HIGHWAY RESEARCH CIRCULAR

91

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Department of Traffic and Operations

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CLEVELAND TRANSIT AND PARKING OPERATIONS

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Cleveland Transit System

A. DESCRIPTION OF CLEVELAND TRANSIT SYSTEM

1. Territory Served

a. General Description of the Area -- The Cleveland Transit System, a municipally owned operation, provides urban transportation service in the City of Cleveland, Ohio, and 41 adjacent suburban communities, of which 32 are served in whole or substantially in whole and 9 in part. The area served is located in Cuyahoga County and to a small extent in the northwest corner of Lake County and the northeast portion of Lorain County. It covers approximately 140 square miles and has an estimated present population of approximately 1,637,000.

b. Population Growth -- The 1960 census population figures for 1960 and projection of the estimated population for 1970 and 1980 for Cuyahoga County, the City of Cleveland, and for Cuyahoga County excluding the City of Cleveland, are shown in Table 1.

Table 1
Cleveland and Cuyahoga County Population Data

Year	Cuyahoga County Population	City of Cleveland Population	%	Suburbs Population	%
1960	1,647,895	876,050	53	781,845	47
1970*	1,875,000	850,000	45	1,025,000	55
1980*	2,165,000	835,000	39	1,330,000	61

*Regional Planning Commission estimate.

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2. Property Description of Cleveland Transit System

a. Operating Routes -- There are 78 motor coach routes with 21 branches, which are operated over 714.5 route miles of regular service. The Rapid Transit System, described in detail in section A 3 operates over 14.92 route miles. In addition, 181.8 route miles of special bus service are operated providing special service to schools and industrial plants.

Figure I is a graph which shows the number of buses and rapid transit cars in service by 15-minute periods for a weekday schedule. As of December 28, 1966, a total of 935 buses and 88 rapid transit cars were available to operate this service.

3. Present Rapid Transit Operations

Fast private right-of-way transportation plus adequate parking facilities have proven to be a combination capable of drawing commuters to public transportation and, thereby, relieving the traffic load on city streets of Cleveland.

The C.T.S. Rapid is the most recent completely new rapid transit installation in the country. Its cost, over $38,900,000, is being paid for solely from farebox revenues of the Transit System. Its present route is 14.92 miles. It extends from the West Park Station (West 143rd St. and Lorain Ave. on the west side) to Windermere Station (Doan Ave. and Euclid Ave. on the east side).

The first section, 7.84 miles in length, from the Union Terminal to Windermere Station in East Cleveland, was opened on March 15, 1955, followed by the 5.24 mile section extending from the Union Terminal to West 117th St.-Madison Ave. on August 14, 1955. A 1.84 mile extension from West 117th St. to West Park Station was opened November 15, 1958, to complete the present system.

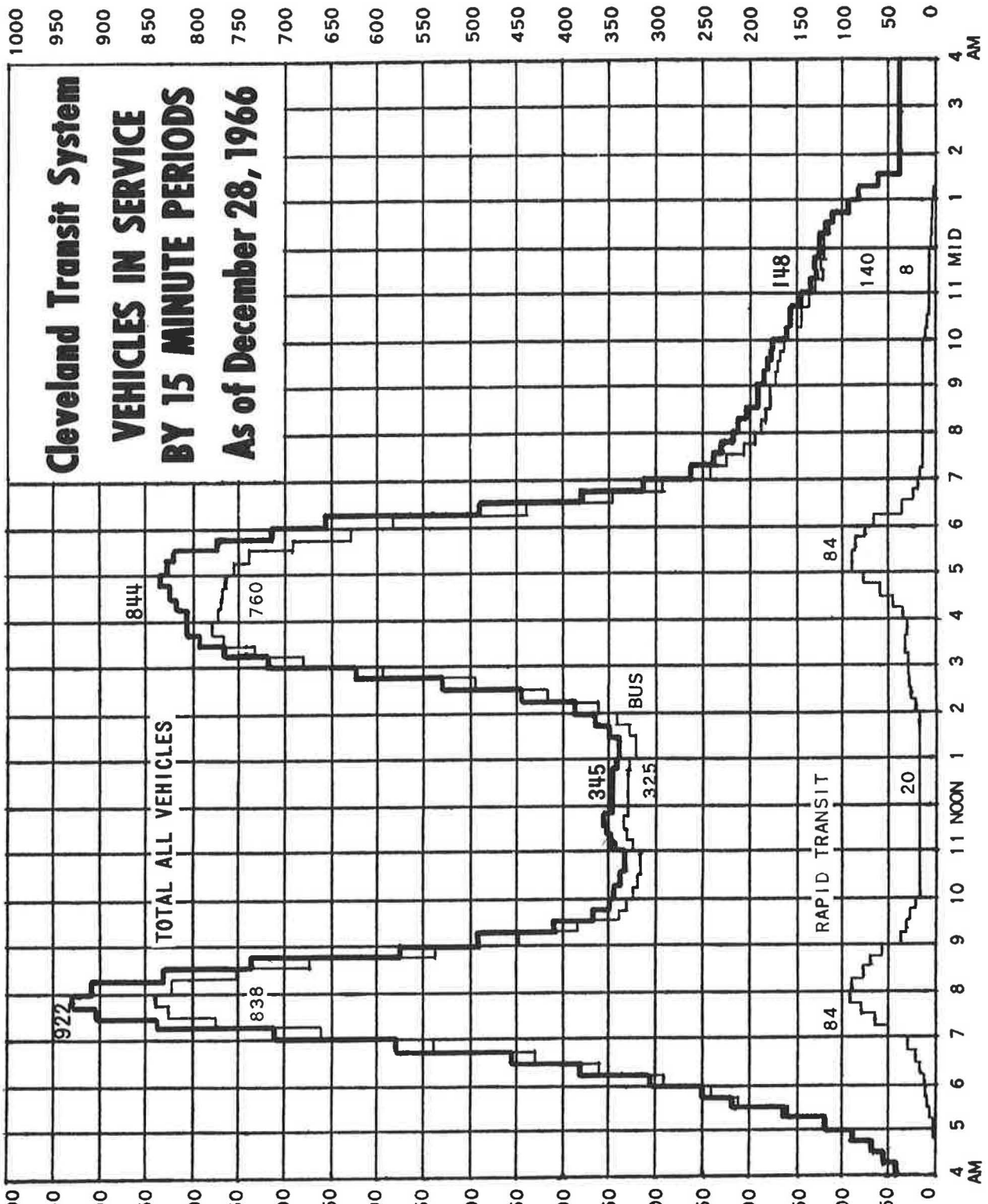
On June 30, 1966, construction was started on a four-mile extension to the Cleveland Hopkins International Airport. This project is described under item E.

Figure II shows the sectional development of the present C.T.S. Rapid Transit route and connecting major highway arteries.

The C.T.S. Rapid is a completely grade-separated, high-level platform, rail operation constructed on mainline railroad right-of-way. It has fourteen stations which are spaced on the average of more than one mile apart. It is designed principally as a high-speed mass hauler between Downtown Cleveland and various collection and distribution stations to the east and west. At all of these stations, convenient transfer is provided with surface lines. At seven of the fourteen stations, special off-street bus terminals have been constructed adjacent to the Rapid so as to provide a sheltered connection. Fifty-seven C.T.S. bus lines and one bus route, operated by the North Olmsted Municipal Bus Line, provide bus feeder service to the fourteen rapid transit stations.

