Locating & Landscaping the MOUND SYSTEM of On-Site Waste-water Disposal

SMALL SCALE WASTE MANAGEMENT PROJECT

Locating and Landscaping the Mound System of On-Site Wastewater Disposal

Kathy Schutt, James Converse, Dave Vala and Richard Otis

Preface

The Small Scale Waste Management Project developed in response to the need for safe, reliable and economic alternative treatment and disposal systems for small wastewater flows in unsewered areas.

The Wisconsin Geological and Natural History Survey, University of Wisconsin-Extension, has been working on the problem since 1969, with initial support from the Wisconsin Department of Natural Resources. The Upper Great Lakes Regional Commission also provided funding to the University Extension. Special research funds were appropriated by the State of Wisconsin in November, 1971 to the College of Agricultural and Life Sciences, University of Wisconsin-Madison to develop solutions to the problem. Additional funds were granted to the Water Resources Center, University of Wisconsin-Madison by the Environmental Protection Agency.

PARTICIPATING GROUPS

University of Wisconsin-Madison

College of Agricultural and Life Sciences
- School of Natural Resources
- Center for Resource Policy Studies
- Departments of: Soil Science, Bacteriology, Food Research Institute, Agricultural Engineering, and Agricultural Economics

College of Engineering
- Sanitary Engineering Laboratories

Graduate School
- Water Resources Center

University of Wisconsin-Extension

Division of Economic and Environmental Development
- Environmental Resources Unit
- Geological and Natural History Survey

CONTENTS

	page
Introduction	1
Site Requirements	2
Landscape Options	3
Design Checklist	4
Functional Analysis	6
Landform, Vegetation & Design	7
Plant Selection	9
Putting It All Together	11
Want To Know More ?	12

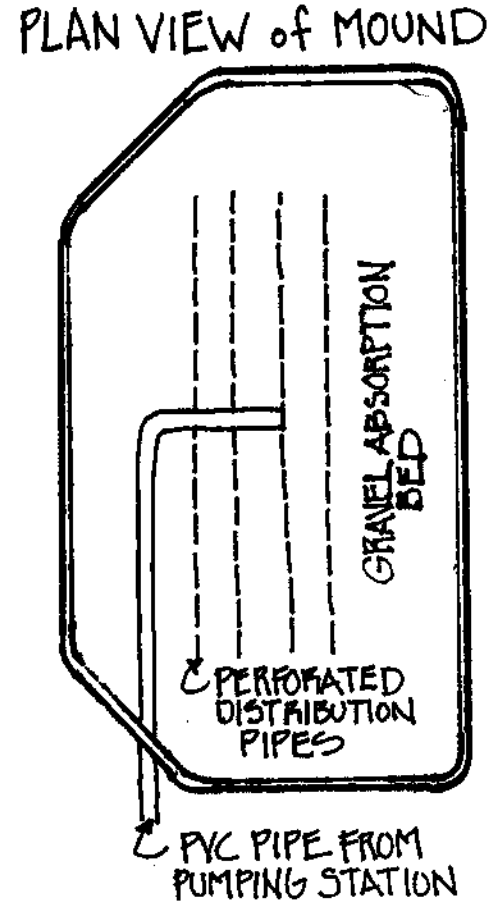
INTRODUCTION

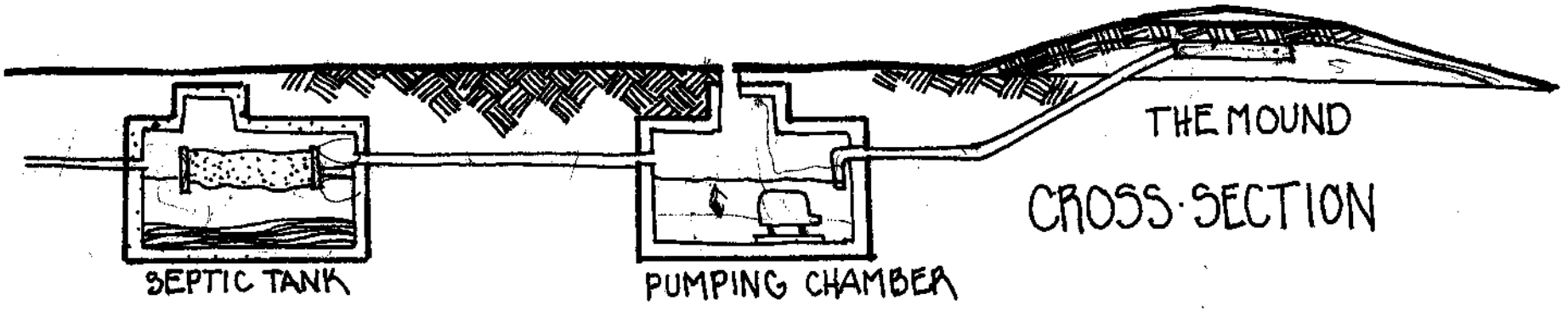
This publication introduces you to the possibilities of the mound system as a landform design element. This landform element, as part of an overall yard design, should fit harmoniously with your needs without destroying the natural amenities of your lot. At the same time, however, the functional requirements of the system are of extreme importance. Because of these exacting requirements on severely limited soils, locating the mound **must** take precedence over the house's location and over any landscape design.

