

**B** EFORE

**D** URING

**A** FTER

**IMPACT STUDY**

**for the**

**Buffalo LRRT**

*NFTC*

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NIAGARA FRONTIER TRANSPORTATION COMMITTEE



MEMORANDUM

FROM Gordon Foster/Michelle Penca *GF* DATE March 22, 1978  
 TO NFTPCC Members cc: Barry Hecht  
 SUBJECT Before-During-After Rapid Transit Impact Study

A revised study design for the subject study is submitted here for review. An earlier design was prepared on the basis of the original 11 mile "heavy" rail concept and submitted to the PCC October 16, 1974. Comments were received, the study revised, and copies forwarded to UMTA April 2, 1975. After UMTA approval of the rail transit project for engineering, extensive comments were received on the impact study from both UMTA and NYSDOT in October, 1976. This new study design has been prepared to reflect those comments, the shortened version of the rail project and the LRRT concept which has now been adopted.

Although much of the basic structure of the original study design has been retained, there are also significant differences and the design has been completely rewritten in a more condensed form. Certain details are yet to be completed such as new cost estimates, reports and reporting procedures and revised versions of suggested survey forms. We are hoping for early comment on the general approach and agreement on certain key questions (e.g., who will do each work task) before completing the other items. At this time we are thinking in terms of a consultant (or consultants) performing all tasks except, perhaps, the special systems analysis (Work Item 1) and the Business and Home Interview Survey Sampling (Work Item 14).

Important similarities with the earlier study design include:

- Investigation of all possible sectors of rapid transit impact, social, economic and physical.
- Retention of most original data collection methods and model procedures.

Important changes include:

- Organization of work tasks to more clearly indicate areas of rapid transit impact being investigated.
- Presentation of investigative methodologies in a research defensible manner; i.e., each work item has a brief narrative followed by hypotheses or assumptions concerning the specific impact area; then the general strategy for conducting tests of impacts is outlined.
- Increased emphasis on assessing transit line impacts downtown, in response to UMTA's stress on the transit line's impact there.

(over)

- ③ More emphasis on developing relationships between impact causes and effects and less emphasis on survey data collection for documentation purposes, in response to UMTA comment.
- ③ Increased use of readily available statistical data to quantify impacts and less use of the home interview and business surveys for this purpose (but their focus on assessing causation of change is retained).
- ③ Introduction of "key informants" or "panel" groups, as an additional method of identifying impacts and their causes.
- ③ Elimination of the "control corridor" as a study element for comparison purposes. (It was not possible to locate a suitable corridor that seemed to adequately answer the questions raised both by UMTA and NYSDOT regarding the originally suggested use of this concept.)

A letter is under preparation which will outline in detail the changes made in response to NYSDOT's specific comments.

It is important to begin the "Before" phase of the study as soon as possible. Comments upon this study design are requested as soon as possible, hopefully prior to the next PCC meeting. We are available to discuss the study design in detail if that would assist your review. Please contact us in that regard. Then, the CTPS can complete the remaining budget estimates and other portions of the study design, have the design submitted to UMTA, and, hopefully, be interviewing consultants early this summer and have work started by this fall. Obviously, if there is significant delay, transit line construction could be well underway before the "Before" data collection is completed.

GWf/db  
Attachment

## NIAGARA FRONTIER TRANSPORTATION COMMITTEE

181 ELLICOTT STREET \* P. O. BOX 5008 \* BUFFALO, NEW YORK 14205 \* Area Code 716, 856-2026

May 1, 1978

Mr. James McQueen  
Senior Transportation Representative  
Department of Transportation  
Urban Mass Transportation Administration  
Washington, D.C. 20590

Dear Jim:

Enclosed please find a copy of the revised edition of the Buffalo Light Rail Rapid Transit Project Before-During and After (BDA) Impact Study. Although the PCC and the State have not yet finished their review, we are forwarding a copy of the draft document to you in the hope that this may expedite review by all concerned parties.

The revised version differs from the original document in several important respects. These areas are outlined in the cover memo attached to the report.

Please feel free to call us as we would welcome any comments/suggestions resulting from your review and look forward to hearing from you.

Very truly yours,



Gordon W. Foster, P.E.  
Assistant Staff Director

GWF/MP/db

cc: NFTPCC Members



Study Design  
for the

REVIEW COPY ONLY.  
NOT FOR RELEASE

BEFORE, DURING & AFTER

IMPACT STUDY

of the

Buffalo Light Rail Rapid Transit Project

Niagara Frontier Transportation Committee  
March 1978

Prepared by the

Continuing Transportation Planning Staff

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Prepared in cooperation with the U. S.  
Department of Transportation, Urban Mass  
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The contents of this document reflect the views  
of NFTC who is responsible for the facts and the  
accuracy of the data presented herein. The  
contents do not necessarily reflect the official  
views or policies of the Federal Highway Ad-  
ministration or the Urban Mass Transportation  
Administration. This report does not constitute  
a standard, specification, or regulation.



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## INTRODUCTION

### The Buffalo LRRT Project

The development of a rapid transit project in an urban environment has profound impacts on urban form and structure. The decision to build a light rail rapid line through one of Buffalo's main traffic corridors presents an unparalleled opportunity to study the impacts of a major investment on the different sectors of urban life.

Consisting of 6.4 miles of track, including a downtown at-grade pedestrian mall section, cut and cover and deep rock tunnel portions, (see Figure 1 in Appendix, Main Street Trunk, only) the system is expected to integrate with a network of feeder buses to increase accessibility to economic and social opportunities downtown. It is important to realize that the rapid transit project is one part of an overall development plan for the region which includes major redevelopment of downtown, including a downtown Mall, construction of a convention center and increased hotel space.

In fact, it is a goal of the project in coordination with other activities to strengthen the City of Buffalo economically and enhance the prospects for a healthy future. As accessibility increases, it is expected that both businesses and consumers will be diverted to the city. The multiplier effect should be felt in increased land value, concomitant increased tax revenue, a stemming of the decline in residential density and increased retail sales.

In the physical system reasonable objectives include decreased travel times, lessening of air pollution and a decrease of traffic congestion.



## Study Objectives

How well the above goals\* are achieved is the thesis of this project. The impacts of the transit line will be assessed during three phases: (1) A before phase which begins with the study and continues until the start of construction; (2) The during stage, from the beginning of construction to the end of construction excluding any period of partial operation; (3) The after stage - this period will be from one year following full operation to a point in time approximately five years later. This one year lag will allow the initial effects of the opening to stabilize. In each phase, data collection will focus on a simple year which is often designated as the "data collection year" in the work program that follows.

Information regarding impacts will be made available to decision makers to enhance the quality of future decisions regarding planning efforts. Since the process of measuring impacts will be done at the three critical phases of the project, information on impacts can be used as a feedback loop to aid policy and decision makers to reinforce beneficial aspects of other projects and discontinue efforts that are producing negative results.

## Study Methodology

The Buffalo light rail rapid transit (LRRT) project will be examined using sound evaluation techniques, to determine expected impacts. Although it is recognized that causal relationships between predicted regional impacts and the transit project are difficult to isolate and define due to confounding exogenous factors, it is felt that using the research hypotheses method outlined in the BDA project, reasonable conclusions regarding cause and effect can be made.

Impact areas will be defined and a temporal investigation into conditions relating to the study area will yield data to be used in formulating research

\*See page 4 for a complete listing of project goals which are the subject of this study



conclusions. Wherever possible, impact interpretation will be done in a deductive manner; however, the nature of some impacts demands that there be a professional interpretation of the degree of impact brought about by the LRRT.

Concurrent events which could distort data collections will be documented in order to remove bias the events would bring to the study results. The impact areas to be studied include both transportation system elements and an investigation of the social and economic sectors of the urban landscape. Where hypotheses about impacts cannot be formed, such as community and residential attitudes concerning the LRRT, recent developments in marketing investigations will be employed. The research activities are listed in Table 1.

A multi-disciplinary approach will be used to ensure maximum reliability of efforts. Consultants with expertise in specific fields will conduct the appropriate work items. Although it is recognized that studies of this sort encounter serious methodological difficulties that hamper their implementation and limit the applicability of their results, it is strongly felt that a properly designed and cautiously executed study of the nature herein outlined can be a benefit to policy makers and planners in Buffalo and similar urban areas.





Summary of Expected LRRT Impacts to be Measured or Observed

Travel costs will decrease

Travel time will decrease

Energy consumption will decrease

Traffic congestion will decrease

Air quality will be enhanced due to decreased amounts of auto emissions

Use of mass transit will increase

Service to the transportation dependent will be improved

Vehicle-pedestrian conflicts will be decreased

Coordination between modes will be increased

Noise levels in the corridor will decrease

Cost savings from reduced accidents will accrue.

Accessibility to the city will improve

Property value in the rapid transit corridor, especially around stations, will increase

Population density will increase in the LRRT corridor

Tax revenue from property taxes will increase

Retail sales in CBD will increase as a % of SMSA retail sales

Eating and drinking establishments will increase in the CBD

Eating and drinking sales in CBD as % of city sales will increase

Numbers of retail employees in the CBD will increase

Vacant office space will decrease

Rental rates in the 20 major CBD office buildings will increase

Development along station areas will occur

The quality of life in neighborhoods will be enhanced



Table I  
Summary of Work Items

Systems Studies

- 1 Special Systems Analysis
- 2 Traffic Capacity Study
- 3 Noise Pollution Study
- 4 Air Quality Study
- 5 Utilities Study
- 6 Photographic Study

Socio-Economic Sector Study

- 7 Business Study
- 8 Land Use and Population Study
- 9 Assessment Study
- 10 Government Services Study

Survey and Interview

- 11 Panel Survey of Resident and Community Groups
- 12 Home Interview Survey
- 13 Rapid Transit Rider Survey
- 14 Business Survey and Home Interview Survey Sampling Method



## WORK ITEM 1

### NFTC Transportation Planning Process Special Systems Analysis

The impact of the rapid transit line on the existing transportation system is of special interest to planners and decision makers. The staff has a travel model available from the continuing transportation planning process. The NFTC surveillance program also provides data for updating the travel mode. The flow charts following illustrate the process. It basically is an iterative procedure which makes use of the NFTC base year networks (both transit and highway) and also utilizes base year person trip data.

