(WTC archives)

APPENDIX "A"

Transportation and Site Study

September 4, 1962

A-81921

MEMORANDUM

WTC

REFER		NOTED	
TO	DATE	BY	DATE
RETURN TO		FILE	

TO: Edward S. Olcott, Chief, Central Planning Division
FROM: Herbert Tessler
DATE: August 20, 1962
SUBJECT: WORLD TRADE CENTER POPULATION ESTIMATE
REFERENCE:

COPY TO: Messrs. Levy, McAvey, Schachter

This will confirm hand delivery on August 17, 1962 of a draft outlining a preliminary population estimate in accordance with your verbal request on the aforementioned date. Attached to this memo is a copy of this estimate (dated August 20, 1962) It should be noted that the estimate will be revised periodically in order to conform to the latest definitive information available regarding occupancy.

Herbert Tessler
Supervisor, Planning
World Trade Center

CKP

CKP:mc

att.

Date: August 20, 1962

PRELIMINARY
WORLD TRADE CENTER POPULATION ESTIMATES

Area	Net Sq. Ft.	Employees	Average Pk. Hr. Visitors	Assumptions
General Office (excl. Customs)	3,700,000	37,000	-----	100 sq. ft. per employee
Display	1,100,000	1100	8,800	50% of space occupied by displays-remainder of space estimated at 50 sq. ft. per visitor with a 20% diversity factor. One employee per 1000 sq. ft. of display area.
Hotel	165,000	100	530	Hotel accommodates 350 rooms @ average occupancy of 1½ persons per room.
World Trade Institute	60,000	30	240	200 sq. ft. per person & 80% composed of persons not considered W.T.C. employees. One employee per 10 visitors.
World Trade Info.	20,000	40	300	50 sq. ft. per person & 75% of persons specifically coming to W.T.C. for information and guided tours. One employee services 10 persons.
Commodity Exchanges	80,000	400	800	50% of space utilized for offi employees estimated at 100 sf/ person. 50% of area utilized trading at 50sf/person
Restaurant, Utility Companies & Other Services	500,000	2250	5,200	Utility companies constitute approximately 10% of the genera grouping-population negligable. Remainder of space composed of restaurants & shops accommodat one person per 35 sq. ft. On this basis consumer services ma accommodate approximately 13,0 persons. 50% of this will be composed of persons not conside W.T.C. employees. In addition a 20% diversity factor has been applied. One employee per 200 sq. ft. has been assumed.

	Sq. Ft.	Employees	Average Peak Hr. Visitors	Assumptions
Domestic Banks	65,000	330	130	50% of area utilized as office space at 100 sq. ft. per employee. 20% of the persons using facilities are visitors @ 50 sq. ft. per person.
Customs	200,000 office & 540,000 warehouse	1700 office 400 warehouse	200 (400 daily)	figures provided by Customs
Total		43,350	16,000 (excl. Customs)	

It is assumed that the visitor population peaks do not occur at the same time as the employee peaks. In order to arrive at an average peak daily visitor population, it has been assumed that during two hours an average peak condition will exist and during six hours a 50% average peak condition will exist, totaling approximately 80,400 visitors including Customs. Allowing a deviation of 20% above and below this figure the average peak daily visitor population is assumed to be between 64,000 and 97,000 persons.

MEMORANDUM

A-61921

REFER		NOTED	
TO	DATE	BY	DATE
RETURN TO		FILE	

M. P. Levy, Chief - Planning Division, World Trade Center
Edward S. Olcott
September 4, 1962
BJECT: WORLD TRADE CENTER - TRANSPORTATION AND SITE STUDY
EFERENCE: Memo Levy to Olcott, same subject, 7/16/62, and
Memo Olcott to Levy, same subject, 7/31/62.
OPY TO: Messrs. Johnson, Sullivan, Storm, Connerley, Mellor, Lovejoy, Quimby, Roy

In accordance with your request of July 16, 1962, we have analyzed the existing transportation situation including demand and capacity in the vicinity of the World Trade Center site. In addition, based on World Trade Center population estimates provided by your office, we have superimposed on the existing transportation situation the future estimated demands as a result of the new World Trade Center population. We have compared these future demands with capacity and have recommended improvements in existing facilities where we feel such improvements would be required.