The automobile is recognized as an important feeder to the Rapid as is evident through the provision of extensive "Park 'N Ride" facilities. A total of 5,295 parking spaces (5,218 free, plus 77 metered spaces) are provided at seven rapid stations.

Figure I


Cleveland Transit System
VEHICLES IN SERVICE
BY 15 MINUTE PERIODS
As of December 28, 1966
TOTAL ALL VEHICLES
922
838
844
760
345
325
BUS
RAPID TRANSIT
84
20
84
148
140
8
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
4 AM
5
6
7
8
9
10
11 NOON
1
2
3
4
5
6
7
8
9
10
11 MID
1
2
3
4 AM


LAKE ERIE
CLEVELAND
INAUGURATED
March 15, 1955
August 14, 1955
November 15, 1958
Fall 1967
RAPID TRANSIT PARKING SPACES
1. Brookpark 1250
2. Puritas - W. 150th 1250
3. West Park 2000
4. Triskett 1200
5. W. 117 - Madison 575
6. W. 98 - Detroit 315
7. East 55th 85
8. Superior 150
9. Windermere 900
Figure II

In addition, "Kiss 'N Ride" facilities are provided at six stations so that Rapid passengers may be conveniently dropped off or picked up at the Rapid Transit stations. The importance of "Park 'N Ride" and "Kiss 'N Ride" to the success of this system is illustrated by a recent post card survey taken at the West Park and Triskett Rapid stations. This survey indicated that 2,480 passengers or 55% of the passengers entering these stations, in the peak morning rush hour, arrive by auto - 46% parkers and 9% "Kiss 'N Ride" drop-offs. Another survey indicated that parking spaces are being used at the rate of 1.3 cars per day with an average of 1.2 passengers per auto. The "Park 'N Ride" and "Kiss 'N Ride" facilities at West Park Station are shown in Figure III and at the Triskett Station in Figure IV.

The Cleveland Rapid is now handling approximately 60,000 passengers per weekday. On shopping nights, this increases by 6,000 and has peaked to over 80,000 during the Christmas and Easter shopping seasons.

The Cleveland Rapid Transit System was designed to provide a convenient change of mode facilities for "Park 'N Ride" and "Kiss 'N Ride" automobile passengers.

It reaches out 7.8 miles to the east and 7.4 miles to the west from the center of the city so as to intercept automobile commuters at points beyond the congested area. This concept provides a high-speed rail rapid transit service into the Central Business District, resulting in a strong incentive for people to use Rapid Transit service instead of driving in heavily congested areas. As a result, traffic on arteries from these areas has been reduced, and, therefore, tends to reduce traffic congestion at parking garages. In addition, it also relieves local street congestion by removing buses which would be required to handle these longer ride passengers if the Rapid did not exist. This concept has been widely accepted by Clevelanders as indicated by the steady increase in the number of Rapid riders at stations with large parking lots.

It is also interesting to note that more than one and one-half times as many people are now carried across the Cuyahoga River on the Rapid over one track in the PM peak hour as are moved by automobiles in the three westbound lanes over the High Level Bridge, just west of Public Square. In the peak hour, the High Level Bridge is operating at maximum capacity while the Rapid is capable of handling much larger volumes as they develop, and they will develop, at no extra capital expense except for the purchase of additional cars.

a. Stations, Distances, Running Time -- Table 2 shows the fourteen stations, distance between them and scheduled running time on the present route.

b. Table 3 shows the number of trains, cars used, and headways (service frequency) operated during the various periods of the weekday schedule.

In the morning 12 express trains and in the evening rush hours 14 express trains operate between West Park Station and the Cleveland Union Terminal (Public Square). These express trains operate non-stop for a distance of 5.25 miles between West 117th and the Public Square Station.

The time saving which the Rapid has made possible is impressive. The running time from Windermere to the Cleveland Union Station is 17 minutes as compared to 36 minutes for the Euclid Express bus No. 28 operating between the same points over

Figure III

WEST PARK RAPID TRANSIT STATION FACILITIES FOR PARK 'N RIDE -- KISS 'N RIDE PASSENGERS

2,000 Parking Spaces -- Two Lanes (50 autos) for Kiss 'N Ride Customers

Figure IV

TRISKETT RAPID TRANSIT STATION FACILITIES FOR PARKING
1,200 AUTOS AND SEPARATE LANES FOR 20 KISS 'N RIDE CUSTOMERS

Table 2
Distance and Running Times Between Stations

Station	Miles Between Stations	Miles From Downtown Cleveland	Scheduled Running Times in Minutes	
			Base	Rush
Windermere	---	7.86	-	-
Superior	.68	7.17	1	1
Euclid Avenue	.88	6.29	2	2
University-Cedar	.85	5.44	1	1
East 105th Street	.67	4.77	2	2
East 79th Street	1.16	3.61	2	2
East 55th Street	1.05	2.56	2	2
C. U. T. (Pub. Sq.)	2.55	0.00	5	5
West 25th Street	1.06	1.06	2	3
West 65th Street	1.87	2.94	3	3
West 98th Street	1.37	4.31	3	3
West 117th Street	.94	5.25	3	3
Triskett	.77	6.02	2	2
West Park	1.07	7.09	2	2
Total	14.92		30	31

Table 3
Rapid Transit Trains, Cars and Headways

Time Period	No. of Cars	No. of Trains	Average Headway	
			East	West
AM Rush	84	19	6 min.	3 min.
Day Base	20	18	4	4
PM Rush	84	19	6	2.75
Night to 10 PM	16	8	10	10
After 10 PM	8	8	10	10

Table 4 - Rapid Transit "Park 'N Ride--Kiss 'N Ride" Facilities

Rapid Transit Station	No. of Bus Berths	No. of Bus Feeder Lines	No. of Parking Spaces	Kiss 'N Ride Auto Capacity
West Park	7	6 (a)	2,000	50
Triskett	3	2	1,200	20
W. 117th-Madison	8	4	575	20
W. 98th-Detroit	4	3	315	15
W. 65th-Madison	1	4	0	--
W. 25th-Lorain	2	14	0	--
C. U. T. (Pub. Sq.)		2 (b)	0	--
East 55th Street	1	2	85	--
East 79th Street	1	3	0	---
East 105th-Quincy	1	2	0	--
University-Cedar	8	10	0	5
Euclid-East 120th	1	4	0	--
Superior	3	3	160	10
Windermere	12	6	960 (c)	15
Total	52			135
		Total Parking Spaces	5,295	
		Metered Parking Spaces	77 (c)	
		Free Parking Spaces	5,218	

(a) Includes one line operated by the City of North Olmsted Municipal Bus Line.

(b) Connections with A, B, and E Loop Lines and other downtown routes to provide distribution in the Central Business District.

(c) Includes 77 metered parking spaces (3 hours - 10¢; 4-1/2 hours - 15¢; 6 hour maximum - 20¢)

a shorter route. A similar comparison on the west side shows the Rapid requiring 16 minutes from West Park Station to Cleveland Union Terminal as compared to 34 minutes for the Lorain Express bus No. 85. Total running time from one end of the line to the other ranges from 30 to 31 minutes which gives an average speed range of 29.8 to 28.9 miles per hour.

