PROJECTED LAND-USE FOR BRUNSWICK-GLYNN COUNTY

An Economic Analysis of the Growth Potentials and Optimum Land Allocation

Ernst W. Swanson
Project Director

Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia
PROJECTED LAND-USE FOR BRUNSWICK-GLYNN COUNTY

An Economic Analysis of the Growth Potentials
and Optimum Land Allocation

by
Joseph E. Kling
Research Assistant

and
Alvin H. Lewis
Graduate Assistant

Industrial Development Branch
Engineering Experiment Station
Georgia Institute of Technology
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Foreword

The second in a series of analyses concerned with the development of the Brunswick area's economic potentials, this report focuses on a vital topic too often neglected in industrial development research: the effective use of available land. In particular, it focuses on the need for reserving key areas for special uses in order to insure that necessary acreages will be available in the right place at the right time as Brunswick's economy grows.

Like the petroleum refinery report which preceded it, this report is unique in that it provides what we believe will prove to be a firm bridge between the work ordinarily assigned to the economist and that which properly belongs within the field of city planning. It is intended to provide the planner with essential economic data and analyses which should make his work infinitely easier and at the same time more accurate. The lack of such data and its proper interpretation has too often in the past proved an almost insurmountable handicap to the planner conscientiously seeking to do an adequate land-use analysis.

This report was prepared for a specific, practical purpose—to assist the people of Brunswick in their preparations for the economic growth which is certain to come as they follow through on the refinery study and other research yet to be completed. Its value is predicated on its usefulness to them in the months ahead.

Comments and criticisms on the report and the approach used will be welcomed, whether from persons in the field of city planning, in economics, or from others who may use the report or have occasion to review it.

Kenneth C. Wagner, Head
Industrial Development Branch
Summary

In proceeding toward its stated goal of making recommendations for future patterns of land-use and development, this report has analyzed the growth potentials of Glynn County. These growth potentials have been measured in terms of city-forming employment, total non-farm employment, population, and land requirements, by types of use. The results are summarized below:

Growth Potentials and Additional Land Requirements
Glynn County

<table>
<thead>
<tr>
<th></th>
<th>Short-run</th>
<th>Long-run</th>
</tr>
</thead>
<tbody>
<tr>
<td>City-forming employment</td>
<td>5,500</td>
<td>7,400</td>
</tr>
<tr>
<td>Total non-farm employment</td>
<td>15,700</td>
<td>21,100</td>
</tr>
<tr>
<td>Population</td>
<td>47,100</td>
<td>63,300</td>
</tr>
<tr>
<td>Industrial land</td>
<td>3,000 acres</td>
<td>5,000 acres</td>
</tr>
<tr>
<td>Residential land</td>
<td>520</td>
<td>965</td>
</tr>
<tr>
<td>Commercial land</td>
<td>65</td>
<td>125</td>
</tr>
<tr>
<td>Public land</td>
<td>215</td>
<td>405</td>
</tr>
<tr>
<td>Total additional land requirements</td>
<td>3,800 acres</td>
<td>6,500 acres</td>
</tr>
</tbody>
</table>

It is not possible to indicate the time periods involved in short-run and long-run periods, since timing will depend on a number of factors that are not readily predictable at this time. However, in general the short run refers to a period extending to about five years in the future if a favorable rate of growth takes place between the present and that time. With a slower rate of growth, the short run would refer to a period extending some 10 to 15 years into the future. The long-run period can be considered to refer to a period up to 10 to 15 years if there is a favorable rate of growth such as Brunswick and Glynn County can and should achieve.

Maps 1, 2, and 3 show the optimum land allocation for future growth as determined by this report. By this allocation, Colonel's Island, the section of Blythe Island south of Highway 303, and the Hermitage Point area are designated for short-run industrial expansion. The section of Blythe Island north of Highway 303 and the area in the vicinity of the intersection of Highways 99 and 25 are designated for long-run growth. The general area west of Hermitage Point to Green Creek is an alternate site for long-run development.
The area from the northern boundary of the present residential area to Glynco toward the north and to Dixon Swamp to the northwest, and from Highway 17 to Turtle River is designated for short-run residential growth. The area bounded by the Southern Railroad tracks on the west, Highway 99 on the north, swamps on the east and the short-run residential development area on the south is designated for long-run residential expansion.

Saint Simons Island and Jekyll Island are designated for residential resort uses. The remainder of the County is designated for agricultural uses.

In addition to determining the optimum land allocation, the report has made a number of specific recommendations with regard to implementation of the plan, specific land areas, municipal service requirements, and major thoroughfares. These recommendations are compiled in this summary.

General Recommendations for Implementation of the Report

1. A detailed land-use plan should be prepared on the basis of this land allocation analysis.
2. A comprehensive zoning map, based on the land-use plan, should be drawn up.
3. Land sub-division regulations should be up-dated.
4. Building and occupancy permits should be used in land-use control.
5. The use of a long-range capital improvements budget should be considered.
6. Consideration should be given to the use of development-right contracts and a tax reduction program for land-use control.

Recommendations Pertaining to Specific Land Areas

1. The availability of Colonel's Island should be protected for a petroleum refinery.
2. The lower section of Blythe Island should be reacquired from the Navy if possible. It should be used as a long-range industrial district and dock site.
3. Consideration should be given to the need for replacing the bridge on Highway 303 between Blythe Island and the mainland.
4. A long-range study should begin of industrial location potentials of the area in the general vicinity of the intersection of Highways 99 and 25.
5. Consideration should be given to methods of making land available in the central business district. This consideration should include evaluation of
clearing out low-class housing and other structures through urban renewal or other programs.

6. Plans for shopping centers in residential areas should be outlined prior to the development of residential areas.

7. A thorough plan for meeting service requirements and transportation needs is particularly important in the area designated for short-range residential growth.

8. A preliminary study should be made of the area designated for long-range industrial growth with respect to major highway needs.

9. The production of certain agricultural products, such as milk, vegetables, and fruits should be encouraged in the region designated for agricultural uses.

Recommendations Pertaining to Municipal Service Requirements

1. Means of developing new sources of water should be considered immediately.

2. Increased demands for sewage disposal facilities, garbage collection, police and fire protection, and so forth should be assessed and projected.

Recommendations Pertaining to Major Thoroughfare Requirements

1. Highway 303 should be extended eastward to intersect with Highway 17.

2. Highway 99 should eventually be realigned and improved.

3. Consideration should be given to a plan to build a new connector road from Highway 303 on Blythe Island to Fourth Street.

4. There should be periodic studies on the need for other connector highways.
Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword</td>
<td>i</td>
</tr>
<tr>
<td>Summary</td>
<td>ii</td>
</tr>
<tr>
<td>I. Introduction</td>
<td>1</td>
</tr>
<tr>
<td>II. Glynn County's Future Requirements for Urban Land</td>
<td>6</td>
</tr>
<tr>
<td>Projections of Employment in City-Forming Industries</td>
<td>6</td>
</tr>
<tr>
<td>Projections of Population</td>
<td>12</td>
</tr>
<tr>
<td>Estimating Future Urban Land Requirements</td>
<td>13</td>
</tr>
<tr>
<td>III. Recommended Areas for Expansion</td>
<td>15</td>
</tr>
<tr>
<td>Summary of Future Land Needs</td>
<td>15</td>
</tr>
<tr>
<td>Identifying Areas for Future Land-Use</td>
<td>16</td>
</tr>
<tr>
<td>Planning the Areas of Future Land-Use</td>
<td>19</td>
</tr>
<tr>
<td>The Industrial Corridor</td>
<td>19</td>
</tr>
<tr>
<td>The Urban Expansion Area</td>
<td>23</td>
</tr>
<tr>
<td>Residential-Resort Area</td>
<td>26</td>
</tr>
<tr>
<td>Agriculture and Forestry</td>
<td>27</td>
</tr>
<tr>
<td>IV. Implementing the Optimum Land Allocation</td>
<td>28</td>
</tr>
<tr>
<td>Municipal Service Requirements</td>
<td>28</td>
</tr>
<tr>
<td>The Major Thoroughfare System</td>
<td>29</td>
</tr>
<tr>
<td>Controls for the Areas of Future Land-Use</td>
<td>30</td>
</tr>
<tr>
<td>Planning Tools</td>
<td>31</td>
</tr>
<tr>
<td>Long-Range Capital Improvements Program and Budget</td>
<td>32</td>
</tr>
<tr>
<td>Development Rights and Tax Policies</td>
<td>32</td>
</tr>
</tbody>
</table>
I. INTRODUCTION

This report basically is focused on the economic development of Brunswick and Glynn County. Its primary aim is to make recommendations for future patterns of land-use and development so that land can be utilized in the manner that will most surely provide the maximum economic and social benefits to the people of this area.