#### The Transportation Model

The NFTC transportation model will be run with the modified transit network. Modifications will include the 6.4 mile LRRT line and the proposed feeder bus system. The 1985 person trips from the NFTC forecast will be split by mode and assigned to the 1985 NFTC highway and transit network. This procedure will establish expected transit line benefits for comparison with the results of tests from the during and after phases as described below.

Data will be collected in the during and after year data collection phases to update the transportation model. This involves updating the transit and highway networks and an update of person trip data using information from the NFTC surveillance program. Then, trip assignments to the networks are made and any needed calibrations and adjustments will be done.

When correspondence with the during or after data collection is complete, the transit and highway networks will be adjusted to original "do-nothing" conditions. A new modal split, trip distribution and assignment will occur to evaluate changes brought about by the transit line at that phase of progress.

The same procedure will be followed using person trip data from the "after"



phase data collection year.

In the during and after phases, another alternative system will be tested. In this situation, highway and transit network improvements are made, remaining, however, below the overall capital expenditure budget which includes the LRRT. Realistic levels of investment will be affirmed realizing that the large LRRT grant would probably not be available for other kinds of transportation improvements. The networks will be updated and a new modal split, trip distribution and assignment will be made.

#### Evaluation of Transportation System Impact

Since all conditions except the rapid transit line, the transit network, and the highway network will be held constant during the testing of alternatives with the travel model, it will be assumed that differences in results with both the "do-nothing" and "alternative" model will represent the differences caused by the transit project.

While it is true that the region probably would have developed differently without the rapid transit project, estimating different land use and socio-economic data for the purpose of more accurately reproducing these factors requires a great reliance on judgment as to what would have happened. It is felt that the alternative network assigned from the results of the "do-nothing" test will most faithfully produce LRRT impact as compared to what probably would have happened without the project.

All impact in this work item will be reduced to tentative dollar amounts and energy consumed on an annual basis.

Degree of impact benefit will be shown by savings in capital, operating and time costs, and in gasoline and other energy consumed.





## Impact Comparison Categories

The previously outlined comparisons to be used in the transportation model will be developed in the following categories.

### Vehicle Usage Costs:

- the NYSDOT cost allocation model will be used including calculation for truck costs
- through trips will not be included

### Bus Transit Service Cost

- Annual operating costs of NFTA Metro System, excluding inter-city service, contract school service and charter service.

### Accident Cost

- The NYS accident cost model and/or the NYSDOT Traffic and Safety division will be used, discounting those reductions due to other variables such as improved safety devices.

### Travel Time Costs

- Total travel time will be determined for highway and transit travellers from the travel model. Time will be multiplied by an average value rate determined from data available for the data year of comparison.
- Truck travel time will be determined and multiplied by average truck driver hourly salary.

## Transportation Investment Cost

Total transportation investments since the base year of the "before" condition including property, roadway and structures, transit vehicles, (auto purchase costs will be included in the per mile costs) and any other appropriate capital costs for projects in service in the data year will be determined. Costs will include tax losses from property taken off the tax rolls. Probable investment costs for the "do-nothing" and "alternate" conditions for projects which would have been in service in the data year will roughly be determined using unit cost data appropriate to the period when construction would have been carried out. All investment costs will be computed to an annual basis for comparison purposes using expected service lives and appropriate interest rates.



## Energy Use

NYSDOT Energy Consumption Model will be used to calculate energy used by the transit and highway network.

### Supporting Data Needs

This work item will include assembly of all necessary data to carry out the cost comparisons described above including:

- . Highway and transit accident data for the region
- . Typical vehicle operating costs per mile for autos and trucks
- . Average miles per gallon of gasoline for autos and trucks
- . Estimated diesel fuel used by trucks in Erie and Niagara Counties
- . Transit system operating costs
- . Transit system fuel consumption
- . Average accident cost dollar values for each type of accident
- . Travel time values
- . Typical unit construction costs
- . Actual construction costs of transportation improvements actually made and completed in study period
- . Property tax losses for property removed from private use for transportation purposes



## NFTC Surveillance Items Utilized in the Systems Analysis

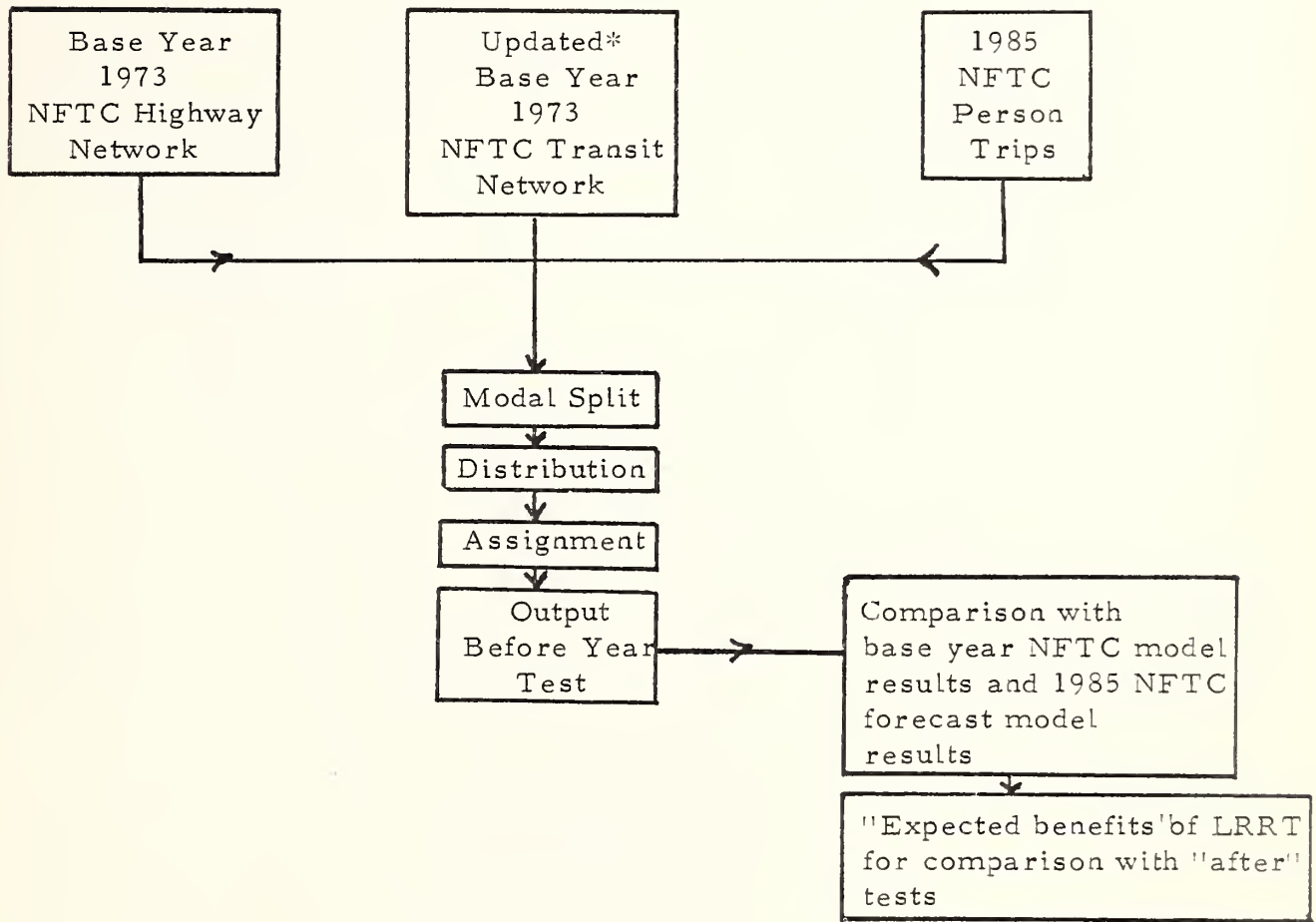
The Before-During-After Study will be intimately tied in with progress in the regional continuing transportation planning program. Future updates in the transportation plan should mesh as nearly as possible with the data collection years of the before, during and after phases of this study. It is expected that the following information needed in this study will be available by traffic analysis zones from the transportation planning process either directly or through adjustment provided in the data surveillance portion of the transportation study.

- . Total employment and retail and service employment
- . School enrollment for public, parochial and private schools  
and colleges
- . Dwelling Units and Households
- . Population
- . Auto ownership

Travel data utilized will include highway and transit route changes, and travel volumes estimated for network links of both modes.



