A STUDY OF BUS TRANSIT PLANNING IN SMALL URBAN AREAS

MARCH 1973 – NUMBER 6

BY
M.S. HERMAN
G.T. SATTERLY, JR.
W.L. GRECCO
K.W. HEATHINGTON

JHRP
JOINT HIGHWAY RESEARCH PROJECT
PURDUE UNIVERSITY AND
INDIANA STATE HIGHWAY COMMISSION
Final Report

A STUDY OF BUS TRANSIT PLANNING IN SMALL URBAN AREAS

TO:    J. F. McLaughlin, Director
        Joint Highway Research Project

FROM:  H. L. Michael, Associate Director
        Joint Highway Research Project

March 27, 1973

The attached Final Report titled "A Study of Bus Transit Planning in Small Urban Areas" has been authored by Messrs. M.S. Herman, G. T. Satterly, Jr., W. L. Grecco, and K. W. Heathington. The research and preparation of the Final Report was sponsored by the Urban Mass Transportation Administration of the Department of Transportation through a program of Research and Training in Urban Transportation funded at Purdue University in the School of Civil Engineering.

The attached copy of the Report has been duplicated by the Joint Highway Research Project and is presented to the members of the Advisory Board as information of interest and value to the transportation functions of that body.

Respectfully submitted,

Harold L. Michael
Associate Director

HLM:ms

cc:  W. L. Dolch  M. L. Hayes  C. F. Scholer
     R. L. Eskew  C. W. Lovell  M. B. Scott
     W. H. Goetz  G. W. Marks  J. A. Spooner
     M. J. Gutzwiller  R. D. Miles  N. W. Steinkamp
     G. K. Hallock  J. W. Miller  H. R. J. Walsh
     R. H. Harrell  G. T. Satterly  E. J. Yoder
Final Report

A STUDY OF BUS TRANSIT PLANNING IN SMALL URBAN AREAS

by

Michael S. Herman, UMTA Trainee
Gilbert T. Satterly, Jr., P.E., Research Engineer
William L. Grecco, P.E., Research Engineer
Kenneth W. Heathington, P.E., Research Engineer

School of Civil Engineering
Purdue University

This report was produced as part of a program of Research and Training in Urban Transportation sponsored by the Urban Mass Transportation Administration of the Department of Transportation.

The results and views expressed are the independent products of University research and are not necessarily concurred in by the Urban Mass Transportation Administration of the Department of Transportation.

Purdue University
West Lafayette, Indiana
March 27, 1973
ACKNOWLEDGMENTS

In conducting this study numerous persons and organizations provided information and assistance to the authors. It is the authors' wish to recognize all those who have contributed, however, it is possible that someone might be missed and for this the authors are truly sorry.

Appreciation is also expressed for the following persons for discussions which aided greatly in the study: John B. Schnell, Director of Research, American Transit Association; and Phillip McBride, General Manager, Greater Lafayette Public Transportation Corporation.

Appreciation is expressed for the numerous consultants and planning organizations throughout the United States that have provided publications. The organizations are listed in the bibliography and general references.

The authors are also thankful for the assistance of the following persons in the preparation of the manuscript: Mrs. Marian Sipes, Secretary for the Joint Highway Research Project, Purdue University; and Mrs. Virginia I. Cunningham, who typed the final manuscript.
Even though the study is based on the material and advice provided by many contributors, the responsibility for content remains solely with the authors.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF TABLES</td>
<td>vii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>viii</td>
</tr>
<tr>
<td>SUMMARY</td>
<td>1</td>
</tr>
<tr>
<td>HOW TO USE THIS STUDY</td>
<td>2</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>3</td>
</tr>
<tr>
<td>CHAPTER I. MANAGING THE STUDY</td>
<td>6</td>
</tr>
<tr>
<td>Consultant to Conduct Study</td>
<td>11</td>
</tr>
<tr>
<td>City to Conduct Study</td>
<td>14</td>
</tr>
<tr>
<td>Establishing Committees</td>
<td>17</td>
</tr>
<tr>
<td>Policy Committee</td>
<td>17</td>
</tr>
<tr>
<td>Technical Committee</td>
<td>17</td>
</tr>
<tr>
<td>Citizens Advisory Committee</td>
<td>18</td>
</tr>
<tr>
<td>Study Group Organization</td>
<td>20</td>
</tr>
<tr>
<td>Notes</td>
<td>21</td>
</tr>
<tr>
<td>Selected References</td>
<td>21</td>
</tr>
<tr>
<td>CHAPTER II. ESTABLISHING GOALS, OBJECTIVES, AND CRITERIA FOR EVALUATION</td>
<td>23</td>
</tr>
<tr>
<td>Establishing Transit Goals</td>
<td>25</td>
</tr>
<tr>
<td>Who Should Establish Goals and Objectives</td>
<td>28</td>
</tr>
<tr>
<td>Considerations in Establishing Transit Goals and Objectives</td>
<td>30</td>
</tr>
<tr>
<td>Notes</td>
<td>37</td>
</tr>
<tr>
<td>Selected References</td>
<td>37</td>
</tr>
<tr>
<td>CHAPTER III. DATA COLLECTION AND ANALYSES -- EXISTING SYSTEM</td>
<td>39</td>
</tr>
<tr>
<td>Origin and Destination Data of Riders</td>
<td>42</td>
</tr>
<tr>
<td>Data Collection</td>
<td>47</td>
</tr>
<tr>
<td>Coding and Tabulation of Data</td>
<td>53</td>
</tr>
<tr>
<td>Rider Characteristics</td>
<td>55</td>
</tr>
<tr>
<td>System Characteristics</td>
<td>57</td>
</tr>
<tr>
<td>Notes</td>
<td>64</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS (continued)

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV.</td>
<td>POTENTIAL RIDERS AND AREA CHARACTERISTICS.</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>Types and Sources of Data</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>Land-Use Data</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>Land-Use Classification System</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>Land-Use Classification Manual</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td>Notes</td>
<td>79</td>
</tr>
<tr>
<td>V.</td>
<td>FORECASTING AND DATA PRESENTATION</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Data Presentation</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>Notes</td>
<td>87</td>
</tr>
<tr>
<td>VI.</td>
<td>SYSTEM DESIGN AND ANALYSIS</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td>Hardware Alternatives</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td>Organization Alternatives</td>
<td>98</td>
</tr>
<tr>
<td></td>
<td>Developing Alternative Transit Systems</td>
<td>101</td>
</tr>
<tr>
<td></td>
<td>Notes</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>Selected References</td>
<td>113</td>
</tr>
<tr>
<td>VII.</td>
<td>SELECTION OF ALTERNATIVE</td>
<td>114</td>
</tr>
<tr>
<td></td>
<td>Selected References</td>
<td>117</td>
</tr>
<tr>
<td>VIII.</td>
<td>IMPLEMENTATION</td>
<td>118</td>
</tr>
<tr>
<td></td>
<td>Selected References</td>
<td>121</td>
</tr>
<tr>
<td>IX.</td>
<td>ACQUISITION OF TRANSIT OPERATIONS BY A CITY</td>
<td>122</td>
</tr>
<tr>
<td></td>
<td>Applying for Federal Assistance</td>
<td>128</td>
</tr>
<tr>
<td></td>
<td>Notes</td>
<td>132</td>
</tr>
<tr>
<td></td>
<td>CONCLUSIONS</td>
<td>133</td>
</tr>
<tr>
<td></td>
<td>BIBLIOGRAPHY</td>
<td>134</td>
</tr>
<tr>
<td></td>
<td>General References</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>APPENDICES</td>
<td>143</td>
</tr>
<tr>
<td></td>
<td>Appendix A</td>
<td>143</td>
</tr>
<tr>
<td></td>
<td>Appendix B</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>Appendix C</td>
<td>154</td>
</tr>
<tr>
<td></td>
<td>Appendix D</td>
<td>160</td>
</tr>
<tr>
<td>Appendix</td>
<td>Page</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Appendix E</td>
<td>174</td>
<td></td>
</tr>
<tr>
<td>Appendix F</td>
<td>182</td>
<td></td>
</tr>
<tr>
<td>Appendix G</td>
<td>186</td>
<td></td>
</tr>
<tr>
<td>Appendix H</td>
<td>204</td>
<td></td>
</tr>
<tr>
<td>Appendix I</td>
<td>213</td>
<td></td>
</tr>
<tr>
<td>Appendix J</td>
<td>227</td>
<td></td>
</tr>
<tr>
<td>Appendix K</td>
<td>230</td>
<td></td>
</tr>
<tr>
<td>Appendix L</td>
<td>234</td>
<td></td>
</tr>
<tr>
<td>Appendix M</td>
<td>236</td>
<td></td>
</tr>
<tr>
<td>Notes for Appendices</td>
<td>236</td>
<td></td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table Page
1. Greater Lafayette Bus Company Revenues and Operating Expenses........ 62
2. Summary of Revenue and Operating Expenses Spokane City Lines........ 63
3. 1970 Census Subject Items Compared with 1960 Content.................... 70
4. Trip Table from Greater Lafayette Area Bus Study......................... 86
5. Trip Purpose-Internal Survey Auto Drivers Champaign-Urbana Urban Area Transportation Study.................................................. 88
6. Trip Purpose-Internal Survey Transit Passenger Champaign-Urbana Urban Area Transportation Study.................................................. 88
7. Tampa Transit Trip Purpose by Income....................................... 89
8. Origin and Destination of Industrial Employees in the Schenectady Area.......................... 90
9. Survey of Retired Persons Living in Schenectady Area...................... 91
10. Auto Drivers' Reasons for Selecting Mode of Travel for Work Trip........ 92
11. Summary of Alternatives..................................................... 111
12. Summary of Alternatives..................................................... 112
13. Book Values of UTC Property Involved in Prospective Sale to Rhode Island Public Transit Authority.......................... 124
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Study Organizations &amp; Relationships</td>
<td>19</td>
</tr>
<tr>
<td>2.</td>
<td>Transit Planning Flow Chart</td>
<td>22</td>
</tr>
<tr>
<td>3.</td>
<td>Systems Analysis Process</td>
<td>27</td>
</tr>
<tr>
<td>4.</td>
<td>Hierarchical Interrelationships Among Values, Goals, Objectives, and Criteria</td>
<td>36</td>
</tr>
<tr>
<td>5.</td>
<td>Lafayette, Indiana 1960 Census of Population Enumeration Districts</td>
<td>41</td>
</tr>
<tr>
<td>7.</td>
<td>SDTC Operating Revenue and Operating Expense (1948-1969)</td>
<td>61</td>
</tr>
<tr>
<td>8.</td>
<td>Sample Survey Card</td>
<td>75</td>
</tr>
<tr>
<td>9.</td>
<td>Passenger Revenue - Greater Lafayette Bus Co</td>
<td>83</td>
</tr>
<tr>
<td>10.</td>
<td>Trip Distribution by Time &amp; Purpose (SDTC)</td>
<td>93</td>
</tr>
<tr>
<td>11.</td>
<td>Bus Routes and Coverage (1/4 Mile on Each Side of Route)</td>
<td>94</td>
</tr>
<tr>
<td>12.</td>
<td>Traffic Zone Map Indicating Major Generators Bus Passengers</td>
<td>95</td>
</tr>
<tr>
<td>13.</td>
<td>Organization Chart--Small Firms (10 or Less Buses)</td>
<td>99</td>
</tr>
<tr>
<td>14.</td>
<td>Organization Chart--Medium-Sized Firm (11 to 30 Buses)</td>
<td>99</td>
</tr>
<tr>
<td>15.</td>
<td>Organization Chart--Large Firms (31-100 Buses)</td>
<td>100</td>
</tr>
<tr>
<td>16.</td>
<td>Sample Appraisal of Transit Facilities</td>
<td>125</td>
</tr>
<tr>
<td>Appendix</td>
<td>Figure</td>
<td>Page</td>
</tr>
<tr>
<td>----------</td>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>A1.</td>
<td>San Diego Transit Corporation English Questionnaire</td>
<td>144</td>
</tr>
<tr>
<td>A2.</td>
<td>On-Bus, Self Administered Questionnaire</td>
<td>145</td>
</tr>
<tr>
<td>A3.</td>
<td>On-Bus Survey</td>
<td>146</td>
</tr>
<tr>
<td>A4.</td>
<td>On-Bus Survey Greater Lafayette Area Bus Study</td>
<td>148</td>
</tr>
<tr>
<td>A5.</td>
<td>Sample Load Data Sheet</td>
<td>149</td>
</tr>
<tr>
<td>B1.</td>
<td>Coding Key</td>
<td>152</td>
</tr>
<tr>
<td>B2.</td>
<td>Traffic Zone Map</td>
<td>153</td>
</tr>
<tr>
<td>F1.</td>
<td>Sample Specification Sheet</td>
<td>184</td>
</tr>
</tbody>
</table>
SUMMARY

A need for guidelines covering the methodology for bus transit planning in small urban areas is well documented. This need is further evidenced by the large number of small privately owned bus systems that have been forced out of business due to declining revenue.

This study presents a bus transit planning process and provides alternatives to the city for conducting various phases of the planning process. The information for the guidelines was obtained from current literature, bus transit studies, and discussion with persons active in the bus transit field.

The study can be helpful to an understanding of the conduct of transit studies or the evaluation of studies provided by consultants. In general the information in the report should prove useful to anyone interested in studying the transit planning process for small urban areas.
HOW TO USE THIS STUDY

In reviewing this report the reader should recognize that, while the material presented can be useful in planning, conducting or evaluating a bus transit study it should not be construed to be an official guide to follow nor does it proprot to be all inclusive in its scope.

The study does provide a broad treatment of many facets of bus transit planning. It also attempts to give an insight into many of the actions that an area planning organization should consider or take.

The reader should refer to the Urban Mass Transportation Administration for current information regarding Federal Support Programs.
INTRODUCTION

In the past only the larger cities in the United States were concerned with bus transit planning. Bus transit was necessary in these large cities because of the large number of people dependent upon it and because of the rapidly increasing congestion on the highways which were unable to carry the large number of vehicles in the peak periods.

Many cities under 200,000 population were completely auto oriented and those which had a bus system were not experiencing congestion problems similar to the large cities. Generally, the bus systems in these smaller cities were privately owned and operated and provided efficient service as long as the system was profitable.

This situation has changed in many cities throughout the United States. More and more small privately owned bus systems have been going out of business due to a sharp decline in revenue. Thus, many cities have been forced to take over these faltering bus systems in order to provide service to those people in the community who depend on the system for transportation.

In order for the city to improve the bus system and operate it more efficiently it is necessary to obtain data upon which to base recommended changes. In many cases the
city manager or engineer is put in charge of the study. This may mean that the city conducts its own study or that the manager or engineer oversees a study conducted by a consulting firm.

In either case it requires the manager or engineer to be knowledgeable about transit planning. In many cases the manager or engineer lacks this knowledge and he has to seek information on transit planning, especially what to do and standards to be met. This requires collecting sources and sorting out pertinent information.

A search through any good transportation library would indicate that much has been written concerning transit planning. However, further investigation would show that much of this information deals with planning in the large metropolitan areas. Also, many of the techniques and procedures were developed for use in large metropolitan areas. This does not mean that they cannot be used in small urban areas but in many cases the techniques and procedures must be applied differently.

The main problem with the present information is that in many instances each publication only covers one or two phases of the planning process. For the person in charge of transit planning in the small urban area, this means reviewing numerous publications in order to cover the complete planning process. Not only is this inconvenient but it is confusing; particularly to someone who is not familiar with the transit planning process.
This report studies the information necessary for transit planning in small urban areas generally under 200,000 in population. The contents cover the complete planning process from public acquisition of the transit operations to implementation of the plan.

There are a number of reasons for looking at small urban areas. This appears to be the place where most of the future bus transit planning will be done; for approximately 80 per cent of the existing intracity bus transit operations are located in cities under 200,000 in population. Most of these companies are privately owned and operated. However, as the profit potential of transit declines these companies are forced out of business and cities are forced into the transit business.

It is at this point that the city decision makers need clear, concise, and complete information on the various alternatives available to solve the city's transit problems. This report attempts to discuss the procedures that can provide much of the information. It should be emphasized that the procedures will not make the decisions for the city, rather they will present the necessary information so that the decision makers can decide what path the city should take in solving its transit problems.
CHAPTER I. MANAGING THE STUDY

The purpose of this section is to describe the framework and organization of personnel to conduct a bus transit study. However, before beginning the city must make several major decisions.

MAJOR DECISION #1: Is the city or a consultant going to conduct the study?

This is an important decision for the city as it will determine the organization of the study and the personnel required. This should not be a hasty decision but should be the result of an extensive analysis of the city's personnel and resources. Some of the more important considerations are listed below.

Things to Consider

1. The reasons for conducting the study.

Is there a desire to make minor changes in the existing system or are major changes desired? What are the general goals and objectives of the city in providing public transportation? Is there a need to involve the public and to create more public awareness concerning bus transit?

These are just a few of the questions the city should consider in trying to determine the reasons for a study and what is expected from the study.
2. Does a planning body exist?

The city should look at the personnel in the planning department and the qualifications of each. What type of work has the department done in the past; was it satisfactory? What is the present work load of the department? Could personnel be made available for work on a bus transit study and for how long?

If a planning body does not exist, is there a desire to establish one? Does the state have a planning agency that can provide some assistance?

3. Legal constraints to setting up a planning body.

If a need exists for the establishment of a planning body what are the legal restrictions? What area is to be served by the planning body; city, county, etc? What political areas and agencies will be concerned with the transit study?

4. What facilities and city personnel are available?

Check with all city departments to find out what facilities are available such as computers, calculators, drafting equipment, etc. Check on the work loads of each department to find out what personnel might be available for assisting in a transit study. These personnel would include people from the engineering and various departments such as the welfare and health departments. People with experience in different areas can provide beneficial advice for the transit study. People with experience in the following areas can be
of great help: engineering, planning, sociology, statistics, economics, law, coding and keypunching, drafting, interviewing, and general office work such as typing, shorthand and filing.

Is there a university nearby whose faculty may be consulted and/or facilities used? Are there commercial or industrial establishments that could provide assistance?

5. Has a transportation study been conducted?

This is an important question, for if a study has been conducted within the last five to ten years, it might provide valuable information for the transit study. This information can save the city time and money if it can provide data on the travel characteristics of non-transit users and also data concerning land uses and traffic generators.

A word of caution is necessary here. The city must make sure that the above information is readily available. In many cases only aggregate data is available as a final report. It will be necessary to obtain individual data such as tally sheets and matrix trip tables. In some cases these are included as an appendix to the final report. In any case the city must check to see what information is available.

If the city planning department conducted the transportation study then the information is probably in the planning files. However, if a consultant conducted the study this information may or may not be in his files.
6. Time available for the study.

In general, a consultant can complete a transit study in less time than it will take the city. This should not be surprising since the consultant has the necessary personnel and is organized for this type of work. However, it is false to assume that it will cost the city less if a consultant does the study. In many cases it will cost the city more, and it may take the consultant as long as for the city to conduct the study.

7. Is financial assistance available?

Before deciding who is to conduct the study it would be wise to see what federal or state assistance is available. No matter if the city or a consultant conducts the study, the city might qualify for a technical studies grant from the Urban Mass Transportation Administration (UMTA). A technical studies grant could cover up to two-thirds of the costs for transit planning. Also, if the final study meets the UMTA requirements the city may qualify for a capital grant for the purchase of new equipment, buildings, etc. Since the requirements under which UMTA operates may change from year to year it is best to contact UMTA at the beginning of the study to make sure that the study will fulfill their requirements.

The considerations listed above are not meant to be all inclusive. Rather they are used to help the city set a pattern for its thinking concerning a transit study and who
might conduct it. In some cases the city may do most of the study and contract certain parts, such as the interviewing and data tabulation. In the end the final decision must rest with the decision makers of the city.

Listed below are some of the main advantages favoring the use of a consultant or city personnel for conducting the transit study.

**Advantages of Consultant**

1. It will take less time to get the study initiated and completed.
2. Consultants generally have some of the best professional personnel in the field.
3. Consultants generally have access to the most recent data and techniques used in the planning field.

**Advantages of City Personnel**

1. Generally, the personnel involved are more concerned with the city's transit problems and their solution than is a consultant.
2. The political and social problems that are present in the city and their effects are more evident to the people living within the area.
3. Public awareness and involvement is generally greater than if a consultant conducts the study.
4. After completion of the study the information and techniques used in the study are still available as well as the personnel who conducted the study. This can be helpful in the implementation phase. This is particularly true if changes need to be made in the final plan during implementation.

The above listing is not at all complete but it puts forth the major advantages for having a consultant or the city conduct the transit study. Again it must be emphasized that the final decision rests with the city's decision makers. Their decision must be based on what the city desires and its capability to fulfill those desires.

**Consultant to Conduct Study**

If the city decides to have a consultant conduct the study, then its next task is to choose a consultant.

**MAJOR DECISION #2.** Which consultant should be hired? Choosing a consultant is not an easy task but the following guidelines set forth by the International City Managers' Association should prove helpful.

**Selection of the Consultant**

The first step in securing outside aid is to define the general nature, type, and scope of the problem, list the technical resources available locally, and decide what outside technical services are desired. On the basis of these general specifications, inquiry concerning consulting services can be made of a number of consulting firms and agencies. The firms should be invited to state their interest and availability, and to offer suggestions as to possible modifications of the proposed consulting service program.
Where the consultant expresses interest in the undertaking, he should be required to indicate at least generally how the project would be staffed, scheduled, and otherwise conducted, and to provide appropriate references in jurisdictions previously served and examples of reports prepared as well as estimates of the probable cost of professional services to be rendered. After analyzing replies and making inquiry of references it is advisable to hold interviews with representatives of several firms. The prospective consultants might be asked to cite all projects they have performed rather than a few selected undertakings.

Inquiry could then be made of responsible officials who were in office when the consulting work was done and who have lived with the results of the work. Only in this manner, except perhaps in the case of a limited number of nationally known consultants, can the municipality assure itself that it is likely to receive technical services of the type and calibre which it desires. This checking-up process before consulting services are engaged is highly desirable from the point of view both of the municipality and of any reputable consultant.

Since the city is employing personal services it should be as exacting in employing a consultant as it is in putting a top-level professional person on its payroll. Similarly, from the point of view of the consultant, anything which enhances the municipality's confidence in him or his firm will contribute to a type of working relationship essential to effective consulting services. Also, possible differences over what is expected from whom should be resolved before, rather than after consulting services are formally engaged.

In the course of using consulting services, municipal officials will find it profitable to provide full local cooperation and a maximum of competent local technical participation. This can do much to expedite progress and minimize the cost of outside service. In addition, it provides local employees with useful training opportunities and a valuable knowledge of what was done, when it was done, and what the future operational requirements are. Needless to say, this opportunity should not be wasted by assigning to the consultant any other than capable local technicians.
Competitive Bidding

As in the case of the employment of other types of professional consultants, such as accountants, architects, attorneys, and professional engineers, it is not desirable for the city to obtain formal bids and make the award to the lowest bidder. There are real advantages, however, in securing statements from several consultants first as to the extent and kind of work they would perform, and second as to their estimate of the cost of the services.

Follow-Up

The responsibility for following through on work done by a consultant belongs primarily to the local jurisdiction. Most of the follow-through aspects of an undertaking lie beyond the authority of the consultant, and even the best consulting work can be no more effective than the degree of follow-up exercised by local officials.

The credit for a successful consulting project belongs no more to the consultant than to the public officials who engage him. The objective must be defined clearly, and local officials must recognize project limitations and the capacity of the local staff for work with the consultant, provide the consultant with local facilities that will make for the maximum utilization of the consultant's staff and preferably furnish some local participation of technical grade, make expeditious decisions on those matters which affect project progress, observe the project progress, and make known to the consultant any dissatisfactions.

Above all, the authority and responsibility for making decisions rests with local officials and not with the consultant. Accordingly, local officials must make decisions on all recommendations, accepting them, rejecting them, modifying them, or in some instances establishing a specific schedule and procedure for their reconsideration. Also local officials should make known to the consultant any difficulties encountered in the continued operation of systems which the consultant has developed.

Once the consultant is chosen, the city's main task will be to work with the consultant to make sure the work performed
is satisfactory. The guidelines will be helpful in evaluating the consultant's work. The city still must choose a study director to work with the consultant, and set up its advisory committees. These tasks will be discussed in the next section.

City to Conduct Study

No matter who conducts the study, the following important decision must be made.

MAJOR DECISION #3: Who is to be the study director?

The qualifications of a study director can not be standardized. In general, he must be more of a manager than a technician. However, he should possess some knowledge of the general planning process. Above all he must be able to get along with people and communicate ideas to the politician as well as the technician. Of all the people in the study his job will be the most difficult. He must coordinate the work of all the different departments and agencies. He must act as the communications link between the various committees and the planning group to insure that everyone is informed of the problems and progress of the study group.

The full importance of his job will not be realized until the implementation phase of the study. If he has done a good job of coordinating the work of all groups and informing all persons involved, especially the public, then there should be little opposition to the implementation of the
study recommendations. This has been the problem with many of the studies conducted in the past. They have lacked public support, due to a lack of communication during the study, and have therefore not been implemented.

There are a number of ways of obtaining a study director. Many cities hire a study director and others have appointed a member of the technical committee to be the study director. Generally, the study director's job will be a full time position. This means that it will be difficult to find someone already on the city's staff who will have the time to perform his present duties as well as those of study director.

Another possibility for a study director might be the eventual manager of the transit operation. In many cases where a city takes over transit operations from a private operator, the city must hire a new management team to operate the system. If this is the case, then it might be possible to hire the transit manager to be the study director until the study is completed and the city takes over the operation of the transit system. Many times, when a city takes over a transit system it will make an agreement with the private operator to continue operating the system until the city has time to complete a study and decide what is to be done.

If the new transit manager acts as the study director it will give him an opportunity to become familiar with the
city's personnel and the public. He also will become familiar with all aspects of the study which should aid him in the implementation of the study recommendations when he assumes his duties as the transit manager.

A word of caution should be inserted here. The city must be careful that the study director does not impose his ideas into the study over the wishes of the advisory committees. Although the study director should be impartial in his work he none-the-less occupies a very influential position.

There is much discussion as to whether a local person will do a better job than someone from outside the area. In some cases a local individual can understand some of the political and social problems of the area better but there is also the chance that he may impose his own prejudices on the study group. The individual from outside the area is generally impartial and could bring fresh ideas into consideration, but this may provide the possibility of some of the existing problems of the area being overlooked. Also, he may not have the self interest in doing as good a job as someone who lives in the area and must live with the results.

Obviously, there is no single way of obtaining a good study director. Again, the final decision must rest with the city's decision makers.
Establishing Committees

At the same time and in some cases before the study director has been chosen, the city must set up its advisory committees. There are three committees which are generally used when conducting any type of planning study. These are a policy committee, a technical committee, and a citizens advisory committee. Each of these will be discussed below.

Policy Committee. This committee is made up of elected and appointed officials from all political areas and other agencies affected by the transit study. The committee's function is to set policy and make the decisions concerning the hiring of consultants, the study director and other personnel. Also, this committee reviews the final work and sees that it is presented to the public. In many cases this committee will be set up at the start of the study to make the necessary decisions for the city.

This committee usually appoints a technical committee to advise them on the technical aspects of the study. A citizens advisory committee is also appointed by the policy committee to advise them on the public views concerning the study. Coordination among the various committees and the study group is handled by the study director. There is no set number of people to be on the policy committee. The main thing is to have all sections of the area represented.

Technical Committee. This committee is made up of technical personnel such as city and county engineers, planners
and possibly representatives from state agencies. Anyone with technical ability that might be of help to the study group would be a good committee member.

If the city is conducting the study then the technical committee will work closely with the study group making recommendations about the type of techniques and methods that might be used in conducting various parts of the study.

Generally, each agency and political area represented on the policy committee will appoint members to the technical committee. Not only will this insure a good representation on the technical committee but the technical committee member can then keep his agency or area informed on what is happening and explain the technical aspects of the study.

Citizens Advisory Committee. This committee is made up of people from all parts of the community. Their job is to let the policy committee know what the public wants and does not want in its transit system. The main thing here is to get a good representation of the community's various interest groups on the committee.

The main idea in all the committees is to promote communication between the public, the elected officials, and the technical personnel. Figure 1 shows the study organization and the relationship between the various committees. Hopefully, by communicating between these groups throughout the study the final recommendations will meet the approval of all concerned and therefore have a good chance for implementation.
CONSULTANT CONDUCTS STUDY

CITIZENS' ADVISORY COMMITTEE

POLICY COMMITTEE

TECHNICAL COMMITTEE

STUDY DIRECTOR

PROFESSIONAL CONSULTANT

CONTRIBUTED STAFF

CITY CONDUCTS STUDY

CITIZENS' ADVISORY COMMITTEE

POLICY COMMITTEE

TECHNICAL COMMITTEE

STUDY DIRECTOR

STUDY GROUP

COMPOSED OF PLANNING STAFF AND PERSONNEL FROM OTHER DEPARTMENTS

FIGURE 1
STUDY ORGANIZATIONS & RELATIONSHIPS
Study Group Organization

After the committees are established and the study director chosen, then it is time to set up the study group if the city is going to conduct the study itself. This is the group that will actually perform the study. It is at this point that the policy and technical committees must work with the study director to determine what departments will perform various tasks.

If the city has a planning department, the planning department will generally perform the bulk of the study. However, many parts of the study may be handled by other city departments. Additional personnel might be obtained on a temporary basis from other city departments or hired specifically for the study team. Each department should be contacted to find out what information and personnel will be available to the study group. The technical committee should be helpful in pointing out areas where each city department might be of help.

It is important at the outset to establish lines of communication and responsibility between the departments working on the study. Everyone concerned must know who is responsible for each part of the study as well as who has the authority for making the necessary decisions. If this is not done at the outset then there is a good chance that duplication of work may develop as well as arguments over who has the authority to do certain parts of the study.
Communication between and within each group is the key to the success or failure of the study.

Having set up the various committees, chosen a study director, and organized the study group it is now time to proceed with the transit study. The study should follow the flow chart shown in Figure 2. As can be seen a number of activities will be going on at the same time. It will be the study director's job to keep everyone informed of the progress and problems of the study group. Each section of the rest of the guidelines covers one phase listed on the flow chart.

Notes


3 Hensen and Grecco, p. 25.

Selected References


ORGANIZATION OF STUDY

GOALS, OBJECTIVES AND CRITERIA FOR EVALUATION

DATA COLLECTION
EXISTING SYSTEM, AREA CHARACTERISTICS, POTENTIAL RIDER CHARACTERISTICS

PROJECTIONS AND FORECASTS

ALTERNATIVE DESIGNS AND ANALYSIS

SELECTION OF ALTERNATIVE

IMPLEMENTATION INCLUDING ACQUISITION OF OPERATIONS AND FEDERAL ASSISTANCE

CONTINUOUS MONITORING AND EVALUATION OF SYSTEM

FIGURE 2
TRANSIT PLANNING FLOW CHART
CHAPTER II. ESTABLISHING GOALS, OBJECTIVES, AND CRITERIA FOR EVALUATION

The first step in establishing goals and objectives for transit in the community is to determine what goals and objectives, if any, have previously been established for the community. There are numerous places to look for community goals such as land-use and recreational development studies, transportation studies, social and environmental development studies, and economic and future growth studies. Various organizations should also be consulted such as the chamber of commerce, businesses organizations, and other citizen organizations to determine what community goals they may have established for the groups they represent.

It is necessary to determine the existing community goals so that those formed for transit will be compatible. Every city should have an established set of goals to guide and coordinate its future development. Weiming Lu in his paper "Thoroughfare Planning and Goal Definition" lists four reasons for the development of community goals.¹

1. Goals clarify the difference between primary and secondary issues, thereby providing a clearer understanding of both.

2. They provide an opportunity for community and individual discussion of objectives, enabling citizens to participate in the planning process.
3. They give direction to public officials and private interests, enabling them to work in closer accord with community desires.

4. They constitute a step of agreement and understanding, upon which more detailed and extensive planning can be initiated.

It is beyond the scope of these guidelines to discuss the development of overall community goals. However, the following list of basic needs of people within a community was developed at a conference on Transportation and Community Values conducted by the Highway Research Board and should prove helpful in guiding the development of community goals.

A. Basic Social Needs
   1. Personal identity and recognition
   2. Control over own destinies—a voice in decision-making; involvement and participation
   3. A sense of community or belonging (at the local level)
   4. Territoriality—identification with a bounded "turf" or neighborhood
   5. A sense of being part of a united society at the metropolitan level
   6. Compatible neighbors
   7. Compatible playmates for children
   8. Stability and security; lack of anxiety

B. Basic Environmental Needs
   1. Clean air, unpolluted water, trash-free land
   2. Low levels of noise and vibration
   3. Conveniently situated local services: parks, schools, shops, churches
   4. Compatible mixtures of land uses
   5. Adequate shelter
   6. Privacy
   7. Uncongested transportation systems (in the locality)
   8. Preservation of buildings and sites of unusual beauty or historical and architectural interests
   9. Preservation of established neighborhoods
   10. Environment allowing social contact within the neighborhood
11. Safety and security, especially for children
12. Avoidance of commotion, such as during major construction

C. Basic Access Needs
   1. Access to employment, whether one has an automobile or not
   2. Access to the facilities and services of an entire city, whether one has an automobile or not; mobility, opportunity, and variety
   3. Low travel times
   4. Low travel costs
   5. Safety while traveling
   6. Reliable means of travel
   7. Comfort and convenience in travel
   8. Choice of mode of travel
   9. A transportation system that is comprehensible because it is orderly; one can find one's way around easily

D. Basic Economic Needs
   1. Avoidance of financial losses occasioned by the construction of transportation facilities
   2. Preservation of community tax base (municipal or county)
   3. Maintenance of economic stability of a community
   4. Low transportation costs, both capital and operating
   5. Encouragement of economic growth, especially for the lower income and minority groups

Establishing Transit Goals

Once the existing community goals have been determined, it is then possible to proceed with the development of transit goals. Much has been written concerning the development of goals and objectives and the procedures and persons to be involved in goals development.

Recently, a renewed emphasis has been placed on the use of "systems analysis" not only for developing goals and
objectives but for analyzing community problems and determining various alternative solutions. The use of systems analysis for problem solving implies that an interdisciplinary approach will be used; that is that the problem will be studied from all viewpoints. Not only from the engineers or planners viewpoint, but also from the viewpoint of the economist, the sociologist, etc.

Figure 3 is a diagram of the systems analysis process. From this diagram it is evident that the problem solution (alternatives) is dependent upon the objectives and criteria developed. Before proceeding with a discussion of who should develop the communities transit goals, it will be beneficial to define some of the terms that are used.

Systems Analysis: "it is a systematic attempt to provide decision makers with a full, accurate, and meaningful summary of the information relevant to clearly define issues and alternatives."

Goals: "Goals are generalized statements that broadly relate the physical environment to values; but, because of their generality, no test for fulfillment may readily be applied to them. For example, the provision of equal opportunities for all members of a community, derived from the values of belonging and security, may be a goal toward which to strive. Because of the breadth and complexity of what is meant by "equal opportunities," it may be impossible either to fully achieve this ideal or to directly measure the degree to which it is achieved."

Objectives: "An 'objective' is a specific statement that is the outgrowth of a goal. Objectives appear to be attainable and are stated so that it is possible to measure the extent to which they have been attained. Given the previously stated goal of equal opportunity for all members of a community, one transportation system objective might be that the cost of travel to work on public transportation be equal for rich and poor regardless of location in a community. As a measure of
FIGURE 3

SYSTEMS ANALYSIS PROCESS
equality, the dollar cost of travel to work on public transportation during a time period compared with salaries during that period, determined on a sample basis, could be used. Defined in this way, equal cost for all residents is an objective because it is conformal with a goal, appears to be attainable, and is subject to objective measurement."

Criteria: "Criteria" result directly from the fact that the levels of attainment of objectives are measurable. In a sense, criteria are the working or operational definitions attached to objectives. They are the measures, tests, or indicators of the degree to which objectives are attained. Criteria impart the quantitative characteristics to objectives and add the precision to objectives that differentiate them from goals. In the preceding example, equal transportation cost is the objective; the ratio of the cost of transportation to the salaries, the criterion."

Standards: "One particular type of criterion, a 'standard,' is a fixed objective; i.e., the lowest (or highest) level of performance or attainment acceptable. A standard is a cut-off point beyond which performance is rejected. When they can be invoked, standards are useful because they can make routine the aspects of decision making to which they relate; all alternatives above or below the standard are routinely rejected."

Determining transit goals and objectives according to the above definitions will accomplish two things. First, it will be of great help to the planning group in developing transit plans. Secondly, it will increase the probability that the plans once made will be implemented. It is hoped that by using a systems approach that most of the problems of transit will be analyzed. This means that there should be less public resistance to the final plans that are developed.

Who Should Establish Goals and Objectives?

At present, there are probably three answers to this question. They are the planners, the public, and the elected
officials. As might be expected there are advantages and disadvantages to each of the above answers.

The main advantage to having the planning group determine the transit goals and objectives is that they are more familiar with the alternatives available as well as the capabilities and consequences of each alternative. However, this may tend to make the goals they develop favor a particular solution. Less public criticism will probably develop if the planning group does not determine the goals and objectives for transit. The planning group should be encouraged to suggest possible objectives, criteria and standards for transit. The community transit goals should be determined by a group more representative of the community than the planning group.

From a purely democratic viewpoint it would be desirable to have the public determine the community transit goals and objectives. However, this would require such things as conducting group sessions with interviews conducted by the planning team, home interviews, some type of mail-in-questionnaire or possibly a referendum vote. In any case the cost would be great in comparison to the cost of the transit study. This would also considerably increase the length of time for the transit study.

Letting the elected officials determine the goals and objectives can be expedient and may seem to be representative. However, elected officials tend to stress short range goals
due to the short period between elections.

In most small cities the transit study will be restricted by a lack of time and money. Therefore, it will probably be necessary to compromise on the process for determining the transit goals and objectives. In this compromise situation it would be best to determine what group will actually approve or disapprove the final transit plans. The main objective for the planning group is to develop a plan that will be implemented. To insure this it is necessary that the transit plans are developed according to goals and objectives that meet the approval of the community's decision makers. In most small cities this will mean the elected officials. The main idea here is to get a good representation of the community as well as the community influential involved in the goals determination process.

Thus, a good compromise solution for determining goals and objectives might be to let the policy committee and the citizens advisory committee work together to develop the goals and objectives. However, the final decision as to how the communities goals and objectives are to be determined must rest with the decision makers.

Considerations in Establishing Transit Goals and Objectives

A. Transit goals and objectives must be established to complement existing community goals. This means considering such things as population and economic projections, the number of people attracted to the area such as tourists,
conventioners etc., and desired land-use patterns. Also, if the area is auto oriented it must be determined if the city is to remain that way in the future.

B. What type of service is desired? Is the transit service to be profit-motivated, subsidized, or possibly a break-even operation? The answer to these questions will effect the quality and extent of service as well as the amount of financing that will be needed.

C. What people are to be served? Just those to young or old to drive? Just persons not owning a car? It will be necessary to decide who is to be served as well as the areas of the city to be served and the extent of service to these areas. The question here is really one of accessibility. That is, what areas should be accessible to what people and to what extent?

D. Is transit service to be CBD (central business district) oriented? Is transit to serve all areas of the city to the same extent or are certain areas such as the CBD to receive greater emphasis. This may well depend on the economic desires and land-use patterns of the community. The answers to these questions well depend on the value that transit is to have to the community. Will it serve the business sector, the school system, the economically deprived, the unemployed, etc?