It must be remembered that three sets of interests are involved in future land-use planning: those of the community as a whole, those of the property-owners in the area, and those of outside industry being sought by the community. Neglecting the interests of either of the first two parties will partially, if not entirely, offset the benefits derived from industrial growth. On the other hand, neglecting the interests of potential new industry will most likely force it to locate elsewhere and thereby seriously handicap the community's economic development.

The specific nature of the problems which arise out of the neglect of any of these interests will be elaborated in the report. However, it seems clear at this point that an early step in planning for economic development is to select the areas of Glynn County which can best be developed for each use, keeping always in mind the interests and needs of all parties concerned.

The urgency of this problem and the need for planned growth may not be immediately obvious. However, the experiences of various communities throughout the United States afford ample evidence that economic growth without planned land-use and development results in much unnecessary reduction in property values, reduction of the overall tax base, and in general the hindrance of economic growth.

A common result of growth without planned land utilization is the development of fringe areas between residential and industrial sections and between residential and agricultural areas. In these situations the two uses of land run together and overlap. Usually there are several unfortunate results from the outgrowth of such fringe areas. There is often an inefficient use of resources in private development. Frequently there is an invasion of outlying areas by urban types of land use with no regard for agricultural soil capabilities. Again, there is a pronounced tendency for residences in fringe areas to become the lowest class of housing.
Perhaps the major justifications for land-use planning are the necessity of preserving private property values, preserving the community's tax base, and insuring adequate agricultural production in the vicinity of a community to meet a substantial proposition of the community's demand for food. It is with the aim of attacking these problems outlined above that this projected land-use analysis for Brunswick has been prepared.

Since the focus of the report primarily is on economic growth, Glynn County's "potential for growth" is first estimated by several methods in order to determine the quantities of land that should be set aside for the various uses. These estimates are made in terms of population and employment and thence in terms of land requirements.

Next, recommendations are made that certain sections of the County be reserved for special types of activity. In selecting sections for the various land-uses, the land best suited for industrial activity is first identified on the basis of an analysis of the economic resources of the Brunswick-Glynn County area and the soil characteristics of the land itself. Using the industrial sector thus identified as a starting point, the logical areas of expansion and development for wholesale and retail activity, for other commercial activity, for residences, and for resort establishments are then determined. Recommendations are also made with regard to present and future uses of rural land of the County.

Finally there is a discussion of implementing the projected land-use analysis: a short examination of the probable increase in municipal services and a few comments about controls for the areas of future land-use.

It should be emphasized strongly that this report is not intended to be a comprehensive, detailed land-use plan. It is rather a report to the people of Brunswick and Glynn County outlining the basic areas that should be set aside to insure that land will be available to meet the various requirements of growth. This report and previous reports from the Industrial Development Branch have indicated the vast potential for growth that the Brunswick region possesses. It is to assist the City and County to realize the benefits of this growth potential to the utmost degree that this report was prepared.
LAND MAP 2

LEGEND:

- BRUNSWICK CITY LIMITS
- GLYNN CO. CORP. LIMITS
- STREAMS OR WATERWAYS
- RAILROADS
- MINOR ROADS AND STREETS
- EXISTING COUNTY CIRCULATION ROADS
- PROPOSED COUNTY CIRCULATION ROADS
- MAJOR HIGHWAYS
- PROPOSED INTERSTATE ROUTE

GLYNN COUNTY

SCALE IN MILES

PROPOSED AREAS FOR URBAN EXPANSION
LEGEND:

- BRUNSWICK CITY LIMITS
- GLYNN CO. CORP. LIMITS
- STREAMS OR WATERWAYS
- RAILROADS
- MINOR ROADS AND STREETS
- MAJOR HIGHWAYS
- EXISTING COUNTY CIRCULATION ROADS
- PROPOSED COUNTY CIRCULATION ROADS
- PROPOSED MAJOR HIGHWAYS
- PROPOSED INTERSTATE ROUTE

LAND USE SYMBOLS:

- AGRICULTURE AND FORESTRY
- RESORT-RESIDENTIAL

PROPOSED AREAS FOR RESORT AND AGRICULTURAL EXPANSION
II. GLYNN COUNTY'S FUTURE REQUIREMENTS FOR URBAN LAND

The factors which govern the growth of a community are primarily economic ones. Indeed, the key to all forecasts of total employment, population and land-use requirements in Glynn County is to be found in the County's success in attracting new industries of the city-forming type. Such industries are not found distributed uniformly throughout a region or a country; rather they typically serve wide market areas from a few central locations chosen for a particular resource or combination of resources. The growth of this type of industry around such a combination of resources causes the clustering together of a labor force and thus results in a center of population. Other industries and business establishments grow up to serve the needs of the population in and near this cluster and to serve the city-forming industries. The income of the community grows proportionately. By this process the growth of a community occurs, creating the need for additional urbanization of land to be used for homes, for business, and for industry.

Projections of Employment in City-Forming Industries

The quantitative estimates of a community's future urban land requirements--those for new homes and business--quite naturally depend on future estimates of population of the community. These in turn depend on estimates of the rate of attracting new city-forming industry as previously explained. The growth of existing industry is also of great importance. Therefore, the first step in predicting urban land requirements must necessarily be forecasting future increases of employment in city-forming activities and from there, future population. From such forecasts the city-forming industrial land requirements can be estimated directly; the land requirements for additional service industry, commercial establishments, and homes can be determined indirectly.

It is difficult to project statistically future levels of employment in city-forming industries. This type of employment depends on many factors, most of which are not readily expressed in quantitative terms. These factors, include such qualitative characteristics as the decisions of officials of the State government authorities on future development of the State Docks at Brunswick, the aggressiveness and effectiveness of the Brunswick Port Authority and local officials in promoting the Port of Brunswick, the progress of research aimed toward evaluating local mineral resources, the prompt action of City and
County governments to insure the availability of adequate waterfront land for industrial growth and to provide municipal services as expansion occurs, and finally the future general attitude of the community with regards to industrial development.

The forecasts of population and city-forming employment in Glynn County are made first by two descriptive methods. First, the adjusted employment in city-forming industries in Glynn County has been plotted on a graph. These employment figures have been adjusted by multiplying the actual number of workers in each industry by an index based on average wages paid in that industry in 1957. This adjustment is made to reflect the fact that workers in high-wage industries have more money to spend and therefore have a greater economic impact on a community than workers in low-wage industries. This adjustment makes the employment estimates more useful for later analysis.

