Existing Calvert - Purdue Farm
Content

Introduction
Site Survey
Program
Design Development
Design Proposal
Supplemental Information
Bibliography
Introduction
TO WHOM IT MAY CONCERN:

This study deals with the problems the Purdue Animal Sciences Department is facing as it relocates its Research Farms on the Baker and Calvert Land. As with any design project there are parts of this proposal and program which are controversial. I would like to emphasize that this proposal is based on current information and goals, as I understand them. This proposal does not necessarily reflect Purdue's plans.

I would like to thank Dr. W.H. Woods and those people in the Animal Sciences and Agricultural Engineering Departments, as well as my other consultants throughout the project. Everyone was most helpful and cooperative.

Harry Mohler  
College of Architecture and Planning  
Ball State University  
Thesis Critic,  
Professor Anthony Costello
RESEARCH CENTER DESCRIPTION

The Purdue Animal Sciences Center provides facilities for graduate programs, classwork and agricultural thesis projects. The land and facilities are owned by the Purdue Research Foundation and operated by the Animal Sciences Department. Their existing facilities are located on the north and west sides of West Lafayette and consist of 1661 acres which are divided into several units. The facilities include dairy, beef research and teaching, swine nutrition and teaching, purebred swine, sheep, and poultry units, the farm shop and livestock pavilion.

PROBLEM DESCRIPTION

In the early 1960's the Purdue Research Foundation entered into an agreement with the city of West Lafayette. They agreed to sell their lands on the north side of the city as public demand dictated. The concept behind this decision was that West Lafayette would expand to the north and Purdue would expand to the west.

The existing facilities operate inefficiently due to the distances between the fields and facilities, as well as the distances between the facilities.

Calvert—Purdue Animal Sciences Center
Relocation on a single site would greatly improve the efficiency in terms of time and energy.

In recent years security of equipment and livestock has become an increasing problem. The frequency of vandalism, theft and livestock deaths have all increased due to the numerous access points to unsupervised facilities from public roads. Measures taken to increase security include: night lighting, locked gates and student housing in various barns.

There is currently a proposal to route the new West Lafayette By-pass for State Road 43 directly through several of the existing farms. This is only one of three proposals, but if it should be selected, its construction would completely disrupt major farm functions.

**P.R.F. SOLUTION**

The Foundation has purchased two farms, the Baker and Calvert farms, which are located eleven miles west of West Lafayette and one mile north of Montmorenci. The farms are one-half mile apart. The Baker farm consists of 440 acres, and some relocation of purebred
swine and poultry units has begun. A small grain mill is now under construction. The remaining land is used for corn production. The Calvert farm's 660 acres are farmed for shares by Elmer Janssen.

**SITE ANALYSIS**

**PROBLEMS**
The soils typically have low permeability and 0 to 5% slopes. There is a drop of twenty-five feet per mile on the Calvert farm. The field tiling is over fifty years old and is broken in many places. These conditions create ponding, wet fields and general drainage problems.

The relocation plan calls for 1661 acres of farm operations to take place on 1100 acres of land. The Baker and Calvert land is more usable than Purdue's existing farmland: fewer wooded areas, creeks and valleys. However it is still 400 acres short of the programmed acreages. This means that corn will either be purchased or transported from distant fields. If the 400 acres separating the farms is placed on the market, hopefully Purdue will purchase them. The separation of the farms causes some inefficiency by requiring traffic between some farm units to use longer public roads instead of an internal circulation system.

**Calvert—Purdue Animal Sciences Center**
Assets

Soils maps show that the site has some of the most productive, drought resistant, erosion resistant soils in Tippecanoe County.

The regional context is consistent with the rural nature of the research center.

Baker farm is within one mile of US 52, which facilitates travel to the Purdue campus and the shipment of livestock.

Currently each farm fronts on two roads and has one entrance. These entrances can serve as control points for farm security.

This Research Farm is within the West Lafayette City Limits. New Apartments are in the Background.

Introduction
Site Survey
**Temperature**

During the three summer months, four-fifths of the days average greater than 68°F and one-fifth of the days average 58.6°F.

