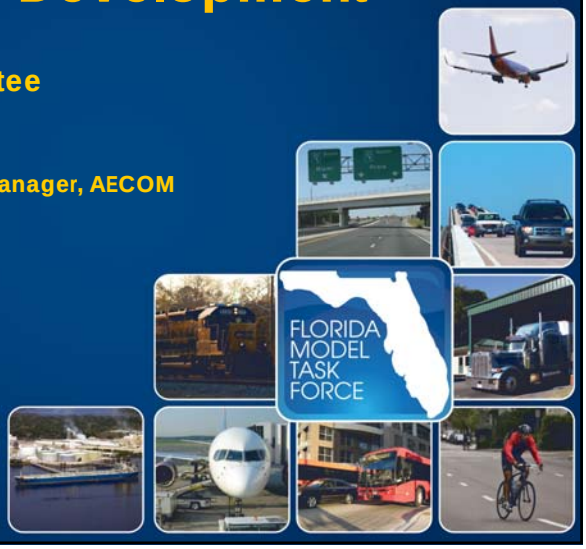
Data-Driven Near-Term Forecasting Transit Model Development

presented to
Transit and Rail Committee

presented by
Ashutosh Kumar, Consulting Manager, AECOM

12/5/2012



Data Driven Forecasting Approach

- What is it:
  - A tool to forecast ridership using the existing data in the corridor
- Where is it best applied:
  - Corridors with currently robust transit services and reliable observed data on:
    - Route ridership and stop activities
    - Travel behavior and demographic info of the existing riders
  - Corridor studies planning to implement short-term improvements

2

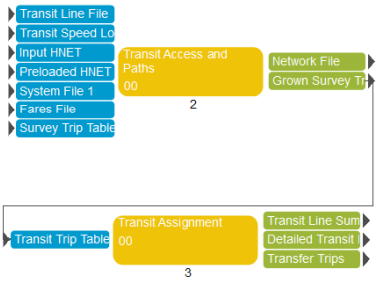
Benefits


- Relies on corridor-specific data, rather than regionally validated travel models
  - Easier to explain the forecasts
  - Fewer risks involved because of fewer moving parts
- Consistent with FTA's NPRM, which highlights data-driven modeling and short-term forecasts
- Can be used to easily estimate travel time savings and FTA New Starts user benefits
- Quicker model development and application
- Easily transferrable to/from existing FSUTMS models

3

Sample Model in Cube Voyager


Data Driven Model 11/5/2012



Data Needed –
Networks from SERPM,
On-board survey data, and
data on corridor riders

4

Modeling Concept


- Relies on the observed data on the existing corridor riders
- Estimates of existing and project service levels needed
  - Bus travel time impacts
  - Bus frequency improvements etc.
- Projected corridor riders = existing riders + new riders
  - New riders due to improvements in the transit service levels
- Opening year riders = scaled up (existing + new) riders
- Can be used to easily estimate travel time savings and FTA New Starts user benefits

5

Modeling Approach – Steps


- Step 1: Develop a 2012 BCT on-board survey P→A trip table
  - Using the 2010 BCT on-board survey and corridor on/off counts
  - *Incorporate data from route-specific surveys*
- Step 2: Assign the survey trip table to the transit network
  - Using simplified transit path-building process in SERPM
- Step 3: Refine networks and survey data based on findings from the unassigned records – 'calibration' step
- Step 4: Repeat steps 2 & 3 until we have reasonable networks, calibrated survey data and the model
  - *Validate to route-specific survey data*
- Step 5: Develop forecasts taking into account the (1) land use growth and (2) transit service improvements

6

Approach – (Step 3: Model 'Calibration')


- Review transit speeds
- Calibrate the model to reflect reasonable…
  - Ridership levels by route
  - Boardings by segment (group of stops) on the corridor route
  - Transfers to connecting routes
- Networks and survey data refinement
  - Detailed coding of routes in the corridor, including the community buses
  - Reasonable access connections at major destinations (e.g., Sawgrass Mills Mall)
  - Survey clean up (geocoding issue at Sawgrass Mills Mall)

7

Approach – (Step 4: Transit Travel Times)


	Route	Route Name	Headway (pk/op)	Distance (miles)	Scheduled Travel Time (mins)		Estimated Travel Time (mins)		Difference	
			2012	2012	Peak Period					
					EB/SB	WB/NB	EB/SB	WB/NB	EB/SB	WB/NB
	72	Oakland Park Blvd Local Bus	15/15	16.2	70	75	70	72	(0)	(3)
EW Routes	36	Sunrise Blvd Local Bus	20/20	20.9	81	78	88	86	7	8
	22	Broward Blvd Local Bus	15/15	11.5	46	43	47	42	1	(1)
	55	Commercial Blvd Local Bus	30/30	16.3	60	75	58	76	(2)	1
	62	Cypress Creek/McNab Local Bus	40/40	27.0	96	85	103	102	7	17
	81	West Tamarac to BCT	20/30	20.1	84	85	93	91	9	6
NS Routes	14	Powerline Rd Local	20/30	14.8	56	61	63	61	7	(0)
	60	Andrews Blvd Local Bus	20/30	16.7	69	68	74	69	5	1
	50	Dixie Hway Local Bus	20/30	16.2	73	73	76	72	3	(1)
	10	US 1 Local Bus North	30/30	18.2	60	72	77	75	17	3
	1	US 1 Local Bus South	15/15	13.5	67	76	68	71	1	(5)
	Breeze	US 1 Breeze/ Rapid Bus	30/-	25.0	89	91	91	87	2	(4)
	11	A1A Local	30/30	23.7	100	100	105	105	5	5
	31	BCT to Hillsboro Blvd	20/30	18.3	75	75	78	76	3	1
	2	University Blvd Local Bus	20/30	25.8	113	120	127	115	14	(5)
	Breeze	University Blvd Breeze	30/-	29.2	83	85	84	72	1	(13)
	18	SR 7 Local Bus	15/15	27.3	113	112	113	109	0	(3)
	Breeze	SR 7 Breeze	30/-	25.2	86	87	85	79	(1)	(8)
	88	Pines Island Rd Local	30/60	14.1	52	52	55	53	3	1
Regional Routes	Tri-Rail	Tri-Rail	25/60	70.9	115	115	116	116	1	1