Using these data as a guide, four trend lines are fitted to represent the reasonable possibilities as to the rate of growth of city-forming employment. (See Chart I.) From these curves four estimates of city-forming employment are obtained for each of three years: 1960, 1965 and 1970. It is believed that the four estimates include the extremes which can be expected for these years. The results of these four estimates, labeled A, B, C, and D in ascending magnitude, are shown below, together with adjusted city-forming employment in 1950 and 1957:

<table>
<thead>
<tr>
<th>Year</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>1,960</td>
<td>1,960</td>
<td>1,960</td>
<td>1,960</td>
</tr>
<tr>
<td>1957</td>
<td>3,290</td>
<td>3,290</td>
<td>3,290</td>
<td>3,290</td>
</tr>
<tr>
<td>1960</td>
<td>3,725</td>
<td>3,900</td>
<td>3,900</td>
<td>4,110</td>
</tr>
<tr>
<td>1965</td>
<td>4,340</td>
<td>4,850</td>
<td>5,050</td>
<td>5,950</td>
</tr>
<tr>
<td>1970</td>
<td>4,700</td>
<td>5,560</td>
<td>6,970</td>
<td>8,600</td>
</tr>
</tbody>
</table>

The second descriptive method of estimating city-forming employment involves the use of several models of the structure of city-forming industry in Glynn County in 1970. Six models have been prepared, based in part on an analysis of the present and potential resources of the Brunswick area and in part on basic research by the Industrial Development Branch on the industry-attracting resources of Georgia and the Southeast. (See Page 9.)

1/ 1950 data are included in the table as a basis for comparison.
CHART 1
PROJECTIONS OF ADJUSTED EMPLOYMENT — GLYNN COUNTY

EMPLOYMENT

10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000

ADJUSTED INCOME

Models Depicting Probable Range of City-Forming Industrial Growth by 1970.\(^1\)

<table>
<thead>
<tr>
<th>Model</th>
<th>Industries</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 ore reducing plant</td>
<td>800 employees</td>
</tr>
<tr>
<td></td>
<td>2 other non port-oriented plants</td>
<td>650 employees</td>
</tr>
<tr>
<td></td>
<td>3 other port-oriented plants</td>
<td>300 employees</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>1,150 employees</strong></td>
</tr>
<tr>
<td>2</td>
<td>1 petroleum refinery</td>
<td>600 employees</td>
</tr>
<tr>
<td></td>
<td>1 ore processing plant</td>
<td>200 employees</td>
</tr>
<tr>
<td></td>
<td>2 other non port-oriented plants</td>
<td>650 employees</td>
</tr>
<tr>
<td></td>
<td>3 other port-oriented plants</td>
<td>300 employees</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>1,750 employees</strong></td>
</tr>
<tr>
<td>3</td>
<td>2 ore processing plants</td>
<td>400 employees</td>
</tr>
<tr>
<td></td>
<td>4 other non port-oriented plants</td>
<td>1,300 employees</td>
</tr>
<tr>
<td></td>
<td>5 other port-oriented plants</td>
<td>540 employees</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>2,240 employees</strong></td>
</tr>
<tr>
<td>4</td>
<td>1 petroleum refinery</td>
<td>600 employees</td>
</tr>
<tr>
<td></td>
<td>2 ore processing plants</td>
<td>400 employees</td>
</tr>
<tr>
<td></td>
<td>4 other non port-oriented plants</td>
<td>1,300 employees</td>
</tr>
<tr>
<td></td>
<td>5 other port-oriented plants</td>
<td>540 employees</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>2,840 employees</strong></td>
</tr>
<tr>
<td>5</td>
<td>1 petroleum refinery</td>
<td>600 employees</td>
</tr>
<tr>
<td></td>
<td>2 petrochemical plants</td>
<td>650 employees</td>
</tr>
<tr>
<td></td>
<td>2 ore processing plants</td>
<td>400 employees</td>
</tr>
<tr>
<td></td>
<td>4 other non port-oriented plants</td>
<td>1,300 employees</td>
</tr>
<tr>
<td></td>
<td>5 other port-oriented plants</td>
<td>540 employees</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>3,490 employees</strong></td>
</tr>
<tr>
<td>6</td>
<td>2 petroleum refineries</td>
<td>1,200 employees</td>
</tr>
<tr>
<td></td>
<td>2 petrochemical plants</td>
<td>650 employees</td>
</tr>
<tr>
<td></td>
<td>2 ore processing plants</td>
<td>400 employees</td>
</tr>
<tr>
<td></td>
<td>4 other non port-oriented plants</td>
<td>1,300 employees</td>
</tr>
<tr>
<td></td>
<td>5 other port-oriented plants</td>
<td>540 employees</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>4,090 employees</strong></td>
</tr>
</tbody>
</table>

\(^1\) See page 10 for examples of non port-oriented and port-oriented plants.
The industries which can most likely be attracted to Brunswick can be grouped in two classes: They are:

1. those which will rely on Brunswick's port as a major means of transportation;
2. those which will choose Brunswick as a plant site because of its non-port resources.

The first group includes one or possibly two petroleum refineries and manufacturers of such products as high-grade furniture, asbestos products, ceramic tile, rope, and farm equipment. It also includes plants for smelting and refining various imported non-ferrous ores such as cobalt, chromite, magnesium, and perhaps lead.

A report previously published by the Industrial Development Branch, *A Petroleum Refinery for Brunswick, Georgia*, develops the reasons for the assumption that Brunswick may well become a refinery site. Basically, they rest on the fact that United States consumption of petroleum products, according to the best information presently available, will increase 100 per cent by 1975. Markets for many other consumer goods are likely to experience similar expansion.

The second group includes petrochemicals manufacturers which would be attracted primarily by petroleum refining activity, and plants utilizing mineral resources found in the area in and near Glynn County. The latter might include manufacturers of flat glass, hydraulic cement, titanium dioxide, and/or various chemical products.

The United States average number of employees per plant for each of the industries which are good prospects for a Brunswick location has been determined. Using these averages the increased adjusted city-forming employment for six representative situations is estimated for 1970, together with the total city-forming employment for that date as follows:

<table>
<thead>
<tr>
<th>Model</th>
<th>Increased City-Forming Employment</th>
<th>Total City-Forming Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>1,150</td>
<td>4,440</td>
</tr>
<tr>
<td>Model 2</td>
<td>1,750</td>
<td>5,040</td>
</tr>
<tr>
<td>Model 3</td>
<td>2,240</td>
<td>5,530</td>
</tr>
<tr>
<td>Model 4</td>
<td>2,840</td>
<td>6,130</td>
</tr>
<tr>
<td>Model 5</td>
<td>3,490</td>
<td>6,780</td>
</tr>
<tr>
<td>Model 6</td>
<td>4,090</td>
<td>7,380</td>
</tr>
</tbody>
</table>
These 1970 estimates are generally of the same magnitude as those obtained by the previous method of projection. From these two sets of estimates, a low, moderately low, moderately high, and high composite estimate of city-forming employment in 1970 are made. These are 4,500, 5,500, 6,100, and 7,400 employees respectively. No attempts are made to make employment or population projections beyond 1970 because the methods of projection are at best estimates, and the uncertainties beyond 1970 are so great as to make forecasting past that time of little value.

These four projections can be verified in another manner, using statistical correlation techniques. There is a close relationship in a community between increases in city-forming employment and increases in per capita effective buying income.\(^1\) This has been demonstrated empirically in various localities throughout the country and furthermore is a logically valid relationship. Therefore the city-forming employment in Glynn County from 1950 through 1957 has been correlated with per capita effective buying income and with a time variable.\(^2\) The equation thus derived constitutes a model of the employment-income-time relationships in Glynn County. By making certain assumptions as to the rate of increase in productivity as reflected by increasing per capita effective buying income, forecasts of 1970 city-forming employment are made.