We have also analyzed three possible site plans which have been furnished by your office with particular respect to the city's street requirements and for the best possible service to the World Trade Center itself. We have prepared sketches of recommended street patterns and traffic circulation for each of the three schemes. Since we do not have available detailed information on the location of specific facilities within the World Trade Center site itself, these plans are only general in principle reflecting what we feel to be minimum requirements. They are, however, plans upon which we feel you may proceed for discussion with the City and the Transit Authority and for your own more detailed planning.

The recommended street layout and circulation plans for each of the three sites are attached and in addition for your information and analysis are assignments of vehicular movements with estimated World Trade Center traffic supplemented on existing traffic. An appendix is attached to this report which includes detailed tabulations of pedestrian, bus, subway and taxi flows, volumes and capacity for your information and use in your detailed planning.

While there are several potential problems associated with specific subway station areas beyond the limits of the site, these are not pertinent to your immediate considerations. I would like, therefore, to report to you separately on our recommendations on those external subway considerations within the next week or so.

E.S. Olcott

Edward S. Olcott, Chief
Central Planning Division

ESO:bk

WORLD TRADE CENTER
TRANSPORTATION CONSIDERATIONS

Street Requirements

The following is an analysis of street requirements for the sites defined as Schemes I and II as well as for Scheme III, a site location subsequently introduced by the World Trade Department. In progressing the analysis of these schemes the existing street volumes, as determined by traffic counts taken in the field, have been expanded to represent expected street traffic at the time of the opening of the World Trade Center. On top of this base volume have been superimposed estimated of the vehicular loads generated by the World Trade Center employees and visitors in terms of parked vehicles and taxis. These estimates are felt to be reasonable values for preliminary planning purposes. No factor, however, has been included for commercial traffic generated by the Center since such an estimate would be completely unrealistic at this time. In the peak hours considered, however this volume should be relatively small and thus not critical with respect to street capacities.

As previously reported it is felt that for any layout of the Center, it is essential to carry Greenwich St. (actually Greenwich St as an extension of West Broadway) through the site area as well to make provision for Fulton St. to be carried through to the Hudson River as a two-way street as per the stated desire of the City.

Beyond these criteria, our subsequent analysis, based on estimated future traffic loads, indicates the need for direct access between the Center and the West Side Highway to and from the north as a minimum.

In the analysis that follows, a possible solution is attached for each of the three schemes by means of a street layout plan with overlays for both morning and evening peak hour conditions (except for Scheme III where only the evening flows were developed) showing the estimated street volumes into and out of the Center at assumed access points. The peak hour street volumes are shown on drawings WTC - 1A, 1B, 2A, 2B and 3B.

The following paragraphs summarize each of the Schemes as individual plans. However, it must be realized that the layouts shown are more illustrative than definitive because actual space requirements for the Center are not available. For example, given the same Center area as defined by Scheme III, the method of accomplishing the street layout criteria as shown for Scheme II could also be applied if it better fits the internal layout of the Center. Thus, while it is not feasible to draw a definite conclusion as to the best street plan without knowing the specific needs of the Center itself in more detail, general recommendations can be set forth. These are summarized following the discussions of the individual plans.

Scheme I

Under Scheme I, the site would be located between Vesey, Cortlandt, West and Church Streets. As reported in the referenced memorandum, this scheme would permit Greenwich Street to be carried directly through the site, but would block the development of Fulton Street as a through two-way street along its present alignment between the Hudson and East Rivers. The plan would also not provide full circulation around the periphery of the site.

