Training Agenda

District 7 Sub-Area Analysis

December 14, 2017. 9:30 a.m. – 3:30 p.m.

1. **Attendees**

   a. Training presented by Chao Wang of CS.

   b. Training attended Chao Wei, Kevin Wu, Andrew Teng, Jonathan D. Osborn, Lisa Tse, Joann Chiu and Mark Mai of Caltrans District 7.

2. **Topics and Discussion Items**

   a. Introduction of sub-area analysis

   b. Introduction of traffic assignment procedures in the SCAG model

   c. How to define a sub-area in TransCAD

   d. How to run a sub-area analysis using TransCAD menus

   e. Hands on exercise to perform sub-area analysis using TransCAD menus

Procedures for Conducting Subarea Analysis using TransCAD User Interface based on SCAG 2016RTP

12/14/2017

Step 1 Open the AM files to be used for the subarea analysis

Purpose: This step is to open the geographic file, AM network file and AM OD file, which are required input files for subarea analysis, in TransCAD.

1) Open the SCAG working highway geographic file in TransCAD. This file is saved in the folder "\networks\Outputs\" and the file name is "scag_network_working.dbd".
2) Open the AM network file in TransCAD. This file is saved in the folder "\networks\Outputs\" and the file name is "hnet_am.net". This is the AM network file after the fifth iteration run.
3) Open the AM OD flow matrix file in TransCAD. The OD flow matrix files are saved in the folder "\ODTable\Outputs\" and the file name is "AM_OD.mtx". This is the AM OD file after the fifth iteration run.
4) Choose **Matrix → Indices** to display the Matrix Indices dialog box.
5) On the Matrix Indices dialog box, click on the drop-down list for Rows and select NodeIDs; click on the drop-down list for Columns and select Nodes IDs. Click Close to close the Matrix Indices dialog box.
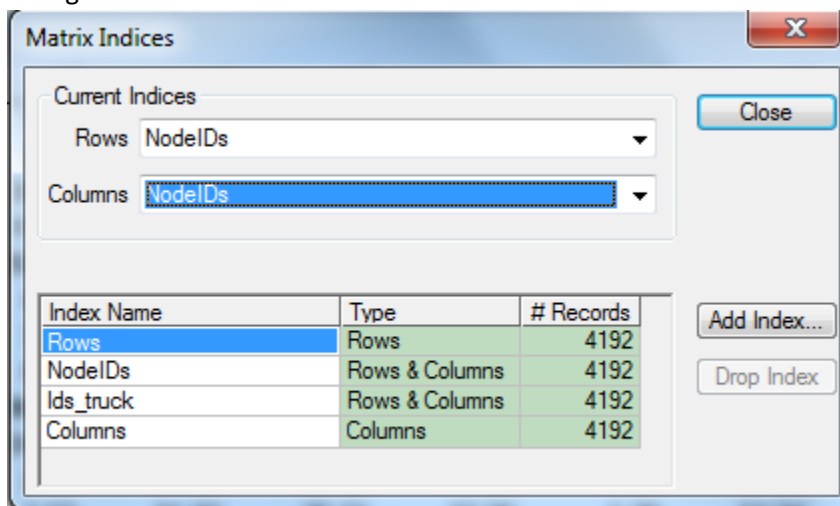
6) Click the map window to make it the active window.

Step 2 Define subarea boundary by polygon annotation

Purpose: This step is to define a subarea on the map opened in Step 1 by drawing a polygon.

1) Navigate the map to the subarea to be studied.
2) Click on the Freehand Shape tool ⌐ on the Drawing Toolbox. The Drawing Toolbox is usually located in the lower left corner of a TransCAD window. A screenshot is shown below. If this toolbox is not shown, choose "Tools" on TransCAD menu and check "Drawing Toolbox".

3) Use the Freehand Shape tool to draw a polygon on the map window opened in Step 1: click on each corner of the polygon and double click to close the polygon (the first and last points connect automatically).