E. What financing is desired by the community? This is an extremely important question for it may determine the
quality and extent of service that can be provided. The city has numerous options open to it. The city may own the operations but lease them to a private operator. Under this set up a subsidy may or not not be needed for the operation of the system, however in all probability it will be needed in order to periodically replace equipment.

A second alternative would set up transit as a city department. In this case a subsidy would probably be required to cover any losses incurred by the system.

A third alternative would be to establish a transit authority to operate the system. Depending on the state laws governing this situation, the authority may have the power to set up a taxing district to support the operations.

There are probably other possible alternatives for city operation of transit but these are the three major types in use today. In most cases, especially in small urban areas, a subsidy will be necessary in order to provide good transit service. The size of this subsidy will depend on the quality and extent of service as well as the amount of community support given the system once in operation. If the system is able to increase ridership by providing good service then only a small subsidy may be needed to aid in the periodic replacement of equipment.

Another thing that will affect the size of the subsidy, will be the amount of money needed to improve the capital equipment of the existing operations. Up to two-thirds of
these funds may be obtained from UMTA (Urban Mass Transportation Administration) if the city can meet their requirements. These requirements and the process for making application are discussed in the chapter on Acquisition of Transit Operations by a City.

The above discussion was not meant to provide an extensive coverage of all factors affecting the establishment of transit goals and objectives. Every community will have different goals and objectives for transit depending on the aspirations of the community.

In order to aid in the establishment of goals and objectives the following examples are provided. It is emphasized that these are only examples and should not be copied by any community.

General Transportation Goals, Planning District Two, Twin Cities Metropolitan Planning Commission. 7

1. A convenient, safe, and efficient transportation system providing for local movement as well as accommodating through-traffic in the district.

2. A transportation system that effectively accommodates personal, commercial, industrial, and public needs at all times of the day, week, and year.

3. A circulation system that effectively serves all age and economic groups, with a transit system to augment the road system carrying private vehicles and a comprehensive walkway and bicycle trail system in areas of urban density.

4. A total circulation system that can be economically maintained and effectively open for needed service under all conditions.

5. A transportation and circulation system designed and staged to encourage development to go when
and where desired and to accommodate projected growth.

The following general transportation and transit goals were suggested by Littleton C. MacDorman and Joseph M. Goodman in their paper "The Case for Bus Transit in Urban Areas."\(^8\)

Improved transportation service to alleviate the peak period highway overloads.

Transportation service to a relatively large segment of the population, such as the poor, the aged, the young, or the infirm, who do not have access to an automobile or are unable to use one.

Short-term transportation service to developing areas or to socially or economically deprived areas, without lengthy planning periods or high capital expenditures.

A flexible means of public transportation that can adapt quickly and economically to changing socio-economic and land use patterns.

Minimum-level transportation service in small communities in order to maintain a viable community identity and cohesiveness.

The following transit goals were suggested for a publicly owned, service-oriented transit system in "Mass Transit Management: A Handbook for Small Cities" which was compiled by the Institute for Urban Transportation of the Graduate School of Business at Indiana University.\(^9\)

(1) Provide transportation services to those without an automobile.

(2) Help relieve traffic congestion.

(3) Minimize use of land for parking.

(4) Increase interaction between all parts of the community.
(5) Aid in shaping community development toward ends established in comprehensive planning.

(6) Help reduce the costs of transportation to the community and its residents.

(7) Enhance the image of the town.

(8) Extend the labor market and increase job opportunities available to workers.

(9) Help maintain downtown property values through improved access.

(10) Attract new business to the area.

The above examples only list goals. Each goal would have a number of objectives designed to try and fulfill that goal. Also, each objective would have a number of criteria designed to measure the fulfillment of each objective. This process is shown in Figure 4. As can be seen two goals may have the same objective and two objectives may have the same criteria. Also, the diagram shows that the goals must be developed from community values. Since this is true, it is possible that conflicting goals, objectives and criteria may develop. In this case the decision makers must determine which goals, objectives, and criteria are most important to the community.

It is hoped that great emphasis will be placed on the establishment of transit goals and objectives that adequately represent the values of the community. Only through the use of representative goals and objectives can the study group develop transit plans that will successfully meet the needs of the community.
FIGURE 4

HIERARCHICAL INTERRELATIONSHIPS AMONG VALUES, GOALS, OBJECTIVES, AND CRITERIA
Notes


10 Thomas and Schofer, p. 42.

Selected References


CHAPTER III. DATA COLLECTION AND ANALYSIS

-- EXISTING SYSTEM

Before the necessary data can be collected and analyzed by the study group, a number of decisions need to be made and tasks need to be done.

1. Existing data should be located and analyzed. Potential sources of data would be transportation or land-use studies, population and economic studies, recreational and general development studies, and any other studies or surveys that may have been conducted in the last ten years. An analysis of these data will determine how much may be used in the transit study. The use of existing data will reduce the time and effort for the transit study as well as the cost of data collection.

2. A decision must be made as to how the data are to be coded and tabulated. This means determining the boundary of the study area and then breaking this area up into zones or districts for analysis. There are a number of ways of doing this. If the city is over 50,000 in population and has been tracted for the United States Census then the census tracts may be used. However, in most cases the tracts contain about 4,000 residents which may constitute a large area in smaller cities. Therefore it may be necessary to
divide the census tract into two or three parts for analysis. In dividing up the census tracts avoid splitting blocks and where possible avoid splitting up neighborhoods. Generally, the tracts can be split by using streets as boundaries. The reason for using census tracts is that all the census data are tabulated and reported by tract for those areas that have been tracted. This information could be very useful in the transit study.

If the city is under 50,000 in population and has not been tracted for the United States Census, then it is possible to use census enumeration districts for the zones or districts for the transit study. These districts contain about 800 residents. Figure 5 is an example of the enumeration districts in Lafayette, Indiana in 1960. The reason for using enumeration districts is that all the census data collected at the 100 per cent level are tabulated and reported by enumeration districts for those areas that have not been tracted. This information will be very useful in the transit study. Maps of the census tracts and enumeration districts can be obtained from the Bureau of the Census in Washington, D.C.

If a transportation study has been conducted and used zones which do not correspond to the census tracts or enumeration districts, it may be more advantageous to use these zones so that the data collected may be used in the transit study. This decision will depend on the value the study
FIGURE 5

LAFAYETTE, INDIANA 1960 CENSUS OF POPULATION

ENUMERATION DISTRICTS}$^1$
group places on the data collected in the transportation study.

3. Once the area has been divided into zones for analysis, it is necessary to decide how the data are to be tabulated. Generally, the data will be coded according to the zones to which it pertains and the information punched on computer cards. These data are then tabulated for each zone. This tabulation can be done by hand for the smaller cities, however, if computer facilities are available it is possible to tabulate the data by use of the computer.

**Origin and Destination Data of Riders**

The main objective in collecting origin and destination data is to determine where present transit riders are coming from and where they are going. Also, it is desirable to obtain some limited socio-economic data on the transit riders. Generally, the origin and destination data are obtained through a short on-board questionnaire completed while the rider is on the bus, the questionnaire must be short, usually no longer than 15 questions, and take little time to complete, usually less than 5 minutes. If a larger amount of data is desired on transit riders it must be acquired through a mail-in type questionnaire or through a home interview conducted in person or over the telephone.

Generally, origin and destination data on transit riders will not be available from other sources and it will be necessary to conduct a survey of transit riders in order
to obtain the desired information. The first task in preparing for the origin and destination survey (O-D survey) is to determine the type of data desired. Obviously, it will be necessary to obtain the riders trip origin and destination. However, other important data are also desirable such as, distance from place of boarding transit vehicle to origin of trip and distance from place of departing vehicle to trip destination, type or purpose of trip, age of rider, number of persons in household, availability of auto, possession of drivers license, etc. The additional information collected will depend on what information is felt necessary for analysis of the present transit system as well as the type of information available from other sources. Sample questionnaires are provided in Appendix A and should prove helpful in determining the type of information necessary as well as the structure of the questionnaire.

Each piece of data collected in the O-D survey should serve some particular purpose in order to warrant the time and money spent in collecting and tabulating it. There are numerous reasons for collecting data, a few of which are discussed below.

1. It is necessary to find out where people are coming from and where they are going. It is necessary to find out if the present system is adequately serving the present ridership. From the O-D data it will be possible to determine which zones are generating a high ridership and those zones producing low ridership.
2. It is also necessary to determine the type of ridership such as the age distribution, income distribution, general occupational breakdown, etc. It will be useful to know if only a captive ridership exists; that is, those with no alternative means of transportation.

3. It will be useful to determine the number of persons having to transfer from one bus to another in order to complete their trip. This information will be helpful in making necessary route changes for the existing system or possibly in establishing new routes for a new system.

4. At the same time that the O-D survey is conducted, a load data sheet will be filled out. A sample load data sheet is provided in Appendix A. On this sheet will be recorded the number of persons boarding and alighting at each stop as well as a running total of those riders on the bus. This information will be useful in determining the maximum load points for each route which will determine the size of vehicle necessary to adequately meet ridership demands. This information will also be useful in making route changes or planning new routes.

It will be up to the study group to decide what data will be collected on the O-D survey. This decision will be based on the information needed for analysis that is not available from other sources. A decision should also be made at this time as to whether a mail-in questionnaire or some type of home interview will be used to obtain additional socio-economic data on transit riders. If this type of
survey is to be conducted, it may be possible to reduce the number of questions on the on-board O-D survey questionnaire. If a mail-in or home interview is not performed it will be necessary to have a longer on-board O-D questionnaire. The development, distribution, collection, and tabulation of a mail-in or home interview questionnaire are discussed in a later section of this chapter.

After determining the data to be collected in the O-D survey, it will be necessary to design the questionnaire. Designing a good questionnaire is not an easy task and should be the work of a number of individuals. Some general guidelines are listed below.

1. The questions should be self-explanatory. This means avoiding technical terms and words that most transit riders would not understand or that would not be familiar to them.

2. The questions should be easy to answer. Where possible a choice of answers should be provided with the interviewee indicating his answer by circling, checking, or underlining his choice. Whatever method is chosen should be used as much as possible throughout the questionnaire to avoid confusing the interviewee.

3. Questions should not be crowded together and should be printed in large enough print so as to be easily readable.
4. On a short questionnaire it will not be necessary to worry about a boring questionnaire, but questions should be arranged in an orderly manner. For example ask the place of origin before asking for the destination etc. If a "touchy question" such as family income is used it should be placed toward the end of the questionnaire. Sometimes a person will stop answering the questions when confronted with a "touchy question." However, if the questionnaire has been partially filled in and then turned in, the information, particularly the O-D information, may be useful even though all of the questions have not been answered.

5. Generally, a very brief statement of the purpose of the study is provided at the beginning of the questionnaire.

6. If space is available, it is a good idea to provide a place for comments. Riders like to feel that the study group is interested in their opinions.

In designing the questionnaire it will be helpful to go over the sample questionnaires provided in Appendix A. After the questionnaire has been designed it will be necessary to pre-test it. The best way to do this is to administer it to 15 to 25 transit riders on several different routes. From this pre-test it will soon be evident as to what questions are unclear and those that may not be answered. After the pre-test it will be necessary to re-work the questions that were unclear. The re-worked questionnaire
should then be pre-tested again to see if the initial problems have been overcome and to make sure that no new problems have been developed. Generally, two pre-tests are all that will be necessary. However, if the study group is not satisfied with the results of the second pre-test, it will be necessary to re-work and pre-test the questionnaire until the results are satisfactory.

Data Collection

After the questionnaire has been designed, it is necessary to determine the sample size to be surveyed. Once the sample size has been chosen the number of questionnaires needed for each route can be calculated. There are a number of things to consider before deciding what sample size should be used.

1. One of the first considerations should be determining the number of personnel that will be available to assist in conducting the O-D survey. Generally, there should be at least two people assigned to each bus that is being sampled. One person will take care of the load data sheet while the other one hands out questionnaires and answers any questions that might come up. After the load data is recorded at each stop the person in charge of that task can then assist in the distribution of questionnaires. During off peak hours and where low ridership exists, one person may be able to handle the load data sheet as well as the distribution of questionnaires.
2. An estimate of ridership per route should be obtained. This can be calculated from the daily revenue for each route. Generally, the route revenue is divided by the average fare to determine the number of riders. The average fare will depend on the fare structure being used by the transit system. There usually is a standard fare for each trip. (Lafayette for example is 30 cents.) There also may be reduced fares for school children and the elderly (say 25 cents). The average fare will then be somewhere between the standard fare and the reduced fare. This information will be helpful in determining the number of questionnaires necessary for each route as well as the number of personnel needed to administer the questionnaires.

3. Another consideration would be the time required to complete the survey. Is it desired to collect all the data in one day or over a period of days or weeks? The shorter the time period is for the collection of the data the larger the number of personnel that will be needed.

In determining the sample size the number of riders will be a determining factor. Generally, the smaller the ridership the larger the percentage sample size must be. In the areas for which these guidelines were written, the ridership will generally be low usually consisting of captive riders. It is necessary in this situation to obtain a fairly large percentage sample in order to obtain a sufficient number of trip origins and trip destinations in each zone for
An example which the author is familiar with, was the transit O-D survey conducted in Lafayette, Indiana in the fall of 1970.

The cities of Lafayette and West Lafayette along with Purdue University contain a population in excess of 100,000. At the time of the O-D survey there were four transit routes being used. A total of six buses were in use, two of the routes having two buses operating on them. The daily ridership was about 1500 riders. An attempt was made to obtain a 100 per cent survey of the riders. The survey was conducted in one day beginning with the first buses in the morning until shut down that night. After the survey had been completed, a check against the load data sheet and revenue for each route for the survey day indicated that about 10 per cent of the riders had been missed.\(^2\) Some of this 10 per cent was due to refusals to fill out the questionnaire. However, the largest portion of the 10 per cent was due to students that were missed, because large numbers of them boarded at schools and then rode only a short distance.

The end result was that 1372 on-board questionnaires were completed.\(^3\) This is not a large number for analysis in an area the size of Lafayette and West Lafayette. Had a smaller sample been taken the results may not have been very useful for analysis purposes.

The decision as to sample size must be made by the study group. It is not proposed that a 100 per cent sample
be taken, but that a significant number of responses be obtained in relation to the size of the area being surveyed. Truly, this is a judgment decision and must take into account a number of the considerations mentioned earlier.

Once the sample size is chosen, there are numerous tasks that must be completed before the survey can take place.

1. The number of personnel needed to conduct the survey must be determined. This will depend on the length of time used for the study. The study should be conducted on a "typical day" which is usually a weekday. A number of studies have used either a Tuesday, Wednesday or Thursday and have omitted Monday and Friday feeling that they were not "typical" because many workers stayed home on these days. This has never been confirmed to any great extent and therefore any weekday will probably yield satisfactory results. Days to avoid would be days that the banks close early or when a significant number of businesses or employers are closed. Not only is a "typical day" needed but also a "typical month." It is usually recommended that the survey be conducted in the early fall or spring. Not only does this provide better weather but also it avoids the loss of ridership due to vacations which normally are taken in the summer.

There are a number of ways to spread out the survey. One route can be surveyed on each day. Also every other bus
on a route can be surveyed. The method used will depend on the sample size desired as well as the number of personnel available.

2. The personnel must be briefed as to how the survey is to be conducted. They must know how to fill out the load data sheet as well as being able to spot check the completed questionnaires for accuracy. Also, it is beneficial to instruct them on how to assist people in filling out the questionnaire without biasing their answers. They must also be instructed as to how to handle refusals as well as antagonistic statements and questions that might come from riders that are skeptical of the survey being conducted.

3. The questionnaires should be numbered and coded according to the route on which they are distributed. This will aid greatly in the coding and tabulation of the data.

4. A system must be worked out for relieving survey personnel. A schedule should be made up so that everyone knows his assignment, time and specifically his duties. Supervisors should be in the field during the survey to make sure everything is going according to the schedule. They should be provided with extra questionnaires, load data sheets, pencils, etc. Also, stand-by personnel should be available in case someone becomes sick or is hurt. If the routes meet at a common point such as the central business district, the supervisors can make their periodic checks at this point. All aspects of the survey must be worked out in advance.
5. The public should be kept informed as to what the study group is doing. Periodic news releases can be sent to the local newspapers and radio and television stations. A few days prior to the O-D survey, an announcement should be made by all media as to why the survey is being conducted, the day and time as well as the routes being surveyed. The more information that is given to the public the better the cooperation that can be expected.

6. Throughout this time period the study group must work with the transit company personnel particularly the drivers. Not only should the drivers be informed as to what is happening but their suggestions should be encouraged. It is very beneficial to have the drivers behind the survey. They can help greatly by preparing their riders for the survey and encouraging their cooperation.

7. All the personnel connected with the study should have some form of visible identification. This will avoid confusion as to whether or not they should be on the bus.

In preparing for and conducting the O-D survey, the important thing is communication and cooperation. Everyone involved must be informed as to what is happening, when, where, and why. If a concerted effort is made to keep everyone informed before and up to the survey day, it should insure a smooth and successful survey.
Coding and Tabulation of Data

After the survey has been completed it is time to begin coding and tabulating the data. If a mail-in or home interview questionnaire of transit riders is being used, it may be necessary to wait until these are returned before coding and tabulation is started. Generally, if a mail-in or home interview questionnaire is used it will be coded to correspond to the O-D questionnaire filled out by the transit rider. In this way the two questionnaires can be coordinated and the data tabulated together. A more detailed discussion of this procedure is contained in the section on Rider Characteristics.

It is advisable to have all the survey data recorded on computer punch cards. This will aid in the handling and analysis of the data. Each questionnaire will have at least one punch card and possibly more depending on the amount of data to be recorded. Recorded on the punch card will normally be the questionnaire identification number which will indicate the route to which the questionnaire pertains. The questionnaire will then be coded to the zones of origin and destination. The questionnaire data will then be punched on the card in the columns designated for the answers to each question. Generally, this information is taken from the questionnaire and placed on computer coding sheets from which the key punch operator can punch the cards. In some cases such as the San Diego Transit Questionnaire in Appendix A the computer columns are listed on the questionnaire.
Then question answers are transferred to the columns and the key punch operator can punch the cards from the questionnaires. In other instances the answers can be punched on the cards directly from the questionnaire without transferring the answers. An example of this type of questionnaire is the Iowa City Area Transportation Study--Transit User Survey in Appendix A.

If it is necessary to code each questionnaire and to transfer the answers to computer coding sheets, then each person doing the coding must be well versed in the coding procedure being used. Spot checks should be made of each coder's work to insure accuracy. The punched cards should also be checked to make sure that the data has been punched in the right columns. A sample of the coding procedure used in the transit survey in Lafayette, Indiana is provided in Appendix B.

Once the data are punched, the cards can then be sorted for tabulation of the data. There are two ways of sorting and tabulating the data. Computer programs are available to sort and tabulate the data. The type to be used will depend on the computer equipment and personnel available to the study group. These programs should not be used unless capable personnel well versed in computer operations are available to perform the data tabulation.

The second method for data tabulation takes longer but it is easy and inexpensive. The cards are sorted
according to zones by the use of a card sorter. A sorter generally has ten sort compartments, nine for sorting by a specific column or number and the tenth for the left over cards. Thus, if there were 90 zones it would take ten separate sorts to divide the cards into zones. After the cards have been sorted into zones it is then possible to sort each zone according to certain columns. In this way a tabulation of each data entry can be made. This method was used in the study in Lafayette, Indiana and was felt to be satisfactory.

After tabulation, data can be recorded in tables, graphs and on maps for further evaluation. It is very helpful to show the data by zone on a map of the area. In this way it will be easy to see what areas are being served by the present transit system and those zones not being served. These data can then be compared with the data collected on persons not using transit. The presentation and analysis of data is discussed in the chapter on Forecasting and Data Presentation.

Rider Characteristics

As was pointed out earlier, it might be desirable to obtain additional information from present transit riders that could not be obtained on the short O-D questionnaire. There are a number of data items that might be requested, such as, additional socio-economic data. Generally, the majority of the information requested will concern possible
changes in the present transit system. Information on type of system, fares, operating times, activity centers to be served, and other information could be collected to obtain public reaction to the study group's ideas for possible system changes.

There are a number of ways that these data can be collected. The most inexpensive method would be to use a mail-in questionnaire. This questionnaire would be handed out with the O-D questionnaire and would be coded with the same number as the O-D questionnaire to aid in coding the mail-in questionnaire to the study zones. Generally, the return rate is very low (20-30 per cent). However, if the riders are informed of the importance of the information to the study group it may be possible to increase the return rate. In the Lafayette study a 51 per cent return rate occurred indicating a high interest on the part of the transit riders.\(^4\)

Another method for collecting these data would be through a home interview. This can be done in two ways. An interviewer can be sent to the home or he can call on the telephone. If the interview is conducted over the phone it must be fairly short. Both methods are costly with the in-home interview being the most expensive. Due to the high cost of these methods they are not recommended for use in collecting this type of data.

If it is decided to use a mail-in questionnaire, it must be designed in the same manner as the O-D questionnaire.
It can be longer but it still must be self-explanatory. Since, the questionnaire will be longer an attempt should be made to vary the questions not only by topic but by the method for answering them. This is desirable in order to keep the interviewee from becoming bored. This questionnaire will probably have a number of open ended or short answer questions which will make the coding process a little harder but it will provide for a variety of answers and opinions. A sample mail-in questionnaire from the Lafayette study is provided in Appendix C.

A stamped and addressed return envelope should be provided with each questionnaire. Generally, a mailing permit can be obtained from the postal department. The permit number is stamped on the envelope; in this way postage is paid only on questionnaires that are returned. However, the return rate is usually higher if a stamped envelope is used.

The information received in the mail-in questionnaire will be coded and tabulated for computer input in the same manner as the O-D data (see Appendix B). The returned mail-in questionnaires should be correlated to the O-D questionnaire with the same number so that the data can be compared and assigned to a study zone for analysis.

**System Characteristics**

Most of the necessary data on the present system can be obtained from the transit company records. A number of
Data items are desirable in order to plan for changes to the transit system.

1. A map should be obtained of present routes. Also, a schedule showing headways, location of stops and time of stop should be obtained. From this information it will be possible to determine transfer points and also the extent of transit coverage in the area. Coverage is generally determined by including the area one-quarter mile on each side of a route. If this area is shaded in on a map of the city it will determine those areas not presently within the one-quarter mile service area.

2. Information should be obtained on the existing maintenance system. This would include items such as a rotation schedule for routine service as well as the procedure for performing major repairs. It would also be useful to determine what type of parts are kept in stock as well as where parts and other service supplies are obtained. This information will be helpful in making changes in the system in order to increase efficiency and decrease costs.

3. Data on special services provided by the transit system should be obtained. This would include charter service as well as the transporting of school children by special buses. This information will be necessary to determine what services should be continued and those to be terminated.
4. In order to make an analysis of the system it will be necessary to obtain some economic data. The revenue from the system by route should be obtained. A number of graphs should be made from this information. A plot of daily revenue by route can be made for a period of three or four months. Also, monthly revenue for the whole system can be plotted for a number of years to obtain a picture of the past revenue trends of the system. The form and amount of information available will determine what analysis can be performed. Figures 6 and 7 show examples of how data might be presented. A good source of information would be income tax records, which should be available from the transit company.

Data on operating costs should be obtained, such as cost of fuel, drivers wages, maintenance costs, depreciation costs, etc. As much economic data as possible should be obtained in order to analyze the present system to see where changes can be made. An example of the type of economic data collected in previous transit studies is presented in Tables 1 and 2.

5. An inventory of all equipment and property should be made. This will include a complete run down on the age and condition of each piece of rolling stock. See Table 13 in the chapter on Acquisition of Transit Operations by a City. This information will be beneficial in planning for the purchase of new equipment and the retiring of wornout equipment.
FIGURE 6
MONTHLY PASSENGER REVENUE (1968-1970) - GREATER LAFAYETTE BUS COMPANY
FIGURE 7

SDTC OPERATING REVENUE AND OPERATING EXPENSE (1948-1969)
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Revenue</td>
<td>$187,505.70</td>
<td>$187,571.97</td>
<td>$200,185.69</td>
<td>$201,569.67</td>
<td>$188,605.47</td>
<td>$187,037.36</td>
<td>$198,104.59</td>
<td>$190,604.50</td>
<td>$141,756.27</td>
<td>$127,217.95</td>
<td>$141,542.27</td>
</tr>
<tr>
<td>Specials and Charters</td>
<td>$16,495.40</td>
<td>$16,966.46</td>
<td>$16,269.38</td>
<td>$21,028.15</td>
<td>$15,806.95</td>
<td>$13,110.95</td>
<td>$16,399.27</td>
<td>$16,846.84</td>
<td>$17,064.00</td>
<td>$15,710.00</td>
<td>$13,110.00</td>
</tr>
<tr>
<td>Other Operating Revenue</td>
<td>$1,182.74</td>
<td>$1,170.38</td>
<td>$4,142.70</td>
<td>$3,689.76</td>
<td>$3,099.21</td>
<td>$3,956.11</td>
<td>$3,911.75</td>
<td>$3,956.27</td>
<td>$3,956.27</td>
<td>$3,956.27</td>
<td>$3,956.27</td>
</tr>
<tr>
<td><strong>Total Revenue</strong></td>
<td>$206,775.87</td>
<td>$219,894.60</td>
<td>$256,586.15</td>
<td>$259,478.63</td>
<td>$225,405.44</td>
<td>$219,050.49</td>
<td>$252,604.96</td>
<td>$237,606.15</td>
<td>$202,606.15</td>
<td>$189,842.12</td>
<td>$212,582.87</td>
</tr>
<tr>
<td><strong>Net Gain (Loss)</strong></td>
<td>$9,584.80</td>
<td>$10,272.40</td>
<td>$16,684.75</td>
<td>$16,540.40</td>
<td>$12,708.04</td>
<td>$12,595.58</td>
<td>$16,414.96</td>
<td>$16,019.94</td>
<td>$13,864.00</td>
<td>$13,740.00</td>
<td>$14,036.00</td>
</tr>
<tr>
<td><strong>Operating Expenses</strong></td>
<td>$196,190.80</td>
<td>$209,622.20</td>
<td>$240,301.40</td>
<td>$242,938.20</td>
<td>$212,737.36</td>
<td>$206,454.91</td>
<td>$241,189.00</td>
<td>$221,586.21</td>
<td>$188,740.06</td>
<td>$186,102.00</td>
<td>$195,546.87</td>
</tr>
<tr>
<td><strong>Total Expenses</strong></td>
<td>$205,775.60</td>
<td>$220,396.80</td>
<td>$257,086.55</td>
<td>$259,478.63</td>
<td>$225,405.44</td>
<td>$219,050.49</td>
<td>$252,604.96</td>
<td>$237,606.15</td>
<td>$202,606.15</td>
<td>$189,842.12</td>
<td>$212,582.87</td>
</tr>
</tbody>
</table>

**TABLE 1**

**GREATER LAFAYETTE BUS COMPANY REVENUES AND OPERATING EXPENSES**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Passenger Revenue</strong></td>
<td>$187,505.70</td>
<td>$187,571.97</td>
<td>$200,185.69</td>
<td>$201,569.67</td>
<td>$188,605.47</td>
<td>$187,037.36</td>
<td>$198,104.59</td>
<td>$190,604.50</td>
<td>$141,756.27</td>
<td>$127,217.95</td>
<td>$141,542.27</td>
</tr>
<tr>
<td><strong>Specials and Charters</strong></td>
<td>$16,495.40</td>
<td>$16,966.46</td>
<td>$16,269.38</td>
<td>$21,028.15</td>
<td>$15,806.95</td>
<td>$13,110.95</td>
<td>$16,399.27</td>
<td>$16,846.84</td>
<td>$17,064.00</td>
<td>$15,710.00</td>
<td>$13,110.00</td>
</tr>
<tr>
<td><strong>Other Operating Revenue</strong></td>
<td>$1,182.74</td>
<td>$1,170.38</td>
<td>$4,142.70</td>
<td>$3,689.76</td>
<td>$3,099.21</td>
<td>$3,956.11</td>
<td>$3,911.75</td>
<td>$3,956.27</td>
<td>$3,956.27</td>
<td>$3,956.27</td>
<td>$3,956.27</td>
</tr>
<tr>
<td><strong>Total Revenue</strong></td>
<td>$206,775.87</td>
<td>$219,894.60</td>
<td>$256,586.15</td>
<td>$259,478.63</td>
<td>$225,405.44</td>
<td>$219,050.49</td>
<td>$252,604.96</td>
<td>$237,606.15</td>
<td>$202,606.15</td>
<td>$189,842.12</td>
<td>$212,582.87</td>
</tr>
</tbody>
</table>

**Notes:**
- The table includes detailed financial data for the Greater Lafayette Bus Company for the years 1949 to 1958, covering passenger revenue, specials and charters, other operating revenue, total revenue, net gain (loss), operating expenses, total expenses, and various other financial metrics.
- The average values are calculated based on the given data.
- The table provides a comprehensive view of the company's financial performance during the specified timeframe.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger</td>
<td>$1,258,790</td>
<td>$1,225,080</td>
<td>$1,171,080</td>
<td>$1,147,695</td>
<td>$1,100,435</td>
<td>$233,408</td>
<td>$1,175,548</td>
<td>$1,103,963</td>
<td>$1,111,555</td>
<td>$471,772</td>
<td>$851,487</td>
</tr>
<tr>
<td>Charter</td>
<td>7,175</td>
<td>7,737</td>
<td>5,503</td>
<td>25,684</td>
<td>6,894</td>
<td>14,242</td>
<td>48,465</td>
<td>31,733</td>
<td>49,108</td>
<td>6,156</td>
<td>4,170</td>
</tr>
<tr>
<td>Advertising</td>
<td>6,498</td>
<td>6,395</td>
<td>9,542</td>
<td>8,924</td>
<td>8,617</td>
<td>8,859</td>
<td>6,321</td>
<td>8,056</td>
<td>7,113</td>
<td>107</td>
<td>8,203</td>
</tr>
<tr>
<td>City Portion (from Transit Tax)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>221,962</td>
</tr>
<tr>
<td>Total Revenue</td>
<td>1,274,463</td>
<td>1,241,212</td>
<td>1,186,125</td>
<td>1,180,303</td>
<td>1,195,946</td>
<td>256,509</td>
<td>1,230,338</td>
<td>1,135,732</td>
<td>1,209,118</td>
<td>6,997</td>
<td>1,443,049</td>
</tr>
<tr>
<td>Revenue Per Mile</td>
<td>55.13</td>
<td>53.22</td>
<td>51.55</td>
<td>52.66</td>
<td>53.71</td>
<td>55.79</td>
<td>58.02</td>
<td>59.35</td>
<td>62.67</td>
<td>59.02</td>
<td>68.32</td>
</tr>
<tr>
<td>OPERATING EXPENSES</td>
<td>1,126,524</td>
<td>1,122,811</td>
<td>1,109,013</td>
<td>1,107,585</td>
<td>1,155,608</td>
<td>165,430</td>
<td>1,166,100</td>
<td>1,096,540</td>
<td>1,146,863</td>
<td>757,214</td>
<td>1,366,352</td>
</tr>
<tr>
<td>Expense Per Mile</td>
<td>48.73</td>
<td>48.13</td>
<td>48.23</td>
<td>49.42</td>
<td>51.90</td>
<td>51.75</td>
<td>54.99</td>
<td>57.30</td>
<td>59.55</td>
<td>83.85</td>
<td>63.26</td>
</tr>
<tr>
<td>Operating Profit</td>
<td>147,939</td>
<td>118,601</td>
<td>77,112</td>
<td>72,718</td>
<td>40,240</td>
<td>91,079</td>
<td>64,238</td>
<td>39,192</td>
<td>60,255</td>
<td>(57,317)</td>
<td>76.697**</td>
</tr>
<tr>
<td>Profit/Loss Per Mile</td>
<td>6.40</td>
<td>5.09</td>
<td>3.32</td>
<td>3.24</td>
<td>1.81</td>
<td>4.04</td>
<td>3.03</td>
<td>2.05</td>
<td>3.12</td>
<td>(4.83)</td>
<td>5.06</td>
</tr>
<tr>
<td>Net Income After Taxa</td>
<td>80,955</td>
<td>61,945</td>
<td>43,786</td>
<td>49,101</td>
<td>31,703</td>
<td>60,767</td>
<td>46,521</td>
<td>38,218</td>
<td>56,285</td>
<td>(29,342)</td>
<td></td>
</tr>
<tr>
<td>Income Per Mile</td>
<td>3.50</td>
<td>2.60</td>
<td>1.87</td>
<td>2.19</td>
<td>1.42</td>
<td>2.70</td>
<td>2.19</td>
<td>2.00</td>
<td>3.02</td>
<td>(2.47)</td>
<td></td>
</tr>
</tbody>
</table>

1/ 1968 represents only seven months operations due to strike.

*Includes $41,042 in additional contract charter revenue.

**This represents a surplus rather than a profit.

NOTE: All "Per Mile" costs are in cents.
6. An analysis of the present form of management should be made. This will include determining the number of administrative personnel and the duties and responsibilities of each. This information will be used to determine if changes need to be made in the form of management. Items to be considered would be the qualifications necessary for each position as well as the attitude of the personnel toward the present system. It would also be useful to determine the drivers' attitude toward the system and toward the present management organization.

The amount of data collected on the characteristics of the present transit system will depend on the time available, the number of personnel available, and the money available for this part of the study. Generally, the more pertinent the data that is obtained, the easier it will be to determine the changes that will improve the transit system's efficiency.

Notes

1Stephen W. Ricks, *A Synthesis of Urban Travel Patterns in Metropolitan Lafayette, Indiana* (Joint Highway Research Project, Engineering Experiment Station, Purdue University, Civil Engineering Building, Lafayette, Indiana 47907, October, 1965), p. 34.


3Ibid., p. 31.

4Ibid., p. 62.
5 Ibid., p. 38.


CHAPTER IV. POTENTIAL RIDERS AND AREA CHARACTERISTICS

In most areas for which this report was written, the transit ridership will consist mainly of captive riders. In this situation, it is necessary to design the new transit system or to change the old system so that it will attract new riders. An increase in ridership is necessary in order to help cover the costs of improving transit service. Improvements in transit service will depend on the goals and objectives that have been established for transit in the area. It will be necessary to know what areas are to be served, the people to be served, and the frequency of service to be provided to each area.

Once these decisions have been made, it will be necessary to determine the "latent demand" for transit service in the area including both potential captive and choice riders. In many cases, there are persons within the city who would be captive riders if transit were presently available to them and if it served the areas where they wished to go. These persons must be located as well as those persons that might become choice riders if the level and quality of transit service were improved.

In order to design the new system or make changes in the old one, it is necessary to obtain data on persons that
do not presently use transit. Data on characteristics of the area will also be needed in order to plan needed changes or to design a new system. The types of data, the sources for the data, and their presentation are discussed in the following sections.

**Types and Sources of Data**

The method used to obtain the data will depend on the type and amount of data to be collected. In general, it will be helpful to collect data similar to that collected on present transit riders. Useful information would include such things as the number of cars per household, the income per household, the number of persons in each household, the age distribution of each household, etc. The exact data collected will depend on what data are available from other sources.

Data sources would include transportation studies and any other studies or surveys that have been conducted in the area. Another source of information is the state bureau of motor vehicles. In some states, a list can be obtained of the vehicle registrations for the area. These registrations can be coded to the study zones for analysis. A very important source of information will be census data. The availability of the data as well as its form will depend on the size of the area and whether the area has been tracted.
For those cities over 50,000 that have been tracted, it will be possible to obtain all the census data. Part of the data will be in printed form and the rest on summary tapes. Also, available to these cities will be a standard package of programs (Urban Transportation Package) developed by the Bureau of the Census and funded by the Federal Highway Administration (FHWA) to produce a summary tape of a defined set of data for each traffic zone. The cost of this tape will be for processing only.

The delivery process on these tabulations is as follows: (a) a local agency, if it chooses to participate in the program, makes its request; (b) the request must be accompanied by a conversion file of census block numbers to traffic zones; and (c) the Bureau of the Census produces the summary tape and delivers it to the requester. This program is expected to begin in late 1971 or early 72.

The areas of summarization need not be traffic zones. The programs can develop summaries at any area level defined by block, consistent with disclosure and reliability constraints.

STANDARD PACKAGE CONTENTS

The package contains a trip table and tabulations at the zone of residence, zone of employment, and area-wide level. The trip tables give work trips from all zones to all zones. Tabulations at the zone of residence include summaries of person characteristics, head of household characteristics, household characteristics, and housing characteristics. Tabulations at the zone of employment include summaries of workers by occupation and by industry. Tabulations at the area-wide level include cross-tabulations of household characteristics, housing characteristics, and mode of transportation to work. Detailed formats of these tabulations have been circulated among the state transportation planning agencies and are available from the Federal Highway Administration.
These data will provide a means of doing extensive transit planning at a very minimal cost.

The only other data that might be needed are information on trips other than the work trip. There are a number of economical ways to obtain this information such as a license plate survey, a post card survey of a sample of the elderly or special groups or a post card type survey at major activity centers. These surveys are discussed in the next section dealing with cities under 50,000 that have not been tractored.

For those cities under 50,000 that have not been tractored, it will be possible to obtain a limited amount of census data by enumeration district. The data available by enumeration district (E.D.) consists of the information obtained at the 100 per cent survey level which is on the first count summary tapes from the 1970 census of population and housing. A list of the items collected in the 1970 census and the sample size used for each are shown in Table 3. All the information on these tapes are available in microfilm which is useful in small areas because it does not require a programmer or computer to be read. However, the information is in coded form on the microfilm (see Appendix D). Therefore, it will take some time to locate the desired information for each enumeration district. However, the cost of this information is very small, only $8 per roll of 16mm microfilm. The number of rolls required for File A in
## TABLE 3

1970 Census Subject Items Compared With 1960 Content\(^2\)

The sample percentages for population and housing items included in the 1970 census in comparison with the items in the 1960 census are shown below. Each item is discussed on the page indicated.