The basic weekday service of a 4-minute headway and a 10-minute headway on Sunday and during early morning and evening hours is operated with a one-car, one-man train. Increased rush hour service is provided by lengthening the base trains to two, four, or to six cars, and are operated with 2 men.

c. The present equipment consists of 88 steel rapid transit cars with bodies 48'6" long and 10' wide and seating 52 or 54 passengers. This fleet is made up of eighteen (18) single car units and seventy (70) semi-permanently coupled into 2-car units. All car units have fare boxes immediately adjacent to the operator's cab for use when cashiers' booths at the stations are not manned.

High-level platforms are in use at all of the Rapid Transit stations.

B. RAPID TRANSIT PARKING LOTS, "PARK 'N RIDE--KISS 'N RIDE" FACILITIES AND BUS FEEDERS

1. Rapid Transit Parking Lots

Table 4 shows the bus feeder routes, parking spaces, and "Park 'N Ride--Kiss 'N Ride" facilities at each Rapid station. The above parking lots are easily accessible to and from main highways. See Figure II.

Parking lot driveways and stalls are designed for maximum number of parking spaces. Adequate space is available at each station except at Triskett and West Park. This condition will be remedied when the Airport extension will be completed within 18 months.

Figure V shows the origin area of Rapid Transit riders using the Triskett or West Park Rapid stations who arrive at these stations by automobile - either "Park 'N Ride" or "Kiss 'N Ride".

The ten suburbs adjoining Cleveland to the west and southwest have a population density of only 2.5 PERSONS PER ACRE.

2. Free Parking

Practically all parking is "free". It was determined that because of the operating costs and investment charges required for transporting potential "Park 'N Ride" passengers to the stations on feeder buses, it would be more economical to provide "free" parking if parking facilities could be built at a cost not to exceed $500 per car space. This $500 per car space was not exceeded at any lot and our average cost is under $300 per car space.

Table 5 shows costs at four representative parking lots.

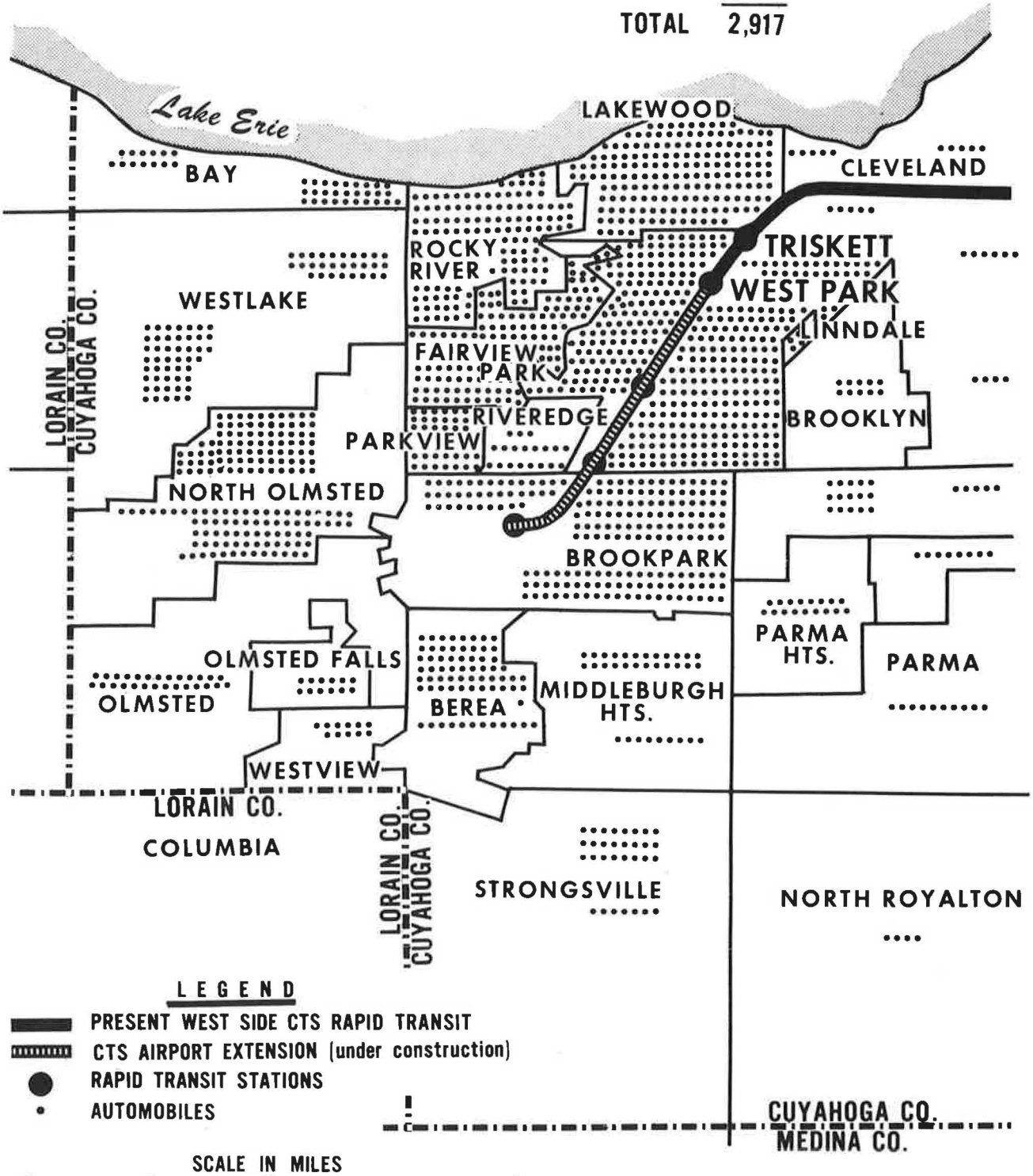
Figure V

CLEVELAND TRANSIT SYSTEM

RAPID TRANSIT PARK-N-RIDE ORIGIN SURVEY

FEBRUARY 25, 1966

AUTOS PARKED AT WEST PARK STATION	1,860
AUTOS PARKED AT TRISKETT STATION	1,057
TOTAL	2,917



Data excludes turnover during entire day

NOTE: Area constitutes approx. 60 sq. miles with avg. population density of 2.5 persons per acre.

Table 5 - Parking Lot Land and Paving Costs

	Land Cost	Paving Cost	Total	No. Cars	Cost Per Car
Doan-Elderwood	$ 27,500	$ 14,800	$ 42,300	128	$330.50
West 117th	75,000	22,000	97,000	196	494.89
Triskett	96,000	207,000*	303,000	1,200	252.50
West Park	261,380	256,000	517,380	2,000	258.62

* Includes $55,730 (7,285 sq. yds.) of 8" concrete for bus roads.

3. Windermere Short-Term Parking

Parking was increased at a prime location at Windermere Station, the easterly terminus. However, women shoppers complained that when they arrived at 9:00 a.m., all parking was gone and they had to park on the outer fringes resulting in a long walk to the station. The Transit Board decided to do something for these women shoppers and other passengers who had to get downtown in midday for short periods. Since the Transit Board had set a policy of "free" parking for rapid transit riders, a parking lot in front of the station fronting on Euclid Avenue was leased to the City of East Cleveland at $1 per year. The City of East Cleveland installed parking meters for 77 cars with a parking charge of 10 cents for 3 hours; 15 cents for 4-1/2 hours; or a maximum of 20 cents for 6 hours. The revenue was collected by the City of East Cleveland to amortize the cost of the parking meters. After the parking meters were amortized, the City of East Cleveland turned over all money collected in excess of that required for maintenance of the parking meters to the Cleveland Transit System.