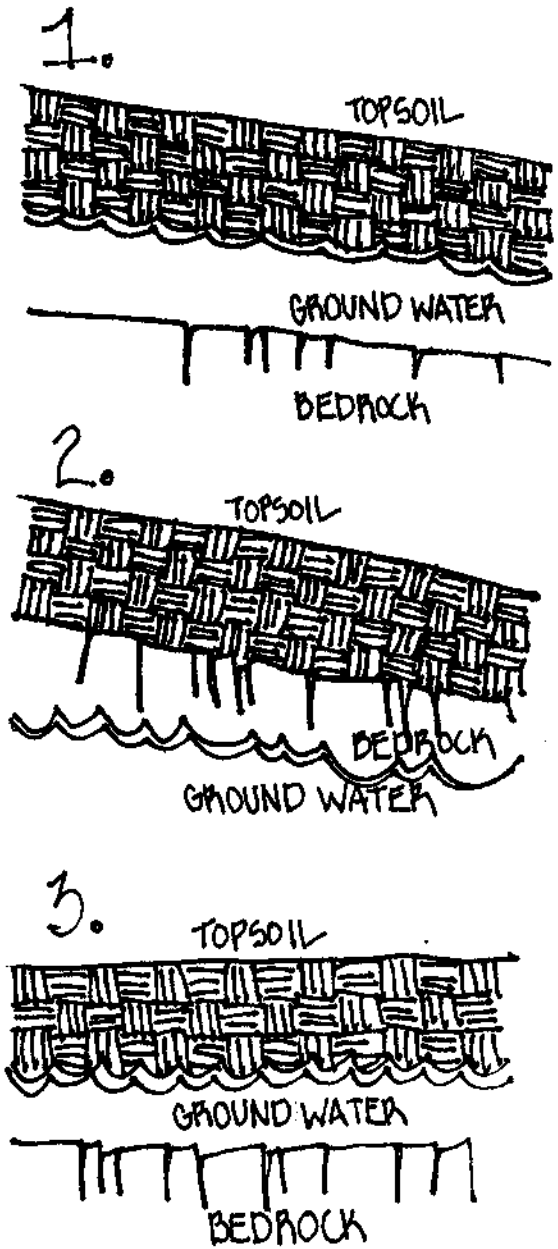
If, after having your soil tested, you must use a mound in your on-site wastewater disposal system, you will have to follow detailed instructions to provide for technical performance. Your local zoning administrator or sanitarian can advise you about what steps to take to determine the system your lot needs. An excellent reference for detailed procedural steps is "The Mound or Fill System for On-Site Wastewater Disposal for Rural Homes in Wisconsin" by James Converse and Richard Otis. It is available from your county extension agent.

The conventional septic tank system was designed to meet this on-site need but it fails to purify waste waters often because half the soil types in the state clog up when dosed with septic effluent.

Alternative systems have been developed to be used when there is not enough soil over porous or creviced bedrock to the water table or if the soil is not the right permeability. A mound of sand must be built on the existing soil surface, provided with a dosing chamber and distribution system and covered with top soil.







SITE REQUIREMENTS

The Wisconsin Department of Health and Social Services has detailed plans and construction procedures for these alternative systems, referred to as "packages." Each package system is designed for specific problem site conditions.

Package One: Mound System for slowly permeable soils
- a percolation rate of 60-120 min./in. measured in a 24-inch deep test hole
- a depth to ground water greater than 2 feet
- a depth to bedrock greater than 5 feet
- a surface slope less than 6%

Package Two: Mound System for shallow permeable soils with creviced or porous bedrock
- a percolation rate of 3-60 min./in. measured in a 12-inch deep test hole
- a depth to ground water greater than 5 feet
- a depth to bedrock greater than 2 feet
- a surface slope less than 12% for percolation rates of 3-29 min./in. and less than 6% for percolation rates of 30-60 min./in.

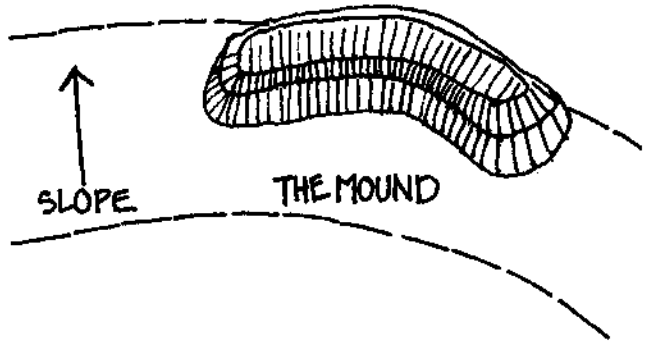
Package Three: Mound System for shallow permeable soils to ground water
- a percolation rate of 3-60 min./in. measured in a 24-inch test hole
- a depth to groundwater greater than 2 feet
- a depth to bedrock greater than 5 feet
- a surface slope less than 12% for percolation rates of 3-29 min./in. and less than 6% for percolation rates of 30-60 min./in.

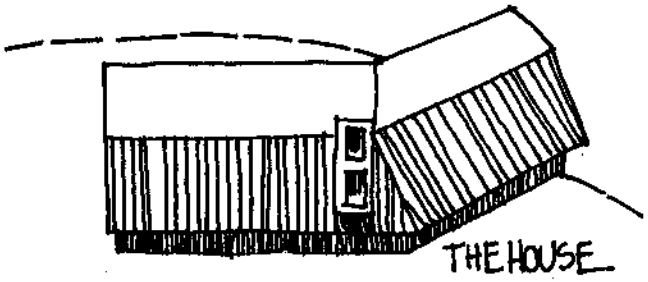
No system can be installed in a flood plain.