"BEFORE" DATA YEAR  
Transportation Model Test



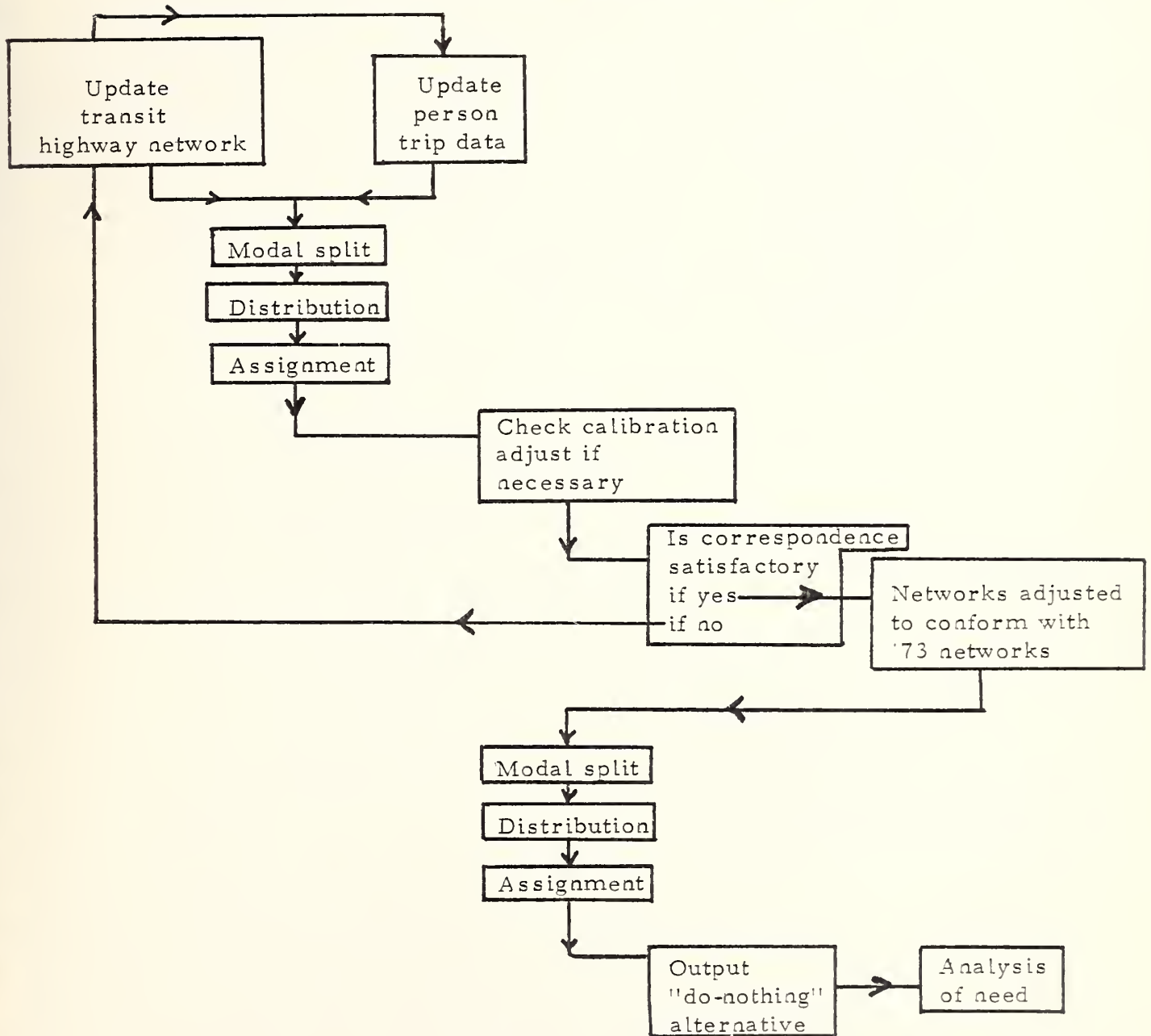
\*Updated to include LRRT and appropriate feeder bus route changes only





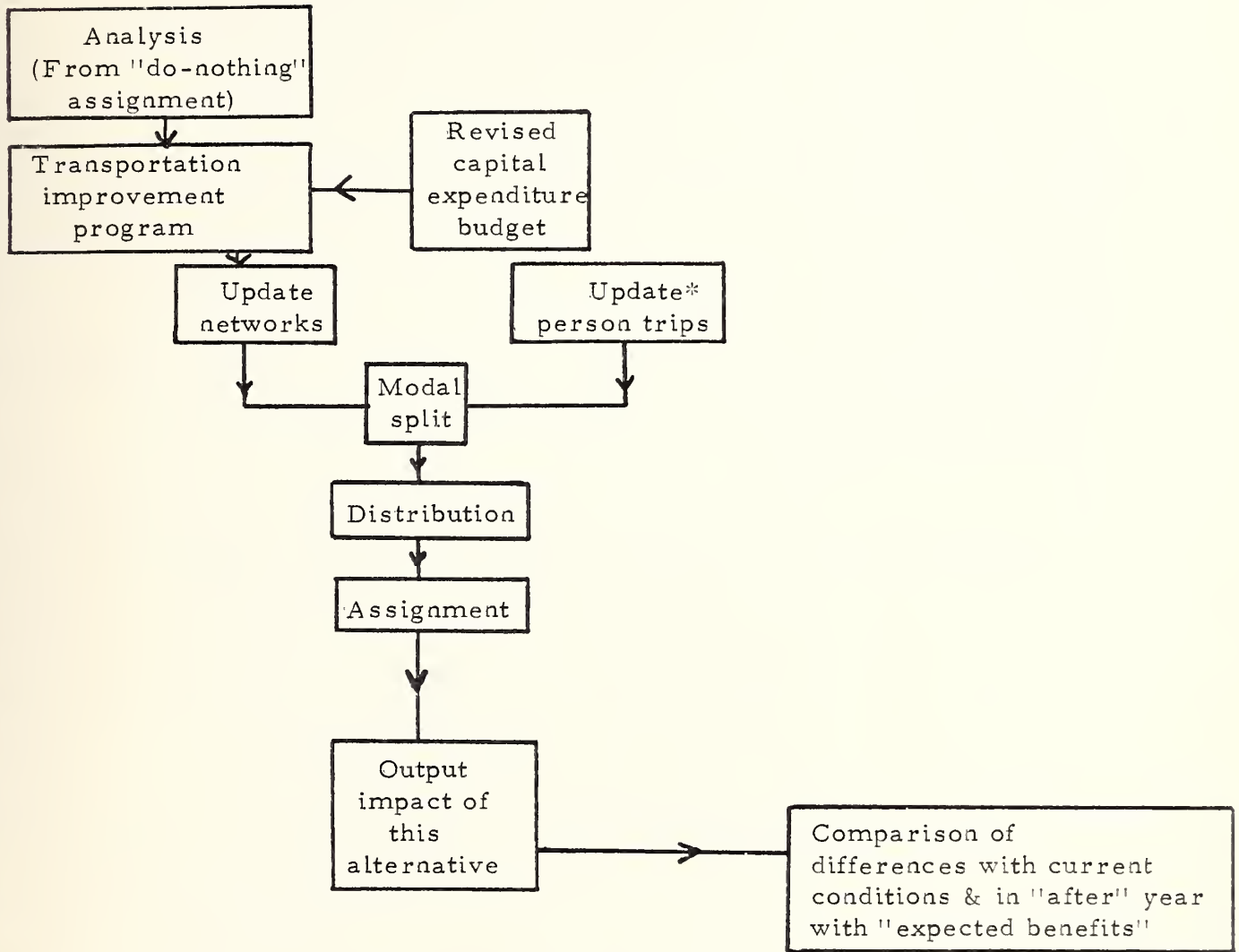
"Do-nothing" Alternative

During and After Data Collection Year





Non-LRRT - Transit and Highway Alternative  
During or After Data Collection Year



\*Same as in "Do Nothing" alternative for during or after data collection years



## WORK ITEM 2

### Traffic Capacity Study

"Capacity of a given section of roadway given either in one direction or in both directions for a two-lane or a three-lane roadway may be defined as the maximum number of vehicles which has a reasonable expectation of passing over a given section of roadway during a given time period under prevailing roadway and traffic conditions"<sup>1</sup>

The level of service on a facility is designated as the different levels of operating speed and congestion under which a roadway can function.

It has been determined that capacity and level of service on a facility are affected by two groups of factors.

#### I Roadway factors - the physical make-up of the roadway such as:

- a) lane widths
- b) lateral clearance from edge of pavement
- c) width of shoulders
- d) presence and nature of auxiliary lanes
  - 1) parking lanes
  - 2) speed change lanes
  - 3) towing and storage lanes
  - 4) auxiliary lanes in weaving section
  - 5) truck climbing lanes and passing lanes
- e) surface condition
- f) alignment
- g) grades

#### II Traffic Factors - composition of traffic and controls over traffic

- a) percent trucks
- b) percent busses
- c) lane distribution
- d) variations in traffic flow
- e) traffic interceptions

Intersection level of service is affected by:

- 1) approach width of intersection

<sup>1</sup>Highway Capacity Manual-Special report 87, Highway Research Board, Washington, D. C. 1965



- 2) location within the metropolitan area
- 3) traffic flow variations
- 4) size of metropolitan area
- 5) percent right and left turns
- 6) percent busses entering intersection
- 7) percent trucks entering intersection
- 8) location of bus stop in relation to intersection
- 9) parking status

The June 1976 Voorhees report "Metro for Buffalo" identified intersection capacity deficiencies along Main Street. Forty-two intersections have critical lane volumes greater than 1000 VPH. \* This information along with TOPICS data for the three categories of information listed previously, plus any updating necessary, will represent before conditions in the study corridor. Similar measurements will be made in the during and after phases. The research will attempt to discover if the transit line alleviates traffic congestion at the critical intersections. The negative impact of construction will also be apparent, if such an impact exists.

