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- **This** webinar will last approximately two hour.
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2014 Travel Behavior Surveys in Southern Nevada

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RTC
OF SOUTHERN NEVADA

Presented by

Beth Xie Ph.D., RTC of Southern Nevada

Fred Gsell, ETC Institute

Jeremy Wilhelm, Westat

Greg Gaides, Parsons Transportation Group

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Project Team

Beth Xie is a Manager of Planning for Regional Transportation Commission of Southern Nevada (RTC) with more than 18 years of experience in the fields of transportation planning and travel demand modeling. She has Ph.D. in Transportation Geography from Indiana University and M.A in Economics from University of Toledo, OH. She worked as the Project Manager for both RTC 2014 Household Travel Survey and RTC 2014 Transit Origin Destination On Board Survey.

Fred Gsell is a Project Manager of ETC Institute with more than 15 years of experience in transportation research, focusing primarily on OD transit research. In addition to OD research, he has been involved in market analysis, user / non-user, Title VI, and customer satisfaction studies as a project manager for transit research. Prior to working for ETC Institute for the last three years he worked for NuStats. He received a B.S. from LSU and a M.S. from LSU Medical Center – New Orleans.

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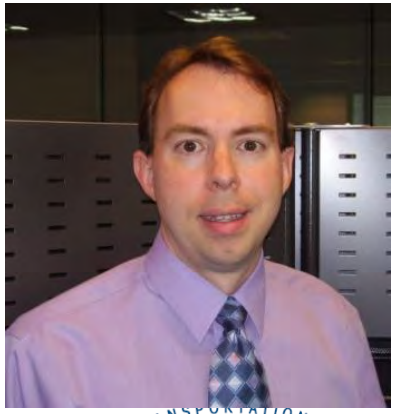
Jeremy Wilhelm: Jeremy is a project manager at Westat with 8 years of experience designing and managing travel behavior surveys for clients throughout the United States, including regional planning agencies, public transit agencies, and state departments of transportation. He has collaborated on large-scale travel behavior studies with a focus on the use of GPS technology, web-based surveys, and incorporating new technologies in research design. Jeremy has a Masters Degree in City and Regional Planning from the Georgia Institute of Technology.

Greg Gaides: Greg has more than 21 years of experience in the fields of travel demand modeling and transportation planning, all with Parsons. He received his M.S. and B.S. in Civil Engineering from the University of Tennessee and the University of North Dakota, respectively. Parsons is assisting RTC with the enhancements to their travel demand model, based in part on the RTC 2014 Household Travel Survey and RTC 2014 Transit Origin Destination On Board Survey data that was collected. Parsons similarly assisted RTC with model updates the last time survey data was collected.



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Introduction - Presentation Outline

- Introduction (RTC)
- Transit Origin Destination Survey (ETC Institute)
- Household Travel Survey (Westat)
- Quality Control, Data Processing and Modeling (Parsons Transportation Group)

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Introduction-Transit Survey

- **Purpose of the survey**
  - Improve transit ridership forecasts produced by RTC's travel demand model.
  - Generate reliable linked Origin-Destination data to support TDM
  - Compile statistically accurate information
  - fulfill requirements for Federal Transit Administration (FTA) New Starts funding

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Introduction-Transit Survey -Continued

- **Overview of 2014 Origin & Destination On-Board Transit Survey**
  - **Goals:**
    - Obtain useable On-to-Off Pairs from ¼ of the service representing at least 20% of riders on routes with an average Tues-Thurs daily ridership of at least 2,000 (10% - SDX and Deuce)
    - Obtain useable Intercept Interviews (OD Survey) from at least 7.5% of riders for all routes (4.5% - SDX and Deuce)Survey Administration (April - Jan 2015)
  - **Survey Administration**: (April 2014-Jan 2015)

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Introduction-2014 Household Travel Survey

- **Purpose of 2014 Household Travel Survey**
  - Collect socio-demographic and travel behavior data among residents and transit riders
  - Provide high quality usable data to support the update and enhancement of the travel demand model and to support transportation planning activities.

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Introduction-Household Travel Survey-con

- **Overview of Household Travel Survey**
  - **Goals:** Complete 7,000 usable surveys
  - State-of-the-practice Data Collection Methods
  - 10% (700) GPS Sub-component
  - Data collected between February 2014 and January 2015 (no summer collection)

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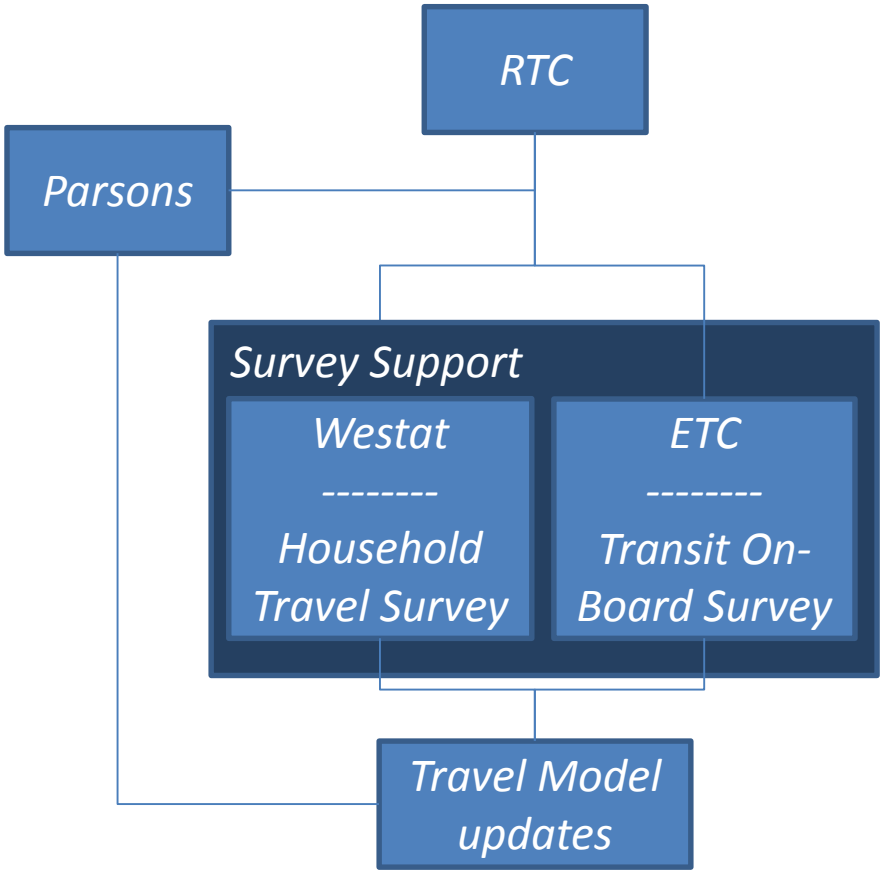
Project Team and Projects Management



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Survey Projects Management

- A. Collaborate team work
- B. Coordination among different resources
- C. Client's data quality
- D. Project management

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2014 Travel Behavior Surveys in Southern Nevada - Topics

- a. Overview of the survey
- b. Any lessons learned regarding survey design efforts
- c. Sampling methods used
- d. Type of emerging technologies used in the survey
- e. Outreach to non English speakers
- f. Response rates
- g. Real-Time QC During Data Collection
- h. Geocoding / Location Data and other QC
- i. Post-Collection Adjustments
- j. Quality Control, Data Processing and Modeling

2014 Transit Survey

Presenter: Fred Gsell, ETC Institute

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Transit Survey - Overview

- On-to-Off (20% sample rate of 2K routes)
  - Goal: approximately 30,000 pairs
  - Actual: 41,772 bus pairs
- Full Intercept Survey (7.5% / 4.5% samples)
  - Goal: approximately 12,000 interviews
  - Actual: 14,125 interviews

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Transit Survey - Results

- 80% of riders on the Deuce and SDX were visitors to the Las Vegas region and made up 22% of overall ridership
- 97% of riders walked to access / egress transit
- 85% of riders are employed or looking for employment

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Transit Survey - Lessons Learned

- Overall, the survey design and execution occurred without significant incident
- Importance of quality APC data
  - Boardings and alightings by stop for each route /direction / TOD
  - Without this data the expansion process cant be as targeted
- QA/QC changes documentation

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Transit Survey - Sampling Methods – On-to-Off

- On-to-Off Survey used to understand travel patterns between bus stops.
- Riders were asked to participate in the On-to-Off survey after they boarded the bus.
- On Buses:
  - Riders who agreed to participate were handed a barcode card which was scanned by a surveyor.
  - Riders handed their barcode card back to the surveyor as they exited the bus.