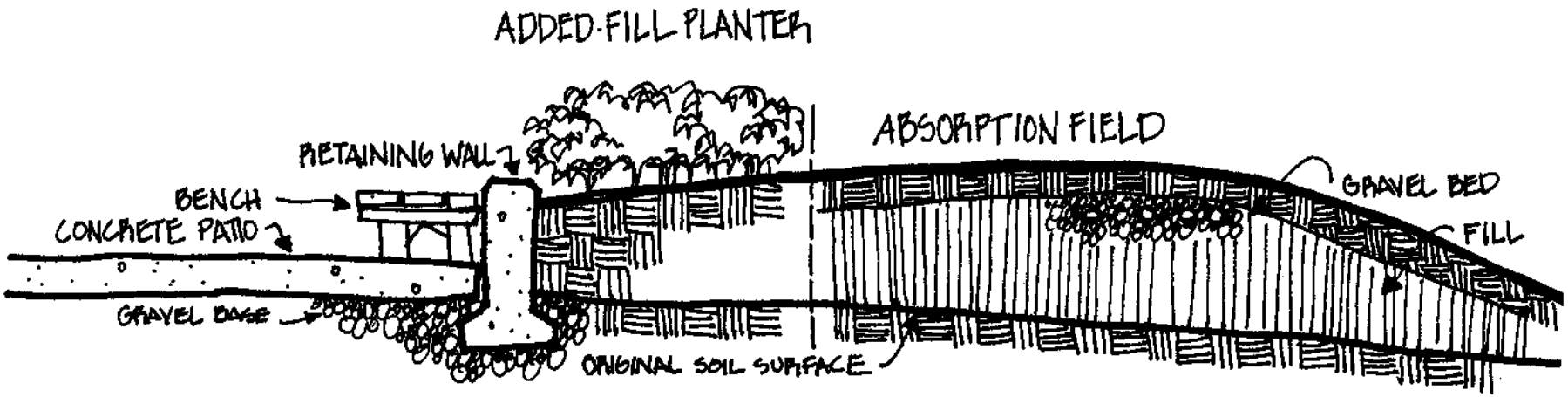
LANDSCAPE OPTIONS

The mound is typically rectangular, placed across the slope, if any, of your lot. Its location is determined by soil and slope characteristics. However, it is important to realize that a mound can do more for you than process waste. By adding fill material beyond that required for the functional mound, the esthetic landscape features of the lot may be improved. This additional fill will mean added cost (unless it is taken from some part of your lot) but can create a more harmonious blend of the mound with existing slopes. The mound can be extended to enclose space, block winds and improve appearances and views.

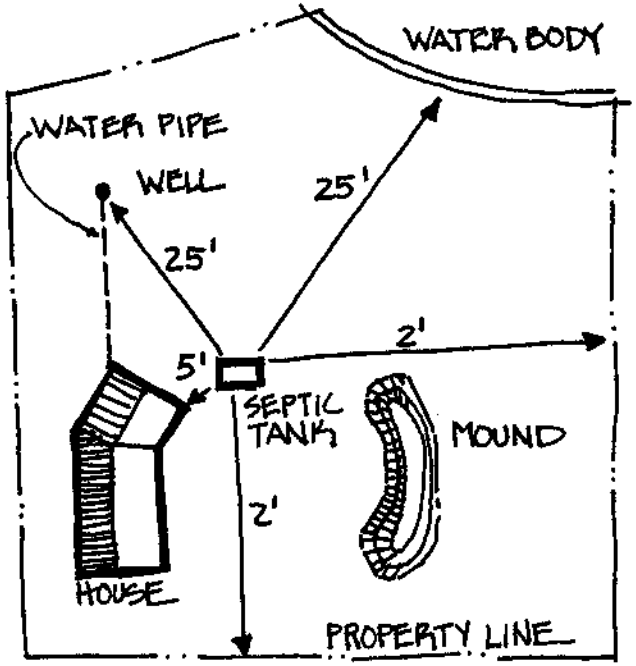
Working with the existing forms and materials on the site saves money and energy, while creating a harmonious visual appearance. So, get to know your site. Take leisurely walks to become acquainted with over-all character. Later be more critical. The next few pages will tell you what to look for and why.