<table>
<thead>
<tr>
<th>Population Items</th>
<th>1960</th>
<th>1970</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationship to head of household</td>
<td>100</td>
<td>100</td>
<td>7</td>
</tr>
<tr>
<td>Color or race</td>
<td>100</td>
<td>100</td>
<td>7</td>
</tr>
<tr>
<td>Age (month and year of birth)</td>
<td>100</td>
<td>100</td>
<td>7</td>
</tr>
<tr>
<td>Sex</td>
<td>100</td>
<td>100</td>
<td>7</td>
</tr>
<tr>
<td>Marital status</td>
<td>100</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>State or country of birth</td>
<td>25</td>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>Years of school completed</td>
<td>25</td>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>Number of children ever born</td>
<td>25</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>Employment status</td>
<td>25</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>Hours worked last week</td>
<td>25</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>Weeks worked last year</td>
<td>25</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>Last year in which worked</td>
<td>25</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>Occupation, industry, and class of worker</td>
<td>25</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>Activity 5 years ago</td>
<td>-</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>Income last year</td>
<td>25</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Wage and salary income</td>
<td>25</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Self-employment income</td>
<td>25</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>Other income</td>
<td>25</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Country of birth of parents</td>
<td>25</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Mother tongue</td>
<td>25</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Year moved into this house</td>
<td>25</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>Place of residence 5 years ago</td>
<td>25</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>School or college enrollment (public or private)</td>
<td>25</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>Veteran status</td>
<td>25</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>Place of work</td>
<td>25</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Means of transportation to work</td>
<td>25</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>Mexican or Spanish origin or descent</td>
<td>-</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Citizenship</td>
<td>-</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Year of immigration</td>
<td>-</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>When married</td>
<td>-</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Vocational training completed</td>
<td>-</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Presence and duration of disability</td>
<td>-</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Occupation-Industry 5 years ago</td>
<td>-</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

---

1 Single item in 1960, two-way separation in 1970 by farm and nonfarm income.
2 Single item in 1960, three-way separation in 1970 by social security, public welfare, and all other receipts.
3 This item is also in the 5 percent sample but limited to State of residence 5 years ago.
4 Street address included in 1970.
5 In 1960, whether married more than once and date of first marriage, in 1970, also includes whether first marriage ended by death of spouse.
### TABLE 3

1970 Census Subject Items Compared With 1960 Content—Continued

<table>
<thead>
<tr>
<th>Housing Items</th>
<th>1960</th>
<th>1970</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of units at this address</td>
<td>-</td>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>Telephone</td>
<td>25</td>
<td>7100</td>
<td>11</td>
</tr>
<tr>
<td>Access to unit</td>
<td>100</td>
<td>100</td>
<td>11</td>
</tr>
<tr>
<td>Kitchen or cooking facilities</td>
<td>100</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Complete kitchen facilities</td>
<td>-</td>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>Condition of housing unit</td>
<td>100</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Rooms</td>
<td>100</td>
<td>100</td>
<td>11</td>
</tr>
<tr>
<td>Water supply</td>
<td>100</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td>Flush toilet</td>
<td>100</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td>Bathtub or shower</td>
<td>100</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td>Basement</td>
<td>25</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td>Tenure</td>
<td>100</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td>Commercial establishment on property</td>
<td>100</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td>Value</td>
<td>100</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td>Contract rent</td>
<td>100</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td>Vacancy status</td>
<td>100</td>
<td>100</td>
<td>13</td>
</tr>
<tr>
<td>Months vacant</td>
<td>25</td>
<td>100</td>
<td>13</td>
</tr>
<tr>
<td>Components of gross rent</td>
<td>25</td>
<td>20</td>
<td>13</td>
</tr>
<tr>
<td>Heating equipment</td>
<td>25</td>
<td>20</td>
<td>13</td>
</tr>
<tr>
<td>Year structure built</td>
<td>25</td>
<td>20</td>
<td>13</td>
</tr>
<tr>
<td>Number of units in structure and whether a trailer</td>
<td>20</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>Farm residence (acreage and sales of farm products)</td>
<td>25</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>Land used for farming</td>
<td>25</td>
<td>-</td>
<td>16</td>
</tr>
<tr>
<td>Source of water</td>
<td>20</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Sewage disposal</td>
<td>20</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Bathrooms</td>
<td>20</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Air conditioning</td>
<td>5</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Automobiles</td>
<td>20</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Stories, elevator in structure</td>
<td>20</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Fuel—heating, cooking, water heating</td>
<td>5</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Bedrooms</td>
<td>5</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Clothes washing machine</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Clothes dryer</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Dishwasher</td>
<td>-</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Home food freezer</td>
<td>5</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Television</td>
<td>5</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Radio</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Second home</td>
<td>-</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

^6 To be collected primarily for coverage check purposes.
^7 Required on 100-percent for field followup purposes.
each state is shown in Appendix D. A complete copy of the census report from which this information was taken is provided in Appendix D. The report title is "1970 Census Summary Tape User Memorandum No. 30 (Revised)."

The exact type of information available on the first count summary tapes is provided in Appendix D in a census report titled "First Count Summary Tapes from the 1970 Census of Population and Housing." There are a number of data items that will prove quite useful. The information on population distribution by specific age groups for each E.D. will be helpful in locating those areas having a high number of young and elderly. These areas are where higher transit ridership may be expected. Along this same line the data items, value of owner-occupied housing units and monthly contract rent for renter-occupied units will be useful in determining an approximate income level for each E.D. Those areas with a high income level can generally be expected to generate a low transit ridership. A lot more information is available and can be used at the discretion of the study group.

Those census data items that were not collected at the 100 per cent level cannot be obtained for enumeration districts unless a special tabulation is made. These special tabulations are quite expensive depending on the amount of information requested and the size of the area. A number of organizations throughout the United States have purchased
the census tapes and are making special tabulations. A list of these organizations is contained in Appendix D in a census report titled "Summary Tape Processing Centers." If the study group wishes to have special tabulations made it should contact one of these centers or the United States Bureau of the Census in Washington, D.C.

In the cities under 50,000 that have not been tracted, the data from the census will probably not be enough to do all the transit planning. It may be necessary to obtain additional data particularly on non-transit user travel patterns. There are a number of relatively inexpensive methods for obtaining this data. In order to get work trip data it should be possible to conduct an employee survey. There are a couple of ways to do this. In some cases it will be possible to go to the employers of the area and obtain the names and addresses of their employees as well as their usual work schedule. This information can then be coded to the analysis zones.

If it is felt that the first method violates the employees rights or if more information is desired from each employee, then a survey card can be used to collect the desired information. This survey card is usually small and contains only a few questions. The usual information is home address, work schedule, and then a few questions which the study group may wish to ask concerning such things as mode to work, reaction to transit system, etc. The survey card
should be designed in the same manner as the on-board O-D survey questionnaire discussed in Chapter III.

Besides work trip information it might be desired to collect information on other trips such as shopping, recreation, etc. These can be obtained through a license plate survey at major activity centers. In conducting the survey a "typical day" should be used as in the on-board O-D survey. The license plate survey can be conducted over a period of days or weeks. It is not necessary to obtain a 100 per cent sample, but it will probably be as easy to get a 100 per cent sample as it would to get a random sample. Once the license plate numbers are recorded they are then matched to the addresses which can be obtained from the state bureau of motor vehicles. This information is then coded to the analysis zones.

If more information is desired from persons making trips such as shopping, recreation, etc. or from special groups such as the elderly, a post card survey can be done. Generally, these post cards are handed out at the major activity centers with the respondent mailing in the completed card. The cards are coded with a number which will be used to record the building or area where the cards were passed out. A sample survey card that was used in Detroit is shown in Figure 8. The return rate on this type of survey is generally very low, usually ranging from 10-30 per cent.
CITY OF DETROIT – CENTRAL BUSINESS DISTRICT STUDY

Your help is needed to plan an improved downtown Detroit. Please fill out this card about your trips today. Drop in any U.S. mailbox.

NOTE: If you received more than one card today, fill out and mail only one.

1. WHAT WAS YOUR DESTINATION IN THIS BUILDING?

   (Room No., Name of Company or Name of Doctor, Lawyer, etc.)

2. WHAT WAS THE PURPOSE OF YOUR TRIP TO THIS BUILDING?

   □ Place of work □ Business call □ Shopping □ Eat – Coffee Break
   □ Social – Recreation □ Personal business (Visit doctor, lawyer, bank, gov’t. office, etc.) □ Pass thru □ Other

3. IF YOU WORK HERE, HOW OFTEN DID YOU LEAVE BLDG? _______ TIME(S)

4 WAS TRIP TO THIS BUILDING MAIN REASON FOR COMING DOWNTOWN?

   □ YES □ NO

   IF NO (a) WHAT WAS THE MAIN REASON FOR COMING DOWNTOWN?

   □ Place of Work □ Business call □ Shopping □ Eat meal
   □ Social – Recreation □ School □ Personal business (Visit doctor, lawyer, gov’t. office, etc.) □ Other

   (b) LOCATION OF MAIN REASON FOR COMING DOWNTOWN

   (Nearest Street Corner or Building Name)

5. HOW DID YOU ENTER DOWNTOWN AREA TODAY? (CHECK ONE)

   □ Auto Driver □ Auto Passenger □ Bus □ Train □ Taxi □ Walk □ Other

6. HOW DID YOU GET FROM DOWNTOWN END OF TRANSPORTATION CHECKED IN QUESTION NO. 5 TO THE FIRST PLACE YOU WERE GOING?

   □ Walk □ Bus □ Taxi □ Auto Passenger □ Other

7. IF YOU DROVE DOWNTOWN –

   (a) WHERE DID YOU PARK? □ In Lot □ In Garage □ At Curb
   (b) HOW MANY BLOCKS WAS PARKING PLACE FROM WHERE YOU WERE GOING? □ Less than 1 □ 1-2 □ 3-4 □ Over 4
   (c) HOW MANY HOURS DID YOU PARK? □ Less than 1 □ 1-2 □ 3-4 □ 4-5 □ Over 5

8. CHECK ONE OR MORE PRINCIPAL REASONS FOR CHOICE OF TRANSPORTATION USED FOR TRIP INTO DOWNTOWN AREA

   AUTO DRIVERS  BUS OR TRAIN RIDERS  AUTO PASS. & OTHERS
   □ No bus available □ Do not like to drive □ No bus available
   □ Bus service too slow □ Bus or train more convenient than auto □ Bus service too slow
   □ Bus service requires transfer □ No driver’s license □ Bus service requires transfer
   □ Prefer comfort and convenience of auto □ Family does not have auto □ Ride available
   □ Need auto for other purposes □ Auto used by others □ Guest in hotel
   □ Parking not available at reasonable rates □ Bus or train less expensive than auto

9. WHAT IS YOUR HOME ZIP CODE?

10. WHAT IS YOUR AGE?

   □ Under 15 □ 16-20 □ 20-30 □ 30-40 □ 40-50 □ 50-65 □ Over 65

   NO. 37493

   FIGURE 8

   SAMPLE SURVEY CARD³
A final but more costly method of obtaining travel data from non-bus users is through the use of a mail-in or home interview questionnaire. A sample copy of the cover letter, trip log, and one of the two questionnaires used in the home interviews in the Greater Lafayette Area Transportation and Development Study conducted by the Tippecanoe County Area Plan Commission are provided in Appendix E. The questionnaire is self-explanatory and could have been used in a mail-in survey. However, the home interview was used to insure a higher return rate and to help reduce the amount of bias in the sample. The sample size can vary widely, but the following rates are recommended.4

For determining general transportation plans, the sample rates should not be smaller than given below. However, if more precise plans are called for, the sample rates recommended by the Bureau of Public Roads should be followed.

<table>
<thead>
<tr>
<th>Metropolitan Population</th>
<th>Minimum Sample Rate</th>
<th>Sample Rate Recommended by the Bureau of Public Roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 50,000</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td>50,000 - 150,000</td>
<td>5%</td>
<td>12-1/2%</td>
</tr>
<tr>
<td>150,000 - 300,000</td>
<td>3%</td>
<td>10%</td>
</tr>
<tr>
<td>300,000 - 500,000</td>
<td>2%</td>
<td>6-2/3%</td>
</tr>
<tr>
<td>500,000 - 1 million</td>
<td>1.5%</td>
<td>5%</td>
</tr>
<tr>
<td>Over 1 million</td>
<td>1%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Additional data besides those on non-bus users are needed for transit planning. These include information on the area in the form of land-use data as well as economic and population growth trends. These items will be discussed in the following sections.
Land-Use Data

This information is necessary to determine the location of activity centers in relation to residential areas which should aid in routing and scheduling. Also, by continued updating of the land-use map, changes in location trends can be found. This will aid in planning new routes and making changes in old ones.

There are a number of ways to obtain land-use data. In the larger cities land-use maps may already have been developed by the planning department. However, if a land-use map is not available, it will be necessary to develop one. For transit planning purposes this map can be less detailed than typical land-use maps. The main thing is to locate specific land-use groups and in the case of large businesses or industries, the exact use and owner can be specified. A typical land-use grouping will contain 8-10 land-use classifications. Two examples are provided below.


1. Residential
2. Business and Commercial
3. Industrial
4. Transportation Services
5. Public, Cultural, Educational and Related
6. Parks and Recreation
7. Utilities
8. Agricultural
9. Miscellaneous Uses
Land-Use Classification Manual. Developed by the Land Classification Advisory Committee of the Detroit Metropolitan Area.

6

0. Residential
1. Extractive and Industrial Nonmanufacturing
2. Manufacturing (light)
3. Manufacturing (heavy)
4. Transportation, Communications, and Utilities
5. Commercial
6. Personal, Business, and Professional Services
7. Public and Quasi-Public Services
8. Recreation
9. Unused Space

Both of the examples listed above are further broken down for each classification, however, for transit planning purposes the broad groups will be adequate. It might be beneficial to have a number of residential classifications which distinguish dwelling types.

A number of methods may be used to obtain land-use information. Where available, airphotos can be used to locate general land-uses. Those areas which are unclear can be checked by visual inspection. Another possible source is the use of Sanborn maps. These maps may be available through local insurance companies. In using these maps the study group should check to see if the information is up-to-date. In some cases these maps are updated only every five to ten years. However, between the use of airphotos, Sanborn maps, and visual inspection, it should be possible to develop a fairly accurate land-use map with a minimum of effort.
Once the information is obtained it should be color coded or coded to a set of black and white patterns which can then be used to code a map of the area. This map will be very helpful in planning new transit routes or making changes in old routes.

Notes


3 Central Business District Study, City of Detroit, Central Business District Study Survey Card (Detroit, Michigan, 1968).


In the conventional transportation studies that have been conducted, a lot of time and effort has gone into the forecasting phase. This phase consists of such things as trip generation, trip distribution, and modal split and trip assignment. Also, included in this phase were other projections such as population and economic forecasts as well as future land-use trends.

In transit planning and particularly in small areas a lot of effort cannot be spent on the forecasting phase. However, this phase cannot be ignored! Most of the studies in the past have made their forecasts for periods of 10 to 20 years in the future. A long planning period may be alright if no major changes are to be made in the transportation system during that time. However, if major changes are to be made in the system, it becomes difficult to predict the effects on the system due to these major changes. Thus, for the transit planning being done in small areas a much shorter forecasting period must be used. There are several reasons for this. Generally, transit ridership will consist of captive riders at the time planning is being done. Also, old equipment will probably be in use over routes that haven't changed in years. Once the planning
recommendations are implemented, one might expect drastic changes to be made in the type of equipment used as well as the routes used and the level of service being provided. It will therefore be impossible to forecast accurately the ridership trends on this new system 10 to 20 years hence based on the data collected on the old system.

It is suggested that a 3 to 5 year forecasting period be used for designing the new or improved transit system. In making the forecasts for this period it is suggested that the mathematical models developed in other studies not be used. There are several reasons for this.

1. Generally, a large amount of data is needed to calibrate and use most of the models that have been developed. Not only is it expensive to collect these data but a high level of technical know how is needed to properly use these models.

2. Generally, these models are less accurate for small areas having a small number of daily trips. Also, these models are usually designed and calibrated to forecast for a 10 to 20 year period. Therefore, the models would have to be recalibrated to the 3 to 5 year period as well as to reflect any differences between the area where the model was developed and any other area where it was to be used.

Before the study group attempts to do any forecasting, it should look for other sources of forecast data. If a transportation study has been done in the area, it may be
possible to evaluate and use the forecasts previously prepared. These forecasts would include population and land-use forecasts as well as trip generation, etc.

Another source of information might be colleges and universities in the state that may have done population and economic forecasts for certain regions of the state. Along this same line it might be helpful to check with business organizations in the area such as the chamber of commerce for any economic forecasts that are available for the area.

From the above sources it should be possible to obtain the population, economic, and land-use trends to be expected in the 3 to 5 year planning period. However, it may not be possible to obtain a forecast for transit ridership for that same period. There are a couple of ways that the study group may obtain a forecast for transit ridership.

In most cases the present transit system will have experienced a fluctuating up and down trend in ridership over the last ten years with a continued decline over the past several years. This pattern can be determined by plotting the yearly system passenger revenue for a ten year period. This plot might look like that of the Lafayette system as shown in Figure 9. If so, a good estimate for ridership expected from a new or improved system in the 3 to 5 year planning period would be the ridership at the highest peak in the last ten years. In the case of the Lafayette system, this would be in 1960.
FIGURE 9

PASSENGER REVENUE - GREATER LAFAYETTE BUS CO!
Generally, this point will occur at a time in the past when the present system was then providing a higher level of service, possibly had expanded coverage, and better equipment over what presently exists. This ridership estimate is based on an increased level of service. In some cases the increase in ridership may come quickly with the implementation of major system improvements. However, it most likely will take 2 to 3 years for people to change their riding habits, particularly those that have purchased a second car as an alternative to using the old transit system. The new system will have to prove itself before these people will be willing to give up that second car.

If the plot of passenger revenue does not decline for the last year or two but is increasing then it may be possible to apply a growth factor to develop a ridership forecast. Generally, ridership can be expected to equal past ridership peaks and in a few cases exceed them in the 3 to 5 year forecast period.

It should be remembered that this increased ridership will come from persons presently having an alternative means of transportation. They may be persons that were once transit users and stopped using transit because of the poor level of service or those that do not wish to spend the money for a second car. In either case they will be attracted to transit only if they are convinced that the improved level of service will be maintained.
Since a short forecasting period is being used it will be necessary to continue monitoring the system after implementation to insure that the system does not become overloaded. Since the transit system is flexible, it will be possible to prevent overloading by adding additional vehicles as they are needed. This continuing planning process will be discussed in a later chapter.

**Data Presentation**

After the planning data have been collected it should be presented in a way that aids in the analysis process. Some of the data will lend itself to being tabulated in tables or charts; other data can be plotted on graphs or maps. The purpose of this section is to encourage the study group to be innovative and to present the data in any form which might be useful in the analysis phase.

Placing data on maps of the area, particularly one showing the analysis zones, can be very effective for analysis purposes. The use of color schemes should be encouraged not only because it improves the appearance of the report but also because it enables the study group to put two or three types of information on one map.

A few examples of data presentation will be provided here in order to show some of the ways that data may be presented for analysis purposes. The origin and destination data collected in the on-board 0-D survey can be tabulated and presented in a trip table as shown in Table 4. The 0-D
### TABLE 4
TRIP TABLE FROM GREATER LAFAYETTE AREA BUS STUDY

<table>
<thead>
<tr>
<th>TRIP ORIGINS</th>
<th>001</th>
<th>002</th>
<th>003</th>
<th>101</th>
<th>102</th>
<th>103</th>
<th>104</th>
<th>105</th>
<th>106</th>
<th>107</th>
<th>108</th>
<th>200</th>
<th>201</th>
<th>202</th>
<th>203</th>
<th>204</th>
<th>205</th>
<th>206</th>
<th>208</th>
<th>210</th>
<th>212</th>
<th>213</th>
<th>300</th>
<th>301</th>
<th>302</th>
<th>303</th>
<th>304</th>
<th>305</th>
<th>306</th>
<th>307</th>
<th>310</th>
<th>Sub-Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>10</td>
<td>4</td>
<td>5</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>11</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>18</td>
<td>119</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>002</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>12</td>
<td>5</td>
<td>9</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>12</td>
<td>4</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>5</td>
<td>9</td>
<td>84</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>003</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>8</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>101</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>102</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>103</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>104</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>105</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>106</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>107</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>108</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>201</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>202</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>203</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>204</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>205</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>206</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>208</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>210</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>212</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sub-Totals: 84 61 7 26 4 21 7 14 16 12 5 5 7 1 20 7 9 12 13 5 5 18 5 7 24 5 40 441
information collected on non-bus users can also be presented in this manner. Other information gathered from the various surveys can be presented in tabular or chart form as in Tables 5-10 and Figure 10.

Once the data have been tabulated and recorded, it is then possible to plot some of it on maps of the area. Figure 11 shows the presentation of transit routes and the area coverage of each route. From this map it is easy to find those areas outside of the one-quarter mile service area. If colors are used, it is possible to show other data on this map such as average family income for each analysis zone. This can also be done through the use of transparent overlays each having a specific type of data recorded on them by analysis zone. A plot can also be made as in Figure 12 showing the zones that are major generators of trips. Other types of data such as number of employees in each zone, number of persons in certain age groups by zone etc., can be presented in the same manner. It has often been said that a picture is worth a thousand words and this statement was never truer than in the analysis phase of the planning process. Putting forth a lot of time and effort on data presentation will prove worthwhile when it is time for system design and analysis.

Notes

1CE 664, Urban Transportation Planning, Term Project, Purdue University, Greater Lafayette Area Bus Study, Professor Kenneth W. Heathington (Civil Engineering Building, Lafayette, Indiana 47907, January 1971), p. 32.
### TABLE 5
**TRIP PURPOSE - INTERNAL SURVEY**

Champaign-Urbana Urban Area Transportation Study

<table>
<thead>
<tr>
<th>PURPOSE FROM</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>TOTAL</th>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home</td>
<td>16,928</td>
<td>12,265</td>
<td>2,358</td>
<td>6,271</td>
<td>13,911</td>
<td>79</td>
<td>1,188</td>
<td>13,139</td>
<td>14,168</td>
<td>80,307</td>
<td>36.6</td>
<td></td>
</tr>
<tr>
<td>Work</td>
<td>15,650</td>
<td>4,025</td>
<td>3,170</td>
<td>539</td>
<td>180</td>
<td>973</td>
<td>67</td>
<td>4,707</td>
<td>2,211</td>
<td>1,816</td>
<td>33,348</td>
<td>15.7</td>
</tr>
<tr>
<td>Personal Business</td>
<td>11,492</td>
<td>948</td>
<td>3,126</td>
<td>185</td>
<td>179</td>
<td>915</td>
<td>--</td>
<td>236</td>
<td>1,580</td>
<td>520</td>
<td>19,181</td>
<td>8.7</td>
</tr>
<tr>
<td>Medical-Dental</td>
<td>2,076</td>
<td>189</td>
<td>221</td>
<td>211</td>
<td>27</td>
<td>228</td>
<td>--</td>
<td>41</td>
<td>370</td>
<td>93</td>
<td>3,456</td>
<td>1.6</td>
</tr>
<tr>
<td>School</td>
<td>5,546</td>
<td>231</td>
<td>461</td>
<td>115</td>
<td>279</td>
<td>475</td>
<td>--</td>
<td>527</td>
<td>389</td>
<td>450</td>
<td>8,473</td>
<td>3.9</td>
</tr>
<tr>
<td>Social-Recreation</td>
<td>15,319</td>
<td>125</td>
<td>441</td>
<td>139</td>
<td>123</td>
<td>2,026</td>
<td>--</td>
<td>202</td>
<td>752</td>
<td>620</td>
<td>19,787</td>
<td>9.0</td>
</tr>
<tr>
<td>Change Mode</td>
<td>120</td>
<td>45</td>
<td>28</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>28</td>
<td>--</td>
<td>221</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Eat</td>
<td>1,128</td>
<td>3,473</td>
<td>519</td>
<td>90</td>
<td>518</td>
<td>458</td>
<td>--</td>
<td>444</td>
<td>487</td>
<td>7,117</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>Shop</td>
<td>16,773</td>
<td>515</td>
<td>1,671</td>
<td>174</td>
<td>220</td>
<td>1,621</td>
<td>17</td>
<td>3,641</td>
<td>718</td>
<td>25,307</td>
<td>11.5</td>
<td></td>
</tr>
<tr>
<td>Serve Passenger</td>
<td>11,277</td>
<td>2,305</td>
<td>1,489</td>
<td>488</td>
<td>918</td>
<td>1,380</td>
<td>18</td>
<td>467</td>
<td>1,509</td>
<td>2,121</td>
<td>22,472</td>
<td>10.2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>79,401</td>
<td>28,794</td>
<td>23,391</td>
<td>4,319</td>
<td>8,715</td>
<td>21,987</td>
<td>191</td>
<td>7,925</td>
<td>24,063</td>
<td>20,993</td>
<td>219,669</td>
<td></td>
</tr>
<tr>
<td>PERCENT</td>
<td>36.1</td>
<td>13.1</td>
<td>10.7</td>
<td>2.0</td>
<td>4.0</td>
<td>10.0</td>
<td>0.1</td>
<td>3.6</td>
<td>10.9</td>
<td>9.5</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 6
**TRIP PURPOSE - INTERNAL SURVEY**

Champaign-Urbana Urban Area Transportation Study

<table>
<thead>
<tr>
<th>PURPOSE FROM</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>TOTAL</th>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home</td>
<td>268</td>
<td>33</td>
<td>61</td>
<td>1,187</td>
<td>50</td>
<td>8</td>
<td>--</td>
<td>68</td>
<td>--</td>
<td>1,375</td>
<td>40.0</td>
<td></td>
</tr>
<tr>
<td>Work</td>
<td>161</td>
<td>--</td>
<td>10</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>10</td>
<td>10</td>
<td>9</td>
<td>10</td>
<td>210</td>
<td>5.1</td>
</tr>
<tr>
<td>Personal Business</td>
<td>44</td>
<td>--</td>
<td>8</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>24</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>76</td>
<td>1.8</td>
</tr>
<tr>
<td>Medical-Dental</td>
<td>53</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>53</td>
<td>1.3</td>
</tr>
<tr>
<td>School</td>
<td>1,106</td>
<td>8</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>31</td>
<td>22</td>
<td>286</td>
<td>9</td>
<td>1,499</td>
<td>35.8</td>
</tr>
<tr>
<td>Social-Recreation</td>
<td>60</td>
<td>--</td>
<td>8</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>16</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>92</td>
<td>2.3</td>
</tr>
<tr>
<td>Change Mode</td>
<td>26</td>
<td>32</td>
<td>16</td>
<td>--</td>
<td>--</td>
<td>16</td>
<td>8</td>
<td>8</td>
<td>--</td>
<td>114</td>
<td>7.8</td>
<td></td>
</tr>
<tr>
<td>Eat</td>
<td>10</td>
<td>10</td>
<td>--</td>
<td>--</td>
<td>244</td>
<td>8</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>272</td>
<td>6.5</td>
</tr>
<tr>
<td>Shop</td>
<td>128</td>
<td>--</td>
<td>18</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>17</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>163</td>
<td>3.9</td>
</tr>
<tr>
<td>Serve Passenger</td>
<td>--</td>
<td>21</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>21</td>
<td>0.5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,583</td>
<td>339</td>
<td>93</td>
<td>61</td>
<td>1,500</td>
<td>84</td>
<td>53</td>
<td>312</td>
<td>135</td>
<td>10</td>
<td>4,175</td>
<td></td>
</tr>
<tr>
<td>PERCENT</td>
<td>38.0</td>
<td>8.1</td>
<td>2.3</td>
<td>1.5</td>
<td>35.8</td>
<td>2.0</td>
<td>1.3</td>
<td>7.5</td>
<td>3.3</td>
<td>0.2</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Income of Residential Zone</td>
<td>Work No.</td>
<td>Work %</td>
<td>Shopping No.</td>
<td>Shopping %</td>
<td>Personal Business No.</td>
<td>Personal Business %</td>
<td>Social Recreational No.</td>
<td>Social Recreational %</td>
<td>School No.</td>
<td>School %</td>
<td>Other No.</td>
<td>Other %</td>
</tr>
<tr>
<td>----------------------------</td>
<td>----------</td>
<td>--------</td>
<td>-------------</td>
<td>------------</td>
<td>-----------------------</td>
<td>--------------------</td>
<td>------------------------</td>
<td>-----------------------</td>
<td>------------</td>
<td>---------</td>
<td>-----------</td>
<td>--------</td>
</tr>
<tr>
<td>$2,000 - $3,000</td>
<td>977</td>
<td>11</td>
<td>-</td>
<td>-</td>
<td>136</td>
<td>7</td>
<td>-</td>
<td>-</td>
<td>45</td>
<td>1</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>$3,001 - $4,000</td>
<td>3667</td>
<td>42</td>
<td>708</td>
<td>40</td>
<td>609</td>
<td>30</td>
<td>330</td>
<td>28</td>
<td>1305</td>
<td>26</td>
<td>74</td>
<td>13</td>
</tr>
<tr>
<td>$4,001 - $5,000</td>
<td>1987</td>
<td>22</td>
<td>504</td>
<td>29</td>
<td>555</td>
<td>28</td>
<td>381</td>
<td>33</td>
<td>1214</td>
<td>24</td>
<td>286</td>
<td>49</td>
</tr>
<tr>
<td>$5,001 - $6,000</td>
<td>809</td>
<td>9</td>
<td>212</td>
<td>12</td>
<td>220</td>
<td>11</td>
<td>276</td>
<td>23</td>
<td>992</td>
<td>20</td>
<td>32</td>
<td>6</td>
</tr>
<tr>
<td>$6,001 - $7,000</td>
<td>871</td>
<td>10</td>
<td>228</td>
<td>13</td>
<td>182</td>
<td>9</td>
<td>169</td>
<td>14</td>
<td>423</td>
<td>8</td>
<td>67</td>
<td>12</td>
</tr>
<tr>
<td>$7,001 - $8,000</td>
<td>116</td>
<td>1</td>
<td>24</td>
<td>1</td>
<td>76</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>252</td>
<td>5</td>
<td>56</td>
<td>10</td>
</tr>
<tr>
<td>$8,001 - $10,000</td>
<td>158</td>
<td>2</td>
<td>85</td>
<td>5</td>
<td>170</td>
<td>8</td>
<td>26</td>
<td>2</td>
<td>348</td>
<td>7</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>$10,001 - $15,000</td>
<td>259</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>50</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>458</td>
<td>9</td>
<td>48</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>8844</td>
<td>100</td>
<td>1761</td>
<td>100</td>
<td>1998</td>
<td>100</td>
<td>1182</td>
<td>100</td>
<td>5037</td>
<td>100</td>
<td>577</td>
<td>100</td>
</tr>
<tr>
<td><strong>Percent</strong></td>
<td></td>
<td>46</td>
<td></td>
<td></td>
<td>10</td>
<td>6</td>
<td>26</td>
<td>3</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 8

**Origin and Destination of Industrial Employees in the Schenectady Area**

<table>
<thead>
<tr>
<th>Industry:</th>
<th>Consolidated Diesel</th>
<th>Electric Seaboard</th>
<th>Foods</th>
<th>Schenectady Chemicals, Inc.</th>
<th>MMM Corp.</th>
<th>Also Products</th>
<th>General Electric Corp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>Schenectady Scotia</td>
<td>Schenectady</td>
<td>Niskayuna</td>
<td>Rotterdam Int.</td>
<td>Schenectady</td>
<td>Schenectady</td>
<td>Schenectady Niskayuna</td>
</tr>
<tr>
<td>Destination Zone:</td>
<td>SC</td>
<td>4</td>
<td>2B</td>
<td>3B</td>
<td>SC</td>
<td>14</td>
<td>SC</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>2A</td>
<td>10</td>
<td>6</td>
<td>12</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>2B</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>3A</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>8</td>
<td>2</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>3B</td>
<td>11</td>
<td>14</td>
<td>7</td>
<td>21</td>
<td>6</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>3C</td>
<td>17</td>
<td>14</td>
<td>6</td>
<td>9</td>
<td>2</td>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td>04</td>
<td>6</td>
<td>14</td>
<td>11</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>05</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>06</td>
<td>7</td>
<td>2</td>
<td>13</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>08</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>-</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>07</td>
<td>8</td>
<td>9</td>
<td>7</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>09</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>-</td>
<td>11</td>
</tr>
<tr>
<td>10</td>
<td>12</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>9A</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>9B</td>
<td>14</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>1</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>9C</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>11</td>
<td>10</td>
<td>2</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>14</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>16</td>
<td>10</td>
<td>19</td>
<td>14</td>
<td>7</td>
<td>1</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>17</td>
<td>8</td>
<td>3</td>
<td>11</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>30</td>
<td>22</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>19</td>
<td>45</td>
<td>50</td>
<td>-</td>
<td>7</td>
<td>2</td>
<td>17</td>
<td>1</td>
</tr>
</tbody>
</table>

**Approximate Number of Employees**

<table>
<thead>
<tr>
<th>233</th>
<th>205</th>
</tr>
</thead>
<tbody>
<tr>
<td>148</td>
<td>128</td>
</tr>
<tr>
<td>65</td>
<td>98</td>
</tr>
<tr>
<td>179</td>
<td>794</td>
</tr>
<tr>
<td>20,000</td>
<td>5,000</td>
</tr>
</tbody>
</table>

**NOTE:** Employee origin by zones determined from addresses furnished by employers, except for General Electric Corporation, which was expanded from information available.
<table>
<thead>
<tr>
<th>Analysis of Questionnaire</th>
<th>Driver's License Available</th>
<th>Driver's License Not Available</th>
<th>Total</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Driver's License</td>
<td></td>
<td></td>
<td>72</td>
<td>100.0</td>
</tr>
<tr>
<td>2. Average Monthly Trips/Person</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shopping Trips</td>
<td>11.9</td>
<td>9.1</td>
<td>11.0</td>
<td></td>
</tr>
<tr>
<td>Medical Trips</td>
<td>1.4</td>
<td>2.6</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>Work Trips</td>
<td>6.0</td>
<td>5.2</td>
<td>5.7</td>
<td></td>
</tr>
<tr>
<td>Social Trips</td>
<td>8.0</td>
<td>6.4</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td>Average Monthly Trips/Person</td>
<td>27.3</td>
<td>23.30</td>
<td>26.0</td>
<td></td>
</tr>
<tr>
<td>3. Auto Availability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Available</td>
<td>44</td>
<td>2</td>
<td>46</td>
<td>63.9</td>
</tr>
<tr>
<td>Not Available</td>
<td>4</td>
<td>22</td>
<td>26</td>
<td>36.1</td>
</tr>
<tr>
<td>4. Use of Local Bus Service</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use</td>
<td>27</td>
<td>24</td>
<td>51</td>
<td>70.8</td>
</tr>
<tr>
<td>Do not use</td>
<td>21</td>
<td>-</td>
<td>21</td>
<td>29.2</td>
</tr>
<tr>
<td>5. Use of Evening Bus Service</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Would use</td>
<td>16</td>
<td>18</td>
<td>34</td>
<td>47.2</td>
</tr>
<tr>
<td>Would not use</td>
<td>30</td>
<td>6</td>
<td>36</td>
<td>50.0</td>
</tr>
</tbody>
</table>

NOTE: Based on return of questionnaires mailed to 250 retired persons selected at random from the 1968 City of Schenectady Directory (Manning).
**TABLE 10**

**AUTO DRIVERS’ REASONS FOR SELECTING MODE OF TRAVEL FOR WORK TRIP**

<table>
<thead>
<tr>
<th>Auto Drivers</th>
<th>Number of Responses of Auto Drivers</th>
<th>Percent of Total Responses from Auto Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No bus available</td>
<td>138</td>
<td>16.0</td>
</tr>
<tr>
<td>Bus service too slow</td>
<td>83</td>
<td>9.6</td>
</tr>
<tr>
<td>Bus service requires transfer</td>
<td>42</td>
<td>4.9</td>
</tr>
<tr>
<td>Prefer comfort and convenience of auto</td>
<td>320</td>
<td>37.1</td>
</tr>
<tr>
<td>Use auto at work</td>
<td>92</td>
<td>10.7</td>
</tr>
<tr>
<td>Auto less expensive</td>
<td>67</td>
<td>7.8</td>
</tr>
<tr>
<td>Auto would otherwise be idle</td>
<td>77</td>
<td>8.9</td>
</tr>
<tr>
<td>Member of car pool</td>
<td>10</td>
<td>1.2</td>
</tr>
<tr>
<td>Other</td>
<td>33</td>
<td>3.8</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>862</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Note: Respondents could indicate more than one reason for their choice of mode of travel to work.
FIGURE 10

TRIP DISTRIBUTION BY TIME & PURPOSE (SDTC)
Figure II
Bus Routes and Coverage
(1/4 Mile on Each Side of Route)
2 Ibid., p. 65.


6 Corddry, Carpenter, Dietz, and Zack, and Gannett, Fleming, Corddry, and Carpenter, Engineers, P.O. Box 1963, Harrisburg, Pennsylvania 17105, Mass Transit Feasibility Study Schenectady City and County (Prepared for the State of New York, Department of Transportation, Development Division, 1220 Washington Avenue, Albany, New York 12226, April 4, 1969), Exhibit R.

7 Ibid., Exhibit T.


9 CE 664, Urban Transportation Planning, p. 17.

10 Ibid., p. 18.
CHAPTER VI. SYSTEM DESIGN AND ANALYSIS

In order to develop a number of alternative system designs, the study group must determine what types of hardware are available, the possible organizational set ups, as well as establishing certain design assumptions such as drivers wages, levels of service, depreciation rates, etc. This chapter covers some of the more important areas in the design phase.

Hardware Alternatives

One of the most important items in system design will be choosing the size and type of vehicle to be used. It is a good idea for the study group to design a number of systems using several different size buses. It will be necessary for the study group to obtain information on each type of bus as to its initial cost, operating costs, use life, options available, specifications, etc., such as would be available from manufacturers. A list of manufacturers and their addresses is provided in Appendix F. Also, provided are examples of some of the various types of equipment presently available as well as a sample specification sheet.

In purchasing new buses it will be necessary to develop a set of specifications. It is a legal requirement if public funds are used to purchase the equipment. In this case
it will be necessary to obtain bids from the manufacturers. To encourage competitive bids, the specifications must be written so that more than one manufacturer can bid on them. The specifications must also be written to cover every item desired by the study group. To add or change the contract can be very costly and time consuming. A sample of the bid forms and specifications used in Lafayette is provided in Appendix G.

The design of a number of alternative systems and the use of various types of hardware will be discussed in a later section of this chapter.

Organization Alternatives

The number of administrative personnel that will be needed will depend upon the organizational form. Generally, the type and structure of the set up for managing the transit operations will be dependent on the size of the operations. Figures 13, 14, and 15 show possible organizational frameworks based on the number of buses operated by the transit system. It will be up to the study group to develop alternative types of management which could then be presented to the decision makers, thus giving them a choice.

Each of the management alternatives has its own advantages and disadvantages as well as certain economic costs. Therefore, it is necessary to develop a number of combinations of these alternatives in order to evaluate the ability of each to meet the system objectives. The next section
Figure 13: Organization Chart--Small Firms (10 or Less Buses)

Figure 14: Organization Chart--Medium-Sized Firm (11 to 30 Buses)
Figure 15: Organization Chart--Large Firms (31-100 Buses)
will discuss the development of alternative systems.

Developing Alternative Transit Systems

Before developing the alternative systems, it would be wise to go over the objectives that have been established for transit in the area.

There is no established procedure for developing alternative systems. The quality of the systems designed will depend on the time and effort expended as well as the ingenuity and expertise of the personnel in the study group. Spending extra time on this phase of the planning process should be very beneficial.

In developing alternative systems, it will be necessary for the study group to establish assumptions to be used in designing each alternative with these assumptions varying for each urban area being studied. These assumptions will include such things as the level of service to be used for each alternative, the drivers wages to be used, the cost of equipment and facilities, etc. For example, some of the assumptions used in the Lafayette study are provided below. The values listed in the assumptions are probably low, as they do not reflect the inflationary trends since the Lafayette study was conducted. 3

**Assumptions**
The basic assumptions concerning levels of service used in the evaluation of system alternatives are as follows:

1. Continuing the present level of service the same routes and schedules will be maintained.
2. Improving the level of service, a reduction of headways will be made by utilizing more equipment.

3. Improving the level of service, an extension of the area of coverage will be made by extending the present routes and/or establishment of new routes. Some routes may have a reduction in headways.

In all three levels of service, new equipment, new management and organization, and new terminal facilities will be used.

