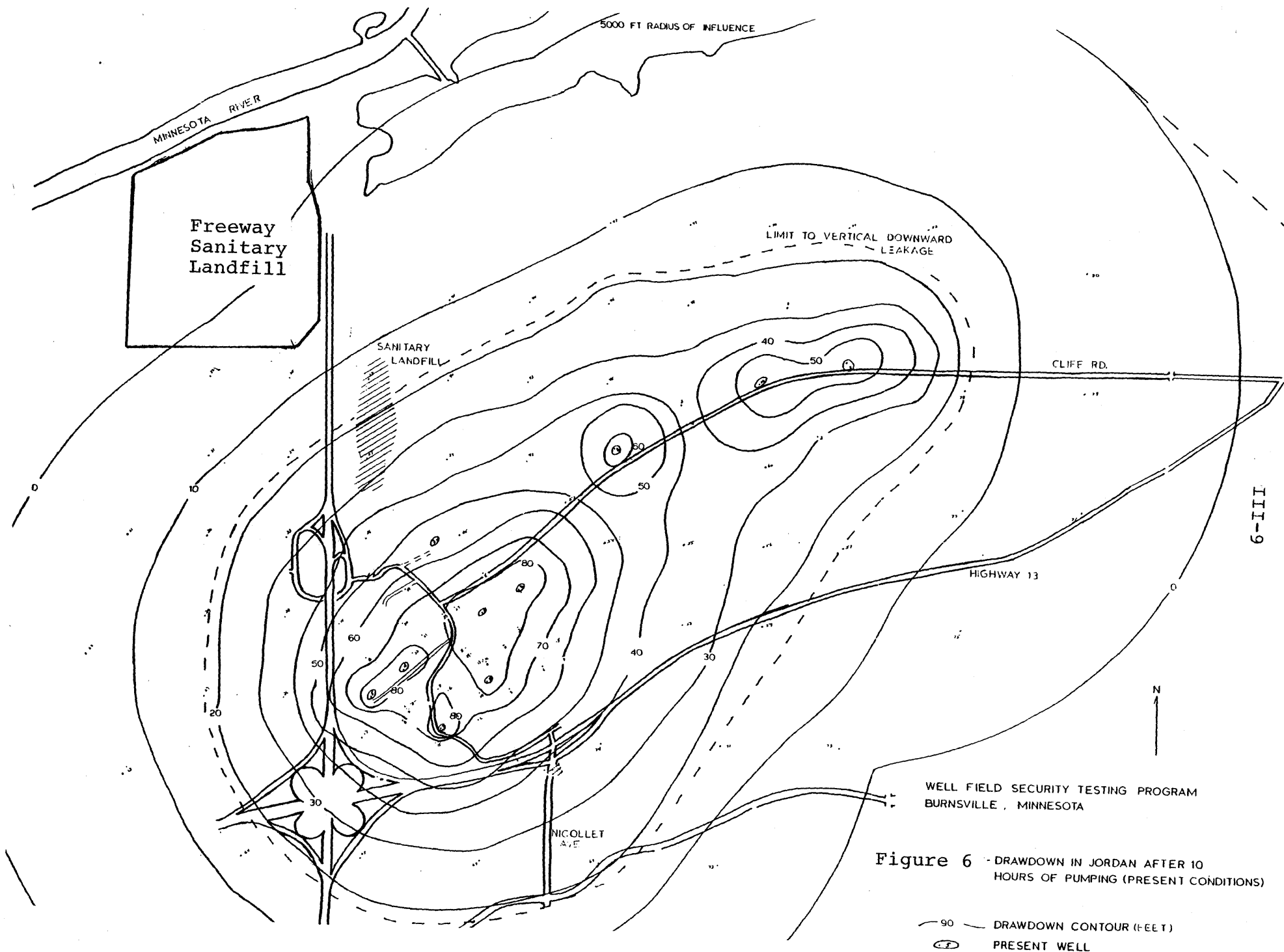
PUMPING TEST ANALYSIS

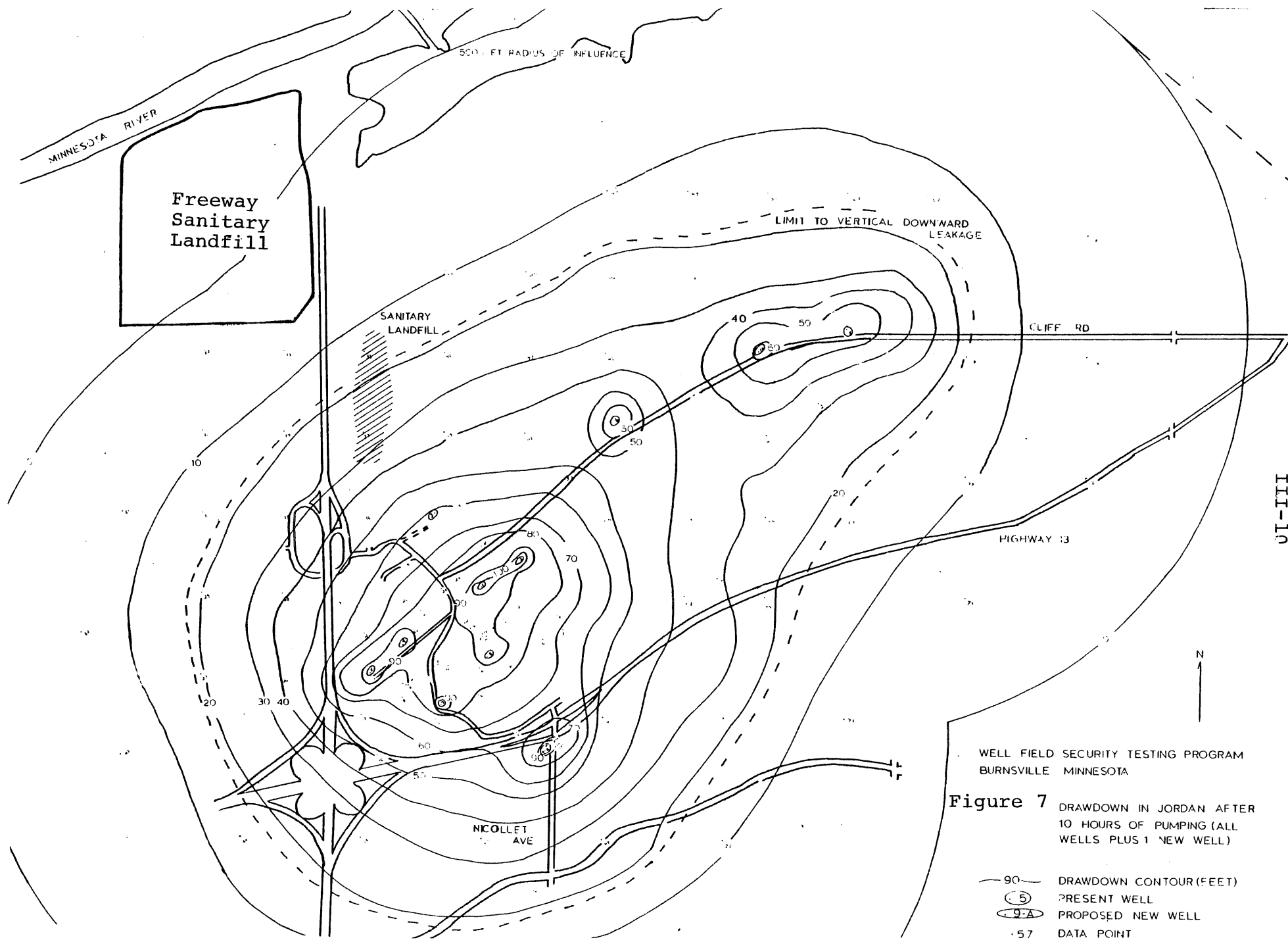
During the testing procedure at each well, drawdown and recovery water levels were measured at the pumped well, at nearby municipal production wells and at the Jordan and Shakopee observation wells. The data were plotted and analyzed using the time-drawdown, time-recovery Theis non-equilibrium method modified by Jacob, and by distance-drawn equilibrium methods.

Upon completion of the analysis of the pumping data, a mathematical model, based on distance-drawdown curves, was developed to simulate the reaction of the aquifer and its potentiometric surface to varying pumping rates and well field configurations. This allowed a study of the reaction of the aquifer to the location and pumping of new wells in various configurations. As a calibration control for the model, a pumping test was run October 13 and 14, 1980. This test consisted of pumping all the wells except 6, and observing the drawdown in the wells throughout the 9.5 hours of pumping. Water levels were measured before the test to determine the trend caused by recovery from antecedent pumping and to determine the approximate projected water level in the flowing Jordan observation well.

The computed drawdowns derived from the mathematical model and the actual drawdowns observed in the October 13 and 14 pumping test were in very close agreement, especially in the observation wells. This indicates that the model, based on the distance-drawdown curves, along with the assumptions are representative of the hydraulic conditions in the Burnsville well field area.

Drawdown maps were compiled using the aquifer mathematical model to observe the reaction to various well configurations. The first drawdown map, Figure 6, represents the drawdown associated with pumping all the present city wells at 1200 gpm for 10 hours, at which point equilibrium was reached. An additional well was then added at the intersection of Nicollet and Highway 13 (SW corner) and a drawdown map developed to study the change in the Jordan water levels, Figure 7. The proposed new well was assumed to be located in a segment of the aquifer represented by the model in the vicinity of well 8. With this new well pumping, additional drawdown observed at the Jordan observation well would be 2.6 feet after 10 hours of pumping. In a worst-case scenario the new well could follow the distance-drawdown curve for well 2 and cause 4.3 feet of drawdown at the Jordan observation well at equilibrium.





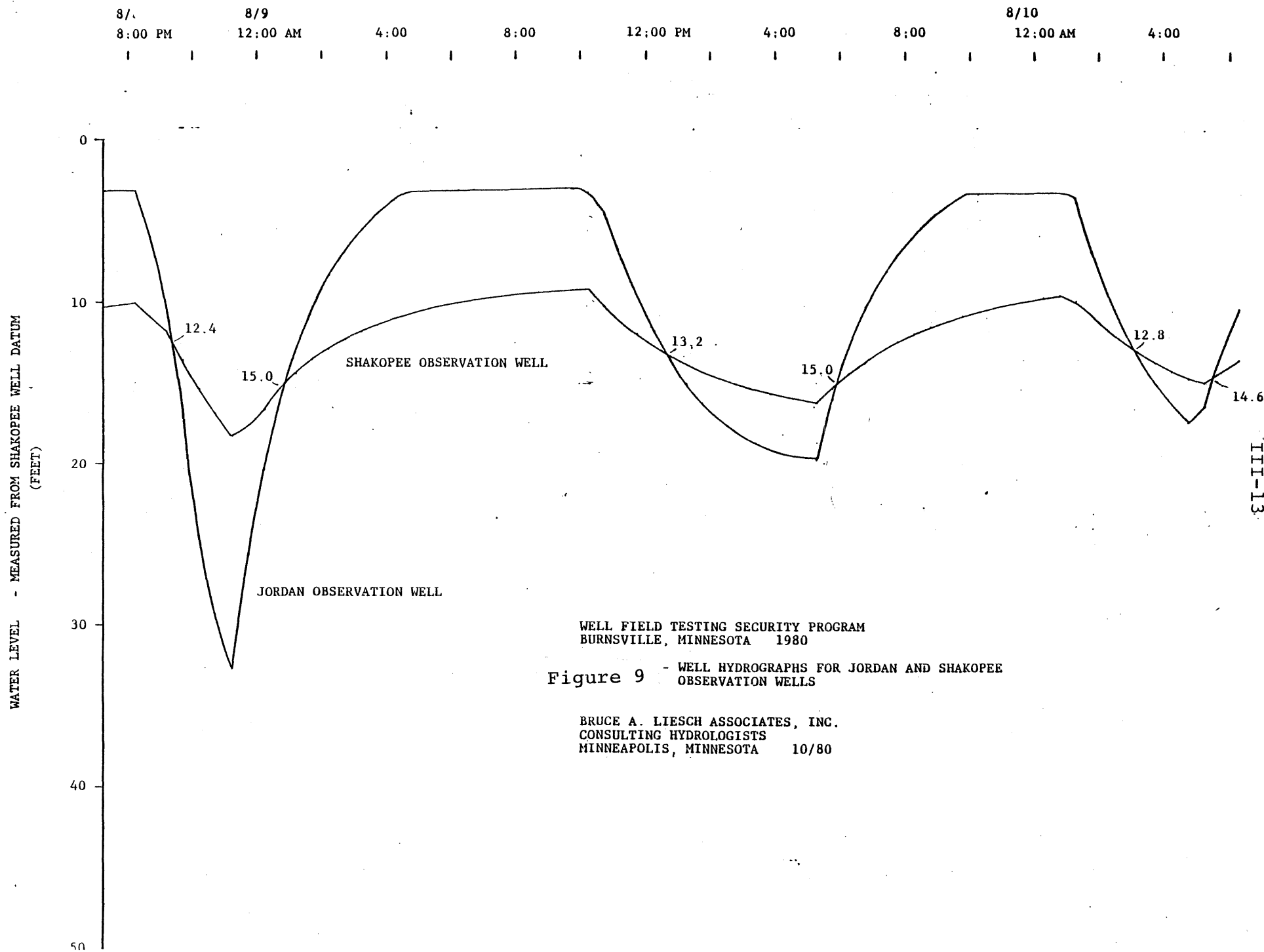
A major concern in Burnsville is the possible contamination of the water supply from leachate at the abandoned landfill site north of the well field. Upon analysis of the drawdown maps of Figures 6 and 7, it appears that no appreciable change is observed in the Jordan water surface by the addition of a well at the intersection of Nicollet and Highway 13. The distance between the new well and the southern-most extent of the landfill is approximately 4,100 feet. At this distance the new well would cause a maximum increase in drawdown under the landfill of 1.2 to 1.9 feet, dependent on the assumed distance-drawdown relationships. At a point approximately three-quarters of the way through the landfill there would be no drawdown change caused by the new well.

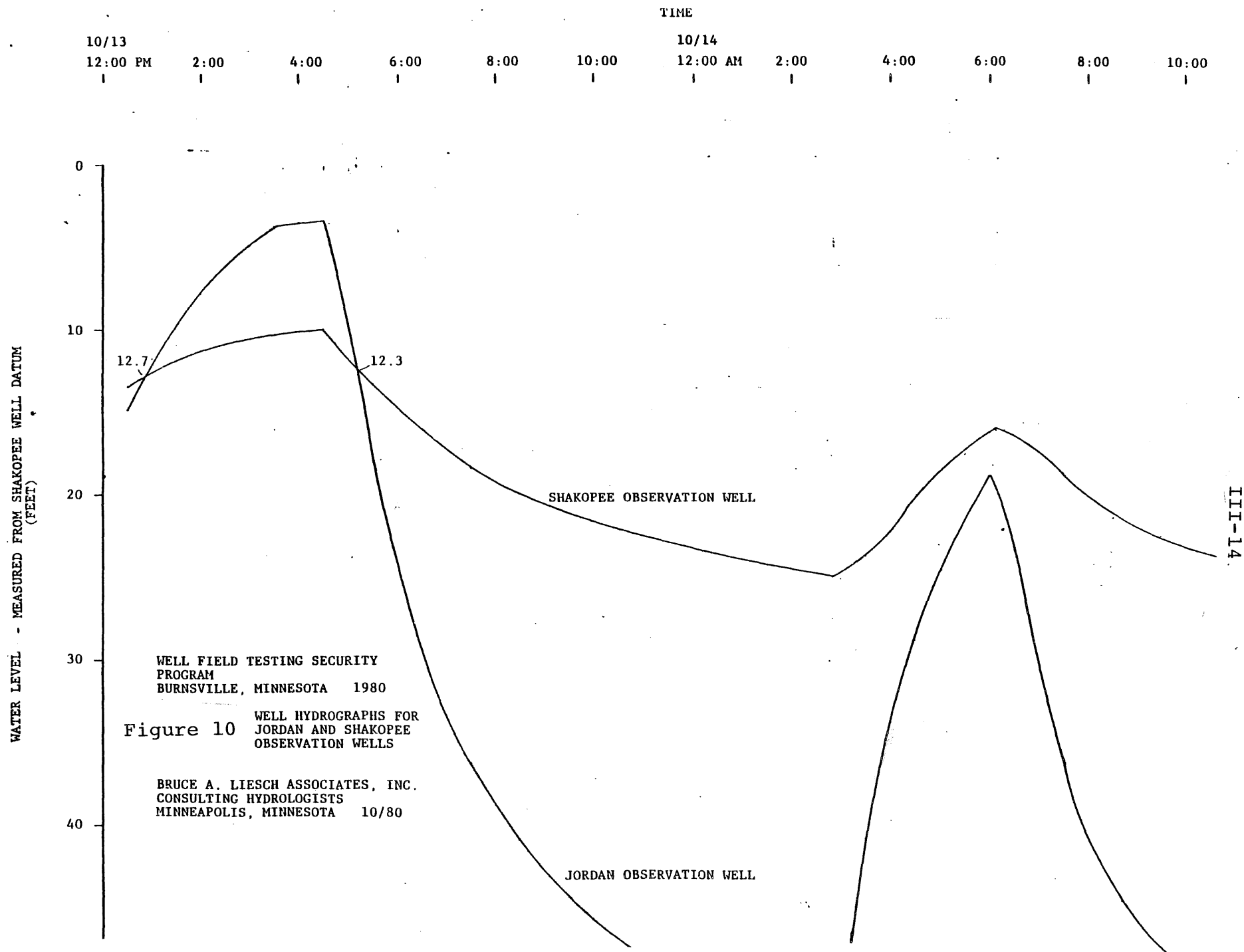
Hydrographs of the Shakopee and Jordan observation wells under the conditions of all wells pumping are shown in Figures 8 and 9. The intersections of the hydrographs indicate points where flow direction between the two formations is reversed. By extrapolating the Jordan observation well recovery curve to a status level, the drawdown in the Jordan at which leakage begins to occur can be determined. During the drawdown and recovery cycle, leakage between formations is reversed at a drawdown of between 14 and 17 feet. A line of leakage is assumed to be between the 10- and 20-foot drawdown contour lines in Figures 6 and 7. Under both well configurations studied, three fourths of the landfill is in an area of vertical leakage from the Shakopee dolomite into the Jordan sandstone during part of the pumping cycle.

The drawdown contours in Figure 6 were further defined in Figure 8 by using a computer model. Figure 8 shows the drawdown contour with pumping all of the present city wells at 1200 gpm for 10 hours. The Burnsville Landfill is about one mile west of the vertical leakage line according to Figure 8.

The hydrograph of Figures 9 and 10 gives some idea as to the length of time leakage from the Shakopee into the Jordan takes place. To determine how long leakage occurs under the abandoned landfill site, these water level curves have to be modified. Figure 10 shows the modification of the drawdown trends, indicating the water levels in the formations underlying the abandoned landfill.

