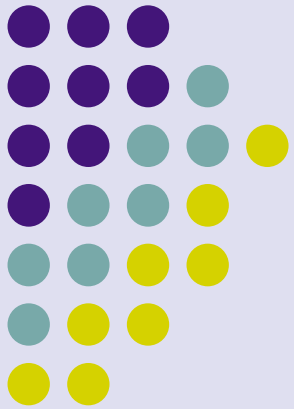
Travel Forecasting for New Starts

A Workshop Sponsored by

The Federal Transit Administration

March 23-25, 2009

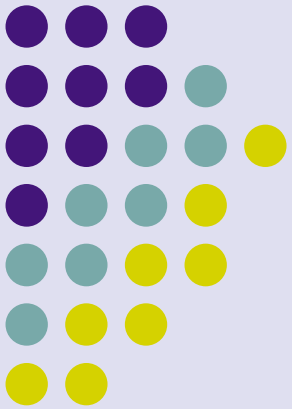
Tampa



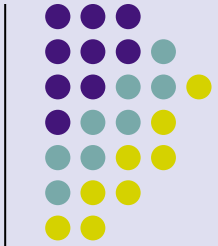
Welcome

Session 1

- Motivations
- Some perspective
- Agenda
- Logistics

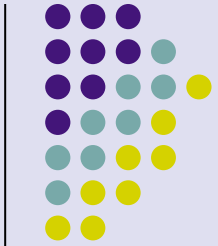


Motivations



- Reliable information for New Starts projects
  - Local decisions
  - FTA evaluation and rating of proposed projects
- Useful big-picture cases for projects
  - Problems → alternatives → analysis → insights
  - Important information from travel forecasts
    - Nature of the problem and reasonable alternatives
    - Alternatives' impacts on transit service and ridership
    - Transportation benefits and their consequences
  - Key arguments, reliably made

Workshops on Forecasting



- June 2006: Minneapolis
  - Findings from detailed FTA QC reviews, 2003-2006
  - Actions taken, and additional actions contemplated
- September 2007: St. Louis
  - Additional actions taken and contemplated
  - Examples of improved practice in transit forecasting
- March 2009: Phoenix and Tampa
  - Finding the big picture: models, forecasts, outcomes
  - More examples of improved practice

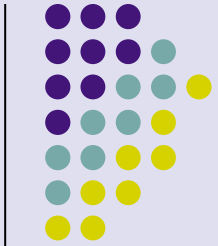
Agenda

- Day 1:
  - Summit tutorial
  - Summit applications
- Day 2:
  - Lessons learned
  - Data and model testing for transit forecasting
  - Better information from improved forecasts
- Day 3:
  - Learning from completed projects
  - Simplified methods for Small Starts
  - Ongoing research efforts

Participants

- Show of hands
  - Transit agencies
  - Metropolitan Planning Organizations
  - State agencies
  - Local governments
  - Consultants
  - FTA
  - Other
- Registration lists → on the FTA website

Logistics



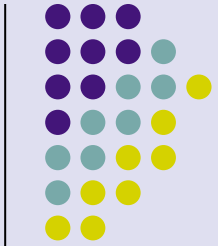
- Slides
  - Handouts
  - Website
- Schedule adherence and breaks
- Lunch
- Rest rooms
- Materials in the room overnight
- Other announcements

Lessons Learned 2003-2008

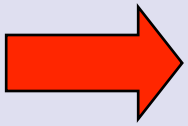
Session 2

- Purposes
  - Summary for newcomers to New Starts
  - Review for veteran participants
  - Opportunity to comment
- Contents
  - Challenges to good forecasts
  - Lessons
  - Conclusions

