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Use of High Performance Computing in the assessment of Congestion Charging in the Greater Dublin Area

Volume II of II

Eoin Alexander O'Cearbhaill

Thesis submitted to the University of Dublin, Trinity College, for the degree of Doctor of Philosophy

2004

Appendix 1

DTI Objectives/Criteria and Sub-Criteria

Source: DTI Final Report, 1994.

1.1 Employment and the Regional Economy

1. Encourage economic development and regeneration
2. Consolidate existing business and industry
3. Attract new investment and stimulate growth in tourism
4. Improve physical access to all job opportunities and for the unemployed

1.2 Quality of Life

1. Improve reliability and comfort of travel
2. Improve personal safety and security on-street and in-transit
3. Reduce road accident levels
4. Reduce direct environmental effects from transport: noise, air pollution, energy consumption
5. Improve access to leisure and cultural facilities

1.3 International and National Context

1. Achieve consistency with EC and national Government plans and policies
2. Improve access to international markets via ports and airports
3. Improve access to and from the Greater Dublin Area
4. Help foster sustainable economic development

1.4 Development of the City and the Region

1. Maintain the relative advantage of the city centre in terms of accessibility for all

2. Provide the framework for a satisfactory pattern of new town/suburban development (impacts on implementation of land use scenario B)

3. Achieve coherence with development plans and policies including those of outlying areas (Kildare, Meath, Wicklow)

4. Conserve and enhance physical and cultural heritage

1.5 Efficiency in Implementation

1. Contain finance needs within available levels (National Government, European)

2. Optimise use of existing infrastructure and facilities

3. Timescale; full implementation possible this (20^{th}) century (if finance were not a constraint)

4. Capacity for self enforcement

5. Additional legislation/administrative structures required

6. Provide a framework for financial health of transport operating companies

7. Minimise disruption during construction/implementation

Appendix 2

Little Endian and Big Endian

The adjectives *big-endian* and *little-endian* refer to which bytes are most significant in multi-byte data types and describe the order in which a sequence of bytes is stored in a computer's memory.

In a big-endian system, the most significant value in the sequence is stored at the lowest storage address (i.e., first). In a little-endian system, the least significant value in the sequence is stored first. For example, consider the number 1025 (2 to the tenth power plus one) stored in a 4-byte integer:

"00000000 00000000 00000100 00000001"

Address	Big-Endian representation of 1025	Little-Endian representation of 1025
00	00000000	00000001
01	00000000	00000100
02	00000100	00000000
03	00000001	00000000

Many mainframe computers, particularly IBM mainframes, use a big-endian architecture. Most modern computers, including PCs, use the little-endian system. The PowerPC system is *bi-endian* because it can understand both systems.

Converting data between the two systems is sometimes referred to as the *NUXI problem.* Imagine the word *UNIX* stored in two 2-byte words. In Big-Endian systems, it would be stored as *UNIX.* In a little-endian system, it would be stored as *NUXI.*

Note that the example above shows only big- and little-endian byte orders. The bit ordering within each byte can also be big- or little-endian, and some architectures actually use big-endian ordering for bits and little-endian ordering for bytes, or vice versa.

Appendix 3

Fortran code description of the assignment and shortest path algorithms within the SATURN model

To make sure that every part of the code that must be considered has been looked at carefully, and to gain a detailed understanding of the routines involved in the assignment and shortest path algorithms, the code for the 2 main subroutines of interest, LOADIT_PLUS and DESOPO_CB, have been reverse engineered. What this means is that each line of the code, as seen in the routine itself, has been described and explained in the paragraph directly following the relevant line in the document below. This was seen as the easiest way to ensure a comprehensive understanding of what the variables, parameters and arrays are doing within the two subroutines of the SATALL program.

3.1 SUBROUTINE DESOPO_CB (IORIG)

Build minimum paths, or a tree, for the origin, IORIG, read in from the calling routine, LOADIT_PLUS. The subroutine LOADIT_PLUS is described at a later stage.

The tree building algorithm is the D'Esopo algorithm. The load sequence is All-Or-Nothing (AON). Each origin-destination (O-D) pair is loaded separately.

COMMON blocks are defined at the start of routines and are used to gather together different types of variables. The COMMON blocks associated with this subroutine aren't included in this document as they incorporate a lot of information, or variables, that isn't used in this subroutine and which could cause unnecessary confusion.

Initialisations necessary at the start of each tree build:

Set the distance to each node to infinity and the ISTATE, or status, associated with each real node to 1. Setting the parameter ISTATE of a node to 1 indicates that the tree building process has not yet reached, or examined, that node. ISTATE can also be set to 0 or –1 for different nodes. The ISTATE of all of the centroids on the network is set to 0 by the routine LOADIT_PLUS. This means that trees will always be built to centroids but that they will never be added to the loose-end table, as held in the array LOOSEN. This effectively prohibits through routing via centroids. A loose-end table contains nodes that have been reached by the algorithm but not fully explored as predecessors for other nodes. If the ISTATE of a node is set to –1 then the node has

previously been entered into the table. It has also been examined and removed so it is now put at the top of the loose-end table.

CALL INITR (XLBKT, NNODES, 1.0E20)

The subroutine INITR takes cost associated with all the nodes on the network, NNODES, and sets them all to 1.0E20, i.e., infinity. Then it outputs these in the array XLBKT. The array XLBKT contains the minimum costs for paths associated with output.

CALL INIT (ISTATE (NCENTS+1), NNODES - NCENTS, 1)

The subroutine INIT inputs the real nodes, which are equal to the total number of nodes, NNODES, minus the number of centroids, NCENTS, on the network. It then initialises the status, ISTATE, of all of these nodes to 1 so that they will be analysed by the algorithm and outputs them in the array ISTATE of size (NCENTS+1). The array ISTATE holds all the ISTATE values for each of the nodes in the network.

N1 = 0

N2 = 1

LOOSEN (N2) = IORIG

The array LOOSEN is used to store the "active" nodes. N1 is the first position in the array LOOSEN which currently holds an active node, while N2 is the last. Hence the next node to be considered is in N1+1, while active nodes are either added at the end of the current list (i.e. @ N2) or at the beginning (i.e. @ N1) depending on their ISTATE.

CALL INIT (LBKL, NCENTS, NL1)

NL1 = NLINKS+1 is used as a 'DUMMY' back-link in order to identify the origin/centroid, IORIG, in the loading and link analysis stages below. To be safe the back-link of all zones is initialised to NL1 because it is possible that certain zones may not be reached from this zone but have non-zero elements in the trip matrix. This might

in turn cause the loading stage to loop. The total number of centroids, NCENTS, is also equal to the number of zones and the number of O-D pairs in the trip matrix for each user class, as defined by the parameter NOMAD. NCENTS is input to the routine INIT. This routine initialises these nodes to NL1 and outputs them in an array called LBKL, which holds the back-links of nodes. When the algorithm reaches a back-link of the value NL1 then it knows that it can go no further because it has reached an origin/centroid.

```
XLBKT (IORIG) = 0.0
```

The cost associated with the origin that is being looked at, IORIG, is set to zero because this is where the path is starting. There is no cost to get to where you already are.

```
IF (NKNOTS.EQ.0) GO TO 320
```

If there are no U-turns, NKNOTS equals zero, then proceed to line number 320.

The following section, from the line "120 N1....." to the line "GO TO 300", describes how to build a tree with U-turns banned at externals. If the back-node of the current IANODE has been tagged with a negative value of NAME, indicating that it is a point where U-turns at externals may occur, then evasive action must be taken.

```
120 N1 = N1 + 1
```

N1 is set to N1+1. N1+1 is the next node to be considered in the array LOOSEN, as described earlier.

```
IANODE = LOOSEN (N1)
```

IANODE is set equal to the value from the array LOOSEN, i.e., IANODE is the A-node being analysed.

```
TCUM = XLBKT (IANODE)
```

TCUM is set equal to the minimum cost for output paths associated with the 'active' node, IANODE. This is contained in the array XLBKT.

K = INDEXA (IANODE)

K is set equal to the value associated with the node, IANODE, in the array, INDEXA, which points to the first position in a sorted link table for the A-nodes of an exit from the node, IANODE.

KK = INDEXA (IANODE+1) – 1

KK is set equal to the value associated with the node, (IANODE+1), in the array, INDEXA, that is now pointing to the second position in the sorted link table (one down from the top, i.e., (INDEXA () - 1)). From K to KK represents a link.

IF (KANU (LANODE (LBKL (IANODE))).LT.0) GO TO 220

If the value given to the back-link of the node, IANODE, by the array LANODE, points to a position in the array KANU that has been set to a negative value, then a special situation has arisen where a U-turn may occur between the simulation and buffer networks. In this situation GO TO 220.

DO 125 LINK = K, KK

Where GO TO 220 does not apply the loop DO 125 for the link, LINK, between the nodes K and KK must be completed.

IBNODE = LBNODE (LINK)

Within the loop, the node, IBNODE, is set equal to the node designated by the other end of the link, LINK, as pointed to by 'LINK' in the array LBNODE.

XYTIME = TTIME (LINK) + TCUM

XYTIME is set equal to the sum of the fixed costs (FLOW), variable times (TIME) and the free flows (FTIME) contained in the array TTIME for the link in question, LINK.

This is added to the minimum costs associated with paths from the 'active' node, IANODE, contained in the array XLBKT and set equal to TCUM above.

IF (XYTIME.GE.XLBKT (IBNODE)) GO TO 125

If the total cost, XYTIME, for travelling over the link is greater or equal to (.GE.) the 'current minimum cost' associated with travelling over the link (XLBKT (IBNODE)) then it is too expensive to travel down this route so GO TO 125, i.e., continue looking for a cheaper path.

XLBKT (IBNODE) = XYTIME

If XYTIME is less than (.LT.) XLBKT (IBNODE) then re-assign the current minimum (i.e., XLBKT (IBNODE)) for IBNODE to XYTIME.

LBKL (IBNODE) = LINK

Then assign the back-link of IBNODE to equal the link, LINK, being analysed.

IF (ISTATE (IBNODE)) 121,125,123

If the status, ISTATE, of the node, IBNODE, is equal to –1 then GO TO 121 (i.e., put it at the start of the loose-end table LOOSEN. The node has been entered, examined, removed and is put at the top of the table for re-examination).

If ISTATE = 0 then GO TO 125 (i.e., don't do anything with the node, leave it alone).

If ISTATE = 1 then GO TO 123 (i.e., put it at the end of the loose-end table LOOSEN).

121 LOOSEN (N1) = IBNODE

Assign the first number in the array LOOSEN equal to IBNODE, instead of IANODE.

N1 = N1 - 1

Then move IBNODE in one place on the array LOOSEN so that the first number in the array is left free once again, i.e., N1=N1-1.

ISTATE (IBNODE) = 0

Re-set the status, ISTATE, of the node IBNODE to zero so that it isn't added to the table or examined a second time during this tree build.

GO TO 125

All done for this node, GO TO 125.

123 N2 = N2 + 1

Set N2 equal to N2+1 and in doing so push it 1 place in from the end of the array LOOSEN.

LOOSEN (N2) = IBNODE

Now the second last number in the array LOOSEN is set equal to the node IBNODE and a space is left at the end of the array.

ISTATE (IBNODE) = 0

The status of IBNODE is set to zero so that it isn't used again.

125 CONTINUE

The loop 125 either ends or continues.

126 ISTATE (IANODE) = -1

The status of the node, IANODE, is set to –1, i.e., put back at the top of the loose-end table, LOOSEN, so that the other exits from the node can be analysed.

IF (N1.LT.N2) GO TO 120

If the position N1 in the loose end table is less than (.LT.) N2 then restart the loop 120 and continue finding the shortest paths for origin, IORIG. When N1 is greater than or equal to (.GE.) N2 then there are no more 'active' nodes left in the loose end table so

the algorithm has finished its analysis of the origin in question, IORIG, therefore continue to the next line.

GO TO 300

If the position of N1 is .GE. N2 in the table then go to the end of the shortest path subroutine as all possible avenues have been explored for this origin, IORIG.

The following loop is entered through the GO TO 220 statement mentioned above. This node is an external simulation node whose back-link is the dummy link coming out of the simulation network. It is not desirable to build paths to the other dummy node that goes back into the simulation network and whose node number is NONO below, since that would be a U-turn. Otherwise the loop below is the same as that above.

220 NONO = LANODE (LBKL (IANODE)) + 1

The dummy node that goes back into the simulation network, NONO, is set equal to the value given to the back-link of the node, IANODE, by the array LANODE, plus one. This represents the dummy node going back into the simulation network, and it is not acceptable for the path to go back in this direction. The dummy node coming out of the simulation network is equal to LANODE (LBKL (IANODE)).

DO 225 LINK = K, KK

IBNODE = LBNODE (LINK)

See previous code and explanation.

IF (IBNODE.EQ.NONO) GO TO 225

If the node IBNODE is equal to the node NONO then GO TO 225 (i.e., exit the shortest path loop for this IBNODE node but put the node IANODE back on top of the loose-end table LOOSEN to be re-examined for a different IBNODE, i.e., a different link from IANODE).

```
XYTIME = TTIME (LINK) + TCUM

IF (XYTIME.GE.XLBKT (IBNODE)) GO TO 225

XLBKT (IBNODE) = XYTIME

LBKL (IBNODE) = LINK

IF (ISTATE (IBNODE)) 221,225,223

221 LOOSEN (N1) = IBNODE

N1 = N1 - 1

ISTATE (IBNODE) = 0

GO TO 225

223 N2 = N2 + 1

LOOSEN (N2) = IBNODE

ISTATE (IBNODE) = 0

225 CONTINUE
```

All of the above code has been described earlier above.

```
GO TO 126
```

This GO TO statement sends the program back to 126 so as to set the IANODE to –1 and in doing so prepare it to be examined again in the next loop.

The next section of code is for simple tree building with no calculations, i.e., disregarding possible U-turns.

```
320 N1 = N1 + 1
```

```
IANODE = LOOSEN (N1)

TCUM = XLBKT (IANODE)

K = INDEXA (IANODE)

KK = INDEXA (IANODE+1) - 1

DO 325 LINK = K, KK

IBNODE = LBNODE (LINK)

XYTIME = TTIME (LINK) + TCUM

IF (XYTIME.GE.XLBKT (IBNODE)) GO TO 325

XLBKT (IBNODE) = XYTIME

LBKL (IBNODE) = LINK

IF (ISTATE (IBNODE)) 321, 325, 323

321 LOOSEN (N1) = IBNODE

N1 = N1 - 1

ISTATE (IBNODE) = 0

GO TO 325

323 N2 = N2 + 1

LOOSEN (N2) = IBNODE

ISTATE (IBNODE) = 0

325 CONTINUE

ISTATE (IANODE) = -1
```

IF (N1.LT.N2) GO TO 320

The code above is similar to that described above in loop 120, except that the check for possible U-turns (to see if KANU is negative) does not have to be done.

300 ISTATE (IORIG) = 0

Finally, the ISTATE of the origin being analysed, IORIG, is set to zero so that it isn't examined twice.

RETURN

The program returns and ends.

3.2 SUBROUTINE LOADIT_PLUS (IWANT, NOMAD, JASON, FACTOR)

This subroutine calls the subroutine DESOPO_CB and in doing so builds minimum paths for each of the origins/centroids. It then loads the trip matrix onto the array FLOW ().

Subroutine arguments;

The parameter IWANT = 1 for SUE assignment, anything else for All-Or-Nothing (AON) assignment. For this application the IWANT parameter that is input to the LOADIT_PLUS routine is set equal to the value zero, which means that AON assignment is being used. As a result of this some code can be left out.

The parameter NOMAD is the user class being assigned.

The parameter JASON controls how the array FLOW () is initialised:

If JASON is zero then the FLOW is set to zero.

If JASON is one then the FLOW is set equal to the flows (fixed), which are located in the array VOLX.

If JASON is two then the flow is left alone as the calling segment sets it.

For this application JASON is set to zero.

FACTOR is a factor applied to all trip elements loaded.

The tree build algorithm is the D'Esopo algorithm. The load sequence is All-Or-Nothing (AON) and each Origin-Destination (O-D) pair is loaded separately.

The COMMON blocks associated with this subroutine aren't included in this document as they incorporate a lot of information that isn't used in this subroutine and as such, can be confusing.

TCMIN = 0.0

TCMINR = 0.0

CONVER_A = 0.0

Initialise counter sums;

TCMIN: Total cost on minimum routes by maximum trip matrix to either the road or pseudo network.

TCMINR: Total cost on minimum routes, road trips only

ROAD: Total trips assigned to the road.

CONVER_A: Absolute convergence statistics.

Under the SAVEIT option (which is TRUE in this case) the current link costs are output to the file MTCOST_SCR.

IF (MTCOST_SCR.GT.0 .AND. NITER.GE.1 .AND. NITER.LE.NITA) THEN

If the current link costs, as held in the file MTCOST_SCR, are greater than (.GT.) zero and it is at least the first iteration of the assignment (NITER .GE. 1) and the maximum number of assignment iterations, NITA, has not been reached (NITER .LE. NITA) then continue with the IF statement, otherwise skip it.

```
ICODE = 1003 + 10*NOMADS*(NITER - 1) + 10*(NOMAD - 1)
```

Determine the appropriate code by finding the correct record (line of code) as stored in the Dirck Access array ICODE.

```
KDAEX = 'COST - costs used on iteration 1, UC 1'

WRITE (KDAEX(32:33),1003) NITER

WRITE (KDAEX(39:40),1003) NOMAD

1003 FORMAT (I2)
```

Set up text description using the array KDAEX and write to the output. KDAEX is a 40-character description of the contents of a file put in the header record for that file.

```
CALL BOP3 (MTCOST_SCR, TTIME, NLINKS, ICODE)
```

BOP3 outputs the real array TTIME, of size NLINKS, to the file MTCOST_SCR in blocks of 256.

```
END IF
```

End of the if statement.

Various initialisations are necessary prior to commencing a load.

```
CALL INIT (ISTATE, NCENTS, 0)
```

The status, ISTATE, of all centroids, NCENTS, is permanently set to zero (this means that trees are always built to centroids but they will never be added to the loose-end table, hence through routing via centroids is prohibited, as discussed previously).

CALL INIT (LBKL, NNODES, NL1)

The back-links, LBKL, of the nodes, NNODES, are set to the dummy link NL1 (necessary in case a tree cannot reach certain links). Discussed previously.

CALL BOLIN (LBOL, LBNODE, NOMAD)

If there are any banned turns for user class NOMAD then the subroutine BOLIN shorts them out by assigning the LBNODE () to its ANODE value and outputting it to the array LBOL, which stores penalty information about banned turns.

IF (JASON.EQ.0) CALL INITR (FLOW, NLINKS, 0.0)

IF (JASON.EQ.1) CALL HAMEQ3 (FLOW, VOLX, NLINKS)

JASON is set to zero for this application, therefore ignore second line of code. Since JASON equals zero initialise the FLOW on the links, NLINKS, to zero.

Record initial flows at U-turns.

IF (NKNOTS.EQ.0) GO TO 15

If the number of U-turns, NKNOTS, equals zero then GO TO 15, skip next three lines. Otherwise continue.

DO 13 KNOT = 1,NKNOTS

For the U-turns that are present DO the loop 13 until all the U-turns have been dealt with.

FLOWBC (KNOT) = FLOW (KNOTBC (KNOT))

The flow over the U-turn, KNOT, from B to C, FLOWBC, in a turn made up of three nodes, A-B-C, is set by the array FLOW, which points to a separate array KNOTBC that holds the position that points to the flow for the U-turn in question, KNOT.

```
13 CONTINUE
```

Do this for all U-turns and then move on.

```
15 IF (IWANT.EQ.1) CALL HAMEQ3 (XCOST, TTIME, NLINKS)
```

IWANT equals zero so there is no stochastic option, move on.

```
MZERO = (NMAT (NOMAD) - 1) * NCENTS
```

MZERO defines a zero row in the trip matrix for user class NOMAD. NMAT is a parameter that gives the number of the matrix giving trips for user class NOMAD. For example, if NOMAD equals 2 then NMAT (NOMAD) = 2 and the number of zero rows before the information wanted comes up is (2 – 1)*NCENTS (the number of centroids which is equal to the number of O-D pairs). This makes sense because the information in the matrix for, say, user class 1 is stored ahead of a user class 2. Since the information is stored vertically in the matrix file, when trying to read information for user class 2 the information pertaining to user class 1 must be skipped so the lines of data giving information on user class 1 are set to zero, or MZERO.

```
CFCF = CFACT (NOMAD) * FACTOR

IF (GONZO.GT.0.0) CFCF = CFCF * GONZO
```

CFCF is a trip factor which includes any class-specific factors (CFACT ()), a factor requested by the calling segment (FACTOR) and a universal factor (GONZO). GONZO and FACTOR are user defined as being equal to 1, so they have no effect.

```
COWS = .FALSE.
```

The logical parameter COWS equals TRUE if some O-D pairs aren't connected to each other in some way.

STRAYS = 0.0

The parameter STRAYS counts the number of unconnected trips and is initialised to zero.

NZERO_TIJ = 0

The parameter NZERO_TIJ records the number of negative trips between zones. It is usually very small as it doesn't make that much sense for there to be minus trips going to a destination.

MISNOM = .FALSE.

The logical parameter MISNOM checks for mismatched zone names. It is initialised to FALSE as there have been no mismatched names as yet.

LANODE (NL1) = NNODES + 1

An additional node is added to the pointer array of the A-nodes for the back-link NL1.

NAME (NNODES+1) = IABS (NAME (NNODES)) + 1

The node's name is set equal to the numerical name of the node before it, NNODES, plus one.

Loop over all of the centroids/zones/origins, NCENTS. This large loop is the most important area of the routine LOADIT_PLUS as all of the programming within this loop applies to each separate origin, IORIG. This loop calls the subroutine DESOPO_CB and also loads the flows onto the trip matrix.

DO 800 IORIG = 1,NCENTS

IF (USEMF) THEN

If the parameter USEMF is assigned the value TRUE then a trip matrix .UFM file is being used for input. If this is so then check if there are any positive trips in this row by

calling the function LONGDA. LONGDA checks the length of the next row (which is already known) purely in order to read the Dirck Access header record so that the array MISC (2) will contain the first non-zero element in the row.

```
ICODE = 93 + 10*(IORIG + MZERO)
```

ICODE is set equal to the record number for the next row in the matrix. MZERO has been described before.

```
JIMMY = LONGDA (MF, ICODE)
```

The variable JIMMY is equal to the return value from the function LONGDA, which is the length of the record coded ICODE above. The matrix is read in on channel MF along with ICODE and a value called JIM is returned from the function LONGDA to this subroutine.

```
IF (MISC (2).GT.NCENTS) GO TO 800
```

MISC (2) is a miscellaneous array used for different things in the code. Here it gives the first non-zero position in the trip matrix. If all the positions are zero, MISC greater than (.GT.) NCENTS, then there aren't any trips associated with this origin so skip it. GO TO 800.

```
END IF

IF (USETIJ) THEN
```

If the logical parameter USETIJ is TRUE then an internal matrix used. An internal matrix is a matrix that has been loaded into the internal memory of the computer being used to run SATALL. It is unlikely that this will be possible when large matrix files are involved, which is the case when there are multiple user classes or the network is large, both of which are true in this case.

If using an internal trip matrix check to see if there are no trips from this zone.

IJ1 = INDEXI (MZERO + IORIG)

The variable IJ1 is set equal to the value that the array INDEXI points to for the zone/centroid (MZERO + IORIG). The array points to the first element from the zone.

IJ2 = INDEXI (MZERO + IORIG + 1) - 1

The variable IJ2 is set equal to the value pointed to by the array INDEXI minus one. This minus one is so that if the value of the IJ element from the next zone (hence the +1) is zero then the '-1' will make IJ2 negative.

IF (IJ2.LT.IJ1) GO TO 800

If IJ2 is negative as a result of there being no trips in the next zone then it will be less than IJ1 which will be zero or positive. If IJ2 is less than (.LT.) IJ1 then GO TO 800 as there is nothing else to do for a zone with no trips.

END IF

The next check is for unconnected origins. Zones with no out-bound connectors are excluded (e.g. in the case where zones are located at cordon points, which are 1-way out of the network).

STRAY = 0.0

STRAY has been described earlier. It is initialised to zero here.

IF (INDEXA (IORIG+1).LE.INDEXA (IORIG)) THEN

If the first position pointed to by the array INDEXA for the node/origin (IORIG+1) gives a value that is less than or equal to (.LE.) the same position for the previous origin/node (IORIG) then enter the IF statement. The array INDEXA (I) is a pointer array to a sorted link table of an exit from node I. Therefore, if the number of exits from (IORIG+1) is less than or equal to (.LE.) the number of exits from the previous

node (IORIG) then there is an unconnected origin. INDEXA (IORIG) has not been connected.

IF (NITER.NE.1 .OR. GONZO.LT.0.0 .OR. .NOT.USEMF) GO TO 800

If the number of the assignment iteration, NITER, is not one, if the universal factor, GONZO, is less than zero (it is equal to one for this application) or if a .UFM file is not being used, then GO TO 800. There is nothing to be done with this disconnected origin. But, since GONZO is greater than (.GT.) 0 ignore this statement.

For an unconnected origin check for any trips in the trip matrix.

CALL INMR3 (MF, IORIG+MZERO, ID, XLBKT, NCENTS

The subroutine INMR3 reads in a single row from a matrix file of real numbers whose length is four bytes (real*4). MF is the input device number and is input to the subroutine. (IORIG+MZERO) is the sequential row number input to the subroutine. ID is the row name that is output from the subroutine, while XLBKT is also output and contains the row elements. NCENTS is input and corresponds to the row length (columns of the matrix).

IF (ID.NE.NAME (IORIG)) MISNOM = .TRUE.

If the name of the row output from INMR3 is not equal to the name of the origin row contained in the array NAME for the origin, IORIG, then there is a mismatched zone name, i.e., MISNOM = .TRUE.

XLBKT (IORIG) = 0.0

The costs associated with the origin, IORIG, are set to zero. It does not cost anything to get to where you already are.

DO 30 I = 1,NCENTS

STRAY = STRAY + XLBKT (I)*CFCF

30 CONTINUE

Now loop over all of the destinations to count the strays associated with the unconnected zone/origin. XLBKT (I) goes through all of the nodes on the row to find stray trips. Any trips that are found are multiplied by the trip factor CFCF, which includes any class specific factors (CFACT ()) and a universal factor (GONZO=1).

GO TO 790

Once this loop has been completed then skip the shortest path and loading sequence and GO TO 790.

END IF

Build the tree for this origin.

CALL DESOPO_CB (IORIG)

This subroutine builds the tree for the origin, IORIG. It has been described above.

IF (.NOT.USETIJ) THEN

Load the trip matrix using an unformatted matrix file (.UFM file) on device number MF.

Read in the trip matrix row for this origin using the array XLBKT and load the trips.

IF (GONZO.LT.0.0) THEN

CALL INITR (XLBKT, NCENTS, -GONZO)

These 2 lines may be skipped as GONZO is not less than (.LT.) zero.

ELSE

Since GONZO is greater than (.GT.) zero run through the ELSE section of the IF statement.

```
CALL INMR3 (MF, IORIG+MZERO, ID, XLBKT, NCENTS)

IF (ID.NE.NAME (IORIG)) MISNOM = .TRUE.

END IF
```

INMR3 opens up a row of the matrix as discussed previously. Then the row name is checked for accuracy to see if a zone has been mismatched/misnamed.

```
XLBKT (IORIG) = 0.0
```

As described earlier.

The trip element as read is factored by the class factor CFCF.

```
DO 650 J = 1,NCENTS
```

Loop over all of the columns in the matrix for the origin, IORIG.

```
V = XLBKT (J)
```

V is set equal to the number of trips at position J in the array XLBKT.

```
IF (V.LE.TIJMIN) THEN
```

If V is less than or equal to (.LE.) the user defined value, TIJMIN = 10E-10, then there is a situation where V is very, very small.

For this situation where V is zero or very small.

```
IF (V.LT.0.0 .AND.  NITER.EQ.1) THEN
```

If the value of V is less than (.LT.) zero and the number of the assignment iteration is equal to one then.....

```
NZERO_TIJ = NZERO_TIJ + 1
```

.....the number of zero elements, as recorded by MZERO_TIJ, is incremented by one.

```
IF (NZERO_TIJ.LT.10) THEN
```

If the number of zero elements, MZERO_TIJ, is less than (.LT.) ten then .....

```
WRITE (LP,1620) NAME(IORIG), NAME(J), V

1620 FORMAT (/, ' **** - WARNING - **** THE NUMBER OF TRIPS
FROM', /,

1' ZONE', I6, ' TO ZONE', I6, ' IS NEGATIVE -', E12.2, ' - FUNNY!')
```

.....write the warning shown above, self explanatory.

```
KNEES = KNEES + 1
```

The parameter KNEES records the number of ordinary warnings and is incremented by one each time a warning is printed/output.

```
END IF

END IF

ELSE
```

If V is not less than (.LT.) TIJMIN then continue here.

```
V = V*CFCF
```

The value V is factored by CFCF.

```
LINK = LBKL (J)
```

The parameter LINK is set equal to the back-link of the centroid, or node defining a zone, J.

```
IF (LINK.NE.NL1) GO TO 640
```

If the link isn't equal to NL1 then the tree can reach the link so proceed normally by Going TO 640.

```
IF (GONZO .LT. 0.0) GO TO 650
```

If GONZO is less than zero then this is a flat matrix and it is not loaded. Therefore, GO TO 650.

```
STRAY = STRAY + V
```

If LINK is equal to (.EQ.) to NL1 then the tree can't reach the link and STRAY is increased by the flow V.

```
LASTD = NAME (J)
```

The parameter LASTD stands for 'Last Destination not connected', and is set equal to the name of the node, J.

```
GO TO 650
```

```
640 FLOW (LINK) = FLOW (LINK) + V
```

Here the trips are loaded. The array FLOW contains the assigned AON flows for the link, LINK. V is then added to the flow for this link.

```
LINK = LBKL (LANODE (LINK))
```

LINK is then set to equal the back-link of the A node of the link as found by the array LANODE, which points to a list of A nodes by link number, i.e., LINK.

```
IF (LINK.NE.NL1) GO TO 640
```

If the link isn't equal to NL1 then it can be reached by the tree and the loop is continued until the path is complete and LINK .EQ. NL1.

END IF

650 CONTINUE

ELSE

Loading a trip matrix from internal memory.....

IF (MCGILL.EQ.5) THEN

MCGILL is an elastic assignment parameter and is user defined as being equal to zero for this application, Therefore, ignore this part of the IF statement.

ELSE

Instead use the fixed trip matrix.