4. Improved Parking Facilities - West Side Extension

a. Construction of a 2-mile extension of the Rapid from West 117th Street westerly to West Park Station was started in 1957 with operation beginning November 15, 1958. Operating experience since 1955 proved that more ample and improved facilities for "Bus 'N Ride", "Park 'N Ride", and "Kiss 'N Ride" passengers should be provided. Fortunately, available large acreage was purchased for the two new stations - Triskett and West Park. Enough property was acquired so that ingress and egress for automobiles and buses could be provided via two thoroughfares at each station.

b. The West Park and Triskett stations were constructed in the center of each station property so that the parking lot would fan out in a semi-circle from the station. This arrangement minimized the walking distance from the automobiles on the fringes of the lot to the station. Sufficient space was provided at reserved "Kiss 'N Ride" lanes. The "Kiss 'N Ride" traffic does not present a problem in the morning since passengers are dropped off and the autos are driven out of the parking lot. In the evening, however, the "Kiss 'N Ride" automobile driver may arrive 10 or 15 minutes ahead of the rapid transit passenger and space must be provided along the roadway for this short-time parker.

5. Need for Parking Spaces Underestimated

a. Originally parking for only 600 cars was provided at Triskett Station and for 800 cars at West Park Station when the new facility was opened on November 15, 1958. At the end of the first week, parking facilities at these two new stations were filled beyond capacity and steps had to be taken to immediately pave the remaining portions of the available land. We had seriously underestimated the "hunger" for these convenient and attractive facilities by automobile users.

b. The following spring (1959), all available land then owned at these two stations was paved to provide the much needed additional parking capacity.

In 1960, additional land was purchased and paved at the West Park Station, thereby, increasing this station to 2,000 spaces. It should be noted that in less than three years, the parking capacity at these two new west side rapid transit stations was more than doubled--from 1,400 to 3,200 spaces.

6. Parking Lot Traffic

a. To expedite traffic to and from the parking lots at Triskett and West Park stations, the Traffic Engineer of the City of Cleveland installed traffic lights at two of the CTS drives and the local major street. He also provided a special left turn lane with a traffic light on Lorain Ave. for entrance to the West Park parking lot.

b. Tables 10 and 10a show the mode of travel used by the passengers using the West Park and Triskett stations by hours for the 12-hour period from 6:00 a.m. to 6:00 p.m. on March 24, 1964, and April 16, 1964, respectively. A summary of this data for the 12-hour period is shown in Table 6.

Table 6
Mode of Travel to West Park and Triskett Stations
March - April 1964

	PASSENGERS USING			
Mode of Travel	West Park	Triskett	Combined Total Passengers	%
Auto:				
Park 'N Ride	2,159	1,480	3,639	36.5
Kiss 'N Ride	1,038	447	1,485	14.9
Subtotal	3,197	1,927	5,124	51.4
Feeder Bus	3,669	768	4,437	44.6
Pedestrians	86	316	402	4.0
Total	6,952	3,011	9,963	100.0%

c. Table 10b shows the hourly turnstile count for passengers boarding at each station on Friday, March 25, 1966. This table shows that a successful rapid transit service can be operated on a rather modest peak rush hour passenger volume--7,400 on the west side and 3,100 on the east side.

d. Table 11 shows the outbound automobile traffic at West Park Station in the afternoon peak rush hours between 4:00 p.m. and 6:00 p.m. In the peak 15 minute period from 5:30 to 5:45 p.m., 383 outbound autos used the two exit roadways, or at the rate of more than 1,500 autos per hour.

e. With turnover, at least 4,200 autos are intercepted at Triskett and West Park stations at distances of approximately 6 to 7 miles from Downtown Cleveland. As a result, rush hour traffic congestion on heavily traveled roads between these stations and the downtown business area was substantially reduced according to the Commissioner of Traffic, Engineering and Parking.

With the 2,095 parking spaces at the five additional rapid transit stations listed on page 6, a combined total of approximately 7,000 automobiles are intercepted by the rapid transit parking lots located from approximately 3 to 8 miles from the Downtown Cleveland business district.

f. In addition to relieving rush hour automobile traffic on thoroughfares from areas served by these rapid transit stations and the central business district, the present 5,295 rapid transit parking spaces help to cut the demand for conversion of valuable downtown land to downtown parking facilities.

At least 40% of the Cleveland central business district land area is now devoted to roads and parking space.

7. Parking Area Pavement, Driveway, and Stall Dimensions

a. All of the parking lots at the rapid stations are self-parking lots. Practically all parking stalls are lined for right angle parking. The spaces measure 8'6" x 18'. The driveways are 22' wide.

b. There are no barriers between car rows. Car spaces are outlined with paint on the parking surface as shown in Figures VI and VII.

c. Steel posts cut from old trolley poles, are used to delineate the main drives. They are also used for protection to fencing and structures.

d. Pedestrian walks are raised 6" above the parking surface and constructed with a minimum of 6' in width so that they can be plowed free of snow with snow removal equipment.

e. Incandescent floodlights are used for parking lot lighting. Lights are mounted on old steel trolley poles so as to give 0.5 foot candles at the ground level.

f. The parking surface is constructed with the Ohio State Highway macadam pavement B-20 to which is added a surface seal treatment in accordance with Ohio

STRIPED PARKING STALLS AT WEST PARK STATION
8'6" x 18' for Right Angle Parking - Driveways are 22' Wide

Figure VI

STRIPED PARKING STALLS AT WINDERMERE STATION
8'6" x 18' for Right Angle Parking - Driveways are 22' Wide

Figure VII

State Highway specification B-33. The B-20 calls for an 1" inverse choke of screenings #7, then a 5" layer of coarse aggregate #12 which is then choked with another 1" application of screenings. After the B-20 pavement has been constructed, it is surface treated as follows:

(1) Penetrate surface with 0.4 gallon of MC-1 liquid asphalt per yard.

(2) Spread #46 slag at the rate of 30 pounds per square yard and thoroughly roll and broom.

(3) After 4 hours, apply 0.35 gallon of RS-2 asphalt emulsion per square yard.

(4) Spread #6 slag at a rate of 22 pounds per square yard and thoroughly roll and broom.

(5) Apply 0.4 gallon of RS-2 asphalt emulsion per square yard.

(6) Spread #6 slag at a rate of 22 pounds per square yard and thoroughly roll and broom.

g. The driveways in the parking lots are constructed with a 6" base of B-20 and then paved with 3" of asphalt which is Ohio State Highway specification T-35A.