Roadway level of service on Main Street will be determined three times; before, during and after construction. The analysis will consider intersection capacity data and speed and delay runs which will be done on Main Street during both peaks and in mid-day. Runs will be timed with delay points listed and total running and delay time accumulated. As a result of the transit line reducing traffic on the roadway, it is expected that the speed and delay times will become better.

A list of major traffic generators in the study corridor (Figure 4. Appendix) will be maintained by study phase to aid in interpreting results.

Total daily traffic through the intersections being studied will also be assessed and compared regarding comparison of peak periods.

\*See Figure 5 in Appendix





## WORK ITEM 3

### Noise Study

The construction and operation of the rapid transit line will impact the ambient noise level in the study corridor.

The 1977 LRRT Environmental Impact Statement by the NFTA identified certain design goals for noise levels in the study corridor. Standards compatible with these goals have been established. The American Public Transit Association has developed an area classification system with typical median ambient noise levels. The noise levels are measured using a sound level meter which meets the Type 2 requirements of American National Standard (ANSI) S1.41971, specification for Sound Level Meters.

The NFTA conducted a study to determine existing noise levels along the LRRT corridor. The 31 sample sites and the associated neighborhood type with the measurements are given in figure 2.

It is proposed that the Impact Study monitor noise levels at these sites\* at a time during and after transit construction. Data will be collected in the same manner as used in the NFTA study. Analysis will check to see if noise levels exceed the standards established for each area. Special care will be given for areas designated as acoustically sensitive. If data increases significantly over time and no new noise generators are identified, it will be assumed that the rapid transit line caused the increase.

\* For comparison's sake, it may be deemed important to monitor some sites outside the corridor.



Goals of NFTA-LRRT Environmental Impact Statement regarding noise

levels:

1. To provide system patrons with an acoustically comfortable environment by maintaining noise and vibration levels in vehicles and stations within acceptable limits.
2. To reduce any adverse impact of the system operation on the community by minimizing transmission of noise and vibration to adjacent properties.
3. To provide noise and vibration control consistent with economic constraints and appropriate technology.



## WORK ITEM 4

### Air Quality Monitoring

Erie County has a mobile air pollution monitoring station which regularly serves a variety of locations. The station measures a full range of pollutants including carbon monoxide, sulphur dioxide and particulates or dust.

It is proposed to use this station to record measurements at two locations in the study corridor. The sites are the northern terminus of the LRRT at the Main Street Campus of the University, and Canisius College Campus, on Main Street.

These two locations will be measured as part of Erie County's regular measurement program which would be scheduled to provide at least a two month stay at each of these locations.

The recordings will be in the same season in each data collection year of the study.

Information from these two locations along with that from the permanent air quality station atop the Buffalo City Hall will be used to measure changes in air quality in the study corridor. Information on locations outside the study corridor will be available from other sites visited by the County's mobile station and from the State's permanent air quality measurement station on Ogden Street near the New York State Thruway. Automobile pollutants are of particular interest for this study since this is the area where improvement may be expected to be brought about by the rapid transit project. Since such pollutants are presently far below critical levels, this program should adequately monitor this change. Note will be taken of improvements in auto emissions through manufacturing changes when evaluating air pollution improvements.



The Environmental Protection Agency sets standards for suspended particulates and sulphur dioxide. There are no EPA standards for settleable particulates. Autos are identified as the largest contributors of hydro-carbons and carbon monoxide, while sulfur dioxide and particulate emissions are generated mainly from stationary sources.

Evidence exists that the air quality of the region has been steadily increasing. Data also shows that the quantity of pollutants from autos is decreasing and will continue to decrease.

Therefore, the research in the air quality study will be directed to monitoring air pollution levels during and after construction and noting any serious increases or decreases. It is thought that air quality will increase over time in the study corridor. This will be due to decreasing auto emissions and decreasing vehicle volumes.

Generally dust will increase during construction, but this is considered to be of a temporal nature.





## WORK ITEM 5

### Utilities Study

As a result of the increase in business activity along the rapid transit line, it is expected that some savings in utilities construction can be realized. Since the rapid transit line is projected to slow expansion into suburbs, new utility trunk lines may not need to be constructed.

Through discussion with key individuals in the gas, electric and telephone companies' planning departments, it will be possible to derive an estimate of the construction savings due to the transit line. The costs saved will be estimated by discussing the probable difference in construction programs with utility company personnel. Company cost forecasts will be used. The actual amounts spent on utility trunk line service extensions will also be documented for the periods between data collection years.



## WORK ITEM 6

### Photographic Study

In order to have a visual record of changes along the study corridor it is proposed in each before, during and after phase to take a set of ground level photographs. The photographs would be taken from exactly the same spot and facing the same direction for each phase. The number of pictures to be taken and their locations would be determined in the before stage in such a manner that all station areas and other major impact points are covered as well as "typical" shots of the surrounding neighborhoods. Information regarding camera location, date and time for each photograph would be fully documented in the "before" phase. This picture record of change will not be used directly as an instrument to measure change, but it is felt that comparing prints of the same area throughout the study stage should be an extremely helpful tool in evaluating the statistical data and other information developed from other portions of the study.

In addition, a picture record would be available to assess how the neighborhood ambience had changed, particularly in station areas. It is expected that station development in the so-called theater area would be one of the most noticeable.

If possible, NYSDOT highway photography series will be used to supplement this work item.



## WORK ITEM 7

### Business Survey

It is reasonable to expect the LRRT to impact businesses in the rapid transit corridor and to assume that these impacts can be measured. This work item assumes great significance in view of the often stated goal of the project to stimulate positive development in the CBD.

It is recognized that the rapid transit line can be the "most important physical structuring element"<sup>1</sup> in the corridor. Buffalo rapid transit has the potential to be the "backbone of economic revitalization of the downtown core" and "encourage renewal and rehabilitation of inner city areas."<sup>2</sup> The LRRT can stimulate private development and "encourage more effective and efficient utilization of vacant and underutilized land."<sup>3</sup>

Thoughtful investigation is necessary in order to prove attainment of such clearly and strongly stated goals. Two methods will be utilized toward this end. They are the formation and subsequent testing of research hypotheses and the use of key informant interviews supplemented by a business survey.

The research hypotheses will be stated followed by the strategy for testing them.

<sup>1</sup>Technical Report - Niagara Frontier Mass Transit Study - NFTA, Sept. 1971  
page 163

<sup>2</sup>Ibid

<sup>3</sup>Ibid



Hypotheses of Impact on Business as a result of rapid transit line.

H<sub>1</sub> = The total retail sales (measured in \$1,000) for the Buffalo CBD will increase.

H<sub>2</sub> = The number of eating and drinking establishments (SIC code 58) will increase after construction of the LRRT.

H<sub>3</sub> = The number of paid employees in the retail sector of the Buffalo CBD will increase.

H<sub>4</sub> = The total number of retail establishments as listed in the Census of Business will increase.

H<sub>5</sub> = CBD retail sales as a percent of SMSA sales will increase.

H<sub>6</sub> = CBD eating and drinking sales as a percent of city sales will increase.

H<sub>7</sub> = The total square feet vacant of the 20 major downtown office buildings will decrease.

H<sub>8</sub> = There will be an increase in the rental rates of the 20 major CBD office buildings.

Care will be taken to correct for inflation when comparing sales figures.

Where possible, the effects of the new downtown convention center will be identified in evaluating hypotheses H<sub>2</sub> and H<sub>6</sub>.

Sources of data for these hypotheses will come from the Census of Business which is published every five years and from the Chamber of Commerce. Each time the Census of Business is published, information on the first 6 variables will be compared against preceding years. The Census published its report in 1972 and will for 1977. This will establish before conditions. For every five years thereafter information can be had for the during and after phases. Concurrent reports from the Chamber of Commerce on building rentals will be used.

A priori assumptions about the direction of change due to the rapid transit line have already been made in the hypotheses. The magnitude will be empirically determined.





While it is difficult to isolate the effect that the rapid transit project alone has had in the change magnitude of the variables, the efforts described below will be utilized to seek answers to this question.

The key informant interviews will attempt to ascertain less easily measurable information in an informal manner. Panels of businessmen will be formed, drawing upon individuals indentified in the business survey and others who may be willing to participate in discussions during the three phases of the study. Panel participants will be queried on the effect they perceive the LRRT has on business, the amount of inconvenience and loss of business caused by construction and their attitude about the LRRT's role in the redevelopment of downtown. It is hoped that such a free-form method of interviewing will reveal information about the LRRT and economic development that would not have been anticipated by a traditional survey.

A business survey will be conducted to provide a relatively unbiased sample of LRRT effect throughout the study corridor, including the CBD, by use of a survey questionnaire distributed to a sample of area businesses. A sample of businesses in the study corridor that have moved into or out of the corridor will be determined through the survey. Comparing changes in the survey sample to a pre-construction inventory produces business which may have changed location due to the project. Phone surveys with the individual who was responsible for the location change will be conducted. Respondents will be asked to assess the degree to which the LRRT influenced their move. The business survey results will be presented with the product of the key informant interviews to complete the attitudinal aspect of this work item.

The survey instrument will be determined and included as an addendum to the study design. The sample frame is described in Work Item 14.



## WORK ITEM 8

### Land Use and Population

Changes in land use and population distribution are among the most important effects expected from the rapid transit project. This work item will attempt to assess whether or not substantial changes in the intensity and distribution of land development have occurred. However, it is important to note several issues involved with land use changes.

First, the rapid transit line alone is not enough stimulus for change. Other conditions must be met. High density zoning with possible inclusion of density premiums and policies which encourage favorable change along with a strong market for commercial and residential properties are needed.

