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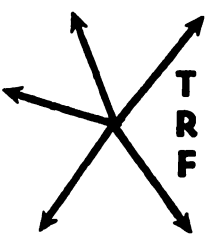

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THE FOLLOWING is a study of the current redevelopment of Roosevelt Island into a new town "intown" with a discussion of its proposed transportation elements. Of particular concern will be how the Island's transportation system has been viewed as instrumental in developing a balanced community, both in terms of its residential distribution and housing and also in preserving an open and pleasing community environment immediately adjacent to Manhattan.

Before discussing Roosevelt Island, it might be appropriate to review the pertinent aspects of new town development that have been taking place in the U.S. during the last ten years. New towns are an important factor in development in the United States. Government sees new towns as an important means of housing a large segment of our urban population. Not only are new towns visualized as absorbing an expanding population but they are seen as a way of relieving the pressures and congestion of our major urban areas. Theoretically at least, new towns altruistically attempt to reflect a heterogeneous population composed of varying incomes, backgrounds and age groups within a totally planned community. Although new towns are seen as being self-sufficient, they usually of necessity fall within the area of influence of an existing large central city.

In their efforts to create successful new communities, developers have generally planned for middle income families. The exclusion of low income groups is usually a result of the financing and planning process rather than of overt policy.[1] Robert C. Weaver has stated that "the vast majority appear destined to become country-club communities for upper income families."[2] In many cases, the exclusion of lower income residents appears to work against new towns as an answer to urban sprawl and instead tends to increase the imbalance between the inner city and suburb.

The absence of planning for the aged and lower income families is all too often reflected in the absence of a transit system that can fulfill a wide range of individual travel desires. Emphasis is still being placed on a road system that will allow maximum freedom of movement only for those with an automobile. Only in the densest centers is any provision made for either excluding the automobile or including mass transit as a viable element.

The development of new towns should encourage transportation planners to investigate new systems, hardware, and methodologies to satisfy and maximize two basic travel patterns. These are:

1) **Internal movements:** These are meant to increase accessibility to all parts of the community as well as supporting the necessary land uses. The quality of the overall system is important in attracting a desirable population mix; and

2) **External movements:** Essentially these are trips which connect the new town to the surrounding region. Residents still prefer to live a good distance from their place of employment, placing one end of the work trip outside of the community.[3]

It is these two patterns of mass transit and how they will be implemented in the Roosevelt Island Development that will be the main focus of this paper.

HISTORICAL BACKGROUND

Roosevelt Island is being transformed into a new town 'intown'. With the exception of two city hospitals, the island has lain virtually vacant since the 1930's when the city penitentiary was closed. Since that time it has been used only for city hospitals, nurses' homes and other public welfare institutions. Located in the East River between Manhattan and Queens, the island has always been viewed by developers as an ideal location for development. However, the island's relative inaccessibility, lack of community facilities and the unwillingness on the part of the City of New York to sell have always stood in the way of private development. Previous development proposals for the 167 acre island have included making it a site for a nuclear power plant, a center for industrial research, an exhibit center for U.N. member countries, a licensed gambling area and a former proposal for a new town intown, to house a total population of 70,000.[4] This last proposal should be looked at before studying current development plans.

In 1961 the City of New York was approached by a private development firm with plans done by Victor Gruen to create a new town intown community with schools, stores and churches. It would have its own subway connection to Manhattan. Known at the time as Welfare Island, it was to be renamed East Island and high rise apartment buildings would have been developed. In total, there would have been approximately 20,000 apartments primarily for middle income families with children. This would have resulted in an average population density of greater than 400 per acre.[5]

There were two unique planning ideas that have been partially incorporated into the present development:

1) No automobiles would have been allowed on the island except for hospital emergency and public safety traffic. All cars were to be stored in a central garage on the nearby Queens mainland.

Design and Planning of Mass Transit—Roosevelt Island: A New Town 'Intown'

*by Charles A. Ehrhorn**

2) Running through the major development would be an internal passenger and service transportation system for the island.[6]

No further information was available as to what became of this proposal or why it was rejected.