This polygon defines the boundary of the subarea. All links within the polygon are links in the subarea, and links intersecting with the polygon boundary become external station links for the subarea. An example polygon is shown below. Please notice that the polygon boundary line is red in the example shown below, but the default polygon boundary line is black and is thinner than the example shown below.
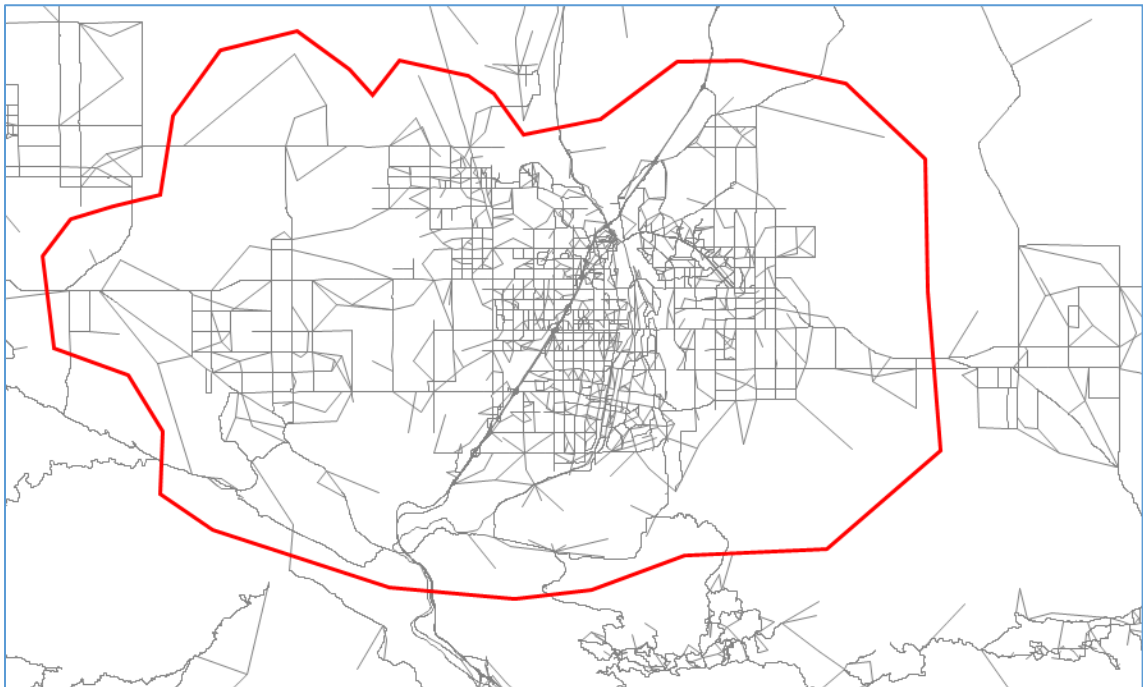
4) To refine the boundary of polygon, use the Pointer Tool on the Drawing Toolbox. Click on the Pointer Tool then click on the polygon to show all corners of the polygon. The corners can be moved to refine the boundary.

Hint: use the Pointer Tool to double click the polygon can bring up the Freehand Shape Style window, in which the polygon line style can be changed.

5) Choose **File → Save** to save the map. The polygon is saved in the map.

Step 3 Create highway links, centroids, and external stations for the subarea

Purpose: In this step, a TransCAD procedure is used to analyze the highway network and the subarea polygon. This procedure generates two selections sets on the line layer: "Sub_Links"

and "Sub_Crossing", which are links within the subarea and links crossing the subarea boundary. This procedure also generates two selection sets on the node layer: "Sub_Centroids" and "Sub_External", which are centroids for the subarea and external stations for the subarea.

