CAMBRIDGE SYSTEMATICS

Think Forward

Hands-On TransCAD Training

Performance Measure Calculation

presented to

Caltrans District 12

presented by

Cambridge Systematics, Inc.

Sean McAtee

12/21/2016

Performance Measures

- VMT (per capita) Matrix
- VMT, VHT, and VHD (Delay) Network
- Congested VMT Network
- Jobs / Population within X minutes via auto (or via transit) Matrix
- Person Throughput, etc. Network
- Mode Share Matrix
- Toll Trips Matrix Network

Future Topics

Matrix Fundementals

CAMBRIDGE SYSTEMATICS

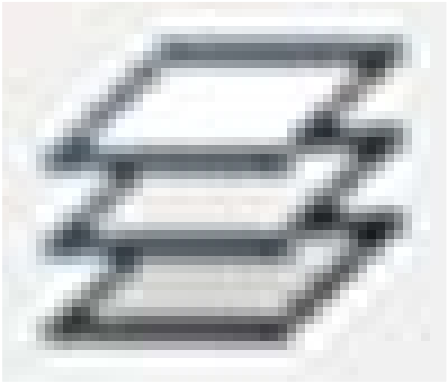
Matrix Files

- Contain zone to zone data
  - Trip tables
  - Shortest Paths (“Skims”)
  - Mode shares, logsums, etc
- Tend to be very large files
  - Real numbers = Big files
  - Compression reduces file size and increases access speed
    - CPU Speed > Disk Speed

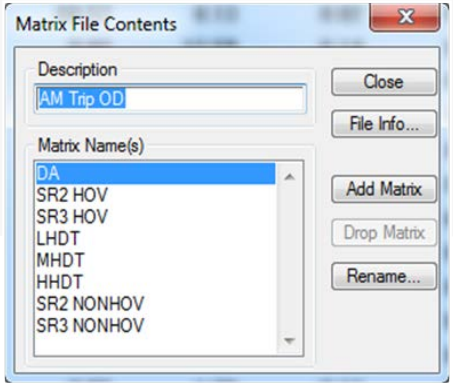
4

Matrix Files

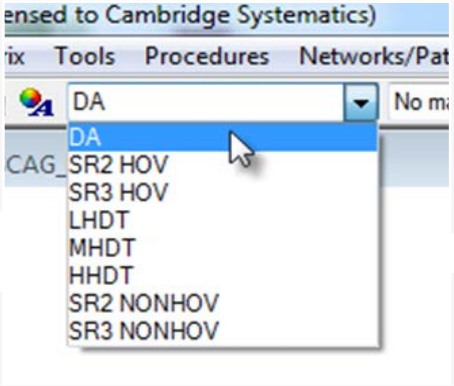
One File, multiple tables



Add/Delete/ Rename



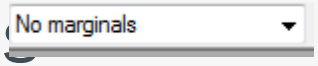
Select a “Core”



5

CAMBRIDGE SYSTEMATICS

Matrix Files

- Show row/column statistics 

  - Sum, min, max, etc.
  - TransCAD 5.
  - Sort by matrix marginals
- Get overall matrix statistics with Matrix → Statistics ( )
- Compare all core values in a single cell
  - Right-click → Info
- QuickSum ( ) Adds a new core with the sum of all existing cores in the file

Matrices in TransCAD (Tier 1)

TAZ Layer

ID	SEQ
60001000	1
60002000	2
…	…
14109000	4109

- Internal zones only

Centroid Layer

Tier1TAZ	Internal_sequence_id_T1
60001000	1
60002000	2
…	…
14109000	4109
…	…
28091000	4192

- All 4192 zones
- Also contains transit pseudo zones (not discussed today)

Matrix File

	1	2	…	4109	…	4192
1						
2						
…						
4109						
…						
4192						

- Index by Seq or TAZ ID
- Contains all 4192 zones
- Matched to TAZ and centroid layers

Matrix Indexing

Filter Matrices

- Internal Only
- Selected subarea only

ID Correspondence

- Switch between TAZ and Sequential IDs
- Explode matrix to more zones

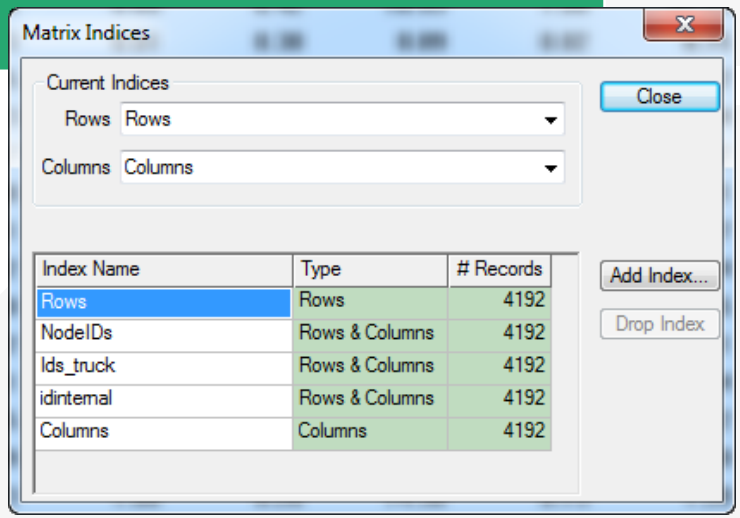
Matrix Indexing

Switch Between Existing Indices

- **Matrix → Indices…**
- Pick from indices defined in the file
- Set Rows and columns independently

