

# Supporting Development of the PSRC Activity-Based Transportation Model

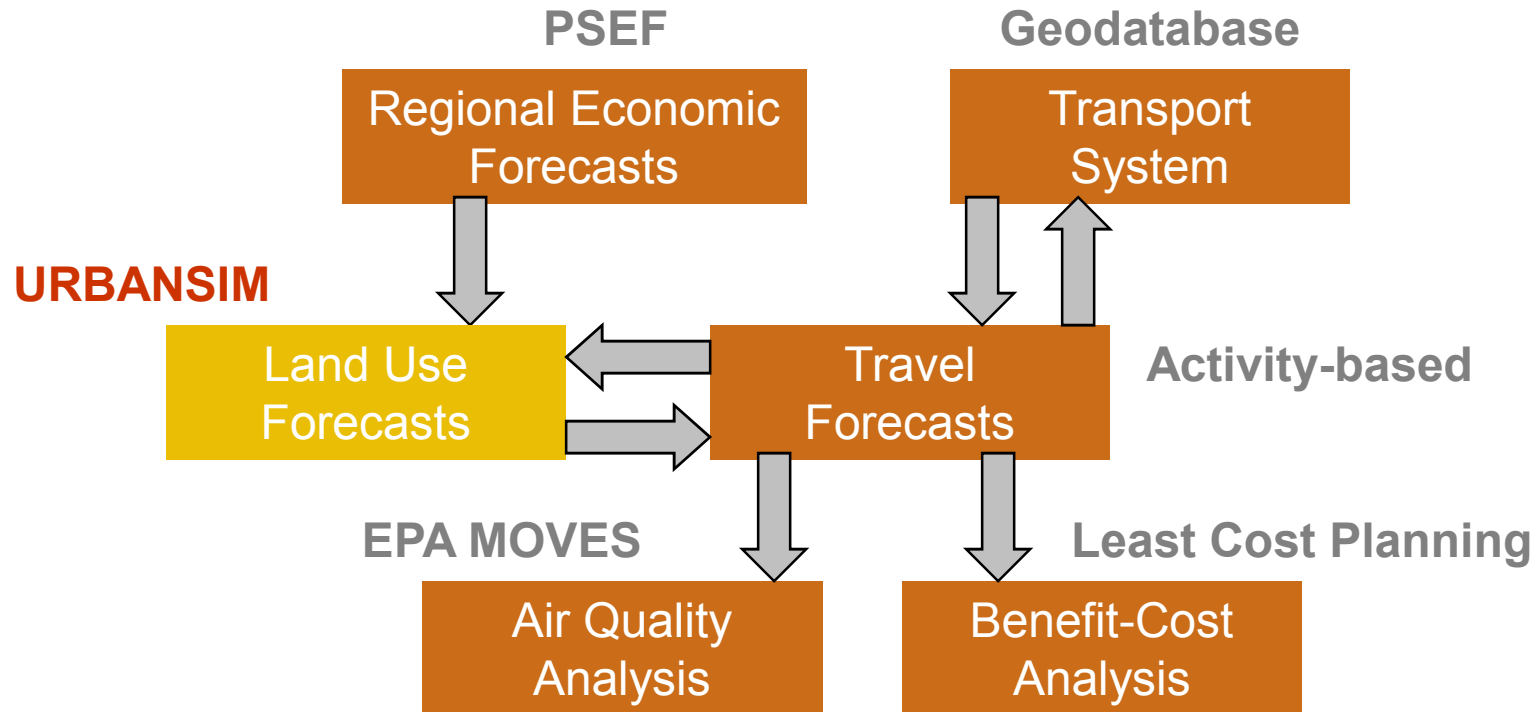
## Overview of UrbanSim Integration and the Socioeconomic Data Needs

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# UrbanSim is now part of the PSRC Modeling Suite

Replacing DRAM-EMPAL as Land Use Model



# Incremental Approach to Implementation of Activity Models

- Develop activity generator
  - Assess changes in trip-making from tolling and growth management strategies
  - Assess impacts on climate change and transportation efficiency
- Link with current trip-based models
  - Necessary to use in current transportation plan update
  - Validation of activity generator with current models
- Complete remaining activity model components
  - Destination choice
  - Mode choice
  - Time of day