The basic assumptions used throughout the study for cost estimations are as follows:

1. Thirty-three passenger bus operational cost = $.12 per mile.
2. Eighteen to twenty-three passenger bus operational cost = $.07 per mile.
3. Twelve passenger bus operational cost = $.07 per mile.
4. Basic hourly wage for drivers = $3.00.
5. Managers annual salary = $16,000.
6. Secretary-Bookkeeper's annual salary = $5,400.
7. Two interns (1/2 time - each at $6,000) = $12,000.
8. Two maintenance employees (full time, each at $6,000/year) = $12,000.
9. Total salaries and wages including sick leave, vacation, unemployment, F.I.C.A., hospitalization, etc. = 1.15 times basic salary and wage rate.
10. Estimated cost of vehicles:
   A. 45 passenger bus, air conditioned = $36,000.
   B. 33 passenger bus, air conditioned, other extras = $26,500.
   C. 18-23 passenger bus, air conditioned = $13,152.
   D. 12 passenger bus, air conditioned = $8,000.

Capital recovery cost of vehicles for the various systems was based on a 10 year period at 8% interest for the 33 and 45 passenger buses, a 6 year period at 8% interest for the 18-23 passenger buses, and a 3 year period at 8% interest for the 12 passenger buses.
11. Office Expense:
   A. Utilities, per year = $2,200.
   B. Supplies per year = $4,000.

12. All systems are estimated with two way radio equipment at a cost per unit of $500.

13. New fare boxes for all vehicles are included at an estimated cost of $220 each.

14. The passenger figures used for all alternatives were obtained from the survey data.

Before the required number of buses and drivers can be determined, it will be necessary to determine the routes that will be used. It should be possible to develop a number of routing alternatives. These alternatives will include the existing routing scheme and possible extensions of those routes as well as the development of new routes. The development of routing schemes is a very difficult task. There are no set rules to follow in establishing routes, however a few guidelines are suggested as follows.  

Routing

Transit routes should be laid out to provide maximum service to the community as a whole. Transit should be conceived on a systemwide basis, but in the development of individual routes the following considerations are important:

1. The route should be direct with respect to origins and destinations of passengers. (Transfers which riders must make should be held to a minimum.)
2. Routes should be free of duplication except where they converge.
3. In built-up areas, routes should be spaced at approximately half-mile intervals (quarter-mile walking distance) with intervals increased proportionately in areas of medium and low population density.
4. Routes should include a minimum number of turning movements, and should have adequate provision for turn-around at both ends and for layover at one or both ends.
5. Routes should have reasonable long-term flexibility (not necessarily day-to-day flexibility), to meet changing conditions.

6. Routes should be laid out to take full advantage of street characteristics and possible operational improvements. Such factors include the condition and type of roadways utilized, design features, traffic control measures, strength of roadway structure (especially at vehicle stops), width, surface, control of access from side streets, and provisions for loading and unloading.

In adjusting present routes and developing new ones, the convenience and comfort of passengers should be a prime consideration. Improvement of transit speed is of the utmost importance. Speed often can be stepped up by selecting routes which have desirable physical characteristics and on which advantageous parking and traffic control measures can be adopted.

The routing process itself is mostly a trial and error method which attempts to satisfy the travel desires of the community. Although the routing method is mostly trial and error, there are a number of types of routing that can be used. The following discussion of routing is taken from the publication Mass Transit Management: A Handbook for Small Cities which was compiled at the Institute for Urban Transportation at Indiana University.\(^5\)

**Routing**

Basiclly, routing is of two types: through-routing and cycle-routing.

Through-routing is simply routing the vehicles from one side of town to the other--generally through the central business district.
Cycle-routing is running the buses into the central business district and routing them back out over the same line, usually at a fixed interval. Both of these plans allow arrivals at the central business district to be scheduled for convenient transfers to other lines.

Through-routing will minimize the number of passengers who must transfer at the central business district to complete their trips. On the other hand, if a service interruption occurs, two lines are affected rather than one.

Cycle-routing simplifies scheduling somewhat, but it forces more passengers to transfer from one line to another. If through traffic is heavy, through-routing is preferable because it minimizes time, energy and money costs.

In some areas, a type of routing called reverse-routing is used. This technique involves shunting an outbound run to a formerly
separate adjacent line for the inbound run. The ordinary plan, of course, is to provide service both outbound and inbound over the same route. The reverse-routing plan has the advantage of reducing bus-miles-operated, since one bus seems to do the work of two. On the other hand, only half the work is being performed. Obviously, this use of routing is not designed to increase ridership. A passenger on the outbound portion of the route who wishes to go to the central business district is forced to board the outbound bus, ride it to the end of the outbound line, ride the loop, and then ride in to the center of town, which has the effect of increasing the passenger’s time and energy costs. The cost savings of reverse-routing may thus be offset by revenue losses as riders find alternative means of making trips.

**REVERSE - ROUTING**

Reverse-routing is a tool that should be used sparingly and judiciously. Loops should never have layovers at the end of the outbound runs, and they should in every case have short running times over the loop portion of the trip.

Balloon-routing is a useful tool for outlying areas....This type of routing is used at the outlying end of a line to serve residential areas.

As can be seen from the illustration, more than one residential area can be served in this manner. The use of balloon-routing results in "fine-grained" service in the area served. In fact, if the residential areas take the character of reasonably small subdivisions, the
balloon-routing technique can be regarded almost as door-to-door service. Balloon-routing is a very consumer-oriented technique, and it should be used wherever possible.

Recently, a new type of system has been used in small areas which does not require the conventional type routing. The system is referred to by many names such as Dial-A-Bus, demand-actuated transportation, etc. It operates similar to a taxi in that passengers phone into the transit company for a ride. However, a small mini-bus is used and more than one rider is picked up on each trip. The number of riders picked up will depend on the destinations of the persons on-board. Generally, the first passenger picked up must be delivered to his destination within 15 to 20 minutes after the time he was picked up. This type of service is very marketable in that it is a door-to-door type service. However, since the level of service is high the cost is somewhat higher than that on a regular transit system. However, the cost is less
than that for a taxi.

This system appears to have great potential for use in small, low density areas, particularly where daily ridership is low, thus permitting hand scheduling. This system has been recommended for use in Lafayette during the off-peak hours. Not only does this system provide a high level of service, but it may reduce the vehicle operating costs during the off-peak hours since less vehicles may be necessary. A good source of additional information on this type of system is Highway Research Board Special Report 124 titled Demand-Actuated Transportation Systems.

At the same time routing is being designed, it is necessary to consider the scheduling process. The type of schedule developed will depend not only on the routing but also on the type and level of service to be provided. A few guidelines for scheduling are provided below.

GUIDELINES FOR SCHEDULING

(1) Scheduling is a most important marketing variable. In the firm's marketing strategy, it is designed, in conjunction with other marketing tools, to hold customers who have been enticed to use the service.

(2) Schedules should be simple and easy to remember. The passengers are not scheduling experts. Simplicity is also helpful to the operating employees (drivers and dispatchers alike). Scheduling should not require highly skilled people nor a computer, in keeping with the restrictions on available funds.

(3) For cities of under 100,000 in population, headways of 30 minutes should meet the needs, although this idea should be carefully evaluated for each and every route. For larger cities, headways should be shortened.
(4) From a financial standpoint, it is probably impossible to have very frequent headways (i.e., in the five-minute range), which makes careful drawing and scrupulous maintenance of schedules extremely important.

(5) Schedules should be coordinated so that transferring is made as convenient to the rider as possible. Waiting time at transfer points should be minimized.

(6) Schedules attempting to appeal to certain riders should be made in such a way that these riders are actually being served. Buses that make work-related trips cannot be scheduled to arrive at the work place five minutes after the starting time.

(7) Schedules should be checked constantly to assure that they are being kept. Schedules should be reliable.

(8) Schedules and schedule changes should be publicized.

(9) Schedules should be continuously reviewed as an ongoing activity of the firm. All changes should be evaluated in terms of their marketing implications.

Once the assumptions have been established and the routing alternatives designed, it will then be possible to develop alternative systems using different levels of service and different types of equipment. It would be a good idea for the study group to provide a cost break down and description of each alternative. This will be very helpful to the decision makers in their evaluation. Two of the alternatives developed in the Lafayette study are provided in Appendix H.

After the alternatives have been developed the study group should analyze each according to five areas. The
first area is the performance of the system. Included here
would be such things as meeting the objectives for transit
in the community, level of service, flexibility, etc. The
second area of evaluation is the economics of the system
such as, initial cost, yearly operating cost, fare structure,
etc. The third area for analysis is the political acceptabil-
ity of the alternatives. The fourth area of evaluation is
the financing possibilities. How much can be financed from
federal grants, etc. Also, how much subsidy, if any, will
be required and where will this subsidy come from? The last
area that should be evaluated is the environmental effects
of each alternative, such as the pollution controls present
on equipment, aesthetics, etc. Each of these areas should
be evaluated and the results presented to the decision makers
along with each alternative. Where possible, information
should be tabulated or put in a form that will aid in the
analysis. Tables 11 and 12 show one way that some informa-
tion might be presented to the decision makers.

Notes


2Ibid., p. 20.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Total Initial Investment</th>
<th>Capital Recovery Cost (Annual)</th>
<th>Operational Cost (Annual)</th>
<th>Total Cost (Annual)</th>
<th>Level of Service</th>
<th>No. and Type of Buses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$251,452</td>
<td>$34,700</td>
<td>$172,600</td>
<td>$207,300</td>
<td>I</td>
<td>6L,1XL</td>
</tr>
<tr>
<td>2</td>
<td>278,148</td>
<td>36,900</td>
<td>177,400</td>
<td>214,300</td>
<td>I</td>
<td>2L,4H,1XL</td>
</tr>
<tr>
<td>3</td>
<td>304,844</td>
<td>39,100</td>
<td>182,200</td>
<td>221,300</td>
<td>I</td>
<td>4L,2H,1XL</td>
</tr>
<tr>
<td>4</td>
<td>331,540</td>
<td>41,500</td>
<td>187,200</td>
<td>228,800</td>
<td>I</td>
<td>6L,1XL</td>
</tr>
<tr>
<td>5</td>
<td>251,452</td>
<td>34,700</td>
<td>206,700</td>
<td>241,400</td>
<td>I</td>
<td>6M,1XL</td>
</tr>
<tr>
<td>6</td>
<td>312,492</td>
<td>40,100</td>
<td>234,700</td>
<td>274,800</td>
<td>I</td>
<td>6M,7S,1XL</td>
</tr>
<tr>
<td>7</td>
<td>392,580</td>
<td>63,800</td>
<td>223,400</td>
<td>287,200</td>
<td>I</td>
<td>6L,7S,1XL</td>
</tr>
<tr>
<td>8</td>
<td>334,684</td>
<td>52,400</td>
<td>259,300</td>
<td>311,700</td>
<td>II</td>
<td>12M,1XL</td>
</tr>
<tr>
<td>9</td>
<td>334,684</td>
<td>52,400</td>
<td>286,400</td>
<td>338,800</td>
<td>II</td>
<td>12H,1XL</td>
</tr>
<tr>
<td>10</td>
<td>395,724</td>
<td>74,900</td>
<td>269,000</td>
<td>343,900</td>
<td>II</td>
<td>12M,7S,1XL</td>
</tr>
<tr>
<td>11</td>
<td>316,460</td>
<td>71,600</td>
<td>335,300</td>
<td>406,900</td>
<td>II</td>
<td>17S,1XL</td>
</tr>
<tr>
<td>12</td>
<td>358,760</td>
<td>45,300</td>
<td>208,800</td>
<td>254,100</td>
<td>III</td>
<td>7L,1XL</td>
</tr>
<tr>
<td>13</td>
<td>413,200</td>
<td>54,200</td>
<td>261,600</td>
<td>315,800</td>
<td>III</td>
<td>9L,1XL</td>
</tr>
<tr>
<td>14</td>
<td>494,860</td>
<td>66,500</td>
<td>308,900</td>
<td>375,400</td>
<td>IIIIA</td>
<td>12L,1XL</td>
</tr>
</tbody>
</table>

a Demand-responsive during off peak. Demand responsive fares are assumed to be $.10 higher than the fare shown in Table which is peak hour or base fare for fixed route, fixed schedule service.

b Includes $25,000 for 5 acres of land, $105,000 for facilities. Also includes buses, fare boxes, and radios.

c Level of Service

I - Present routes and schedules
II - Present routes, reduced headways
III - Extension of area of coverage
IIIA - Extension of area of coverage and reduced headways

d XL - 45 passenger bus, L - 33 passenger bus, M - 18-23 passenger bus, S - 12 passenger bus.
<table>
<thead>
<tr>
<th>Alternative</th>
<th>Present Passengers (Annual)</th>
<th>Using Present No. of Passengers, Fixed Schedule Fare to Equal</th>
<th>Maximum No. of Passengers for System with 1.5 Load Factor During Peak (Annual)*</th>
<th>Using Maximum No. of Passengers, Fixed Schedule Fare To Equal</th>
<th>% Increase in Passengers Over Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>428,000</td>
<td>Total Cost $.48 Operational Cost $.40</td>
<td>715,000</td>
<td>Total Cost $.29 Operational Cost $.24</td>
<td>75%</td>
</tr>
<tr>
<td>2</td>
<td>428,000</td>
<td>.50 .41</td>
<td>665,000</td>
<td>.32 .26</td>
<td>55%</td>
</tr>
<tr>
<td>3</td>
<td>428,000</td>
<td>.52 .43</td>
<td>865,000</td>
<td>.26 .21</td>
<td>102%</td>
</tr>
<tr>
<td>4</td>
<td>428,000</td>
<td>.53 .44</td>
<td>1,075,000</td>
<td>.21 .19</td>
<td>151%</td>
</tr>
<tr>
<td>5a</td>
<td>428,000</td>
<td>.52 .44</td>
<td>715,000</td>
<td>.29 .24</td>
<td>75%</td>
</tr>
<tr>
<td>6a</td>
<td>428,000</td>
<td>.60 .51</td>
<td>715,000</td>
<td>.34 .28</td>
<td>75%</td>
</tr>
<tr>
<td>7a</td>
<td>428,000</td>
<td>.63 .48</td>
<td>1,075,000</td>
<td>.22 .16</td>
<td>151%</td>
</tr>
<tr>
<td>8a</td>
<td>428,000</td>
<td>.69 .57</td>
<td>1,430,000</td>
<td>.17 .13</td>
<td>234%</td>
</tr>
<tr>
<td>9</td>
<td>428,000</td>
<td>.79 .67</td>
<td>1,430,000</td>
<td>.24 .20</td>
<td>234%</td>
</tr>
<tr>
<td>10a</td>
<td>428,000</td>
<td>.76 .59</td>
<td>1,430,000</td>
<td>.19 .14</td>
<td>234%</td>
</tr>
<tr>
<td>11a</td>
<td>428,000</td>
<td>.91 .74</td>
<td>1,100,000</td>
<td>.32 .26</td>
<td>157%</td>
</tr>
<tr>
<td>12</td>
<td>428,000</td>
<td>.59 .49</td>
<td>1,200,000</td>
<td>.21 .17</td>
<td>180%</td>
</tr>
<tr>
<td>13</td>
<td>428,000</td>
<td>.74 .61</td>
<td>1,430,000</td>
<td>.22 .18</td>
<td>234%</td>
</tr>
<tr>
<td>14</td>
<td>428,000</td>
<td>.88 .72</td>
<td>2,150,000</td>
<td>.17 .14</td>
<td>402%</td>
</tr>
</tbody>
</table>

* Total computed assuming all buses during peak loaded to 1.5 scaled capacity and off peak demand adjusted by factor obtained from ratio of present peak hour demand to above calculated demand.


6. Ibid., p. 223.


8. Ibid., p. 30.

Selected References


CHAPTER VII. SELECTION OF ALTERNATIVE

After the study group has completed the development of alternative systems, a copy of each alternative should be distributed to the members of the policy committee and the citizens advisory committee. The committee members should also be provided with a copy of the information used to develop the alternatives as well as the results of the study groups' evaluation of each alternative. With this information the committee members will be able to make their own evaluation.

Before making the evaluation it would be helpful to go over the goals and objectives that were developed at the beginning of the study. Keeping this in mind the committee members should then evaluate each alternative according to the following five areas.

1. System Performance: Does the alternative system provide an adequate level of service? This covers such things as headways, travel speed, area coverage, seating capacity, reliability, etc.

2. Economic and Other Costs: Are the system costs acceptable? Can the system pay for itself from the farebox? If not, how large a subsidy will be necessary? Is the fare structure acceptable? Along with the monetary costs there
are social costs. Are there areas not served? Are there specific groups not adequately served such as the elderly, the handicapped, and the young? If so, what effect will this have on the community?

3. Financing: How much financing will be needed to implement the system and what will be the source of the financing? What are the requirements for each source of financing? Will additional financing be required for replacement of equipment in the future?

4. Political: Is the proposed system politically acceptable? Will the system need local funding and is the levying of a tax possible? Does the system serve all areas and specific groups? Does the system serve more than one political area? If so, is each area provided with the same level of service, etc?

5. Environmental: Does the equipment recommended meet pollution standards? Also, is the equipment design pleasing both inside and out? If new facilities are to be built, is the site acceptable from an aesthetic as well as an environmental viewpoint?

After the committees have had time to study the alternatives, they should meet with the study director. At this meeting the study director can go over the reasons that the study group had favoring the alternative that they recommended. The committee members can then ask questions and make recommendations.
The selection of an alternative to be implemented should not be made at this meeting. The study director should make note of all the committees' recommendations. The study director should present the alternatives and the committee recommendations to the decision makers of the area. At this meeting the decision makers should have open discussion of the alternatives and recommendations. At this time changes might be made in the alternatives as well as developing new alternatives. If the decision makers are to select an implementable alternative, they must become familiar with each alternative and its ability to meet the needs of the community. It may be necessary to combine parts of various alternatives or develop new ones in order to develop a system that meets the needs of the community. In any case, the decision makers must avoid the pitfall of unquestioningly accepting the recommendation of the study group.

The decision as to whether the community has transit and if so, the particular system chosen must rest with the decision makers of the area. As the elected representatives of the community they must make the final decision but they must not treat this decision lightly, for they and the community will have to live with this decision in the future.
Selected References


CHAPTER VIII. IMPLEMENTATION

Once an alternative has been chosen, it is necessary to establish an implementation program. This program will essentially be a time schedule for implementing the system changes called for in the chosen alternative. As many of the system changes as possible should be implemented at one time. This is particularly true for any route and schedule changes.

The exact timetable for implementation will depend on a number of factors. The largest factor will be the source of funding and the time required to obtain this funding. If federal funding is desired, the city must work closely with UMTA to make sure they meet all of UMTA's requirements for funding. A sample application from the Lafayette study is provided in Appendix I. It is possible for the city to obtain from UMTA two-thirds of the funding needed for the system changes, however, the city will have to provide the other one-third. Therefore, the time needed for implementation will depend not only on the time needed to obtain federal funding but also the time needed to secure the local share.

Once funding has been secured it is then necessary to obtain bids for the new equipment to be purchased. Each
company bidding must be provided with a copy of the specifications and the bid forms. A sample of the ones used in the Lafayette study is provided in Appendix G. After a bid has been accepted, the equipment can be ordered, but it may take as long as six months for the production and delivery of the equipment.

All the above factors must be kept in mind when setting up the implementation program. After a timetable has been set up, it will take continued coordination among all parties concerned to make sure the time schedule is met.

While the above tasks are being carried out, the study group should be working on the advertising campaign to be used to market the transit product. Extensive use should be made of all advertising media in promoting the new system. This extensive campaign should be aimed at the date for the implementation of most of the system changes. Many cities have had short ceremonies at the town square to promote the new system. A number of things have been done at these ceremonies such as introducing the drivers for each route, presenting the drivers with new uniforms, a speech by the mayor promoting the new system, a ribbon cutting ceremony that starts the new system, giving free rides on the first day, etc. The main idea is to get the public involved and to let them know that there is a new system aimed at better serving the public.

After the initial implementation the use of advertising can be reduced, however, a moderate advertising campaign
should be continued. This campaign should include such things as newspaper ads, posters promoting special services or routes, complimentary passes to new residents, the periodic mailing of schedules and route maps, etc. The transit system might be kept in the news through such things as the selection of a driver of the month with his picture and a short biography placed in the newspaper, the description of any additional changes in the system such as the installation of a bus washing machine, etc. The idea here is to continue to remind the public that the transit system is geared to serving them.

Along with the marketing of transit is the need for continuous monitoring and evaluation of the system. This is necessary to maintain and possibly improve the level of service. All routes must be periodically checked to make sure the drivers are maintaining schedules, that the buses are not overcrowded, that transfers can be made, etc. An evaluation should be made of possible extensions of routes as well as the establishment of new routes. As time goes on people will change their travel patterns, neighborhoods will change, and activity centers will change, thus necessitating route changes. If the transit system is to continue to provide a high level of service to the community, it must be willing and able to change. The only way to do this is to continually evaluate the transit system and make the necessary changes to meet the needs of the community.
Selected References


Schneider, Lewis M., Marketing Urban Mass Transit, Division of Research, Graduate School of Business Administration, Harvard University, Boston, Massachusetts, 1965.
CHAPTER IX. ACQUISITION OF TRANSIT OPERATIONS BY A CITY

In most cases the city will not have the time for planning before it is faced with taking over bus transit operations from a private operator. This happens because the city usually doesn't consider taking over the operations until the private operator has decided to go out of business or asks the city for financial assistance.

If the private operator has decided to go out of business, the city must purchase the operations quickly in order to insure continued operation. In this situation there is little time for evaluation of the operations being purchased. However, if the city is afforded the time to evaluate the system and to negotiate with the operator, the following considerations should be made.  

A. The requirements of state and local laws governing the purchase and operation of transit facilities by a city should be determined. The city must find out the options it has available. Can bus transit be operated as a city department? Can the city set up a transit authority? Can the city subsidize transit operations? What are the geographic limits to a city or authority operated transit system? Can the city or an authority levy a tax to support operations? Can the city or an authority use the power of eminent domain
to acquire transit properties? These are just a few of the legal questions the city must answer before it actually acquires transit operations from a private operator.

B. At least two appraisals should be obtained as to the value of the property and equipment of the private operator. This information will be helpful in determining exactly what facilities are available for purchase as well as the condition of those facilities. Sample appraisals are shown in Table 13 and Figure 16. This information will be helpful if negotiations are made with the private operator or if eminent domain is used to acquire the property. It would be desirable to determine if the present property on which bus garage and terminal are located is large enough for expansion of the facilities in the future. The city might also find out what land it has available for possible use as the site of new facilities if the present facilities are felt to be inadequate.

C. The availability of federal assistance for the purchase and improvement of facilities should be determined. It is important that the city find out the requirements that must be met to qualify for a federal grant or loan. This information can be obtained from the Urban Mass Transportation Administration in Washington, D.C. A sample application from the Lafayette study is provided in Appendix I. The city should also consider other means of obtaining funds at this time such as the issuance of bonds and the levying
TABLE 13

BOOK VALUES OF UTC PROPERTY INVOLVED IN PROSPECTIVE SALE TO
RHODE ISLAND PUBLIC TRANSIT AUTHORITY

<table>
<thead>
<tr>
<th></th>
<th>Book Cost</th>
<th>Depreciation to 12/31/64</th>
<th>Book Value as of 12/31/64</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>$359,764</td>
<td>—</td>
<td>$359,764</td>
</tr>
<tr>
<td>Buildings</td>
<td>1,832,707</td>
<td>$809,118</td>
<td>1,023,589</td>
</tr>
<tr>
<td>Tunnel</td>
<td>1,004,763</td>
<td>—</td>
<td>1,004,763</td>
</tr>
<tr>
<td>Other Structures</td>
<td>69,886</td>
<td>47,537</td>
<td>22,349</td>
</tr>
<tr>
<td>Grading &amp; Paving</td>
<td>19,436</td>
<td>12,288</td>
<td>7,148</td>
</tr>
<tr>
<td>Communications System</td>
<td>43,701</td>
<td>30,861</td>
<td>12,840</td>
</tr>
<tr>
<td>Revenue Equipment — Gas Buses</td>
<td>475,544</td>
<td>474,188</td>
<td>1,356</td>
</tr>
<tr>
<td>Revenue Equipment — Diesel Buses</td>
<td>2,184,525</td>
<td>1,343,372</td>
<td>841,153</td>
</tr>
<tr>
<td>Service Cars &amp; Equipment</td>
<td>81,925</td>
<td>67,229</td>
<td>14,696</td>
</tr>
<tr>
<td>Shop &amp; Garage Equipment</td>
<td>197,080</td>
<td>177,787</td>
<td>19,293</td>
</tr>
<tr>
<td>Furniture &amp; Office Equipment</td>
<td>140,868</td>
<td>120,343</td>
<td>20,525</td>
</tr>
<tr>
<td>Miscellaneous Equipment</td>
<td>3,271</td>
<td>3,271</td>
<td>—</td>
</tr>
<tr>
<td>Improvements to Leasehold Property</td>
<td>35,123</td>
<td>29,752</td>
<td>5,371</td>
</tr>
<tr>
<td></td>
<td>$6,448,593</td>
<td>$3,115,746</td>
<td>$3,332,847</td>
</tr>
</tbody>
</table>

Adjustments
- One-half of parcel No. 12: $26,978
- U.T. & B.S. Co. Bldg: 102,268
- 112 Overage buses: 162,831

Property Excluded From Sale: 292,077
Physical Assets to be Acquired: 3,040,770
Estimated Value of Materials and Supplies: $176,858
Book Value of Property Involved in Prospective Sale: $3,217,628
Appraised Estimate of Value:

Bus barn and two lots known as No. 1396 S. Gilbert St., Iowa City, Iowa consisting of two lots each 100 by 186 feet in size, making a tract of 37,200 square feet with 100 feet of frontage on S. Gilbert Street and 100 feet of frontage on Highland Court.

Legal description: Lots 11 and 20 of Highland Park Addition to Iowa City, Iowa.

Summary of estimated values for property on Dec. 9, 1970:

- Value of the land including the street improvements: $31,260.00
- Depreciated value of the building excluding the compressor: $61,671.00
- Value today of cement drives and cement slab east of building: $329.22
- Value today of black top surfacing (depreciated value): $3,659.00
- Depreciated value of the rock surfacing on this lot: $335.00
- Depreciated value of the 10,000 gal. underground gas storage tank: $900.00
- Depreciated value of the gasoline pump: $275.00

Total estimated value of this property: $82,777.22

Rounded to the nearest $100 would be: $82,000.00

Signed
Samuel B. Whiting, Appraiser.

Explanation of the above estimates are shown on the next two pages.

FIGURE 16

SAMPLE APPRAISAL OF TRANSIT FACILITIES
of a tax. These funds may be necessary to meet the matching requirements of a federal grant as well as to subsidize the present operation.

D. The city should make an agreement with the private operator to continue operating the bus system until the city can arrange for the purchase of the operations. It might be necessary for the city to subsidize the operations by covering the private operators losses over this period. This may be expensive, however, it will give the city time to complete its evaluations and other arrangements before actually taking over the transit operations.

E. As was pointed out in the first chapter, it will be necessary to determine if a new management team will be needed to manage and operate the transit system once the city assumes ownership. If new management is needed, the city should begin to look for a manager immediately. It will be beneficial for the new manager to have time to become acquainted with the operations before the city actually takes over the operation of the system.

F. There are a number of economic and administrative details that must be evaluated. If the transit system is to become a city department, its employees may come under city employment conditions. The city will also have to take over the accounting and budgetary tasks of the transit system. These will probably have to be changed to meet the standards and procedures used by the city. The city must look into the
insurance and safety programs that are being used. These programs will have to be changed to fit into the city programs. These are just a few of the administrative and procedural changes that will need to be made before the city takes over operation of the transit system.

G. If the transit employees are members of a union, the city must look into the present pay structure and benefits of the employees. The city will have to review the promotion and pay structure as well as the benefits such as insurance, sick leave, retirement, etc. It is important to find out how much these benefits cost. If the city obtains funds from UMTA it will have to sign a 13(c) agreement as one of the requirements. A sample 13(c) agreement from the Lafayette study is provided in Appendix J. By signing this agreement the city states that the present employees will not be put in a worse position due to city ownership. Essentially, this means that the city will have to maintain all programs presently in effect or may be able to negotiate with the union for changes.

The above considerations are not all inclusive but are probably the main considerations that will need to be made. Obviously, the type and number of considerations will vary from city to city depending on its size, location, etc.

After the city has evaluated the transit operations and the legal requirements for purchase and operation, it can proceed with negotiations for the purchase of the transit
operations. The final purchase agreement must be spelled out in a formal contract between the city and the private operator. A sample contract is shown in Appendix K.

During the process of acquisition of transit operations numerous questions will be raised concerning the type of operation by the city such as city department, transit authority, etc., as well as the method of financing. The answers to these questions usually evolve from a consideration of the goals and objectives of the community. The development of these goals and objectives is discussed in the chapter on Establishing Goals, Objectives, and Criteria for Evaluation.

**Applying for Federal Assistance**

If the city wishes to obtain federal assistance in financing bus transit, it should contact UMTA (Urban Mass Transportation Administration, U.S. Department of Transportation, Washington, D.C. 20590) as soon as possible. At this initial contact it will be possible to obtain information on the types of assistance that are available and the requirements that the city must meet for each.

Most cities will wish to apply for a capital grant which can cover up to two-thirds of the cost in purchasing new rolling stock, facilities, and land. Although the UMTA requirements for a capital grant may change from time to time, the following items will generally be required in the Preliminary Application. 4, 5, 6
Letter of Application: This is a cover letter that briefly describes the general purpose of the grant, the equipment, facilities, and land to be purchased, and the total amount of the grant requested. The letter should be signed by an authorized representative of the city or by the chairman of the transit authority if one has been established.

1. This section provides a detailed description of the equipment, facilities, and land which are to be purchased with the grant. This information will probably be based on the results of a transit study.

2. A description of the transportation system in which the equipment, facilities, and land will be used. Included in this section might be such things as a general description of the area emphasizing the employment and general economic atmosphere. Also, included here would be a description of the present transit system and the proposed changes in service and facilities.

3. This section describes the benefits that are expected to accrue from the purchase of new equipment and facilities. These benefits would include such things as an increased level of service due to shorter headways, more area coverage, more reliable service, etc. Benefits should also
be related to the overall transportation system such as reducing congestion, decreasing the amount of parking space needed, etc.

4. This section provides a break down of the estimated total cost of the project. This section should include things like the costs of new rolling stock, new or improved facilities, and land.

5-7. Sections 5-7 provide estimates of the portion of the project cost that can be funded from revenues, or other local and state sources. Described in these sections are the ways in which the local area is to obtain funds to cover that part of the project cost that cannot be covered by revenues or an UMTA grant.

8. This section provides a description of the various types of planning that exist in the area. This includes such things as land-use and economic planning as well as a description of the transportation planning that has been done to provide for mobility throughout the area. Also listed are the agencies responsible for planning in the urban area.

9-10. Sections 9-10 are concerned with the development of a system for coordinating mass transportation in the urban area such as a transit authority. Also, it is necessary here to insure
that the public will control the operation and use of the transit facilities whether they are privately or publicly operated.

11. This section describes the affects that the transit system will have on the present employees of the system as well as the employees of other transportation systems in the area. All transportation systems and labor unions that are involved must be identified. The rights of employees must be protected according to the conditions set up in Section 13(c) of the Urban Mass Transportation Act. A copy of the 13(c) agreement from the Lafayette study is provided in Appendix J. If any families, businesses, or organizations must be relocated, they must be identified and the reasons for the relocation explained.

12. This section provides a Draft Environmental Statement which lists the impact which the proposed project will have on the surrounding environment. Included here would be such things as whether the equipment purchased will meet federal emission standards, expected short-term and long-term impacts on the local area or land occupied by the transit facilities, and any expected loss of resources in the area. Any objections raised at the federal, state, or local levels must also be included here.
The above items are not provided to be followed in making an application but to give the city an idea of the general requirements which must be met to qualify for an UMTA grant. A sample application from the Lafayette study is provided in Appendix I. If the city decides to apply for an UMTA grant it should contact UMTA for a set of up-to-date requirements.

Notes


5 Greater Lafayette Public Transportation Corporation, Preliminary Application for a Capital Grant from the Urban Mass Transportation Administration (324 Ferry Street, Lafayette, Indiana 47907, December 14, 1971), pp. 1-23.

CONCLUSIONS

This report has attempted to cover the complete transit planning process for small urban areas. Undoubtedly a few areas may have been missed and others may have to be supplemented with additional references. It is believed that the report coupled with the listed references will provide cities with the process required to adequately plan for the community’s transit needs.

It must be re-emphasized that the city must assess its capabilities before embarking on a course of action. These guidelines were developed to aid the city’s personnel in conducting a transit study or to evaluate the work of a consultant. Again the final decision as to who conducts the study must rest with the city’s decision makers.
BIBLIOGRAPHY
BIBLIOGRAPHY


Greater Lafayette Public Transportation Corporation, Agreement Pursuant to Section 13(c) of the Urban Mass Transportation Act of 1964, as Amended, 324 Ferry Street, Lafayette, Indiana 47907, 1971.

Greater Lafayette Public Transportation Corporation, Preliminary Application for a Capital Grant from the Urban Mass Transportation Administration, 324 Ferry Street, Lafayette, Indiana 47907, December 14, 1971.


NCUT, National Committee on Urban Transportation, Better Transportation for Your City, Public Administration Service, 1313 East Sixtieth Street, Chicago 37, Illinois, 1958.


Ricks, Stephen W., A Synthesis of Urban Travel Patterns in Metropolitan Lafayette, Indiana, Joint Highway Research Project, Engineering Experiment Station, Purdue University, Civil Engrg. Bldg., Lafayette, Indiana 47907, October, 1965.


General References


Catalog of Federal Assistance Programs, Produced by the Office of Economic Opportunity, Executive Office of the President, Washington, D.C., June 1, 1967.


Kennedy, Norman, and Homburger, Wolfgang S., A Study of Metropolitan Transit Agencies, Institute of Transportation and Traffic Engineering, University of California, Berkeley, California, January, 1956.


Mass Transportation Commission, Commonwealth of Massachusetts, Mass Transportation in Massachusetts, Director Joseph F. Maloney, Boston, Massachusetts, July, 1964.


NCUT, National Committee on Urban Transportation, Public Administration Service, 1313 East Sixtieth Street, Chicago 37, Illinois, 1958. Procedural Manuals:

1A Determining Street Use
2A Origin-Destination and Land Use
2B Conducting a Home Interview Origin-Destination Survey
3A Measuring Traffic Volumes
3B Determining Travel Time
3C Conducting a Limited Parking Study
3D Conducting a Comprehensive Parking Study
3E Maintaining Accident Records
4A Measuring Transit Service
5A Inventory of the Physical Street System
6A Financial Records and Reports
6B Cost Accounting
7A Standards for Street Facilities and Services
8A Standards for Transit Facilities and Services
10A Establishing Project Priorities
11A Improving Transportation Administration
12A Modernizing Laws and Ordinances

New Castle Area Transit Authority, Mass Transportation in a Small City, New Castle, Pennsylvania, Fall, 1968.

Principles of Urban Transportation, Edited by Frank Homer Mossman, The Press of Western Reserve University, 1951.


Schneider, Lewis M., Marketing Urban Mass Transit, Division of Research, Graduate School of Business Administration, Harvard University, Boston, Massachusetts, 1965.


The Transportation Center, Northwestern University, Basic Issues in Chicago Metropolitan Transportation, Director Franklin M. Kreml, Evanston, Illinois, June, 1958.


Appendix A

This appendix contains a number of sample on-board questionnaires that have been used in various transit studies throughout the United States. Also, provided is a sample load data sheet from the Lafayette study.
<table>
<thead>
<tr>
<th>Question</th>
<th>Response Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Where did you get on THIS bus?</td>
<td>Street Intersection or Name of Building</td>
</tr>
<tr>
<td>2. How did you get to THIS bus?</td>
<td>○ Transferred from another bus</td>
</tr>
<tr>
<td>3A. Where did you come FROM? (check one)</td>
<td>○ Home</td>
</tr>
<tr>
<td></td>
<td>○ Work</td>
</tr>
<tr>
<td></td>
<td>○ School</td>
</tr>
<tr>
<td></td>
<td>○ Shopping</td>
</tr>
<tr>
<td>4. Where will you get off THIS bus?</td>
<td>Street Intersection or Name of Building</td>
</tr>
<tr>
<td>5. Will you transfer to another bus to get to your destination?</td>
<td>○ Yes</td>
</tr>
<tr>
<td>6A. Where are you GOING? (check one)</td>
<td>○ Home</td>
</tr>
<tr>
<td></td>
<td>○ Work</td>
</tr>
<tr>
<td></td>
<td>○ School</td>
</tr>
<tr>
<td></td>
<td>○ Shopping</td>
</tr>
<tr>
<td>6B. Where is the place you are GOING?</td>
<td>Approximate Street Address or Name of Building</td>
</tr>
<tr>
<td>7. How many cars do you have in your household?</td>
<td>○ No cars</td>
</tr>
<tr>
<td>8. Was a car available to you for this trip?</td>
<td>○ Yes</td>
</tr>
<tr>
<td>9. Are you?</td>
<td>○ Male</td>
</tr>
<tr>
<td>10. To what age group do you belong?</td>
<td>○ 14 or under</td>
</tr>
<tr>
<td></td>
<td>○ 15 - 19</td>
</tr>
<tr>
<td></td>
<td>○ 20 - 24</td>
</tr>
<tr>
<td>11. What is your yearly family income?</td>
<td>○ Less than $3,000</td>
</tr>
<tr>
<td></td>
<td>○ $3,000 - $4,000</td>
</tr>
<tr>
<td></td>
<td>○ $4,000 - $6,000</td>
</tr>
</tbody>
</table>

**FIGURE A1**
SAN DIEGO TRANSIT CORPORATION ENGLISH QUESTIONNAIRE

**PLEASE RETURN TO INTERVIEWER - THANK YOU**
IOWA CITY AREA TRANSPORTATION STUDY——TRANSIT USER SURVEY

The Institute of Urban and Regional Research at the University of Iowa is performing this study to assess transit needs for the Johnson County Regional Planning Commission. Your cooperation is appreciated.

Please CHECK or CIRCLE the appropriate response for each question. Return this form to the checker when leaving the bus.

