

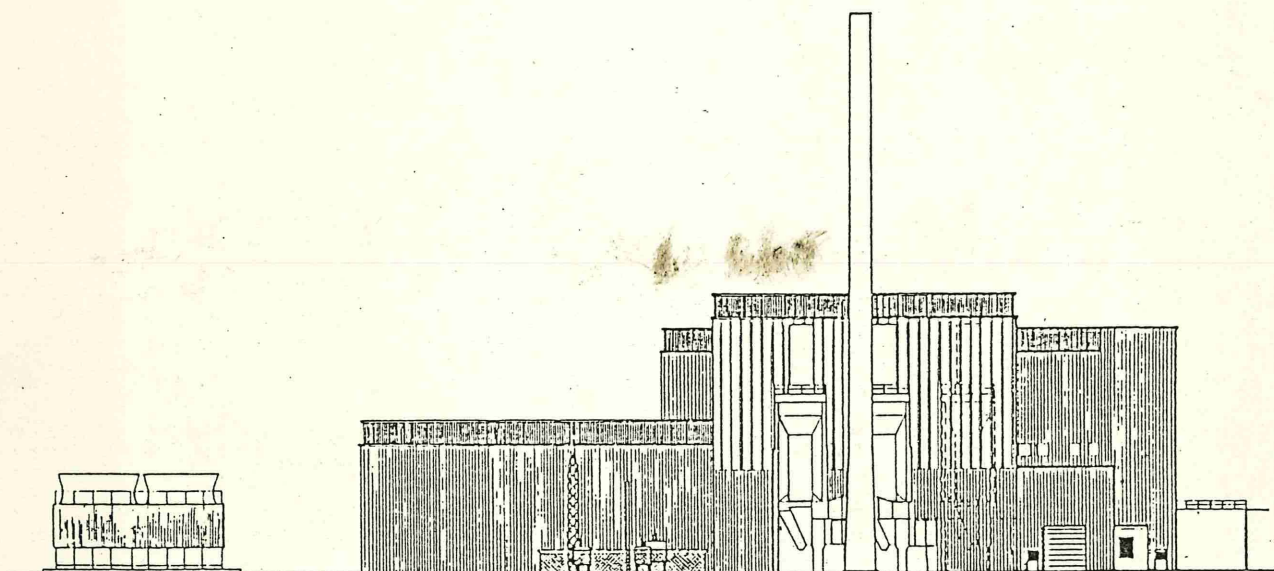


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Draft Environmental Impact Statement

Ramsey/Washington
Waste-to-Energy Project



Henningson, Durham and Richardson

Prepared by: Metropolitan Council of the Twin Cities Area



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October 1983

RAMSEY/WASHINGTON WASTE-TO-ENERGY PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Prepared by: Metropolitan Council of the Twin Cities Area
300 Metro Square Building, 7th and Robert Streets
St. Paul, Minnesota 55101

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ABSTRACT: Ramsey and Washington Counties have proposed construction of a solid waste waste-to-energy facility on a site in Lake Elmo, Mn. The facility would be designed to burn 600 tons of waste daily; steam would be produced for sale to the 3M Center in Maplewood, Mn. This EIS describes and evaluates the proposed project, several locational alternatives, technological alternatives, and a no-build alternative. Written comments on this Draft EIS are due December 23, 1983, and should be sent to:

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October, 1983

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EXECUTIVE SUMMARY

The Environmental Quality Board has established a review process for projects that have the potential for significant environmental impacts. Under that process, solid waste waste-to-energy facilities that burn more than 500 tons of material per day must have an environmental assessment worksheet (EAW) and an environmental impact statement (EIS) prepared before any permitting decisions can be made. This report details the findings of such an EIS for the proposed 600 ton-per-day Ramsey/Washington solid waste waste-to-energy facility, to be located in Lake Elmo, Minnesota.

The project's scoping decision document, required as a part of the environmental review process, identifies the issues that the EIS must address. Those issues can be dealt with under several major headings: environmental concerns, alternatives to the project, land use concerns, and employment/economic concerns.

ENVIRONMENTAL CONCERNS

Impacts on soils, geology, air quality, noise levels, habitat and surface and ground water are all discussed in the EIS. The characteristics of residues from the facility are also described.

Mucky and organic soils, shallow groundwater depths, runoff and erosion hazards will constrain development of the waste-to-energy facility site. These constraints should not be unmanageable, however, if the applicants exercise such mitigative techniques as removal or avoidance of poor soils, or filling of low areas. The proposed steamline route will require special construction practices where it crosses wetlands.

The characteristics of the proposed site's habitat will be greatly altered by the project: woodlands will be removed and several wetlands will be filled. Much of the fauna associated with the existing habitats can be expected to be displaced, destroyed or altered in importance. It is not believed, however, that any rare or endangered species will be affected. Habitats and animal communities along the steamline route should not be as affected as those on the waste-to-energy facility site itself, especially if the line is constructed during winter when the fewest species are present.

Earthmoving, excavation and steamline placement are all activities that will generate dust during the project construction period. Dust emissions can be lessened by staging development, water spraying of haul roads, covering exposed surfaces and other measures. The volume of traffic going to and from the facility is low in comparison with the capacity of nearby streets and highways and so will not cause violations of air quality standards. The waste-to-energy facility will not emit odors. Air for combustion will be drawn from the waste tipping floor and storage pit, thereby keeping the building under negative air pressure, preventing release of odor. Combustion temperatures will be high enough to destroy odors in stack emissions.

State and federal regulations will require that the waste-to-energy facility use an electrostatic precipitator (or equally effective technology) to control particulate emissions. Emissions of other pollutants are low, and air quality near the plant and in surrounding areas will not change greatly, remaining well within ambient air quality standards. The plant will also emit small amounts of metals, acid gases and other substances for which there are no ambient or

emission standards. The concentrations of these substances near the plant will be much lower than guideline values intended to conservatively assure that risk to human health is minimized.

Noise levels at the site can be expected to change. Stationary mechanical devices will be the major new noise sources; they may be loud enough to cause violations of residential-area noise standards at the site's boundaries. Truck traffic on Helmo Av. could also be a major noise source; however, no violations of daytime noise standards are predicted for nearby receivers. Due to proximity to I-694, nighttime residential noise standards may already be exceeded near the site. Project traffic will not increase nighttime noise levels. Measures can be taken to minimize increases in noise. They include using the boiler-house itself as a noise barrier, maintaining and operating equipment properly, and restricting delivery hours.

Site development will affect surface waters by altering drainage patterns, increasing runoff volumes and causing erosion. Changes in the site's surface contours will decrease the storage capacity of on-site wetlands. This loss of storage, in association with an increase in the area of impervious surface on the site, will result in higher runoff volumes. An existing on-site wetland and a constructed detention pond could be used to contain the runoff. Special management techniques, such as the use of netting or mats, will be needed to control erosion on the site.

No adverse impact on groundwater is foreseen from the proposed project. In this respect the project sharply contrasts with the long term risk to groundwater that results from land disposal of solid waste, one of the most likely no-build alternatives to the project.

Ash will be the principal residue from the plant. Typically incineration reduces the volume of waste by 90 to 95 percent, an 80 to 85 percent reduction by weight. Thus, if the waste-to-energy facility receives 600 tons of solid waste daily, it will also generate approximately 100 tons of ash. Bottom ash is the unburned residue from the combustion chamber. As much as 20 percent can be ferrous metals which can be magnetically separated and reclaimed. Fly ash is the material removed by air pollution control equipment. Fly ash has a high heavy metals content and for that reason is normally mixed with bottom ash to lessen disposal problems. Mixed fly ash and bottom ash can usually be disposed of at a conventional sanitary landfill; and in some cases the material is used as part of the landfill daily cover. The mixed ash is biologically inert, has almost no organic content, and has a lower propensity to release its metals content than the initial equivalent amount of solid waste.

ALTERNATIVES TO THE PROJECT

The EIS investigated a number of alternatives to the proposed project. They included alternative sites and steamline routes, other waste-to-energy processes, and a no-build option.

The alternative sites included locations considered by the counties' siting task force and locations identified by Metropolitan Council staff. The Lake Elmo site compared favorably with the others on the basis of environmental suitability and compatibility with surrounding land use. Three additional sites were felt to merit addition analysis: a site just north of existing 3M facilities, a site in Battle Creek Regional Park and a site in Oakdale north of the proposed site.

A total of four possible steamline routes were analyzed, including the applicant's preferred route. The preferred route was the shortest of the four; however, it passes through a residential area and a protected wetland. The second alternative closely followed the first, but would cause less disruption along Century Av. Alternative 3 avoids residential areas by paralleling Minnehaha Avenue, however, traffic disruptions could be significant if the line is placed under, rather than beside, the road. Alternative 4 also avoids residential areas: it jogs south and follows the frontage road for Hwy. 12. This route is over three miles long, and could be unfeasible for that reason.

For the most part, Ramsey and Washington Counties have focused their investigations on consideration of a mass-burn waste-to-energy facility.

Refuse-derived fuel (RDF) systems, modular incineration, and pyrolysis are the alternative waste-to-energy processes that are discussed in the EIS. RDF systems produce a more uniform fuel than unprocessed solid waste and facilitate recycling. However, operating experience with such systems is quite limited in the U.S., and many have been shut down because of technical or economic difficulties.

Modular combustion units are prefabricated mass-burn units generally designed to process less than 200 tons of waste per day; they have rarely been used for large-scale processing. Quality of the units varies. In general, these systems have encountered problems similar to those associated with the larger, field-erected mass burn units.

Pyrolytic systems are still experimental. A number of pyrolysis processes have been developed in the U.S., but none has proven to be viable on a commercial scale. Pyrolysis processes produce both liquid and gaseous fuels.

If the proposed waste-to-energy facility or an alternative waste-to-energy facility is not built, the waste that would otherwise be burned must be disposed of by some other means, and 3M will have to use an alternative source of fuel to generate steam. Ramsey and Washington counties both have proposed to scale-up their co-composting efforts if the waste-to-energy facility is not built. Co-composting feasibility studies are still underway, however, and firm commitments have not been made by all of the involved parties. If cocomposting proves unviable, it is likely that the waste will be landfilled. 3M currently uses either natural gas or No. 6 fuel oil for steam generation in their on-site boiler plant. These fuels will continue to be used if the waste-to-energy facility is not built.

LAND USE CONCERNS

In this section of the EIS, visual impacts, transportation impacts, impacts on historical artifacts, and compatibility with local and regional plans are addressed.

The proposed site was compared with three alternative sites in a visual analysis. The Lake Elmo site compared favorably with the others in terms of compatibility with surrounding land uses and the theoretical size of the area that could view the site. An alternative site just to the north was more visible; alternative sites near 3M and in Battle Creek Park were more visible and had a greater potential for land use conflicts because of nearby residences.

The amount of traffic generated by the project is low in comparison to the capacities of nearby roadways. Most travel to the plant will not coincide with peak travel hours for adjacent roads. Helmo Av. will be relocated to the eastern site boundary and upgraded to nine-ton capacity. A short segment of Minnehaha Av. (County Rd. 70) must also be upgraded. Widening of this segment was suggested as a safety improvement.

The proposed Lake Elmo site is not important from an historical/archeological perspective. A field survey of the site did not unearth evidence of any historical or archeological resources.

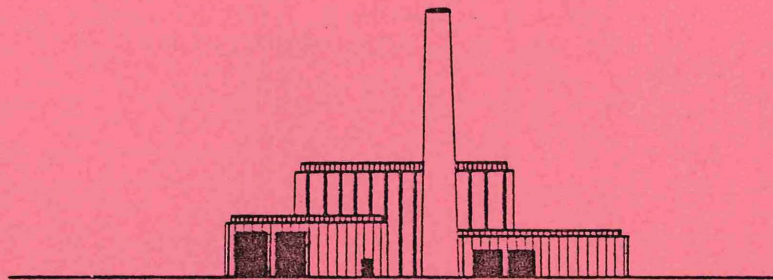
From a land use planning perspective, the waste-to-energy facility project and site appear quite compatible with local and regional proposals and policies. The project furthers the policies and objectives in the Metropolitan Council's Solid Waste Management Development Guide/Policy Plan by helping to maximize recovery of energy from solid waste, by reducing the need for land disposal, and by making Ramsey and Washington counties responsible for the fate of a greater proportion of their solid waste stream. It conforms with the counties' plans for waste abatement, and is consistent with Lake Elmo's latest concept plan for the southwestern portion of that city.

EMPLOYMENT/ECONOMIC CONCERNS

The project will create jobs both during its construction and its operation. During the construction phase approximately 1,000 people will work on the project, with an average of 100-200 at any particular time. Permanent employment for the facility will be approximately 33 full time positions for continuous operation.

No definitive statement can be made about the ability of the facility to induce development nearby. It is likely that success in these efforts will be more dependent on efforts by the city or others to market the area than on any inherent ability of the facility to stimulate growth.

PROJECT DESCRIPTION



PROJECT DESCRIPTION

BACKGROUND

Washington and Ramsey Counties have proposed construction of a solid waste waste-to-energy facility at a site in Lake Elmo, Minnesota. The facility would produce steam for sale to the 3M Company in Maplewood.

Figure 1 shows the general site location, and Figure 2 illustrates the proposed steamline route between the site and the 3M Center.

The proposal is the culmination of a three-year effort, begun by the City of St. Paul, investigating the feasibility of waste-to-energy processes and markets. A conceptual evaluation of waste-to-energy processes was completed in 1980. The second phase of effort was market evaluation. This work led to the identification of the 3M Center as the primary potential energy market. Since the 3M complex is in Maplewood, not in St. Paul, Ramsey County became an active partner in project planning.

Because the concept was consistent with county solid waste abatement responsibilities under Minnesota's Waste Management Act, and because several potential project sites were located in Washington County, a joint powers agreement was entered into early in 1982 between the two counties and the city. Under this agreement a multi-jurisdictional task force representing local governments and the counties evaluated potential project locations, selecting the proposed Lake Elmo site in July 1982.

The project came under the sole auspices of the counties in December 1982 through execution of a second joint powers agreement. To oversee project implementation efforts, a project board was formed consisting of commissioners from each county and a representative from the City of Lake Elmo.

CONCEPT

Based on market energy demand, the counties have focused their proposal on a facility capable of processing 600 tons of waste daily, with an annual throughput of 180,000 tons. The project has been scaled to meet 3M's non-peak steam demands. 3M will keep its steam plant in operation to carry loads in excess of the waste-to-energy plant output and as a precaution in case service from the facility should be disrupted. While the facility is proposed with a 600 ton per day rating, annual through-put estimates presume that the facility will not operate continuously at maximum capacity. This retains the flexibility to increase throughput to supply a greater share of 3M's peak demand or also the capacity to supply energy to other development which may occur near the facility. No expansion of the facility is contemplated at present; however, it is likely that the facility design and layout will allow for possible expansion at a later time.

Efforts to-date have concentrated on mass burn technology. This type of waste-to-energy process is described below.

The term "mass burn" system refers to large, field-erected waste-to-energy facility units which burn unprocessed solid waste. Figure 3 is a cross-sectional illustration representative of a mass burn waste-to-energy facility.

Figure 1 .
SITE LOCATION

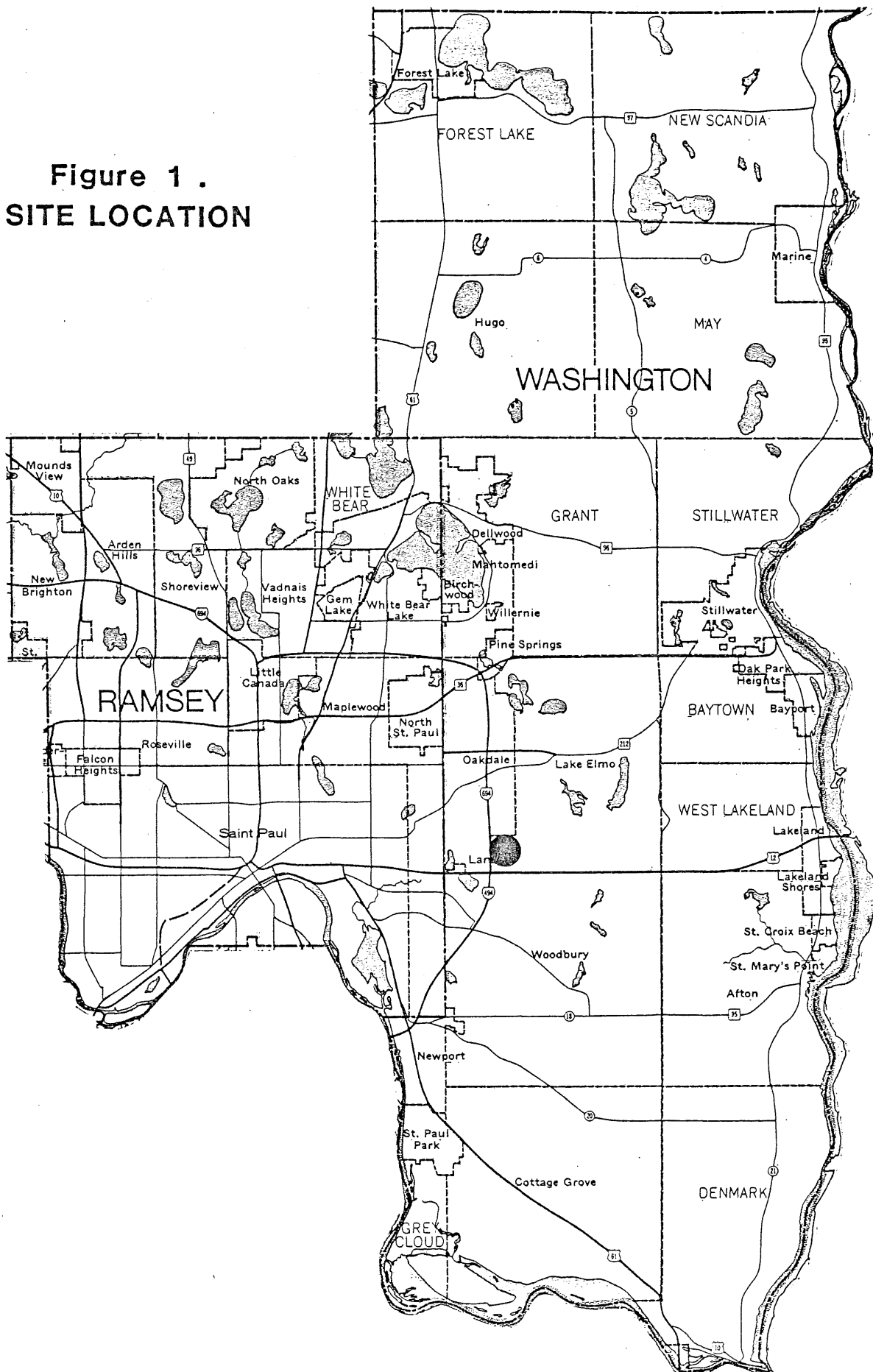


Figure 2.

**RAMSEY/WASHINGTON COUNTY WASTE-TO-ENERGY PROJECT
PROPOSED STEAMLINE ROUTE**

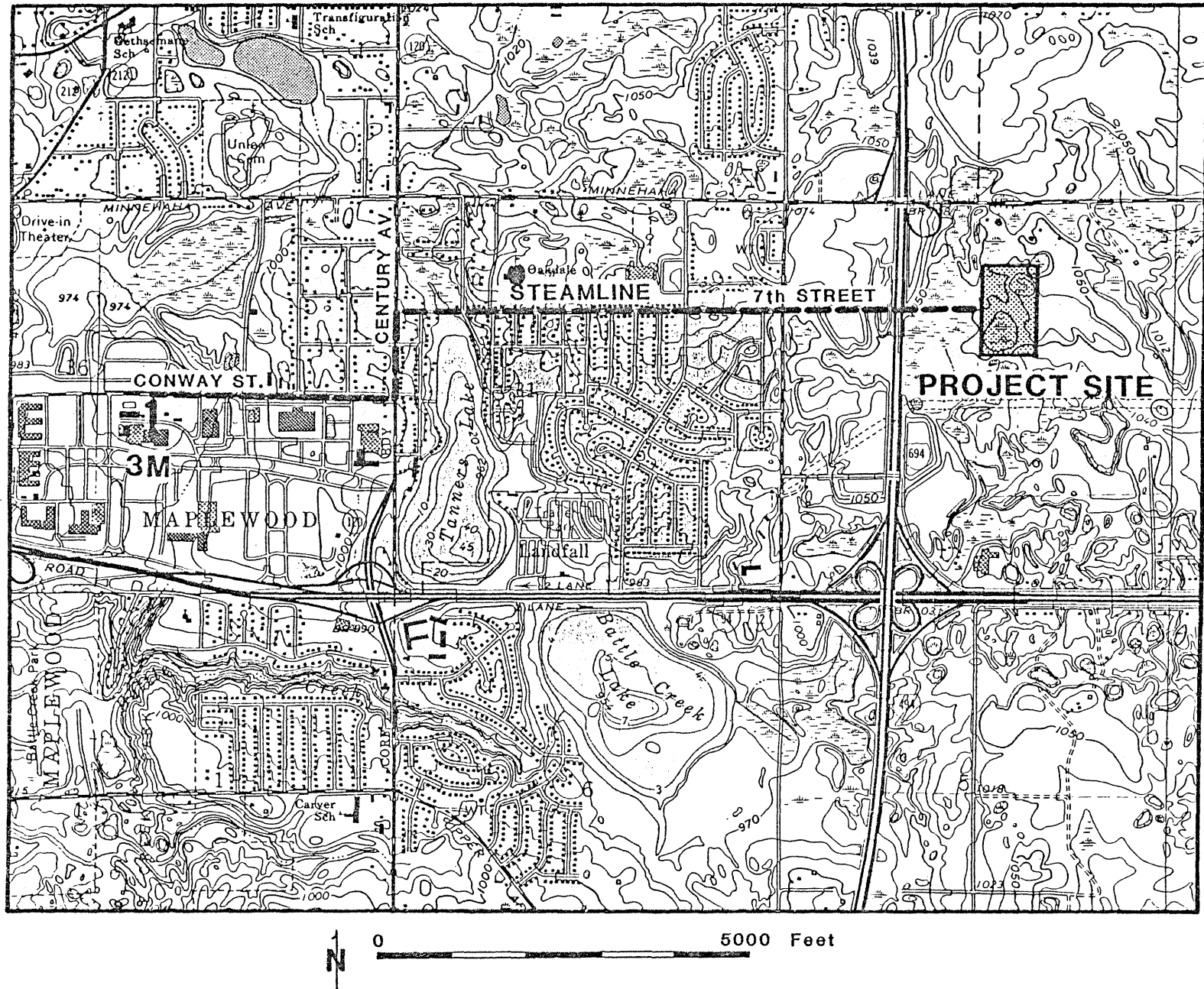
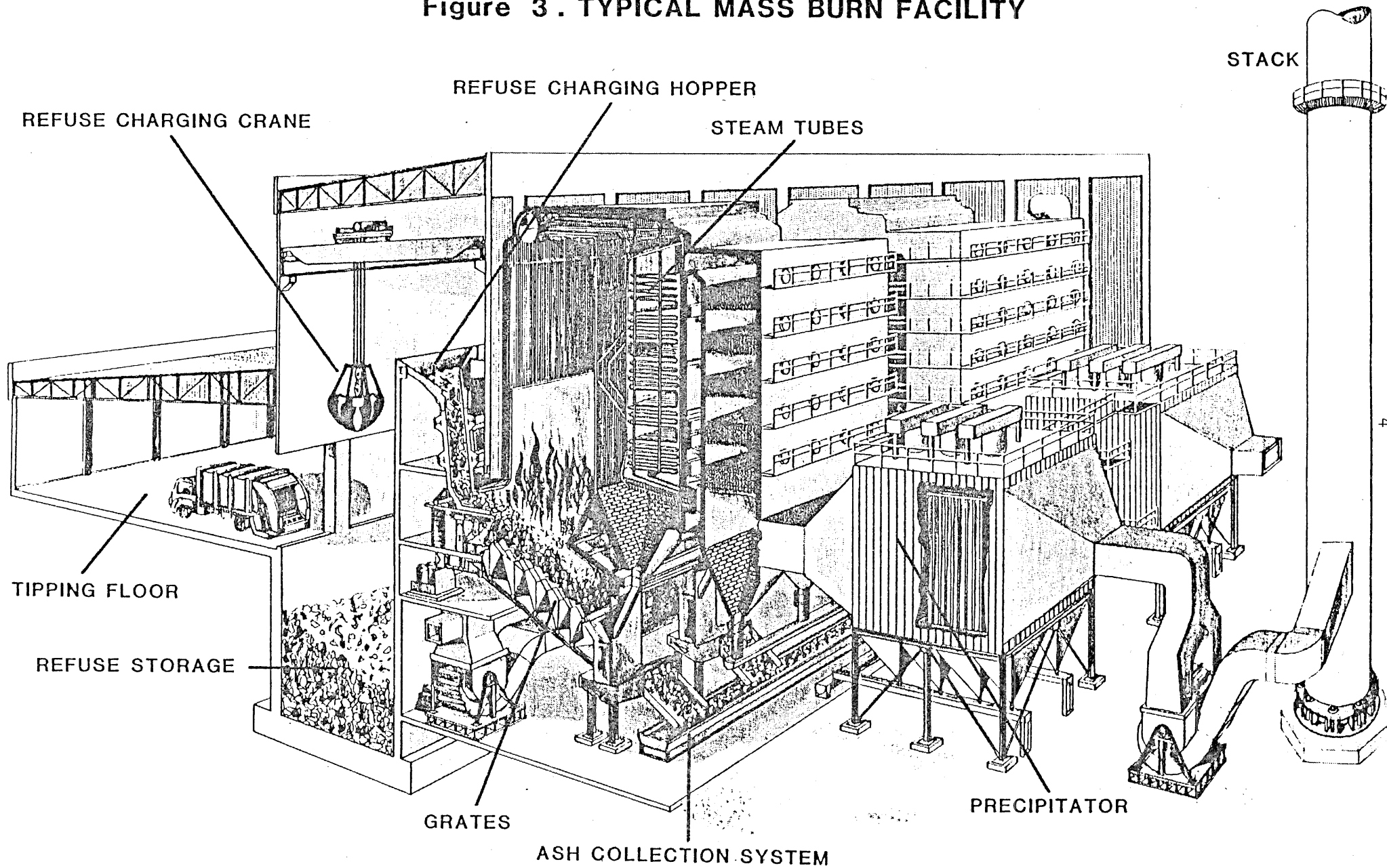


Figure 3 . TYPICAL MASS BURN FACILITY



Incoming trucks drive into the facility and discharge their waste directly into the storage pit from the tipping floor. The pit is essentially a concrete bunker with capacity to hold three to four days waste supply. The excess capacity allows for continuous operation during times such as holidays or weekends when waste deliveries are infrequent.

Overhead clam shell or orange peel cranes are used to mix the waste. This blends the material to provide a more consistent fuel and allows the crane operator to sort out unprocessable materials for separate handling. The cranes feed the blended waste directly to the changing hopper for each combustion unit.

Multiple combustion systems are the norm. The Ramsey/Washington facility is planned to have either two or three units with a combined capacity of 600 tons per day. This redundancy is desirable as it allows for back-up capabilities during periods of down-time and scheduled maintenance.

Waste falls from the feed hoppers onto an inclined grate. Variations in grate design are the principal distinguishing feature of competing mass burn technologies. Waste is propelled forward along the grate floor by gravity and usually also by mechanical action of the grate components. Some systems rely on rollers, others use a reciprocating movement of the grate elements. All are designed to move the waste through the chamber and to agitate it in the process. This mixing of the waste greatly increases combustion efficiency, providing a more complete burn-out.

Mass burn systems supply "excess" air to the combustion chamber: That is, the systems supply more air than theoretically needed to sustain combustion. Air is introduced from below the grates, above the grate, and from the sides of the chamber. Management of the air flow further mixes the waste. It stabilizes combustion conditions in each part of the chamber and maximizes burn out. Combustion air is drawn from the tipping floor and storage pit. This maintains a negative air pressure in these areas, preventing release of odors.

Refractory lined furnaces produce steam by discharging the hot gases to the boiler. Waterwall systems also directly expose steam tubes in the combustion chamber.

Off-gases are passed through an electrostatic precipitator or comparable device to remove particulate emissions and are then discharged through the stack.

Steam is piped to the energy market. The Ramsey/Washington proposal is for a closed system with a condensate return of at least 90 percent. Figure 4 shows typical cross-sections for a steam line and condensate line. The two lines can either be laid side-by-side or can be placed together in a single casing as illustrated in Figure 5.

Residue from the grates is cooled by a water bath or spray quench. The ash is dewatered and can either be loaded directly for transfer to a disposal site or can be processed for ferrous metals recovery. The Ramsey/Washington Joint Project Board has indicated that ferrous recovery will be pursued.

A conceptual layout of the facility on the Lake Elmo site is shown in Figure 6. In addition to the activities shown, a small recycling drop-off station for public use has been proposed immediately south of the truck entrance. Figure 7 illustrates an exterior view of the proposed waste-to-energy plant.

Figure 4 .
STEAM LINE AND CONDENSATE LINE
CROSS SECTIONS

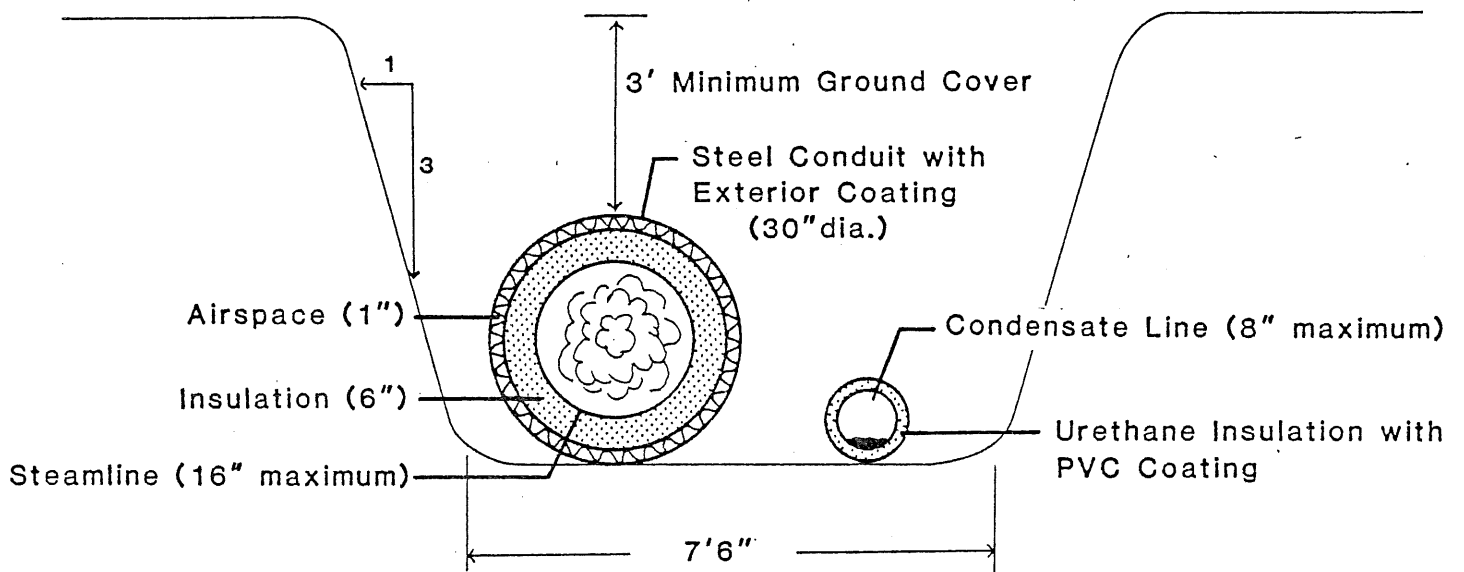
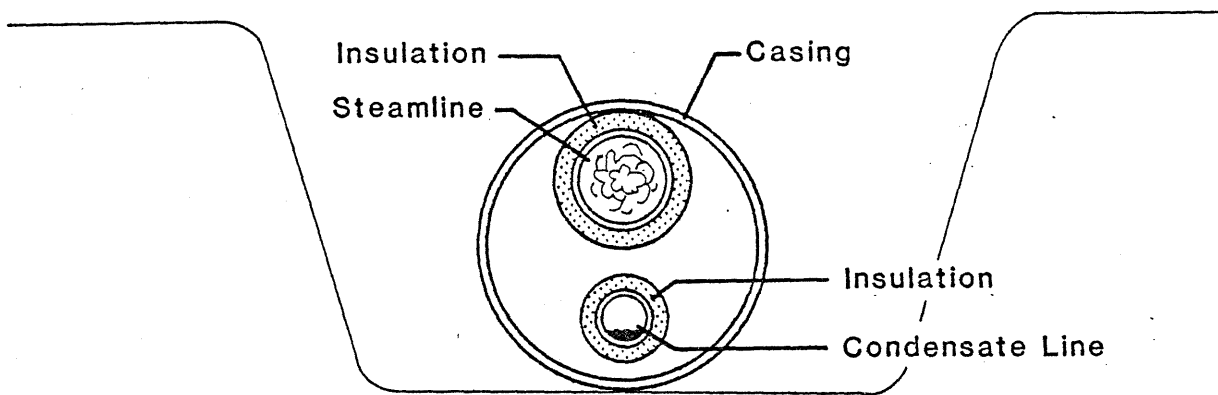
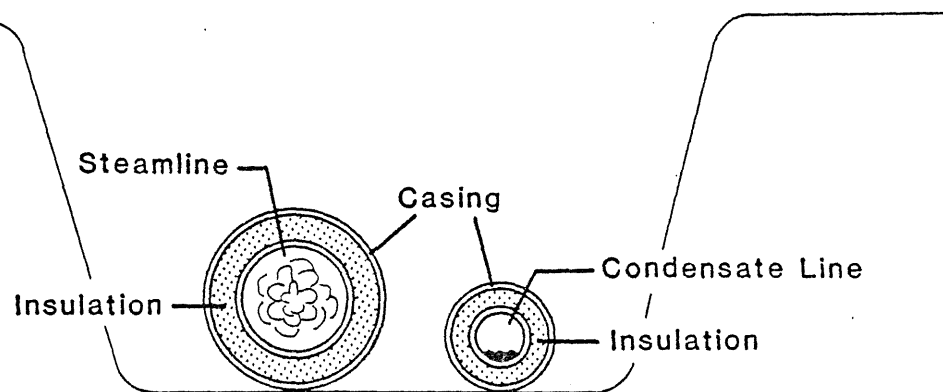


Figure 5.
STEAM LINE PLACEMENT OPTIONS

OPTION 1



OPTION 2



RAMSEY/WASHINGTON COUNTY WASTE-TO-ENERGY PROJECT PRELIMINARY SITE LAYOUT

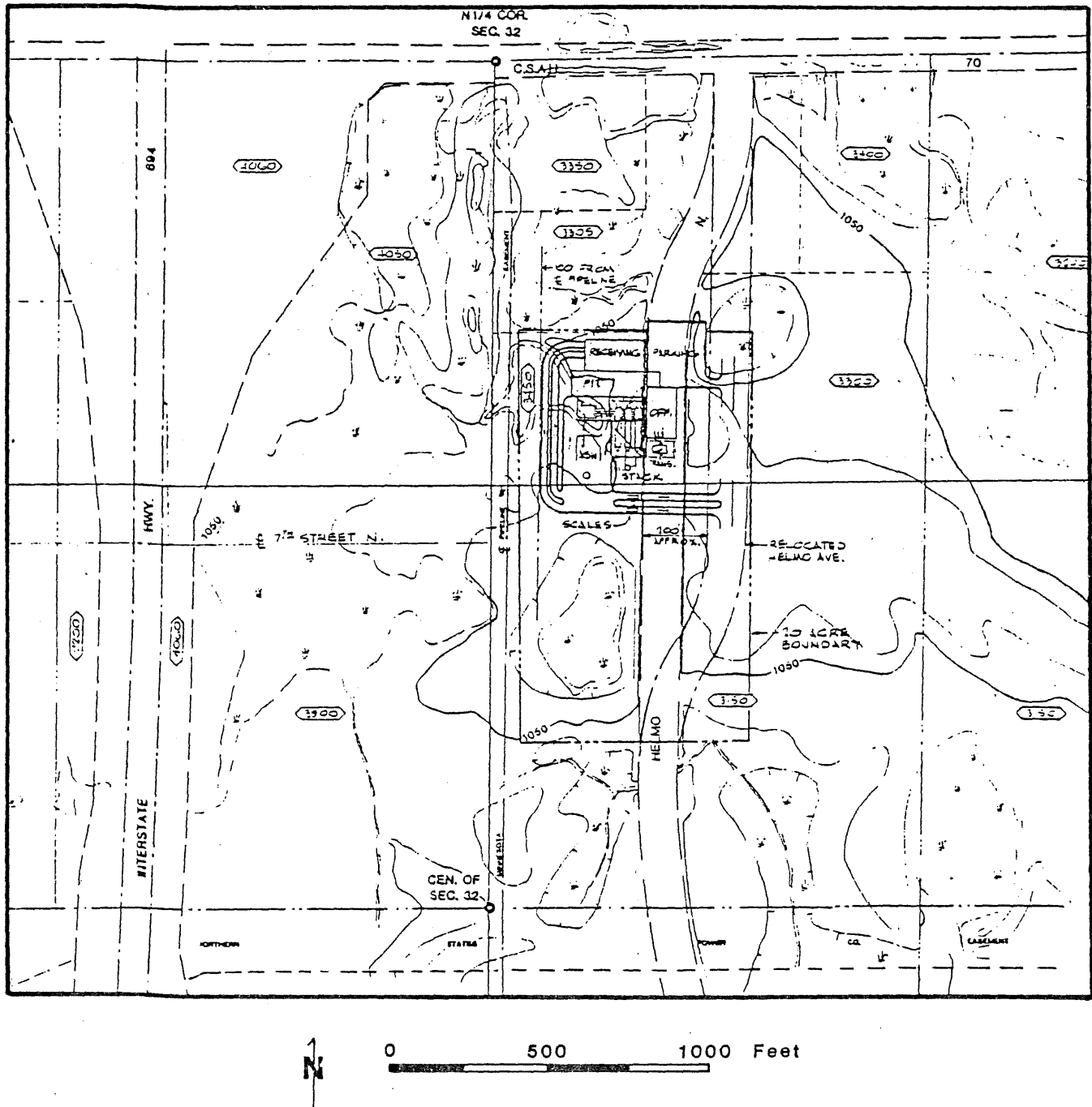
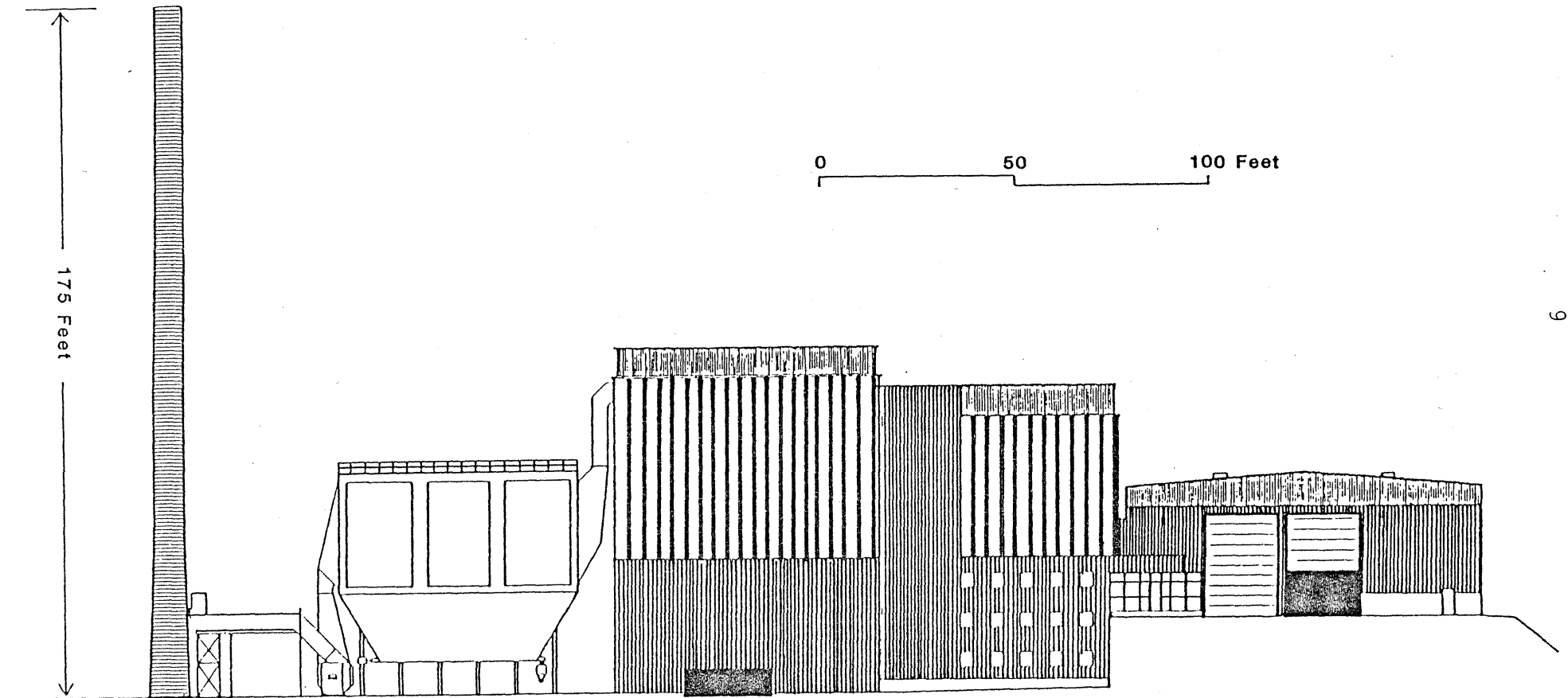


Figure 7.