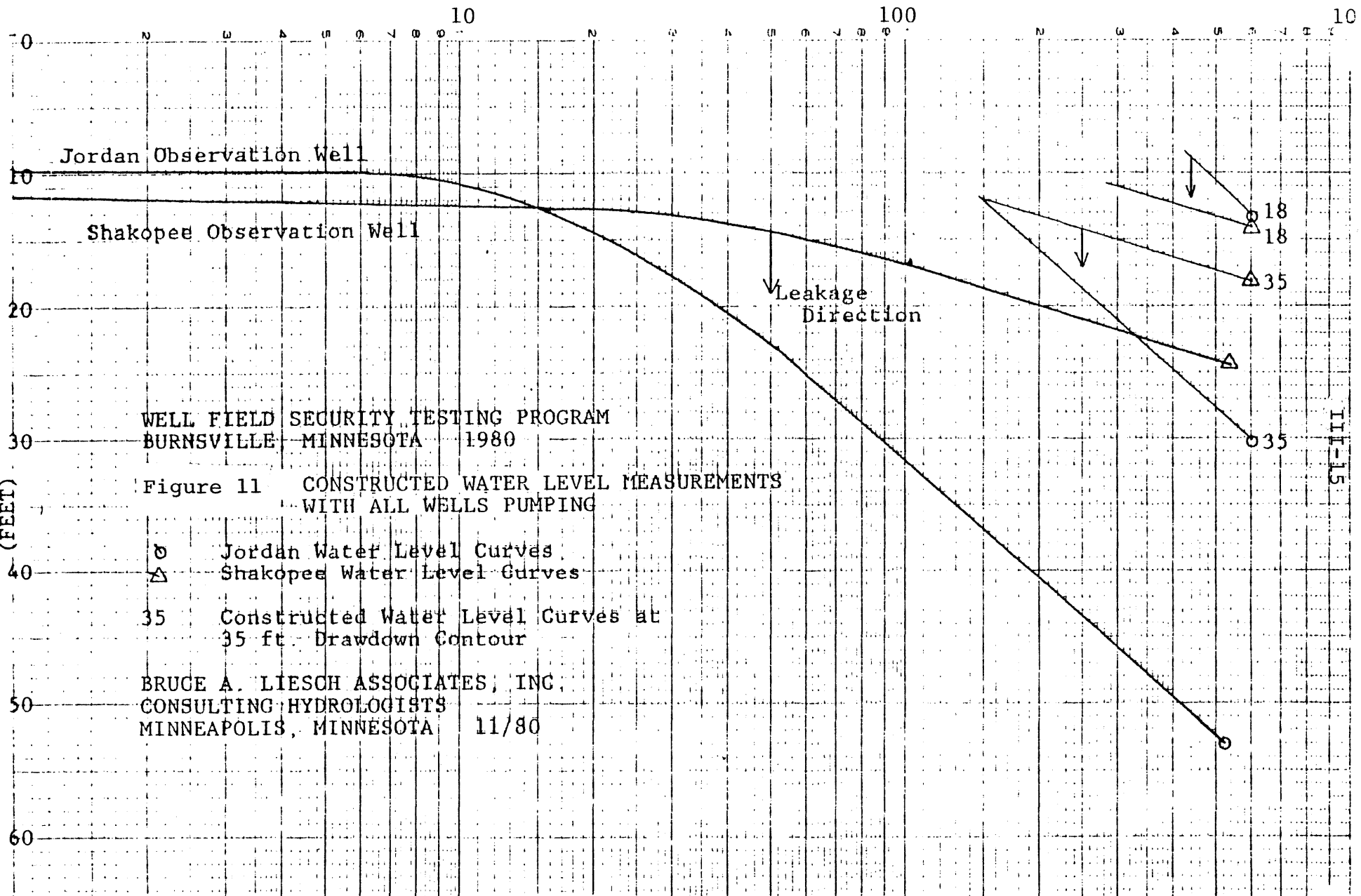
According to Figure 8, the abandoned landfill's southern most extent is overlying an area which has 40 feet of drawdown associated with steady state pumping and a northern-most extent associated with 20 feet of drawdown at steady state. Figure 11 shows that leakage starts at the Jordan and Shakopee observation wells 15 minutes after pumping begins but does not start at the beginning of the landfill until the pumps have been going for 150 minutes. Figure 11 also indicates that at 18 feet of drawdown or less, there is no leakage from the Shakopee into the Jordan. The 18-foot drawdown contour line shown in Figures 6, 7 and 8 represents the limit of vertical leakage from the Shakopee to the Jordan at steady state conditions. Since the pumps are seldom run long enough to attain a steady state condition, the drawdown under the abandoned landfill and the leakage associated with the drawdown is almost always less than predicted.





TIME - MINUTES

WATER LEVEL - MEASURED FROM SHAKOPEE WELL DATUM
(FEET)



An analysis was conducted to determine the length of time that groundwater leaked from the Shakopee dolomite into the Jordan sandstone during the period of maximum pumpage. Table 1 shows the results of the analysis, indicating that the leakage from above occurs over a much longer time period than the natural flow from the Jordan to the Shakopee. At one point there are 25.5 hours of leakage over three pumping cycles in which the water level in the Jordan is below the water level in the Shakopee at the observation wells.

In contrast, hydrographs from two and one-half weeks later, Figure 9, indicate that the upward flow from the Jordan into the Shakopee occurs over much longer periods of time than reversed flow. During the pumping of August 9, flow was reversed for a period of five hours, followed by a period of upward flow of nine hours. Previous to the five hours of reversal, the flow was from the Jordan to the Shakopee over a 12-hour period. Figure 10 indicates an extended period of leakage into the Jordan during the middle of October. This was caused by extended pumping to fill a storage reservoir and does not represent a normal pumping period for October.

This analysis indicates that only over a short period of time during the year does leakage into the Jordan exceed the natural condition of leakage direction from the Jordan into the Shakopee.

HYDROLOGIC INVESTIGATION WEST OF THE BURNSVILLE WELL FIELD

On December 15, 1980, a meeting was held between representatives of the City of Burnsville, representatives of Ed Kraemer and Sons, and the Metropolitan Council staff. At the meeting concern was expressed with respect to the effect that the Landfill would have on the Burnsville wells at their current pumping rates. The representatives of Burnsville felt that more information was needed to identify the hydrologic characteristics of the area west of the Burnsville well field.

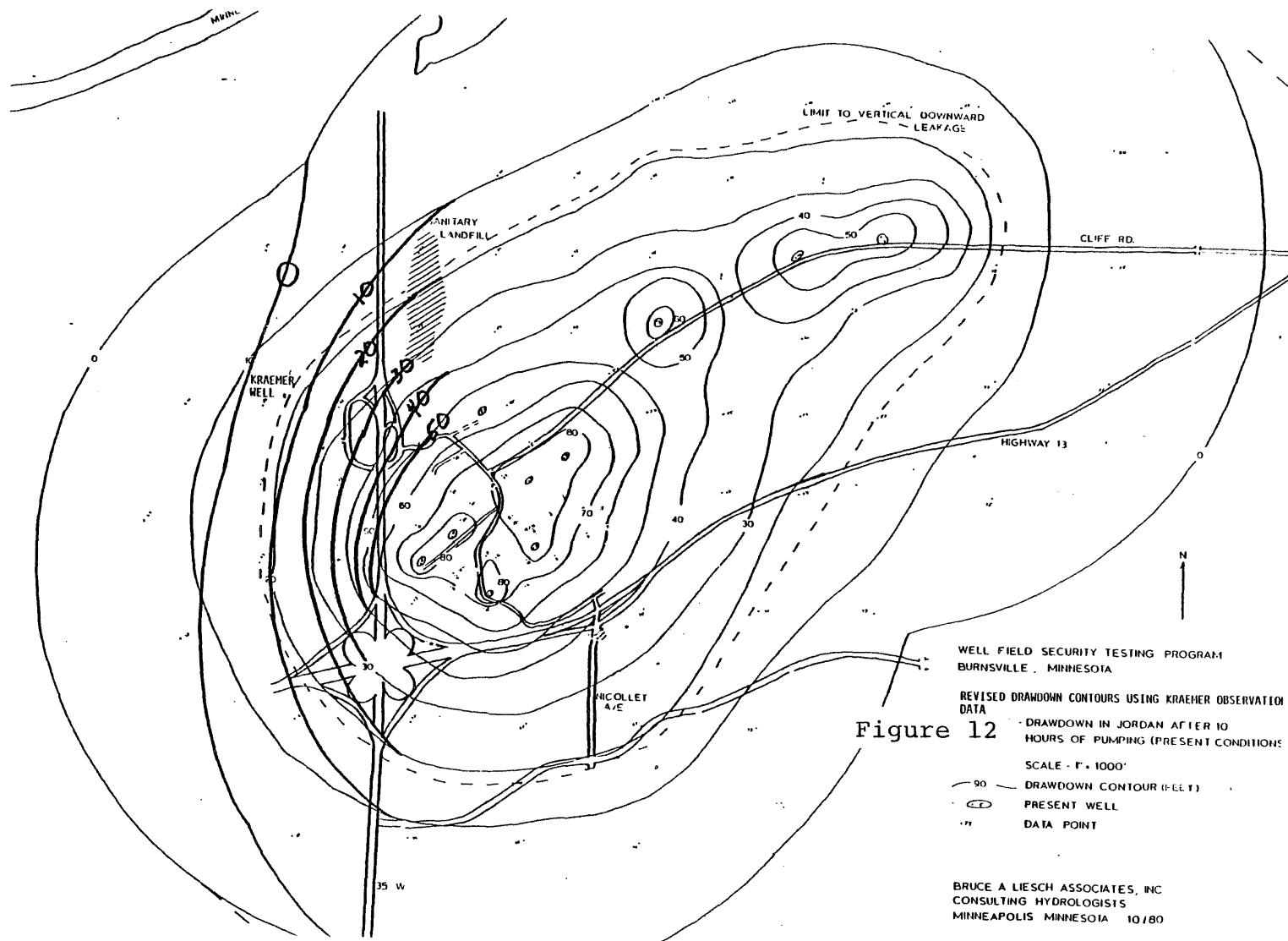
To provide the information requested, a 10-hour pumping test was run by the City's consultant on December 29, 1980. The test consisted of pumping city wells 1, 2, 4, 5, 7 and 8 and observing drawdown in a Jordan well on the Kraemer quarry property as well as drawdown in city wells 3 and 6 and in the Shakopee and Jordan observation wells.

The results of the pumping test represent the actual drawdown expected during the peak pumping periods of the City's well field. The results were compared to the theoretical drawdown computed from the mathematical model developed for the Burnsville area and the conclusions drawn. Figure 12 shows revised drawdown contours using the Kraemer observation well data. As can be seen, the extent of drawdown is considerably less than that observed in Figures 6, 7, and 12.

The water levels observed at the quarry well indicate a deep cone of depression in the Jordan aquifer caused by pumping from the quarry. The cone of depression beneath the quarry acts as a barrier sink to the movement of groundwater in the Shakopee-Oneota-Jordan aquifer system. The measured interference water level drawdown at the quarry

TABLE 1 - Analysis of Leakage Direction Measured at the Jordan and Shakopee Observation Wells 7/22-7/28, 1980.

<u>Date</u> <u>July</u> <u>1980</u>	<u>Flow Into Jordan</u> <u>Start</u> <u>Stop</u>	<u>Flow Into Shakopee</u> <u>Start</u> <u>Stop</u>	<u>Total Time</u>	
			<u>Hrs.</u>	<u>Min.</u>
22	1:10P 5:20P		4	10
22		5:20P 6:40P	1	20
22-23	6:40P 4:30A		9	50
23		4:30A 10:20A	5	50
23	10:20A 4:40P		6	20
23		4:40P 5:00P		20
23-24	5:00P 8:50A		15	50
24		8:50A 10:20A	1	30
24-25	10:20A 5:00A		18	40
25		5:00A 6:30A	1	30
25	6:30A 11:00A		4	30
25		11:00A 2:30P	3	30
25	2:30P 7:20P		4	50
25		7:20P 10:40P	3	20
25-26	10:40P 3:00A		4	20
26		3:00A 11:30A	8	30
26	11:30A 3:40P		4	10
26		3:40P 5:00P	1	20
26-27	5:00P 12:00A		7	0
27		12:00A 9:30A	9	30
27-28	9:30A 11:00A		25	30



well caused by the Burnsville Jordan wells pumping at a maximum rate for 10 hours was 1.35 feet. In contrast, the mathematical model indicated an interference drawdown of 17 feet. The lack of agreement between the actual observed interference conditions and the mathematical model may be attributed to a) a higher effective coefficient of transmissivity in the area of the quarry than has been assumed for the model, b) an increase in the coefficient of storage caused by partial dewatering of the Shakopee dolomite and partial transition from artesian to water table condition, c) higher leakage rates from the Shakopee to the Jordan in the intervening area between the well field and the quarry, d) a combination of all the factors a, b and c. A higher coefficient of transmissivity and higher leakage rates would be natural physical characteristics of the units. The increase in the coefficients of storage that would accompany a transition to partial water table conditions would be induced by the deep cone of depression in equilibrium beneath the quarry. A cessation of pumping at the quarry would cause a trend toward natural conditions and the protective effects of the barrier sink would be diminished or eliminated.

CONCLUSIONS

1. The mathematical model developed for the Burnsville well field is representative of the actual aquifer conditions and can be used to model varying well field configurations of future proposed wells.
2. In the vicinity of the Jordan and Shakopee observation wells the flow direction is reversed at a drawdown of between 14 and 17 feet where upon flow is from the Shakopee into the Jordan.
3. Under current pumping conditions and only during short periods of peak demand, the combined cones of depression in the Burnsville well field produce a net transfer of groundwater from the Shakopee-Oneota dolomites to the Jordan sandstone within the area encompassed by the dashed line between the 10-foot and 20-foot drawdown contours shown in Figure 6.
4. Only during short periods in the summer does the length of time of flow from the Shakopee dolomite into the Jordan sandstone exceed the length of time of flow from the Jordan sandstone into the Shakopee dolomite.
5. The potential for short-term groundwater contamination in a limited area adjacent to the abandoned landfill appears to be more a function of the duration of the pumping periods at the existing municipal wells rather than additional wells pumping at more remote sites to the south and east.
6. The potential for long-term, widespread contamination of the Jordan aquifer would be greatly enhanced by the extended pumping periods at the existing municipal wells resulting from an increase in the water requirements rather than by orderly expansion of new wells to the south and east.

7. During steady state conditions, the water pumped from the Jordan is replaced by groundwater leakage through the Shakopee-Oneota descending from the overlying geologic units. To avoid contamination it would be preferred that the replacement water be derived largely from the St. Peter sandstone and glacial drift deposits south of the well field rather than from the valley alluvium.
8. The combined cones of depression in the Burnsville well field shows no impact from the Burnsville Sanitary Landfill.
9. The Landfill is approximately one mile west of the City's well drawdown between 14 and 17 feet where upon flow is from the Shakopee into the Jordan. Distance alone appears to be a mitigating measure.
10. The quarry dewatering that exists between the Landfill and the municipal wells represents a second level of protection by intercepting any flow that could otherwise possibly occur between the Landfill and the wells.

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APPENDIX IV

Summary of Public Meeting Record Comments
Council Response to Public Comments
Recommendations for Changes to EIS
Editorial Changes
Written Comments

TRANSPORTATION IMPACTSComments

A comment was received for the public meeting record on the draft EIS from the City of Burnsville concerning the effects of the expansion on transportation. The City points out that the Trunk Highway 35W and Black Dog Road are congested, and the expansion of the landfill will extend the period of time of congestion. The Minnesota Department of Transportation (MnDOT) indicated they have received complaints from citizens regarding refuse falling from garbage trucks on I-35W. MnDOT further noted that the landfill's expansion should not adversely affect the levels of service on I-35W or Trunk Highway 13.

Council Response

The City of Burnsville correctly points out that the period of time of congestion will be extended due to the expansion. Litter along the highway coming from refuse vehicles is primarily an enforcement problem. The problem appears to be caused by overloaded compactor trucks and uncovered trailers and pickup trucks going to the landfill. MPCA regulations state that vehicles or containers used for the collection and transportation of any solid waste shall be covered when necessary to prevent the blowing of material. MPCA regulations also state that 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 avenue properly cleaned.

Operation of the Burnsville Landfill does not appear to be a cause of the litter problem. Traffic going to the landfill is the main cause of the problem. Measures to alleviate the problem include (1) increased awareness of the problem by law enforcement officials, (2) increased awareness of the problem by refuse haulers going to the landfill and (3) refusal by the landfill operator to except refuse that is uncovered. A possible mitigating measure that could be implemented at the Landfill would be to have the Landfill post a sign at its entrance stating that MPCA regulations require that vehicles transporting solid waste cover the material to prevent blowing and littering. Such a provision was recently implemented at the Pine Bend Landfill.

RESOURCE RECOVERYComments

Comments on the draft EIS were submitted by both the DNR and MPCA respecting materials and energy recovery. The DNR stated that the EIS should address both the present and future cost-effectiveness of resource recovery as an alternative to the landfill expansion. The MPCA states that EIS does not consider the possibility of accelerating resource recovery and materials recovery programs. MPCA further states that the resource recovery discussion in the Pine Bend

Landfill draft EIS is inadequate and that reference to the Pine Bend draft in the Burnsville draft EIS is also inadequate and does not meet EQB content requirements.

Council Response

The Council agrees with the comments of the MPCA. The Alternatives Section of the EIS has been revised to include further discussion on materials and energy recovery. Reference to the Pine Bend EIS has been deleted. The possibility of accelerating resource recovery and materials recovery programs, as suggested by the MPCA, are now included in the final EIS.

To assess the complete costs of present and future resource recovery, suggested by the DNR, is beyond the scope of this EIS. The Council has recently completed a major report on resource recovery and materials recovery options in the Region and the metropolitan counties are presently evaluating the cost-effectiveness of specific reduction and recovery projects. This effort of the Council and counties will continue over the next two years as per requirements of the new Waste Management Act. In 1983, the cost-effectiveness of these projects will have been fully evaluated and the Council and counties will make decisions that will lead to the implementation of the needed projects. Such information is presently not readily available and is beyond the scope of this EIS.

COMPARATIVE ANALYSIS WITH NEW FACILITY ALTERNATIVES

Comments

The State Planning Agency (SPA) submitted comments stating that it would be useful to "rank" this proposal with new landfills that will be sited in the Metropolitan Area. SPA states that new landfills will likely be more expensive than today's facilities, if they are to meet current environmental and social requirements, and that pending decisions should be on the basis of how much capacity the Region needs until future landfills are sited.

Council Response

Presently, there are no new landfill proposals being considered in the Metropolitan Area. The draft EIS already contains cost information on siting a new landfill using a 120-acre site as an example of the range of costs involved. The Council agrees with SPA that a comparison of the economic and environmental costs of this proposal with future, perhaps more environmentally sound, alternatives would be useful to know to make well informed decisions. The costs, however, of siting a landfill, of controlling environmental impacts and obtaining the necessary approvals on a project will vary, perhaps, significantly, depending on the location, size and impacts of the project. The example of costs presented in the draft EIS is not meant for direct comparison with the Burnsville Landfill, but only for informational purposes. The Council agrees with SPA that such direct comparisons are useful; however, since such information was not reasonably available it was felt that this was beyond the scope of the EIS.

WASTESHED ANALYSISComments

Comments were received at the public meeting on the project concerning the Landfill's wasteshed or service areas. The City of Burnsville points out that the Landfill (referring to Figure II-4 in the draft EIS) receives wastes from the Metropolitan Area in general and such wastes are becoming a threat to the City's water system. The law firm of Henson and Efron, on behalf of the Landfill operator, also submitted comments respecting the Landfill's service area. Henson and Efron state that Figure II-4 in the draft EIS is in substantial error and that Figure III-16, also in the draft, is a more accurate summary of the Landfill's service area. Henson and Efron further state that the Landfill receives no municipal waste from Minneapolis or St. Paul, nor does it receive, on any regular basis, any material amounts of waste from the northern suburbs of the Twin Cities.

Council Response

Figure II-4 is ambiguous with regard to where the majority of the refuse is collected. It is accurate to the extent that on occasion a load of refuse may come from northern Ramsey County but it fails to indicate that the majority of the refuse comes principally from Burnsville, Savage, Apple Valley and Eagan in Dakota and Scott Counties (75 percent) and from Bloomington and Richfield in Hennepin County (20 percent). Figure II-4 is deleted from the Final EIS and Figure III-16 is substituted for it. Figure III-16 was determined on the basis of a telephone survey by the Metropolitan Council staff of area haulers and landfill operators and discussions with nearby community officials. Figure III-16 more accurately reflects current conditions of the landfill.

GROUNDWATER MONITORINGComments

The DNR states that the monitoring program described in the EIS should include analysis of leachate for PCBs, heavy metals and phenols in addition to other parameters. The MPCA states that historic groundwater sampling as described on page 19 of the draft includes many more parameters than listed. The MPCA also states that the depth of all the wells should be included in the EIS to indicate what aquifer or portion of the aquifer is being sampled and the zone of influence for each of these wells.

Council Response

The MPCA determines which parameters are tested for as part of the monitoring program. The location and types of monitoring stations, sampling frequency and procedures and the parameters that are tested for are generally specified as conditions in the permit issued by the

MPCA. The MPCA, with reason, can modify that permit at any time to change the monitoring program. The current monitoring plan includes sampling of groundwater wells for chemical oxygen demand, pH, chloride, ammonia and specific conductance. The drainage ditch located east of the Landfill is monitored for the same parameters. These parameters are known as indicator parameters that will point to the presence of other constituents. Should the indicator parameters rise the monitoring program is expanded to include testing for other constituents.

Appendix V has been added to the EIS to show the results of monitoring at the Landfill for the last 10 years. The depth of the Landfill monitoring wells are included in the following table. These wells extend into the bedrock aquifer.

	<u>Elevation/Top of Well (MSL)</u>	<u>Depth of Well (Feet)</u>	<u>Elevation/Bottom of Well (MSL)</u>
Well No. 1	706.6	21.7	684.9
Well No. 2	701.0	21.0	680.2
Well No. 3	700.0	23.0	677.0
Well No. 4	699.0	13.0	686.0

LOCAL COMPENSATION

Comments

A comment was submitted by the State Planning Agency at the public meeting on the draft EIS in regard to taxation of landfill facilities. The Agency points out that this would be one way to compensate local governments for problems the facility may cause in the future.

Council Response

In response to this comment, the City of Burnsville submitted tax figures to the Council for three scenarios: 1) the 1980 tax if the Burnsville Landfill were presently taxable, 2) if the Burnsville Landfill were assessed and taxed differently if it were full and closed, and 3) what the land tax would be if they had water, sewer, streets, etc. in and were ready for development.

The parcel numbers, assessed values, acreages and 1980 taxes are listed below.