Second, experience in Miami indicates that change of land use in an area may only be a reallocation of the activity within the region. Therefore, growth around stations may be at the expense of the CBD.\* This suggests the importance of analysis at a greater level of detail.

The land use portion of this work item will make use of two research methods: key informant survey and the testing of research hypothesis.

Summary of land use hypothesis:

H<sub>1</sub> - there will be a change in land use around stations reflecting positive impacts of the LRRT.

H<sub>2</sub> - There will be an overall change in land use throughout the corridor.\*\*

H<sub>3</sub> - Zoning will be enacted to restrict commercial development in residential areas.

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\*However, neither the theory nor the experience of other metropolitan areas can provide a clear expectation for the relative growth of the Miami CBD. A longterm reallocation of activity may cause growth of station areas relative to activity centers which are not served by transit. But it may also cause the reallocation of activities among "served" areas in a manner which reduces the intensity of activity in the CBD relative to other station areas." South Florida Transit Impact Study, Research Design & Work Program, Dec. 1976, S. Florida Regional Planning Council.

\*\*For the land use study the corridor is defined as the the area that is two blocks outward from Main Street, on both sides of Main Street.



Two innovations in data management will facilitate the investigation of the above hypothesis. A county wide property assessment to full value is nearing completion stages. Also near completion is a geographic base file.

The county reassessment will give property size and land use as defined by the 210 land use codes. Using the DIME (Dual Independent Map Encoding) file, it will be possible to match addresses within the corridor to property descriptions from the tax files. Since the matching is done at the lot level, it is possible to aggregate up to a previously defined station area or corridor or even the region. This matching and sampling can be done three times; before construction activity begins, during construction and at a time after construction during full operation. Total number of acres (or square feet) can be determined for each land use category. The land use data will be used to formulate a map of existing land uses.

The City of Buffalo Zoning Board maintains information on permitted non-conforming land use. Also available from the Zoning Board are petitions to enlarge or change zoning in a particular area. All data is maintained by street address.

In the before stage of the land use study, it will be necessary to determine existing land use in the specially designated study corridor. This would be available from the reassessment files.

The record of current land use could then be matched with permitted land use, available from the city zoning map. Land usage which deviates from permitted uses will be the result of the matching process. Permitted non-conforming use will be noted. This will establish base year ("before") conditions.

The during and after phase will again generate a map of land use which exists during that collection year. The matching of current land use with the zoning map



will produce deviations for the during year phase and after year phase. The business survey (Work Item 12) will investigate any deviations. Of equal importance with the deviations will be the comparison of "existing" land use maps in each of the three data collection stages. Differences will be examined. Was the change from a higher land use to a less intense use or vice versa? If the transit line does stimulate development, the land use in the station areas should reflect a change. Vacant land may be occupied during the latter years of the study or new business could relocate to the study corridor.

A record of petitions to change land use will be particularly important in evaluating the impact of the LRRT on land use, since each petition lists the reason for changing zoning.

The key informant survey will reveal attitudes of property owners on several issues. (Work Item 11). Sampled participants will be questioned on their perceptions of the extent of land speculation within their neighborhood. The degree of neighborhood disruption and residential and commercial displacement due to the LRRT will be determined.

As previously mentioned, it will be very important to consider concurrent policies favoring land use change. For this reason, it will be necessary to maintain a record of changes in city objectives, plans and policies relating to land use. Observed changes will then be viewed in the proper perspective.

The determination of population density in the corridor is straight-forward. Nineteen-eighty, and 1985 (if available, if not 1990) census figures will be used for the during and after populations. The NFTC has derived population and household figures for 1973, which will be used for the before period.

Total population divided by residential acres will yield population density. Summing density to the traffic analysis zone will produce a regional picture of change.

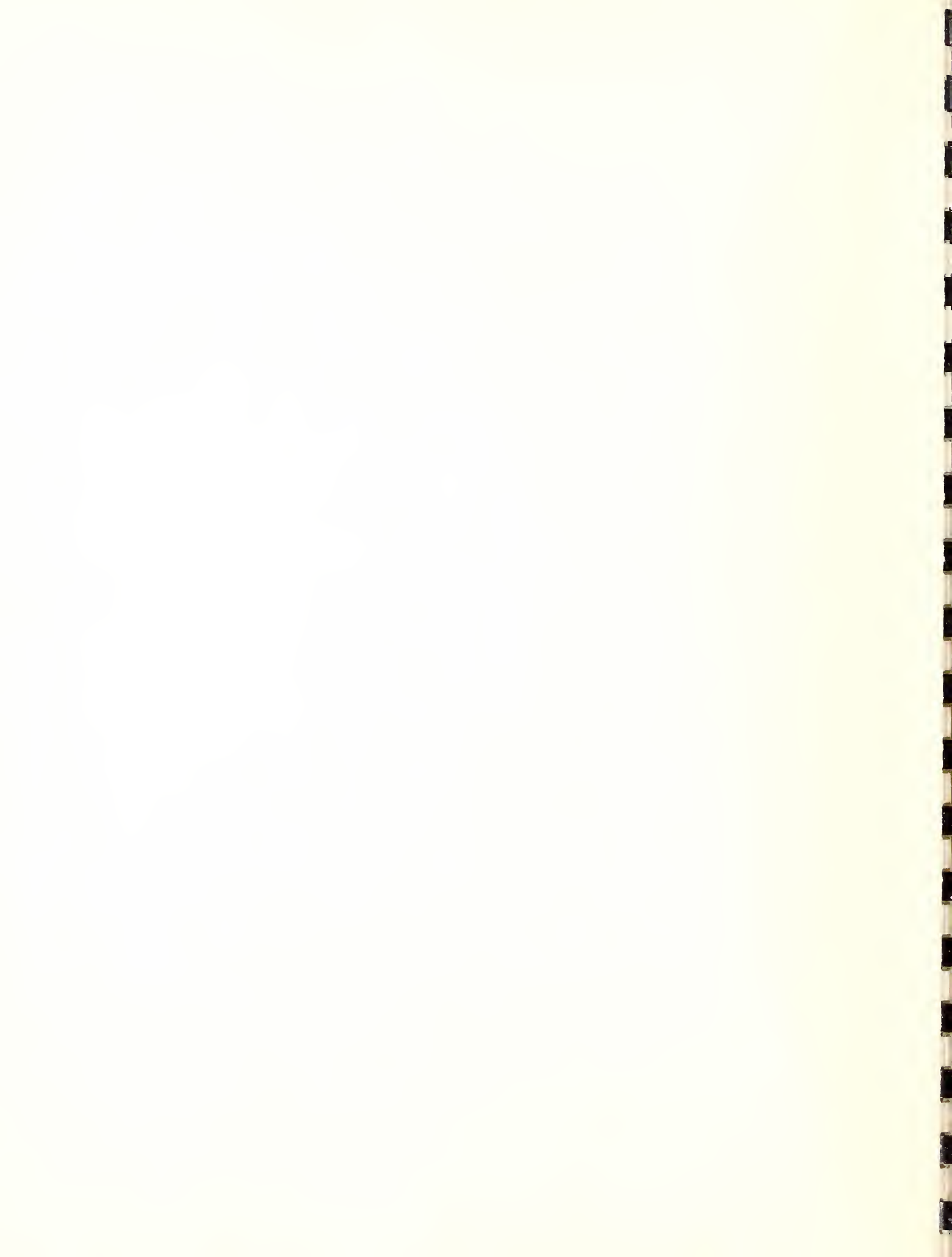




Therefore, an increase in one area, for instance the study corridor, will be checked against a decrease in density in an outlying area. Density around stations will be of special importance, as it is a generally accepted theory that a large scale transit improvement encourages higher density use in close proximity to the line.

Thus the research hypothesis for the population section is:

$H_1$  - population density will increase in the LRRT corridor.



## WORK ITEM 9

### Assessment

Property value increases are considered to be a good objective measure of growth resulting from the construction of the rapid transit project.

Increased land values, which result in a higher real estate tax base, are considered to be an indirect or non-user benefit. The Philadelphia-Lindenwold line construction prompted a study to determine whether the line impacted land values and what direction the impact took. Operating on the theory that the line reduced total travel cost and that savings depended on the number of trips made and the origin of the trip, the study assumed that these savings accrued to a household's location.

In this work item, the property values in the before phase will be determined for the study corridor and the remaining "Buffalo" region, (see Figure 6 in Appendix). Property values are available from computing the assessed value of the property, found on municipal tax records, multiplied by the state derived equalization rates.

It is possible that a particular section of the city be under assessed or over assessed while completing this work item. This will not be an issue in the before phase, as a complete reassessment will just have been completed. However, later stages may need an additional step to insure accurate data. Therefore, a sampling of properties within the study area in the city will be done. Any variation in assessments with recent sales data will be noted. An area that appears to be over assessed or under assessed will become apparent. Differences in equalization rates will be input when evaluating a change which may occur to properties due to the effects of the transit line.



It is expected that values will rise for properties located within the impact corridor. If growth is seen in both areas, the rate of change will be important. If there is a positive change in the impact area but a concomitant decrease in the region, it would be reason to investigate for the existence of the phenomenon of conservation of property values. This theory states that a shift of property values in one direction creates a corresponding change in the opposite direction in some other part of the region.

Once it has been established that a change in property value has occurred, the study will seek to determine probable cause. That is, if an increase in value occurred in the impact area, was the rapid transit line responsible? The Philadelphia case, as analyzed by the Wharton School of Finance, relied on a simple regression analysis. The following seven variables were tested:

1. lot size
2. building description - number of stories, building material and number of garages
3. land use in base year
4. year of sale
5. neighborhood type
6. distance from the center of the city
7. travel savings in the impact and control corridors after the opening of the line.