ROOSEVELT ISLAND

The development of Roosevelt Island may presage how new communities will be developed. The New York State Urban Development Corporation, through its subsidiary, Welfare Island Development Corporation, began construction of its planned development of the recently renamed Roosevelt Island in 1971. Completion is expected within the decade. The planners and developers are hopeful that the island will become a showpiece for the controversial New York State Development Corporation and its subsidiary. The U.D.C. was created by the State Legislature in 1968 to expedite housing and urban renewal with the capacity to over-ride local codes and ordinances. Before construction began, a 99 year lease was completed between the U.D.C. and the City with overall responsibility and coordination lying with the U.D.C. Planning and administration included a "team approach, a sensitive overall plan, a genuine racial and economic mix, and a powerful new government agency dedicated to new technology and equipped to bypass the usual snarls or red tape and to provide the funds necessary."[7]

The role of the Welfare Island Development Corporation has been to control the overall project, acting as land developer and financier. Its responsibilities were to define the original goals, hire architects and approve designs. The Corporation also chose builders and provided the mortgage. In addition the Roosevelt Island Development has been designated a "new community" by the federal government which opens the way to priority in obtaining federal grants for community facilities.[8] Federal aid is continuing to play a role in the form of supplementary grants of up to 20% from 13 basic community federal aid programs.

The basic town plan was done by Philip Johnson and John Burgee along with a team of ten New York and Boston architects. The final plan is for a comprehensive new town intown, an objective of which is to provide an "attractive, innovative and secure urban life for approximately 18,000 people."[9] When fully occupied it is planned to have a wide diversity of residents representing the full range of economic and ethnic variety of the region. Roosevelt Island will hopefully become an economically integrated, technologically innovative and environmentally balanced community.[10]

Major planning elements include housing and related facilities, parks and open space networks, internal transportation and external transportation. The development of the island is estimated to cost $325 million.

Housing and Related Facilities

Housing will include 5,000 dwelling units located in four major building clusters. The housing will be distributed with 30% for low income families, 10% of which will be for the elderly, 25% moderate income, 20% middle income and 25% luxury apartments. There will be no public housing even though the new town is being built by the efforts of a public agency and private firms working together.[11] Community facilities to serve this range of housing will include schools for 2,000 pupils, day care centers, public play rooms, arts and crafts shops, two indoor pools, a family care center and fire and police facilities for a town of 20,000. In addition there will be a total of 100,000 sq. ft. of shopping facilities, 100,000 sq. ft. of office space and a 300 room hotel. Project density will be approximately 110 dwelling units per acre.

The development plan calls for the town to be built in two stages related to the two major residential areas of the island: North Town and South Town. Both neighborhoods will be connected to a town center by the island's spine road, the town's only street. Initial construction is underway on North Town which will include a total of 2,100 dwelling units with initial occupancy slated for 1974. Housing will include both rentals and cooperatives. Forty year mortgages equal to 95% of development cost have been issued for the rental projects, while the cooperatives have been granted mortgages equal to 90% of cost.[12]

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All buildings are connected allowing all residents to have easier access to community and commercial facilities located on the ground floors of the buildings.[13]

Two city hospitals will continue to operate on the island. These are the Bird S. Coler Hospital at the northern end and the Goldwater Memorial Hospital to the south. It is projected that some patients will be able to move into publicly assisted apartments specially designed for their occupancy. It is also assumed that many of the staff members will desire housing on the island.

Parks and Historical Preservation

Five parks will be integrated into the project to separate the four major building clusters. Each park will have a different emphasis and will be related to a continuous network of pedestrian open space. One third of the island will be developed for park and open space use which will be developed as the community grows. A number of historical monuments are being restored within the parks. Linking these areas will be a promenade for bicyclists and pedestrians that will encircle the island. Tree lined pedestrian pathways will connect across the island with the promenade. The pathway system is a primary aspect in making the development pedestrian oriented.

Internal Transportation

Roosevelt Island will be the nation's first pedestrian town in which privately owned vehicles will be virtually banned, resulting in both safety and environmental benefits. To this end it is necessary to study how the internal movements will be handled. When completed there will be three interrelated systems that affect the capacity and efficiency of the island's internal movement system. These are the development of the Motorgate garage complex, the mini-bus transit system and a refuse collection service.