1) Parcel No.	Assessed Value		Acreage	
	Existing	Expanded	Existing	Expanded
03210-010-35	\$12,103	\$24,499	16.6	33.6
03210-010-18	27,265	27,265	37.4	37.4
03210-010-12	11,010	11,010	15.1	15.1
03210-010-23	2,479	2,479	3.4	3.4
03210-010-95	<u>8,531</u>	<u>8,531</u>	<u>11.7</u>	<u>11.7</u>
Total	\$61,388	\$74,372	84.2	101.2
1980 Mill Rate	<u>.0975526</u>	<u>.0975526</u>		
Tax	\$ 5,988.55	\$ 7,255.18		

- 2) The landfill property would be assessed equally \$5,988.55 for the existing landfill, or \$7,255.21 for the expanded landfill, if it were full and closed.
- 3) The 1980 market value rate is \$18,000 per acre for Burnsville Industrial Park. The gross land area is reduced 25 percent for streets and the tax is then estimated to be as follows.

	Existing Landfill	Expanded Landfill
Total acreage	85	102
Reduction for streets (25 percent)	21.25	25.5
Net acreage	63.75	76.5
Assessors market value/acre	\$ <u>18,000</u>	\$ <u>18,000</u>
Total market value	\$1,147,400	\$1,377,000
Assessment rate (percent)	<u>0.43</u>	<u>0.43</u>
Assessment value	\$ 493,425	\$ 592,110
Mill rate	<u>.0975526</u>	<u>.0975526</u>
Tax	\$ 48,134.89	\$ 57,761.87

It should also be noted that for the 1980 assessment, taxes payable 1981, the assessor has increased land values 25 percent; therefore, if the mill rate remains about the same, the above estimated taxes would also increase by approximately the same amount.

It should be pointed out that the 1980 Waste Management Act required the Council to prepare by January 1, 1980, a report to the Legislative Commission on Waste Management respecting methods of mitigating and compensating for the local risks and effects of solid waste disposal facilities. Methods of financing mitigation and compensation measures will be considered in the report.

VEGETATIVE COVERComments

The MPCA submitted comments stating that the majority of the top portion of the landfill lacks good vegetative cover and that the draft EIS is in error where it states that during the growing season the side slopes and the finished areas of the landfill are vegetated soon after completion.

Council Response

The statement in the draft EIS referred to in this comment is not in error since it refers to the sides of the landfill which, to the best of our knowledge, do become covered with vegetation soon after the application of final cover material. The water budget assumed that the top of the landfill was not covered with vegetation until closure, which is why there is a significant difference between the leachate generation rates that are assumed to occur before and after closure.

METROPOLITAN COUNCIL CRITERIAComments

The MPCA submitted comments that the EIS should include a thorough discussion of the proposed Landfill expansion's compliance with all the Metropolitan Council's criteria for solid waste management. The MPCA further states that such discussion should give particular attention to the Council's policies respecting preferred waste management alternatives.

Henson and Efron, on behalf of the Burnsville Landfill operator, states that the draft EIS's evaluation of compliance with Council criterion 5g, which discusses litter violations, should be put into proper context of the Landfill's recent stipulation agreement with the MPCA and the results of inspections over the past seven to eight months.

Council Response

The discussion contained in Section X of the EIS was intended as a check with the criteria in the Council's Solid Waste Policy Plan which appeared to be the most pertinent and affected by the proposal. A more thorough evaluation of the Council's policies and criteria will be conducted as part of the permitting process. This quick look at the Council's Plan was intended as a check for any obvious major policy conflicts. The Council will use the EIS itself as part of the informational resources to determine compliance with the Regional Plan. Quite obviously compliance with the Plan cannot be fully determined until the EIS is completed. It is also important to point out, that if the EIS was to contain a complete and final analysis of the proposal with respect to the Council's policies and

criteria the Council's decision whether or not to approve the expansion would be contained in the EIS. It's the Council position that an EIS is a disclosure document and not intended as the final decision on a proposal.

The Council agrees with the comments submitted by Henson and Efron. This section of the EIS and Appendix II have been revised to include a more thorough discussion of inspections at the Landfill and compliance with MPCA regulations.

OTHER LANDFILL EXPANSIONS

Comments

The MPCA submitted comments stating that the EIS should evaluate other proposed landfill expansions as alternatives to the Burnsville Landfill expansion.

Council Response

The Alternatives Section of the EIS evaluated regional land disposal capacity needs including the alternatives of expanding or not expanding the Burnsville Landfill and expanding or not expanding the Louisville, Freeway and Pine Bend Landfills. These other landfills would be the primary alternatives to the Burnsville Landfill if it were closed. Various closing dates for the Burnsville Landfill and for the regional land disposal system were determined depending on which expansions were granted or not (see Figure VI-1).

To rank the landfill expansions in terms of net environmental impacts was beyond the scope of the EIS. The circumstances and environmental impacts associated with each of the landfills varies and direct comparison would involve making major policy decisions as to the importance of these impacts. The Council believes EISs such as these should not be used as policy-making tools and that the proposed landfill expansions should be evaluated on their own merits.

IMPACT ON BURNSVILLE'S WATER SUPPLY WELL FIELD

Comment

A number of comments were submitted at the public meeting on the Landfill respecting potential impacts on the water supply well field of the City of Burnsville. Comments from the City of Burnsville pointed to this concern. The City states that prior to expanding its water system to meet future demands, at the Department of Health's request, the City has had to undertake an evaluation of what impacts might occur to the well field from an abandoned sanitary landfill, located midway between the well field and the Freeway Landfill. The reason for doing this was to determine the extent of flow reversal in the vicinity of the abandoned landfill that might occur as a result of pumping at the well field. It was felt that such reversal could cause leachate from the abandoned landfill to enter the water system. Because of the proximity of the City's well field to the

Freeway and Burnsville Landfills, the City expressed similar concern that flow reversal might intercept beyond the abandoned landfill to the two operating landfills.

The Department of Health also expressed concern that the Burnsville Landfill might impact the City's water supply well field. The Health Department stated that nine of the City's wells are completed in the Jordan formation, structurally below, but hydraulically continuous with the Prairie du Chien formation. The Health Department further stated that these wells are high capacity wells and drawdowns in the Prairie du Chien-Jordan system during periods of heavy pumping are sufficient to cause reversal of groundwater flow. The MPCA also submitted comments stating that the EIS should include an evaluation as to the potential impact if the existing water supply wells are pumped at a higher rate than presently occurring.

Council Response

In August 1980, the Minnesota Environmental Quality Board granted the Metropolitan Council an extension of time to complete the Burnsville Landfill EIS. The extension of time was necessary to await the results of a report being prepared for the City of Burnsville on its water supply well field expansion. The City's well field is located about 1.5 miles east of the Landfill. The Council felt the City's report would provide further definition on the groundwater hydrology in the vicinity of the Landfill and any impact that might occur to the groundwater and City's well field as a result of the Landfill's expansion.

The City's report on its water supply well field expansion was completed in December 1980. Appendix III, an analyses of the City's report, was prepared as a supplement to the EIS. Relevant areas of the EIS text have been revised to reflect the findings in the supplement. The supplement states that distance alone between the well field and landfill appears to be a sufficient mitigating measure. The supplement further states that the quarry dewatering that exists between the landfill and the municipal wells represents a second level of protection by intercepting any flow that could otherwise possibly occur between the landfill and the wells.

PROTECTION OF THE LANDFILL AGAINST FLOODS

Comments

The Department of Natural Resources (DNR) submitted written comments for the public hearing record on the draft EIS expressing concern with regard to 10- and 100-year frequency flood control measures at the landfill. DNR states that the western portion of the landfill is currently susceptible to 10- and 100-year frequency floods, and suggests an extension of the existing dike at 721 feet around the entire landfill. DNR further states that the existing dike has trees and large shrubs growing on it which can cause loosening of the dike structure and lead to possible dike failure. The DNR suggests mitigative measures that would include the removal of the trees and shrubs, recompaction, grass seeding, and semi-annual mowing.

Finally, the DNR points out that the draft EIS states that the flood stage at the site will increase by one-tenth foot due to the expansion, but there is no analysis of the concomitant upstream flood stage increases in the draft EIS.

The MPCA also submitted written comments for the public hearing record concerning flooding at the Landfill. The MPCA stated that the EIS should contain an evaluation of the amount of area that would be inundated by a 100-year flood frequency.

Council Response

The permit application submitted for the expansion of the Landfill shows that the expansion area will be protected against the 100-year frequency flood by a dike constructed to elevation 722.5. The DNR correctly points out, however, that portions of the existing landfill are susceptible to 10- and 100-year frequency floods. Notwithstanding, this becomes an enforcement issue with the existing operations of the Landfill. The expansion of the Landfill will not affect the portions of the Landfill that are protected against the 10-year frequency flood. Similarly, the suggestion by DNR to remove trees and shrubs that might threaten the integrity of the existing dike structure is also an enforcement issue. A suggestive mitigative measure with respect to this issue would be for the appropriate regulatory agencies (MPCA, Dakota County, the City of Burnsville) to reexamine the conditions stipulated in the existing permits on the facility. If particular maintenance measures are warranted concerning this issue, appropriate action could be taken under existing enforcement procedures.

Concerning the DNR's comments regarding upstream flood stage increases resulting from the expansion, the information shown in Table III-13 shows that the floodway designation chosen by the Cities of Burnsville and Bloomington at the Landfill location increased the 100-year frequency level in the Minnesota River by 0.1 foot. This information was taken from the U.S. Department of Housing and Urban Development Federal Insurance Administration, Flood Insurance Study for the City of Burnsville. The information requested by the DNR regarding the effect of the selected floodway designation on flood levels upstream of the Landfill is included in that publication, but is not relevant to the expansion of the Landfill since the expansion is entirely in the flood fringe area and has nothing to do with the floodway designation that was made in 1973. Upstream flood protection levels have been based on the assumption that the flood fringe area will eventually be filled.

Concerning MPCA's comments, the reference to the 10-year frequency flood inundating a portion of the Landfill was a typographical error in the draft EIS. This should read a 100-year frequency flood and not 10-year. Under these conditions (a 100-year frequency flood) the elevation of flood water in the area adjacent to the Landfill (easterly drainage ditch) will be between elevation 704 and 706. At such elevations, less than 0.5 acres of the existing landfill will be inundated and the inundation is expected to last for less than 12 hours.

WASTE MANAGEMENT ACT OF 1980

Comments

The MPCA submitted comments on the draft EIS stating that the EIS should contain discussion on how the new Waste Management Act affects this landfill expansion project.

Council Response

The Council agrees with the comments of the MPCA and Section X of the Final EIS has been revised to contain discussion on the Waste Management Act and its affect on the Landfill.

DILUTION IS "THE SOLUTION"

Comments

The MPCA expressed concern that the water quality analysis of the draft EIS relies on dilution as a solution to the leachate problem, a philosophy the MPCA believes will always lead to the nonattainment of water quality standards because each source of pollution, in and of itself, is generally insignificant. The MPCA also states that the EIS should consider the significance of all inputs of pollution to the Minnesota River and the degree of control affordable in reducing such pollutants. The MPCA further states that the water quality impact analysis of the draft EIS assumes ideal conditions and does not assume worse case conditions.

Council Response

The dilution model used to simulate impacts of the Landfill's expansion does not assume ideal conditions as stated by the MPCA. The use of the seven-day duration, 10-year frequency low flow in the River, the use of only 25 percent of the River low flow for mixing, the use of River quality data measured during low flow and measured downstream of both the Burnsville and Freeway Landfills and the use of actual leachate concentrations measured at the toe seep without considering the effect of attenuation between the Landfill and the River all are "worst case" assumptions which, when added together, present a very conservative picture of the actual impact of the Landfill on the river.

It would be nice to consider the significance of all sources of pollution on the River; however, such an analysis is beyond the scope of this EIS. The quality of the Minnesota River has been monitored for many years by the U.S.G.S., the MPCA and the Metropolitan Waste Control Commission (MWCC). Such efforts provide enough data to determine background conditions of the River, without having to undertake an extensive analysis on the contributors of pollution to the River.

As to whether dilution is "the solution" to pollution, the Council's position has been that waste and its constituents must be assimilable by the environment before the land disposal of waste can take place. If the natural environment cannot assimilate the waste than special design features must be met. Dilution has been commonly employed for years by environmental engineers and planners as a standard control and mitigating measure. To do otherwise, often involves total containment and treatment of any constituents that might be produced from a source, a practice that is not always practicable.

COMPLIANCE WITH EXISTING PERMIT CONDITIONS

Comments

Comments were received at the public hearing on the draft EIS concerning the Landfill's history of compliance with operational regulations. The State Planning Agency (SPA) submitted comments stating that the draft EIS paid insufficient attention to the compliance history of the Landfill with respect to daily cover. SPA states that the EIS does not discuss the implications of known daily cover violations with respect to the granting of a permit for the Landfill's expansion. SPA suggests that the draft EIS should incorporate discussions concerning the frequency of the cited violations, the likelihood of violations between inspections, and the operator's explanation for the lack of daily cover. SPA further suggests that the draft EIS should cover the position of the county and state regulatory agencies regarding the history of violations, their analysis of the impact of the violations on the environment and nearby residents, and their expectations for future compliance. Finally, SPA suggests that the draft EIS should discuss the relative merits of granting the respective landfill permits (such as Woodlake, Freeway, Burnsville and Pine Bend Landfills) on the basis of the different compliance records of the different facilities. SPA points out that we can either assume that enforcement will be adequate to ensure future compliance, or assume that regulatory resources will be inadequate to ensure compliance where the permittee has not shown a predisposition in that direction. The MPCA also stated that the draft EIS failed to identify the significant compliance problems at the Landfill and failed to address the potential effects of these compliance problems over the years.

Comments were also submitted by the law firm of Henson and Efron on behalf of the Landfill operator concerning the issue of past violations at the Landfill. Henson and Efron point out that chronology of significant events in Appendix II of the draft EIS fails to show the stipulation agreement entered into between the Burnsville Landfill and the MPCA in February 1980 and the results of various inspections since that time. Henson and Efron point out that the Landfill has had some operating problems in the past, which were significantly accentuated in the late 1978 to 1979 period by increased waste volumes beyond the Landfill's control. Henson and Efron state that the EIS should discuss the constructive and effective measures that have been taken by the Burnsville Landfill since the fall of 1979 and since entering into the stipulation agreement with the MPCA.

Council Response

As correctly pointed out by both the SPA and the MPCA, the Burnsville Landfill has had a history of operating violations of Minn. Rule SW-6 (2). The most consistent violations have been for litter, maintaining too large a working face, daily cover and improper termination of previous fill areas. Other violations noted on a less frequent basis include filling directly into surface water, ponding surface water on-site, salvaging, open burning, untimely submittal of report forms and plan compliance. Appendix II has been revised to more accurately reflect the history of violations and compliance at the Landfill. On February 5, 1980, the MPCA and the Landfill entered into a stipulation agreement which allowed the Landfill to operate in excess of permitted boundaries until they could apply for an expansion. The agreement specified civil penalties for noncompliance with Minn. Rule SW-6 (2) as well as the completion of a daily cover test cell. Since approximately the fall of 1979 the Landfill has shown great improvement in the routine operation of the site, and the site continues to be operated in substantial compliance with solid waste rules as of July 1980.

It is extremely difficult to assess what impact has occurred as a result of violations at the Landfill. Lack of daily cover will provide increased opportunities for infiltration at the Landfill thus increasing the potential for leachate and methane gas production. Failure to apply daily cover will also increase the chances for blowing litter and the breeding and infestation of vectors. The degree to which this has occurred at the Landfill as a result of noncompliance with state rules would be extremely speculative and beyond the scope of an EIS. Unless the Landfill is inspected practically everyday to determine if violations are occurring or unless surrounding residents are reporting frequent violations, the environmental impacts from such violations are almost impossible to determine. The projected impacts of leachate and methane gas production are generally determined based on compliance with permitted conditions at the Landfill. Incidents of vectors and litter will often imply a past violation of permitted operating practices.

Appendix II and relevant text areas of the EIS have been revised to more accurately reflect compliance conditions of the Landfill.

Concerning the issue of granting or denying a permit to a facility operator based on the operator's past performance, the following is an opinion on the matter from the Metropolitan Council's legal staff. State law provides that solid waste facilities may not be operated or extended without a permit issued by the MPCA. Minn. Stat. 116.081 (1978). Permits issued pursuant to this provision can be revoked or modified whenever it is necessary, in MPCA's opinion, to prevent or abate pollution. Minn. Stat. 116.07, subd. 4 (1978).

Minn. Stat. 116.07 (1978) authorizes MPCA to adopt solid waste disposal standards. These standards appear at SW 5 and SW 6 of the Minnesota Code of Agency Regulations. SW 6 required landfill operators to obtain permits prior to operating solid waste

facilities. SW 5(2) requires permit applications to be accompanied by plans as described in the regulations and by a plan of operation. SW 5(3) states that plans and specifications shall be approved and a permit issued when the MPCA believes they are in accordance with the regulations (emphasis is supplied). SW(5) provides that permits may be revoked for violation of the regulations. Sanitary landfill regulations and requirements are described in SW 6.

Neither the statutes nor the regulations provide for permit denial based upon past performance pursuant to a MPCA permit. To the contrary, both the statutes and regulations explicitly provide that existing permits may be revoked or modified. Additionally, the regulations provide for mandatory MPCA approval of permit applications whose plans and specifications are in accordance with the regulations.

MPCA action is governed by its officially adopted regulations. These regulations do not include past performance as a criteria for current permit applications. The MPCA cannot use such a criteria without first amending its regulations. Such a criteria cannot be implied. Furthermore, since the statute upon which the regulations are based provides that permits may be revoked or modified to prevent pollution, it seems doubtful that the regulations could be amended to provide past performance as a reason for denying a permit application.

Minn. Stat. 473.873, subd. 3 (1978) provides the MPCA "may issue permits for the operation of waste facilities in the Metropolitan Area where the operation thereof is consistent with applicable regulation..., provided that no permit may be issued for the operation of a waste facility in the Metropolitan Area which is not in accordance with the Metropolitan Council's solid and hazardous waste policy plan." Further, "If the Council determines that a permit is in accordance with its policy plan, the Council shall approve the permit." (Emphasis added.)

This provision gives the Council veto over permit applications in the Metropolitan Area--as long as the Council acts within the scope of its own authority.

The Council's standard of review for permit applications is consistency with the goals, policies, standards and criteria in its Solid Waste Policy Plan. Protection and enhancement of environmental quality are two of the considerations the Council must use in preparing its Policy Plan. Accordingly, while prevention of environmental degradation is preeminently a function belonging to the MPCA, it is partially within the Council's domain as well.

Unless the Solid Waste Policy Plan embodies past performance of the permit applicant as a standard, the Council cannot negatively review the application for that reason.

No such criteria currently exist in the Solid Waste Policy Plan. Criteria 6b and 6e, relating to solid waste facility personnel, focus on the need for adequately trained personnel who are capable of environmentally safe management. There is no policy stating that the Council will deny permits to those facility operators who, though apparently capable, have failed to operate their facilities consistent with permit conditions.

The statute granting the Council review authority in this field does not on its face provide for a regulatory or enforcement function by the Council. The statutory scheme plainly does lodge this function in the MPCA. While the Council is empowered to embody environmental concerns in its policy plans, it would be anomalous to read Section 473 as implying that the Council can enforce permit conditions. To imply such a power in the Council would go beyond the wording of the statute and would give the Council an enforcement power unique among the powers given by the legislature to the Council. It would also create an inconsistency between 116.07, subd. 4a and 473.823, subd. 3.

Pursuant to Minn. Stat. 473.723, subd. 3 (1978), the Council can apply the criteria and standards of its Policy Plan in the permit review process. The components of the Policy Plan are describe at 473.149, subd. 1 (1978). Operator past performance is not listed, though "operation" and "economic viability" are. Operating criteria and standards are not the same thing as performance. Criteria and standards are absolute measures against which behavior, i.e. performance, is measured.

Accordingly, it is doubtful that the Council could properly assume a regulatory function by amending its Policy Plan to include a criteria consisting of past performance pursuant to a MPCA permit. As a practical matter, this would entail the creation of highly detailed criteria: how many violations? over what time period? should there be a distinction between intentional and unintentional violations? must there be a process for operator challenge to alleged violations? Plainly this would drag the Council into a highly complex regulatory and enforcement function, for which it has not received legislative authorization and for which it presently has neither the expertise nor the experience.

COMPLIANCE WITH EPA'S "OPEN DUMP" CRITERIA

Comments

SPA submitted comments regarding the draft EIS on what effect EPA's open dump inventory criteria would have on this landfill. SPA states that all facilities in the state will be expected to be in compliance with EPA's criteria for the classification of solid waste disposal facilities and that if this landfill is in violation of these criteria it may be cited as an open dump. SPA states that the EIS should discuss this issue, particularly in light of leachate that generally occurs from open dumps. The MPCA also submitted comments stating that the Burnsville Landfill is a dump conversion and the EIS should discuss this.