Lot size, distance from center and travel savings were continuous variables. The four remaining were dummy (0, 1) variables. From this an estimate of the positive or negative price differential caused by the associated characteristic was determined.

The Philadelphia study found that there was indeed a differential in property



values in the two corridors studied due to the travel savings resulting from the rapid transit line.

It is proposed that a similar study be undertaken in Buffalo. Assuming the city-wide property reassessment is complete as predicted by 1980, all information necessary for the regression analysis, which is to be run in the during and after stages, will be available.

An increase in the net value of property along the line and the ensuing increase in property tax revenue would constitute benefits of the system.

### Travel Savings

The travel savings model to be used for the Buffalo BDA is essentially the same one used in the Philadelphia model, as excerpted from the NTIS report prepared for the Department of Transportation, Impact of Rapid Transit on Suburban Residential Property Values and Land Development- Analysis of the Philadelphia-Lindenwold High Speed Line - Wharton School of Finance and Commerce, November 1972: A Savings Model of Property Value Impact; "The rationale of the savings model is straight-forward. Users of the High-Speed Line choose it over automobile or bus commuting because it reduces their total travel cost; the amount saved by using the Line varies according to trip origin, as well as the number of trips made. These travel savings, therefore, can be attributed to household location, the usual origin of week-day journey-to-work trips, or of shopping trips. Since these savings accrue to a person or household residing at that site, its capitalized value may be considered to accrue to the property value. In other words, any individual selling such a residential property will seek to extract the capitalized value of these savings from the buyer. From the buyer's point of view, the capitalized savings are an investment with a return, at the prevalent rate of interest, equal to the transportation savings he receives by residing at that location. The model sketched below describes





the spatial distribution of these savings."

What are the savings,  $S$ , received by a trip maker? They are the cost of commuting by auto less the cost of commuting by the High-Speed Line.

$$S = (aD_O + P_O) - (aD_A + F_A)$$

where  $D_O$  and  $D_A$  are the distance from any origin location to the central business district and Station A on the Line respectively;  $a$  is the access cost per mile including travel time and vehicle operating costs;  $P_O$  is parking cost in the center, and  $F_A$  is the fare from Station A to the center and return. Solving the equation (1-1) for  $D_O$  and  $D_A$ ,

$$D_O - D_A = \frac{S + F_A - P_O}{a}$$



## WORK ITEM 10

### Government Services Study

The LRRT project is expected to bring major benefits to the City of Buffalo, particularly the downtown area and the study impact corridor. However, it is felt that a key factor in making the benefits possible is the maintenance of services provided by the city government.

This would be at a level sufficient to enable the benefits of the project in terms of new growth and development to take place. For instance, a fall-off in the city's ability to maintain services (or a significant increase in taxes to maintain the same services) could possibly have a strong negative impact on new development potential expected from the transit line. The purpose of this work item is to monitor the level of city government services. In this manner an understanding of government activity is available to assess the benefits resulting from the transit project. The transfer of some responsibilities to the county or the institution of some form of metropolitan government could happen during the time frame of this study, and the work item would have to be modified appropriately.

Results from the Business, Key Informant, and Home Interview Surveys will be input to the government services study. If the evidence from these studies indicates that a change in the level of government has indeed impacted the area, then information which has been monitored by this work item can be analyzed in conjunction with information from the previously mentioned studies.

Items to be monitored include:\*

- a) Pupil to Faculty ratio for:
  - 1) elementary
  - 2) middle and junior high schools
  - 3) vocational high school
  - 4) academic high school



- b) Expenditure per pupil minus inflation factor - from Board of Education
- c) Trends in calls for police service per:
  - 1) 1,000 population
  - 2) 1,000 patrol officer
 from Department of Police and Division of Planning
- d) Calls for Police Service by precinct giving city average per 1,000 population and whether above or below average - from Department of Police and Division of Planning
- e) Cost of providing police service minus an inflation factor
- f) 1) number of Civil Service employees and aids per capita
  - 2) wages per capita with inflation factor reduction

All indicators in this work item will be expressed in terms of expenditures per capita.

A second area of interest in this work item relates to the impact of the LRRT on city government itself. Interviews with key personnel in the City Department of Administration and Finance and the Comptroller's Office will be conducted.

Of concern to the study is:

- a) The effect the LRRT is seen as having on the city's ability to borrow.
- b) If the cost of borrowing has increased, is it due to the LRRT?

Very careful analysis is needed to determine the effect of the transit line on the indicators. Should government expenditures for an item decrease, is it a result of a population shift to the suburbs which is part of a present trend, or is the decrease in expenditures a result of a transit caused shift in land use density? Recent studies indicate that an increase in land use density attributable to transit results in a reduction in local government costs annually.

City administrators will be consulted to examine changes and judge the impact the transit project has had.

However the best determinants appear to be the affect of the LRRT on the demand for and ability to survey service.



Panel Information (Key informant survey)

There are a number of impacts expected from the transit line which would be difficult to measure in a standard etiological manner. As such, it is felt that different techniques must be used in order not to lose valuable but elusive information. Impacts of the transit line on various segments of the region's population will be assessed borrowing from marketing research methods.

Perceptions and attitudes about the transit line will be explored through a series of panels representing different target groups. The panels will meet at the three critical periods of impact, before, during and after. Attempts will be made to select individuals who best represent the population segment being considered.\*

Three panels will be set up, one composed of residents in the study corridor, one representing community groups in the area, and the third composed of businessmen.

It is felt that the panel method reveals important consumer attitudes. Although not all individuals on the panel will be consumers, they will have attitudes about transit and large development projects such as the LRRT which will need to be documented. Serious objections raised will be addressed by planners, and attitudes discovered will be of interest to planners of future projects. Citizens' pronouncements will be incorporated in an overall evaluation of the success or failure of the project.

\*The NFTA Metro Construction Community Rapid Transit Interaction Panel will be used if possible





Issues of interest to planners and citizens which will be explored in the panel portion of the study include:

- the extent of land speculation due to the LRRT and whether it is good or bad
- the degree of commercial and residential displacement due to the LRRT
- the extent of neighborhood disruption during and after construction
- change in land value
- extent of auto intrusion due to park and ride effect
- degree of change in neighborhood security due to LRRT

Whenever possible, factual results of other studies will be correlated with this attitudinal survey. For instance the assessment study can be revealed with response to perceived change in land value.

Results of panels will be summarized in reports which will be compared with the previous phase report.



## WORK ITEM 12

### Home Interview Survey

The home interview survey will be carried out to determine the LRRT impact through questions involving the residents' perception of their urban environment, certain trip data for work and other trips, and a limited amount of household information.

Data from this survey will be the prime source for evaluating many of the possible indirect benefits that have been hypothesized as flowing from highly improved transit service. These impacts include the slowing, stopping or preventing of deteriorating social conditions through conservation of population and civic leadership and decreased cost of government services without decreased quality of government services. This survey will also provide data for measuring direct benefits such as improved family mobility and accessibility to the urban environment as well as seeking citizen opinions on adequacy of government services and benefits and problems from the rapid transit project and related transportation services. Also of interest will be the decision to locate near to or away from the transit facility.

It is also hoped that the special concerns of the elderly and handicapped will be discovered in this work item.

The home interview survey will be administered in each of the three phases of the study.

The sample selection is described in Work Item 14. The survey instrument will be developed at a later time.



## WORK ITEM 13

### Rapid Transit Rider Survey

This work item will be performed only in the "after" phase and will provide a much better sample of actual rapid transit line use than can be expected from the home interview survey alone. It will be used to evaluate a number of project impacts including origin and destination of riders, reasons for using, time of travel, previous mode of travel, purpose of travel, socio-economic characteristics of riders and time and money saved in travel. It would also be expected that survey data would aid the future travel model calibration process such as that included in Work Item 1 in the "after" phase.

Details of the survey form and conduct of the survey will be developed at the appropriate time in the "after" phase.



## WORK ITEM 14

### Business Survey and Home Interview Survey Sampling Method

While these surveys are quite different in their questions and their target groups, it is proposed to use a common method of sampling. Significant changes in ownership and land use are possible over the long period of time included in this study, so that sampling lists of one type or another may become updated and virtually a completely new sample necessarily drawn (which may not be consistent with the original) for later phases of the study.

The samples for both surveys will be selected geographically by designating coordinate points on maps as the sample points. The occupant of the land at the sample point for either the business or home interview survey would be interviewed. While businesses and residences may come and go, and even streets change, the geographically located sample point will remain to designate whatever occupies that point of land as a potential sample, if it is, or becomes, occupied by a residence or business. This method assures that if the type of residences of the sample changes from dominantly single family, to dominantly multi-family, the change will be picked up in the increased number of apartments falling under the geographically selected sample points, while at the same time providing a single consistent bias-free sampling process over the period of the study. In order to adequately sample multi-story buildings, one interview (either business or residence) will be carried out on each floor if an independent residence or business is so located.

The selection of the sample coordinates would be done by using a rectangular grid overlay for a regional map and designating the intersections of the grid lines as the sample locations. Density of the grid would vary as necessary to designate a





sufficient number of points to provide the following minimum completed sample in the base (before) survey.

- 200 business interviews in the CBD
- 400 dwelling unit interviews in the transit corridor
- 200 business interviews in the study corridor outside the CBD
- 200 dwelling unit interviews in the regional area outside the study corridor

The total actual sample size cannot be determined until the sampling process is actually tried, but for the purposes of this study program, it is assumed 1,700 interviews will be completed, of which at least 700 will be business interviews and 800 will be dwelling unit interviews.