To overcome the deficiencies of this basic plan it would be possible, as shown on attached drawing WTC-1, to widen Church Street and make it two-way between Vesey and Cortlandt Streets. With this addition, Fulton Street could then be made to function as a through two-way Street. Westbound Fulton Street traffic could turn south on widened Church Street to Cortlandt Street and use one-way Cortlandt Street west to West Street. Eastbound Fulton Street traffic could use Vesey Street to Church Street and widened Church Street south to Fulton Street. The use of widened Church Street as a two-way thoroughfare past the Center would also give full circulation around the entire site in a clockwise direction.

A potential trouble spot with this plan is the intersection of Fulton and Church Street particularly with the crossover of Fulton Street traffic. This intersection would require extensive study to determine the best channelization and signal planning. This means of handling Fulton Street traffic would also increase the volume of traffic on Church Street in front of the site by the forced detouring of the Fulton Street traffic around the site. Nevertheless, we believe that a scheme such as that outlined for Scheme I would be feasible.

Scheme II

Under Scheme II, the site would be located between Fulton, Liberty, West and Church Streets. This site location would permit Fulton Street to be carried through to West Street but would involve, under assumption of the World Trade Department, the closing of Greenwich Street.

To substitute for a through Greenwich Street, as shown on the attached plan WTC-2, Greenwich Street traffic could be carried around the site by providing a new southbound street adjacent to West Street and utilizing Fulton and Liberty Streets to complete the through route. This routing is circuitous and although it would not add to the left turn conflicts on West Street, it would introduce additional left turn conflicts on Fulton Street at the new street. Under this plan Liberty Street would be one-way eastbound, so that traffic from areas south and east of the center destined for West Street would be forced to continue past the Center via Church Street and Fulton Street. Full circulation would be provided around the Center but in a counter-clockwise direction rather than in the clockwise pattern, which would be preferable for World Trade Center convenience.

Certain of these problems could be eliminated if Greenwich Street were retained on its present alignment as in Scheme I and Liberty Street widened and made two-way between West Street and Church Street.

Scheme III

In this scheme the Center would be located between Vesey, Liberty, West and Church Streets blocking both Greenwich and Fulton Streets. These streets could be re-established as shown in plan WTC-3 in which Fulton Street is carried through on a diagonal routing to Vesey Street. Greenwich Street is carried around the site by widening Church Street to provide for two-way traffic between Fulton and Liberty Streets and utilizing Fulton and Liberty Streets to complete the through route. Circulation around the Center would be in the preferable clockwise direction.

Under this plan the intersection of West Broadway and Vesey Street (Fulton Street) would be complex, requiring a three-phase signal operation. It would probably require closing Greenwich Street north of the site between Barclay and Vesey Street (Fulton Street) and routing Greenwich Street traffic via Barclay Street to West Broadway. Further, the Center would be bounded on three sides by two-way streets which would complicate the entrances and exits at the site and introduce added left turn conflicts at these points.

Again, some of these problems could be overcome if Greenwich Street could be retained in place in lieu of a route via two-way Church Street. While this would divide the site, the area west of Greenwich Street would approximate the site area provided in Scheme II.

Summary

In summary, each of the plans shown is workable although none is ideal. From the review of each one, however, it is our conclusion that the most ideal plan would permit Greenwich Street to be retained in its present alignment and would provide for continuing Fulton Street through to West Street on the existing Fulton Street alignment, Scheme II, or on a diagonal alignment to Vesey Street as shown in Scheme III. If Greenwich Street were to be carried through Scheme III, the area west of Greenwich Street would approximate the site area of Scheme II.

Pedestrian Flows

Pedestrians anticipated at the proposed World Trade Center site total 78,550 during the evening peak hours on the assumption that the World Trade Center offices would generate 43,000 employees and 10,000 visitors during the peak hour. This compares to a maximum existing population of

45,000 pedestrians in the area during the peak hour. At that peak time, the important component movements would be 31,170 pedestrians to the subway access points currently within the site, 27,950 World Trade Center and other pedestrians to the H&M and 19,430 pedestrians leaving the site via streets for nearby subway stations and the Staten Island Ferry. The most critical of these flows would be between the site and adjacent subways.