**RAMSEY/WASHINGTON COUNTY WASTE-TO-ENERGY PROJECT
600 TON PER DAY FACILITY SIDE ELEVATION SCHEMATIC**

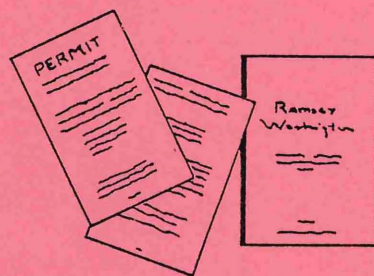


Source: Henningson, Durham and Richardson

SCHEDULE AND COST

At present the project board is working toward determining the qualifications of firms seeking to develop the project. It is not likely that selection of a vendor could be completed prior to mid-summer 1984. Given approval by both county boards to implement the project, the earliest possible construction date is estimated to be spring 1985. Based on the record of similar projects, a 30-36 month period is foreseen before the facility would be fully operational. Construction costs for facility development and steamline placement are now estimated to be approximately \$55 million.

PERMITS AND APPROVALS



PERMITS AND APPROVALS

EIS PURPOSE

The purpose of this EIS is to disclose information about the significant environmental impacts of a proposed action. The document is not intended to justify either a positive or negative decision on the project, but can be used as a guide in issuing or denying permits or approvals for the project and in identifying measures necessary to avoid or mitigate adverse environmental effects and to restore or enhance environmental quality.

Table 1 lists permits and approvals which are or may be required for the project to be successfully implemented.

Table 1
RAMSEY/WASHINGTON COUNTY WASTE-TO-ENERGY PROJECT
PERMITS AND APPROVALS LIST¹

<u>Permit/Approval</u>	<u>Agency</u>	<u>Authority</u>	<u>Approximate Time for Preparation and Review</u>	<u>Filing or Inspection Fees</u>	<u>Comments</u>
<u>Federal</u>					
Permit to discharge dredge or fill materials into waters of U.S.	U.S. Army Corps of Engineers	Ch. 404 Clean Water Act	6 months	\$100	Includes discharges into wetlands.
FAA Obstruction analysis	Federal Aviation Administration	14CFR77	3 months		Applies to any structures over 200 feet high or within restricted airspace near airports. Sets standards for structure lighting.
<u>State</u>					
Air emission facility installation and operation permits	Minnesota Pollution Control Agency (MPCA) Air Quality Division	Mn. stats.ss116.081; Federal Clean Air Act; and regulations thereunder.	20 months		Includes prevention of significant deterioration review. If facility qualifies for monitoring exemptions, preparation/review time could be reduced to 12 months. Metropolitan Council has approval authority.
Solid waste facility approval	MPCA Solid and Hazardous Waste Division	Mn. stats.ss116.081; Federal Resource Conservation and Recovery Act; and regulations thereunder.	Included above		This is done concurrently and incorporated into the installation permit.
Co-disposal permit approval	MPCA Solid and Hazardous Waste Division	Mn. stats.ss116.081; Federal Resource Conservation and Recovery Act; and regulations thereunder.	6 months		Required if ash residue is disposed of at sanitary landfill.
Sewer extension permit	MPCA and City of Lake Elmo	MPCA rule; WPC 36 and Lake Elmo sewer systems ordinances.	1 month	\$12.00 (city)	
Permit to work in protected waters	Department of Natural Resources	Mn. stats.ss105.42	6 months	\$15.00	Filling wetlands requires creation of new wetlands to compensate (Mn. Stats. ss105.391)
Utility crossing license	Department of Natural Resources	Mn. stats.ss84.415	6 months	\$15.00	Applies to utility lines which cross public lands or waters. There is a fee for the license based on the length of the crossing.
Water appropriation permit	Department of Natural Resources	Mn. stats.ss.105.41	6 months	\$15.00	Required for appropriations of 10,000 gallons or more per day, or 1 million gallons or more per year.
Boiler approval	Department of Labor and Industry Boiler Inspection Division	Mn. stats.ss.183.45	Inspection done within 1 week of request.	\$20.00	Can get exemption if boiler is insured. (ss183.57) \$10.00 fee.

Table 1 (Cont.)
 RAMSEY/WASHINGTON COUNTY WASTE-TO-ENERGY PROJECT
 PERMITS AND APPROVALS LIST¹

<u>Permit/Approval</u>	<u>Agency</u>	<u>Authority</u>	<u>Approximate Time for Preparation and Review</u>	<u>Filing or Inspection Fees</u>	<u>Comments</u>
Steam line approval	Department of Labor	Mn. stats.ss.326.46	Same as above.		
Utility permit	Department of Transportation	Mn. stats.ss.161.45	3 months	\$25.00 per crossing	Required for utility lines to use or cross federal or state highway right-of-way.
Plumbing approval	Department of Health	MCAR 39A/Rule MHD 134	1 day ²		May also be made by local government.
Public water supply approval	Department of Health	Mn. stats.ss.144.383	1 month		For systems serving 25 or more persons per day, 60 or more days per year.
Electrical installation approval	Board of Electricity	Mn. stats.ss.326.244	Inspection on request.	\$100+	
Archaeological/historical approval	Historical Society	National Historic Preservation Act (P.L. 89-665)	1 month		Survey may be necessary to determine potential impacts on archaeological and historical resources.
Formation of waste management district	Waste Management Board	Waste Management Act ss.115A.62-.72; and rules thereunder.	18+ months		Time estimates subject to substantial variation due to public hearing and waste management planning requirements.
Designation of resource recovery	Waste Management District or county makes designation.	Waste Management Act ss.115A.70	12+ months		Same as above. Metropolitan Council and WMB have approval authority.
<u>Local</u>					
Industrial discharge permit	Metropolitan Waste Control Commission	Clean Water Act; Mn. stats.ss. 473.501	5 months	\$30 to \$180	Discharges must be compatible with system. Discharge fees vary with nature and quantity of discharge. Pretreatment may be required.
Drainage permit	Ramsey/Washington County Metro Watershed District	Mn. Watershed Act ss.112.43	2 months		A separate permit may not be required if a DNR ss105.42 permit is issued.
Zoning approval	Lake Elmo zoning/building department; city council	Lake Elmo zoning ordinances	6 months		Current zoning is rural residential. and facility is not listed as an allowable use; an amendment is necessary.
Building/construction permits	Same as above.	Lake Elmo building ordinances	--- ³		Wells must meet Health Department requirements. Fire protection systems must meet fire code requirements. All applicable codes and ordinances must be met.
Access approval	Washington County highway engineer	Washington County ordinances	1 month	\$10	

¹The permits and approvals stated here are only for matters relating to the design, construction and control of waste. Other regulatory requirements such as those relating to bonding and financial matters are not included.

²Period begins from notice of readiness for inspection.

³Permits are issued upon completion of construction plans and plan review. Required inspections and approvals must be made upon completion of construction.

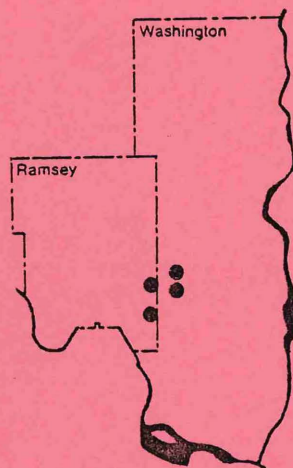
RECORD OF DECISION

For the permitting and approval decisions listed on Table 2, the EIS must be utilized. These permitting/approval agencies are required to provide a record of decision stating how the pertinent information in the EIS was used in reaching their decision.

Table 2
PERMITS AND APPROVALS REQUIRING A RECORD OF DECISION

<u>Agency</u>	<u>Permit/Approval</u>
MPCA	Air Quality Construction Permit and concurrently Solid Waste Facility Approval
Mn/DOT	Utility Permit
DNR	Permit to Work in Protected Waters
Metropolitan Council	MPCA Solid Waste Facility Approval
Lake Elmo	Zoning approval

ALTERNATIVES



LOCATIONAL ALTERNATIVES TO THE PROPOSED SITE

SITING TASK FORCE ALTERNATIVES

The proposed site is in an undeveloped area of Lake Elmo. It was selected by a Siting Task Force established by Washington and Ramsey Counties and the City of St. Paul. The task force members represented each county and the Cities of Lake Elmo, Maplewood, Oakdale, St. Paul and Woodbury. They considered 11 preliminary areas as potential sites (Figure 8).

The Siting Task Force evaluated each of the 11 preliminary search areas with respect to a number of factors (Table 3). Of the initial 11 sites, four were chosen for more detailed studies: Site C, Site D, Site G and Site K. Based on the factors considered by the Siting Task Force, a site in Lake Elmo north of Site D appeared most acceptable.

The EIS is required to evaluate potential alternative sites for the project. These alternatives include sites rejected by the task force, as well as potential sites it did not consider.

The Siting Task Force originally considered 11 potential sites within a three-mile radius of 3M. The three mile distance was chosen because steamlines are generally not economically or technically feasible for longer distances. Only four of the sites merited detailed investigations in the task force's opinion, Sites C, D, G and K. They evaluated each of the four sites against the criteria in Table 4.

Site C, the workhouse site, was dropped primarily because of its potential for visual impacts. The site is highly visible from surrounding lands. The project's stack would be the highest structure in the area, and would be visible for two or more miles. The boiler house would be visible in the surrounding, open, predominantly residential area. The task force felt that nearby residents and users of Battle Creek Park would be highly sensitive to such a noticeable facility in an open area.

Site C would require a 2.4 mile steamline, while the proposed site requires about 2.2 miles of steamline. Site C is adjacent to an existing sewer line, water mains and adequate electrical service.

Site G, the K-Mart site, appeared less desirable to the task force than Site D because of its greater visual impact and its potential for traffic congestion. The task force felt that incoming trucks would conflict with traffic drawn to existing commercial development on 10th Street. Site G is also within a mile of several hundred homes. The facility would be out of character with this residential development, but would not differ significantly in height from existing transmission lines and commercial developments. Because of its high elevation and open nature, this site affords little capacity for visual buffering. The site does have sewers, water mains and electrical service nearby.

Located at the western edge of the 3M campus, Site K has the obvious advantage of a short steamline route. The steamline would be about 4,000 feet long, making this site the least costly of those considered in depth by the task force. The site is also adjacent to existing sanitary sewers, water lines and adequate electrical service. The boiler house would be visible from about 100 residences; however, the facility would probably have no more aesthetic impact than the existing 3M complex. Access to this site was not perceived as being as good as Site D.

Figure 8.
POTENTIAL SITES CONSIDERED BY
THE SITING TASK FORCE

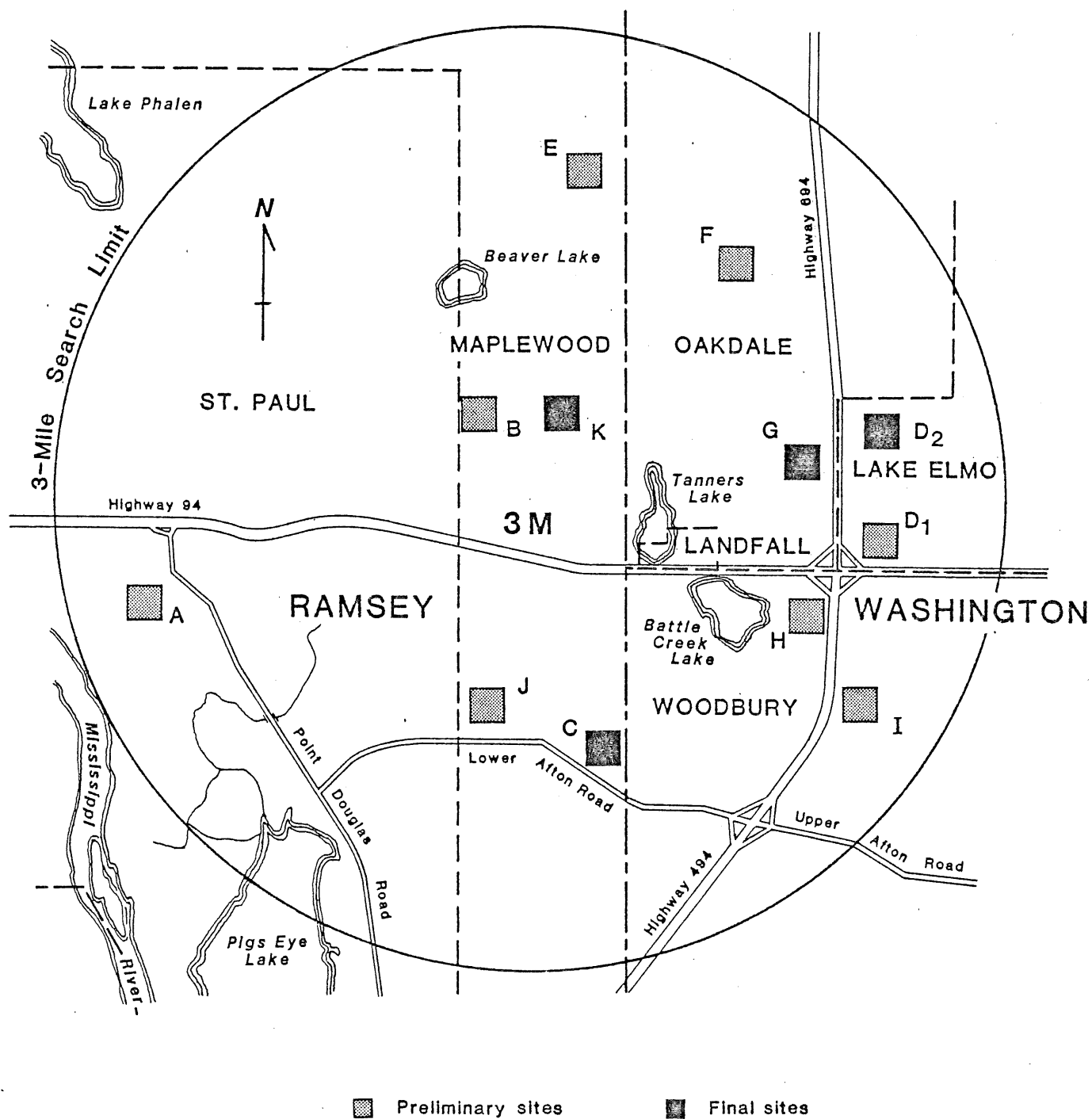


Table 3
PRELIMINARY SITE REVIEW SUMMARY

Site		Location		Impact on Cost					Land Use Impacts				Overall Summary of Acceptability
				Distance to 3M	Steam Line Routing	Proximity to Major Highways	Truck Access	Summary Cost Acceptability	Existing Use	Compatibility With Zoning	Visual Screening	Summary Land Use Acceptability	
A	Fish Hatchery	St. Paul	Ramsey	Poor (3.2 Miles)	Poor	Good	Good	Fair	Good (Public)	Poor (Residential)	Good	Fair	Fair
B	Outdoor Theater	Maplewood	Ramsey	Good (0.85 Miles)	Good	Good	Good	Good	Fair (Vacant)	Good (Lt. Manufact)	Poor	Poor *	Poor
C	Workhouse	Maplewood	Ramsey	Poor (2.4 Miles)	Good	Good	Good	Good	Fair (Institut.)	Good (Farm Res. Dist)	Poor	Fair	Fair
D	Ford Dealer (Conco)	Lake Elmo	Washington	Poor (2.8 Miles)	Fair	Good	Good	Fair	Good (Open)	Fair (Rural Resident)	Good	Good	Good
E	Maplewood Dump	Maplewood	Ramsey	Poor (2.9 Miles)	Fair	Poor	Poor	Poor	Poor (Wetland)	Good (Heavy Manufact)	Good	Fair	Poor
F	Open Land	Oakdale	Washington	Poor (2.75 Miles)	Fair	Poor	Poor	Poor	Poor (Wetland)	Fair (Agricultural)	Good	Fair	Poor
G	K-Mart	Oakdale	Washington	Poor (2.8 Miles)	Fair	Good	Good	Fair	Good (Open)	Good (Agricultural)	Good	Good	Fair
H	Wooddale West	Woodbury	Washington	Fair (2.0 Miles)	Fair	Fair	Poor	Fair	Good (Open)	Good (lmy Business)	Fair	Good	Fair
I	Wooddale East	Woodbury	Washington	Poor (2.4 Miles)	Poor	Fair	Fair	Poor	Good (Open)	Fair (Ltd. Indust.)	Fair	Good	Fair
J	Battle Creek	Maplewood	Ramsey	Fair (1.5 Miles)	Good	Good	Good	Good	Poor (County Park)	Good (Lt. Manufact)	Poor	Fair	Fair
K	Minnehaha	Maplewood	Ramsey	Good (0.6 Mile)	Good	Good	Good	Good	Fair (Resid./Open)	Fair (Lt. Mfg./Resid)	Good	Fair	Good

SOURCE: Siting Task Force Report, July, 1982.

* Site of 3M planned development. 3/12/82

Table 4
DETAILED REVIEW CRITERIA

Feasibility	Preferred sites have a minimum of 10 acres for site development.
Cost	Preferred sites minimize site costs. Preferred sites minimize the distance required for a steamline. Preferred sites minimize construction or upgrading of roads for access. Preferred sites minimize the distance to existing electrical and sanitary services.
Visual	Preferred sites minimize visual impacts on residences.
Agriculture	Preferred sites minimize consumption of prime agricultural land (SCS types I and II).
Noise	Preferred sites minimize traffic noise on residential areas. Preferred sites minimize construction and operating noise impacts on residential and other noise sensitive areas.
Historical/Archaeological	Preferred sites minimize impacts on historical and archaeological resources.
Fish and Wildlife	Preferred sites minimize impacts on rare, endangered and threatened plant and animal species.
Water Quality	Preferred sites minimize water quality impacts on lakes, ponds, rivers, streams and marshes.
Air Quality	Preferred sites minimize the potential for cumulative impacts with other major air emission facilities.
Recreation	Preferred sites minimize impacts on federal, state, county or local recreation or open space areas.
Zoning	Preferred sites minimize impacts on local zoning.
Planning	Preferred sites are compatible with existing land use plans.
Geology	Preferred sites are not located in geologically unstable areas such as fault zones, shrink-swell soils, peat lands or sink holes.

Table 4 (Cont.)
DETAILED REVIEW CRITERIA

Vegetation	Preferred sites minimize impacts on forest and woodland resources.
Hydrology	Preferred sites minimize: a) drainage or runoff to water courses; b) shoreline alterations; c) dredging and filling; and d) channel modifications.
Steamline Impacts	Preferred sites minimize potential impacts associated with routing, construction and operation of a steam line.
Haul Distance	Preferred sites minimize the haul distance.
Future Steam Users	Preferred sites are near future steam users.
Traffic Congestion	Preferred sites minimize impacts on traffic congestion.
Airports	Preferred sites minimize impacts on airport approach patterns.

The siting committee ranked the potential for this site to have water quality, hydrology and geologic impacts as significant or potentially significant because of a wetland on the site.

Two of the preliminary siting areas rejected by the task force ranked well with respect to most criteria. Site B, the drive-in theatre, was not studied further because 3M reported that its long-term plans include construction of research and/or office facilities on the site. A second potentially feasible site is Site J. This site is within 1-1/2 miles of 3M. Portions are wooded, which could visually buffer nearby residents. The primary objection to this site is that it is in Battle Creek Regional Park. It could also cause more traffic problems, or require more road upgrading, than the chosen site.

SITES NOT CONSIDERED BY THE TASK FORCE

Metropolitan Council staff identified other potential sites by using topographic maps, aerial photos, field reconnaissance and comprehensive plans. Within a three-mile straight-line distance from 3M, staff looked for open parcels that did not have obvious problems such as extensive wetlands, steep slopes, or numerous nearby residential areas on all sides (Figure 9). 1980 aerial photos were used to update the surface features of the topographic maps. Field checks were used to gather more information and to verify the map data. Very few of the sites identified in this initial screening appear to merit further consideration (Table 5). Most are located more than 2.5 miles from the 3M center. Sites 5, 6, 7, 12, and 14 have environmental limitations due to wetlands or slopes. Visual buffering is poor for Sites 2, 10, 11, 12 and 13. The existing access is inadequate for sites 4, 5, 6 and 7.

Area 8, just west and northwest of existing 3M facilities in Maplewood, would be easily accessible from Hwy. 94 and would have reduced steamline costs. The facility would have approximately the same aesthetic impact on nearby residences as the existing 3M campus. Because the area is closer to residences, however, earth berms or vegetative screening would be desirable. McKnight Rd. would require some upgrading, as well. Area 9 does not appear to be of adequate size to be a viable site.

A viable area is located just north of the proposed site, across Minnehaha Av. Sites 1 and 3 are as accessible as the proposed site, but have less natural buffering. The most feasible steamline route if either of these sites were considered is along Minnehaha to Century, and from Century to Conway. Utilities are available to serve this area.

VIABLE ALTERNATIVES

The chosen site fares quite well when compared to other potential sites. All of the sites considered have disadvantages as well as advantages. Nevertheless, it appears that the area north of Conway Avenue (including Sites B and K and their surrounding lands), Site J in Battle Creek Regional Park and Site 1 in Oakdale just north of the proposed site have the greatest potential as feasible alternative sites. In the discussions which follow of potential environmental and economic impacts these will be the only locational alternatives discussed. Additional information about environmental impacts of sites considered by the Siting Task Force can be found in the July, 1982 Siting Task Force Report.

Figure 9 .
 POTENTIAL SITES IDENTIFIED BY
 METROPOLITAN COUNCIL STAFF

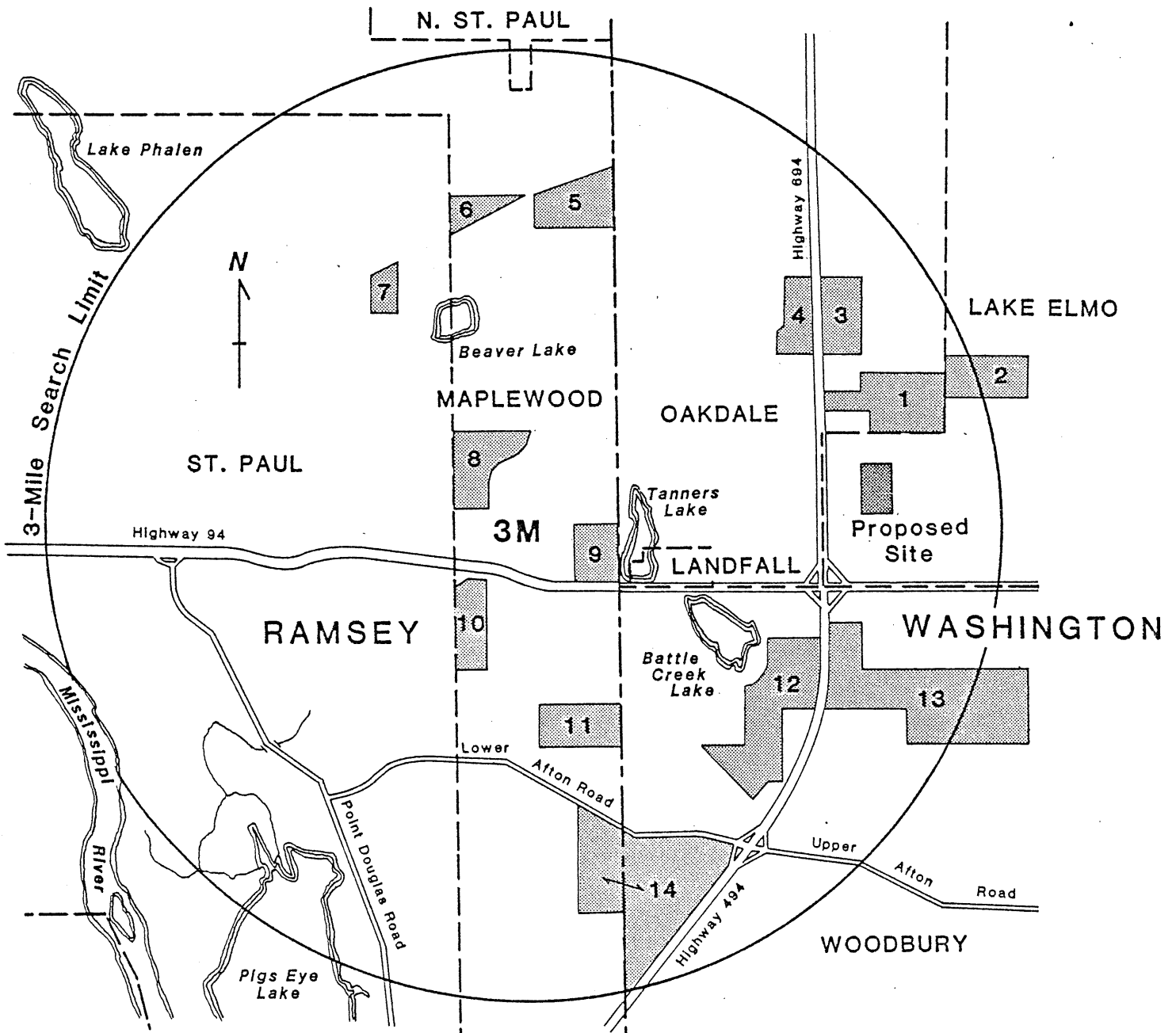


TABLE 5
CHARACTERISTICS OF OTHER POTENTIAL SITES

Site	Visual Buffering	Steamline Distance	Existing Access	Site Size	Other Environmental Constraints	Compatibility with Nearby Land Use	Compatibility with City Plans
1	Fair	Poor (≥2.5 mi.)	Good	Excellent	None	Good	Good
2	Poor	Poor (≥2.5 mi.)	Good	Excellent	None	Good	Fair
3	Good	Poor (≥2.5 mi.)	Poor	Excellent	None	Good	Poor
4	Good	Poor (≥2.5 mi.)	Poor	Excellent	None	Good	Poor
5	Fair	Poor (≥2.5 mi.)	Poor	Excellent	Moderate. Portions low and wet.	Fair	Poor
6	Excellent	Poor (≥2.5 mi.)	Poor	Fair	Severe. Large wetland on-site.	Good	Poor
7	Fair	Poor (≥2.5 mi.)	Poor	Fair	Moderate. Appears low.	Fair-poor	Good
8	Fair	Excellent (<.5 mi.)	Good	Good	Moderate. Wetland in NE portion.	Good	Good
9	Good	Excellent (<.5 mi.)	Good	Poor	None	Good-excellent	Good
10	Poor	Excellent (<.5 mi.)	Fair	Excellent	Poor	Fair	Poor
11	Fair-poor	Good (<2.5 mi.)	Fair	Excellent	None	Fair	Fair
12	Poor	Poor (≥2.5 mi.)	Fair-poor	Excellent	Moderate: low and wet	Good	Fair
13	Poor	Poor (≥2.5 mi.)	Fair-poor	Excellent	None	Good	Good
14	Good-fair	Poor (≥2.5 mi.)	Fair	Excellent	Moderate: ravine in E. portion.	Fair	Fair

During the EIS Scoping Process one additional alternative was presented: dual facilities, one near the 3M campus and a second at the project site to satisfy energy needs of potential adjacent development. Impacts of this alternative are not explicitly dealt with in later sections. Impacts of a 3M site and the proposed site are discussed, and the effects of multiple facilities can be inferred from these sections. From a practical standpoint this alternative is not feasible. Development of a facility on the Lake Elmo site in the absence of any firm market is too speculative a venture to be credible.

ALTERNATIVE STEAMLINE ROUTES

The proposed waste-to-energy facility is approximately two miles from its steam market at 3M. Because of this, a fairly long steamline must be constructed between the two facilities. Several routes are possible. Figure 10 shows four of the more likely choices.

Ideally, the steamline route will minimize economic, technical, environmental and social costs. It should be less than three miles long; at greater distances, the combination of heat loss and increased construction costs are considered prohibitive. A route that travels parallel to a little used, relatively unpopulated roadway will likely cause less social disruption than a route through a residential neighborhood or under a busy roadway. Routes that avoid sensitive habitats will minimize impacts on wildlife and vegetation.

Alternative number 1 is the route proposed by the applicant. It is the shortest of the alternatives, and is approximately 2.2 miles long.

Alternative 1 passes through a protected wetland and will require a permit from the Department of Natural Resources. Special construction practices will be needed to ensure that the wetland is not damaged significantly. At this point in time, the applicant proposes to place the line on pilings where soils are unstable, such as in the wetland. No other special protections or precautions are proposed. It may be advisable, however, to implement additional readily available measures. For example, the line could be constructed and serviced in the late fall or winter when soils are firmer or frozen. Construction and maintenance activity could be avoided during nesting seasons to minimize impacts on the habitat value of the wetland. Practices could also ensure that sediments are not disrupted to the point that outflows and drying of the wetland could occur.

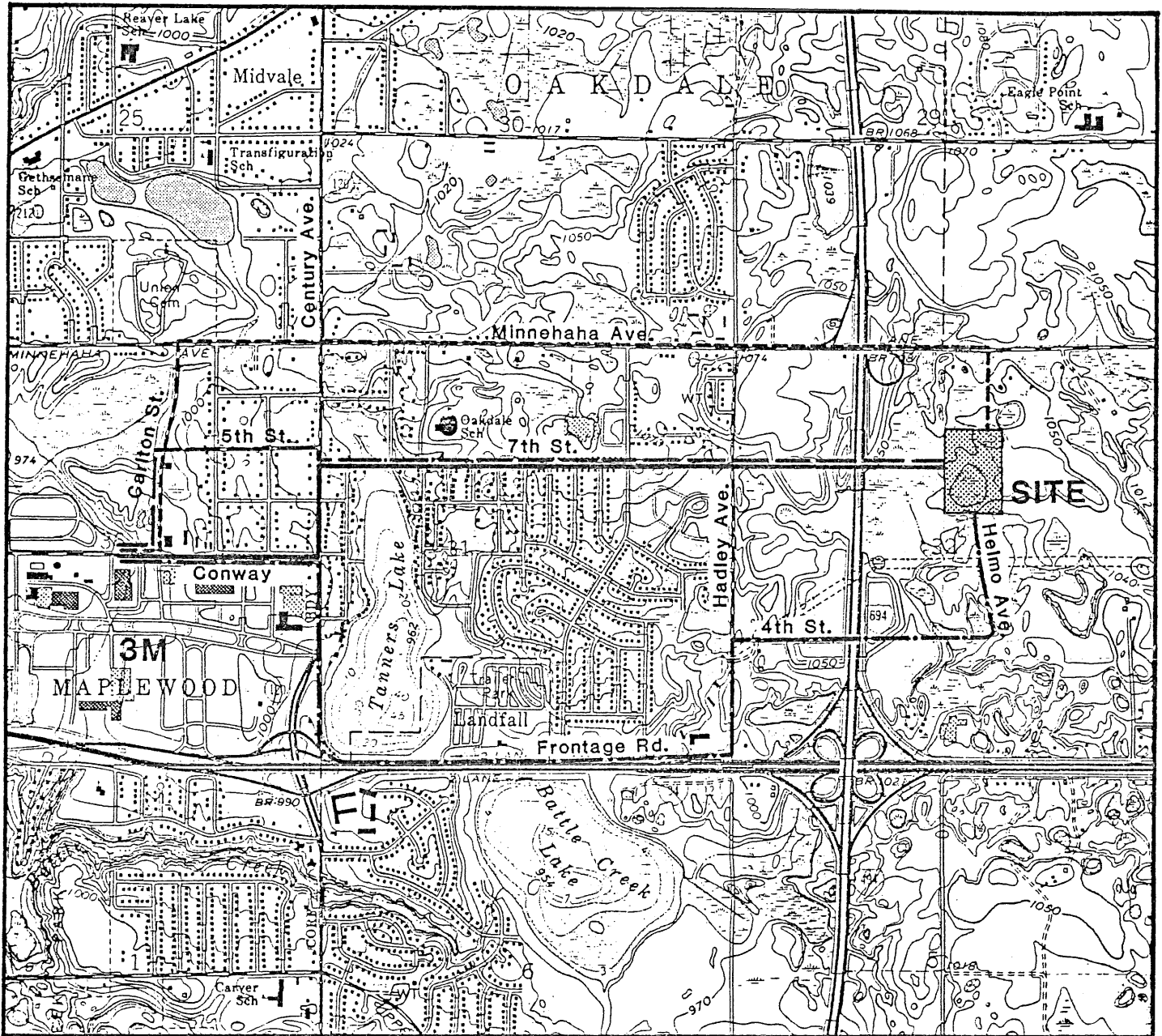
Alternate 1 proceeds west from the site across the wetland to I-694, under the highway, and then across an open field to a residential area along Seventh St. While the route is being constructed, disruption of traffic flows, noise, and dust will have to be tolerated by residents along the route. The duration of disruptive activities is not exactly known at this time, but is not expected to be more than a few weeks. The severity of the disruption can be minimized by keeping the working area of construction small, and by quickly restoring disturbed areas.

Alternative 1 follows Century Av. for about a quarter mile before it turns west onto 3M property along Conway Av. The steamline would be placed under Century, as well as under Conway.

Alternative 2 follows Alternative 1 until Century Av. is reached. Instead of going south on Century, it goes north for a very short distance, then goes west on 5th St. to Evar, and south on Evar to the 3M plant. This route is only slightly longer than Alternative 1. Its advantage is that it follows Century for a much shorter distance and, therefore, disrupts traffic flow to a lesser degree. In addition, Century Av. has been recently reconstructed and it may be desirable to minimize disruption.

Alternative 3 is approximately 2.6 miles long. It would primarily follow Minnehaha Av. and would avoid the developed residential area along 7th St. If the line is placed under, rather than beside, Minnehaha, traffic disruptions could be significant; Minnehaha has relatively high traffic volumes.

Figure 10.
ALTERNATIVE STEAMLINE ROUTES



- Alternative 1
- - - - Alternative 2
- Alternative 3
- . . . Alternative 4

0 .5 1 Mile

Alternative 4 is desirable for the same reason as 3; it avoids the heavily populated residential area by jogging southward along Helmo, 4th St. and the frontage road for Hwy. 12. However, because of the need to go around Tanner Lake, this route is over three miles long. Placement of the steamline along the south shore of the lake could be difficult due to the limited space between the shore and the interstate right-of-way.