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**Precipitation**

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**Sunshine**

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**Site Survey Climate**
Winds, days per direction

Spring

Summer

Autumn

Winter

Calvert – Purdue
Animal Sciences Center
Site Survey
Relationship to Purdue
Site Survey
Regional Hydrology
Site Survey
Regional Topography
Program
MASTER PLAN CONCEPT

Due to: 1) existing farm buildings and roads
2) the survey of soil productivity and permeability
3) the land required for waste disposal
4) the land required for producing silage for the Beef and Dairy Units
5) the required isolation for disease control of the Boar Testing Station, from other Swine Units,

The decision was made to locate the Boar Testing, Beef Research, Beef Teaching and the Dairy Units on the Calvert Farm. The Sheep, Swine, Poultry Units, Farm Shop and Grain Mill were located on the Baker Farm.

For the purposes of this study the decision was also made to focus the rest of the study on a specific design proposal for the development of the Calvert Farm.
BEEF RESEARCH

This unit will require facilities for feeding 500 head of cattle per year. A controlled environment for conducting nutrition research experiments must be provided for 432 cattle. An open feedlot must be provided for 100 animals. Three full-time men and three part-time students will be employed at this unit. The facilities and grazing areas will require a fifty acre site. Fifty acres of corn and five million pounds of water will be consumed per year. This will produce 4.5 million pounds of waste and 500,000 pounds of meat per year. Feeder calves which are bought and transported from the western states will require an isolation period to protect the other herds from infection. This unit will host the annual Cattle Feeders Day convention in late April each year.

BEEF TEACHING

Two full-time men and two part-time students will operate this unit, which contains 125 cows, 25 bulls and 125 calves. Approximately 150 acres will be needed for the facilities and grazing. Facilities will be minimal in nature so the cattle can collect their own ruffage and spread their own waste. Only 40 acres of silage and 2.8 million pounds of water will be required per year. During the school year, cattle from this unit will frequently be transported to campus for classwork.

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Animal Sciences Center
Dairy

The Dairy Unit with facilities for approximately 200 milking cows and 25 heifers will require adequate research facilities for nutritional and physiological studies. Approximately five full-time men and six part-time students are to be employed at this unit. The facilities and grazing areas can be expected to require 100 acres. Approximately twenty acres of hay, 125 acres of corn, 200 acres of silage and 11.1 million pounds of water will be consumed by the dairy cattle each year. This will result in the production of 8.4 million pounds of waste and 3.65 million pounds of milk each year. These facilities will be the most costly and the last to be relocated.

Boar Testing

Hogs are brought to Purdue by farmers across Indiana to be tested and rated at these facilities. Boars, 6-8 weeks old and 30-40 pounds, are fed standard rations and then rated on their rate of gain and amount of back-fat when they reach approximately 225 pounds. This mixing of boars from separate herds increases the risk of infection. Two full-time men care for the 200 boars tested each year. Five acres will be required for these facilities and access to public roads is important.

Waste Treatment

This facility will treat and dispose of the combined waste from the beef research, dairy and swine boar testing units. According to estimates this involves the processing of 20.7 million pounds of waste per year. The design should facilitate research into alternative uses of livestock wastes, such as irrigation, fertilizer, bedding, refeeding, and methane production.

Program Summary
A Comparative Analysis of Consumption

**Corn**
- Beef research: 31,000 bushels
- Beef teaching: 2,500 bushels
- Dairy cattle: 25,000 bushels
- Swine testing: 5,000 bushels
- Total: 63,500 bushels

**Hay**
- Beef research: 25 tons
- Beef teaching: 300 tons
- Dairy cattle: 50 tons
- Swine testing: None
- Total: 375 tons

**Silage**
- Beef research: 1,500 tons
- Beef teaching: 1,250 tons
- Dairy cattle: 2,250 tons
- Swine testing: None
- Total: 5,000 tons
Acres

- beef research: 50 acres
- beef teaching: 150 acres
- dairy cattle: 100 acres
- swine testing: 5 acres
- Total: 305 acres

Animals

- beef research: 500 animals
- beef teaching: 275 animals
- dairy cattle: 225 animals
- swine testing: 200 animals
- Total: 1,200 animals

man-hours

- beef research: 9,000 hours
- beef teaching: 6,000 hours
- dairy cattle: 16,000 hours
- swine testing: 4,000 hours
- Total: 35,000 hours
production

Meat

beef research ● 500,000 pounds
beef teaching ○ none
dairy cattle ○ none
swine testing ○ none

500,000 pounds

Milk

beef research ● none
beef teaching ○ none
dairy cattle ○ 3,650,000 pounds
swine testing ○ none

