

Data Management Group Annual Report 2002

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SUMMARY

The Data Management Group (DMG), in cooperation with the funding agencies, administers a collection of urban travel data of interest to public and private transportation planners in the Greater Toronto Area. The data also represents a valuable resource to the research community. The year 2002 saw two major additions to this collection, the release of the 2001 Transportation Tomorrow Survey and the results of the 2001 Cordon Count Program. Access to these data, including data collected earlier, is possible either interactively or by special request. During the year the funding agencies and their consultants together with the research community instigated 7617 data queries during 1668 computer sessions related to urban travel, compared with 8536 queries during 993 sessions in 2001. There were only 3 special data requests in 2002, which reflects the success of allowing much more universal access. The Cordon Count data, which allows access only to funding agencies or their agents, had 5596 queries in 931 computer sessions in 2002, compared with 2662 queries in 713 sessions the previous year.

The funding agencies and several local governments, in addition to consultants working for these agencies and the research community, share the operation of the EMME/2 simulation package on the Data Management Group's computer system. During the year, the DMG provided support to these users in five major categories:

- development of complementary data for models developed within the EMME/2 framework, including new and enhanced annotation sets,
- update of 2001 EMME/2 road network to include links to CCDRS,
- road and transit comparisons of 2001 TTS at major screen lines.
- testing of the new graphical user interface for EMME/2 (ENIF),
- technical assistance in the form of technical advice, macro writing, and recommendations on EMME/2 procedures,

The DMG's role in information processing and support of EMME/2 is made possible by the sharing of a central computing resource at the DMG. Changes to the computer systems and software used by the funding agencies are providing new challenges. In particular the introduction of Windows XP and the growing interest in the new EMME/2 graphical interface, ENIF. System security is a constant concern and new secure access procedures are being introduced. As an example, in 2002 there were over 16,000 unauthorized connection attempts to DMG systems. All were blocked or cleaned out quickly.

In 1999, the DMG agreed to manage the 2001 TTS under the guidance of the Transportation Tomorrow Survey Technical Committee with representation from all participating agencies. The year 2000 and 2001 phases were completed on time. However, early in 2002 the management team discovered a discrepancy and decided to conduct a supplementary interviewing phase of the project to

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Summary

correct this problem. After careful checking of the data, a preliminary data base was presented in October 2002 and the final data base released in January 2003. Ten reports on the conduct of the survey and summaries of the results were prepared during the year.

The DMG's interaction with the academic community in 2002 resulted in 10 undergraduate and graduate theses plus 18 reports, publications and presentations.

Introduction

INTRODUCTION

The Data Management Group is a research project located at the Joint Program in Transportation, which is a research centre of the Faculty of Applied Science and Engineering at the University of Toronto. The Joint Program in Transportation was established in 1970 and the Data Management Group began operation in 1988. A brief history of both is contained in the *"Data Management Group Annual Report 1998, Report 81, Joint Program in Transportation (May 1999)"* available in Adobe Acrobat format at <http://www.jpint.utoronto.ca/PDF/doc81.html>. Under the guidance of the funding agencies, the project has grown from a distribution centre for the 1986 Transportation Tomorrow Survey to an interactive centre where transportation planners can access four travel surveys, over 25 years of traffic counts and access a powerful computer software package for synthesizing urban travel in the Toronto Area. One measure of the Data Management Group's success is the increase in the number of times transportation planning agencies have requested access to the available data. In one calendar year early in the project, the staff would process approximately 40 data requests. In the calendar year 2002, interactive data requests to a greatly expanded database numbered over 13,000.

Program approval and funding of the Data Management Group is the collective responsibility of members of the Transportation Information Steering Committee (TISC) with the following membership:

- City of Hamilton
- City of Toronto
- GO Transit
- Ministry of Transportation, Ontario
- Regional Municipality of Durham
- Regional Municipality of Halton
- Regional Municipality of Peel
- Regional Municipality of York
- Toronto Transit Commission

Each participating agency appoints a member of their technical staff to the Transportation Research and Data Management Group (TRADMAG), which is a standing committee of TISC, responsible for coordinating the needs of the funding agencies and the activities of the research project.