1) Choose **Planning → Static Traffic Assignment → Multi-Modal Multi-Class Subarea Analysis** to display the Multi-Modal Multi-Class Assignment dialog box.
2) On the Multi-Modal Multi-Class Assignment dialog box, click the button "Sub-Area" to display the Subarea Setting dialog box.
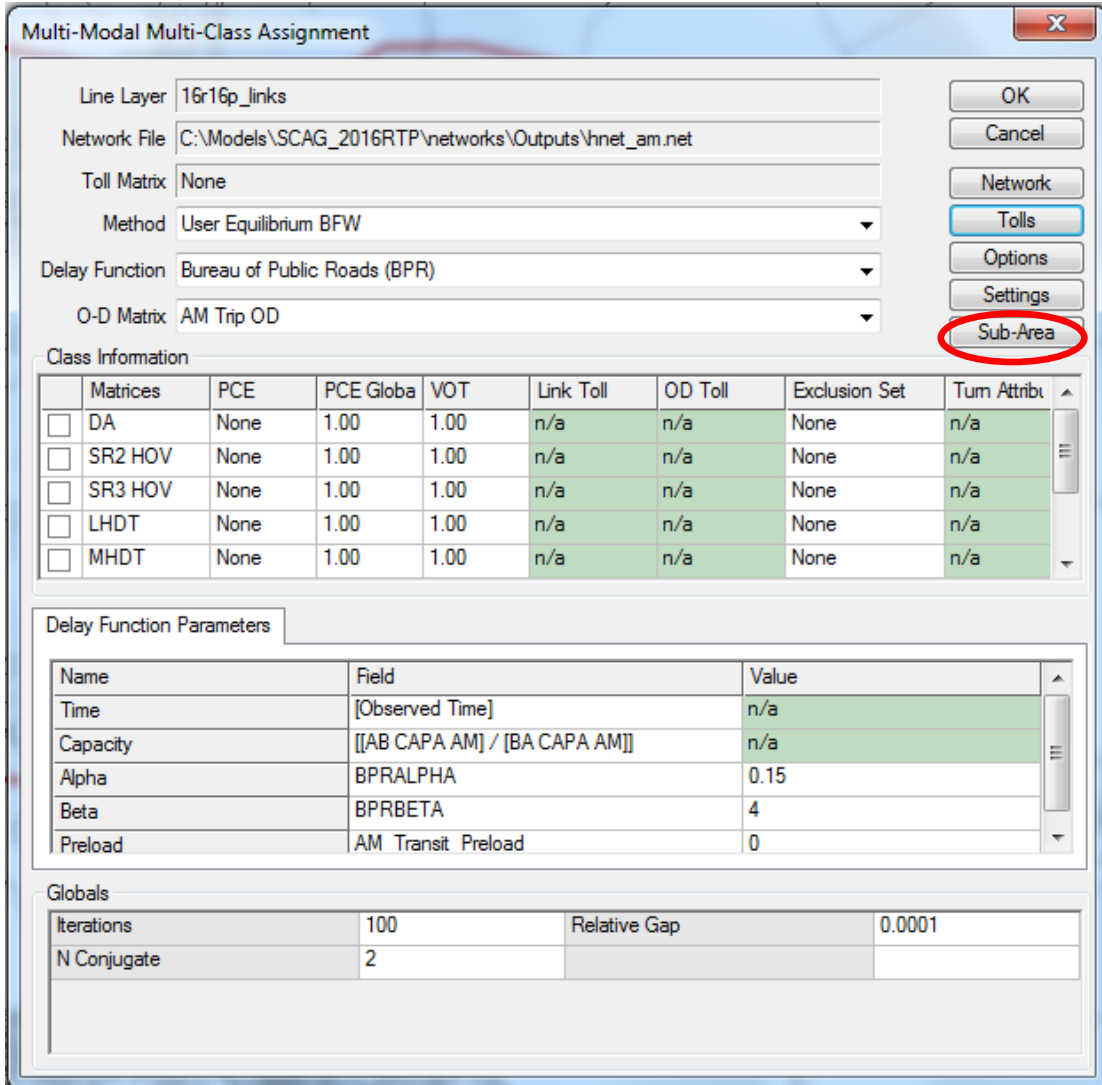
3) On the Subarea Setting dialog box, Polygon is already selected as the method to create subarea. Click the button "Create Subarea". TransCAD analyses the subarea and displays information about the subarea in the Area Info edit box.
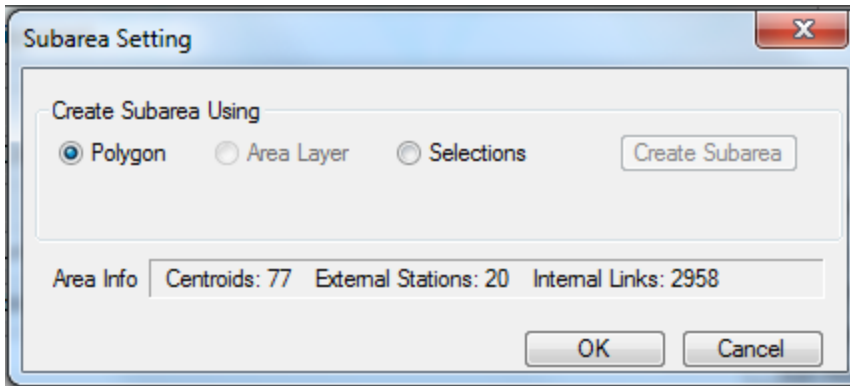
4) Click OK to return to the Multi-Modal Multi-Class Assignment dialog box.
5) Click Cancel to close the Multi-Modal Multi-Class Assignment dialog box.