3,650,000 pounds

Waste

beef research ● 5,600,000 pounds
beef teaching ○ 5,900,000 pounds
dairy cattle ○ 8,400,000 pounds
swine testing ○ 800,000 pounds

20,700,000 pounds

Calvert—Purdue Animal Sciences Center
# Land Required

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# Land Available

**Baker Farm** | **Calvert Farm** | **Total**
---|---|---
440 | 660 | **1,100**

**unit in acres**
Beef Research

Feed Storage Area

- silage storage, 3 tons per cow or
  1,500 tons or
  60,000 cu. ft.
- corn storage, three units at 7,600 cu. ft.
- research feeds, two units at 5-6 tons
  four units at 25 tons
  twenty units at 2.5 tons
- loading and unloading areas must be accessible
  by semitrailers and tractors with wagons

Feed Preparation

- the primary purpose of this space is the
  mixing and weighing of feeds
- this space must be accessible by trucks
  and wagons

Housing

- open lots, six lots 16-20 cows each,
  6 acres lots,
  self feeders and mineral feeders,
  partially surfaced
- cold confinement, 72 lots, 6 cows each,
  40 sq. ft. per animal,
  slotted floors
- metabolism study units,
  8 units, 60 sq. ft. each
  total confinement for
  isolation and closer measurement
  of body functions

Straw Storage

- 15-25 tons, or 6,000 cu. ft.
Weighing Facilities

- used monthly for documentation of weight gains 10,000 sq. ft.
- scales and recording space must be sheltered
- loading chute, squeeze chute, holding pens

Storage

- storage of vehicles and equipment 1,000 sq. ft.

Office

- one man office for conferences and filing research records 225 sq. ft.
- the space must be heated

Lab Area

- multipurpose space for chemical testing of feeds, small maintenance projects, and coffee breaks 700 sq. ft.
- equipment storage must include: small mixers, air compressors, lawn mowers, table saw, hand tools and wood storage
- the space must be heated and provide access for medium size equipment

Horse Facilities

- two horses are used for handling cattle 100 sq. ft.
- spaces: tack room
  - open shed 300 sq. ft.
  - feed and straw storage 200 sq. ft.

Program

Facility Requirements
Rest Rooms

- facilities for men and women must include lockers and showers for all employees, professors, and grad students  600 sq. ft.

Mechanical Room

- provide space for water heater, furnace and fuse box  75 sq. ft.

Student Apartment

- living space for two students, including bath and kitchen  500 sq. ft.
Beef Teaching

Feed Storage Area

- silage storage, 5 tons per cow or 1,250 tons or 50,000 cu. ft.
- corn storage, 5-10 bushels per cow or 1,250-2,500 bushels or 1,570-3,140 cu. ft.
- protein storage, 200 lb. per cow or 25 tons

Feed Preparation

- the primary purpose of this space is the mixing and weighing of feeds 1,000 sq. ft.
- this space must be accessible by trucks and wagons and have access to all feed storage areas and feedlots

Finishing Research Feedlots

- the purpose of these research feedlots is to compare the effects of different housing systems on finishing cattle
- open lot, two lots, 6 cows each, 6,000 sq. ft.
  400-500 sq. ft. per cow, self feeders and mineral blocks
- open shed and lot, two lots, 6 cows each, 2,000 sq. ft.
  100-150 sq. ft. per cow, sheltered with bedding, covered feed bunks, partially surfaced
- cold confinement, two lots, 6 cows each, 240 sq. ft.
  30-40 sq. ft. per cow, completely slotted floor
- warm confinement, two lots, 6 cows each, 240 sq. ft.
  30-40 sq. ft. per cow, completely slotted floor, heating and ventilating system

Program Facility Requirements
Hospital Space

- used for sperm collection, artificial insemination, hoof trimming and treatment 300 sq. ft.
- tool storage and tip table

Cow Wash Room

- preparation space for showing and treatment 600 sq. ft.
- tie rings for two cows

Storage

- storage of vehicles and equipment 1,000 sq. ft.

Office

- one man office for conferences and records 225 sq. ft.
- space must be heated

Lab Area

- multipurpose space which is heated 700 sq. ft.

Rest Rooms

- facilities for men and women must include lockers and showers for all employees, professors and grad students 600 sq. ft.
Mechanical Room

- provide space for water heater, furnace and fuse box 75 sq. ft.

Student Apartment

- living space for two students, including bath and kitchen 500 sq. ft.