DO 750 K = IJ1, IJ2, 2

This is the loading loop for K equal to the first IJ element of zone (MZERO+IORIG) to the first element in the next zone (MZERO+IORIG+1), minus one. This is done in steps of two as it is links that are being loaded and each link has a node at each end.

J = LJNODE (K)

J is set equal to a position K in the array LJNODE.

V = TIJXA (K+1) * CFCF

V, the flow, is set equal to the position in the array TIJXA as described by (K+1), (i.e., 2, 4, 6, ...) multiplied by the factor CFCF.

```
LINK = LBKL (J)
```

The link is set equal to the back-link of the node J, which is equal to the position K in the array LJNODE.

```
IF (LINK.LE.NLINKS) GO TO 740
```

If the link being analysed is less than or equal to (.LE.) the total number of links then OK, load link by Going TO 740.

```
IF (GONZO .GE. 0.0) THEN
```

Otherwise, if the link is greater than (.GT.) NLINKS check if the trip matrix factor, GONZO, is greater than or equal to (.GE.) zero. GONZO is equal to one for this application, therefore, enter the IF statement.

```
STRAY = STRAY + V

LASTD = NAME(J)

END IF
```

STRAY is incremented by the number of trips/the flow V. Then the 'Last Destination not connected' is set equal to the name of J.

```
GO TO 750
```

There is no path to load so GO TO 750 and continue.

```
740 FLOW (LINK) = FLOW (LINK) + V

LINK = LBKL (LANODE (LINK))

IF (LINK.NE.NL1) GO TO 740
```

This loop is exactly the same as 640 and loads the flow V onto the links in the path, until the path reaches the last back-link, NL1.

750 CONTINUE

The loop continues for each value of K until the next zone is reached.

END IF

End of internal memory trip matrix loading.

END IF

End of loading trip matrix IF statement.

IF (NKNOTS.EQ.0) GO TO 790

If the number of U-turns is equal to zero then proceed to 790.

Otherwise there must be an analysis of the possible U-turns.

DO 780 KNOT = 1,NKNOTS

Analyse each U-turn by Doing the loop 780.

IF (ISTATE (KNOTB (KNOT)).EQ.1.OR.ISTATE (KNOTC (KNOT)).EQ.1) GO TO 780

If the status, ISTATE, of the node B for the knot, KNOT, as pointed to by the array KNOTB is equal to one (node not yet reached by tree) or the status of node C for KNOT in the array KNOTC is equal to one, then GO TO 780 as there is no point in looking at this possible U-turn yet.

IF (LBKL (KNOTB (KNOT)) .NE. KNOTAB (KNOT)) GO TO 780

If the back-link value for the U-turn from B back to A is not equal to the value given by the array KNOTAB for the same U-turn (KNOT) then there is no U-turn so GO TO 780.

UFLOW (KNOT) = UFLOW (KNOT) + FLOW (KNOTBC (KNOT)) – FLOWBC (KNOT)

Otherwise, there is a U-turn so set the flow on the U-turn, KNOT, equal to the total AON flows associated with the link BC (KNOTBC (KNOT)) minus the normal flows associated with the direction B to C for the turn (FLOWBC (KNOT)).

KNOTY (KNOT) = IORIG

The origin that led to the U-turn is recorded in the array KNOTY for the U-turn KNOT.

KNOTS (KNOT) = KNOTS (KNOT) + 1

The number of U-turns recorded is incremented by one.

780 FLOWBC (KNOT) = FLOW (KNOTBC (KNOT))

The normal B to C flow for the turn KNOT is set equal to the AON total flows associated with there being a U-turn so that it is recognised by the program that there isn't a U-turn there any more and the flow associated with the U-turn wont be re-added to the array UFLOW.

790 STRAYS = STRAYS + STRAY

Add total strays.

IF (NITER.NE.1 .OR. STRAY.LE.0.0) GO TO 800

If the number of the assignment process in progress isn't equal to one or the number of strays are zero then the analysis of this origin is over. GO TO 800

IF (.NOT.FARMER) GO TO 800

If the parameter FARMER is FALSE then various warnings will not be printed, i.e., those following on from this statement, so GO TO 800, analysis over.

IF (COWS) GO TO 795

If COWS is TRUE then some O-D pairs aren't connected so GO TO 795 to print an error message.

```
      WRITE (LP,1791) NOMAD

      KNEES = KNEES + 1

1791  FORMAT (//, ' **** - WARNING - **** TRIPS FROM THE
     FOLLOWING ORIGI

     1N ZONES', /, ' CANNOT FIND PATHS TO THEIR DESTINATIONS FOR
     USER CL

     2ASS', I3, /, ' - IS THE NETWORK DISCONNECTED IN ANY WAY?', //,

     3 ' ORIGIN   TOTAL    LAST UNREACHED', /,

     4 ' ZONE    TRIPS     DESTINATION')
```

A warning message is written for user class NOMAD (1 or 2) so the parameter KNEES is incremented by one. The message says that trips from certain origin zones can't find paths to their destinations. It then asks if the network is disconnected in any way.

```
      795 WRITE (LP,1795) NAME(IORIG), STRAY, LASTD

      1795 FORMAT (I5, F10.1, I12)
```

The line 795 writes the name of the origin/zone, the number of strays associated with it and the last destination not connected (LASTD).

```
      COWS = .TRUE.

      800 CONTINUE
```

The loop to find the shortest paths and to load then ends here.

Error messages follow, not important.

```
      CALL BOLIN (LBOL, LBNODE, 0)
```

If there have been any banned turns, they are un-shorted by calling BOLIN with the user class set equal to zero; this re-sets all proper B-nodes in the pointer array LBNODE.

RETURN

The loaded paths for the origin, IORIG are returned if all was well.

END OF SEGMENT LOADIT_PLUS

Appendix 4

MPI Implementation

4.1 Parallel Implementation

This appendix describes a sample of four different MPI procedures that were used in the parallel implementation of the SATURN model and which are used in any parallel implementation.

4.1.1 Initialise, finalise, rank and size

The first thing that is done in any MPI parallel program is to call MPI_INIT. This is called before any other MPI routine and it sets up MPI for the particular machine on which you are running. The final call in the program is to MPI_FINALIZE. This shuts down MPI before the program ends.

The first two routines called in a parallel MPI program are MPI_COMM_SIZE and MPI_COMM_RANK. These tell a processor the number of processors on which the program is running and the rank of that processor. If a program is run on N processors then these processors are numbered 0, 1, 2, 3,..., N-1. This is called the rank of a processor.

4.1.2 Variable set-up

Here the program is set up so that only one processor prints to the screen terminal for interaction with the user and only this processor inputs the relevant necessary files, i.e. the .UFM file (unformatted matrix file) and the .UFN file (unformatted network file), as indicated to by the user. An example of how this can be done can be seen below where "myid" is the rank of a processor. Any information within this if statement will only be carried out by the processor with rank two. In this way the input files are loaded onto one of the processors.

```
IF ( myid .EQ. 2 ) THEN

      .....

ENDIF
```

The next step is to broadcast this information to the other processors. This can be done using a number of methods but the easiest one for sending a lot of data to all of the processors at the same time is MPI_BCAST. For example;

```
IF (myid .EQ. 0) THEN

        CALL TREAD5 (ANS, 1, 9220, IRETX, 'Y', 1, M, .TRUE.)

ENDIF

CALL MPI_BCAST(ANS, 1, MPI_CHARACTER, 0, MPI_COMM_WORLD, ierr)
```

This inputs the answer to some interactive question, ANS, on processor zero (myid is equal to zero). This answer is then broadcast to the other processors using MPI_BCAST.

4.1.3 Data dispersion

The following code was used to split the number of centroids between the processors. NCPP stands for the number of centroids per processor. REM is equal to the remainder of the number of centroids divided by the number of processors. MYNC stands for the number of centroids distributed to each processor after the remainder has been calculated.

```
NCPP = NCENTS/NUMPROCS

REM = MOD(NCENTS, NUMPROCS)

IF (myid .LT. REM) THEN

        MYNC = NCPP + 1

ELSE

        MYNC = NCPP

ENDIF

IF (myid .LT. REM) THEN
```

```
        OFFSET = myid*MYNC

ELSE

        OFFSET = (REM*MYNC) + ((myid-REM)*NCPP)

ENDIF

PRINT*,'PROCESS', myid,' IS HANDLING CENTROIDS', OFFSET +1,' -
        ',OFFSET+MYNC

DO 800 CENTCTR = 1, MYNC

        IORIG = OFFSET + CENTCTR

        (shortest path algorithm and loading process)

800     CONTINUE
```

OFFSET is then equal to the sum of the previously distributed centroids, MYNC for each of the previous processors. The print statement prints out the processor rank and the centroid that have distributed to it in a line printer file that can be assessed at execution time. When the OFFSET and MYNC have been calculated a new do loop is put in place of the old linear one whereby each processor works on a separate group of centroids.

4.1.4 Data gathering

Once the shortest path algorithm has run its course the output needs to be gathered together from all of the processors, reconstituting the problem. This means putting all the subsets of origins back together to give the assignment solution for that iteration of the assignment, and returning this information to all the processors so that they can continue with the updated information. Examples of how this can be done for large amounts of similar data include calls to MPI_REDUCE, MPI_ALLREDUCE, MPI_GATHER and MPI_ALLGATHER. An example of how an MPI_ALLREDUCE call is used can be seen below. This call takes all the parts on the different processors, PARTUFLOW, and creates

UFLOW by applying the MPI_SUM call to add them together. It then rebroadcasts the new array UFLOW back to all the processors.

```
        .....
800     CONTINUE
DO 47 KNOT = 1, NKNOTS
        PARTUFLOW(KNOT) = UFLOW(KNOT)
        UFLOW(KNOT) = 0.0
47      CONTINUE
CALL MPI_ALLREDUCE (PARTUFLOW, UFLOW, NKNOTS, MPI_REAL, MPI_SUM,
        MPI_COMM_WORLD, ierr)
.....
```

Appendix 5

MPI Sample coding taken from an assignment routine within SATALL

The MPI sections are highlighted in bold in the text of the routine Sesame_full, which is an assignment routine used in SATURN to differentiate between the different types of assignment and to make the appropriate calls to other subroutines to progress with the assignment process.

```
SUBROUTINE SESAME_FULL (MT, NED, MUSE, KDFILE, LIKE, IRET,
LEVEL,
     1                          DIRECT, ESSENTIAL, APPENDABLE)
C
C       OPEN THE EXTERNAL FILE MT, NED IS THE CORRESPONDING
STANDARD
C      CHANNEL NUMBER (GENERALLY THE TWO ARE THE SAME BUT ANY
C      MACHINE PECULIARITIES ARE ACCOUNTED FOR BY NFILE()
C      SUCH THAT MT <==> NFILE(NED).
C
C       NED LE 0 IMPLIES THAT MT HAS ALREADY BEEN SET TO ITS
DESIRED
C       VALUE AND WE LOCATE THE CORRESPONDING VALUE OF N IN
NFILE().
C      IF NED<0 THE VALUE N IS RETURNED AS NED
C
C      MUSE = 1 ==> INPUT ONLY (HENCE AN EXISTING FILE),
C             2 ==> OUTPUT ONLY (HENCE A NEW FILE)
C                3 ==> INPUT AND OUTPUT BOTH (BUT WITH OUTPUT
FIRST SO
C                           THAT THIS MUST BE A NEW FILE AS
WELL)
C
C       KDFILE IS (PARTLY) AS USED IN MTHIN AND MTHOUT TO
IDENTIFY
C      DIFFERENT FILE TYPES:
C            -1  ==>  AS 0 BUT CANNOT BE A TERMINAL
```

```
C               0   ==>  KR, LP, KP OR TERMINAL FILES, I.E.,
UNFORMATTED.
C             1  ==>  MATRIX DIRCK ACCESS FILE - UFM
C             8  ==>  FORMATTED SCRATCH FILE
C             9  ==>  AN UNFORMATTED SCRATCH FILE,
C            19 ==>  A SCRATCH DIRCK ACCESS FILE - UFX
C             20 ==>  SATURN DIRCK ACCESS FILE - UFN, UFS OR
UFA
C             29 ==>  PIJA FILES - UFP, SATURN 9.2+ FULL DA
FORMAT
C            30 ==>  PIJA FILES - UFP, OLD STYLE HODGE-PODGE
C
C     LIKE > 0 ==> A DEFAULT FILE NAME IS BUILT FROM THAT ON
CHANNEL
C                    LIKE BUT WITH A DIFFERENT EXTENSION AS
STORED BY
C                  THE CALLING SEGMENT IN "ZEXT" IN DVV3.
C
C             = NED > FULL DEFAULT FILE NAME SET BY CALLING
SEGMENT
C                  BUT MAY BE TREATED AS A DEFAULT
C
C               0 ==> FILE NAME MUST BE USER INPUT, EITHER
ALREADY
C                     STORED IN FILNAM(), E.G. AS READ FROM
LOOK.ERE,
C                  OR ELSE VIA CONVERSATIONE
C
C          < 0 ==> AS POSITIVE VALUES BUT FILE NAME
C         -NED ==> INPUT OR BUILT IS MANDATORY, NOT OPTIONAL
C
C         IRET = 0 ==> NORMAL RETURN
```

```
C                 1 ==> RETURN ON "QUIT"
C                 2 ==> FAILED TO OPEN AND DON'T CARE
C
C          LEVEL = 0 ==> QUIT MEANS TERMINATE
C                  1 ==> QUIT MEANS RETURN WITHOUT OPENING A
FILE
C
C     DIRECT = T ==> OPEN AS DIRECT ACCESS
C                    ELSE NOT
C
C      ESSENTIAL = T ==> A FATAL ERROR IF WE FAIL TO OPEN,
ELSE
C                       RETURN WITH IRET = 2
C
C     NOTE THAT WITH MAIN FRAMES AND MOOD=0 INTERNAL OPENING
IS NOT
C         REQUIRED, THIS BEING TAKEN CARE OF BY EXTERNAL
PROCEDURES,
C     SO WE JUST SET MT AND BEAT A HASTY RETREAT,
C     BUT FOR MICROS AND/OR F77 SOMETHING ELSE MAY BE NEEDED.
C
C
C       SESAME_FULL MAY ONLY BE USED AFTER PGMHD HAS BEEN
CALLED
C
C
      CHARACTER*96 AFILE, AFDEF
      CHARACTER AFORM*11, ASTAT*7, ANS*12, AEXT*3,
     1          FTYPE*7, ONPUT*6, QM*1, DEFEXT*3, ZEXT2*6
CAMD      CHARACTER DDNAME*3, FCS*36
CMIC4      CHARACTER*16 DFILE
```

```
      CHARACTER   KDAIN*40,   KDAEX*40,   FILNAM*96,   KATZ*80,
ZEXT*6
C
      COMMON /DVV2/ KR, LP, KP, ITIN, ITOUT, MODET
      COMMON /DVV3/ KDAIN, KDAEX, FILNAM(50), KATZ, ZEXT
      COMMON /DVV4A/ NBOOB, LBW, KICKS, KNEES, NBUGS, INSULT,
     1               LITES, LPERT, LINES, LPERP, IPAGE,
     2               MONEY, MICRO, IDPGM, MODECF, MOOD,
     3               MYSEED, IWARN, NHL, MAXFN, NFADD,
     4               MISC(5), XTRAS(5), XTCPU, XTZERO
      COMMON   /DVV4B/   NFILE(50),   JFK(50),   JFMUSE(50),
JFHEAD(50),
     1               LENGTH(50), LSTATE(50), KODE(50)
      COMMON /DVVL/ GO4IT, ANSI_OK, SKIP24
C
CAMD      COMMON /F76/ NFDS
C
      LOGICAL KREX, DEFALT, SCRAT, QDEF, FOPEN, DIRECT,
     1        ESSENTIAL, APPENDABLE
      LOGICAL GO4IT, ANSI_OK, SKIP24
C
      DATA QM /'?'/
C
CTOP#############################################################
C
C     PARALLEL CHANGES: E. O'CEARBHAILL
C
      INTEGER myid, ierr, numprocs
C
      include "mpif.h"
C
      call MPI_COMM_RANK( MPI_COMM_WORLD, myid, ierr )
```

```
      call MPI_COMM_SIZE( MPI_COMM_WORLD, numprocs, ierr )
C
CBOT#############################################################
C
      NSLIP = 0
      N101  = 0
      IRET  = 0
C
C       REMEMBER INPUT VALUES OF NED IN CASE WE QUIT WITHOUT
DOING
C     ANYTHING
C
      NEDIN = NED
C
C     CHECKS ON MUSE AND KDFILE:
C
      IF  (MUSE.LT.1  .OR.  MUSE.GT.3)  CALL  BOOB3  (MUSE,  0,
9008, 53)
C
      IF (KDFILE.NE.0   .AND. KDFILE.NE.1   .AND. KDFILE.NE.8
.AND.
     1    KDFILE.NE.9   .AND. KDFILE.NE.29 .AND. KDFILE.NE.-1
.AND.
     2    KDFILE.NE.19 .AND. KDFILE.NE.20 .AND. KDFILE.NE.30)
     3    CALL BOOB3 (KDFILE, 0, 9009, 53)
C
      IF (NED.GT.0) GO TO 20
C
C     NED LE 0 IMPLIES THAT MT HAS ALREADY BEEN SET AND THAT
WE ONLY
C     NEED TO FIND ITS INTERNAL EQUIVALENT
C
```

```
      MTIN  = MT
      CALL MTINT (MT, N, 9273, 71)
      IF (NED.LT.0) NED = N
      GO TO 22
C
C     SET N TO BE CHANNEL NUMBER IN 1-50 RANGE
C
   20 N = NED
      IF (N.GT.MAXFN) CALL BOOB3 (N, 0, 9010, 71)
      MT = NFILE(N)
C
C     JFK() DEFAULTS TO -1 OR -2; FATAL ERROR IF NOT SO SINCE
THIS MEANS
C     CHANNEL N IS ALREADY OPEN. RECALL ITS DEFINITION:
C     JFK(I)      -2 : Channel I unopened but FILNAM(I) set
C                 -1 : Unopened
C                   0 - 30) File opened and JFK records file
type KDFILE
C
   22 JFKIN = JFK(N)
      IF (JFKIN.GE.0) CALL BOOB3 (JFK(N), N, 9011, 29)
C
C       RECORD THE INPUT FILE CHARACTERISTICS IN JFK() AND
JFMUSE()
C
      IF (KDFILE.GE.0) THEN
      JFK(N)    = KDFILE
                  ELSE
      JFK(N)    = 0
                  END IF
      JFMUSE(N) = MUSE
C
```

```
C
C      MIKE ACTS AS LIKE BUT MAY HAVE ITS VALUE CHANGED HERE.
MURRAY IS
C      THE  CHANNEL NO ONLY. NOOD SUBSTITUTES FOR MOOD SINCE
IT MAY HAVE
C      ITS VALUE RE-SET BEFORE STATEMENT 48 BELOW.
C
       MIKE   = LIKE
       MURRAY = IABS(MIKE)
       NZEXT  = 0
       NOOD   = MOOD
C
C        ZEXT2 STORES INPUT VALUE OF ZEXT FOR RE-SETTING ON
EXIT.
C      UNDER LOWER CASE OPTION REVERSE DEFINITION OF ZEXT SO
THAT
C      LOWER CASE DEF COMES FIRST
C
       ZEXT2 = ZEXT
CLCASE       ZEXT(1:3) = ZEXT2(4:6)
CLCASE       ZEXT(4:6) = ZEXT2(1:3)
C
C       SCRATCH FILES ARE IDENTIFIED BY TYPES 8, 9 OR 19 -
SCRAT = T
C
       SCRAT = KDFILE.EQ.8 .OR. KDFILE.EQ.9 .OR. KDFILE.EQ.19
C
C      AFILE IS THE DEFAULT FILE NAME.
C
       AFILE = '     '
       IF (JFKIN.EQ.-2) AFILE = FILNAM(N)
C
```

```
C                    FILE NAMES MUST BE DECLARED AND OPENED
INTERNALLY.
C
C     DIFFERENTIATE BETWEEN FORMATTED AND UNFORMATTED FILES
C      FROM THE VALUE OF KDFILE, AND SET THE STATUS FROM THE
VALUE
C     OF MUSE.
C
      AFORM = 'FORMATTED   '
      IF    (KDFILE.GT.0    .AND.    KDFILE.NE.8)    AFORM    =
'UNFORMATTED'
C
      ASTAT = 'NEW     '
      IF (MUSE.EQ.1) ASTAT = 'OLD     '
C
C     DEFINE FCS - FILE CHARACTERISTICS - THE BIT OF JCL THAT
GOES
C     AFTER THE FILENAME WHEN A FILE IS OPENED UNDER IBM CMS.
C     THE DEFAULT IS FOR KR/KP TYPE FILES; OTHERWISE ...
C
CAMD      FCS = ' (RECFM F LRECL 80 BLOCK 80'
C
.. LP
CAMD      IF (N.EQ.6) FCS = ' (RECFM F LRECL 132 BLOCK 132'
C
..UF?
CAMD      IF (KDFILE.EQ.1 .OR. KDFILE.GE.9)
CAMD     1              FCS = ' A4 (RECFM V LRECL 1028 BLOCK
1032'
C
C
C
```

```
C            SET THE FILE NAME - AFILE - THE TRICKY BIT
C
C
C      FILE NAME PRE-DEFINED AS INDICATED BY JFKIN = -2? ...
C
       IF (JFKIN.NE.-2) GO TO 45
C       IF (JFKIN.NE.-2) GO TO 42
C
C      ... YES - CHECK FOR EXISTENCE.
C
       CALL QFILE (AFILE, KREX, FOPEN)
C
C       WE MAY WANT TO USE THIS FILE NAME AS A DEFAULT IF IT
COMES
C       FROM LOOK.ERE AND WE ARE INTERACTIVE.  BUT NOT IF IT
DOESN'T
C      EXIST WHEN IT SHOULD (AS INPUT)
C
       IF (LIKE.EQ.N .AND. MODET.NE.0 .AND. NOOD.LT.0) THEN
          IF (KREX .AND. MUSE.EQ.1) GO TO 50
          IF (MUSE.NE.1) GO TO 50
                                          END IF
C
C      ERRORS IF ...
C
C       ... A FILE WHICH IS READ IN DOES NOT EXIST (FATAL) OR
...
C           (WHICH THE EXTERNAL JCL SHOULD HAVE TRAPPED)
C
       IF (.NOT.KREX .AND. MUSE.EQ.1) THEN
C
       IF (MODET.EQ.0) THEN
```

```
C
C         ... BUT ONLY FATAL IF ESSENTIAL = T
C
          IF (ESSENTIAL) THEN
C
          WRITE (LP,9042) N, AFILE
          CALL BOOB3 (N, 0, 9012, 42)
 9042     FORMAT (//, ' CHANNEL', I3, ' FILE: ', A96)
C
                         ELSE
C
          GO TO 995
                         END IF
C
                       ELSE
C
C      IF WE ARE NOT yet INTERACTIVE (NOT DEFINED THE SCREEN)
EXIT
C
       IF (ITOUT.LT.0) GO TO 995
C
C       CHANGE OF MIND - SINCE WE ARE INTERACTIVE WE GIVE THE
PUNTER
C         ANOTHER CHANCE TO DEFINE THE FILE BY IGNORING THE
DEFAULT
C      INFORMATION WHICH PROBABLY AROSE FROM A NOT-VERY-CLEVER
BAT FILE
C
       WRITE (ITOUT,8042) AFILE, N
 8042  FORMAT (//, ' **** - NON-FATAL ERROR - **** DEFAULT
FILE ', A96,
```

```
     1 /, 8X, 'ON CHANNEL', I3, ' DOES NOT EXIST AND IS
IGNORED')
      CALL PAUSES
      JFKIN = -1
      AFILE = '     '
      MIKE  = 0
      MURRAY = 0
      GO TO 50
C
                        END IF
C
                                        END IF
C
C     ... AN EXISTING OUTPUT FILE WHICH MAY BE OVERWRITTEN BY
C         CHANGING ITS STATUS (NON-FATAL).
C
      IF (KREX .AND. MUSE.NE.1) ASTAT = 'OLD     '
C
C     OK - OPEN DIRECTLY.
C
      GO TO 200
C
C
C                       NO PRE-DEFINED NAME; IF ...
C
C
   45 IF (.NOT.SCRAT) GO TO 50
C
C     ... THIS IS A SCRATCH FILE OR WE ARE WORKING UNDER MOOD
< 0.
C     SET STANDARD DEFAULT FILE NAMES.  FOR MICROS NOTE THAT
C     THE DRIVE LETTER HAS BEEN SUPPRESSED IN ORDER TO USE
```

```
C     THE DEFAULT DRIVE. THIS FITS BETTER THE XT OR AT
C
      IF (N.LE.9) WRITE (AFILE,1046) N
 1046 FORMAT (9X, I1)
      IF (N.GT.9) WRITE (AFILE,1047) N
 1047 FORMAT (9X, I2)
      AFILE(1:9) = '$SATURN.$'
CAMD      AFILE(1:9) = 'SCRATCH F'
C
C     IF THIS A SCRATCH FILE WE JUST USE THE DEFAULT NAME SET
C     ABOVE AND OPEN DIRECTLY ...
C
      IF (SCRAT) GO TO 250
C
C        MOOD NEGATIVE: THE FILE NAME WAS NOT DEFINED IN
LOOK.ERE;
C     SO WE MUST CREATE THE NAME FROM THE LIKE VALUE
C     (AND BECAUSE WE ARE NOT ALLOWED TO ASK THE USER WE MUST
C      HAVE LIKE, OR ITS ALIAS MIKE, NEGATIVE).  IF LIKE WAS
0
C     LIFE IS IMPOSSIBLE. IF NOT CARRY ON AS BELOW AND WE
C     WILL EVENTUALLY DO THE FILE CHECKS AT  130/150
C
      IF (MIKE.NE.0) GO TO 49
C
C     OR IS LIFE IMPOSSIBLE? IF MODET IS INTERACTIVE
C     PRETEND WE ARE IN MOOD 1 - INTERACTIVE FILE DEFINITION.
C     NOOD = 2 MEANS WRITE A MESSAGE BELOW.
C
      IF (MODET.EQ.0) THEN
      IF (ESSENTIAL) THEN
      IF (MODET.GE.0) WRITE (LP,9042)    N, AFILE
```

```
      IF (MODET.NE.0) WRITE (ITOUT,9042) N, AFILE
      CALL BOOB3 (N, 0, 9013, 42)
                     ELSE
      GO TO 995
                     END IF
                      END IF
      NOOD = 2
C
   49 MIKE = -MURRAY
C
C
C
C                  INTERACTIVE NAMING OF FILES
C
C            USE KDFILE AND/OR N TO DEFINE A FILE TYPE
C            AND MUSE TO DISTINGUISH INPUT/OUTPUT FILES
C
   50 FTYPE = 'KR      '
      IF (N.EQ.6)        FTYPE = 'LP      '
      IF (N.EQ.7)        FTYPE = 'ASCII   '
      IF (KDFILE.EQ.1)   FTYPE = 'MATRIX '
      IF (KDFILE.EQ.8 .OR. KDFILE.EQ.9)
     1                   FTYPE = 'SCRATCH'
      IF (KDFILE.EQ.19) FTYPE = 'DIRCK A'
      IF (KDFILE.EQ.20) FTYPE = 'SATURN '
      IF (KDFILE.EQ.29) FTYPE = 'DA PIJA'
      IF (KDFILE.EQ.30) FTYPE = 'PIJA    '
      ONPUT = 'INPUT '
      IF (MUSE.NE.1) ONPUT = 'OUTPUT'
C
      IF (NOOD.EQ.2) WRITE (ITOUT,1049) ONPUT, FTYPE, MT
 1049 FORMAT (/, ' NO BATCH NAME SET FOR THE ', A6, 1X, A7,
```

```
     1   ' FILE ON CHANNEL', I3, /,
     2   ' PLEASE SET IT INTERACTIVELY', /)
C
C      NZEXT IS THE NUMBER OF "VALID", I.E., NOT ?, CHARACTERS
IN
C      ZEXT.
C
       NZEXT = 3
       IF (ZEXT(3:3).EQ.QM) NZEXT = 2
       IF (ZEXT(2:2).EQ.QM) NZEXT = 1
       IF (ZEXT(1:1).EQ.QM) NZEXT = 0
       IF (ZEXT(1:3).EQ.'    ') NZEXT = 0
C
C      DEFINE WHETHER OR NOT A DEFAULT EXTENSION EXISTS - NOTE
C      SPECIAL CASE OF UF? WHERE THE DEFAULT BECOMES UFS.
C
       QDEF = .FALSE.
       IF (NZEXT.LT.3) GO TO 52
       DEFEXT = ZEXT(1:3)
       GO TO 54
    52 IF (ZEXT2(1:3).NE.'UF?') GO TO 55
       DEFEXT = 'UFS'
CLCASE      DEFEXT = 'ufs'
    54 QDEF = .TRUE.
C
    55 IF (MIKE.EQ.0) GO TO 101
C
C         NON ZERO MIKE IMPLIES A RELEVANT NAME IS SET IN
FILNAM(MURRAY)
C      - TRANSFER INTO AFILE
C
       AFILE = FILNAM(MURRAY)
```

```
C
      IF (MURRAY.EQ.N) GO TO 90
C
C     BUILD UP FILE NAME FROM THAT ON CHANNEL MURRAY
C     BUT WITH AN EXTENSION AS PRE-SET IN ZEXT.
C
      IF (JFK(MURRAY).NE.-1) GO TO 80
C
C     PREVIOUS FILE ON CHANNEL MURRAY NOT OPENED AND NO
C      NAME HAS BEEN SET - POSSIBLE FATAL ERROR IF LIKE<0;
OTHERWISE
C      JUST IGNORE THE POSSIBLE DEFAULT BY SETTING MIKE TO
ZERO.
C
      IF (MIKE.LT.0) THEN
      IF (ESSENTIAL) THEN
      IF (MODET.GE.0) WRITE (LP,9042)    MURRAY, AFILE
      IF (MODET.NE.0) WRITE (ITOUT,9042) MURRAY, AFILE
      CALL BOOB3 (MURRAY, 0, 9014, 42)
                    ELSE
      GO TO 995
                    END IF
                     END IF
      MIKE = 0
      GO TO 101
C
C     WHERE DID THE OLD FILE EXTENSION START? POSITION J.
C     REPLACE THE OLD EXTENSION BY THE NON QUESTION MARK
C     CHARACTERS IN ZEXT.
C
   80 CALL CEXT (AFILE, AEXT, J, JZ)
      IF (J.LE.1) GO TO 85
```

```
      AFILE(J+1:J+3) = '    '
      IF (NZEXT.GT.0) AFILE(J+1:J+NZEXT) = ZEXT(1:NZEXT)
   85 FILNAM(N) = AFILE
C
C      NEGATIVE MIKE IMPLIES FILE NAME NOW SET AND CANNOT BE
USER
C      SET
C
   90 IF (MIKE.LT.0) GO TO 130
C
C
C                    ENTER FILE NAME INTERACTIVELY
C
C
  101 N101 = N101 + 1
      IF (N101.GT.100) CALL BOOB3 (N101, 0, 9113, 29)
C
CTOP#############################################################
C
C     PARALLEL CHANGES: E. O'CEARBHAILL
C
C     ############ BEGIN: PROCESS 0 ONLY ###################
C
      IF (myid .EQ. 0) THEN
C
CBOT#############################################################
C
      WRITE (ITOUT,1100) ONPUT, FTYPE, MT
      IF (QDEF) WRITE (ITOUT,1101) DEFEXT
      IF (MIKE.NE.0)  THEN
         WRITE (ITOUT,1102) FILNAM(N)
         AFDEF = FILNAM(N)
```

```
                        ELSE
          AFDEF = '     '
                        END IF
C
 1100 FORMAT (/, ' PLEASE ENTER A FILENAME FOR THE ', A6, 1X,
A7,
     1   ' FILE ON CHANNEL', I3, /)
 1101 FORMAT (5X, 'IF NO EXTENSION INCLUDED ASSUME: ', A3)
 1102 FORMAT (5X, 'PRESS RETURN TO ACCEPT THE DEFAULT FILE ',
A96)
C
      IF  (KDFILE.EQ.0  .AND.  MUSE.NE.3)  WRITE  (ITOUT,1103)
ONPUT
 1103 FORMAT (5X, 'TYPE TERM TO SUBSTITUTE TERMINAL ', A6)
C
      IF (LEVEL.EQ.1) WRITE (ITOUT,1104)
 1104 FORMAT (5X, 'TYPE QUIT TO CANCEL FILE OPENING')
C
CMIC4       IF (MUSE.EQ.1) WRITE (ITOUT,1105)
CMIC4 1105 FORMAT (5X, 'TYPE ? FOR DIRECTORY ENQUIRIES')
C
C     N.B. MAXIMUM CHARACTER LENGTH FROM TERMINAL IS 80
C
      AFILE = '     '
      CALL TREAD5 (AFILE(1:80), 80, 0, IRETX,
     1             '     ', 4, M, .FALSE.)
C
CTOP##########################################################
C
C     PARALLEL CHANGES: E. O'CEARBHAILL
C
      ENDIF
```

```
C
C     ############## END: PROCESS 0 ONLY ####################
C
      call                  MPI_BCAST(AFILE,                  80,
MPI_CHARACTER,0,MPI_COMM_WORLD,ierr)
C
C      MODIFY THE INPUTED LPT FILENAME SO THAT EACH PROCESS
HAS A UNIQUE
C     FILENAME.
C
CBOT#################################################################
C
  105 DEFALT = .FALSE.
C
C     REQUEST FOR DIRECTORY ENQUIRIES?
C
CMIC4       IF (AFILE(1:1).EQ.'?' .AND. MUSE.EQ.1) GO TO 148
C
C       WHAT TO DO WITH A NULL INPUT - 121 ALLOWS USE OF A
DEFAULT
C     APARENTLY OK ON THE SUN ...
C
      IF (AFILE(1:4).EQ.'    ') GO TO 121
C
C     ... BUT NOT OTHER MAIN FRAMES ...
C
      IF (MICRO.LE.0 .AND. AFILE(1:4).EQ.'    ') GO TO 101
C
C     ... BUT OK WITH PC'S (INCL SALFORD F77 PC)
C
      IF (MICRO.GT.0 .AND. AFILE(1:4).EQ.'    ') GO TO 121
C
```

```
C     CHECK FOR A COMMAND TO QUIT.
C
      IF   (AFILE(1:4).EQ.'QUIT'   .OR.   AFILE(1:4).EQ.'quit')
THEN
C
C     RE-SET ANY VALUES THAT MAY HAVE BEEN CHANGED UP TO NOW
C
      JFK(N)     = -1
      JFMUSE(N)  = 0
      IF (NEDIN.GT.0) MT = 0
      IRET = 1
      RETURN
                                                              END
IF
C
C     SUBSTITUTE TERMINAL?
C
      IF (KDFILE.NE.0 .OR. MUSE.EQ.3) GO TO 115
      IF (AFILE(1:4).NE.'TERM' .AND. AFILE(1:4).NE.'term') GO
TO 115
C
C      RE-DEFINE THIS DEVICE AS INPUT AND OUTPUT TERMINAL AS
REQUIRED
C      IN ADDITION IF THIS THE LINE PRINTER, N = 6, AND MODET
> 0
C     THEN SET IT NEGATIVE TO IMPLY THAT ONLY THE TERMINAL IS
USED
C     FOR OUTPUT.
C
      MT = ITIN
      IF (MUSE.NE.1) MT = ITOUT
      IF (N.EQ.6 .AND. MODET.GT.0) MODET = -MODET
```

```
      FILNAM(N) = FILNAM(15)
      GO TO 901
C
C        FIND THE EXTENSION OF AFILE AND CHECK WHETHER IT
MATCHES
C     THE STANDARD EXTENSIONS IMPLIED BY ZEXT.
C
  115 CALL CEXT (AFILE, AEXT, J, JZ)
      IF (J.GT.0) GO TO 117
C
C          NO EXTENSION FOUND IN AFILE ...
C
      IF (.NOT.QDEF) GO TO 116
C
C                  ....  SUBSTITUTE DEFEXT
C
      AFILE(JZ+1:JZ+1) = '.'
CAMD      AFILE(JZ+1:JZ+1) = ' '
      AFILE(JZ+2:JZ+4) = DEFEXT
      WRITE (ITOUT,1115) AFILE
 1115 FORMAT (/, 5X, 'FULL FILE NAME: ', A96)
      GO TO 130
C
  116 IF (MICRO.NE.-1) GO TO 130
CAMD      WRITE (ITOUT,1116)
CAMD 1116 FORMAT (//, ' THE AMDAHL MUST HAVE AN EXTENSION -
GIMME!')
CAMD      GO TO 101
C
C     FOUND AN EXTENSION - CHECK IF OK?
C
  117 IF (NZEXT.EQ.0) GO TO 130
```

```
      IF (AEXT(1:NZEXT) .EQ. ZEXT(1:NZEXT) .OR.
     1    AEXT(1:NZEXT) .EQ. ZEXT(4:3+NZEXT) )  GO TO 130
C
      WRITE (ITOUT,1117) AFILE, AEXT, ZEXT(1:3)
 1117 FORMAT (/, 5X, 'FILE ', A96, /, 5X, 'HAS EXTENSION ',
A3,
     1 ' WHEREAS THE STANDARD EXTENSION IS ', A3, /,
     2 5X, 'IS THIS OK? (Y/N; Default=Y)')
C
CTOP#########################################################
C
C     PARALLEL CHANGES: E. O'CEARBHAILL
C
      IF (myid .EQ. 0) THEN
      CALL TREAD5 (ANS, 1, 9220, IRETX, 'Y', 1, M, .TRUE.)
      ENDIF
C
      call     MPI_BCAST(ANS,     1,     MPI_CHARACTER,     0,
MPI_COMM_WORLD, ierr)
C
CBOT#########################################################
C
      IF (ANS(1:1).EQ.'N' .OR. ANS(1:1).EQ.'n') GO TO 101
      GO TO 130
C
C     NULL INPUT - USER WISHES TO USE THE DEFAULT NAME
C
  121 IF (MIKE.EQ.0) GO TO 101
      AFILE = FILNAM(N)
      DEFALT = .TRUE.
C
C
```

```
C             THE FILE NAME HAS NOW BEEN SET
C
CTOP#############################################################
#
C
C      PARALLEL CHANGES: E. O'CEARBHAILL
C
C       THE NUMBER 130 WAS PUT BEFORE THE CALL TO QFILE BELOW
BEFORE THE CHANGES.
C
 130   IF (NED .EQ. 6) THEN
          CALL CEXT(AFILE, AEXT, J, JZ)
          PRINT*, AFILE, AEXT, J, JZ
          AFILE = AFILE(1:JZ-4)//'.'//ACHAR(myid/10+48)//
     1          ACHAR(myid-(myid/10)*10+48)//'.'//AEXT(1:3)
C
C      IT IS ASSUMED THAT myid <= 99.
C
       ELSE IF (NED .EQ. 2) THEN
          CALL CEXT(AFILE, AEXT, J, JZ)
          PRINT*, AFILE, AEXT, J, JZ
          AFILE = AFILE(1:JZ-4)//'.'//ACHAR(myid/10+48)//
     1          ACHAR(myid-(myid/10)*10+48)//'.'//AEXT(1:3)
C
       ENDIF
C
CBOT#############################################################
C
C      CHECK FOR A "NEW" FILE WHICH ALREADY EXISTS OR AN "OLD"
FILE
C      WHICH DOES NOT OR A FILE WHICH IS ALREADY OPEN.
C
```

```
C
      CALL QFILE (AFILE, KREX, FOPEN)
C
      IF (FOPEN) THEN
      WRITE (ITOUT,1131) AFILE
 1131 FORMAT (5X, 'FILE ', A96, /, 5X, 'ALREADY IN USE BY
THIS PROGRAM;
     1 PICK AGAIN')
      GO TO 138
                  END IF
C
      IF (KREX .OR. MUSE.NE.1) GO TO 150
C
C     "OLD" INPUT FILE DOES NOT EXIST:
C
      WRITE (ITOUT,1137) AFILE
 1137 FORMAT (/, 5X, 'INPUT FILE ', A96, /, 5X, 'NOT FOUND')
C
C     USEFUL TO PUT MESSAGE TO THE LP FILE?
C
      IF (LP.GT.0 .AND. LIKE.LT.0) WRITE (LP,1137) AFILE
C
C      HOW WAS THE NAME SET? IF MIKE = 0 THEN BY THE USER SO
GIVE
C     GIVE HIM ANOTHER GO; ELSE IF ...
C
  138 IF (MIKE) 140, 147, 145
C
C       ..   THE FILE NAME WAS SET AS MANDATORY BUT WE ARE
NAMING
C     FILES INTERACTIVELY GIVE THE PUNTER A SECOND GO, OR ...
C
```

```
  140 IF (NOOD.LE.0) THEN
      IF (ESSENTIAL) THEN
      IF (MODET.GE.0) WRITE (LP,9042)    N, AFILE
      IF (MODET.NE.0) WRITE (ITOUT,9042) N, AFILE
      CALL BOOB3 (N, 0, 9015, 42)
                      ELSE
      GO TO 995
                      END IF
                      END IF
      MIKE = 0
      GO TO 147
C
C     ... THE MISSING FILE WAS FORMED FROM ANOTHER FILE NAME;
C       IF IT WERE ONLY A DEFAULT FILE NAME BUILT UP BY THE
PROGRAM,
C     CANCEL THIS OPTION BY SETTING MIKE TO 0.
C
  145 IF (DEFALT) MIKE = 0
C
C       SECOND GO - IN SOME SYSTEMS WHICH ALLOW A DIRECTORY
SEARCH
C     WITH PAUSES ALLOW THE CHANCE TO DO SO.
C
  147 IF (MICRO.EQ.-3 .OR. MICRO.EQ.2 .OR. MICRO.EQ.3)
     1  PAUSE  '  Why  not  look  in  your  directory  before
<return>?'
CMIC4       CALL PAUSES
CMIC4  148 CALL DISDIR (ZEXT, IWANT, DFILE)
CMIC4       IF (IWANT.GT.0) THEN
CMIC4           AFILE = '     '
CMIC4           AFILE(1:16) = DFILE
CMIC4           GO TO 105
```

```
CMIC4                       END IF
      GO TO 101
C
C
C     "NEW" FILE ALREADY EXISTS - OK TO OVERWRITE?
C     N.B. THIS CHECK IS NOT REQUIRED UNDER SYSTEMS SUCH
C     AS THE VAX (MICRO = -3) WHICH AUTOMATICALLY INCLUDE A
C     GENERATION NUMBER. ALSO NOT INCLUDED IF GO4IT HAS BEEN
SET T
C
  150 IF (.NOT.KREX .OR. MUSE.EQ.1) GO TO 200
      IF (MIKE.LT.0 .OR. MICRO.EQ.-3) GO TO 155
C
      IF (GO4IT) THEN
C
CTOP##########################################################
C
C     PARALLEL CHANGES: E. O'CEARBHAILL
C
         IF (myid .EQ. 0) THEN
C
            WRITE (ITOUT,2150) AFILE
 2150       FORMAT (5X, 'OUTPUT FILE ', A96, /,
     1              5X, 'ALREADY EXISTS BUT WILL BE OVER-
WRITTEN')
            CALL PAUSES
         ENDIF
C
      ELSE
C
         IF (myid .EQ. 0) THEN
C
```

```
            WRITE (ITOUT,1150) AFILE
 1150       FORMAT (5X, 'OUTPUT FILE ', A96, /, 5X,
     1     'ALREADY EXISTS; DO YOU WISH TO OVER-WRITE? (Y/N;
Default=Y)')
C
C     FURTHER OPTION - APPEND, SALFORD EXTENSION
C
            IF (APPENDABLE) THEN
               WRITE (ITOUT,1151)
 1151            FORMAT (5X, 'TYPE A TO APPEND NEW OUTPUT TO
THIS FILE')
            END IF
C
            CALL TREAD5 (ANS, 1, 9240, IRETX, 'Y', 1, M,
.TRUE.)
C
            IF (ANS(1:1).EQ.'N' .OR. ANS(1:1).EQ.'n') GO TO
101
            IF      (APPENDABLE.AND.(ANS(1:1).EQ.'A'      .OR.
ANS(1:1).EQ.'a'))
     1           THEN
               ASTAT = 'APPEND '
               GO TO 200
            END IF
C
         ENDIF
       ENDIF
       call                  MPI_BCAST(ANS,                  1,
MPI_CHARACTER,0,MPI_COMM_WORLD,ierr)
C
C
CBOT#############################################################
```

```
C
C     OK - CHANGE STATUS TO OLD
C
  155 ASTAT = 'OLD     '
C
C
C
C                AT LAST OPEN THE FILE: EITHER ...
C
C
C
  200 IF (SCRAT) GO TO 250
C
C     .... A NON-SCRATCH FILE OR ...
C
      IF (AFILE(1:4).EQ.'    ') GO TO 890
C
C       ALLOW FOR CASE CONVERSION
C
CLCASE      CALL ULCASE (AFILE, 96, 0)
C
C           ON THE AMDAHL WE NEED A "DDNAME" INSTEAD OF THE
FILE NAME
C
CAMD      NFDS = NFDS + 1
CAMD      IF (NFDS.GE.10) WRITE (DDNAME,1210) NFDS
CAMD 1210 FORMAT ('F', I2)
CAMD      IF (NFDS.LT.10) WRITE (DDNAME,1211) NFDS
CAMD 1211 FORMAT ('F', I1)
CAMD       CALL CMSCMD ('FI '//DDNAME//' DISK '//AFILE//FCS,
IRETA)
```

```
CAMD        OPEN (MT, FORM = AFORM, FILE = DDNAME, STATUS =
ASTAT)
CAMD       IF (NOOD.NE.-99) GO TO 900
C
       IF (DIRECT) THEN
       OPEN (MT, FORM = AFORM, FILE = AFILE, STATUS = ASTAT,
      1       ACCESS='DIRECT', RECL = 80, IOSTAT=IERR)
       JFMUSE(N) = -JFMUSE(N)
       LENGTH(N) = 0
                   ELSE
       OPEN (MT, FORM = AFORM, FILE = AFILE, STATUS = ASTAT,
      1            IOSTAT=IERR)
                   END IF
C
       GO TO 890
C
C                        ... A SCRATCH FILE
C
  250 CONTINUE
C
CAMD       NFDS = NFDS + 1
CAMD       IF (NFDS.GE.10) WRITE (DDNAME,1210) NFDS
CAMD       IF (NFDS.LT.10) WRITE (DDNAME,1211) NFDS
CAMD        CALL CMSCMD ('FI '//DDNAME//' DISK '//AFILE//FCS,
IRETA)
C
       ASTAT = 'SCRATCH'
       IF (DIRECT) THEN
       OPEN (MT, FORM = AFORM, STATUS = ASTAT,
      1       ACCESS='DIRECT', RECL = 80, IOSTAT=IERR)
       JFMUSE(N) = -JFMUSE(N)
       LENGTH(N) = 0
```

```
                ELSE
      OPEN (MT, FORM = AFORM, STATUS = ASTAT, IOSTAT=IERR)
                END IF
C
C     CHECK THE ERROR STATUS AFTER OPENING
C
  890 IF (IERR.GT.0) THEN
C
C     LOOKS BAD! ...
C
      WRITE (LP,1205) N, AFILE, IERR, ASTAT
 1205 FORMAT (//, 5X, 'A SPOT OF FILE OPENING STRIFE:', //,
     1    5X, 'CHANNEL ', I3, '  FILENAME:', 2X, A96, /,
     2    5X, 'OPENING FILE PRODUCES IOSTAT = ', I10, /,
     3    5X, 'STATUS = ', A7)
CMIC4       WRITE (LP,1206)
CMIC4 1206 FORMAT (//, 5X,
CMIC4       1 'TRY CHECKING YOUR AUTOEXEC.BAT AND CONFIG.SYS
FILES;',
CMIC4      2 /, 5X,
CMIC4       3 'AND MAKE SURE THAT BUFFERS = A LARGE NUMBER IN
CONFIG.SYS')
C
C     MAYBE STATUS = NEW IS A PROBLEM
C
      IF (MUSE.GT.1 .AND. ASTAT.EQ.'NEW    ') THEN
      WRITE (LP,1207)
 1207 FORMAT (//, 5X, 'TRY CHANGING THE STATUS TO UNKNOWN')
      ASTAT = 'UNKNOWN'
      GO TO 200
                                                END IF
      IF (ESSENTIAL) THEN
```

```
C
C      ... EVEN FATAL
C
       CALL BOOB3 (N, IERR, 9016, 43)
                       ELSE
C
C      ... HOPE TO SURVIVE
C
       CALL BOOB3 (N, IERR, 9016, 243)
       GO TO 995
                       END IF
C
                       END IF
C
C                                  OK - EXIT
C
CAMD   900 FILNAM(N) = AFILE
       FILNAM(N) = AFILE
C
C          RE-SET ZEXT IN CASE IT WAS CHANGED.
C
  901  ZEXT = ZEXT2
C
       RETURN
C
C        FAILED TO OPEN AND DON'T CARE - RETURN WITH CHANNEL
CLOSED
C
  995  MT         = 0
       JFK(N)     = -1
       JFMUSE(N)  = 0
       JFHEAD(N)  = 0
```

```
      LENGTH(N) = 0
      LSTATE(N) = 0
      KODE(N)   = -1
      FILNAM(N) = '     '
      IRET      = 2
      RETURN
C
C     END OF SEGMENT SESAME_FULL
C
      END
C
C
```