TECHNOLOGICAL ALTERNATIVES

REFUSE DERIVED FUEL (RDF)

Refuse-derived fuel (RDF) systems, mass-burn and modular waste-to-energy facilities can all turn municipal solid waste into energy for steam generation. Each technology, however, has its own distinctive waste handling processes and fuel characteristics (Figure 11). Wastes are not processed for mass-burn waste-to-energy facilities; they burn essentially all nonhazardous wastes that collectors drop off. At a RDF plant on the other hand, incoming wastes are processed before they are burned and only the light, combustible portion of the waste becomes RDF. The processed waste is either used for on-site boilers fueled 100 percent by RDF, or it may be burned off-site as a supplemental fuel in existing utility or industrial equipment.

RDF Processing Technology

Size reduction and materials separation are the major RDF preparation techniques. Shredders pulverize the incoming wastes into small particles. Other machines, including air classifiers, magnetic separators, and trommels, are commonly used to separate the waste into its various components. Air classifiers separate the light, combustible portion of the waste stream from the heavy, primarily noncombustible portions. Magnetic separators and electromagnetic fields can recover iron and aluminum. Trommels, or large screens, can remove small particles such as glass and dirt.

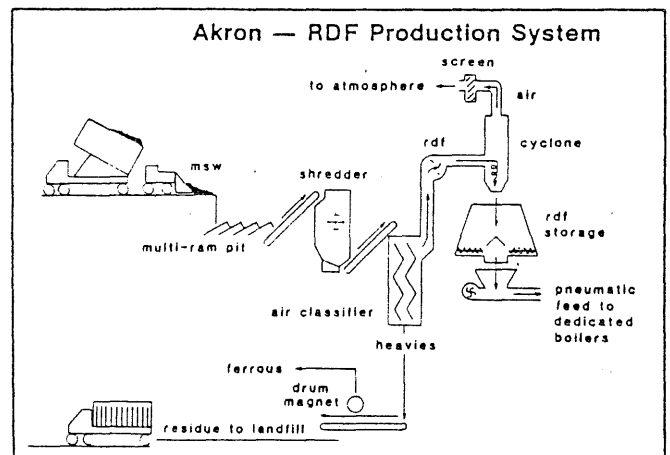
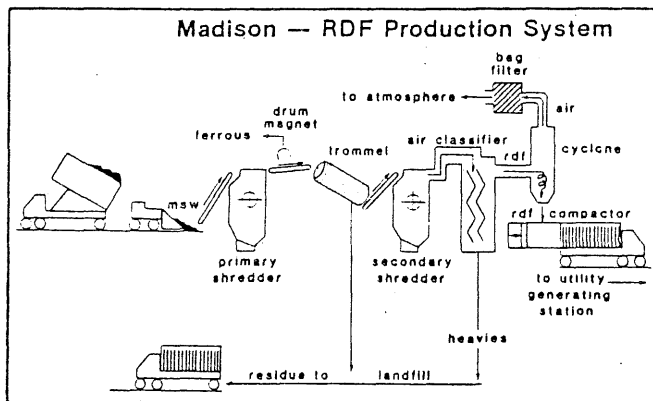
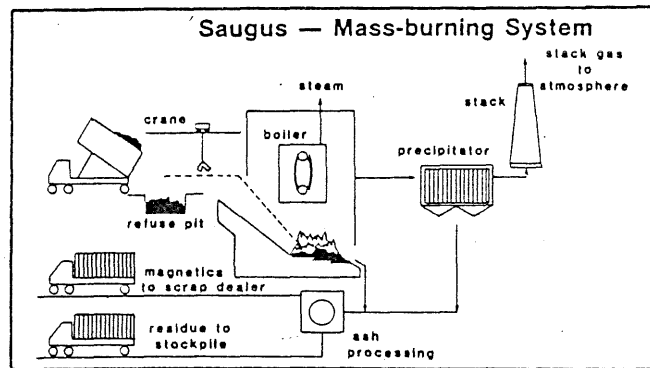
The above equipment can be used in various combinations to process the waste; no one combination of equipment or processing steps is standard, and it is possible to produce RDF in several forms. A coarse RDF (six-inch diameter particles or less) is used for stocker or grate-fired boilers. Fine RDF (3/4-inch size or less) is required for suspension-fired boilers. A second stage shredder and air classifier are usually needed to produce fine RDF.

There are two major assets of RDF: enhanced fuel quality and recycling. RDF is generally a more uniform fuel, with more BTU's/lb., than unprocessed municipal wastes. Shredding the wastes before they are burned homogenizes them, while removing non-combustibles such as iron, glass and aluminum results in a higher fuel value per pound. Because of the shredding and separation, an RDF-dedicated boiler may have fewer problems with slagging than a mass-burn facility and will generate less ash. Waste combustion will also be more efficient.

Materials recovery is also an advantage. At an RDF plant, ferrous materials are commonly recycled. Aluminum and glass may also be recovered and sold. Such recycling saves energy and materials, and provides an additional source of revenue for the project. Nevertheless, the experience to date has been that over 80 percent of an RDF facility's revenues come from the sale of the fuel or steam, not the sale of recycled goods (Solid Wastes Management, Nov. 30, 1980).

RDF facilities have experienced a number of problems, however. Operating experience with RDF plants in the U.S. is far more limited than with mass-burn waste-to-energy facilities (Table 6). Currently, about 50 percent of the resource recovery plants in the U.S. are mass-burn facilities, but only 21 percent are RDF plants (World Wastes, May 1983). Furthermore, nearly as many RDF plants have been temporarily down or closed as are operating.

Figure 11.
EXAMPLES OF MASS-BURN AND RDF PROCESSES



Source: Solid Wastes Management, August 1981.

Table 6
STATUS OF MASS-BURN AND RDF FACILITIES IN THE U.S.

	<u>Operational</u>	<u>Temporarily Down</u>	<u>Closed</u>	<u>Planned, Under Construction, or in Shakedown</u>
Mass burn	31	2	1	20
RDF	7	3	3	14

Source: Waste Age, Nov. 1982, p. 28-52

The mass-burn technology dominates on a world-wide scale as well as a national scale. More than 400 mass-burn waste-to-energy facilities operate world-wide, and refinements in mass-burn technology have occurred for more than 20 years.

The RDF facilities that do exist have encountered a number of technical and economic problems. The plants are still considered developmental in terms of processing, equipment, and applications (Solid Wastes Management, May 1980).

Some of the specific technical problems that have plagued RDF plants are excessive shredder maintenance needs, fire and explosion hazards, poor in-plant air quality, abrasion in conveyance systems, waste storage problems, and unmarketable fuels and materials.

A common problem has been excessive shredder maintenance requirements. At the St. Louis RDF facility, shredder hammers needed to be retipped after every 600 tons of throughput (G.E.). Frequent retipping needs are not unusual.

Fires and explosions are hazards at RDF facilities. They can occur in shredders, dust hoods, pneumatic ducts, cyclones and storage bins (Solid Wastes Management, May 1980). Some researchers estimate that an explosion should be expected for about every 60,000 tons of waste processed (Solid Wastes Management, July 1981). Excessive dust build-up can be the cause of explosions. More commonly, explosive or flammable materials are occasionally found in the waste stream and inadvertently processed through the facility. Examples have included aerosol cans, gas cylinders and even munitions.

High dust levels are common within RDF plants. Sources are the tipping floor, cranes, shredders, trommels and also conveyors and air classifiers. Building enclosure and maintaining a negative pressure can control external emissions. The high indoor levels, however, have prompted some sources to recommend that plant personnel wear protective face masks. One EPA study indicated some in-plant health risks from micro-organisms in addition to the risk from high dust levels (D. Bendersky, et al. 1980).

Pneumatic waste conveyance systems have been another sore point. Glass and other small particles caused abrasion problems in the pneumatic conveyance system at Akron, Ohio, for instance (Solid Wastes Management, June 1981). Plugging of the pneumatic conveyor has been a problem in Ames, Iowa; wear has been a problem in St. Louis.

Operators have had difficulty storing RDF. Difficulties have arisen because the stored fuel compacts, bridges, picks-up moisture, cakes and degrades easily (Solid Wastes Management, July 1981). Such problems hinder removal and use of the fuel.

A final problem is producing marketable fuel and recovered materials. Fuel markets seem primarily to be a problem when the RDF is used as a supplemental fuel. According to Alfred Scaramelli, "The inability to secure long term contracts for purchase of RDF and the problems associated with handling and burning this supplemental fuel have significantly limited this resource recovery approach." (Solid Wastes Management, April 1982). The Americology plant in Milwaukee, for instance, closed because its market refused to continue buying the RDF. The fuel caused problems with slagging, air quality and bottom ash filter clogging (Solid Wastes Management April 1982). A report based on site visits by members of the Congressional Research Service and the subcommittee on Environment and Atmosphere and the Committee on Science and Technology notes that, "...it must be remembered that, generally, coal is not in short supply, and that RDF is less desirable than coal in many respects" (Solid Wastes Management, Dec. 1978).

Other drawbacks of RDF facilities are primarily economic, rather than technical. Project feasibility is dependent on guaranteed stable markets for RDF fuel. If the RDF can be used as a supplemental fuel in existing boilers, then a project's capital costs will most likely be lower than an comparable mass-burn facility.

Materials markets can be a problem in two situations. In the first, no suitable market may be available within an economically feasible distance from the plant. In the other situation, a market may be available, but the quality of goods recycled at the RDF facility may not meet the buyer's specifications (World Wastes, May 1982). This latter situation has occurred with potential glass, aluminum and ferrous markets near RDF plants.

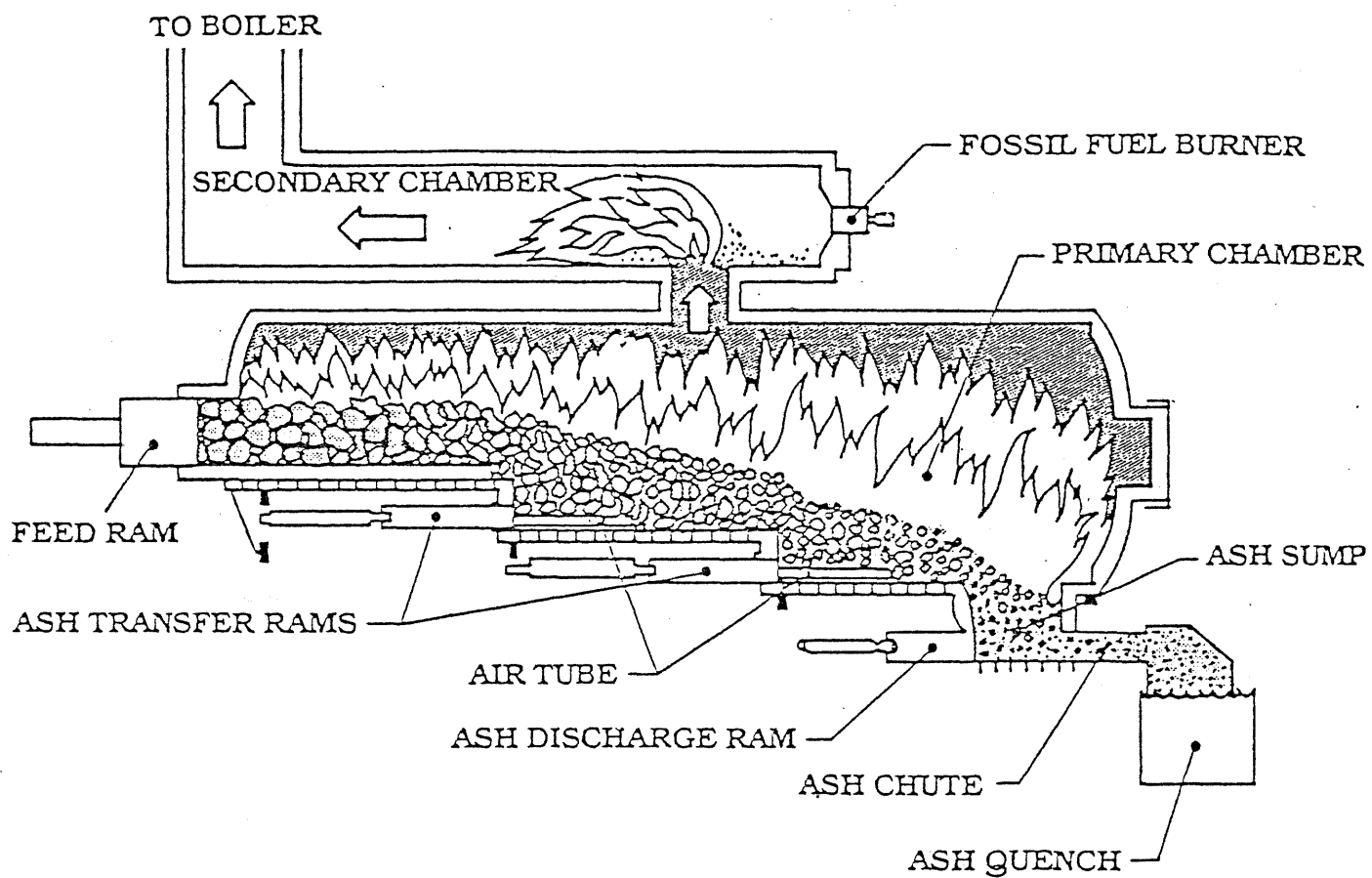
MODULAR COMBUSTION

Like mass burn systems, modular combustors burn unprocessed municipal solid waste. The distinguishing feature of modular units is that the component pieces are manufactured off-site and shipped to the project location for assembly, in contrast to the massburn systems which are built on-site. The individual modular units are smaller, usually not designed to process more than 150 to 200 tons of waste per day.

Characteristically, the modular systems utilize both a primary and secondary combustion chamber. A typical unit is depicted in Figure 12. Unprocessed refuse is fed to the waste-to-energy facility either by crane or front-end loader. Waste travels gradually through the primary combustion chamber. Ash is discharged through a water bath. Combustible gases generated in the primary chamber are burned in the secondary combustion chamber. The hot off-gases are then used for heat recovery.

Some systems are designed to operate with excess air supplied to the primary combustion chamber. Historically, these designs have had difficulty satisfying air pollution requirements unless pollution control equipment was added. The alternative design is a "starved air system" which supplies less oxygen to the primary combustion chamber. Combustible gases generated by the semi-pyrolytic conditions of the primary chamber are then fully combusted in the presence of excess air in the secondary chamber.

Figure 12.
TYPICAL MODULAR COMBUSTION UNIT



Source: Consumat Company

Over the past 10 years, the use of modular systems has increased considerably. There are now 24 facilities in the U.S. in the 7 to 240 ton per day range which are either operating or in shakedown. The modular units are rarely used in facilities processing more than 200 tons waste daily. The largest known application, however, is proposed in Duchess County, Pennsylvania with a rotary combustor designed to process 400 tons per day.

Problems encountered with these systems are similar to the field erected mass burn units. In addition, there is a fairly large number of manufacturers of modular systems. There is variability in the quality of manufacture of the systems. Some problems have occurred where designs were untested prior to operation, such as at the St. John's facility in Collegeville, MN. Efforts to scale up a design without testing have also led to problems.

PYROLYSIS TECHNOLOGY

Pyrolysis is an alternative resource recovery technology in which organic waste is chemically broken down at high temperatures (480°C to 1650°C / 900°F to $3,000^{\circ}\text{F}$) in the absence of oxygen or in an oxygen-deficient environment. A number of processes have been proposed but no system has been built in the U.S. that has proven viable. The processes differ chiefly in the temperature and pressure at which pyrolysis occurs; the length of time refuse remains in the reactor; the size and moisture content of incoming garbage and, as a result, the composition and quantity of the final products. Pyrolysis systems are intended to produce a gaseous fuel or an oil-like liquid fuel.

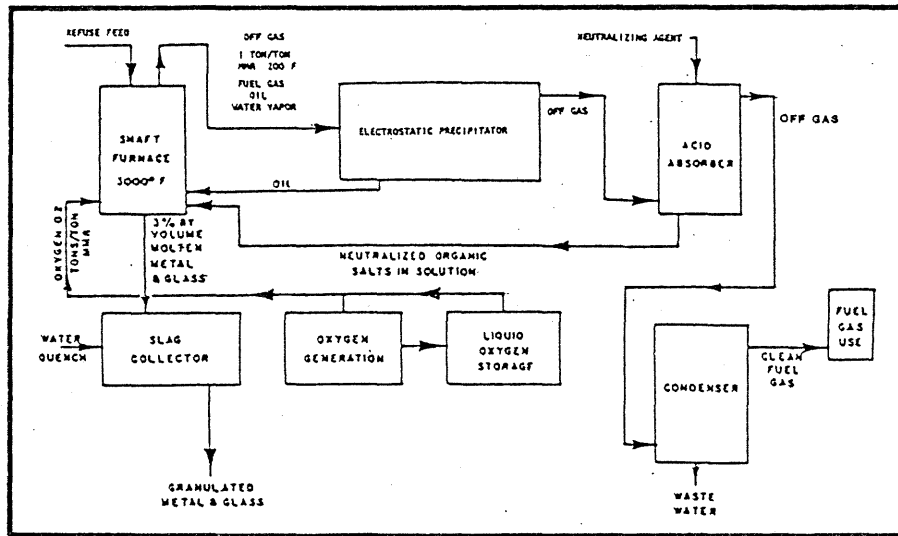
The Monsanto Landgard system operated in Baltimore, Maryland (Figure 13). At this facility, incoming waste was shredded to equalize size and moisture content, then fed into a rotating refractory-lined kiln where pyrolysis occurred at a maximum temperature of 980°C ($1,765^{\circ}\text{F}$). Additional fuel oil had to be added for complete decomposition. The gases resulting from the pyrolysis process were burned in a refractory-lined chamber to increase the temperature to approximately 1095°C ($2,000^{\circ}\text{F}$). Waste heat boilers produced steam for sale. The final combustion gases were passed through pollution control devices before emission.

The solid residue was cooled in a water quench tank and metals were removed by magnetic separation. A floatation process removed the carbon char, leaving an inorganic aggregate, chiefly glass, as the final product.

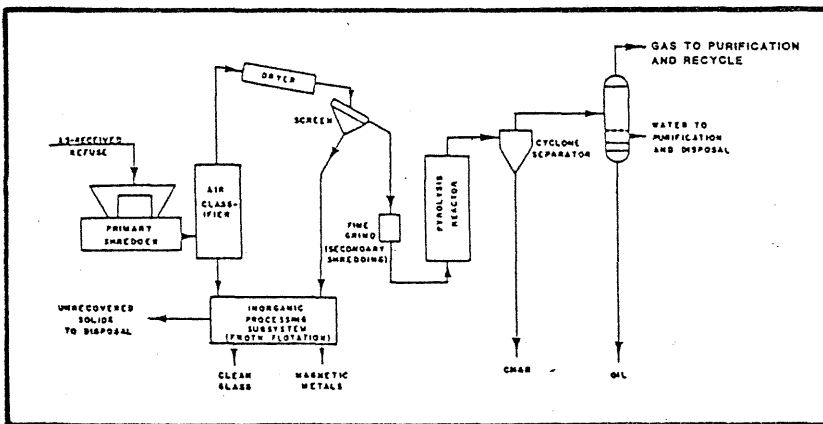
The Andco-Torrax system differs from the Landgard process chiefly in that pyrolysis occurs in a vertical shaft furnace at higher temperatures. Air is preheated to $1,095^{\circ}\text{C}$ ($2,000^{\circ}\text{F}$) and is blown into the bottom of the furnace, which is fed at the top with refuse. The hot air moves up the column, pyrolyzing waste near the bottom and drying that at the top. Furnace temperatures reach 1650°C ($3,000^{\circ}\text{F}$). Noncombustible materials melt and drain continuously into a water quench chamber, forming a sterile glassy aggregate. Steam is produced from the combustion of pyrolysis gases (Payne, 1976). This system has been used at several locations in Europe. A hot water heating and cooling system designed for Walt Disney World has been tested but is not operating due to unfavorable economics.

Two other American processes showed promise in demonstration tests. In the Purox process marketed by Union Carbide (Figure 13), the pyrolysis gases are compressed and refined into a fuel comparable to natural gas, but with a lower heating value. The Occidental flash pyrolysis system (Figure 13) also produces

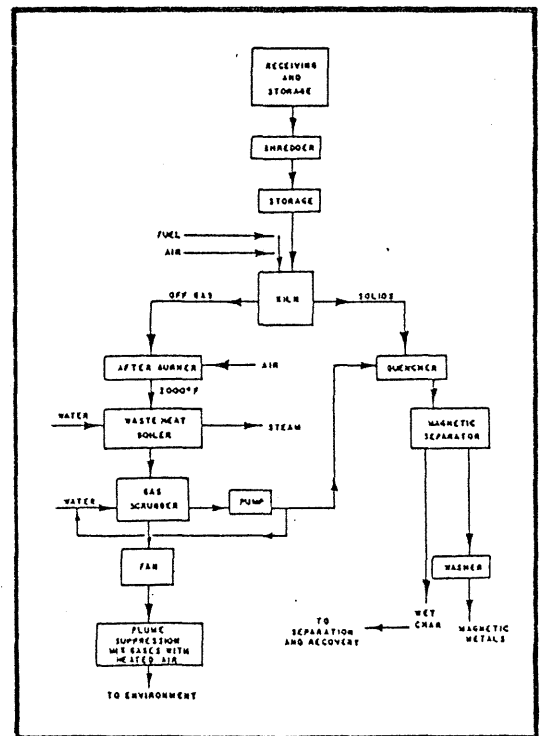
Figure 13.
EXAMPLES OF PYROLYSIS SYSTEMS



UNION CARBIDE PUROX SYSTEM



OCCIDENTAL FLASH PYROLYSIS SYSTEM



MONSANTO LANDGARD SYSTEM

Adapted from: Greenberg, 1976.

fuel gas, but can be altered to further compress pyrolysis gases to a liquid fuel. The process requires that incoming refuse be shredded and organic and inorganic materials separated in an air stream. The organic component is more finely shredded and dried to a uniform moisture content, then pyrolyzed. Metals are recovered from the inorganic portion by magnetic separation and glass by froth floatation. The carbon char resulting from pyrolysis is partially used as fuel for the process (Greenberg 1976).

Although volume reductions of 95-100 percent are claimed for some pyrolysis processes, this depends on the marketability of the recovered glass and metals and the suitability of the sterile residue for fill material in construction (Wilson 1977).

Pyrolysis is potentially a more versatile technology than incineration. Energy from refuse can be recovered in several different forms. Pyrolytic fuel oil and gas are low in sulfur and may be of greater economic value than steam. In addition, these fuels can be stored and transported long distances. Pyrolysis facilities producing gas or oil would not vent combustion gases directly to the atmosphere and so theoretically require little air pollution control equipment. Steam producing plants, however, would have emissions similar to those of incineration facilities.

Pyrolytic systems are at a disadvantage because of the complexity of their technology and the critical performance requirements this often entails. Demonstration projects have been plagued by equipment failure, difficulties in achieving the necessary particle size and moisture reduction and problems in temperature control, storage of shredded waste and separation of organic and inorganic materials.

In addition, special equipment such as the ceramic air preheater required by the Andco-Torrax process or the oxygen generation plant necessary in Union Carbide's Purox system are extremely expensive.

Another difficulty associated with pyrolysis facilities is the potential for water pollution control problems not found with incineration. Cleaning and cooling of gas, oil and inorganic residues produce many insoluble inorganic chemicals which would require treatment before waste water could be discharged. This is particularly true for processes such as the Occidental flash pyrolysis system which produce liquid fuel as their primary product (General Electric Co. 1975).

Baltimore's Monsanto Langard system, which was closed and is now being demolished, was designed to handle 1,000 tons of waste per day. It operated considerably below capacity in order to stay within environmental requirements. Major, expensive equipment modifications were made and air pollution control devices were installed in efforts to rectify the many technical problems which were the result of the plant's direct scale-up from a small demonstration project. A mass burn waste-to-energy facility is being built in its place. No other U.S. pyrolysis systems have progressed from the experimental and pilot plant stages.

NO-BUILD ALTERNATIVE

The purpose of the proposed solid waste waste-to-energy facility in Lake Elmo is two-fold: to provide solid waste disposal for Ramsey and Washington counties, and to provide steam for the 3M plant in Maplewood. If the facility is not built, other methods will be needed to dispose of about 600 tons per day of solid waste, as well as to generate steam for 3M.

The no-build options are, in general, limited by several factors. For solid waste disposal, the feasible options are constrained by the current, established waste disposal system and the counties' waste abatement plans. For 3M, they are limited by the company's existing investment in steam generation equipment, as well as the economics and environmental impacts of various alternative fuel sources.

WASTE DISPOSAL OPTIONS

Currently, the vast majority of solid waste in Ramsey and Washington counties is disposed of in sanitary landfills. Neither county, however, currently has sanitary landfills operating within their own boundaries. Waste in Ramsey County most often goes to landfills in Anoka and Dakota Counties while that in Washington County primarily goes to landfills in Dakota County, Chisago County and Wisconsin. The counties will not be able to rely on the existing system for much longer, however. The Metropolitan Council estimates that existing landfill capacity in the Twin Cities Region will be exhausted by 1989; most landfills in Anoka County may be full by next year, and most of those in Dakota County by 1987.

State legislators recognized the need to change the current land disposal system in the Waste Management Act of 1980. Two of the principles embodied in the Act are: 1) that the counties be responsible for waste disposal; and 2) that land disposal of wastes be minimized. The act provides for counties to develop and implement waste abatement proposals to decrease land disposal, and to site and implement landfill sites if abatement is not feasible.

The proposed project will assist the counties in implementing the legislature's mandate: the counties will be responsible for a greater portion of their own waste disposal, and will help decrease the need for landfills.

The waste-to-energy facility, however, comprises just the energy recovery element of the counties' abatement proposals. Each county has proposed a mixture of additional abatement strategies (Table 7).

Table 7
RAMSEY AND WASHINGTON COUNTY ABATEMENT STRATEGIES

	Percent of Waste Ramsey	Stream Abated Washington
Waste Reduction	1-2	1-3
Recycling	7-8	14
Composting/Co-composting	3-57	3-30
Energy Recovery	40	30-50

Source: Application of Abatement Evaluation Matrix to Counties' Abatement Proposals, Metropolitan Council, 1983.

Washington County plans to reduce waste volumes by evaluating procurement policies, developing a public information campaign and office paper reduction programs, and encouraging appropriate state and federal legislation. It will initiate recycling programs aimed at: 1) public education; 2) commercial recovery of materials such as corrugated cardboard and office paper; and 3) residential recovery through curbside pick-ups, cooperative marketing and possibly, a local recycling industrial park. Both backyard leaf waste composting and centralized municipal composting are also a part of the county's plans. Co-composting, or the composting of a mixture of municipal solid waste and sewage sludge, is the county's final abatement strategy. It will conduct studies on the feasibility of co-composting at the Cottage Grove and Stillwater wastewater treatment plants, and will work with St. Paul, Ramsey County and the Metropolitan Waste Control Commission (MWCC) on feasibility studies for a Pig's Eye Metro Plant co-composting demonstration project.

Ramsey County's programs address much the same areas as Washington County's. Ramsey County will try to reduce waste volumes through county procurement policies, office paper reduction programs, and public education. It also plans to institute a county-wide curb side recycling program and to recycle office paper. Yard waste composting will be encouraged, both at centralized sites and in backyards. Leaf waste composting sites and free distribution of leaf waste compost are elements of the plan. Finally, the county will participate with St. Paul and the MWCC in developing a co-composting project at the Pig's Eye Metro Plant.

Neither of the counties' abatement proposals will entirely eliminate the need for landfills: ash from the waste-to-energy facility, as well as unrecovered waste materials, will still need to be disposed of. It is doubtful, as well, whether either county will be able to develop a full complement (four sites each) of landfills as legislated. Thus far, Ramsey County does not have any proposed sanitary landfills in its inventory; Washington County has only one. At this time, the counties' efforts to find additional acceptable sites have come to no avail.

Both counties have outlined contingency plans that will go into effect if the waste-to-energy facility is not built. Washington County plans to co-compost about 90 tons of solid waste per day in Stillwater and Cottage Grove, and to consider taking part in the co-composting project at the Metro plant in St. Paul. The magnitude and probable chances of success of the Metro plant project, however, are not yet known. Feasibility studies are still underway; no firm commitments have been made by any of the participating agencies. If the Metro plant project is found unfeasible, and if the Cottage Grove and Stillwater projects also appear unfeasible, then there would be greater reliance on land disposal, i.e., more landfills would have to be developed.

Ramsey County's contingency plan initially follows the same track as Washington County's--scaled-up co-composting at the Metro plant in the event that the waste-to-energy facility is not built. Again, however, the co-composting project is still undergoing feasibility studies. Modular incineration as well as a waste-to-energy system at NSP's Riverside Plant would also be reinvestigated by Ramsey County. In the event that co-composting and the waste-to-energy options are not found viable, the county may develop a waste transfer/processing station to facilitate waste transport to landfills or resource recovery plants outside of the county.

ALTERNATIVE FUELS

Steam produced by the proposed waste-to-energy facility is intended to be utilized primarily by the 3M Company at the 3M Center headquarters complex in Maplewood, approximately 2.2 miles west of the site. There are approximately 6.4 million square feet of office, laboratory, and manufacturing space in the complex, with about 12,000 employees. Steam is used primarily for heating in winter and air conditioning in summer.

3M currently produces steam at their central boiler and cooling plant (Building 210) on Conway Av. near the center of the 3M property. The plant consists of five operating dual-fuel (gas and oil) boilers with a total steam generating capacity of 480,000 lbs/hr. The plant's primary fuel is natural gas supplied on an interruptible basis. The secondary fuel is No. 6 fuel oil. There is sufficient on-site storage to enable the plant to operate on oil if natural gas is not available. The boiler plant generates 280 psig saturated steam.

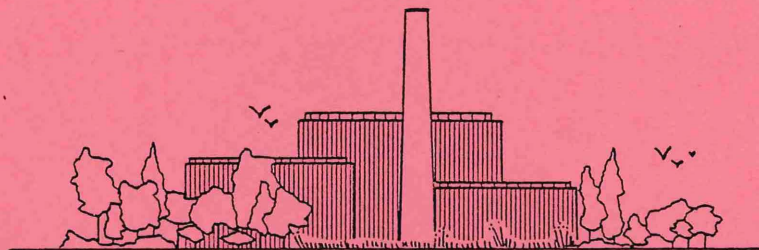
The majority of the summer load is based on the use of six steam driven centrifugal chillers with a combined capacity of 20,050 tons. The plant has a seventh chiller which is electrically driven that has a capacity of 3,500 tons.

Total steam generation in 1981 was 1.029 billion pounds. 3M intends to keep its steam plant in operation to be available in case of shutdown of the waste-to-energy facility, and to carry peak loads in excess of the facility's steam output.

If the waste-to-energy facility is not built, 3M's energy requirements will continue to be supplied "in-house." Reasonably available options are increased reliance on natural gas or conversely increased use of residual fuel oil. Any other alternative would necessitate a significant new capital investment for 3M. Assuming an economic reason to do so, conversion to No. 2 fuel oil would be technically feasible.

Coal, the only other possible fuel option, does not appear feasible. The 3M campus is developed and there appears to be inadequate storage for that fuel. Difficulties in transporting coal to the complex are also a deterrent. (Access problems were cited as a major objection to proposed waste-to-energy facility sites near the 3M Center.)

ENVIRONMENTAL IMPACTS



SOILS AND GEOLOGY

Whenever a building is constructed, the implications of surface and subsurface conditions for facility design and engineering must be understood. This section of the EIS describes existing soils and geologic conditions and their potential influence on facility design and construction.

EXISTING CONDITIONS

The site lies in a region of glacial till with local deposits of fine and coarse alluvial materials. It is a transitional area between the eastern St. Croix Moraine and the Rochester Till Plain. The site's land form, moderate relief and predominantly reddish-brown soils, compare more favorably with the southern extent of the eastern St. Croix Moraine. However, some portions of the project area are very sandy, evidence of the outwash character of the Till Plain.

The Soil Conservation Service's general soil association description for the area is Santiago-Kingsley which represents soils formed predominantly from glacial till. Approximately 80 percent of the site soils are Kingsley sandy loam. Ten to 15 percent of the soils are mucky or organic soils associated with wetlands (Figure 14). These wetlands appear to be an expression of the local drift groundwater table.

Minnesota Geologic Survey maps* of bedrock strata indicate that the first bedrock unit encountered beneath the site is Platteville limestone at depths of 75 to 100 feet.

The site has a gently rolling terrain; elevations vary from 1,039 to 1,054 feet. Slopes exceed 12 percent for approximately 60 percent of the site.

IMPLICATIONS OF DEVELOPMENT

On-site Construction

On-site soils and geologic conditions will constrain or control possible development plans in several ways.

First, the mucky and organic soils could limit building placement. These soils have high water tables, are subject to flooding, and generally have poor potentials as building sites due to their low strength. The mucky area in the southwest portion of the site is not proposed for building, but for stormwater retention purposes. An area of organic soils to the north of the retention area, however, is proposed for construction. From an engineering standpoint, potential problems with these soils can be avoided by removing, compacting, and/or filling over them. At this point in time the proposer plans to fill the organic soils.

Shallow depth to groundwater is a second potential development constraint. The proposer must construct a tipping floor to receive and store refuse before it is burned. It is not common practice to excavate to depths below the water table because special engineering measures are required. This constraint is normally overcome by construction of the pit at grade and providing fill to elevate the tipping floor (see Figure 15) and approach ramp.

*Minnesota Geological Survey, USGS, Metropolitan Council, MDNR, 1980.

Source: Soil Survey of Washington
and Ramsey Counties,
Minnesota.

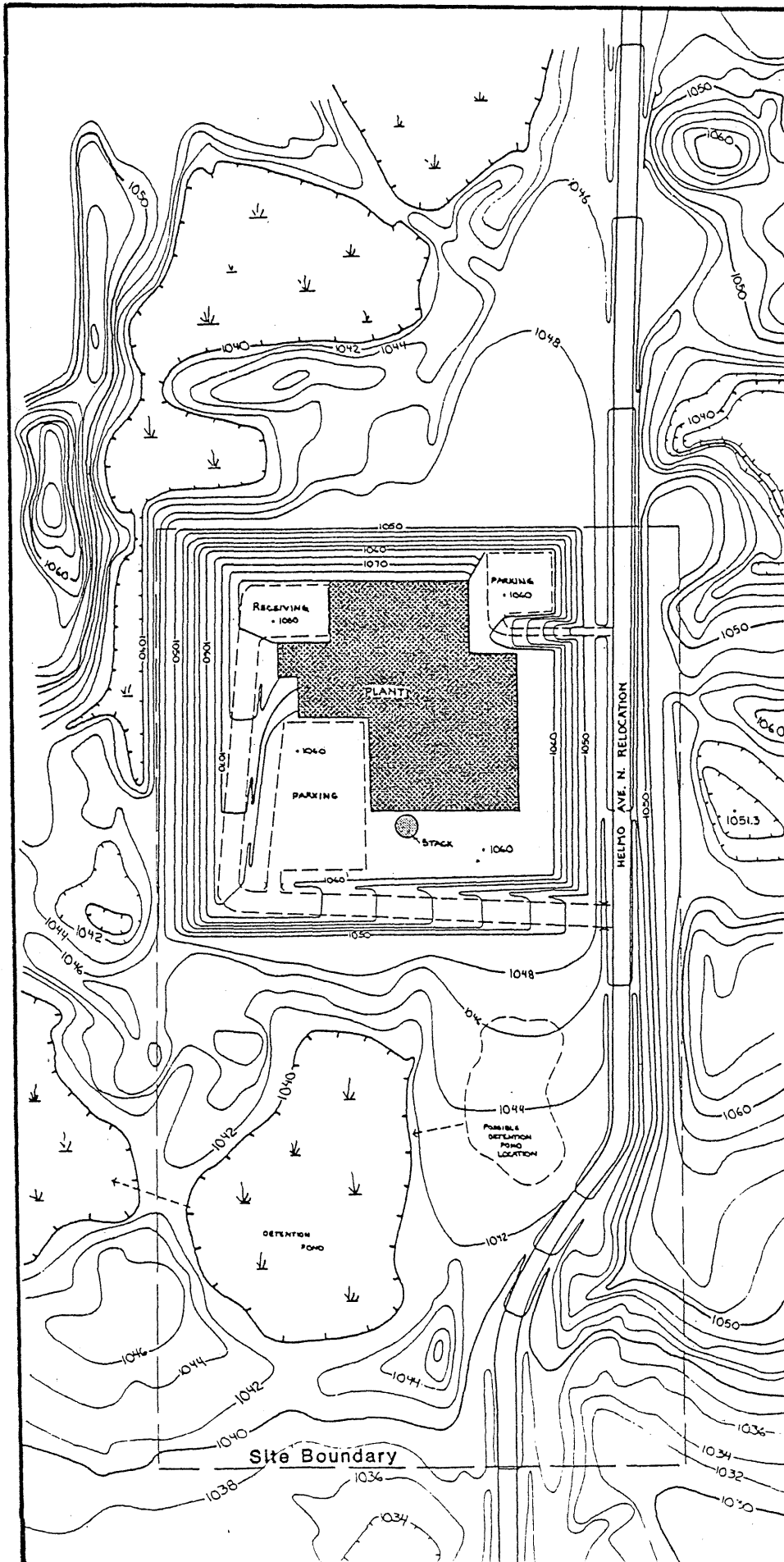


Figure 15.
POSSIBLE FINAL
CONTOURS

A third potential constraint relates to runoff and erosion hazards. A great deal of soil will be moved to develop the final site contours. Material from the knolls east of Helmo Av. will be removed to allow relocation of Helmo to the east edge of the site and to provide fill material for the low areas in the west. The excavated soils will be sandy loams and loamy fine sands. Extreme care will need to be taken to control runoff volume and quality, as well as wind erosion, when these soils are disturbed. (See the Surface Water section for details of possible controls).

In summary, mucky and organic soils, shallow groundwater depths, and potential runoff and erosion problems will constrain on-site development. Proper mitigating techniques should reasonably control these problems, however. Poor soils can be avoided, excavated, or filled. The groundwater table can be avoided by filling or by modifying facility design. Runoff and erosion can be controlled by instituting those measures mentioned in the surface water section.