Step 4 Create selection sets to be used as exclusion sets in traffic assignment

Purpose: This step is to create 5 selection sets by condition on the line layer. They will be used to define exclusion sets in the traffic assignment step. The names and conditions for the 5 selection sets are shown below.

Query Name	Condition
sovqry	mode = 2 and ((ab_Facility_Type >= 20 and ab_Facility_Type < 30) or (ba_Facility_Type >= 20 and ba_Facility_Type < 30) or ab_facility_type = 90 or ba_facility_type = 90)
gp2qry	mode = 2 and (ab_Facility_Type = 21 or ba_Facility_Type = 21 or ab_facility_type = 90 or ba_facility_type = 90)
gp3qry	mode = 2 and (ab_facility_type = 90 or ba_facility_type = 90)
truckqry	mode = 2 and (TRUCK_Prohibit_Flag = 1 or (ab_Facility_Type >= 20 and ab_Facility_Type < 30) or (ba_Facility_Type >= 20 and ba_Facility_Type < 30))
hov_nonhot_qry	mode = 2 and ((ab_Facility_Type >= 20 and ab_Facility_Type < 30) or (ba_Facility_Type >= 20 and ba_Facility_Type < 30) or ab_facility_type = 90 or ba_facility_type = 90 or TOLL_FLAG > 20)

1) Make sure the map window is active and the line layer is the current layer.
2) Choose **Selection** ➔ **Select by Condition** to display the Select by Condition dialog box for the line layer.
3) On the Select by Condition dialog box, type or copy/paste the condition for the selection set "sovqry" in the "Enter a Condition" text box.
4) On the Select by Condition dialog box, type "sovqry" in the "Set Name" text box; make sure "Create Set" is selected as the Selection Method.
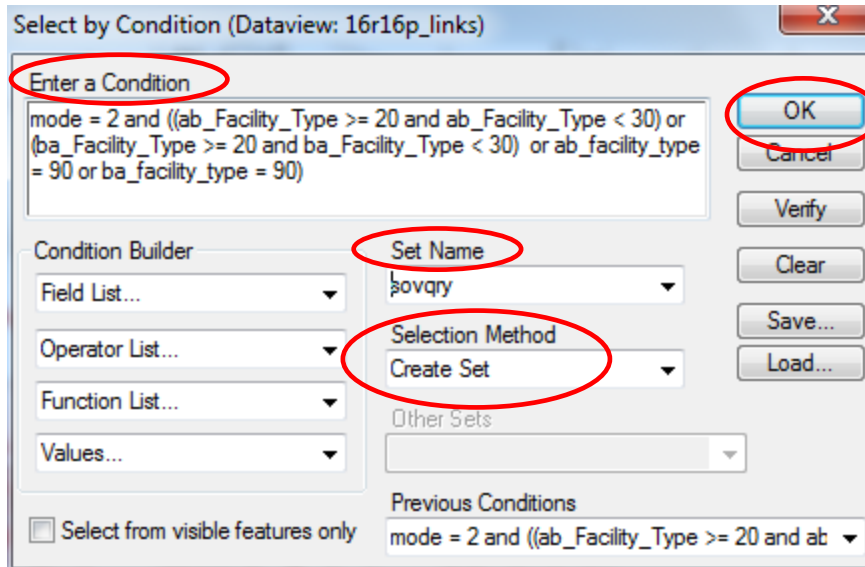
5) Click OK to create the selection set "sovqry" and close the Select by Condition dialog box.
6) Repeat Step 4-2 to 4-4 to create selection sets "gp2qry", "gp3qry", "truckqry" and "hov_nonhot_qry".
7) Choose *File* → *Save* to save the map. All selections will be saved in the map, and this step is not needed any more for other time periods.

Step 5: Run AM subarea analysis using TransCAD user interface

Purpose: This step is to run the multi-modal multi-class traffic assignment (MMA) with subarea analysis for the AM time period.