Program

Facility Requirements
Dairy Cattle

Feed Storage Area

- silage storage, 10 tons per cow or,
  2250 tons or,
  90,000 cu.ft.
- hay, 50 tons or 12,000 cu.ft.
- supplement, bean meal, 25 ton,
  urea, 5 ton
- concentrate, dry corn, 750 ton or,
  25,000 bu. or,
  31,000 cu.ft.
- salt, mineral, commercial mix, 10 ton

Feed Preparation

- the primary purpose of this space is the mixing and weighing of feeds
- this space must be accessible by trucks and wagons

Housing

- mature cows, cold shelter,
  stalls for 200 cows,
  continuous feeding mangers,
  access to milking house,
  gutter waste removal system,
  access to open lots
- maternaty cows, cold confinement
  15-20 stalls, 144 sq.ft. each,
  straw bedding,
- heifers, cold shelter, 25 stalls,
  gutter waste removal system,
  access to lots
- calves, cold confinement, straw bedding,
  15 floor level pens, 32 sq.ft. each,
  1 lot for 15 head, 40 sq.ft. per calf

Calvert—Purdue
Animal Sciences Center
Housing

- open shed and lot, two lots, 30 cows each, 9,000 sq. ft.
  100-150 sq. ft. per cow, shelter with bedding, covered feed bunks, partially surfaced
- open grazing 32,000 sq. ft.
  65 cows, 400-500 sq. ft. per cow, self feeders and mineral blocks
- maternity area, two lots, 15 cows each, 4,500 sq. ft.
  open shed and lot, 100-150 sq. ft. per cow, shelter with bedding, covered feed bunks, partially surfaced
- open shed and lot, 25 bulls, 3,750 sq. ft.
  100-150 sq. ft. per bull, sheltered with bedding, covered feed bunks, partially surfaced
- open shed and lot, 25 heifers, 3,750 sq. ft.
  100-150 sq. ft. per heifer, sheltered with bedding, covered feed bunks, partially surfaced

Straw Storage

- 150 tons straw and 150 tons hay or 90,000 cu. ft.

Weighing Facilities

- the scales and recording space must be sheltered
- loading chute, squeeze chute, holding pens 10,000 sq. ft.

Program

Facility Requirements
Hospital and Treatment Area
- warm confinement, 5 isolation stalls, 144 sq.ft.
- treatment area, restraint facilities, digestive trials 300 sq.ft.

Weighing and Handling Facilities
- used by cows and calves 3,000 sq.ft.
- scales and recording space must be sheltered
- loading chute, squeeze chute, holding pens

Milking Area
- holding area 1,000 sq.ft.
- milking room 600 sq.ft.
- milk house 400 sq.ft.
- office 250 sq.ft.
- utility room 150 sq.ft.

Student Apartments
- 4 students, 2 man rooms, 500 sq.ft. each 1,000 sq.ft.

Storage
- storage of vehicles and equipment 1,000 sq.ft.

Calvert—Purdue Animal Sciences Center
DESIGN GOALS

To integrate the philosophy, technology and equipment systems of current agricultural architecture with the scientific needs of a modern Animal Sciences Research Center. Producing a pleasant, efficient and productive environment for the various employees and livestock.

DESIGN CONCEPTS

Respect and reinforce existing natural systems.

Maximize the productive potential of land and facilities while minimizing energy and operating costs.

Long-range planning suggests that the land separating the Baker and Calvert Farms will be purchased in the future. The future location of an internal transportation link should be considered.

Labor requirements, particularly hand labor, are to be kept to a minimum.

Maintenance and upkeep of facilities is to be minimized through the design and materials selection.

Security is an increasing problem due to the public access and unsupervised nature of the center, therefore controlled access after dark is important.

Consider future research of livestock waste reuse and disposal in designing waste collection systems.

Respect the fact that farm technology is rapidly changing, design for flexibility.

The nature of the facilities should respect the rural context of the region.
COMMENT

In reviewing my design process in this project, I feel that throughout the site analysis and programming stages, no preconceived building form or concept emerged. After an intensive search for design concept alternatives the linear concept evolved. The decision to focus on the linear concept was the key to the flexibility, efficiency, image and form of the facility.

The following pages are photographs of my sketches, maps, models and drawings which have been placed in chronological order and periodically dated. Notes have been added to identify important ideas expressed in the pictures. Unfortunately there are gaps in the documentation and some alternatives and ideas have been lost.