It is not proposed to interview government institutions and agencies either as resident or business interviews if designated under the grid selection process. Sample points designated in street or other transportation rights-of-way, parks, cemeteries, utilities vacant land, water area and similar places, would not generate interviews, but would remain sample points for potential future interviews if land use changes. Agricultural land also would not generate interviews, unless grid intersection falls on or near a home, which would then call for a dwelling unit interview. Some amusement and entertainment enterprises are not proposed for sampling either because of their peripheral connection to the local economy. Generally, if a sample point falls on the property of a dwelling unit or business (including the parking lots therefore), it would be considered to have fallen directly on the structure. In the case of structures containing a number of businesses and/or residences on each floor, the sample for each floor will be designated by counting off the number of possible choices and selecting the sample using standard random sample techniques. Tall buildings with many businesses such as those encountered in the CBD would



have all of the offices in a vertical line sampled, those theoretically under the point of intersection of the grid line. The sampling would be done separately from the interviews, and each sample point would be identified, the locations for interviews established, and non-interview land uses fully described in a complete listing. It must be ascertained that a sufficient sample is established to meet the minimum requirements for completed interviews before proceeding. Maps of various scales would be used as needed and field inspection would be necessary where structures are designated which have multiple uses, or land use is otherwise not completely known.



APPENDIX



## APPENDIX

### Figures

- |   |  |
|---|--|
| 1 | Map of LRRT System and possible extensions         |
| 2 | 31 noise sites to be used in Work Item 3           |
| 3 | Map of Buffalo SMSA and CBD for use in Work Item 7 |
| 4 | Impact Corridor for use in BDA research            |
| 5 | Intersection capacity Deficiencies                 |
| 6 | The Buffalo Region                                 |





FIGURE 1

LRRT Main Street Trunk Line

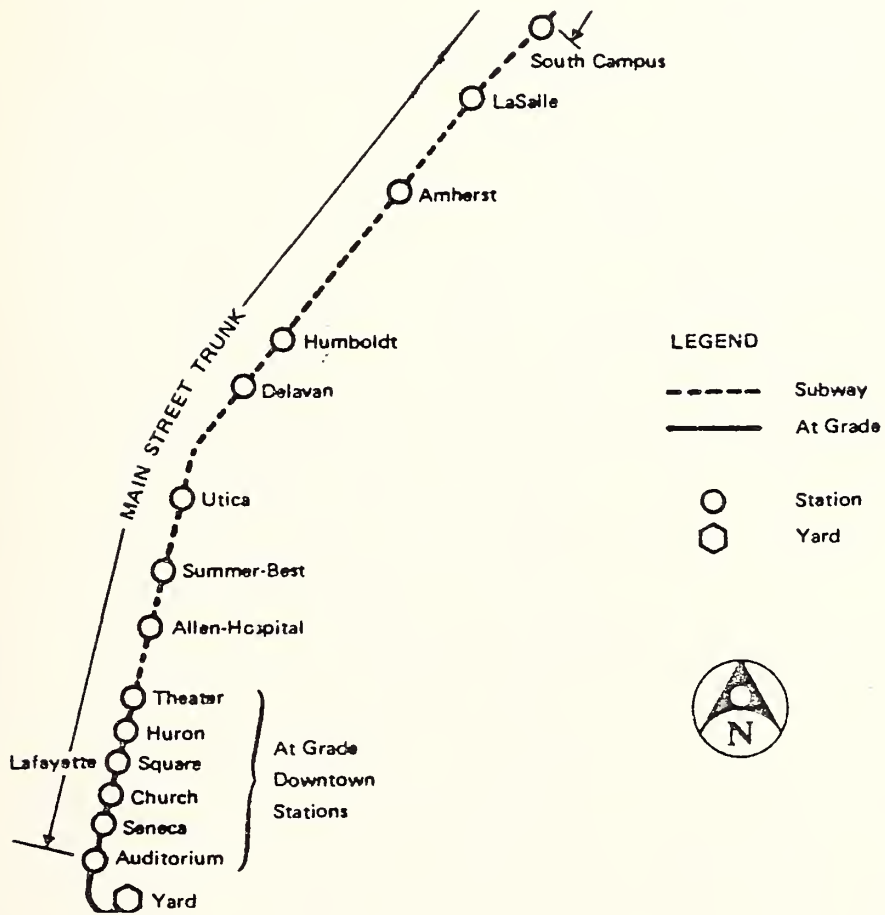
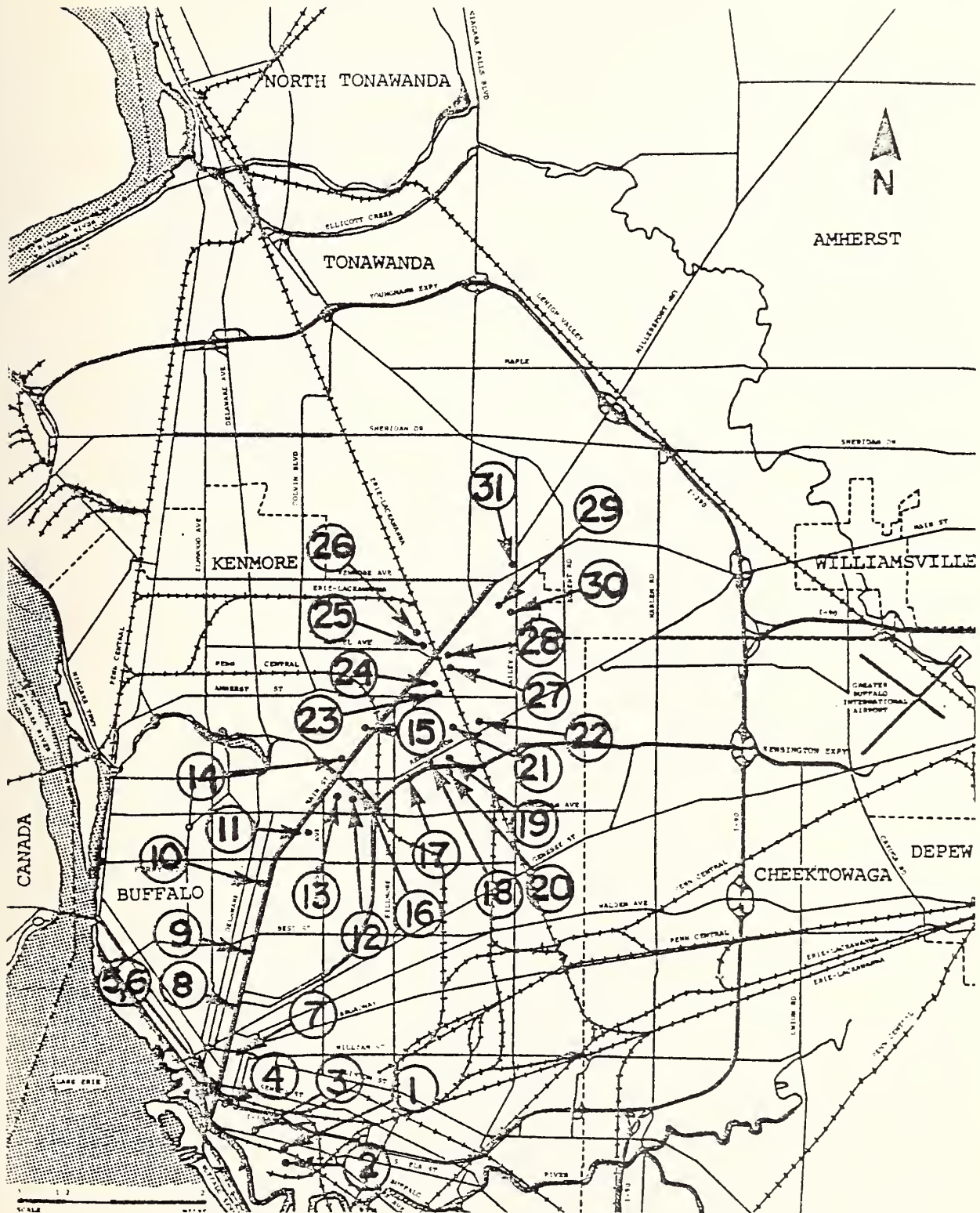




FIGURE 2



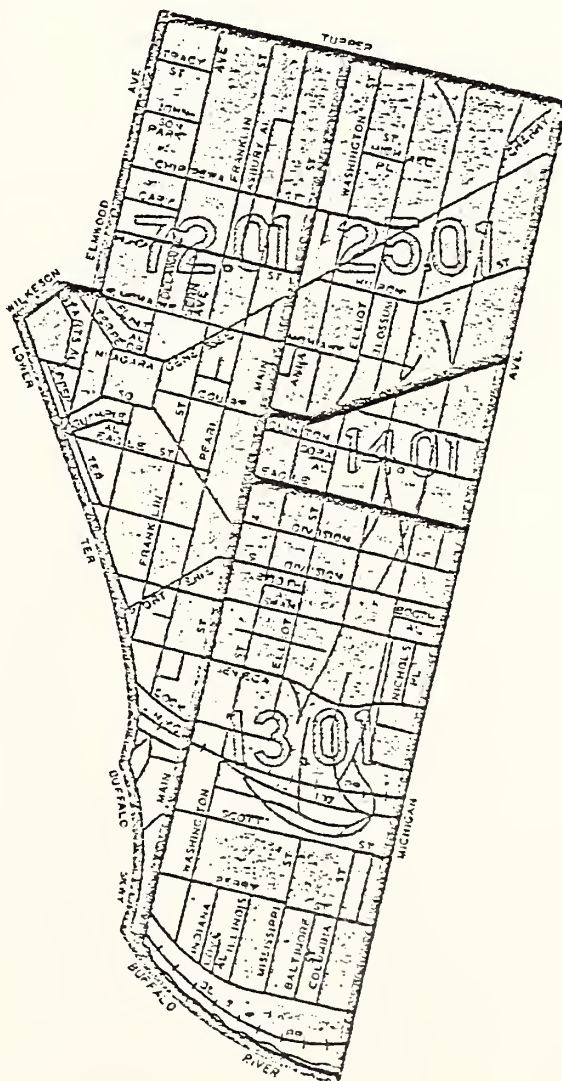
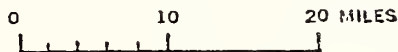
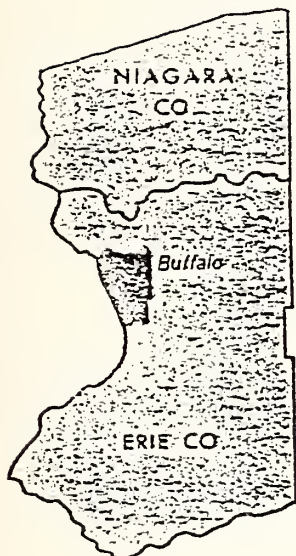
Sites for Studies of Noise Levels