Transit Survey - Sampling Methods - OD

- Origin – Destination participants were randomly selected by the computer based on the number of people who boarded at each stop / on vehicle
- Those who did not have time to complete the survey during their trip provided their phone number, which allowed an interviewer from ETC Institute to call them later to capture short trips
- All variables required to be answered except income

Transit Survey - Emerging Technologies

- **On-to-Off** - GPS-based tablet utilized with scan guns and survey cards
- **OD** – Google maps, web-based survey program that allows live geocoding and constant field supervision (data downloads don't occur)
- **OD** Elvis Review – Google maps interface with all routes and stops used as well as possible transfers information

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Transit Survey - Emerging Technologies

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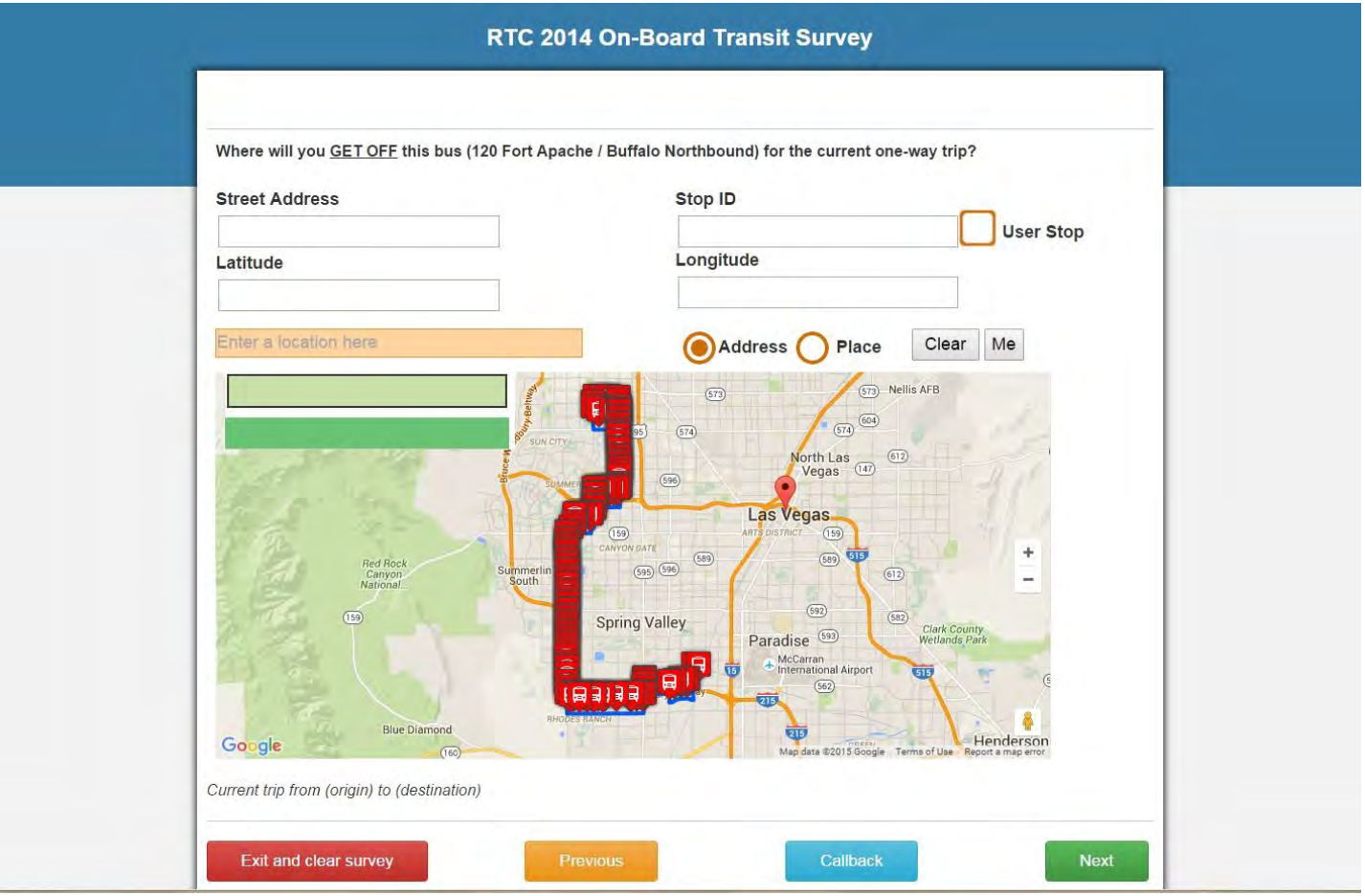
Transit Survey - Emerging Technologies



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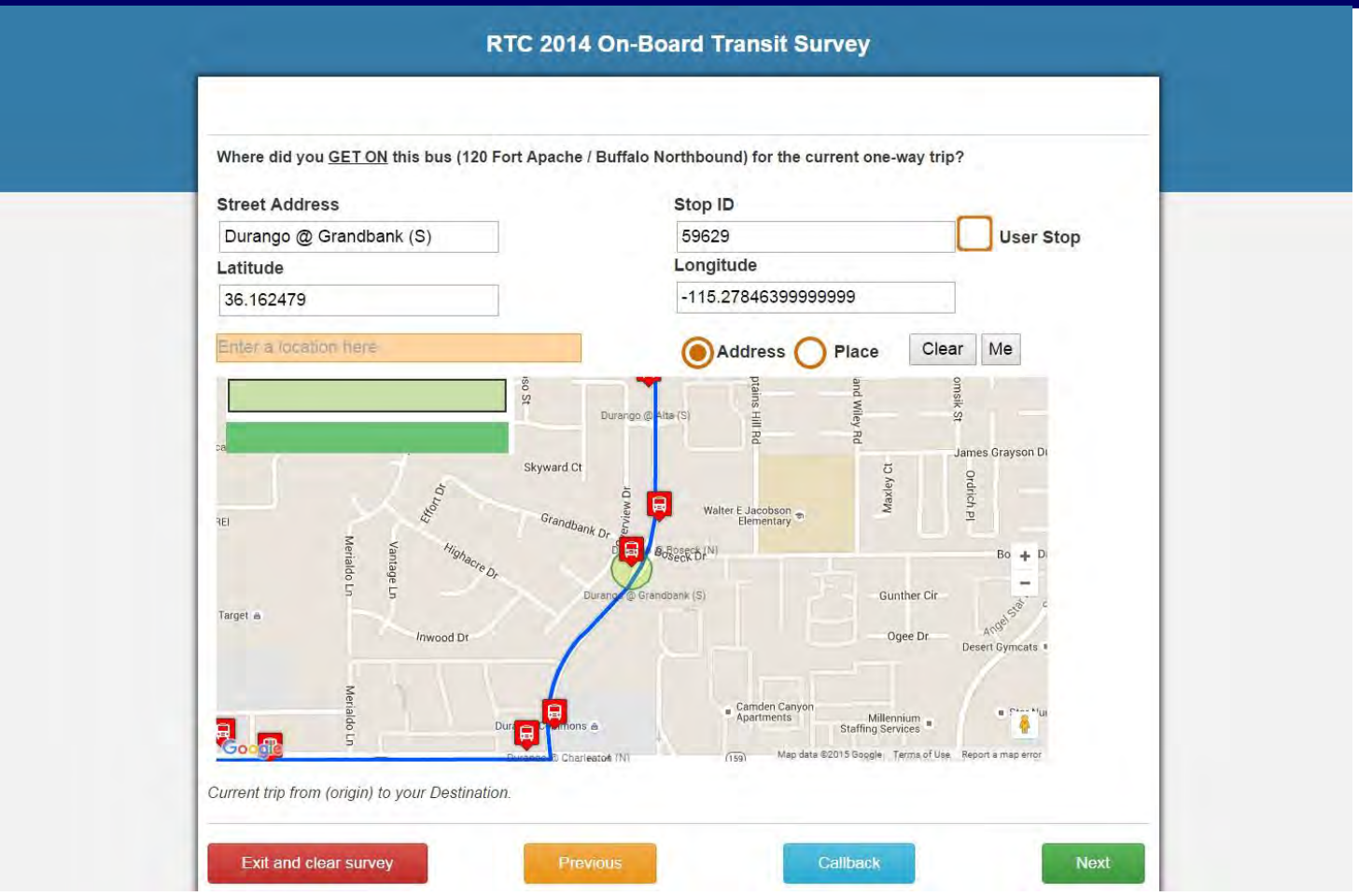
Transit Survey - Emerging Technologies