Council Response

According to the MPCA, the Burnsville Landfill was given a "pass" rating under the state open dump survey that was completed in December 1980. The MPCA examined past quarterly monitoring and operational reports of the Landfill and, on the basis of these reports, determined that the Landfill is in compliance with the Federal Land Disposal Criteria and State regulations. It should be noted, though, that EPA has not officially adopted final land disposal criteria.

As correctly pointed out by the MPCA, the Landfill was operated as a dump prior to being permitted as a landfill in October 1971. It's our understanding that the landfill originally opened in the mid-1960s. As to the operation of the facility prior to being permitted, it is difficult to know exactly what was occurring at that time. Open dumps were generally considered nuisance facilities in the Metropolitan Area in the 1960s. Because of this, the state passed its first solid waste law in 1969 requiring that solid waste facilities be permitted in accordance with adopted state standards. The extent to which the Burnsville Landfill as an open dump was a nuisance facility and contributed to environmental degradation is unknown and would be speculative at this point. The Council believes such discussion is beyond the scope of the EIS.

Appropriate sections of the EIS have been revised to reflect the above discussion.

HAZARDOUS WASTESComments

The MPCA stated that the draft EIS contains no discussion about hazardous wastes that are received at the Landfill.

Council Response

The following wastes are not accepted for disposal in the Landfill, except in amounts normal in household waste, (1) liquids, (2) digested sewage sludge, lime sludges, grit chamber cleanings, bar screenings and other sludges, (3) raw sewage, sewage sludge, raw animal manure or septic tank pumpings, and (4) hazardous waste as defined by the MPCA. In addition, tree waste and tires are not accepted. Waste is identified by the scale house attendant and only permissible waste is accepted for disposal.

WATER SUPPLY WELLSComments

Several comments were submitted respecting potential impact on nearby water supply wells. (See comments and the Council's response concerning impacts on the Burnsville water supply well field).

The Minnesota Department of Health (MDOH) submitted comments stating that two high-capacity wells were omitted from the draft EIS's discussion on water supply wells within one mile of the Landfill. These are wells located at Cargill and Continental Machines. According to the MDOH, the impact of these two wells would create a general pumping center west-southwest of the Landfill and widen the envelopes of intercepted flow from the Cargill well that is identified in the draft. MDOH further states that the combination of the Cargill and Continental Machine wells may cause a diversion of groundwater flow from north to west and may draw leachate into the wells.

The MDOH also submitted comments stating that a number of wells exist beyond the one-mile boundary in the draft which may aggravate the potential for groundwater flow to the west. These include wells at Port Bunge and Port Continental grain handling facilities and at Port Richard's oil recovery facility. The MDOH further states that many residential areas south of 130th Street in Savage are on private wells, and although they are small capacity wells upgradient of the Landfill, they are finished in the Prairie du Chien formation.

The MPCA submitted comments stating that there should be an evaluation to the potential impact if the existing water supply wells are pumped at a higher rate than presently occurring. The MPCA also stated that the EIS should determine any effect the Landfill may have on the artesian well located at the Cargill property.

Henson and Efron, on behalf of the Landfill operator, submitted comments stating that there is a small parcel of land to the west of the existing landfill and north of the horizontal expansion area which is not within the floodway and is owned by Cargill. According to Henson and Efron, Cargill has stated that there is absolutely no potential for development of this small parcel of land in any way that will affect the accuracy of the draft EIS's discussion of local water supply wells on page 68. This proportion of the EIS stated that the only locations where a well could be influenced by the Landfill would be between the Landfill and the river or drainage ditch and immediately south or west of the Landfill.

Council Response

The well owned by Cargill Processing and Refining and discussion in the MDOH's letter was omitted from the analysis that went into the draft EIS. We did not locate a log of this well at the Minnesota Geological Survey during our search for existing wells in the area and the individual we contacted at Cargill was not aware of its existence. Relevant information about this well has now been obtained from Cargill and was used in a further analysis of the areas influenced by wells within a mile of the Landfill. The results of the further analysis are illustrated in Figures A and B. Figure A is a revised Figure III-10 (page 67) and Figure B is a revised Figure II-1 (page 117) from the draft EIS. The further analysis indicates that the effect of the second Cargill well does not change the conclusion of the draft EIS that the area presently or potentially influenced by leachate from the Landfill does not intercept the recharge area of

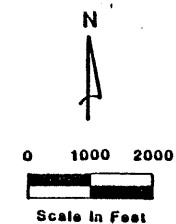
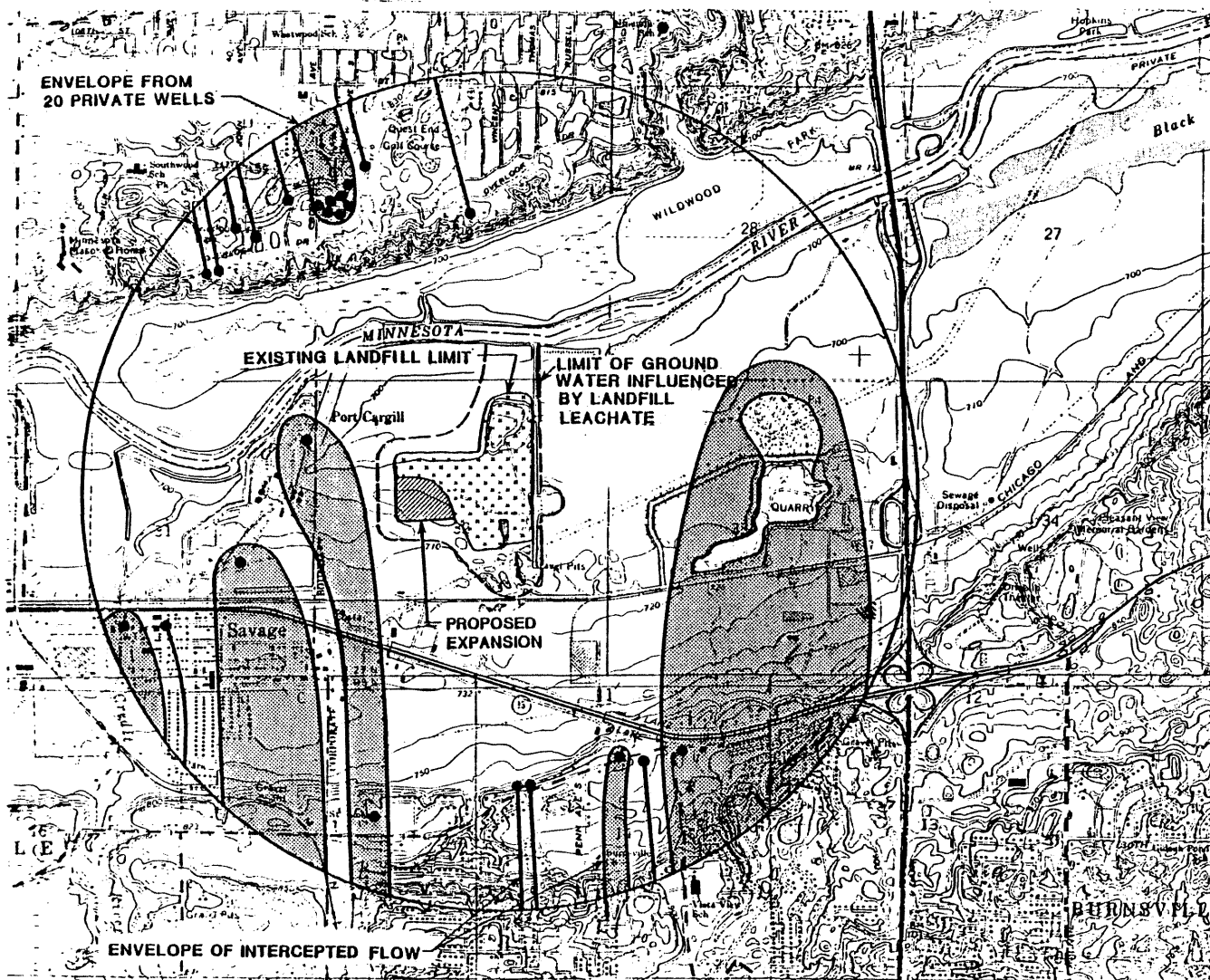
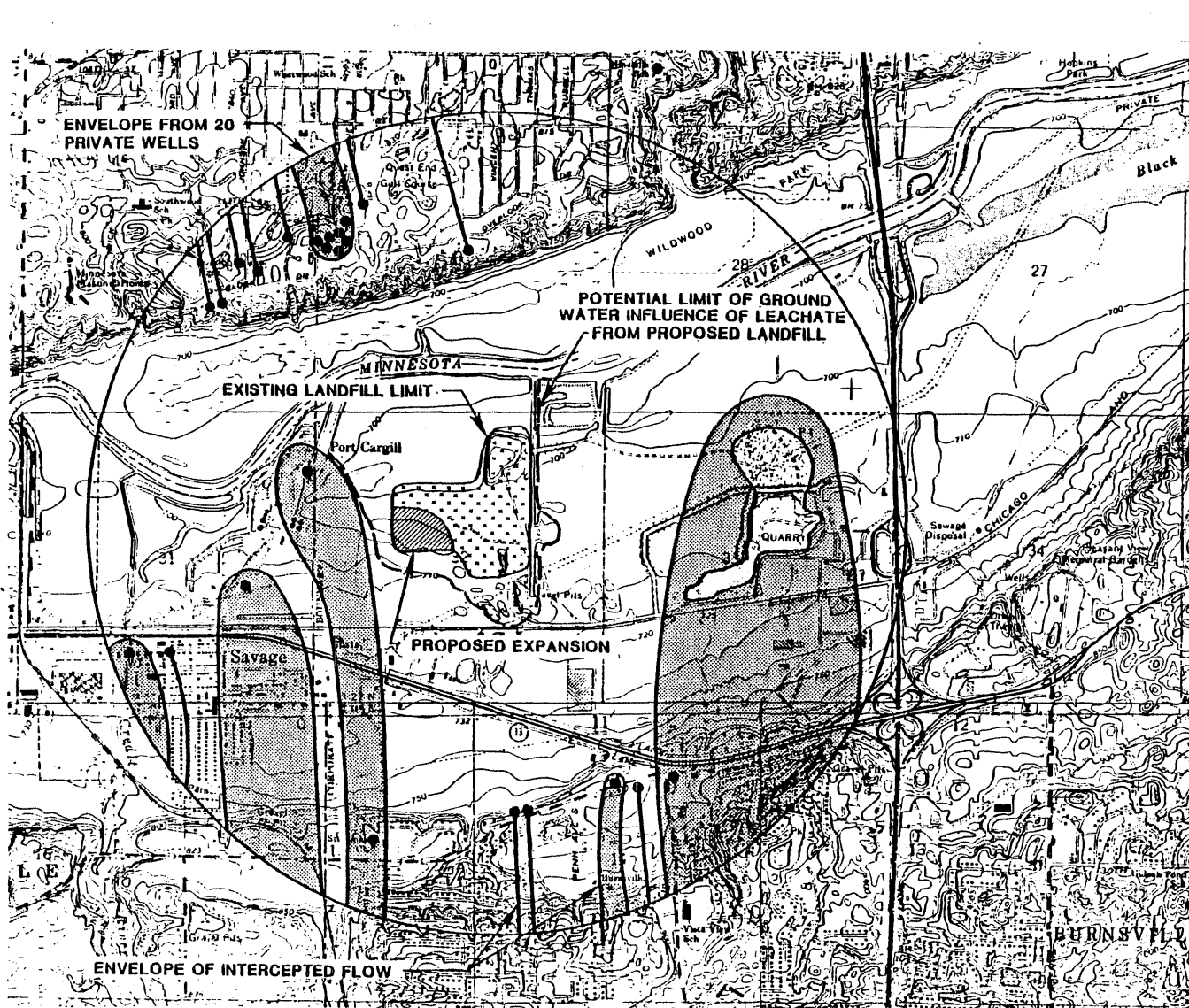


FIGURE A
Envelopes Of Intercepted Flow
To Wells Located Within 1 Mile Of
Burnsville Landfill Boundary
(Revised To Include Second
Cargill Well)



NOTE: Envelopes of intercepted flow to wells located within 1 mile of Burnsville Landfill boundary.

FIGURE B
Potential Groundwater Impact Area
And Area Influenced By Area Wells
Proposed Expansion Landfill

Revised To Include Second
Cargill Well)

any water supply well. As shown in Figure B, the recharge area for the easternmost Cargill well does come close to the estimated area potentially affected by leachate from the expanded landfill.

Edward Kraemer and Sons, Inc. proposes to include the easternmost Cargill well and a new small diameter monitoring well on the Cargill property north of the expansion area to the routine quarterly landfill monitoring program to collect data on the movement of leachate to the northwest and on the quality of water pumped from the Cargill well.

The well owned by Continental Machine is more than a mile from the Landfill and we believe its influence has been adequately considered in the boundary conditions of the model used in the analysis (see following response).

We recognize that there are wells located more than one mile from the Landfill. The influence of these wells, which are located principally to the south of the Landfill, was taken into account through the boundary conditions used in the model. Pumping from wells south of the Landfill could lower the peizometric levels between the wells and the Minnesota River. To check the validity of southern boundary conditons used in our model, we contacted Mike Schoenberg of the U.S.G.S. to determine the static water levels measured by the U.S.G.S. in the Northwestern Bell substation well located at 115-21-14abc. This well is approximately 4,000 feet southeast of the Landfill and is near the southern boundary of the area considered in the model. According to Mr. Schoenberg, the water level in the well varied between Elevations 732 and 734 based on spot measurements taken in August 1977 and Feburary 1978 and 1980. Peizometric levels predicted for the Northwestern Bell substation well by the model used in the groundwater analysis of the Burnsville Landfill varied from Elevations 732 and 733 depending on the pumping rates used in the model. The good comparison between the predicted groundwater levels and the levels actually measured in the Northwestern Bell well indicates that the effect of wells to the south of the Landfill outside the one mile radius area were adequately considered in the boundary conditions used in the model. In addition, we contacted representatives of the Cities of Burnsville and Savage and the areas along 130th Street (Dakota County Road 34) that are served by municipal water. Most of the residential wells in the area are probably not used for potable supply purposes.

The text of the EIS has been revised to incorporate Figures A and B and to include further discussion on the results of these new findings.

In responding to the MPCA comments, the Cargill well effect was analyzed as described above. Concerning an evaluaton of the potential impact of existing wells pumped at higher rates, such an analysis was carried out to determine the impact on the Burnsville water supply well field (see Appendix II). With respect to other wells, further analyses is possible. However, the Council recommends that the MPCA, the MDOH and the Council discuss this matter further

under the permitting process to determine if such an analysis is actually warranted. The EIS has assumed worse case conditions in practically all instances and further analysis does not appear necessary at this time.

The comments submitted by Henson and Efron have been incorporated in the EIS.

SITE-SPECIFIC DESIGN ALTERNATIVES

Comments

The DNR submitted comments stating that the EIS does not address the reason why clay is not going to be used as a daily cover material. The DNR further states that the EIS should include more information on alternatives for preventing or minimizing leachate flow into the Minnesota River including analyses of trenches or collection wells. The DNR states that this information would be particularly useful in view of the fact that the Landfill will continue to contribute leachate to the River after it ceases to be actively used. The MPCA also submitted comments stating that the site-specific design alternatives in the draft EIS were inadequate and that the closure discussion on the Landfill (page 20, draft EIS) should specify that a soil material of an acceptable permeability rate will be used in order that infiltration will be minimized.

Council Response

The Landfill will generate leachate which will eventually enter into the ground and surface water systems. The Landfill's expansion will result in the production and generation of greater quantities of leachate and extend its areal impact (see Figure IV-1). The EIS shows that dilution of the leachate should be sufficient to mitigate surface water impacts. Groundwater, however, will be directly impacted immediately surrounding the facility. The impact on most local water supply wells should be negligible, but because of the close distance between drawdown at the Cargill wells and the expanded landfill's identified zone of leachate influence, these wells could be potentially affected.

Leachate control approaches would reduce either the quantity of leachate generated or the potential for the escape of leachate from the Landfill and subsequent degradation of groundwaters. The disadvantage associated with these options, however, relates to the generally substantial costs involved in implementing and maintaining these systems. At some point, the costs of leachate control result in diminishing benefits. It is usually very difficult to determine when this occurs, because of the difficulties in arriving at the costs of environmental impacts and the benefits of its control.

The Council agrees with the DNR and the MPCA that the EIS should contain a discussion of minimizing leachate from the Landfill. Although the EIS found no direct impacts on surface water quality or nearby water supply wells, Sections V and VI of the EIS have been revised to include discussion on leachate control measures that would provide the expanded facility an increased level of protection and minimize direct groundwater impacts.

The Council disagrees with the MPCA that the EIS should specify (require) that a soil material of an acceptable permeability will be used in order to minimize infiltration at the expanded landfill. The EIS is a disclosure document and provides information as to what effect various controls or mitigating measures will have on impacts from the expanded facility. Once the EIS is completed, it is up to the decision-making bodies to make the final decisions as to which controls will be used or not using the EIS as an informational resource. If the EIS specifies or requires particular controls or mitigating techniques, it goes beyond being a disclosure-informational resource to becoming the final decision-making document. In such a case, the authority of the decision-making bodies would be preempted. A recent State Attorney General's opinion has been written on this matter stating this position.

Methane gas and other problems which would necessitate the consideration of site-specific design features were not identified as major potential problems of the expanded facility. To the extent problems were identified, the Council believes that the EIS adequately covered the site-specific design measures that could be employed. Notwithstanding, if leachate control facilities are implemented at the Landfill, methane buildup could become a problem at which point appropriate mitigative measures would have to be taken. The EIS has been revised to discuss this matter (see Section V).

EFFECT OF LANDFILL ON BURNSVILLE WELL FIELD WITHOUT QUARRY DEWATERING

Comments

The MDOH and the MPCA submitted comments stating that the EIS should consider the impact of the Landfill on Burnsville's water supply well field without the quarry dewatering.

Council Response

Modeling runs have been carried out that indicate that the western edges of the area influenced by the existing Burnsville well field without dewatering of the quarry would be at least 1,500 feet east of the existing Burnsville Landfill. This analysis was based on the "worse case" assumptions that all of the nine existing Jordan wells in the City well field would each be pumping for extended periods of time at a rate of 1,200 gallons per minute which is their maximum capacity. The average rate of pumping from these wells is significantly below their capacity.

LEACHATE

Comments

The MPCA submitted comments stating that a small amount of leachate is known to occur along the southeastern toe of the Landfill. The MPCA states that it would be valuable to have estimates on the actual amount of leachate in order that the adequacy of the mitigating measure can be determined.

Henson and Efron, on behalf of the Burnsville Landfill, state that they disagree with page 49 of the draft EIS which states that "in fact, if a landfill is constructed properly, the reduction of measurable quantities of leachate can be eliminated." According to Henson and Efron, it is not possible in climates such as Minnesota to construct a landfill that does not produce measurable quantities of leachate.

Henson and Efron also point out that seasonal degradation of the surface water quality in the drainage ditch east of the Landfill (page 147 of the draft EIS) cannot be demonstrated in light of the extensive monitoring data which exist for this surface water. In addition, Henson and Efron state that the estimated capital costs for treatment facilities (page 147 of the draft) are substantially understated.

Council Response

The quantity and rate of leachate flow from the southeastern toe of the Landfill has not been determined. The quantity is known to be small and the Council believes the mitigating measures described on page 16 of the draft EIS are adequate to handle this problem.

The Council disagrees with Henson and Efron that landfills cannot be constructed in Minnesota that will eliminate the production of measurable quantities of leachate. Several practices are available that will eliminate the production of significant quantities of leachate and minimize its impact. These practices relate to cover selection, design, and construction; on-site and off-site surface runoff controls; landfill closure; leachate collection and treatment; and leachate monitoring. It is important to note that leachate control is generally aimed at reducing the rate of discharge of leachate even though the total quantities produced over time may be great. The environmental impacts of leachate depends largely on its rate of discharge from the landfill and its strength and composition. The total quantity produced by a landfill over time may be a negligible factor, if its rate of discharge is controlled to a rate that can be assimilated by the environment. The Council believes that landfills in Minnesota can be constructed that will control the rate of discharge to assimilable quantities.

The Council disagrees with Henson and Efron that the quality of water in the drainage ditch has not shown some degradation. Monitoring has shown elevated parameters. Although not pointed out in the draft EIS, the extent to which the elevated parameters can be attributed to leachate from the Landfill is unknown. The noted parameters could be the result of upstream pollutant sources away from the Landfill. Sections V and VI of the EIS have been revised to clarify this point.

The leachate treatment system costs were obtained from Hennepin County's 1979 report on solid waste energy recovery. This report was prepared by Ellerbe Associates and the costs were for the development of an 120-acre landfill. All cost estimates were based on discussions with system vendors and were adjusted to reflect mid-1979 costs. Those costs would be higher today by perhaps as much as 20 to 40 percent.