Steamline

Some of the same precautions would need to be taken along the preferred steamline route. This route crosses a wetland just to the west of the site, and will encounter Cathro muck. The muck's high water table, low strength and high susceptibility to frost action will necessitate special engineering precautions. The proposer's have planned to construct the line on pile bents in this and any other unstable soils that may be encountered. Because of the soil's high susceptibility to frost action, it appears preferable to place the line over the wetland rather than to bury it. A suspended line will require insulation and will be visible, however. It is possible that the line could be placed below the frost line to avoid the problem of heaving. Local soils also require special precautions against frost heaving between I-694 and Hadley Av.

Alternative Sites

The area just north of the proposed site, as well as Site J in Battle Creek Regional Park and several spots just north of existing 3M facilities were identified as possible alternative sites (see section on Alternatives to the Proposed Project).

Most of the area to the north of the proposed site (about 50 percent) is Santiago silt loam. This soil type, as well as most of the other soils in this area, may require special design considerations to avoid frost heaving damage. Three areas of Cathro muck cover about 10 percent of this alternative site and would have to be avoided, excavated or filled if they were built on.

Alternative 8, just north of existing 3M facilities, has an extensive area of open water, as well as mucky soils and ponded Aquolls and Histosols in the northeast. Just to the west of the mucky soils, and east and south of the drive-in, however, are areas of Kingsley sandy loam. The sandy loam east of the drive-in is interrupted by a sliver of frequently flooded Auburndale silt loam. Nevertheless, it appears that extensive areas of the soils on this site are suitable for an waste-to-energy facility and have few natural constraints. The southern portion of this site is the Mahtomedi-Kingsley Complex and is also suitable for building as long as erosion controls are implemented.

The alternative site in Battle Creek Regional Park has numerous wet or mucky spots. About 50 to 75 percent of the soils are silt loam. Much of the site has slopes of over 12 percent. Because of the slopes and low, wet spots this site will likely need extensive regrading. In the regrading process, it is possible that three small wetlands on site could be destroyed.

Of the three alternative sites considered feasible, the site just north of 3M appears the most suitable from a soils standpoint. It would not have as many problems with frost heaving as the area just north of the Lake Elmo site, nor would it require the extensive regrading that the Battle Creek Regional Park site would. Areas of mucky and organic soils would need to be avoided, however.

Alternative Steamline Routes

Three alternative steamline routes have been identified (see section on Alternative Steamline Routes). Alternative 2 follows Alternative 1 for most of its length, and so poses essentially the same magnitude and types of difficulties as the preferred route (Alternative 1).

Alternative 3, which parallels Minnehaha Rd. for most of its length, will also encounter problems similar to the preferred route. East of I-694 and west of I-694 to Hadley Av., it would pass through mucky and organic soils, and also soils that are susceptible to frost heaving. As the line travels south on Carlton, these same difficulties would be present again.

Alternative 4 may encounter small areas of soils susceptible to frost heaving, specifically the Auburndale silt loam and Ronneby fine sandy loam, as it goes south on Helmo and west on 4th St. Slopes of over 12 percent would be encountered before the line reaches I-694, and frost heaving could be a problem west of I-694. The soil survey shows an extensive area of Udorthent soils with a wet substrate along the frontage road for Hwy. 12. If this soil, which is actually fill, is underlain by organic materials, settling could cause problems with the steamline. If this route is chosen, on-site investigations will be needed to determine the nature of the substrate. If organic matter is present, it should be removed so as to avoid excessive steamline maintenance problems.

HABITAT

SURVEY

The habitat of the proposed facility site and steamline route was studied in May 1983. Plants and animals present on the site were identified, and the structures of the component communities were analyzed. This work is summarized below. More detailed presentations can be found in the Metropolitan Council's Technical Report: Habitat Evaluation of the Ramsey/Washington County Waste-to-Energy Project, June, 1983; this document is hereby incorporated by reference as a part of this EIS.

The portion of Washington County in which the site is located was originally oak/aspen forest. Its present vegetation is the result of human disturbance--first agricultural, then urban development. The three types of habitat now present on the site, woodland, wetland and grassland, are shown in Figure 16.

The Department of Natural Resource's Natural Heritage Program has no record of rare or sensitive species or unique ecological features occurring on the site or in the surrounding area. Species found on the site during the Council's surveys did not include endangered, threatened or ecologically sensitive flora or fauna.* Although many species were probably not yet present during the study period, the disturbed character of the site makes it unlikely that any sensitive plants or animals are among them. Identified species are in Table 8.

Woodlands

The woodlands on the site can be roughly divided into three stands: oak/cherry/aspen, oak, and aspen. The stand to the east of Helmo Av. is of the first type. It sits largely atop mounds that are 10 to 30 feet above street level, although low-lying areas occur in the central portion. The woodland is long and narrow, extending along most of the eastern border of the site and occupying about 3.2 acres. Oak and black cherry are dominant through the site, and quaking aspen is co-dominant in the northern section. The dominant trees are 16 to 33 ft. high, and no trees taller than 60 ft. were seen, indicating a relatively young woodland. The prevalence of aspen, an early-successional species, as well as a greater number of saplings suggests that the northern portion of the woodland is the most recently disturbed.

Other tree and shrub species which occur east of Helmo Av. include American elm, common elder, boxelder, tartar honeysuckle, ironwood, gooseberry, currant, dogwood and raspberry. A number of herbs were noted: Bicknell's cranesbill, wood anemone, rue anemone, the sessile-leaved bellwort, and wild onion were among the most common.

Most of the wooded area to the west of Helmo Av. is dominated by red and white oak which are considerably larger than those to the east. Some are more than 66 feet tall, while the majority are in the 16 to 33 foot range. Associated shrubs and smaller trees are black cherry, chokecherry, common elder, ironwood, boxelder, dogwood and downy serviceberry. The herb layer is similar to that

*Hansen, Zachary. Technical Report: Habitat Evaluation of the Ramsey/Washington County Waste-to-Energy Project, June 1983.

TABLE 8

SPECIES LISTS

TREES

Acer negundo = Box elder
Amelanchier arborea = Downy service-berry
Betula papyrifera = White birch
Ostrya virginiana = Ironwood
Pinus banksiana = Jack pine
Picea glauca = White spruce
Populus deltoides = Cottonwood
Populus tremuloides = Quaking aspen
Prunus americana = Wild plum
Prunus serotina = Black cherry
Prunus virginiana = Chokecherry
Pyrus prunifolia = Plum leaf crab
Quercus alba = White oak
Quercus borealis = Red oak
Rhamnus cathartica = European buckhorn
Salix spp. = Willow
Sorbus americana = Mountain ash
Ulmus americana = American elm

SHRUBS AND VINES

Cornus alba = Siberian dogwood
Cornus racemosa = Panicked dogwood
Cornus rugosa = Round-leaved dogwood
Cornus stolonifera = Red-osier dogwood
Lonicera tartarica = Tartarian honeysuckle
Prunus pumila = Sand cherry
Ribes americanum = Wild black currant
Ribes missouriense = Missouri gooseberry
Ribes nigrum = Black currant
Rubus sp. = Raspberry
Rubus idaeus = European raspberry
Sambucus canadensis = Common elder
Vitis sp. = Grape

HERBS

Achillea millefolium = Yarrow
Actaea sp. = Baneberry
Alisma sp. = Water plantain
Anemonella thalictroides = Rue anemone
Anemone quinquefolia = Wood anemone
Anemone quinquefolia var. interior = Wood anemone
Antennaria plantaginifolia = Plantain-leaved pussytoes
Asclepias sp. = Milkweed
Asparagus sp. = Asparagus
Brassica sp. = Field mustard
Bromus sp. = Brome grass
Caltha palustris = Marsh marigold
Carex sp. = Sedge
Cirsium spp. = Thistle

Comandra umbellata = Bastard-toadflax
Cyperus sp. = Sedge
Dryopteris sp. = Fern
Equisetum arvense = Field horsetail
Equisetum fluviatile = Water horsetail
Equisetum sylvatica = Wood horsetail
Eupatorium sp. = Snakeroot
Fragaria virginiana = Wild strawberry
Galium sp. = Bedstraw
Geranium bicknellii = Bicknell's cranesbill
Geranium maculatum = Wild geranium
Glyceria sp. = Manna grass
Impatiens capensis = Jewelweed
Lamium amplexicaule = Henbit
Lemna sp. = Duckweed
Maianthemum canadense = Wild lily of the valley
Lespedeza virginiana = Bush clover
Onoclea sensibilis = Sensitive fern
Osmunda cinnamomea = Cinnamon fern
Osmunda claytonia = Interrupted fern
Oxalis acetosella = American wood sorrel
Parthenocissus sp. = Virginia creeper
Phalaris arundinacea =
Plantago major = Common plantain
Poa palustris = Fowl meadow grass
Potentilla simplex = Old-field cinquefoil
Potentilla sp. = Cinquefoil
Pteridium aquilinum = Bracken fern
Ranunculus arborvitus = Small-flowered crowfoot
Ratibida pinnata = Gray-headed coneflower
Rhus radicans = Poison ivy
Rosa sp. = Wild rose
Rumex acetosella = Sheep sorrel
Sagittaria spp. = Arrowhead
Saxifraga pennsylvanica = Swamp saxifrage
Scirpus spp. = Bulrush
Sium suave = Water parsnip
Smilacina racemosa = False Solomon's seal
Sparganium sp. = Bur-reed
Stellaria media = Common chickweed
Solanum sp. = Nightshade
Solidago spp. = Goldenrod
Taraxacum officinale = Common dandelion
Thalictrum dioicum = Early meadow rue
Thalictrum polygamum = Tall meadow rue
Trifolium repens = White clover
Typha sp. = Cattail
Typha angustifolia = Narrow-leaved cattail
Urtica dioica = Stinging nettle
Urtica gracilis = Slender nettle
Uvularia sessifolia = Sessile-leaved bellwort
Viola cucullata = Marsh blue violet
Viola pallens = Northern white violet
Viola pedatifida = Prairie violet
Viola pratensis = Violet
Viola sagittata = Arrow-leaved violet
Verbascum thapsus = Common mullein
Zea mays = Domestic corn

BIRDS

American redstart
American egret
Black and white warbler
Bluejay
Blue-winged teal
Brown thrasher
Canada goose
Cardinal
Catbird
Chickadee
Crow
Downy woodpecker
Eastern kingbird
Field sparrow
Goldfinch
Grackle
Great blue heron
Hairy woodpecker
House wren
Killdeer
Magnolia warbler
Mallard duck
Meadowlark
Mourning dove
Myrtle warbler
Northern oriole
Northern watherthrush
Ovenbird
Palm warbler
Phoebe, eastern
Redwinged blackbird
Ring-necked pheasant
Robin
Rose breasted grosbeak
Scarlet tanager
Song sparrow
Sora rail
Sparrow hawk
Swainson's thrush
Tree swallow
Warbling vireo
White breasted nuthatch
White throated sparrow
Wood duck
Yellowthroat
Yellow shafted flicker
Yellow warbler

MAMMALS

Scirius niger = Eastern grey squirrel

Sylvilagus floridanus = Eastern cottontail

Odocoileus virginianus = White-tailed deer

Ondatra zibethica = Muskrat

REPTILES

Chrysemys picta = painted turtle

Thamnophis sirtalis = Common garter snake

found east of Helmo, but includes wild geranium and bracken fern as well. Since oak and black cherry are the dominant saplings, the stand is probably at or closely approaching its climax condition.

The remainder of the western woodland consists of small groves found along the edges of the oak woods. The dominance of aspen in the canopy and the high density of aspen saplings indicates that these groves are in an early forest successional stage. They have probably developed since the construction of Helmo Av. and will eventually succeed to an oak stand. Shrubs and other small trees in these stands are of the same species as those found over the remainder of the site, with the addition of several willow species. The herb layer was quite diverse, with 26 species identified, and consisted of a mix of woodland and grassland species.

Wetlands

Wetlands vary in structure and species composition, but share certain common characteristics: they develop in basins which hold water for at least a portion of the year, have soils rich in organic matter that are frequently saturated, have vegetation in zones that reflect water depths and are biologically very productive.

Ten wetlands were identified which will be influenced by the project (Figure 17). Only one, wetland 4, is large enough to be classified as protected under the Water Resources Conservation chapter (105) of Minnesota Statutes.

The wetland boundaries shown in the figure illustrate conditions at the time the site was studied; they will vary according to rainfall and season. During periods of high water, wetlands A, 3 and 5 flow into wetland 4; and wetlands 5 and 6 are connected. Wetlands 1-3 and A, B and C are probably only seasonally flooded and may disappear during dry periods.

Table 9 summarizes the characteristics of the individual wetland habitats.

Table 9
WETLAND SUMMARY

<u>Wetland No.</u>	<u>General Description</u>	<u>Dominant Vegetation</u>
1	Marsh, seasonally flooded	cattail, reed-canary, sedge
2	Woodland, temporarily flooded	oak, cherry, dogwood
3	Woodland, seasonally flooded	dogwood, reed-canary
4	Marsh	sedge, cattail, reed-canary
5	Marsh	manna grass, reed-canary
6	Bog	sedges, duckweed
7	Marsh	reed-canary, dogwood
A	Marsh, seasonally flooded	sedges, cattail
B	Marsh, seasonally flooded	reed-canary, willow
C	Marsh, seasonally flooded	reed-canary, willow

Grassland

Grasslands are found on the site primarily along Helmo Av. and along the proposed steamline route both east and west of I-694. The vegetation in these areas is secondary growth following disturbance and includes many introduced species. Along Helmo Av. grasses dominate. Occasional individuals of cinquefoil, mustard, mullein, strawberry, dandelion, violet, willow and aspen are also found.

Grasslands along the steamline route east of I-694 are more diverse and include the same species as well as pussytoes, dogwood, toad flax, wild geranium, raspberry, water horsetail, bulrush and others. The grassland area west of the freeway is undiversified and is dominated by grasses, mustard and bush clover.

Fauna

Animal populations are difficult to survey. Many are nocturnal, elusive or occupy a site only seasonally. However, the birds, mammals and reptiles observed to be present on the site are listed in Table 8. Forty-seven species of bird were identified. Nests of mallard and red-winged blackbird were common in the wetlands. Numerous white-tailed deer trails cross the site, and deer were seen on several occasions during the habitat field survey.

IMPACTS ASSOCIATED WITH THE PROJECT

Development on the site will have direct and indirect impacts. Examples of direct impacts include the removal of trees and filling of wetlands. Indirectly, there will be fewer insects for insectivorous organisms to feed on, fewer rodents available for birds of prey, etc. Changes to the habitat and its associated communities can, therefore, be more far-reaching than they initially appear to be.

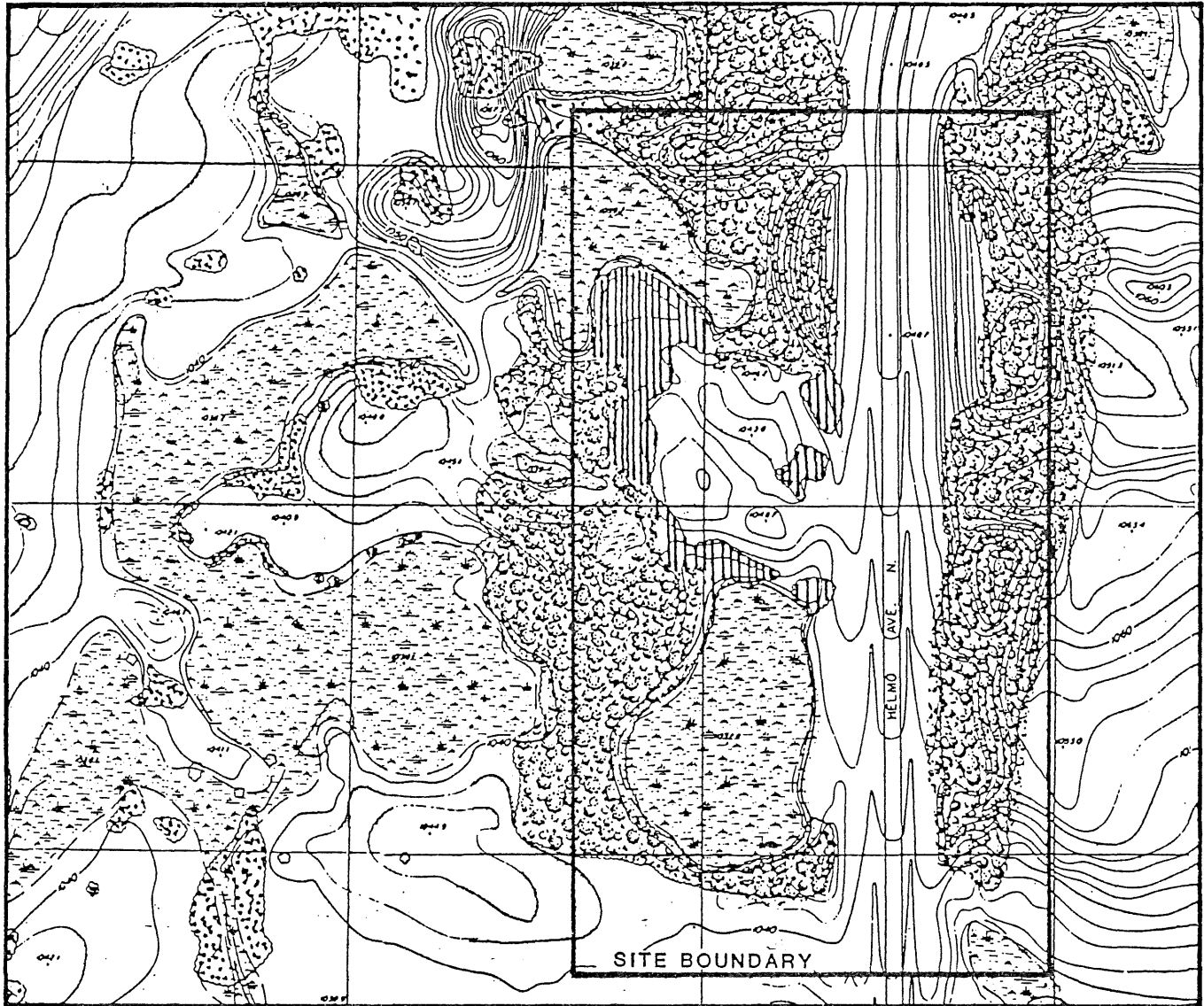
Woodlands on the Site

Woodlands on the site will be directly affected by the relocation of Helmo Av. and the construction of the facility. Relocation of Helmo Av. will remove the oak/cherry/aspen woodland. Construction will also require removal of portions of the oak woodland and aspen groves in the northern part of the site west of existing Helmo (Fig. 16). Slightly more than 5 acres of woodland will be destroyed.

Effects will include: removal of nesting habitat for woodland birds; removal of food sources for herbivores and carnivores; removal of breeding habitat for invertebrates, chiefly insects; removal of nesting habitat for mammals; interruption of deer trails, and removal of nutrients and stored energy in the form of biomass which will be transported from the area.

Revegetation of the roadside areas will likely be as grassland (for safety reasons). Thus the new habitat will be of different character than the old. If any of the woodland remains following construction, the new edges of the stand will be colonized by early-successional species, probably including raspberry, dogwood, aspen and boxelder. The introduction of traffic along Helmo Av. will create a disturbance to which wildlife in the area is unaccustomed. More retiring species will be inclined to migrate from this habitat, while more tolerant species will expand their ranges.

Figure 16.
GENERAL HABITAT TYPES



0

500 Feet



Wetland



Willow/Dogwood



Grassland



Oak/Aspen



Aspen

Some disturbance of the woodland in the southern portion of the site will probably result from facility construction and operation. New edges will be created along the oak woodland borders and disturbed areas will revegetate with aspen and associated early-successional species. This younger woodland will attract different birds and mammals than those currently using the area.

Noise from construction will disturb resident animals, although this effect will be temporary. During plant operation, some disturbance of animals will result from noise and movement of vehicles, but towards the center of the stand these effects will probably not be great.

Thus, woodland on the eastern edge and northern half of the site will be removed as a result of the project. Woodlands in the southern half will be changed in character by the creation of new edges, but will remain in place.

Wetlands on the Site

Wetlands are complex, diverse ecosystems which are dependent on the presence of water. Water can be considered the dominant physical factor that influences the plant community and, hence, animal species present. Wetlands respond to changes in water level over the long term by adapting the character of their vegetative communities. For instance, if tiling or diversion remove water, a community which includes more terrestrial plants will develop, while flooding creates an aquatic habitat.

Wetlands 1, 2, 3, 5, 6 and 7 will be affected by facility construction. Wetlands 3 and 5 will be partially or entirely filled. Thus, these wetlands and the habitat they represent will be lost. Wetland 6 may be partially filled, and a channel will need to be constructed through the remainder of wetland 5 to carry water from wetland 6 to wetland 4. In addition, the woodland at the southeast edge of wetland 5 will be removed. These changes will alter the community structure of wetland 5, which at present is a bog.

Bogs are hydraulically balanced, so a change in their water level will change the status of their dominant plant form. In wetland 5, the dominant form is a mat of floating vegetation principally composed of sedges and bulrushes. A change in species composition from shade to light tolerant plants is a likely result of the removal of trees from the wetland edge. The increase in water temperature which will also occur may affect invertebrate populations. In addition, partial filling will probably alter the bottom substrate and slope. This will favor plants adapted to the new conditions, and will create a new wetland edge plant community.

Wetland 7, a small deep marsh, will be lightly affected as a result of rerouting Helmo Av. A portion of the western lobe containing small trees and shrubs will be truncated and filled. The effect on this habitat will be minimal.

Wetland 2 is a small depression in an oak woodland which is occasionally flooded. This depression will be filled during construction. The impact of eliminating this habitat is similar to that of removing wooded areas.

Wetland 1 will not be filled or otherwise altered by construction. It may be affected, however, if storm water runoff is rerouted from the facility to the wetland, causing a rise in water level. If runoff volume is large enough, water depth may become too great for emergent vegetation to grow. Further, typical fluctuations in water levels within and between years may be altered.

Figure 17.
WETLANDS



Note: Lettered wetlands were assessed qualitatively;
numbered wetlands were surveyed using transects.

These fluctuations are responsible for the high productivity of wetlands because periodic drying accelerates decomposition and nutrient recycling. In the event that the plant community is altered by decrease in productivity or change in composition, there will be corresponding changes in the animal populations.

Effects on site wetlands, therefore, will range from elimination by filling to more subtle changes in community composition. Primary instruments of these changes will be alterations in water level and in the amounts of light reaching the wetlands.

Steamline

Alternative steamline routes are shown on Figure 10. Alternatives 1 and 2, from east to west, cross a small portion of the oak woodland, a grassy peninsula in wetland 4, a narrow portion of wetland 4, grassland adjacent to I-694 (both east and west of the freeway), and a corner of a low-lying wetland near Hadley Av. Impacts on the woodland and grassland will not be great. The woodland will already have been disturbed for facility construction; the grassland is primarily secondary growth following disturbance, and can revegetate fairly quickly.

Since wetland 4 is very narrow at this point, there will not be a large reduction in habitat during construction. Following restoration of the disturbed portion, there will be no habitat loss. Impacts of steamline construction on the wetland will result from movement of equipment, trenching and runoff.

The degree to which animals are disturbed will depend on the time of year during which construction takes place. Fewer species are present in the winter, which would thus be the best time to lay the steamline. Spring would be the least desirable season, particularly because nesting of birds is then at its peak.

The wetland west of I-694 is dominated by reed-canary grass. Only a portion of this wetland will be crossed and impacts will be minimal. The remainder of the routes pass through developed areas.

Alternative 3 is located along roadway right of way for its entire length. Habitat impacts are negligible.

The impacts associated with Alternative 4 are similar to Alternatives 1 and 2. The route follows Helmo Av. south from the site, then turns due west, passing through a wetland complex, then beneath I-694. It then crosses a grassland area between the interstate and Hadley Av. The remainder of the route is through developed areas and habitat impacts are not a concern.

Mitigation

Several precautions can be taken to minimize adverse impacts of construction in wetland areas. These are:

1. Use of mats for heavy equipment.
2. Restoration of previous bottom elevation.
3. Construction in winter preferred; spring construction should be avoided.
4. Reintroduction of original plants.

Steamline maintenance will have the same impacts as construction, and similar precautions should be taken.

To control sedimentation and to avoid the adverse effects of a possible increase in water level in wetland 1, a retention basin could be constructed to the northeast (see Figure 20). Such a basin could also provide an open water habitat with a wetland edge, thus creating habitat to replace that lost in filling wetlands 2, 3, 5, 7 and B.

SURFACE WATER

This section describes the impacts on surface water at the site and in its watershed from construction and operation of the proposed facility. Measures available to control and minimize these effects are also discussed. Development of the site will alter present drainage patterns, increase runoff volume and cause erosion which may degrade water quality. Operation of the plant may increase the level of pollutants present in the surface water.

The discussion which follows summarizes the Metropolitan Council's Technical Report: Surface Water Impacts of the Ramsey/Washington County Waste-to-Energy Project, June, 1983; this report is hereby incorporated by reference as a part of this EIS.

RUNOFF

Changes in Drainage Patterns

The proposed site lies near the boundary of the Battle Creek Subwatershed of the Ramsey-Washington Metro Watershed and the Cottage Grove Ravine Watershed (Figure 18). As shown in Figure 19, water from the northeast corner of the site flows into Cottage Grove Ravine. Flow from the remainder of the site is directed into Battle Creek.

Figure 19 also shows 13 small subwatersheds which lie partially or entirely within the site and will be affected by development. Most of these drain into wetlands (Figure 19 shows wetlands on and near the site). Water from much of the immediate area flows into and through Wetland 4. When water levels are high, Wetlands 3, 5 and 6 drain into this large wetland, and Wetland 1 overflows into a ditch along the western edge of Helmo Av. Water from this ditch flows south. Most runoff from the east side of Helmo Av. flows into a ditch along the eastern edge of the street. Water from Wetland B enters a large wetland system to the southeast.

Approximate final contours of the site following development are shown in Figure 15. The altered drainage patterns this will produce are illustrated in Figure 20, and the shifts in the boundaries of the minor subwatersheds are shown in Figure 21. Specifically, the following changes in surface water movement will occur.

- The boundary between Battle Creek subwatershed and the Cottage Grove Ravine Watershed will be shifted to the east when Helmo Av. is relocated (Figure 21).
- Wetlands 2, 3, most of 5, and part of 6 will be filled.
- The small watershed draining into wetland 5 will be eliminated with the filling of that wetland (Figure 21).
- There will be a larger watershed for wetland 1; this includes drainage from the impervious areas of the facility (Figures 20 and 21).
- The watershed for wetland 6 and the remains of wetland 5 will be incorporated into one watershed which will receive runoff from the steep slopes north and west of the facility.

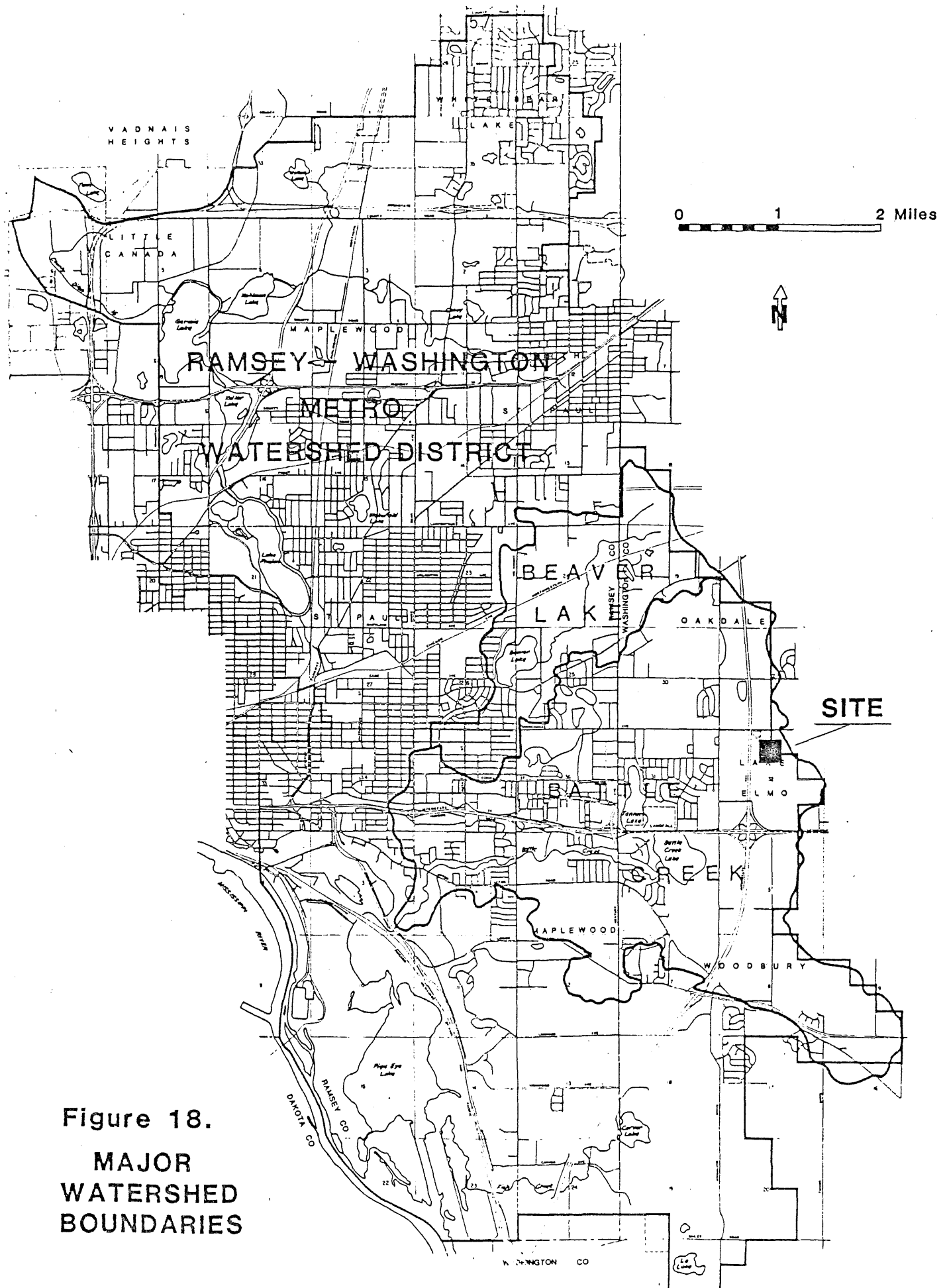


Figure 18.
MAJOR
WATERSHED
BOUNDARIES

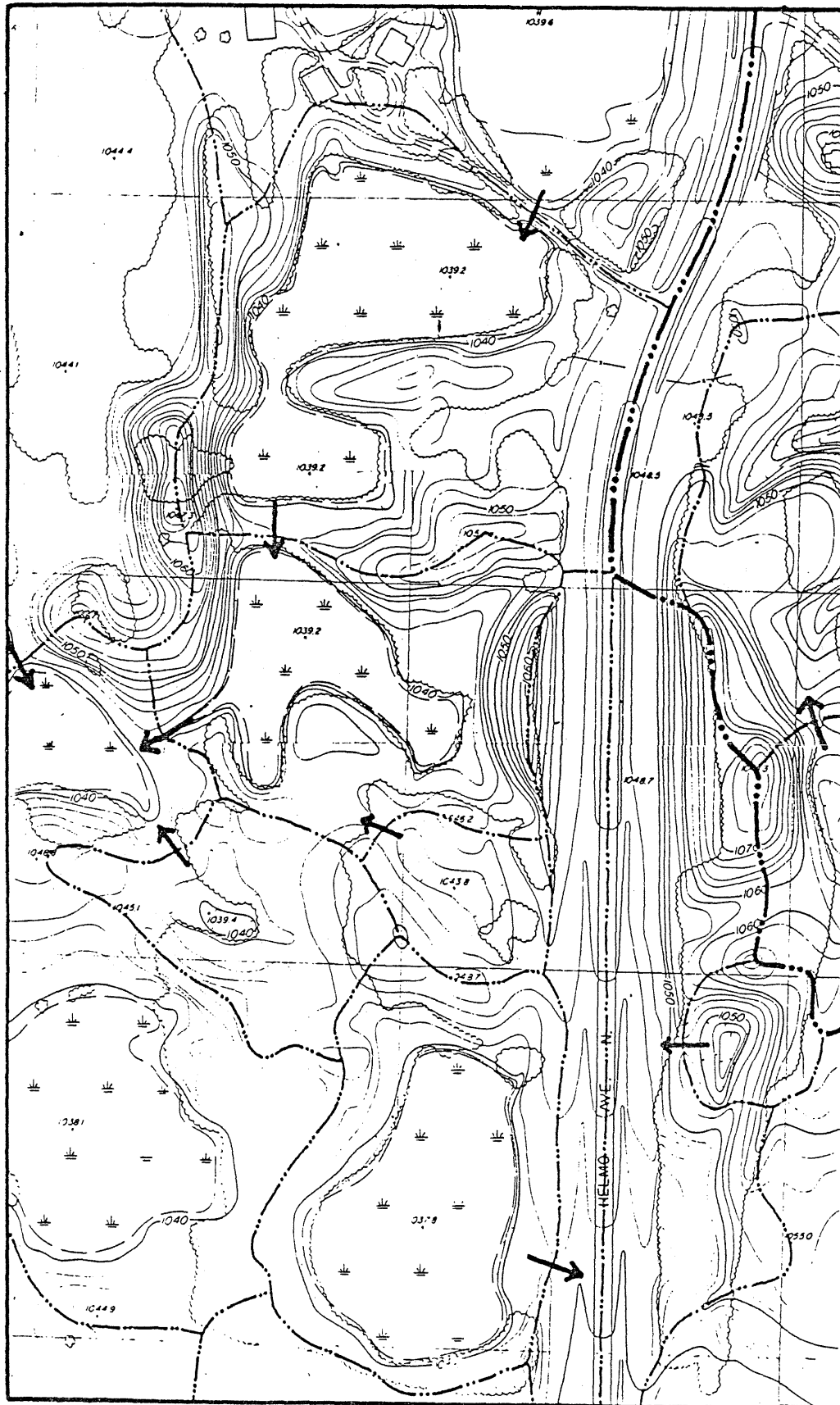
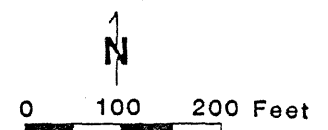


Figure 19.
CURRENT
DRAINAGE
PATTERN

- ← High water flow
- Secondary watershed boundary
- Minor watershed boundary



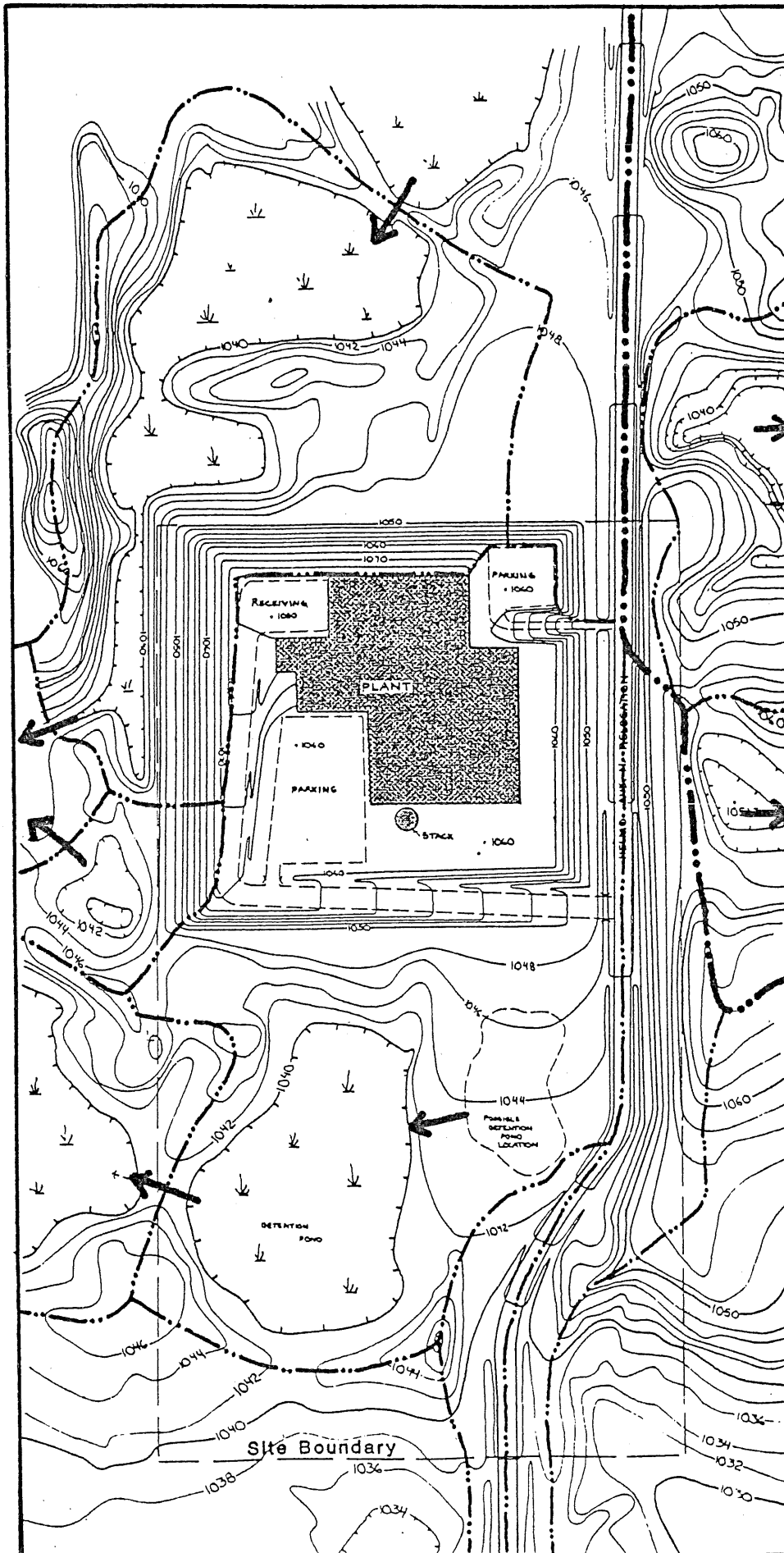


Figure 20.
DRAINAGE
PATTERN
AFTER
DEVELOPMENT

- ← High water flow
- Secondary watershed boundary
- ... Minor watershed boundary