<table>
<thead>
<tr>
<th>Between what hours do you board this bus?</th>
<th>AM</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-7</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>7-8</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>8-9</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>9-10</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>10-11</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>11-12</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>12-1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>13-2</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14-3</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>More than six hours</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CODE</th>
<th>00</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
<th>09</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>06</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How far, to the nearest block, did you travel before boarding this bus?</th>
<th>One</th>
<th>Two</th>
<th>Three</th>
<th>Four</th>
<th>Five</th>
<th>Six</th>
<th>More than six</th>
</tr>
</thead>
<tbody>
<tr>
<td>One block</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Two blocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three blocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four blocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Five blocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Six blocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than six blocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Was an automobile available for your use at the time you made this trip?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What is your automobile ownership status?</th>
<th>Licensed and able to drive</th>
<th>Presently unable to drive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Licensed and able to drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presently unable to drive</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Which of the following best describes the main purpose of your trip?</th>
<th>Work</th>
<th>School</th>
<th>Shopping</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>School</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shopping</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How far, to the nearest block, will you travel after leaving this bus?</th>
<th>One</th>
<th>Two</th>
<th>Three</th>
<th>Four</th>
<th>Five</th>
<th>Six</th>
<th>More than six</th>
</tr>
</thead>
<tbody>
<tr>
<td>One block</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Two blocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three blocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four blocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Five blocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Six blocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than six blocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What is your age group?</th>
<th>0-17</th>
<th>18-22</th>
<th>23-35</th>
<th>36-64</th>
<th>65 or over</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-17</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>18-22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23-35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36-64</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65 or over</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How many automobiles are owned by you and/or other members of your household?</th>
<th>None</th>
<th>One</th>
<th>Two</th>
<th>Three or More</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>One</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three or More</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What is your income category?</th>
<th>Under $5,000</th>
<th>$5,000-$10,000</th>
<th>$10,000-$15,000</th>
<th>$15,000 or over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under $5,000</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>$5,000-$10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$10,000-$15,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$15,000 or over</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How many persons are in your household, including yourself.</th>
<th>1-2</th>
<th>3-4</th>
<th>5-6</th>
<th>7+</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Please describe yourself.</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FIGURE A3

BUS SURVEY
### Figure A3 (Continued)

<table>
<thead>
<tr>
<th>ON</th>
<th>IOWA AVENUE</th>
<th>MELROSE AVENUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-16</td>
<td>Clinton</td>
<td>13-13</td>
</tr>
<tr>
<td>25-16</td>
<td>N. Dubuque</td>
<td>14-13</td>
</tr>
<tr>
<td>25-15</td>
<td>Washington</td>
<td>16-13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16-13</td>
</tr>
<tr>
<td>25-15</td>
<td>Clinton</td>
<td>18-14</td>
</tr>
<tr>
<td>25-15</td>
<td></td>
<td>19-14</td>
</tr>
<tr>
<td>24-15</td>
<td>S. Capitol</td>
<td>19-14</td>
</tr>
<tr>
<td>24-15</td>
<td>Washington</td>
<td>19-15</td>
</tr>
<tr>
<td>24-15</td>
<td>College</td>
<td>20-15</td>
</tr>
<tr>
<td>24-15</td>
<td>Burlington</td>
<td>21-15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21-14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21-14</td>
</tr>
<tr>
<td>24-15</td>
<td>R. W. UTINGTON STREET</td>
<td>22-14</td>
</tr>
<tr>
<td>24-15</td>
<td>Madison</td>
<td>22-14</td>
</tr>
<tr>
<td>22-14</td>
<td>Riverside Drive</td>
<td>22-14</td>
</tr>
<tr>
<td>22-14</td>
<td>S. Grand Avenue</td>
<td>21-14</td>
</tr>
<tr>
<td>21-15</td>
<td>Byington Road</td>
<td>21-14</td>
</tr>
<tr>
<td>21-14</td>
<td>S. Grand Avenue</td>
<td>22-14</td>
</tr>
<tr>
<td>21-15</td>
<td>S. Grand Avenue</td>
<td>22-14</td>
</tr>
<tr>
<td>19-15</td>
<td>Wool Avenue</td>
<td>21-15</td>
</tr>
<tr>
<td>19-14</td>
<td>WOOLF AVENUE</td>
<td>25-14</td>
</tr>
<tr>
<td>19-14</td>
<td>Melrose Avenue</td>
<td>25-14</td>
</tr>
<tr>
<td>19-14</td>
<td>MELROSE AVENUE</td>
<td>25-14</td>
</tr>
<tr>
<td>18-14</td>
<td>Stadium Park Road</td>
<td>19-15</td>
</tr>
<tr>
<td>16-13</td>
<td>Sunset Street</td>
<td>16-13</td>
</tr>
<tr>
<td>14-13</td>
<td>Emerlaid Street</td>
<td>14-13</td>
</tr>
<tr>
<td>14-13</td>
<td>Westgate Street</td>
<td>14-13</td>
</tr>
<tr>
<td>13-13</td>
<td>MacBride Road</td>
<td>13-13</td>
</tr>
<tr>
<td>19-14</td>
<td>Olive Court</td>
<td>19-14</td>
</tr>
<tr>
<td>19-14</td>
<td>Stadium Park Road</td>
<td>19-14</td>
</tr>
<tr>
<td>21-14</td>
<td>Byington Road</td>
<td>21-14</td>
</tr>
<tr>
<td>23-14</td>
<td>Madison</td>
<td>23-14</td>
</tr>
<tr>
<td>24-14</td>
<td>S. Capitol</td>
<td>24-14</td>
</tr>
<tr>
<td>25-14</td>
<td>Burlington</td>
<td>25-14</td>
</tr>
<tr>
<td>25-15</td>
<td>College Street</td>
<td>25-15</td>
</tr>
<tr>
<td>25-15</td>
<td>Washington Street</td>
<td>25-15</td>
</tr>
</tbody>
</table>

**ON-BUS SURVEY: BOARDING AND DEPARTING LOCATIONS**
Dear Bus User: Your answers to these questions will help to decide the future of the Lafayette bus system. Your cooperation is appreciated.
Please return this form when you leave the bus.

A. Have you been interviewed before? yes ___ no ___
(if yes, complete only questions 1, 2, 3, and 4.)

1. What is the purpose of this trip?
   work ___ school ___ social/recreational ___ shopping ___ other ___

2. Have you transferred to this bus from another bus? yes ___ no ___

3. Will you transfer to another bus before you finish this trip? yes ___ no ___

4. What is your final destination? ________________________________

5. Are you: employed full time ___ retired ___ housewife ___
   employed part time ___ elementary or high school student ___
   Purdue student ___ other ___

6. How many trips a week do you make for the following purposes?
   work ___ school ___ social/recreational ___ shopping ___ other ___

7. How did you reach the bus stop where you began this trip?
   walked ___ drove and parked ___ rode as a passenger in a car ___ other ___

8. How far did you travel to get to the bus stop?
   blocks ___ miles ___

9. Where will you get off the bus when you complete this trip?
   nearest street intersection ________________________________

10. How far will you travel after you get off the bus?
    blocks ___ miles ___

11. How will you get to your destination after you get off the bus?
    walk ___ drive ___ ride as a passenger in a car ___ other ___

12. Was a car available for your use on this trip? yes ___ no ___

13. Do you have a driver's license? yes ___ no ___

14. How many cars are owned by you and others now living in your household?
    none ___ one ___ two ___ more than three ___

15. What is your sex? male ___ female ___

16. What is your age bracket? 0-9 ___ 10-19 ___ 20-29 ___ 30-44 ___ 45-64 ___ over 65 ___

FIGURE A4
ON-BUS SURVEY GREATER LAFAYETTE AREA BUS STUDY
PASSENGER LOAD DATA SHEET

Route:

<table>
<thead>
<tr>
<th>Check Points (all stops)</th>
<th>Volumes</th>
<th>Time of Leaving</th>
<th>Balance on Leaving</th>
<th>Check Points (all stops)</th>
<th>Volumes</th>
<th>Time of Leaving</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Indicate causes and amount of delays - e.g., Blocked by Trains.

FIGURE A5
SAMPLE LOAD DATA SHEET
Appendix B

This appendix contains an example of the coding procedure used in the Lafayette study. This is only one of a number of methods that can be used to code data for tabulation and analysis.
<table>
<thead>
<tr>
<th>Punch Card Columns</th>
<th>Function or Question Being Coded</th>
<th>Coded Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>Form Number</td>
<td>Four digits</td>
</tr>
<tr>
<td>5</td>
<td>Used for duplicates and children</td>
<td>One digit</td>
</tr>
<tr>
<td>6</td>
<td>Used for numbering cards (there were three cards used in order to</td>
<td>One digit (1, 2, or 3)</td>
</tr>
<tr>
<td></td>
<td>record all the data from the on-board questionnaire along with the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>data from the mail-in questionnaire)</td>
<td>recorded in tenths of an hour on a 24 hour basis</td>
</tr>
<tr>
<td>7-9</td>
<td>Time of boarding</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Blank</td>
<td>Three digits</td>
</tr>
<tr>
<td>11-13</td>
<td>Zone number (see Figure 82)</td>
<td>Three digits</td>
</tr>
<tr>
<td>14-16</td>
<td>Sub-zone</td>
<td>1 or 2</td>
</tr>
<tr>
<td>17</td>
<td>Question A</td>
<td>1, 2, 3, 4, or 5</td>
</tr>
<tr>
<td>18</td>
<td>Question 1</td>
<td>1 or 2</td>
</tr>
<tr>
<td>19</td>
<td>Question 2</td>
<td>1 or 2</td>
</tr>
<tr>
<td>20</td>
<td>Question 3</td>
<td></td>
</tr>
<tr>
<td>21-23</td>
<td>Zone number, question 4</td>
<td>Three digits</td>
</tr>
<tr>
<td>24-26</td>
<td>Sub-zone, Question 4</td>
<td>Three digits</td>
</tr>
<tr>
<td>27</td>
<td>Question 5</td>
<td>1, 2, 3, 4, 5, 6, or 7</td>
</tr>
<tr>
<td>28-37</td>
<td>Question 6</td>
<td>Two digits for each purpose</td>
</tr>
<tr>
<td>38</td>
<td>Question 7</td>
<td>1, 2, 3, or 4</td>
</tr>
<tr>
<td>39-42</td>
<td>Question 8</td>
<td>Two digits for each answer</td>
</tr>
<tr>
<td>43-45</td>
<td>Zone number, Question 9</td>
<td>Three digits</td>
</tr>
<tr>
<td>46-48</td>
<td>Sub-zone, question 9</td>
<td>Three digits</td>
</tr>
<tr>
<td>49-52</td>
<td>Question 10</td>
<td>Two digits for each answer</td>
</tr>
<tr>
<td>53</td>
<td>Question 11</td>
<td>1, 2, 3, or 4</td>
</tr>
<tr>
<td>54</td>
<td>Question 12</td>
<td>1 or 2</td>
</tr>
<tr>
<td>55</td>
<td>Question 13</td>
<td>1 or 2</td>
</tr>
<tr>
<td>56</td>
<td>Question 14</td>
<td>1, 2, 3, 4, or 5</td>
</tr>
<tr>
<td>57</td>
<td>Question 15</td>
<td>1 or 2</td>
</tr>
<tr>
<td>58</td>
<td>Question 16</td>
<td>1, 2, 3, 4, 5, or 6</td>
</tr>
</tbody>
</table>
Dear Bus User: Your answers to these questions will help to decide the future of the Lafayette bus system. Your cooperation is appreciated. Please return this form when you leave the bus.

1. Have you been interviewed before? (If yes, complete only questions 1, 2, 3, and 4.)
   - yes 1  no 2

2. What is the purpose of this trip?
   - work 1  school 2  social/recreational 3  shopping 4  other 5

3. Will you transfer to another bus before you finish this trip?
   - yes 1  no 2

4. What is your final destination?
   - ZONE 1

5. Are you:
   - employed full time 1  retired 4  housewife 5
   - employed part time 2  elementary or high school student 6
   - Pursue student 3  other 7

6. How many trips a week do you make for the following purposes?
   - work 1  school 2  social/recreational 3  shopping 4  other 5

7. How did you reach the bus stop where you began this trip?
   - walked 1  drove and parked 2  rode as a passenger in a car 3  other 4

8. How far did you travel to get to the bus stop?
   - blocks 1  miles 2

9. Where will you get off the bus when you complete this trip?
   - ZONE 1
   - nearest street intersection

10. How far will you travel after you get off the bus?
    - blocks 1  miles 2

11. How will you get to your destination after you get off the bus?
    - walk 1  drive 2  ride as a passenger in a car 3  other 4

12. Was a car available for your use on this trip?
    - yes 1  no 2

13. Do you have a driver's license?
    - yes 1  no 2

14. How many cars are owned by you and others now living in your household?
    - none 1  one 2  two 3  three 4  more than three 5

15. What is your sex?
    - male 1  female 2

16. What is your age bracket?
    - 0-9 1  10-19 2  20-29 3  30-44 4  45-64 5  over 65 6

FIGURE B1
CODING KEY
FIGURE E2
TRAFFIC ZONE MAP 7
Appendix C

Provided in this appendix is a mail-in questionnaire for transit riders that was used in the Lafayette study. The questionnaire was distributed on-board the transit vehicles during the origin-destination survey.
No. __________________

LAFAYETTE BUS STUDY

Dear Bus User, the information you furnish by answering the following questions will be used to determine the future of the bus system. Completion and return in the furnished, stamped, addressed envelope today is extremely important.

1. Rank the following items in order of their importance to you. (Rank the most important number 1, the second important number 2, etc.)

   ______ Public Housing
   ______ Public Schools
   ______ Pollution Control
   ______ Police Protection
   ______ Welfare
   ______ Public Bus System
   ______ Downtown Railroad Crossing
   ______ Streets and Roads
   ______ Public Parks

2. Place an X next to your reason(s) for riding the bus (you may choose more than one)

   ______ Do not like to drive
   ______ Bus more convenient than auto
   ______ No driver's license
   ______ Family does not own car
   ______ Bus less expensive than auto
   ______ Parking not available at destination
   ______ Auto used by another family member
   ______ Other

3. On the bus trip where you received this questionnaire, what would have been a more convenient time for you to get on the bus?

   ______ A.M. ______ P.M.

4. On the same trip, what would have been a more convenient place, if any, for you to get on the bus?

   __________________________________________ nearest street intersection

5. On the same trip, what would have been a more convenient place, if any, for you to get off the bus?

   __________________________________________ nearest street intersection

6. On the same trip, what time did you want to get to your destination? (nearest 15 min.)

   ______ A.M. ______ P.M.
7. Assume that you are making a trip by yourself on the bus within the Lafayette-West Lafayette area. Write, in the space below, what you think would be an acceptable fare for the one-way trip, if the bus picked you up within 4 blocks of your home.

______________ Each Way

8. Assume that you could have the bus pick you up in front of your home rather than the regular bus stop nearest your home. Write in the space below what you think would be an acceptable charge for the one-way trip.

______________ Each Way

9. Indicate below your opinion about who should operate the bus system in the Lafayette-West Lafayette area. Assume that the same fares would be charged no matter who operates the service.

- Lafayette-West Lafayette and County
- Lafayette-West Lafayette
- Private Bus Company

10. The following statements concern the financial operation of a bus service. Indicate your preferences.

Bus Service should pay for itself from fares charged users.

Yes ___   No ___   No Opinion ___

Bus Service should be supported in part by fares and in part by local taxes.

Yes ___   No ___   No Opinion ___

Bus Service should be free with entire cost paid from local taxes.

Yes ___   No ___   No Opinion ___

11. For regularly employed bus riders: would you consider purchasing a service that picked you up at home, took you to work and returned you to your home at the end of the day. Yes ___   No ___

If no, go to question No. 12.

If yes, continue.

a) Where do you work? (name of store, company or address)

b) When do you start work? _______ A.M. _______ P.M.

c) When do you finish work? _______ A.M. _______ P.M.

d) How long a riding time would be satisfactory? _______ minutes

e) How much would you be willing to pay for each one-way trip? (check one)

- 10¢
- 20¢
- 30¢
- 40¢
- 50¢
- 60¢
12. Education (check one)

_____ 0-8 years of grade school
_____ 2 years of high school
_____ high school graduate
_____ 2 years of college
_____ college graduate
_____ advanced degree

13. Assuming you were to use an improved bus system for transportation, circle the number which shows how important it would be to you to have bus service to the place named. For example, if you feel it is unimportant for you to have bus service to the place named, circle the number 1. If on the other hand, you feel it is important to you, circle the number 7. If you do not have strong feelings one way or the other, circle one of the numbers between 1 and 7 to show how you feel.

DOWNTOWN LAFAYETTE
Unimportant 1 2 3 4 5 6 7 Very important

K-MART, TOPPS
Unimportant 1 2 3 4 5 6 7 Very important

PURDUE UNIVERSITY
Unimportant 1 2 3 4 5 6 7 Very important

MARKET SQUARE
Unimportant 1 2 3 4 5 6 7 Very important

ALCOA - NATIONAL HOMES
Unimportant 1 2 3 4 5 6 7 Very important

PURDUE RESEARCH PARK
Unimportant 1 2 3 4 5 6 7 Very important

ELI LILLY
Unimportant 1 2 3 4 5 6 7 Very important

COLUMBIAN PARK
Unimportant 1 2 3 4 5 6 7 Very important

HOSPITALS (St. Elizabeth-Home)
Unimportant 1 2 3 4 5 6 7 Very important
YMCA-TIPPECANOE FAIRGROUNDS
Unimportant 1 2 3 4 5 6 7 Very important

SEARS-SHOPPERS FAIR
Unimportant 1 2 3 4 5 6 7 Very important

WEST LAFAYETTE BYPASS SHOPPING AREAS (Wabash Village)
Unimportant 1 2 3 4 5 6 7 Very important

TEAL ROAD SHOPPING CENTERS (Jefferson Square - Lafayette Square)
Unimportant 1 2 3 4 5 6 7 Very important

DUNCAN ELECTRIC
Unimportant 1 2 3 4 5 6 7 Very important

GENERAL FOODS
Unimportant 1 2 3 4 5 6 7 Very important

List any other places in the Lafayette - West Lafayette area to which you would desire bus service.

14. For the following statements concerning the present Bus Service indicate your feelings by checking the appropriate answer.

It is easy to find out which bus to take
Yes ___ No ___ No Opinion ___

There are enough shelters at the stops
Yes ___ No ___ No Opinion ___

Bus stops are adequately marked
Yes ___ No ___ No Opinion ___

It is not much trouble to transfer
Yes ___ No ___ No Opinion ___

Bus schedules are easy to find
Yes ___ No ___ No Opinion ___
The bus hardly ever breaks down

Yes ___ No ___ No Opinion ___

The insides of buses are clean, neat, and in good repair

Yes ___ No ___ No Opinion ___

Buses are usually on schedule

Yes ___ No ___ No Opinion ___

Buses are comfortable and pleasant to ride

Yes ___ No ___ No Opinion ___

Buses make too many stops along the route

Yes ___ No ___ No Opinion ___

Bus drivers are neat in appearance

Yes ___ No ___ No Opinion ___

Bus drivers are often helpful and courteous

Yes ___ No ___ No Opinion ___

Buses go where I need to go

Yes ___ No ___ No Opinion ___

Other general comments concerning the bus system

15. Each set below contains two items, A and B. Select the way which you would prefer to pay for your bus trips. Show your selection by circling the letter A or B. Circle an A or B for each pair. (Each pair appears only once.)

A. Cash
B. Tokens

A. Credit Card
B. Monthly billing

A. Tokens
B. Credit Card

A. Credit Card
B. Cash

A. Monthly billing
B. Tokens

A. Cash
B. Monthly billing

Other, describe ____________________________________________________________________________

Thank you for your cooperation and assistance.
Appendix D

Contained in this appendix are a number of reports dealing with the types of census data available and the procedures for obtaining the data. The reports are listed below in the order in which they appear.

1. 1970 Census Summary Tape User Memorandum No. 30 (Revised)\(^9\)

2. First Count Summary Tapes from the 1970 Census of Population and Housing\(^{10}\)

3. Summary Tape Processing Centers\(^{11}\)
February 28, 1972

1970 Census Summary Tape User Memorandum No. 30 (Revised)

SUBJECT: 1970 Census First Count Summary Data on Microfilm

Microfilm of the contents of the 1970 Census First Count Summary Tapes is available for each State, the District of Columbia, and Puerto Rico. The microfilm version of the First Count was prepared because of the interest in small-area data which are not found in printed reports, including data for block groups and enumeration districts. Providing the information on microfilm, as well as on computer tape, facilitates access to the data for redistricting and other uses. Paper copies of microfilm images, as shown on page 3, may also be obtained.

The microfilm was prepared directly from the First Count tapes. A machine, the 5-C LLII, "read" a summary tape containing specific formatting instructions and arranged the tape's contents for photographing. To minimise the amount of film and programming required, the microfilm frames are essentially an array of numbers organized into lines and columns, as illustrated on page 3. Each frame presents the First Count data for one particular geographic area, such as an enumeration district (ED), block group (BG), or county.

There is no descriptive text found on the microfilm itself. Purchasers are furnished documentation similar to that used with the summary tapes. The documentation contains a listing of the tabulated items (referred to as a matrix) accompanied by the line and column location of various items.

Coded geographic identification appears at the top of each frame. The abbreviations used are interpreted on page 4. However, to interpret the numeric codes, users need to consult the 1970 Master Enumeration District List (MED LIST) or the Geographic Area Code Index (GACI) which carries the names and associated codes for the political and statistical subdivisions of States. For information on MED LIST and GACI, see Summary Tape User Memorandum No. 29 (Revised) and No. 29A. Census Bureau maps are also needed in order to determine the boundaries of ED's, BG's, and tracts. See Summary Tape User Memorandum No. 27 and Data Access Description No. 12.

Advantages of the Microfilm — It offers the entire contents of the First Count summary tapes but does not require a programmer or computer to be read. No printed report will be issued which will contain all the information found on the microfilm and tapes.

Secondly, there is a cost advantage in comparison to data on census summary tapes. For example, First Count data for California requires 19 rolls of microfilm, for a total cost of $152. Eight rolls of computer tape are necessary for a total cost of $480 (at $60 per reel).

Thirdly, if a reader-printer is available, a photocopy of any frame can be made at about the cost of a regular Xerox copy. Finally, microfilm is a more easily stored and managed source of information.

Disadvantages of the Microfilm — Use of the microfilm may be tedious because of the necessity to identify and locate a specific geographic unit by hand. In addition, documentation will have to be referred to in order to locate the desired data on the microfilm frame. To determine the location of any data cell of interest for the ED reported in the attached illustration, it is necessary to know the field number (column identifier) and matrix number (row identifier). For example, number of males under 5 years is found in field 1, matrix 18; "110" males under 5. The number of males age 19 is found in field 11 (represented by field 1, line 1) of matrix 18: "19" males age 19.

Information and Orders -- The cost is $5 per roll of 16mm microfilm, with one to 19 rolls per State. The number of rolls of microfilm required for File A and File B of the First Count for each State is listed on page 5. Orders for microfilm should be directed to the Users' Service Staff. The Users' Service Staff should also be contacted for information on cost and arrangements for obtaining paper copies of microfilm images for selected area.
Format for Microfilm Frames of 1970 Census First Count Summary Tapes.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Record Type</td>
<td>R</td>
</tr>
<tr>
<td>2</td>
<td>Year Code</td>
<td>1970</td>
</tr>
<tr>
<td>3</td>
<td>Code</td>
<td>SI</td>
</tr>
<tr>
<td>4</td>
<td>Field Code</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Description</td>
<td>Q</td>
</tr>
<tr>
<td>6</td>
<td>Type</td>
<td>U</td>
</tr>
<tr>
<td>7</td>
<td>Code</td>
<td>J</td>
</tr>
<tr>
<td>8</td>
<td>Field Code</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Description</td>
<td>M</td>
</tr>
<tr>
<td>10</td>
<td>Type</td>
<td>C</td>
</tr>
<tr>
<td>11</td>
<td>Code</td>
<td>D</td>
</tr>
<tr>
<td>12</td>
<td>Field Code</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>Description</td>
<td>O</td>
</tr>
<tr>
<td>14</td>
<td>Type</td>
<td>E</td>
</tr>
<tr>
<td>15</td>
<td>Code</td>
<td>F</td>
</tr>
<tr>
<td>16</td>
<td>Field Code</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>Description</td>
<td>U</td>
</tr>
<tr>
<td>18</td>
<td>Type</td>
<td>G</td>
</tr>
<tr>
<td>19</td>
<td>Code</td>
<td>H</td>
</tr>
<tr>
<td>20</td>
<td>Field Code</td>
<td>3</td>
</tr>
<tr>
<td>21</td>
<td>Description</td>
<td>M</td>
</tr>
</tbody>
</table>

*Record Type Codes are:

- 0 = State
- 1 = County
- 2 = Minor Civil Division (CCD) Place Segment
- 3 = Minor Civil Division (CCD) Place Code
- 4 = Place
- 5 = Congressional District
- 6 = Enumeration District
- 7 = Block Group

*The data presented here are for an enumeration district (full) within a census tract (#606).*
<table>
<thead>
<tr>
<th>State</th>
<th>Number of Rolls</th>
<th>File A</th>
<th>File B</th>
<th>State</th>
<th>Number of Rolls</th>
<th>File A</th>
<th>File B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>4</td>
<td>1</td>
<td></td>
<td>Montana</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Alaska</td>
<td>1</td>
<td>1</td>
<td></td>
<td>Nebraska</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Arizona</td>
<td>2</td>
<td>1</td>
<td></td>
<td>Nevada</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Arkansas</td>
<td>3</td>
<td>2</td>
<td></td>
<td>New Hampshire</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>California</td>
<td>19</td>
<td>2</td>
<td></td>
<td>New Jersey</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Colorado</td>
<td>3</td>
<td>1</td>
<td></td>
<td>New Mexico</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Connecticut</td>
<td>3</td>
<td>1</td>
<td></td>
<td>New York</td>
<td>14</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Delaware</td>
<td>1</td>
<td>1</td>
<td></td>
<td>North Carolina</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>District of Columbia</td>
<td>1</td>
<td>1</td>
<td></td>
<td>North Dakota</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Florida</td>
<td>7</td>
<td>2</td>
<td></td>
<td>Ohio</td>
<td>10</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Georgia</td>
<td>4</td>
<td>2</td>
<td></td>
<td>Oklahoma</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Hawaii</td>
<td>1</td>
<td>1</td>
<td></td>
<td>Oregon</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Idaho</td>
<td>1</td>
<td>1</td>
<td></td>
<td>Pennsylvania</td>
<td>10</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Illinois</td>
<td>12</td>
<td>4</td>
<td></td>
<td>Rhode Island</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Indiana</td>
<td>5</td>
<td>2</td>
<td></td>
<td>South Carolina</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Iowa</td>
<td>4</td>
<td>3</td>
<td></td>
<td>South Dakota</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kansas</td>
<td>4</td>
<td>3</td>
<td></td>
<td>Tennessee</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kentucky</td>
<td>3</td>
<td>2</td>
<td></td>
<td>Texas</td>
<td>12</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Louisiana</td>
<td>4</td>
<td>1</td>
<td></td>
<td>Utah</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Maine</td>
<td>1</td>
<td>1</td>
<td></td>
<td>Vermont</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Maryland</td>
<td>4</td>
<td>1</td>
<td></td>
<td>Virginia</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Massachusetts</td>
<td>2</td>
<td>1</td>
<td></td>
<td>Washington</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Michigan</td>
<td>8</td>
<td>3</td>
<td></td>
<td>West Virginia</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Minnesota</td>
<td>5</td>
<td>4</td>
<td></td>
<td>Wisconsin</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Mississippi</td>
<td>2</td>
<td>1</td>
<td></td>
<td>Wyoming</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Missouri</td>
<td>5</td>
<td>3</td>
<td></td>
<td>Puerto Rico</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

*File A: data summaries for ED's and SG's. File B: data summaries for State, counties, MCD's or CCD's, MCD-places, places, congressional districts.*
FIRST COUNT SUMMARY TAPE FROM THE 1970 CENSUS OF POPULATION AND HOUSING

Introduction

This Data Access Description is a revision of CT-2, "First Count Summary Tapes" from the 1970 Census of Population and Housing, dated April 1968. This revision describes the final planned contents of the First Count Summary Tapes, the first of the three complete-count censuses. The tapes will be released on a 90-day basis during the period August through December 1970. The population and housing data on these tapes are segregated into enumeration districts or larger geographic areas.

Data Access Descriptions CT-3 and CT-4 describe the contents of the Second and Third Census Summary Tapes, respectively. The smallest geographic areas on the Second Count tapes will be census blocks and minor civil divisions, while data for city blocks will be contained on the Third Census tapes. For general information on the computer tape program, consult Data Access Description CT-1, "General Information About Summary Tapes," December 1967.

Contents of First Count Summary Tapes

Geographic Areas For Which Data Will Be Available
- These tapes for each state will be organized into two files and will contain approximately 500 cells of information for each of the geographic areas listed in File A and File B below.

File A - Summaries for the State and for each enumeration district or block group
File B - Summaries for the State, county, minor civil division (or census county division), minor civil division place, places, and congressional districts

Each of these areas will be identified on the tape by a numeric code interpretation of the codes will require the use of geographic reference materials. The 1970 Master Reckoning Districts List (similar to the 1960 Geographic Identification Code Scheme) will carry all the codes for State political and statistical subdivisions for which 1970 census data are calculated. This master list will be available for purchase from the Bureau of the Census.

The smallest civil division place is a portion of an incorporated or unincorporated place that is a part of a given minor civil division or a census county division. For example, if a given place straddles three minor civil division boundaries, a record of data for each of these three portions of that place will appear on the summary tapes.

This Data Access Description is intended to introduce the user to the tape program and the Bureau of the Census data on which the summary tapes are based. It is intended to provide the necessary background information for those who will use the summary tapes in their work.
### First Count Summary Tapes

#### First Count Summary Tapes—Continued

<table>
<thead>
<tr>
<th>Data summaries</th>
<th>Number of data items</th>
<th>Data summaries</th>
<th>Number of data items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A POPULATION AND HOUSING UNIT TOTALS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Count of all persons</td>
<td>1</td>
<td>14. Aggregate dollar value (^1) for units with all plumbing facilities for which value is tabulated, by occupancy status and race of head (See 15)</td>
<td>3</td>
</tr>
<tr>
<td>2. Count of all housing units</td>
<td>1</td>
<td>15. Aggregate dollar value (^1) for units with all plumbing facilities for which value is tabulated, by occupancy status and race of head (See 14)</td>
<td>3</td>
</tr>
<tr>
<td>3. Count of persons in urban areas (less than 50,000 urban places)</td>
<td>1</td>
<td>17. Aggregation of monthly contract rent for units with all plumbing facilities for which rent is tabulated, by occupancy status and race of head (See 19)</td>
<td>3</td>
</tr>
<tr>
<td>4. Count of persons in urban places of less than 5,000</td>
<td>1</td>
<td>18. Population tabulations</td>
<td>44</td>
</tr>
<tr>
<td>5. Count of persons in rural housing units</td>
<td>1</td>
<td>19. Black and other races (except white) by age and sex</td>
<td>32</td>
</tr>
<tr>
<td>7. Count of persons in urban population of central cities of Large central cities</td>
<td>1</td>
<td>21. Other specified races (includes Japanese, Chinese, Filipinos, Russians, and Koreans) in Alaska, Montana, and Wyoming will be reported by race and ethnic origin</td>
<td>1</td>
</tr>
<tr>
<td>8. Count of persons in rural places of 1,000 to 2,499</td>
<td>1</td>
<td>22. Population under 1 year old by household relationship</td>
<td>24</td>
</tr>
<tr>
<td>9. Count of persons in rural places of less than 1,000</td>
<td>1</td>
<td>23. Population under 1 year old by household relationship</td>
<td>10</td>
</tr>
<tr>
<td>10. Count of persons in urban population of central cities of Small central cities</td>
<td>1</td>
<td>24. Population of 85 years and older over household relationship</td>
<td>6</td>
</tr>
<tr>
<td>11. Count of persons in urbanized areas in urban places of 29,000 to 39,999</td>
<td>1</td>
<td>25. Families by family type and presence of focal household relationships (as defined by户family-head and with under 18 and 65 and over</td>
<td>12</td>
</tr>
<tr>
<td>12. Count of persons in urbanized areas in urban places of 29,000 to 24,999</td>
<td>1</td>
<td>26. Families by family type and presence of focal household relationships (as defined by户family-head and with under 18 and 65 and over</td>
<td>9</td>
</tr>
<tr>
<td>13. Count of persons in urbanized areas in urban places of 10,000 to 24,999</td>
<td>1</td>
<td>27. Families by family type and presence of focal household relationships (as defined by户family-head and with under 18 and 65 and over</td>
<td>9</td>
</tr>
<tr>
<td>14. Aggregate dollar value (^1) for units with all plumbing facilities for which value is tabulated, by occupancy status and race of head</td>
<td>20</td>
<td>28. Families by family type and presence of focal household relationships (as defined by户family-head and with under 18 and 65 and over</td>
<td>9</td>
</tr>
<tr>
<td>15. Aggregate dollar value (^1) for units with all plumbing facilities for which value is tabulated, by occupancy status and race of head</td>
<td>20</td>
<td>29. Families by family type and presence of focal household relationships (as defined by户family-head and with under 18 and 65 and over</td>
<td>9</td>
</tr>
<tr>
<td>16. Family head of household by racial group</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Aggregate dollar value (^1) for units with all plumbing facilities for which value is tabulated, by occupancy status and race of head</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Family head of household by racial group</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Black and other races (except white) by age and sex</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Count of persons by race</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Other specified races (includes Japanese, Chinese, Filipinos, Russians, and Koreans) in Alaska, Montana, and Wyoming will be reported by race and ethnic origin</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Population under 1 year old by household relationship</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Population under 1 year old by household relationship</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Population of 85 years and older over household relationship</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Families by family type and presence of focal household relationships (as defined by户family-head and with under 18 and 65 and over</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Families by family type and presence of focal household relationships (as defined by户family-head and with under 18 and 65 and over</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Families by family type and presence of focal household relationships (as defined by户family-head and with under 18 and 65 and over</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Families by family type and presence of focal household relationships (as defined by户family-head and with under 18 and 65 and over</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

\(^{1}\) Data are from the 1960 Census of Housing, SpecialTabulation Sheet A, "1960 Census of Housing, Special Tabulations for the States and Counties." See footnotes at end of table.
<table>
<thead>
<tr>
<th>Data summary</th>
<th>Number of data items</th>
<th>Data summary</th>
<th>Number of data items</th>
</tr>
</thead>
<tbody>
<tr>
<td>29. a. Count of occupied units by number of persons in unit</td>
<td>8</td>
<td>With direct access, lacking complete kitchen facilities for this household only</td>
<td>8</td>
</tr>
<tr>
<td>1 person</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 persons</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 persons</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 persons</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Aggregate number of persons in occupied units by tenure and race of head</td>
<td>6</td>
<td>Lacking direct access, with complete kitchen facilities for this household only</td>
<td>6</td>
</tr>
<tr>
<td>Total occupied</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renter occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. Count of occupied units with telephones available</td>
<td>10</td>
<td>Lacking both direct access and complete kitchen facilities for this household only</td>
<td>10</td>
</tr>
<tr>
<td>35. a. Value of owner-occupied housing units for which value is tabulated</td>
<td>8</td>
<td>Owner occupied</td>
<td>8</td>
</tr>
<tr>
<td>Less than $5,000</td>
<td>$5,000 to $9,999</td>
<td>$10,000 to $14,999</td>
<td>$15,000 to $19,999</td>
</tr>
<tr>
<td>36. b. Units for which value is tabulated</td>
<td>3</td>
<td>Owner occupied</td>
<td>3</td>
</tr>
<tr>
<td>(See 14)</td>
<td>(See 14)</td>
<td>(See 14)</td>
<td>(See 14)</td>
</tr>
<tr>
<td>38. Number of occupied and vacant year-round housing units in multiple-unit structures</td>
<td>3</td>
<td>Owner occupied</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. Number of occupied and vacant year-round housing units by basement</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. Occupied units with plumbing facilities for washing dishes, cooking, and toilet facilities only</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. Occupied units with plumbing facilities for washing dishes, cooking, and toilet facilities only</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. Occupied units with plumbing facilities for washing dishes, cooking, and toilet facilities only</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>43. Occupied units with plumbing facilities for washing dishes, cooking, and toilet facilities only</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. Occupied units with plumbing facilities for washing dishes, cooking, and toilet facilities only</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. Occupied units with plumbing facilities for washing dishes, cooking, and toilet facilities only</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. Occupied units with plumbing facilities for washing dishes, cooking, and toilet facilities only</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47. Occupied units with plumbing facilities for washing dishes, cooking, and toilet facilities only</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>48. Occupied units with plumbing facilities for washing dishes, cooking, and toilet facilities only</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49. Occupied units with plumbing facilities for washing dishes, cooking, and toilet facilities only</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50. Occupied units with plumbing facilities for washing dishes, cooking, and toilet facilities only</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51. Occupied units with plumbing facilities for washing dishes, cooking, and toilet facilities only</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52. Occupied units with plumbing facilities for washing dishes, cooking, and toilet facilities only</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>53. Occupied units with plumbing facilities for washing dishes, cooking, and toilet facilities only</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>54. Occupied units with plumbing facilities for washing dishes, cooking, and toilet facilities only</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55. Occupied units with plumbing facilities for washing dishes, cooking, and toilet facilities only</td>
<td>2</td>
<td>Owner occupied</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner occupied</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Count Summary Tapes—Continued</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data summary</strong></td>
<td><strong>Number of data items</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>--------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Complete kitchen facilities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of rooms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot and cold piped water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toilet facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building facilities (basement or above)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of foundation (basement)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tenure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of structure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foundation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elevated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of property</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value of unit</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*This aggregate along with the relevant count of units will permit the computation of a mean value (e.g., average number of rooms, average number of persons per unit, average neat, etc.). Multiply the aggregate value by 100 to obtain the true value. The tabulated values are scaled by a factor of 100 for purposes of presentation.*

**Value** is tabulated for owner-occupied and vacant-for-sale only one-family houses which are on a place of less than 10 acres and have no business or medical office on the property. Value is not tabulated for multi-unit, apartment, institutional, or commercial units.