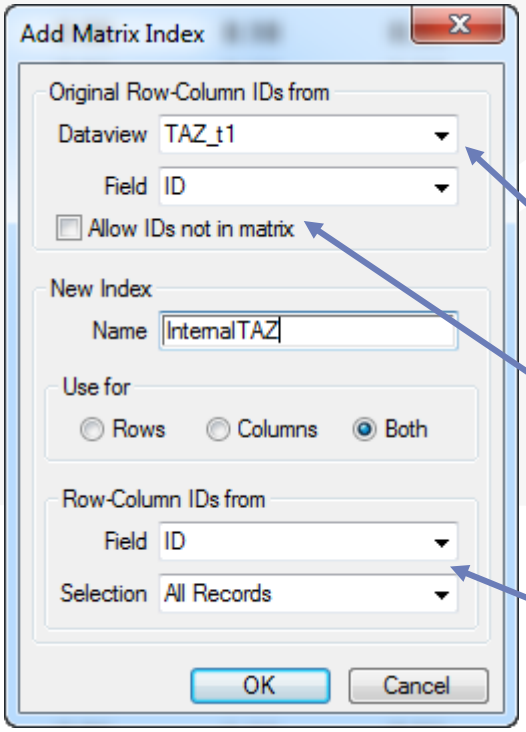
Defaults in vehicle OD tables

- Rows & Columns: TAZ ID
- All Others: SEQ (1 through 4192)



CAMBRIDGE SYSTEMATICS

Matrix Indexing



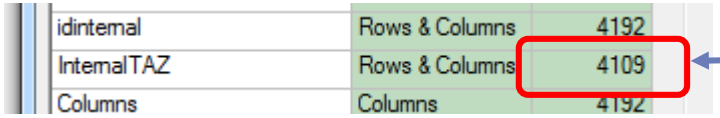
Create a New Index

- Matrix and View must be open
- **Matrix → Indices…** or
- Click **Add**

Matching dataview and Existing base ID

Allows expanding with new "null" values

Use a new ID or a new set of records



TAZ layer only has internal 4109 zones

CAMBRIDGE SYSTEMATICS

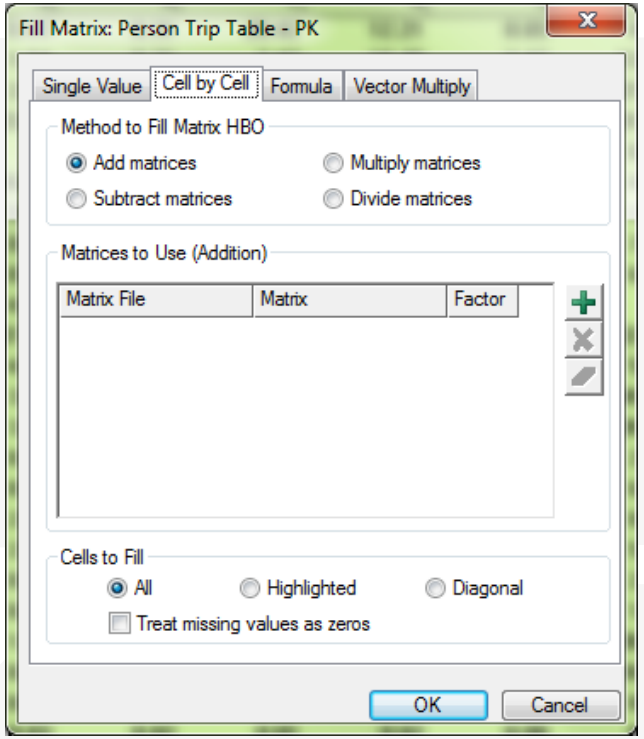
Practice

- Work with matrix indices
  - Add a matrix index for internal zones only
  - Try different ways to index OD trip tables

- Look at totals from different cores and indices
  - Using marginals
  - Using **Matrix→ Statistics**
  - Using info for a single cell

Matrix Calculations

- Matrix → Fill ( )
- Single Value
  - » Simple add/subtract/clear/replace
- Cell by Cell
  - » Compute values from two or more matrix cores
- Formula
  - » Mix operators and use functions
- Vector Multiply
  - » Multiply by a row or column from a dataview