The activities of the Data Management Group can be grouped as follows:

Information Processing is the set of activities supporting the organization, storage and distribution of urban travel information. The principle components of this information are the results of the Transportation Tomorrow Surveys and regular cordon count surveys.

EMME/2 Technical Support is the set of activities in support of the shared computer simulation procedures used by transportation planning agencies in the Greater Toronto Area.

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2001 Transportation Tomorrow Survey is a separately funded project, managed and administered by the Data Management Group that collects the next in the series 1986, 1991, 1996 and 2001 of travel surveys in the GTA and surrounding areas.

Computer System Support is provided to all of the activities listed above.

The Data Management Group operates with a part-time director, a full-time technical staff of four, part-time technical staff and summer students. Administrative support is provided by the Joint Program in Transportation.

The Data Management Group is located in offices at;

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35 St. George Street
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INFORMATION PROCESSING

In cooperation with the funding agencies, the Data Management Group (DMG) has assembled a set of data on urban transportation that is of collective interest to transportation planning agencies in the Greater Toronto Area plus Hamilton and to the research community. A summary of these data is as follows:

- household, person and trip data from the 1986, 1991, 1996 and 2001 Transportation Tomorrow Surveys,
- trip data from the 1964 MTARTS,
- place of work and place of residence linkages from the 1986 Census,
- GO Rail and GO Bus surveys from 1983 to 1997,
- vehicle and person classification counts contained in all Cordon Counts from 1975 to 2001.

These data are stored on the DMG's computer system in a relational database structure. Users can access these data in three ways. First, all registered users of the system have access to travel information with a command line procedure called 'drs'. Second, registered users have access to information, both travel information and cordon count data, with two browser-based procedures. Access to travel information uses 'iDRS' and the separate procedure for cordon count information is 'CCDRS'. Third, because the data are complex, the staff at the DMG will extract information for a particular application using custom computer programs. DMG staff refer to this as a 'complex data request'.

Text-based Data Retrieval System 'drs'

Staff at the DMG developed the text-based data retrieval system (drs) more than ten years ago as the original method for external users to gain access to the data files. This retrieval system is very effective when a modem is used as the principle method of remote access to the DMG's computer system. Over the past ten years, as the needs of the funding agencies changed and as the internet became the preferred method of remote access, use of drs has diminished. Internet access is supported with the Internet Data Retrieval System (iDRS). Unfortunately, the computer system and software employed in drs are no longer in active use. In particular, the relational database software has been replaced. If a major problem with the software occurs, drs will no longer be operational.

Staff at the DMG and some remote users of the EMME/2 software use this text-based data extraction method for some particular purposes. In particular, drs is a convenient method of data extraction for users of EMME/2 as the initial text screen on system sign in can be used to access drs and the resulting data files are automatically stored in their home directory. The existence of the text based data retrieval system, however, requires all travel information from every year of the TTS to be stored in two separate data base systems, one for drs and one for the browser based data retrieval system, iDRS. In the year 2002, a process began to incorporate the attractive features of drs into the browser-based iDRS.

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Information Processing

At this time, the 2001 TTS has not been placed into drs in anticipation the system will need to be discontinued. The functions should be available in iDRS in the year 2003. The following is a summary of the use of drs during the calendar year 2002 and is compared with a total in 2001.