**Contract rent** is tabulated for all renter-occupied and owner-occupied units excluding the following:

- Units with "all plumbing facilities" have all of the following: hot and cold water, flush toilet for this household only, and a stove or oven for this household only.
- Units in a building or a building row which does not house more than 10 units or are subdivided.
- Units in a building or a building row which have less than 10 units.
- Units in a building or a building row which have 10 or more units.
- Units in a building or a building row which have 11 or more units.
- Units in a building or a building row which have 12 or more units.
- Units in a building or a building row which have 13 or more units.
- Units in a building or a building row which have 14 or more units.
- Units in a building or a building row which have 15 or more units.
- Units in a building or a building row which have 16 or more units.
- Units in a building or a building row which have 17 or more units.
- Units in a building or a building row which have 18 or more units.
- Units in a building or a building row which have 19 or more units.
- Units in a building or a building row which have 20 or more units.
- Units in a building or a building row which have 21 or more units.
- Units in a building or a building row which have 22 or more units.
- Units in a building or a building row which have 23 or more units.
- Units in a building or a building row which have 24 or more units.
- Units in a building or a building row which have 25 or more units.
- Units in a building or a building row which have 26 or more units.
- Units in a building or a building row which have 27 or more units.
- Units in a building or a building row which have 28 or more units.
- Units in a building or a building row which have 29 or more units.
- Units in a building or a building row which have 30 or more units.
- Units in a building or a building row which have 31 or more units.
- Units in a building or a building row which have 32 or more units.
- Units in a building or a building row which have 33 or more units.
- Units in a building or a building row which have 34 or more units.
- Units in a building or a building row which have 35 or more units.
- Units in a building or a building row which have 36 or more units.
- Units in a building or a building row which have 37 or more units.
- Units in a building or a building row which have 38 or more units.
- Units in a building or a building row which have 39 or more units.
- Units in a building or a building row which have 40 or more units.
- Units in a building or a building row which have 41 or more units.
- Units in a building or a building row which have 42 or more units.
- Units in a building or a building row which have 43 or more units.
- Units in a building or a building row which have 44 or more units.
- Units in a building or a building row which have 45 or more units.
- Units in a building or a building row which have 46 or more units.
- Units in a building or a building row which have 47 or more units.
- Units in a building or a building row which have 48 or more units.
- Units in a building or a building row which have 49 or more units.
- Units in a building or a building row which have 50 or more units.
- Units in a building or a building row which have 51 or more units.
- Units in a building or a building row which have 52 or more units.
- Units in a building or a building row which have 53 or more units.
- Units in a building or a building row which have 54 or more units.
- Units in a building or a building row which have 55 or more units.
- Units in a building or a building row which have 56 or more units.
- Units in a building or a building row which have 57 or more units.
- Units in a building or a building row which have 58 or more units.
- Units in a building or a building row which have 59 or more units.
- Units in a building or a building row which have 60 or more units.
- Units in a building or a building row which have 61 or more units.
- Units in a building or a building row which have 62 or more units.
- Units in a building or a building row which have 63 or more units.
- Units in a building or a building row which have 64 or more units.
- Units in a building or a building row which have 65 or more units.
- Units in a building or a building row which have 66 or more units.
- Units in a building or a building row which have 67 or more units.
- Units in a building or a building row which have 68 or more units.
- Units in a building or a building row which have 69 or more units.
- Units in a building or a building row which have 70 or more units.
- Units in a building or a building row which have 71 or more units.
- Units in a building or a building row which have 72 or more units.
- Units in a building or a building row which have 73 or more units.
- Units in a building or a building row which have 74 or more units.
- Units in a building or a building row which have 75 or more units.
- Units in a building or a building row which have 76 or more units.
- Units in a building or a building row which have 77 or more units.
- Units in a building or a building row which have 78 or more units.
- Units in a building or a building row which have 79 or more units.
- Units in a building or a building row which have 80 or more units.
- Units in a building or a building row which have 81 or more units.
- Units in a building or a building row which have 82 or more units.
- Units in a building or a building row which have 83 or more units.
- Units in a building or a building row which have 84 or more units.
- Units in a building or a building row which have 85 or more units.
- Units in a building or a building row which have 86 or more units.
- Units in a building or a building row which have 87 or more units.
- Units in a building or a building row which have 88 or more units.
- Units in a building or a building row which have 89 or more units.
- Units in a building or a building row which have 90 or more units.
- Units in a building or a building row which have 91 or more units.
- Units in a building or a building row which have 92 or more units.
- Units in a building or a building row which have 93 or more units.
- Units in a building or a building row which have 94 or more units.
- Units in a building or a building row which have 95 or more units.
- Units in a building or a building row which have 96 or more units.
- Units in a building or a building row which have 97 or more units.
- Units in a building or a building row which have 98 or more units.
- Units in a building or a building row which have 99 or more units.
- Units in a building or a building row which have 100 or more units.

**Use of the Summary Tapes**

The computer tapes cannot be used by the publisher unless they are compatible with his computer. Some of the potential compatibility problems are discussed in Data Access Description (DAD), which is available upon request. Technical documentation describing tape format and content in detail will be furnished with copies of the tape reels and can be purchased separately.

**Further Information**

Questions and inquiries concerning the First Count Summary Tapes should be addressed to: U.S. Bureau of the Census, Washington, D.C. 20533.
Summary Tape Processing Centers

Introduction

Since early 1969 the Bureau of the Census has recognized over 175 organizations (private, public, governmental, and academic) as Summary Tape Processing Centers. The Census Bureau recognizes those organizations and groups which file a statement with the Bureau indicating their intention to service the needs of census data users outside their organization and specifying their planned activities. The recognition of new centers is announced to users in Small-File Data Notes, a monthly newsletter. The Census Bureau considers the public listings of Summary Tape Processing Centers as a useful means of calling attention to their programs and thereby encouraging the pooling of resources and avoiding possible duplications of effort and extra expense to census data users. The processing center address list, which begins on page 2, is part of this effort.

The centers are not franchised, established or supported by the Bureau of the Census. Data products are available to the centers on the same basis as to all other data users. Centers develop through local initiative and respond to needs recognized by their organizations. The forms which centers assume, their purposes, and the goals they strive to achieve are determined by the organizers of the centers. The mode of operation of each center is determined by the group organizing the center. The Bureau has no requirements. Each processing center establishes its own cost structure for services and may serve any interested client as it chooses.

Centers generally provide the following kinds of services:

1. Prepare summary tape copies for other users.
2. Provide an information exchange for users on subjects such as display programs, problems in tape use, and new applications of census data. This kind of exchange encourages more effective use of the data and helps to reduce duplication of effort.
3. Maintain general computer programs prepared by the Bureau or by others and offer the application of these programs to local users. These programs might be designed to accomplish the more simple and elementary uses of the tapes in such areas as data displays, aggregations of census data for areas not presented on the tapes, and calculation of derived measures commonly wanted.

4. Develop or purchase special computer programs and advise users of their availability. There is frequent need for such programs. For example, some centers, particularly those involved in special information systems, need programs to assist in the dissemination of local data bases to the census data base for small areas.

Brief descriptions of the proposed activities of the Summary Tape Processing Centers and listings of the summary tape files each center anticipates maintaining will be presented in a booklet now being prepared, along with the address, phone number and name of the principal contact. Previously, this information has been carried inissues of the Summary Tape User Memoranda No. 17 series; however, the series is now out of date and will not be republished. The booklet will be available from the Data Access and User Facility Laboratory. To obtain detailed information or arrange for services, please write directly to the processing centers of interest to you.

Summary Tape Processing Center Address List

Alabama
Bureau of Research and Community Service
School of Community and Allied Health Resources
University of Alabama
1919 Seventh Avenue, South
Birmingham, Alabama 35233

Center for Business and Economic Research
Graduate School of Business
University of Alabama, Box 111
University, Alabama 35486

University Computer Center
University of South Alabama
Mobile, Alabama 36608

Alaska
City of Anchorage
Data Processing Division
P.O. Box 400
Anchorage, Alaska 99501

Institute of Social, Economic, and Government Research
University of Alaska
College, Alaska 99701

Arizona
Resource Consultants, Inc.
201 East Earl Drive
Phoenix, Arizona 85012

Western American Computing Corporation
2214 North Central Avenue
Phoenix, Arizona 85008

Arkansas
Industrial Research and Extension Center
University of Arkansas
P.O. Box 3017
Little Rock, Arkansas 72203

California
Institute of Governmental Studies
3600 Humboldt Street
University of California
Berkeley, California 94720

Systems, Science and Software
P.O. Box 1620
La Jolla, California 92037

Public Systems Research Institute
University of Southern California
University Park
Los Angeles, California 90007
Acquaint Systems
904 Manhattan Avenue
Suite 8
Manhattan Beach, California 90266

Adams Franke Research Center
2101 17th Street
San Francisco, California 94103

Systems Exploration, Inc.
3567 Valencia Street
San Francisco, California 94116

Markut Compilation and Research Bureau
13011 Victory Boulevard
North Hollywood, California 91609

Academic Census Data Center
19312 Arrow Street
Pacific Palisades, California 90272

Larry Smith & Company, Inc.
One Maritime Plaza
San Francisco, California 94104

David Blackwell & Associates
Pier 3, Embarcadero
San Francisco, California 94111

Wilbur Smith & Associates, Inc.
Western Region
1111 Wilshire Boulevard, Room 1500
San Francisco, California 94104

Booker & Hayes, Inc.
11665 Saticoy Street, Suite 907
Los Angeles, California 90049

Decision Making Information
7000 A Main Street
Suite 800
Santa Ana, California 92705

Darley/Sabat Associates, Inc.
19002 Irvine Boulevard
Beauin, California 90210

Consolidated Analysis Centers, Inc.
1301 San Vicente Boulevard
Suite 390
Los Angeles, California 90049

Environmental Systems Research Institute
11 Fifth Street
Redlands, California 92373

Sperco, Inc.
14760 Gerard Street
Van Nuys, California 91407

Colorado
Business Research Division
Graduate School of Business Administration
University of Colorado
Boulder, Colorado 80302

Scientific Software Corporation
Education & Economic Systems Division
1123 Spruce Street
Boulder, Colorado 80302

Bureau of Business and Public Research, School of Business
University of Northern Colorado
Greely, Colorado 80631

Connecticut
AIDU-System
Division of SOS Industries, Inc.
239 Service Road, West Hartford, Connecticut 06101

Managed Marketing
P.O. Box 523
Boston, Connecticut 06010

Wilbur Smith & Associates, Inc.
Northeastern Region
156 Whitney Avenue
New Haven, Connecticut 06510

Social Science Data Center
University of Connecticut
Storrs, Connecticut 06268

District of Columbia
Census Data Corporation
1710 N Street, N.W.
Washington, D.C. 20036

Claritas Corporation
Suite 200
3600 M Street, N.W.
Washington, D.C. 20007

Computer Cartography, Inc.
416 C Street, N.E.
Washington, D.C. 20002

Applied Urbanics, Inc.
1182 17th Street, N.W.
Suite 1103
Washington, D.C. 20036

Metropolitan Washington Council of Governments
1225 Connecticut Ave., N.W.
Washington, D.C. 20036

Boeing Computer Services, Inc.
955 L'Enfant Plaza, North, S.W.
Third Floor
Washington, D.C. 20024

Florida
The Center for Urban Studies
University of Miami, P.O. Box 8002
Coral Gables, Florida 33124

Census '70 Data Center
7600 S.W. 57th Avenue
Miami, Florida 33143

Housing Data Bank Division
Economic Data Bank, Inc.
7600 S.W. 62d Avenue
Miami, Florida 33143

Computing Center
Florida State University
Tallahassee, Florida 32304

Electronics Data Processing Division
Department of General Services
State of Florida
Tallahassee, Florida 32304

Strategy Research Corporation
1100 N.W. 79th Avenue
Miami, Florida 33166

Georgia
Demographic Research and Training Center
Social Science Research Institute
University of Georgia
Athens, Georgia 30601

Urban Life Center
Georgia State University
Atlanta, Georgia 30303

Attitude Research Studies
Georgia Institute of Technology
Atlanta, Georgia 30332

Bureau of State Planning and Community Affairs
270 Washington Street, S.W.
Atlanta, Georgia 30303

Environmental Data Planning Associates
1182 West Peachtree St., N.W.
Suite 306
Atlanta, Georgia 30309

Hawaii
Information Systems Department
City and County of Honolulu
Honolulu, Hawaii 96813

Department of Budget & Finance
Statewide Information Center
State of Hawaii
P.O. Box 150
Honolulu, Hawaii 96810

Computab, Inc.
Suite 200
700 Bishop Street
Honolulu, Hawaii 96812

Idaho
State Auditors Office
Data Processing Center
Capitol Building
Boise, Idaho 83702

Illinois
Burton-Ashman Associates, Inc.
1771 West Howard Street
Chicago, Illinois 60626
Consolidated Analysis Centers, Inc. (C.A.C.I.)
1815 North Fort Myer Drive
Arlington, Virginia 22209

Computing and Software
3700 Mt. Vernon Avenue
Alexandria, Virginia 22305

Division of State Planning and Community Affairs - Governor's Office
1010 James Madison Building
109 Governor Street
Richmond, Virginia 23219

National Data Use and Access Laboratories, Inc. (DUALabs)
Suite 900
1601 North Kent Street
Rosslyn, Virginia 22209

Washington
Urban Data Center
125 More Hall, PW-10
University of Washington
Seattle, Washington 98195

Office of the Governor
Office of Program Planning and Fiscal Management
House Office Building
State Capitol Campus
Olympia, Washington 98501

Battelle-Northwest
Economic and Operations Research Department
P.O. Box 967
Richland, Washington 99352

Sociological Data Processing Center
Department of Sociology
Washington State University
Todd Hall, Room 145
Pullman, Washington 99163

Boeing Computer Services, Inc.
P.O. Box 28346
Og. C-700 R/S EC-55
Seattle, Washington 98121

West Virginia

West Virginia Housing Development Fund
500 Charleston National Plaza
Charleston, West Virginia 25301

Wisconsin

Analytical Computer Systems Corporation
1800 E. Capitol Drive
Suite 2F
Milwaukee, Wisconsin 53211

Department of Administration
State Bureau of Systems and Data Processing
1 West Wilson Street
Madison, Wisconsin 53702

Wyoming

Division of Business and Economic Research
University of Wyoming, POB 3925
University Station
Laramie, Wyoming 82070
Appendix E

Provided in this appendix is the home interview questionnaire used in the Lafayette Transportation and Development Study. With a few minor changes this type of questionnaire could be used as a mail-in questionnaire for collecting data on non-transit users.
Dear Citizen:

As explained in the letter recently sent to you, your household is one of the number selected, from which we would like to obtain vitally needed travel information in connection with the Greater Lafayette Area Transportation and Development Study.

Each member of your household over 5 years of age will be asked by our interviewer to record all of the trips which he or she makes on __________, __________, from 4:00 AM to 4:00 AM the following day.

Our interviewer will return to your home on __________, __________, about __________ PM to make the interview.

The interviewer will also provide you with a sufficient number of Trip Reminder Forms that you may keep with you on all trips during the above indicated travel day. Please do not consider this Trip Reminder a substitute for the home interview. It is only an aid for the home interview to save you time.

The information is completely confidential and will be used for statistical purposes only.

Very truly yours,

[Signature]
Joseph A. Fletcher
Executive Director
GREATER LAFAYETTE AREA
TRANSPORTATION & DEVELOPMENT STUDY
Tippecanoe County Area Plan Commission

BUS STUDY QUESTIONNAIRE
(For all persons 18 years of age or older)

1. Each set below contains two statements, A and B. Select the one statement which you feel is more important to you, in your preference by circling the letter A or B, whichever your choice may be. Circle an A or B for every pair. (Each pair appears only once.)

A. Shorter walking distance to a bus stop
B. More frequent service

A. Lower fare for passengers
B. More protection from weather at public bus stops

A. Making a trip without changing buses
B. Lower fare for passengers

A. More protection from weather at public bus stops
B. A shorter walking distance to a bus stop

A. Making a trip without changing buses
B. More protection from weather at bus stops

A. A shorter time spent traveling in bus
B. Longer hours of available service

A. The assurance of getting a seat
B. Lower fare for passengers

A. More protection from weather at public bus stops
B. Longer hours of available service

A. A shorter walking distance to a bus stop
B. A shorter time spent traveling in bus

A. More frequent service
B. The assurance of getting a seat

A. Making a trip without changing buses
B. Longer hours of available service
A. A shorter time spent traveling in bus
B. The assurance of getting a seat

A. Longer hours of available service
B. Lower fare for passengers

A. More protection from weather at public bus stops
B. A shorter time spent traveling in bus

A. More frequent service
B. Making a trip without changing buses

A. Lower fare for passengers
B. A shorter walking distance to a bus stop

A. More protection from weather at public bus stops
B. More frequent service

A. A shorter time spent traveling in bus
B. Making a trip without changing buses

A. The assurance of getting a seat
B. A shorter walking distance to a bus stop

(Please do not write below this line)
1. The number of blocks from my place of work to the nearest bus stop is

2. Circle one or more places you go to from your home by bus. Then circle the number of times a week or a month you go by bus, and whether you return by bus. (consider only non-work trips).

3. The number of blocks from my home to the nearest bus stop is

   8 or more

   check here if you cannot answer question.
Assuming you were to use an improved bus system for transportation, circle the number which shows how important it would be to YOU to have bus service to the places named. For example, if you feel it is unimportant for YOU to have bus service to the place named, circle the number (1). If on the other hand, YOU feel it is important to YOU, circle the number (7). If you do not have strong feelings one way or the other, circle one of the numbers between (1) and (7) to show how you feel.

<table>
<thead>
<tr>
<th>Location</th>
<th>Unimportant</th>
<th>Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>JUANITA LAFAYETTE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JUANITA LAFAYETTE</td>
<td>1 2 3 4 5 6 7</td>
<td>Very Important</td>
</tr>
<tr>
<td>SHAVET, TOPPS</td>
<td>1 2 3 4 5 6 7</td>
<td>Very Important</td>
</tr>
<tr>
<td>PURDUE UNIVERSITY</td>
<td>1 2 3 4 5 6 7</td>
<td>Very Important</td>
</tr>
<tr>
<td>MARKET SQUARE</td>
<td>1 2 3 4 5 6 7</td>
<td>Very Important</td>
</tr>
<tr>
<td>ALCOA - NATIONAL MONES</td>
<td>1 2 3 4 5 6 7</td>
<td>Very Important</td>
</tr>
<tr>
<td>PURDUE RESEARCH PARK</td>
<td>1 2 3 4 5 6 7</td>
<td>Very Important</td>
</tr>
<tr>
<td>ELI LILLY</td>
<td>1 2 3 4 5 6 7</td>
<td>Very Important</td>
</tr>
<tr>
<td>COLUMBUSIANS PARK</td>
<td>1 2 3 4 5 6 7</td>
<td>Very Important</td>
</tr>
</tbody>
</table>

**HOSPITALS (ST. ELIZABETH - HOS)**

<table>
<thead>
<tr>
<th>Unimportant</th>
<th>Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TRCA - TRAPPERS FALLS**

<table>
<thead>
<tr>
<th>Unimportant</th>
<th>Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SEARS - SHOPPERS FAIR**

<table>
<thead>
<tr>
<th>Unimportant</th>
<th>Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**WEST LAFAYETTE BYPASS SHOPPING AREAS (MARSH VILLAGE)**

<table>
<thead>
<tr>
<th>Unimportant</th>
<th>Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TEAL ROAD SHOPPING CENTERS (JEFFERSON SQUARE - LAFAYETTE SQUARE)**

<table>
<thead>
<tr>
<th>Unimportant</th>
<th>Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DUNCAN ELECTRIC**

<table>
<thead>
<tr>
<th>Unimportant</th>
<th>Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GENERAL FOODS**

<table>
<thead>
<tr>
<th>Unimportant</th>
<th>Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

List any other places in the Lafayette - West Lafayette area to which you would desire bus service.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
10. The following statements concern the financial operation of the service. Indicate how acceptable each method of operation would be to you.

**BUS SERVICE SHOULD PAY FOR ITS FARES CHARGED USERS**

Unacceptable 1 2 3 4 5 6 7 Acceptable

**BUS SERVICE SHOULD BE SUPPORTED IN PART BY FARES AND IN PART BY LOCAL TAXES**

Unacceptable 1 2 3 4 5 6 7 Acceptable

**BUS SERVICE SHOULD BE FREE WITH ENTIRE COST PAID FROM LOCAL TAXES**

Unacceptable 1 2 3 4 5 6 7 Acceptable

11a. Assume that you are making a trip by yourself on the bus within the Lafayette-West Lafayette area. Write in the space below what you think would be an acceptable fare for the one-way trip, if the bus picked you up within 2 blocks of your home.

---------- Each Way

11b. Assume that you could have the bus pick you up in front of your home rather than the regular bus stop nearest your home. Write in the space below what you think would be an acceptable charge for the one-way trip.

---------- Each Way

12. The amount the fare would be on the bus is to be determined in a number of ways. Indicate how acceptable each of the methods described below would be to you.

**ONE FIXED FARE REGARDLESS OF DISTANCE TRAVELED**

Unacceptable 1 2 3 4 5 6 7 Acceptable

**FARE BASED ON DISTANCE TRAVELED**

Unacceptable 1 2 3 4 5 6 7 Acceptable

13. Usually the time spent traveling on a public transportation system is longer than would be required by private automobile. Fill in the table below to show what you think would be acceptable trip times on a bus if the time by car were as given on the left side of the table. Do not include any time you might have to spend waiting for the bus to pick you up; consider only the actual time spent riding.

<table>
<thead>
<tr>
<th>TRIP TIME BY CAR</th>
<th>ACCEPTABLE BUS TRIP TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Minutes</td>
<td>... Minutes</td>
</tr>
<tr>
<td>10 Minutes</td>
<td>... Minutes</td>
</tr>
<tr>
<td>15 Minutes</td>
<td>... Minutes</td>
</tr>
<tr>
<td>20 Minutes</td>
<td>... Minutes</td>
</tr>
</tbody>
</table>

**PLEASE DO NOT WRITE BELOW THIS LINE**

(Repeat columns 2 thru 13 from previous card.)
Hi.

Do you consider purchasing a service that picks you up in front of your home, takes you to your place of employment and returns you home at the end of the work day.

YES NO

If YES, continue with this question.

Where do you work?

[Name of large store or company or street address]: 

When do you start work?

[ ] A.M. [ ] P.M.

What would be the earliest you would be willing to leave home?

[ ] A.M. [ ] P.M.

When are you normally finished work?

[ ] A.M. [ ] P.M.

What would be the latest you would be willing to arrive home?

[ ] A.M. [ ] P.M.

Circle the amount you would be willing to pay for this monthly service:

- $4.50 (45 cents per one way trip)
- $9.00 (90 cents per one way trip)
- $13.50 (135 cents per one way trip)
- $18.00 (180 cents per one way trip)
- $22.50 (225 cents per one way trip)
- $27.00 (270 cents per one way trip)

Please fill in the following questions so that we can tell if married people have different preferences than single people and so on.

Marital Status

1. Married
2. Single

Education Completed

1. 0-6 years of grade school
2. 7 years of high school
3. Graduated from high school
4. 2 years of college or trade school
5. Graduated from college
6. Completed graduate degree

Employment

1. Employed full-time
2. Employed part-time
3. Unemployed
4. Retired
5. Elementary or high school student
6. Purdue student
7. Housewife
Appendix F

Contained in this appendix is a list of a number of transit vehicle manufacturers. Also, provided is a sample specification sheet for recording information on each vehicle type.

List of Bus Manufacturers

1. Highway Products, Inc.  
   789 Stow Street  
   Kent, Ohio 44240  
   Phone: 216-673-9821  
   (Makes the Twin Coach)  
   Seating Capacity Range (19-35)

2. The Flxible Co.  
   Loudonville, Ohio 44842  
   Phone: 419-994-4141  
   (Makes the Flxette)  
   Seating Capacity Range (19-53)

3. GMC Truck and Coach Division of General Motors Corporation  
   Coach Advertising Department  
   Pontiac, Michigan 48053  
   Phone: 313-335-4111  
   (Makes GMC Transit Coaches)  
   Seating Capacity Range (33-53)

4. Minibus Inc.  
   Creative Transportation System  
   7711 Paramount Blvd.  
   Pico Rivera, California 90660  
   Phone: 213-723-9071  
   (Makes the Minibus)  
   Seating Capacity Range (19-23)

   East Coast Sales Office:  
   900 Ohio Drive S.W.  
   Washington, D.C. 20024  
   Phone: 202-638-5014
5. Motor Homes Inc.  
3709 West Erie Avenue  
Lorain, Ohio 44053  
Phone: 216-245-9755  
(Makes the Ford Courier)  
Seating Capacity Range  
(10-15)

6. Metropolitan Coach Corporation  
4201 S. Congress  
P.O. Box 3255  
Austin, Texas 78704  
Phone: 512-442-1401  
(Makes the Metropolitan Coach)  
Seating Capacity Range  
(Special order any size)
1. Body structure:
   a. Chassis body or Integral
   b. Riveted or Welded
   c. Length
   d. Width
   e. Standard number of seats (and seat configurations available)
   f. Height, ground to first step
   g. Number of steps
   h. Height, ground to floor (at front axle)
   i. Flat floor (transit only)
   j. Headroom
   k. Approximate unloaded weight
   l. Weight on front axle
   m. Weight on rear axle

2. Suspension:
   a. Wheelbase
   b. Track - front
   c. Track - rear
   d. Turning radius over outside
   e. Turning radius of body (front corner)
   f. Type (air, leaf-spring, etc.)
   g. Steering manufacturer and model
   h. Rear axle manufacturer and model

3. Engine (recommended for given specs):
   a. Location
   b. Inline or Transverse
   c. Manufacturer
   d. Gas or Diesel
   e. Configuration (6, V-6, V-8, etc.)
   f. Displacement
   g. Peak hp/rpm
   h. Peak torque/rpm
   i. Estimated engine life before major overhaul

4. Brakes:
   a. Type
   b. Total area
   c. Estimated life

5. Transmission:
   a. Manufacturer
   b. Model
   c. Type (torque, conv., 3-speed, etc.)

FIGURE F1
SAMPLE SPECIFICATION SHEET
6. Performance:
   a. Acceleration
      0-20 mph
      0-30 mph
      0-40 mph
   b. Maximum grade
   c. Braking

7. Ventilation and lighting:
   a. Heat type (recirculating or fresh air)
   b. Air conditioning capacity
   c. Air conditioning type (integral w/ heat or other)
   d. Candle-power at reading plane

8. Other specifications:
   a. Seat spacing
   b. Aisle width
   c. Fuel tank capacity
   d. Standard tire size
   e. Front axle capacity
   f. Rear axle capacity
   g. Estimated fuel mileage

9. Typical price for the coach, rounded to the nearest $1,000.00.

10. Items normally considered optional equipment
Appendix G

Provided in this appendix are the bid forms and specifications from the Greater Lafayette Public Transportation Corporation. Forms and specifications of this type must be developed if federal money is to be used for the purchase of new equipment.
NOTICE TO BIDDERS

Notice is hereby given that the Board of the Greater Lafayette Public Transportation Corporation will receive sealed bids in the Office of the Corporation, 920 Ferry Street, Lafayette, Indiana, EST, 19__, for the following equipment and/or supplies:

SIXTEEN (16) MEDIUM SIZED, AIR-CONDITIONED, TRANSIT TYPE MOTOR COACHES

Specifications are on file in the office of the Corporation.

Bids shall be submitted on Regular Bid Form No. 95 which may be obtained at the office of the Corporation. All bids must be accompanied by Bidder's Bond, Certified Check or Cash in an amount equal to five percent (5%) of the total bid price, and a non-collision affidavit, and in all particulars must comply with the laws of the State of Indiana.

The Board of the Greater Lafayette Public Transportation Corporation reserves the right to reject any and all bids.

Bids received after the specified time, will be returned unopened to the bidder.

BOARDS OF THE GREATER LAFAYETTE PUBLIC TRANSPORTATION CORPORATION

ATTEND:

Board Secretary

PUBLISH:

________________________

________________________
I, ________________________________, ________________________________, do hereby certify that prevailing wage and fringe benefits, as determined by statistics compiled by the United States Department of Labor and related to the Greater Lafayette area by said department, will be paid for labor hired and paid on ________________________________, Proof of compliance will be furnished before payments are made on this contract.

______________________________
SIGNATURE

______________________________
Name of Notary Public
Notary
County
Commission Expires

Subscribed and sworn to before me this ______ day of ________, 19____.

__________________________________________
SIGNATURE OF NOTARY PUBLIC

(Any, print or stamp)
### List of Items to Be Supplied with Proposal

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposal Deposit</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Terms of Payment</td>
<td>14</td>
<td>33</td>
</tr>
<tr>
<td>Policy on Warranty</td>
<td>13</td>
<td>22</td>
</tr>
<tr>
<td>List of Transportation Plans</td>
<td>13</td>
<td>29</td>
</tr>
<tr>
<td>Letters of Certification Re: Horsepower adequacy compliance with criteria on Air Pollution</td>
<td>9-10</td>
<td>3</td>
</tr>
<tr>
<td>Location of Parts Warehouse</td>
<td>13</td>
<td>23</td>
</tr>
<tr>
<td>List of Units</td>
<td>10</td>
<td>6</td>
</tr>
</tbody>
</table>

**Post Bid Requirements (By Successful Bidder)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Bond</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>Documents for Securing Title</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td>Supply Weight Slips</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Furnish Sample Seat Materials</td>
<td>25</td>
<td>19</td>
</tr>
<tr>
<td>Furnish Paint Charts</td>
<td>30</td>
<td>41</td>
</tr>
<tr>
<td>Maintenance &amp; Parts Books</td>
<td>32</td>
<td>46</td>
</tr>
</tbody>
</table>

**Post Bid Requirements (By the GLFTC)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Sign Readings</td>
<td>24</td>
<td>14</td>
</tr>
<tr>
<td>Determine Seat Colors</td>
<td>25</td>
<td>19</td>
</tr>
<tr>
<td>Determine Paint Scheme</td>
<td>30</td>
<td>41</td>
</tr>
<tr>
<td>Supply Location of Coach Numbers</td>
<td>31</td>
<td>42</td>
</tr>
</tbody>
</table>

### General Provisions
GENERAL PROVISIONS

The Greater Lafayette Public Transportation Corporation, Tenth and Ferry Streets, Lafayette, Indiana hereinafter called "GLPTC", requests quotations from manufacturers of transit type motor coaches, under the following requirements and conditions, which shall be considered an essential part of specifications and proposal:

1. The buses described in these specifications are to be purchased with the assistance of a grant from the Federal Government under the Urban Mass Transportation Act of 1966. The successful bidder will be required to comply with all terms and conditions prescribed for third party contracts in a grant contract between the United States of America and the Purchaser. This grant contract is available for examination by prospective bidders at the office of the Purchaser.

2. The award of a contract for the purchase of these vehicles is subject to the concurrence of the U.S. Department of Transportation (D.O.T.). Any change in the contract, likewise, shall be submitted to D.O.T. for prior written approval.

3. The contract between the Purchaser and the successful bidder shall contain the following provisions:
   (a) Equal Employment Opportunity. To connection with the carrying out of this project, the contractor shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, color, sex, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other compensation; and selection for training, including apprenticeship.
   (b) Prohibited Interests. No member, officer, or employee of the Public Body, Transit Authority, Commission, or locality during his tenure or for one year thereafter shall have any interest, direct or indirect, in this contract or the proceeds thereof.
   (c) Interest of Members or Delegates to Congress. No member of or delegate to the Congress of the United States shall be admitted to any share or part of this contract or to be any benefit arising therefrom.
   (d) Air Pollution Criteria. The contractor hereby certifies that:
      (1) Horsepower of the vehicle to be furnished shall be adequate for the speed and terrain in which they will operate. Such horsepower includes the requirements of auxiliary power equipment.
      (2) Gases and vapors emanating from the crankcase of spark ignition engines are controlled in such a manner as to minimize their escape to the atmosphere. (Such control may provide for the return of such gases to the induction system of the engine.)

4. These specifications state detailed requirements for transit type coaches of twenty-five (25) - thirty (30) passenger capacity, propelled by a heavy-duty V type liquid propane fueled engine, with fully automatic transmission. The coaches shall be a minimum of 96 inches in width and an overall maximum length not to exceed thirty (30) feet.

5. It is the intent of these specifications to provide for a coach of first quality, and the workmanship must be the best obtainable in the various trades. The design of the body and equipment which the manufacturer proposes to furnish must be of such as to produce a vehicle of substantial and durable construction in all respects. The successful bidder must furnish vehicles complete in every detail ready to function in operation. The complete vehicle and all working and moving parts and operation devices shall be thoroughly tested and put in operating condition by the manufacturer, or his duly appointed agent.

6. Bids must be accompanied by a comprehensive description of bidders standard product. The quality of standard components, not covered by the language of these specifications, will be a factor in determining a bid award. No advantage shall be taken by the bidder or manufacturer in the omission of any part or detail which goes to make the coaches complete and ready for service, even though such part is not mentioned in this specification.

7. All bids must be in strict compliance with the requirements and provisions of these specifications, including the provisions herein regarding "approved", "approved equals", and "deviations". Where a feature, component, or item is specified by brand name in these specifications, the words "or approved equal" will apply. Where the approval of the Purchaser is specifically required by these specifications in connection with a particular feature, or if the bidder proposes to submit a bid containing "approved equals" or "deviations" from specific requirements of these specifications, the bidder must obtain such approval, confirmed in writing, prior to the date for the bid opening. With respect to "approved equals" or "deviations", the details of same, and the reasons and justifications therefore, must be submitted to the Purchaser, including a statement whether the bidder has previously furnished, or offered to furnish, the item in question as herein specified. Bids may be submitted containing any such approvals, approved equals or deviations as are specifically approved by the Purchaser, confirmed in writing, prior to bid opening date. Each bid must be accompanied by documentation regarding any such
7. (Continued)

approvals granted by the Purchaser for that bid. Notice of any such approvals given to a bidder shall be furnished by the Purchaser to other prospective bidders at least five days prior to bid opening date. Any unapproved deviations, exceptions, substitutions, alternates, or conditional qualifications contained in a bid may be cause for its rejection.

Protests concerning the specifications or bidding procedure, request for clarification of the specifications and requests for the substitution of "approved equal" items must be submitted, in writing, to the Greater Lafayette Public Transportation Corporation not less than 21 days before bid opening. Any protest relating to restrictive specifications must be fully supported by evidence that the substitute offered is equal to or better than the specification requirement.

Greater Lafayette Public Transportation Corporation will accept or reject any request under the foregoing subparagraph, in writing, not less than 14 days before bid opening. Any change in the specifications will be affected by the issuance of an addendum.

Any appeal from the decision of the Greater Lafayette Public Transportation Corporation must be submitted, in writing, to UMTA not less than 7 days before bid opening. Appeals received by UMTA later than 7 days before bid opening will not be considered.

8. All coaches shall be in complete compliance with all requirements of the laws of the State of Indiana and the Federal Motor Vehicle Safety Standards as established by the U.S. Department of Transportation.

9. Purchaser reserves the right to accept any bids, or to reject any or all bids, in award the contract for the purchase of the motor coaches on such basis as Purchaser deems to be in its best interest.

10. As security for the acceptance of the contract, each bid shall be accompanied by a certified check or bid bond in the amount of five per cent (5%) of the bid, rounded to the nearest thousand dollars drawn payable to the Purchaser. Such bid deposits of all bidders will be held by Purchaser until all proposals submitted shall have been canvassed, and the bids have either been rejected in whole, or in part, or the award of the contract or contracts has been made. The bid deposit of the successful bidder will be held until the contract is duly executed. Bid deposits will be returned to unsuccessful bidders within two weeks after the award of the contract. If the successful bidder to whom the contract shall have been awarded refuses to execute the contract and to furnish the performance bond herein prescribed within seven days after the award of the contract the amount of the bid deposits shall be forfeited to and retained by the Purchaser as liquidated damages for such neglect or refusal.

All bids received shall remain in effect for 30 days from bid opening.

11. The successful bidder shall furnish at his own expense a performance bond payable to the Purchaser in the amount of one hundred per cent (100%) of the full amount of the contract as a guarantee of good faith on behalf of the contractor that the terms of these specifications will be complied with in every particular.

12. The price to be quoted in any proposal submitted shall include all labor, materials, tools, equipment and other costs necessary to fully complete the manufacture and delivery of the coaches pursuant to the specifications. It is the intention of these specifications to provide and require a complete motor coach vehicle of the type prescribed ready for operation. Any items omitted from such specifications which are clearly necessary for the completion of such equipment and its appurtenances shall be considered a portion of such equipment although not directly specified or called for in these specifications.

13. Bids shall be submitted on terms "Net-30-days".

14. Purchaser is exempt from payment of all Federal, State, and local taxes in connection with this purchase. Said taxes must not be included in bid prices. Purchaser will provide necessary tax exemption certificates to manufacturer.

15. The earliest possible delivery time is urgently required; therefore, bidder must submit the earliest possible delivery date, but all buses must be completed and delivered no later than 180 days following the date of award.

16. In the event of delay in the completion of delivery of coaches beyond the date the successful bidder specified, the Purchaser shall assess as liquidated damages, one-hundred ($100.00) dollars per day per coach.

17. In case the delivery of completed coaches under the terms of these specifications and related purchase contract shall be necessarily delayed because of strike, injunction, government controls, or by reason of any cause or circumstances beyond the control of the contractor, the time of completion of delivery shall be extended by a number of days to be determined in each instance by mutual agreement between Purchaser and contractor.

18. The bid shall state with his bid the weight per coach for the coach on which bid is submitted in accordance with these specifications. The stated weight shall be for an empty coach, complete with tires and included full complement of fuel, oil and water. Purchaser may require verification of weight stated in bid as condition of acceptance of delivery of coaches.

19. The coach manufacturer shall assume responsibility for all materials and accessories used in the vehicles, whether the same is made by the coach builder or purchased, ready-made, from an outside source.

20. Successful bidder must agree to save, keep, bear harmless, and fully indemnify the Purchaser, and any of its employees or agents from all damages, costs or expenses in law or equity, that may at any time arise or be set up, for any infringement of the patent rights of any person or persons in connec-
sequence of the use by the Purchaser or by any of its employees or agents, of articles supplied under contract, arising from bids submitted and which the bidder is not lawfully entitled to sell. The Purchaser will give the successful bidder prompt notice in writing of the initiation of any suit or proceeding and permit the successful bidder through his counsel to defend same and will give all needed information, assistance and authority to enable successful bidder to do so.

21. Bids shall provide for delivery of coaches to the garage of Purchaser at Lafayette, Indiana.

22. Bidder shall submit details of the warranty provisions offered, at least 14 days prior to bid opening date, for review and acceptance by the Purchaser.

23. Bidder shall state with his bid location of parts warehouse which will serve the Purchaser, and give best estimate as to time that will be required to deliver most parts anticipated to be required. Bidder must guarantee all replacement parts will be made available for a period of not less than ten (10) years.

24. Bidder shall state with his bid the names and locations of technical service and parts representatives available to assist the Purchaser with information and advice regarding maintenance of the coaches.

25. Each proposal will be submitted with the understanding that the acceptance in writing by Purchaser of the offer to furnish any or all of the vehicles described therein, shall constitute a contract between the bidder and the Purchaser which shall bind the bidder on his part to furnish and deliver at his bid price, and in accordance with conditions of said accepted proposal and specifications.

26. Bidder shall submit with his bid a list of parts with prices for a representative running parts inventory, and including prices on components such as engine, transmission, alternator, etc.

27. Bidder shall submit with his bid one copy each of maintenance manual, parts book and operator manual applicable to coaches on which bid is submitted. Successful bidder shall, at least fifteen (15) days prior to delivery of the coaches, furnish copies of such material in sufficient quantity to satisfy requirements of Purchaser, and compliance with this requirement may be made a condition for acceptance of delivery of the coaches.

28. In determining successful bidder consideration will be given to price, financial responsibility of bidder, responsiveness to these specifications, and availability of the vehicles offered for use in the local transit system. Conditional or qualified bids shall be rejected.

29. Bidder shall provide with his bid, for the coach on which bid is submitted or its predecessor model having the same or comparable engine and transmission, a list showing names of purchasers and approximate delivery dates of all deliveries of such coaches for a period of at least the last two years.

30. Conditional bids, or those which take exception to the specifications, shall be considered non-responsive and will be rejected.

31. Bids must be submitted on the form provided. Bids submitted in any other form will be considered non-responsive and will be rejected.

32. Acceptance of delivery of any coach or coaches shall not release the contractor from liability for faulty workmanship or materials appearing even after final payment has been made. The Greater Lafayette Public Transportation Corporation reserves the right and shall at liberty to inspect all materials and workmanship at any time during the manufacturing process and shall have the right to reject any materials and workmanship which do not conform to the specifications, provided, however, the Greater Lafayette Public Transportation Corporation is under no duty to make such inspections and if such inspection is made, the contractor shall not be relieved of any obligations to furnish materials and workmanship strictly in accordance with specifications.

33. Each proposal shall state terms of payment proposed; it being understood that the Greater Lafayette Public Transportation Corporation shall pay or arrange for payment, therefore, only against delivery and acceptance of coaches pursuant to these specifications.

34. Each bidder shall familiarize himself with all of the attached forms, advertisement, instructions, specifications, drawings, bonds and agreement, as he will be held responsible to fully comply therewith. Each bidder shall acquaint himself with the conditions affecting the work.