If a rather moderate three per cent annual average increase in per capita income is assumed, the forecasting equation yields a forecast of 5,084 for 1970 city-forming employment, which is between the low and the moderately low forecasts from the methods previously used. A more dynamic, and probably more realistic, four per cent annual average per capita increase in income gives a forecast of 6,796 for 1970 city-forming employment. This falls between the moderately high and the high forecasts made previously.

It should be noted that these statistical estimates of 1970 city-forming employment not only reinforce and confirm the descriptive estimates. More important, the use of the correlative relationship between city-forming employment and per capita effective buying income points out how and to what extent increases in the one are associated with increases in the other. It specifically spotlights the economic benefits to the community that will result from the attraction of additional city-forming industry.

\(^1\) As published by Sales Management in the Annual Survey of Buying Power.

\(^2\) The forecasting equation is \(X_0 = -268.8 + 4.6 X_1 - 7.8 X_2\). The coefficient of variation \((R^2)\) is .955.
Projections of Population

Based on the four estimates of city-forming employment for 1970, population forecasts can now be made.

For the large metropolitan areas of the United States, population estimates have been predicted with reasonable success by correlation techniques, relating the growth of a city to measures of national product or national income. Such a methodology is not at all feasible for forecasting the growth of a community such as Brunswick, so it is from the forecasts of new city-forming employment in the Brunswick community that population forecasts must arise.

Again, two methods of projections are employed. First, it has been found that a close statistical relationship exists between the adjusted employment in city-forming industries in Glynn County and total nonagricultural employment in the County from 1950 through 1957.$^{1/}$ Using the four composite estimates of city-forming employment obtained above, total nonagricultural employment for 1970 is estimated on the basis of this ratio.

Assuming a ratio of three to one for total population to nonagricultural employment, a ratio which has been verified in a rough fashion for Brunswick and similar communities, population forecasts are derived from the estimates of nonagricultural employment. The 1970 Glynn County estimates of city-forming employment, total nonagricultural employment, and population estimates obtained by the method outlined above are shown below:

<table>
<thead>
<tr>
<th>City-forming Employment</th>
<th>Nonagricultural Employment</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>4,500</td>
<td>12,900</td>
</tr>
<tr>
<td>Moderately low</td>
<td>5,500</td>
<td>15,700</td>
</tr>
<tr>
<td>Moderately high</td>
<td>6,100</td>
<td>17,400</td>
</tr>
<tr>
<td>High</td>
<td>7,400</td>
<td>21,100</td>
</tr>
</tbody>
</table>

Research by the Urban Land Institute$^{2/}$ indicates that for the United States as a whole the addition of one worker in a city-forming industry in a given community results in an average increase of seven people in the community. However, in a community of the size of Brunswick where the increases

$^{1/}$ For the eight years the mean ratio of city-forming employment to total nonagricultural employment was 0.35 and the standard deviation only 0.02.

in city-forming economic activity are taking place rapidly and are expected to continue to grow rapidly, this ratio is probably high. This is because Brunswick will for many years continue to depend on the larger communities in the region, such as Jacksonville, for some of its service needs. A six to one ratio is probably more realistic. Therefore, the four estimates of increased city-forming employment are multiplied by six and added to the estimates of Glynn County population in 1957. The results are 1970 population estimates of 44,200, 50,200, 54,600, and 61,500, which agree rather well with the estimates obtained by the first method.

Estimating Future Urban Land Requirements

The Urban Land Institute has also done considerable research on estimating new land requirements resulting from the growth of the industry and population of a community.\(^1\) Table 1 shows the requirements in acreage, by type of urban land-use, for the four city-forming employment estimates in 1970, based on the Urban Land Institute's data.

The estimates do not, of course, include land requirements for city-forming industry itself nor do they consider the changed requirements for agricultural land. The industrial land requirements are discussed just below. The agricultural land requirements are not concerned with a fundamental change in basic type of usage but rather with a change in agriculture practices. For this reason the consideration of agricultural land-use is postponed to a later section of this report.

Estimating city-forming industries' future land requirements is a different matter from estimating future residential and commercial land needs; the latter in a sense depend on the former. The estimates of the land needs of new city-forming industry are made on the basis of the same models used to estimate city-forming employment. On this basis the estimates were very rough, since many new variables enter the picture. Nonetheless, analysis indicates that immediate steps ought to be taken to insure the availability of approximately 3,000 acres of land for industry. In addition, serious thought and planning should be directed toward the eventual need by industry for an additional 2,000 acres if the rate of growth follows one of the optimistic paths that this report has charted, and as growth continues beyond the period considered.

Table 1

Estimated New Urban Land Requirements in Glynn County
by Class of Use, for 1970
(totals acres)

<table>
<thead>
<tr>
<th>Class of Use</th>
<th>Low</th>
<th>Moderately Low</th>
<th>Moderately High</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-family dwellings</td>
<td>240</td>
<td>440</td>
<td>560</td>
<td>820</td>
</tr>
<tr>
<td>Multi-family dwellings</td>
<td>26</td>
<td>48</td>
<td>62</td>
<td>90</td>
</tr>
<tr>
<td>Single-person dwellings</td>
<td>16</td>
<td>29</td>
<td>36</td>
<td>53</td>
</tr>
<tr>
<td>Total Residential</td>
<td>282</td>
<td>517</td>
<td>658</td>
<td>963</td>
</tr>
<tr>
<td>Retail business and offices</td>
<td>16</td>
<td>29</td>
<td>36</td>
<td>53</td>
</tr>
<tr>
<td>Service Industries</td>
<td>20</td>
<td>37</td>
<td>48</td>
<td>70</td>
</tr>
<tr>
<td>Total Commercial</td>
<td>36</td>
<td>66</td>
<td>84</td>
<td>123</td>
</tr>
<tr>
<td>Public and semi-public areas</td>
<td>30</td>
<td>55</td>
<td>70</td>
<td>102</td>
</tr>
<tr>
<td>Public Streets</td>
<td>88</td>
<td>161</td>
<td>204</td>
<td>300</td>
</tr>
<tr>
<td>Total Net Developed Area</td>
<td>118</td>
<td>216</td>
<td>274</td>
<td>402</td>
</tr>
<tr>
<td>(excluding Requirements for City-Forming Industry)</td>
<td>436</td>
<td>799</td>
<td>1,016</td>
<td>1,488</td>
</tr>
</tbody>
</table>
III. RECOMMENDED AREAS FOR EXPANSION

Summary of Future Land Needs

For the purpose of flexibility in planning for future land needs, the areas designated by the projected land-use analysis are broken down into two general classifications: short-range and long-range. Immediate steps should be taken to insure that land is available for orderly development in those areas designated for short-range growth. Less restrictive measures may be utilized in long-range areas to assure continuity of growth in the more distant future.

Planned land-use implies, and indeed requires, active advance planning for servicing areas about to undergo development. If too little land is available for development needs arising from increased economic activity, pressures build up for "spot" locations outside already designated areas, and quite often land prices within such areas rise to uneconomic levels. Furthermore, not only are prices too high but because of unplanned scatter of stores, plants, and services, costs of transportation and communication also rise. Orderly development may thereby be stifled or halted.

On the other hand, designation of too large an area for future use should be avoided to prevent a tendency for development to occur in a spotty fashion within the designated area. Cost of extending streets and utilities and of providing police and fire protection to residential developments that are interspersed with open areas are often prohibitively high.

Therefore, there is a real need to encourage development, whether it be industrial or residential, so that the innermost lands (those within or closest to Brunswick) are developed first wherever feasible, then the land adjacent, and so on out into the County.

The decision involving the quantity of land to fall within the "short-range" category can only be subjective, since there is no specific indicator of the speed with which land so designated will become used. The projected land-use analysis which has been outlined in Maps 1, 2, and 3, uses the moderately low estimates of future land needs from Table 1 to designate land requirements for short-range growth and the high estimates to indicate needs for long-range growth.