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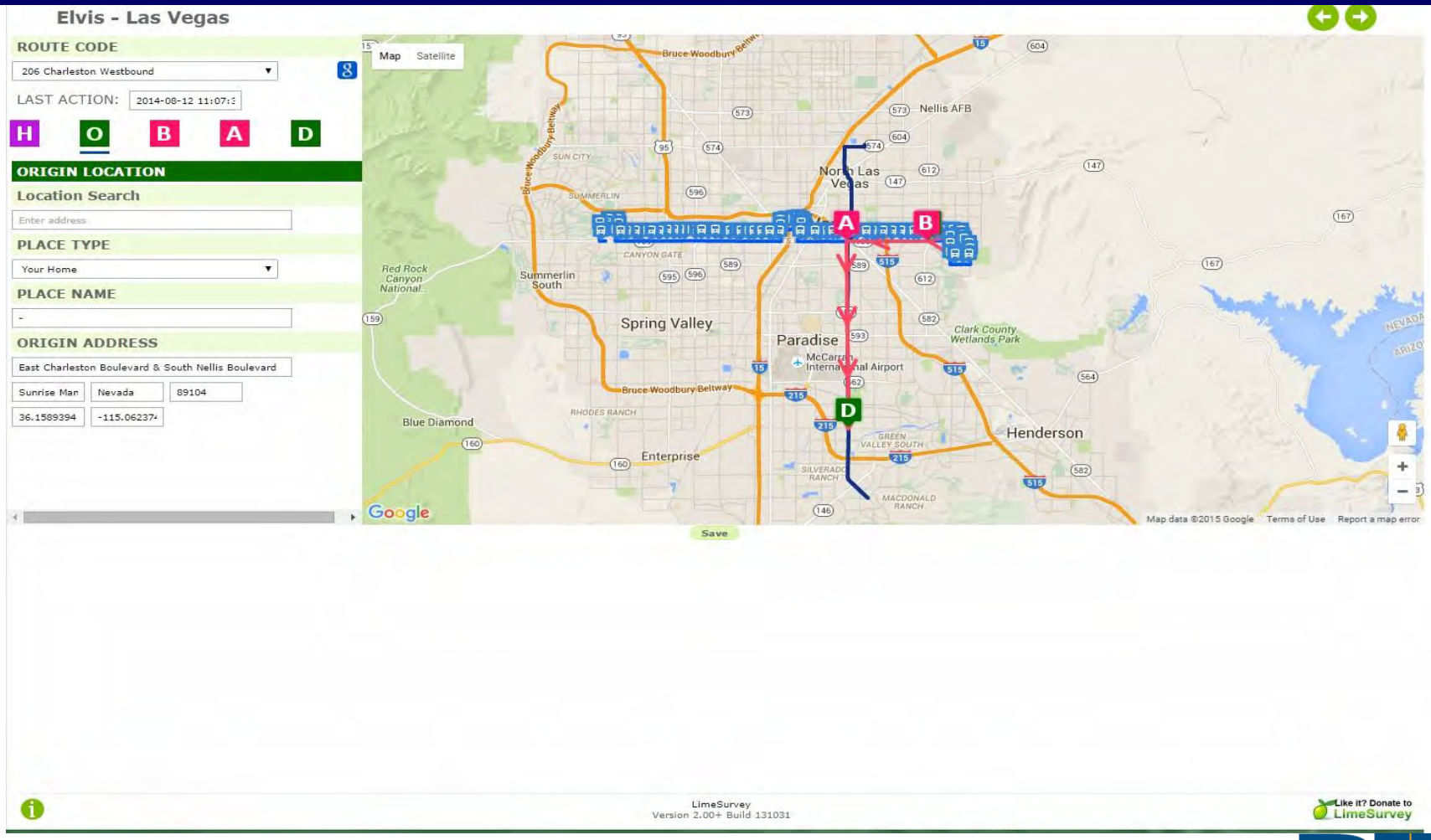
Transit Survey - Emerging Technologies



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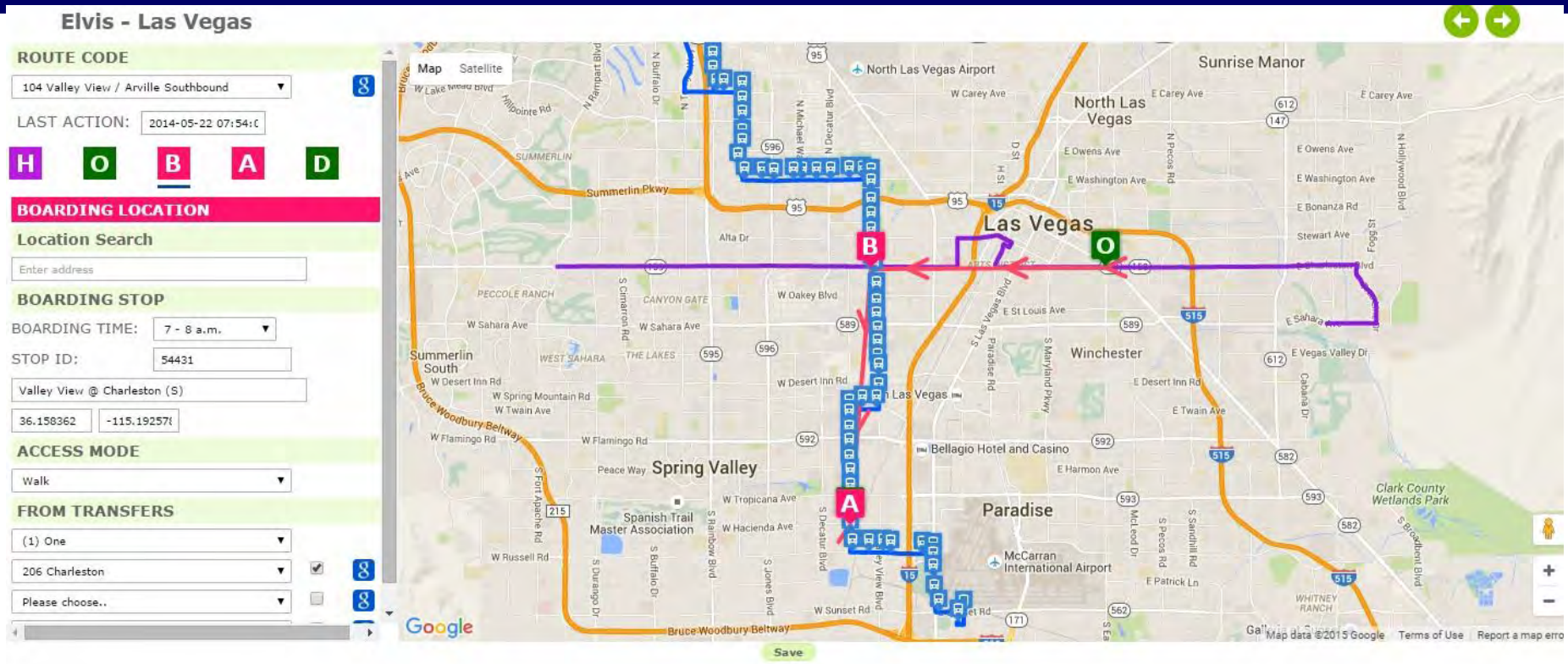
Transit Survey - Emerging Technologies



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Transit Survey - Response Rates

- On-to-Offs – More than 90% of individuals received and returned the survey card
- Origin – Destination
  - More than 80% of the passengers agreed to participate in the survey
  - Useable surveys were obtained from more than 90% of those who agreed to participate

Transit Survey - Data Collection Challenges

- Short Trippers
  - Paper takes about 10 min
  - Interview can take as little as 4 min
  - If rider doesn't have 5 min, CATI retrieval done through ETC call center improves trip time distribution
- Linguistically Isolated Foreign Language Speakers (primarily Spanish)
  - Attempt to pair interviewers on routes where most likely to occur
  - Collect contact info and reach out via ETC call center
- Crush loads – Because the sampling unit is the individual rider, crush load bias of paper-based minimized

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Transit Survey - Real-time QC of Data Collection

- High level of field supervisor oversight throughout collection process (technology only does so much)
- Web-enabled program allows for real time monitoring of collection
  - Able to review when and where interviews occur
  - Able to review demographics of respondents across all interviewers
  - Able to review the trip path including all four primary locations, transfer info, and access / egress modes
- Monitoring of staff through transit agency feedback and secret shoppers

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Transit Survey - Expansion Method -1

- **Step 1:** Reviewed APC data for each route by direction and time of day

RIDERSHIP DATA WAS VERY GOOD

- **Step 2:** Applied the distribution of the On-to-Off survey data to the stop level data acquired by APCs to develop an estimated distribution of trips between stops along each route

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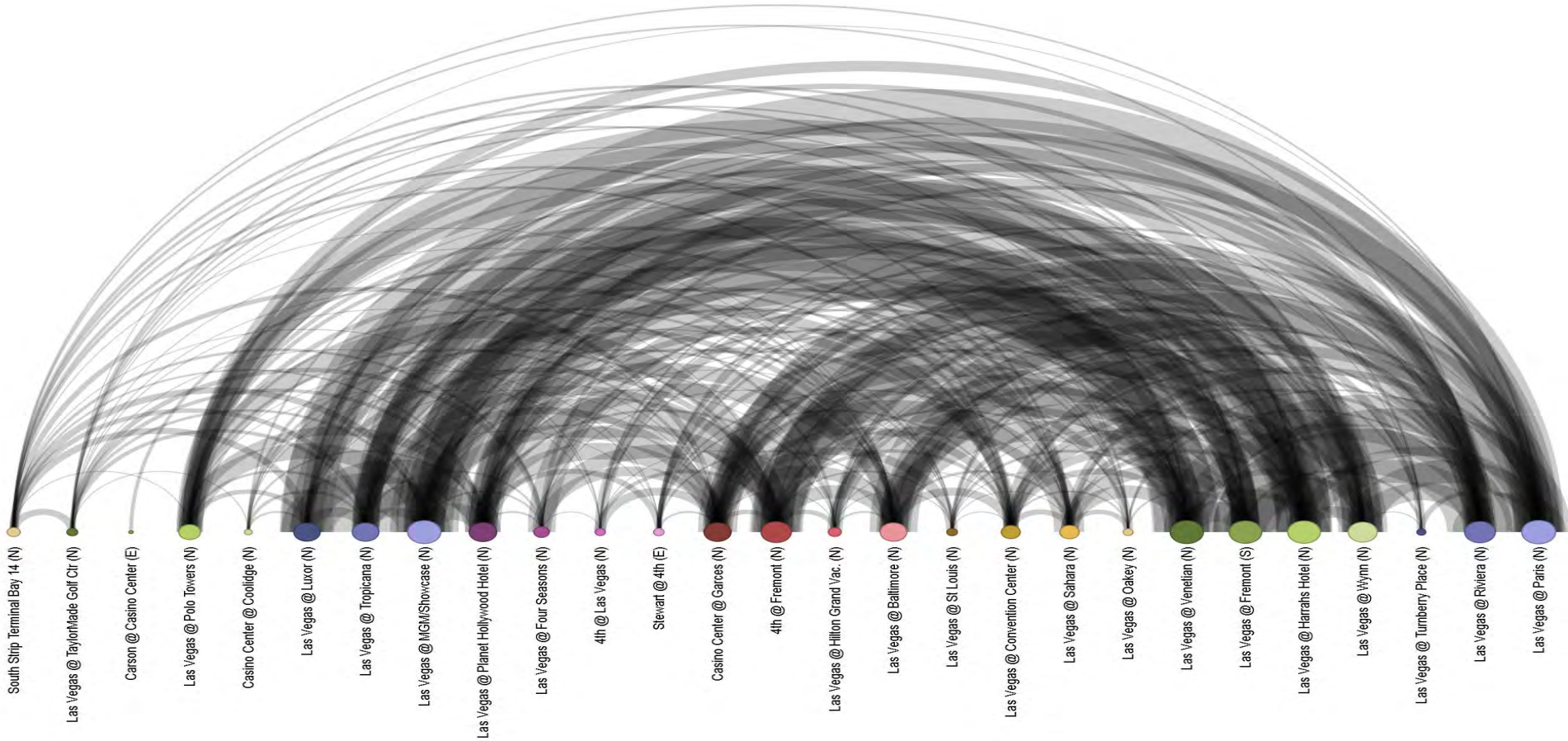
Transit Survey - Expansion Method -2