Calvert—Purdue
Animal Sciences Center
Land ownership map, properties around West Lafayette. Dark areas are operated by the Purdue Animal Sciences Department.

Land ownership map, the dark areas are the Baker and Calvert Farms.

Regional Map

The square is Tippecanoe County and the circle locates the Baker and Calvert Farms.

Soils Identification Map

Topographic Map of the Baker and Calvert Farms

Soils Map

Soil Permeability Map

General Productivity Map

Natural Soil Drainage Map

Water Runoff Map

Forestation Map

Design Development
Design Development
First Linear Concept for Farm Plan

Expansion Concept

Study of Individual pen design for beef research

Farm Plan

Beef Research Feedlots,
Notice similarity of plan to the final plan. Also, the first Saw-tooth roof

Beef Research Feedlots

Beef Teaching Facilities,
Notice similarity to final plan and roof system.

Notes on sequence of farm operations, seasonal and daily.
Calvert—Purdue
Animal Sciences Center
December 1975
Study Model

Study of Animal, Feed, Waste and People Circulation

Perspective study

Calvert—Purdue Animal Sciences Center
December 1975
Study Model

Study of Animal, Feed, Waste and People Circulation

Perspective study

Calvert—Purdue Animal Sciences Center
Notes from desk crit by Art Schaller

Building section, study of waste collection system

Topography study for landscape design

Topography alternative

Site sections, study of cut and fill requirements

Study of cut and fill

Landscape design alternative

Landscape design alternative

Landscape design alternative

Drawing of 3/8" scale for wind tunnel tests

Design Development
Design Proposal
Framing Isometrics

- Purdue Sciences Center
Supplemental Information
ENVIRONMENTAL IMPACT STATEMENT

BAKER FARM

TIPPICANOE COUNTY, INDIANA

Excellent

prepared by harry mohler

may 9, 1925
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<tr>
<td>a. Positive and negative effects</td>
<td>3</td>
</tr>
<tr>
<td>b. Secondary impacts of the proposed action</td>
<td>4</td>
</tr>
<tr>
<td>4. ALTERNATIVES TO THE PROPOSED ACTION</td>
<td>4</td>
</tr>
<tr>
<td>a. Alternative actions</td>
<td>4</td>
</tr>
<tr>
<td>1. No action</td>
<td>4</td>
</tr>
<tr>
<td>2. Alternative sites</td>
<td>4</td>
</tr>
<tr>
<td>3. Relocation without consolidation</td>
<td>4</td>
</tr>
<tr>
<td>4. Alternative systems designs</td>
<td>4</td>
</tr>
<tr>
<td>5. PROBABLE ADVERSE ENVIRONMENTAL IMPACTS WHICH CANNOT BE AVOIDED</td>
<td>4</td>
</tr>
<tr>
<td>a. Adverse and unavoidable impacts</td>
<td>4</td>
</tr>
<tr>
<td>b. Avoiding adverse impacts</td>
<td>5</td>
</tr>
<tr>
<td>a. Trade-off between short-term environmental gains at the expense of long-term losses</td>
<td>5</td>
</tr>
<tr>
<td>b. Trade-off between long-term environmental gains at the expense of short-term losses</td>
<td>5</td>
</tr>
<tr>
<td>c. Extent to which the proposed action forecloses future options</td>
<td>5</td>
</tr>
<tr>
<td>7. IRREVERSIBLE AND IRRETREIVABLE COMMITMENTS OF RESOURCES</td>
<td>5</td>
</tr>
</tbody>
</table>

Appendix
SUMMARY

BAKER FARM, TIPPECANOE COUNTY, INDIANA

DESCRIPTION OF ACTION
The Baker Farm is located on county road 500 North, Tippecanoe County, Indiana. It is approximately eleven miles northwest of West Lafayette. The action involves developing a research facility for 1000 head of cattle in a confinement feedlot environment. The 425 acre site has poor drainage and is currently used for crop production.

ENVIRONMENTAL IMPACT
The action involves management of large amounts of livestock waste which could potentially violate the Federal Water Pollution Act of 1972. Full reconciliation and compliance with the law has been met with the employment of an anaerobic waste treatment system.