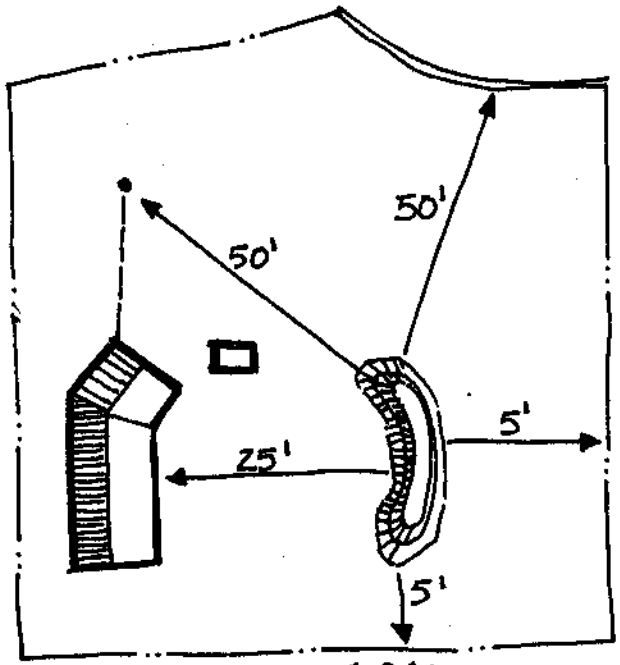






SECTION VIEW of EXTENDED MOUND





MINIMUM LEGAL DISTANCES

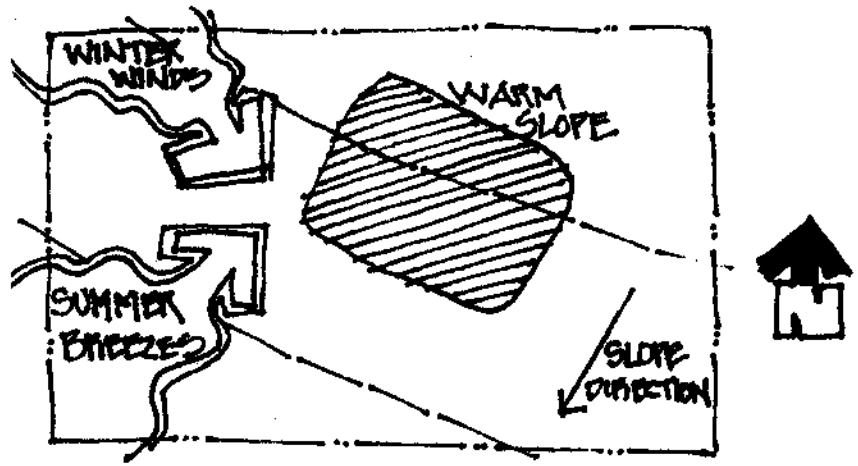
DESIGN CHECKLIST

The design checklist will guide you to the important considerations in analyzing your site. You can become sufficiently acquainted with the soils, slopes, weather and vegetation to decide which areas are best suited for home-building, road/driveway building and activity and preservation areas. Of course, the first area decided upon will be the mound system. Other locations will then have to be decided in relation to it. For instance, the mound cannot be placed uphill from any structure. Also, there are legal limitations on minimum distances as seen in the illustrations.

Obtain a map of your lot to mark down the following information on.

Micro-climate

Differences in slope orientation and steepness mean differences in temperature, humidity, solar intensity and wind intensity. Mark south and northward facing slopes which will exhibit extremes of warmth and coolness. Westerly winds cool the slopes in summer and make them extremely cold in winter. It is advantageous to site the house where it will be protected from northwesterly winter winds but still receive southwesterly summer breezes.



MICRO-CLIMATE

Soils, Slopes & Water

Some soils are better suited for construction than others, depending on their characteristic components, depth and degree of slope. A certified soil tester can give you detailed information about your soils, locate suitable areas, drainage channels and low spots. Avoid wet areas.

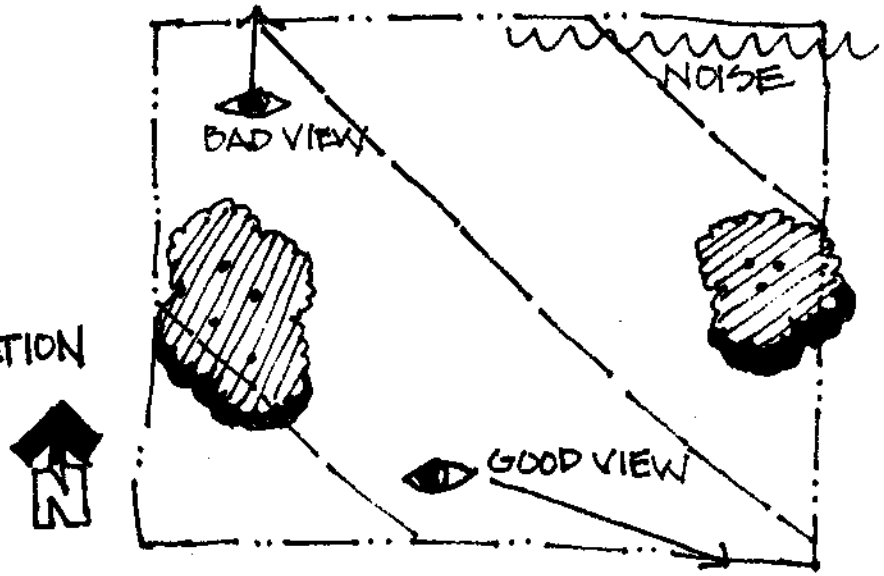
Views

High points provide wide views. Record potential good and bad views and noise problems.