# Activity-Based Modeling Implementation Plan

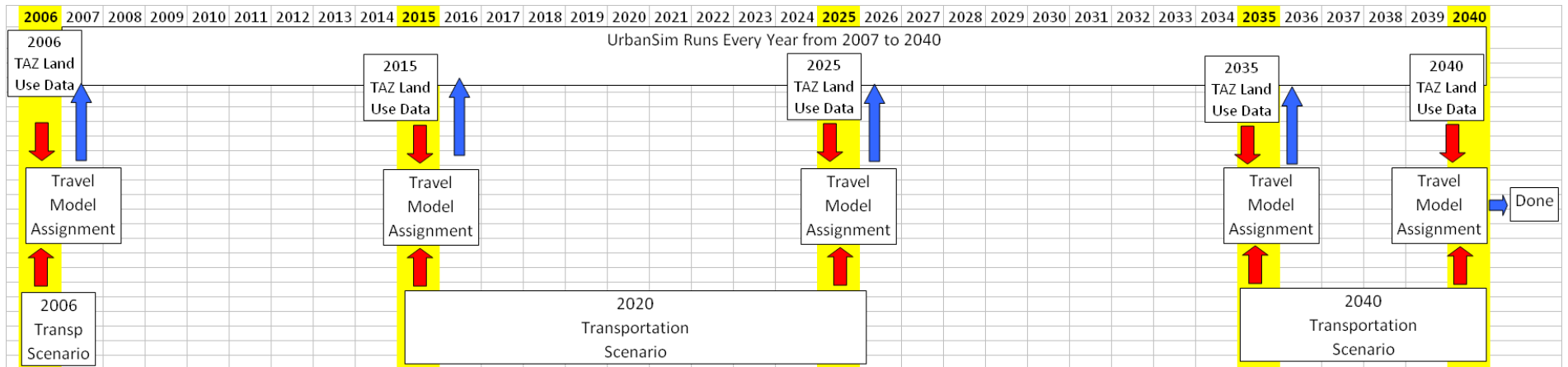
- Phase I: (BBC Consultants)
  - Activity Generator/Vehicle Availability (1/08 – 1/09)
  - Total Budget: \$165K
- Phase II: (DKS Prime, w BBC, RSG, and UA Subs)
  - Year 1: January 2009 – December 2009
    - Stage 1—Prepare for AB Model Estimation
    - Stage 2—Develop models
    - Stage 3—Convert assignment software (PSRC led task)
  - Year 2: January 2010 – December 2010
    - Stage 4—Develop software
    - Stage 5—Prepare for Base Year Model Validation
    - Stage 6—Validate with base year data
  - Year 3: January 2011 – December 2011
    - Stage 7—Deploy model system
  - Total Budget \$750K

# Integrated Travel Model: Run Sequence

- 1) UrbanSim Run Finishes, Creates:
  - **Synthetic Population, TAZ Data File**
- 2) Activity Generator Runs, Creates:
  - **Person Day Pattern, Tour File, Stop File, Trip File**
  - **Full Distribution Matrices for Work Purposes**
  - **Production/Attraction Vectors Non-Work Purposes**
  - **Vehicle Availability Cross-Classification**
- 3) Travel Model Runs:
  - **4 Intermediate Feedback Loops**
  - **Non-Work Distribution, Mode Choice, Time of Day, Assignment**
- 4) Activity Generator Runs:
  - **Uses LOS Skims from Last Travel Model Feedback Iteration**
- 5) Travel Model Runs:
  - **Final Global Iteration**
  - **Input to Next UrbanSim Run**

# Sequence between UrbanSim and Travel Model

## For T2040 Alternative Analysis



- Normally a 10 year land use – travel model interaction schedule
- Altered for T2040 Analysis
  - Run time
  - Uncertain phasing of scenario improvements
  - Allow for lead and lag response to travel network changes

## Data from Travel Model to UrbanSim

### **Origin-Destination Skim Matrices (~20):**

- **AM Time Skims (All Modes)**
- **AM SOV Generalized Cost Skim (Non-Work)**
- **AM SOV Distance Skim (Non-Work)**
- **HBW Mode Choice Log Sums**
- **AM Trip Tables (SOV Non-Work, Bike, Walk Transit)**