ADVERSE ENVIRONMENTAL EFFECTS
Obnoxious odors and noise pollution will have occasional adverse environmental effects. Due to remote siting, these impacts will be minimal.
1. **PROJECT DESCRIPTION**

a. **Purpose of Action.** At the present time Purdue University and Purdue's research farms physically contain and restrict the future growth of the city of West Lafayette. In cooperation with the city fathers, the Purdue Research Corporation has agreed to sell the research farms as the public demand dictates. This transition has already begun, with the development of the Cumberland neighborhood and school.

The proposed action is to relocate and improve the research facilities of the Purdue farms. Currently, there are three separate facilities: Beef research, Purebreed Beef and the Dairy. The proposed facility would consolidate these three units into one facility, located eleven miles northwest of West Lafayette. This facility would incorporate modern technology and be designed to increase the efficiency and accuracy of Purdue's research program, and function as a field laboratory. Experiments dealing with livestock environment, nutrition and breeding will be carried out.

b. **Description of the Action.** The proposed site is known as the Purdue Baker Farm, and is currently owned by the Purdue Research Corporation. Baker Farm is located on County Road 500 North, one mile north of Mountmorreni. The site's 425 acres will be developed with a warm confinement feedlot housing approximately 1000 head of cattle. There will be 30,000 square foot of slotted floor feedlot and 12,000 square foot of circulation and support space. Support structures will include: equipment storage and maintenance buildings, a small grain mill, grain bins and silos, livestock waste treatment facilities, and housing for the farm manager. The surrounding fields will be planted with grassed for grazing cattle not housed in the feedlot.

c. **Environmental setting.** Lafayette and West Lafayette are located eleven miles southwest of Baker Farm, and have a combined population of 90,000. Mountmorenci, population 7,000, is located one mile south of Baker Farm. The region is primarily agricultural in nature, with corn and soybeans as the major crops. U.S. 52 highway connects Mountmorenci with Chicago to the north and West Lafayette to the south. Historically, this region was once the edge between the eastern plains and the dense forests of Indiana and Ohio.
The existing topography has only a ten foot grade change over the entire site. This combined with the dense clay soil create a severe drainage problem. Intermitten manmade drainage ditches provide marginal improvement in surface water drainage.

The site is bounded on three sides by gravel roads: County Road 500 North, County Road 500 West, and County Road 600 North. A high voltage power transmission line crosses the site's southeast corner. Ten acres of the site are heavily wooded with mature deciduous trees. The remainder of the site is planted yearly with corn and soybean crops. The fields are separated by fences and hedgerows. The wooded area supports a thriving community of squirrels, ground hogs assorted species of birds, and a few fox. The hedgerows provide nesting grounds for pheasant and quail. Squirrel, pheasant and quail are frequently hunted for recreation on the site.

Existing structures on the site include: a cold confinement feedlot structure for approximately fifty head of swine, an equipment storage shed, three grain storage bins, and a house for the farm manager.

2. LAND-USE RELATIONSHIPS

a. Conformity of Conflict with other Land-use Plans, Policies and Controls. The region surrounding Baker Farm is distinctly agricultural in nature. Both farming and small scale beef production are present. Some livestock research facilities for swine research already exist at Baker Farm. The further development of livestock research activities conforms with the existing land-use, land-use plans and policies.

The dense livestock confinement is potentially in conflict with the Federal Water Pollution Control Act of 1972. With 1000 head of cattle contained in a feedlot, 68,000 pounds of manure will be produced each day. If this livestock waste or a substantial portion of it leaves the site via the drainage ditches, the proposed action will be inconsistent with federal water pollution control policies.

b. Conflict and/or Inconsistent Land-use Plans.
   1. Extent of Reconciliation. Virtually complete elimination
of livestock waste runoff will occur due to the employment of a completely controlled system of livestock waste treatment facilities. The confinement feedlot will be designed with a slotted floor and an eight-foot deep waste slurry collection tank. The waste slurry will be pumped to an anaerobic slurry treatment facility which will biologically break down the waste. The liquid effluent from this process will be finally disposed of on the adjacent fields by irrigation sprayers of trucks mounted with conventional tank sprayers. The 375 acres required for yearly liquid waste disposal will be provided on Baker Farm's 425 acres.

2. Reasons for Proceeding with Action. With the use of the livestock waste treatment system and facilities planned, full reconciliation and compliance with the Federal Water Pollution Control Act of 1972 will be achieved.

3. PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT

a. Positive and Negative Effects. Purdue University currently uses chemical fertilizers on the fields at the Baker Farm. Rainwater runoff from these fields contains chemical pollutants which foul the water leaving the site via the drainage ditches. The proposed action would make the use of such chemical fertilizers unnecessary and thereby eliminate this form of water pollution.