Appendix 6

Model hardware

6.1 IBM RS/6000 F50 - 4 Processor SMP System

6.1.1 Overview of the Workstation

Make IBM

Model RS/6000 F50

Operating System UNIX (AIX 4.3.3)

Number of Processors 4

Interconnection Symmetric Multi-Processing (SMP) ("shared memory")

6.1.2 Processors

Architecture PowerPC-604

Clock Speed 166 MHz

Peak Performance 332 MFLOPS

L1 Inst Cache Size in KB: 32

L1 Data Cache Size in KB: 32

L1 Data Cache Line Sz (B): 32

L2 Cache Size in KB: 256

L2 Cache Associativity : 1

6.2 Centre for Supercomputimg in Ireland (CSI) IBM RS/6000 SP System Details

6.2.1 Hardware Specifications

- The CSI IBM RS/6000 SP consists of 48 single processor IBM SP2 node.

- Each node contains a single Power2SC processor running at 160MHz and runs its own copy of the AIX V4.3.3 operating system.
- 16 nodes contain 1 GB memory, 10 contain 0.5GB and 22 contain 0.25GB.
- The total peak performance of this system is 30GFlops.

6.2.2 Memory Configuration

The memory configuration of each node is as follows:

- node 01 -> node 16 : 1 GB memory
- node 17 -> node 26 : 512MB memory
- node 27 -> node 48 : 256MB memory

6.2.3 Interconnect

The nodes are connected together via the High Performance Switch Omega Network as well as via a simple ethernet connection. Parallel codes which use message passing should use the High Performance Switch for communication.

The following tables describe relevant hardware characteristics:

Clock Speed	160MHz
FP Results/Clock	4
Peak Performance	640 MFlops
L1 Instruction Cache	32 K
L1 Data Cache	128K

Appendix 7

Results from 1997 congestion charging tests

7.1 List of tests

See table 1 for a cross-reference list of the tests carried out on the 1997 Base Year model produced by the DTO. In addition to these tests the following results files were produced for the base case and for a test case:

- A97s182: Output from the base year trip matrix and network file for 1997, obtained from the DTO; and,
- A97h-by0: Test case applying a charge of 3000secs and an elasticity of –0.1 to the trip matrix but not to the network file to assess the effect, or lack of an effect on the model.

Table 1: Details of the names of the test result files in this Appendix with reference to the road user charge and elasticity used.

	No Charge	Ch = 3000 secs	Ch = 4500 secs	Ch = 6000 secs
No elasticity	A00h-by0			
El. = -0.1		A97ic0	A97ic4	A97ic8
El. = -0.3		A97ic1	A97ic5	A97ic9
El. = -0.5		A97ic2	A97ic6	A97ic10
El. = -0.7		A97ic3	A97ic7	A97ic11

7.2 SATURN SIMULATION SUMMARY RESULTS (a97s182)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 6115.7 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 23117.7 PCU. HRS./HR.

(ON LINKS = 22591.6 ON CENTROIDS = 526.1)

LINK CRUISE TIME = 16332.3 PCU. HRS./HR.

(FREE FLOW = 16330.3 DELAYS = 2.0)

TOTAL TRAVEL TIME = 45565.7 PCU. HRS./HR.

TRAVEL DISTANCE = 834343.9 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 18.3 KPH

7.2.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 3201.5 PCU. HRS.

OVER-CAPACITY QUEUES = 18039.6 PCU. HRS./HR.

(ON LINKS = 17547.1 ON CENTROIDS = 492.4)

LINK CRUISE TIME = 7362.5 PCU. HRS./HR.

(FREE FLOW = 7361.7 DELAYS = .9)

TOTAL TRAVEL TIME = 28603.6 PCU. HRS./HR.

TRAVEL DISTANCE = 380832.5 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 13.3 KPH

7.2.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	6115.7	3201.5	9317.1	PCU. HRS.
OVER-CAPACITY QUEUES =	23117.7	18039.6	41157.3	PCU. HRS.
(ON LINKS =	22591.6	17547.1	40138.7	
ON CENTROIDS =	526.1	492.4	1018.6)	
LINK CRUISE TIME =	16332.3	7362.5	23694.8	PCU. HRS.
(FREE FLOW =	16330.3	7361.7	23691.9	
DELAYS =	2.0	.9	2.9)	
TOTAL TRAVEL TIME =	45565.7	28603.6	74169.2	PCU. HRS.
TRAVEL DISTANCE =	834343.9	380832.5	1215176.4	PCU. KMS.
OVERALL AVERAGE SPEED =	18.3	13.3	16.4	KPH
FUEL CONSUMPTION =	110197.0	59791.4	169988.4	LITRES

7.2.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	6115.7	3201.5	9317.1	PCU. HRS.
(B) =	36.7	2.0	38.7	
(T) =	6152.4	3203.5	9355.8	
OVER-CAPACITY QUEUES =	23117.7	18039.6	41157.3	PCU. HRS.
(B) =	7214.6	6921.2	14135.8	
(T) =	30332.3	24960.8	55293.1	
LINK CRUISE TIME (S) =	16332.3	7362.5	23694.8	PCU. HRS.
(B) =	8822.1	8822.1		
(BCC) =	13634.6	13634.6		
(T) =	38789.0	7362.5	46151.6	
TOTAL TRAVEL TIME (S) =	45565.7	28603.6	74169.2	PCU. HRS.
(B) =	16073.4	6923.2	22996.6	
(BCC) =	13634.6	13634.6		
(T) =	75273.7	35526.8	110800.5	
TRAVEL DISTANCE (S) =	834343.9	380832.5	1215176.4	PCU. KMS.

	(B) =	665970.5	665970.5	
	(BCC) =	217256.8	217256.8	
	(T) =	1717571.2	380832.5	2098403.8
AVERAGE SPEED	(S) =	18.3	13.3	16.4 KPH
	(B) =	29.0	29.0	
	(BCC) =	15.9	15.9	
	(T) =	22.8	10.7	18.9

7.2.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 932769.2

TOTAL NUMBER OF SECOND STOPS/HOUR = 357710.4

TOTAL NUMBER OF STOPS/HOUR = 1290479.5

RATE OF FUEL CONSUMPTION = 110197.0 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 110197.0 LITRES

7.3 SATURN SIMULATION SUMMARY RESULTS (a97h-by0)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 5748.6 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 15513.8 PCU. HRS./HR.

(ON LINKS = 15281.4 ON CENTROIDS = 232.4)

LINK CRUISE TIME = 15441.4 PCU. HRS./HR.

(FREE FLOW = 15434.2 DELAYS = 7.1)

TOTAL TRAVEL TIME = 36703.8 PCU. HRS./HR.

TRAVEL DISTANCE = 784556.8 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 21.4 KPH

7.3.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 2870.6 PCU. HRS.

OVER-CAPACITY QUEUES = 10589.1 PCU. HRS./HR.

(ON LINKS = 10370.9 ON CENTROIDS = 218.2)

LINK CRUISE TIME = 6080.1 PCU. HRS./HR.

(FREE FLOW = 6075.9 DELAYS = 4.2)

TOTAL TRAVEL TIME = 19539.8 PCU. HRS./HR.

TRAVEL DISTANCE = 298846.3 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 15.3 KPH

7.3.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	5748.6	2870.6	8619.2	PCU. HRS.
OVER-CAPACITY QUEUES =	15513.8	10589.1	26102.9	PCU. HRS.
(ON LINKS =	15281.4	10370.9	25652.3	
ON CENTROIDS =	232.4	218.2	450.5)	
LINK CRUISE TIME =	15441.4	6080.1	21521.5	PCU. HRS.
(FREE FLOW =	15434.2	6075.9	21510.2	
DELAYS =	7.1	4.2	11.3)	
TOTAL TRAVEL TIME =	36703.8	19539.8	56243.6	PCU. HRS.
TRAVEL DISTANCE =	784556.8	298846.3	1083403.1	PCU. KMS.
OVERALL AVERAGE SPEED =	21.4	15.3	19.3	KPH
FUEL CONSUMPTION =	95705.8	43911.8	139617.5	LITRES

7.3.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	5748.6	2870.6	8619.2	PCU. HRS.
(B) =	50.4	2.4	52.9	
(T) =	5799.1	2873.0	8672.1	
OVER-CAPACITY QUEUES =	15513.8	10589.1	26102.9	PCU. HRS.
(B) =	2643.6	1526.9	4170.5	
(T) =	18157.4	12116.0	30273.4	
LINK CRUISE TIME (S) =	15441.4	6080.1	21521.5	PCU. HRS.
(B) =	5883.8	5883.8		
(BCC) =	8260.9	8260.9		
(T) =	29586.1	6080.1	35666.2	
TOTAL TRAVEL TIME (S) =	36703.8	19539.8	56243.6	PCU. HRS.
(B) =	8577.8	1529.4	10107.2	
(BCC) =	8260.9	8260.9		
(T) =	53542.5	21069.2	74611.7	
TRAVEL DISTANCE (S) =	784556.8	298846.3	1083403.1	PCU. KMS.

(B) =	444636.1		444636.1	
(BCC) =	122804.4		122804.4	
(T) =	1351997.2	298846.3	1650843.5	
AVERAGE SPEED (S) =	21.4	15.3	19.3	KPH
(B) =	44.0		44.0	
(BCC) =	14.9		14.9	
(T) =	25.3	14.2	22.1	

7.3.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 853276.8

TOTAL NUMBER OF SECOND STOPS/HOUR = 323890.9

TOTAL NUMBER OF STOPS/HOUR = 1177167.6

RATE OF FUEL CONSUMPTION = 95705.8 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 95705.8 LITRES

7.4 SATURN SIMULATION SUMMARY RESULTS (a97ic0)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 5337.0 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 16057.3 PCU. HRS./HR.

(ON LINKS = 15873.4 ON CENTROIDS = 183.9)

LINK CRUISE TIME = 15139.7 PCU. HRS./HR.

(FREE FLOW = 15129.0 DELAYS = 10.7)

TOTAL TRAVEL TIME = 36534.0 PCU. HRS./HR.

TRAVEL DISTANCE = 779304.9 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 21.3 KPH

7.4.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 2586.7 PCU. HRS.

OVER-CAPACITY QUEUES = 12486.4 PCU. HRS./HR.

(ON LINKS = 12289.8 ON CENTROIDS = 196.6)

LINK CRUISE TIME = 6877.1 PCU. HRS./HR.

(FREE FLOW = 6866.9 DELAYS = 10.2)

TOTAL TRAVEL TIME = 21950.2 PCU. HRS./HR.

TRAVEL DISTANCE = 375679.4 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 17.1 KPH

7.4.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	5337.0	2586.7	7923.7	PCU. HRS.
OVER-CAPACITY QUEUES =	16057.3	12486.4	28543.6	PCU. HRS.
(ON LINKS =	15873.4	12289.8	28163.2	
ON CENTROIDS =	183.9	196.6	380.5)	
LINK CRUISE TIME =	15139.7	6877.1	22016.8	PCU. HRS.
(FREE FLOW =	15129.0	6866.9	21995.8	
DELAYS =	10.7	10.2	21.0)	
TOTAL TRAVEL TIME =	36534.0	21950.2	58484.2	PCU. HRS.
TRAVEL DISTANCE =	779304.9	375679.4	1154984.2	PCU. KMS.
OVERALL AVERAGE SPEED =	21.3	17.1	19.7	KPH
FUEL CONSUMPTION =	94056.8	50334.3	144391.1	LITRES

7.4.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	5337.0	2586.7	7923.7	PCU. HRS.
(B) =	49.8	1.3	51.1	
(T) =	5386.8	2588.1	7974.9	
OVER-CAPACITY QUEUES =	16057.3	12486.4	28543.6	PCU. HRS.
(B) =	2742.5	1521.1	4263.6	
(T) =	18799.8	14007.4	32807.2	
LINK CRUISE TIME (S) =	15139.7	6877.1	22016.8	PCU. HRS.
(B) =	5971.2	5971.2		
(BCC) =	8260.5	8260.5		
(T) =	29371.4	6877.1	36248.5	
TOTAL TRAVEL TIME (S) =	36534.0	21950.2	58484.2	PCU. HRS.
(B) =	8763.5	1522.4	10285.9	
(BCC) =	8260.5	8260.5		
(T) =	53558.0	23472.6	77030.6	
TRAVEL DISTANCE (S) =	779304.9	375679.4	1154984.2	PCU. KMS.
(B) =	449942.3	449942.3		

(BCC) =	122792.5		122792.5	
(T) =	1352039.8	375679.4	1727719.2	
AVERAGE SPEED (S) =	21.3	17.1	19.7	KPH
(B) =	43.7		43.7	
(BCC) =	14.9		14.9	
(T) =	25.2	16.0	22.4	

7.4.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 776035.2

TOTAL NUMBER OF SECOND STOPS/HOUR = 283139.8

TOTAL NUMBER OF STOPS/HOUR = 1059175.0

RATE OF FUEL CONSUMPTION = 94056.8 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 94056.8 LITRES

7.5 SATURN SIMULATION SUMMARY RESULTS (a97ic1)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 5141.7 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 13661.7 PCU. HRS./HR.