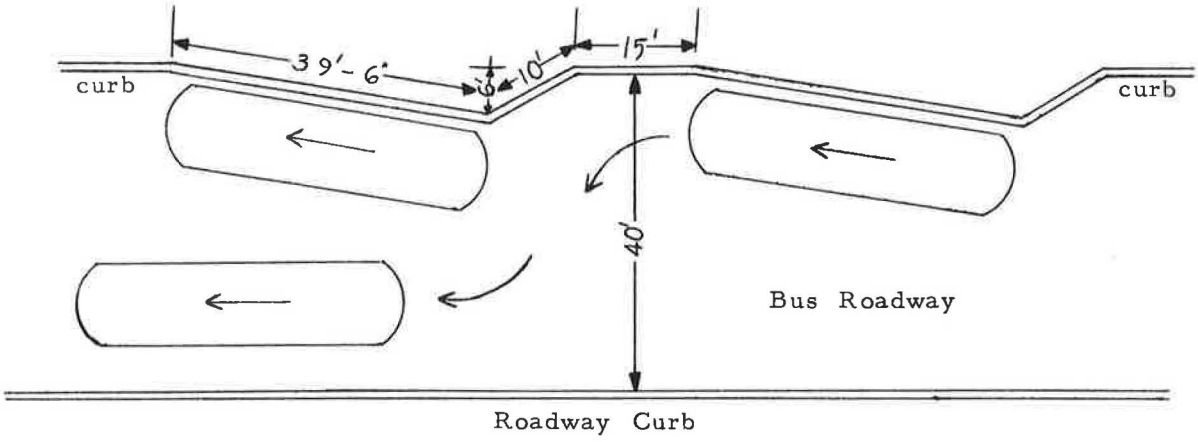
h. The roadways for the "Kiss 'N Ride" traffic are paved with asphalt. A raised concrete platform is provided for these auto passengers. Aluminum shelters with benches are provided so that the passengers can have protection while waiting for their private transportation.

i. The bus driveways and loops are constructed with 8" concrete, air-entrained, with no reinforcement and no base. Contraction joints were installed every 20 feet with dowels used at construction joints. This type of pavement for bus driveways was recommended by the Portland Cement Association and has held up well.

8. Sawtooth Bus Loading Platforms

The buses had some difficulty when pulling into the loading platform in front of another bus at stations on our original 13 mile rapid transit lines. Because of this condition, a sawtooth loading platform was designed for West Park and Triskett stations to facilitate the pull-in. The sawtooth platform practically forces the bus operator to pull in with both front and rear doors of the bus aligned with the curb. The following sketch shows the design and dimensions of this type of loading platform.

Bus Loading Platform



The sawtooth loading platform provides a more flexible bus operation and also provides a separate loading berth for each bus line serving the station. Figure VIII illustrates this type of bus loading platform.

9. Undercover Passenger Protection from Elements

a. Bus passengers are discharged and picked up at a canopied platform at the station. They are protected from inclement weather from the time they leave the bus until they board the rapid train. (See Figure IX).

b. The rapid transit train stations have center platforms. Pedestrian tunnels under the track are used by passengers to get to and from the parking areas and to the bus station.

c. Escalators are provided at the station stairways for the convenience of the passengers in the up direction only.

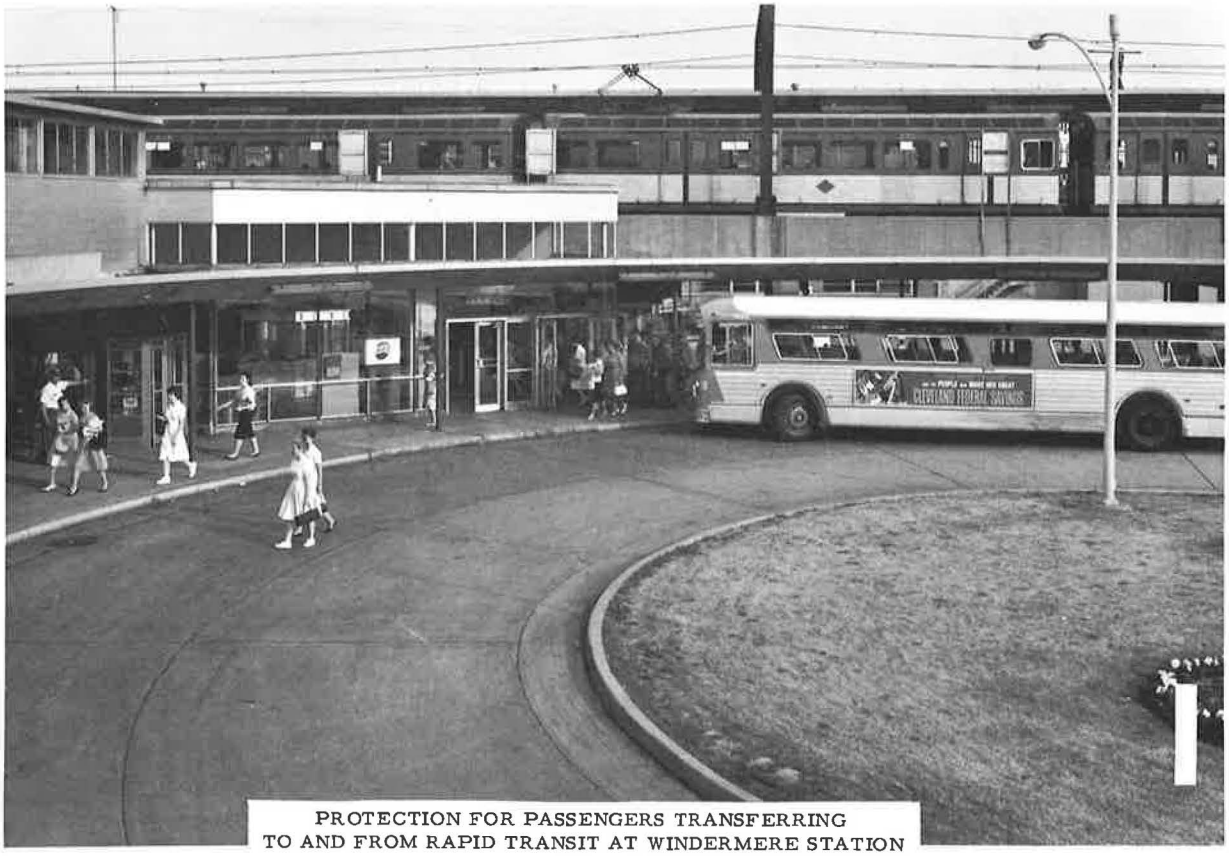
d. Heated enclosures, built on the rapid transit train platform at the head of the stairs and escalator, are of sufficient size to take care of passengers waiting to board rapid transit trains.

e. Fare collection facilities are in the rapid transit station building located on the bus platform.

f. Heated waiting rooms are equipped with benches, and space provided for concession areas at each station. Another facility provided at the rapid transit bus station for the convenience of passengers is a taxi stand with a cab phone.

CTS WEST PARK RAPID TRANSIT-BUS TERMINAL
SHOWING OUTBOUND "SAW-TOOTH" TYPE BUS LOADING BERTHS

Figure VIII



PROTECTION FOR PASSENGERS TRANSFERRING
TO AND FROM RAPID TRANSIT AT WINDERMERE STATION

C. RAPID TRANSIT ROUTE CHARACTERISTICS

The characteristics of the rapid transit route, the high standard of frequency of service, and the excellent condition of rapid transit cars serving the West Park and Triskett stations are summarized in Table 7.

D. NEED FOR DOWNTOWN RAPID TRANSIT DISTRIBUTION ROUTE

The Cleveland Rapid, like most of the commuter railroads in the country, is severely handicapped in that it has only a single downtown station. This station in the Union Terminal building (adjacent to Public Square) is located at the western edge of the downtown business district, approximately one-half mile from its center. Only 21% of those employed in the main core area are within 800 feet of this station. (See Table 8 and Figure X). The location of this terminal, with respect to most of the major retail and commercial establishments in Downtown Cleveland, makes it necessary for many Rapid passengers to transfer to special downtown loop and other regular route buses to reach their final destinations.