Summary of Text Based 'drs' Data Requests in 2002

Month	Number of Data Queries	Number of Sessions
January	56	25
February	71	31
March	35	11
April	74	20
May	58	27
June	82	44
July	123	39
August	43	13
September	70	24
October	57	16
November	15	4
December	9	3
Total	693	257

Total 2001	1041	266
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Text Based 'drs' Users in 2002

City of Mississauga
City of Toronto
IBI Consulting Group*
McCormick Rankin Consultants*
Ministry of Transportation, Ontario
Regional Municipality of Peel
Regional Municipality of York
Toronto Transit Commission
Totten Simms Hubicki Associates*
University of Toronto
(*access permission granted by a funding agency)

Internet Browser Data Retrieval System (iDRS)

Development of the data retrieval system using a web browser (iDRS) began in 1998 and was made fully functional in 1999. A complete description of the iDRS is contained in a previous Annual Report, "Data Management Group Annual Report 1998", Report 81, Joint Program in Transportation (May 1999), which is available in Adobe Acrobat format at <http://www.jpint.utoronto.ca/PDF/doc81.html>.

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Information Processing

On completion of the final database for the 2001 Transportation Tomorrow Survey, the data were added to iDRS. In the first instance, a preliminary database was released to the funding agencies on October 31, 2002 on the understanding the agencies would use the preliminary information with caution and, through their investigations, help find any inconsistencies. The final database was released in late December 2002.

An anticipated increase in use of iDRS when the final 2001 TTS data became available, improvement to the speed and reliability of iDRS were undertaken before the final release. Improvements were made possible through the cooperative efforts of the DMG staff and an Oracle database specialist.

Currently, access to the TTS data through iDRS is available to any person completing a 'System Access Request Form'. System security is maintained by assigning all users a unique login and password. During these early stages of an open access policy, the accounts are never terminated unless the user is found to be violating their access privilege. Access through iDRS, when used in conjunction with the latest data guide "2001 Transportation Tomorrow Survey: Data Guide", Report 96, Joint Program in Transportation (January 2003), is a very powerful and widely used data extraction method.

The following is a summary of the use of iDRS during the calendar year 2002 compared with a total in 2001.

Summary of Browser Based 'iDRS' Data Requests in 2002

Month	Number of Data Queries	Number of Sessions
January	356	59
February	286	63
March	278	71
April	182#	48#
May	28#	8#
June	228	61
July	227	44
August	391	60
September	837	151
October	1162	254
November	1735	318
December	1242	282
Total	6924	1411
Total 2001	7495	727

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Information Processing

- # These numbers do not reflect the actual use of iDRS in April and May. The computer serving the web site stopped recording logins properly in April 2002. As indicated on page 13 of this report under 'Computer System Support', the computer was replaced and operational by late May 2002.

Browser Based 'iDRS' Users in 2002

BA Consulting Group
Cansult Ltd.
Centre for Sustainable Transportation
City of Guelph
City of Mississauga
City of Toronto
Dillon Consulting Ltd.
Entra Consultants Ltd.
GO Transit
Hamilton Eco Footprint
IBI Consulting Group
iTrans Consulting Ltd.
Lea Consulting Ltd.
McCormick Rankin Consultants
McMaster University
Ministry of Transportation, Ontario
Paradigm Transportation Solutions
Regional Municipality of Durham
Regional Municipality of Halton
Regional Municipality of Niagara
Regional Municipality of Peel
Regional Municipality of York
Tedesco Engineering
Toronto Transit Commission
Town of Markham
University of Toronto
Wilfrid Laurier University
York University
University of Toronto undergraduate and graduate students

Complex Data Requests

The interactive procedures available on drs and iDRS satisfy the majority of data needs. However, some data needs are too complex and require the intervention of an experienced analyst to formulate a custom query from the database. In addition, the DMG's staff can often help define the most relevant data for the problem at hand. Although complex data requests are an important function, an objective of the Data Management Group continues to be to reduce the number

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Information Processing

of such data requests in favour of users processing their request through iDRS. Success in meeting this objective is evident in the year 2002. There were 8 complex data requests from funding agencies and the research community in 2001 and only 3 in the year 2002. In the past, a small number of private firms have asked for travel data. These private requests were processed on a cost recovery basis. There were 9 such requests in 2001 but there were none in the year 2002, which is another measure of the success to the open access policy to iDRS. Brief descriptions of the 3 special data requests in 2002 are contained in Appendix A.