Challenges to good forecasts

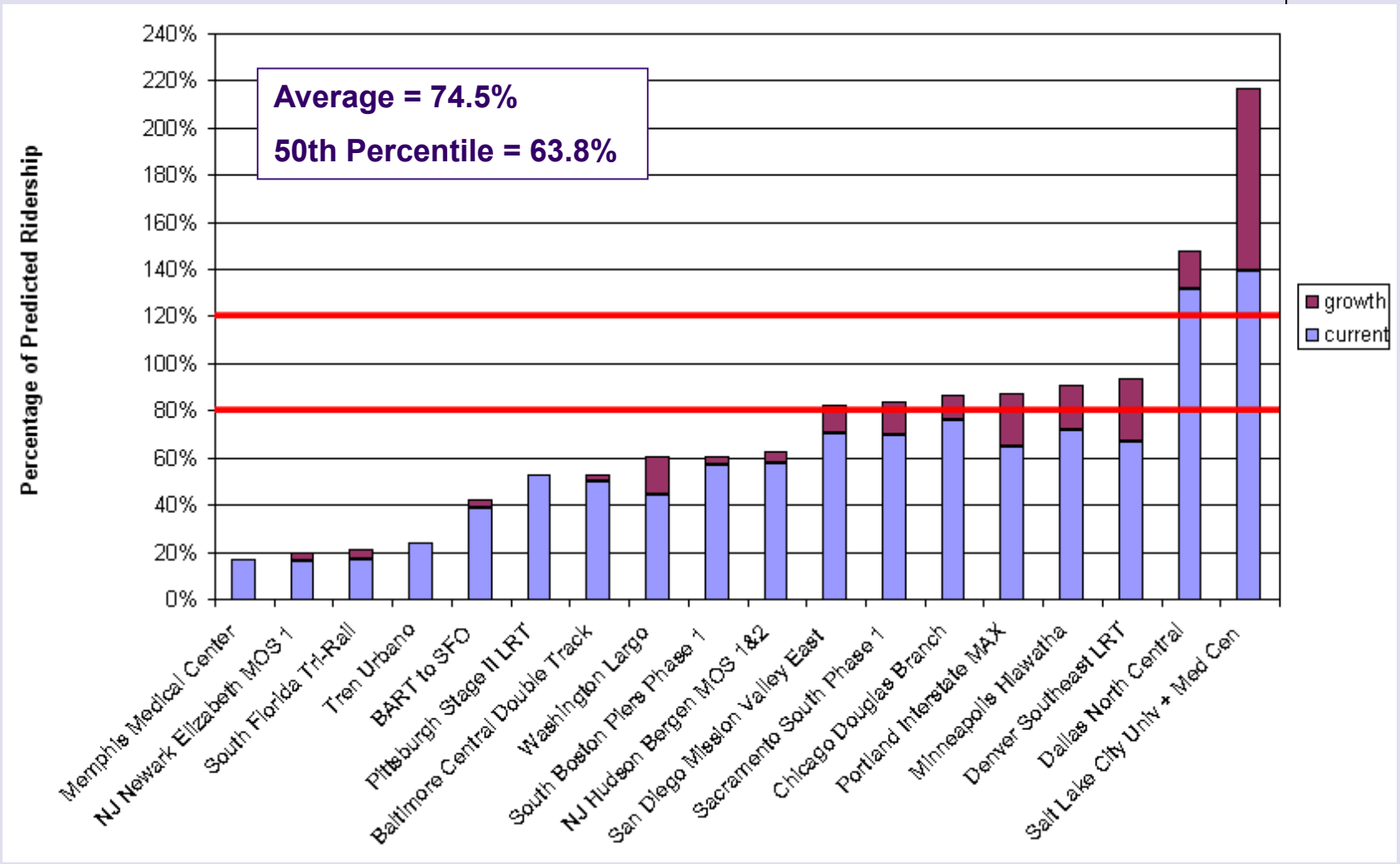


- Absence of standard forecasting tools
- Emphasis on models instead of forecasts
- “Black box” approach to forecasting
- “Black box” approach to forecasts
- Local decisions with different criteria
- “Compounded optimism” to satisfy FTA criteria

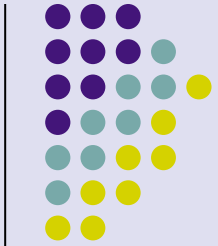


Shortfalls in actual ridership vs. forecasts

Predicted vs. Actual Ridership for Projects Completed 2003-2007



Lessons



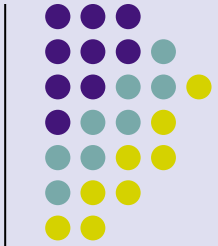
- General lesson: *insights* in addition to numbers
- Lessons about travel models
  - Reporting
  - Data
  - Testing
- Lessons about forecasting for project planning
  - Quality control
  - Peer comparisons
  - Analysis of uncertainties
  - Post-implementation assessments
- *Comments / additions / deletions / clarifications*

General Lesson

- *Insights* rather than just numbers
  - Numbers are essential but not sufficient

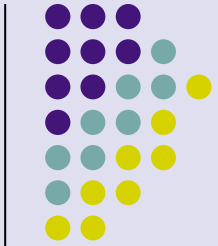
  - Useful forecasts must include derived insights into:
    - Nature of the problem(s) for specific travel markets
    - Ability of the alternatives to improve transit service
    - Ridership response for specific travel markets
    - Benefits accruing to those markets and others

General Lesson (continued)