- **Step 3:** Stops along each route were aggregated into segments based on surrounding land use and the ridership distribution on the route.
  - This was done by direction & times periods on most routes.
- **Step 4:** The estimated distribution of trips was divided by the actual number of useable Intercept Interviews that were obtain from each [Stop/segment ON]-to-[Stop/Segment OFF] to determine the weighting factor
- **Step 5:** The weighting factors from Step 4 were then applied to each record in the survey database to expand the data to total boardings on each route.

Transit Survey - Expansion 3-Deuce NB OtO



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Transit Survey - Expansion Method -4

Unlinked Weight Factor Value	% of Records
0.00 - 4.99	21.04%
5.00 - 9.99	22.10%
10.00 - 14.99	20.27%
15.00 - 19.99	15.02%
20.00 - 29.99	16.86%
30.00 - 39.99	2.94%
40.00 - 49.99	1.77%
TOTAL	100.00%

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Transit Survey - Expansion Method -5

- The **linked** data expansion factors were applied to adjust the data from total boarding to the actual number of trips completed from a single origin to a destination

Formula = 1/(1+number of transfers)

2014 Household Travel Survey

Presenter: Jeremy Wilhelm, Westat

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2014 Household Travel Survey

- Overview of Household Travel Survey
  - Goal: Complete 7,000 usable surveys
  - Used state-of-the-practice data collection methods
  - 10% (700) households GPS Sub-component
  - Data collected from February 2014 to January 2015)
- Background
  - Geographic and demographic representation
  - GPS component implemented (10% sample) to study trip under-reporting

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2014 Household Travel Survey

- Sampling methods used
  - Address-based sample (ABS) design
    - Geographic, random sample
    - Reduced coverage bias
    - Enables oversampling for specific H-T-R populations where census tract-level clustering is identifiable:
      - Household size
      - Vehicle insufficiency
      - Limited English proficiency

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2014 Household Travel Survey

- Global Positioning System sub-sample
  - Used for trip rate correction using a log-GPS comparison approach

- Collected up to 3 days of data
  - First day used for comparison with log report
  - RTC was interested in weekend travel patterns
  - Additional opportunities to use GPS data

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2014 Household Travel Survey

- Outreach to Non-English Speaking Households
  - All materials and surveys were provided in Spanish
  - Public website included Spanish-language version
  - Oversampled census tracts with prevalence of Spanish-speaking households
  - Press releases and direct outreach were handled by RTC

2014 Household Travel Survey

- Response Rates
  - 181,000 addresses sampled
  - 11,545 Recruited (6.4%)
  - 7,072 Reported travel and cleared all logic checks (61.3%)
- GPS Households
  - Recruited 1,171 and delivered 857 (73.2%)

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2014 Household Travel Survey

- Geocoding/Location Data and Other QC
  - Mapping and geocoding
  - Speed checks
  - Post processing QC
- Real-time QC During Data Collection

2014 Household Travel Survey

- Tutorial walk-trough
  - Illustration of survey tools and validation
  - Insight into the resources available to participants

2014 Household Travel Survey

A Brief Tutorial on Reporting Your Travel Online

Hello! Welcome to this tutorial on how to report your travel.

Your goal is to report everywhere you went on your travel day and mark each place on a map.

If you used the paper travel log to keep track of the places you went on your travel day, please make sure you have it with you. It will make completing the online survey easier.

Click the black arrow buttons to move through the tutorial.

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HOUSEHOLD TRAVEL SURVEY

Need more help? Click ***Contact Us*** or call us toll free at 1-866-436-7828.

2014 Household Travel Survey

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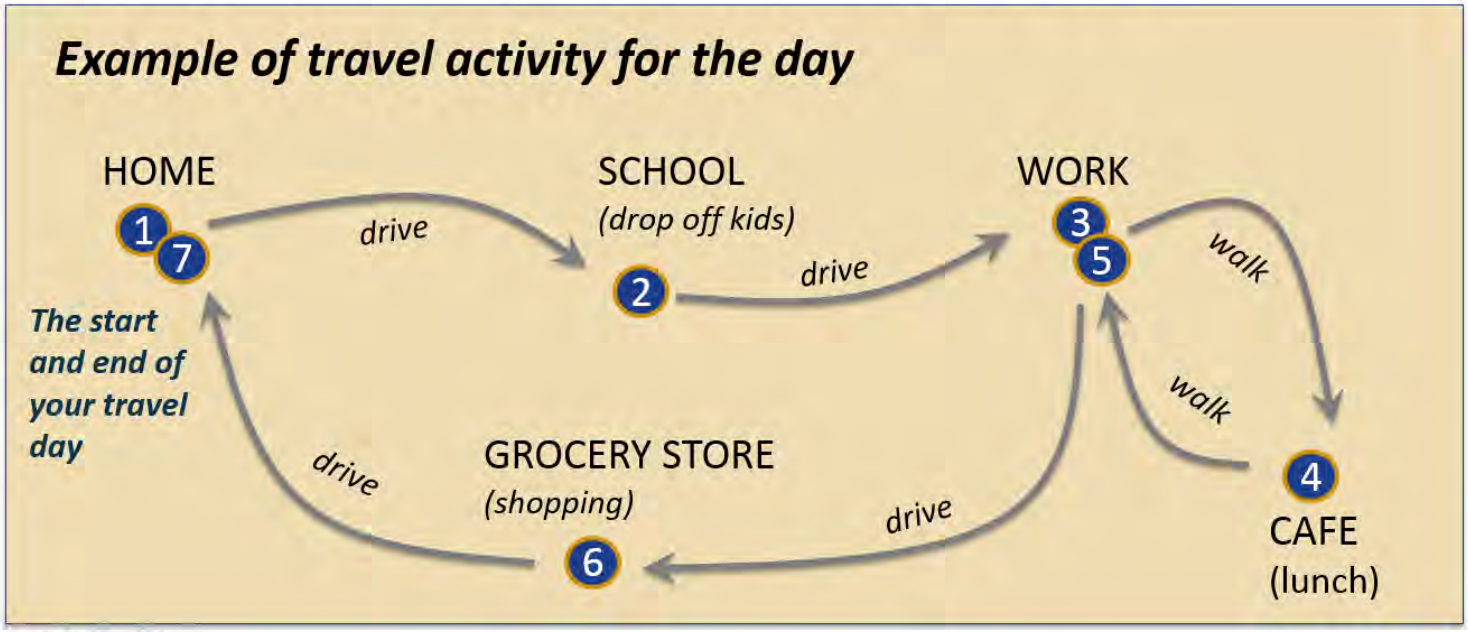
What is a "Place"?

A place is any location you go to, no matter how long you are there. Examples:

- A gas station
- A drive-thru window
- A bus stop
- A building where you dropped someone off or picked someone up
- An off-site location for a meeting with a client

Each place you visit will be given a number, starting with Place 1.