The low land requirement figures from Table 1 were not used for delineating future land use areas in order to avoid the dangers of pressure for "spot"
locations and inflated land values. However, the local planning agency may for the sake of continuity of development employ the low figures for planning in the immediate future; those in the moderately low column for planning for intermediate future development; and those in the high column for long-range future development. The refinements can best be determined by the local agency as the nature and extent of development and timing dictate.

A summary of the acreages allocated to each use on the future land-use plan is given below in Table 2. Each land-use category is discussed in detail later in this section.

Identifying Areas for Future Land-Use

The basic purpose of land-use planning is to determine and set aside in use classifications those lands which physical, economic, and social factors indicate as best suited for a particular human activity. Certain kinds of economic activities, for example, are best accommodated when they are located near similar or complementary activities. For example, shopping is facilitated when the various apparel shops and stores are located in the same general area as the central business district. Further efficiency is gained when incompatible uses are prohibited from locating in these areas.

In established, built-up urban areas the selection and definition of classified land-use areas is often a slow process that takes place only over the span of generations. However, good, modern zoning laws can help communities go a long way in a relatively short time toward the final grouping of like uses into compatible areas. The urban renewal processes, slum clearance, urban redevelopment, and rehabilitation have enabled many cities during the past 10 years to speed up the re-grouping of their older land-use patterns.

In looking to future land development, however, every city and county has an otherwise irretrievable opportunity to guarantee its further development into the desired patterns, because raw land is involved. It is this phase of the planning of Brunswick and Glynn County which this report seeks to assist.

Most urban communities have development problems that are related to their natural geography. Some land features actually prevent urban development in a given direction. Others act as barriers for a considerable number of years, while still others temporarily slow the expansion of urban areas. The degree to which all of the land in a community can be put to productive use depends upon two things: first, the amount of interruption in land continuity resulting from the geography of the locale; second, the success of engineering
Table 2

Future Land Use Acreages Shown on Plan
for Glynn County, 1959-1970

<table>
<thead>
<tr>
<th></th>
<th>Short Range</th>
<th>Additional Long-Range</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-family dwellings</td>
<td>440</td>
<td>380</td>
<td>820</td>
</tr>
<tr>
<td>Multi-family dwellings</td>
<td>48</td>
<td>42</td>
<td>90</td>
</tr>
<tr>
<td>Single-person dwellings</td>
<td>29</td>
<td>24</td>
<td>53</td>
</tr>
<tr>
<td>Total residential</td>
<td>517</td>
<td>446</td>
<td>963</td>
</tr>
<tr>
<td>Retail business and offices</td>
<td>29</td>
<td>24</td>
<td>53</td>
</tr>
<tr>
<td>Service industries</td>
<td>37</td>
<td>33</td>
<td>70</td>
</tr>
<tr>
<td>Total commercial</td>
<td>66</td>
<td>57</td>
<td>123</td>
</tr>
<tr>
<td>Public and semi-public areas</td>
<td>55</td>
<td>47</td>
<td>102</td>
</tr>
<tr>
<td>Public streets</td>
<td>161</td>
<td>139</td>
<td>300</td>
</tr>
<tr>
<td>Total public</td>
<td>216</td>
<td>186</td>
<td>402</td>
</tr>
<tr>
<td>Heavy industry</td>
<td>1,500</td>
<td>1,500</td>
<td>3,000</td>
</tr>
<tr>
<td>Other city-forming industries</td>
<td>1,000</td>
<td>300</td>
<td>1,300</td>
</tr>
<tr>
<td>Light industry</td>
<td>500</td>
<td>200</td>
<td>700</td>
</tr>
<tr>
<td>Total industrial</td>
<td>3,000</td>
<td>2,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Total urban land shown*</td>
<td>3,800 acres</td>
<td>2,700 acres</td>
<td>6,500 acres</td>
</tr>
</tbody>
</table>

*Figures are rounded off.
accomplishments in overcoming physical obstacles to expansion. If the kind of land needed for development is scarce, or if the benefits to be realized are in excess of the costs involved in rendering the land useful, greater improvement expenditures may be justified than under normal land improvement situations.

The physical characteristics of the land of the Brunswick area assist development in one sense and hinder it in another. From the standpoint of service by water transportation, Brunswick is almost ideally situated. This fact should serve as the basis of much of the future growth of the entire area. However, with respect to physical accessibility by motor and rail transportation and utilities, the topography presents problems.

Furthermore, the Brunswick River, the East River, Turtle River, and the Marshes of Glynn all are barriers to the uninterrupted growth of Brunswick's present residential areas. Unless expansion of the City crosses extensive marshes and rivers, expansion can only take place toward the north. Perhaps an economic way will be found some day to fill some of the marshlands within or close to the present city limits. For the time being, however, growth must be northward.

Even to the north, Brunswick has a partial barrier to future growth in the Glynco Naval Air Station. This barrier results not only from the Station property itself, but also from need to protect present and future landing and take-off paths.

The point requiring special emphasis is that all further urban expansion requiring services from the City should be carefully controlled in order to avoid land waste resulting from faulty subdivision layout and to maximize property values. The latter aim will be accomplished by extensive planning of areas for extended growth to prevent intrusion of non-compatible uses.

Land can be physically and economically acceptable for a specified use and still be undesirable for other reasons. The orientation of the various uses of land must be such that the needs of the people who live in a community are met with a high degree of efficiency and convenience. Residential areas should provide home sites in well-designed subdivisions that are close to neighborhood shopping facilities, recreation areas, and schools. They should also be accessible to traffic arteries leading to the downtown business district and fairly convenient to places of employment.
In addition, non-residential uses of land in residential areas should be carefully restricted. Failure to do this results in the generation of additional traffic in the residential areas, adding unnecessarily to congestion.

A neighborhood should be well defined by the principal streets or streams that bound it, and within these boundaries, only those auxiliary uses that are "residential" in character, such as churches, schools, and play areas should be permitted. Certainly no industry or community-wide business should be permitted, and streets which might attract through traffic should be avoided. Shopping facilities should be located on one of the bordering streets, preferably where they could also serve another neighborhood.

Planning the Areas of Future Land-Use

Having established the basis of identifying the areas of future land-use, the next task is to pinpoint the location of these areas, to plan for their development, and to devise measures which will assure the proper carrying out of these plans. Since planning and plan implementation require time and detailed local knowledge, no attempt can be made here to undertake more than a general discussion of the basic factors necessary to achieve the broad goals of the overall plan presented here.

The Industrial Corridor

The area shown on Map 1 for industrial development forms an industrial "corridor" that may well be unequaled anywhere in its potentialities to accommodate a high-level industrial base. Its development not only should bolster the economy of the City and County and thus generate rapid urban expansion, but should also contribute significantly to the State's economy as well. The industrial corridor has these further advantages: (1) it is wholly accessible to water transportation, although it is doubtful that all of it need be; (2) practically all portions of the corridor can be made readily accessible from adjacent or nearby roads; (3) there is sufficient land in the corridor to meet all anticipated needs of industry by 1970; and (4) generally speaking, it can be reached with ease from all parts of the County. The greatest difficulty at present is the lack of rail service to most of the land in the corridor. Such service will undoubtedly be provided when the location of industry in the corridor demands it.
Industrial Area 1. The land designated for industrial use on Colonel's Island is the high land--approximately 2,500 acres--and should be zoned for "heavy industry" and associated uses. (See Map 1.) As reported previously in the petroleum refinery feasibility study, this site should be reserved for a petroleum refinery. Since a minimum of 1,500 acres is required for a refinery, some of the total land available may not be needed for this purpose. This can be determined only after negotiations for the site are completed. The remaining acreage, however, should be retained and planned, in conjunction with the refinery layout, for industrial uses that will either serve the refinery, make use of its products, or assist in its operations. Eventually, a highly efficient chemical complex may be located here.