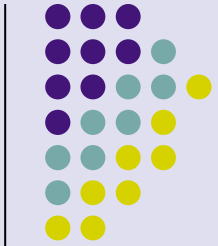
- Benefits of emphasis on *insights*
  - Provides better context for data on transit riders
  - Helps set standards for travel models
    - Few FTA specifications on model properties
    - New focus on ability to provide insights for decisions
  - Helps with quality control on forecasts
    - Easy to put a bad number in a table
    - Harder to include a bad number in a coherent story
  - Focuses on information for decision-making(!)
  - Sets stage for evaluation of success

General Lesson (continued)



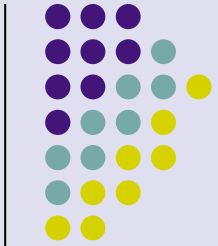
- Implementation of emphasis on *insights*
  - Data and model testing
    - What are the major transit markets on the system?
    - How well does the model set grasp those markets?
  - "Case" for each proposed project
    - Required part of information for FTA rating of project
    - What key things do we think the project will accomplish?
  - Before-and-After Studies
    - What key things did the project actually accomplish?
    - How well did our forecasts anticipate those things?

Lessons about Travel Models



- Reporting
- Data
- Testing

Lessons about Travel Models



- Analytical reporting is absolutely crucial
  - Tradition: aggregate summaries → "black box"
  - FTA response
    - Standard set of analytical summaries with FTA software
    - Routine part of project information for FTA review
  - Outcome: key properties of forecasts are clearer
    - For testing of travel models
    - For quality control on forecasts
    - For understanding and refinement of alternatives
    - For selecting a project and making a case for funding