Cordon Count Data Retrieval System (CCDRS)

The City of Toronto (then the Regional Municipality of Metropolitan Toronto) began in 1975 to collect detailed information on the type and volume of traffic crossing selected points on the road system. The counting locations were selected such that screen lines or cordon lines could be defined and the counting program has continued every few years on a regular basis since that time. Subsequently, other Regions began similar programs. Given the number of Regions with a similar program, they began coordinating their count programs and defining a common set of definitions. In 1998, this cooperation made it possible for the DMG to assemble the most recent of such traffic counts in a common data base structure and develop a Cordon Count Data Retrieval System (CCDRS). The CCDRS data files contain count information from 1975 in the City of Toronto, from 1981 in Peel Region, from 1985 in Halton and York Regions and from 1989 in Durham Region.

CCDRS was made fully functional in 1999. For the first time, funding agencies were able to access the complete set of counts from all cordon count programs. A complete description of the CCDRS is contained in *"Data Management Group Annual Report 1998", Report 81, Joint Program in Transportation (May 1999)* available in Adobe Acrobat format at <http://www.jpint.utoronto.ca/PDF/doc81.html>. In 2002, the data base was updated to include the counts taken in the year 2001. These counts were undertaken and checked by the responsible Region. In addition, Durham Region updated their entire set of counts for the years prior to 2001. York Region changed the definition of their count stations from alphanumeric to numeric to make them consistent with other Regions and for compatibility with EMME/2 definitions. Peel Region changed their definitions of some Taxi counts to comply with standards used by other Regions. In addition, the DMG harmonized the appropriate link definition in EMME/2 to the definitions used in CCDRS.

Finally, the DMG undertook an update of the two summary reports of Cordon Count information to reflect the findings in 2001. The results are contained in *"Greater Toronto Area - 2001 Cordon Count Program, Analysis of Peak Periods", Report 93, Joint Program in Transportation, (November 2002)* and *"Greater Toronto Area - Cordon Count Summary, Analysis of Traffic Trends 1985 to 2001", Report 92, Joint Program in Transportation (November 2002)*.

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Information Processing

The following is a summary of all uses of CCDRS during 2002 compared with a total for 2001.

Summary of CCDRS Data Requests in 2002

Month	Number of Data Queries	Number of Sessions
January	185	42
February	643	105
March	360	106
April	267#	53#
May	6#	3#
June	336	57
July	532	109
August	686	125
September	560	103
October	1305	110
November	496	61
December	220	57
Total	5596	931

Total 2001	2662	713
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- # These numbers do not reflect the actual use of CCDRS in April and May. The computer serving the web site stopped recording logins properly in April 2002. As indicated on page 13 of this report under 'Computer System Support', the computer was replaced and operational by late May 2002.

CCDRS Users in 2002

Bate Enterprises*
City of Mississauga
City of Toronto
IBI Consulting Group*
iTrans Consulting Ltd.*
McCormick Rankin Consultants*
Ministry of Transportation, Ontario
Regional Municipality of Durham
Regional Municipality of Halton
Regional Municipality of Peel
Regional Municipality of York
(*access permission granted by a funding agency)

EMME/2 TECHNICAL SUPPORT

The funding agencies and several local governments, in addition to consultants working for these agencies, share the operation of the EMME/2 simulation package on the Data Management Group's computer system. In addition, access to the simulation package is given to teaching and research activities at the University of Toronto. During the calendar year 2002, the DMG provided support to these users in five major categories:

- development of complementary data for models developed within the EMME/2 framework, including new and enhanced annotation sets,
- update of 2001 EMME/2 road network to include links to CCDRS,
- road and transit comparisons of 2001 TTS at major screen lines,
- testing of the new graphical user interface for EMME/2 (ENIF),
- technical assistance in the form of technical advice, macro writing, and recommendations on EMME/2 procedures.