Example of travel activity for the day



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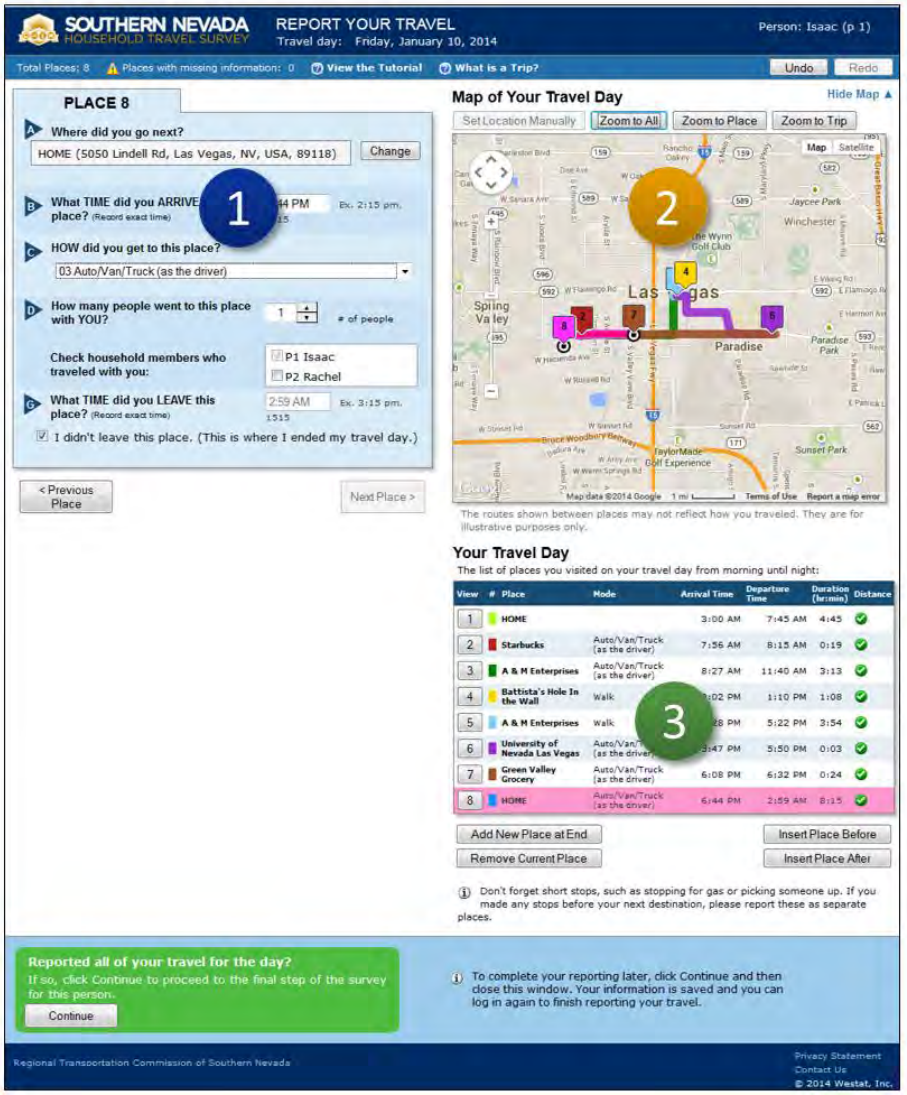
The Basics

Here's what the **Report Your Travel** page looks like.

Let's briefly look at the three key sections.

1. **Recording places**
2. **Mapping places**
3. **Building your travel day**



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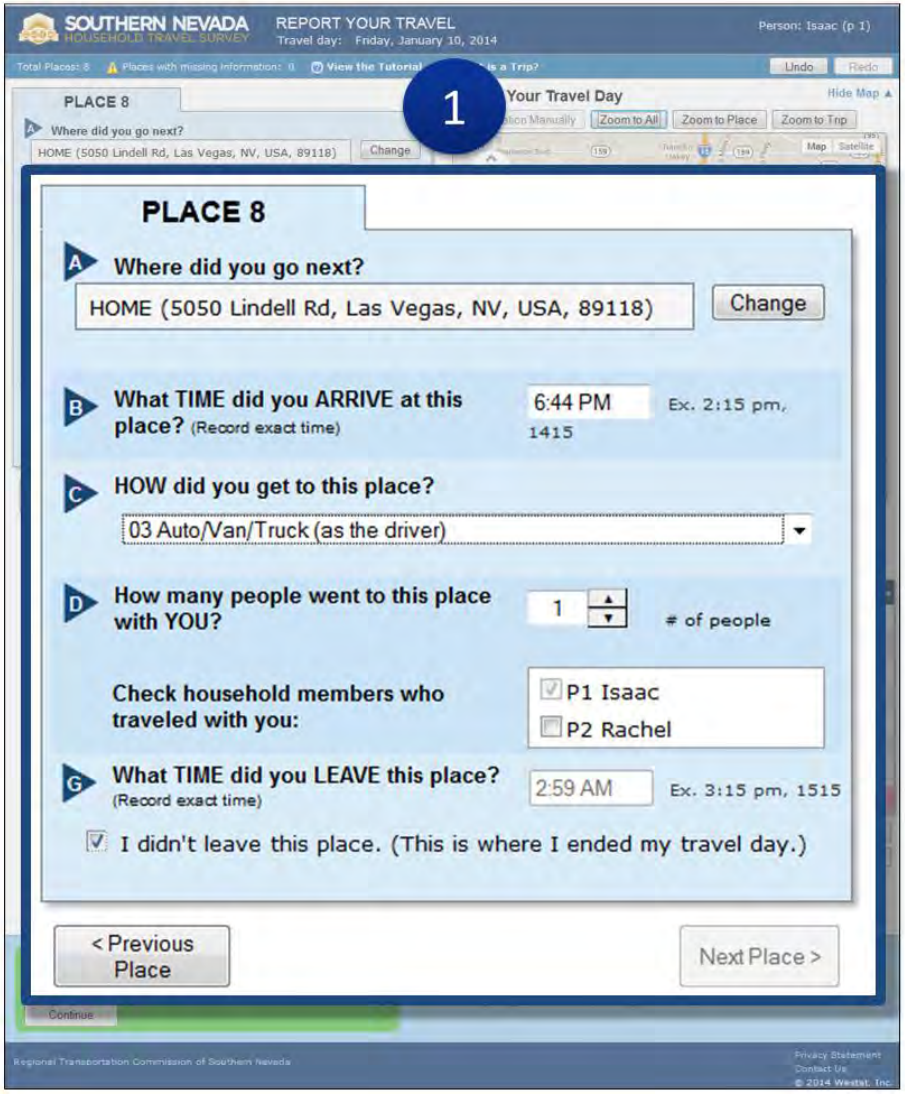
Recording Places

1. This is where you tell us the *where*, *when*, *how*, and *who* details of the places you visited.



2014 Household Travel Survey

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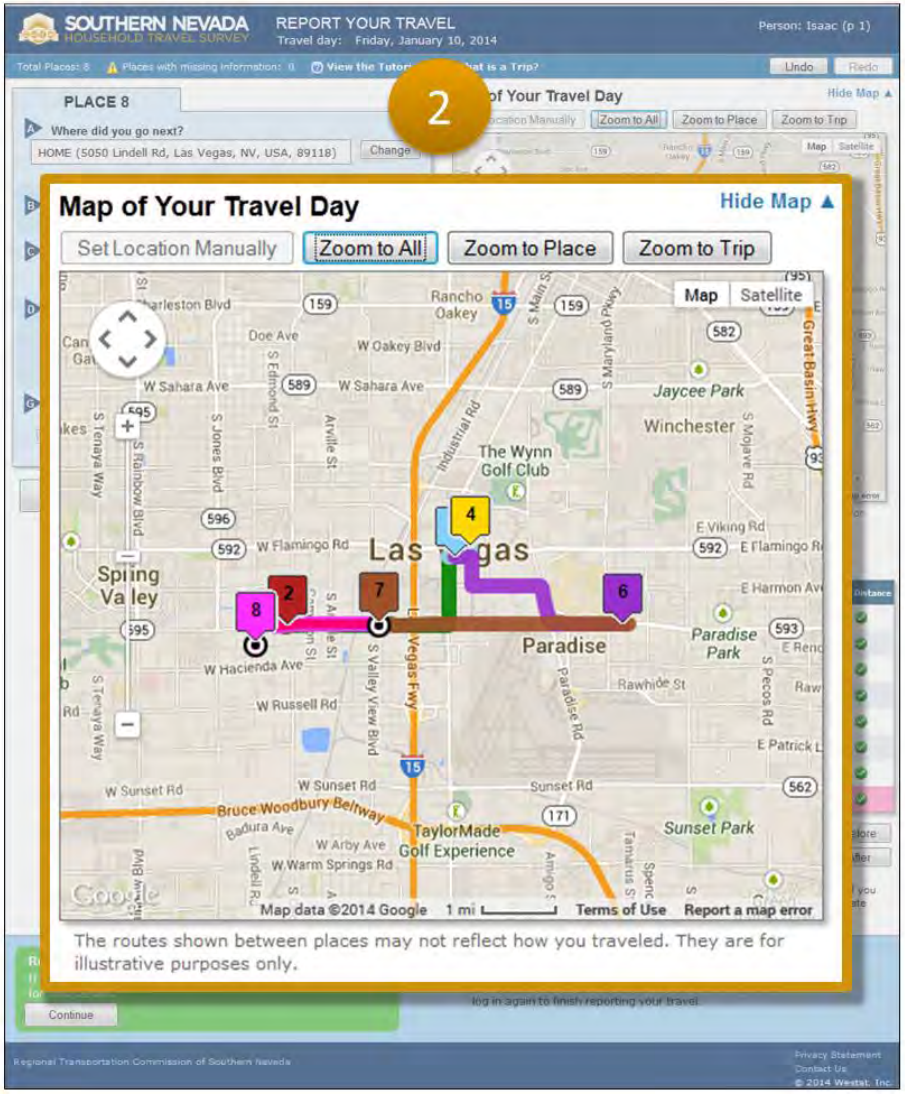
Mapping Places

2 As you tell us about the places you went, the map creates a picture of the places you went.

Note: The routes shown between places are the most direct routes from point A to point B and may not reflect exactly how you got from place to place.



