Transit Carrying Capacity
MPO Transit Study

Appendix

December 14, 2007

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INTRODUCTION

In parallel with the transit modeling effort, Cambridge Systematics developed a spreadsheet tool to compute the anticipated maximum carrying capacity of the transit lines proposed as part of each 2050 transit concept. This effort was designed to identify the potential maximum ridership that could be carried by the proposed transit projects (as opposed to the ridership estimated from the travel demand model) which could be compared with the anticipated carrying capacity of roadway/highway projects that might be built as an alternative to the transit lines.

Carrying capacity for transit was estimated based on the following factors:

- Transit technology
- Vehicle type, number of seats, standing passengers
- Headways for peak and off-peak periods
- Span of service (daily hours of operation)

TRANSIT TECHNOLOGIES

Transit technologies assumed for the various alternative transit concepts for 2050 included:

- Commuter Rail
- Light Rail Transit (LRT)
- Express bus

The assumptions used for vehicle carrying capacity, number of seats and standing passengers and number of vehicles in a "train" are shown in the attached tables.

PEAK HOUR CARRYING CAPACITY

The spreadsheet tool was built to estimate maximum carrying capacity for the peak hour in the system – which equates to the condition for which transportation facilities are usually designed. Transit systems tend to be most efficient at a peak period condition when they are able to move a great number of people in a limited space. During off-peak conditions, especially late night/early morning for example, efficiency

can be far lower due to the necessity of paying the driver and other operating costs when relatively few travelers use the system. Highways, by contrast, have a constant operating cost and therefore serve these off-peak conditions without additional cost.

Equivalent Lane-Miles Calculation

The ultimate objective of this analysis was to compare the equivalent number of roadway lane-miles that would be required to be built to carry the same number of people the same distance as would the transit projects included in each 2050 Concept. This would allow a comparison of capital investment – with the hypothesis that the transit projects are a more cost-efficient means of providing mobility within the Hillsborough County study area.

In comparing carrying capacity for transit versus highway facilities, the following assumptions were made:

- Commuter rail capacity was compared with the peak hour carrying capacity of freeway lanes
- Bus and LRT capacity was compared with the peak hour carrying capacity of arterial street lanes

The following tables present the assumptions and calculations used to develop the comparison of carrying capacity for Hillsborough County 2050 Alternative Transit Concepts for 2050 with roadway projects required to provide the same mobility.

Table 1: Transit Vehicle Capacity Assumptions

Capacity/Car	Seats	Stand	Total	
LRT	**75**	**25**	100	passenger/car
Express Bus	**70**	**20**	90	passenger/car
Commuter Rail	**120**	**0**	120	passenger/car

Table 2: Freeway Lane Capacity Peak Hour Directional (Interchange spacing > 2 mi)

No. of Lanes	LOS C	LOS D
2	2,940	3,580
1	1,470	1,790

Table 3: Arterial Lane Capacity Peak Hour Directional (Class I, Undivided)

No. of Lanes	LOS C	LOS D
2	1,810	1,860
1	720	860

Table 4.1: Carrying Capacity Comparison – Concept A and B

CONCEPT A: Urban Core

Transit Line	Peak Headway (mins)	Pk Hr Trains/ Buses	Transit Car Capacity	Passengers Per Hour (Both Dir)	Transit Route Miles	Equivalent Road Lanes	Equivalent Lane-Miles
Light Rail Transit							
Tampa Int. Airport to USF	**10**	6	100	1,200	**39.6**	1.7	66.0
Express Bus							
Florida Ave. Corridor USF to CBD	**10**	6	90	1,080	**15.2**	1.5	22.8
Hillsborough Ave. Corridor Town and Country to Seffner	**10**	6	90	1,080	**24.0**	1.5	36.0
Dale Mabry Hwy Corridor Lutz Lake Fern Rd., Dale Mabry Hwy, Kennedy Blvd. to CBD	**15**	4	90	720	**25.1**	1.0	25.1
US 301 South Corridor not included in this Option.							-
US 301 North Corridor McIntosh Rd, US 301, I-4, Ashley Dr. to CBD	**15**	4	90	720	**22.8**	1.0	22.8
I-4 Corridor not included in this Option							
Brandon to CBD Via SR 618 (Crosstown Exy) to Morgan St.	**15**	4	90	720	**33.1**	1.0	33.1
Commuter Rail							
No commuter rail in this alternative.							
Concept Total				5,520	**159.8**		206