Development of Complementary Data for Models Developed Within EMME/2

The combined road and transit networks developed in EMME/2 by the DMG in the period from 1999 through 2001 is now widely used. As a supplement to these networks, in 2002 the DMG developed a collection of annotation sets as a visual aid to users and for presentation of results. In particular, the following annotation sets were developed or improved in 2002 at the same UTM projection as the EMME/2 networks:

- screen lines representing those used by the participating agencies in the Cordon Count program,
- street names of major arterials on an annotation set representing the actual urban street system,
- a representation of physical barriers in the GTA plus Hamilton.

2001 EMME/2 Road Network Inclusion of Links to CCDRS

The DMG updated the 2001 EMME/2 combined road and transit network to include the new station codes and node numbers in the 2001 Cordon Count program. This action was taken in preparation for the validation process in the 2001 Transportation Tomorrow Survey. In addition, a comprehensive set of macro procedures were developed in 2002 to automate the calculation of observed auto volumes on all major screen lines during the Cordon Counts. The procedure should be useful to other users wanting to compare ground counts with TTS results.

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EMME/2 Technical Support

Road and Transit Comparisons of 2001 TTS at Major Screen Lines

As part of the validation process in the 2001 TTS, the procedures described above were used to compare travel survey results with ground counts. The ground counts, including transit, were recorded in the same year as the GTA portion of the TTS. Comparisons were made for the peak hour, the peak period and the 13 hour period corresponding to when the ground counts were active. The results appear in the report, "2001 Transportation Tomorrow Survey: Data Validation", *Joint Program in Transportation Report 97, (February 2003)*.

Graphical User Interface for EMME/2 (ENIF)

In the calendar year 2001, the Data Management group was selected by INRO as a test site for the new graphical user interface for EMME/2. The new program is called ENIF and is intended to compliment and partially replace some of the EMME/2 functionality. The software was officially released in 2002. However, in order to be prepared for the technical support of the new interface and to investigate the implications of remote access to the DMG's computer system, DMG is testing the performance under a variety of access methods. DMG staff attended in 2002 an ENIF training course in Montreal. Preliminary testing of access procedures and performance issues under a variety of versions of Windows were carried out at the offices of several of DMG's funding agencies. Preliminary results are encouraging and investigation of possible improvements is continuing.

Technical Support To EMME/2 Users

Technical support is provided to EMME/2 users in the Greater Toronto Area in response to requests and if the user is associated with a funding agency or a university research project. Many requests for technical assistance are received during the year, but only requests requiring more than one hour to satisfy are recorded. In the calendar year 2002 there were 122 requests of a substantial nature, compared with 158 requests in the calendar year 2001. The following is a brief summary of the source of these requests:

Source	Number of Requests in 2002	Number of Requests in 2001
Funding Agencies	77	57
Local Municipalities	13	15
University Research	30	29
Consultants	38	21
Total	158	122

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EMME/2 Technical Support

The requests fall into five broad categories:

- execution of a specific technical task in EMME/2,
- execution of a specific analytical or modelling task in EMME/2 with or without macro development,
- technical assistance with setup of the EMME/2 program and related utilities,
- management of the data related to EMME/2 networks or trip tables,
- inquires pertaining to methodological and mathematical particulars of models and applications.

COMPUTER SYSTEM SUPPORT

The role of the Data Management Group in information processing and technical support of EMME/2 is made possible by the sharing of a central computing resource at the offices of the DMG. The success of such a concept is dependent on three important conditions; a fast and reliable method to access the central system, ease of use and a level of computing service that is consistent with current technology. Technical support staff at the DMG use these principles to solve problems on a daily basis and as a guide to system improvement. As much as possible, reliable computer system access is provided every day of the week for 24 hours a day. A major challenge in 2001 was to maintain this service while providing computer system support for the Transportation Tomorrow Survey.