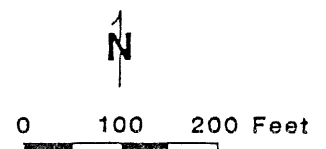
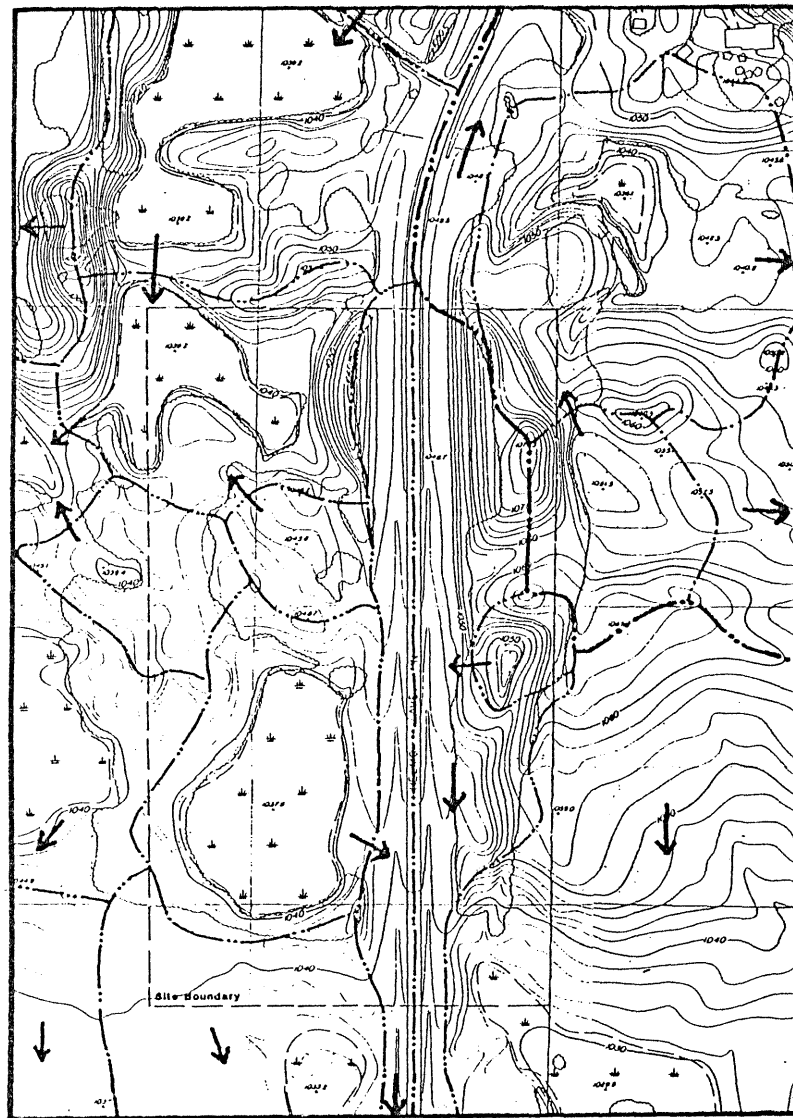
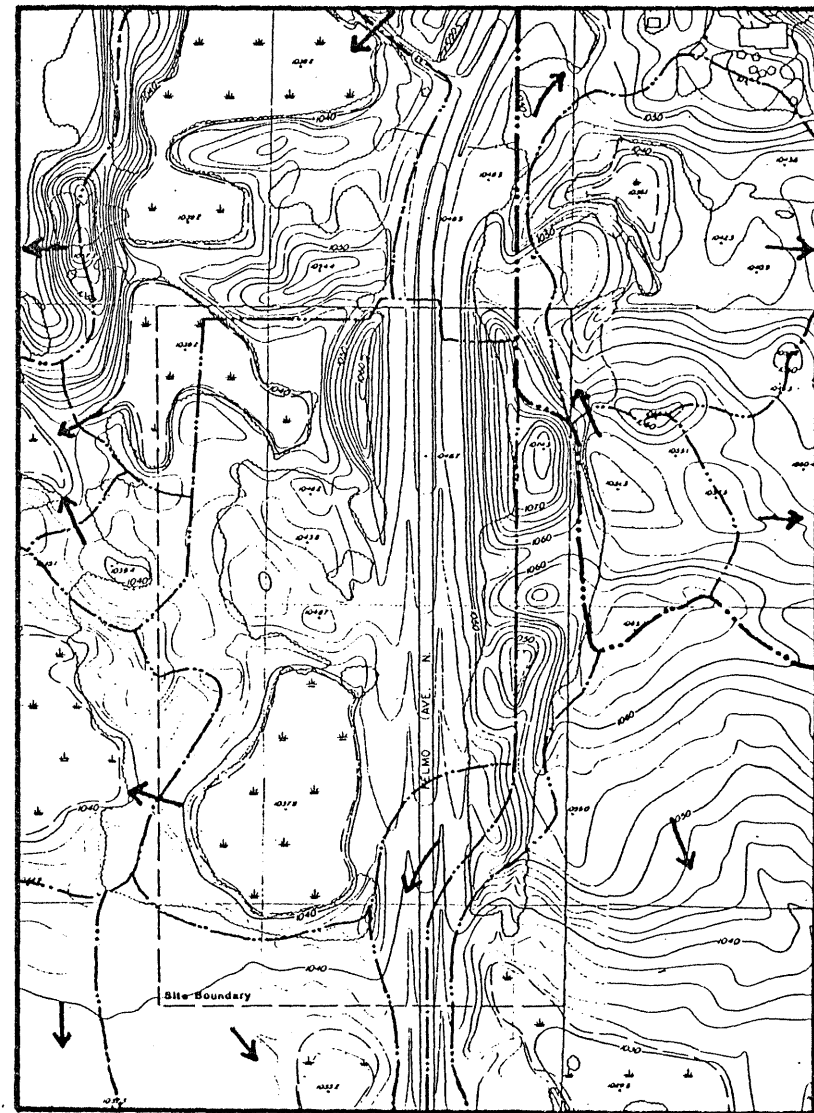


Figure 21. WATERSHED BOUNDARY CHANGES



Current



After Development



0 500 1000 Feet

- Drainage from the western side of relocated Helmo Av. will flow to wetland 1; on the east side it will flow south in the road ditch.
- The watershed for wetland 7 will be smaller as a result of the relocation of Helmo Av.

Changes in Runoff Volume

The approximate storage capacity of the four wetlands on the site is given in Table 10. (Storage capacity is defined here as the volume of water which can be contained in the basin before it begins to flow out of the wetland.) The amount of water actually present will vary according to season and precipitation levels.

Table 10
CURRENT WETLAND STORAGE CAPACITIES

<u>Wetland</u>	<u>Area (ha)</u>	<u>Storage volume in m³ acre-feet</u>
1	0.81	4400 (3.57)
3	0.12	951 (0.77)
5	0.52	1268 (1.03)
6	0.24	585 (0.47)
Total	1.69	7204 (5.84)

Since Wetland 3, most of Wetland 5 and a portion of Wetland 6 will be filled, there will be a loss of water storage capacity, resulting in an increase in runoff volume from the site.

Runoff volume will also increase due to the creation of impervious surfaces and changes in the types of vegetation present on the site. To determine the extent of the increase, a model developed by the U.S. Department of Agriculture Soil Conservation Service was applied. This model permits the prediction of runoff volume based on soil type, land use or vegetative cover, and rainfall amounts. Table 11 lists 24-hour rainfall amounts for storms likely to occur at frequencies of 2.5, 10, 25 and 100-year intervals.

Table 11
RAINFALL AMOUNTS

<u>Rainfall Frequency (years)</u>	<u>Rain (inches)</u>
2.5	2.95
10.0	4.00
25.0	4.75

Source: National Weather Service 1961.

Table 12 presents runoff volumes according to type of surface cover before site development. The model predicts that runoff volumes will be substantially higher for the site after development. This is due largely to the increase in impervious area from 0.69 acre to 5.54 acres. For any rainfall event, runoff volumes from these areas will increase eight-fold. Grassland area will increase slightly, which will also increase runoff volume. Runoff from woodlands will decrease since total wooded land will decrease from 7.62 to 2.05 acres.

Table 12
RUNOFF VOLUMES FOR SELECTED RAINFALL EVENTS BEFORE DEVELOPMENT

Cover Type	Area (acres)	2.5*	Runoff Volume (acre-feet)		
			10*	25*	100*
Impervious	0.69	0.16	0.22	0.26	0.32
Wetland	2.74	0.35	0.57	0.71	0.97
Woodland	7.62	0.06	0.32	0.57	0.95
Grassland	9.05	0.11	0.45	0.79	1.24
Total**	20.1	0.33	0.99	1.62	2.51

*x-year 24-hour rainfall amounts.

**Does not include wetland runoff; assumes storage occurring.

Table 13 gives runoff volumes for the site after development. The increase in runoff volume due to changes in cover type combined with the loss of storage capacity in the wetlands will have a significant impact on the quantity of surface water flowing from the site.

Table 13
RUNOFF VOLUMES FOR SELECTED RAINFALL EVENTS AFTER DEVELOPMENT

Cover Type	Area (acres)	2.5*	10*	25*	100*
Impervious	5.54	1.29	1.75	2.08	2.58
Wetland	2.01(2.51**)	0.26(0.32)	0.42(0.51)	0.52(0.66)	0.71(0.89)
Woodland	2.05	0.02	0.08	0.15	0.26
Grassland A	10.5(10.0**)	0.13(0.12)	0.52(0.50)	0.92(0.87)	1.44(1.37)
Total***	20.1	1.44(1.43)	2.35(2.33)	3.15(3.10)	4.28(4.21)

*x-year 24-hour rainfall amounts

**Numbers in parentheses are values that assume a 0.5 acre detention facility will be built.

***Does not include wetland runoff; assumes storage occurring.

Mitigation

According to the Battle Creek Watershed Management Plan, stormwater runoff is causing severe erosion problems in the watershed. To avoid contributing to these problems, the site should be designed to prevent increased runoff from flowing downstream. The most feasible measure appears to be the use of wetland 1 and development of a detention pond nearby to contain runoff. Such a pond could be developed early in construction and would provide the necessary storage capacity.

The detention pond (Shown in Figure 20) should be approximately 0.5 acres, excavated to a depth of four feet to be able to provide two acre-feet of storage capacity and retain all the runoff from the 2.5 year rainfall event. This water would eventually be lost to infiltration and evaporation. During larger rainfalls, the detention facility would act as a settling pond. Water would be retained in the pond for 20.4, 15.2 and 11.2 hours, respectively, for the 10-, 25- and 100-year frequency rainfall events before flowing through Wetland 1 and off the site. These detention times would be sufficient to accomplish solids reduction through settling-out of particulate matter and for volume reduction by infiltration and evaporation.

Several design features could enhance the detention pond's effectiveness. Water volume could be reduced with a permeable bottom which would allow greater infiltration. The quality of the water leaving the site could be improved by excavating the pond to a depth of five feet, leaving one foot of permanent pond. This would serve to prevent inflowing water from stirring up settled debris and would supply a sediment storage area. The pond could also be equipped with a grate and a floating skimmer at the outflow point to trap floating debris.

As an alternative to the detention pond, Wetland 1 could be deepened to provide increased storage. This is a somewhat less desirable solution, however, since higher water levels could change the plant community structure and composition. This in turn would cause a change in the types of animals present. A detention basin would also prevent the wetland from becoming clogged with sediment and would remove some of the pollutants which might have toxic effects on the wetland's flora and fauna.

The location of the detention pond as shown in Figure 20 was chosen to ensure that runoff from the site would flow through it before draining into Wetland 1. This location, however, has also been considered as the plant's 0.5 acre recycling drop-off station. Because of the desirability of the detention basin, it is recommended that an area to the north of the waste-to-energy plant be considered instead for the recycling drop-off. This location may also provide easier public access and prevent traffic congestion around the entrance to the main facility.

WATER QUALITY

Sediment and Erosion

Soil will be exposed during some phase of construction on approximately half of the 20-acre site, chiefly due to the relocation of Helmo Av. and the construction of a ramp to the tipping floor. The elevation necessary for the facility also requires that steep slopes be created (Figure 15). Thus, the potential for serious erosion problems exists.

Sediment carried in runoff would be deposited in the wetlands. This would result in an increase in suspended solids which would inhibit light penetration and may cause a decrease in photosynthetic activity. Water temperature would also rise, possibly causing a change in the types of plant and animal life found in the wetlands. Sediment which settles to the bottom would interfere with rooted plants and would gradually fill in the wetland basin, decreasing water storage capacity.

Special surface water management practices will be essential for controlling erosion on this site. The usual practice of using hay mulch to hold soil in place while vegetation is becoming established will probably be insufficient because of the steep slopes. The use of burlap, fiberglass netting or other types of mats would greatly decrease erosion potential. After Helmo Av. has been relocated, prompt sodding of the ditches and installation of sediment traps will reduce soil loss. Early construction of a detention area will divert runoff from flowing directly into the wetlands. After construction, the basin should be dredged to return it to its intended depth.

Construction along the streamline will also create erosion problems, and similar management practices should be applied.

Other Pollutants

In addition to sedimentation, other forms of pollution may result during construction activity. Construction sites monitored by the Metropolitan Council in 1980 (Oberts, 1982) showed elevated concentrations of suspended solids, nitrogen, phosphorus, chlorides, lead, zinc and chromium. Erosion control practices for the site will also help to control nonpoint source pollution during construction.

Operation of the plant could add other pollutants to surface water. The principal potential source would be atmospheric deposition (for example, fugitive ash resulting from ash-truck loading). Ash would be a concern because it will contain trace metals, such as cadmium, chromium, silver, lead and zinc. (Giordan et. al 1983). The ash loading area will be enclosed and under negative pressure thus preventing escape.

Alternative Sites

Oakdale Site

Depending upon how this site is graded and drained, it can flow either south into the drainage of the currently proposed site in the Battle Creek Watershed, or south-southeast into the Cottage Grove Ravine Watershed. Either condition would not result in any major runoff problems, since both watersheds have numerous areas where adequate runoff storage could be developed in the upper parts of these watershed.

3M Site

This site is in the Battle Creek Watershed. Runoff problems would probably be minimal, however, because of the large pond located just south of the site on 3M property. Present use of this site as a drive-in theater means that little grading would likely be needed, with resultant soil loss thereby minimized.

Battle Creek Site

This site has numerous steep slopes and depressions. Many of the depressions contain wetlands. Extensive grading would be required to develop this site, and serious soil erosion problems would likely arise.

GROUNDWATER

SETTING

Near wetlands and for some other parts of the site the surficial groundwater table is at or near the surface. For most of the site, however, it is estimated to be 10 feet or more below ground level.

The first major bedrock aquifer beneath the site is the Prairie du Chien, at a depth of approximately 300 feet.

IMPACTS

Water use for the facility is estimated at less than 11 million gallons, approximately 0.03 million gallons per day. The supply source may be either a municipal well or on-site well. Usage rates are low and would not create sufficient draw-down to affect the water table.

Domestic wastewater discharge will be to the municipal sewer system. Other wastewater from boiler blowdown or other system processes will be used as makeup water for the ash quench system or treated and released to the municipal sewer system. No materials would be directly or indirectly discharged to groundwater.

Neither the proposed project nor locational or technological alternatives represent a risk to groundwater either through excess withdrawal or by contamination. On the other hand, landfilling as a likely no-build option poses an indeterminate risk of groundwater contamination lasting throughout the life of the facility and for decades following closure.

AIR QUALITY

SETTING

Ambient Standards

The proposed site is located in an area which the Minnesota Pollution Control Agency (MPCA) considers as complying with state and federal ambient air quality standards. Ambient standards refer to outdoor air. Ambient standards have been established for so-called "criteria" pollutants: particulates, sulfur dioxide, ozone, oxides of nitrogen, carbon monoxide, and lead.

The site is within an area for which the MPCA is seeking EPA approval to classify as attaining ambient standards for suspended particulates and for sulfur dioxide. The MPCA is beginning to take steps to classify the area as attaining standards for ozone and for carbon monoxide as well. It is an area officially recognized as attaining the ambient standard for lead. This description is equally applicable to the Oakdale alternate site.

Primary ambient air quality standards are intended to protect the health of all people, including those especially sensitive to air pollution. Secondary standards are set at levels which protect vegetation, wildlife, buildings or other materials from air pollution damage.

The MPCA's proposed particulate designations cite Maplewood as a community in which the primary annual particulate standard is attained, but the secondary standard is not met. This description affects the alternate sites at 3M and Battle Creek Park. Limitations placed on development of new sources in non-attainment areas can be more restrictive.

Regulation of Emissions

The facility will require a construction permit and an operating permit for the MPCA. Both the MPCA and EPA limit particulate emissions from municipal waste-to-energy facilities. (The emission limit is 0.08 grains per dry standard cubic foot, corrected to 12 percent CO₂, and 20 percent is the maximum allowable opacity of the emission plume.) As part of the permitting process, the MPCA customarily requires modelling of other criteria pollutants to ensure that violations of ambient air quality standards will not occur.

The EPA has also set emission standards for some hazardous air pollutants: asbestos, beryllium, mercury, and vinyl chloride. The agency is considering standards for benzene, arsenic, cadmium, and polycyclic organic compounds.

Federal regulations require that efforts be made in areas which comply with ambient standards to prevent the significant deterioration of air quality (PSD). New emission sources must not only stay within applicable emission limits, but must also use the best available control technology (BACT). This is a custom-tailored decision on what control technology is appropriate for a proposed facility, based on energy, environmental and economic impacts.

In areas which do not meet ambient standards, the requirements for large new sources are stricter. Facilities must control their emissions to the lowest achievable emission rate, frequently requiring more sophisticated control equipment or processes.

IMPACTS FROM STACK EMISSIONS

Regulated Pollutants

Modelled Ambient Impact

The proposer has worked with the MPCA Division of Air Quality to assess the impact of the project for regulated emissions. A series of conservative assumptions were made about the facility's emission characteristics (Table 14).

Ambient impacts for particulates, sulfur dioxide, nitrogen dioxide, carbon monoxide, hydrocarbons, lead, beryllium, mercury, fluorides, and chlorides were modelled using the EPA's CDMQC and RAMF models. The results of this analysis are shown in Table 15. Pollutant levels will not exceed standards and are not even at levels warranting pre-construction ambient monitoring. The forecast fluoride concentrations were high enough, however, that the MPCA has indicated a possible need to monitor this pollutant after construction.

Should the final plant design differ markedly from the modelled assumptions, the MPCA can require additional modelling of ambient impacts as part of its permitting process.

Table 14
EMISSION CHARACTERISTICS
RAMSEY/WASHINGTON COUNTY RESOURCE RECOVERY FACILITY
600 TPD FACILITY

Model Parameters

Stack Height	53.3 m	175 feet
Exit Gas Vel.	18.3 m/s	60 ft/s
Exit Gas Temp.	505 ^o K	450 ^o F
Stack Diameter	1.8 m	6 feet
Pollutant Emission Rate	7.9 gm/s	2.5 lb/T

Met. Data: WX data from Minnesota Pollution Control Agency for years 1973 to 1977.

Emission Significants (Lb/T)

Particulate	0.6	Lead	.1
Sulfur Dioxide	2.5	Beryllium	1×10^{-5}
Nitrogen Dioxide	3.0	Mercury	6×10^{-3}
Carbon Dioxide	1.0	Fluorides	0.1
Hydrocarbons	0.3	Chlorides	4.0

Table 15
HIGHEST MODELED RESULTS

	<u>Modeled ug/m³</u>
Particulate:	
1 hour	7.4
24 hour	2.9
Annual	0.1
Sulfur Dioxide:	
24 hour	12.26
Annual	0.3
Carbon Monoxide, 24 hour	4.9
Nitrogen Oxides, Annual	0.4
Hydrocarbons, 24 hour	1.5
Lead, 3 month	0.02
Mercury, 24 hour	0.03
Beryllium, 24 hour	4.9×10^{-5}
Fluorides, 24 hour	.49
Chlorides, 24 hour	19.6

Alternatives

Control Technologies

The analysis described above assumed the facility will be equipped with an electrostatic precipitator for particulate control. Federal and state emission limitations for municipal waste-to-energy facilities are 0.08 grains/dry standard cubic foot. The analysis assumed the electrostatic precipitator could continuously meet a limit of 0.03 grains.

Alternative devices that have been used for particulate and for acid gas control on waste-to-energy facilities include: mechanical collectors, fabric filters, electrostatic gravel bed filters, wet scrubbers and dry scrubbers.

These control devices have been historically applied to fossil fuel, wood waste, and refuse combustion systems in the United States, and have been demonstrated to achieve particulate emissions of 0.02 to 0.08 gr/dsfc.

Of these alternative devices, electrostatic precipitators and electrostatic gravel bed filters are preferred for particulate control based on technical feasibility and demonstrated performance levels. These two devices have consistently achieved low emission levels and present fewer potential operational problems. Mechanical collectors alone are not considered capable of continuously meeting the required outlet grain loadings. Fabric filters have extremely high collection efficiencies; however, these devices applied to waste-to-energy facilities are subject to moisture condensation with subsequent blinding of the bags, acid condensation resulting in bag deterioration, and potential fire due to air leakage. Wet scrubbers have difficulty in continuously meeting the required outlet grain loading, and also require installation of additional wastewater treatment facilities and experience higher operating and maintenance costs than the alternative devices.

If acid gas control is necessary, the preferred device is a semi-dry scrubber upstream of either an electrostatic precipitator or fabric filter. The use of a fabric filter system, as opposed to an electrostatic precipitator, permits higher removal efficiency as additional acid vapors are collected in the filter media. However, the incremental annual operating cost associated with acid gas/particulate removal through use of a semi-dry scrubber in series with a fabric filter versus particulate collection via an electrostatic precipitator or gravel bed filter is estimated to be about \$6.50 per ton of solid waste.* The alternative acid gas removal device, a wet scrubber, is not preferred due to the reasons cited above.

Project Alternatives

Council staff utilized the CDMQC model to compare the impacts of different sites and of different fuel mixes for 3M. The model was used to estimate an annual average SO_2 concentration for an area 40 km by 40 km centered near the proposed site.

Eight situations were assessed:

1. Background SO_2 concentrations, excluding emissions from either 3M or the proposed facility.
2. Background plus emissions from 3M with natural gas the sole fuel source.
3. Background plus emissions from 3M with natural gas and residual fuel oil each supplying half of the energy demand.
4. Background plus emissions from 3M with residual fuel oil the sole fuel source.
5. Background, plus emissions from the proposed site, plus 3M emissions to supply half of energy demand using fuel oil.
6. Background, plus emissions from Oakdale alternate site, plus 3M emissions to supply half of energy demand using fuel oil.
7. Background, plus emissions from 3M alternate site, plus 3M emissions to supply half of energy demand using fuel oil.
8. Background, plus emissions for Battle Creek alternate site, plus 3M emissions to supply half of energy demand using fuel oil.

Background concentrations within the study area were forecast to be between 8.01 and 39.02 ug/m^3 . Minnesota's annual primary SO_2 standard is 80 ug/m^3 ; the secondary standard is 60 ug/m^3 .

*ERT, Inc., Air Quality Assessment for the Ramsey/Washington County Waste-to-Energy Facility, 1983.

that location to 21.92 ug/m^3 . Use of residual oil exclusively at the 3M complex increases the concentration at the same point to 22.96 ug/m^3 --a 2.29 ug increase over background, the highest of any scenario tested.

For the scenarios assessing the proposed waste-to-energy facility site and alternate locations, each added a maximum of 0.16 ug/m^3 to background.

The overall point of maximum concentrations did not change from the background analysis. Thus, although emissions are highest for the 3M residual oil scenario, the impact is only negligibly greater than the other options. And there is no significant distinction between the locational alternatives for the waste-to-energy facility.

Other Pollutants

In addition to the regulated pollutants, the facility will emit trace metals, polycyclic organic matter and acid gases. An Air Quality Assessment for the Ramsey/Washington County Waste-to-Energy Facility was completed in August 1983 by Environmental Research and Technology, Inc., which estimated the amount of such emissions and evaluated their potential health risk. This work is summarized below, and is hereby incorporated by reference as a part of this EIS.

Emissions

The combustion of solid waste will result in the emission of numerous trace elements. The quantities and characteristics of these trace pollutant emissions depend on the constituency of the waste, properties of the trace element, operational features of the combustion process, and performance of the pollution control technology.

Typical components of solid waste for Washington and Ramsey Counties are shown in Table 16. This mix is expected to remain stable over time. The study found no significant change in waste composition even with implementation of Ramsey and Washington Counties' other strategies for waste abatement.

Based on emissions data for similar facilities, emission factors were derived for metals and trace elements, acid gases and organic compounds. These emission factors and the resulting estimated hourly and annual emission rates are presented in Table 17. These values are based on the assumption of a continuous charge rate of 600 tons daily, annual through-put of 219,000. Thus the emission factors are conservative since the expected through-put is 18 percent lower, 180,000 tons per year.

Among the metals, emissions of lead and zinc are highest, exceeding 10 tons per year. Emissions of other metals: beryllium, mercury, arsenic, cadmium, chromium, cobalt, copper, iron, manganese, nickel and titanium are several orders of magnitude lower.

The proposed waste-to-energy facilities will also discharge acid vapors, including hydrogen chloride (HCl), hydrogen fluoride (HF), and sulfuric acid mist (H_2SO_4). The principal acid vapor present in waste-to-energy facility flue gases is HCl. Emissions of HCl result principally from combustion of polyvinyl

TABLE 16
COMPOSITION OF MIXED MUNICIPAL SOLID WASTE BEFORE AND AFTER SEPARATION
FOR RAMSEY/WASHINGTON COUNTY

<u>Component</u>	<u>Before Separation</u>		<u>After Separation</u>	
	<u>(tpy)</u>	<u>(% Weight)</u>	<u>(tpy)</u>	<u>(% Weight)</u>
Paper	254,310	44.5	216,060	43.7
Metals				
Ferrous	34,307	6.0	21,397	4.3
Non-ferrous	6,841	1.2	5,615	1.1
Plastics	23,416	4.1	23,416	4.7
Rubber/Leather	14,840	2.6	14,840	3.0
Textiles	10,891	1.9	10,891	2.2
Wood	38,556	6.7	38,477	7.8
Glass	44,691	7.8	37,484	7.6
Food Wastes	62,351	10.9	62,194	12.6
Yard Wastes	51,461	9.0	34,105	6.9
Miscellaneous	30,358	5.3	30,279	6.1
	<u>572,022</u>	<u>100.0</u>	<u>494,758</u>	<u>100.0</u>

SOURCE: ERT, Inc., Air Quality Assessment for the Ramsey/Washington Waste-to-Energy Facility, 1983.

Table 17
ESTIMATED POLLUTANT EMISSIONS FROM PROPOSED
WASTE-TO-ENERGY FACILITY

Pollutant	Emission Factor (lb/ton)	Emission Rate*	
		(lb/hr)	(tpy)
Lead	0.13	3.25	14.2
Asbestos	Negligible	Negligible	Negligible
Beryllium	1.5×10^{-7}	3.8×10^{-6}	1.6×10^{-5}
Mercury	3.6×10^{-6}	0.090	0.39
Fluorides	0.052	1.30	5.69
Sulfuric Acid	0.029	0.73	3.18
Hydrogen Chloride	3.10	77.5	339.0
PAH	4.3×10^{-5}	1.1×10^{-3}	4.8×10^{-3}
TCDD	5.7×10^{-9}	1.4×10^{-7}	6.0×10^{-7}
Zn	0.12	3.00	13.1
Trace Metals:			
As	2.5×10^{-4}	6.3×10^{-3}	0.027
Cd	1.5×10^{-3}	0.038	0.16
Cr	5.1×10^{-4}	0.013	0.056
Co	7.0×10^{-6}	1.8×10^{-4}	7.7×10^{-4}
Cu	1.8×10^{-3}	0.045	0.020
Fe	6.7×10^{-3}	0.17	0.73
Mn	7.5×10^{-4}	0.019	0.082
Ni	1.5×10^{-4}	3.8×10^{-3}	0.016
Ti	2.5×10^{-3}	0.063	0.27

*Maximum hourly emission rate based on 600 tpd solid waste; annual emission rated based on 219,000 tpy solid waste

SOURCE: ERT, Inc., Air Quality Assessment for the Ramsey/Washington County Waste-to-Energy Facility, 1983.

chloride (PVC), with about 65 percent of the chlorine reduced to HCl. Smaller quantities of HF and H₂SO₄ are also found in waste-to-energy facility gases. Control of these pollutants could be accomplished by tail-gas cleaning with wet or semi-dry scrubbers. Removal efficiencies with either device range from 50 percent for H₂SO₄ to in excess of 90 percent for HCl. However, the incremental cost associated with acid gas removal is not necessarily justified considering that the levels emitted from the proposed facility are not forecast to have identifiable health effects and should not result in significant impacts to soils or vegetation.

Emission of polycyclic organic matter (POM) results from the incomplete combustion of aromatic and olefinic hydrocarbons in the waste. The major POM pollutants include polynuclear aromatic hydrocarbons (PAH), polychlorodibenzo-p-dioxins (PCDD), and polychlorodibenzofurans (PCDF). Several of the PAH species including benzo(a)pyrene, are suspected carcinogens to humans. Similarly, tetrachlorodibenzo-p-dioxins (TCDD), especially 2,3,7,8-TCDD, have been shown to be carcinogens and teratogens in animal studies. Although emitted in only trace quantities, these pollutants are of major concern in evaluating waste-to-energy facility emissions.

Health Risk Assessment

Resource recovery facilities emit an array of substances in small quantities, including metals and trace elements, acid gases and organic compounds. At certain levels, some of these substances are known to be irritants, others have acute or chronic toxic properties, some are known or suspected carcinogens.

To assess the impacts of these pollutants on health, the concept of Acceptable Ambient Limit (AAL) was used. The AAL's are guidelines which indicate that if predicted pollutant concentrations are in the same order of magnitude as the AAL (or are lower) that it is reasonable to conclude, with a margin of safety, that there will be no significant impact on public health,

The AAL's were generally derived from occupational exposure standards, adding a large safety factor. The occupational standards used to derive the AALs were the Threshold Limit Values (TLVs) developed by the American Council of Governmental Industrial Hygienists.

In contrast to a TLV, the AAL should be designed to protect the entire population from significant health effects with a margin of safety. For nuisance pollutants, a factor of 0.04 (1/25) was used. A safety factor of 0.02 (1/50) was chosen for hazardous pollutants with proven adverse health effects. The assessment of risk for dioxins and furans was more conservative. The safety factor employed was 1/500, and the evaluation treated all emissions as having the same toxic properties as 2,3,7,8-TCDD.

A time adjustment factor is also required as the TLV is designed for 8 hours per day, 40 hours per week exposure, rather than continuous exposure for the AAL. Based on these criteria, AALs were developed for various averaging times. For pollutants with acute effects, a short-term (24-hour) AAL was deemed appropriate; for chronic impacts, on the other hand, a long-term (annual) AAL was considered appropriate. Where short-term peak exposure TLV's exist for some pollutants, a one-hour AAL was also developed. To derive an AAL for a given pollutant, the following relationships were used:

$$\begin{aligned} \text{AAL}_{24\text{-hour}} &= \text{TLV}/150 \\ \text{AAL}_{\text{annual}} &= \text{TLV}/438 \\ \text{AAL}_{1\text{-hour}} &= \text{TLV}_{\text{ceiling}}/200 \end{aligned}$$

Evidence is growing that for suspected carcinogens a concentration threshold does not exist below which there is no possibility of health effects. Rather, it is thought that the health risk varies proportionally to the dose of a substance and its carcinogenic potential. The EPA's Cancer Assessment Group has devised a model by which individual lifetime risk of cancer equals the ambient concentration multiplied by a factor called "potency slope." This method was used to gauge risk from carcinogenic pollutants. Minnesota's Health Department has established a level of acceptable risk as being one chance in one hundred thousand (10^5), and this was used as a standard for interpreting results of the assessment. The AAL's and acceptable level of carcinogenic risk used for this analysis are shown in Table 18.

Table 19 compares the AAL's for potentially toxic pollutants with predicted ground level concentrations (GLC's). The only pollutant with a maximum impact exceeding 10 percent of the AAL was HCL. (For this irritant, the predicted concentration was 40 percent below AAL.) Given the conservative nature of the analysis, the findings demonstrate no significant risk to human health.

TABLE 18
RECOMMENDED ACCEPTABLE AMBIENT LIMITS
AND CARCINOGENIC RISK

Pollutant	Acceptable Ambient Limit		Carcinogenic Risk	
	Averaging Period	Concentration ($\mu\text{g}/\text{m}^3$)	Potency Slope ($\mu\text{g}/\text{m}^3$) ⁻¹	Effective AAL($\mu\text{g}/\text{m}^3$)
Arsenic	Annual	0.0046	4.0×10^{-3}	2.5×10^{-3}
Asbestos (crocidolite)	Annual	0.00086	-	-
Beryllium	30-day	0.01	2.7×10^{-1}	3.7×10^{-5}
	24-hour	0.013		
Cadmium	Annual	0.091	1.9×10^{-3}	5.3×10^{-3}
Chromium (VI)	1-hour	0.25	1.17×10^{-2}	8.6×10^{-4}
	Annual	0.0023		
Cobalt	1-hour	0.50	-	-
	Annual	0.11		
Copper (dust) (fume) (dust)	1-hour	10.0	-	-
	24-hour	0.67		
	Annual	2.3		
Dioxins (TCDD)	24-hour	7.0×10^{-5}	121.4	8.24×10^{-8}
	Annual	9.2×10^{-8}		
Fluorides	1-hour	24.0	-	-
	Annual	4.3		
	24-hour	2.85		
Hydrogen Chloride	1-hour	70.0	-	-
Iron (Oxide)	1-hour	50.0	-	-
	Annual	8.0		
Lead	Annual	0.11	-	-
	3-month	1.5		
Manganese	1-hour	25.0	-	-
Mercury (metal) (alkyl) (metal)	1-hour	0.75	-	-
	Annual	0.023		
	Annual	0.11		
Nickel	Annual	0.034	3.29×10^{-4}	3.04×10^{-2}
Polynuclear Aromatic Hydrocarbons	Annual	0.23	3.29×10^{-3}	3.04×10^{-3}
Sulfuric Acid	24-hour	13.0	-	-
Titanium (Dioxide)	24-hour	46.0	-	-
Zinc	1-hour	40.0	-	-
	24-hour	26.7		

SOURCE: ERT, Inc., Air Quality Assessment for the Ramsey/Washington Waste-to-Energy Facility, 1983.

TABLE 19

TOXICITY-BASED IMPACT ANALYSIS

Pollutant	Concentrations ($\mu\text{g}/\text{m}^3$)					
	Annual Average		Maximum 24-hour		Maximum 1-hour	
	AAL	GLC	AAL	GLC	AAL	GLC
Arsenic	0.0046	3.5×10^{-5}	NA	NA	NA	NA
Asbestos	0.00086	Trace	NA	NA	NA	NA
Beryllium	NA	NA	0.013	7.3×10^{-7}	NA	NA
Cadmium	0.091	0.00021	NA	NA	NA	NA
Chromium	0.0023	7.9×10^{-5}	NA	NA	0.25	0.0063
Cobalt	0.11	9.7×10^{-7}	NA	NA	0.50	8.6×10^{-5}
Copper	2.3	2.5×10^{-4}	0.67	0.0088	10.0	0.022
Dioxins	9.2×10^{-8}	7.8×10^{-10}	7.0×10^{-5}	2.8×10^{-8}	NA	NA
Fluorides	4.3	0.0072	2.85	0.25	24.0	0.64
Hydrogen Chloride	NA	NA	NA	NA	70.0	38.3
Iron (Oxides)	8.0	0.00093	NA	NA	50.0	0.083
Lead	1.5	0.02	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	25.0	0.0093
Mercury	0.11	4.9×10^{-4}	NA	NA	0.75	0.045
Nickel	0.034	2.1×10^{-5}	NA	NA	NA	NA
PAH	0.23	6.0×10^{-6}	NA	NA	NA	NA
Sulfuric Acid	NA	NA	13.0	0.14	NA	NA
Titanium	NA	NA	46.0	0.012	NA	NA
Zinc	NA	NA	26.7	0.60	40.0	1.5

SOURCE: ERT, Inc., Air Quality Assessment for the Ramsey/Washington Waste-to-Energy Facility, 1983.

Table 20 estimates the maximum potential risk of contracting cancer due to life-time exposure to each of the carcinogens studied and also the combined risk. The highest risk shown is from chromium followed by cadmium, arsenic and TCDD. Beryllium, nickel and PAH together account for only two percent of the projected risk. Noting that the most highly carcinogenic form of each pollutant is assumed, the actual risk is likely to be much less than the 1.5×10^{-6} forecast. Thus, the analysis shows that the carcinogenic impact of projected emissions from the waste-to-energy plant will be much less than the Minnesota Health Department's 10^{-5} level of acceptable risk. Hence, the project does not represent a significant risk to public health.

TABLE 20
CARCINOGENIC RISK ANALYSIS

<u>Contaminant</u>	<u>Risk</u>	<u>% of Total Risk</u>
Beryllium	5.7×10^{-9}	0.4
Arsenic	1.4×10^{-7}	9.3
Cadmium	4.0×10^{-7}	26.7
Chromium	8.3×10^{-7}	55.3
Nickel	6.8×10^{-9}	0.5
TCDD	9.5×10^{-8}	6.3
PAH	2.0×10^{-8}	1.3
Total Lifetime Cancer Risk	1.5×10^{-6}	

SOURCE: ERT, Inc., Air Quality Assessment for the Ramsey/Washington Waste-to-Energy Facility, 1983.

IMPACTS FROM TRAFFIC

Four pollutants from transportation sources are regulated: hydrocarbons, oxides of nitrogen, carbon monoxide and lead.

Hydrocarbons and oxides of nitrogen interact in the presence of heat and sunlight to form ozone. Ozone formation is a regional scale phenomena, not a localized air quality problem. The MPCA has undertaken an extensive ozone monitoring program in recent years and has begun to investigate the possibility of reclassifying the Twin Cities as an area in which the ambient ozone standard is attained.