REVERSAL OF LEACHATE MOVEMENT DURING RIVER FLOOD STAGESComments

The MDOH submitted comments stating that the EIS's estimate of leachate production rates is based on the principle that the only water available for infiltration would be from precipitation. The MDOH points out that under conditions of high water table, it is not unlikely that portions of the Landfill would be below the water table. The MDOH also points out that in the 1965 flood the water table was at 718.6 feet, well about normal groundwater levels. The MDOH states that the wetland area north of the Landfill appears to be recharge area and that all of these factors combined with the high transmissivity of the bedrock indicate that portions of the Landfill may be saturated and groundwater flow may be reversed during high river stages. Such conditions, according to the MDOH, would greatly enhance leachate production, mobility and flow to the southwest.

Council Response

The surficial groundwater in the vicinity of the Landfill appears to be dominated by two controls. The wetland area, shown in Figure III-7, is enclosed by a dike with a regulated outlet. When the outlet is closed, water will build up in this area and recharge the groundwater table causing water levels to rise. Even with the outlet open, the wetland area seems to serve as a recharge area. The drainage ditch along the east side of the Landfill acts as a local groundwater discharge zone for the shallow groundwater beneath the Landfill. As a result, the predominant flow pattern for the surficial groundwater beneath the Landfill is from west to east which is from the wetland, beneath the Landfill, and to the drainage ditch. Any groundwater moving laterally and coming in contact with the existing refuse or vertically infiltrating into the water table through the refuse will remain in the uppermost portion of the Landfill as it flows to the drainage ditch (see Section III - Site Groundwater Hydrology).

The location of the site within a floodplain and near a surface of highly permeable bedrock may cause leachate formation by flooding. Although the site has been diked to prevent flooding waters from entering the site, it has been reported that a moderate amount of seepage into the site has occurred through the highly permeable bedrock. Should groundwater elevations rise significantly because of flooding, groundwater flow may be reversed and the limit of the identified potential leachate zones of influence (Figures III-10 and IV-1) could extend farther to the south and southwest. Its unknown whether or not leachate production would be enhanced if such conditions were to occur. In general, the quantity of leachate produced is a direct function of the amount of external water entering the Landfill. However, under conditions of a high, temporary water table and rapid seepage through the fill area, the effect may be to dilute existing leachate in the fill area.

GROUNDWATER IMPACTSComments

The MPCA submitted comments stating that the Landfill must be evaluated based on state and federal rules and, therefore, groundwater cannot be dismissed from the impact evaluation.

Council Response

Groundwater impacts of both the existing and expanded landfill were covered in the EIS including compliance with existing standards. Refer to Sections III and IV.

SOILSComments

The MPCA submitted comments stating that the EIS should describe the on-site soils at the site in detail.

Council Response

The expansion area has one to eight feet of peat and/or silty clay loam overlaying bedrock. In general, the soils on the southern boundary of the expansion area are one to five feet of peat, zero to two feet of silty sand, and one to two feet of clay, while the soil in the northern portion is one to six feet of silty loam.

SURFACE WATER RUNOFFComments

The MPCA submitted comments stating that the EIS makes the assumption that there will be a negligible impact on water quality from surface runoff and the worse-case conditions should be identified. The MPCA further states that worse-case leachate values do not appear to have been used in the evaluation.

Council Response

The impact of surface runoff from the Landfill on the receiving waters was handled qualitatively based on the assumption that surface runoff from revegetated areas will not have a significant impact on the river. Although no data are available on the quality of surface runoff from the unvegetated areas of the Landfill, it is doubtful that particulates (which would be the primary source of degradation in runoff from unvegetated areas) could reach the river directly. No significant increases in particulate levels are apparent in the eastern drainageway from the monitoring thus far. Worse-case leachate concentrations were used in the analysis where they were available. Since the actual leachate concentrations seemed to fall near the center of the range in leachate concentrations measured in other studies, we felt that it was appropriate to use median values for those parameters where literature values had to be used.

WETLANDSComments

Comments were submitted by Henson and Efron concerning surface water impacts from the Landfill. Henson and Efron state that the discussions of wetlands should be clarified to indicate that only Types 3, 4 and 5 wetlands are considered intrastate water. Henson and Efron also state that the end of page 70 of the draft EIS does not seem to coincide with the beginning on the next page of written material. Henson and Efron further point out that the groundwater quality standards discussed on page 82 of the draft EIS are not applicable to Type 2 and 6 wetlands which is the only wetland actually on the proposed landfill expansion. Henson and Efron state that they are not at all sure that it is possible to extrapolate groundwater parameters to the small wetland adjacent to the landfill expansion as the draft EIS does. Finally, Henson and Efron state that no governmental permits are needed by the applicant in order to fill the small wetland area in the horizontal expansion area.

Council Response

As correctly pointed out by Henson and Efron, the wetland area in the proposed expansion area is classified as a Type 2 and 6. It is, thus, not within the jurisdiction of the DNR. Henson and Efron also correctly point out that water quality standards on page 82 are not applicable to the wetland in the expansion area. This wetland is less than two and one-half acres in size and is, therefore, not considered public waters and subject to MPCA regulations. The EIS has been revised to correct this matter. The operator of the Landfill does, however, need solid waste permits and licenses from the appropriate approval agencies in order to fill the wetland area with solid waste. Henson and Efron's statement that no permits are needed is incorrect.

The last sentence on page 80 has been corrected to complete the sentence.

EDITORIAL CORRECTIONSComments

A number of the comments submitted are considered of an editorial nature noting corrections and clarifications of the EIS. The Council does not believe a response analysis is necessary for these comments. The following changes to the EIS are made on the basis of these comments. Page numbers refer to pages in the draft EIS.

Corrections to the EIS

1. Page 2, Section I, Major Environmental Impacts, Air Quality, first paragraph.

Delete "most of" from "should be sufficient to handle most of the air emission problems"

2. Page 3, Section I, Major Environmental Impacts, Terrestrial Ecology, second paragraph.

Change to read:

"A small wetland area, approximately .25 to .50 acres in size, on the expansion area will be filled. This wetland is privately owned and has been classified as Types 2 and 6. It is, therefore, not within the jurisdiction of the Department of Natural Resources."

3. Page 4, Section I, Major Environmental Impacts, Socio-Economics, second paragraph.

Add "10 to 20 feet below" prior to "the opposing bluff on the north side..."

4. Page 11, Section II, Solid Waste Service Conditions, Solid Waste Quantities, first and second paragraphs.

Delete the first and second paragraphs and reword to read:

"In 1979, the Burnsville Sanitary Landfill received approximately 40,000 cubic yards a month of mixed municipal solid waste (with a peak monthly intake of nearly 90,000 cubic yards). Mixed municipal waste consists of solid waste that is collected from residential, commercial and industrial sources. No hazardous or liquid wastes are accepted at the landfill.

"This volume dropped by nearly 70 percent when the landfill initially reduced hours, increased rates and took other actions to deal with its rapidly decreasing capacity and with the problems associated with the sudden rise in intake experienced during the summer of 1979. Monthly intake volumes have now gradually increased to approximately 20,000 to 25,000 cubic yards per month."

5. Page 21, Section II, Description of Proposed Action, Present Application, second paragraph.

Change "812" to "806."

6. Page 28, Section III, Meteorology/Climatology, second paragraph.

Reword the paragraph after the first sentence to read:

"Cover material may be difficult to obtain when the frost line is more than six inches below the ground surface. The stockpiling, transport and placement of off-site cover material may also be difficult during freezing conditions. It's important to note, however, that the operating equipment available at the Burnsville Sanitary Landfill is adequate to handle these problems. There have been no problems identified concerning this matter at the landfill."

7. Page 29, Section III, Meteorology/Climatology, Temperature.

Delete Table III-1 in the draft EIS; and

Delete first and second sentences of the second paragraph.

8. Page 38, Section III, Air Quality, Existing Landfill Site, Suspended Particulate Matter.

Reword the first sentence to read:

"Particulates at the landfill site are generated, for the most part, by fugitive dust emissions."

9. Page 51, Section III, Water Quality, Area Topography, first sentence.

Change "685 feet" to "687.3 feet"; and

Change "810 feet" to "820 feet."

10. Page 70, Section III, Water Quality, Site Specific Water Budget.

In the second to last paragraph under this section replace in the first sentence "and sand from dredging" to "soils."

11. Page 72, Section III, Water Quality, Surface Water Quality, State Regulations.

Change the second sentence of the fourth paragraph under this heading to read:

"The Minnesota River is not located within 300 feet of the northern boundary of the landfill and, thus, the landfill would not be subject to SW 6 (1)."

12. Page 82, Section III, Ground Water Quality, State Regulations, first paragraph.

Change "the more stringent conditions are applied" to read "the more stringent conditions may be applied."

13. Page 88, Section III, Water Quality, Local Water Supply Quality.

Change title of Figure III-11 to read "Location of Municipal and Private Water Supply Wells Tested by MDOH."

14. Page 93, Section III, Terrestrial Ecology, Wildlife, first paragraph.

Change "brown leaded cowbirds" to read "brown headed cowbirds."

15. Page 92, Section III, Terrestrial and Aquatic Ecology, Minnesota River.

Add prior to the last sentence of the second paragraph under this heading:

"Channel dredging in this area of the river has had and will continue to have a significant, adverse impact on the organisms sensitive to turbidity and nutrient enrichment."

16. Page 93, Section III, Terrestrial and Aquatic Ecology, Other Surface Waters.

Delete the word "catchment" from the first paragraph.

17. Page 119, Section IV, Surface Water Quality, Primary Impacts.

Delete the third to the last sentence in the third paragraph and change to read:

"none of the parameters are expected to increase measurably above levels of the existing landfill."

18. Page 130, Section IV, Rare and Endangered Species, Primary Impacts, first paragraph.

Change "some bald eagle sitings" to read "some bald eagle and peregrine falcon sitings"; and

Change "as no bald eagles have been sited" to read "as no bald eagles and peregrine falcons have been sited."

19. Page 137, Section V, Air Quality, fourth paragraph.

Add "utilization of dust retardants and/or water to minimize dust from temporary dirt roads or other exposed areas."

20. Page 138, Section V, Surface Water Quality, second paragraph.

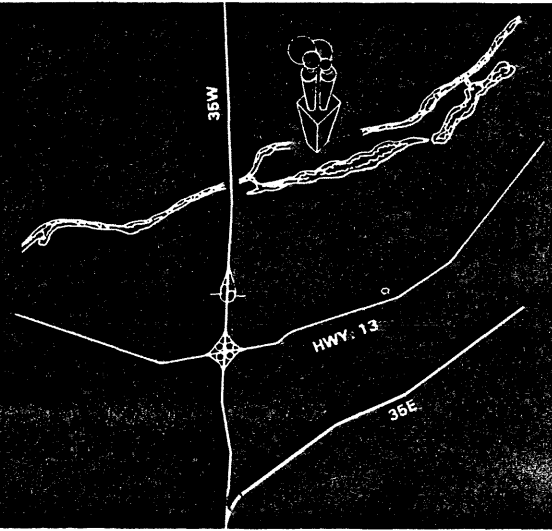
Add the following sentence:

"It should also be pointed out, that the drainage ditch serves to drain approximately 3,000 acres of Burnsville and any treatment facility installed in the drainage ditch would treat nearly 100 percent storm water."

B'ville

CITY OF BURNSVILLE

1313 East Highway 13 • Burnsville, Minnesota 55337



July 16, 1980

Admin. _____ JUL 18 1980

P. R. _____

H. R. _____

CS/PIO _____

Mr. Charles Weaver, Chairman
Metropolitan Council
Metro Square Building, Room 300
St. Paul, Minnesota 55101

For your information _____

Take appropriate action _____

Please reply _____

Prepare reply for Chmn sig _____

Subj: The draft of the Environmental Impact Statement of the Freeway Sanitary Landfill Expansion and the Burnsville Sanitary Landfill Expansion.

Dear Mr. Weaver:

The following comments are intended to apply to both of the above draft EIS statements. Please take the appropriate steps to see that these comments are entered in the record in both cases.

The number one concern of the City of Burnsville, is the continued quality of its municipal water system. Prior to expanding its water system to serve the needs of our growing population, the City has been required to prepare a detailed report. We are required to do this by the Minnesota Department of Health. Included in the report are such things as monitoring the quality of the water from a test well and further constructing a ground water model. The cost of doing this is approximately \$15,000. The reason for doing it is the potential for ground water flow reversal during high river stages. Such reversal could cause leachates from the sanitary landfill to enter our municipal water system.

We note with interest that both of the landfills receive their waste from the metropolitan area in general. In the case of the Freeway Land fill (see Page 10) virtually all of Ramsey County, portions of Washington County, Southern Hennepin County, portions of Northern Dakota County and Scott County are within the watershed. In the cases of the Burnsville Landfill, the watershed has virtually the same limits. In other words, wastes from the entire metropolitan area are deposited in Burnsville and become a threat to Burnsville's municipal water system.

We concur with the comments by the Director of the Division of Environmental Health, Mr. Roger L. DeRoos, in his letter dated June 16, 1980. We feel that the draft EIS in both cases is totally inadequate in addressing the water quality, water quantity

Page 2

July 16, 1980

Mr. Charles Weaver, Chairman
Metropolitan Council

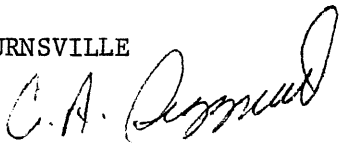
and public health impacts. Our concerns are chiefly twofold: (1) The EIS fails to adequately address the impacts on the ground water due to the two landfills. (2) The City feels strongly that any costs it is presently incurring due to ground water monitoring, plus future costs that the City may incur for monitoring or correcting any contamination problems, must be borne by either the landfill operators and/or the metropolitan area as a whole.

The City is also concerned about the affects on transportation. We would only like to note, that the intersection of Trunk Highway #13 and the access to the Burnsville Sanitary Landfill and also the intersection at Trunk Highway 35W and Black Dog Road are already congested. The extension of the landfills will only of course, extend the period of time of congestion.

We also note, that both drafts contained an End-Use Plan, the City reserves the right to be the final authority on the end uses of these properties.

Sincerely,

CITY OF BURNSVILLE



C. A. Siggerud, P.E.
Director of Public Works

CAS/lc

cc: Roger L. DeRoos, Ph.D., Director
Division of Environmental Health

HENSON & EFRON

ROBERT F. HENSON
STANLEY EFRON
WELLINGTON W. TULLY, JR.
LESLIE H. KITTLER
RICHARD B. SOLUM
JOSEPH T. DIXON, JR.
ALAN C. EIDSNES
WILLIAM F. FORSYTH
STUART T. WILLIAMS
PETER H. HITCH
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STEPHANIE J. WILLBANKS
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MINNEAPOLIS, MINNESOTA 55401

AREA CODE 612

339-2500

July 17, 1980

Mr. Paul Smith
Senior Environmental Planner
Metropolitan Council
300 Metro Square Building
7th Street and Robert Street
St. Paul, Minnesota 55101

Re: Burnsville Sanitary Landfill Expansion
Environmental Impact Statement

Dear Mr. Smith:

Enclosed please find the written comments of the Burnsville Landfill on the Draft Burnsville Sanitary Landfill Expansion EIS.

These written comments are submitted in supplementation of our testimony at the public hearing on June 26 at the Metropolitan Council.

I would also take this opportunity to confirm that we have requested that we be granted until Friday, July 18 in which to provide a response to the comments offered on the above EIS by the Minnesota Department of Health. As you know, we are currently working with the Department of Health to satisfy or answer the issues they raised in its letter of June 16, 1980 addressed to Charles Weaver, Chairman. By Friday, we expect to be in a position to have eliminated a number of the issues they have raised, and to provide you with additional information responsive to other of the issues raised.

Should you have any questions concerning these comments or on our supplemental response to the Department of Health

Mr. Paul Smith
July 17, 1980
Page Two

comments, please feel free to contact either myself or Al
Gebhard, our consulting engineer.

Very truly yours,

HENSON & EFRON, P.A.


Joseph T. Dixon, Jr.

JTD:jms
Enclosure

cc: Robert D. Miller
Allan Gebhard

BURNSVILLE'S COMMENTS ON THE DRAFT
ENVIRONMENTAL IMPACT STATEMENT
FOR THE
BURNSVILLE SANITARY LANDFILL EXPANSION

SECTION I

Page 2 - Air Quality and Noise

In the fourth line of the first paragraph the words "most of" should be stricken. As has been, we believe, clearly demonstrated, current operational procedures eliminate all of the "problems" involving potential air emissions in the proposed expansion areas.

Page 3 - Terrestrial and Aquatic Ecology

As we have discussed and publicly commented upon, it is our view that the draft document should be expanded to clarify, and put into perspective, the small wetland area in the proposed expansion site. First, we would note that the size of the affected wetland is between .25 and .5 acres. Secondly, the wetland has been classified as a Type 2 and 6 wetland, thus not within the jurisdiction of the Department of Natural Resources. Further, no governmental permits are needed by the applicant in order to fill this small wetland area. In summary, the area is a very small, marginal area which, strictly speaking, is not within the public domain. These comments are also applicable to the discussions of the wetlands contained on pages 94, 122 and 125.

Page 4 - Socio-Economics

With respect to the discussion in the second paragraph, our data indicate that the final elevation of the expansion would be approximately 20 feet below the opposing bluff on the north side of the Minnesota River.

SECTION II

Page 11 - Solid Waste Quantities and Composition

Our comments in this area concern the past and present intake volumes. While intake volume at the Burnsville Landfill has been in a state of considerable flux over the past 12 months, the best information we have indi-

cates that during 1979 the Burnsville Landfill had an average monthly intake of approximately 40,000 cubic yards (with a peak monthly intake of nearly 90,000 cubic yards); that this volume dropped by nearly 75% when the Landfill initially reduced hours, increased rates and took other actions to deal with its rapidly decreasing capacity and with the problems associated with the sudden rise in intake experienced during the summer of 1979; and that the monthly intake volumes have now gradually increased to approximately 20,000 to 25,000 cubic yards per month.

Page 11 - Collection-and Disposal System

As discussed in our public presentation, we believe that the wasteshed discussed in the first paragraph and shown in Figure II-4 is in substantial error. The information prepared by your staff in connection with this draft EIS and discussed at pages 101 and 102 and shown in Figure III-16 is a far more accurate summary of our actual collection area. In particular, the Burnsville Landfill receives no municipal waste from the major cities of Minneapolis or St. Paul, nor does it receive, on any regular basis, any material amounts of waste from the northern suburbs of the Twin Cities.

Page 16 - Site Inspections

The chronology referred to in this paragraph and shown at Appendix II is of significant concern to us in that it fails to show the Stipulation Agreement entered into between the Burnsville Landfill and the Minnesota Pollution Control Agency, and the results of the various inspections occurring at the Burnsville site beginning in December, 1979. As we have discussed before the Council, we recognize that the Landfill has had some operating problems in the past, which problems were significantly accentuated in the late 1978 to 1979 period by increased volumes beyond our control. However, in our view a balance presentation of the chronology requires updating the chronology through the date hereof in such a way to clearly demonstrate the constructive and effective measure that have been taken by the Burnsville Sanitary Landfill to deal with those problems. In particular, a review of the inspection reports would show no citations or violations in the past seven to eight months.

Page 21 - Present Application

The third line of the first paragraph should be changed to show a request for an increase in maximum permitted elevation from 785 to 800 feet.

The first line of the second paragraph should be changed to show a remaining permitted capacity of 806 acre-feet.

SECTION III

Page 28 - Meteorology/Climatology, General

The second paragraph should be changed to delete the comments after the first sentence. The operating equipment available to the Burnsville Sanitary Landfill make these comments concerning potential problems caused by freezing temperatures inapplicable.

Page 38 - Suspended Particulate Matter

The first sentence of this discussion should be changed to read as follows: "Particulates at the landfill site are generated, for the most part, by fugitive dust emissions." As clearly explained in your discussion thereafter, these fugitive dust emissions do not create a "particulate problem."

Page 49 - Leachate

As you know, we disagree with the statement made in the second sentence of the last paragraph that: "In fact, if a landfill is constructed properly, the production of measurable quantities of leachate can be eliminated." In our view, it is not possible in climates such as Minnesota to construct a landfill that does not produce measurable quantities of leachate.

Page 51 - Area Topography

The "normal" water surface level of the Minnesota River in the vicinity of the Burnsville Sanitary Landfill is approximately 687.3 feet, and the height of the bluffs in Bloomington on the north side of the River are approximately 820 feet.