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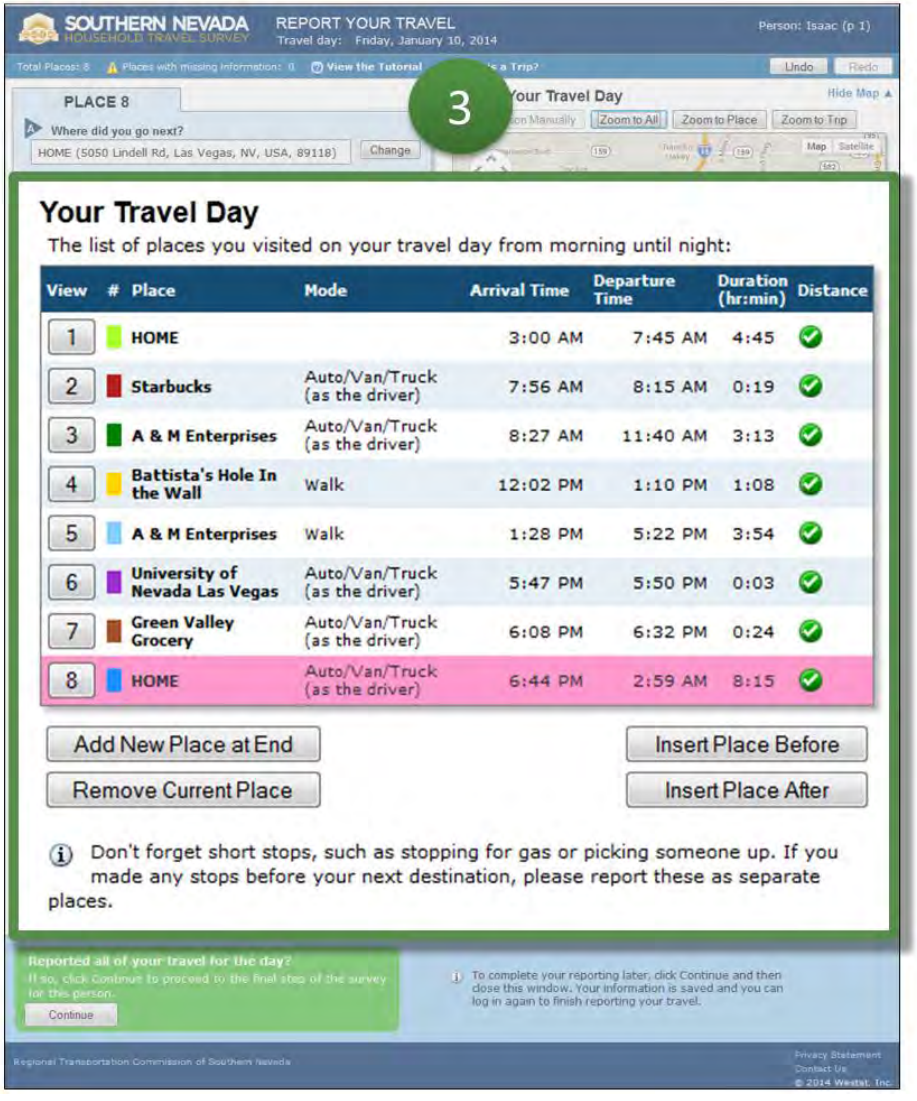
Your Travel Day

3 As you tell us about the places you visited on your travel day, we build a list for you to review. This way you can make sure all the places you went are recorded.



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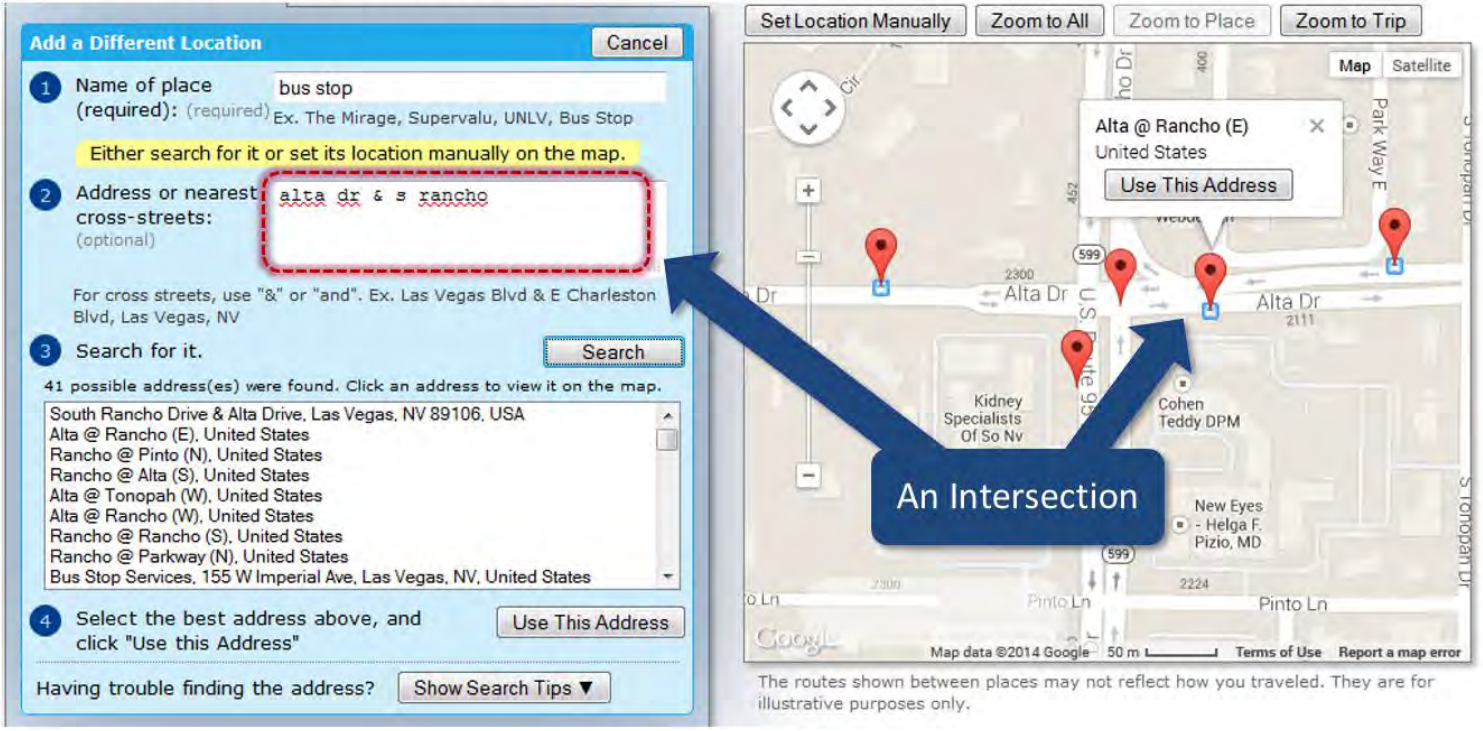
Search Tip #2 – Use the closest intersection (cross-streets)

Having trouble finding the location you're looking for? Add the closest intersection to your search.

To enter the cross-streets, use "&" or "and", such as **Alta Dr & S Rancho**. Search uses Google, is not case sensitive, and will return information even if you misspell or abbreviate words. See this intersection search below:



2014 Household Travel Survey

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Review your reported day

As you complete the survey, we've been building "Your Travel Day" list. Review it to make sure you have told us about all the places you went.

Anything missing?

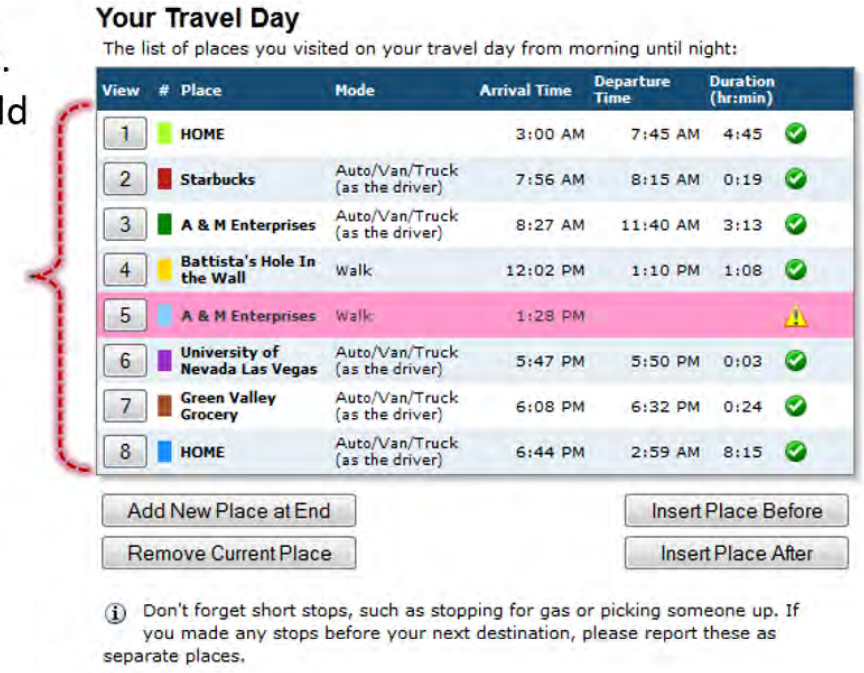
- Green check means you have entered all the information for the place.
- Yellow yield sign means one or more pieces of information is missing for this place.

To correct a place…

Click on the **Place # buttons** to return to that place and make updates.

Forget to add a place?

Use the buttons below Your Travel Day list.