1) Choose *Planning* → *Static Traffic Assignment* → *Multi-Modal Multi-Class Subarea Analysis* to display the Multi-Modal Multi-Class Assignment dialog box.
2) Repeat Step 3 to create sub-area
3) On the Multi-Modal Multi-Class Assignment dialog box, use the following settings to fill the dialog box.

Method: User Equilibrium BFW

Delay Function: SCAG Volume Delay with Toll Facilities Model

O-D Matrix: AM Trip OD

Class Information:

	Matrices	PCE	PCE Global	VOT	Link Toll*	OD Toll	Exclusion Set	Turn Attributes
☑	DA	None	1.00	1.00	PERIOD_DA_COST	n/a	sovqry	n/a
☑	SR2 HOV	None	1.00	1.00	PERIOD_SR2GP_COST	n/a	gp2qry	n/a
☑	SR3 HOV	None	1.00	1.00	PERIOD_SR3GP_COST	n/a	gp3qry	n/a
☑	LHDT	AM_LH_PCE	1.2	1.00	PERIOD_LT_COST	n/a	truckqry	n/a
☑	MHDT	AM_MH_PCE	1.5	1.00	PERIOD_MT_COST	n/a	truckqry	n/a
☑	HHDT	AM_HH_PCE	2	1.00	PERIOD_HT_COST	n/a	truckqry	n/a
☑	SR2 NONHOV	None	1.00	1.00	PERIOD_SR2_COST	n/a	hov_nonhot_qry	n/a
☑	SR3 NONHOV	None	1.00	1.00	PERIOD_SR3_COST	n/a	hov_nonhot_qry	n/a

* If field of "Link Toll" is disabled, follow these steps to enable it: click the "Network" button on the Multi-Modal Multi-Class Assignment dialog box to display the Network Settings dialog box, click on the "Toll" tab, choose "In Network" in the "Toll Links" session, then click the "OK" button.

Delay function parameters:

Name	Field	Value
Time	FreeTime	n/a
Capacity	[[AB CAPA AM]/[BA CAPA AM]]	n/a
a	Akcelik_A	0.0025
b	Akcelik_C	0.5273
AKTime	Ak_Constrained_FFTime	n/a
Alpha	BPRALPHA	0.15
Beta	BPRBETA	4
Toll	[[AB TOLLV AM DA] / [BA TOLLV AM DA]]	n/a
Auto Operating Cost	Auto_Operating_Cost	n/a
Penalty	AM_HOV_PENALTY	n/a
ALANES	AKLANES	1
LANES	LANES	1
FACTYPE	FACTYPE	50
ATYPE	ATYPE	4
Preload	AM_Transit_Preload	0

Delay Function Constants:

Name	Value
VDF_FUNCTION	3
VOT	9.84
DAMP_FACTOR	0.25 for AM and PM, 0.5 for MD and EVE, and 0 for others
B_LOW	4
HOURS	3 for AM, 4 for PM, 6 for MD, 2 for EVE and 9 for others

Globals:

Iterations	200
Relative Gap	0.001
N Conjugate	2

The following figures show examples of filled Multi-Modal Multi-Class Assignment dialog box.

Multi-Modal Multi-Class Assignment

Line Layer 16r16p_links

Network File C:\Models\SCAG_2016RTP\networks\Outputs\hnet_am.net

Toll Matrix None

Method User Equilibrium BFW

Delay Function SCAG Volume Delay with Toll Facilities Model

O-D Matrix AM Trip OD

OK **Cancel** **Network** **Tolls** **Options** **Settings** **Sub-Area**

Class Information

	Matrices	PCE	PCE Globa	VOT	Link Toll	OD Toll	Exclusion Set	Turn Attribu
☑	DA	None	1.00	1.00	PERIOD_DA_COST	n/a	sovqry	n/a
☑	SR2 HOV	None	1.00	1.00	PERIOD_SR2GP_COST	n/a	gp2qry	n/a
☑	SR3 HOV	None	1.00	1.00	PERIOD_SR3GP_COST	n/a	gp3qry	n/a
☑	LHDT	AM_LH_PCE	1.2	1.00	PERIOD_LT_COST	n/a	truckqry	n/a
☑	MHDT	AM_MH_PCE	1.5	1.00	PERIOD_MT_COST	n/a	truckqry	n/a
☑	HHDT	AM_HH_PCE	2	1.00	PERIOD_HT_COST	n/a	truckqry	n/a
☑	SR2 NONHOV	None	1.00	1.00	PERIOD_SR2_COST	n/a	hov_nonhot_qry	n/a
☑	SR3 NONHOV	None	1.00	1.00	PERIOD_SR3_COST	n/a	hov_nonhot_qry	n/a