Page 68 - Local Water Supply

In the last paragraph of this discussion, we would suggest recognition that there is a small parcel of land to the west of the existing landfill and north of the horizontal expansion area which is not within the floodway and is owned by Cargill. Nevertheless, our discussions with Cargill have indicated that there is absolutely no potential for development of this small parcel of land in any way to affect the accuracy of your discussion in this section. However, we wanted to

make sure that this fact was brought to your attention since it had originally escaped us in preparation of earlier materials provided to you. The existence of this parcel is recognized in Section IV of the Draft EIS. (See also, page 82, State Regulations)

Page 70 - Site Specific Water Budget

In the second to the last paragraph in this section there is a reference to the cover materials presently used on the Burnsville Landfill. These cover materials do not include any sand from dredging. In connection with our original permit application for this site there was some discussion of use of such material as cover, but we have never done so.

Page 72 - State Regulations

In the first paragraph there is a reference to surface water regulations affecting the surface waters in the area of the Burnsville Landfill. It is important to note and to advise the reader that these classifications exclude the Type 2 and 6 wetland area located on the horizontal expansion site and previously discussed above. In our view, this sentence should read: "All other surface waters in the Burnsville Sanitary Landfill area are included under WPC use classifications 2B, 2C, 3B, 3C, 4A, 4B, 5 and 6 for intrastate waters, except for the Type 2 and 6 wetland areas around the landfill.

Secondly, we would ask that the reference to the Minnesota River in the second to the last paragraph of this section be corrected to clearly indicate that, as a stream under SW 6(1), the Minnesota River is not located within 300 feet of the northern boundary of the landfill and, thus, the landfill would not be subject to SW 6(1).

Page 80 - Other Surface Waters In The Landfill Area

Again, we would ask that the discussions of wetlands be clarified to indicate that only Types 3, 4 and 5 wetlands are considered intrastate water. We would also bring to your attention the fact that the end of page 80 does not seem to coincide with the beginning on the next page of written material. Finally, we take issue with the assertion on page 82 that "it is probable that the wetlands on and adjacent to the Burnsville Landfill have much the same water quality [as the ground water] and are in violation of some of the water quality parameters." As we have previously pointed out, these water quality parameters are not applicable to Type 2 and 6 wetland which is the only wetland actually on the

proposed landfill. Further, we are not at all sure that it is possible to extrapolate possible ground water parameters to the small wetlands adjacent to the proposed location of the landfill expansion.

Page 88 - Figure III-11

The information provided on Figure III-11 deals with all wells tested by the Minnesota Department of Health, not just municipal water supply wells.

Page 93 - Minnesota River

We believe it important to include a reference to the fact that channel dredging in this area has had and will continue to have a significant, adverse impact on the organisms sensitive to turbidity, nutrient enrichment, etc.

Page 93 - Other Surface Waters

The reference in the first and second lines of this discussion to a "catchment" pond is incorrect. The small man-made depression to the east of the drainage ditch was created by the removal of gravel from the area. It does receive runoff from the landfill and any reference to "catchment" should be eliminated.

Page 94 - Wetlands

In the last paragraph of this discussion the small wetland area located on the horizontal expansion area is incorrectly referred to as a Type 3, 6. In fact, this area, as discussed more fully in our comments above, has been classified as Type 2, 6. We would again reiterate our earlier comments concerning this wetland.

SECTION IV

Page 119 - Surface Water Quality, Primary Impacts

The second to the last sentence in the third paragraph should be changed to read as follows: "None of the parameters are expected to increase measurably above levels of the existing landfill." As it currently stands, this sentence might be read to suggest a contrary conclusion, although it is clear from the context, as well as our discussions with you, that that is not the case.

SECTION V

Page 138 - Surface Water Quality

While we agree with the conclusion reached in the second paragraph of this discussion, it might be helpful to the reader to provide him with the knowledge that the drainage ditch serves to drain approximately 3,000 acres of Burnsville and any treatment facility installed in the drainage ditch would treat nearly 100% storm water.

Page 139 - Closure and Post-Closure

The suggestion that a clay over cover could be used as a mitigative measure fails to deal adequately with the increased methane gas problems that would be associated with the use of such clay cover. In our view such a construction technique would create more problems than it would solve.

SECTION VI

Page 147 - Leachate Control

The reference in the third sentence to the seasonal degradation of the surface water quality in the drainage ditch east of the landfill cannot be demonstrated according to our review of the extensive monitoring data which exist for this surface water. We believe that analysis of existing data requires the elimination of all reference to seasonal degradation of surface water quality in this ditch.

Further, the estimated capital costs for treatment facilities discussed in the third paragraph are substantially understated, and are far more prohibitive than even those indicated in the discussion. In particular, we would refer you to the comments provided by the Pine Bend Landfill in connection with the EIS prepared for that proposed expansion.

SECTION X

Page 155 - Criterion 5g

The third paragraph refers to the litter citations received by the Burnsville Landfill from the MPCA. As discussed above, we believe that to put the issue into proper context it is necessary to refer to the action

recently taken by the landfill immediately prior to and following the execution of a Stipulation Agreement with the MPCA, and the results of inspections over the past seven or eight months which have demonstrated significant improvement in this and all other operational areas.



minnesota department of health

717 s.e. delaware st. minneapolis 55440

(612) 296-5221

June **ROUTING**

JUN 23 1980

Admin. _____

P. R. _____

H. R. _____

CS/PIO _____

For your information _____

Take appropriate action _____

Please reply _____

Prepare reply for _____

Mr. Charles Weaver, Chairman
Metropolitan Council
Metro Square Building, Room 300
7th and Robert Streets
St. Paul, Minnesota 55101

Dear Mr. Weaver:

The staff of the Environmental Health Division has reviewed the Draft Environmental Impact Statement for the Burnsville Sanitary Landfill Expansion (dated May 29, 1980) and would like to propose the addition of important information that we feel will make the statement complete.

In the identification of water supply wells within one mile of the Burnsville Landfill boundary (p. 61, Figure III-9), two high-capacity wells are omitted. These include a second active well serving Cargill Processing and Refining and a well serving Continental Machines, Inc. (5505 W. 123rd Street). The Cargill well is a 240-foot Prairie du Chien-Jordan well, supplying 700 gpm for drinking and processing purposes. The Continental Machine well is a 337-foot Prairie du Chien-Jordan well supplying 150 gpm. Both wells are in continuous use. The impact of these two additional wells would create a general pumping center west-southwest of the landfill and widen the envelopes of intercepted flow of the Cargill well(s). In the computer simulation outlined in Figure IV-1 (p. 117), the western extent of groundwater contamination by leachate is already extremely near the 300-gpm Port Cargill well (Jordan). The combination of a 700-gpm well at Cargill Processing and a 150-gpm well at Continental Machine may cause a diversion of groundwater flow from north to west and potentially may draw leachate into the wells.

A number of other wells exist just beyond the one-mile boundary outlined in Figure III-9. Major industrial wells supply two grain handling facilities (Port Bunge, Port Continental) and an oil recovery facility (Port Richard) that are located west of Cargill on the Minnesota River. These three wells may aggravate the potential problem of groundwater flow to the west. None of these wells were identified in the EIS. In addition, many of the residential areas south of 130th Street in Savage are on private wells. Although the residential wells are primarily small capacity wells located to the south (upgradient from the landfill), most are probably finished in the Prairie du Chien formation.

In 1977, the Department of Health collected a number of well samples in Savage (including the port facilities) in response to suspected groundwater contamination by hexane used by the Cargill Processing and Refining operation. Although no contamination was found beyond the Cargill site, the water quality information compiled would provide a good index of background groundwater conditions in the area. Incorporation of this data would be appropriate to identify background water quality characteristics.

June 16, 1980

Leachate production rates are estimated at three inches/year based on the principle that the only water available for leachate production would be that water available from infiltration of precipitation. It appears that the watertable has been measured as high as 698-699 feet (p. 57, 7-19-79), extremely close to the landfill bottom (701-702 feet, p. 26). Under conditions of high watertable, it is not unlikely that portions of the landfill would be below the watertable, completely saturated. This is particularly true during flood conditions where water may flow from the Minnesota River into the Prairie du Chien system. An example would be the 1965 flood which had a peak stage of 718.6 feet, well above normal groundwater levels. Furthermore, the wetland area north of the landfill appears to be a recharge area (p. 60). All these factors, when combined with the high transmissivity of the bedrock, indicate that portions of the landfill may be saturated and groundwater flow may be reversed during high river stages, resulting in greatly enhanced leachate production and mobility and flow of leachate to the southwest.

In the discussion of potential impacts on the Burnsville water supply (p. 123), it is correct to state that the municipal wells are located east of Interstate 35W. However, nine of the ten municipal wells are completed in the Jordan formation, structurally below but hydraulically continuous with the Prairie du Chien formation. These wells are high capacity wells and drawdowns in the Prairie du Chien-Jordan system during periods of heavy pumping are sufficient to cause reversal of groundwater flow. This condition was identified in a report prepared by Bruce Liesch for the City of Burnsville (5/22/78). As long as the quarry operation is active, there is no direct threat of leachate from the Burnsville landfill reaching the Burnsville wells. However, if the quarry pumping were to cease, this hydraulic barrier would be removed and the heavy pumping of the Burnsville municipal wells may become influential and draw leachate towards the southeast. Burnsville plans to double the number of wells in their well field.

In summary, the assertion that the proposed horizontal and vertical expansion of the Burnsville landfill will not impact existing water supply wells cannot be supported at this time because important information was omitted from the Draft Environmental Impact Statement. The impacts of the Cargill Processing and the Continental Machine wells on groundwater flow were not identified or addressed. Major industrial wells just beyond the one-mile boundary were not identified. The high potential of elevated groundwater levels and groundwater flow reversal during elevated river stages was not identified or investigated. These factors indicate that contamination of the Cargill wells by leachate may occur. Likewise, the impacts of the Burnsville municipal wells following closing of the quarry were not assessed. Until these questions are investigated and incorporated into the Environmental Impact Statement, the report is inadequate in addressing water quality, water quantity, and public health impacts.

Sincerely,



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

cc: Dale Wikre, MPCA
Environmental Quality Board
Laura Oatman, MDH



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

IV-41

July 3, 1980

ROUTING

Mr. Charles Weaver
Metropolitan Council
Metro Square Building
St. Paul, MN 55101

RE: Burnsville Sanitary Landfill Expansion
Draft Environmental Impact Statement

Admin. _____
P. R. ✓
H. R. _____
CS/PIO _____

JUL 07 1980

For your information _____
Take appropriate action ✓
Please reply _____
Prepare reply for Chmn sig _____

Dear Mr. Weaver:

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

We are concerned that the landfill is currently susceptible to 10 to 100 year frequency floods in the western portion. We recommend that the effects of flooding on the landfill be reduced by extending the existing dike at 721 feet to surround the landfill. The same specifications used for constructing the original dike should be used for the extension. Because the effects of the 721 foot elevation dike have been taken into account by the U.S.G.S. floodplain study, the dike extension will have no impacts on flood stages.

The statement explains that flood stage increases at the site will be one-tenth foot over existing conditions. There should also be an analysis and reporting of the upstream flood stage increases if any, resulting from the expansion.

The existing dike at the 721 foot elevation currently has trees and large shrubs growing on it. Presence of heavy woody vegetation on dikes can cause loosening of the dike structure and lead to possible failure. The document should address measures to protect the dikes from failure. We suggest removal of trees and shrubs, re-compaction, grass seeding, and semi-annual mowing.

The document should have included more information on alternatives for preventing or minimizing leachate flow into the Minnesota River. Such mitigative measures could include trenches or collection wells. This information would be particularly useful in view of the fact that the landfill will continue to contribute leachate to the river along after it has ceased being actively used.

The monitoring program described in the document should include analysis of leachate for PCBs, heavy metals and phenols in addition to other parameters.

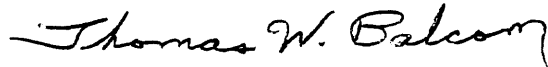
Mr. Charles Weaver
July 3, 1980
Page Two

The document should address the reason why clay is not going to be used as a daily cover material. Has this decision been made on the basis of cost, availability, or feasibility?

The present and future cost/effectiveness of resource recovery as an alternative to landfill expansion should be addressed.

Thank you for the opportunity to review this project.

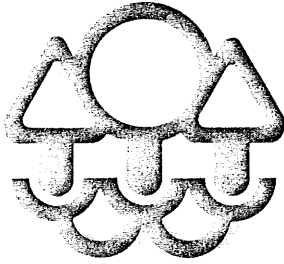
Sincerely,

A handwritten signature in cursive script that reads "Thomas W. Balcom".

Thomas W. Balcom
Environmental Review Coordinator

TWB:DB:mp

cc: Karen Loechler
Ron Harnack
Earl Huber



Minnesota Pollution Control Agency

July 21, 1980

Paul Smith
Metropolitan Council
300 Metro Square Building
7th & Robert Streets
St. Paul, Minnesota 55101

Dear Mr. Smith:

The Minnesota Pollution Control Agency staff has reviewed the draft EIS on the Burnsville Sanitary Landfill expansion. There are several areas where additional work is needed. These areas include:

1. Ground water impacts--hydrology and water quality impacts; pp. 19, 82 and 153.
2. The potential impacts on existing drinking water wells; pp. 3, 19 and 66.
3. Alternatives and materials recovery; pp. 4, 136, 146 and 184.
4. Management practices at the existing landfill and the environmental consequences of these practices; pp. 68, 74 and 164.
5. The on-site soils that are available for cover material; pp. 20 and 55.
6. Surface water impact; pp. 16, 64, 75, 119, 123 and 127.
7. Hazardous waste practices; p. 68

The attached page-by-page comments reference the pages given above.

Sincerely,


Terry Hoffman
Executive Director

Phone: 296-7301

1935 West County Road B2, Roseville, Minnesota 55113
Regional Offices - Duluth/Brainerd/Detroit Lakes/Marshall/Rochester
Equal Opportunity Employer

Burnsville Sanitary Landfill
Draft EIS Comments

Page 2 There should be discussion which indicates the Burnsville Sanitary Landfill is a dump conversion. There also should be a discussion on the effect of the WMA 1980 on the landfill siting situation.

Page 3 indicates that there is no potential for leachate contamination of water supply wells. There should be an evaluation as to the potential impact if the existing water supply wells are pumped at a higher rate than presently occurring.

Page 4 There should be an evaluation of the expansion at Pine Bend and freeway landfill as to whether this is a reasonable alternative to the Burnsville Sanitary Landfill. Also, an evaluation of new sites vs Burnsville Sanitary Landfill should be provided.

Page 16 indicates a small amount of leachate occurs/along the southeastern toe of the fill. It would be valuable to have estimates on the actual amount of the leachate in order that the adequacy of the mitigating measure can be evaluated.

Page 19 Historic groundwater sampling has included many more parameters than listed on page 19. This information should be available in the EIS.

Page 19 The depth of all the wells should be included to indicate what aquifer or portion of the aquifer is being sampled in addition the zone of influence for each of these wells should also be indicated.

Page 20 In the closure discussion the soil material and degree of compaction should be specified according to an acceptable permeability rate, so that infiltration is minimized.

Page 55 The existing soils at the site should be described in detail.

Page 64 the DEIS indicates that a portion of the landfill could be inundated by a 10 year frequency flood. There should be an evaluation of the amount of area that would be inundated by an 100 year flood frequency. In addition there should be an evaluation of this landfill based on the criteria of the U.S. EPA for determining open dumps.

Page 66 There should be a determination as to any effect this landfill may have on the artesian well located on the Cargill property. Does this have any significance to local hydrology?

Page 68 The Burnsville Sanitary Landfill has a history of failure to daily cover. If the hydrologic model developed by Barr Engineering assumed that the landfill received daily cover, had adequate vegetation established, and slopes were up to specification, the model's projected time when this landfill may reach field capacity could be in significant error. In general the EIS fails to identify the significant compliance problems at the landfill and fails to address the potential effects of these compliance problems over the years. There is also no discussion about hazardous wastes that are received at the landfill.

Page 74 The last paragraph indicates that during the growing season, the side slopes in finished areas of the landfill are vegetated soon after completion. Since the majority of the top portion of the site lacks good vegetative cover this statement is in error.

Page 75 The DEIS makes the assumption that there will be a negligible impact on water quality from surface run-off. The EIS should identify worst-case conditions to determine whether significant impacts may occur. It appears that worst-case river quality and flow are used, however, worst-case leachate values do not appear to have been considered.

Page 82 The landfill must be evaluated based on state and federal rules. Therefore, ground water cannot be dismissed from impact evaluation.

Page 82 The statement is made "where differences exist between WPC 14 and WPC 22, the more stringent conditions are applied" this should read "conditions may be applied."

Page 92 The brown leaved cowbirds should be changed to brown headed cowbirds.

Page 119 It should be noted that the whole impact analysis section relies on dilution as a solution to the leachate problem. No consideration is given to the cumulative impacts of all inputs of pollution to the Minnesota River. The significance of each discharge and the degree of control affordable must be considered in reducing total loadings to the River. A major problem with this analysis is that it assumes ideal conditions and does not assume worse case. There should be a determination as to whether there are currently point source discharges from this landfill and to what degree effluent limitations should apply.

Page 123 The DEIS gives the indication that because the Minnesota River currently has poor quality and because it assumes that the contribution of pollution to the River from this landfill is insignificant no substantial accumulative effects are predicted. With this philosophy the attainment of water quality standards will never be achieved because each source of pollution in and of itself will be insignificant. If the landfill discharge represents a controllable source of pollution, it should be eliminated. Again, if the pumping rate of the water supply wells is changed in the future --will the wells be impacted?

Page 127 There is no evaluation of sensitive organisms in the immediate study area. The EIS should include a biota survey of the area conducted by a qualified person. Existing data is available from studies which should be included in the Aquatic Ecological Section. Specifically, significant studies have been done at the Black Dog Power Plant.

Page 130 It should be noted that the peregrine falcon has been identified as being sighted along the Minnesota River and in Dakota County.

Page 136 Additional mitigative measures that might be undertaken to further reduce potential impacts from air pollutants are:

- Provision for dust control via paving
- Reduction of dust generation via prompt revegetation
- Utilization of dust retardants and/or water to minimize dust from temporary dirt roads or other exposed areas

Page 146 A discussion on the effect of not expanding this landfill does not consider the possibility of accelerating resource recovery and material recovery programs. In fact, continued reliance on landfiling may retard the development of less polluting, less energy intensive, and less wasteful solid waste management practices such as landfiling.

Page 153 The discussion on compliance with the regional plan does not consider all of the metropolitan council's criteria. Specifically the EIS fails to describe the proposed actions compliance with the preferred management alternatives of waste reduction, and materials recovery, and energy recovery. There should be a thorough discussion of all of the metropolitan councils criteria for solid waste management and whether the proposed action addresses the criteria adequately.

There is a question as to the effect on ground water hydrology when the quarry operation next to the landfill ends. Will there be a change in the ground water systems which will affect the future impacts of this landfill?

Page 164 The Agency staff believes that it would be more appropriate to have a statement about the general past history, rather than the summary of the events provided in appendix two.

Page 184 The Agency does not believe that the site specific design alternatives, waste reduction, and energy recovery discussion in the Pine Bend Landfill draft EIS are adequate. Therefore, the reference to the Pine Bend Sanitary Landfill draft EIS does not satisfy the contents requirements of the Minnesota Environmental Quality Act and EQB Rules. It should be noted that a significant amount of background materials is available to support the implementation of materials recovery alternatives. This section should be expanded and materials recovery should be addressed as an alternative and as a mitigating measure.

The discussion provided by this Agency given in the Final EIS on the Pine Bend Landfill on materials recovery is appropriate for this landfill. The calculations will differ slightly, but the net results will remain the same.

General Comments:

1. The EIS does not address the proposed marina discussed in the Freeway Landfill EIS. This marina would be located between the two landfills.

2. There is little or no discussion on the combined effect of the Burnsville and Freeway Landfills. The close proximity of these two landfills warrants this consideration.

DEPARTMENT _____

Office Memorandum

TO : Paul Smith
Metropolitan Council

DATE: 6/17/80

FROM : Robert F. Benner, Executive Director
Environmental Quality Board

PHONE: 296-9027

SUBJECT: Draft EIS prepared by Met Council staff on Proposed Expansions
of the Freeway, Pine Bend, and Burnsville Sanitary Landfills.

I have directed staff to review the draft EIS and wish to provide you with the following comments:

Daily Cover Compliance History -- Daily cover is a key requirement of MPCA's solid waste rules, and one which MPCA defended rigorously during our Solid and Hazardous Waste Study effort. Given this emphasis, the EISs pay insufficient attention to the compliance histories of the various sites with respect to daily cover.

The EIS Appendices indicate that Freeway and Burnsville landfills have been cited by MPCA numerous times for violation of this requirement, while Pine Bend has been relatively citation-free. But apart from a few sentences acknowledging citations (e.g., Freeway EIS, pp. 12, 41), and a few comments relating the lack of daily cover to odor and litter, there is no discussion of the implications of these violations for granting expansion permits. In particular, I believe it would be useful to incorporate discussions of the following issues:

- frequency of cited violations, the likelihood of violation between inspections, and the operator's explanation for the lack of daily cover.
- the position of the county and state regulatory agencies regarding the history of violations, their analysis of the impact of the violations on the environment and the nearby residents, and their expectations for future compliance.
- the relative merits of granting the respective permits on the basis of the different compliance records of the different facilities.