Subway Service

Five major subway lines serve the World Trade Center site. These lines are the IRT-Seventh Avenue, IRT-Lexington Avenue, IND-Eighth Avenue, BMT Broadway, and BMT Nassau Loop. On a typical weekday, these lines presently handle an estimated 132,300 peak hour passengers leaving Lower Manhattan between 4:30 and 5:30 p.m. Three of the five lines make two station stops which would be convenient to users of the World Trade Center while the remaining two lines make only one stop.

Each of these lines, with the exception of the BMT Broadway line, has a stop at the passenger transfer station in the vicinity of Fulton Street. These stations, in total, handle about fifty per cent of the afternoon peak hour passengers leaving the World Trade Center. The remaining four subway stops are located in or adjacent to the site or are connected to the site with direct underground passageways. All but the IRT-Lexington Avenue Line and the Nassau Loop are represented at these latter stations. These four latter stations handle the remaining fifty per cent of the afternoon peak hour subway passengers leaving the area.

Appendix I shows the tabulation of World Trade Center employees and visitors assigned to each of the eight subway stations in or near the site area. These and other downtown subway stations and the services to the station are reviewed in terms of stairwell capacity and the number of existing trains and cars. No specific service problems are anticipated on the subway system as a result of the World Trade Center load. Furthermore, from the standpoint of subway service and access, we find little or no difference in proposed Schemes I, II or III.

Bus and Taxi Access

The handling of busses and taxis at the site should not pose any particularly difficult problems nor is it apparent that these factors vary materially from scheme to scheme. Specific bus, automobile, and taxi space requirements, and the relation of bus, subway, and taxi services to the site are discussed in some detail in the appendices. In general, we believe the problems, if any, that will be encountered in this area, can only be dealt with after the preparation of definitive plans for the Trade Center which pinpoint the concentrations of activity and the points of vehicular access.

APPENDIX

APPENDIX I

LOWER MANHATTAN POPULATION AND TRANSPORTATION MODE

The following tables show the distribution by transportation mode of the existing Lower Manhattan population and in the future with new World Trade Center employees and visitors added. These figures include 21,500 employees that are new to the downtown area and 21,500 employees who may transfer from another area of Lower Manhattan.

Peak Hour Population

Estimates of the World Trade Center population include a maximum peak hour of 53,000 persons leaving the World Trade Center between 4:30 and 5:30 p.m. on a typical weekday. This peak hour exceeds the 8:00 to 9:00 a.m. peak inbound flow by 2,000 pedestrians. Assumptions used to develop the total peak hour population at the World Trade Center include a peak hour of approximately 43,000 employees, and during the morning, an inbound flow of 8,000 visitors. During two other hours of the work day, the inbound flow of visitors reaches 16,000 per hour. These large subsequent flows cause a visitor accumulation in the World Trade Center at the closing of the business day, resulting in 10,000 visitor departures between 4:30 and 5:30 p.m.

Daily and annual pedestrian figures were developed using the peak hour data. No weekend visitors are included in annual pedestrian figures.

Noontime Visitors

It is estimated that eight thousand people will visit the World Trade Center during the one and a half hour period beginning at noon. These visitors will make use of various areas of the Center such as display areas and restaurants for business purposes. No estimated for

this period are pedestrians who visit the World Trade Center for non-business consumer service activity such as eating lunch or window shopping. There will be 10,500 additional noontime visitors if it is assumed that a number of people equal to 5 per cent of the total downtown business population visit the World Trade Center for non-business activity. It is important that access between the World Trade Center and the adjacent streets provide for these flows. By way of a rough approximation, it may be assumed that these visitors distribute themselves to the street approaching the site in the same pattern as anticipated peak hour users of the H&M.

(Followed by tables & charts)