Delay Function Parameters | Constants

Name	Field	Value
Time	FreeTime	n/a
Capacity	[[AB CAPA AM] / [BA CAPA AM]]	n/a
a	Akcelik_A	0.0025
c	Akcelik_C	0.5273
AKTime	Ak_Constrained_FFTime	n/a
Alpha	BPRALPHA	0.15
Beta	BPRBETA	4

Globals

Iterations	200	Relative Gap	0.001
N Conjugate	2		

Name	Field	Value
Toll	[[AB TOLLV AM DA] / [BA TOLLV AM DA]]	n/a
Auto Operating Cost	Auto_Operating_Cost	n/a
Penalty	AM_HOV_PENALTY	n/a
ALANES	AKLANES	1
LANES	LANES	1
FACTYPE	FACTYPE	50
ATYPE	ATYPE	4
Preload	AM_Transit_Preload	0

Name	Value
VDF_FUNCTION	3
VOT	9.84
DAMP_FACTOR	0.25
B_LOW	4
HOURS	3

4) After the Multi-Modal Multi-Class Assignment dialog box is filled, follow these steps to save the settings for future traffic assignment:

Click the button "Settings" on the Multi-Modal Multi-Class Assignment dialog box to display the Settings dialog box, on which click and enter the Name and Description of the settings, then click the button "Save" to save the settings.

5) Click the button "OK" on the Multi-Modal Multi-Class Assignment dialog box. A new dialog box, Output File Settings, is displayed. On the Output File Settings dialog box, specify the folder to save the output files, and specify the file names.

Hint: It is a good practice to put time period in file names to differentiate output files for different time periods.

6) Click the button "OK" on the Output File Settings dialog box to start the traffic assignment with subarea analysis.

Step 6: Run MD subarea analysis using TransCAD user interface

Purpose: This step is to run the multi-modal multi-class traffic assignment (MMA) with subarea analysis for the MD (mid-day) time period.

1) Close TransCAD after Step 5.
2) Open TransCAD and open the map file (*.map) saved in Step 4-7.
3) Open the MD network file in TransCAD. This file is saved in the folder "\networks\Outputs\" and the file name is "hnet_md.net". This is the MD network file after the fifth iteration run.
4) Open the MD OD flow matrix file in TransCAD. The OD flow matrix files are saved in the folder "\ODTable\Outputs\" and the file name is "MD_OD.mtx". This is the MD OD file after the fifth iteration run.
5) Choose **Matrix → Indices** to display the Matrix Indices dialog box.
6) On the Matrix Indices dialog box, click on the drop-down list for Rows and select NodeIDs; click on the drop-down list for Columns and select Nodes IDs. Click Close to close the Matrix Indices dialog box.
7) Click the map window to make it the active window.
8) Choose **Planning → Static Traffic Assignment → Multi-Modal Multi-Class Subarea Analysis** to display the Multi-Modal Multi-Class Assignment dialog box.
9) On the Multi-Modal Multi-Class Assignment dialog box, click the button "Sub-area" to display the Subarea Setting dialog box, and to create the subarea. Click OK once done.
10) On the Multi-Modal Multi-Class Assignment dialog box, click the button "Settings" to display the Settings dialog box, on which select the settings saved in Step 5-4, then click the button "Load" to load the settings to the Multi-Modal Multi-Class Assignment dialog box.
11) Modify the settings on the Multi-Modal Multi-Class Assignment dialog box for MD, based on the information shown in Step 5-2. These modified settings can also be saved for future uses.
12) Click the button "OK" on the Multi-Modal Multi-Class Assignment dialog box. A new dialog box, Output File Settings, is displayed. On the Output File Settings dialog box, specify the folder to save the output files, and specify the file names.

    Hint: It is a good practice to put time period in file names to differentiate output files for different time periods.

13) Click the button "OK" on the Output File Settings dialog box to start the traffic assignment with subarea analysis.

Step 7: Run PM, EVE and NT subarea analysis using TransCAD user interface

Purpose: This step is to run the multi-modal multi-class traffic assignment (MMA) with subarea analysis for the PM, EVE and NT time periods.

1) Repeat Step 6 for PM, EVE and NT.