Adjacent marshlands should also be zoned for heavy industry with the stipulation that they may be used in the interim for agricultural purposes only. This will serve to protect these areas for future industrial uses in the event that an economic method of rendering them usable is discovered. It will also insure that they are not used in a manner which is incompatible with the proposed use.

Industrial Area 2. The second area shown on Map 1 is Blythe Island, which contains some 3,000 usable acres. However, only that undeveloped portion which is now held by the U. S. Navy (about 1,600 acres) is recommended for immediate consideration.

A definite effort should be made to determine whether or not this site can be obtained from the Navy. If so, steps to effect the transfer to the City and County should be taken as quickly as possible.

For industrial purposes, this area constitutes perhaps the best site for a full-scale planned industrial district. It is served by an important connector route, State Highway 303, which is likely to assume even greater importance in the future. It is also serviceable by water transportation from Turtle River and probably can be served by rail when necessary. Even more important, the land can be entirely utilized, with a long frontage for docks and shipping.

Should the above area be available, it should be incorporated along with the remainder of Blythe Island into the City of Brunswick so that it can be served by municipal water and sewer facilities--the latter within limitations of a future treatment and disposal system, of course.

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served by municipal water and sewer facilities--the latter within limitations of a future treatment and disposal system, of course.

One of the chief advantages of a planned industrial district is its attraction of small and medium-sized manufacturing and other firms which must rely upon domestic water supplies and sewage treatment facilities. Unless such services are offered, these firms very often cannot locate advantageously.

There should be a study of highway connections to Highway 303 and all major circulatory and access roads south of Highway 303 on Blythe Island. The redesign of the present bridge to carry heavier vehicles and volumes of traffic, as well as to permit shipping to pass up and down the Turtle River will also be necessary. However, redesign of the bridge should come only after studies have been made to see whether Highway 303 could be re-routed across Turtle River to a more direct connection with U. S. Highway 25.

This industrial district should be planned for light and medium industrial uses, including service industries such as warehousing, wholesaling, and distributing. One area could be planned for light industry and another for medium-sized industries; or, the entire area could be planned to accommodate both types without reference to special locations for each. In either case, about 500 acres should be required for light industry, and 900 acres for medium-sized industries. The remaining 200 acres can be used for shipping docks, roads, and so on.

As in heavy industry zones, planned industrial districts should provide for industrial service business. In addition, employee service establishments, such as restaurants, barber shops, banks, and the like, should be provided for.

Should the Blythe Island Naval Reservation not be available for redevelopment, Industrial Area 4 or 5 might possibly be considered for a planned industrial district instead. These two sites are discussed later.

Regardless of the status of the Blythe Island Naval Reservation, the portion of Blythe Island north of Highway 303 should be zoned as a planned industrial district for long-range needs. Since portions of this area, estimated at between 1,500 and 2,000 acres, are already developed with residences or other uses, it should be designated only for long-range industrial use. The same characteristics discussed above apply to this section of the Island, thereby making it a choice location for port-oriented as well as non port-oriented industries.

Zoning of this land should include all of the land bounded by the Brunswick and Turtle Rivers, omitting, of course, the Naval Reservation in the event that it is unobtainable.
Industrial Area 3. The Hermitage Point area, lying north of Turtle River and between Buffalo River and Cowpen Creek, comprises Area 3. It has an advantage possessed by none of the other sites. It is already served by the Atlantic Coast Line Railroad and has advantages of access by water and highway. It is presently undeveloped and can therefore be used immediately.

Since heavy industry requires more land for its operations than light industry, more land needs to be set aside for it. Area 3, therefore, should be zoned for heavy industry, particularly of the type that requires both rail and water transportation.

Usable land in Area 3 is estimated at about 800 acres. By diverting Oakgrove Creek into the Buffalo River, and by some extensive land fill, this site might be consolidated and enlarged considerably, making it equally as valuable as the lower portion of Blythe Island.

Industrial Area 4. The large area in the general vicinity of the intersection of State Highway 99 and U. S. Highway 25 is designated for long-range industrial use for several reasons.

First, it can be served by two railroads, as well as by two roads affording access to the City and to all parts of the County. It will also be within easy access to the proposed Interstate Route, provided Highway 99 is improved as a first-class road and an interchange is built.

Second, much of this site is presently occupied by various residences and businesses which are in generally poor condition. Improvement of Highway 99, discussed later in connection with the major highway system, would make the land too valuable for the continuance of these structures. The County, therefore, should develop plans for acquiring and clearing the land of these structures prior to the time when this site will be needed for industry.

Third, the portions of this site not now developed should be reserved for industries requiring sites in advance of the availability of locations within Areas 1, 2, or 3.

Fourth, some of this site may be needed in case the Blythe Island Naval Reservation is unobtainable and some of it may be needed in connection with Area 3.

For these reasons, early detailed study of and the development of plans for Area 4 should be accomplished, taking into account the potentials of Area 3. The study should aim toward refining the boundaries shown on Map 1 so as to include only those existing structures which it will be feasible to remove, and

-22-
to assure that no residential or other structures would remain to interfere
with or to be adversely affected by any industrial development occurring within
the area.

In the meantime, the entire site should be zoned for industry as a protective measure until detailed studies and plans can be worked out.

Industrial Area 5. This area is a possible alternative to any of the other industrial sites discussed above, if soil tests reveal sufficient soil bearing capacity. With extensive dredging of Turtle River, some of this area can be served by water transportation. It is also served by two branches of the Atlantic Coast Line Railroad, and by State Highways 32 and 99. There is ample space here to accommodate a petroleum refinery, or any of the largest industrial land users, with enough space left over for several industrial parks for light industry.

All of the above industrial sites represent the land in the County which could best accommodate industry. No attempt should be made to zone any more than is recommended herein, and only those portions of Areas 4 and 5 which are determined by local study to be necessary for emergency or for long-range use should be zoned. In this connection, it should be borne in mind that industrial sites for relatively small firms are now available in the area designated for short-range urban growth. Some smaller firms can be expected to locate therein, particularly those firms which do not need direct port shipping facilities and those which have no particular interest in locating in a planned industrial district. The zoning of land for industry should therefore be scaled to a realistic estimate of short-range and long-range need. The decision to reserve industrial land for post-long-range needs should be accomplished by zoning such land for industry and restricting its interim use to agriculture.

The Urban Expansion Area

The three general areas of urban expansion are:

1. the present Brunswick urban area,
2. the short-range area of Brunswick's urban growth, and
3. the long-range area of Brunswick's urban growth.

Urban Area 1 (the Central Business District). The heart of any urban area is its central business district. As residential population grows and as industry expands, the central business district must keep pace if it is to grow into an effective regional shopping and business center. Such characteristics as compactness of the district, quick access from outlying as well as
close-in areas, and ample off-street parking must be planned in advance of growth if the district is to expand properly.

Compared to amounts of land required for residential and industrial growth, the business district requires little land for its growth. The very nature of the CBD (central business district) requires that it be compact so that the people doing business there can walk from the parking area to their places of business and from store to store without moving their automobiles. Moreover, as the CBD grows, the uses of land within it will become more and more selective. This process of selectivity makes the land too expensive for certain kinds of business activities, while other business activities can take over the vacated land and buildings and operate economically.

Therefore, in discussing land needs, only two kinds of land need be considered with respect to the CBD:

1. land adjacent to the district, and
2. land within the district which now may be occupied or vacant but which will change in character, resulting in a higher, more profitable, use.