(ON LINKS = 13522.8 ON CENTROIDS = 139.0)

LINK CRUISE TIME = 14712.1 PCU. HRS./HR.

(FREE FLOW = 14701.5 DELAYS = 10.6)

TOTAL TRAVEL TIME = 33515.5 PCU. HRS./HR.

TRAVEL DISTANCE = 758996.7 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 22.6 KPH

7.5.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETINGTHEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 2124.7 PCU. HRS.

OVER-CAPACITY QUEUES = 10104.8 PCU. HRS./HR.

(ON LINKS = 9983.8 ON CENTROIDS = 121.1)

LINK CRUISE TIME = 5893.7 PCU. HRS./HR.

(FREE FLOW = 5884.2 DELAYS = 9.5)

TOTAL TRAVEL TIME = 18123.3 PCU. HRS./HR.

TRAVEL DISTANCE = 328122.2 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 18.1 KPH

7.5.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	5141.7	2124.7	7266.4	PCU. HRS.
OVER-CAPACITY QUEUES =	13661.7	10104.8	23766.6	PCU. HRS.
(ON LINKS =	13522.8	9983.8	23506.6	
ON CENTROIDS =	139.0	121.1	260.0)	
LINK CRUISE TIME =	14712.1	5893.7	20605.8	PCU. HRS.
(FREE FLOW =	14701.5	5884.2	20585.7	
DELAYS =	10.6	9.5	20.2)	
TOTAL TRAVEL TIME =	33515.5	18123.3	51638.8	PCU. HRS.
TRAVEL DISTANCE =	758996.7	328122.2	1087118.9	PCU. KMS.
OVERALL AVERAGE SPEED =	22.6	18.1	21.1	KPH
FUEL CONSUMPTION =	88792.3	42516.2	131308.5	LITRES

7.5.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC)ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	5141.7	2124.7	7266.4	PCU. HRS.
(B) =	45.7	.1	45.8	
(T) =	5187.4	2124.9	7312.2	
OVER-CAPACITY QUEUES =	13661.7	10104.8	23766.6	PCU. HRS.
(B) =	1833.0	762.9	2595.8	
(T) =	15494.7	10867.7	26362.4	
LINK CRUISE TIME (S) =	14712.1	5893.7	20605.8	PCU. HRS.
(B) =	5595.8	5595.8		
(BCC) =	7772.6	7772.6		
(T) =	28080.5	5893.7	33974.3	
TOTAL TRAVEL TIME (S) =	33515.5	18123.3	51638.8	PCU. HRS.
(B) =	7474.5	763.0	8237.5	
(BCC) =	7772.6	7772.6		
(T) =	48762.6	18886.3	67648.9	
TRAVEL DISTANCE (S) =	758996.7	328122.2	1087118.9	PCU. KMS.

	(B) =	421067.2	421067.2	
	(BCC) =	115290.7	115290.7	
	(T) =	1295354.6	328122.2	1623476.8
AVERAGE SPEED	(S) =	22.6	18.1	21.1 KPH
	(B) =	51.1	51.1	
	(BCC) =	14.8	14.8	
	(T) =	26.6	17.4	24.0

7.5.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 739453.9

TOTAL NUMBER OF SECOND STOPS/HOUR = 253438.2

TOTAL NUMBER OF STOPS/HOUR = 992892.1

RATE OF FUEL CONSUMPTION = 88792.3 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 88792.3 LITRES

7.6 SATURN SIMULATION SUMMARY RESULTS (a97ic2)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 4955.7 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 12537.0 PCU. HRS./HR.

(ON LINKS = 12425.7 ON CENTROIDS = 111.3)

LINK CRUISE TIME = 14318.7 PCU. HRS./HR.

(FREE FLOW = 14308.0 DELAYS = 10.7)

TOTAL TRAVEL TIME = 31811.5 PCU. HRS./HR.

TRAVEL DISTANCE = 741135.5 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 23.3 KPH

7.6.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 1882.5 PCU. HRS.

OVER-CAPACITY QUEUES = 9132.0 PCU. HRS./HR.

(ON LINKS = 9042.0 ON CENTROIDS = 90.0)

LINK CRUISE TIME = 5388.0 PCU. HRS./HR.

(FREE FLOW = 5378.9 DELAYS = 9.2)

TOTAL TRAVEL TIME = 16402.5 PCU. HRS./HR.

TRAVEL DISTANCE = 303874.2 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 18.5 KPH

7.6.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	4955.7	1882.5	6838.2	PCU. HRS.
OVER-CAPACITY QUEUES =	12537.0	9132.0	21669.0	PCU. HRS.
(ON LINKS =	12425.7	9042.0	21467.7	
ON CENTROIDS =	111.3	90.0	201.3)	
LINK CRUISE TIME =	14318.7	5388.0	19706.8	PCU. HRS.
(FREE FLOW =	14308.0	5378.9	19686.8	
DELAYS =	10.7	9.2	19.9)	
TOTAL TRAVEL TIME =	31811.5	16402.5	48214.0	PCU. HRS.
TRAVEL DISTANCE =	741135.5	303874.2	1045009.6	PCU. KMS.
OVERALL AVERAGE SPEED =	23.3	18.5	21.7	KPH
FUEL CONSUMPTION =	85290.6	38751.1	124041.6	LITRES

7.6.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	4955.7	1882.5	6838.2	PCU. HRS.
(B) =	40.5	.1	40.5	
(T) =	4996.1	1882.6	6878.7	
OVER-CAPACITY QUEUES =	12537.0	9132.0	21669.0	PCU. HRS.
(B) =	1420.1	451.7	1871.9	
(T) =	13957.2	9583.7	23540.9	
LINK CRUISE TIME (S) =	14318.7	5388.0	19706.8	PCU. HRS.
(B) =	5351.5		5351.5	
(BCC) =	7468.9		7468.9	
(T) =	27139.1	5388.0	32527.2	
TOTAL TRAVEL TIME (S) =	31811.5	16402.5	48214.0	PCU. HRS.
(B) =	6812.1	451.8	7263.9	
(BCC) =	7468.9		7468.9	
(T) =	46092.5	16854.4	62946.8	
TRAVEL DISTANCE (S) =	741135.5	303874.2	1045009.6	PCU. KMS.

(B) =	402839.3		402839.3	
(BCC) =	110674.5		110674.5	
(T) =	1254649.4	303874.2	1558523.5	
AVERAGE SPEED (S) =	23.3	18.5	21.7	KPH
(B) =	55.5		55.5	
(BCC) =	14.8		14.8	
(T) =	27.2	18.0	24.8	

7.6.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 701556.9

TOTAL NUMBER OF SECOND STOPS/HOUR = 238977.0

TOTAL NUMBER OF STOPS/HOUR = 940534.0

RATE OF FUEL CONSUMPTION = 85290.6 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 85290.6 LITRES

Appendix 8

Results from 2000 congestion charging tests

8.1 List of tests

See table 1 for a cross-reference list of the tests carried out on the 2000 Base Year model produced by the DTO. In addition to these tests the following results files were produced for the base case and for a test case:

- A00h-by0: Output from the base year trip matrix and network file for 2000, obtained from the DTO;
- A00ic4: Test case applying a charge of 3000secs and an elasticity of –0.5 to the trip matrix but not to the network file to assess the effect, or lack of an effect on the model; and,
- A00ic5: Test case applying a charge of 3000secs to the network file, i.e., defining the cordon around the network and the penalty for crossing it, but not applying the effects of the charge to the trip matrix.

Table 1: Details of the names of the test result files in this Appendix with reference to the road user charge and elasticity used.

	No Charge	Ch = 3000 secs	Ch = 4500 secs	Ch = 6000 secs
No elasticity	A00h-by0			
El. = -0.1		A00ic7	A00ic9	A00ic13
El. = -0.3		A00ic6	A00ic10	A00ic14
El. = -0.5		A00ic3	A00ic11	A00ic15
El. = -0.7		A00ic8	A00ic12	A00ic16

8.2 SATURN SIMULATION SUMMARY RESULTS (a00h-by0)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 6972.6 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 37547.8 PCU. HRS./HR.

(ON LINKS = 36551.8 ON CENTROIDS = 995.9)

LINK CRUISE TIME = 18856.1 PCU. HRS./HR.

(FREE FLOW = 18850.2 DELAYS = 6.0)

TOTAL TRAVEL TIME = 63376.5 PCU. HRS./HR.

TRAVEL DISTANCE = 972458.4 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 15.3 KPH

8.2.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 5287.4 PCU. HRS.

OVER-CAPACITY QUEUES = 38365.0 PCU. HRS./HR.

(ON LINKS = 37518.0 ON CENTROIDS = 847.0)

LINK CRUISE TIME = 12707.3 PCU. HRS./HR.

(FREE FLOW = 12702.7 DELAYS = 4.6)

TOTAL TRAVEL TIME = 56359.7 PCU. HRS./HR.

TRAVEL DISTANCE = 682150.8 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 12.1 KPH

8.2.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	6972.6	5287.4	12260.0	PCU. HRS.

OVER-CAPACITY QUEUES = 37547.8 38365.0 75912.8 PCU. HRS.
(ON LINKS = 36551.8 37518.0 74069.8
ON CENTROIDS = 995.9 847.0 1842.9)
LINK CRUISE TIME = 18856.1 12707.3 31563.4 PCU. HRS.
(FREE FLOW = 18850.2 12702.7 31552.9
DELAYS = 6.0 4.6 10.5)
TOTAL TRAVEL TIME = 63376.5 56359.7 119736.1 PCU. HRS.
TRAVEL DISTANCE = 972458.4 682150.8 1654609.2 PCU. KMS.
OVERALL AVERAGE SPEED = 15.3 12.1 13.8 KPH
FUEL CONSUMPTION = 141571.6 113247.4 254818.9 LITRES

8.2.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	6972.6	5287.4	12260.0	PCU. HRS.
(B) =	166.3	28.4	194.7	
(T) =	7138.9	5315.8	12454.7	
OVER-CAPACITY QUEUES =	37547.8	38365.0	75912.8	PCU. HRS.
(B) =	15003.6	16543.3	31547.0	
(T) =	52551.4	54908.3	107459.7	
LINK CRUISE TIME (S) =	18856.1	12707.3	31563.4	PCU. HRS.
(B) =	12251.2	12251.2		
(BCC) =	20471.3	20471.3		
(T) =	51578.6	12707.3	64285.9	
TOTAL TRAVEL TIME (S) =	63376.5	56359.7	119736.1	PCU. HRS.
(B) =	27421.1	16571.8	43992.9	
(BCC) =	20471.3	20471.3		
(T) =	111268.8	72931.4	184200.2	
TRAVEL DISTANCE (S) =	972458.4	682150.8	1654609.2	PCU. KMS.
(B) =	933499.2	933499.2		
(BCC) =	323603.6	323603.6		
(T) =	2229561.2	682150.8	2911712.0	
AVERAGE SPEED (S) =	15.3	12.1	13.8	KPH

(B) =	21.2		21.2
(BCC) =	15.8		15.8
(T) =	20.0	9.4	15.8

8.2.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 1098715.6

TOTAL NUMBER OF SECOND STOPS/HOUR = 499121.5

TOTAL NUMBER OF STOPS/HOUR = 1597837.1

RATE OF FUEL CONSUMPTION = 141571.6 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 141571.6 LITRES

8.3 SATURN SIMULATION SUMMARY RESULTS (a00ic3)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 6002.2 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 25975.1 PCU. HRS./HR.

(ON LINKS = 25185.7 ON CENTROIDS = 789.3)

LINK CRUISE TIME = 16985.7 PCU. HRS./HR.

(FREE FLOW = 16972.1 DELAYS = 13.6)

TOTAL TRAVEL TIME = 48963.0 PCU. HRS./HR.

TRAVEL DISTANCE = 871611.6 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 17.8 KPH

8.3.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4075.0 PCU. HRS.

OVER-CAPACITY QUEUES = 28859.4 PCU. HRS./HR.

(ON LINKS = 27838.0 ON CENTROIDS = 1021.4)

LINK CRUISE TIME = 11301.4 PCU. HRS./HR.

(FREE FLOW = 11279.6 DELAYS = 21.7)

TOTAL TRAVEL TIME = 44235.8 PCU. HRS./HR.

TRAVEL DISTANCE = 643444.9 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 14.5 KPH

8.3.2 ABSOLUTE TOTALS:

THIS PERIOD NEXT PERIOD TOTAL

TRANSIENT QUEUES = 6002.2 4075.0 10077.3 PCU. HRS.
OVER-CAPACITY QUEUES = 25975.1 28859.4 54834.5 PCU. HRS.
(ON LINKS = 25185.7 27838.0 53023.8
ON CENTROIDS = 789.3 1021.4 1810.7)
LINK CRUISE TIME = 16985.7 11301.4 28287.1 PCU. HRS.
(FREE FLOW = 16972.1 11279.6 28251.8
DELAYS = 13.6 21.7 35.3)
TOTAL TRAVEL TIME = 48963.0 44235.8 93198.8 PCU. HRS.
TRAVEL DISTANCE = 871611.6 643444.9 1515056.5 PCU. KMS.
OVERALL AVERAGE SPEED = 17.8 14.5 16.3 KPH
FUEL CONSUMPTION = 115911.8 94497.3 210409.0 LITRES

8.3.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	6002.2	4075.0	10077.3	PCU. HRS.
(B) =	92.1	11.5	103.6	
(T) =	6094.4	4086.5	10180.9	
OVER-CAPACITY QUEUES =	25975.1	28859.4	54834.5	PCU. HRS.
(B) =	5889.9	3294.3	9184.2	
(T) =	31865.0	32153.7	64018.7	
LINK CRUISE TIME (S) =	16985.7	11301.4	28287.1	PCU. HRS.
(B) =	7328.5	7328.5		
(BCC) =	11744.5	11744.5		
(T) =	36058.7	11301.4	47360.0	
TOTAL TRAVEL TIME (S) =	48963.0	44235.8	93198.8	PCU. HRS.
(B) =	13310.5	3305.8	16616.3	
(BCC) =	11744.5	11744.5		
(T) =	74018.0	47541.6	121559.6	
TRAVEL DISTANCE (S) =	871611.6	643444.9	1515056.5	PCU. KMS.
(B) =	559105.1	559105.1		
(BCC) =	172683.4	172683.4		
(T) =	1603400.0	643444.9	2246845.0	

AVERAGE SPEED	(S) =	17.8	14.5	16.3 KPH
	(B) =	33.6	33.6	
	(BCC) =	14.7	14.7	
	(T) =	21.7	13.5	18.5

8.3.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 899765.9

TOTAL NUMBER OF SECOND STOPS/HOUR = 425989.6

TOTAL NUMBER OF STOPS/HOUR = 1325755.5

RATE OF FUEL CONSUMPTION = 115911.8 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 115911.8 LITRES

8.4 SATURN SIMULATION SUMMARY RESULTS (a00ic4)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 6408.2 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 24880.3 PCU. HRS./HR.

(ON LINKS = 24011.3 ON CENTROIDS = 869.0)

LINK CRUISE TIME = 17373.1 PCU. HRS./HR.

(FREE FLOW = 17363.1 DELAYS = 10.0)

TOTAL TRAVEL TIME = 48661.6 PCU. HRS./HR.

TRAVEL DISTANCE = 888559.3 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 18.3 KPH

8.4.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4529.0 PCU. HRS.

OVER-CAPACITY QUEUES = 25424.5 PCU. HRS./HR.

(ON LINKS = 24220.6 ON CENTROIDS = 1204.0)

LINK CRUISE TIME = 10192.5 PCU. HRS./HR.

(FREE FLOW = 10181.3 DELAYS = 11.2)

TOTAL TRAVEL TIME = 40146.0 PCU. HRS./HR.

TRAVEL DISTANCE = 534048.3 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 13.3 KPH

8.4.2 ABSOLUTE TOTALS:

THIS PERIOD NEXT PERIOD TOTAL

TRANSIENT QUEUES = 6408.2 4529.0 10937.1 PCU. HRS.
OVER-CAPACITY QUEUES = 24880.3 25424.5 50304.9 PCU. HRS.
(ON LINKS = 24011.3 24220.6 48231.9
ON CENTROIDS = 869.0 1204.0 2073.0)
LINK CRUISE TIME = 17373.1 10192.5 27565.6 PCU. HRS.
(FREE FLOW = 17363.1 10181.3 27544.4
DELAYS = 10.0 11.2 21.2)
TOTAL TRAVEL TIME = 48661.6 40146.0 88807.7 PCU. HRS.
TRAVEL DISTANCE = 888559.3 534048.3 1422607.6 PCU. KMS.
OVERALL AVERAGE SPEED = 18.3 13.3 16.0 KPH
FUEL CONSUMPTION = 117543.5 84542.6 202086.1 LITRES

SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	6408.2	4529.0	10937.1	PCU. HRS.
(B) =	89.5	13.0	102.6	
(T) =	6497.7	4542.0	11039.7	
OVER-CAPACITY QUEUES =	24880.3	25424.5	50304.9	PCU. HRS.
(B) =	5566.0	3140.5	8706.4	
(T) =	30446.3	28565.0	59011.3	
LINK CRUISE TIME (S) =	17373.1	10192.5	27565.6	PCU. HRS.
(B) =	7338.1	7338.1		
(BCC) =	11740.5	11740.5		
(T) =	36451.7	10192.5	46644.3	
TOTAL TRAVEL TIME (S) =	48661.6	40146.0	88807.7	PCU. HRS.
(B) =	12993.6	3153.5	16147.1	
(BCC) =	11740.5	11740.5		
(T) =	73395.8	43299.5	116695.3	
TRAVEL DISTANCE (S) =	888559.3	534048.3	1422607.6	PCU. KMS.
(B) =	560381.8	560381.8		
(BCC) =	172620.0	172620.0		
(T) =	1621561.1	534048.3	2155609.5	

AVERAGE SPEED	(S) =	18.3	13.3	16.0 KPH
	(B) =	34.7	34.7	
	(BCC) =	14.7	14.7	
	(T) =	22.1	12.3	18.5

8.4.3 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 973434.0

TOTAL NUMBER OF SECOND STOPS/HOUR = 444630.4

TOTAL NUMBER OF STOPS/HOUR = 1418064.5

RATE OF FUEL CONSUMPTION = 117543.5 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 117543.5 LITRES

8.5 SATURN SIMULATION SUMMARY RESULTS (a00ic5)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 6653.2 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 38261.2 PCU. HRS./HR.

(ON LINKS = 37121.9 ON CENTROIDS = 1139.4)

LINK CRUISE TIME = 18559.3 PCU. HRS./HR.

(FREE FLOW = 18551.8 DELAYS = 7.6)

TOTAL TRAVEL TIME = 63473.8 PCU. HRS./HR.

TRAVEL DISTANCE = 964998.2 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 15.2 KPH

8.5.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 5046.2 PCU. HRS.

OVER-CAPACITY QUEUES = 43246.6 PCU. HRS./HR.

(ON LINKS = 42078.7 ON CENTROIDS = 1167.9)

LINK CRUISE TIME = 13365.6 PCU. HRS./HR.

(FREE FLOW = 13356.7 DELAYS = 8.9)

TOTAL TRAVEL TIME = 61658.4 PCU. HRS./HR.

TRAVEL DISTANCE = 750447.6 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 12.2 KPH

8.5.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL

TRANSIENT QUEUES = 6653.2 5046.2 11699.5 PCU. HRS.
OVER-CAPACITY QUEUES = 38261.2 43246.6 81507.8 PCU. HRS.
(ON LINKS = 37121.9 42078.7 79200.6
ON CENTROIDS = 1139.4 1167.9 2307.2)
LINK CRUISE TIME = 18559.3 13365.6 31924.9 PCU. HRS.
(FREE FLOW = 18551.8 13356.7 31908.4
DELAYS = 7.6 8.9 16.5)
TOTAL TRAVEL TIME = 63473.8 61658.4 125132.2 PCU. HRS.
TRAVEL DISTANCE = 964998.2 750447.6 1715445.9 PCU. KMS.
OVERALL AVERAGE SPEED = 15.2 12.2 13.7 KPH
FUEL CONSUMPTION = 140449.3 122601.4 263050.7 LITRES

8.5.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	6653.2	5046.2	11699.5	PCU. HRS.
(B) =	170.6	29.2	199.8	
(T) =	6823.9	5075.4	11899.3	
OVER-CAPACITY QUEUES =	38261.2	43246.6	81507.8	PCU. HRS.
(B) =	15194.4	16568.1	31762.5	
(T) =	53455.6	59814.7	113270.2	
LINK CRUISE TIME (S) =	18559.3	13365.6	31924.9	PCU. HRS.
(B) =	12253.0	12253.0		
(BCC) =	20474.1	20474.1		
(T) =	51286.4	13365.6	64652.0	
TOTAL TRAVEL TIME (S) =	63473.8	61658.4	125132.2	PCU. HRS.
(B) =	27618.0	16597.3	44215.3	
(BCC) =	20474.1	20474.1		
(T) =	111565.9	78255.7	189821.6	
TRAVEL DISTANCE (S) =	964998.2	750447.6	1715445.9	PCU. KMS.
(B) =	931331.5	931331.5		
(BCC) =	323625.1	323625.1		
(T) =	2219955.0	750447.6	2970402.5	

AVERAGE SPEED	(S) =	15.2	12.2	13.7 KPH
	(B) =	21.1	21.1	
	(BCC) =	15.8	15.8	
	(T) =	19.9	9.6	15.6

8.5.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 1032108.3

TOTAL NUMBER OF SECOND STOPS/HOUR = 497671.3

TOTAL NUMBER OF STOPS/HOUR = 1529779.6

RATE OF FUEL CONSUMPTION = 140449.3 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 140449.3 LITRES

8.6 SATURN SIMULATION SUMMARY RESULTS (a00ic6)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 6475.9 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 26407.4 PCU. HRS./HR.

(ON LINKS = 25475.9 ON CENTROIDS = 931.4)

LINK CRUISE TIME = 17569.7 PCU. HRS./HR.

(FREE FLOW = 17559.8 DELAYS = 9.8)

TOTAL TRAVEL TIME = 50453.0 PCU. HRS./HR.

TRAVEL DISTANCE = 898838.0 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 17.8 KPH

8.6.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4845.7 PCU. HRS.

OVER-CAPACITY QUEUES = 27480.5 PCU. HRS./HR.

(ON LINKS = 26177.4 ON CENTROIDS = 1303.1)

LINK CRUISE TIME = 10830.1 PCU. HRS./HR.

(FREE FLOW = 10818.6 DELAYS = 11.5)

TOTAL TRAVEL TIME = 43156.3 PCU. HRS./HR.

TRAVEL DISTANCE = 564997.2 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 13.1 KPH

8.6.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL

TRANSIENT QUEUES = 6475.9 4845.7 11321.6 PCU. HRS.
OVER-CAPACITY QUEUES = 26407.4 27480.5 53887.9 PCU. HRS.
(ON LINKS = 25475.9 26177.4 51653.4
ON CENTROIDS = 931.4 1303.1 2234.5)
LINK CRUISE TIME = 17569.7 10830.1 28399.8 PCU. HRS.
(FREE FLOW = 17559.8 10818.6 28378.4
DELAYS = 9.8 11.5 21.3)
TOTAL TRAVEL TIME = 50453.0 43156.3 93609.3 PCU. HRS.
TRAVEL DISTANCE = 898838.0 564997.2 1463835.2 PCU. KMS.
OVERALL AVERAGE SPEED = 17.8 13.1 15.6 KPH
FUEL CONSUMPTION = 120525.4 90375.0 210900.4 LITRES

8.6.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	6475.9	4845.7	11321.6	PCU. HRS.
(B) =	90.6	13.9	104.5	
(T) =	6566.6	4859.6	11426.2	
OVER-CAPACITY QUEUES =	26407.4	27480.5	53887.9	PCU. HRS.
(B) =	6269.6	3847.5	10117.1	
(T) =	32677.0	31328.0	64005.0	
LINK CRUISE TIME (S) =	17569.7	10830.1	28399.8	PCU. HRS.
(B) =	7558.4	7558.4		
(BCC) =	12018.1	12018.1		
(T) =	37146.3	10830.1	47976.4	
TOTAL TRAVEL TIME (S) =	50453.0	43156.3	93609.3	PCU. HRS.
(B) =	13918.7	3861.4	17780.1	
(BCC) =	12018.1	12018.1		
(T) =	76389.9	47017.7	123407.6	
TRAVEL DISTANCE (S) =	898838.0	564997.2	1463835.2	PCU. KMS.
(B) =	576983.2	576983.2		
(BCC) =	176825.5	176825.5		
(T) =	1652646.8	564997.2	2217644.0	

AVERAGE SPEED	(S) =	17.8	13.1	15.6 KPH
	(B) =	32.5	32.5	
	(BCC) =	14.7	14.7	
	(T) =	21.6	12.0	18.0

8.6.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 994483.8

TOTAL NUMBER OF SECOND STOPS/HOUR = 447005.1

TOTAL NUMBER OF STOPS/HOUR = 1441488.9

RATE OF FUEL CONSUMPTION = 120525.4 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 120525.4 LITRES

8.7 SATURN SIMULATION SUMMARY RESULTS (a00ic7)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 6275.9 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 29194.6 PCU. HRS./HR.

(ON LINKS = 28276.6 ON CENTROIDS = 918.1)

LINK CRUISE TIME = 17466.1 PCU. HRS./HR.

(FREE FLOW = 17452.6 DELAYS = 13.4)

TOTAL TRAVEL TIME = 52936.6 PCU. HRS./HR.

TRAVEL DISTANCE = 895439.2 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 16.9 KPH

8.7.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4820.3 PCU. HRS.

OVER-CAPACITY QUEUES = 34669.3 PCU. HRS./HR.

(ON LINKS = 33362.2 ON CENTROIDS = 1307.1)

LINK CRUISE TIME = 12803.8 PCU. HRS./HR.

(FREE FLOW = 12780.9 DELAYS = 22.9)

TOTAL TRAVEL TIME = 52293.3 PCU. HRS./HR.

TRAVEL DISTANCE = 717814.8 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 13.7 KPH

8.7.2 ABSOLUTE TOTALS:

		THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES	=	6275.9	4820.3	11096.1	PCU. HRS.

OVER-CAPACITY QUEUES = 29194.6 34669.3 63863.9 PCU. HRS.
(ON LINKS = 28276.6 33362.2 61638.8
ON CENTROIDS = 918.1 1307.1 2225.1)
LINK CRUISE TIME = 17466.1 12803.8 30269.9 PCU. HRS.
(FREE FLOW = 17452.6 12780.9 30233.5
DELAYS = 13.4 22.9 36.4)
TOTAL TRAVEL TIME = 52936.6 52293.3 105229.9 PCU. HRS.
TRAVEL DISTANCE = 895439.2 717814.8 1613254.0 PCU. KMS.
OVERALL AVERAGE SPEED = 16.9 13.7 15.3 KPH
FUEL CONSUMPTION = 122762.1 109421.6 232183.7 LITRES

8.7.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	6275.9	4820.3	11096.1	PCU. HRS.
(B) =	100.2	13.0	113.1	
(T) =	6376.0	4833.2	11209.2	
OVER-CAPACITY QUEUES =	29194.6	34669.3	63863.9	PCU. HRS.
(B) =	7539.5	5022.2	12561.7	
(T) =	36734.2	39691.4	76425.6	
LINK CRUISE TIME (S) =	17466.1	12803.8	30269.9	PCU. HRS.
(B) =	7869.3	7869.3		
(BCC) =	12412.9	12412.9		
(T) =	37748.3	12803.8	50552.1	
TOTAL TRAVEL TIME (S) =	52936.6	52293.3	105229.9	PCU. HRS.
(B) =	15509.0	5035.1	20544.2	
(BCC) =	12412.9	12412.9		
(T) =	80858.5	57328.5	138187.0	
TRAVEL DISTANCE (S) =	895439.2	717814.8	1613254.0	PCU. KMS.
(B) =	599625.7	599625.7		
(BCC) =	182811.9	182811.9		
(T) =	1677876.8	717814.8	2395691.5	
AVERAGE SPEED (S) =	16.9	13.7	15.3	KPH

(B) =	29.2		29.2
(BCC) =	14.7		14.7
(T) =	20.8	12.5	17.3

8.7.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 949799.2

TOTAL NUMBER OF SECOND STOPS/HOUR = 463980.7

TOTAL NUMBER OF STOPS/HOUR = 1413779.9

RATE OF FUEL CONSUMPTION = 122762.1 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 122762.1 LITRES

8.8 SATURN SIMULATION SUMMARY RESULTS (a00ic8)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 5877.8 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 24882.5 PCU. HRS./HR.

(ON LINKS = 24170.9 ON CENTROIDS = 711.6)

LINK CRUISE TIME = 16759.5 PCU. HRS./HR.

(FREE FLOW = 16746.0 DELAYS = 13.5)

TOTAL TRAVEL TIME = 47519.8 PCU. HRS./HR.

TRAVEL DISTANCE = 861325.2 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 18.1 KPH

8.8.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 3817.2 PCU. HRS.

OVER-CAPACITY QUEUES = 27005.2 PCU. HRS./HR.

(ON LINKS = 26073.6 ON CENTROIDS = 931.6)

LINK CRUISE TIME = 10755.6 PCU. HRS./HR.

(FREE FLOW = 10734.6 DELAYS = 20.9)

TOTAL TRAVEL TIME = 41578.0 PCU. HRS./HR.

TRAVEL DISTANCE = 616128.8 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 14.8 KPH

8.8.2 ABSOLUTE TOTALS:

		THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES	=	5877.8	3817.2	9695.1	PCU. HRS.