Topsoil conditions will be improved with the application of organic fertilizer in the form of liquid effluent from the anaerobic waste treatment facility. Erosion will be reduced due to the year-round groundcover which will replace the seasonal crop vegetation.

Some modification of wildlife habitat and population can be expected. The conversion of fields from crops to grazing land will not continue to attract wildlife, such as pheasant and quail, which feed on the corn and bean stubble. The wooded areas will not be significantly modified and little change should occur in the wildlife population. Due to grazing cattle in open fields decreased pheasant and quail populations, somewhat less hunting on the site can be expected.

Minimal amounts of livestock waste discharge into the surface water can be expected, due to malfunctions or overloading the anaerobic treatment facility during storms.
Periodically the proposed action will be a source of noise pollution. When young calves arrive at the site, after being shipped from the great plains, they usually bawl loudly for several days. The impact will be minimal due to the sparse population in the area.

Remote siting also minimizes the impact from the odor of livestock waste. Although the effluent produced by the anaerobic treatment facility is odorless, the waste slurry storage pit can be expected to emit unpleasant odors.

b. Secondary Impacts of the Proposed Action. Increased use of secondary county roads can be expected by farm machinery, livestock transport vehicles, Purdue faculty and students. This increased volume of traffic will create some maintenance and dust problems on the gravel roads.

4. ALTERNATIVES TO THE PROPOSED ACTION

a. Alternative Actions

1. No Action. This alternative is currently being implemented because West Lafayette has not grown as rapidly as was expected ten years ago. This is primarily due to the national economy. In addition to this, many members of the Cumberland neighborhood have actively fought new zoning proposals which would have promoted further strip-development nearby. This alternative is satisfactory until the Purdue Research Corporation is forced to honor their commitment to relocate as public demand dictates.

2. Alternative Sites. **

3. Relocation Without Consolidation. **


** These alternatives will not be dealt with in this report due to time restrictions.

5. PROBABLE ADVERSE ENVIRONMENTAL IMPACTS WHICH CANNOT BE AVOIDED.

a. Adverse and Unavoidable Impacts. The impacts of obnoxious
odors and noise pollution have been minimized significantly by the remote siting of the facility. Further reconciliation is impractical due to the magnitude and nature of the impacts.

b. Avoiding Adverse Impacts. The most serious environmental impact of the proposed action—water pollution due to livestock waste, has been avoided by the utilization of available technology to speed the biological processes which recycle livestock waste.

6. RELATIONSHIPS BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG TERM PRODUCTIVITY

a. Trade-off Between Short-term Environmental Gains At The Expense Of Long-term Losses. No long term losses in environmental quality have been found that will be the result of the proposed action.

b. Trade-off Between Long-term Environmental Gains At The Expense Of Short-term Losses. Short-term wildlife habitat disruption, erosion, and water pollution will result during construction of the proposed action. Long-term improvement of soil conditions and erosion problems can be expected. Also long-term gains will be achieved by the proposed action, due to the improved research facilities, in the area of controlled livestock environments.

c. Extent To Which The Proposed Action Forcloses Future Options. No foreclosure of future options has been found.

7. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

No irretrievable commitments of resources have been found.

Appendix — next page
Figure 2.—Physiography, age of soil materials, and original vegetative cover in Tippecanoe County, Indiana.
Figure 4.—Topographic position of the soils of Tippecanoe County, Ind.
Figure 5.—Internal drainage of soils of Tippecanoe County, Ind.
1. Very high:

Cc8, Gc8—Dark-colored soils in upland swales and depressions; high in organic matter; underlain by slowly permeable glacial till; receive runoff from higher areas.

Dn8, Kn8—Permeable soils in swales and depressions on stream terraces; underlying material is permeable, but drainage outlets are needed.

Uc4—Soils on overflow bottoms of streams; water table fluctuates with stream level; subsoil of swales and meander channels is clayey and slowly permeable; subsoil of higher areas is sandy and freely permeable.

2. High:

Ac2, Gc2—Predominantly dark-colored deep soils from slowly permeable till on level uplands.

1m—Organic soils in deep depressions.

3. Moderate:

Cc4, Jc4—Gently rolling soils of upland prairies.

Ac4, Gc4—Deep soils of forests on rolling uplands; rapid runoff.