Lack of convenient delivery to most parts of the downtown area, plus the crowded conditions and inconveniences of the single downtown station, have kept patronage of the Rapid Transit System below its potential. If a downtown distribution subway were constructed, it is estimated that present number of passengers using the Rapid Transit System would at least be doubled, and a substantial number of C.B.D. oriented automobiles, particularly on the east side, would be intercepted at outlying rapid transit parking lots.

E. AIRPORT RAPID TRANSIT EXTENSION

A ground-breaking ceremony was held on June 30, 1966, for a four-mile, $14 million extension of the west side rapid to the Cleveland Hopkins International Airport. The ceremony was described as a momentously significant highpoint in transit progress in Cleveland.

The Honorable Robert C. Weaver, Secretary of Housing and Urban Development, who officiated at this ceremony, described the extension as being "the first modern rapid transit line in the nation serving both the downtown area and the airport which will provide attractive and comfortable high-speed trains, a convenient access road to airport parking lots, good parking facilities at transit terminals to lure the driver from the highway, and loading platforms at transit terminals to accommodate feeder bus lines and what you describe as 'kiss 'n ride' passengers."

Additional parking for approximately 2,500 automobiles will be provided at two new stations on this four-mile extension.

Twenty stainless steel rapid transit cars, purchased at a cost of $3,424,160 and delivered in October 1967, will be used on the new extension to the airport. The new cars are air-conditioned, 70 feet long, and seat 80 passengers each. The present Cleveland Transit cars are 48 feet long and seat 52 passengers. The entire car body is of stainless steel and the bodies are equipped with air-ride trucks.

TABLE 7

CHARACTERISTICS OF RAPID TRANSIT ROUTE

	WEST PARK STATION	TRISKETT STATION
Distance to C. B. D.	7.09 mi.	6.02 mi.
Time to C. B. D.		
Peak Hours - Local	15.0 min.	13.0 min.
Express	13.0 min.	11.0 min.
Off-Peak Hours	14.0 min.	12.0 min.
Service Frequency		
Peak Hours - Local & Express - AM	3.0 min.	3.0 min.
PM	2.7 min.	2.7 min.
Off-Peak - Local Service	4.0 min.	4.0 min.
After 7:00 PM - Local Service	10.0 min.	10.0 min.
Time by Auto to C. B. D.		
Peak Hours	25.0 min.	22.0 min.
Off-Peak Hours	20.0 min.	18.0 min.
No. of Express Rapid Transit Trains		
AM Peak	12	12
PM Peak	14	14
Express Service Frequency		
AM & PM Peak	6.0 min.	6.0 min.
Availability of Seats	Seats available for all boarding passengers	Seats available for 75% of boarding passengers

Age of Equipment	WEST PARK STATION		TRISKETT STATION	
Year Manufactured	Year	Cars	Year	Cars
	1954	44	1954	44
	1955	24	1955	24
	1958	20	1958	20
TOTAL		88		88

Rapid Transit Cars - Average Age	10.8 yrs.	10.8 yrs.
Condition of Rapid Transit Cars	Excellent	Excellent
Fare to C. B. D. - Cash	35¢	35¢
Tickets - 5 for $1.65	35¢	35¢
$4.25 Weekly Pass	Plus 5¢	Plus 5¢

TABLE 8

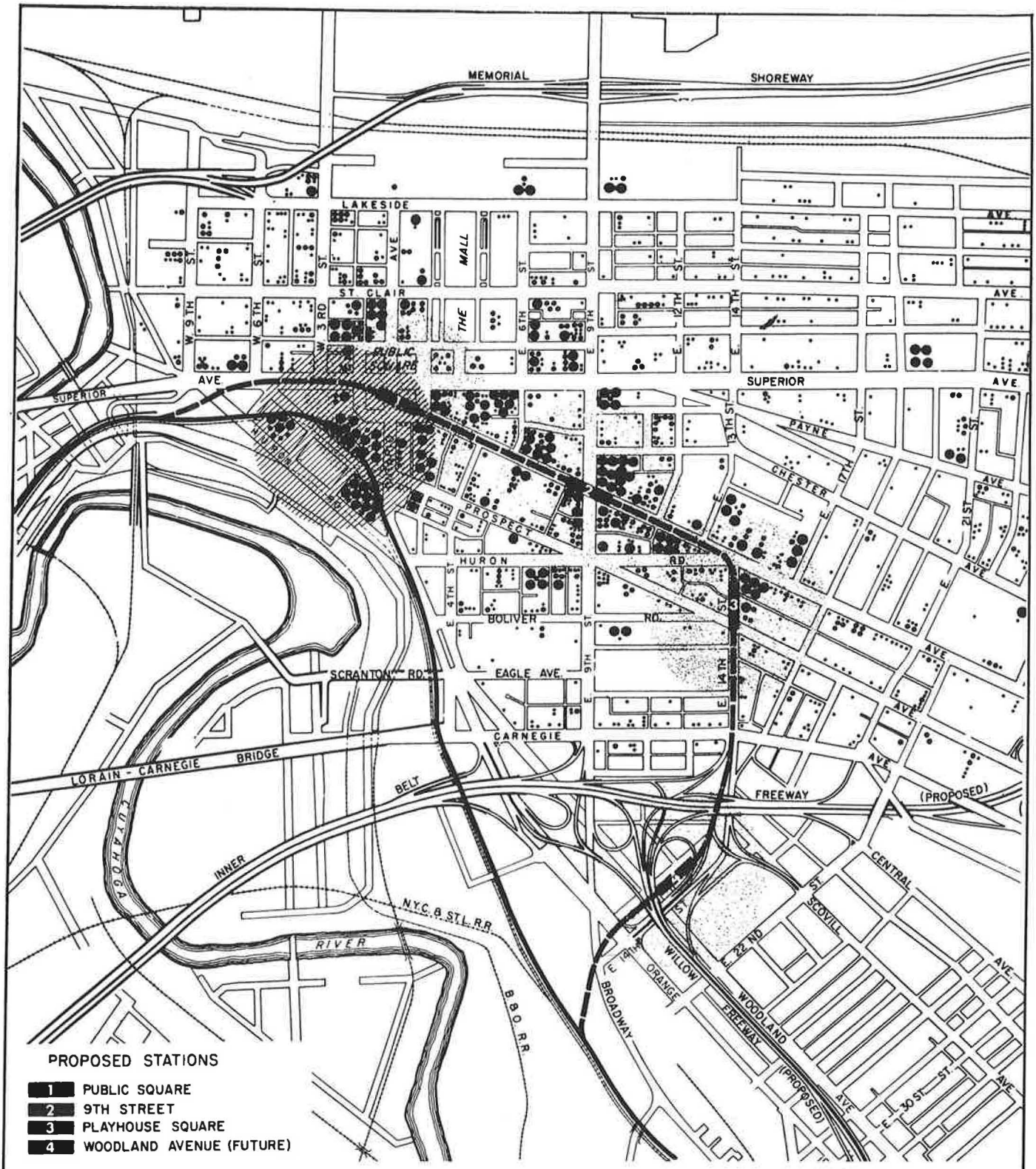
DOWNTOWN EMPLOYMENT WITHIN 800 FEET OF EXISTING

AND PROPOSED SUBWAY RAPID TRANSIT STATIONS

NOVEMBER 1959

	Major Business Area		Total Downtown Area	
Employment	87,657		124,077	
Employment Served By Present Single Rapid Transit at C. U. T. on Southwestern Edge of Downtown Business Area	18,643	21.3%	18,643	15.0%
The Three Proposed Subway Rapid Transit Stations on Euclid Avenue would serve . . .	77,138	88.0%	78,433	63.2%
Increase in Number of Downtown Employment Served . .	58,495		59,790	
Employees Served by Proposed Stations Compared With Present Single Station.	4.14 times as great		4.21 times as great	