OVER-CAPACITY QUEUES = 24882.5 27005.2 51887.6 PCU. HRS.
(ON LINKS = 24170.9 26073.6 50244.5
ON CENTROIDS = 711.6 931.6 1643.2)
LINK CRUISE TIME = 16759.5 10755.6 27515.1 PCU. HRS.
(FREE FLOW = 16746.0 10734.6 27480.7
DELAYS = 13.5 20.9 34.4)
TOTAL TRAVEL TIME = 47519.8 41578.0 89097.8 PCU. HRS.
TRAVEL DISTANCE = 861325.2 616128.8 1477454.0 PCU. KMS.
OVERALL AVERAGE SPEED = 18.1 14.8 16.6 KPH
FUEL CONSUMPTION = 113299.0 89396.1 202695.1 LITRES

8.8.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	5877.8	3817.2	9695.1	PCU. HRS.
(B) =	90.7	10.9	101.6	
(T) =	5968.6	3828.1	9796.7	
OVER-CAPACITY QUEUES =	24882.5	27005.2	51887.6	PCU. HRS.
(B) =	5334.2	2808.3	8142.5	
(T) =	30216.7	29813.5	60030.2	
LINK CRUISE TIME (S) =	16759.5	10755.6	27515.1	PCU. HRS.
(B) =	7132.6	7132.6		
(BCC) =	11506.4	11506.4		
(T) =	35398.5	10755.6	46154.1	
TOTAL TRAVEL TIME (S) =	47519.8	41578.0	89097.8	PCU. HRS.
(B) =	12557.5	2819.2	15376.7	
(BCC) =	11506.4	11506.4		
(T) =	71583.8	44397.2	115980.9	
TRAVEL DISTANCE (S) =	861325.2	616128.8	1477454.0	PCU. KMS.
(B) =	544550.7	544550.7		
(BCC) =	169100.8	169100.8		
(T) =	1574976.8	616128.8	2191105.5	
AVERAGE SPEED (S) =	18.1	14.8	16.6	KPH

(B) =	35.4		35.4
(BCC) =	14.7		14.7
(T) =	22.0	13.9	18.9

8.8.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 879348.1

TOTAL NUMBER OF SECOND STOPS/HOUR = 404855.9

TOTAL NUMBER OF STOPS/HOUR = 1284204.0

RATE OF FUEL CONSUMPTION = 113299.0 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 113299.0 LITRES

8.9 SATURN SIMULATION SUMMARY RESULTS (a00ic9)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 6048.9 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 29114.6 PCU. HRS./HR.

(ON LINKS = 28234.6 ON CENTROIDS = 880.0)

LINK CRUISE TIME = 17206.3 PCU. HRS./HR.

(FREE FLOW = 17192.0 DELAYS = 14.3)

TOTAL TRAVEL TIME = 52369.7 PCU. HRS./HR.

TRAVEL DISTANCE = 884538.8 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 16.9 KPH

8.9.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4669.6 PCU. HRS.

OVER-CAPACITY QUEUES = 37370.6 PCU. HRS./HR.

(ON LINKS = 36160.0 ON CENTROIDS = 1210.6)

LINK CRUISE TIME = 13102.4 PCU. HRS./HR.

(FREE FLOW = 13076.1 DELAYS = 26.3)

TOTAL TRAVEL TIME = 55142.6 PCU. HRS./HR.

TRAVEL DISTANCE = 745477.2 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 13.5 KPH

8.9.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	6048.9	4669.6	10718.5	PCU. HRS.

OVER-CAPACITY QUEUES = 29114.6 37370.6 66485.2 PCU. HRS.
(ON LINKS = 28234.6 36160.0 64394.6
ON CENTROIDS = 880.0 1210.6 2090.6)
LINK CRUISE TIME = 17206.3 13102.4 30308.7 PCU. HRS.
(FREE FLOW = 17192.0 13076.1 30268.1
DELAYS = 14.3 26.3 40.6)
TOTAL TRAVEL TIME = 52369.7 55142.6 107512.3 PCU. HRS.
TRAVEL DISTANCE = 884538.8 745477.2 1630016.0 PCU. KMS.
OVERALL AVERAGE SPEED = 16.9 13.5 15.2 KPH
FUEL CONSUMPTION = 120884.0 113994.1 234878.1 LITRES

8.9.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC)ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	6048.9	4669.6	10718.5	PCU. HRS.
(B) =	102.4	12.3	114.7	
(T) =	6151.3	4681.9	10833.2	
OVER-CAPACITY QUEUES =	29114.6	37370.6	66485.2	PCU. HRS.
(B) =	7401.7	4822.9	12224.6	
(T) =	36516.3	42193.5	78709.8	
LINK CRUISE TIME (S) =	17206.3	13102.4	30308.7	PCU. HRS.
(B) =	7789.0	7789.0		
(BCC) =	12313.2	12313.2		
(T) =	37308.5	13102.4	50410.9	
TOTAL TRAVEL TIME (S) =	52369.7	55142.6	107512.3	PCU. HRS.
(B) =	15293.2	4835.2	20128.4	
(BCC) =	12313.2	12313.2		
(T) =	79976.1	59977.8	139953.9	
TRAVEL DISTANCE (S) =	884538.8	745477.2	1630016.0	PCU. KMS.
(B) =	593685.7	593685.7		
(BCC) =	181303.7	181303.7		
(T) =	1659528.1	745477.2	2405005.2	
AVERAGE SPEED (S) =	16.9	13.5	15.2	KPH

(B) =	29.5		29.5
(BCC) =	14.7		14.7
(T) =	20.8	12.4	17.2

8.9.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 913373.4

TOTAL NUMBER OF SECOND STOPS/HOUR = 431229.3

TOTAL NUMBER OF STOPS/HOUR = 1344602.8

RATE OF FUEL CONSUMPTION = 120884.0 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 120884.0 LITRES

8.10 SATURN SIMULATION SUMMARY RESULTS (a00ic10)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 5829.1 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 26784.1 PCU. HRS./HR.

(ON LINKS = 25987.1 ON CENTROIDS = 797.0)

LINK CRUISE TIME = 16790.9 PCU. HRS./HR.

(FREE FLOW = 16776.8 DELAYS = 14.1)

TOTAL TRAVEL TIME = 49404.1 PCU. HRS./HR.

TRAVEL DISTANCE = 864205.2 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 17.5 KPH

8.10.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4176.1 PCU. HRS.

OVER-CAPACITY QUEUES = 33082.3 PCU. HRS./HR.

(ON LINKS = 31958.6 ON CENTROIDS = 1123.7)

LINK CRUISE TIME = 12079.4 PCU. HRS./HR.

(FREE FLOW = 12054.3 DELAYS = 25.1)

TOTAL TRAVEL TIME = 49337.8 PCU. HRS./HR.

TRAVEL DISTANCE = 694752.8 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 14.1 KPH

8.10.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	5829.1	4176.1	10005.2	PCU. HRS.

OVER-CAPACITY QUEUES = 26784.1 33082.3 59866.4 PCU. HRS.
(ON LINKS = 25987.1 31958.6 57945.7
ON CENTROIDS = 797.0 1123.7 1920.7)
LINK CRUISE TIME = 16790.9 12079.4 28870.2 PCU. HRS.
(FREE FLOW = 16776.8 12054.3 28831.0
DELAYS = 14.1 25.1 39.2)
TOTAL TRAVEL TIME = 49404.1 49337.8 98741.8 PCU. HRS.
TRAVEL DISTANCE = 864205.2 694752.8 1558958.0 PCU. KMS.
OVERALL AVERAGE SPEED = 17.5 14.1 15.8 KPH
FUEL CONSUMPTION = 115726.7 103576.4 219303.1 LITRES

8.10.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	5829.1	4176.1	10005.2	PCU. HRS.
(B) =	96.4	11.2	107.6	
(T) =	5925.5	4187.2	10112.8	
OVER-CAPACITY QUEUES =	26784.1	33082.3	59866.4	PCU. HRS.
(B) =	6088.6	3480.7	9569.4	
(T) =	32872.7	36563.1	69435.8	
LINK CRUISE TIME (S) =	16790.9	12079.4	28870.2	PCU. HRS.
(B) =	7374.7	7374.7		
(BCC) =	11805.1	11805.1		
(T) =	35970.7	12079.4	48050.1	
TOTAL TRAVEL TIME (S) =	49404.1	49337.8	98741.8	PCU. HRS.
(B) =	13559.8	3491.9	17051.7	
(BCC) =	11805.1	11805.1		
(T) =	74769.0	52829.7	127598.6	
TRAVEL DISTANCE (S) =	864205.2	694752.8	1558958.0	PCU. KMS.
(B) =	562486.6	562486.6		
(BCC) =	173611.8	173611.8		
(T) =	1600303.6	694752.8	2295056.5	
AVERAGE SPEED (S) =	17.5	14.1	15.8	KPH

(B) =	33.0		33.0
(BCC) =	14.7		14.7
(T) =	21.4	13.2	18.0

8.10.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 879174.6

TOTAL NUMBER OF SECOND STOPS/HOUR = 405947.6

TOTAL NUMBER OF STOPS/HOUR = 1285122.2

RATE OF FUEL CONSUMPTION = 115726.7 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 115726.7 LITRES

8.11 SATURN SIMULATION SUMMARY RESULTS (a00ic11)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 5878.8 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 27635.2 PCU. HRS./HR.

(ON LINKS = 26882.7 ON CENTROIDS = 752.4)

LINK CRUISE TIME = 16867.7 PCU. HRS./HR.

(FREE FLOW = 16853.5 DELAYS = 14.2)

TOTAL TRAVEL TIME = 50381.7 PCU. HRS./HR.

TRAVEL DISTANCE = 869037.9 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 17.2 KPH

8.11.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4353.6 PCU. HRS.

OVER-CAPACITY QUEUES = 34677.6 PCU. HRS./HR.

(ON LINKS = 33602.2 ON CENTROIDS = 1075.4)

LINK CRUISE TIME = 12406.2 PCU. HRS./HR.

(FREE FLOW = 12380.3 DELAYS = 25.9)

TOTAL TRAVEL TIME = 51437.5 PCU. HRS./HR.

TRAVEL DISTANCE = 712287.0 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 13.8 KPH

8.11.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	5878.8	4353.6	10232.4	PCU. HRS.

OVER-CAPACITY QUEUES = 27635.2 34677.6 62312.8 PCU. HRS.
(ON LINKS = 26882.7 33602.2 60484.9
ON CENTROIDS = 752.4 1075.4 1827.8)
LINK CRUISE TIME = 16867.7 12406.2 29273.9 PCU. HRS.
(FREE FLOW = 16853.5 12380.3 29233.8
DELAYS = 14.2 25.9 40.1)
TOTAL TRAVEL TIME = 50381.7 51437.5 101819.1 PCU. HRS.
TRAVEL DISTANCE = 869037.9 712287.0 1581325.0 PCU. KMS.
OVERALL AVERAGE SPEED = 17.2 13.8 15.5 KPH
UEL CONSUMPTION = 117330.0 107371.0 224701.0 LITRES

8.11.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL
TRANSIENT QUEUES (S) =	5878.8	4353.6	10232.4 PCU. HRS.
(B) =	96.5	11.2	107.7
(T) =	5975.3	4364.8	10340.1
OVER-CAPACITY QUEUES =	27635.2	34677.6	62312.8 PCU. HRS.
(B) =	6124.6	3427.0	9551.7
(T) =	33759.8	38104.6	71864.4
LINK CRUISE TIME (S) =	16867.7	12406.2	29273.9 PCU. HRS.
(B) =	7382.8	7382.8	
(BCC) =	11830.6	11830.6	
(T) =	36081.1	12406.2	48487.4
TOTAL TRAVEL TIME (S) =	50381.7	51437.5	101819.1 PCU. HRS.
(B) =	13604.0	3438.2	17042.2
(BCC) =	11830.6	11830.6	
(T) =	75816.2	54875.7	130691.9
TRAVEL DISTANCE (S) =	869037.9	712287.0	1581325.0 PCU. KMS.
(B) =	562747.7	562747.7	
(BCC) =	173584.7	173584.7	
(T) =	1605370.4	712287.0	2317657.5
AVERAGE SPEED (S) =	17.2	13.8	15.5 KPH

(B) =	33.0		33.0
(BCC) =	14.7		14.7
(T) =	21.2	13.0	17.7

8.11.4 FUEL CONSUMPTION SATISTICS

UEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 886513.0

TOTAL NUMBER OF SECOND STOPS/HOUR = 419267.0

TOTAL NUMBER OF STOPS/HOUR = 1305780.0

RATE OF FUEL CONSUMPTION = 117330.0 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 117330.0 LITRES

8.12 SATURN SIMULATION SUMMARY RESULTS (a00ic12)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 5616.2 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 24816.5 PCU. HRS./HR.

(ON LINKS = 24120.0 ON CENTROIDS = 696.4)

LINK CRUISE TIME = 16299.2 PCU. HRS./HR.

(FREE FLOW = 16285.1 DELAYS = 14.1)

TOTAL TRAVEL TIME = 46732.0 PCU. HRS./HR.

TRAVEL DISTANCE = 841788.3 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 18.0 KPH

8.12.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 3716.9 PCU. HRS.

OVER-CAPACITY QUEUES = 30248.9 PCU. HRS./HR.

(ON LINKS = 29252.6 ON CENTROIDS = 996.4)

LINK CRUISE TIME = 11044.8 PCU. HRS./HR.

(FREE FLOW = 11020.7 DELAYS = 24.1)

TOTAL TRAVEL TIME = 45010.6 PCU. HRS./HR.

TRAVEL DISTANCE = 645180.7 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 14.3 KPH

8.12.2 ABSOLUTE TOTALS:

	THIS PERIOD TIME	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	5616.2	3716.9	9333.1	PCU. HRS.

OVER-CAPACITY QUEUES = 24816.5 30248.9 55065.4 PCU. HRS.
(ON LINKS = 24120.0 29252.6 53372.6
ON CENTROIDS = 696.4 996.4 1692.8)
LINK CRUISE TIME = 16299.2 11044.8 27344.0 PCU. HRS.
(FREE FLOW = 16285.1 11020.7 27305.8
DELAYS = 14.1 24.1 38.2)
TOTAL TRAVEL TIME = 46732.0 45010.6 91742.6 PCU. HRS.
TRAVEL DISTANCE = 841788.3 645180.7 1486969.0 PCU. KMS.
OVERALL AVERAGE SPEED = 18.0 14.3 16.2 KPH
FUEL CONSUMPTION = 110729.5 94983.0 205712.5 LITRES

8.12.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

THIS PERIOD TIME NEXT PERIOD TIME TOTAL

TRANSIENT QUEUES (S) = 5616.2 3716.9 9333.1 PCU. HRS.
(B) = 94.1 10.1 104.2
(T) = 5710.3 3727.0 9437.3
OVER-CAPACITY QUEUES = 24816.5 30248.9 55065.4 PCU. HRS.
(B) = 5016.0 2568.6 7584.6
(T) = 29832.5 32817.5 62650.0
LINK CRUISE TIME (S) = 16299.2 11044.8 27344.0 PCU. HRS.
(B) = 6989.5 6989.5
(BCC) = 11318.5 11318.5
(T) = 34607.3 11044.8 45652.0
TOTAL TRAVEL TIME (S) = 46732.0 45010.6 91742.6 PCU. HRS.
(B) = 12099.5 2578.7 14678.2
(BCC) = 11318.5 11318.5
(T) = 70150.1 47589.3 117739.3
TRAVEL DISTANCE (S) = 841788.3 645180.7 1486969.0 PCU. KMS.
(B) = 533629.5 533629.5
(BCC) = 166275.9 166275.9
(T) = 1541693.8 645180.7 2186874.5
AVERAGE SPEED (S) = 18.0 14.3 16.2 KPH

(B) =	36.4		36.4
(BCC) =	14.7		14.7
(T) =	22.0	13.6	18.6

8.12.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 834874.8

TOTAL NUMBER OF SECOND STOPS/HOUR = 385412.3

TOTAL NUMBER OF STOPS/HOUR = 1220287.1

RATE OF FUEL CONSUMPTION = 110729.5 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 110729.5 LITRES

Appendix 8

Appendix 9

Results from 2006 congestion charging tests

9.1 List of tests

See table 1 for a cross-reference list of the tests carried out on the 2006 Base Year model produced by the DTO. In addition to these tests the following results files were produced for the base case and for a test case:

- A06H-ds5: Base year trip matrix and network file for 2006; and,
- A06ic1: Test case adding charge of 3000secs to the network file and not applying any demand management reaction to the trip matrix.

Table 1: Details of the names of the test result files in the Appendix with reference to the road user charge and elasticity used.

	No Charge	Ch = 3000 secs	Ch = 4500 secs	Ch = 6000 secs
No elasticity	A06H-ds5			
El. = -0.1		A06ic5	A06ic6	A06ic10
El. = -0.3		A06ic4	A06ic7	A06ic11
El. = -0.5		A06ic3	A06ic8	A06ic12
El. = -0.7		A06ic2	A06ic9	A06ic13

9.2 SATURN SIMULATION SUMMARY RESULTS (A06H-ds5)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 7333.0 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 44844.1 PCU. HRS./HR.

(ON LINKS = 44011.7 ON CENTROIDS = 832.5)

LINK CRUISE TIME = 22233.1 PCU. HRS./HR.

(FREE FLOW = 21998.4 DELAYS = 234.8)

TOTAL TRAVEL TIME = 74410.2 PCU. HRS./HR.

TRAVEL DISTANCE = 1351582.1 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 18.2 KPH

9.2.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 5486.4 PCU. HRS.

OVER-CAPACITY QUEUES = 42042.3 PCU. HRS./HR.

(ON LINKS = 40781.8 ON CENTROIDS = 1260.5)

LINK CRUISE TIME = 15286.2 PCU. HRS./HR.

(FREE FLOW = 15146.5 DELAYS = 139.7)

TOTAL TRAVEL TIME = 62814.9 PCU. HRS./HR.

TRAVEL DISTANCE = 947317.6 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 15.1 KPH

9.2.2 ABSOLUTE TOTALS:

THIS PERIOD NEXT PERIOD TOTAL

TRANSIENT QUEUES = 7333.0 5486.4 12819.4 PCU. HRS.
OVER-CAPACITY QUEUES = 44844.1 42042.3 86886.4 PCU. HRS.
(ON LINKS = 44011.7 40781.8 84793.5
ON CENTROIDS = 832.5 1260.5 2092.9)
LINK CRUISE TIME = 22233.1 15286.2 37519.4 PCU. HRS.
(FREE FLOW = 21998.4 15146.5 37144.9
DELAYS = 234.8 139.7 374.5)
TOTAL TRAVEL TIME = 74410.2 62814.9 137225.1 PCU. HRS.
TRAVEL DISTANCE = 1351582.1 947317.6 2298899.8 PCU. KMS.
OVERALL AVERAGE SPEED = 18.2 15.1 16.8 KPH
FUEL CONSUMPTION = 180658.5 137506.5 318165.0 LITRES

9.2.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	7333.0	5486.4	12819.4	PCU. HRS.
(B) =	336.1	47.7	383.8	
(T) =	7669.1	5534.1	13203.2	
OVER-CAPACITY QUEUES =	44844.1	42042.3	86886.4	PCU. HRS.
(B) =	8680.1	4609.4	13289.5	
(T) =	53524.2	46651.7	100175.9	
LINK CRUISE TIME (S) =	22233.1	15286.2	37519.4	PCU. HRS.
(B) =	14068.7		14068.7	
(BCC) =	29958.0		29958.0	
(T) =	66259.8	15286.2	81546.1	
TOTAL TRAVEL TIME (S) =	74410.2	62814.9	137225.1	PCU. HRS.
(B) =	23084.8	4657.1	27741.9	
(BCC) =	29958.0		29958.0	
(T) =	127453.1	67472.0	194925.1	
TRAVEL DISTANCE (S) =	1351582.1	947317.6	2298899.8	PCU. KMS.
(B) =	1218608.5		1218608.5	
(BCC) =	476798.9		476798.9	

(T) = 3046989.5 947317.6 3994307.0

AVERAGE SPEED (S) = 18.2 15.1 16.8 KPH

(B) = 43.9 43.9

(BCC) = 15.9 15.9

(T) = 23.9 14.0 20.5

9.2.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 1214795.1

TOTAL NUMBER OF SECOND STOPS/HOUR = 799699.6

TOTAL NUMBER OF STOPS/HOUR = 2014494.8

RATE OF FUEL CONSUMPTION = 180658.5 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 180658.5 LITRES

9.3 SATURN SIMULATION SUMMARY RESULTS (A06ic1)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 7139.8 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 45124.9 PCU. HRS./HR.

(ON LINKS = 44310.8 ON CENTROIDS = 814.1)

LINK CRUISE TIME = 22418.8 PCU. HRS./HR.

(FREE FLOW = 22101.0 DELAYS = 317.8)

TOTAL TRAVEL TIME = 74683.5 PCU. HRS./HR.

TRAVEL DISTANCE = 1370942.0 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 18.4 KPH

9.3.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4939.3 PCU. HRS.

OVER-CAPACITY QUEUES = 46340.4 PCU. HRS./HR.

(ON LINKS = 44519.3 ON CENTROIDS = 1821.1)

LINK CRUISE TIME = 15888.9 PCU. HRS./HR.

(FREE FLOW = 15676.2 DELAYS = 212.7)

TOTAL TRAVEL TIME = 67168.6 PCU. HRS./HR.

TRAVEL DISTANCE = 1045167.8 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 15.6 KPH

9.3.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	7139.8	4939.3	12079.1	PCU. HRS.
OVER-CAPACITY QUEUES =	45124.9	46340.4	91465.3	PCU. HRS.
(ON LINKS =	44310.8	44519.3	88830.1	
ON CENTROIDS =	814.1	1821.1	2635.2)	
LINK CRUISE TIME =	22418.8	15888.9	38307.8	PCU. HRS.
(FREE FLOW =	22101.0	15676.2	37777.2	
DELAYS =	317.8	212.7	530.6)	
TOTAL TRAVEL TIME =	74683.5	67168.6	141852.1	PCU. HRS.
TRAVEL DISTANCE =	1370942.0	1045167.8	2416109.8	PCU. KMS.
OVERALL AVERAGE SPEED =	18.4	15.6	17.0	KPH
FUEL CONSUMPTION =	181633.6	147691.1	329324.7	LITRES

9.3.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	7139.8	4939.3	12079.1	PCU. HRS.
(B) =	343.2	47.9	391.1	
(T) =	7483.0	4987.1	12470.1	
OVER-CAPACITY QUEUES =	45124.9	46340.4	91465.3	PCU. HRS.
(B) =	8767.4	4620.4	13387.8	
(T) =	53892.3	50960.8	104853.1	
LINK CRUISE TIME (S) =	22418.8	15888.9	38307.8	PCU. HRS.
(B) =	14107.0	14107.0		
(BCC) =	29962.7	29962.7		
(T) =	66488.5	15888.9	82377.4	
TOTAL TRAVEL TIME (S) =	74683.5	67168.6	141852.1	PCU. HRS.
(B) =	23217.7	4668.3	27885.9	
(BCC) =	29962.7	29962.7		
(T) =	127863.8	71836.9	199700.7	
TRAVEL DISTANCE (S) =	1370942.0	1045167.8	2416109.8	PCU. KMS.

(B) =	1221751.9	1221751.9	
(BCC) =	476858.4	476858.4	
(T) =	3069552.2	1045167.8	4114720.0
AVERAGE SPEED (S) =	18.4	15.6	17.0 KPH
(B) =	43.8	43.8	
(BCC) =	15.9	15.9	
(T) =	24.0	14.5	20.6

9.3.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 1189646.8

TOTAL NUMBER OF SECOND STOPS/HOUR = 783131.4

TOTAL NUMBER OF STOPS/HOUR = 1972778.2

RATE OF FUEL CONSUMPTION = 181633.6 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 181633.6 LITRES

9.4 SATURN SIMULATION SUMMARY RESULTS (A06IC2)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 6112.3 PCU. HRS./HR.
OVER-CAPACITY QUEUES = 37397.0 PCU. HRS./HR.
(ON LINKS = 35654.0 ON CENTROIDS = 1743.0)
LINK CRUISE TIME = 20453.2 PCU. HRS./HR.
(FREE FLOW = 20040.1 DELAYS = 413.0)
TOTAL TRAVEL TIME = 63962.5 PCU. HRS./HR.
TRAVEL
OVERALL AVERAGE SPEED = 19.5 KPH

9.4.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4648.3 PCU. HRS.
OVER-CAPACITY QUEUES = 54359.8 PCU. HRS./HR.
(ON LINKS = 50677.5 ON CENTROIDS = 3682.3)
LINK CRUISE TIME = 14892.0 PCU. HRS./HR.
(FREE FLOW = 14527.8 DELAYS = 364.3)
TOTAL TRAVEL TIME = 73900.1 PCU. HRS./HR.
TRAVEL DISTANCE = 964474.7 PCU. KMS./HR.
OVERALL AVERAGE SPEED = 13.1 KPH

9.4.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	6112.3	4648.3	10760.7	PCU. HRS.
OVER-CAPACITY QUEUES =	37397.0	54359.8	91756.8	PCU. HRS.
(ON LINKS =	35654.0	50677.5	86331.5	
ON CENTROIDS =	1743.0	3682.3	5425.2)	
LINK CRUISE TIME =	20453.2	14892.0	35345.2	PCU. HRS.
(FREE FLOW =	20040.1	14527.8	34567.9	
DELAYS =	413.0	364.3	777.3)	
TOTAL TRAVEL TIME =	63962.5	73900.1	137862.6	PCU. HRS.
TRAVEL DISTANCE =	1244631.2	964474.7	2209106.0	PCU. KMS.
OVERALL AVERAGE SPEED =	19.5	13.1	16.0	KPH
FUEL CONSUMPTION =	158072.2	150650.3	308722.4	LITRES

9.4.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	6112.3	4648.3	10760.7	PCU. HRS.
(B) =	87.6	11.2	98.8	
(T) =	6199.9	4659.5	10859.4	
OVER-CAPACITY QUEUES =	37397.0	54359.8	91756.8	PCU. HRS.
(B) =	4187.7	1964.9	6152.6	
(T) =	41584.7	56324.7	97909.3	
LINK CRUISE TIME (S) =	20453.2	14892.0	35345.2	PCU. HRS.
(B) =	8016.1	8016.1		
(BCC) =	16055.5	16055.5		
(T) =	44524.8	14892.0	59416.8	
TOTAL TRAVEL TIME (S) =	63962.5	73900.1	137862.6	PCU. HRS.
(B) =	12291.4	1976.1	14267.5	
(BCC) =	16055.5	16055.5		
(T) =	92309.5	75876.2	168185.6	
TRAVEL DISTANCE (S) =	1244631.2	964474.7	2209106.0	PCU. KMS.

(B) =	673686.4	673686.4	
(BCC) =	237924.1	237924.1	
(T) =	2156241.8	964474.7	3120716.5
AVERAGE SPEED (S) =	19.5	13.1	16.0 KPH
(B) =	47.2	47.2	
(BCC) =	14.8	14.8	
(T) =	23.4	12.7	18.6

9.4.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 999141.6

TOTAL NUMBER OF SECOND STOPS/HOUR = 550099.5

TOTAL NUMBER OF STOPS/HOUR = 1549241.0

RATE OF FUEL CONSUMPTION = 158072.2 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 158072.2 LITRES

9.5 SATURN SIMULATION SUMMARY RESULTS (A06IC3)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 6180.3 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 37723.4 PCU. HRS./HR.

(ON LINKS = 35962.3

ON CENTROIDS = 1761.1)

LINK CRUISE TIME = 20605.3 PCU. HRS./HR.

(FREE FLOW = 20186.4

DELAYS = 418.9)

TOTAL TRAVEL TIME = 64509.0 PCU. HRS./HR.

TRAVEL DISTANCE = 1251890.8 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 19.4 KPH

9.5.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4712.2 PCU. HRS.

OVER-CAPACITY QUEUES = 54676.8 PCU. HRS./HR.

(ON LINKS = 50890.4 ON CENTROIDS = 3786.4)

LINK CRUISE TIME = 15060.7 PCU. HRS./HR.

(FREE FLOW = 14688.4 DELAYS = 372.3)

TOTAL TRAVEL TIME = 74449.7 PCU. HRS./HR.

TRAVEL DISTANCE = 974473.2 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 13.1 KPH

9.5.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	6180.3	4712.2	10892.5	PCU. HRS.
OVER-CAPACITY QUEUES =	37723.4	54676.8	92400.2	PCU. HRS.
(ON LINKS =	35962.3	50890.4	86852.7	
ON CENTROIDS =	1761.1	3786.4	5547.5)	
LINK CRUISE TIME =	20605.3	15060.7	35666.0	PCU. HRS.
(FREE FLOW =	20186.4	14688.4	34874.8	
DELAYS =	418.9	372.3	791.2)	
TOTAL TRAVEL TIME =	64509.0	74449.7	138958.8	PCU. HRS.
TRAVEL DISTANCE =	1251890.8	974473.2	2226364.0	PCU. KMS.
OVERALL AVERAGE SPEED =	19.4	13.1	16.0	KPH
FUEL CONSUMPTION =	159379.7	152057.9	311437.6	LITRES

9.5.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	6180.3	4712.2	10892.5	PCU. HRS.
(B) =	88.1	11.0	99.1	
(T) =	6268.4	4723.3	10991.6	
OVER-CAPACITY QUEUES =	37723.4	54676.8	92400.2	PCU. HRS.
(B) =	4277.3	2020.0	6297.3	
(T) =	42000.7	56696.8	98697.5	
LINK CRUISE TIME (S) =	20605.3	15060.7	35666.0	PCU. HRS.
(B) =	8073.6		8073.6	
(BCC) =	16147.4		16147.4	
(T) =	44826.4	15060.7	59887.1	
TOTAL TRAVEL TIME (S) =	64509.0	74449.7	138958.8	PCU. HRS.
(B) =	12439.0	2031.0	14470.0	
(BCC) =	16147.4		16147.4	
(T) =	93095.5	76480.7	169576.2	
TRAVEL DISTANCE (S) =	1251890.8	974473.2	2226364.0	PCU. KMS.

(B) =	678390.2		678390.2	
(BCC) =	239372.4		239372.4	
(T) =	2169653.5	974473.2	3144126.8	
AVERAGE SPEED (S) =	19.4	13.1	16.0	KPH
(B) =	46.9		46.9	
(BCC) =	14.8		14.8	
(T) =	23.3	12.7	18.5	

9.5.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 1019603.9

TOTAL NUMBER OF SECOND STOPS/HOUR = 549839.4

TOTAL NUMBER OF STOPS/HOUR = 1569443.4

RATE OF FUEL CONSUMPTION = 159379.7 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 159379.7 LITRES

9.6 SATURN SIMULATION SUMMARY RESULTS (A06IC4)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 6257.9 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 38208.6 PCU. HRS./HR.