35. Each and every bidder who submits bid specifically waives any right to withdraw it except as heretofore provided. Bidders will be given permission to withdraw any bid after it has been deposited with the GLPTC provided any bidder makes his request by telephone, telegraph or in writing twenty-four (24) hours before the time fixed for bid opening. Requests pertaining to withdrawal by telephone or telegraph must be confirmed in writing by the bidder and must reach the Office of the General Manager of the Greater Lafayette Public Transportation Corporation not later than one (1) hour prior to the time fixed for submission of bids.

36. Bidders may be required to submit duplicate sworn statements of their financial responsibility, technical qualifications and performance record before contract can be awarded to them.

37. No contract may be assigned, sublet or transferred without the written consent of the Greater Lafayette Public Transportation Corporation. The enumeration in these conditions and instructions of certain rights and remedies of the Greater Lafayette Public Transportation Corporation shall not be construed to exclude the exercise by the Greater Lafayette Public Transportation Corporation of other and additional rights and remedies which are available generally at law or which may be implied from the foregoing.
30. The estimated quantities given in this proposal are for the purpose of bidding only. The Greater Lafayette Public Transportation Corporation may purchase more or less than the estimated quantities, and the bidder does not assume that such estimated quantities are part of the contract.

SPECIFICATIONS

for

SIXTEEN (16)

MEDIUM SIZED

LIQUID PROPANE GAS POWERED

TRANSIT TYPE MOTOR COACHES

April, 1972

GREATER LAFAYETTE PUBLIC TRANSPORTATION CORPORATION

Lafayette, Indiana 47901
### Index

**Detailed Specifications**

<table>
<thead>
<tr>
<th>Item</th>
<th>Paragraph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advertising Racks</td>
<td>39</td>
</tr>
<tr>
<td>Airbags, Splash</td>
<td>17</td>
</tr>
<tr>
<td>Axle, Front</td>
<td>3</td>
</tr>
<tr>
<td>Axle, Rear</td>
<td>2</td>
</tr>
<tr>
<td>Body &amp; Chassis</td>
<td>27</td>
</tr>
<tr>
<td>Brakes</td>
<td>9</td>
</tr>
<tr>
<td>Bumpers</td>
<td>36</td>
</tr>
<tr>
<td>Compartment, Engine</td>
<td>18</td>
</tr>
<tr>
<td>Cooling</td>
<td>26</td>
</tr>
<tr>
<td>Dimensions</td>
<td>20</td>
</tr>
<tr>
<td>Doors</td>
<td>30</td>
</tr>
<tr>
<td>Driveshaft</td>
<td>24</td>
</tr>
<tr>
<td>Electrical</td>
<td>7</td>
</tr>
<tr>
<td>Engine</td>
<td>12</td>
</tr>
<tr>
<td>Exhaust</td>
<td>22</td>
</tr>
<tr>
<td>Floors &amp; Covering</td>
<td>29</td>
</tr>
<tr>
<td>Fuel</td>
<td>25</td>
</tr>
<tr>
<td>Heating</td>
<td>13</td>
</tr>
<tr>
<td>Horn</td>
<td>37</td>
</tr>
<tr>
<td>Instruments &amp; Controls</td>
<td>8</td>
</tr>
<tr>
<td>Lettering</td>
<td>42</td>
</tr>
<tr>
<td>Lighting, Exterior</td>
<td>11</td>
</tr>
<tr>
<td>Lighting, Interior</td>
<td>10</td>
</tr>
<tr>
<td>Mirrors</td>
<td>15</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>46</td>
</tr>
<tr>
<td>Painting</td>
<td>41</td>
</tr>
<tr>
<td>Panels, Modesty</td>
<td>38</td>
</tr>
<tr>
<td>Passenger Signal</td>
<td>40</td>
</tr>
<tr>
<td>Sealing &amp; Insulation</td>
<td>28</td>
</tr>
<tr>
<td>Seat, Drivers</td>
<td>34</td>
</tr>
<tr>
<td>Seating, Passenger</td>
<td>19</td>
</tr>
<tr>
<td>Shock Absorbers</td>
<td>5</td>
</tr>
<tr>
<td>Signs</td>
<td>14</td>
</tr>
</tbody>
</table>

**Index**

**Detailed Specifications**

<table>
<thead>
<tr>
<th>Item</th>
<th>Paragraph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Springs</td>
<td>4</td>
</tr>
<tr>
<td>Stanchions</td>
<td>16</td>
</tr>
<tr>
<td>Steering</td>
<td>6</td>
</tr>
<tr>
<td>Steps</td>
<td>31</td>
</tr>
<tr>
<td>Transmission</td>
<td>23</td>
</tr>
<tr>
<td>Wheels</td>
<td>21</td>
</tr>
<tr>
<td>Windshield</td>
<td>33</td>
</tr>
<tr>
<td>Windows</td>
<td>32</td>
</tr>
<tr>
<td>Wipers, Windshield</td>
<td>35</td>
</tr>
</tbody>
</table>
DETAILED SPECIFICATIONS

For

LIQUID PROPANE GAS POWERED TRANSIT

TYPE MOTOR COACHES

1. GENERAL:

a. These specifications cover transit type motor coaches of 25-30 passenger seated capacities with automatic transmission, propelled by a single, heavy duty industrial V type engine mounted in the rear, outside width not to exceed 96 inches, length over bumpers not to exceed 30 feet.

b. Contractor will incorporate in his coach the latest technological advancements in the art of building motor coaches to achieve maximum service and attractiveness of appearance.

c. The coach shall be front entrance, rear exit type.

d. The body shall be built with suitable and easily accessible compartments for all apparatus, sound deadening insulation wherever needed, and all operating devices not mounted as to reduce and keep all noise and vibration to a minimum. Coach body shall be integral in design.

e. No advantage shall be taken by the contractor in the omission of any part or detail which goes to make the coach complete and ready for service, even though such part or detail is not mentioned in the specifications.

f. The contractor shall assume responsibility for all material and accessories and their proper installation, used in the coach whether the same is manufactured by the contractor, or purchased, ready made, from a source outside the contractor's company.

g. The coach shall be capable of negotiating a ten (10%) percent grade at ten (10) miles per hour with a full seated load and twenty (20) standees.

h. The net weight of the 25-30 passenger capacity coach shall not exceed 14,000 pounds. Any weight in excess shall carry a penalty of 50¢ per pound which shall be deducted from the contractor's invoice to the GLPCT. In analyzing bid prices, the overweight penalty will not be considered. A certified weight slip shall be furnished for each coach immediately following delivery of the last coach and before payment is made.

i. The motor vehicles will comply with the Motor Vehicle Safety Standards as established by the U.S. Department of Transportation and the State of Indiana.

j. Each coach shall be delivered by a mutual agreed method to the City of Lafayette, Indiana in first class condition, complete and ready for service and the contractor shall assume all responsibility and liability incident to such delivery.

k. If any coach is delivered incomplete or incorrect, or does not pass the Indiana State Vehicle Inspection, or contains any defective or damaged parts, said parts shall be removed and new or repaired parts, acceptable to the GLPCT, shall be furnished and labor for removal and installation of said parts shall be free of all costs to the GLPCT, including the transportation charges on said parts.

l. If the work involved in repairing or placing the coach/coaches in proper condition reaches a magnitude where the GLPCT cannot supply the space or labor for the necessary corrections, such replacement or repair shall be made by an approved company other than the GLPCT. If the GLPCT finds it necessary to perform any work on any coach which should have been performed by the contractor within the intent of these specifications, the contractor agrees to reimburse the GLPCT all costs incident thereto, including material, labor and overhead.

2. REAR AXLE

a. The rear axle shall be heavy duty, with minimum 15,000 pounds capacity with hypoid gears.

b. The rear axle-to-tire ratio of twelve of the coaches shall be such as to provide top speeds of at least 55 MPH (i.e., when operating on level terrain) at manufacturer's maximum engine R.P.M. The rear axle ratio on three of the coaches shall be such as to provide top speeds of at least 65 MPH (i.e., when operating on level terrain) at manufacturer's maximum engine R.P.M.

c. Provision shall be made for ample reserve of lubricants. Drain and filler plugs shall be of magnetic type.

3. FRONT AXLE

a. The front axle shall be Rockwell-Standard or equal and so designed as to provide proper wheel and axle geometry.

b. Radius rod controlling the caster must be adjustable while in position.

c. Front axle shall not have closed in backing plates but should be equipped with brake spindles affording complete visibility of brake components.

d. Front axle shall be of proper size to carry loads imposed upon it by street and other conditions encountered in the Greater Lafayette area of operation.
4. SPRINGS
a. If full air suspension system is required which functions by compressed air, it shall be regulated by leveling valves. System must maintain constant height of body in relation to axles regardless of load. Air supply shall be from main coach air system and a pressure regulating valve shall protect against air loss from leaks or failure of the suspension system.
b. To control lateral, longitudinal, and torsional movement adequate radius rods shall be provided.
c. If the rider is unable to supply air suspension, leaf type springs of adequate capacity to handle the load weights will be acceptable. Spring bushings shall be rubber and shall be replaceable.

5. SHOCK ABSORBERS
a. Heavy duty shock absorbers are to be provided on each side of both front and rear axles.

6. STEERING
a. Steering gear ratio and design shall be such as to preclude the need for power steering. Steering must operate with out under effort and shall not require more than seven complete turns of the steering wheel for full from wheel travel.
b. Provision shall be made for external adjustment of devel gears and axle unit.
c. Steering gear shall be Ross Cam and Lever, or approved equal.

7. ELECTRICAL SYSTEM
a. The Alternator shall be heavy duty twelve (12) volt having a minimum capacity output of 120 amperes. It shall be capable of maintaining full battery charge in normal operation, and shall be negatively grounded.
b. A transistorized voltage regulator shall be provided, so designed so to maintain proper control of power flow. It must be mounted for easy access and protected from dust and dirt.
c. A 205 ampere-hour rating battery shall be supplied. The battery shall be mounted in a readily accessible place. Mounting tray and terminals shall be treated to prevent corrosion.
d. All electrical wiring in the engine compartment shall have flame resistant, non-abrasion insulation. All electrical wiring and harness shall be loomed and meet SAE specifications and shall be adequately

d. clipped with rubberized wiring harness clips and installed according to SAE recommended practices. The electrical system shall be protected by the use of circuit breakers. All electrical junctions, fuses, circuit breakers, and miscellaneous units shall be readily accessible. All spark plug wires shall be made of heavy duty copper wire.
e. A 24 inch coil of wire shall be provided under the floor below the fire box location. A switch with circuit breaker controlling circuit shall be provided on instrument panel.
f. Special wiring shall be factory installed as required for both a two-way radio and an AM-FM radio. All wiring required for speakers and the speakers themselves shall also be factory installed. Four 5" high quality speakers shall be required per coach.

8. INSTRUMENTS AND CONTROLS
a. The control panel shall be mounted to the left of the driver on the coach wall. Individual circuit breaker type switches shall control all lighting and electrical units. Door control switches shall be toggle type. A master control switch of 120 ampere circuit breaker type to enable entire system to be secured shall be provided. All controls must be within easy reach of driver's position.
b. Instruments shall be installed on control panel and shall consist of:
   1. Speedometer and Odometer.
   2. Battery condition indicator.
   3. Engine temperature needle gauge and overheat engine warning light and warning buzzer.
   4. Air pressure needle gauge with light and audible warning buzzer.
   5. High beam indicator light.
   6. Turn signal indicator light.
   8. Oil pressure needle gauge and audible warning buzzer and light.
  10. Engine oil temperature needle gauge.
  11. LPG fuel level needle gauge.

9. BRAKES
a. Service brakes shall be air operated. Brake lining area shall be of a minimum of 501 square inches and shall be capable of providing a smooth stop under continuous operation as encountered in the Greater Lafayette area. Service brakes shall be capable of stopping the vehicle at a deceleration rate equivalent to a stop within 22 feet from a speed of 20 MPH. All air brake controls shall be Bendix Westinghouse or approved equal, with a quick release type rear brake valve. A spring type secondary braking system or similar "fail-safe" system shall be provided.
b. Parking brake shall be provided and shall be a part of the rear axle brake system. Operating valve shall be located at the left and within easy reach of the coach operator. Teen-tale light for parking light shall be mounted on the shift lever housing. Parking brake shall be capable of stopping vehicle at a deceleration rate equivalent to a stop within 50 feet from a speed of 20 MPH.
9. BRAKES (Continued)
   c. Provide three (3) air tanks with minimum reservoir capacity totalling 3,500 cubic inches.
   d. The coach shall be equipped with an air compressor of minimum capacity of 75 cubic feet of Midland or approved equal make.
   e. Air tanks shall be equipped with manual drain valves.

10. INTERIOR LIGHTING
    a. The front entrance and rear exit step wells shall be lighted by step well lights, suitable mounted and of a brilliance so that the entire step well and not less than two (2) feet of the adjacent ground area outside the coach is well illuminated.
    b. Fluorescent light fixtures shall be provided in the passenger area of an intensity to provide well lighted seat areas, or three sections of fluorescent tubes mounted end-to-end in the center of the ceiling over the main aisle.
    c. Provide individual light, separately controlled over driver's area.
    d. Illuminate drivers instrument panel.
    e. Adjustable drivers light.

11. EXTERIOR LIGHTING
    a. Provide exterior lighting at all points as required by the state of Indiana and I.C.C. Regulations.
    b. Provide I.C.C. exterior type reflectors in locations as required by law.
    c. Provide sufficient lighting, controlled from compartment, to enable night time inspection of engine compartment.

12. ENGINE
    a. The coach shall be powered by a heavy duty V type L.P.G fueled engine, capable of giving satisfactory life and performance under conditions which prevail in the Greater Lafayette area.
    b. The engine shall be equipped with a hardened crankshaft, steelite valve seats, sodium cooled exhaust valves, hydraulic lifters and valve rotators. Engine shall have a minimum horsepower of 194 at 3200 RPM and a net torque of 355 at 2400 RPM. All components requiring frequent inspection or replacement shall be readily accessible. The engine must be an "LPG engine" that is specifically factory built for LPG fuel consumption.

12. ENGINE (Continued)
    c. The power plant shall be demountable as a complete unit, including transmission.
    d. Air cleaners shall be provided and shall be so mounted that elements can be easily removed and replaced.
    e. Engine to be equipped with full flow oil filter of ample capacity. It is to be located for easy removal and replacement of a completely throw away type filter element.
    f. Starter shall be 12 volt and of ample capacity to furnish sufficient torque to crank engine.
    g. Provide starter switch and engine run control switch in the engine compartment.
    h. A panel or door shall be installed to provide access to the engine from the interior of the coach.

13. HEATING AND WINDSHIELD DEFOGGER
    a. Provide a filtered fresh air circulating type with dual fans. Provide an auxiliary circulating pump for equal heat distribution with ball bearings.
    b. Rear heater shall have a minimum output of 78,000 BTU, front heater shall have an output of 35,000 BTU.
    c. Heating system shall be designed to afford maximum comfort to passengers and operators.
    d. Drivers defroster fan mounted on lower wind shield header-adjustable with separate switch on console panel.

14. SIGNS
    a. Front destination sign box (to be roof mounted) is to provide single curtain to accommodate fifteen (15) readings. Minimum opening to be 6" x 6".
    b. Provide drivers visibility door on inside of coach and manual sign operator.
    c. The sign box shall be illuminated so as to provide good visibility.
    d. List of sign readings, not to exceed fifteen (15) will be supplied to successful bidder following award of contract.
    e. A destination sign shall also be installed on the right side of each coach. The sign shall be mounted at a side window that is adjacent to front entrance door of coach. Five easily countable signs shall be supplied per coach. A list of sign readings shall be supplied to successful bidder.
15. MIRRORS
   a. Provide mirrors as follows:
      1. 2-4" x 8" rear view mirrors, installed for maximum driver visibility.
      2. 1-4" x (minimum) 22" driver's rear view mirror.
      3. 1-12" convex mirror mounted over rear stepwell.

16. STANCHIONS
   a. All stanchions shall be 1", stainless steel clad and shall be placed
      conveniently for passenger safety.
   b. Provide vertical stanchions at inside corner of each stepwell with horizontal
      rail to body side. Provide stanchion at right rear of driver from floor
to ceiling. Provide a guard rail to right and rear of driver. Provide one
      vertical stanchion from seat to ceiling grab rail for every other longitudinal
      seat position. Provide vertical stanchion forward side of exit door. Provide
      special grab rails at entrance and exit step wells. The location and arrange-
      ment of all stanchions and grab rail and the type of fittings to be used are
      to be approved by the purchaser.

17. SPLASH APNONS
   a. Wheelhouse splash aprons, made of mat less than one quarter (1/4) inch
      rubber and composition material shall be provided to the rear of each
      wheel housing, projecting downward to a point within three (3) inches of the
      ground when empty. Rear aprons shall be sufficient distance from rear of
      wheelhouse to prevent damage from broken chains. All wheelhouse fenders
      shall have rubber mounted exterior fenders.

18. ENGINE COMPARTMENT
   a. The engine compartment shall be sealed so that smoke and fumes do not
      enter the passenger compartment of the coach. Insulate behind seat back
      and under seat cushion of rear lounge seat.
   b. Insulation shall be installed to minimize engine noise.

19. SEATING
   a. Provide seating for 25-30 passengers on all coaches.
   b. Seats to be Model 307 Haywood Wakefield or equal, and upholstered with trans-
      portation quality #2 OZ. Surer TImkote fabric or approved equal. Seat cushions
      to be of spring construction with 1" Urethane Topper. Successful bidder to
      furnish samples and to recommend color combinations following award of contract.
   c. Seat backs shall be leather patterned or simulated aluminum.
   d. Seats shall be wall mounted and supported on aisle side by two (2) pedestal legs.
   e. Frames shall be constructed of tubular steel and enamelled, with stainless
      steel top rail. Cushion and back shall be removable.

20. COACH DIMENSIONS
   a. The following coach dimensions, indicated as "minimum" or "maximum" are
      acceptable within these specifications:
      1. Overall length (Maximum) 30 feet
      2. Overall width (Minimum) 96 inches
      3. Aisle width (Minimum) 20 inches
      4. Overall height (Minimum) 120 inches
      5. Ceiling height (Minimum) 78 inches

21. WHEELS
   a. Wheels shall be six hole disc with ventilating holes, 8" x 20" hub
      plated type. The coach shall be equipped with dual rear wheels. Stain-
      less steel or chrome plated wheels are to be provided on all wheels.
      All wheels shall be interchangelable.
   b. Furnish one (1) spare wheel and tire with each coach.
   c. All tires shall be 8:25 x 20" tube type type 10 ply rated bus type tires. Tires
      shall be first line, top grade heavy duty, steel belted radial Michelin
      tires or approved equal. All wheels and tires shall be spin balanced and
      counterweighted as necessary.

22. EXHAUST SYSTEM
   a. Furnish aluminized steel muffler.
   b. Muffler shall be of minimum diameter of 10" and minimum length of 24-
      with three (3) pass chamber.
   c. The exhaust pipe shall terminate below the rear bumper and be so con-
      structed that it will not cause back pressure in the motor or damage the
      paint on the coach, and shall be anchored near the end of the exhaust
      line as possible. The exhaust shall be directed rearward on a plane par-
      allel to the road surface. Flexible tubing will not be permitted in the
      exhaust system.

23. TRANSMISSION
   a. Transmission shall be heavy duty Allison automatic transmission Model No.
      540 or approved equal, as Manufactured by Detroit Diesel Allison, a
      Division of G.N.
   b. Transmission shall be so constructed and adjusted as to provide a soft,
      no-jar action during shifting.
   c. The transmission oil shall be cooled by means of a heat exchanger.
24. DRIVE SHAFT
   a. Drive shaft shall be one piece torque tube with a slip spline and of such length not requiring midship bearings.
   b. The drive shaft guard shall meet I.C.C. regulations.

25. FUEL SYSTEM
   a. Engine shall be LPG fueled, and shall have a minimum displacement of 380 cubic inches. A factory LPG fuel conversion system is preferred. In event factory conversion is not available, LPG fuel system shall be Impco Model 425 M carburetion with Impco Model EBP vaporizer and regulator. Fuel lock and filter shall have built-in installation and include hydrostatic relief between tank and fuel lock. Fuel lock and filter shall be Impco Model VPP30 or approved equal. All fuel lines shall be stainless steel, wire braid hose. Fittings shall be O. L. approved. Engine shall be installed so that all routine service points are readily accessible. Engine compartment must be sufficiently sealed and insulated to prevent heat and fumes from entering coach. All component parts of the engine including the carburetor, the manifold, etc., shall be designed and built specifically for economical and efficient consumption of LPG fuel that meets the LPG industries high standards (i.e., specification N05).
   b. LPG fuel tank shall have 95 gallon water rated capacity with minimum strength of 250 P.S.I. Tank construction must meet A.S.M.E. Motor Fuel specifications and include Signal Gauge. Tank must be installed in safe place with due regard to areas where highest incidence of hazard occur. Installation shall be approved by Purchaser. All buses shall be capable of being completely fueled from one fill intake receptacle. An appropriate fuel filter shall be provided.

26. COOLING SYSTEM
   a. Provide a minimum of 40 quart capacity system.
   b. A surge tank of at least 4 quart capacity shall be provided, mounted in radiator's top tank.
   c. Provide vents to top of surge tank at all possible air traps.
   d. Radiator shall be mounted in engine compartment, adjacent to engine, and to be so installed as to provide easy access for servicing.

27. BODY AND CHASSIS
   a. The underframe shall be constructed of minimum 10 gauge steel channel. Side posts shall be minimum 18 gauge steel with minimum 18 gauge steel roof carlines. All members shall be welded and gusseted below and above window lines so as to provide a complete integral coach.
   b. Panels shall be riveted to the steel structure in such manner as to prevent electrolytic corrosion.
   c. The coach structure shall be so designed as to prevent uneven loading of the outer panels.
   d. The structure shall be designed so as to prevent the accumulation or entrapment of moisture within the body panels.
   e. All exterior panels shall be of aluminum, of the following minimum thickness: 0.03 between the wheels and on the front and rear of the coach, and 0.05 on the roof. To facilitate manufacturing, molded fiberglass panels will be permissible in some areas as recommended by the manufacturer.
   f. Centers of rivet lines on all outside panels shall not exceed 2 1/2", spacing of all posts not to exceed 24".
   g. All interior lining of the coach, between the window frames and below windows, shall be with 0.040 aluminum and shall be applied sectionally and secured to assure a neat and lasting finish. Ceiling lining to be melamine or approved equal.
   h. Carpeting shall be installed on the interior side wall below the windows and over inside of the rear engine compartment. Samples and colors to be supplied by successful bidder.

28. SEALING AND INSULATION
   a. All panel joints shall be lapped and double riveted with an application of corrosion inhibiting sealer between the surfaces. Windows shall have rubber stripping.
   b. Roof and sidewall areas, together with the engine seat and risers shall be fully insulated. Fiberglass, urethane foam or other approved material may be used if the heat conduction rate and noise absorption qualities are equal to those provided by fiberglass blankets of 1.08 pounds density, used in the following thicknesses:
      Roofs: 1 1/2 inches
      Sidewalls: 3/4 inches
      Seat and Risers: 1 1/2 inches

29. FLOORS AND COVERING
   a. The plywood used for flooring shall be 3/4" marine grade, waterproof type with sealed edges. Floor shall be laid in such manner as to be free from squeaks.
   b. The floor shall be level throughout and all joints between the floor and vertical sides shall be protected to prevent the entry of water and dirt.
   c. Floor covering to be 5/16" ribbed in step area; 3/16" ribbed on aisles; 1/32 smooth under seats.
   d. Material for floor covering shall be RCA Plas-1-floor, or equal, color to be finished for successful bidder.
   e. Provide a metal strip around each wheelhousing to seal the floor covering to wheelhouse.
30. DOORS
   a. Doors shall be air operated with individual motors located above each door.
   b. The rear exit door shall contain a brake interlock.
   c. Provide safety edges on both front and rear doors.
   d. Door openings to be minimum of 79" in height with 29 3/4" openings.
   e. Door operation shall be air controlled with a five-way valve which shall conform to Transit Industry standards.
   f. Provide separate circuit breaker emergency switch for rear door to prevent use, if desired.

31. STEPS AND WHEELOUSINGS
   a. Provide 3 steps from ground level to floor.
   b. First step shall not exceed 14" from ground.
   c. Provide white safety taping on all entrance and exit steps.
   d. To be corrosion-resistant reinforced molded fiberglass construction. Mud-flaps to be installed behind all wheels.

32. WINDOWS
   a. Windows shall be of manufacturer's standard design.
   b. Side windows shall be of the emergency push out design and be glass of single density, safety sheet.
   c. All windows to be light-tinted glass-minimum of 30% tint.

33. WINDSHIELD
   a. The windshield shall be 1/4", safety plate which shall be heat absorbing and glare reducing.
   b. It shall be rubber mounted and shall meet SAE standards.
   c. The top portion of the windshield shall be heavily tinted (minimum 70% tint) approximately 8" wide.

34. DRIVER'S SEAT
   a. The driver's seat shall be Heywood Wakefield model 235-5 or equal.
   b. Seat back to be leather patterned, anodized aluminum back to match passenger seats.
   c. Seat cushion to be foam rubber, covered with same materials and colors as determined under Item 19, Para. (b).

35. WINDSHIELD WIPERS
   a. Two-speed electric operated wipers as approved by purchaser may be provided. Wiper motors to be mounted for uncluttered appearance and to provide maximum visibility. Two air operated heavy duty Sprague Super Challenger, or approved equal, windshield wipers of self-parking type with individual control for each wiper shall be provided.
   b. Sprague, or approved equal, air push windshield wipers shall be provided.
   c. Defroster with screened opening shall be provided so that entire windshield will be kept free from frost or fog.
   d. If applicable, wiper motors shall be piped so that air will exhaust below floor.

36. BUMPERS
   a. The front and rear bumpers shall be at least 7 3/4 inches high and shall be installed so as to adequately protect the vehicle. Bumpers must extend beyond a projected vertical line of all body panels, lights, and windshield wipers. Bumpers shall have a bright metal finish. Rubberised bumper hats to cushion impact and to function as an anti-climb feature shall be provided. Tow eyes shall be provided at the front bumper mounted to the frame.

37. HORN
   a. Provide dual 12 volt electric horns. Also, a pleasant sounding bell, either electrically operated or simulated, shall be controlled by a switch readily accessible to the driver as an alternative to using his horn.

38. SAFETY SHIELDS AND MODesty PANEL
   a. Install safety shield to rear of entrance door to prevent passenger from placing arm between grab rail and door-open position.

39. INSIDE CARD RACKS
   a. Install standard 11" card retainers on both sides of the coach above windows.

40. PASSENGER SIGNAL SYSTEM
   a. Provide single note stop chime. Cords to run full length of each side over passenger area and to be of plastic covered steel.

41. PAINTING
   a. Exterior and interior painting shall be of colors to be in accordance with drawings and charts furnished to the GLPTC for approval by the successful bidder.
   b. Exterior surface shall be two (2) coats synthetic baked enamel, applied over a suitable primer, colors not to exceed three. All metal and wood must be properly cleaned before first paint application. All metal to metal joints must be properly primed.
c. Inside finish shall consist of primer and finish coat. Interior finish to be two (2) color schemes, determination of colors to be in accordance with paragraph "a".

42. LETTERING
a. GLPTC coach number to be in accordance with GLPTC supplied information.

b. Apply coach numbers as applicable, to four positions on each coach using a minimum of 3" numbers. Location of letters to be furnished to successful bidder.

43. AIR CONDITION EQUIPMENT
a. The condenser-evaporator combination to be Thermo King Model H-1-96 (or approved equal system with a minimum of 4 ton capacity and a minimum of 48,000 BTU/hr) mounted at the top rear with a cover styled to blend with the exterior lines of the coach, and adding only approximately 10 inches to the overall height.

b. Two blowers circulate the conditioned air through full length slotted ducts located above the windows on each side of the passenger compartment. Dual rows of slots distribute air across the ceiling and down the sidewalls to provide uniform cooling without drafts. The noisless blower fan shall have 3 speeds. The blower system may also be used for ventilation without cooling, at the option of the driver. The ducts are to be designed to conform to the interior styling of the coach and will permit the use of advertising card retainers. The return air is to be returned to the evaporator through a removable grill located in the upper rear of the coach interior. A control thermostat is to be placed behind the grill to avoid passenger tampering.

c. Compression is accomplished by a Frigidaire Rotary Compressor (or approved equal) with a 12.6 cubic inch capacity. A 24 volt alternator, rated at 70 amperes and 24 volts, is to be used to supply power for the blower motors in the condenser-evaporator unit. Both the compressor and the alternator are to be located in the engine compartment, adjacent to the engine coach, readily accessible for maintenance purposes.

d. As an additional requirement the air conditioning system is to have a 24 volt battery system, in order to maintain a constant blower speed under city transit operating conditions, in which the engine is constantly being accelerated and decelerated and may idle for prolonged periods.

e. A manually controlled high idle speed of from 1000 to 1200 RPM shall be provided in order to adequately cool the bus while parked. The entire air conditioning system is to be approved by the Purchaser.

44. FAXE BOX
a. To be Diamond model E (or approved equal) mounted on a fuse station convenient to the driver with fuse box light switch mounted on driver console panel. Three extra fuse box units shall be supplied for every two complete fuse box units. The location of fuse box and fuse box attachments shall be approved by purchaser.

45. EMERGENCY EQUIPMENT BOX
a. An emergency equipment box shall be installed at the front of the bus. The box shall be equipped with standard emergency equipment including a first aid kit, 2 1/2 pound dry type fire extinguisher and fire axe. Installation of box and equipment shall be approved by Purchaser.

46. MISCELLANEOUS
a. Bidders to supply as a separate item in the bid pricing for (2) two spare engine and transmission assembly mounted as a unit for replacement purposes.

b. The contractor shall furnish copies of maintenance manuals and parts books covering all items on coach in sufficient number to supply the requirement of the GLPTC.

47. NOT PART OF COACH QUOTATION
a. Bidders shall submit a letter, separate from bid, indicating list of spare units recommended for the number of coaches covered by these specifications, together with current prices.

Note...These units are not to be part of the "Request for Quotations" for the coaches covered by these specifications.

b. Prices for for these units must be for units identical to those covered in these specifications. Each unit shall be identified by part number and sufficient added description to enable the ordering of units identical to those used in the specifications.

c. The letter shall indicate the length of time the quotations will remain firm.

48. UNDERCOATING
a. The entire underside of the bus shall be sealed and coated with a suitable undercoating material. Drain tube openings, and mechanical components whose operation or inspection would be adversely affected, must not be coated.

49. RADIO EQUIPMENT
a. Each bus shall be equipped with an Audiovox Model 975, AM-FM radio and 8 track stereo tape deck combination or approved equal. Purchaser shall approve installation location of all radio equipment.
50. LIQUID PROPANE GAS SAFETY

a. All LP-Gas related equipment must conform to the National Fire Protection Association pamphlet Number 36 and the United States Department of Transportation specification 45-240.

b. LP-Gas tanks shall include a safety device that makes it impossible to fill fuel tanks to over 87% of the fuel tanks water rated capacity. The overflow safety device shall be a positive mechanical shut-off type.
Appendix H

Contained in this appendix are two of the fourteen alternative transit systems that were developed in the Greater Lafayette Area Bus Transit Study. The examples are provided to show how alternatives might be developed and the information that might be provided.
Alternative No. 6

System: Six 18-23 passenger air-conditioned buses, one 45 passenger air-conditioned bus, seven 12 passenger air-conditioned buses.

Routes, Schedules: Operations during peak hours (see "Peak Hours on Existing Routes") will be on the existing four routes (Figure 10-1). Headways during peak hours will be the same as those presently existing with 30 minute headways on the Fairpark-Union and Monon-University routes and 60 minute headways on the South Street-Salisbury and the Kossuth-Purdue Airport routes.

Operation during off peak hours will be demand-responsive, that is the buses on duty will respond to a telephoned request for service with the telephoned request handled through a dispatcher. There would be no fixed routes or schedules during this period.

Seven buses will operate during off peak. Two buses will operate before 6:00 a.m. During 9:00 a.m. to 3:00 p.m. seven buses will operate. During 6:00 p.m. until 8:00 p.m. three will operate. 8:00 p.m. to 11:00 p.m. two buses will operate.

Estimated Costs:

Vehicle Operating Cost:

Peak hours: Assume operation from 6:30-9:00 a.m. and 3:00-5:30 p.m. on all routes except Monon-University where the peak will be 6:30-9:00 a.m. and 1:00-5:30 p.m.
URBAN STREET MAP
for LAFAYETTE & WEST LAFAYETTE

--- Kossuth - Purdue
----- Monon - University
--- South Salisbury
----- Fairpark Union

FIGURE 10-1

PRESENTLY SCHEDULED BUS ROUTES
Peak Hours:

\[
((\text{Fairpark-Union - 11.9 mile route } \times 2 \text{ buses } \times 5 \text{ trips}) + (\text{South Street-Salisbury - 12.4 mile route } \times 1 \text{ bus } \times 5 \text{ trips}) + (\text{Kossuth-Purdue Airport - 10.5 mile route } \times 1 \text{ bus } \times 5 \text{ trips}) + (\text{Monon-University - 9.6 mile route } \times 2 \text{ buses } \times 7 \text{ trips})) \times \$0.07/\text{mile} = \$25.75/\text{day}; \$25.75/\text{day} \times 6 \text{ days} \times 52 \text{ weeks} = \$8,034.94
\]

Off Peak Hours:

\[
((7 \text{ buses } \times 12 \text{ miles per hour } \times 7 \text{ hours}) + (3 \text{ buses } \times 12 \text{ miles per hour } \times 3 \text{ hours}) + (2 \text{ buses } \times 12 \text{ miles per hour } \times 5 \text{ hours})) \times \$0.07/\text{mile} = \$57.12; \$57.12/\text{day} \times 6 \text{ days} \times 52 \text{ weeks} = 17,821.44
\]

*Drivers Salaries:*

\[
113 \text{ driver hours per day} \times 6 \text{ days} \times 52 \text{ weeks} \times \$3.45/\text{hour} = 121,633.20
\]

Operating Expenses:

\[
58,500.00
\]

Dispatcher:

\[
10,800.00
\]

Capital Recovery Cost for Facilities:

\[
11,300.00
\]

Capital Recovery Cost for Vehicles:

\[
(6 \text{ buses @ } \$13,152) + (1 \text{ bus @ } \$36,000) + (7 \text{ buses @ } \$8,000); \$78,912 \times 0.21632 + (\$36,000 \times 0.14903) + (\$56,000 \times 0.38803) = 44,165.00
\]

Capital Recovery Cost - Radios, Fare Boxes:

\[
(14 \text{ Radios @ } \$500.00)+(1,500 \text{ Base Station}) + (14 \text{ Fare Boxes @ } \$220.00); \$11,580 \times 0.14903 = 1,725.77
\]
Yearly Radio Maintenance: 10% x $8,500 = 850.00
Total System Cost (per year) $274,830.35

*Includes 15% for vacation, sick leave, F.I.C.A., unemployment, hospitalization, etc.

This alternative utilizes six medium size buses and seven mini buses. The operation is on fixed routes and schedules now existing during the peak hours and a "demand-responsive" system at all other periods. The "demand" for service will be by phone through a dispatcher. The level of service will be considerably higher than present but the cost is also proportionately higher. The fare necessary to support the total annual cost from the fare box is $.58. The fare to support the annual operating cost from the fare box is $.49 assuming ridership remains the same as the present.
Alternative No. 14

System: Twelve 33 passenger air-conditioned buses, one 45 passenger air-conditioned bus.

Routes, Schedules: Seven fixed routes radiating from downtown Lafayette are shown in Figure 10-3. This is the result of combining and extending existing routes to more effectively use equipment. Although this alternative requires twelve buses, it has the best coverage and 20 minute service to most incorporated areas.

The present Monon-University route will be expanded to include Purdue Airport and provide 20 minute headways. This results in an elimination of the need for the old Purdue Route.

The Union Street Route is expanded to extend out Greenbush to the Green Acres Apartment area. The Fairpark-Union route is changed to provide two way service on Ninth Street including Central Catholic High School and the Norma Jean Subdivision. Twenty minute service is provided. The Salisbury route is improved and expanded with 20 minute headways. The route includes major apartment complexes and Purdue University. The route uses the Harrison Bridge to reduce travel time to downtown Lafayette. The South Street route is modified and extended to K-Mart. It has 40 minute headways.

The Kossuth route is dropped, completely eliminating the old Purdue Kossuth Route. Two way service is
Seven proposed routes for extended area coverage
High School, Tecumseh Addition, and Woolco. Forty minute service is provided.

**Estimated Cost:**

**Vehicle Operating Cost:**

4 Buses - Monon-University:

324 route miles per day x 6 days x 52 weeks

x $.12/mile

$12,230.56

4 Buses - Salisbury-K-Mart-Woolco:

432 route miles per day x 6 days x 52 weeks

x $.12/mile

16,174.08

4 Buses - Greenbush-South 9th Street:

410 route miles per day x 6 days x 52 weeks

x $.12/mile

15,350.40

*Drivers Salaries:*

12 buses x 16 hours per day x 6 days x 52 weeks

x $3.45/hour

206,668.80

**Operating Expenses:**

58,500.00

**Capital Recovery Cost for Facilities:**

11,300.00

**Capital Recovery Cost for Vehicles:**

(12 buses @ $26,500)+(1 bus @ $36,000);

$354,000 x .14903 = 52,756.62

**Capital Recovery Cost - Radios, Fare Boxes:**

(13 Radios x $500.00)+($1,500 Base Station) +

(13 Fare Boxes x $220.00) = $10,860 x .14903 = 1,618.47

Yearly Radio Maintenance: 10% of $8,000 = 800.00

Total System cost (per year) $375,398.93

*Includes 15% for vacation, sick leave, F.I.C.A., unemployment hospitalization, etc.
The system utilizes twelve full size buses to greatly increase the area served and the level of service.

The total annual system cost is approximately $375,000.00. To support this system entirely from the fare box would require a fare of $.88. To support the annual operating cost from the fare box would require a fare of $.72 assuming present level of ridership is continued.
Appendix I

Contained in this appendix is the preliminary UMTA Grant application from the Lafayette study. This information is provided to show the amount of information required as well as the detail necessary for each part of the application. The appendices to the preliminary application have been omitted.
GREATER LAFAYETTE PUBLIC TRANSPORTATION CORPORATION

BOARD OF DIRECTORS
Kenneth W. Heathington
Chairman
William S. Hammer
Secretary
Cliff L. Baker
Jack B. Can
Gerald A. Lunn
Clayman F. Boumphrey
James M. Willeman

Urban Mass Transportation Administration
U.S. Department of Transportation
Washington, D.C. 20590

Gentlemen:

The Greater Lafayette Public Transportation Corporation applies for a grant of $834,000 under the Urban Mass Transportation Assistance Act of 1970 to assist in financing a capital improvement project generally described as:

(a) Purchase of (1) 15 new medium size (20 to 33 passenger) air conditioned diesel, gasoline or propane transit buses; (2) 10 new mini size (12 passenger) air conditioned gasoline buses and (3) one 3/4 ton pick-up truck.

(b) Purchase of land for and construction of a new transit terminal to include the office, maintenance facilities and bus storage facilities for the Greater Lafayette Public Transportation Corporation.

The sections that follow describe in more detail the proposed capital improvement project.

The applicant represents that the data submitted to the Department of Transportation in support of this application are true and correct.