Figure X



EMPLOYMENT SCALE
- 25 EMPLOYEES
- 100 EMPLOYEES
- 500 EMPLOYEES

LEGEND
- PROPOSED SUBWAY
- EXISTING RAPID TRANSIT

AREA WITHIN 800 FEET OF:
- EXISTING STATION
- PROPOSED SUBWAY STATIONS

EUCLID AVENUE SUBWAY
CLEVELAND, OHIO

LOCATION MAP

SHOWING

DISTRIBUTION OF EMPLOYEES IN CENTRAL BUSINESS DISTRICT

CHARLES E. DE LEUW · CONSULTING ENGINEER
NOVEMBER 1959

NORTH

SCALE
0 500 1000
FEET

BASE MAP COURTESY OF CLEVELAND CITY PLANNING COMMISSION

Tinted windows are used to reduce glare and keep out infra-red rays of the sun. Convenient baggage storage facilities are located at the entrance-exit doors.

The new cars are fluorescent lighted with fixtures recessed to frame car card advertising racks. Seats in the new cars are wider than present transit cars and are spaced farther apart for added passenger comfort. Air-conditioning is tied in with the heating system so that either cold or hot air can be entered into the cars at window seat level. There are no roof fans. The new cars are driven by four 100-horsepower motors, compared with 55-horsepower motors on the present cars. The higher powered motors will permit greater sustained acceleration and a top speed of 60 miles per hour.

These new cars will provide through service, without transfer, from the airport to Downtown Cleveland, a distance of 11.3 miles in 20 minutes (nearly 34 mph) and continue to Windermere Station, the east side terminal, an additional distance of 7.8 miles in 16 minutes. The through ride from the airport to Windermere Station, covering a distance of 19.1 miles, will require only 36 minutes at an average speed of 32 mph. Figure II shows the location of the four-mile extension to the Cleveland Hopkins International Airport.

F. SUMMARY

Based on twelve years of experience, the Cleveland Rapid Transit operation has clearly demonstrated that there is a wide-spread demand for extensive "change of mode" facilities in the form of large parking lots ("Park 'N Ride" passengers), and provision for drop-off and pick up space ("Kiss 'N Ride" passengers) at outlying rapid transit stations.

The Greater Cleveland Area has benefited from such facilities through relief in peak rush hour traffic and in reducing the need for converting valuable downtown land to parking facilities.

With present "Park 'N Ride" and "Kiss 'N Ride" facilities at seven of the fourteen rapid transit stations and on the six proposed extensions shown on the cover of this report, the C.T.S. can ultimately provide such convenient "change of mode" facilities as shown in Table 9.

With the current turnover of 1.3, at least 33,000 automobiles would be intercepted at the 30 stations where such facilities are now available or planned by CTS. An additional 2,300 automobiles are now intercepted at the Shaker Hts. Rapid Transit parking lots. If the total of 27,131 parking spaces (Table 9) were available it is estimated that a minimum of 35,300 automobiles in the Greater Cleveland Area would be intercepted at rapid transit "Park 'N Ride" facilities at distances of 3 to 15 miles from the Cleveland downtown business district.

Table 9

Park 'N Ride and Kiss 'N Ride Spaces at Present and Proposed Rapid Transit Routes

	Stations	Parking Spaces	Kiss 'N Ride Spaces
Present Route	14	5,295	135
Airport Extension (Under Construction)	3	2,500	50
Proposed Future Extensions	21	17,605	615
Subtotal CTS Plan	38	25,400	800
Present Shaker Hts. Rapid Transit		1,731	100
TOTAL		27,131	900

Table 10

SURVEY OF INBOUND PASSENGERS BY MODE OF TRAVEL AT WEST PARK STATION

TUESDAY, MARCH 24, 1964 - 6 a.m. to 6 p.m.

	Total Automobiles & Auto Passengers Entering Station			Park'n Ride				Drop Off				Sub Total Park'n Ride and Drop Off								
	Auto	Pass.	Pass. per Auto	Auto	Pass.	Pass. per Auto	%	Auto	Pass.	Pass. per Auto	%	Auto	Pass.	Pass. per Auto	%	Pedes.	%	* Bus Pass.	%	Total Pass. to Rapid	Turnstile Count 3-24-64
A. M.																					
6-659	281	397	1.4	209	247	1.1	37.6	72	76	1.1	11.6	281	323	1.1	49.2	1	.2	332	50.6	656	656
7-759	1204	1790	1.5	807	924	1.2	35.2	397	453	1.1	17.2	1204	1377	1.1	52.4	27	1.0	1226	46.6	2630	2630
8-859	499	775	1.6	325	412	1.3	32.8	174	183	1.1	14.5	499	595	1.2	47.3	25	2.0	638	50.7	1258	1258
9-959	165	244	1.5	120	150	1.3	42.1	45	48	1.1	13.5	165	198	1.2	55.6	6	1.7	152	42.7	356	356
10-1059	141	235	1.7	101	116	1.1	35.5	40	52	1.3	15.9	141	168	1.2	51.4	1	.3	158	48.3	327	327
11-1159	106	161	1.5	76	87	1.1	39.5	30	32	1.1	14.6	106	119	1.1	54.1	0	---	101	45.9	220	220
P. M.																					
12-1259	80	113	1.4	58	67	1.2	41.6	22	23	1.0	14.3	80	90	1.1	55.9	1	.6	70	43.5	161	161
1-159	70	95	1.4	50	57	1.1	30.8	17	21	1.2	11.4	(3) 67	78	1.2	42.2	2	1.1	105	56.7	185	185
2-259	60	90	1.5	23	26	1.1	16.4	19	19	1.0	11.9	(18) 42	45	1.0	28.3	4	2.5	110	69.2	159	159
3-359	84	127	1.5	34	38	1.1	14.9	24	27	1.1	10.6	(26) 58	65	1.1	25.5	7	2.7	183	71.8	255	255
4-459	138	210	1.5	24	25	1.0	5.8	40	52	1.3	12.0	(74) 64	77	1.2	17.8	10	2.3	345	79.9	432	432
5-600	248	309	1.2	9	10	1.1	3.2	47	52	1.1	16.6	(192) 56	62	1.1	19.8	2	.6	249	79.6	313	313
TOTAL	3076	4543	1.5	1836	2159	1.2	31.1	927	1038	1.1	14.9	2763	3197	1.2	46.0	86	1.2	3669	52.8	6952	6952

*--Latest available data 12/63; 1/64; 3/64 adjusted to 3-24-64 turnstile reading.

()--Pick up autos.

Research & Planning
April 1, 1964

Table 10a

SURVEY OF INBOUND PASSENGERS BY MODE OF TRAVEL AT TRISKETT STATION
WEDNESDAY, MARCH 25 and THURSDAY, APRIL 16, 1964 - 6 a.m. to 6 p.m.