The daily cover issue is an example of a more general issue, namely the weight to give a permit applicant's prior performance in evaluating and granting a permit. Pete Ashbrook tells me this question comes up in feedlot permit hearings, where citizens question whether the permit conditions will be met by the permittee or enforced by the regulatory agency.

We can either assume that enforcement will be adequate to ensure future compliance, or assume that regulatory resources will be inadequate to ensure compliance where the permittee has not shown a predisposition in that direction. I believe the latter assumption is sounder and I think most citizens would agree. But I do not know the legality of denying a permit ("prior restraint") on grounds of past performance.

Leachate Problems - The EISs do not address the implications of the upcoming Resource Conservation and Recovery Act's "Open Dump Inventory." All facilities in the state will be expected to be in compliance with EPA "criteria for classification of solid waste

disposal facilities." (Title 40, Code of Federal Regulations, Part 257.) In particular, a discussion would be useful of leachate from the landfills in light of Part 257.3-3(a): "A facility or practice shall not cause a discharge of pollutants into waters of the U.S. that is in violation of the requirements of the National Pollutant Discharges Elimination System ..."

If any of these landfills is in violation of this or other "open dump" criteria, it may be cited as an open dump during RCRA-required open dump inventory.

Expected Revenues from Landfills - The EISs note that the 1980 Waste Management Act made landfills taxable by local governments (e.g., Freeway EIS, p. 141). It would be interesting to show exactly how much property tax these facilities might be expected to pay, to see how much compensation the local governments may expect for the problems the facility may cause.

Comparative Analysis Between Applications, and the "New Facility" Alternative - I believe it would be useful to rank the applications on the basis of various factors, including environmental and social impacts, and compliance histories. Similarly, these alternatives should be ranked against siting new sanitary landfills. Each EIS discusses the need for landfill capacity in the Metro area, but that is not to say that all applications must be approved, or that new facilities might not be environmentally preferable, even if they are hard to site, more expensive, and more disruptive to the individual hauler (Freeway EIS, p. 145-- some say haulers should be using transfer stations anyway, to save time and gasoline).

At some time during this decade the Metro area will need new landfills and resource recovery facilities. They will likely be more expensive than today's facilities, if they are to meet current environmental and social requirements. But this should be seen as a challenge to the Area, not as a threat. The pending decisions should be how much capacity does the Area need before more acceptable and suitable facilities are available, and which of these expansions are necessary to provide that capacity in the most environmental and economically sound fashion. That is the question that must be addressed in the EISs.

cc Don Kredit
Met Council



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

July 7, 1980

Phone 296-1653

Mr. Paul Smith
Metropolitan Council
Suite 300, Metro Square Building
St. Paul, MN 55101

In reply refer to: 702
Burnsville Sanitary Landfill Expansion
Draft Environmental Impact Statement

Dear Mr. Smith:

The Minnesota Department of Transportation (Mn/DOT) has reviewed the above-referenced document and offers the following comments for your consideration.

It is anticipated that this proposed development will not have an adverse impact on levels of service on I-35W or T.H. 13; however, Mn/DOT's Golden Valley District Office has received verbal complaints from citizens regarding refuse falling from garbage trucks on the interstate system.

On page 2, the description of the proposed action states, "the proposed vertical and horizontal expansions would provide for an additional 3,418 acre-feet of space..." Pages 21 and 22 give the size of the expansion as 2400 acre-feet.

Table III-1, on page 29 shows that the maximum temperature in the Metropolitan Area is 32°F or above on only 83 days annually, and the minimum temperature is 0°F and above on only 34 days annually. In addition, the paragraph below Table III-1 states that "the minimum temperature for more than one-half of the year (193 days) is below 32°F," while the table shows that the minimum temperature is at or above 32°F for 153 days annually. This is a total of only 346 days per year.

If you have any questions or desire further information from Mn/DOT, please contact Robert Morast, Transportation Analysis Engineer, at our Golden Valley Office, 545-3761.

Sincerely,

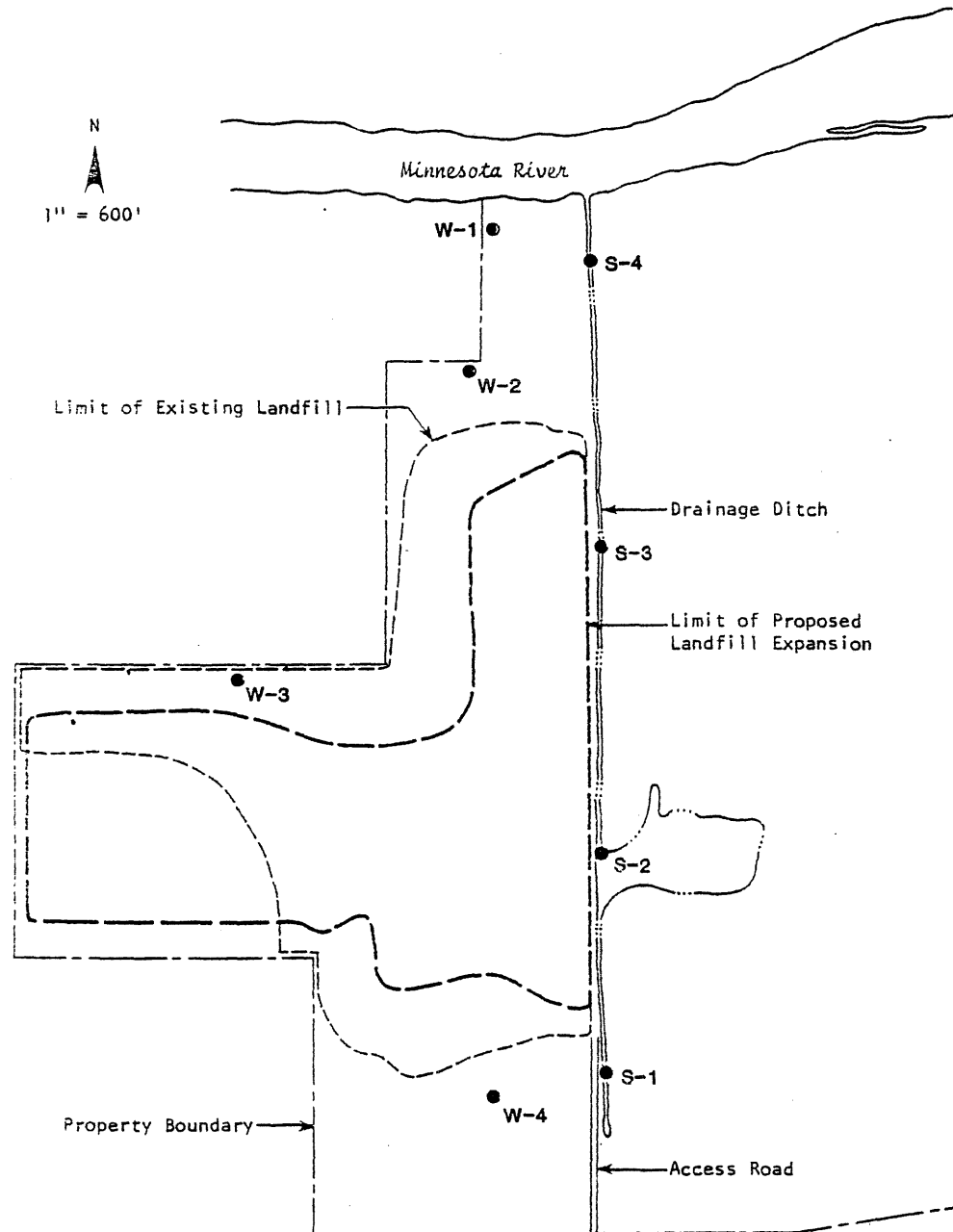
Jonnette Kreideweis
Planner
Environmental Planning Section

cc: Mary Sullivan, Administrator
Environmental Quality Board
Robert Morast, Transportation Analysis Engineer
District 5 - Golden Valley

APPENDIX V

Water Quality Monitoring

V-1



W = monitoring well
S = surface water
monitoirng station

WATER QUALITY MONITORING STATIONS
Burnsville Sanitary Landfill

BURNSVILLE SANITARY LANDFILL
Ground Water Data
Ground Water Monitoring Station W-1a

[illegible]

Metal well pipe

^bMonitoring well W-5 changed to W-1 on 6/1/78 . NPCA designation of W-1 is 60100 , effective March 9, 1979

 $C_{mg/L}$

^d Possible anomalous value

BURNSVILLE SANITARY LANDFILL
Ground Water Data
Monitoring Station W-1a,b

	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	1 13	10 16	12 26	1 23	9 10	12 18	2 25	6 3	9 2	1 20	4 15	7 17	10 9	1 23	4 23	7 23	10 25	1 21	4 15		
Parameter																					
COD (mg/L)	-	-	-	-	218	215	96	24	1373	168	324	72	440	79	20	2830	1160	1940	87		
COD, Filtered (mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	37	25	20			
NO3 (mg/L)	20	10	13	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NO3, Filtered (mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH (lab)	6.90	7.20	7.00	6.80	7.10	7.40	6.70	6.90	7.20	6.90	6.7	7.2	8.1	6.8	6.8	7.6	6.8	7.1	7.2		
pH (field)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride (mg/L)	22	200	70	20	30	14	21	9	12	22	13	13	15	20	15	17	12	12	2		
Ammonia (mg/L) as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Chromium (µg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Chromium (Filtered) (µg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper (µg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper, Filtered (µg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Specific Conductance (µmhos/cm @25°C) (lab)	-	-	-	-	800	900	825	780	1000	900	920	820	820	980	1250	925	990	810	100		
Specific Conductance (µmhos/cm @25°C) (field)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ground Water Elevation (MSL)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity, NTU																					
Dissolved Oxygen (mg/L)																					
Discharge (cfs)																					
Nitrates (mg/L) as N	0.70	0.79	0.11	0.41	0.15	<0.05	0.04	<0.05	0.30	0.47	0.86	-	1.4	0.81	0.65	<0.10	0.5	0.5	<0		
Total Solids (mg/L)	-	3990	6315	1370	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Volatile Solids (mg/L)	-	475	1040	345	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Organic Nitrogen (mg/L) as N	-	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-

^a Metal well pipe

^b Monitoring well W-5 changed to W-1 on 6/1/78. MPCA designation of W-1 is 6010Q effective March 9, 1979

^c mg/L

^d Possible anomalous value

BURNSVILLE SANITARY LANDFILL
Ground Water Data
Monitoring Station W-2a,b

Parameter	6 1 78	7 6 78	8 7 78	8 8 78	5 25 79	7 19 79	10 4 79	1 23 80										
COD (mg/L)	158	151	-	151	43	120	54	79										
COD, Filtered (mg/L)	133	146	-	151														
NO ₃ (mg/L)	20	15	-	14														
NO ₃ Filtered (mg/L)	20	15	-	13														
pH (lab)	7.1	6.6	-	6.8	7.2													
pH (field)	6.8	7.2	-	7.3		7.0	6.8	7.5										
Chloride (mg/L)	498	650	-	770	50	483	550	450										
Ammonia (mg/L) as N	1.8	1.5	-	2.6	1.1	2.1	3.8	0.4										
Total Chromium (µg/L)	-	-	<0.05	1														
Total Chromium (Filtered) (µg/L)	52 ^d	3.5	-	14														
Copper (µg/L)	-	-	-	0.8														
Copper, Filtered (µg/L)	2.2	3.0	-	0.4														
Specific Conductance (µmhos/cm @25°C) (lab)	-	2640	2640	3100	932													
Specific Conductance (µmhos/cm @25°C) (field)	2960	2520	-	4000		2250	2596	2210										
Ground Water Elevation (MSL)	693.7	695.8	-	692.1	698.0	695.2	696.2	692.0										

^a NPCA well designation 60221 effective March 9, 1979

^b Plastic well pipe

^c mg/L

^d Possible anomalous value

BURNSVILLE SANITARY LANDFILL
Ground Water Monitoring Data
Monitoring Station W-3a,b

Parameter	6 1 78	7 6 78	8 7 78	8 8 78	5 2 79	7 19 79	10 4 79	1 23 80											
COD (mg/L)	146	62	-	36	40	20	-												
COD, Filtered (mg/L)	140	83	-	36	-	-	-												
IOD5 (mg/L)	40	14	-	10	-	-	-												
IOD5, Filtered (mg/L)	40	15	-	8	-	-	-												
pH (lab)	7.8	7.4	-	7.3	7.7	-	-												
pH (field)	7.8	7.8	-	7.6	-	7.6	-												
Chloride (mg/L)	19	13	-	10	18	22	-												
Ammonia (mg/L) as N	1.4	1.0	-	1.8	0.27	0.88	-												
Total Chromium (µg/L)	-	-	<0.05 ^d	4.0	-	-	-												
Total Chromium (Filtered) (µg/L)	6.0	0.3	-	3.0	-	-	-												
Copper (ug/L)	-	-	-	1.5	-	-	-												
Copper, Filtered (µg/L)	5.4	0.8	-	0.5	-	-	-												
Specific Conductance (umhos/cm @25°C) (lab)	-	555	555	622	586	-	-												
Specific Conductance (umhos/cm @25°C) (field)	520	650	-	640	-	558	-												
Phenol (mg/L)																			
Ground Water Elevation (MSL)	69 4.5	69 6.2	-	69 3.5	0	0	-												

^aMPCA well designation 60323 effective March 9, 1979

^bPlastic well pipe

^cWell flooded and samples could not be obtained

^dmg/L

BURNSVILLE SANITARY LANDFILL
 Ground Water Monitoring Station W-4a,b

	6 1 78 ^a	7 6 78 ^b	8 7 78 ^b	8 8 78 ^b	5 25 78 ^b	7 19 79 ^b	10 4 79 ^b	1 23 80 ^b										
Parameter																		
COD (mg/L)	297	16	-	104	24	232	12	8										
COD, Filtered (mg/L)	219	6	-	90	-	-	-	-										
NO ₂ (mg/L)	160	4	-	80	-	-	-	-										
NO ₂ , Filtered (mg/L)	160	12	-	80	-	-	-	-										
pH (lab)	7.5	7.2	-	7.3	7.2	-	-	-										
pH (field)	7.5	7.6	-	7.6	-	7.4	7.7	7.5										
Chloride (mg/L)	40	30	-	40	48	78	67	44										
Ammonia (mg/L) as N	0.52	0.40	-	1.2	1.8	0.88	2.0	1.5										
Total Chromium (µg/L)	-	-	0.05 ^c	3.4	-	-	-	-										
Total Chromium (Filtered) (µg/L)	21 ^d	0.4	-	3.0	-	-	-	-										
Copper (µg/L)	-	-	-	0.6	-	-	-	-										
Copper, Filtered (µg/L)	0.2	0.2	-	0.4	-	-	-	-										
Specific Conductance (µmhos/cm @25°C) (lab)	-	634	634	754	1350	-	-	-										
Specific Conductance (µmhos/cm @25°C) (field)	770	700	-	740	-	1050	868	765										
Ground Water Elevation (MSL)	693.5	694.6	-	692.8	698.7	693.8	694.2	692.3										

^aNPCA well designation 60413 effective March 9, 1979

^bPlastic well pipe

^cmg/L

^dPossible anomalous value

DURNSVILLE SANITARY LANDFILL
Surface Water Data
Drainageway Sampling Station S-1^a

Parameter	3 3 71	5 25 71	5 28 71	9 8 71	1 13 71	10 13 71	12 25 71	1 28 71	9 10 71	12 18 71	2 23 71	6 3 74	9 2 74	1 20 75	4 15 75	7 14 75	10 9 75	1 28 76
COD (mg/L)																		
COD, Filtered (mg/L)																		
BOD ₅ (mg/L)	0.3	3	1.5	1.0	2.6	5	10	1										
BOD ₅ Filtered (mg/L)																		
pH (lab)	7.2	7.80	7.60	7.7	7.00	7.20	7.50	7.20	7.55	7.60	7.00	7.60	8.70	7.20	7.7	7.7	7.9	7.4
pH (field)																		
Chloride (mg/L)	43	45	33	33	30	50	50	60	47	40	55	65	79	12	25	33	44	34
Ammonia (mg/L) as N																		
Total Chromium (µg/L)																		
Total Chromium (Filtered) (µg/L)																		
Copper (µg/L)																		
Copper, Filtered (µg/L)																		
Specific Conductance (µmhos/cm @25°C) (lab)									1100	950	1075	950	1300	1400	900	900	900	910
Specific Conductance (µmhos/cm @25°C) (field)																		
Phenol (mg/L)																		
Oil (mg/L)																		
Turbidity, NTU																		
Dissolved Oxygen (mg/L)																		
Discharge (cfs)																		
Nitrates (mg/L) as N	<1	0.21	0.41	0.5	1.02	0.53	0.63	0.37	0.08	0.13	0.33	0.05	0.08	0.13	0.57		0.80	0.03
Total Solids (mg/L)	660	685	800	620	740	710	740	650										
Total Volatile Solids (mg/L)				85	145	195	210	190										
Organic Nitrogen (mg/L) as N																		
Surfactant (MBAS) (mg/L)	<0.05																	

^aMPCA designation 30100 effective March 9, 1979

^bPossible anomalous value

BURNSVILLE
Drainageway Sampling Station
S-1a

BURNSVILLE SANITARY LANDFILL
Surface Water Data
Drainageway Sampling Station S-1^a

Parameter	4	7	10	11	14	17	17	18	18	18	19	19	20	23	80
COD (mg/L)	20	29	33	40	24	40	23	23	20	39	<4	12	21		
COD, Filtered (mg/L)							20	20	20						
BOD ₅ (mg/L)							<4	<3	<3						
BOD ₅ Filtered (mg/L)							4	6	<3						
pH (lab)	7.8	8.0	8.0	7.4	8.0	8.4	7.8	7.7	7.6	7.7					
pH (field)							7.5	7.9	7.8	-	7.5	7.7	7.8		
Chloride (mg/L)	39	74	67	140	41	52	40	33	40	48	58	35	71		
Ammonia (mg/L) as N							0.28	0.25	2.0	0.28	0.22	0.07	0.6		
Total Chromium (µg/L)							18 ^b	1.7	3.5						
Total Chromium (Filtered) (µg/L)							16 ^b	0.8	3.5						
Copper (µg/L)							2.2	2.5	4.5						
Copper, Filtered (µg/L)							1.3	1.1	0.9						
Specific Conductance (µmhos/cm @25°C) (lab)	850	1050	1100	2200	850	560	740	816	863	869					
Specific Conductance (µmhos/cm @25°C) (field)							860	800	920	-	900	612	218		
Phenol (mg/L)							<0.002	0.003	<0.002						
Oil (mg/L)							2	3	<1						
Turbidity, NTU						5.6	12	5.3	17						
Dissolved Oxygen (mg/L)							5.0	6.5	8.5	3.1					
Discharge (cfs)							-	-	1.9	0	0	9			
Nitrates (mg/L) as N	<0.10	<0.10	0.6	0.6	<0.1	<0.1									
Total Solids (mg/L)															
Total Volatile Solids (mg/L)															
Organic Nitrogen (mg/L) as N															
Surfactant (MBAS) (mg/L)															

^aMPCA designation 30100 effective March 9, 1979

^bPossible anomalous value

BURNSVILLE SANITARY LANDFILL
Surface Water Data
Drainageway Sampling Station S-2

Parameter	5 25 71	5 28 71	9 8 71	1 13 72	10 13 72	12 26 72	1 23 72	9 10 72	12 18 73	2 25 74	6 3 74	9 2 74	1 20 75	4 15 75	7 14 75	10 9 75	1 28 76	4 29 76	7 23 76
COD (mg/L)								< 4	8	56	4	4	12	4	32	52	46	< 4	37
COD, Filtered (mg/L)																			
BOD5 (mg/L)	8	3.5	3.0	3.4	5	5	4												
BOD5 Filtered (mg/L)																			
pH (lab)	7.55	7.80	7.8	7.30	7.70	7.80	7.80	7.85	7.20	7.30	7.80	8.80	7.50	7.8	7.7	8.0	7.4	7.7	7.9
pH (field)																			
Chloride (mg/L)	33	45	42	43	60	60	60	52	50	54	70	75	89	8	31	68	33	52	78
Ammonia (mg/L) as N																			
Total Chromium (µg/L)																			
Total Chromium (Filtered µg/L)																			
Copper (µg/L)																			
Copper, Filtered (µg/L)																			
Specific Conductance (µmhos/cm @25°C) (lab)																			
Specific Conductance (µmhos/cm @25°C) (field)								1080	1200	925	1000	1200	1500	190	810	1000	890	1000	1050
Phenol (mg/L)																			
Oil (mg/L)																			
Turbidity, NTU																			
Dissolved Oxygen (mg/L)																			
Discharge (cfs)																			
Nitrates (mg/L) as N	0.52	0.42	0.4	0.80	0.64	0.11	0.53	1.42	0.21	1.18	0.21	0.16	0.11	0.49	-	0.56	0.20	0.15	< 0.10
Total Solids (mg/L)	815	910	780	840	800	860	590												
Total Volatile Solids (mg/L)			150	165	205	255	155												
Organic Nitrogen (mg/L) as N																			
Surfactant (MBAS) (mg/L)														< 0.3					

10 25 76
3 21 77
4 15 77
7 11 77

V-10.