There are two unusual aspects to the island's transportation development: 1) the island, similar to the typical new town site, is virtually empty except for the two city hospitals. Therefore, the transportation network can be developed isolated from constraints imposed by obsolete systems, and 2) the island has only one bridge connection to the surrounding region, making it possible to control vehicular movement by limiting it to a town transit system and vehicles absolutely necessary to the community (public safety vehicles, delivery trucks).[14]

The Motorgate

All privately owned vehicles entering the town will be intercepted and required to park in the 2,400 car Motorgate garage, located at the island's only vehicular entrance. The garage is only accessible over the Roosevelt Island Bridge from the Queens mainland. It will be located in North Town and will have a direct connection with the island's transit and pedestrian systems. This will serve as a focal point for all of the island's movement systems—being a distribution point for both goods and people. Town car owners will pay graduated monthly rents according to income.[15] Daily rates are estimated at approximately $3.00 per day. This was based on existing rates in Queens and Manhattan.

Revenue from the Motorgate will include income from daily and monthly parking rates, and from rental charges for supermarket, cafe and car rental agencies. Although the Motorgate is not envisioned as providing a large profit, it is expected to produce enough income to break even or possibly to make enough to cover amortization and operating expenses.

"The Motorgate parking facility has two major functions to perform: a) provide parking facilities for residents, with admission regulated by monthly pass cards, and b) provide parking facilities for visitors, with appropriate charges based on the number of hours parked. These two functions would be controlled by a mini-computer, which would also maximize the utilization of the vacated resident spaces to visitors."[16]

A list of the functions and program costs of the computerized system appear in Appendix A.

In arriving at capacity requirements for the garage, the engineers used as a basis the expected economic makeup of the island and car ownership in both Queens and Manhattan. Initial estimates indicated a need for 1875 spaces for the completed development. Further, based on current practice of the New York City Housing and Development Administration of one space for every two apartments, the two stages of construction would require an initial provision for 1600 spaces with a possible later expansion to 2400 spaces. Because of the unknowns involved, it was recommended that the ultimate size of the garage be determined at a later development stage based on operational experience.[17]

The Motorgate is a primary component in the successful functioning of the island's transportation system and represents a key link between internal and external systems. As a major transfer point, the Motorgate is seen as providing several functions other than parking. Specifically, standing areas will be required for conventional buses from Queens, town mini-buses, taxis, and

rental cars. Provisions must be made for the easy transfer between these several modes that converge at this point. Space requirements as projected by the transportation engineers are:

1) space should be alloted for 5 conventional and 2 mini-buses during loading and unloading operations.

2) a taxi stand should be provided for approximately 6 taxis.

3) Rental car storage should be located at the garage entrance with a rental office at the plaza level of the Motorgate.

4) Elevators should be provided to facilitate the movement of the elderly and infirm.

5) The mini-bus garage should be located on the ground floor capable of storage for 20 vehicles, along with battery-charging and maintenance pits.[18]

Mini-Bus Service and Island Street Design

Having passed through the Motorgate and upon entering the new town passengers will have the option of either walking to their destinations or riding on one of several electrically powered mini-buses. This latter mode will provide a free, quiet, nonpolluting and prompt service to all parts of the island.

In designing the mini-bus system, it was projected that upon project completion it would have to be able to transport 6250 passengers during the peak period of 7-9 a.m.[19] The following criteria were established for the proposed intra-island transportation system design:

"Maximum total travel time between any building in North Town and any building in South Town should be equal to no more than 12 minutes, including walking time to and from transportation stops, waiting time, and actual riding time.

Transportation stops should be so arranged that walking distance from the front lobby of any building to the nearest stop is no greater than 1,000 ft. with special consideration for the elderly and infirm where practicable.

The vehicles should provide easy boarding for people with packages or small shopping carts, and for people in wheel chairs.

Although some seats should be provided for off-peak travel, a seated ride is not an important feature of rush hour travel because of the short travel time.