(ON LINKS = 36374.9 ON CENTROIDS = 1833.6)

LINK CRUISE TIME = 20777.9 PCU. HRS./HR.

(FREE FLOW = 20347.3 DELAYS = 430.7)

TOTAL TRAVEL TIME = 65244.5 PCU. HRS./HR.

TRAVEL DISTANCE = 1259755.6 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 19.3 KPH

9.6.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4826.7 PCU. HRS.

OVER-CAPACITY QUEUES = 55579.3 PCU. HRS./HR.

(ON LINKS = 51586.2 ON CENTROIDS = 3993.1)

LINK CRUISE TIME = 15290.1 PCU. HRS./HR.

(FREE FLOW = 14910.2 DELAYS = 380.0)

TOTAL TRAVEL TIME = 75696.2 PCU. HRS./HR.

TRAVEL DISTANCE = 985335.3 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 13.0 KPH

9.6.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	6257.9	4826.7	11084.7	PCU. HRS.
OVER-CAPACITY QUEUES =	38208.6	55579.3	93787.9	PCU. HRS.
(ON LINKS =	36374.9	51586.2	87961.1	
ON CENTROIDS =	1833.6	3993.1	5826.7)	
LINK CRUISE TIME =	20777.9	15290.1	36068.1	PCU. HRS.
(FREE FLOW =	20347.3	14910.2	35257.4	
DELAYS =	430.7	380.0	810.7)	
TOTAL TRAVEL TIME =	65244.5	75696.2	140940.6	PCU. HRS.
TRAVEL DISTANCE =	1259755.6	985335.3	2245091.0	PCU. KMS.
OVERALL AVERAGE SPEED =	19.3	13.0	15.9	KPH
FUEL CONSUMPTION =	160854.2	154365.4	315219.6	LITRES

9.6.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	6257.9	4826.7	11084.7	PCU. HRS.
(B) =	89.1	11.3	100.4	
(T) =	6347.1	4838.0	11185.0	
OVER-CAPACITY QUEUES =	38208.6	55579.3	93787.9	PCU. HRS.
(B) =	4465.0	2114.9	6579.9	
(T) =	42673.6	57694.1	100367.7	
LINK CRUISE TIME (S) =	20777.9	15290.1	36068.1	PCU. HRS.
(B) =	8158.0		8158.0	
(BCC) =	16276.7		16276.7	
(T) =	45212.6	15290.1	60502.8	
TOTAL TRAVEL TIME (S) =	65244.5	75696.2	140940.6	PCU. HRS.
(B) =	12712.1	2126.1	14838.2	
(BCC) =	16276.7		16276.7	
(T) =	94233.3	77822.3	172055.5	

TRAVEL DISTANCE (S) = 1259755.6 985335.3 2245091.0 PCU. KMS.
(B) = 685447.1 685447.1
(BCC) = 241382.7 241382.7
(T) = 2186585.5 985335.3 3171920.8
AVERAGE SPEED (S) = 19.3 13.0 15.9 KPH
(B) = 46.2 46.2
(BCC) = 14.8 14.8
(T) = 23.2 12.7 18.4

9.6.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR
TTD = TOTAL TRAVEL DISTANCE PER HOUR
FLPK = .07 LITRES/KM.
TDT = TOTAL DELAYED TIME (IDLING) PER HOUR
FLPH = 1.20 LITRES/HR.
S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS
FLPPS = .016 LITRES PER PRIMARY STOP
S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS
FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 1031596.4
TOTAL NUMBER OF SECOND STOPS/HOUR = 561182.8
TOTAL NUMBER OF STOPS/HOUR = 1592779.2
RATE OF FUEL CONSUMPTION = 160854.2 LITRES/HOUR
FUEL CONSUMED DURING TIME PERIOD = 160854.2 LITRES

9.7 SATURN SIMULATION SUMMARY RESULTS (A06IC5)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 6354.9 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 39093.9 PCU. HRS./HR.

(ON LINKS = 37165.3 ON CENTROIDS = 1928.6)

LINK CRUISE TIME = 20984.7 PCU. HRS./HR.

(FREE FLOW = 20554.4 DELAYS = 430.3)

TOTAL TRAVEL TIME = 66433.6 PCU. HRS./HR.

TRAVEL DISTANCE = 1270747.0 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 19.1 KPH

9.7.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 5024.0 PCU. HRS.

OVER-CAPACITY QUEUES = 57856.1 PCU. HRS./HR.

(ON LINKS = 53472.7 ON CENTROIDS = 4383.4)

LINK CRUISE TIME = 15661.9 PCU. HRS./HR.

(FREE FLOW = 15279.8 DELAYS = 382.0)

TOTAL TRAVEL TIME = 78542.0 PCU. HRS./HR.

TRAVEL DISTANCE = 1004723.0 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 12.8 KPH

9.7.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	6354.9	5024.0	11379.0	PCU. HRS.
OVER-CAPACITY QUEUES =	39093.9	57856.1	96949.9	PCU. HRS.
(ON LINKS =	37165.3	53472.7	90638.0	
ON CENTROIDS =	1928.6	4383.4	6312.0)	
LINK CRUISE TIME =	20984.7	15661.9	36646.6	PCU. HRS.
(FREE FLOW =	20554.4	15279.8	35834.3	
DELAYS =	430.3	382.0	812.3)	
TOTAL TRAVEL TIME =	66433.6	78542.0	144975.5	PCU. HRS.
TRAVEL DISTANCE =	1270747.0	1004723.0	2275470.0	PCU. KMS.
OVERALL AVERAGE SPEED =	19.1	12.8	15.7	KPH
FUEL CONSUMPTION =	162966.6	159088.1	322054.7	LITRES

9.7.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	6354.9	5024.0	11379.0	PCU. HRS.
(B) =	91.1	11.5	102.6	
(T) =	6446.0	5035.5	11481.5	
OVER-CAPACITY QUEUES =	39093.9	57856.1	96949.9	PCU. HRS.
(B) =	4736.0	2274.7	7010.8	
(T) =	43829.9	60130.8	103960.7	
LINK CRUISE TIME (S) =	20984.7	15661.9	36646.6	PCU. HRS.
(B) =	8289.9	8289.9		
(BCC) =	16475.7	16475.7		
(T) =	45750.3	15661.9	61412.2	
TOTAL TRAVEL TIME (S) =	66433.6	78542.0	144975.5	PCU. HRS.
(B) =	13117.0	2286.2	15403.2	
(BCC) =	16475.7	16475.7		
(T) =	96026.3	80828.1	176854.4	
TRAVEL DISTANCE (S) =	1270747.0	1004723.0	2275470.0	PCU. KMS.

(B) = 696326.4 696326.4

(BCC) = 244498.2 244498.2

(T) = 2211571.5 1004723.0 3216294.5

AVERAGE SPEED (S) = 19.1 12.8 15.7 KPH

(B) = 45.2 45.2

(BCC) = 14.8 14.8

(T) = 23.0 12.4 18.2

9.7.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 1035759.5

TOTAL NUMBER OF SECOND STOPS/HOUR = 580709.0

TOTAL NUMBER OF STOPS/HOUR = 1616468.5

RATE OF FUEL CONSUMPTION = 162966.6 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 162966.6 LITRES

9.8 SATURN SIMULATION SUMMARY RESULTS (A06IC6)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 6230.9 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 39055.5 PCU. HRS./HR.

(ON LINKS = 37236.5 ON CENTROIDS = 1818.9)

LINK CRUISE TIME = 20946.8 PCU. HRS./HR.

(FREE FLOW = 20488.4 DELAYS = 458.4)

TOTAL TRAVEL TIME = 66233.2 PCU. HRS./HR.

TRAVEL DISTANCE = 1271091.6 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 19.2 KPH

9.8.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4793.9 PCU. HRS.

OVER-CAPACITY QUEUES = 60423.1 PCU. HRS./HR.

(ON LINKS = 56085.7 ON CENTROIDS = 4337.5)

LINK CRUISE TIME = 15901.4 PCU. HRS./HR.

(FREE FLOW = 15483.5 DELAYS = 417.9)

TOTAL TRAVEL TIME = 81118.4 PCU. HRS./HR.

TRAVEL DISTANCE = 1040239.6 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 12.8 KPH

9.8.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	6230.9	4793.9	11024.8	PCU. HRS.
OVER-CAPACITY QUEUES =	39055.5	60423.1	99478.6	PCU. HRS.
(ON LINKS =	37236.5	56085.7	93322.2	
ON CENTROIDS =	1818.9	4337.5	6156.4)	
LINK CRUISE TIME =	20946.8	15901.4	36848.2	PCU. HRS.
(FREE FLOW =	20488.4	15483.5	35972.0	
DELAYS =	458.4	417.9	876.2)	
TOTAL TRAVEL TIME =	66233.2	81118.4	147351.6	PCU. HRS.
TRAVEL DISTANCE =	1271091.6	1040239.6	2311331.2	PCU. KMS.
OVERALL AVERAGE SPEED =	19.2	12.8	15.7	KPH
FUEL CONSUMPTION =	162269.3	163787.9	326057.2	LITRES

9.8.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	6230.9	4793.9	11024.8	PCU. HRS.
(B) =	90.6	11.5	102.2	
(T) =	6321.5	4805.4	11126.9	
OVER-CAPACITY QUEUES =	39055.5	60423.1	99478.6	PCU. HRS.
(B) =	4702.4	2277.2	6979.6	
(T) =	43757.9	62700.4	106458.2	
LINK CRUISE TIME (S) =	20946.8	15901.4	36848.2	PCU. HRS.
(B) =	8245.3	8245.3		
(BCC) =	16417.5	16417.5		
(T) =	45609.6	15901.4	61511.0	
TOTAL TRAVEL TIME (S) =	66233.2	81118.4	147351.6	PCU. HRS.
(B) =	13038.3	2288.8	15327.1	
(BCC) =	16417.5	16417.5		
(T) =	95689.0	83407.2	179096.2	
TRAVEL DISTANCE (S) =	1271091.6	1040239.6	2311331.2	PCU. KMS.

(B) =	692363.0	692363.0	
(BCC) =	243606.3	243606.3	
(T) =	2207061.0	1040239.6	3247300.5
AVERAGE SPEED (S) =	19.2	12.8	15.7 KPH
(B) =	45.2	45.2	
(BCC) =	14.8	14.8	
(T) =	23.1	12.5	18.1

9.8.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 1014008.1

TOTAL NUMBER OF SECOND STOPS/HOUR = 545030.6

TOTAL NUMBER OF STOPS/HOUR = 1559038.8

RATE OF FUEL CONSUMPTION = 162269.3 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 162269.3 LITRES

9.9 SATURN SIMULATION SUMMARY RESULTS (A06IC7)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 6090.5 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 38090.5 PCU. HRS./HR.

(ON LINKS = 36334.5 ON CENTROIDS = 1756.0)

LINK CRUISE TIME = 20616.9 PCU. HRS./HR.

(FREE FLOW = 20170.0 DELAYS = 446.9)

TOTAL TRAVEL TIME = 64797.9 PCU. HRS./HR.

TRAVEL DISTANCE = 1255465.5 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 19.4 KPH

9.9.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4570.7 PCU. HRS.

OVER-CAPACITY QUEUES = 58373.2 PCU. HRS./HR.

(ON LINKS = 54511.3 ON CENTROIDS = 3862.0)

LINK CRUISE TIME = 15480.0 PCU. HRS./HR.

(FREE FLOW = 15072.6 DELAYS = 407.4)

TOTAL TRAVEL TIME = 78423.9 PCU. HRS./HR.

TRAVEL DISTANCE = 1019815.4 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 13.0 KPH

9.9.2 ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES =	6090.5	4570.7	10661.2	PCU. HRS.
OVER-CAPACITY QUEUES =	38090.5	58373.2	96463.8	PCU. HRS.
(ON LINKS =	36334.5	54511.3	90845.8	
ON CENTROIDS =	1756.0	3862.0	5618.0)	
LINK CRUISE TIME =	20616.9	15480.0	36096.9	PCU. HRS.
(FREE FLOW =	20170.0	15072.6	35242.6	
DELAYS =	446.9	407.4	854.3)	
TOTAL TRAVEL TIME =	64797.9	78423.9	143221.8	PCU. HRS.
TRAVEL DISTANCE =	1255465.5	1019815.4	2275281.0	PCU. KMS.
OVERALL AVERAGE SPEED =	19.4	13.0	15.9	KPH
FUEL CONSUMPTION =	159614.4	159252.8	318867.2	LITRES

9.9.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD	NEXT PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	6090.5	4570.7	10661.2	PCU. HRS.
(B) =	88.1	11.4	99.5	
(T) =	6178.6	4582.1	10760.7	
OVER-CAPACITY QUEUES =	38090.5	58373.2	96463.8	PCU. HRS.
(B) =	4379.7	2101.8	6481.6	
(T) =	42470.2	60475.1	102945.3	
LINK CRUISE TIME (S) =	20616.9	15480.0	36096.9	PCU. HRS.
(B) =	8088.6		8088.6	
(BCC) =	16174.0		16174.0	
(T) =	44879.5	15480.0	60359.5	
TOTAL TRAVEL TIME (S) =	64797.9	78423.9	143221.8	PCU. HRS.
(B) =	12556.4	2113.2	14669.6	
(BCC) =	16174.0		16174.0	
(T) =	93528.3	80537.1	174065.5	
TRAVEL DISTANCE (S) =	1255465.5	1019815.4	2275281.0	PCU. KMS.

(B) =	679376.9	679376.9	
(BCC) =	239794.3	239794.3	
(T) =	2174636.8	1019815.4	3194452.0
AVERAGE SPEED (S) =	19.4	13.0	15.9 KPH
(B) =	46.3	46.3	
(BCC) =	14.8	14.8	
(T) =	23.3	12.7	18.4

9.9.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 1002373.4

TOTAL NUMBER OF SECOND STOPS/HOUR = 535316.8

TOTAL NUMBER OF STOPS/HOUR = 1537690.2

RATE OF FUEL CONSUMPTION = 159614.4 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 159614.4 LITRES

9.10 SATURN SIMULATION SUMMARY RESULTS (a06ic8)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 5993.2 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 37652.9 PCU. HRS./HR.

(ON LINKS = 35960.5 ON CENTROIDS = 1692.4)

LINK CRUISE TIME = 20400.5 PCU. HRS./HR.

(FREE FLOW = 19965.5 DELAYS = 434.9)

TOTAL TRAVEL TIME = 64046.6 PCU. HRS./HR.

TRAVEL DISTANCE = 1245641.0 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 19.4 KPH

9.10.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4425.9 PCU. HRS.

OVER-CAPACITY QUEUES = 57109.2 PCU. HRS./HR.

(ON LINKS = 53460.7 ON CENTROIDS = 3648.5)

LINK CRUISE TIME = 15240.7 PCU. HRS./HR.

(FREE FLOW = 14838.1 DELAYS = 402.6)

TOTAL TRAVEL TIME = 76775.8 PCU. HRS./HR.

TRAVEL DISTANCE = 1009596.8 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 13.1 KPH

9.10.2 ABSOLUTE TOTALS:

	THIS TIME PERIOD	NEXT TIME PERIOD	TOTAL	
TRANSIENT QUEUES =	5993.2	4425.9	10419.1	PCU. HRS.
OVER-CAPACITY QUEUES =	37652.9	57109.2	94762.1	PCU. HRS.
(ON LINKS =	35960.5	53460.7	89421.2	
ON CENTROIDS =	1692.4	3648.5	5340.9)	
LINK CRUISE TIME =	20400.5	15240.7	35641.1	PCU. HRS.
(FREE FLOW =	19965.5	14838.1	34803.6	
DELAYS =	434.9	402.6	837.5)	
TOTAL TRAVEL TIME =	64046.6	76775.8	140822.3	PCU. HRS.
TRAVEL DISTANCE =	1245641.0	1009596.8	2255237.8	PCU. KMS.
OVERALL AVERAGE SPEED =	19.4	13.1	16.0	KPH
FUEL CONSUMPTION =	157879.1	156437.5	314316.6	LITRES

9.10.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS TIME PERIOD	NEXT TIME PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	5993.2	4425.9	10419.1	PCU. HRS.
(B) =	87.3	11.4	98.7	
(T) =	6080.5	4437.3	10517.8	
OVER-CAPACITY QUEUES =	37652.9	57109.2	94762.1	PCU. HRS.
(B) =	4229.8	2022.1	6251.8	
(T) =	41882.7	59131.2	101013.9	
LINK CRUISE TIME (S) =	20400.5	15240.7	35641.1	PCU. HRS.
(B) =	7990.6	7990.6		
(BCC) =	16036.5	16036.5		
(T) =	44427.6	15240.7	59668.3	
TOTAL TRAVEL TIME (S) =	64046.6	76775.8	140822.3	PCU. HRS.
(B) =	12307.7	2033.4	14341.1	
(BCC) =	16036.5	16036.5		
(T) =	92390.8	78809.2	171200.0	
TRAVEL DISTANCE (S) =	1245641.0	1009596.8	2255237.8	PCU. KMS.

(B) =	671595.9	671595.9	
(BCC) =	237635.3	237635.3	
(T) =	2154872.2	1009596.8	3164469.0
AVERAGE SPEED (S) =	19.4	13.1	16.0 KPH
(B) =	46.8	46.8	
(BCC) =	14.8	14.8	
(T) =	23.3	12.8	18.5

9.10.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 979645.6

TOTAL NUMBER OF SECOND STOPS/HOUR = 526905.1

TOTAL NUMBER OF STOPS/HOUR = 1506550.8

RATE OF FUEL CONSUMPTION = 157879.1 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 157879.1 LITRES

9.11 SATURN SIMULATION SUMMARY RESULTS (a06ic9)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 5948.3 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 37311.5 PCU. HRS./HR.

(ON LINKS = 35615.3 ON CENTROIDS = 1696.2)

LINK CRUISE TIME = 20278.1 PCU. HRS./HR.

(FREE FLOW = 19855.0 DELAYS = 423.1)

TOTAL TRAVEL TIME = 63537.9 PCU. HRS./HR.

TRAVEL DISTANCE = 1239786.2 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 19.5 KPH

9.11.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4382.8 PCU. HRS.

OVER-CAPACITY QUEUES = 56326.3 PCU. HRS./HR.

(ON LINKS = 52851.2 ON CENTROIDS = 3475.1)

LINK CRUISE TIME = 15075.0 PCU. HRS./HR.

(FREE FLOW = 14684.2 DELAYS = 390.8)

TOTAL TRAVEL TIME = 75784.1 PCU. HRS./HR.

TRAVEL DISTANCE = 999257.2 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 13.2 KPH

9.11.2 ABSOLUTE TOTALS:

	THIS TIME PERIOD	NEXT TIME PERIOD	TOTAL	
TRANSIENT QUEUES =	5948.3	4382.8	10331.1	PCU. HRS.
OVER-CAPACITY QUEUES =	37311.5	56326.3	93637.8	PCU. HRS.
(ON LINKS =	35615.3	52851.2	88466.5	
ON CENTROIDS =	1696.2	3475.1	5171.3)	
LINK CRUISE TIME =	20278.1	15075.0	35353.1	PCU. HRS.
(FREE FLOW =	19855.0	14684.2	34539.3	
DELAYS =	423.1	390.8	813.8)	
TOTAL TRAVEL TIME =	63537.9	75784.1	139322.0	PCU. HRS.
TRAVEL DISTANCE =	1239786.2	999257.2	2239043.5	PCU. KMS.
OVERALL AVERAGE SPEED =	19.5	13.2	16.1	KPH
FUEL CONSUMPTION =	157002.2	154689.7	311691.9	LITRES

9.11.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS TIME PERIOD	NEXT TIME PERIOD	TOTAL	
TRANSIENT QUEUES (S) =	5948.3	4382.8	10331.1	PCU. HRS.
(B) =	86.8	11.4	98.2	
(T) =	6035.1	4394.2	10429.3	
OVER-CAPACITY QUEUES =	37311.5	56326.3	93637.8	PCU. HRS.
(B) =	4139.7	1974.5	6114.2	
(T) =	41451.2	58300.8	99752.0	
LINK CRUISE TIME (S) =	20278.1	15075.0	35353.1	PCU. HRS.
(B) =	7936.7	7936.7		
(BCC) =	15949.9	15949.9		
(T) =	44164.7	15075.0	59239.7	
TOTAL TRAVEL TIME (S) =	63537.9	75784.1	139322.0	PCU. HRS.
(B) =	12163.2	1985.9	14149.1	
(BCC) =	15949.9	15949.9		
(T) =	91651.0	77770.0	169421.0	
TRAVEL DISTANCE (S) =	1239786.2	999257.2	2239043.5	PCU. KMS.

(B) = 667080.1 667080.1

(BCC) = 236260.9 236260.9

(T) = 2143127.2 999257.2 3142384.5

AVERAGE SPEED (S) = 19.5 13.2 16.1 KPH

(B) = 47.1 47.1

(BCC) = 14.8 14.8

(T) = 23.4 12.8 18.5

9.11.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 980562.4

TOTAL NUMBER OF SECOND STOPS/HOUR = 523291.6

TOTAL NUMBER OF STOPS/HOUR = 1503854.0

RATE OF FUEL CONSUMPTION = 157002.2 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 157002.2 LITRES

9.12 SATURN SIMULATION SUMMARY RESULTS (a06ic10)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 6160.6 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 38686.8 PCU. HRS./HR.

(ON LINKS = 36557.1 ON CENTROIDS = 2129.6)

LINK CRUISE TIME = 20508.2 PCU. HRS./HR.

(FREE FLOW = 20079.0 DELAYS = 429.3)

TOTAL TRAVEL TIME = 65355.7 PCU. HRS./HR.

TRAVEL DISTANCE = 1246818.4 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 19.1 KPH

9.12.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4794.5 PCU. HRS.

OVER-CAPACITY QUEUES = 60397.9 PCU. HRS./HR.

(ON LINKS = 55698.6 ON CENTROIDS = 4699.3)

LINK CRUISE TIME = 15911.1 PCU. HRS./HR.

(FREE FLOW = 15540.5 DELAYS = 370.6)

TOTAL TRAVEL TIME = 81103.4 PCU. HRS./HR.

TRAVEL DISTANCE = 1035679.9 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 12.8 KPH

9.12.2 ABSOLUTE TOTALS:

	THIS PERIOD TIME	NEXT PERIOD TIME	TOTAL	
TRANSIENT QUEUES =	6160.6	4794.5	10955.1	PCU. HRS.
OVER-CAPACITY QUEUES =	38686.8	60397.9	99084.7	PCU. HRS.

(ON LINKS = 36557.1 55698.6 92255.7
ON CENTROIDS = 2129.6 4699.3 6828.9)
LINK CRUISE TIME = 20508.2 15911.1 36419.3 PCU. HRS.
(FREE FLOW = 20079.0 15540.5 35619.5
DELAYS = 429.3 370.6 799.8)
TOTAL TRAVEL TIME = 65355.7 81103.4 146459.1 PCU. HRS.
TRAVEL DISTANCE = 1246818.4 1035679.9 2282498.2 PCU. KMS.
OVERALL AVERAGE SPEED = 19.1 12.8 15.6 KPH
FUEL CONSUMPTION = 159723.1 163201.4 322924.4 LITRES

.12.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD TIME	NEXT PERIOD TIME	TOTAL	
TRANSIENT QUEUES (S) =	6160.6	4794.5	10955.1	PCU. HRS.
(B) =	94.4	10.1	104.4	
(T) =	6255.0	4804.6	11059.6	
OVER-CAPACITY QUEUES =	38686.8	60397.9	99084.7	PCU. HRS.
(B) =	5150.2	3056.8	8207.0	
(T) =	43836.9	63454.7	107291.6	
LINK CRUISE TIME (S) =	20508.2	15911.1	36419.3	PCU. HRS.
(B) =	8288.0	8288.0		
(BCC) =	15778.5	15778.5		
(T) =	44574.7	15911.1	60485.8	
TOTAL TRAVEL TIME (S) =	65355.7	81103.4	146459.1	PCU. HRS.
(B) =	13532.5	3066.9	16599.4	
(BCC) =	15778.5	15778.5		
(T) =	94666.7	84170.3	178837.0	
RAVEL DISTANCE (S) =	1246818.4	1035679.9	2282498.2	PCU. KMS.
(B) =	680311.8	680311.8		
(BCC) =	229763.3	229763.3		
(T) =	2156893.5	1035679.9	3192573.5	
VERAGE SPEED (S) =	19.1	12.8	15.6	KPH
(B) =	41.0	41.0		
(BCC) =	14.6	14.6		
(T) =	22.8	12.3	17.9	

9.12.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 1005710.8

TOTAL NUMBER OF SECOND STOPS/HOUR = 507494.4

TOTAL NUMBER OF STOPS/HOUR = 1513205.2

RATE OF FUEL CONSUMPTION = 159723.1 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 159723.1 LITRES

9.13 SATURN SIMULATION SUMMARY RESULTS (a06ic11)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 6080.6 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 39156.0 PCU. HRS./HR.

(ON LINKS = 37579.5 ON CENTROIDS = 1576.5)

LINK CRUISE TIME = 20720.6 PCU. HRS./HR.

(FREE FLOW = 20372.4 DELAYS = 348.2)

TOTAL TRAVEL TIME = 65957.2 PCU. HRS./HR.

TRAVEL DISTANCE = 1273041.8 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 19.3 KPH

9.13.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 5495.5 PCU. HRS.

OVER-CAPACITY QUEUES = 63976.9 PCU. HRS./HR.

(ON LINKS = 60581.3 ON CENTROIDS = 3395.6)

LINK CRUISE TIME = 17933.8 PCU. HRS./HR.

(FREE FLOW = 17593.2 DELAYS = 340.6)

TOTAL TRAVEL TIME = 87406.2 PCU. HRS./HR.

TRAVEL DISTANCE = 1188863.5 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 13.6 KPH

9.13.2 ABSOLUTE TOTALS:

	THIS PERIOD TIME	NEXT PERIOD TIME	TOTAL	
TRANSIENT QUEUES =	6080.6	5495.5	11576.1	PCU. HRS.
OVER-CAPACITY QUEUES =	39156.0	63976.9	103132.9	PCU. HRS.
(ON LINKS =	37579.5	60581.3	98160.8	
ON CENTROIDS =	1576.5	3395.6	4972.1)	
LINK CRUISE TIME =	20720.6	17933.8	38654.4	PCU. HRS.
(FREE FLOW =	20372.4	17593.2	37965.6	
DELAYS =	348.2	340.6	688.8)	
TOTAL TRAVEL TIME =	65957.2	87406.2	153363.4	PCU. HRS.
TRAVEL DISTANCE =	1273041.8	1188863.5	2461905.2	PCU. KMS.
OVERALL AVERAGE SPEED =	19.3	13.6	16.1	KPH
FUEL CONSUMPTION =	162291.6	181366.6	343658.2	LITRES

9.13.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD TIME	NEXT PERIOD TIME	TOTAL	
TRANSIENT QUEUES (S) =	6080.6	5495.5	11576.1	PCU. HRS.
(B) =	89.3	8.7	98.0	
(T) =	6169.9	5504.2	11674.1	
OVER-CAPACITY QUEUES =	39156.0	63976.9	103132.9	PCU. HRS.
(B) =	4631.3	2084.1	6715.5	
(T) =	43787.3	66061.0	109848.4	
LINK CRUISE TIME (S) =	20720.6	17933.8	38654.4	PCU. HRS.
(B) =	8466.3	8466.3		
(BCC) =	15206.6	15206.6		
(T) =	44393.5	17933.8	62327.3	
TOTAL TRAVEL TIME (S) =	65957.2	87406.2	153363.4	PCU. HRS.
(B) =	13187.0	2092.8	15279.8	
(BCC) =	15206.6	15206.6		
(T) =	94350.7	89499.1	183849.8	
TRAVEL DISTANCE (S) =	1273041.8	1188863.5	2461905.2	PCU. KMS.

	(B) =	701124.6	701124.6	
	(BCC) =	225597.1	225597.1	
	(T) =	2199763.5	1188863.5	3388627.0
AVERAGE SPEED	(S) =	19.3	13.6	16.1 KPH
	(B) =	45.9	45.9	
	(BCC) =	14.8	14.8	
	(T) =	23.3	13.3	18.4

9.13.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 1020529.4

TOTAL NUMBER OF SECOND STOPS/HOUR = 513251.8

TOTAL NUMBER OF STOPS/HOUR = 1533781.1

RATE OF FUEL CONSUMPTION = 162291.6 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 162291.6 LITRES

9.14 SATURN SIMULATION SUMMARY RESULTS (a06ic12)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 5961.0 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 37361.2 PCU. HRS./HR.

(ON LINKS = 35684.5 ON CENTROIDS = 1676.6)

LINK CRUISE TIME = 20302.9 PCU. HRS./HR.

(FREE FLOW = 19870.0 DELAYS = 433.0)

TOTAL TRAVEL TIME = 63625.1 PCU. HRS./HR.

TRAVEL DISTANCE = 1240663.2 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 19.5 KPH

9.14.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4397.1 PCU. HRS.

OVER-CAPACITY QUEUES = 56526.9 PCU. HRS./HR.

(ON LINKS = 53103.7 ON CENTROIDS = 3423.2)

LINK CRUISE TIME = 15104.6 PCU. HRS./HR.

(FREE FLOW = 14707.7 DELAYS = 396.9)

TOTAL TRAVEL TIME = 76028.6 PCU. HRS./HR.

TRAVEL DISTANCE = 1000540.3 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 13.2 KPH

9.14.2 ABSOLUTE TOTALS:

	THIS PERIOD TIME	NEXT PERIOD TIME	TOTAL	
TRANSIENT QUEUES =	5961.0	4397.1	10358.1	PCU. HRS.
OVER-CAPACITY QUEUES =	37361.2	56526.9	93888.1	PCU. HRS.
(ON LINKS =	35684.5	53103.7	88788.3	
ON CENTROIDS =	1676.6	3423.2	5099.8)	
LINK CRUISE TIME =	20302.9	15104.6	35407.6	PCU. HRS.
(FREE FLOW =	19870.0	14707.7	34577.6	
DELAYS =	433.0	396.9	829.9)	
TOTAL TRAVEL TIME =	63625.1	76028.6	139653.7	PCU. HRS.
TRAVEL DISTANCE =	1240663.2	1000540.3	2241203.5	PCU. KMS.
OVERALL AVERAGE SPEED =	19.5	13.2	16.0	KPH
FUEL CONSUMPTION =	157047.1	154952.2	311999.2	LITRES

9.14.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD TIME	NEXT PERIOD TIME	TOTAL	
TRANSIENT QUEUES (S) =	5961.0	4397.1	10358.1	PCU. HRS.
(B) =	86.7	11.4	98.1	
(T) =	6047.7	4408.4	10456.1	
OVER-CAPACITY QUEUES =	37361.2	56526.9	93888.1	PCU. HRS.
(B) =	4145.1	1976.6	6121.7	
(T) =	41506.3	58503.5	100009.8	
LINK CRUISE TIME (S) =	20302.9	15104.6	35407.6	PCU. HRS.
(B) =	7943.2	7943.2		
(BCC) =	15962.2	15962.2		
(T) =	44208.4	15104.6	59313.0	
TOTAL TRAVEL TIME (S) =	63625.1	76028.6	139653.7	PCU. HRS.
(B) =	12175.0	1988.0	14163.0	
(BCC) =	15962.2	15962.2		
(T) =	91762.4	78016.6	169778.9	
TRAVEL DISTANCE (S) =	1240663.2	1000540.3	2241203.5	PCU. KMS.