FIGURE 3

# BUFFALO, N.Y.

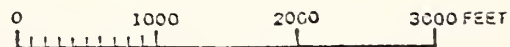
## Standard Metropolitan Statistical Area and Central Business District



For use in  
Work Item 7

### BUFFALO

Comprising Census Tracts  
13.01, 14.01, 25.01 and 72.01





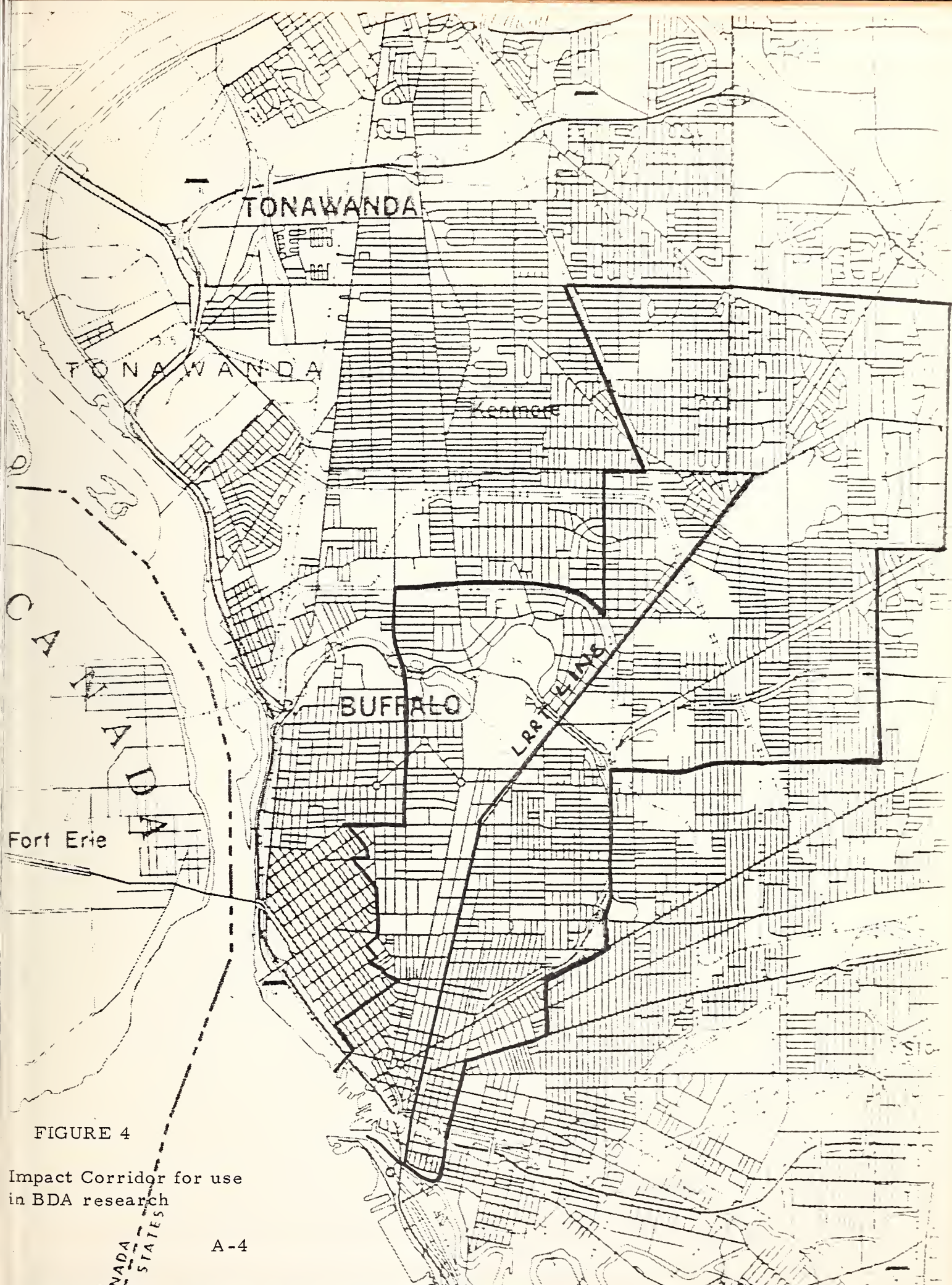


FIGURE 4

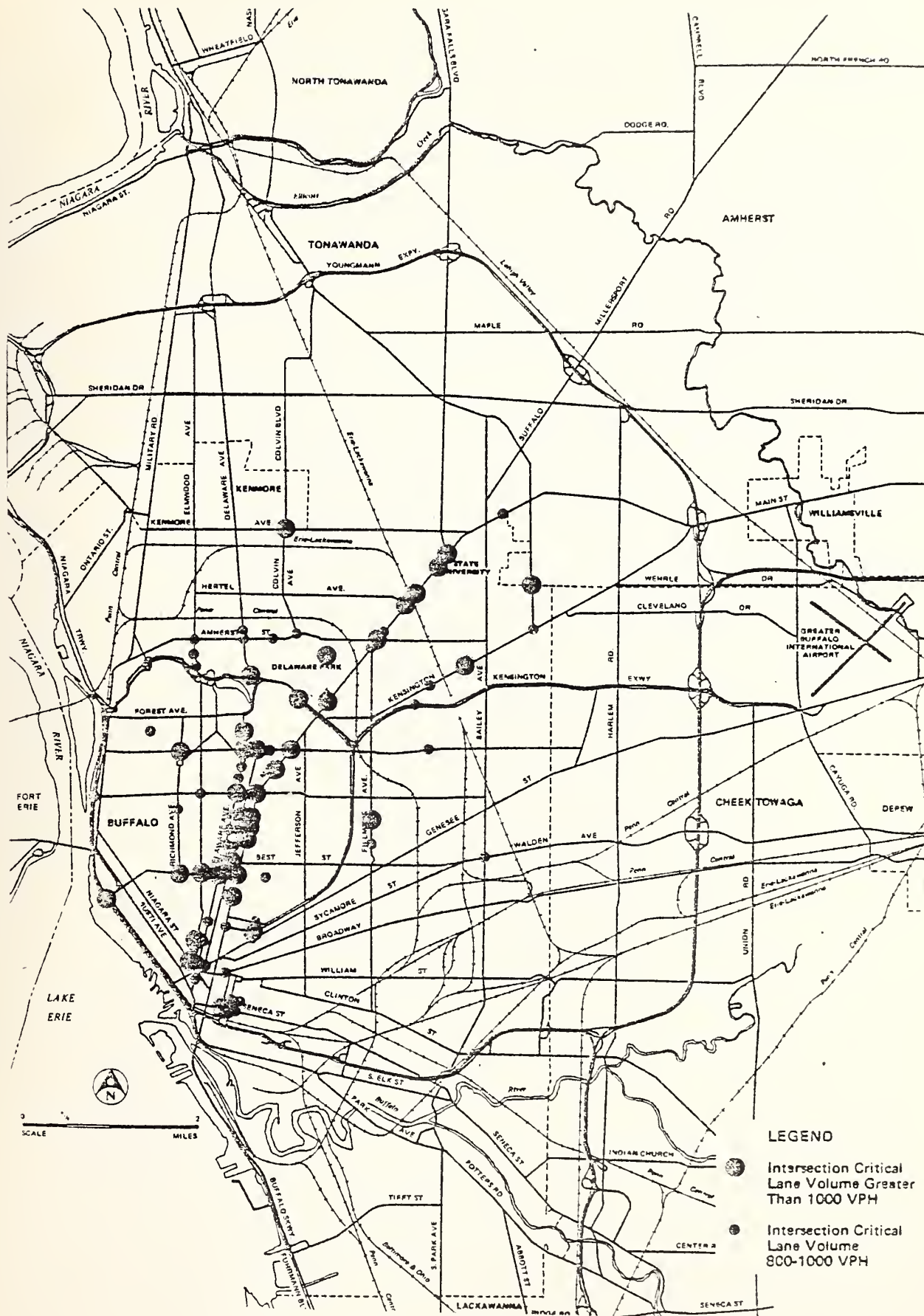
Impact Corridor for use  
in BDA research

CANADA  
STATES





Figure 5



Intersection Capacity Deficiencies  
 Source - Environmental Impact Statement  
 Buffalo LRRT Project









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