For reasons similar to the above, air conditioning during the summer is not an important requirement.

Minimum vehicle heating should be provided during the winter.

Consistent with the total travel time as stated above, the vehicular performance should be designed to maintain minimum power demand, minimum energy consumption, and minimum amount of air and noise pollution.

As a minimum requirement the transit system should continue to provide free service for intra-island hospital workers. Free transit for all intra-island travel should be considered."[20]

In selecting the appropriate mode, comparative studies were made between automated and manual systems. The automated service must operate without on-board attendants in order to be competitive with the manual systems. It is this aspect that necessitates grade separation for the entire system to avoid collisions and to maximize control over the vehicles. Two alternatives were studied for possible implementation, an above ground and a below ground system. In either case stations would be located within buildings as well as at the Motorgate and the two hospitals. Each vehicle would contain its own propulsion system with energy collected from conductor rails.

Although the automatic system would fulfill the planning objectives of a quiet, efficient, non-polluting transportation mode, there were basic considerations that led to rejecting this alternative:

1) high annual cost—$2,000,000/year
2) high installation cost—$10 million
3) inflexibility with respect to varying station stops
4) adverse effect on architectural treatment of individual building and the overall development, and
5) inflexibility results in being unable to implement the system in stages corresponding to the growth of the new town.[21]

See Appendix B for a comparison of intra-island transportation alternatives.

Two aspects were considered in choosing the non-automated or manual mode. These were the design and cost of the system. Mini-buses will have the characteristics of capacity, heating, seating and standards to the same extent as an automated carrier. However, it was felt that it would be better able to provide certain amenities such as ease in handling shopping carts, wheel chairs, and packages. The system will be able to operate over town roads and will be flexible enough to serve both an inner and outer loop. Both loops will originate at the Motorgate, travel through North Town and South Town with the outer loop serving the two hospitals at either end of the island. Mini-buses will stop at designated bus stops throughout each of the two routes. Stops will utilize slightly elevated boarding areas so that the level of the bus stop will be even with the floor of the bus. This will allow the easy access of wheeled vehicles.

Each vehicle will be able to maintain 20-25 mph on level ground with propulsion delivered by an electrical power plant. Headways will vary between 2-10 minutes. Other characteristics recommended by the transportation planners include wide passenger-operated doors centrally located, and spaces allocated on the interior for packages.

"The bus would be electrically propelled with power supplied by rechargeable batteries and would operate for as long as eight hours without recharging. Units would be arranged to operate in pairs in order to reduce the number of drivers needed. The total cost for a 50-passenger pair would be about $25,000. It is anticipated that 20 pairs would be required at a total capital cost of $500,000. Annual maintenance and operating costs for the full capacity system are estimated to be $461,000. The annual amortization cost of buses would be $72,000, based on a 10-year life span at 7.2 percent interest. The total annual cost would be $533,000."[22]

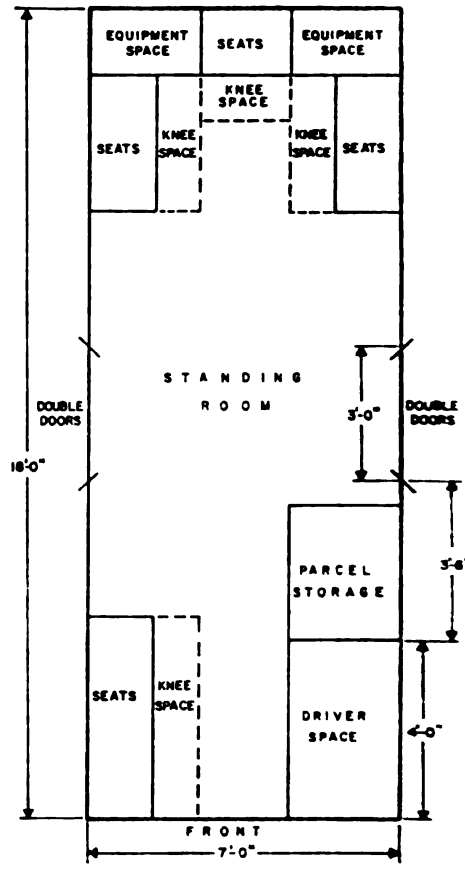
The primary advantage of the mini-bus system was seen in its relatively low cost, flexibility in routing and its easy implementation by stages.