The proposed project will produce no significant change in the amount of annual regional emissions of hydrocarbons and nitrogen oxides. To the degree to which the project represents a shorter haul trip than the no-build alternative, it will produce correspondingly lower emissions.

Carbon monoxide (CO), in contrast, is a pollutant with localized, not regional, impacts. Except for confined areas like a downtown central business district, high concentrations exist only within a few hundred feet of very heavily traveled roadways or locations of extreme traffic congestion.

The U.S. EPA's Carbon Monoxide Hot-Spot Guidelines (EPA-450/3-78-033) were used to assess whether there was a potential for project traffic to generate CO levels approaching ambient standards. The Guidelines use very conservative assumptions about wind speed, dispersion and atmospheric stability, wind angle, and roadway capacities to test for "hot-spot" potential immediately adjacent to the roadways studied. Because the method is so conservative, sites which pass the screening procedure can reasonably be expected to have air quality that meets standards; sites which fail the test may still have acceptable air quality, but require a more detailed evaluation to make that determination.

For the proposed Lake Elmo project, the maximum point for potential traffic congestion is the unsignalized intersection of Helmo and Minnehaha Aves. The screening procedure in the Hot-Spot Guidelines shows this as not being a potential location where standards would be violated. The Guideline's verification technique was used to develop an estimate of the maximum 8-hour average CO concentration. If the additional traffic were present today, the maximum 8-hour concentration for a receptor 50 meters from the intersection would be 3.3 ppm, well within the state and federal standard of 9.0 ppm.

The lead concentration in air has declined dramatically in recent years due to the shift to leadfree fuels. A Federal Highway Administration (FHWA) method* for estimating lead concentrations caused by traffic indicates that traffic volumes in 1986 must be higher than 80,000 ADT for lead levels to be even a fifth of the 1.5 ug/m^3 standard. Much of the traffic drawn to the facility will be diesel fueled and so is not a lead source. Other traffic volumes are too low to emit significant amounts of lead.

*Based on FHWA memorandum 1-31-78.

IMPACTS FROM ODOR

There are two potential sources of odor associated with the project: stack emissions and incoming waste. Both sources are readily controllable by proper design and operation.

Combustion temperatures will be high enough (1,800⁰-2,000⁰F) to destroy odors in plant emissions. Air required for combustion would be drawn from the tipping floor and receiving pit. This keeps these structures under a negative air pressure, preventing odors from escape.

With respect to odors, there is no distinction between the proposed project and locational or technological alternatives. Some no-build waste disposal options, however, have a higher potential to generate noxious odors.

IMPACTS FROM CONSTRUCTION

Construction of the waste-to-energy facility and steamline will produce dust. Earthmoving, excavation, road building equipment and truck traffic will be major sources of construction related dust emissions. Wind erosion of exposed soil is another source.

The amount of dust generated is strongly influenced by soil type. Kingsley and Santiago soils are predominant on the site. The Kingsley soils are highly erodible once exposed, while the Santiago soils are much less susceptible to wind erosion.

Through its regulation APC-6, the MPCA can require dust control practices during construction. Examples of control techniques include watering of exposed surfaces, covering of storage piles, and phased excavation.

Dust emissions will be minimized after construction. All access and on-site roadways and parking areas will be paved. All handling of fly ash and bottom ash will be enclosed.

NOISE

The Ramsey/Washington waste-to-energy facility will change the noise levels at and around the proposed project site. Construction, daily operation of the plant and increased traffic will be new noise sources.

To help quantify potential changes in noise levels, the Council entered into an interagency agreement for a noise impact study with the City of Bloomington and the MPCA. That work is reported by Kelso and Nelson in Noise Assessment of Ramsey/Washington County Waste-to-Energy Project, October 1983; this report is hereby incorporated by reference as a part of this EIS. The study's methodology, results and suggestions for noise control are summarized in this chapter. Possible noise impacts at other potential waste-to-energy facility sites and the results of noise monitoring studies at other facilities are also noted.

NOISE CONCEPTS AND MEASUREMENTS

The noise study's results are best understood if several important concepts and measurements are understood first. One major concept is that of "noise" itself. Generally, "noise" is defined as "unwanted sound." This definition is somewhat tenuous because the perception of a sound as "unwanted" can vary between receivers. Nevertheless, state and federal regulations that control "noise" levels are in place. They were primarily developed to protect public health and safety. These regulations were used in the study as the primary basis against which to evaluate potential changes in noise levels.

A number of sound and, therefore noise, characteristics can be measured. Sound pressure is the most basic and common measure. It is measured in decibels on a scale that ranges from zero to 200.

Basic fundamentals regarding decibels are:

1. The decibel is a man-made unit where zero dB corresponds to the threshold of human hearing.
2. If you double the energy (decibels), your result is three additional decibels ($80 \text{ dB} + 80 \text{ dB} = 83 \text{ dB}$).
3. It takes an increase of 10 decibels before the average person perceives the sound to be twice as loud.
4. It takes an increase of about two to three decibels before the average person perceives any noticeable increase in loudness.

Frequency and wavelength are two additional sound characteristics that can be measured. Frequency is the number of times pressure variations occur each second. It is measured in hertz, abbreviated Hz. In past years the term cycles per second was popular. The distance traveled for each pressure variation of a sound wave is called wavelength. As an example, the rumble of thunder is of low frequency and long wavelength whereas a high pitched whistle is of high frequency and short wavelength.

Sound energy, frequency and wavelength can be recorded on a variety of instruments in a variety of ways. The most commonly used instrument is a sound level meter (SLM).

One SLM attachment allows sound to be "A-weighted." "A-weighting" mimics the human ear's response to sound energy by filtering out certain low and high frequency sounds. A-weighted decibels are reported as dB(A), rather than dB.

A-weighted measurements can be reported as real time measurements, or as statistical descriptors. In the first case, the dBA level recorded at a particular instant in time is reported, or several instantaneous measurements are averaged together and reported as an average dBA level. In the second case, noise is monitored for one hour, and the noise levels that are recorded for each fraction of the hour (L_x) are reported. For instance, an L_{10} noise level represents the dBA level that was reached or exceeded for 10 percent (6 minutes) of the hour. An L_{50} noise level represents the dBA level that was reached or exceeded during 50 percent (30 minutes) of the hour.

Another attachment allows "octave band analysis." In octave band analysis, the decibel levels associated with different frequencies of sound can be recorded. The sound frequencies are grouped into octave bands, each representing an interval in the sound spectrum where frequency doubles, for the analysis. For instance, an octave band could be designated from 100 to 200 Hz, with the center of the band at 150 Hz.

STUDY METHODOLOGY

The consultants monitored the proposed site on June 16 and July 18, 1983 to obtain information on ambient, or existing, noise levels. Nighttime noise levels were monitored on June 16; daytime levels were recorded on July 18. L_{10} and L_{50} dBA levels, average dBA levels, and octave band measurements were all taken. The data collected in the field was compared with, and augmented by, a computer model. On June 13 and 21, two small operating waste-to-energy facilities were also monitored. The information collected was used to describe existing noise levels at the proposed site, noise levels at existing waste-to-energy facilities, and future noise levels if the waste-to-energy facility is built at Lake Elmo.

RESULTS

Existing Noise Levels at the Proposed Site

Ambient noise levels at the proposed site are affected primarily by traffic on I-694 and I-94. Noise from I-694 dominates because it is the closer of the two highways. However, when traffic is reduced on I-694 during the early morning hours (1 a.m. to 4 a.m.), the noise levels from I-94 approach those of I-694.

Other sources of existing noise are birds and insects. These sources are common in agricultural and woodlot settings similar to the proposed site. County Rd. 70 and Helmo Av. also contribute some noise.

The L_{10} readings at the site were below 60 dBA both at night and during the day. The L_{50} readings were below 55 dBA (Table 21).

Table 21
 AMBIENT L₁₀ AND L₅₀ READINGS ALONG HELMO AV.
 dBA

Nighttime (6/16/83)		Daytime (7/8/83)	
L ₁₀	L ₅₀	L ₁₀	L ₅₀
50	46	57	53

Noise control regulations promulgated by the MPCA have established ambient noise level limits for different land uses (Table 22).

Table 22
 MPCA AMBIENT NOISE LIMITS
 dBA

Noise Area Classification (NAC)	Day (7 a.m.-10 p.m.), Night (10 p.m.-7 a.m.)			
	L ₁₀	L ₅₀	L ₁₀	L ₅₀
NAC 1-Residential Areas	65	60	55	50
NAC 2-Commercial Areas	70	65	70	65
NAC 3-Industrial Areas	80	75	80	75

Existing noise levels are well within the levels allowed for all three land use classifications.

Average A-weighted measurements were recorded in addition to L₁₀ and L₅₀ levels (Table 23).

Table 23
 A-WEIGHTED SOUND LEVELS (dBA)

Average Nighttime Ambient	49.1
Average Daytime Ambient	53.7

A low ambient level, from 30 to 45 decibels, indicates the virtual absence of any human activity. This is particularly true for outdoor measurements. Medium ambient sound levels, from 45 to 55 decibels, are commonly recorded in quiet residential areas. High ambient sound levels, from 55 decibels on up, are typical of heavily industrialized areas, major transportation corridors and downtown metropolitan areas.

The results of octave band analysis are shown in Table 24. Octave band measurements help determine whether any noise peaks of unusual strength exist at certain frequency centers. Such peaks contribute the most to the overall sound level. Therefore, a properly designed noise control program would reduce those frequencies to achieve the maximum noise reduction.

Table 24
OCTAVE BAND AMBIENT DATA
(Average Decibels (dB))

Frequency (Hz)	<u>31.5</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>
Nighttime (6/16/83)	55.5	54.0	46.5	41.2	45.7	42.0	36.0	33.0	33.7
Daytime (7/8/83)	62.2	60.7	56.2	48.0	50.2	46.5	40.5	35.2	34.5

The octave band data recorded at the site shows the strong influence of traffic from the freeways, particularly trucks. The slight peak at 500 Hz is directly attributable to tire whine from I-694. This distortion from a normally declining trend in sound levels as frequency increases indicates that the traffic flow on the freeway is relatively constant. The peak at 500 Hz for day and night measurements establishes highway noise as the principal contributor to the ambient sound level at the site.

Noise Levels at Operating Waste-to-Energy Facilities

Two waste-to-energy facilities in the Twin Cities Area were monitored to gather information on common waste-to-energy facility equipment. The first waste-to-energy facility, tested on June 13, 1983, is used for burning industrial waste and has an 80 ton-per-day capacity. The second waste-to-energy facility, tested on June 21, 1983, also burns industrial waste, mainly liquids, and has a 150 ton-per-day capacity. Octave band and A-weighted decibel measurements were taken at both plants.

Neither waste-to-energy facility approaches the proposed 600 ton waste-to-energy facility in size, and may not be representative of the proposed facility either in rate of operation or equipment performance. However, each did have basic equipment common to waste-to-energy facilities: intake and exhaust fans, fan motors, air pollution control devices and exhaust stacks.

The greatest potential for exterior noise comes from fans and fan motor assemblies. Exhaust fans can also allow interior noise to escape through their portals and convey noise from the inside to the outside.

Table 25 summarizes the octave band data recorded, while Table 26 summarizes the A-weighted noise levels. The monitoring data indicates that waste-to-energy facility equipment has the potential to significantly impact surrounding areas. Independent data from a third waste-to-energy facility, however, does not show a significant impact materializing. Signal Resco, Inc. monitored noise levels inside and outside of its 1,500 ton-per-day Saugus, Mass. solid waste waste-to-energy facility. Noise readings at their site boundary did not exceed 55 dBA, despite the fact that interior noise levels exceeded 95 dBA in some spots.

Table 25
A-WEIGHTED TEST RESULTS

Source	dBA
Interior incinerator room ¹	90.7
Interior incinerator room ²	91.1
Electrostatic precipitator ³	89
500 h.p. fan motor ⁴	80.5
500 h.p. fan motor ⁵	73
Fuel pump ⁶	77

-
- ¹Incinerator at 10 ft. (June 13).
²Incinerator at 10 ft. (June 21).
³Exterior measurement at 25 ft.
⁴Exterior standing wave peak at 50 ft.
⁵Exterior standing wave cancellation at 50 ft.
⁶Exterior measurement at 25 ft.

Table 26
OCTAVE BAND DATA FOR INCINERATOR EQUIPMENT
(average decibels (dB))

Source	Frequency (Hz)									
	31.5	63	125	250	500	1K	2K	4K	8K	16K
Exhaust fan ¹	83	86	89	90	84	80	75	70	64	52
500 h.p. ² fan motor	84	84	84	90	72	69	69	60	57	--
Compressor fuel ³	81	81	90	81	81	83	81	78	78	66
Electrostatic precipitator ⁴	83	80	86	86	80	86	80	77	68	59
Burner grid ⁵	83	80	86	86	80	86	80	77	68	59

-
- ¹Represents interior fan noise at 25 ft. (June 13).
²Represents exterior fan motor noise at 50 ft. (June 21).
³Represents interior compressor noise at 25 ft. (June 21).
⁴Represents exterior precipitator noise at 25 ft. (June 21).
⁵Represents interior burners at 25 ft. (June 21).

Projected Noise Levels at the Lake Elmo Site

Potential sources of noise associated with a solid waste waste-to-energy facility project are construction equipment, plant machinery and increased traffic on roads to the plant. These sources include, but are not limited to, refuse vehicles, light vehicles, intake and exhaust fans, air pollution control devices, cooling towers, exhaust stacks, emergency blow-off towers, temperature and pressure warning signals, steam blow-off valves, ash conveyors, compaction loading ramps, tipping floors, afterburners and fan motors. While the site is under construction, noise levels will increase as bulldozers and other earth movers are brought in to re-contour the land surface. Noise levels will remain elevated as the facility itself is built.

The land use classification for the the plant site will be NAC-3. Currently, however, the nearest receivers are classified NAC-1. Based on monitoring data from the two Twin Cities waste-to-energy facilities, no residence could be located within three-quarters of a mile from the plant to comply with the MPCA NAC-1 standard for the nighttime. Daytime operations would preclude any residential land use within one-third of a mile from the plant. Monitoring indicates that interior plant noise levels may reach levels where the Occupational Health and Safety Administration (OSHA) requires a noise control program.

A computer model developed by the FHWA, was used to predict both existing and future traffic noise conditions. Inputs to the model include vehicle speed, vehicle type (autos, heavy trucks, medium trucks), distance to the receiver, land surface type and number of vehicles. Two receivers were modeled (Figure 22).

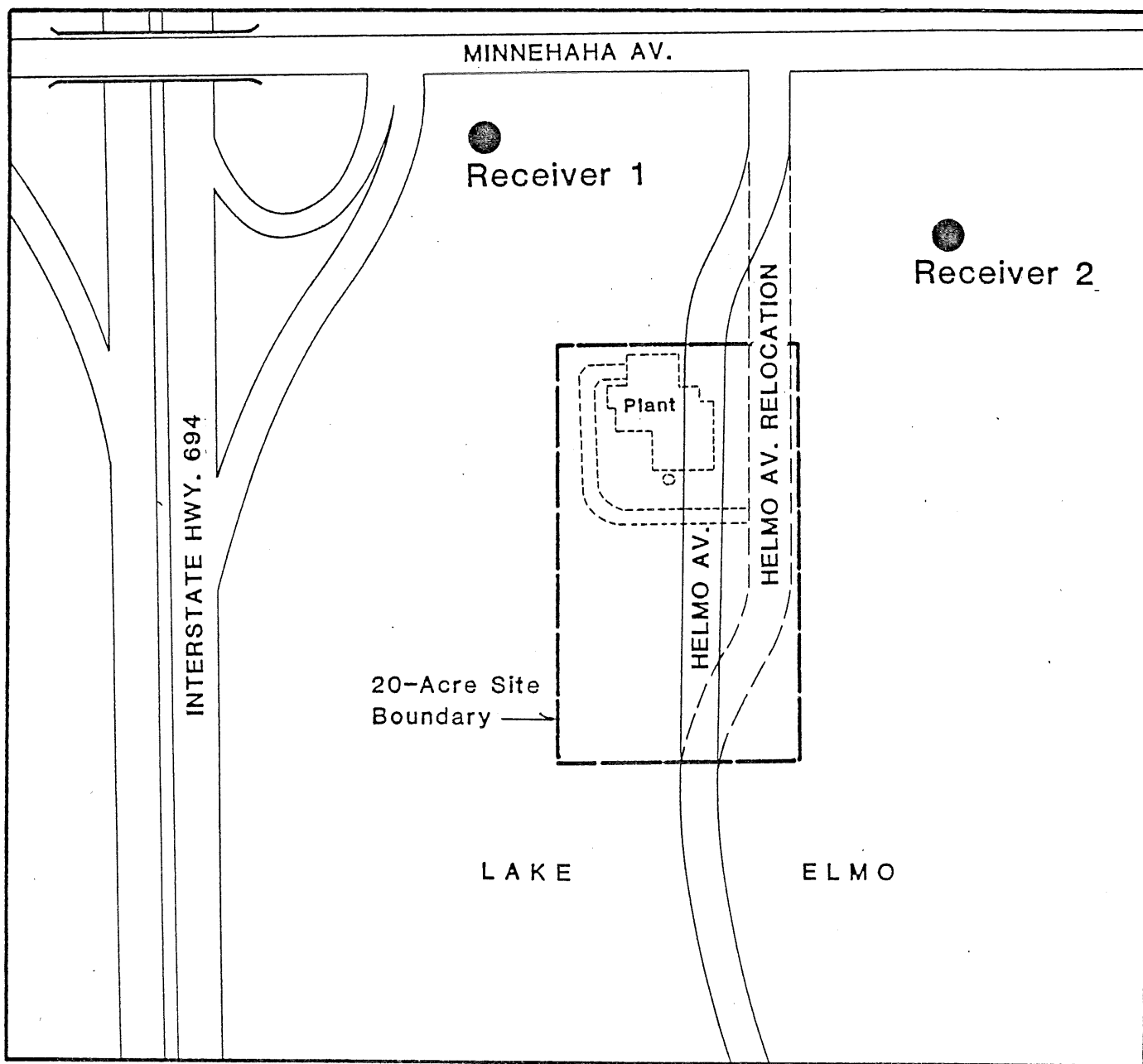
Noise impacts from I-694 will increase by an average of one decibel if the waste-to-energy facility is built due to an increase in traffic volume of 20 autos/hr. and 60 heavy trucks/hr.

The L_{10} and L_{50} modeled noise levels for traffic on Helmo Av. will increase by over 10 dBA for both Receiver 1 and Receiver 2 from 11 a.m. to 12 a.m. (the peak hour). The combined noise levels for Helmo Av. and I-694 at that time will increase by 10 dBA (L_{10}) for Receiver 2, but not at all for Receiver 1. Table 27 summarizes the modeled combined traffic noise levels for Receivers 1 and 2.

Table 27
SUMMARY OF MODELED MAXIMUM FUTURE L_{10} AND L_{50} LEVELS

	Time	L_{10}	L_{50}
Receiver No. 1	11-Noon	59	56
	all other	58	56
Receiver No. 2	11-Noon	66	59
	7-10 p.m.	56	52-53

Figure 22. NOISE RECEIVER LOCATIONS



0 500 1000 1500 2000 Feet

Table 28 summarizes the results of the computer modeling and ambient monitoring efforts with respect to applicable state noise standards.

Table 28
SUMMARY OF NOISE MONITORING AND MODELING RESULTS

Monitored Ambient Levels

Within NAC 1 day by -8 and -7
Within NAC 1 night by -5 and -4
Within NAC 2, 3 day and night

Modeled Present Levels

Receiver No. 1: Within NAC 1, 2, 3 days
Exceeds NAC 1 night by +4 and +6
Within NAC 2, 3 night

Receiver No. 2: Within NAC 1, 2, 3 days
Exceeds NAC 1 night by +1 and +3
Within NAC 2, 3 night

Modeled Future Levels

Receiver No. 1: Exceeds NAC 1 night by +3 and +6 (5-7 a.m. and 10-12 p.m.)
Within NAC 1 day
Within NAC 2, 3 day and night

Receiver No. 2: Exceeds NAC 1 L₅₀ night by +2 (5-7 a.m.); L₁₀ night by +1 (6-7 a.m.)
Exceeds NAC 1 night by +1 and +3 (10-12 p.m.)
Exceeds NAC 1 day L₁₀ by +1
Within NAC 1 day L₅₀
Within NAC 2, 3 day and night

SUMMARY

Existing Conditions

1. Monitored L_{10} and L_{50} noise levels at the proposed waste-to-energy facility site are below the limits for all MPCA noise area classifications.
2. Freeway traffic is a major source of existing noise.
 - a. Mid-frequency band spectral peaks in ambient levels are caused by freeway traffic.
 - b. The major contributor of present traffic noise is I-694.
 - c. Total predicted traffic noise levels at present are at or slightly exceed State Noise Rule NPC-2 (NAC-1) for two modeled receivers.

Projected Future Conditions

1. Stationary mechanical devices at the proposed plant will be major noise sources.
 - a. Fans and motors will be major noise sources.
 - b. Air pollution control devices will be a major noise source.
2. Interior noise levels in the loading and burning area may be high enough to require an OSHA noise control program.
3. Residential area noise standards may be exceeded at the site's boundaries.
4. Combined noise levels from I-694 and Helmo Av. will be within one decibel of present conditions for Receiver 1. NAC-1 L_{10} nighttime standards could be violated.
5. Combined noise levels from I-694 and Helmo Av. will be a maximum of 10 dBA (L_{10}) higher than present for Receiver 2. NAC-1 L_{10} daytime standards could be violated during the peak hour; NAC-1 L_{10} nighttime standards could also be violated.
6. The major contributor of future traffic noise will be additional heavy truck traffic on Helmo Ave.

MITIGATION MEASURES

The projected future conditions data assumes that no special precautions are taken to reduce noise levels. A number of techniques and practices are available to reduce noise levels, however.

Facility Layout and Design

The boilerhouse, because of its height, can act as a noise barrier. The boilerhouse for the proposed project is located north of the air pollution control equipment. Because of this, noise levels reaching the two modeled receivers will be less than those predicted on a distance basis alone.

Fans and motors are expected to be major noise sources. Careful facility design, however, with attention to fan and motor placement will help control these noise sources.

Other useful design features are enclosed tipping floors and enclosed process system equipment. The project as proposed has an enclosed tipping floor.

Finally, a soft, vegetative cover near the plant would help absorb noise. Existing vegetation will be maintained where possible by the applicant to buffer the site.

Equipment Operation and Maintenance

Exhaust systems on trucks and other equipment will be the major noise sources during construction, and will also influence noise levels after the facility is built. Proper maintenance of this equipment will help control noise levels. Posting low speed limits near the facility would also help.

The waste-to-energy facility equipment can be purchased and maintained to reduce noise levels. Expected noise levels should be considered, for instance, when different brands of equipment are compared before purchase. After purchase, equipment modification (such as the addition of silencers) could help decrease noise levels.

Facility Operating Practices

Everyday operating rules can decrease the potential for noise impacts. Restrictions on operating hours could decrease noise impacts by avoiding, say, nighttime hours. The number of haulers arriving per hour could be regulated to control impacts from traffic noise.

POSSIBLE NOISE IMPACTS AT OTHER POTENTIAL SITES

Three other sites have been identified in the EIS as potentially feasible for an waste-to-energy facility location. One of those sites is about one-quarter mile north of the proposed site, in Oakdale. Noise impacts at this site should be very similar to those at the Lake Elmo site. Nearly the same ambient conditions and noise sources exist. Potential receivers would probably also be about the same distance from the facility.

A second alternative location is north of the 3M facilities in Maplewood. Ambient noises at this site are qualitatively and quantitatively different than those at the Lake Elmo site. The predominant noise sources are probably the 3M facilities and traffic along I-94, McKnight Rd. and Minnehaha Av. Ambient noise levels should be higher at this site because of the large amount of surrounding development. If the waste-to-energy facility is located here, the increase in noise levels may not be as noticeable as the same increase at Lake Elmo because of the higher ambient noise levels. However, a much higher number of residential receivers are nearby.

The third alternative site is north of Lower Afton Rd. in Battle Creek Regional Park. The major existing noise sources are probably traffic along McKnight and Lower Afton Rds., and possibly, residential and other developments west of the site. Because of its more urban nature, this site probably has higher ambient noise levels than the Lake Elmo site. Closeby residential developments and park users could be impacted by noise increases associated with the facility.

RESIDUALS

Waste-to-energy facilities typically reduce waste volumes by 90 to 95 percent. However, they do not eliminate the need for waste disposal. The facility will generate bottom ash and fly ash. A portion of incoming wastes will be uncombustible materials, and occasionally potentially hazardous wastes may inadvertently reach the facility. Each category requires different handling for its ultimate disposal.

HAZARDOUS WASTE

Minnesota regulates hazardous waste disposal through 6 MCAR 4.9009. The regulation provides for "cradle-to-grave" control over hazardous waste handling, with the control program a county responsibility.

Wastes from enterprises which regularly generate hazardous substances should not inadvertently reach the proposed waste-to-energy facility; such businesses are regulated and their operators should be well aware of disposal requirements. Some businesses on the other hand may not routinely produce a hazardous by-product--it may be an infrequent event, or amounts may be very small and allowed to accumulate prior to disposal. In such cases operators often do not know what proper disposal practices are, and in fact may not realize a particular material has hazardous properties.

A portion of common household wastes are hazardous. Examples include furniture cleaners, paint cans, and waste oil.

Information available to the householder and small business operators is the best mitigative measure to identify these materials and keep them from entering the solid waste stream. The amounts of household waste are individually too small to effectively separate once they have left the source. However, wastes hauled from commercial establishments may be somewhat more identifiable. Many hazardous wastes have explosive, corrosive or flammable properties. Waste haulers are likely to segregate suspicious loads (barrels, etc.) rather than risk a fire or explosion as their vehicles compact waste materials.

At a resource recovery facility, suspect materials can be segregated as wastes are received on the tipping floor, as waste is mixed in the storage pit or when it is carried toward the feed hoppers.

Combustion temperatures in the waste-to-energy facilities are high enough to fully burn volatile organic wastes. The facilities are designed to withstand explosions from aerosol cans, small propane tanks and other "routine" waste items.

UNCOMBUSTIBLE WASTES

Uncombustible materials such as concrete block or soil may occasionally be received at the facility. The operator is likely to segregate these items as they are received at the tipping floor or as wastes are mixed in the storage pit and periodically send them to a landfill for disposal.

Some incoming materials such as tires and tree trunks are not easily disposed of through incineration. Although the materials are combustible, they are also very dense, and residence time in the combustion chamber may be insufficient to effectively burn them. Again, the operator can segregate such materials or process them and dispose of them with the bottom ash.

White waste and other large items of ferrous metal can either be separated from incoming wastes or reclaimed from the bottom ash magnetically.

ASH

The waste-to-energy facility can accomplish a 90 to 95 percent reduction in waste volume, an 80 to 85 percent reduction by weight. Thus, if the waste-to-energy facility burns 600 tons of waste daily, it will also generate 90 to 120 tons of ash. Of this, more than 85 percent is bottom ash. Magnetic separation of ferrous metals would reclaim 15 to 20 percent of the bottom ash. Washington and Ramsey Counties have expressed their intention to ask potential vendors to explore the potential of ferrous separation.

The ash varies in size from coarse aggregate to very fine particulate. The coarser materials have been used in some locations as a road base. Combined bottom and fly ash is also used as a daily cover material for some landfills.

A comprehensive review of the impacts of waste-to-energy facility fly ash and bottom ash disposal was completed in 1982 for Los Angeles, San Diego, and San Francisco Counties.* The report compares leachate characteristics of the ashes with that of solid waste.

Rapid leaching/bench scale tests using the EPA's extraction procedure consistently showed solid waste, bottom ash, and combined bottom and fly ash to produce extracts classified as non-hazardous when compared with test criterion. Fly ash alone consistently produced extracts which tested as hazardous due to elevated levels of lead and cadmium. Some data was available on waste-to-energy facilities burning an RDF fuel, and the results were not distinguishable from plants mass burning solid waste.

Column lysimeter tests also showed more metals and salts leached from waste-to-energy facility fly ash alone than from solid waste or bottom and fly ash combined. Column lysimeter tests also showed higher salt and metal levels leached per pound of solid waste than per pound of ash. Total dissolved solids leached from bottom ash and from combined as was approximately 50 percent lower than from raw solid waste.

Comparison of leachates collected from sanitary landfills and ash only fills also showed that solid waste will produce higher salt and metal concentrations than equal weights of ash. The ash is more alkaline than solid waste which helps to stabilize the metal content. Heavy metals have extremely low solubilities in an alkaline environment. The report suggests that co-disposal with solid waste may lower leachate metal concentrations. Some empirical support was found in studies comparing leachate from fills that contained a mixture of solid waste and ash from open burning dumps with leachate from an equally aged sanitary landfill from the same locale.

Washington and Ramsey Counties anticipate that fly ash and bottom ash from the waste-to-energy facility will be landfilled. This will require testing of the ash and a permit from the MPCA, Division of Solid Waste for its co-disposal with municipal solid waste.

*Rigo & Rigo Assoc., State-of-the-Knowledge Report on The Disposal of Waste-to-energy facility Ash, 1982.

EMPLOYMENT/ECONOMIC IMPACTS



EMPLOYMENT/ECONOMIC IMPACTS

CONSTRUCTION

Project development is expected to take as much as 36 months. During this time the efforts of many persons, representing a wide range of skills and activities will be utilized.

As many as 1,000 persons may have a role at some stage of construction. However, the average number of persons employed at any given stage of construction will be lower. As an example, the peak work force employed for construction of the 1,200 ton per day waste-to-energy facility in Pinellas County, Florida was approximately 400 with an average during the construction phase of 250 persons, in total representing more than 1,100 different jobs.

There are several distinct phases to project development: site preparation will encompass clearing, grading, and excavation. Transportation improvements are a distinct phase including the relocation of Helmo Av. and upgrading of portions of Minnehaha Av. Construction of the facility will be the major effort; this phase includes steam line placement. A shakedown period will follow construction before the facility is fully operational.

OPERATION

The facility will create permanent new jobs. Round-the-clock operation will require an administrative staff, technical operators, general workers, and maintenance personnel. An estimate of staffing needs is shown on Table 29. Total positions would likely range between 25 and 40 persons depending on vendor specifications.

IMPACT ON PROPERTY VALUES

Detailed study of impact of waste-to-energy facilities on nearby properties is not available. Generally, major industrial developments are viewed as community assets. The Ramsey/Washington project will improve roadway access for the surrounding area and introduce utilities. The facility could potentially supply energy to nearby development, and so may enhance the marketability of adjacent lands. Local planning has been revised to capitalize on the project. Nevertheless, success in achieving substantial spin-off growth will more likely result from active promotional efforts by the city and others than from any inherent ability of the project to induce development.

Waste disposal facilities have a more sensitive image than do other forms of development. This is particularly true for landfills and hazardous waste disposal facilities. Only one reference was found which specifically dealt with impact of waste-to-energy facilities on land values.* The findings were that such projects are normally located in industrial areas and hence, are compatible with adjacent uses. Effects were either positive or not discernible. The sole instance cited for a negative impact was attributed to poor facility operation rather than land use incompatibility.

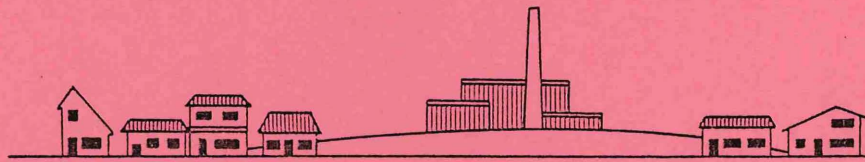
*Terry Piersen, untitled study (received from the Waste Management Board), University of North Carolina, 1980.

Table 29
ESTIMATED PERSONNEL REQUIREMENTS

Normal Operations at 200,000 Tons Per Year

	<u>SHIFT</u>			
	<u>Day</u>	<u>Even.</u>	<u>Night</u>	<u>4th</u>
Administrative:				
General Manager	1			
Plant Engineer	1			
Clerk/Typist	1			
Controller	1			
General:				
Janitor	1			
Laborer	1	1		
Operations:				
Shift Supervisor	1	1	1	1
Control Operator	1	1	1	1
Crane Operator	1	1	1	1
Operations Assistant	1	1	1	1
Ash Handling Operator	1	1		
Residue Driver	2			
Maintenance:				
Electrician	1	1		
Mechanic	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
Total	15	8	5	5
<u>Total positions = 33</u>				

SOCIOLOGICAL IMPACTS



TRANSPORTATION

TRAFFIC VOLUMES

Development of the proposed project will increase traffic on adjacent streets and on the regional roadway system. At the facility's full capacity, waste deliveries would be made by approximately 200 trucks. The facility will generate approximately 10 truck loads of ash daily. Added to this will be employees' travel, deliveries of materials other than waste, and trips by private citizens to a recycling drop-off at the site, all totaling approximately 650 trips.* Combined with waste truck trips, there would be a maximum of slightly less than 1,100 incoming and outgoing trips added by the facility.

Traffic to and from the facility is expected to be at a peak during the later morning hours and at mid-afternoon--times which do not coincide with the peak travel hour for adjacent roadways.

ACCESS

Figure 23 shows the relationship of the proposed site to nearby highways and streets. Immediate access to the site will be via Helmo Av. This local street would be relocated to the eastern edge of the proposed site and built to an all-season, 9-ton capacity standard. Helmo Av. is a one mile long, north-south local street connecting Minnehaha Av. (County Rd. 70) and the frontage road to Hwy. 12.

Access to the site from the regional roadway system is excellent. The site is approximately a quarter mile east of I-694 and three quarters of a mile north of Hwy. 12/I-94. The site is thus within a 30-minute, non-peak hour drive from all of Ramsey County and all but the extreme northeastern and southeastern communities of Washington County.

Most vehicles traveling to the facility will utilize I-694, exiting at Minnehaha Av. This interchange is well designed to accommodate existing traffic and new volumes from the facility.

The interchange and connection with Helmo Av. are shown in detail in Figure 24. The western half of the interchange is a diamond design. The eastern half is a folded diamond layout. Approximately a quarter mile of Minnehaha Av., west of Helmo, will require upgrading to provide all-season, 9-ton access to the site.

The roadway layout, with the high number of additional lanes to separate turning from through traffic, has capacity well above the needs of existing traffic levels (see Figure 25). Capacity is clearly sufficient to accommodate the increased traffic from the proposed facility.

Heavy duty trucks represent a major element in the new traffic volumes. Increased truck volumes can be problematic due to their ponderous movement--slower turning movements and travel speeds. The multiple turn lanes and separate lanes for through traffic will help to mitigate conflict with other traffic at the I-694 interchanges.

*One vehicle coming to the site and the leaving produces two trips.