(B) =	667612.4	667612.4	
(BCC) =	236462.0	236462.0	
(T) =	2144737.5	1000540.3	3145277.8
AVERAGE SPEED (S) =	19.5	13.2	16.0 KPH
(B) =	47.1	47.1	
(BCC) =	14.8	14.8	
(T) =	23.4	12.8	18.5

9.14.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 974025.9

TOTAL NUMBER OF SECOND STOPS/HOUR = 525926.7

TOTAL NUMBER OF STOPS/HOUR = 1499952.6

RATE OF FUEL CONSUMPTION = 157047.1 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 157047.1 LITRES

9.15 SATURN SIMULATION SUMMARY RESULTS (a06ic13)

NOTE THAT THE FOLLOWING STATISTICS ARE GIVEN AS RATES E.G., PCU.HRS/HR AS OPPOSED TO THE PCU.HRS OF TRAVEL TIME DURING THE TIME PERIOD SIMULATED; THESE ARE GIVEN BELOW.

LINK CRUISE TIME INCLUDES FREE FLOW PLUS DELAYS ON LINKS, DELAYED TIME IS TIME SPENT AT INTERSECTIONS AND THAT QUEUED TIME REFERS TO THE ADDITIONAL TIME SPENT QUEUING AT INTERSECTIONS WHICH ARE OVER CAPACITY.

FINALLY NOTE THAT THE FIGURES ONLY INCLUDE TRAVEL IN THE TIME PERIOD SIMULATED. THE EXTRA TRAVEL TIME AND DISTANCE IN LATER PERIODS DUE TO VEHICLES QUEUED AT OVER-CAPACITY INTERSECTIONS IS ALSO GIVEN BELOW.

TRANSIENT QUEUES = 5923.3 PCU. HRS./HR.

OVER-CAPACITY QUEUES = 37080.5 PCU. HRS./HR.

(ON LINKS = 35401.6 ON CENTROIDS = 1679.0)

LINK CRUISE TIME = 20185.2 PCU. HRS./HR.

(FREE FLOW = 19760.6 DELAYS = 424.6)

TOTAL TRAVEL TIME = 63189.0 PCU. HRS./HR.

TRAVEL DISTANCE = 1235045.4 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 19.5 KPH

9.15.1 ESTIMATED TOTALS FOR QUEUED TRAFFIC COMPLETING THEIR JOURNEY IN THE NEXT TIME PERIOD:

TRANSIENT QUEUES = 4336.8 PCU. HRS.

OVER-CAPACITY QUEUES = 55725.2 PCU. HRS./HR.

(ON LINKS = 52371.2 ON CENTROIDS = 3354.0)

LINK CRUISE TIME = 14973.2 PCU. HRS./HR.

(FREE FLOW = 14582.3 DELAYS = 390.9)

TOTAL TRAVEL TIME = 75035.2 PCU. HRS./HR.

TRAVEL DISTANCE = 993759.4 PCU. KMS./HR.

OVERALL AVERAGE SPEED = 13.2 KPH

9.15.2 ABSOLUTE TOTALS:

	THIS PERIOD TIME	NEXT PERIOD TIME	TOTAL	
TRANSIENT QUEUES =	5923.3	4336.8	10260.1	PCU. HRS.
OVER-CAPACITY QUEUES =	37080.5	55725.2	92805.7	PCU. HRS.
(ON LINKS =	35401.6	52371.2	87772.8	
ON CENTROIDS =	1679.0	3354.0	5032.9)	
LINK CRUISE TIME =	20185.2	14973.2	35158.4	PCU. HRS.
(FREE FLOW =	19760.6	14582.3	34343.0	
DELAYS =	424.6	390.9	815.5)	
TOTAL TRAVEL TIME =	63189.0	75035.2	138224.2	PCU. HRS.
TRAVEL DISTANCE =	1235045.4	993759.4	2228804.8	PCU. KMS.
OVERALL AVERAGE SPEED =	19.5	13.2	16.1	KPH
FUEL CONSUMPTION =	156311.8	153425.7	309737.5	LITRES

9.15.3 SIMULATION (S), BUFFER (B) AND BUFFER CENTROID CONNECTORS (BCC) ABSOLUTE TOTALS:

	THIS PERIOD TIME	NEXT PERIOD TIME	TOTAL	
TRANSIENT QUEUES (S) =	5923.3	4336.8	10260.1	PCU. HRS.
(B) =	86.4	11.3	97.7	
(T) =	6009.7	4348.1	10357.8	
OVER-CAPACITY QUEUES =	37080.5	55725.2	92805.7	PCU. HRS.
(B) =	4067.9	1940.0	6007.9	
(T) =	41148.4	57665.2	98813.6	
LINK CRUISE TIME (S) =	20185.2	14973.2	35158.4	PCU. HRS.
(B) =	7892.3	7892.3		
(BCC) =	15888.6	15888.6		
(T) =	43966.1	14973.2	58939.3	
TOTAL TRAVEL TIME (S) =	63189.0	75035.2	138224.2	PCU. HRS.
(B) =	12046.6	1951.3	13997.9	
(BCC) =	15888.6	15888.6		
(T) =	91124.2	76986.5	168110.7	
TRAVEL DISTANCE (S) =	1235045.4	993759.4	2228804.8	PCU. KMS.

(B) = 663392.3 663392.3

(BCC) = 235286.8 235286.8

(T) = 2133724.5 993759.4 3127484.0

AVERAGE SPEED (S) = 19.5 13.2 16.1 KPH

(B) = 47.4 47.4

(BCC) = 14.8 14.8

(T) = 23.4 12.9 18.6

9.15.4 FUEL CONSUMPTION SATISTICS

FUEL CONSUMPTION IS ESTIMATED USING THE FOLLOWING EQUATION

TFC = FLPK*TTD + FLPH*TDT + FLPPS*S1 + FLPSS*S2

WHERE TFC = FUEL CONSUMPTION IN LITRES PER HOUR

TTD = TOTAL TRAVEL DISTANCE PER HOUR

FLPK = .07 LITRES/KM.

TDT = TOTAL DELAYED TIME (IDLING) PER HOUR

FLPH = 1.20 LITRES/HR.

S1 = NUMBER OF PRIMARY STOPS AT INTERSECTIONS

FLPPS = .016 LITRES PER PRIMARY STOP

S2 = NUMBER OF SECOND STOPS AT INTERSECTIONS

FLPSS = .005 LITRES PER SECOND STOP

TOTAL NUMBER OF PRIMARY STOPS/HOUR= 977927.8

TOTAL NUMBER OF SECOND STOPS/HOUR = 521449.5

TOTAL NUMBER OF STOPS/HOUR = 1499377.2

RATE OF FUEL CONSUMPTION = 156311.8 LITRES/HOUR

FUEL CONSUMED DURING TIME PERIOD = 156311.8 LITRES

Appendix 10

Sample Network file representing the 2000 Dublin Transportation Network with inner city cordon application

The following is the Network file used for the DTNM for 2000 with the inner city cordon application applied in file "a00icrd1.444", see the following subsection, which defines the cordon boundaries and applies a cordon charge of 3000seconds for crossing the boundary. See van Vliet and Hall (2001) for more information on these files and how to read them.

10.1 Network file

```
* a00h-by1        09 Feb 99
 &OPTION
UPDATE =    F
PASSQ  =    F
PLOD   =    F
 &END
DTO AM 2000 a00h-by1 BaseYear                    09 Feb 99
*
*$INCLUDE a00h-by0.800
*$INCLUDE a00h-by0.222
*$INCLUDE a00icrd1.444
*$INCLUDE a00h-by0.555
*$INCLUDE a00h-by0.666
*
* Basis:  a06h-dm0
* 09 Feb 99   222 Separated into $INCLUDE file
* 02 Feb 99   555 Rebased to OSGR
* 27 Jan 99   666 Comprehensive review of frequencies
* 18 Jan 99   666 Comprehensive review of routings
* 14 Dec 98   111 SMcG's edits for Ballsbridge, Sandymount
 &PARAM
AMY    =    F    * T  Assignments with free flow travel times
ASHORT =     T *  ** T  Assignment statistics in table (not per iteration)
AUTOX  =    F    * T  Automatically code external nodes
AUTOZ  =    F    * T  Automatically code zones
BEAKER =    F    * T  Capacity index applies to simulation turns
```

BUSKER = F * ** T Bus routes output to BUS file
COMPAR = F * T Flows compared with previous iteration
DIDDLE = T * T Assignment starts with previous flows
DUTCH = T * * T Buffer nodes up to 8 digits
ERTM = F ** T Negative trips are assigned
EXPERT = F * T Level of printout only for an expert
EZBUS = T * T Bus data in 666 cards in free format
FOZZY = T * T Interpolate bus routes
LEFTDR = T * T Left-hand drive assumed
LIST = T * T SATNET lists input records in LPN
MTFLOW = F * T Assigned flows for each iteration compared with counts
PARTAN = F * ** T PARTAN option for Wardrop
PRE92 = F ** T Ignore certain new options
PRINT = F * * T SATNET prints network description
PRINTF = F * T SATASS prints flows
PRSFD = F * T SATSIM prints flow delay params for each iteration
REDMEN = F ** T Elastic assignment parameter
ROSIE = F * * T FDCs for shared lanes = f(total flow)
SAVEIT = T * T SATASS saves link costs for tree building
SHANDY = F * ** T Link distances compared with crow-flies distances
SIGOPT = F * ** T SATALL optimises green splits
SPEEDS = T * T Simulation coding in speeds (not times)
SUZIE = F * T Assignment is SUE
SUZIEQ = F * T SATASS prints divergence from minimum cost paths
WINDY = T ** T Terminal does not scroll
IFCC = 2 * Default for CCs in buffer
IFRL = 2 * Default for real links in buffer
IROCKY = 10000 * * Divisor of zone number for sector
ISTOP = 90 ***** Convergence parameter
KNOBS = 0 * Number of extra data fields in buffer
KOB = 0 * Type of random distribution of link costs in SUE
KOMBI = 2 * Iteration where flows are averaged
KORN = 0 * Seed value for random number generation

KPHMIN = 10 * * Minimum free flow speed
KPHMAX = 121 * Maximum free flow speed
LCY = 120 * Duration of signal cycle
LRTP = 0 * Length of random time period
LTP = 60 * Length of simulated time period
MASL = 30 ***** Maximum number of assignment / simulation loops
MAXDTP = 10 * * Maximum transient delay
MAXQCT = 60 * * Maximum queue clearsnce time
MAXZN = 92000 * Maximum zone name
MCCS = 1 * Number of count fields
MCGILL = 0 ** Elastic assignment parameter
MCOPT = 0 ** Elastic assignment parameter
MINRED = 8 * * Minimum red phase
MINSAT = 450 * * Minimum saturation flow
MODET = 0 * Terminal information
NITA = 49 ***** Maximum number of iterations in SATASS
NITS = 30 ***** Maximum number of iterations in SATSIM
NOMADS = 2 * Number of multiple user classes
NOPD = 0 * Non-zero to supress platoon dispersion
NOTUK = 1 * * Opposing right turners do not hook
NUC = 15 * Number of time units per cycle
NUCMIN = 15 ** Minimum NUC
ALEX = 5.75 * Average length of a vehicle externally
BCRP = 5.00 * Buffer capacity restraint power
*BETA = 0.10 ** Elastic assignment parameter
BUSPCU = 3.00 * Factor bus flows to PCU
CAPMIN = 30.00 * Minimum capacity for give way turn
DEFCAP =1250.00 * ** Default lane capacity to external node
FISTOP = 0.05 * ** Wardrop assignment stopping parameter
FLPK = 0.07 ** Fuel consumption L/Km/PCU
FLPH = 1.20 ** Fuel consumption L/Hr/PCU
FLPPS = 0.016 ** Fuel consumption L/primary stop
FLPSS = 0.005 ** Fuel consumption L/secondary stop

```
GAP    = 1.50 *  *   Gap accepted at priority and signals
GAPM   = 1.00 *  *   Gap accepted at merges
GAPR   = 1.00 *  *   Gap accepted at roundabouts
GONZO  = 1.00    *   Trip matrix factor
PCNEAR = 5.00    **  Percentage change for ISTOP
*POWER  = -1.00   **  Elastic assignment parameter
PPK    = 6.84    *   Pence per kilometre
PPM    = 6.00    *   Pence per minute
SUET   = 0.20    *   Link cost variation in SUE
TAX    = 2.00    *   Number of X coded PCU clear after green
TDEL   = 3.00    *   Geometric delay at priority and roundabouts
UNCRTS = 0.20 *  **  Wardrop assignment stopping parameter
XFSTOP = 0.05 *  **  Wardrop assignment stopping parameter
XYUNIT = 1.00    *   Metres in co-ordinate definitions
XYFORM ='2I10'   **  Format to define co-ordinates
 &END
11111
$INCLUDE a00h-by0.800
99999
22222
$INCLUDE a00h-by0.222
99999
33333
C   34227    8176  10  10   0 2S 1500 0.0   0
C   35405    5396   6   6   0 2S  600 0.0   0
C   35426    8105  10  10   0 2S 1600 0.0   0
C   35429    8106   4   4   0 2S  400 0.0   0
C   35430    8105   6   6   0 2S  600 0.0   0
C   35431    8107   3   3   0 2S  200 0.0   0
C   35432    8109   3   3   0 2S  200 0.0   0
C   35519    8104   9   9   0 2S 1200 0.0   0
C   35536    8127   5   5   0 2S  500 0.0   0
C   35537    8127   6   6   0 2S  700 0.0   0
```

C 35538 8118 11 11 0 2S 1900 0.0 0
C 35539 8119 8 8 0 2S 1000 0.0 0
C 35540 8127 3 3 0 2S 100 0.0 0
C 35606 8125 3 3 0 2S 200 0.0 0
C 35618 8125 13 13 0 2S 3000 0.0 0
C 35620 8134 5 5 0 2S 500 0.0 0
C 35621 8135 16 16 0 2S 5000 0.0 0
C 35622 8124 5 5 0 2S 500 0.0 0
C 35625 8137 13 13 0 2S 3000 0.0 0
C 35641 8137 12 12 0 2S 2500 0.0 0
C 35702 8114 10 10 0 2S 1400 0.0 0
C 35703 8113 3 3 0 2S 100 0.0 0
C 35707 8113 14 14 0 2S 3800 0.0 0
C 35723 8101 12 12 0 2S 2500 0.0 0
C 35728 8103 3 3 0 2S 200 0.0 0
C 35733 8102 3 3 0 2S 200 0.0 0
C 35734 8101 3 3 0 2S 200 0.0 0
C 36601 9428 10 10 0 2S 1000 0.0 0
C 42202 8261 5 5 0 2S 523 0.0 0
C 42211 8263 6 6 0 2S 732 0.0 0
C 42211 8260 6 6 0 2S 700 0.0 0
C 42222 8262 6 6 0 2S 600 0.0 0
C 42223 8262 5 5 0 2S 500 0.0 0
C 42224 8264 10 10 0 2S 350 0.0 0
C 42224 8265 8 8 0 2S 1000 0.0 0
C 42225 8262 4 4 0 2S 700 0.0 0
C 43415 8207 11 11 0 2S 900 0.0 999
C 43415 8208 9 9 0 2S 1300 0.0 999
C 43416 8176 4 4 0 2S 279 0.0 999
C 43416 8208 10 10 0 2S 1568 0.0 999
C 43417 8206 4 4 0 2S 383 0.0 999
C 42428 8249 8 8 0 2S 1000 0.0 0
C 42428 8250 8 8 0 2S 1000 0.0 0

C	42431	8240	8	8	0	2S	1100	0.0	0
C	42431	8250	7	7	0	2S	900	0.0	0
C	42437	8251	6	6	0	2S	700	0.0	0
C	42438	8251	6	6	0	2S	600	0.0	0
C	42439	8235	4	4	0	2S	450	0.0	0
C	42439	8247	8	8	0	2S	1000	0.0	0
C	42440	8250	8	8	0	2S	1000	0.0	0
C	42440	8240	8	8	0	2S	1100	0.0	0
C	42530	8234	5	5	0	2S	523	0.0	0
C	42532	8234	6	6	0	2S	800	0.0	0
C	42532	8246	11	11	0	2S	700	0.0	0
C	42533	8246	5	5	0	2S	558	0.0	0
C	42601	8244	14	14	0	2S	3700	0.0	0
C	42601	8299	16	16	0	2S	5576	0.0	0
C	42618	8218	6	6	0	2S	100	0.0	0
C	42621	8228	6	6	0	2S	100	0.0	0
C	42627	8245	11	11	0	2S	1812	0.0	0
C	42627	8229	7	7	0	2S	906	0.0	0
C	50209	8341	6	6	0	2S	600	0.0	999
C	50212	8355	5	5	0	2S	500	0.0	999
C	50212	8354	6	6	0	2S	300	0.0	999
C	50213	8353	3	3	0	2S	200	0.0	999
C	50214	8356	4	4	0	2S	400	0.0	999
C	50215	8354	5	5	0	2S	500	0.0	999
C	50215	8362	6	6	0	2S	600	0.0	999
C	50216	8351	6	6	0	2S	700	0.0	999
C	50216	4327	6	6	0	2S	600	0.0	999
C	50342	8374	3	3	0	2S	200	0.0	999
C	50351	8375	4	4	0	2S	400	0.0	999
C	50351	8368	4	4	0	2S	400	0.0	999
C	50352	8375	3	3	0	2S	200	0.0	999
C	50352	8368	3	3	0	2S	400	0.0	999
C	50432	8371	4	4	0	2S	300	0.0	999

C 50433 8359 6 6 0 2S 600 0.0 999
C 50434 8371 5 5 0 2S 500 0.0 999
C 50435 8371 6 6 0 2S 700 0.0 999
C 50436 8371 6 6 0 2S 600 0.0 999
C 50436 8364 4 4 0 2S 400 0.0 999
C 50443 8373 5 5 0 2S 500 0.0 999
C 50443 8372 5 5 0 2S 500 0.0 999
C 50443 8365 7 7 0 2S 900 0.0 999
C 50444 8368 4 4 0 2S 400 0.0 999
C 50445 8362 4 4 0 2S 300 0.0 999
C 50445 8367 6 6 0 2S 600 0.0 999
C 50446 8367 4 4 0 2S 400 0.0 999
C 50447 8366 4 4 0 2S 400 0.0 999
C 50447 8365 6 6 0 2S 600 0.0 999
C 50448 8360 4 4 0 2S 279 0.0 999
C 50448 8359 6 6 0 2S 697 0.0 999
C 50449 8366 6 6 0 2S 700 0.0 999
C 50449 8361 4 4 0 2S 400 0.0 999
C 50450 8372 5 5 0 2S 500 0.0 999
C 50450 8365 5 5 0 2S 500 0.0 999
C 50458 8359 10 10 0 2S 1429 0.0 999
C 50458 8364 9 9 0 2S 1220 0.0 999
C 50459 8357 5 5 0 2S 500 0.0 999
C 50507 8359 8 8 0 2S 941 0.0 999
C 50507 8358 4 4 0 2S 350 0.0 999
C 50518 8359 4 4 0 2S 418 0.0 999
C 50519 8336 7 7 0 2S 836 0.0 999
C 50521 8362 9 9 0 2S 1200 0.0 999
C 50553 8340 5 5 0 2S 500 0.0 999
C 50554 8322 8 8 0 2S 1080 0.0 999
C 50554 8323 6 6 0 2S 732 0.0 999
C 50555 8340 5 5 0 2S 500 0.0 999
C 50555 8341 6 6 0 2S 600 0.0 999

C 50556 8321 7 7 0 2S 836 0.0 999
C 51201 8304 6 6 0 2S 700 0.0 999
C 51201 8302 8 8 0 2S 1000 0.0 999
C 51202 8308 4 4 0 2S 453 0.0 999
C 51203 8263 4 4 0 2S 400 0.0 999
C 51203 8303 5 5 0 2S 500 0.0 999
C 51204 8310 5 5 0 2S 500 0.0 999
C 51205 8302 5 5 0 2S 523 0.0 999
C 51206 8308 8 8 0 2S 1045 0.0 999
C 51206 8304 6 6 0 2S 697 0.0 999
C 51222 4306 5 5 0 2S 500 0.0 999
C 51222 8301 4 4 0 2S 383 0.0 999
C 51224 4306 6 6 0 2S 600 0.0 999
C 51240 8306 4 4 0 2S 400 0.0 999
C 51240 4309 6 6 0 2S 600 0.0 999
C 51437 8320 10 10 0 2S 1700 0.0 999
C 51437 8318 5 5 0 2S 500 0.0 999
C 51438 4309 5 5 0 2S 500 0.0 999
C 51439 8318 4 4 0 2S 400 0.0 999
C 51439 8308 4 4 0 2S 400 0.0 999
C 51439 8310 7 7 0 2S 800 0.0 999
C 51562 8349 5 5 0 2S 500 0.0 999
C 51465 8320 6 6 0 2S 700 0.0 999
C 51466 8320 9 9 0 2S 1200 0.0 999
C 51520 8323 6 6 0 2S 592 0.0 999
C 51557 8315 8 8 0 2S 941 0.0 999
C 51560 8332 10 10 0 2S 1500 0.0 999
C 51560 8315 15 15 0 2S 4704 0.0 999
C 51561 8349 6 6 0 2S 627 0.0 999
C 51562 8349 5 5 0 2S 500 0.0 999
C 51569 8305 7 7 0 2S 900 0.0 999
C 60007 8146 18 18 0 2S 6400 0.0 999
C 60007 8154 14 14 0 2S 3800 0.0 999

C 60008 8136 11 11 0 2S 1900 0.0 999
C 60009 8156 8 8 0 2S 1000 0.0 999
C 60010 8146 8 8 0 2S 1000 0.0 999
C 60011 8135 20 20 0 2S 9000 0.0 999
C 60011 8138 20 20 0 2S 9600 0.0 999
C 60012 8145 18 18 0 2S 6400 0.0 999
C 60014 8154 11 11 0 2S 2000 0.0 999
C 60016 8138 8 8 0 2S 1000 0.0 999
C 60017 8155 11 11 0 2S 2000 0.0 999
C 60048 8124 20 20 0 2S 9600 0.0 999
C 71034 8214 8 8 0 2S 1000 0.0 999
C 71037 8214 11 11 0 2S 2000 0.0 999
C 71039 8204 8 8 0 2S 1000 0.0 999
C 71040 8202 8 8 0 2S 1000 0.0 999
C 71041 8213 13 13 0 2S 3000 0.0 999
C 71059 8212 13 13 0 2S 3000 0.0 999
C 71072 8227 11 11 0 2S 2000 0.0 999
C 71076 8228 18 18 0 2S 6400 0.0 999
C 71076 8243 14 14 0 2S 3800 0.0 999
C 71082 8228 16 16 0 2S 5800 0.0 999
C 81010 8242 11 11 0 2S 2000 0.0 999
C 81011 8242 15 15 0 2S 4500 0.0 999
C 81021 8243 11 11 0 2S 2000 0.0 999
C 81022 8241 20 20 0 2S 9999 0.0 999
C 81030 8241 20 20 0 2S 9999 0.0 999
C 81103 8346 5 5 0 2S 500 0.0 999
C 81104 8348 8 8 0 2S 1000 0.0 999
C 81105 8329 9 9 0 2S 1300 0.0 999
C 81106 8332 6 6 0 2S 600 0.0 999
C 81232 8343 7 7 0 2S 900 0.0 999
C 81233 8314 8 8 0 2S 1000 0.0 999
C 81234 8344 9 9 0 2S 1300 0.0 999
C 81235 8328 8 8 0 2S 1000 0.0 999

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C  81236    8313  11  11   0 2S  2000 0.0 999
C  81237    8327  11  11   0 2S  2000 0.0 999
C  81247    8313  14  14   0 2S  4000 0.0 999
C  81256    8343  13  13   0 2S  3000 0.0 999
C  81260    8342   8   8   0 2S  1000 0.0 999
C  81261    8325   8   8   0 2S  1000 0.0 999
C  81264    8326  11  11   0 2S  2000 0.0 999
C  90100    8324  20  20   0 2S  9999 0.0 999
C  90200    8225  20  20   0 2S  9999 0.0 999
C  90300    9421  20  20   0 2S  9999 0.0 999
C  91400    8145  20  20   0 2S  9999 0.0 999
C  91500    8135  20  20   0 2S  9999 0.0 999
C  91600    8111  20  20   0 2S  9999 0.0 999
   8101    8102  73  73 1400  S  6500 1.9   4
   8101    8103  73  73 1400  S  7900 1.9   4
   8101    8113  73  73 1400  S  6300 1.9   4
   8102    8103  73  73 1400  S  5100 1.9   4
   8103    8116  73  73 1400  S  3200 1.9   4
   8104    8117  73  73 1400  S  4000 1.9   4
   8105    5396  73  73 1400  S  4100 1.9   4
   8105    8106  35  25  600  S  1400 4.4  10
   8105    8119  67  67  600  S  3000 1.9   5
   8106    8107  73  73 1400  S  2900 1.9   4
   8106    8108  67  67  600  S  3600 0.0   5
   8107    8109  73  73 1400  S  2500 1.9   4
   8108    8109  67  67  600  S   900 0.0   5
   8108    8110  67  67  600  S  1100 0.0   5
   8109    2080  73  73 1400  S  2400 1.9   4
   8110    5395  67  67  600  S  1300 0.0   5
   8110    5396  67  67  600  S  1000 0.0   5
   8111    8112  76  76 1800  S  4300 1.8   3
   8111    8115 112 101 5200  S 11500 5.9   1   M1 Balbriggan BP
   8112    8113  25  25  600  S  1300 4.4  10
```

8113	8114	25	25	600	S	1300	4.4	10
8113	8124	73	73	1400	S	8800	1.9	4
8114	8115	76	76	1800	S	6000	1.8	3
8115	8116	76	76	1800	S	5700	1.8	3
8116	8117	76	76	1800	S	2700	1.8	3
8116	8125	73	73	1400	S	5400	1.9	4
8117	8118	93	93	4800	S	1700	5.3	2
8118	8119	105	93	4800	S	1200	5.3	2
8118	8127	35	25	600	S	700	4.4	10
8119	8120	105	93	4800	S	1000	5.3	2
8119	8127	35	25	600	S	900	4.4	10
8120	8127	35	25	600	S	1100	4.4	10
8124	8125	73	73	1400	S	7600	1.9	4
8125	8126	73	73	1400	S	5000	1.9	4
8126	8127	84	73	1400	S	3800	1.9	4
8126	8128	84	73	1400	S	4100	1.9	4
8126	8136	84	73	1400	S	8300	1.9	4
8128	8134	67	67	600	S	3000	0.0	5
8134	8137	67	67	600	S	4500	0.0	5
8135	8136	76	76	1800	S	2500	1.8	3
8136	8137	76	76	1800	S	6400	1.8	3
8136	8138	35	35	600	S	5700	0.0	5
8138	8146	25	25	600	S	5800	4.4	10
8145	8146	76	76	1800	S	4600	1.8	3
8146	8147	76	76	1800	S	9600	1.8	3
8147	8148	101	101	5200	S	1600	5.9	1
8147	8156	25	25	600	S	1200	4.4	10
8148	8156	35	25	600	S	950	4.4	10
8154	8155	73	73	1400	S	9000	1.9	4
8155	8156	73	73	1400	S	1900	1.9	4
8156	8162	73	73	1400	S	3800	1.9	4
8162	9414	67	67	600	S	450	0.0	5
9413	9414	67	67	600	S	1050	0.0	5

8175	9413	67	67	600	S	1580	0.0	5	
8175	8176	67	67	600	S	1800	0.0	5	
8176	8206	25	25	600	S	650	4.4	10	
8176	8207	25	25	600	S	600	4.4	10	
8176	8208	25	25	600	S	2100	4.4	10	
8201	8202	76	76	1800	S	4500	1.8	3	
8202	8203	25	25	600	S	3200	4.4	10	
8203	8204	76	76	1800	S	4700	1.8	3	
8204	8205	25	25	600	S	2000	4.4	10	
8205	9422	73	73	1400	S	800	1.9	4	
8206	8207	93	93	4800	S	700	5.3	2	
8206	8214	73	73	1400	S	5900	1.9	4	
8206	9422	73	73	1400	S	800	1.9	4	
8207	8208	93	93	4800	S	1950	5.3	2	
8207	8219	73	73	1400	S	3800	1.9	4	
8212	8213	73	73	1400	S	6100	1.9	4	
8212	8266	73	73	1400	S	8400	1.9	4	
8213	8214	73	73	1400	S	5200	1.9	4	
8218	8219	73	73	1400	S	3700	1.9	4	
8218	8228	73	73	1400	S	3000	1.9	4	
8219	8220	73	73	1400	S	2300	1.9	4	
8225	8226	101	101	5200	S	6600	5.9	1	
8226	8227	93	93	4800	S	3600	5.3	2	
8226	8266	25	25	600	S	2700	4.4	10	
8227	8228	93	93	4800	S	8800	5.3	2	
8228	8229	112	101	7800	S	1200	5.9	1	N7
8229	8230	112	101	7800	S	3400	5.9	1	N7
8229	8245	73	73	1400	S	3000	1.9	4	
8234	8246	45	25	1000	S	1150	4.0	9	
8234	9303	35	25	600	S	1750	4.4	10	
9303	8235	35	25	600	S	1750	4.4	10	
8241	8242	73	73	1400	S	8700	1.9	4	
8242	8243	73	73	1400	S	6600	1.9	4	

8243	8244	73	73	1400	S	2800	1.9	4
8244	8294	84	73	1400	S	9000	1.9	4
8244	8999	84	73	1400	S	4200	1.9	4
8245	8999	84	73	1400	S	4200	1.9	4
8245	8246	105	93	4800	S	2550	5.3	2
8246	8247	105	93	4800	S	250	5.3	2
4394	8259	67	35	200	S	10800	1.0	55
8311	8312	73	73	1400	S	2800	1.9	4
8311	8326	67	67	600	S	9900	0.0	5
8312	8313	73	73	1400	S	8900	1.9	4
8313	8314	73	73	1400	S	3800	1.9	4
8313	8328	73	73	1400	S	1900	1.9	4
8314	8315	73	73	1400	S	5500	1.9	4
8314	8330	73	73	1400	S	2200	1.9	4
8324	8325	76	76	1800	S	10100	1.8	3
8324	8342	73	73	1400	S	8200	1.9	4
8325	8326	101	101	5200	S	3300	5.9	1
8326	8327	93	93	4800	S	3000	5.3	2
8327	8328	76	76	1800	S	4900	1.8	3
8327	8343	73	73	1400	S	1800	1.9	4
8328	8329	93	93	4800	S	1600	5.3	2
8329	8330	93	93	4800	S	1000	5.3	2
8329	8346	25	25	600	S	2900	4.4	10
8330	8331	93	93	4800	S	1400	5.3	2
8331	8332	101	101	5200	S	1600	5.9	1
8332	8333	101	101	5200	S	1600	5.9	1
8331	8347	25	25	600	S	1300	4.4	10
8332	8348	25	25	600	S	600	4.4	10
8342	8343	73	73	1400	S	6800	1.9	4
8343	8344	25	25	600	S	3500	4.4	10
8344	8345	73	73	1400	S	4300	1.9	4
8345	8346	67	67	600	S	4500	0.0	5
8346	8347	67	67	600	S	4500	0.0	5

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    8347    8348  67  67 600  S 4500 0.0   5
    8348    8349  67  67 600  S 4500 0.0   5
    9421    9422 112 101 5200  S 7950 5.9   1
    8129    9428  84  73 2500  S  900 1.9   4
99999
44444
$INCLUDE a00icrd1.444
99999
55555
$INCLUDE a00h-by0.555
99999
66666
$INCLUDE a00h-by0.666
99999
88888
  1   1 1.00 6.00 6.84
  2   2 1.00 6.00 6.84
99999
99999
```