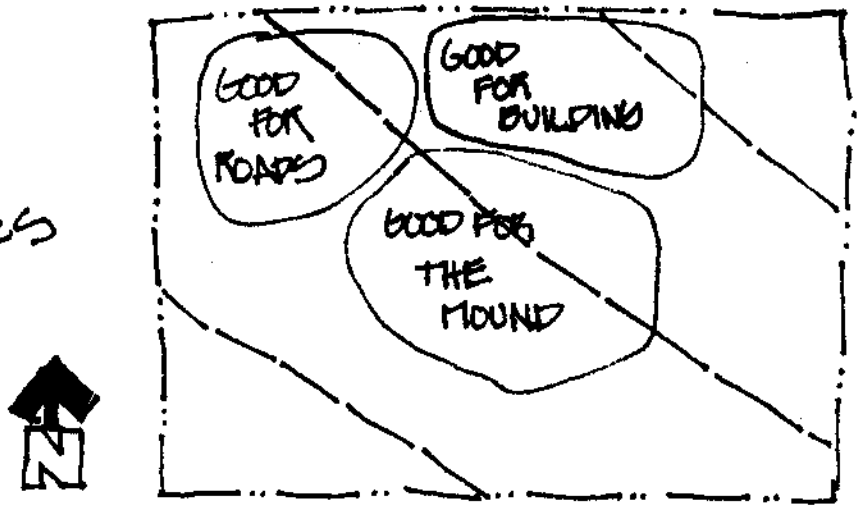
Vegetation

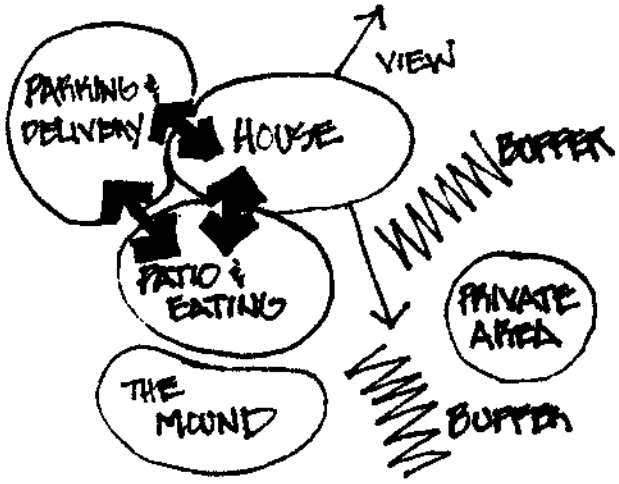
Many rural sites are fortunate enough to have many shade trees and screening undergrowth. Some even have wild flowers, old forest veteran trees or unique wildlife habitat. Record vegetation you would like to save.

VIEWS & VEGETATION

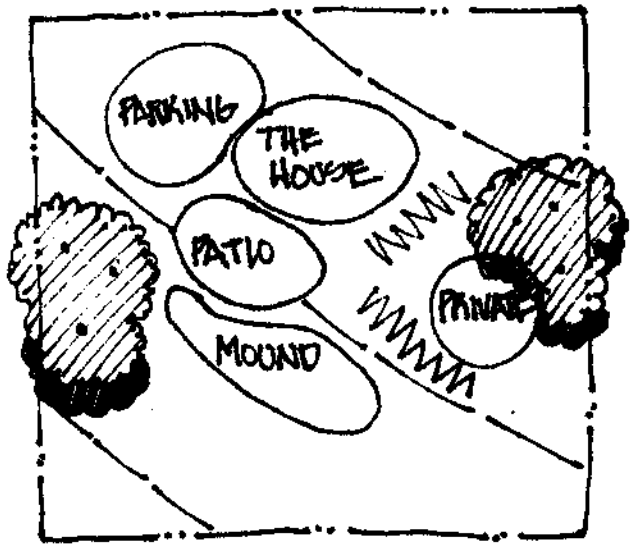


SOILS, SLOPES & WATER





BUBBLE DIAGRAM



BUBBLE DIAGRAM APPLIED TO SITE

FUNCTIONAL ANALYSIS

Many objectives will have to be accommodated on the lot for your family. The house itself has many inter-related activities whose positioning may already be fixed by the house design. Outdoor activities have access and view relationships with indoor activity. For instance, outdoor eating areas are related to the kitchen, entertaining areas to the rec room, family room or living room and sometimes to the eating area. Service and delivery are related to the "backdoor" while guests use the "front door." The list goes on. You must decide what activities your family would like to see on the site, then list them. Next list what types of access you want between different activity areas indoors and outdoors, and what views you want from different rooms.

A good device for organizing your activities in relation to each other is to make a functional diagram as shown.

Each of the bubbles in the diagram represents an activity, while the positioning and arrows indicate abstracted relationships, access and views. Later, keeping in mind the type of land needed for an activity, how much of it is available on your site, and how many people must be accommodated, actual sites can be applied to the diagram and it can be arranged to fit the site and your house layout.

LANDFORM, VEGETATION & DESIGN

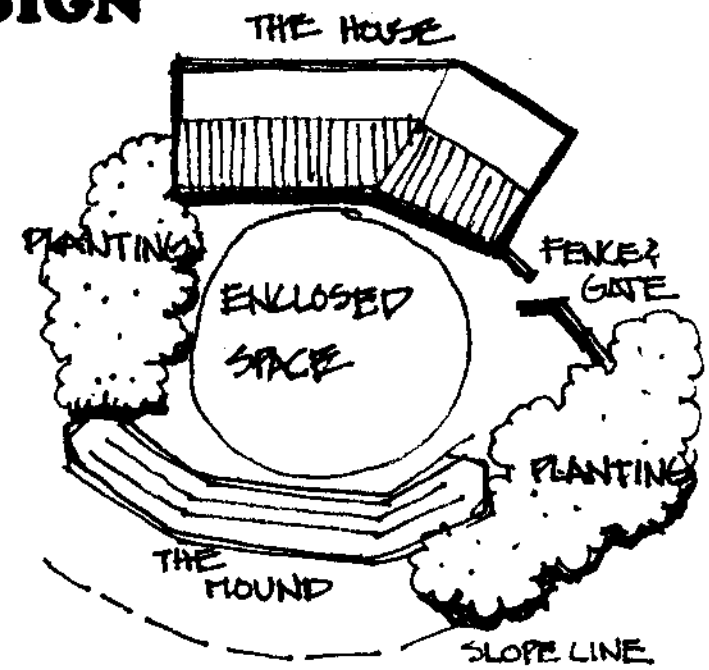
Although the location of your proposed mound system is probably fixed, its shape and orientation can be changed to enhance a site's design, as long as all engineering size and orientation requirements are met. Additional fill can extend the basic functioning unit into a rare and interesting land form combination. A mound can truly do more for you than process waste. Plant material is one of the most important elements in landscape design. Although everyone knows plants *look* nice, there are many things plants can do that most people don't realize. Used together with a mound, you can produce excellent architectural, esthetic and micro-climatic functions.