CONCEPT B: Urban Corridors

Transit Line	Peak Headway (mins)	Pk Hr Trains/ Buses	Transit Car Capacity	Passengers Per Hour (Both Dir)	Transit Route Miles	Equivalent Road Lanes	Equivalent Lane-Miles
Light Rail Transit							
Tampa Int. Airport to USF spur	**15**	4	100	800	**39.6**	1.1	44.0
Westchase to New Tampa	**15**	4	100	800	**66.8**	1.1	74.2
St. Petersburg to South Shore	**10**	6	100	1,200	**80.4**	1.7	134.0
MacDill AFB to Brandon	**10**	6	100	1,200	**37.6**	1.7	62.7
Express Bus							
Florida Ave. Corridor USF to CBD	**10**	6	90	1,080	**15.2**	1.5	22.8
Hillsborough Ave. Corridor Town and Country to Seffner	**10**	6	90	1,080	**24.0**	1.5	36.0
Dale Mabry Hwy Corridor Lutz Lake Fern Rd., Dale Mabry Hwy, Kennedy Blvd. to CBD	**15**	4	90	720	**25.1**	1.0	25.1
US 301 South Corridor South Shore to CBD via US 301, SR 618 (Crosstown Exy) to Morgan St.	**15**	4	90	720	**24.3**	1.0	24.3
US 301 North Corridor McIntosh Rd, US 301, I-4, Ashley Dr. to CBD	**15**	4	90	720	**22.8**	1.0	22.8
I-4 Corridor Plant City to CBD via I-4, Ashby Dr.	**15**	4	90	720	**42.0**	1.0	42.0
Brandon to CBD not included in this Option							
Commuter Rail							
No commuter rail in this alternative.							
Concept Total				9,040	**377.8**		488

Table 4.2: Carrying Capacity Comparison – Concept C and ABC

CONCEPT C: Urban Centers

Transit Line	Peak Headway (mins)	Pk Hr Trains/ Buses	Transit Car Capacity	Passengers Per Hour (Both Dir)	Transit Route Miles	Equivalent Road Lanes	Equivalent Lane-Miles
Light Rail Transit							
No light rail in this alternative							
Express Bus							
Florida Ave. Corridor USF to CBD	**10**	6	90	1,080	**15.2**	1.5	22.8
Hillsborough Ave. Corridor Town and Country to Seffner	**10**	6	90	1,080	**24.0**	1.5	36.0
Dale Mabry Hwy Corridor Lutz Lake Fern Rd., Dale Mabry Hwy, Kennedy Blvd. to CBD	**15**	4	90	720	**25.1**	1.0	25.1
US 301 South Corridor Sun City Center to CBD via US 301, SR 618 (Crosstown Exy) to Morgan St.	**15**	4	90	720	**24.3**	1.0	24.3
US 301 North Corridor McIntosh Rd, US 301, I-4, Ashley Dr. to CBD	**15**	4	90	720	**22.8**	1.0	22.8
I-4 Corridor Plant City to CBD via I-4, Ashby Dr.	**15**	4	90	720	**42.0**	1.0	42.0
Brandon to CBD not included in this Option							
Commuter Rail							
Pasco Co to CBD (1-way)	**30**	2	120	480	**54.2**	0.3	17.7
N. Pinellas Co to CBD (1 way)	**30**	2	120	480	**52.0**	0.3	17.0
St. Petersburg to Lakeland (2-way)	**30**	2	120	960	**116.0**	0.7	75.8
Sarasota to CBD (2-way)	**30**	2	120	960	**102.8**	0.7	67.1
Concept Total				7,920	**478.4**		351

CONCEPT ABC: All Transit Improvements

Transit Line	Peak Headway (mins)	Pk Hr Trains/ Buses	Transit Car Capacity	Passengers Per Hour (Both Dir)	Transit Route Miles	Equivalent Road Lanes	Equivalent Lane-Miles
Light Rail Transit							
Tampa Int. Airport to USF spur	**15**	4	100	800	**39.6**	1.1	44.0
Westchase to New Tampa	**15**	4	100	800	**27.2**	1.1	30.2
St. Petersburg to South Shore	**10**	6	100	1,200	**80.4**	1.7	134.0
MacDill AFB to Brandon	**10**	6	100	1,200	**37.6**	1.7	62.7
Express Bus							
Same as Option C				5,040	**153.4**		173.0
Commuter Rail							
Same as Option C				2,880	**325.0**		177.6
Concept Total				11,920	**663.2**		621

SUMMARY

In summary, this effort indicated that to provide the equivalent mobility (number of passenger trip miles),

- 206 roadway lane miles would be required to replace the 160 miles of transit in Concept A,
- 488 roadway lane miles would be required to replace the 378 miles of transit in Concept B,
- 351 roadway lane miles would be required to replace the 478 miles of transit in Concept C, and
- 621 roadway lane miles would be required to replace the 663 miles of transit in Concept ABC

Transit Concepts A and B certainly provide a more efficient solution than a highway alternative whereas for Concepts C and ABC, this is not the case. However, it should be noted that there are many additional considerations such as the environmental impacts of each solution.