Four systems of fare collection were investigated as to the most workable. Following are the findings of the study which resulted in a recommendation for free service: "a. Due to high labor costs, fare collection by an operator or conductor would cause the mini-bus operation to be prohibitively expensive for most commuters and thus counter to the purpose of the system; b. It would be equally expensive if the necessary equipment were installed to ensure prepayment before entering the bus; c. The honor system is impractical; and d. The turnstile or automatic gate approach inhibits the two-unit, center door design of the mini-bus and unnecessarily prolong the travel time."[24]

The transportation planners concluded their report on Roosevelt Island by recommending that a fleet of electrically powered mini-buses providing free service to all parts of the island be instituted.[25]

The Urban Development Corporation is in the process of buying mini-buses at a price of $35,000 each. These will operate up to 35 mph while running on 3,400 lbs. of lead acid batteries, capable of supplying power for 3-5 hours. The batteries can be exchanged within 5 minutes and need approximately four hours to recharge.[26]

In planning for the street network, the special vehicular needs of the two hospitals had to be taken into account. It was found that this traffic will be low enough to accommodate the planned pedestrian environment of the island.

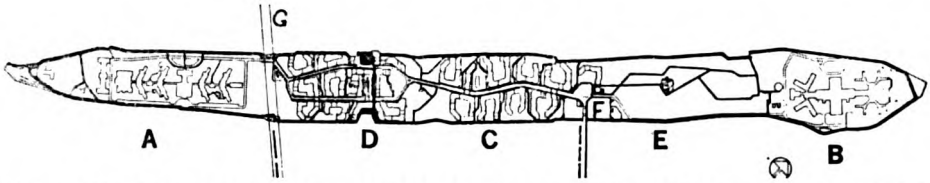


Mini-bus interior plan as recommended by the transportation engineers. Each vehicle when in tandem will have a capacity of approximately 50 passengers.[23]

The street network will consist of the central spine road, encircling promenade and cross streets. The main North-South road will run from the Bird S. Coler Hospital south through the town center to the Goldwater Memorial Hospital. The Roadway will be assigned two way traffic except in South Town where there will be a one-way loop. The encircling pedestrian promenade will have no vehicle traffic except for emergency vehicles. Connecting the main road with the promenade will be a system of 15 ft. wide emergency cross island roads. Like the promenade, these will be pedestrian centered areas.

Refuse Collection Service

In their efforts to maximize a unified and unimpeded pedestrian environment, the planners have gone to great lengths to keep service and delivery vehicles off the island. A partial solution has been



Plan of the Roosevelt Island Development showing the main road network and connecting pedestrian circulation. Elements include the Goldwater Hospital (A), South Town (D), North Town (C), the ecological park (E), the Bird S. Coler Hospital (B), Motorgate (F), and the Queensboro Bridge (G). The planner architect observes that the apparent meanderings of the street/pedestrian system are "planned to stimulate curiosity and avoid the monotony of a long straight road . . . The street is designed for visual drama as well as access."[27]

developed which will eliminate garbage trucks from the interior of the island. Instead, an underground pneumatic system will be installed that takes the refuse to a central compaction and transfer plant in the Motorgate building. Developed in Sweden, the system utilizes 20" vertical collection shutes and 20" pneumatic conveying pipes running from every building on the island to the Motorgate.[28]

External Transportation

"A Manhattan identity and direct transportation access to Manhattan is essential to all economic segments of the potential . . . population and basic to the success of the development."[29] The importance of access to Manhattan has been a prime consideration in the development of an external transportation system. Failure to provide the necessary access is seen as jeopardizing the viability of the new community and its long term success. Conversely, Roosevelt Island, with its 40 acres of parks is seen as a source of needed open space for present city residents. Two modes of exterior transportation will be discussed, the proposed subway and the aerial tramway.