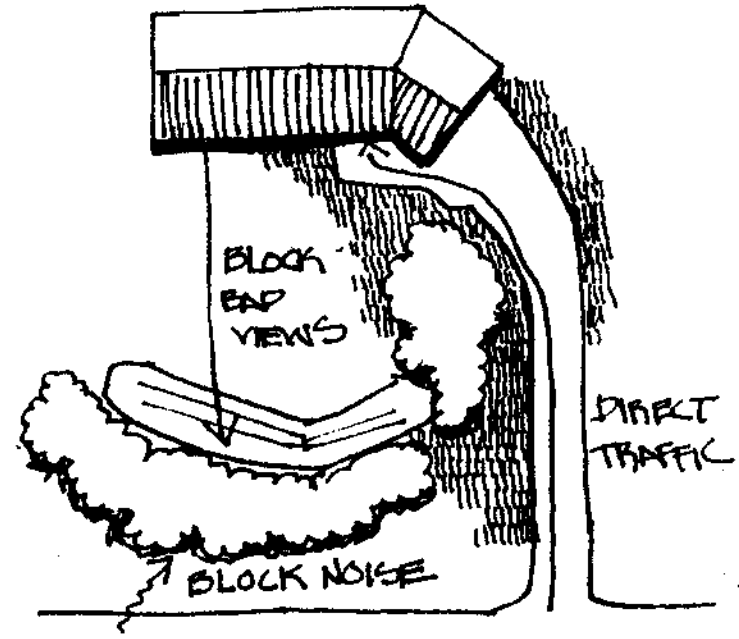
Architectural Functions

A mound can enclose space. Plants can form walls, floors, ceilings and arcades of different sizes and densities to achieve your desired effect. Infinite combinations are possible resulting in the creation of a great variety of moods. Also, vegetation helps create interest and defines space while blending natural and constructed areas.

A mound can invite or discourage traffic through an area, screen a bad view such as a highway, junkyard or quarry, create interest on a flat site, and enhance privacy.

In order to incorporate it into the total design, you will probably want to combine the mound with other objects.





SOFTENS & ACCENTS ARCHITECTURE

Aesthetic Functions

Architecture can be softened and blended with the site's plants and land forms and can act as a background. They can enhance a space or act merely as sculptural forms.

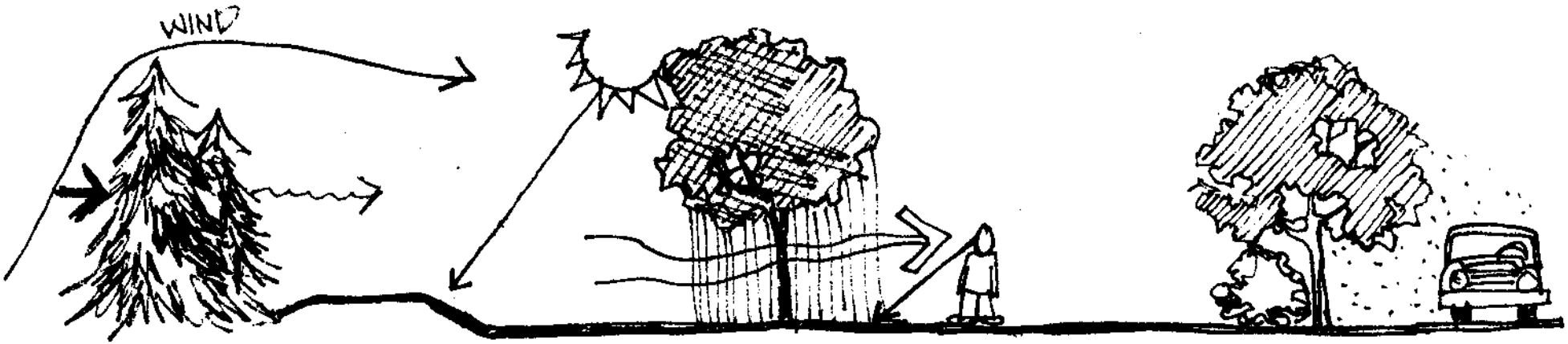
Each plant species has design characteristics such as form, color and texture. They can be combined as design elements. Plants add a dynamic dimension to design with changes through time. In winter, their silhouettes form strong linear patterns. They can make your lot come alive with wildlife.

Micro-Climatic Functions

A mound can trap the sun's direct rays with the right orientation, creating a micro-climate favorable to less hardy species of plants.

Together with dense vegetation, a mound could block and filter cold winds.

As illustrated below, plants alone can effect significant changes on a site's micro-climate.