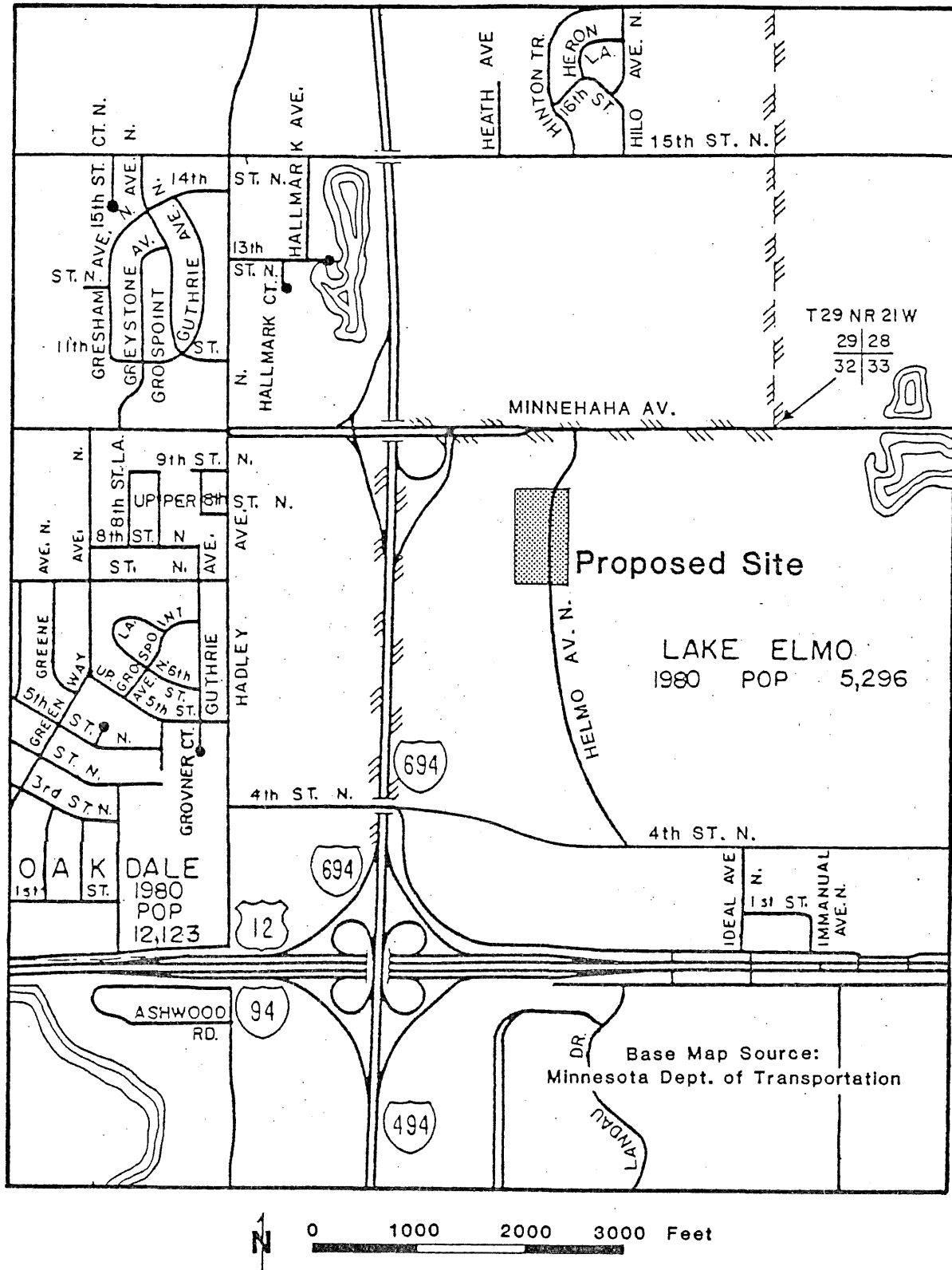
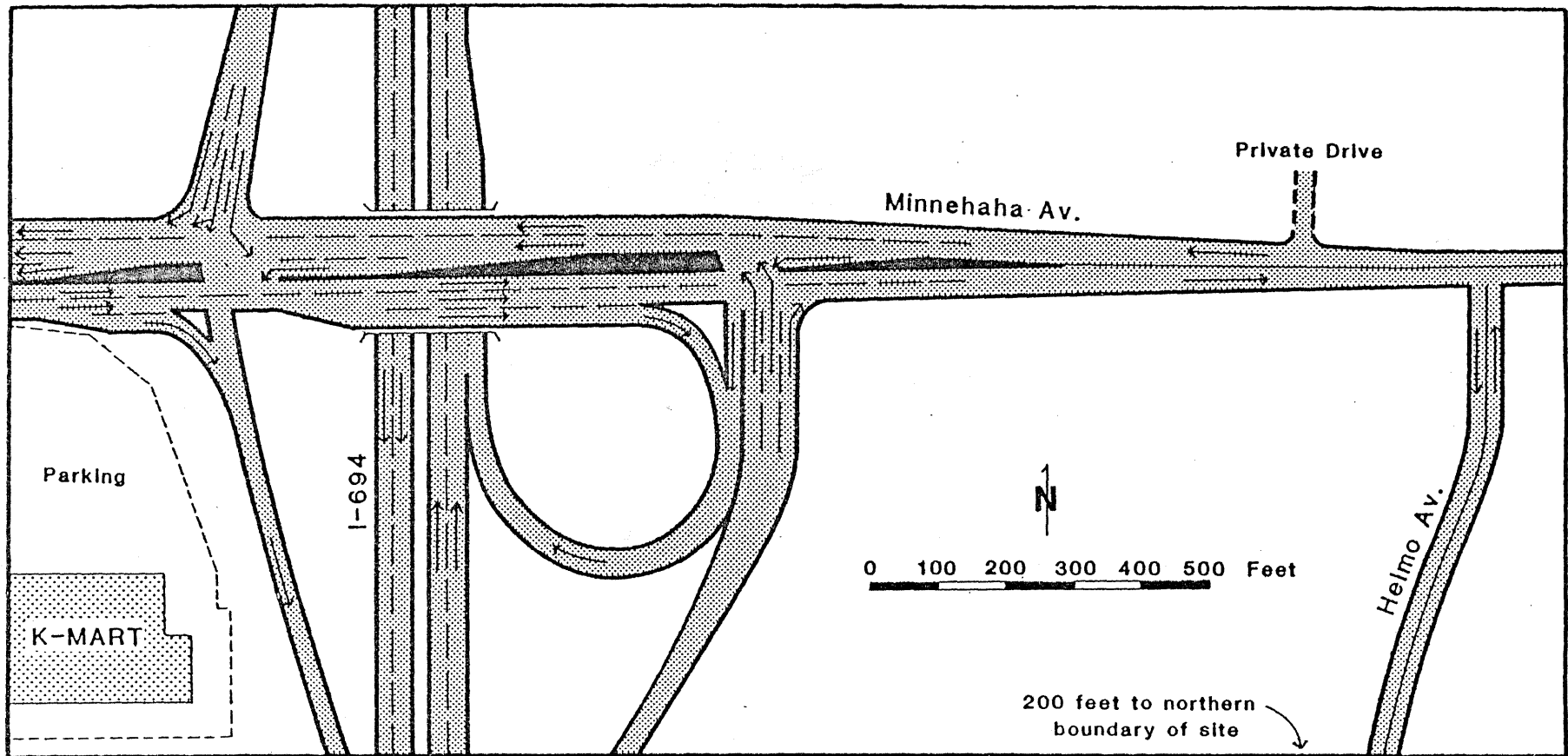


Figure 23. LOCAL AND REGIONAL ROADWAYS
IN THE VICINITY OF THE
RAMSEY/WASHINGTON WASTE-TO-ENERGY FACILITY

Figure 24. DETAIL OF INTERCHANGE TO HELMO AVENUE



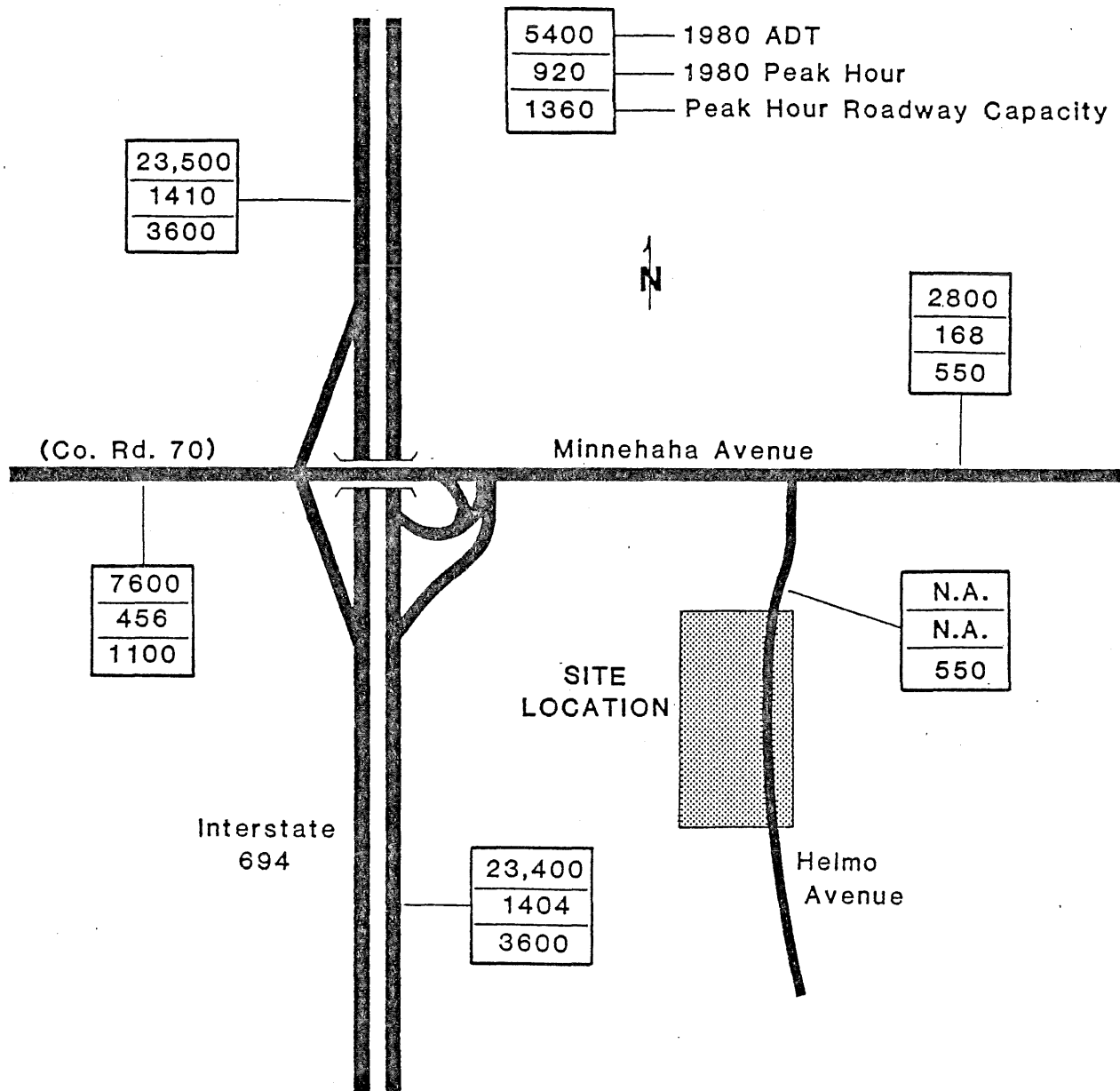


Figure 25.
ROADWAY CAPACITY VS. AVERAGE DAILY TRAFFIC VOLUME

The greatest potential traffic conflict would occur at the intersection of Helmo and Minnehaha Aves., where incoming trucks will be slowing to turn to Helmo Av. and most outgoing trucks will be seeking to cross traffic and turn west onto Minnehaha. Although existing capacities at this intersection are adequate to handle the projected traffic volumes, conflict would be significantly mitigated by providing a turn lane from Minnehaha to Helmo and two westbound lanes on Minnehaha. These roadway improvements could be a part of the design to upgrade this stretch of roadway to 9-ton capacity. Technically these improvements are not necessary from a volume/capacity standpoint, but are desirable from a safety standpoint.

It does not appear that any of the intersections require signalization at this time. However, traffic signals may eventually be needed at the Helmo/Minnehaha intersection, depending on the timing and degree to which the surrounding area develops.

There is one alternative access to the site. Traffic from Hwy. 12 can exit at Inwood and reach the site via the frontage road and Helmo Av. This route would require a significant amount of roadway upgrading to achieve a nine-ton capacity rating, approximately one and a half miles. This route is much less desirable from a safety standpoint because adjacent land uses along the frontage road, include a school, residential development and commercial establishments.

ALTERNATIVE SITES

There is virtually no distinction in accessibility between the proposed site and lands to the north of Minnehaha Av. (Alternative Site 1).

Accessibility was a major limitation near the 3M center cited by the Ramsey/Washington Siting Task Force. Adjacent roadways, particularly McKnight Rd., are already very heavily travelled at peak hours. West of McKnight and north of the site the adjacent areas are residential. I-94 provides good access for this site from the east and west. North-south access, however, is limited.

Access to the Battle Creek alternate site is fair. Major haul routes would be I-94, I-694, and Hwy. 61, with direct access to the site via Lower Afton Rd. and McKnight Rd. Potential problems include considerable residential traffic from development on McKnight Rd. northwest of the site, increasing residential development adjacent to Lower Afton Rd., and poor access eastbound from Hwy. 61 to Lower Afton Rd.

VISUAL IMPACTS

INTRODUCTION

Ideally the proposed waste-to-energy facility can be located and designed in such a manner as to make it visually compatible with the surrounding area. Paint colors that blend in with the background, strategically located vegetation, earthen or other visual berms, and facility layouts that minimize obtrusiveness are all examples of features that can be incorporated into the facility's design, regardless of where it is located, to make it a less obvious feature on the landscape.

Information on topography, vegetation and land use lends insight into a particular location's ability to buffer such an industrial site. A computer program that defines a "viewshed," as well as information from comprehensive plans, was used to analyze and compare four potential waste-to-energy facility sites with respect to their potential for visual impacts. The sites include the counties' preferred site in Lake Elmo, a site to the north of the preferred site in Oakdale, one adjacent to 3M in Maplewood, and one in Battle Creek Regional Park (Figure 26). These four were identified as potentially feasible in the Alternative Sites section of the EIS.

METHODOLOGY

The main tool in this assessment was a computer program developed and used by the Minnesota Land Management Information Center. The program delineates a "viewshed," the area within a specified distance where the facility may theoretically be seen. The program uses elevation data ("digital terrain data") and, in the case of the Lake Elmo and Oakdale sites, data on the height and density of vegetative cover, to identify the viewshed.

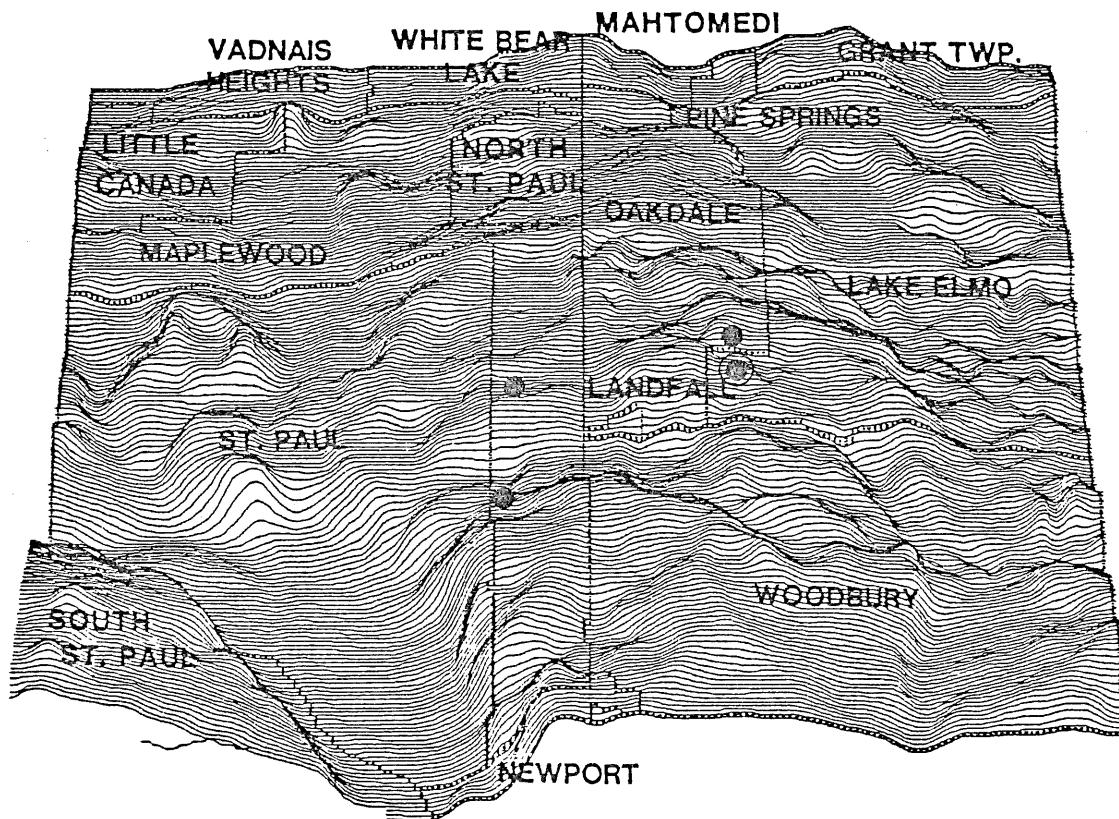
Elevation data from USGS 1:250,000 topographic maps is generally used as the information base in the program. For the sites investigated in Lake Elmo and Oakdale, however, data from the 1:24,000 series (7.5 minutes) USGS maps was available from a previous study of potential I-94 corridors. Thus, less generalization occurred in the Lake Elmo and Oakdale viewsheds because of the availability of this larger scale data.

To identify a viewshed, the computer lays a grid of cells over the terrain data. If the facility is visible in any portion of a cell, the computer records that cell as a part of the theoretical viewshed. A 2.5-acre grid cell size was used in this EIS analysis.

The calculations performed by the computer can be used to display the viewshed in map form. For the EIS, two viewsheds, both encompassing a three-mile radius, were plotted for each of the four potentially feasible sites. One viewshed map displays the areas that could potentially see the facility's stack, while the other displays areas that could potentially see the top of the boiler house.

This computer tool is useful, but it has several limitations that should be kept in mind. One limitation is the level of generalization. Generalization occurs when: 1) the terrain data is encoded; and 2) the grid cell size is selected.

Figure 26.
COMPUTER BASE MAP WITH MUNICIPAL BOUNDARIES



0 1 2 3 4 5 Miles

Scale, east-west, at center of map



PROPOSED SITE



ALTERNATE SITES

In two of the four cases discussed in the EIS, 1:250,000 base maps were used to obtain terrain data; 1:24,000 base maps were used in the other two cases. There will be errors associated with both base maps, however, the data from the 1:250,000 maps will be less accurate because the map scale is smaller.

Grid cell size is the second source of generalization. In this case, the smallest cell available was 2.5 acres. This scale of resolution does not allow distinction of, say, individual residential lots. Furthermore, if an impact is predicted in any portion of a cell, the entire cell is coded as impacted. The viewshed estimated by the computer is larger than the actual viewshed because of this phenomenon.

A second limitation is the amount and type of data available in the program. The program for the EIS did not weight close-in sites as more heavily impacted than those at a distance, nor did it distinguish different land uses and their relative compatibility. The computer assumes that all sites within the viewshed are impacted equally, regardless of their distance from the facility or surrounding land use. Furthermore, it does not distinguish between sites that can see only the top portion of the boilerhouse or stack, and those that can see the entire building or stack. Staff mapped the land uses near each site, and investigated the distribution of land uses within different distances from each site, to help overcome these problems.

RESULTS

Lake Elmo Site

The Lake Elmo site is the location selected by the counties for the proposed waste-to-energy facility. It is northeast of the I-694 and I-94 intersection. Most of the land within three miles to the north, east and south of the site is in agricultural or open space uses (Figure 27). Small pockets of housing and commercial developments are also present. Extensive housing occurs west and northwest of the site.

About 32 percent of the lands scanned by the computer are a part of the viewshed for the boilerhouse, while 66 percent are a part of the viewshed for the waste-to-energy facility stack (Tables 30 and 31). Most of the viewshed for the building occurs to the southeast of the site (Figure 28). The stack viewshed surrounds the site in a more complete circle (Figure 28).

Table 30
THEORETICAL VIEWSHED INFORMATION
FOR INCINERATOR BUILDING

Site	Total Number of Acres Considered	Number of Acres Inside Viewshed	Percent of Land Inside Viewshed	Number of Acres Outside Viewshed	Percent of Land Outside Viewshed
Oakdale	18,025	8,897.5	49	9,127.5	51
Lake Elmo	18,025	5,722.5	32	12,302.5	68
3M	18,025	8,292.5	46	9,732.5	54
Battle Creek	18,025	6,812.5	38	11,212.5	62

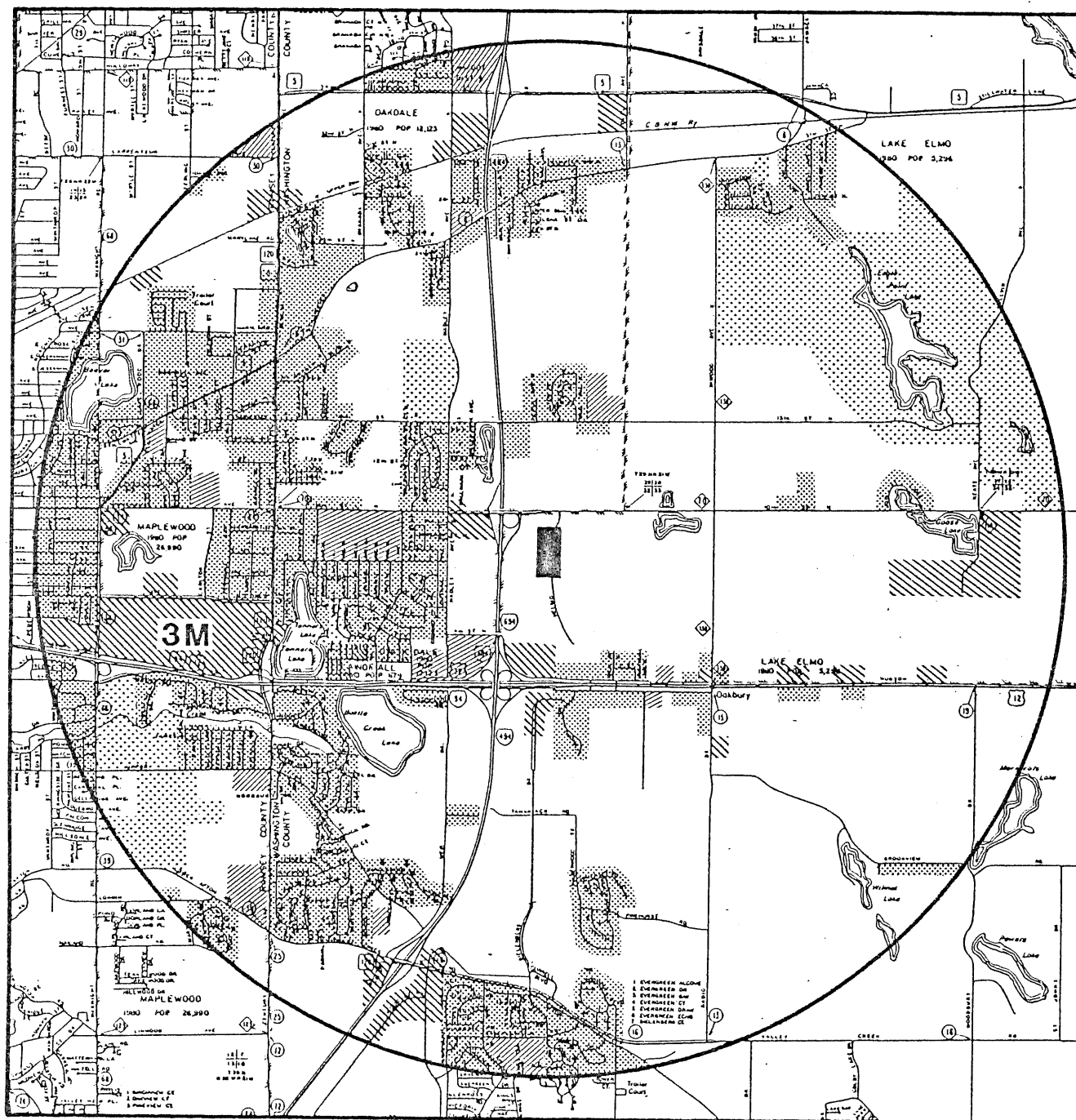
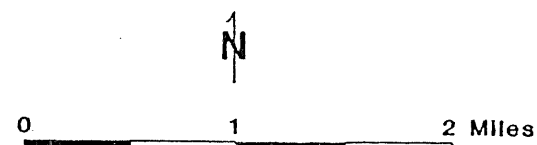


Figure 27.
GENERALIZED LAND USE
WITHIN THREE MILES
OF PROPOSED SITE

-  Site Location
-  Residential
-  Commercial/Industrial
-  Parks, Open Space
-  Public/Institutional
-  General Rural Land Use



Base Map Source: Minnesota
 Department of Transportation.

Figure 28.
VIEWSHEDS FOR PROPOSED LAKE ELMO SITE

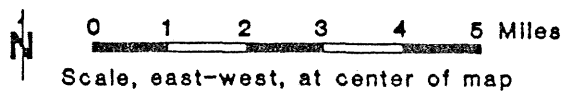
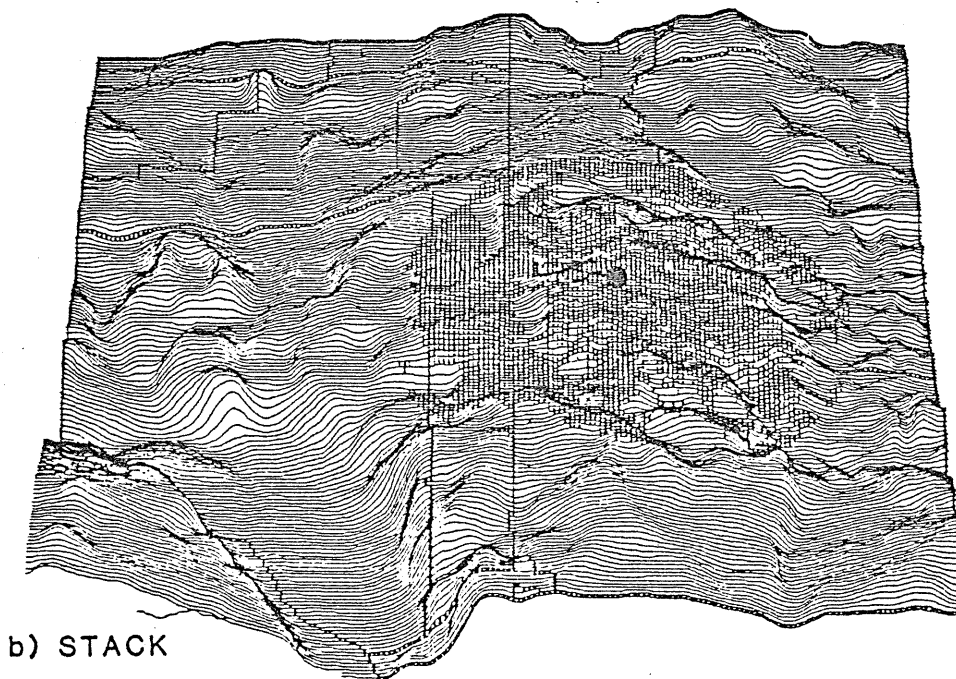
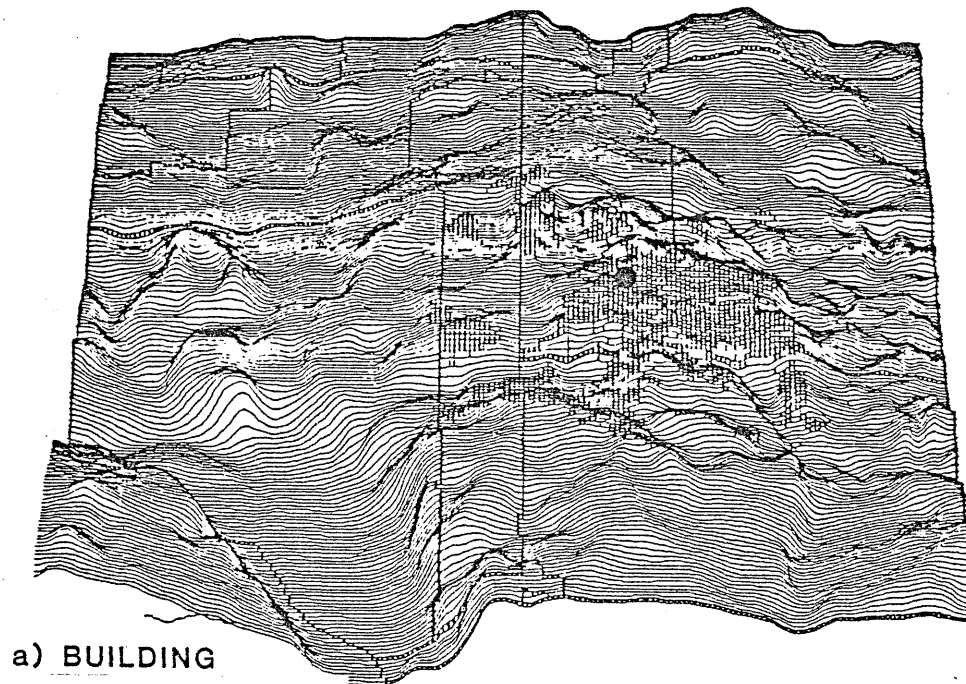


Table 31
THEORETICAL VIEWSHED INFORMATION FOR INCINERATOR
STACK AND EXISTING TRANSMISSION LINE

<u>Site</u>	<u>Total Number of Acres Considered</u>	<u>Number of Acres Inside Viewshed</u>	<u>Percent of Land Inside Viewshed</u>	<u>Number of Acres Outside Viewshed</u>	<u>Percent of Land Outside Viewshed</u>
Oakdale	18,025	13,627.5	76	4,397.5	24
Lake Elmo	18,025	11,832.5	66	6,192.5	34
3M	18,025	12,345.0	68	5,680.0	32
Battle Creek	18,025	12,580.0	70	5,445.0	30
Transmission	18,023	6,785.5	38	11,237.5	62

The building viewshed appears to include the 3M industrial complex in Maplewood, a portion of the residences to the west and some of the commercial/industrial establishments to the south along or near I-94. Some of these residences will be able to see only a small portion of the building because of vegetative screening. Residences approximately one-half mile to one mile to the west are not in the viewshed, nor are all homes to the north. Much of the viewshed occurs in rural or undeveloped portions of Lake Elmo and Woodbury.

The stack viewshed is much more extensive. Development within one-half mile will see the stack. With the exception of some homes to the west, any residences or other developments within one mile are also likely to see the stack. As with the boilerhouse, vegetative screening will decrease the visibility of the stack. Extensive areas at greater distances will have a view of the facility, however, the prominence of the stack as a landscape feature is reduced as distance increases (Figure 29). To a viewer 2.5 miles from the waste-to-energy facility building, the waste-to-energy facility stack would appear no taller than a 35-foot high building.

Oakdale Site

The Oakdale site is just north of Minnehaha Av. and east of I-694, less than one-quarter mile north of the Lake Elmo site. The description of land use near the Lake Elmo site is appropriate for the Oakdale site as well (Figure 30).

The viewsheds for this site are more extensive than those for the Lake Elmo site, despite their close proximity. Nearly one-half of the land scanned by the computer is in the building viewshed; over three-quarters is in the stack viewshed (Tables 30 and 31).

The building viewshed for this site includes more of the land to the north (Figure 31), as well as more land in Maplewood. The residential area to the west in Oakdale would still have about the same amount of protection afforded by the Lake Elmo site.

The stack viewshed is nearly identical to that for Lake Elmo in its general shape; the same general areas still fall outside of the viewshed (Figure 31). In actuality, however, the Oakdale site has nearly 2,000 more acres in its stack viewshed (Table 31).

Figure 29.
APPARENT STACK HEIGHT AT INCREASING DISTANCES

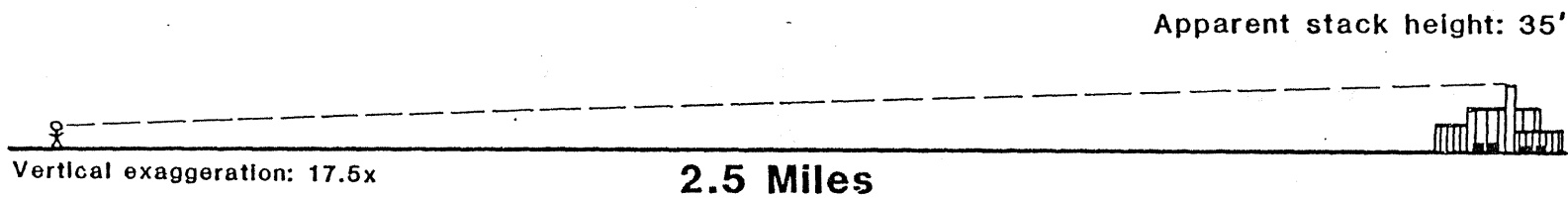
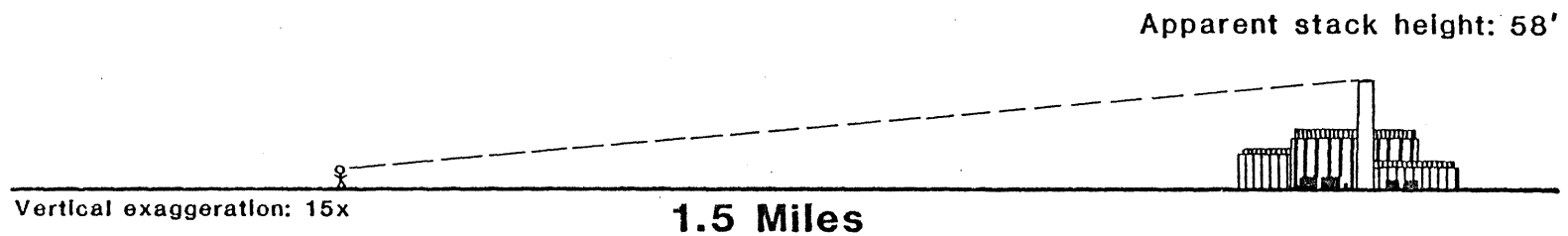
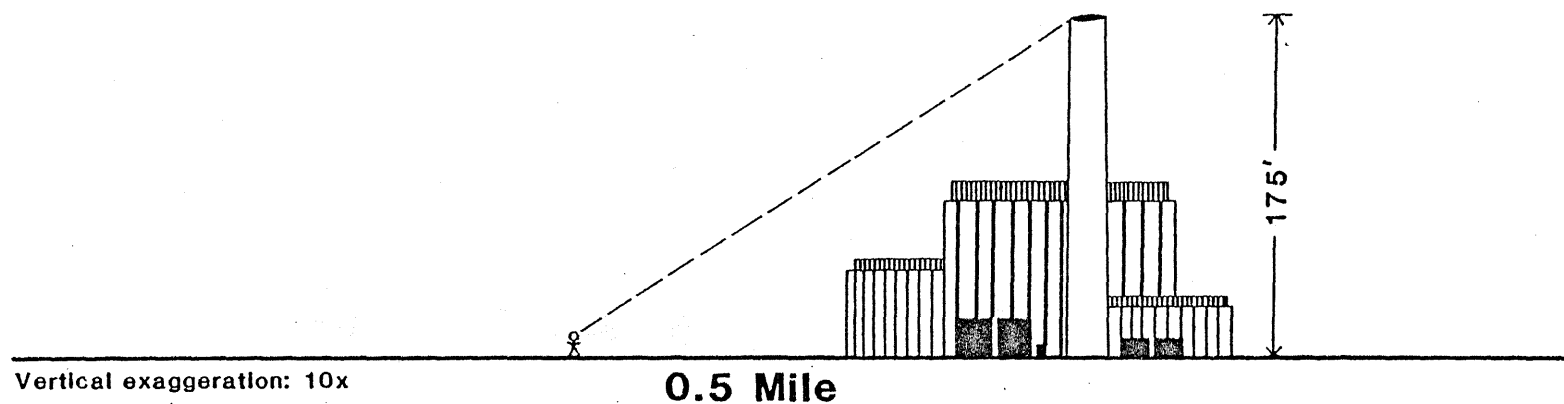
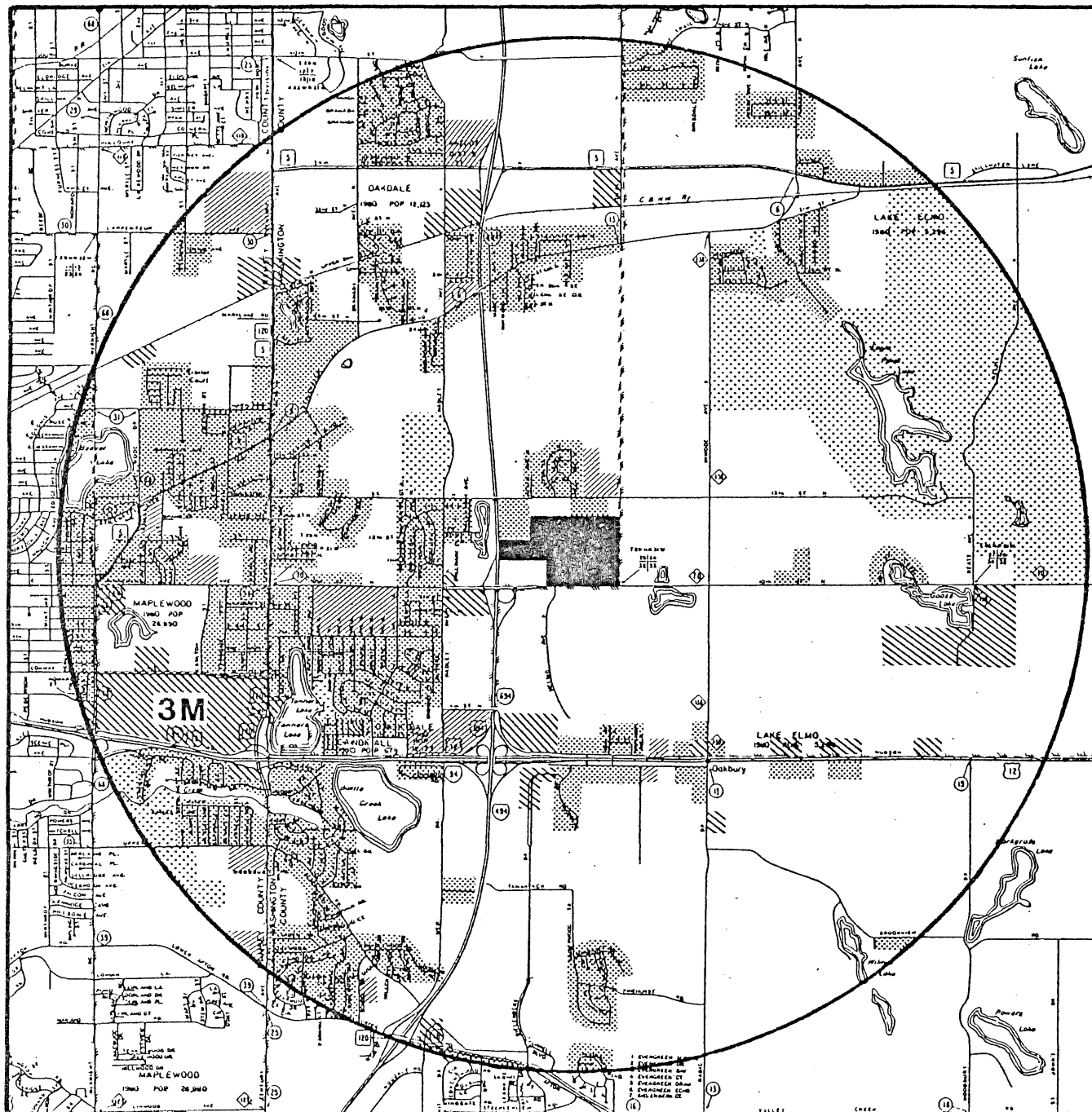
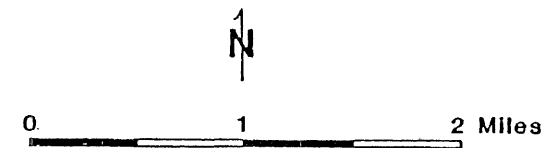


Figure 30.
GENERALIZED LAND USE
WITHIN THREE MILES
OF ALTERNATE SITE 1
(OAKDALE)

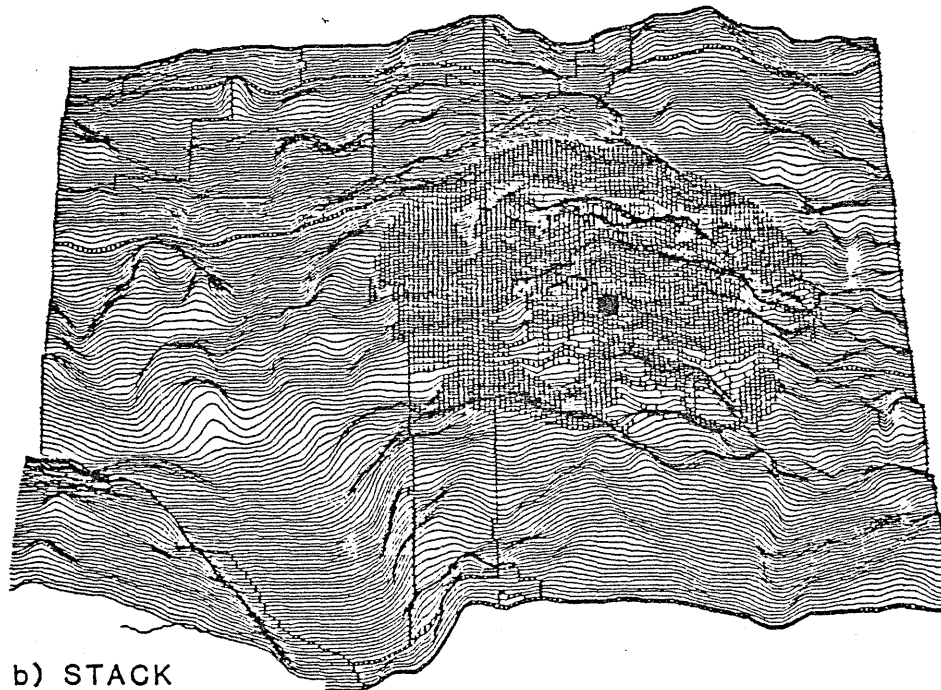
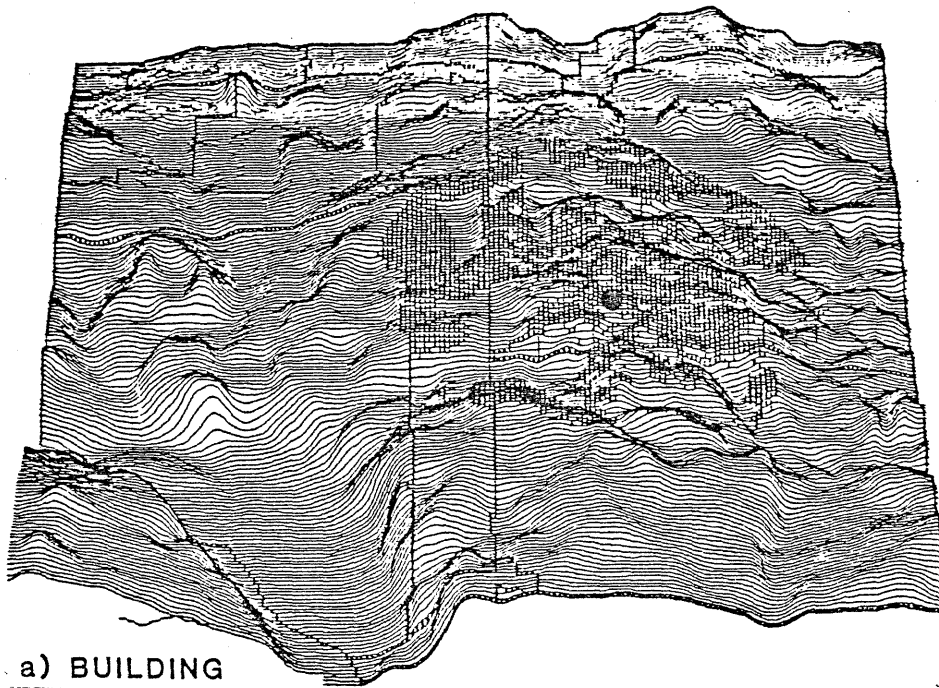


-  Site Location
-  Residential
-  Commercial/Industrial
-  Parks, Open Space
-  Public/Institutional
-  General Rural Land Use



Base Map Source: Minnesota
 Department of Transportation.