Proper planning of the CBD can make available a surprising amount of land to meet short-range requirements. For example, many residences, a large number of which are dilapidated, can be eliminated and replaced with business buildings. In fact, it is common practice now to work toward the elimination of all dwellings within defined boundaries of central business districts. A close inspection of the uses of land in Brunswick's central business district reveals a considerable amount of vacant land, although it is not enough to meet short-range needs.

Another growing practice is to eliminate eventually all frame structures and other "fire traps" so as to provide land for more economic business enterprises.

Finally, areas immediately adjacent to defined CBD boundaries are almost always found to consist of slums or blighted buildings. Through urban renewal, these areas can be cleared and redeveloped for business and other uses.

Through all of these processes, evolving from a coordinated plan, more than enough land for expansion of the CBD can be made available. The plan for the CBD should also take into account the need for neighborhood shopping centers. As the CBD grows, the sale of convenience goods will find a lesser place there, and such businesses as grocery stores, drug stores, and the like will need to be located outside the district in order to serve their customers more...
conveniently. In fact, it would be unwise to allow business establishments
which do not serve the whole community to be located in the CBD and cause it
to sprawl unnecessarily. As growth continues, higher land values in the cen-
tral business district will tend to prevent this. Such new establishments as
super markets, service stations, variety stores, and similar firms should be
situated in residential shopping centers rather than being allowed to create
unnecessary congestion in the central district.

In planning for future business locations it is important to employ the
concept of business centers. All businesses are traffic generators and any
use that generates traffic unnecessarily is detrimental to residential areas.
In fact, such traffic generation very often can greatly interfere with industr­
ial operations by delaying truck movements and increasing the traveltime of
employees to and from work. Business establishments, whether of the central
office and shopping goods type, the local or neighborhood convenience goods
type, or the general commercial type, should be grouped in centers according
to function. This is more easily accomplished in the CBD than in neighbor-
hoods that are already developed. Provision for neighborhood centers must
therefore be made in advance of development of residential areas. Modern zon-
ing practice makes this provision.

Urban Area 2. The area designated for short-range urban growth has al-
ready developed to a substantial extent and there is a need for detailed study
and planning before further growth occurs here. The maze of railroads, roads,
highways, and local streets, most of which follow random routes, points to a
serious need for appraisal and probable replanning of this entire area to
assure its development with an optimum of efficiency. Along with this study,
effects of the location of the proposed Interstate Highway also should be
given attention. Its pre-emption of land, the need for access roads and an
interchange, and its effect on the development of the area should be appraised
well in advance of either the final design of the highway or of further de-
velopment in the area. If the expected short-range growth is to be accommo-
dated in this area, immediate and detailed planning is essential.

On the other hand, if the City should find it had no recourse but to pro-
vide urban services to this area after it has developed further along its
present pattern, the cost of such services will likely be almost prohibitive.
Moreover, if development continues as in the past, it is probable that only a
fraction of the growth expected in the near future can be accommodated here.
This means that the remainder of this growth would have to take place in the area designated for long-range growth. The resultant sprawl would hasten the time when little land suitable for economic expansion of Brunswick's urban services is left in the County.

**Urban Area 3.** This is the area designated for Brunswick's long-range growth needs. It should be reserved for urban development until such time as Area 2 is about 90 per cent developed, in order to postpone the incurrence of the high cost of extending utilities and other services long distances. Nevertheless, some preliminary planning for this area should be done now with respect to major highways. This will be discussed later in the section dealing with the major thoroughfare system.

All of the above urban areas should be devoted predominantly to residential development, along with the customary uses associated with residential neighborhoods: churches, schools, playgrounds and parks, shopping centers, and the like. Locations for small industries should be carefully selected, but emphasis should be placed on good subdivision design.

**Residential-Resort Area**

Since Jekyll Island is State-owned, it is out of the planning jurisdiction of the City and County. But its drawing power for tourists and vacationers should be recognized for its present and potential importance to the economy of the area. In this respect the County should cooperate with the State to assure that the development aims of the Jekyll Island Authority are carried out with the least possible interference from developments elsewhere in the County.

In this respect, the area immediately west of Colonel's Island, lying between the South Brunswick and Little Satilla Rivers and extending beyond the intersection of U. S. Highway 17 and State Highway 50, needs careful study. Residential subdivision of the land has already occurred here, and some rather expensive homes have been built. If a petroleum refinery locates on Colonel's Island, the area in question might become undesirable for residences. On the other hand, developments such as businesses and amusements that would be complimentary to the attractions of Jekyll Island might be ideally located in this section, leaving most of the land on Jekyll available for housing accommodations. This type of development would not constitute a conflicting use with respect to industrial operations on Colonel's Island. The County should consider this problem before permitting further development at this location.
Saint Simons Island should be zoned only for residential and resort-oriented uses, except for the airport area and the present business uses on the Island. The only new industrial firms that should be permitted are those which will locate in the vicinity of the airport and depend on air transportation. No business establishments or industries should be permitted elsewhere on the Island except those directly related to resort activities, so that a maximum of residential development can take place.

Agriculture and Forestry

The remainder of the County has been designated for agricultural and forest uses. (See Map 3.) While a substantial portion of this area is presently in forest, relatively little of it is being devoted to agriculture. As Brunswick's urban area grows, however, agriculture should play a more important part in the economy of the area. More and more dairy products, as well as fresh fruits and vegetables, will be needed. To the extent that these will not have to be imported over long distances and in large quantities, local production will result in savings to the community. Furthermore, local production of agricultural products will provide a balance between industry, business, and agriculture that will lend stability to the economy of both the City and the County.

The land so designated should be reserved only for agriculture and forestry. Otherwise, other developments can break up needed tracts and make them unusable for agricultural purposes.

In general, the marsh lands along the Inland Waterway have not been designated. Whether or not these marshes could be put to some economic use is pure speculation. However, tests and studies of the soils on these and other marshes can and should be made to resolve such questions as whether they are suitable for growing crops that could be exported on a large scale, such as lettuce, cauliflower, and perhaps certain varieties of flowers. Such tests and determinations can be made by the Coastal Plain Experiment Station at Tifton, Georgia.
IV. IMPLEMENTING THE OPTIMUM LAND ALLOCATION

While laying out the areas of future expansion is, of course, the basis for a future land-use plan, full implementation of it is quite another matter. A well-ordered time schedule taking into account the legal methods of postponing as well as encouraging area development must be worked out in considerable detail. The continually increasing demands for more and better municipal services, additional streets and highways, and the capital means of supporting such interests must be met and solved before the potentials compounding a well-defined land-use plan can be effectively realized.

Municipal Service Requirements

It is neither the purpose nor the intention of this report to consider in detail the increased demands for local services which the growth of Brunswick and Glynn County will generate. However, since the predicted increases in industry and population will greatly increase service demands on the City and County governments, the more obvious needs of this sort should be mentioned briefly. It should be noted that officials of both the City and the County governments for some time have recognized and anticipated these problems and are actively planning for their solution.

Glynn County consumes more fresh water per day than any other county in the State. In 1956 about 80,000,000 gallons per day were pumped, over 90 per cent of which was used by Brunswick Pulp and Paper Company, Hercules Powder Company, and the Solvay Process Division plant. In the past, the needs for water have been met adequately by ground water resources of the Coastal Plain, but certain recent findings of geological research groups indicate that ground water resources may not be ample to meet future needs.

In the period from 1948 through 1957 ground water levels dropped between 10 and 20 feet in Glynn County. Moreover a sizeable basin has developed in Glynn County. (The term "basin" refers to an area where the ground water level has dropped more rapidly than in surrounding counties.) Corroboration of the fact that water levels already may be dangerously low is found in the fact that recently water from certain wells in the vicinity was found to contain salt.