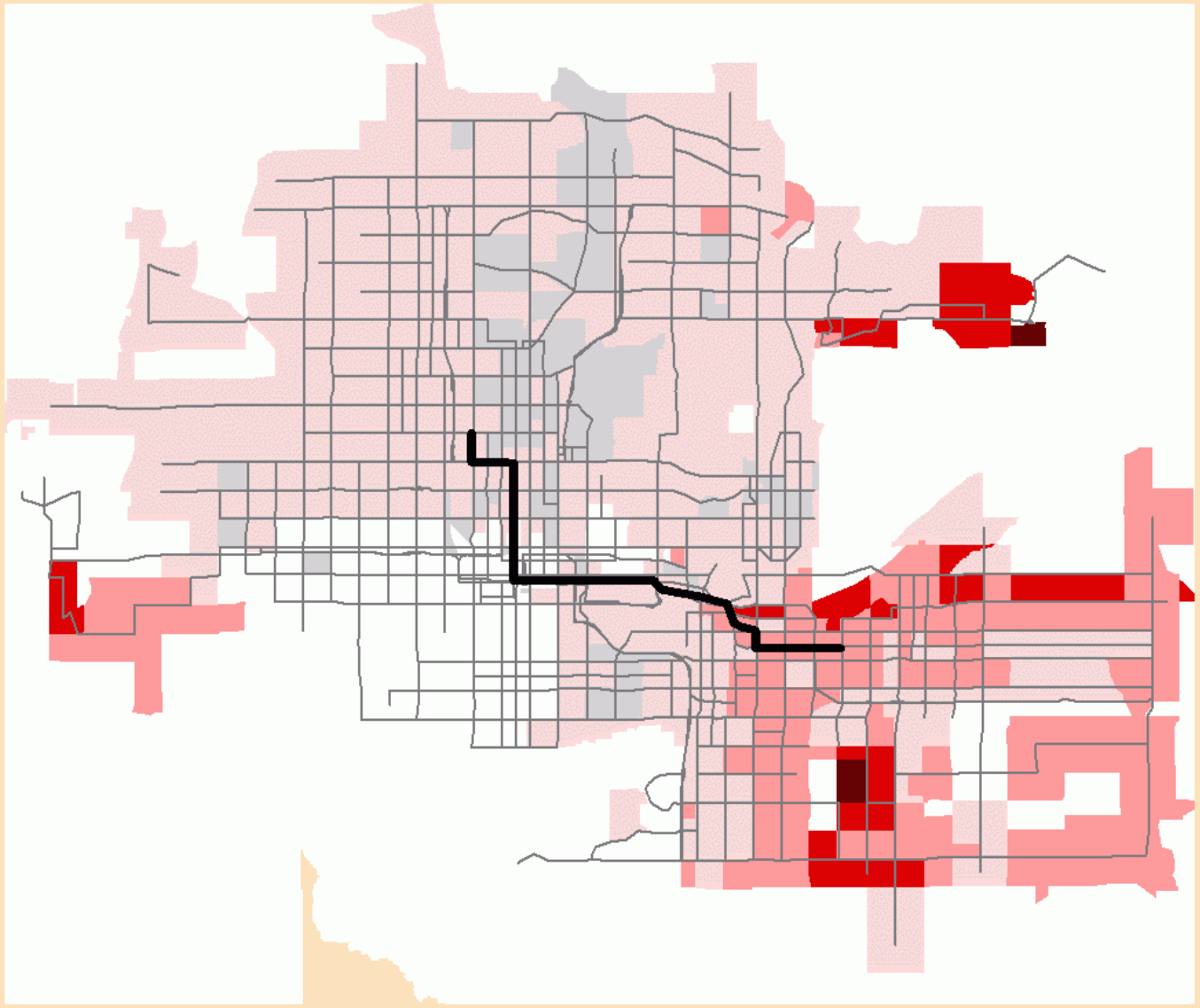
Central Phoenix/East Valley PE/DEIS

MARICOPA ASSOCIATION of GOVERNMENTS

ZONE 842 WEIGHTED TRAVEL TIME DIFFERENCE 2020

[BUILD WALK TO RAIL - NOBUILD WALK TO LOCAL BUS]

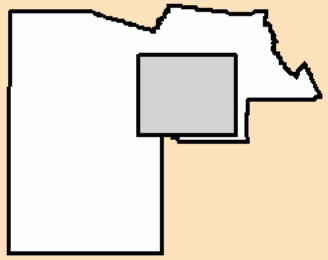
Maricopa County, Arizona
(Transit Service Area)



Travel Time Difference

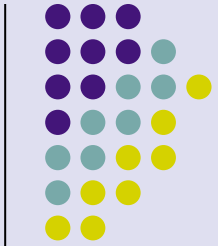
- Out of Range
- More than 60 minutes decrease
- 40 - 60 minutes decrease
- 20 - 40 minutes decrease
- 0 - 20 minutes decrease
- 0 - 20 minutes increase
- 20 - 40 minutes increase
- 40 - 60 minutes increase
- More than 60 minutes increase
- Light Rail
- 2020 Transit Network

MAP AREA



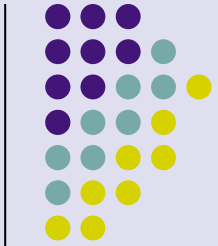
Source: MAG Transportation Model, 2000
RPTA Transit Networks

Lessons about Travel Models



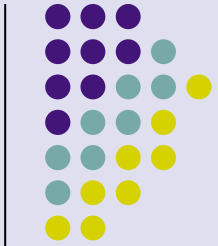
- Data are absolutely crucial
  - Tradition: no data requirements → little data(!)
  - FTA response (requirement effective May 2009)
    - Project proposals supported by "tested" models
    - "Tested" effectively against data on ridership patterns
  - Outcomes
    - Much better understanding of key ridership markets
    - More rigorous testing of models
    - Better detection of errors in travel models
      – transit components and other components

Lessons about Travel Models



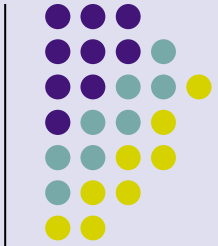
- Useful testing is more than data-matching
  - Tradition: aggregate tests, X-section data, factoring
  - FTA response: meaningful testing that includes:
    - Identification of key transit travel markets in current data
    - Focused testing of model's grasp of key markets
    - Detection and correction of actual sources of error
    - Tests over (1) time and (2) transit system changes
  - Outcomes
    - Cleaner models
    - More plausible predictions of project benefits

Lessons about Travel Models



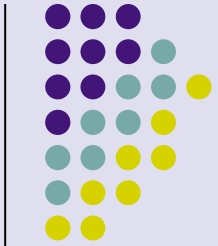
- Testing: an example "based on fact"
  - Existing rail line with 10,000 riders
  - Models calibrated to match counts
  - Subsequent survey of riders
  - Riders with origins and destinations near the line
    - Models: 15% (so line is a collector/distributor)
    - Data: 85% (so line is really a local-area circulator)
  - Ques.: How useful was the "calibrated" model?
  - Ans.: Not useful at all for similar rail lines

Lessons about Forecasting



- Quality control
- Peer comparisons
- Analysis of uncertainties
- Post-implementation assessments