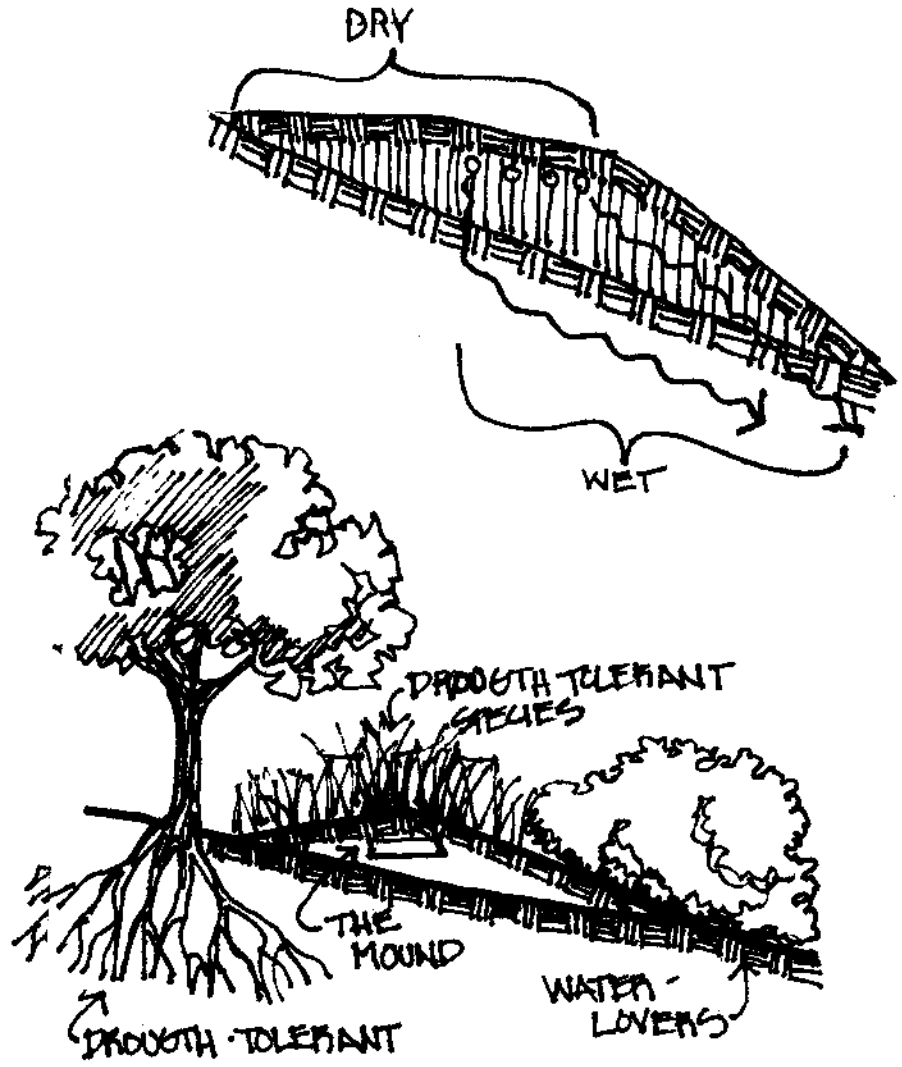
PLANT SELECTION

Plants have very specific needs, in regards to light, water, warm season length, soil pH and nutrients. In order for your plants to thrive, you must analyze what conditions will exist on your site and choose plants to fit in.

The mound itself creates a special set of conditions due to the way it works. The gravel seepage bed creates a drought area on top of the mound, while the effluent produces wetter than ordinary soils downslope.

Grasses and herbs allowed to grow up tall along with ornamental ground covers which can resist water-stress, are excellent choices for the mound top. (They discourage activity there while allowing maintenance access.)

The mound sides are good for shrubs or small trees. They should be water-loving varieties on the downslope side and drought-resistant varieties on the upslope side.



PLANT LOCATIONS BY MICRO-CLIMATE

Here is a brief list of plant species for various parts of a typical mound.

Native species

drought-resistant varieties:

1. Little Bluestem *(Andropogon scoparius)*
2. Sideoats Grama *(Bouteloua curtipendula)*
3. Indian Grass *(Sorghastrum nutans)*
4. Canadian Wild Rye *(Elymus canadensis)*
5. Butterfly Weed *(Asclepius tuberosa)*
6. Black-eyed Susan *(Rudbeckia hirta)*
7. Yellow Cone Flower *(Ratibida pinnata)*
8. Bergamot *(Monarda fistulosa)*
9. Leadplant *(Amorpha canescens)*
10. Purple Prairie Clover *(Petalostemum purpureum)*

water-lovers:

Shrubs

1. Grey Dogwood *(Cornus racemosa)*
2. Winterberry *(Ilex verticillata)*
3. Nannyberry Viburnum *(Viburnum lentago)*
4. New Jersey Tea *(Ceanothus americanus)*
5. Silky Dogwood *(Cornus amomom)*
6. Buttonbush *(Cepolanthos accidentatis)*
7. Redosier Dogwood *(Cornus sericea)*

Ornamental species:

for dry areas:

Grasses and herbal plants

1. Birdsfoot Trefoil *(Lotus corniculatos)*
2. Five Grass *(Lotium)*
3. Timothy Grass *(Phleym)*
4. Succulents in general

Shrubs

1. Rugosa Rose *(Rosa rugosa)*
2. Junipers in general *(Juniperus)*
3. Fragrant sumac *(Rhus aromatica)*
4. Father Hugo Rose *(Rosa hugonis)*
5. Wayfaring tree Viburnum *(Viburnum)*
6. Alpine Currant

water-lovers:

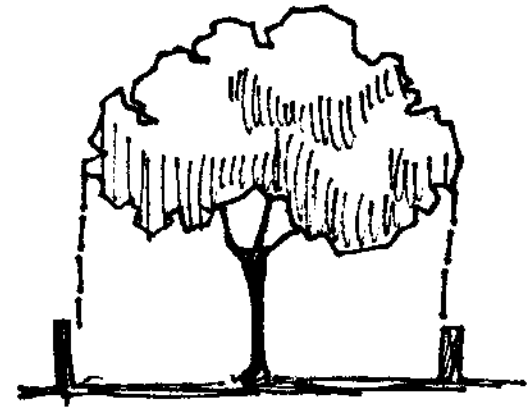
1. Lilacs *(Syringa)*
2. Dogwoods *(Grey, Redosier and Silky)*
3. American Elder