Figure 31.
VIEWSHEDS FOR OAKDALE SITE



0 1 2 3 4 5 Miles
Scale, east-west, at center of map

3M Maplewood Site

This site is located north of the existing 3M facilities in Maplewood, and southeast of the intersection of McKnight Rd. and Minnehaha Av. A major factor that distinguishes this site from the previously two is the intensity of surrounding land use. Dense residential developments occur within three miles on all sides of the site. The existing 3M complex and a commercial district are less than one-half mile to the south; Battle Creek Regional Park is also to the south and southwest. Some undeveloped areas lie to the far south, east and north (Figure 32).

The building viewshed covers 46 percent of the land within three miles; the waste-to-energy facility viewshed, 68 percent (Tables 30 and 31).

The stack appears to be visible for a distance of one mile on all sides (Figure 33). A few residences to the far east are outside of the viewshed, as are some homes along Battle Creek and near Lake Phalen.

When looking at the building viewshed, more of the Battle Creek valley drops out of the viewshed (Figure 33). A substantial number of close by residences, however, still remain in the viewshed. The existing 3M buildings will screen the waste-to-energy facility building from site to the south and east, a factor not considered in the viewshed program.

Battle Creek Regional Park Site

The Battle Creek Regional Park site is just east of McKnight Rd., and about one mile south of I-94 (Figure 34). There is a substantial amount of residential development immediately west of the site, and to the northwest. Pockets of residences also occur in other directions, however, the park separates the site from adjacent development to the east and north. The St. Paul downtown airport (Holman Field) and an industrial area are southwest of the site along the Mississippi River.

Only 38 percent of the land scanned by the computer falls within the building viewshed, but 70 percent is in the stack viewshed (Tables 30 and 31). Much of the building viewshed appears to occur within one mile of the site (Figure 35). The stack can be seen by nearly all areas except those just east of the Mississippi River and some areas in south Maplewood (Figure 35).

The nearby residential areas west of the site, to the northeast and to the northwest appear in the building viewshed. The bluffs along the Mississippi River and hills about one mile south of the site screen a great deal of land and its development. A low, open area associated with a wetland to the north of the 3M complex is screened, along with Beaver Lake and open lands northeast of Beaver Lake.

Portions of the Mississippi River Valley fall outside of the stack viewshed as well as the building viewshed. Hills will protect some of the open land and rural residential development south of the site. Essentially all residential and commercial/industrial developments within two miles to the north and one mile to the west, east and south, however, will be able to see the stack.

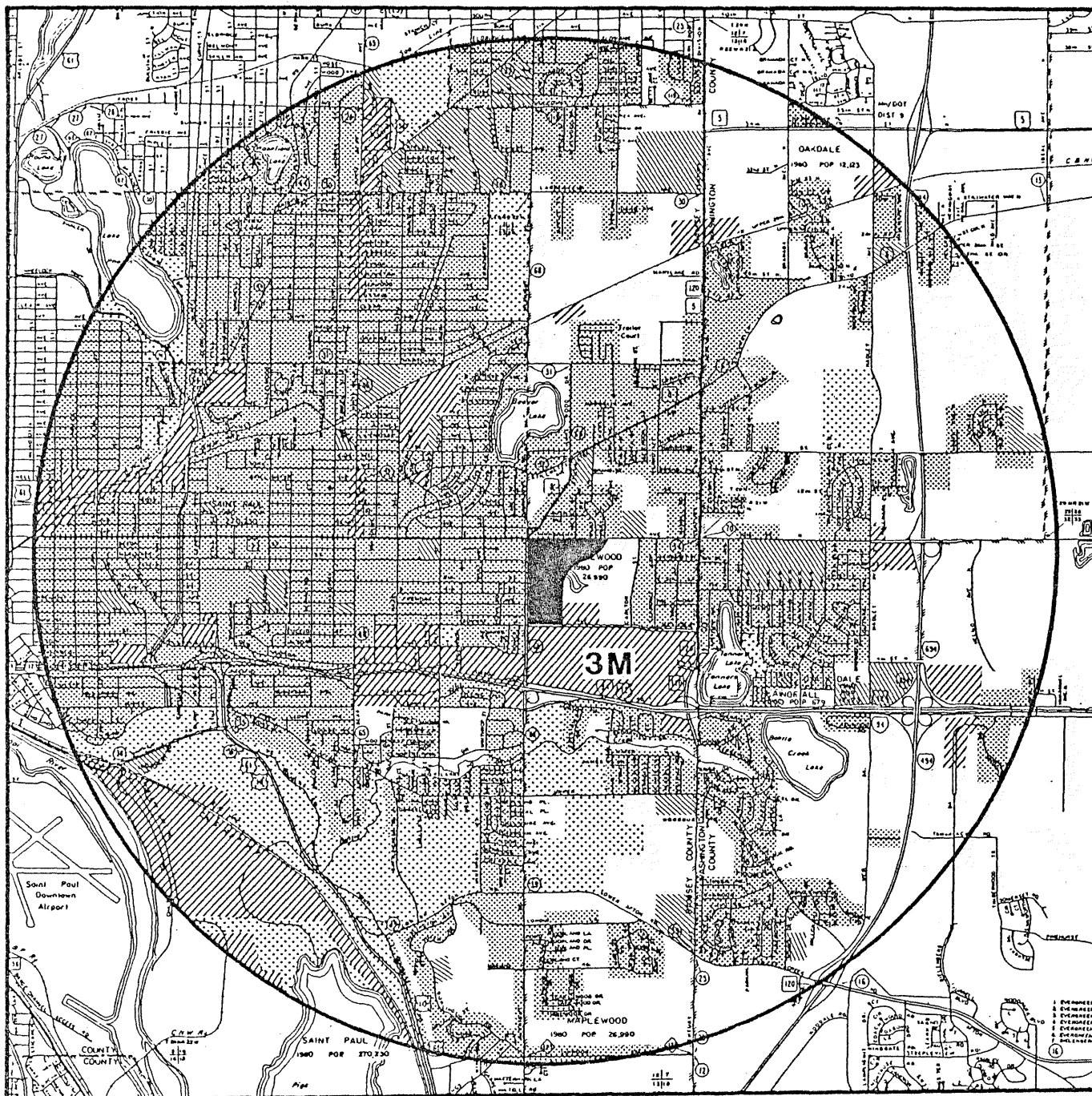


Figure 32.
GENERALIZED LAND USE
WITHIN THREE MILES
OF ALTERNATE SITE 8
(3M)

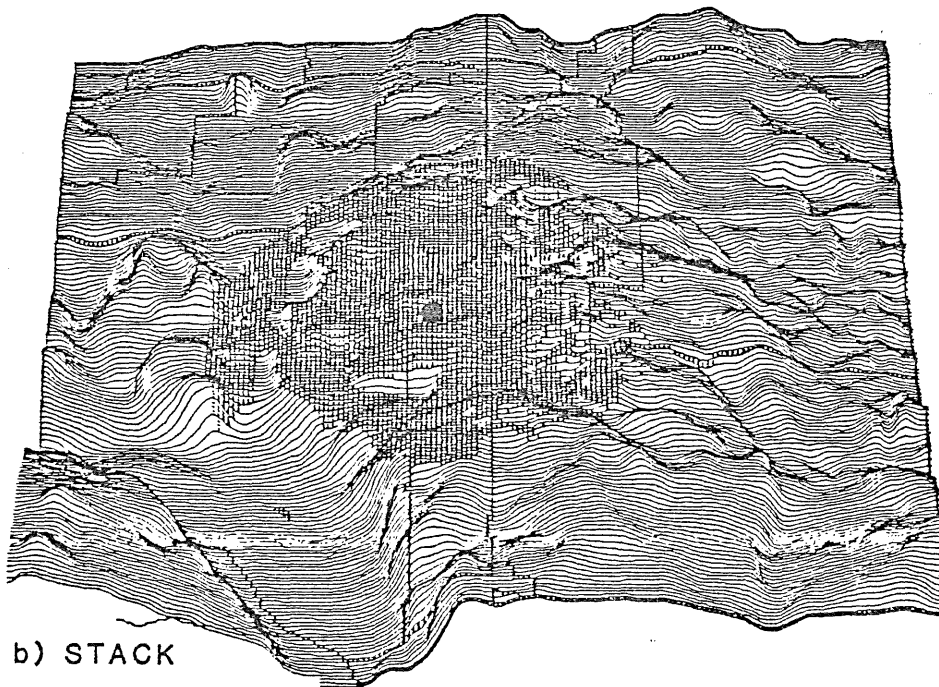
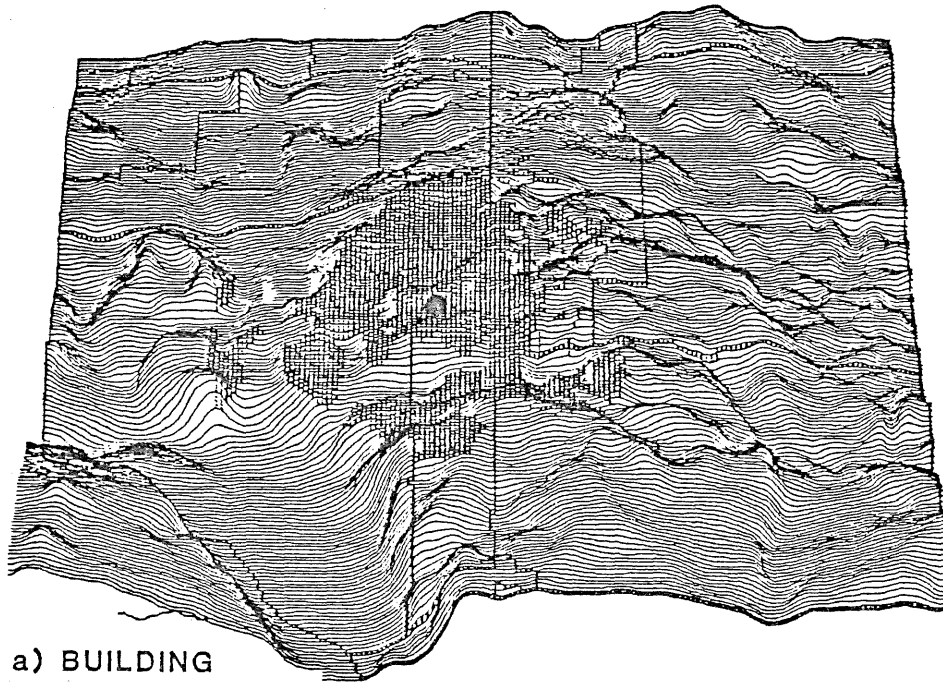
-  Site Location
-  Residential
-  Commercial/Industrial
-  Parks, Open Space
-  Public/Institutional
-  General Rural Land Use



0 1 2 Miles

Base Map Source: Minnesota
 Department of Transportation.

Figure 33.
VIEWSHEDS FOR 3M SITE



0 1 2 3 4 5 Miles
N
Scale, east-west, at center of map

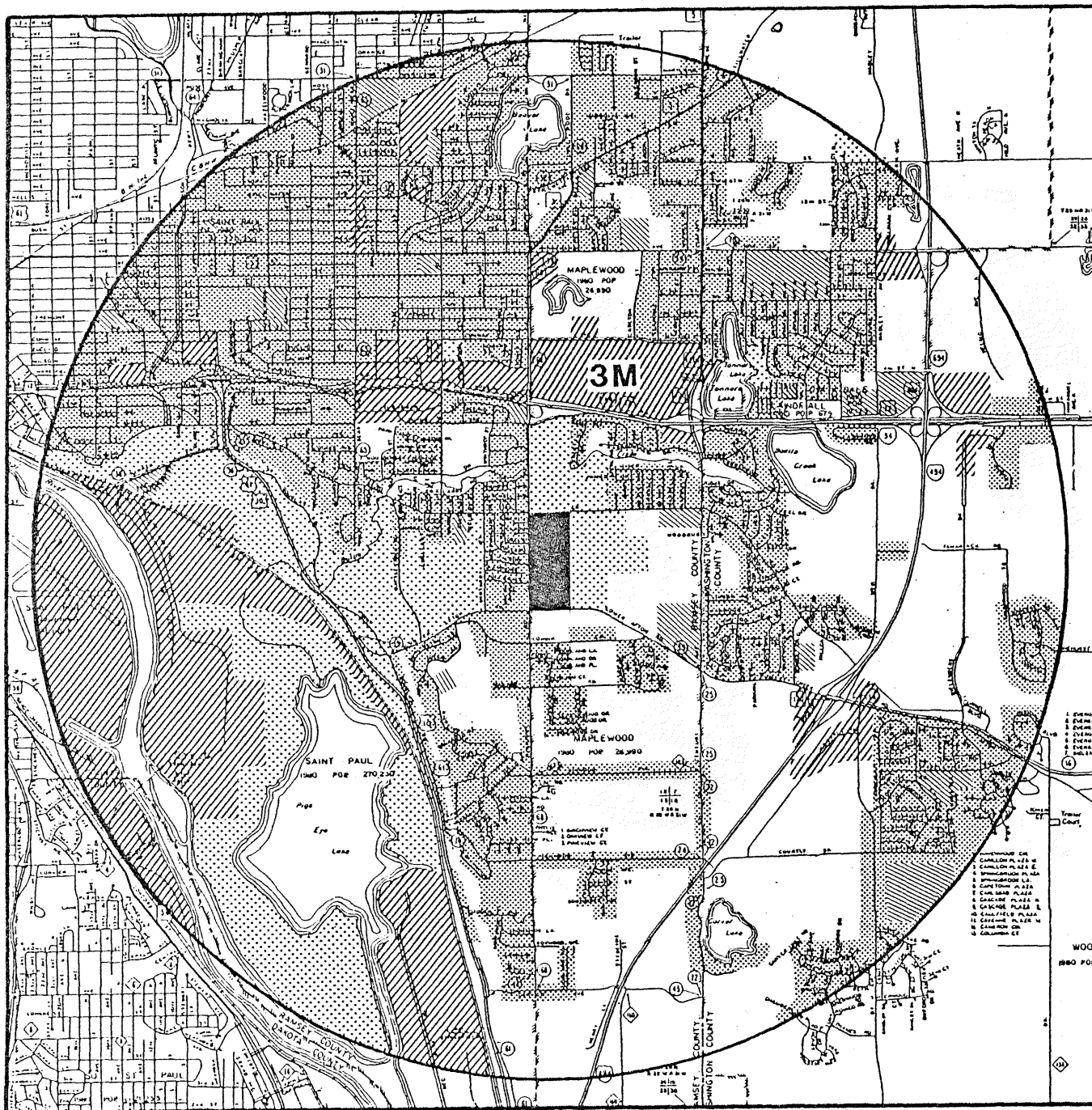
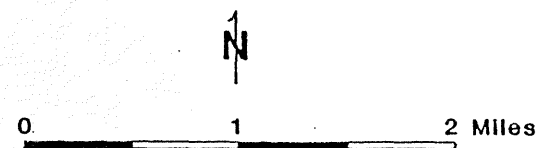


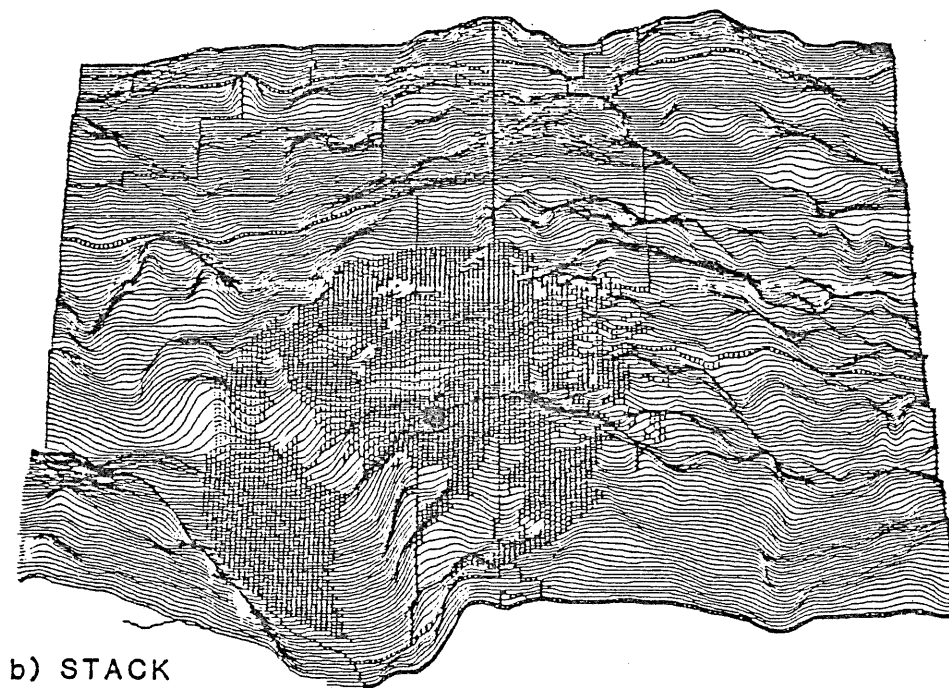
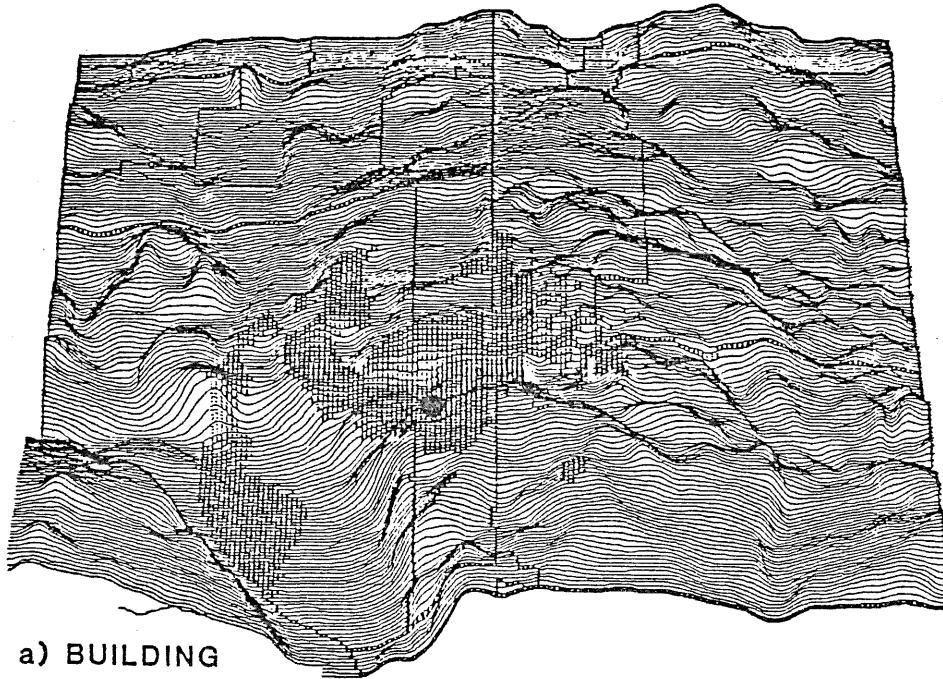
Figure 34.
GENERALIZED LAND USE
WITHIN THREE MILES
OF ALTERNATE SITE 10
(BATTLE CREEK PARK)

-  Site Location
-  Residential
-  Commercial/Industrial
-  Parks, Open Space
-  Public/Institutional
-  General Rural Land Use



Base Map Source: Minnesota
 Department of Transportation.

Figure 35.
VIEWSHEDS FOR BATTLE CREEK PARK SITE



0 1 2 3 4 5 Miles

Scale, east-west, at center of map

DISCUSSION

Based strictly on the percent of land that falls within the viewsheds, the Lake Elmo site appears to be the most suitable, while the Oakdale site appears to be the least suitable. The Battle Creek site appears slightly better than the 3M site because of its smaller waste-to-energy facility building viewshed.

Lake Elmo's favorable status is reinforced when nearby land uses are considered. Little development is present within a one-half mile radius. Some residential development does occur between one-half mile and one mile to the west and the north. Portions of these developments are in the site's viewsheds.

In contrast, the 3M and Battle Creek sites have residential developments adjacent to them. It is possible, however, that vegetation in the park could screen the Battle Creek site to a greater degree than indicated by computer analysis. It is also possible that because of the industrial nature of the land immediately south of the 3M site, an waste-to-energy facility there would appear no more obtrusive than buildings in the existing industrial complex.

The Oakdale site has the largest viewsheds, however, its surrounding land uses minimize its potential visual impacts. Like the Lake Elmo site, the Oakdale site has little development within one-half mile; some residences do occur between one-half and one mile away. It appears that Oakdale's viewsheds are similar to Lake Elmo's at close distances. Most of Oakdale's viewshed increases occur at distances of over 1-1/2 miles. Any developments that are picked up at these greater distances will not be impacted as severely as developments that are added in close proximity to the site.

In summary, the Lake Elmo site appears well suited for the waste-to-energy facility site in terms of the size of its theoretical viewsheds and compatibility with surrounding land use. The Oakdale site's viewsheds are large, however, there is little residential development in close proximity. The 3M and Battle Creek Regional Park sites have the potential to be seen by greater numbers of people, and from residences in closer proximity, than the other two sites. Existing industrial developments, however, could minimize the obtrusiveness of the 3M site. Vegetative screening could ameliorate the obtrusiveness of the Battle Creek Regional Park site.

HISTORICAL/ARCHAEOLOGICAL RESOURCES

A site of historical or archaeological value is a location of a significant event, a prehistoric or historic occupation or activity, or a building or structure whether standing, ruined or vanished, where the location itself maintains a historic or archaeological value regardless of the value of any existing structures.*

The Minnesota Historical Society has indicated that there are no known resources of historic or archaeological value on the project site.** An archaeological survey was recommended, however, because the project is located in close proximity to several wetlands. (There is a higher frequency of finding archaeological sites near wetlands and water bodies.)

A field reconnaissance of the site was completed in June 1983 by Archaeological Field Services, Inc.*** The purpose of this type of survey is to determine whether items or locations of archaeological value are present. Their report: Archaeological Reconnaissance Survey of the Ramsey/Washington County Waste-to-Energy Project, June, 1983, is hereby incorporated by reference as a part of this EIS; findings are summarized below.

Visual inspection was made of the entire site. Twenty-seven subsurface shovel tests were also made. Testing was concentrated in the woodland areas. The Helmo Av. right-of-way, cultivated areas and pasture showed ample evidence of disturbance and so were not extensively tested. Test sites are shown in Figure 36.

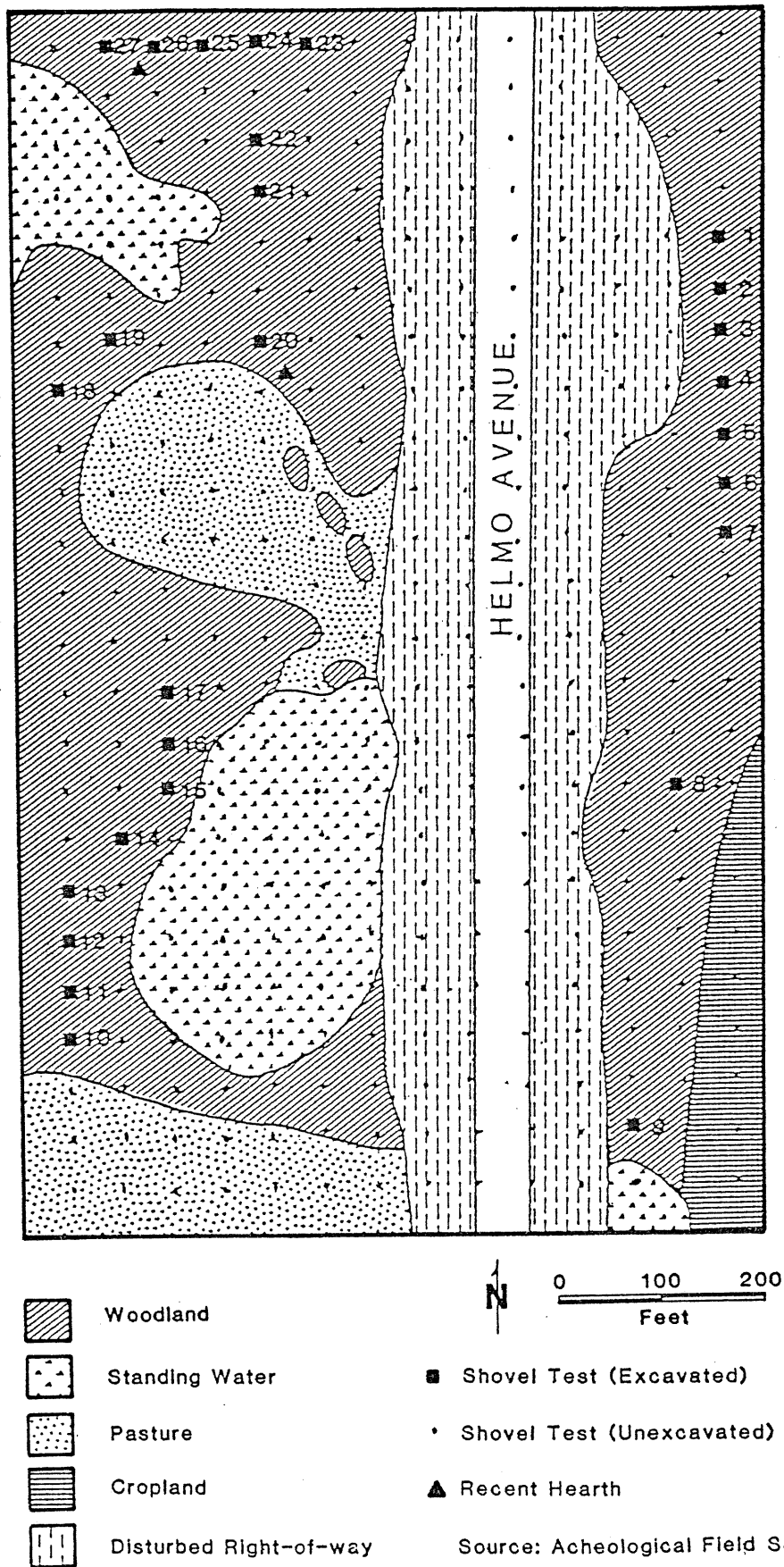
The only items found were two hearths lined with rock which were not more than a few years old. Thus, the conclusion of the survey was that there is no evidence of any historic or archaeological resources within the project area.

*U.S. Department of the Interior 1978 National Register of Historic Places and Comprehensive Statewide Historic Survey and Plans, Criteria, Determinations of Eligibility and Guidelines. Federal Register 42(183). September 21, Part III. National Park Service, Washington D.S.

**Minnesota Historical Society, letter to Gerald Isaacs, February 3, 1983.

***Archaeological Field Services, Inc., Archaeological Reconnaissance Survey of the Ramsey/Washington Waste-to-Energy Project, June 24, 1983. Marine-on-St. Croix, MN.

**Figure 36. LOCATIONS OF SHOVEL TEST UNITS
AND TWO RECENT HISTORIC HEARTHTHS**



CONSISTENCY WITH REGIONAL PLANS

The Metropolitan Council has adopted a Solid Waste Management Development Guide/Policy Plan to ensure efficient and economical management of solid waste facilities in the Twin Cities area, to control air and water pollution, and to protect public health, safety, and welfare. The Plan's policies, criteria, and objectives are used to review new waste facility proposals.

The Ramsey/Washington solid waste waste-to-energy facility proposal will further the policies and objectives in the Plan. It is consistent with regional solid waste disposal needs. The proposal will reduce the Region's dependence on land disposal and help maximize the recovery of energy and materials from solid waste. It will make Ramsey and Washington counties responsible for the use and disposal of a greater portion of their own solid waste streams, and will conform to the counties' plans for waste abatement. The facility will be within an economically feasible distance of waste supplies and energy markets.

The waste-to-energy facility site appears consistent with regional policies and objectives as well. It appears environmentally suitable, readily accessible, and visually compatible with surrounding development.

The facility will be compatible with planned metropolitan systems. The proposed site and each of the locational alternatives are within the Metropolitan Urban Service Area and so are consistent with the Council's Development Framework chapter of the Metropolitan Development Guide.

The Battle Creek alternate site is located within Battle Creek Regional Park, a regional recreation open space facility. The Council's solid waste policies and the Recreation Open Space Policy Plan seek to avoid use of park areas for alternative purposes unless no feasible alternatives exist. The Council has applied very stringent criteria in its review of proposals for even temporary modification to parkland use.

CONSISTENCY WITH LOCAL PLANNING

PROPOSED SITE

The proposed waste-to-energy facility site, as well as nearby lands, are zoned for rural residential development. Lake Elmo's Comprehensive Plan, however, shows the area's future use as mixed urban, with the site's designation as Public Facilities.

In the spring of 1983, property owners in the site vicinity developed a new concept plan for the area (Figure 37). Their concept plan has since been approved by the Lake Elmo Planning Commission and City Council.

The new plan places industrial and general business districts to the east and south of the proposed site. These districts buffer the waste-to-energy facility site from residential developments and provide a location for induced commercial and industrial facilities. It is anticipated that the city's zoning ordinance will be changed in the future to accommodate the new concept plan. A comprehensive plan amendment will also be necessary.

Details of the development plan have yet to be decided; the magnitude, density, and type of nearby businesses and industries is not known. In any case, however, the waste-to-energy facility site and facility are a recognized, integral part of the new development plan.

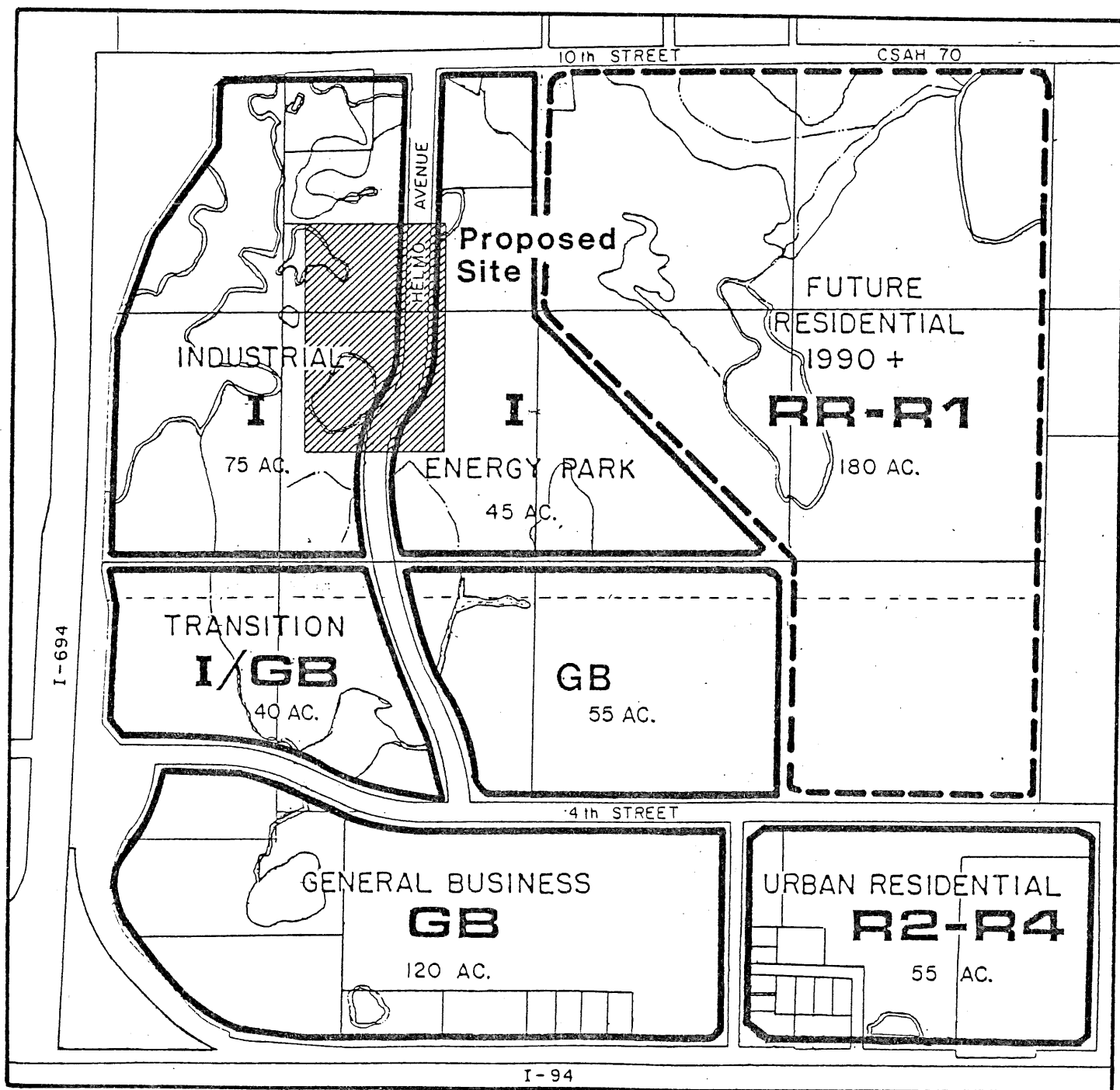
ALTERNATE SITES

The Oakdale site is located within an area planned for commercial/industrial, office, institutional and residential uses. The magnitude of potential conflict with residential and institutional development would be highly dependent on the precise facility site.

Maplewood's Comprehensive Plan shows the 3M alternate site as an area for "Development and Research." To the degree the facility was an integral part of the 3M campus, its development could perhaps be considered a use consistent with the plan.

The Battle Creek Park site in Maplewood is in a designated open space area, and so would not be consistent with the City's plan.

Figure 37.
NEW LAND USE CONCEPT PLAN,
SITE VICINITY



LIST OF PREPARERS

LIST OF PREPARERS

Environmental Quality Board Rules require the EIS to include a list of the names and qualifications of the persons primarily responsible for preparing the EIS and significant background reports.

METROPOLITAN COUNCIL

Many members of the Council's staff as well as other individuals and representatives of other agencies have assisted in the preparation of the EIS. However, the two individuals with primary responsibility for preparation of the document are the project manager for the EIS:

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M.S. University of Minnesota

Karen Harrington - Associate Environmental Planner
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M.A. University of Minnesota

OTHERS

The persons with primary responsibility for each of the five special studies undertaken for the EIS are listed below.

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