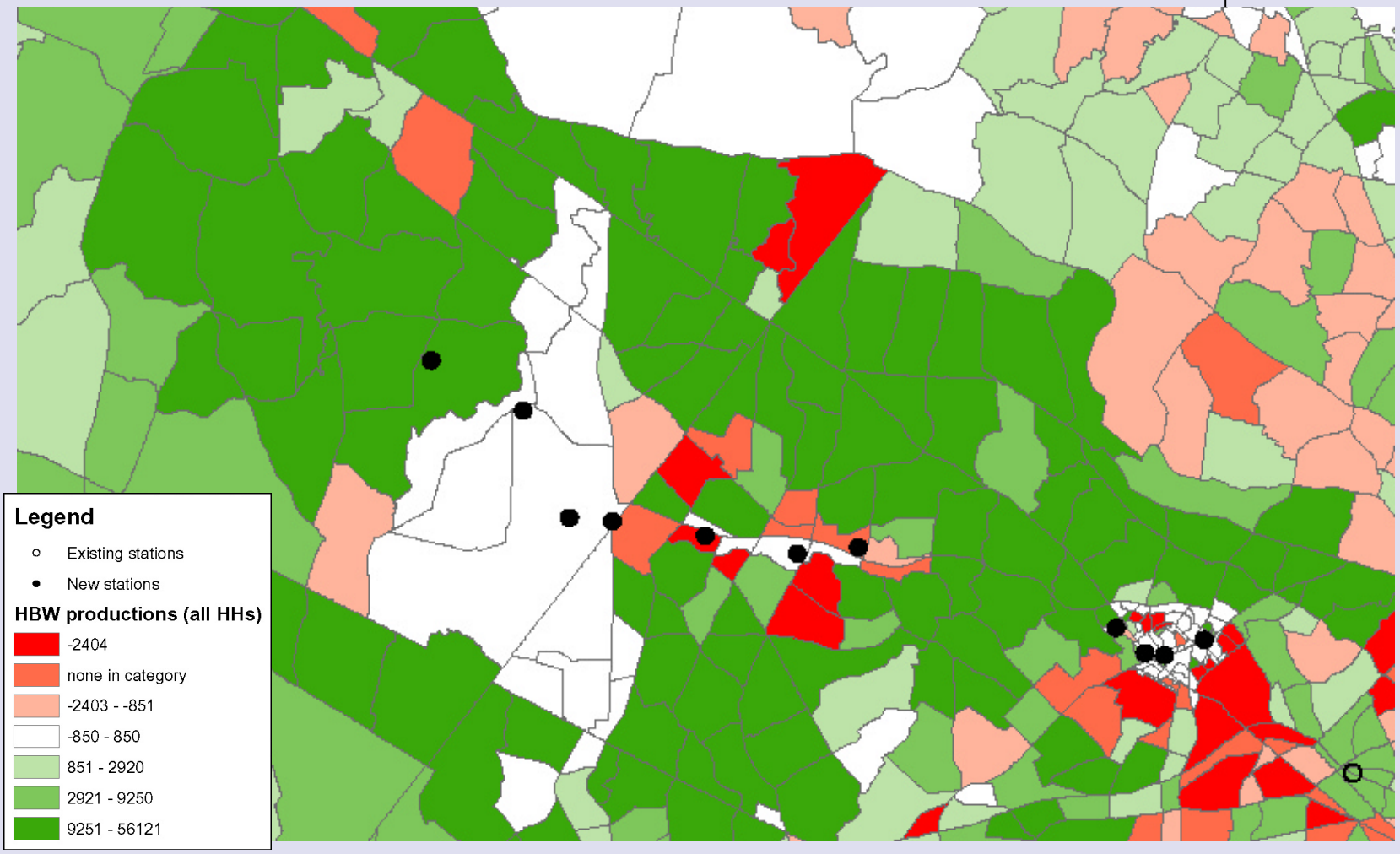
Lessons about Forecasting



- Quality control (QC)
  - All forecasts have errors; question is "How big?"
  - Tradition: little QC → lots of errors, big and small
  - FTA response
    - Standard analytical reports/graphics for project forecasts
    - Routine review by FTA staff → questions → resolutions
  - Outcomes
    - More attention to details by forecasters, project sponsors
    - Much more plausible forecasts; fewer obvious errors