Surface Water Data
Drainageway Sampling Station S-3^{a, b}

Parameter	3 3 71	5 25 71	5 28 71	9 8 71	1 13 72	10 13 72	12 26 72	1 23 73	9 10 73	12 19 73	2 25 74	6 3 74	9 2 74	1 20 75	4 15 75	7 14 75	10 9 75	1 28 76	4 28 76
OD (mg/L)									8	207	128	8	4	12	17	56	24	4	8
OD, Filtered (mg/L)																			
OD5 (mg/L)	6.2	15	8.0	4.0	3.6	6	9	10											
OD5, Filtered (mg/L)																			
pH (lab)	7.3	7.40	7.25	7.5	7.30	7.50	7.40	7.10	7.60	7.50	7.50	7.70	8.20	7.60	7.6	7.7	7.8	7.9	7.7
pH (field)																			
Chloride (mg/L)	53	57	45	63	58	90	80	90	61	66	82	75	73	10	39	36	47	19	23
Ammonia (mg/L) as N																			
Total Chromium (µg/L)																			
Total Chromium (Filtered) (µg/L)																			
Copper (µg/L)																			
Copper, Filtered (µg/L)																			
Specific Conductance (µmhos/cm @25°C) (lab)									1110	1275	1025	950	1200	1550	825	880	875	750	860
Specific Conductance (µmhos/cm @25°C) (field)																			
Phenol (mg/L)																			
Oil (mg/L)																			
Turbidity, NTU																			
Dissolved Oxygen (mg/L)																			
Discharge (cfs)																			
Nitrates (mg/L) as N	< 1	0.57	0.53	0.03	0.70	0.22	0.27	0.38	0.76	1.62	0.22	2.6	0.08	0.14	3.8	-	0.72	0.4	0.80
Total Solids (mg/L)	736	855	930	815	860	880	815	875											
Total Volatile Solids (mg/L)				170	185	240	190	305											
Organic Nitrogen (mg/L) as N																			
Surfactant (MBAS) (mg/L)	< 0.05															2			

a Surface Water Station S-3 changed to S-2 on 6/1/78.

b MPCA designation 40300 effective March 9, 1979.

BURNSVILLE SANITARY LANDFILL
Surface Water Data
Drainageway Sampling Station S-3^{a, b}

Parameter	7 23 76	10 25 76	1 21 76	4 15 77	7 12 77	6 1 78	7 6 78	8 8 78	5 2 78	7 19 78	10 4 78	1 23 80							
COD (mg/L)	8	8	8	12	20	42	12	20	39	52	8	2							
COD, Filtered (mg/L)						35	16	20											
IOD5 (mg/L)						5	< 3	< 3											
IOD5 Filtered (mg/L)						5	7	< 3											
pH (lab)	7.7	7.7	7.9	8.0	8.3	7.7	7.7	7.7	7.8	-									
pH (field)						7.6	7.9	7.7	-	7.7	7.6	7.7							
Chloride (mg/L)	23	27	20	23	30	80	29	50	37	92	51	44							
Ammonia (mg/L) as N						4.3	0.40	2.2	0.46	4.0	3.7	0.90							
Total Chromium (µg/L)						25 ^c	0.7	2.8											
Total Chromium (Filtered) (µg/L)						22 ^c	0.3	2.2											
Copper (µg/L)						7.0	2.0	2.4											
Copper, Filtered (µg/L)						1.8	0.9	0.6											
Specific Conductance (µmhos/cm @25°C) (lab)	775	800	710	800	545	943	757	911	757			1044							
Specific Conductance (µmhos/cm @25°C) (field)						1140	750	980	-	1150	798								
Phenol (mg/L)						<0.002	0.005	0.002											
Oil (mg/L)						11	4	41											
Turbidity, NTU					26	44	4.3	23											
Dissolved Oxygen (mg/L)						4.5	6.5	6.0											
Discharge (cfs)						-	-	2.2	0	0	0								
Nitrates (mg/L) as N	<0.10	1.3	0.6	1.4	0.5														
Total Solids (mg/L)																			
Total Volatile Solids (mg/L)																			
Organic Nitrogen (mg/L) as N																			
Surfactant (MBAS) (mg/L)																			

a Surface Water Station S-3 changed to S-2 on 6/1/78.

b MPCA designation 40300 effective March 9, 1979.

BURNSVILLE SANITARY LANDFILL
Surface Water Data
Drainage Sampling Station S-4

Parameter	3 3 71	10 13 72	12 26 72	1 23 73	9 10 73	12 18 73	2 25 74	6 3 74	9 2 74	1 20 75	4 15 75	7 14 75	10 9 75	1 28 76	4 23 76	7 22 76	10 25 76	1 21 77	4 15 77
COD (mg/L)					4	161	88	20	16	44	29	32	32	4	4	8	12	8	8
COD, Filtered (mg/L)																			
BOD5 (mg/L)	1.0	10	2	3															
BOD5 Filtered (mg/L)																			
pH (lab)	7.6	7.90	7.60	7.10	7.50	7.10	7.40	8.00	8.70	7.50	7.8	7.6	7.8	7.8	7.6	7.7	7.9	8.0	8.2
pH (field)																			
Chloride (mg/L)	43	50	50	90	35	64	81	36	74	4.0	62	33	52	20	24	24	28	20	24
Ammonia (mg/L) as N																			
Total Chromium (mg/L)																			
Total Chromium (Filtered) (mg/L)																			
Copper (ug/L)																			
Copper, Filtered (ug/L)																			
Specific Conductance (umhos/cm @25°C) (lab)					850	1250	1300	710	1200	4000	640	830	900	750	880	775	800	700	<20
Specific Conductance (umhos/cm @25°C) (field)																			
Phenol (mg/L)																			
Oil (mg/L)																			
Turbidity, NTU																			
Dissolved Oxygen (mg/L)																			
Discharge (cfs)																			
Nitrates (mg/L) as N	<1	0.79	1.7	0.82	0.05	1.43	0.32	3.8	0.08	0.42	8.1	-	0.60	0.4	0.90	<0.10	1.2	0.6	1.5
Total Solids (mg/L)	460	820	730	815															
Total Volatile Solids (mg/L)		195	235	270															
Organic Nitrogen (mg/L) as N																			
Surfactant (MBAS) (mg/L)	<0.05											3							

[illegible]

WATER QUALITY DATA
MINNESOTA RIVER
RIVER MILE 7 SAMPLING STATION

Date From to	Time of Day	Copper Cu, Total µg/l	TURB TRBIDMTR HACH FTU	Conductvty at 25°C MICROMHO	Chloride Cl mg/l	pH	NH3-N Total mg/l	DO mg/l	BOD 5-Day mg/l	COD mg/l
73/07/17	10 00	<10	27.0	720	43	8.0	0.20	7.9	5.4	-
73/09/18	13 50	<10	28.0	670	39	8.0	0.52	7.9	3.8	-
73/10/05	14 40	16	70.0	530	54	8.1	0.33	8.4	3.8	-
73/11/02	14 00	<10	25.0	620	28	8.4	< 0.20	10.9	3.1	-
73/12/04	12 15	<10	19.0	620	25	8.3	< 0.20	9.2	4.3	-
74/01/17	14 00	<10	5.1	960	33	7.7	0.66	8.4	5.8	-
74/02/06	10 00	17	4.5	880	35	7.7	0.46	5.7	5.6	-
74/03/05	13 00	<10	17.0	730	29	7.9	0.50	9.5	4.5	-
74/04/18	15 00	<10	60.0	680	23	8.3	< 0.20	11.6	8.1	-
74/05/23	15 30	<10	28.0	680	22	8.4	< 0.20	8.0	3.8	-
74/06/21	17 15	<10	43.0	680	26	8.2	0.20	-	2.9	-
74/07/15	14 00	<10	33.0	390	29	8.5	< 0.20	8.9	7.6	< 50.0
74/08/15	14 00	<10	36.0	600	40	8.2	0.42	4.8	10.0	-
74/09/20	13 45	<10	39.0	620	44	8.1	0.38	5.7	5.0	23.0
74/10/10	13 30	73	34.0	730	54	8.1	0.96	6.6	7.9	-
74/11/15	13 15	10	22.0	730	40	8.3	0.37	12.0	4.0	-
72/12/16	14 05	<10	4.9	470	50	8.0	6.00	12.7	1.4	19.0
75/01/24	10 25	10	1.7	870	67	7.7	1.10	8.1	1.0	18.0
75/02/11	15 15	<10	5.0	900	49	8.1	0.90	8.4	0.8	21.0
75/03/17	13 15	<10	9.0	870	51	7.7	0.84	9.5	4.0	23.0
75/04/18	12 30	<10	88.0	490	27	7.9	0.52	11.3	4.0	82.0
75/05/02	13 30	20	28.0	520	24	8.0	0.21	9.1	4.3	44.0
75/06/05	14 15	<10	38.0	610	26	7.8	< 0.20	7.6	2.1	56.0
75/06/19	14 20	11	50.0	580	29	8.0	< 0.20	7.2	2.4	49.0
75/07/03	11 45	11	84.0	590	23	7.8	< 0.20	5.8	3.8	120.0
75/08/06	12 20	<10	33.0	590	31	8.1	0.35	6.2	2.9	-
75/09/10	12 35	<10	25.0	810	37	7.8	0.36	6.4	6.8	29.0

MINNESOTA RIVER
RIVER MILE 7 WATER QUALITY (Cont.)

Date From to	Time of Day	Copper Cu, Total µg/l	TURB TRBIDMTR HACH FTU	Conductvty at 25°C MICROMHO	Chloride Cl mg/l	pH	NH3-N Total mg/l	DO mg/l	BOD 5-Day mg/l	COD mg/l
75/10/08	12 00	10	23.00	830	43	8.1	0.33	8.0	6.5	39.0
75/11/06	11 45	10	23.00	860	70	8.2	0.20	10.0	5.5	39.0
75/12/09	13 30	10	6.40	890	59	8.2	0.52	12.7	4.8	26.0
76/01/21	14 35	10	5.60	960	47	7.9	0.98	8.9	4.4	-
76/02/24	13 00	10	13.00	800	54	7.8	0.74	10.5	5.6	-
76/03/24	12 20	10	82.00	550	62	8.0	0.81	11.4	4.6	-
76/04/22	14 50	10	23.00	690	25	8.3	0.20	9.1	5.0	-
76/05/12	14 30	10	32.00	750	38	8.3	0.20	8.0	7.1	-
76/06/10	12 55	10	23.00	560	41	7.9	0.90	4.2	8.7	-
76/06/24	13 45	10	25.00	800	47	8.0	1.60	5.5	12.0	-
76/07/09	13 50	10	26.00	660	45	8.3	1.00	5.0	8.0	-
76/07/23	14 30	10	23.00	790	55	8.0	0.33	5.9	5.1	-
76/08/05	13 30	-	30.00	740	57	8.1	1.30	5.8	11.5	-
76/08/18	14 45	-	30.00	820	55	8.5	0.20	6.6	11.0	-
76/09/01	12 00	-	54.00	780	69	8.3	0.46	6.5	5.7	-
76/09/16	13 15	-	15.00	850	71	8.1	0.59	6.8	2.1	-
76/10/14	14 45	10	35.00	860	69	8.1	0.24	8.8	17.0	-
76/11/12	13 45	10	22.00	930	72	8.0	0.86	11.7	3.0	-
76/12/06	15 00	-	18.00	1000	77	8.1	1.10	12.0	3.4	-
77/01/18	11 30	10	14.00	1100	83	7.8	1.90	8.3	3.1	-
77/02/17	13 00	-	16.00	1100	82	8.0	1.90	7.9	3.3	-
77/03/24	12 20	-	82.00	400	19	7.9	0.85	11.3	4.8	-

AVERAGE: 12* 76.6 730 45 8.1 0.70* 8.4 5.3 42.5*

*

In computing the average, concentrations less than the detection limit were assumed to be at the detection limit.

MINNESOTA RIVER
RIVER MILE 7 WATER QUALITY (Cont.)

DATE FROM TO	TIME OF DATE	WATER TEMP FAHN	TOTAL DISSOLVED SOLIDS mg/l	T ALK CACO ₃ mg/l	Sulfate SO ₄ mg/l	TOT HARD CACO ₃ mg/l	SODIUM Na, DISS mg/l	CADMIUM Cd, TOT µg/l	LEAD Pb, TOT µg/l	ARSENIC As, TOT µg/l	SELENIUM Se, TOT µg/l	FLUORIDE F, DISS mg/l	MBAS mg/l
73/07/17	10 00	77.0	---	250	50	390	28.00	<10	<10	<10	<2	0.30	0.17
73/09/18	13 50	68.0	521	250	62	250	34.00	<10	<10	<10	<5	0.28	<0.10
73/10/05	14 40	60.0	490	200	100	---	17.00	<10	<10	<10	<2	0.51	<0.10
73/11/02	14 00	50.0	580	250	130	330	27.00	<10	12	<10	3	0.32	<0.10
73/12/04	12 15	33.0	602	210	140	310	20.00	<10	<10	<10	5	0.33	0.40
74/01/17	14 00	37.0	660	340	160	450	35.00	<10	<10	<10	<5	0.36	0.75
74/02/06	10 00	---	667	320	120	476	28.00	<10	<10	<10	<5	0.34	0.79
74/03/05	13 00	39.0	596	230	130	380	29.00	<10	42	<10	<2	0.28	0.30
74/04/18	15 00	---	520	230	150	350	32.00	<10	<10	<10	4	0.34	<0.10
74/05/23	15 30	64.0	550	260	150	420	18.00	<10	<10	<10	2	0.39	0.19
74/06/21	17 15	67.0	530	210	140	380	7.30	<10	<10	<10	4	0.43	<0.10
74/07/15	14 00	78.0	508	230	140	350	21.00	<10	<10	<10	<2	0.30	<0.10
74/08/15	14 00	72.0	460	210	120	330	28.00	<10	10	--	--	0.24	0.30
74/09/20	13 45	60.0	480	230	12	300	35.00	<10	16	--	--	0.26	<0.10
74/10/10	13 30	54.0	581	310	140	330	36.00	<10	--	--	--	0.26	0.19
74/11/15	13 15	38.0	628	300	170	360	37.00	<10	<10	<10	<2	0.31	0.12
74/12/16	14 05	33.0	1390	320	150	410	38.00	<10	<10	--	--	0.45	----
75/01/24	10 25	41.0	619	330	160	430	49.00	<10	<10	<10	<2	0.27	----
75/02/11	15 15	37.0	661	350	190	460	38.00	<10	<10	--	--	0.33	----
75/03/17	13 15	37.0	630	190	90	370	48.00	<10	<10	--	--	0.29	----
75/04/18	12 30	41.0	430	170	100	300	10.00	<10	11	<10	3	0.25	----
75/05/02	13 30	52.0	413	150	120	280	10.00	<10	<10	--	--	0.28	----
75/06/05	14 15	68.0	504	240	93	360	15.00	<10	<10	--	--	0.33	----
75/06/19	14 20	68.0	635	240	94	390	12.00	<10	<10	--	--	0.41	----
75/07/03	11 45	80.0	510	210	120	---	13.00	<10	16	<10	3	0.31	----
75/08/06	12 20	76.0	483	270	110	400	31.00	<10	<10	--	--	0.32	----
75/09/10	12 35	69.0	1136	290	100	395	45.00	<10	<10	--	--	0.34	----

MINNESOTA RIVER
RIVER MILE 7 WATER QUALITY (Cont.)

DATE FROM TO	TIME OF DAY	WATER TEMP FAHR	TOTAL DISSOLVED SOLIDS mg/l	T ALK CaCO ₃ mg/l	SULFATE SO ₄ mg/l	TOT HARD CaCO ₃ mg/l	SODIUM Na, DISS mg/l	CADMIUM Cd, TOT µg/l	LEAD Pb, TOT µg/l	ARSENIC As, TOT µg/l	SELENIUM Se, TOT µg/l	FLOURIDE F, DISS mg/l	MBAS mg/l
75/10/08	1200	61.0	526	290	100	380	38.00	10	10	4.2	2.0	0.23	-
75/11/06	1145	54.0	554	320	118	420	41.00	10	17	-	-	0.22	-
75/12/09	1330	32.0	589	320	120	440	54.00	10	10	-	-	0.26	-
76/01/21	1435	32.0	622	330	170	480	48.70	10	10	5.5	3.4	0.31	-
76/02/24	1300	35.6	556	280	120	380	41.00	10	10	-	-	0.23	-
76/03/24	1220	47.3	420	130	110	290	14.00	10	10	-	-	0.23	-
76/04/22	1450	59.0	528	210	160	360	22.00	10	10	2.9	1.4	0.22	-
76/05/12	1430	63.3	539	210	170	380	36.00	10	10	-	-	0.25	-
76/06/10	1255	78.8	494	220	140	340	51.00	10	10	-	-	0.27	-
76/06/24	1345	68.0	539	270	150	380	55.00	10	10	-	-	0.28	-
76/07/09	1350	81.5	404	180	110	270	45.00	10	10	6.7	1.0	0.26	-
76/07/23	1430	72.5	506	240	92	330	48.00	10	10	6.5	1.7	0.30	-
76/08/05	1330	76.1	490	-	-	-	-	-	-	-	-	0.26	-
76/08/18	1445	77.9	508	-	-	-	-	-	-	-	-	0.22	-
76/09/01	1200	71.6	550	-	-	-	-	-	-	-	-	0.30	-
76/09/16	1315	67.1	550	-	-	-	-	-	-	-	-	-	-
76/10/14	1445	59.0	509	260	120	350	68.00	10	10	3.3	-	-	-
76/11/12	1345	38.3	560	390	120	290	68.00	-	-	-	-	-	-
76/12/06	1500	40.1	655	-	-	-	-	-	-	-	-	-	-
77/01/18	1130	36.5	684	383	140	450	70.00	10	10	-	2.0	-	-
77/02/17	1300	38.3	669	-	-	-	-	-	-	-	-	-	-
77/03/24	1220	41.0	280	-	-	-	-	-	-	-	-	-	-
Average		56	573	258	123	368	34.3	10	11	8.6	2.8	0.32	0.24

CHROMIUM CONCENTRATIONS IN THE MINNESOTA RIVER
at Jordan Sampling Station (River Mile 36)
Total Chromium ($\mu\text{g/l}$)

3/12/75	0
6/23/75	0
8/13/75	10
9/25/75	10
11/12/75	<10
2/12/76	0
6/09/76	10
9/14/76	10
11/10/76	0
2/14/77	0
5/25/77	0
6/23/77	10
10/19/77	5
1/25/78	<10
4/02/78	10
8/22/78	<u>30</u>
Average	7

PHENOL CONCENTRATION IN THE MINNESOTA RIVER
at Ft. Snelling State Park Sampling Station (River Mile 3)
1975-1977

	Phenols µg/l		Phenols µg/l
1/15/75	2	10/13/76	2
1/15/75	5	11/03/76	8
2/12/75	3	12/15/76	1
3/12/75	1	2/25/77	13
4/16/75	5	3/16/77	3
5/21/75	5	4/07/77	2
6/17/75	8	5/17/77	4
7/01/75	4	6/28/77	1
8/05/75	7	7/25/77	5
9/02/75	6	8/01/77	1
10/14/75	2	9/14/77	1
11/18/75	0	10/17/77	5
12/17/75	4	11/07/77	2
1/15/76	2	12/22/78	8
2/25/76	3	1/18/78	6
3/24/76	2	2/10/78	11
4/28/76	2	3/15/78	0
5/12/76	4	4/19/78	7
6/30/76	0	5/10/78	1
7/27/76	6	6/05/78	0
8/12/76	3	7/17/78	2
9/15/76	3	8/01/78	5
		9/20/78	0
		Average	4

MINNESOTA RIVER QUALITY
at Ft. Snelling State Park Sampling Station (River Mile 3)

	<u>Total Barium (mg/l)</u>	<u>Total Boron (mg/l)</u>	<u>Cyanide (mg/l)</u>	<u>Total Silver µg/l</u>
2/25/77	0.0	0.18	0.0	<10
4/7/77	0.0	0.12	2.0	<10
6/28/77	0.1	0.14	0.0	<10
8/1/77	0.4	0.23	0.01	<10
10/17/77	0.3	0.14	0.0	<10
Average	0.16	0.16	0.4	<10