Your Travel Day

The list of places you visited on your travel day from morning until night:

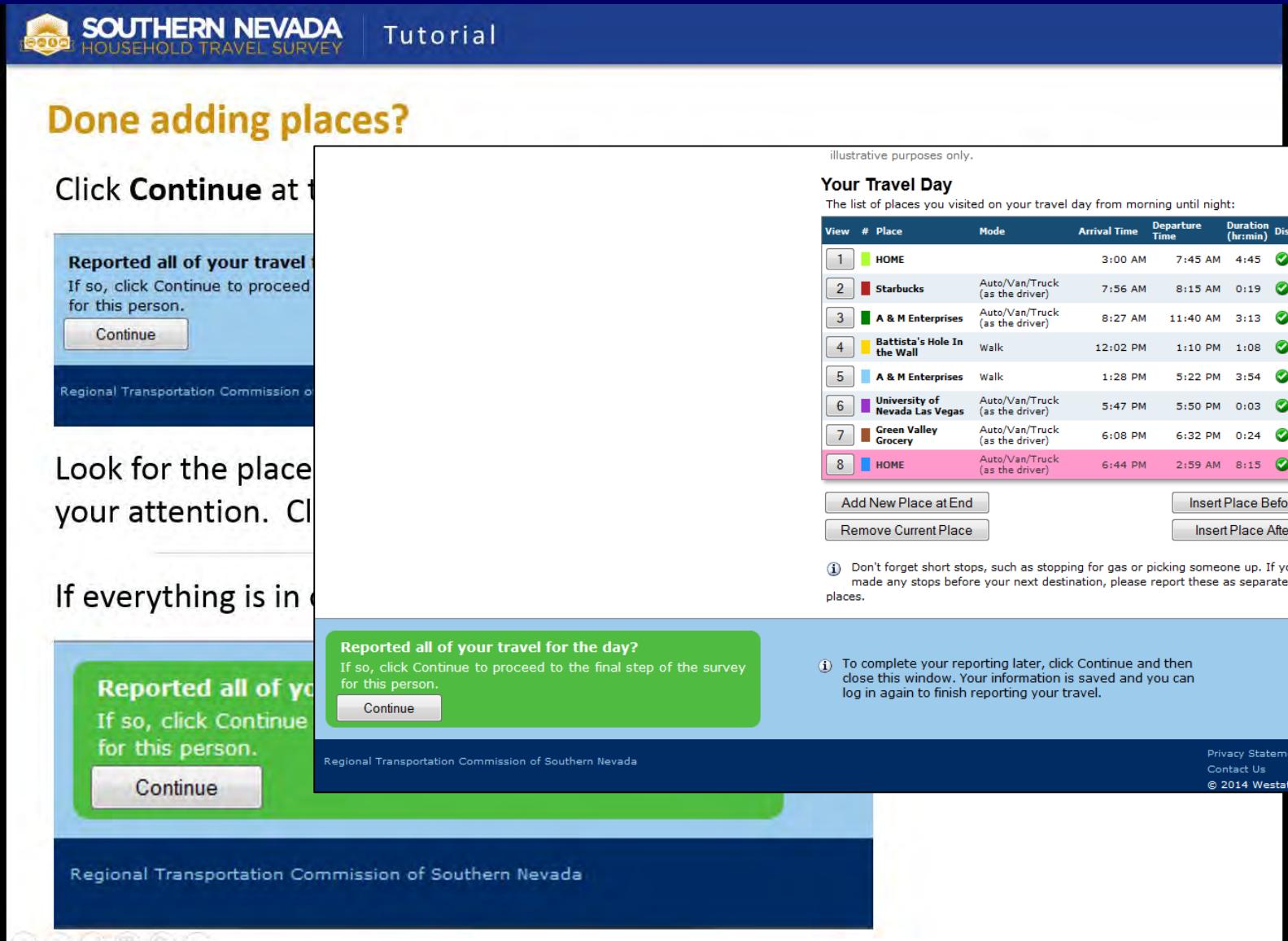
View	#	Place	Mode	Arrival Time	Departure Time	Duration (hr:min)	
	1	HOME		3:00 AM	7:45 AM	4:45	✓
	2	Starbucks	Auto/Van/Truck (as the driver)	7:56 AM	8:15 AM	0:19	✓
	3	A & M Enterprises	Auto/Van/Truck (as the driver)	8:27 AM	11:40 AM	3:13	✓
	4	Battista's Hole In the Wall	Walk	12:02 PM	1:10 PM	1:08	✓
	5	A & M Enterprises	Walk	1:28 PM			⚠
	6	University of Nevada Las Vegas	Auto/Van/Truck (as the driver)	5:47 PM	5:50 PM	0:03	✓
	7	Green Valley Grocery	Auto/Van/Truck (as the driver)	6:08 PM	6:32 PM	0:24	✓
	8	HOME	Auto/Van/Truck (as the driver)	6:44 PM	2:59 AM	8:15	✓

Add New Place at End | Insert Place Before

Remove Current Place | Insert Place After

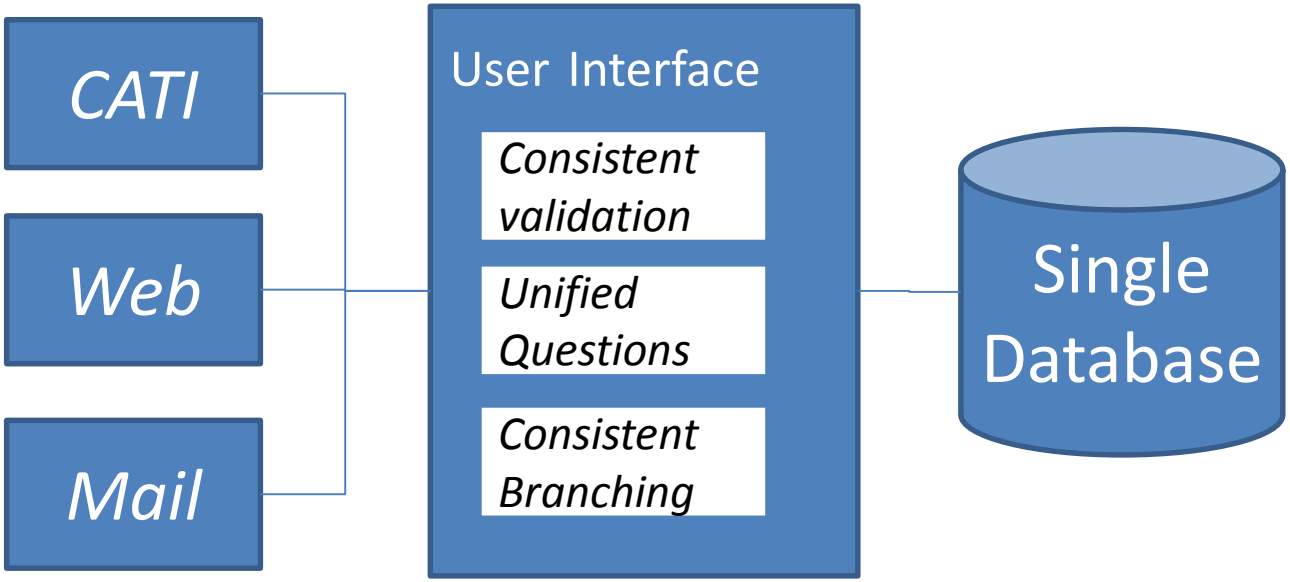
ⓘ Don't forget short stops, such as stopping for gas or picking someone up. If you made any stops before your next destination, please report these as separate places.

2014 Household Travel Survey



2014 Household Travel Survey

Responses by:



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2014 Household Travel Survey

- Post-collection Adjustments
  - Weighting process
    - Demographic
    - Geographic
    - Non-response
  - GPS correction factors

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2014 Household Travel Survey

- Survey Design Lessons Learned
  - Collaborated with Parsons and RTC during early design and data element specification using web conferences and screen sharing to facilitate the discussions
    - Process critical to create dataset to meet primary data user needs
    - Minimized burden by strategically eliminating questions not needed for this effort

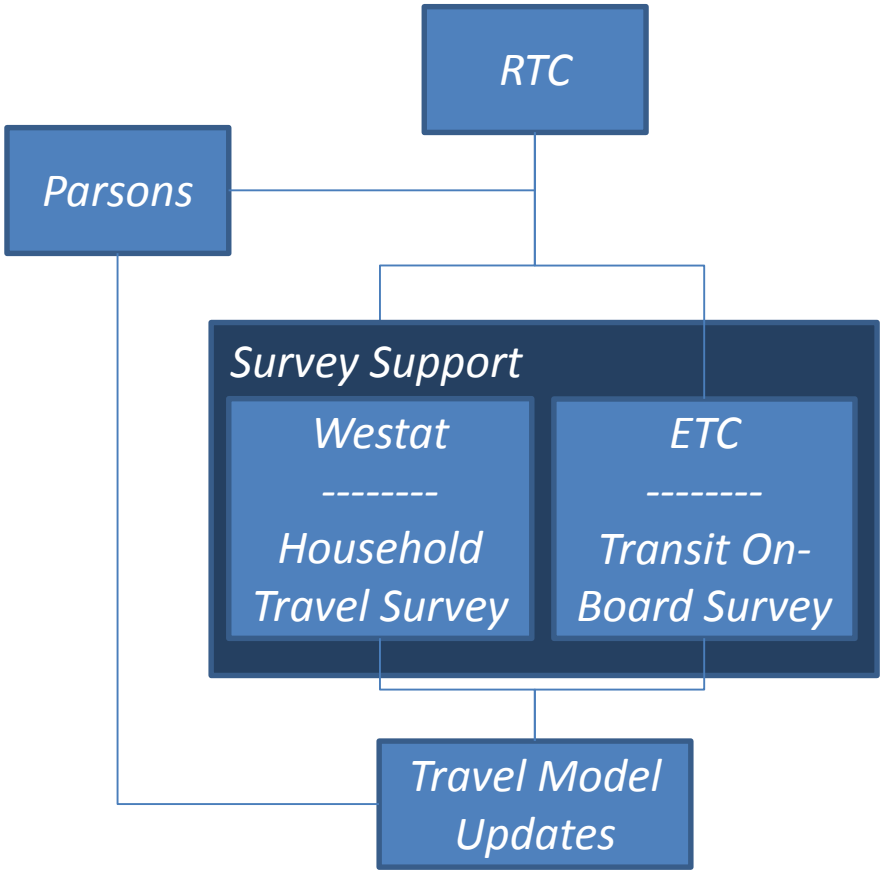
2014 Household Travel Survey

- Survey Design Lessons Learned
  - Branding was critical
    - Tied closely to RTC to take advantage of the good reputation in the region
  - RTC was proactively involved in branding and creating outreach content including an informational video.