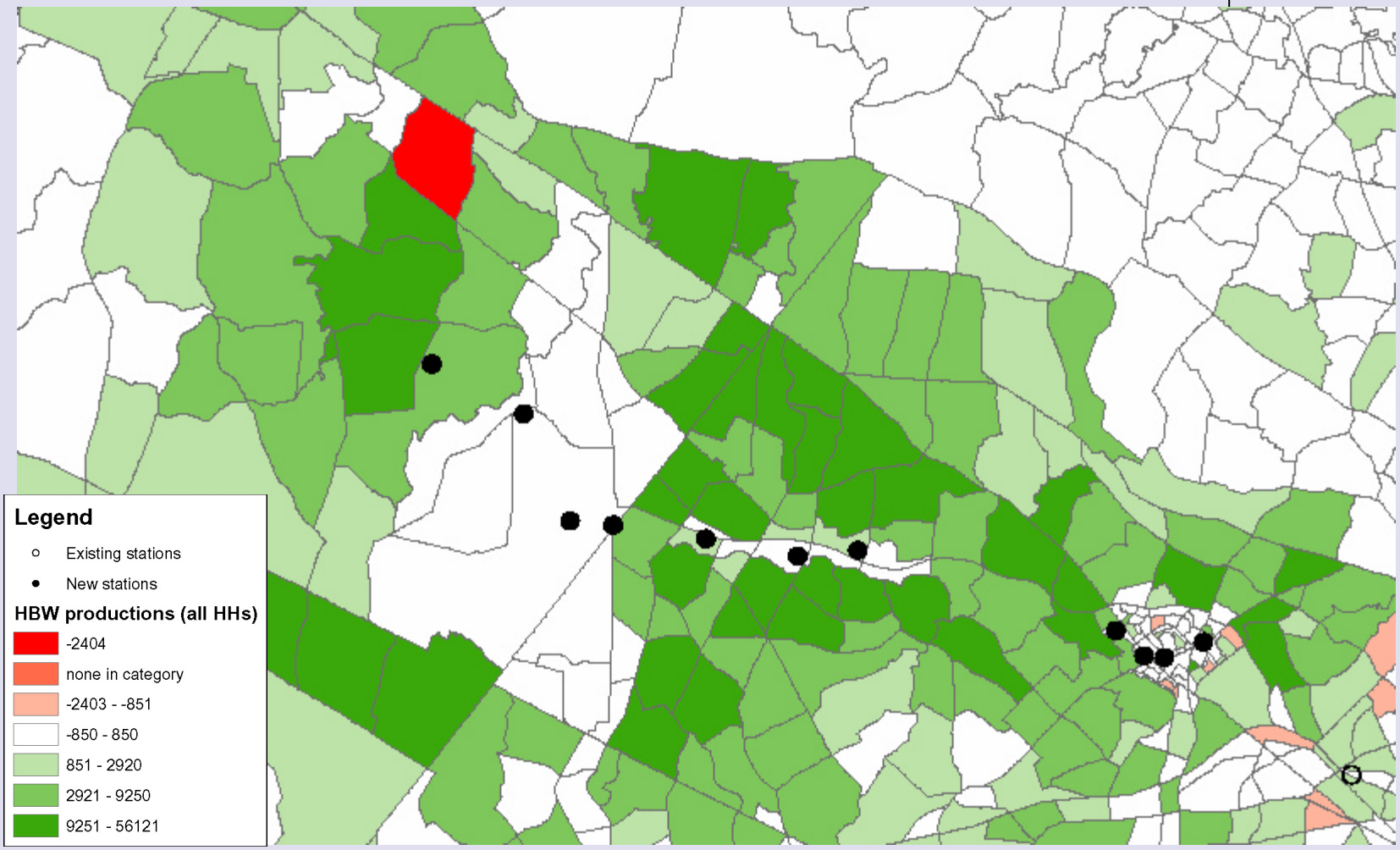
A Lesson in QC

Forecasts Prior to Reporting Requirements

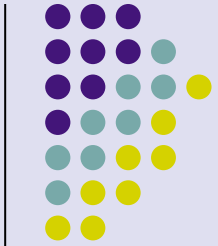


A Lesson in QC

Forecasts after Some Corrections

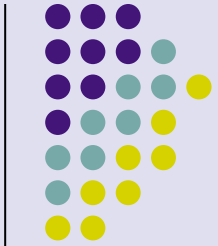


Lessons about Forecasting



- Peer comparisons for new modes, behaviors
  - Local data help little with entirely new conditions.
  - Tradition: calibration → model runs → "forecasts"
  - (Revised) FTA response
    - Checks against ridership outcomes in similar settings
    - Aggregate Rail Ridership Forecasting (ARRF) Model
    - Analysis of, and credits for, "other" guideway benefits
  - Outcomes
    - More realistic treatment of "other" guideway benefits
    - Framework for uncertainties with starter-line projects

Lessons about Forecasting



- Analysis of uncertainties
  - The only thing certain in forecasts is uncertainty.
  - Tradition: single-number forecasts for 25 years out
  - New FTA requirement
    - Analysis of uncertainties → sources of potential error
    - Forecasts as a range: lower – most likely – upper
    - Discussion of specific sources/magnitude of impacts
  - Outcomes (anticipated)
    - Truth in forecasting → better information for decisions
    - Realistic presentation of insights, not just numbers