Many of the industries which are most likely to select Brunswick as a site are large consumers of water; the chemicals and petroleum industries are
notable examples. Consequently it is most important that City and County officials continue to consider means of developing new sources of water. The most obvious of these is a pumping station and purification plant to obtain water from the Altamaha River. It is not stating the case too strongly to assert that the growth of Brunswick and Glynn County may be substantially impeded if such steps are not taken.

The problem of sewage disposal may also become a troublesome one in the near future. Septic tanks are not feasible in certain areas of the County due to soil conditions. If there is a large increase in the amount of sewage which the municipal sewer system dumps untreated into East River, a serious health problem may arise. With the sizeable population growth which is anticipated it seems certain that a sewage treatment plant will be required.

Increases in other services provided by local governments will also be needed. Demands for garbage collection, police and fire protection, street construction and maintenance, will all increase proportionately with population increases.

The increase in all these services requirements is mentioned only because different uses of land result in different service needs. The types and extent of services required for particular uses of land are one determining factor in planning for future growth and must be considered for these purposes.

The Major Thoroughfare System

Most of the existing highways in Glynn County are radial, in that they extend outward from Brunswick to the north, northwest, and west. Only State Highways 303 and 99 connect any of these radial routes. Highway 99 is not usable as a County connector route because it is unsurfaced. This report recommends that Highway 303 be extended eastward to intersect with U. S. Highway 17, and that Highway 99 be realigned and improved. The extension of Highway 303 should be planned and accomplished as soon as possible, so that as further development occurs in Urban Area 2 and on Blythe Island, proper controls can be exerted to protect it as a major connector route. The precise location of its intersection with Highway 17 with the proposed Interstate Highway. It is important that this intersection be determined before the final design of the interchange.
The possibility of connecting a new connector route with Highway 303 on Blythe Island and with Fourth Street should not be overlooked. Depending upon the speed and nature of industrial development in the lower part of the Industrial Corridor, such a route affording better access to the CBD may become essential.

As industrial and urban development progress outward from Brunswick, other cross-routes or connector roads will become necessary. One such road is proposed to run just south of the Glynco Naval Air Station. Others will be needed northward at a later time. (See Maps 1-3)

The improvement, minor relocations, and extension of Highway 99 are seen as long-range needs. However, the State Highway Department will need to know of the County's plans for this route in order that proper interchanges and access roads can be designed into the Interstate Highway before construction begins. Any other major roads contemplated for Urban Area 3 should also be included, along with a general plan for development of that entire area. The Highway Department, if it knows where utility lines will have to cross the path of the Interstate Highway, can provide for this now. If left until the highway is built, installation of such utility lines may be impossible and certainly would be very costly. This also applies to grade separations for future streets passing over the Interstate Highway's right-of-way for the purpose of connecting the two sections of Urban Area 3 that will be separated by the Highway.

Other than the Interstate Highway, the proposed major highway changes shown on Map 1-3 are neither fixed nor complete. They are meant only to indicate needs to be anticipated along with the expected industrial and urban developments. It is recommended, however that sufficient right-of-way be secured for the major circulation routes to assure a minimum of four moving lanes of traffic, since it is contemplated that these roads will be heavily used by trucking, industrial employees, and tourists.

Controls for the Areas of Future Land-Use

Along with the development of a plan for the use of land, controls should also be devised to assure that the land-use develops as intended. There is no implication here that, once drawn up, a plan must be final. The fact is that situations will change as development occurs, necessitating revision of the plan from time to time. However, while the plan must be
flexible to allow for unforeseen developments, the controls must be devised in such a way that the intent of the plan is assured. There are three general types of control that can be utilized to assure accomplishment of the stated objectives: planning tools, such as zoning and subdivision regulations; development rights and tax policies; and capital budgeting. The first method is direct; the second, indirect; and the third is an indirect method of control and at the same time a way of assuring eventual development.

Planning Tools

Zoning has already been mentioned as a land-use control device. To be effective, zoning must first of all be based upon a general land-use plan. The text of the zoning ordinance should reflect present-day development trends, and should provide allowances for possible trends in the foreseeable future. The zoning map should be geared to short-range needs, but should also fulfill the intent of the long-range goals embodied in the general land-use plan. Since the plan will change as development occurs, the zoning ordinance and map also will need to be revised from time to time.

Several zoning measures should be utilized in Brunswick and Glynn County. One of these is the provision for planned industrial districts. Another is the provision for shipping centers. The third is the provision for large-scale housing developments. The matter of industrial performance standards should also be investigated, and where feasible, incorporated in a new or revised zoning ordinance.

Land subdivision regulations are now in use in Glynn County, but there is indication that they also need up-dating. In doing so, serious consideration should be given to recent efforts to incorporate measures that would assist in controlling the timing of development. Such measures can help to prevent subdivisions "leap-frogging" over undeveloped areas and will enforce a more orderly progression of development and utility extensions. Timing of development can also be achieved through other measures. These will be discussed later.

Regardless of how well-conceived it may be, any ordinance or regulation is only as effective as its enforcement. It is therefore important that a well-qualified building inspector be available to issue building permits. Issuing these permits involves a knowledge of the zoning ordinance and map,
the subdivision regulations, the land-use and other plans, and the current land-use policy decisions of County and City officials.

Serious consideration should also be given to the use of "occupancy permits" by the building inspector as a useful tool in land-use control. Modern zoning ordinances make provision for this.

Coordination of planning and development is essential to secure orderly growth. Government-directed developments such as highway location and construction, installation of sewage treatment facilities and sewers, extension of water mains, and port or harbor development, all should be timed to facilitate urban growth where and when it is wanted. In order to be used effectively, the timing of such projects must be based on a careful analysis of the expected effects each project will have upon growth.

**Long-Range Capital Improvements Program and Budget**

When the community's plans are sufficiently far along so that most of the major capital improvements such as those mentioned above are known, a program of construction should be laid out showing cost estimates and the sources of revenue that will cover the costs of construction for each project. The program should be established on a priority basis for each of the coming five or six years, and the current year's capital budget incorporated into the current annual budget. The capital improvements program and budget can then be revised and another year added.

Capital budgeting and programming also involve the timing of construction. Projects which are most desperately needed should be given priority, according to the community's ability to finance them. Frequently, a project may have to be scheduled for several years until sufficient revenues are available. One of the advantages of the capital program is that political pressures favoring a project of lower priority are pacified when it can be shown that that project is on the program, although it may not be scheduled for four or five years.

**Development Rights and Tax Policies**

A method of controlling land-use which has been in very little use in the United States, but which is gaining favor, is the purchase of development rights. An example would be its application to Urban Area 3, in which the right to develop land would be purchased for a nominal fee from each land owner by the County. When Urban Area 2 became substantially developed, the land owners in Area 3 may reacquire their development rights and develop their
land. In the meantime, their land could be used for agriculture and other temporary uses.

Frequently, where development rights are purchased, a reduction in taxes accompanies the purchase as an incentive for individuals to sell their rights. There are other taxing policies that communities can use to control land-use and development, but most of these have been untried in this country, largely because of the difficulties in overcoming traditional taxing methods. There is always room for pioneering, however, and areas of impending, dynamic growth are usually the first to do so. The whole subject of tax policy, as well as development rights contracts, is so large and intricate that it would have to be the subject of a separate study.

This type of revision in tax policy, the power to purchase development rights, and the use of timing controls in subdivision regulations would probably require State enabling legislation, either in the form of a general act or a special act. These measures have been discussed here in the belief that they all have special merit for Brunswick and Glynn County in view of the potential for truly large-scale industrial and urban development. Only the community itself can decide the value of these measures and take steps to bring them into being.