Sincerely yours,

Kenneth W. Heathington, Ph. D. P.E.
Chairman of the Board of Directors of Greater Lafayette Public Transportation Corporation

---

1. Description and estimated cost for capital facilities to be acquired by the Greater Lafayette Public Transportation Corporation through the proposed DOT Urban Mass Transportation Administration capital grant.

A. Rolling Stock

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 Medium Size Buses - 20 to 33 passenger, gasoline or propane engine, air conditioned</td>
<td>$450,000</td>
</tr>
<tr>
<td>10 Mini Buses - 12 passenger, gasoline engine, air conditioned</td>
<td>$80,000</td>
</tr>
<tr>
<td>One 3/4 ton pick-up truck</td>
<td>$3,000</td>
</tr>
<tr>
<td><strong>Total Cost Rolling Stock</strong></td>
<td><strong>$533,000</strong></td>
</tr>
</tbody>
</table>

B. Radios and Fare Boxes

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 Radios @ $1,100 per unit, base station, antenna, and remote line</td>
<td>$35,500</td>
</tr>
<tr>
<td>25 Fare Boxes @ $500</td>
<td>$12,500</td>
</tr>
<tr>
<td><strong>Total Cost Radios and Fare Boxes</strong></td>
<td><strong>$48,000</strong></td>
</tr>
</tbody>
</table>

C. Terminal - Land, Buildings, Equipment

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Land and Utilities</td>
<td></td>
</tr>
<tr>
<td>Land 5 acres @ $20,000/acre</td>
<td>$100,000</td>
</tr>
<tr>
<td>Utility adjustments</td>
<td>$5,000</td>
</tr>
<tr>
<td><strong>Total Cost Land and Utilities</strong></td>
<td><strong>$105,000</strong></td>
</tr>
<tr>
<td>(2) Buildings - Offices, Maintenance Facility, Bus Storage Facilities, and Site Work</td>
<td></td>
</tr>
<tr>
<td>Offices and Maintenance Garage 4,900 sq. ft.</td>
<td>$99,000</td>
</tr>
<tr>
<td>2 Bus Shelters each 80' x 120' @ $10/sq. ft.</td>
<td>$192,000</td>
</tr>
<tr>
<td><strong>Sitelwork including paving, fence, landscaping</strong></td>
<td>$80,000</td>
</tr>
<tr>
<td><strong>Total Buildings and Sitework</strong></td>
<td><strong>$371,000</strong></td>
</tr>
<tr>
<td>(3) Terminal Equipment</td>
<td></td>
</tr>
<tr>
<td>Automatic Bus Washer</td>
<td>$16,000</td>
</tr>
<tr>
<td>Automatic Cyclone Cleaner</td>
<td>$12,000</td>
</tr>
<tr>
<td>Hoists</td>
<td>$12,000</td>
</tr>
<tr>
<td>Gasoline and Diesel Oil Storage Tanks (10,000 Gallon each), 2 pumps and installation</td>
<td>$16,000</td>
</tr>
<tr>
<td>Miscellaneous Maintenance Equipment</td>
<td>$10,000</td>
</tr>
<tr>
<td>Remote Computer Terminal</td>
<td>$3,500</td>
</tr>
<tr>
<td>Office Furniture</td>
<td>$3,000</td>
</tr>
<tr>
<td>Chance Counter</td>
<td>$2,000</td>
</tr>
<tr>
<td><strong>Total Cost Terminal Equipment</strong></td>
<td><strong>$76,500</strong></td>
</tr>
</tbody>
</table>
D. Downtown Bus Shelters

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cost Downtown Bus Shelters</td>
<td>$5,000</td>
</tr>
<tr>
<td>SUB-TOTAL</td>
<td>$1,136,500</td>
</tr>
<tr>
<td>10% Contingency</td>
<td>$113,650</td>
</tr>
<tr>
<td>TOTAL COST</td>
<td>$1,250,350</td>
</tr>
</tbody>
</table>

TOTAL COST CAPITAL FACILITIES $1,250,350

I. Description of transportation system in which the facilities and equipment will be used.

The Greater Lafayette Area is a small metropolis made up of two core cities, Lafayette founded in 1825 and West Lafayette, founded in 1865. The surrounding developing area is in Tippecanoe County which was established in 1826. The Greater Lafayette Area is located a third of the way from Indianapolis to Chicago on Interstate 65. It is served by three railroads: the Norfolk and Western, Penn-Central, and the Monon. Two of the Amtrak passenger routes make stops in Lafayette: Chicago-Cincinnati and Chicago-Hiami. Two airlines, Allegheny, and Air Wisconsin, serve the area from Purdue Airport.

The population of the Lafayette Standard Metropolitan Statistical Area (which includes all of Tippecanoe County) was 109,378 in 1970 and is projected to 130,000 by 1990. It has been a rapidly growing area since 1960. Although part of this growth is the result of the continuing growth of Purdue University, which once was the dominant employer, most of the new and projected growth is, or will be, the result of continued and accelerating growth in industry and commerce.

About 42,000 people are employed in the area, 9,300 of them in local industry. The major industries include Alcoa, National Homes, Anheuser-Busch, General Foods, Fairfield Manufacturing, Eli Lilly, Berger Steel, Ross Gear & Tool Company, Rostone Corporation, and Reliable-Purina. There are also a host of smaller industries, many of which are located in the Purdue Research Industrial Park.

In addition to being a market center for a rich agricultural hinterland, the Greater Lafayette Area is becoming an important banking and financial center. The three full-service banks have combined assets of about $235,000,000, and the Lafayette Life Insurance Company has assets of about $90,000,000. There are also many other financial institutions including savings banks, credit unions, and loan companies.

Commercial areas and shopping centers include such major department stores chains as Sears Roebuck, Ayres, K-Mart, Woolco, Grants, and Zayre, and soon will include Montgomery Ward.

The Greater Lafayette Area is a major stop for auto trips between Indianapolis and Chicago. As a result it has built up a major auto-service complex of restaurants and motels. A second set of auto-service complexes are either being planned or under construction around the several I-65 interchanges serving the community.

Public transportation has played a role in the development of the Greater Lafayette Area for over 100 years beginning shortly after the Civil War in 1869. The first system consisted of a mule drawn railway which lasted only a few years. The first "bus" was an Omnibus, a horse drawn Nerdy Coach, seating 12 passengers. The first electric street
cars began service in 1888. Buses took over the entire public transportation service in 1940.

The public transportation system in the Greater Lafayette Area from its inception until August 14, 1970 was provided by various privately owned companies. In 1970 the Greater Lafayette Bus Company, Inc., a privately owned company, informed the cities of Lafayette and West Lafayette that it was going to cease providing public transportation service on July 1, 1970 because it was no longer profitable to operate the service.

The two cities, agreeing that public transportation service was a necessity in the Greater Lafayette Area, decided to purchase the franchise and equipment from the private bus company. The purchase price was $25,000.00 with 70% paid by the City of Lafayette and 30% paid by the City of West Lafayette. The cities took over the operation on August 14, 1970.

The cities asked Purdue University to make a study of the public transportation system and to make recommendations as to what should be done concerning public transportation. Purdue University through the School of Civil Engineering Joint Highway Research Project accepted the task and the report "The Greater Lafayette Area Bus Transit Study" (Appendix A) was prepared. Among the recommendations made in the report was the recommendation that a transit authority with taxing power be established for the area under the State of Indiana enabling legislation entitled the Urban Mass Transportation Act of 1965 (S274) (Appendix B). In July, 1971 the two cities passed ordinances (Appendix C) establishing the Greater Lafayette Public Transportation Corporation. The corporation assumed control of the public transportation system September 1, 1971.

PRESENT SERVICE AND FACILITIES

The Greater Lafayette Public Transportation Corporation provides the only mass transportation in the Greater Lafayette Area. The presently scheduled bus routes cover the area of Lafayette as shown in Figure 1. Forty-four and 4/10 route miles are provided. Areas within 1 mile of a bus route are shown by a cross hatched symbol. The schedules provide for a headway of one hour on two routes (South Street-Salisbury, Kossuth-Purdue) and thirty minutes on two routes (Monon Shops-University, Fairpark-Union). All routes intersect at their half-way points at the Courthouse to allow transfers.

The Fairpark-Union route is essentially a north-south route which serves the Tecumseh Addition, Jefferson Square shopping center, the downtown area, St. Elizabeth Hospital, Market Square shopping center and portions of the northeast Lafayette residential area. Two buses are used on this route providing half hour headways. Hours of operation are from 5:45 A.M. to 8:15 P.M. (EST).
The Monon Shops-University line serves the northwest residential area of Lafayette, Market Square shopping center, the downtown area, and Purdue University. Two buses are used on the route providing half hour headways. Hours of operation are 5:45 A.M. to 11:10 P.M. (EST).

The South Street-Salisbury line serves Wabash Village and the residential areas of West Lafayette, the downtown area of Lafayette, South Street including Home Hospital, 29th Street, and Kossuth Street. One bus is used giving one hour headway. Hours of operation are 5:45 A.M. to 6:15 P.M. (EST).

Kossuth-Purdue Airport corresponds closely to the South Street-Salisbury route in Lafayette; it also serves the Purdue Campus and the Purdue Airport. One bus is used on this route resulting in one hour headway. Hours of operation are 6:15 A.M. to 9:40 P.M. (EST).

The fares charged are 30 cents per ride for adults and 20 cents for students of high school age and younger.

Table 1 presents revenue data and number of passengers carried for the years 1970 through August 31, 1971. The maximum number of passengers carried (714,971) occurred in 1967. The ridership has declined since 1967. During the period August 14, 1970 (date City took over the operation) to August 31, 1971 (date Transit Authority assumed the operation) 363,312 revenue passengers were carried. For this period the total operating revenues were $159,269.57 and the total operating expenses were $200,763.45 for a net operating loss of $41,493.86.

### Table 1

<table>
<thead>
<tr>
<th>Year</th>
<th>Passenger Revenue</th>
<th>Charter Revenue</th>
<th>School Charter Revenue</th>
<th>Other Revenues</th>
<th>Total Operating Revenue</th>
<th>Total Operating Expenses</th>
<th>NET Operating Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>$159,269.57</td>
<td>$200,763.45</td>
<td>$41,493.86</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td>$187,863.70</td>
<td>$44,693.56</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*On August 14, 1972 cities of Lafayette and West Lafayette assumed operation from private operator*
The rolling stock for the bus system includes 23 buses and one pickup truck. A list of the buses is included in Appendix D. The buses range in capacity from 60 to 45 passengers. The average age of the buses is 21 years. Most of the buses are in poor condition with a few in fair condition. Several, including the only bus that is less than 15 years old, are not in operating condition.

The present terminal facility is rented on a month to month basis. It is a 100' x 130' brick structure built in 1935. The bus storage and repair facility lacks an exhaust system and a tire repair and storage area. The one repair pit provided does not meet safety specifications. Office space, parts storage area, and locker room facilities are inadequate. There is not enough room within the terminal area to allow the maintenance personnel to maneuver the buses for routine nightly cleaning and maintenance and to store the buses. Buses must be parked on the city streets adjacent to the bus barn.

PROPOSED SERVICE AND FACILITIES

The proposed service to be implemented using the facilities proposed in this capital grant application is a combination and modification of several alternatives outlined in the Greater Lafayette Area Bus Transit Study and is described below.

The system includes fifteen 20 to 33 passenger air-conditioned buses, ten 12 passenger air-conditioned buses, two-way radio communication system for all buses, new terminal facilities on five acres of land including office space, maintenance garage, bus storage facilities, and automatic service line facility consisting of fueling facility, safety check, automatic cyclone cleaner and automatic washer facility.

Operations during peak hours are on seven fixed routes radiating from downtown Lafayette as shown in Figure 2. Route mileage totals 51.3 miles. This is the result of combining and extending existing routes to more effectively use equipment. Although this alternative requires fourteen buses, it has very good coverage and 20 minute headways in most incorporated areas.

The present Monon-University route will be expanded to include Purdue Airport and provide 20 minute headways. This results in an elimination of the need for the old Purdue Route.

The Union Street Route is expanded to extend out Greensburg to the Green Acres Apartment area. The Fairpark-Union route is changed to provide two-way service on Ninth Street including Central Catholic High School and the Norma Jean Subdivision. Twenty minute service is provided.

The Salisbury route is improved and expanded with 20 minute headways. The route includes major apartment complexes and Purdue University. The route uses the Harrison Bridge to reduce travel time to downtown Lafayette.
The South Street route is modified and extended to K-Mart. It has 20 minute headways.

The Kasuth route is dropped, completely eliminating the old Purdue Kasuth Route. Two way service is provided on a new route on 16th Street to Jefferson High School, Tecumseh Addition, and Woolco. Twenty minute service is provided.

Operation during off peak hours will be demand-responsive, that is the buses on duty will respond to a telephoned request for service with the telephoned request handled through a dispatcher. There would be no fixed routes or schedules during this period. Ten buses will operate during off peak hours. Three buses will operate before 6:00 A.M. During 9:00 A.M. to 3:00 P.M. ten buses will operate. During 6:00 P.M. until 8:00 P.M. four or more will operate depending upon the demand. 8:00 P.M. to 11:00 P.M. three or more buses will operate, again depending upon the demand. Proposed fares for fixed route, fixed schedule service are 30c for adults and 20c for children of elementary and secondary school age. Fares for the demand responsive service will be higher with the specific fare yet to be determined.

3. Describe the benefits to be derived from the facilities and equipment, and relate these benefits to the transportation program for the urban area.

The equipment and facilities presently available to the Greater Lafayette Public Transportation Corporation are obsolete, substandard, unsafe, undesirable, and discourage ridership. The buses are practically impossible to maintain in acceptable working condition and are polluting the environment. It is imperative that new rolling stock and maintenance facilities be obtained so as to provide reliable, dependable, safe and attractive public transportation service.

The present service is not capable of meeting the minimum demands for service from those who are dependent (captive) on public transit operation in the Greater Lafayette Area. In fact, at times when a bus breaks down and because no replacement bus is available, service is disrupted to a point where no service is provided on certain routes during the day. These persons numbering approximately 1,000 on a typical weekday (in November, 1970 the date of the on-board bus transit survey) are the young, the elderly, the lower economic class owning no automobiles, those families where only one automobile is available to them, and those who for one reason or another are unable to provide or obtain an automobile for their transportation needs.

The proposed system of new buses with a much improved level of service with better area wide coverage, reduced headways and demand responsive service during off peak periods during the day will allow the Greater Lafayette Public Transportation Corporation to provide safe, dependable, reliable, coordinated, attractive, convenient service to those who have no choice but to ride public transit. It will also provide a meaningful alternative to those in the metropolitan area who have a choice as to the mode of transportation they choose to use, the private automobile or public transportation. The hope is that with a modern public transit system providing a high level of service including demand responsive service, a number of persons presently driving automobiles will use transit thus relieving, to some extent, the congestion in parking areas in the downtown area and on the Purdue Campus. Perhaps, with an adequate public transportation system, a number of families will re-examine the decision that has been made to own and use two or more automobiles thus reducing the growth rate of automobile ownership in the Greater Lafayette Area.
4. Estimate total cost of the project. (See Section 1)

5-6. Estimate what portion of the total cost of the project can be financed from revenues, identify the source of the revenues and indicate how such financing will be arranged.

Estimate what portion of the total cost cannot be reasonably financed from revenues and indicate how the local share (at least 1/3 or 1/2) will be secured.

The present bus fleet is, as previously outlined, very old and does not have any resale value other than junk price and it may be that the Greater Lafayette Public Transportation Corporation may have to pay someone to take the old buses. Approximately 10 of the better old buses will be retained to provide for the school charter contracts that the Greater Lafayette Public Transportation Corporation presently has with the Jefferson High School in Lafayette.

Some of the total cost of the project can be financed from revenues from the fare box or from the proceeds of the facilities to be replaced.

The Lafayette City Bus Company from August 14, 1970 (date Cities of Lafayette and West Lafayette took over operation from the privately owned Greater Lafayette Bus Company) to August 31, 1971 (date the Greater Lafayette Public Transportation Corporation assumed control of the bus operation) had an excess of operating expenses over operating revenue, or a deficit of $41,693.50. This operating revenue included fare box receipts, school charter service and charter service. A statement of income and expenses for this time period is included in Appendix E.

Since the Greater Lafayette Public Transportation Corporation assumed control of the transit operation, the expenses have exceeded the income by $18,695.07 for the period September 1, 1971 to October 31, 1971.

The local share of the total cost of the project (1/2 temporarily until the Greater Lafayette Area Transportation and Development Study completes the transportation plan for the area) will be secured by either borrowing the funds from local banks (letter of intent to loan included in Appendix E) or selling bonds, and repaying the loan or bonds from taxes raised by the Greater Lafayette Public Transportation Corporation under its taxing powers given to it by the State of Indiana in the Urban Mass Transportation Act of 1965 (see Appendix B). These taxes are also used to make up operating deficits.
7. Describe efforts made to obtain private revenue financing and any state or local actions which have been taken to provide financial or other assistance in the solution of urban mass transportation problems.

No efforts have been made to obtain private financing for the proposed capital improvements, other than the securing of letters of intent to loan money for the local share of a capital grant from U.M.T.A. The reasons are (1) the history of the bus operation is one of deficits where not even operating expenses, let alone capital improvements, have been met from the fare box; (2) although the Greater Lafayette Public Transportation Corporation has taxing powers, the proceeds from the tax payer are to keep local taxes down and the raising of taxes to meet the local share of an U.M.T.A. capital grant, and the operating deficits of the transit service will politically be a task for the Transit Authority.

State action to provide financial assistance to local public transit service has been to pass enabling legislation (Urban Mass Transportation Act of 1965) allowing the establishment of local transit authorities with taxing powers to raise money locally to meet the needs for public transportation. Local action to provide financial assistance has been to use local municipal tax funds from the Cities of Lafayette and West Lafayette to purchase the assets and liabilities of the privately owned Greater Lafayette Bus Company, operate the transit service and make up operating deficits from municipal tax monies for over one year until the Greater Lafayette Public Transportation Corporation could be established and begin operation at which time the assets and liabilities of the Lafayette City Bus Company were given to the Greater Lafayette Public Transportation Corporation.

8. Describe the status of (a) comprehensive planning for the development of the urban area, and (b) transportation planning undertaken to provide the basic framework of the urban mass transportation system and highway network for the area and list the statewide, subregional and local agencies responsible for comprehensive and transportation planning, and the state and metropolitan or regional clearing houses notified of the application.

Comprehensive planning for the development of the urban area and transportation planning providing the basic framework of the urban mass transportation system and the highway network for the Greater Lafayette Area are being done by the Greater Lafayette Area Transportation and Development Study as part of the Tippecanoe County Area Plan Commission. Plans are that the Study will be completed within the next two years.

The area wide, subregional and local agencies responsible for comprehensive and transportation planning are respectively The State of Indiana, Department of Commerce, Division of State Planning and The Tippecanoe County Area Plan Commission.

State and metropolitan or regional clearing houses notified of this application are The State of Indiana, Department of Commerce, Division of State Planning and The Tippecanoe County Area Plan Commission.
9. Describe the program which exists or is being developed for a unified or officially coordinated urban mass transportation system for the urban area.

All urban mass transportation systems for the urbanised areas are unified and coordinated under the authority of the Greater Lafayette Public Transportation Corporation which was established by a joint ordinance (Appendix C) of the cities of Lafayette and West Lafayette under the State of Indiana Statute 274 - Urban Mass Transportation Act of 1965 (Appendix B). The Mass Transit Authority includes all of the territory within the corporate limits of Lafayette and West Lafayette and territory which extends approximately two miles beyond the corporate limits of both cities.

10. Describe the arrangements which exist or will be made to insure satisfactory continuing public control over the operation or use of the facilities or equipment, whether publicly or privately operated.

The facilities and equipment obtained with capital grant funds from M.T.A. will be owned by, and for the use of, and will be under the continuing operational control of the Greater Lafayette Public Transportation Corporation, a public organization created by the cities of Lafayette and West Lafayette, Indiana under the laws of the State of Indiana.
11. Indicate whether or not the project will: (a) adversely affect employees of the transportation system in the urban area, and identifies the systems and labor unions involved; (b) result in the relocation of any families, individuals, business concerns, or non-profit organizations.

(a) The project will not adversely affect employees of the mass transportation systems in the Greater Lafayette Area but will, in fact, improve the working conditions for the employees of the Greater Lafayette Public Transportation Corporation. The new buses will be used to replace old equipment and to augment service so as to provide a higher level of public transportation in the Greater Lafayette Area. Six of the new 20 to 33 passenger buses will replace old buses presently being used on the fixed routes, fixed schedule operations. An additional 8 new 20 to 33 passenger buses will be used in the fixed routes, fixed schedule operations to provide a higher level of service through reduced headways and increased area of coverage. One new 20 to 33 passenger bus will be used as a spare for the operations described above. The ten new 12 passenger buses will be used for the demand responsive operation during off peak periods. The new terminal facility will replace the old rented bus garage. The systems involved are the Greater Lafayette Public Transportation Corporation and the union involved is Division No. 1244 of the Amalgamated Transit Union (Appendix C contains the agreement between the Greater Lafayette Bus Company, Inc., predecessor of the Greater Lafayette Public Transportation Corporation and the Union).

(b) The proposed bus terminal will be located on a 5-1/4 acre tract of presently vacant land on Canal Road in Lafayette, Indiana which is zoned for industrial use. The development of this land into a bus terminal facility will not result in the relocation of any families, individuals, business concerns, or non-profit organizations. The property will be acquired through negotiations with the present owner without the use of the right of eminent domain by the Greater Lafayette Public Transportation Corporation.


1. The proposed project consists of the purchase of 15 twenty to thirty-three passenger air-conditioned buses with either gasoline, propane or diesel engines, 10 twelve passenger air-conditioned buses with gasoline engines, ten new radios for each bus and a base station, and a bus terminal located on a 5-1/4 acre industrially zoned tract of land on Canal Road in Lafayette, Indiana. The bus terminal will include office and bus maintenance and storage facilities. The maintenance facilities include automatic bus washing and washing equipment. No adverse impact on the environment is foreseen. In fact, an improvement in the local environment is foreseen as the new buses will replace buses presently being used on the streets of the Greater Lafayette Area that have an average age of 21 years and are presently polluting the environment with black smoke, loud noises and foul odors. The buses in their rundown condition also present an adverse affect to the visual environment of the area. The proposed terminal facility will replace a building built in 1895 which is too small for the present bus operation and requires the buses to be stored on the local streets around the bus garage.

2. No unavoidable adverse environmental effects of the project as proposed are foreseen. The buses will be equipped with antipollution devices that meet or exceed Federal antipollution requirements. The proposed terminal facility will be located on vacant land zoned for industrial use. Figure 3 shows the proposed terminal site. To the south of the site is the City of Lafayette Water Works and a commercial building housing Overhead Door Sales and Service. To the north is the Quality Beer Warehouses and various other commercial and industrial land uses. The bus terminal will be located on the right-of-way adjacent to the tracks which is zoned for industrial use. To the west of the proposed bus terminal is land owned by the City of Lafayette which is zoned industrial, but is being acquired by the City of Lafayette Park Board for development as part of a regional park extending along the Wabash River.

3. No reasonable alternatives to the project are proposed as no adverse environmental impacts are foreseen.

4. See Section 1. for a discussion of short-term and long-term impacts on the environment. No long-term adverse environmental impacts are foreseen.

5. No environmental impacts which will result in an irreversible commitment of resources will be made other than the building of the bus terminal on 5-1/4 acres of presently vacant land. A future development generated by this proposed project may be the increase in the size of the bus fleet operating from the bus terminal. No additional land will be needed in the future to accommodate possible increases in the number of buses to be serviced and stored.

6. To date, no problems or objections have been raised to date by Federal agencies, States and local authorities, and citizens. However, public hearings have not been held as yet, nor have the state or local agencies been consulted to date.
The opinion of counsel showing that the Greater Lafayette Public Transportation Corporation is a public body authorized by law to carry out the above described project in the manner contemplated is included in Appendix H.

All of the funds requested from the Urban Mass Transportation Administration for this project would be disbursed within one year to complete the project. Depending upon the date of project approved, the funds may be disbursed over two Federal fiscal years.
Appendix J

Provided in this appendix is the 13(c) agreement signed by the Union and the Greater Lafayette Public Transportation Corporation. This example is provided to show the type of information that might be contained in a 13(c) agreement. This agreement must be signed if federal money is to be obtained.
AGREEMENT PURSUANT TO SECTION 13(c) OF THE URBAN
MASS TRANSPORTATION ACT OF 1966, AS AMENDED.

ETCERAS, the Greater Lafayette Public Transportation Corporation of Lafayette, Indiana ("Corporation") has filed an application with the Department of Transportation under the Urban Mass Transportation Act of 1966, as amended ("Act"), for a capital grant to finance the purchase of 15 new medium-size buses, 10 new mini buses, land for and construction of offices, maintenance and bus storage facilities, as more fully described in the project application ("Project"); and

ETCERAS, certain employees of the Corporation are represented by Local Division 12, Amalgamated Transit Union, AFL-CIO ("Union"); and

ETCERAS, Sections 3(e)(4) and 13(c) of the Act require, as a condition of assistance thereunder, that fair and equitable arrangements be made as determined by the Secretary of Labor "to protect the interests of employees affected by such assistance"; and

ETCERAS, the parties have agreed upon the following arrangements as fair and equitable:

NOW, THEREFORE, IT IS AGREED that in the event the Project is approved for assistance under the Act the following terms and conditions shall apply:

1. The Project shall be carried out in such a manner and upon such terms and conditions as will not in any way adversely affect employees represented by the Union.

2. All rights, privileges and benefits (including pension rights and benefits) of employees covered by this agreement (including employees having already retired) under existing collective bargaining agreements or otherwise, shall be preserved and continued; provided, however, that such rights, privileges, and benefits not previously vested may be modified by collective bargaining and agreement of the parties hereto to substitute rights, privileges and benefits of equal or greater economic value.

3. The collective bargaining rights of employees represented by the Union, including the right to arbitrate labor disputes and to maintain union security and checkoff arrangements, as provided by applicable laws, policies and/or existing collective bargaining agreements shall be preserved and continued.

4. No employee represented by the Union shall be laid off or otherwise deprived of employment, or placed in a worse position with respect to compensation, hours, working conditions, fringe benefits, or rights and privileges pertaining thereto, as a result of the Project, including any program of efficiencies or economies directly or indirectly related thereto. An employee shall be retained in service by the Corporation unless or until laid off for reasons unrelated to the Project or until his employment terminates on account of his resignation, death, retirement, or dismissal for cause in accordance with agreements then in effect. An employee retained in service shall not be regarded as placed in a worse position, as above provided, in case of his failure to work due to disability or discipline or failure to obtain a reasonably comparable position producing compensation equal to or exceeding the compensation of his former position which is available to him in the exercise of his seniority rights, in accordance with agreements then in effect. The Corporation shall have the burden of affirmatively establishing that any deprivation of employment or other worsening of employment position has not been a result of the Project.

5. Any employee covered by the agreement who has been laid off or otherwise deprived of employment for lack of work, and any such employee required to be retained in service by the Corporation under the provisions of this agreement who would otherwise be laid off for lack of work, shall be granted priority of employment or reemployment to fill any vacant position in the transit system for which he is, or by training can become, qualified. In the event training or re-training is required by such employment or reemployment, the Corporation shall finance or provide for such
training or re-training as so cost to the employee, and such employee shall be paid, while training or re-training, the salary or hourly rate of his former job classification. Such employment or reemployment shall not result in any worsening of the employee’s position in his former employment nor any loss of wages, working conditions, hours, seniority, fringe benefits and rights and privileges pertaining thereto.

(6) In case of any labor dispute or controversy regarding the application, interpretation, or enforcement of any of the provisions of this agreement which cannot be settled by collective bargaining within sixty (60) days after the dispute or controversy first arises hereunder, such dispute or controversy may be submitted at the written request of either party hereto to a board of arbitration as hereinafter provided. Each party shall, within ten (10) days after such request, select one member of the arbitration board, and the members thus chosen shall select a neutral member who shall serve as chairman. Should the members selected by the parties be unable to agree upon the appointment of the neutral member within ten (10) days, any party may request the American Arbitration Association to furnish a list of five (5) persons from which the neutral member shall be selected. The parties shall, within five (5) days after receipt of such list, determine by lot the order of elimination, and thereafter the Union and the other interested party or parties shall, in that order, alternately eliminate one name until only one name remains. The decision by majority vote of the arbitration board shall be final, binding and conclusive. Each party shall pay the fee and expenses of the arbitrator it selects. The fees and expenses of the third or impartial arbitrator, as well as any other joint expenses incidental to the arbitration, shall be borne equally by the parties. The term “labor dispute”, as herein used, shall be broadly construed and shall include, but not be limited to, any controversy arising concerning wages, salaries, hours, working conditions, or benefits, including health and welfare, sick leave, insurance, or pension or retirement provisions, any differences or questions that may arise between the parties, including

the making or maintaining of collective bargaining agreements, the terms to be included in such agreements, any grievances that may arise, and any controversy arising out of or by virtue of any of the provisions of this agreement for the protection of employees affected by the Project.

(7) Nothing in this agreement shall be construed as an undertaking by the Corporation, the Union, or the employees to forego any rights or benefits under any other agreement or under any provision of law.

(8) The term “Project”, as used in this agreement, shall not be limited to the particular facility assisted by federal funds, but shall include any part of the transit system or facility thereof which is affected by such assistance. The phrase “as a result of the Project” shall, when used in this agreement, include events occurring in anticipation of, during and subsequent to the Project.

(9) In the event any provision of this agreement is held to be invalid or otherwise unenforceable under federal, state or local law, such provision shall be re-negotiated for purpose of adequate replacement under Section 13(c) of the Act. If such renegotiation shall not result in mutually satisfactory agreement, any party may invoke arbitration under paragraph (b) hereof, or the jurisdiction of the Secretary of Labor, to determine substitute fair and equitable employee protective arrangements which shall be incorporated in this agreement, and/or any other appropriate action, remedy, or relief.

(10) The employees covered by this agreement shall continue to receive coverage under Social Security, Workmen’s Compensation, unemployment compensation, and the like. In no event shall these benefits be reduced as a result of the Project.

(11) This agreement shall be binding upon the successors and assigns of the parties hereto, and no provisions, terms or obligations hereto contained shall be affected, modified, altered, or changed in any respect whatsoever by reason of the arrangements made by the Corporation to manage and operate the system. Any
person, enterprise, body or agency, whether publicly or privately owned, which
shall undertake the management or operation of the transit system, shall agree to be
bound by the terms of this agreement and accept the responsibility for full performance
of those conditions.

(12) In the event this Project is approved for assistance under the Act,
the foregoing terms and conditions shall be made a part of the contract of assistance
between the Federal Government and the applicant for Federal funds, provided, however,
that this agreement shall not merge into the contract of assistance, but shall be
independently binding and enforceable by and upon the parties hereto, in accordance
with its terms; nor shall the collective bargaining agreement between the Union and
the operator of the transit system merge into this agreement but each shall be
independently binding and enforceable by and upon the parties hereto, in
accordance with its terms.

IN WITNESS WHEREOF, the parties hereto have executed this agreement by
their respective duly authorized representatives this ___ day of __________ 1973.

LOCAL DIVISION 1077
AMALGAMATED TRANSIT UNION
By __________________________

GREATER LEAFETTE PUBLIC
TRANSPORTATION CORPORATION
By __________________________
Appendix K

Provided in this appendix is a sample contract for the purchase of transit operations from a private operator by a transit authority. The important thing to note here is the number of items that must be specified and the detail.
May 26, 1965

RHODE ISLAND PUBLIC TRANSIT AUTHORITY
1100 Hospital Trust Building
Providence, R. I. 02903

HERBERT C. WILLS JR. Chairman
SAMUEL C. KAGAN Vice Chairman
ARTHUR J. DEKLOEN, JR.
FRANK BIANCO
ROMEO E. MCKENNE, SR.

JAMES K. EDWARDS, Secretary

United Transit Company
265 Melrose Street
Providence, Rhode Island

Gentlemen:

This letter of intent will confirm the oral understanding which we reached with you on April 30, 1965, as follows:

1. On or before November 1, 1965 (hereinafter referred to as the "Acquisition Date"), we shall purchase for $2,700,000 (subject to the adjustments provided for in paragraph 7 hereof) all of your good will as the operator of the public bus transportation system now operated by you in the Greater Providence Metropolitan area, including all operational records as contrasted with strictly corporate records, and also all of your tangible property, both real and personal, whether or not referred to in your records, free and clear of liens, charges, and encumbrances (other than any leases of your property heretofore made by you in the ordinary course of your operations and other than as provided in paragraph 2 hereof), excepting only:

(a) the following 112 buses (less fare boxes and radio equipment therein, which are not to be excepted):

26 Twin Coach Model 44-D, 44-passenger gas buses, acquired new in 1947;

23 Originally Pullman Standard trolley coaches, 44-passenger, acquired new in 1943–1946 and subsequently converted in 1953–1957 to diesel buses by the installation of Leyland diesel engines; and

63 Used GMC diesel buses purchased from Public Service Coordinated Transport (which 112 buses are hereinafter referred to as the "Excluded Buses"); and

(b) that portion (not to exceed 51%) of the nearly rectangular tract of land, having an area of about 171,160 square feet (which tract is hereinafter referred to as "Lot 12"), in Providence located on Melrose Street between Longfellow Street and Roger Williams Avenue and presently used for employee parking and for the operations of United Truck and Bus Service Co. (hereinafter referred to as "United") which is indicated on Exhibit A hereto.
by the words "To be Retained by the UTC" (which portion of Lot 12, together with the buildings and improvements thereon, is hereinafter referred to as the "Excluded Realty").

2. With respect to the portion of Lot 12 which is to be conveyed to us, except only in the case of the transfer thereof by us to someone to whom we shall, as part of the same transaction, transfer the major portion in value of the assets to be acquired by us from you on the Acquisition Date, you shall have a right of first refusal, which shall be assignable by you only to United and which shall terminate upon (a) the transfer of the Excluded Realty by you to anyone other than United or (b) the transfer of the Excluded Realty by United to anyone. So long as said right of first refusal remains in effect and so long as Melrose Street abutting the Excluded Realty remains unimproved, the portion of Lot 12 which is to be conveyed to us on the Acquisition Date shall be subject to an easement of access to the Excluded Realty in favor of the Excluded Realty.

3. With respect to the Excluded Realty, except with respect to a transfer to United as permitted in paragraph 2 above, we shall have a right of first refusal, assignable to any person who shall acquire the major portion in value of the assets to be acquired by us from you on the Acquisition Date.

4. Commencing on the Acquisition Date you shall lease to us the Excluded Buses at a rental of $55 per month per bus. During the term of such lease we shall maintain the buses (including tire rental) at our expense. Whether a minimum rental term is to be guaranteed by us, and, if so, the length of such minimum rental term, will be the subject of further negotiations between us after we have received a delivery schedule for the 107 new buses with which we intend to replace the Excluded Buses.

5. We shall lease to you office space in the Body Shop and Office Building on such terms and conditions as may be agreed upon.

6. We shall furnish to United substantially the same repair services which are now furnished by you to United, in consideration of United's payment to us of our costs plus one half of the difference between our costs and United's charges to its customers.

7. You represent to us, and we understand, that you will own on the Acquisition Date all of the real property and all of the buses which you owned on September 30, 1964, and that the only differences between the tangible personal property owned by you on September 30, 1964, and such property to be owned by you on the Acquisition Date will result from wear and tear and dispositions and substitutions made in the ordinary course of your operations. An inventory of tangible personal property other than buses shall be taken jointly by representatives of you and us as of the Acquisition Date; and to the extent that the tangible personal property, other than buses, to be acquired is found to be greater or less than such property owned by you on September 30, 1964, said purchase price of $2,700,000 shall be adjusted as follows: Property acquired since September 30, 1964, shall be valued at the actual cost thereof to you or the replacement cost as of the Acquisition Date,
whichever is lower; and property disposed of since September 30, 1964, shall be valued at the actual proceeds therefrom received by you.

8. We shall not assume any of your liabilities except as we may be required to do so by the provisions of section 39-18-17 of the General Laws and except as to supply contracts, leases of real property in which you are the lessee, and other liabilities to which you have subjected yourself in the ordinary course of your operations as operator of a public bus transportation system under agreements to the benefits of which we shall become entitled on the Acquisition Date.

9. The obligations of both of us hereunder and under the formal agreement which, it is contemplated, will supersede this letter of intent, are subject entirely to the condition that we be successful in our efforts to raise the money necessary to consummate the acquisition of the UTC's property as herein provided. (It is recognized that the success of such efforts will depend upon the successful marketing of our revenue bonds, which in turn will depend upon the approval of our application of an HHFA grant in twice the amount of the $819,000 appropriation recently made by the Rhode Island General Assembly.)

10. You shall not, without our consent, except as may be required by law, prior to the Acquisition Date make (a) any further changes in your supervisory personnel or (b) any substantial changes in your transportation operations (other than such changes as you have customarily made in the past to meet changing seasonal conditions).

If you agree that the foregoing correctly states the understanding between us, please sign and return the enclosed carbon copy hereof.

RHODE ISLAND PUBLIC TRANSIT AUTHORITY

By [Signature]
(Chairman)

The foregoing correctly states the understanding between us.

UNITED TRANSIT COMPANY

By [Signature]
(President)
Appendix L

Contained in this appendix are the authors' suggestions for future research in the area of bus transit planning and operation. These suggestions are aimed at providing information to the small transit firms that usually have little money and/or personnel for doing original research.

Recommendations for Research

In gathering information for the development of this report a number of areas were found to be lacking adequate information. These areas should provide excellent topics for future research.

1. There is a definite need for information on the design of fixed route, fixed schedule bus systems for small urban areas. In particular, information is needed on ways to approach routing and scheduling and the type and sources of data on which to base this routing and scheduling.

2. Another area of need is for verification of methods to be used in marketing bus transit in small urban areas. Information is needed on techniques which might be used to promote major system changes once transit planning is complete. Also, needed is information on techniques to be used in an ongoing promotional program.

3. Information is needed concerning the use of special services by publicly owned bus systems in small urban areas. Included here would be the legal restrictions on publicly owned systems governing the use of such services.
as charter service, special school routes, etc. Information on setting up and promoting these special services is lacking.

4. Research should be done to develop a planning program that can be used by bus systems in small urban areas. The program should cover such things as organizational needs, staff and space; when and how to collect data as well as what type of data to collect; and how to analyze the data. The program must be aimed at the small firm that has limited personnel to work on the planning program.
Appendix M

Notes for Appendices


5 Ibid., p. 175.


7 Ibid., p. 15.

8 Joint Highway Research Project, pp. 209-213.


12 Tippecanoe County Area Plan Commission, Greater Lafayette Area Transportation and Development Study, Bus Study Questionnaire (Courthouse, Lafayette, Indiana 47907, 1971).


15 Joint Highway Research Project, pp. 114, 123-125, and 146-149.

16 Greater Lafayette Public Transportation Corporation, Preliminary Application for a Capital Grant from the Urban Mass Transportation Administration (324 Ferry Street, Lafayette, Indiana 47907, December 14, 1971), pp. 1-23.

17 Greater Lafayette Public Transportation Corporation, Agreement Pursuant to Section 13(c) of the Urban Mass Transportation Act of 1964, as Amended (324 Ferry Street, Lafayette, Indiana 47907, 1971), pp. 1-3.