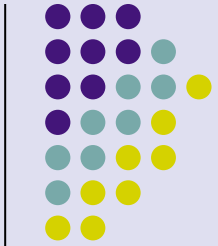
Lessons about Uncertainties

New Transit Trips for a BRT-system Alternative

Report 1-4
Change in Transit Person-Trips: Build minus Baseline
All Transit-Access Markets
Home-Based-Work Trips

Production District	Attraction District 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1 CBD	3	-1	3	0	2	0	0	5	11	0	0	7	0	0	0	0	0	30
2 Urban	135	68	63	0	24	0	0	66	229	6	0	175	0	13	0	0	0	779
3 N Suburb	185	77	54	0	28	0	0	13	48	3	0	68	0	4	0	0	0	480
4 N Rural	1	2	5	0	1	0	0	0	2	0	0	3	0	0	0	0	0	14
5 W Suburb	198	135	40	0	83	0	0	23	223	4	0	79	0	3	0	0	0	789
6 NW Suburb	-14	2	10	0	0	0	0	2	14	1	0	11	0	0	0	0	0	25
7 NW Rural	48	25	19	0	7	0	0	3	6	0	0	11	0	0	0	0	0	120
8 S Suburb	139	85	14	0	18	0	0	122	66	7	0	71	0	1	0	0	0	525
9 SW Suburb	187	157	20	0	116	0	0	36	235	5	0	[illegible]	0	1	0	0	0	827
10 SE Suburb	20	15	4	0	5	0	0	4	10	0	0	18	0	0	0	0	0	75
11 SE Rural	2	6	3	0	2	0	0	2	5	1	0	11	0	0	0	0	0	31
12 E Suburb	740	453	96	0	111	0	0	99	196	26	0	914	0	21	0	0	0	2656
13 E Rural	0	4	4	0	1	0	0	1	4	0	0	14	0	0	0	0	0	29

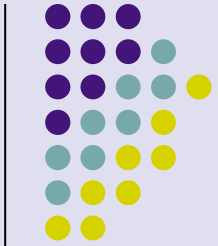
Lessons about Forecasting



- Post-implementation assessments
  - Learn by doing – but learning takes effort.
  - Tradition: no follow-up evaluation of projects
  - New FTA requirement for every funded project
    - Before-and-After comparisons
    - Predicted-versus-Actual comparisons

    } Summarized in annual FTA report to Congress
  - Outcomes (anticipated)
    - Better understanding of projects and their benefits
    - Better tools for prediction of benefits
  - <u>Biggest missed opportunity with the program</u>

FTA Conclusions on Lessons



- General lesson: *insights* in addition to numbers
- Lessons about travel models
  - Reporting
  - Data
  - Testing
- Lessons about forecasting for project planning
  - Quality control
  - Peer comparisons
  - Analysis of uncertainties
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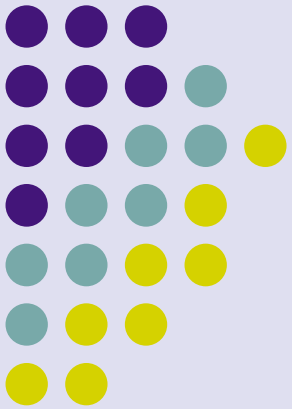
- *Comments / additions / deletions / clarifications*

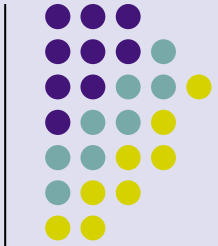
Guidance

Session 3

- Draft guidance on the FTA website
- Central messages
- Invitation to comment

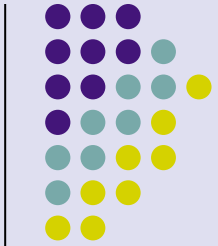


Draft Guidance



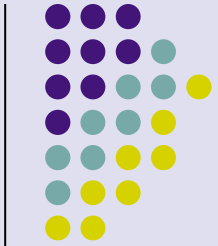
- Properties of travel models
- Data for model testing
- Testing of travel models
- Data for Very Small Starts
- Representation of unincluded transit attributes
- Standard presentation of New Starts forecasts
- Caps on per-rider user benefits
- Analysis of uncertainties in ridership forecasts
- Analytical support of cases for projects

Properties of Travel Models



- Necessary capabilities of the methodology
- Requirements for New Starts forecasting tools
  - Be consistent with good practice
  - Grasp the current transit situation
  - Be mindful of new behaviors
  - Adequately support the case for the project
  - Quantify FTA evaluation measures (& respect conventions)
- Acceptable methodologies
- Thoughts on selected model-design topics