Subway

A new subway route is currently under construction which will pass under the island connecting Manhattan and Queens. Construction will include a new station providing direct access to and from the new town center. Management of the new subway line will be by the M.T.A. However, the construction and operation of the new 63rd Street Subway Line is well behind schedule. At the time the lease was executed between U.D.C. and the city in 1969, the station was to have been in operation by 1976. However, under the revised construction schedule completion won't occur until 1980-1981. Because of the possible impact on the development caused by an excessive delay in providing this service, alternative modes have been investigated to fill this need in the interim.

Aerial Tramway

Prior to choosing the tramway as an interim solution, several alternatives were investigated. These included: 1) ferry service which was rejected as it would fail to provide reasonable connections to employment centers or public transportation facilities as well as having high operating costs and low carrying capacities; 2) Elevator bus on the Queensboro bridge was seen as possibly creating excessive congestion on the bridge plus requiring two new nonstandard vehicle sizes for the outer roadways. 3) Bus to subway stations in Queens was seen as taking additional travel time as well as presenting conflicts with an already over-utilized subway system.

Comparing these alternatives it was found that the aerial tramway will be the quickest and most direct access to Manhattan at a reasonable fare. As chosen, the tramway will have a terminal in Manhattan on the West side of 2nd Avenue between 59th and 60th Streets. The island terminal will be located adjacent to the Queensboro Bridge in a sports park. Combined capacity of the tramway will be approximately 1,700 passengers per hour in each direction. It will represent no new technology as it is a type currently manufactured in Europe. The projected cost is $2 million which will hopefully be offset by a user charge and by the attraction of tourists to the system.

The proposed tramway will be a double reversible system in which two cabins move back and forth between the terminals on separate travel paths.[31] One car will have a capacity of 100 to 125 in either direction with a trip time of approximately 3 minutes. This is at an average operating speed of approximately 13-14 mph. The frequency during peak periods will be 4 to 5 minutes. All mechanical equipment and operating controls will be located on Roosevelt Island, along with ticket processing, thereby reducing the spatial requirements of the Manhattan Terminal.

Aerial Tramway[30]

Each car will travel along a "two track, 2½" diameter wire rope cable."[32] Motive power will be supplied by a third traction cable. The cables will be supported from three towers, one on Roosevelt Island, and two on Manhattan. Power will be electrical energy with a standby generator in case of power failure.

In keeping with city requirements the Manhattan terminal will be raised 16 ft. above the street, allowing bus service to enter at a lower level. Access to the terminal platform will be by stair and/or ramp or special elevator to meet the needs of handicapped passengers. At the present time it appears that the proposed alignment will run along the north side of the Queensboro Bridge to its terminal on 2nd Avenue. This is partly due to vigorous public opposition that caused it to be moved from two previous locations.[33] This alignment will be along 60th Street which is characterized by commercial and auto related uses.

Diagrams 1, 2 and 3 illustrate the alignment characteristics of the tramway along 60th Street. It should be noted in diagram 3 that as the western most tower is moved westward, the line of travel will be raised thereby reducing the interference to adjacent properties.[34]

The transportation planners for Roosevelt Island were concerned primarily with making the new town an environment which maximizes pedestrian involvement and interaction. In planning for this objective both internal and external transportation systems had to be considered as well as their linkage.

During the course of my research several factors common to new town development became apparent:

1) No new town can be completely independent of large regional centers. It therefore becomes necessary that the internal transportation be designed as a