8

Approach – (Step 4: Ridership by Route)

	Route	Route Name	Daily Ridership		
			2012 Observed	2012 Estimated	Percent Difference
EW Routes	72	Oakland Park Blvd Local Bus	8,964	8,798	-2%
	36	Sunrise Blvd Local Bus	5,653	5,636	0%
	22	Broward Blvd Local Bus	4,345	4,342	0%
	55	Commercial Blvd Local Bus	3,095	3,822	24%
	62	Cypress Creek/McNab Local Bus	2,383	2,510	5%
	81	West Tamarac to BCT	4,264	4,648	9%
	EW Routes Sub-Total		*28,702*	*29,756*	*4%*
NS Routes	14	Powerline Rd Local	3,839	3,358	-13%
	60	Andrews Blvd Local Bus	4,418	4,388	-1%
	50	Dixie Hway Local Bus	4,671	3,784	-19%
	10	US 1 Local Bus North	4,147	4,262	3%
	1	US 1 Local Bus South	7,428	8,166	10%
	Breeze	US 1 Breeze/ Rapid Bus	1,052	1,031	-2%
	11	A1A Local	3,156	3,043	-4%
	31	BCT to Hillsboro Blvd	3,880	3,853	-1%
	2	University Blvd Local Bus	6,883	6,169	-10%
	Breeze	University Blvd Breeze/Rapid Bus	1,064	1,875	76%
	18	SR 7 Local Bus	15,492	12,874	-17%
	Breeze	SR 7 Breeze/ Rapid Bus	2,318	951	-59%
	88	Pines Island Rd Local	923	893	-3%
	NS Routes Sub-Total		*59,270*	*54,647*	*-8%*
Corridor Sub-Total			**87,972**	**84,403**	**-4%**
BCT Total Daily Boardings			**123,678**	**124,471**	**1%**

9

Approach – (Step 4: BCT #72 Activity by Segment)

From	To	Daily Activity ([Ons+Offs]/2)			
		2012 Observed	2012 Estimated	Difference	Estimated/ Observed
Sawgrass Mills	Flamingo Rd	740	667	(73)	0.90
Flamingo Rd	NW 85 Way	632	551	(81)	0.87
NW 85 Way	NW 60th Ave	1,228	1,015	(213)	0.83
NW 60th Ave	Rock Island Rd	756	699	(57)	0.93
Rock Island Rd	NW 30th Ave	2,560	2,519	(41)	0.98
NW 30th Ave	Andrews Ave	1,186	1,334	148	1.12
Andrews Ave	Federal Hwy	1,314	1,327	13	1.01
Federal Hwy	End-of-Line	552	687	135	1.24
Total		8,967	8,798	(169)	0.98

From route specific surveys

10

Approach – (Step 4: Transfer Connections)


Route No.	Description	2012 Observed Transfer Boardings	%of 2012 Observed Transfer Boardings	Estimated Transfer Boardings	%of Estimated Transfer Boardings
18	SR 7 Local Bus	1,411	27%	1,616	26%
02	University Dr Local	775	15%	538	9%
31	NW 31st Ave Local Bus	534	10%	563	9%
81	Lauderhill - BCT	507	10%	827	14%
14	Powerline Road Local I	504	10%	416	7%
60	Andrews Ave Local Bus	484	9%	544	9%
50	Dixie Highway Local Bu	314	6%	362	6%
10	US 1 Local Bus	276	5%	370	6%
11	Commercial and US 1	261	5%	439	7%
20	BCT to NE 3rd Ave/Sam	74	1%	83	1%
101	US 1 Breeze	32	1%	9	0%
441	SR 7 Breeze	71	1%	162	3%
102	University Dr Breeze	46	1%	174	3%
Subtotal		**5,289**	**100%**	**6,103**	**100%**
Other		623		433	
Grand Total		**5,912**		**6,536**	

From route specific surveys

Approach – (Step 5: Forecasting)


$$Trips_{project,I \to J} = (Trips_{existing,I \to J} + Trips_{new,I \to J,\ due\ to\ improvements\ in\ transit\ service}) * (1 + \%growth\ in\ activities\ at\ I\ and\ J)$$

- $Trips_{new}$ calculated using observed elasticity (TCRP reports & other literature)
- Transit service levels between I and J (in minutes) =
  - 1.0*In-Vehicle Time +
  - 2.0*Wait Time +
  - 2.0*Walk Times at I and J –
  - Mode bias in minutes to capture un-included attributes (follows FTA guidance)
- Proposed initial service level elasticity = -0.33 (weighted average of observed IVT and headway elasticity)
- %growth in activities at I and J = %growth in sum of population at I and employment at J
- Assign $Trips_{project}$ on the project network to estimate the project boardings

I=origin zone, and J=destination zone


- Thank you!

13