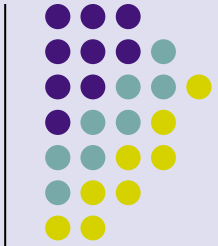
Data for Model Testing



- Supply side
  - Highway speeds, parking costs
  - Transit itineraries, speeds, fares
- Demand side
  - Overall travel patterns
  - Transit counts
  - Transit rider travel patterns (required by FTA policy)
    - Design of on-board surveys
    - Other survey approaches

Details in Session 4

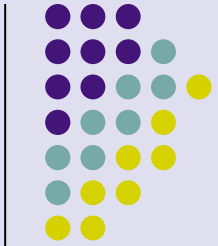
Testing of Travel Models



- Problems with traditional "calibration & validation"
- A better approach
  - Data matching → a "calibrated" model
    - Adjustments to match all available data in useful detail
  - Model assessment → a "plausible" model
    - Scrutiny of coefficients, constants, key assumptions
  - Forecast testing → a "tested" model
    - Back-cast, if possible; perturbed forecasts, certainly
  - Documentation → a "ready-for-forecasting" model
    - Model description; user's guide + applicability of the model

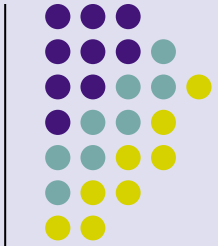
Details in Session 7

Data for Very Small Starts



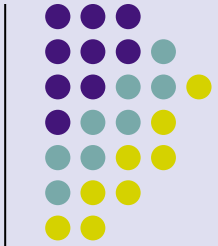
- Purpose – meeting the minimum market size
- General approach
  - On-off counts on existing transit lines in the corridor
  - Computation of "benefiting riders"
  - Demonstration of sufficient market size
- Dealing with exceptions
  - Substantially different service types
  - Intersecting lines

Unincluded Transit Attributes



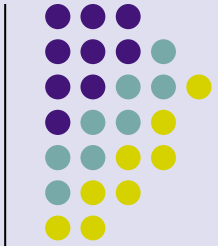
- Approaches for New Starts forecasting
  - For existing guideway modes
  - Guideway modes new to an urban area
  - For settings with both existing and new guideway modes
- Credits for unincluded guideway attributes
  - Specific attributes
  - Allowable ranges of user-benefits credits
  - Examples

Standard Presentation for New Starts



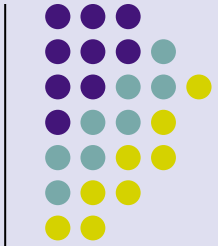
- Standard Summit reports
  - No-Build (2030) versus “today”
  - TSM alternative versus No-build
  - Build alternative versus TSM alternative
  - Build opening year versus “today”
- QC reports
  - Tests on benefits from (1) the project and (2) IVTime
  - New Starts “template” on “Travel Forecasts”
- Transit assignment results for the fixed guideway

Caps on Per-trip User Benefits



- Origins of the capping mechanism
- Higher expectations
- Current implementation
- Lifting or removing the cap for an alternative
  - Significant “real” project benefits above the cap
  - Few “superfluous” benefits above the cap
  - Few “superfluous” benefits below the cap
- Early coordination with FTA

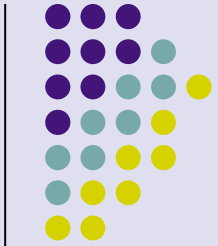
Analysis of Uncertainties



- Purposes
- Contents of an uncertainty analysis
  - Range of ridership forecasts
  - Analysis of specific sources of significant uncertainty
  - Documentation (in appendices) of analyses
- Candidate sources of uncertainty
- Useful analytical tools

Details in Session 10

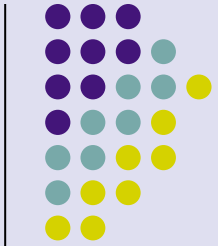
Support of Cases for Projects



- Information requirements
  - Context, current and future conditions
  - Benefits/limitations of the baseline, of the project
  - Uncertainties
- Need for focus in cases prepared in 2007, 2008
  - Many generalities but few insights
  - Lots of model statistics but no information
- An approach
  - Isolate the trips using the project
  - Work backwards to focus on the benefits and context

Details in Session 9

Invitation to Comment



- Draft guidance on the FTA website
  - Section by section posting, March through June
  - Informal 30-day comments through August
  - FTA revisions
  - Final guidance posted by the end of September
  - Coordination through the New Starts listserv