2500-319A001-78

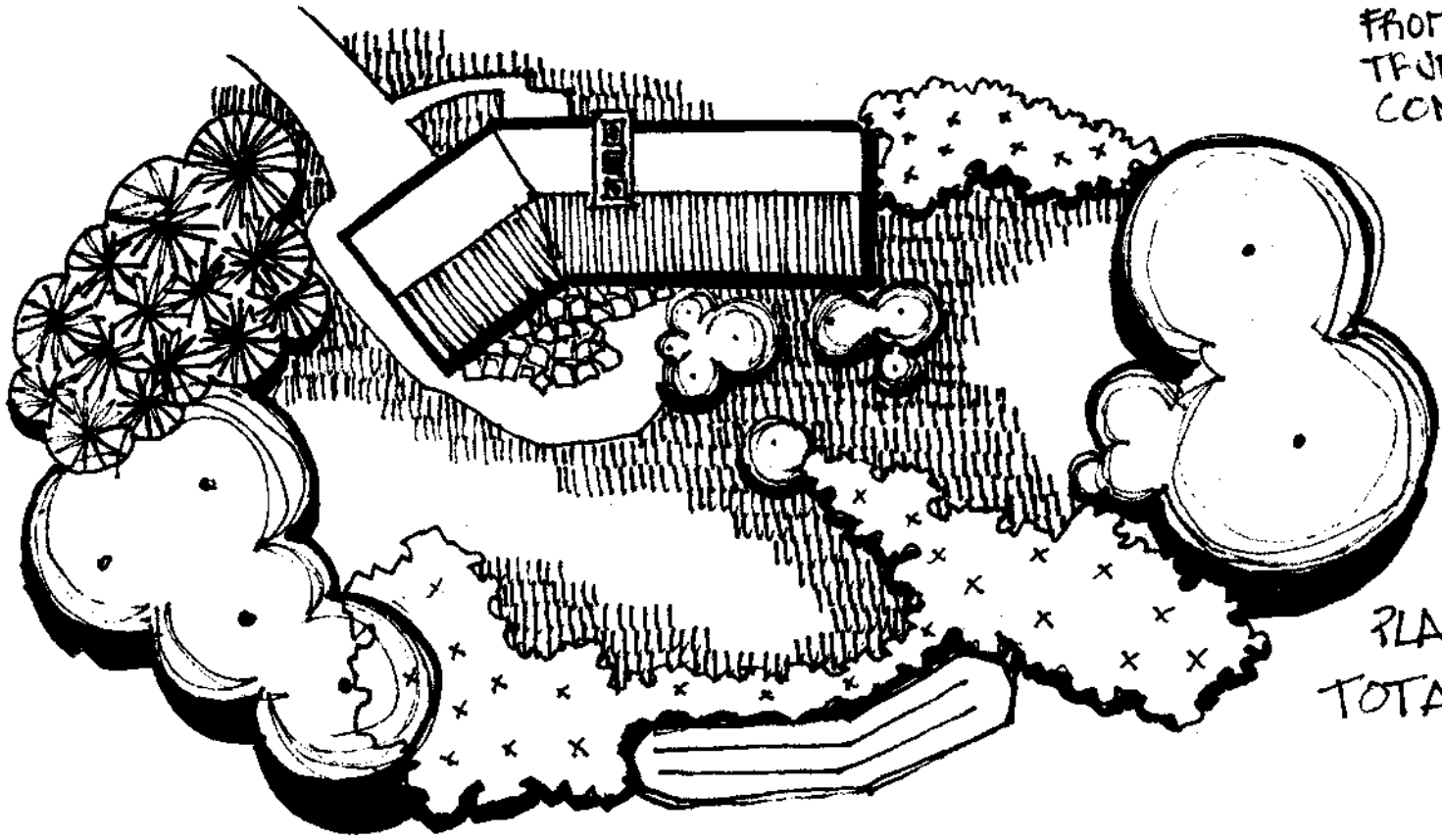
PUTTING IT ALL TOGETHER

Designing in harmony with nature means also that during construction, the existing vegetation and soil must be protected. So remove only plants that are in an area to be built up. Protect the remaining plants with barriers, to avoid root damage from cutting and compaction. Replant disturbed soil as soon as possible or cover with mulch at 1-1/2 tons/acre.

Now that you know your site well and know exactly what your family wants, you can put it all together by capitalizing on some of the design options we have shown you. Once completed, your total lot design will provide wastewater treatment, beauty and enjoyment too, naturally.



PROTECT PLANTS FROM DRIPLINE TO TRUNK DURING CONSTRUCTION



PLAN VIEW - TOTAL DESIGN

WANT TO KNOW MORE?

Literature

About the Mound

Otis, Richard, "G1071 Building a Home in the Country? What You Should Know About Your Septic Tank System". (Copies available from county Extension offices.)

Converse, James and Otis, Richard, "The Mound or Fill System for On-site Wastewater Disposal for Rural Homes in Wisconsin."

Otis, Converse, Bouma, Walker, Anderson, Stewart, "Design and Construction Procedures for Mounds."

About the Landscaping

Time-Life series on Landscape & Gardening. Reader's Digest Guide to Landscape Design. Sunset Series

People:

About the Mound

Local Sanitarian or zoning administrator
County Extension Agent
Contractors

About the Landscaping

Landscape Architect
Nurseryman

Kathy Schutt is a project associate and Dave Vala is assistant professor of landscape architecture, James Converse is associate professor of agricultural engineering, College of Agricultural and Life Sciences, Richard Otis is a specialist in the College of Engineering, University of Wisconsin–Madison.

Research Report

JULY 1978

The Research Division of the College of Agricultural and Life Sciences, University of Wisconsin-Madison, publishes this information in support of its programs and provides equal opportunities in employment, programming and admission. **Single copies of this publication are available free** to Wisconsin residents from county Extension offices and to others from the **Agricultural Bulletin Building, 1535 Observatory Drive, Madison, WI 53706.** The Agricultural Bulletin Building quotes prices for bulk orders. Order by serial number and title.

R2940 **LOCATING & LANDSCAPING THE MOUND SYSTEM OF ON-SITE WASTE-WATER DISPOSAL**