# Data from UrbanSim to Travel Model: TAZ Data

<b>VARIABLE NAME</b>	<b>DESCRIPTION</b>
<b>TAZ</b>	<b>Travel Analysis Zone</b>
<b>LIHH</b>	<b>Low Income Households</b>
<b>LMIHH</b>	<b>Low/Mid Income Households</b>
<b>UMIHH</b>	<b>Mid/High Income Households</b>
<b>UIHH</b>	<b>High Income Households</b>
<b>RETEMP</b>	<b>Retail Employment</b>
<b>FIREMP</b>	<b>FIRE Employment</b>
<b>GOVEMP</b>	<b>Government Employment</b>
<b>EDUEMP</b>	<b>Education Employment</b>
<b>WTCEMP</b>	<b>Wholesale, Communication, Transportation &amp; Utility Employment</b>
<b>MANEMP</b>	<b>Manufacturing Employment</b>
<b>UNIENR</b>	<b>Full-time Equivalent College Students</b>
<b>TOTHH</b>	<b>Total Households</b>
<b>TOTEMP</b>	<b>Total Employment</b>
<b>EMPDENS</b>	<b>Employment density</b>

# Data from UrbanSim to Travel Model: Synthetic Population

<b>VARIABLE NAME</b>	<b>DESCRIPTION</b>
HHID	Household ID
PNUM	Person sequence number within HH
PERSONS	Number persons in the household
HINC	Household annual income (\$)
RELATE	Relation to head of household (PUMS)
SEX	Gender
AGE	Age (years)
STUDENT	Person is a student (0/1)
GRADE	Grade/level in school (PUMS)
WORKER	Person is a worker (0/1)
HOURS	Hours worked per week
HTAZ	Residence zone
HPARCEL	Residence parcel ID
UWTAZ	Usual work zone
UWPARCEL	Usual work parcel ID
UWTYPE	Usual workplace type
EXPFAC	Expansion factor

Synthesize base year, then dup / drop HH records annually to match control totals  
 Better regional forecast desired for HH Control Totals

# PSRC AB Model Phase II

## Socioeconomic Data Needs

- 2006 Household Activity Survey
  - 4400 HHs, two-day activity diary
- Parcel / Building database
  - UrbanSim inputs
- Actors / Activities
  - Synthetic population
  - Jobs
  - K-12 and Post K-12 enrollments

# 2006 Household Activity Survey

## Basic HH and Person information

### • Households (4400 Total):

- Income
- Age of Head
- Number of Children
- Vehicle Availability
- Location
- Own/Rent
- Type of Structure
- Age of Structure
- Time lived at location
- Previous Location
  - Duplicate location / structure information
  - Why chose current location
- Movers subset = 1,677 HHs moved in previous 5 years

### • Persons(7000+):

- Age
- Gender
- Driver's License
- Labor Force Status / Type of Worker (Full or Part time)
- Student status
- Education level
- Frequency of transit usage
- Primary place of work
  - Location
  - Type of Business
  - Length of time in job
- Previous Job
  - Reason moved / changed jobs

# Basic Parcel data

## On specific parcels plus buffered totals

### Parcel

Parcel ID  
 X Y Coord  
 SQFt  
 TAZ nun  
 County ID

Parcel, ¼ Buffer, ½ mile Buffer

### Housing

Dwelling Units

### Jobs

Education  
 Food Service  
 Office  
 Retail  
 Service  
 Medical  
 Industrial  
 TOTAL

### Enrollment

K-12  
 Post K-12 (Univ)