4. Low:

Na5, Kn5—Soils 4 to 6 feet deep over gravelly sand on terraces; moisture-supplying power reduced when gravel and sand is nearer surface.

Pa5, Dn5—Soils 3 to 4 feet deep over gravel on terraces.

5. Very low:

Cc5—Gravelly knolls and ridges on rolling uplands; rapid runoff.

Ht5—Shallow dark-colored sandy soils on terraces.

Xt5—Deep loose light-colored dune sands on terraces near river bottoms.

Figure 6.—Drought resistance of the soils of Tippecanoe County, Ind.
EXPLANATION

1. Little or no erosion:
   
   Uc4------------------- Soils of bottom lands; some scouring may occur during overflow.
   
   Dw4, Kn4, Lm4--------- Soils in swales on terraces; may receive deposits of materials eroded from higher areas.
   
   Gc4, Gc4------------ Soils in swales on uplands; may receive deposits of materials eroded from higher areas.
   
   Kn5, Hk5, Ph5, Dw5, Mt5.

   2. Slight erosion:

   Ac2, Gc2------------ Nearly level light-colored soils on uplands; gently sloping areas included may be moderately eroded.
   
   Kt5------------------ Undulating dune sands; may be slightly eroded by wind.

3. Moderate sheet erosion and scattered gullies:

   Ac4, Gc4------------ Light-colored soils on rolling areas, on moderately steep slopes bordering larger streams, and on breaks above terraces.
   
   Cc4, Jc4------------ Dark-colored soils on undulating prairies; long gentle slopes are erosive.

4. Severe erosion:

   Gc5------------------ Soils on rolling gravelly knolls and ridges; small spots among soils of other groups.

Figure 7.—Erosion on the soils of Tippecanoe County, Ind.
1. Glacial till:
   Ac4, Ac6, Ge4, Ge6, Cc8.
   Medium-textured, unsorted material; highly calcareous; leached of lime carbonates to
   depths of 30 to 40 inches; occurs in uplands of northern part of county.

2. Silt over glacial till:
   Ge4, Ge6, Je4, Je6.
   Silt mantle 10 to 40 inches deep, over
   unsorted, medium-textured, highly calcareous till that is leached of lime carbonates
   to depths of 45 to 60 inches; occurs on
   uplands throughout the county.

   Cc5
   Local areas of assorted gravel and sand on
   knolls and ridges on the uplands.

3. Gravel and sand, shallowly leached:
   Dm5, Dn5, Fn5.
   Highly calcareous material; leached of lime carbonates to depths of 30 to 40 inches;
   occurs on low terraces of major streams.

4. Gravel and sand, deeply leached:
   Kn5, Kn6, Mn5.
   Highly calcareous material; leached of lime carbonates to depths of 40 to 10 inches;
   occurs on higher, older terraces and outwash plains.

5. Sand:
   Mt5.
   Sand that contains some gravel in places;
   noncalcareous to slightly calcareous; occurs
   on high terraces and on Wac Plain.

6. Silt and sand:
   Ue4.
   Bottom-land soils on flood plains or
   present-day streams.

7. Fine sand:
   Kt5.
   Uniformly assorted material deposited by wind;
   usually noncalcareous; occurs in dunes on
   terraces bordering bottom lands.

8. Organic material:
   Dm.
   Decomposed vegetation in former lakes and marshes.

Figure 8.—Parent materials of soils of Tipppecanoe County, Ind.
EXPLANATION

1. No lime required:
   Uc4---------------- Bottom-land soils; neutral to alkaline in reaction.
   IM---------------- Organic soils of former ponds and deeper depressions; may be acid, but crops suited to these soils do not require lime.
   Dn5, Ge5, Gc5, Gc3, 20' Soils of depressions in terraces and uplands; included spots of high ground may require some lime.

2. Up to 1 ton of ground limestone per acre required:
   Kt5---------------- Dune sands; require lime before deep-rooted legumes can be grown.

3. Up to 2 tons of ground limestone per acre required:
   Mt5, Dn5, Kn5, Mh5, Gc2, Ph5, Mn5, Ge2, Ac5, Gc4, Ac6, Ce4, Jc4, Gc5. Soils of high ground on terraces and uplands; require 1 to 2 tons of lime per acre for best growth of red clover; most of the associated low-ground soils do not require lime.

Figure 9.—Lime requirements of the soils in Tippecanoe County, Ind.
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