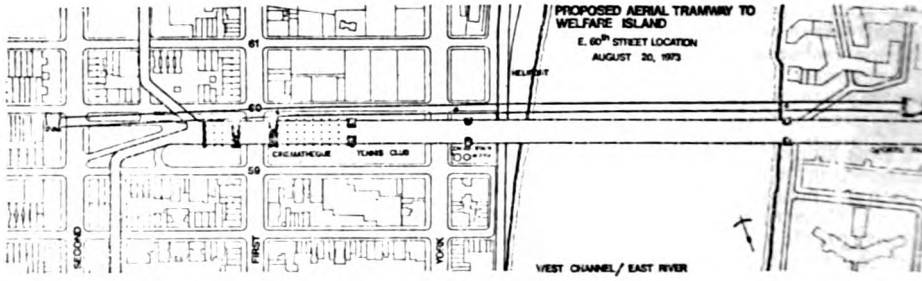


DIAGRAM 1

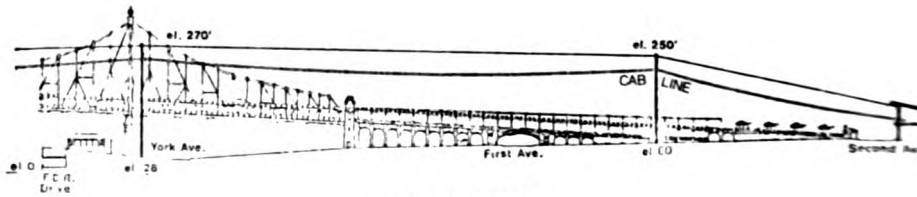
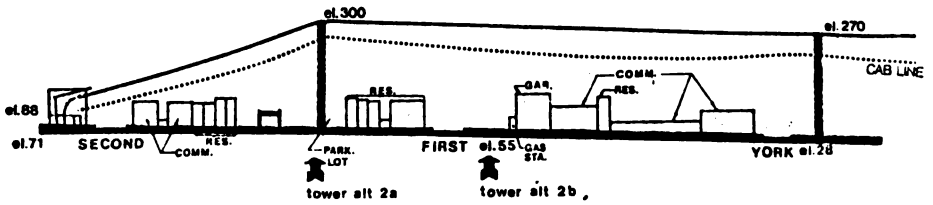


DIAGRAM 2



E. 60TH STREET LOOKING NORTH

DIAGRAM 3

complete system that links into larger regional movement patterns. Development of internal transportation should be in accord with regional transportation plans and should include interchange points connecting to the regional system.

2) The transit system should be able to start operations in the early stages of town development and be able to expand and extend its services as growth occurs. This is a primary consideration as it is important to counteract the early acceptance of auto use. Transportation habits are slow and difficult to change. An operating transit system is necessary if it is to meet the needs of an heterogeneous population.[35]

3) Provisions for both internal and external transportation should be flexible enough to coordinate with the social, economic and physical aspects of the new town in reaching community objectives.

4) Public transportation should have minimal adverse environmental effects and should blend into its surroundings.

5) Finally, planners should maximize any possibilties of securing federal or state funds. The purchase of equipment and facilities will demand extensive and immediate investments if the system is to succeed.

APPENDIX A[36]

FUNCTIONS TO BE PERFORMED BY PARKING SYSTEM AND ESTIMATED COMPUTER PROGRAM COSTS

FUNCTION	Estimated Program Cost
Read cards of residents entering and leaving garage and check. If valid, lift gate. Record in inventory	$ 8000
Count cars on each floor in and out, display status of empty spaces	2800
Count vehicles on/off-Island, display status	1200
Compute current statistics of overbooking of resident spaces by nonresident parkers	4000
Compute statistical and financial results for use by accounting	4000
Total programming costs	$20000

APPENDIX B[37]

COMPARISON OF INTRA-ISLAND TRANSPORTATION SYSTEM ALTERNATIVES

	Automated System	Non-automated System
Design Peak Hour Passenger Demand	4330	4330
Total Daily Passengers	25,000	25,000
Total Weekend Passengers	12,300	12,300
Total Annual Passengers	7,670,000	7,670,000
Capital Investment Cost to WIDC	$10,000,000	$500,000
Annual Amortization	$ 935,000	$ 72,000
Annual Operating and Maintenance Cost to WIDC	$ 300,000	$461,000
Total Annual Cost	$ 1,235,000	$533,000

FOOTNOTES

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19 Op. cit., Plate 7.
20 Op. cit., p. 2-67 and 2-68.
21 Op. cit., p. 2-127.
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23 Op cit., Figure 21.
24 Op. cit., p. 1-22.
25 Op. cit., p. 1-28.
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