### Parking

Daily Paid Spaces  
 Ave Price Daily  
 Hourly Paid Space  
 Ave Price Hourly

¼ and ½ mile Buffer

### Streets

1 Link Nodes  
 3 Link Nodes  
 4+ Link Nodes

Distance Measure

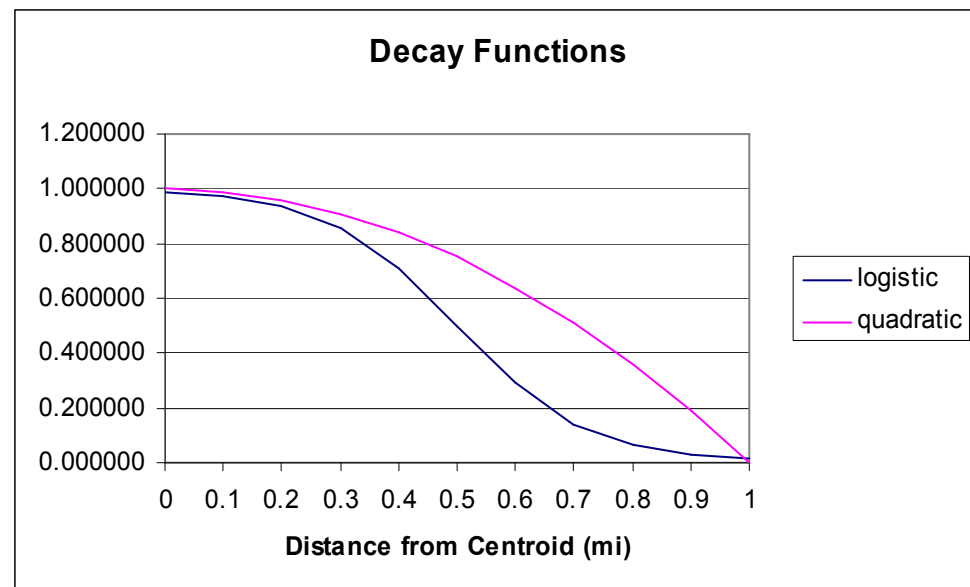
### Transit - Nearest Distance To Stop:

Ferry  
 Comm Rail  
 LRT  
 Express Bus  
 Local Bus

# Possible Data Enhancements

- Buffering
  - Crow flies versus walking distance
  - Decay functions

- K-12 subdivisions
  - Pre-K
  - K-5, 6-8, 9-12
  - Private / Public
  - Resident / Non College



- Node variable for all-street and Pedestrian network
- Include Park and Ride Lots

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EXPFAC	Expansion factor

Add Usual School TAZ, Parcel, and Type

# Employment Sector Plan

<b>ID</b>	<b>Est 2000 Jobs</b>	<b>PSRC UrbanSim</b>	<b>AB Model</b>
1	10,173	Natural resources and mining	Res Const
2	120,316	Construction	Res Const
3	91,188	Aerospace	Industrial
4	109,876	Other durable goods	Industrial
5	24,088	Nondurable goods	Industrial
6	87,430	Wholesale trade	Industrial
7	203,915	Retail trade	Retail
8	68,982	Transportation and warehousing	Industrial
9	2,703	Utilities	Industrial
10	31,542	Telecommunications	Office
11	63,113	Other information	Office
12	111,783	Financial activities	Office
13	215,469	Professional and business services	Office
14	128,233	Food services and drinking places	Food
15	17,143	Educational services	Education
16	181,612	Health services	Medical
17	122,990	Other services	Services
18	166,860	Government	Government
19	92,153	Education	Education
	<b>1,849,569</b>	<b>Total</b>	

# Schools

- K-12 Enrollment
- College Enrollment
- Merge data from Office of Superintendent of Public Instruction (OSPI)
  - Classroom size, student/teacher ratios, test scores...
- Ultimately, build a School Location Choice Model

## Other Potential UrbanSim-related variables

Label	UrbanSim Source	Definition
city_id	Parcel table	
is_inside_urban_growth_boundary	Parcel table	
land_us_type_id	Parcel table	
unit_price (per sq ft)	Parcel table	price of land and improvements per sq ft of buildings on parcel (or of parcel for unimproved parcels)
num_building_records	Parcel table	(on building's parcel)
parcel sqft	Parcel table	sq ft of building's parcel (from assessor)
parcel_sqft_in_gis	Parcel table	sq ft of building's parcel (from GIS maps)
plan_type_id	Parcel table	
tax_exempt_flag	Parcel table	
predominant Building_type_id	Buildings table	
non-residential sqft	Buildings table	
residential_units	Buildings table	
sqft_per_unit	Buildings table	
first_year_built	Buildings table	earliest year built
last year built	Buildings table	most recent year built

## For more information

- PSRC's AB Model Development
  - Chris Johnson, [cjohnson@psrc.org](mailto:cjohnson@psrc.org), 206-389-2876
  - Matthew Kitchen, [mkitchen@psrc.org](mailto:mkitchen@psrc.org), 206-464-6196
  - Maren Outwater, [moutwater@psrc.org](mailto:moutwater@psrc.org), 206-971-3274
- UrbanSim Land Use Model
  - UrbanSim web site: [www.urbansim.org](http://www.urbansim.org)
- Mark Simonson, [msimonson@psrc.org](mailto:msimonson@psrc.org), 206-971-3273
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