10.2 444 file

```
* a96h-by0        29 Apr 97
*   ANode    BNode          UC1  UC2
* East Link
    1702    1712          150  150
    1712    1702          150  150
* West Link
    8275    9515          210  210
    9515    8275          210  210
* Cordon links with charge of £3 applied,
*     1614    1565         3000 3000
    1615    1564         3000 3000
```

1547 1562 3000 3000
1547 1560 3000 3000
1567 1548 3000 3000
1641 1640 3000 3000
1541 1540 3000 3000
1494 1618 3000 3000
1491 1618 3000 3000
1491 1493 3000 3000
1492 1493 3000 3000
1486 1485 3000 3000
1622 1623 3000 3000
1483 1482 3000 3000
1444 1681 3000 3000
1589 1681 3000 3000
1590 1591 3000 3000
1442 1591 3000 3000
1426 1428 3000 3000
1425 1427 3000 3000
1422 1423 3000 3000
1421 1423 3000 3000
1420 1592 3000 3000
1419 1682 3000 3000
1419 1417 3000 3000
1909 1414 3000 3000
1579 1410 3000 3000
1578 1411 3000 3000
1577 1412 3000 3000
3068 1576 3000 3000
3066 1575 3000 3000
3065 1574 3000 3000
3064 1364 3000 3000
3063 1573 3000 3000
3049 1302 3000 3000

3114	1651	3000 3000
3108	1207	3000 3000
3037	1571	3000 3000
3036	1570	3000 3000
3073	1569	3000 3000

* Low bridges along DART line

1693	1583	-1
1583	1693	-1
1223	1221	-1
1220	1218	-1
1218	1220	-1
1212	1213	-1
1213	1212	-1
1203	1202	-1
1202	1203	-1
1703	1569	-1
1569	1703	-1
3036	3073	-1
3073	3036	-1
3036	3034	-1
3034	3036	-1
3038	3074	-1
3074	3038	-1
3041	3075	-1
3075	3041	-1
3027	3028	-1
3028	3027	-1
3026	3094	-1
3094	3026	-1

Appendix 11

DTO Zones

CSO DED Number	1997 DTO Zone Number (432)	1991 DTI Zone Number (367)	DED Zone Description
2076	11101	11176	North Dock A
2077	11103	11177	North Dock B
2077	11101	11177	North Dock B
2077	11101	11177	North Dock B
2077	11102	11177	North Dock B
2073	13101	13173	Mountjoy A
2073	13102	13173	Mountjoy A
2073	13103	13173	Mountjoy A
2074	13111	13174	Mountjoy B
2074	13112	13174	Mountjoy B
2075	13121	13175	North City
2075	13122	13175	North City
2075	13123	13175	North City
2075	13124	13175	North City
2075	13125	13175	North City
2075	13126	13175	North City
2078	13131	13178	North Dock C
2078	13132	13178	North Dock C
2078	13133	13178	North Dock C
2088	13141	13188	Rotunda A
2088	13142	13188	Rotunda A
2088	13143	13188	Rotunda A
2089	13151	13189	Rotunda B
2089	13152	13189	Rotunda B
2001	14101	14101	Arran Quay A
2002	14111	14102	Arran Quay B
2002	14112	14102	Arran Quay B
2002	14113	14102	Arran Quay B
2003	14121	14103	Arran Quay C
2003	14122	14103	Arran Quay C
2003	14123	14103	Arran Quay C
2004	14131	14104	Arran Quay D
2004	14132	14104	Arran Quay D
2004	14133	14104	Arran Quay D
2005	14141	14105	Arran Quay E

2005	14142	14105	Arran Quay E
2066	14151	14166	Inns Quay A
2066	14152	14166	Inns Quay A
2067	14161	14167	Inns Quay B
2067	14162	14167	Inns Quay B
2068	14171	14168	Inns Quay C
2068	14172	14168	Inns Quay C
2068	14173	14168	Inns Quay C
2009	16109	16109	Ballybough A
2010	16110	16110	Ballybough B
2045	16145	16145	Clontarf West D
2046	16146	16146	Clontarf West E
2047	16147	16147	Drumcondra South A
2048	16148	16148	Drumcondra South B
2024	16224	16224	Beaumont D
2025	16225	16225	Beaumont E
2026	16226	16226	Beaumont F
2042	16242	16242	Clontarf West A
2043	16243	16243	Clontarf West B
2044	16244	16244	Clontarf West C
2058	16258	16258	Gracepark
2093	16293	16293	Whitehall D
2037	16337	16337	Clontarf East A
2038	16338	16338	Clontarf East B
2039	16339	16339	Clontarf East C
2040	16340	16340	Clontarf East D
2041	16341	16341	Clontarf East E
2085	16385	16385	Raheny - Foxfield
2086	16386	16386	Raheny - Greendale
2087	16387	16387	Raheny - St. Assam
2008	16408	16408	Ayrfield
2050	16450	16450	Edenmore
2059	16459	16459	Grange A
2060	16460	16460	Grange B
2061	16461	16461	Grange C
2062	16462	16462	Grange D
2063	16463	16463	Grange E

2064	16464	16464	Harmonstown A
2065	16465	16465	Harmonstown B
2071	16571	16571	Kilmore C
2080	16580	16580	Priorswood A
2081	16581	16581	Priorswood B
2082	16582	16582	Priorswood C
2083	16583	16583	Priorswood D
2084	16584	16584	Priorswood E
2021	16621	16621	Beaumont A
2022	16622	16622	Beaumont B
2023	16623	16623	Beaumont C
2069	16669	16669	Kilmore A
2070	16670	16670	Kilmore B
2072	16672	16672	Kilmore D
2027	17127	17127	Botanic A
2028	17128	17128	Botanic B
2029	17129	17129	Botanic C
2049	17149	17149	Drumcondra South C
2006	17206	17206	Ashtown A
2007	17207	17207	Ashtown B
2030	17230	17230	Cabra East A
2031	17231	17231	Cabra East B
2032	17232	17232	Cabra East C
2033	17233	17233	Cabra West A
2034	17234	17234	Cabra West B
2035	17235	17235	Cabra West C
2036	17236	17236	Cabra West D
2079	17279	17279	Phoenix Park
2011	17311	17311	Ballygall A
2012	17312	17312	Ballygall B
2014	17314	17314	Ballygall D
2051	17351	17351	Finglas North A
2052	17352	17352	Finglas North B
2053	17353	17353	Finglas North C
2054	17354	17354	Finglas South A
2055	17355	17355	Finglas South B
2056	17356	17356	Finglas South C

2057	17357	17357	Finglas South D
2013	17413	17413	Ballygall C
2090	17490	17490	Whitehall A
2091	17491	17491	Whitehall B
2092	17492	17492	Whitehall C
2015	17515	17515	Ballymun A
2016	17516	17516	Ballymun B
2017	17517	17517	Ballymun C
2018	17518	17518	Ballymun D
2019	17519	17519	Ballymun E
2020	17520	17520	Ballymun F
2117	20101	20117	Mansion House A
2117	20102	20117	Mansion House A
2117	20103	20117	Mansion House A
2117	20104	20117	Mansion House A
2117	20105	20117	Mansion House A
2117	20106	20117	Mansion House A
2118	20111	20118	Mansion House B
2118	20112	20118	Mansion House B
2118	20113	20118	Mansion House B
2118	20114	20118	Mansion House B
2118	20115	20118	Mansion House B
2118	20116	20118	Mansion House B
2144	20121	20144	Royal Exchange A
2144	20122	20144	Royal Exchange A
2144	20123	20144	Royal Exchange A
2144	20124	20144	Royal Exchange A
2144	20125	20144	Royal Exchange A
2144	20126	20144	Royal Exchange A
2144	20127	20144	Royal Exchange A
2145	20131	20145	Royal Exchange B
2145	20132	20145	Royal Exchange B
2145	20133	20145	Royal Exchange B
2145	20134	20145	Royal Exchange B
2146	20151	20146	St. Kevin's
2146	20152	20146	St. Kevin's
2146	20153	20146	St. Kevin's

2146	20154	20146	St. Kevin's
2146	20155	20146	St. Kevin's
2146	20156	20146	St. Kevin's
2147	20161	20147	South Dock
2147	20162	20147	South Dock
2147	20163	20147	South Dock
2147	20164	20147	South Dock
2147	20165	20147	South Dock
2147	20166	20147	South Dock
2125	22125	22125	Pembroke East A
2125	22125	22125	Pembroke East A
2152	25101	25152	Ushers A
2152	25102	25152	Ushers A
2153	25121	25153	Ushers B
2153	25122	25153	Ushers B
2154	25131	25154	Ushers C
2154	25132	25154	Ushers C
2155	25141	25155	Ushers D
2156	25151	25156	Ushers E
2157	25161	25157	Ushers F
2157	25162	25157	Ushers F
2119	25201	25219	Merchants Quay A
2119	25202	25219	Merchants Quay A
2120	25211	25220	Merchants Quay B
2120	25212	25220	Merchants Quay B
2121	25231	25221	Merchants Quay C
2121	25232	25221	Merchants Quay C
2122	25241	25222	Merchants Quay D
2122	25242	25222	Merchants Quay D
2123	25251	25223	Merchants Quay E
2124	25261	25224	Merchants Quay F
2161	25271	25261	Wood Quay A
2161	25272	25261	Wood Quay A
2161	25273	25261	Wood Quay A
2162	25281	25262	Wood Quay B
2162	25282	25262	Wood Quay B
2104	28104	28104	Decies

2106	28106	28106	Inchicore A
2108	28108	28108	Kilmainham A
2109	28109	28109	Kilmainham B
2110	28110	28110	Kilmainham C
2094	28194	28194	Chapelizod
2105	28205	28205	Drumfinn
2116	28216	28216	Kylemore
2095	28295	28295	Cherry Orchard A
2096	28296	28296	Cherry Orchard B
2097	28297	28297	Cherry Orchard C
2102	28302	28302	Crumlin E
2103	28303	28303	Crumlin F
2107	28307	28307	Inchicore B
2158	28358	28358	Walkinstown A
2159	28359	28359	Walkinstown B
2098	28398	28398	Crumlin A
2099	28399	28399	Crumlin B
2100	28400	28400	Crumlin C
2101	28401	28401	Crumlin D
2111	28411	28411	Kimmage A
2112	28412	28412	Kimmage B
2113	28413	28413	Kimmage C
2114	28414	28414	Kimmage D
2115	28415	28415	Kimmage E
2160	28460	28460	Walkinstown C
2133	28533	28533	Rathfarnham
2138	28538	28538	Rathmines West A
2141	28541	28541	Rathmines West D
2142	28542	28542	Rathmines West E
2143	28543	28543	Rathmines West F
2148	28548	28548	Terenure A
2149	28549	28549	Terenure B
2150	28550	28550	Terenure C
2151	28551	28551	Terenure D
2126	29126	29126	Pembroke East B
2127	29127	29127	Pembroke East C
2128	29128	29128	Pembroke East D

2129	29129	29129	Pembroke East E
2130	29130	29130	Pembroke West A
2131	29131	29131	Pembroke West B
2132	29132	29132	Pembroke West C
2134	29234	29234	Rathmines East A
2135	29235	29235	Rathmines East B
2136	29236	29236	Rathmines East C
2137	29237	29237	Rathmines East D
2139	29239	29239	Rathmines West B
2140	29240	29240	Rathmines West C
4008	34208	34208	Blanchardstown - Abbotstown
4008	34208	34208	Blanchardstown - Abbotstown
4008	34208	34208	Blanchardstown - Abbotstown
4010	34210	34210	Blanchardstown - Coolmine
4011	34211	34211	Blanchardstown - Corduff
4012	34212	34212	Blanchardstown - Delwood
4013	34213	34213	Blanchardstown - Mulhuddart
4014	34214	34214	Blanchardstown - Roselawn
4015	34215	34215	Blanchardstown - Tyrrelstown
4017	34217	34217	Castleknock - Park
4009	34209	34209	Blanchardstown - Blakestown
4009	34209	34209	Blanchardstown - Blakestown
4009	34209	34209	Blanchardstown - Blakestown
4016	34216	34216	Castleknock - Knockmaroon
4016	34227	34216	Castleknock - Knockmaroon
4027	34227	34227	Lucan North
4004	35304	35304	Baldoyle
4024	35324	35324	Howth
4035	35335	35335	Sutton
4005	35405	35405	Balgriffin
4005	35405	35405	Balgriffin
4005	35405	35405	Balgriffin
4026	35426	35426	Kinsealy
4026	35426	35426	Kinsealy
4026	35429	35429	Malahide East
4030	35430	35430	Malahide West
4031	35431	35431	Portmarnock North

4032	35432	35432	Portmarnock South
4042	35442	35442	Turnapin
4019	35519	35519	Donabate
4036	35536	35536	Swords - Forrest
4037	35537	35537	Swords - Glasmore
4038	35538	35538	Swords - Seatown
4040	35540	35540	Swords - Village
4039	35539	35539	Swords - Lissenhall
4039	35539	35539	Swords - Lissenhall
4006	35606	35606	Ballyboghil
4018	35618	35618	Clonmethan
4021	35621	35621	Garristown
4022	35622	35622	Hollywood
4025	35625	35625	Killsallaghan
4020	35620	35620	Dubber
4020	35620	35620	Dubber
4020	35620	35620	Dubber
4020	35620	35620	Dubber
4041	35641	35641	The Ward
4041	35641	35641	The Ward
4041	35641	35641	The Ward
4002	35702	35702	Balbriggan Rural
4003	35703	35703	Balbriggan Urban
4007	35707	35707	Balscadden
4023	35723	35723	Holmpatrick
4028	35728	35728	Lusk
4028	35728	35728	Lusk
4033	35733	35733	Rush
4034	35734	35734	Skerries
4001	36601	36601	Airport
4001	36601	36601	Airport
4001	36601	36601	Airport
3002	42202	42202	Ballyboden
3011	42211	42211	Edmonstown
3013	42213	42213	Firhouse - Knocklyon
3014	42214	42214	Firhouse - Village
3012	42212	42212	Firhouse - Ballycullen

3012	42212	42212	Firhouse - Ballycullen
3022	42222	42222	Rathfarnham - Ballyroan
3023	42223	42223	Rathfarnham - Butterfield
3024	42224	42224	Rathfarnham - Hermitage
3025	42225	42225	Rathfarnham - St. Enda's
3026	42226	42226	Rathfarnham - Village
3041	42341	42341	Templeogue - Cypress
3042	42342	42342	Templeogue - Kimmage Manor
3043	42343	42343	Templeogue - Limekiln
3044	42344	42344	Templeogue - Orwell
3045	42345	42345	Templeogue - Osprey
3046	42346	42346	Templeogue - Village
3047	42347	42347	Terenure - Cherryfield
3048	42348	42348	Terenure - Greentrees
3049	42349	42349	Terenure - St. James
3004	42404	42404	Clondalkin - Ballymount
3004	42404	42404	Clondalkin - Ballymount
3028	42428	42428	Tallaght - Avonbeg
3029	42429	42429	Tallaght - Belgard
3031	42431	42431	Tallaght - Glenview
3034	42434	42434	Tallaght - Kilnamanagh
3034	42434	42434	Tallaght - Kilnamanagh
3036	42436	42436	Tallaght - Kingswood
3037	42437	42437	Tallaght - Millbrook
3038	42438	42438	Tallaght - Oldbawn
3039	42439	42439	Tallaght - Springfield
3040	42440	42440	Tallaght - Tymon
3032	42532	42532	Tallaght - Jobstown
3033	42533	42533	Tallaght - Killinarden
3035	42535	42535	Tallaght - Kiltipper
3030	42530	42530	Tallaght - Fettercairn
3030	42530	42530	Tallaght - Fettercairn
3001	42601	42601	Ballinascorney
3003	42603	42603	Bohernabreena
3018	42618	42618	Newcastle
3018	42618	42618	Newcastle
3021	42621	42621	Rathcoole

3027	42627	42627	Saggart
3005	43305	43305	Clondalkin - Cappaghmore
3008	43308	43308	Clondalkin - Moorfield
3009	4339	43309	Clondalkin - Rowlagh
3010	43310	43310	Clondalkin - Village
3007	43307	43307	Clondalkin - Monastery
3007	43307	43307	Clondalkin - Monastery
3006	43306	43306	Clondalkin - Dunawley
3006	43306	43306	Clondalkin - Dunawley
3015	43415	43415	Lucan - Esker
3016	43416	43416	Lucan - Heights
3017	43417	43417	Lucan - St. Helens
3019	43419	43419	Palmerstown Village
3020	43420	43420	Palmerstown West
3020	43420	43420	Palmerstown West
5008	50208	50208	Blackrock - Booterstown
5009	50209	50209	Blackrock - Carysfort
5010	50210	50210	Blackrock - Central
5011	50211	50211	Blackrock - Glenomena
5012	50212	50212	Blackrock - Monkstown
5013	50213	50213	Blackrock - Newpark
5014	50214	50214	Blackrock - Seapoint
5015	50215	50215	Blackrock - Stradbrook
5016	50216	50216	Blackrock - Templehill
5017	50217	50217	Blackrock - Williamstown
5068	50268	50268	Stillorgan - Priory
5042	50342	50342	Dun Laoghaire - East Central
5051	50351	50351	Dun Laoghaire - Salthill
5052	50352	50352	Dun Laoghaire - West Central
5032	50432	50432	Dalkey - Avondale
5033	50433	50433	Dalkey - Bullock
5034	50434	50434	Dalkey - Coliemore
5035	50435	50435	Dalkey - Hill
5036	50436	50436	Dalkey - Upper
5043	50443	50443	Dun Laoghaire - Glasthule
5044	50444	50444	Dun Laoghaire - Glenageary
5045	50445	50445	Dun Laoghaire - Monkstown

			Farm
5046	50446	50446	Dun Laoghaire - Mount Town
5047	50447	50447	Dun Laoghaire - Sallynoggin East
5048	50448	50448	Dun Laoghaire - Sallynoggin South
5049	50449	50449	Dun Laoghaire - Sallynoggin West
5050	50450	50450	Dun Laoghaire - Sandycove
5058	50458	50458	Killiney North
5059	50459	50459	Killiney South
5007	50507	50507	Ballybrack
5018	50518	50518	Cabinteely - Granitefield
5019	50519	50519	Cabinteely - Kilbogget
5021	50521	50521	Cabinteely - Pottery
5053	50553	50553	Foxrock - Beechpark
5054	50554	50554	Foxrock - Carrickmines
5055	50555	50555	Foxrock - Deansgrange
5056	50556	50556	Foxrock - Torquay
5001	51201	51201	Ballinteer - Broadford
5002	51202	51202	Ballinteer - Ludford
5003	51203	51203	Ballinteer - Marley
5004	51204	51204	Ballinteer - Meadowbroads
5005	51205	51205	Ballinteer - Meadowmount
5006	51206	51206	Ballinteer - Woodpark
5022	51222	51222	Churchtown - Castle
5023	51223	51223	Churchtown - Landscape
5024	51224	51224	Churchtown - Nutgrove
5025	51225	51225	Churchtown - Orwell
5026	51226	51226	Churchtown - Woodlawn
5028	51228	51228	Clonskeagh - Farranboley
5040	51240	51240	Dundrum - Sweetmount
5027	51327	51327	Clonskeagh - Belfield
5029	51329	51329	Clonskeagh - Milltown
5030	51330	51330	Clonskeagh - Roebuck
5031	51331	51331	Clonskeagh - Windy Arbour
5041	51341	51341	Dundrum - Taney
5038	51438	51438	Dundrum - Kilmacud

5039	51439	51439	Dundrum - Sandyford
5039	51439	51439	Dundrum - Sandyford
5039	51439	51439	Dundrum - Sandyford
5037	51437	51437	Dundrum - Balally
5037	51437	51437	Dundrum - Balally
5037	51437	51437	Dundrum - Balally
5063	51463	51463	Stillorgan - Deerpark
5064	51464	51464	Stillorgan - Kilmacud
5065	51465	51465	Stillorgan - Leopardstown
5066	51466	51466	Stillorgan - Merville
5067	51467	51467	Stillorgan - Mount Merrion
5020	51520	51520	Cabinteely - Loughlinstown
5020	51520	51520	Cabinteely - Loughlinstown
5057	51557	51557	Glencullen
5057	51557	51557	Glencullen
5061	51561	51561	Shankill - Rathsallagh
5060	51560	51560	Shankill - Rathmichael
5060	51560	51560	Shankill - Rathmichael
5060	51560	51560	Shankill - Rathmichael
5062	51562	51562	Shankill - Shanganagh
5062	51562	51562	Shankill - Shanganagh
5057	51557	51557	Glencullen
5069	51569	51569	Tibradden
11007	60007	60007	Culmullin
11008	60008	60008	Donaghmore
11009	60009	60009	Dunboyne
11010	60010	60010	Dunshaughlin
11011	60011	60011	Kilbrew
11012	60012	60012	Kileen
11014	60014	60014	Kilmore
11016	60016	60016	Ratoath
11017	60017	60017	Rodanstown
11048	60048	60048	Stamullin
11060	91400	91400	Skreen (External - N3)
11055	91400	91400	Navan (External - N3)
11091	91400	91400	Rathmoylan (External - N3)
11086	91400	91400	Clonard (External - N3)

11026	91400	91400	Kekks (External - N3)
11085	91400	91400	Ballivor (External - N3)
11090	91400	91400	Dunderry (External - N3)
11063	91400	91400	Scurlockstown (External - N3)
11061	91400	91400	Crossakeel (External - N3)
11079	91400	91400	Athboy (External - N3)
11081	91400	91400	Enfield (External - N3)
11092	91400	91400	Trim (External - N3)
11043	91600	91600	Bellewstown (External - N3)
11046	91400	91400	Grangegeeth (External - N3)
11059	91400	91400	Kilberry (External - N3)
11052	91400	91400	Nobber (External - N3)
11044	91400	91400	Duleek (External - N3)
11047	91400	91400	Drogheda Area in Meath (External - N3)
11042	91400	91400	Moynalty (External - N3)
11058	91400	91400	Slane (External - N3)
11068	91400	91400	Oldcastly (External - N3)
6004	90200	90200	Athy (External - N7 / N81)
6079	90200	90200	Naas (External - N7 / N81)
6057	90200	90200	Fontstown (External - N7 / N81)
6083	90200	90200	Dunmurry (External - N7 / N81)
6027	90200	90200	Monasterevin (External - N7 / N81)
6058	90200	90200	Nurney (External - N7 / N81)
6034	71034	71034	Celbridge
6037	71037	71037	Donaghcumper
6039	71039	71039	Leixlip
6040	71040	71040	Maynooth
6041	71041	71041	Straffan
6053	90200	90200	Rathangan (External - N7 / N81)
6084	90200	90200	Dunbryne (External - N7 / N81)
6059	71059	71059	Bodenstown
6062	90200	90200	Clane (External - N7 / N81)
6064	90200	90200	Prosperous (External - N7 / N81)
6078	90200	90200	Newbridge (External - N7 / N81)
6070	90200	90200	Kilcullen (External - N7 / N81)

6071	90200	90200	Kildare Town (External - N7 / N81)
6072	71072	71072	Kill
6076	71076	71076	Kilteel
6082	71082	71082	Oughterard
6085	90200	90200	Ballymore Eustace (External - N7 / N81)
6017	90200	90200	Castledermot (External - N7 / N81)
6089	90200	90200	Ballymount (External - N7 / N81)
6024	90200	90200	Kilca (External - N7 / N81)
6088	90200	90200	Timahoe (External - N7 / N81)
6086	90200	90200	Robertstown (External - N7 / N81)
6055	90200	90200	Carbury (External - N7 / N81)
6038	90200	90200	Kilcock (External - N7 / N81)
6051	90200	90200	Cadamstown (External - N7 / N81)
15009	90100	90100	Baltinglass (External - N11)
15010	81010	81010	Blessington
15011	81011	81011	Burgage
15017	90100	90100	Donard (External - N11)
15021	81021	81021	Kilbride
15022	81022	81022	Lackan
15029	90100	90100	Dunlavin (External - N11)
15030	81030	81030	Togher
15031	90100	90100	Grange Con (External - N11)
15073	90100	90100	Wicklow Mountains (External - N11)
15027	90100	90100	Kilranelagh (External - N11)
15003	81103	81103	Bray No. 1
15004	81104	81104	Bray No. 2
15005	81105	81105	Bray No. 3
15006	81106	81106	Rathmichael (Bray)
15002	90100	90100	Arklow (External - N11)
15066	90100	90100	Wicklow Town (External - N11)
15032	81232	81232	Delgany
15033	81233	81233	Enniskerry

15034	81234	81234	Greystones
15035	81235	81235	Kilmacanogue
15036	81236	81236	Kilmacanogue (Part)
15037	81237	81237	Powerscourt
15039	90100	90100	Aughrim (External - N11)
15055	90100	90100	Avoca (External - N11)
15047	81247	81247	Altidore
15054	90100	90100	Glenealy (External - N11)
15056	81256	81256	Calary
15057	90100	90100	Ashford (External - N11)
15060	81260	81260	Kilcoole
15061	81261	81261	Newcastle Lower
15063	90100	90100	Rathdrum (External - N11)
15064	81264	81264	Newcastle Upper
15078	90100	90100	Annacurragh (External - N11)
15071	90100	90100	Carnew (External - N11)
15081	90100	90100	Mullinacuff (External - N11)
15082	90100	90100	Tinahely (External - N11)
10009	91600	91600	Ardee (External - N1)
10042	91600	91600	Ardee (External - N1)
10040	91600	91600	Grangebellew (External - N1)
10027	91600	91600	Monasterboice (External - N1)
10034	91600	91600	Dundalk (External - N1)
10033	91600	91600	Mansfieldtown (External - N1)
10041	91600	91600	Tallanstown (External - N1)
10028	91600	91600	Tallanstown (External - N1)
10036	91600	91600	Drogheda (External - N1)
0	91600	91600	External - N1 - Dundalk
0	91500	91500	External - N2 - Carickmacross
0	91400	91400	External - N3 - Kells
0	90300	90300	External - N4 - Mullingar
0	90300	90300	External - N6 - Athlone
0	90300	90300	External - R420 - Tullamore
0	90200	90200	External - N7 - Portlaoise
0	90200	90200	External - N9 - Carlow
0	90100	90100	External - N11 - Arklow

Appendix 12

Sample Matrix file representing the 2006 trip demand matrix

The following is a sample from the text-formatted matrix file used for the DTNM for 2006. The file is used as input to the Mx program, which then produces a Matrix.UFM unformatted file. This in turn is used as input to the transport model to represent trip demand across the highway network. See van Vliet and Hall (2001) for more information on these files and how to read them.

12.1 2006 Matrix.DAT file

```
RUN DUMPED MATRIX FROM MX
 &PARAM
 MPNEXT  =    T
 LONG    =    T
 NROWS   =  864
 NCOLS   =  432
 &END
TRIPS            0
 UC1 = HGVs (pcus) UC2 = LVs (pcus)
11101    0.000    0.000    7.352    0.000    0.000    0.000    0.000
         0.000    0.000    0.000    0.000    0.000    0.000    0.000
         0.151    0.113    0.018    0.000    0.000    0.000    0.000
         0.000    0.000    0.000    0.000    0.000    0.000    0.000
         0.000    0.000    0.000    0.000    0.000    0.000    0.000
         0.000    0.000    0.000    0.000    0.000    0.000    0.000
         0.000    0.000    0.000    0.000    0.000    0.000    0.000
         0.000    0.000    0.000    0.000    0.000    0.000    0.000
         0.000    0.000    0.000    0.000    0.000    0.000    0.000
```

0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
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0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.917	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
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0.000	0.000	0.000	0.000	0.000	0.000	0.000
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0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
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0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.063
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000

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0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.133	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	2.740	0.000	0.000
0.000	0.000	0.000	0.000	0.000	5.457	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000

	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	0.293	0.030	0.062	0.107	0.942		
11102	0.000	0.000	18.253	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.375	0.282	0.045	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	2.276	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.157
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
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	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.331	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	6.802	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	13.547	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.004
	0.728	0.073	0.154	0.266	2.338		
11103	0.024	0.063	0.000	0.011	0.014	0.122	0.228
	0.066	0.934	1.879	2.402	1.023	1.030	2.638
	1.910	1.434	0.227	0.086	0.181	0.063	0.185
	0.144	0.287	0.181	0.020	0.116	10.739	44.508
	35.877	0.123	0.152	0.062	0.173	0.145	0.211
	0.017	0.305	0.059	0.140	0.066	0.199	2.643
	0.059	0.044	0.037	0.046	0.052	0.019	0.037
	0.037	0.037	0.186	1.428	1.786	0.037	0.019
	0.037	0.037	0.029	0.037	0.194	0.194	0.374