Quality Control, Data Processing and Modeling

Greg Gaides, Parsons Transportation Group

Parsons Role: Collaborate and Validate



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Survey Support Role

- Survey instrument development
  - Household survey
  - Transit survey
- High-level review
  - Sample frame
  - Sampling plan
- Agree on what constitutes a valid survey record. *No surprises!*
- Data QC: Catch things before too late

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Survey Support Role Highlights: Survey Instrument Development

- Weigh-in on balancing between data *required* vs. data *desired*
  - Household survey
  - Transit survey

Data Quality
vs.
Respondent Burden

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Survey Support Role Highlights: Introduce Land Use Question

- Asked household survey respondents to describe the land use at destination
  - 12 categories provided
    - Residential, industrial, casino hotel, hotel (non-casino), eating/drinking establishment, warehouse, medical, education/school, gov't. office, commercial/business office, retail, open space, other
  - Supports trip attraction modeling procedures
    - Attraction trip rate = survey record trip attractions aggregated by land use / explanatory variables

Survey Support Role Highlights: Introduce Land Use Question

- Not a typical question on a household travel survey. Concerns:
  - Will people respond?
  - How will people interpret it?
- Results
  - 99.3% response rate *(Good!)*
  - Some cleaning required *(Expected)*
    - Example: Same place name…different land use category
  - Improved trip attraction rate equations

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Survey Support Role Highlights: Income

- Household income question
  - Promote consistent income groupings across surveys and Census data
  - Valid response rate expectation
    - ~80% response rate on household survey
    - Slightly lower on transit survey
  - Higher response rate desired
  - Different approaches for different surveys

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Survey Support Role Highlights: Income

- Household survey approach
  - Ask follow-up income question using broader income groupings that are likely to be used in model
  - Consider imputation
- Transit survey approach
  - Survey time constraints prohibited follow-up question
  - Need for income not as important as for household survey…focus on HBW trips
  - Examine trends in data between those who responded and those who did not
  - Consider imputation

Survey Support Role Highlights: Income

- Household survey
  - Response rate better than expected
    - Initial question: 88.2% response rate
    - Follow-up question: 93.1% response rate
  - Chose to impute the non-response
- Transit survey
  - Response rate about what expected
    - All records: 67.3% response rate
    - HBW records: 82.0 %response rate
  - Chose to impute the non-response for HBW

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Survey Support Role Highlights: Income Imputation

- Household survey
  - "Hot-deck" imputation method used
  - Donor records stratified based on multiple variables
  - Imputed incomes fed back to Westat for re-weighting
  - Able to preserve all household records where income was missing!
- Transit survey
  - Simple imputation performed
  - Donor records stratified based on household size and number of workers

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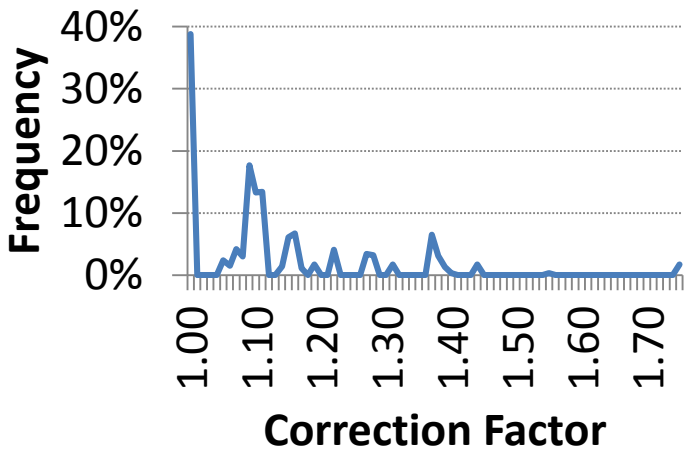
GPS Correction – Influence on Trip Rates

- GPS-Based Data Collection for HTS
  - 10% Subsample
  - Led to trip rate correction factors
    - Applied at the "place" level
    - Unique to person and household
    - Range: 1.0-1.75



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GPS Correction – Influence on Trip Rates

- Past household survey efforts in Las Vegas have yielded "low" household trip rates (for residents)
  - Prior rates: <= 3.00 motorized trips per person
  - Expectation: 3.25-3.75 motorized trips per person
- Why low?
  - Survey characteristics?
    - Length (respondent burden)
    - Collection mechanisms
    - Sample representativeness
  - "What happens in Vegas stays in Vegas"???

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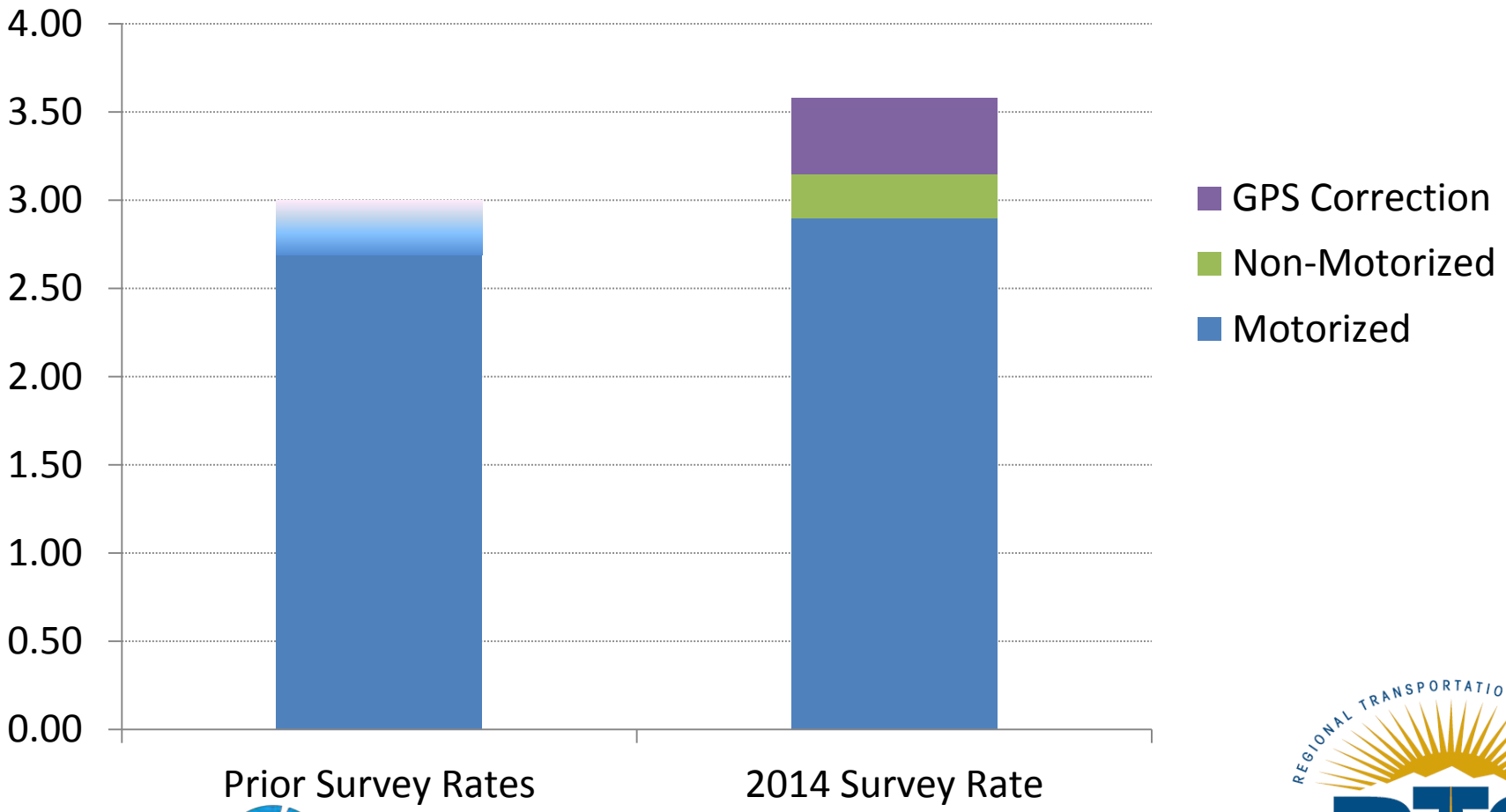
GPS Correction – Influence on Trip Rates



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Questions?

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TMIP Contacts

If you have any questions or comments about today's presentation or TMIP, or if you are interested in sharing your experience, please contact me at:

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