	Total Automobiles & Auto Passengers Entering Station 3-25-64 *			Park'n Ride				Drop Off				Sub Total Park'n Ride and Drop Off				Pedes. 4-16-64	%	Bus Pass. 4-16-64	%	Total Pass. to Rapid	Turnstile Count 4-16-64
	Auto	Pass.	Pass. per Auto	Auto	Pass.	Pass. per Auto	%	Auto	Pass.	Pass. per Auto	%	Auto	Pass.	Pass. per Auto	%						
A. M.																					
6-659	79	110	1.4	67	76	1.1	42.2	12	12	1.0	6.7	79	88	1.1	48.9	40	22.2	52	28.9	180	180
7-759	590	885	1.5	456	565	1.2	46.8	134	147	1.1	12.2	590	712	1.2	59.0	122	10.1	373	30.9	1207	1207
8-859	382	534	1.4	293	359	1.2	56.3	89	100	1.1	15.6	382	459	1.2	71.9	53	8.3	126	19.7	638	638
9-959	90	135	1.5	62	71	1.1	43.1	28	28	1.0	16.9	90	99	1.1	60.0	16	9.7	50	30.3	165	165
10-1059	53	79	1.5	39	49	1.2	47.1	14	15	1.1	14.4	53	64	1.2	61.5	12	11.5	28	27.0	104	104
11-1159	82	118	1.4	63	75	1.2	65.2	19	21	1.1	18.3	82	96	1.2	83.5	1	.9	18	15.6	115	115
P. M.																					
12-1259	77	111	1.4	62	73	1.2	65.8	15	19	1.3	17.1	77	92	1.2	82.9	1	.9	18	16.2	111	111
1-159	74	102	1.4	60	71	1.2	68.3	14	16	1.2	15.4	74	87	1.2	83.7	2	1.9	15	14.4	104	104
2-259	24	38	1.6	13	16	1.2	28.6	11	11	1.0	19.3	24	27	1.1	48.2	8	14.3	21	37.5	56	56
3-359	49	83	1.7	34	41	1.2	39.8	15	23	1.5	22.3	49	64	1.3	62.1	25	24.3	14	13.6	103	103
4-459	62	105	1.7	38	49	1.2	38.3	24	31	1.3	24.2	62	80	1.3	62.5	18	14.1	30	23.4	128	128
5-600	49	83	1.7	29	35	1.2	35.0	20	24	1.2	24.0	49	59	1.2	59.0	18	18.0	23	23.0	100	100
TOTAL	1611	2383	1.5	1216	1480	1.2	49.2	395	447	1.1	14.8	1611	1927	1.2	64.0	316	10.5	768	25.5	3011	3011

*--Automobile passengers adjusted to April 16, 1964 Turnstile Count.

Research & Planning
Revised 5-1-64

RESEARCH & PLANNING
APRIL 12, 1966

Table 10b

HOURLY TURNSTILE PASSENGER COUNT - RAPID TRANSIT SYSTEM

FRIDAY, MARCH 25, 1966

Hourly From	Period To	Wind.	Sup.	E. 120	U. C.	E. 105	E. 79	E. 55	Sub East Sta.	CUT East	CUT West	CUT Total	W. 25	W. 65	W. 98	W. 117	Trisk.	W. P.	Sub West Sta.	System 3-25-66	Total 3-5-65
Start	559 a. m.	155	97	22	63	81	25	86	529	197		197	60	24	80	93	74	234	565	1291	1246
600	659	407	251	31	197	210	110	170	1376	299		299	175	73	171	311	167	512	1409	3084	3263
700	759	1260	602	70	521	231	125	245	3054	343	36	379	335	309	739	1651	1299	3090	7423	10856	10891
800	859	843	353	42	422	126	64	128	1978	159	10	169	135	186	419	664	605	1164	3173	5320	5629
900	959	387	99	16	160	58	30	48	798	128		128	40	20	112	206	136	249	763	1689	1845
1000	1059	169	96	22	92	38	21	21	459	191		191	27	20	79	121	81	199	527	1177	1079
1100	1159	195	62	10	132	25	45	23	492	296		296	38	27	76	92	59	138	430	1218	1225
1200	1259 p. m.	152	59	19	197	44	16	27	514	506		506	24	22	81	81	59	188	455	1475	1247
100	159	217	74	26	143	44	26	35	565	466		466	81	44	81	109	73	178	566	1597	1668
200	259	177	73	37	200	96	42	54	679	845		845	160	98	109	137	58	183	745	2269	2264
300	359	373	87	42	460	156	111	155	1384	1268		1268	273	92	202	233	75	271	1146	3798	3522
400	459	437	146	50	453	198	117	137	1538	2523	776	3299	208	120	209	355	94	359	1345	6182	7025
500	559	375	88	52	336	100	113	102	1166	6021	1694	7715	218	35	150	280	61	279	1023	9904	10267
600	659	167	55	35	144	29	19	55	504	1456		1456	65	28	87	104	61	198	543	2503	2583
700	759	110	28*	11*	58*	17*	9*	10*	243	414		414	27*	18*	37*	42*	17*	127	268	925	1121
800	859	56	27*	10*	54*	16*	8*	9*	180	387		387	26*	16*	34*	39*	16*	57	188	755	1003
900	959	73	13*	6*	26*	8*	4*	5*	135	188		188	12*	8*	17*	19*	8*	56	120	443	865
1000	1059	44	27*	10*	54*	16*	8*	9*	168	389		389	26*	16*	34*	39*	16*	51	182	739	900
1100	1159	85	33*	13*	67*	19*	10*	11*	238	479		479	32*	20*	42*	48*	19*	55	216	933	743
1200	1259 a. m.	57	9*	4*	18*	5*	2*	3*	98	135		135	9*	6*	12*	13*	5*	29	74	307	380
TOTAL		5739	2279	528	3797	1517	905	1333	16098	16690	2516	19206	1971	1182	2771	4637	2983	7617	21161	56465	
3-25-66 IBM RUN		5750	2372	538	3908	1577	932	1384	16461	16690	2516	19206	2022	1219	2868	4639	3017	7617	21382	57049	58766

* No attendant on duty. Figures based on hourly distribution at C. U. T. on March 25, 1966

Note: All turnstiles were checked as of 1:00 a. m. 3-25-66 and 3-26-66 to get complete 24 hour count. (Rain - cold)

TABLE 11

OUTBOUND AUTOMOBILE TRAFFIC AT WEST PARK STATION
ON TUESDAY, MARCH 31, 1964 - 4:00 p. m. to 6:00 p. m.

	Exit to Lorain Outbound		West 145th St. Exit Outbound		Total Both Exits	
	Autos	Pass.	Autos	Pass.	Autos	Pass.
4:00 - 4:15 p. m.	45	74	11	16	56	90
4:15 - 4:30	51	75	7	11	58	86
4:30 - 4:45	71	103	18	24	89	127
4:45 - 5:00	92	128	31	41	123	169
	259	380	67	92	326	472
5:00 - 5:15	138	201	43	62	181	263
5:15 - 5:30	210	303	91	132	301	435
5:30 - 5:45	229	321	154	213	383	534
5:45 - 6:00	184	272	93	138	277	410
	761	1,097	381	545	1,142	1,642
4:00 - 6:00 p. m.	1,020	1,477	448	637	1,468	2,114
Auto Passengers Per Auto		1.44		1.42		1.44

DEPARTMENT OF TRAFFIC AND OPERATIONS

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Purdue University, Lafayette, Indiana

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