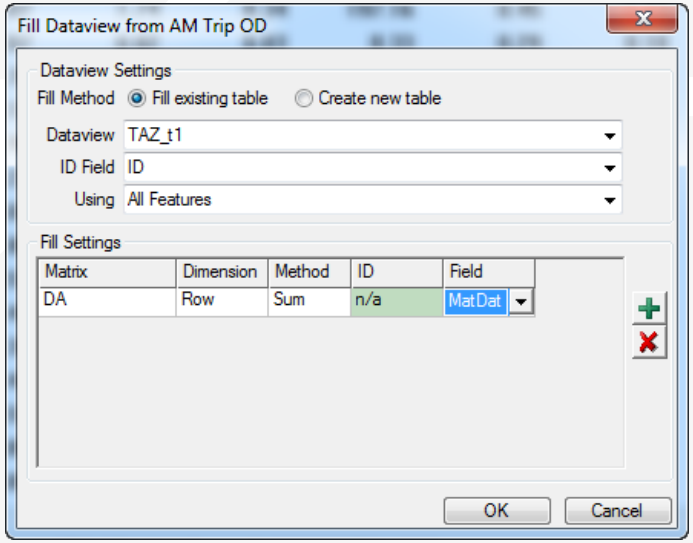
You can work across **compatible** matrix files!

12

CAMBRIDGE SYSTEMATICS

Matrix → Dataview

- Put matrix data into a compatible dataview
  - Compatible = exact same row/column IDs
  - Uses active matrix index
  - Must have a column to receive data
- Matrix → Fill Dataview ( )
  - Identify matching ID
  - Select data to use
  - Choose target column
  - Can do multiple at once



CAMBRIDGE SYSTEMATICS

Practice

- Use the AM OD Matrix
- Compute total passenger vehicles
  - Create a new matrix core
  - Fill, but exclude the truck trips
- Fill a dataview
  - Total AM trip origins
  - AM Trip destinations from a selected zone
- Create heat maps of each

Performance Measures

CAMBRIDGE SYSTEMATICS

VMT Per Capita

Matrix

- Select zones to consider
- Calculate total population in these zones
  - Use a selection set and SED join
  - Consider **Pop + Employment** or **Pop+ [weighted employment]**
- Calculate total Passenger Vehicle VMT with **at least one end** in these zones
  - Compute **Trips x Length** using **matrix fill**
  - Sum for all time periods
  - Add a matrix index for selected zones
  - Get sum for trips **to** selected zones
  - Get sum for trips **from** selected zones
  - Add together
  - **Important:** Trips within the district are counted twice!
- Divide VMT by population (or pop + employment)

VMT, VHT, Delay

Network

- Join the All Day Flow file to the network
  - Use Formula Fields or Formula Fill
- Select links and summarize totals
- Alternate:
  - Create a distinct boundary in a polygon layer
  - Use Fill → Aggregate
  - This will split links that are only partially inside the boundary

- VMT
  - `Length * TOT_Flow`
- VHT
  - `(nz(AB_Time * AB_Flow) + nz(BA_Time * BA_Flow))/  60`
- VHD or Delay
  - ```
    (nz(AB_Flow * (AB_Time – AB_FreeTime)) +
    nz(BA_Flow * (BA_Time – BA_FreeTime))) / 60
    ```
    ```

Congested VMT

Network

- Compute VMT for each link
- Select links that meet a congestion threshold
  - E.g., MAX_VOC > 0.90
- Summarize Total VMT separately from VMT on congested Links
  - % of Links congested

Matrix

Jobs/Pop w/in specified travel time

- Identify zone to analyze
- Fill a new TAZ **PK_TIME** field with Highway Skim row or column
  - File for peak Drive Alone skim is skims\outputs**SPMATPK_DA_Tier1.mtx**
- Select zones with **PK_TIME** < X
- Summation of SED in selected zones
- Option: Heat map showing travel time from zone

Jobs/Pop w/in specified travel time
Transit Edition Matrix

- Transit skims are generated for Tier 2 zones!
  - 12,000 x 12,000 zone matrix
- Transit skims are created for different modes
  - Bus, BRT, LRT, CRT, etc.
- Transit skims have multiple pieces
  - Wait time (1/2 headway)
  - Walk/transfer time
  - In-vehicle time
  - Cost

We can re-visit this in another session if desired

Person Throughput

- Use a formula field to sum and multiply

Occupancy	Vehicle Classes
1	DA
2	SR2 HOV SR2 NONHOV
3+ (3.5)	SR3 HOV SR3 NONHOV

- HOV 3+ - Average Occupancy
  - By purpose in Model Table
  - Approximate to 3.5 (simple avg is 3.466)

44 HOV3 Occupancy HOV3 Car Occupancies for the 12 trip purposes

3.572,3.572,3.572,3.314,3.314,3.314,3.094,3.543,3.443,3.595,3.602,3.654