Computer System Support

The Data Management Group provides access to computing resources via two methods; web access and direct access via modem. Both of these services are available 24/7, mandating highly reliable hardware and software to keep it all running.

Access to Services

The introduction of Windows XP into the client base is presenting new challenges. Windows XP is incompatible with some of the earlier software packages traditionally used to access the DMG servers remotely, forcing an evaluation of new methods of remote access. DMG has been testing newer client versions of the SSH protocol, the X-Window protocol, and the Virtual Network Computer (VNC) system, since late 2002. We hope to have a tested solution by mid-2003.

The development of ENIF is also presenting new challenges. ENIF places more demands on both computational and bandwidth resources than does EMME/2, forcing the DMG to test and evaluate new methods to run ENIF and access remote data. The greater resource requirements of ENIF are exacerbated by the compatibility issues of Windows XP. DMG started to test ENIF performance under various conditions during the summer of 2002. The new access protocol tests include ENIF usability and performance tests.

Systems Security

As of 2002, the vast majority of remote access connections to DMG have been via the internet. Modem connections are increasingly rare and ISDN connections have ceased altogether. Since the vast majority of DMG systems access sessions are via the internet, we are focusing our attention on securing this access route.

Traditionally, all shell level access to DMG systems is via SSH, the Secure Shell protocol. The SSH protocol has two operating levels, protocol 1 and protocol 2, where protocol 2 is not just the current state of the art but is also far more secure than protocol 1. During 2002, most DMG servers were upgraded to sup-

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Computer System Support

port SSH protocol 2. Until recently, the Windows SSH client recommended by DMG has been Teraterm-SSH (TTSSH), a program which has served us well. Unfortunately, TTSSH does not support protocol 2. Because of this, DMG has been evaluating replacements to TTSSH.

Hacking and virus related activity directed at DMG servers continues unabated at levels typical for most internet hosts. The vast majority of unauthorized access attempts logged by DMG servers are automated scans for vulnerability, including viruses and worms looking for new holes to exploit. In 2002, there were over 16,000 unauthorized connection attempts to DMG systems. Only one of these, directed at the ARCinfo server, gained a measure of access via a Sendmail exploit, but was quickly detected and shut down. The hole was then closed almost immediately. An audit of all other servers found no evidence of wider security compromise.

2002 also saw the retirement of DMG's firewall server, a 266 MHz PC running BSD UNIX and the Drawbridge firewall. This system had logged over 1000 days of uninterrupted uptime before it was retired due to hardware problems. The replacement is a 400 MHz system running Linux and IPtables, a "stateful" firewall with greater filtering capabilities than Drawbridge.

System Improvements

In the past year, the DMG's Sun Ultra-1 web server has been replaced with a new Sun V100 server. This replacement also involved updating our Apache server software to the current release level and updating the digital keys to our secure service. This update affected both the TTS Data Retrieval System (iDRS) as well as the Cordon Count Data Retrieval System (CCDRS).

Since database query times did not improve significantly with the hardware upgrade, a code audit of the iDRS was conducted by an outside consultant. A partial rewrite of the iDRS code has resulted in query times up to 25x faster than those for identical queries prior to the audit and rewrite.

In 2002, DMG also moved several non applications services off of the older of our two applications servers (jptdmg2, a Sun Ultra-1) and onto dedicated platforms. System backups, secondary name services (DNS) and email services no longer consume systems resources on this server. All of these services are now handled by a PC running Linux.

2001 TRANSPORTATION TOMORROW SURVEY

The Transportation Tomorrow Surveys (1986, 1991 and 1996) are currently accepted by all public agencies as a sound information base on the characteristics of travel in the Greater Toronto Area. The combined data set from all survey years is actively used by local, regional and provincial planning agencies. A decision to proceed with a 2001 TTS was taken in 1999 by the Transportation Information Steering Committee (TISC). The responsibility for all policy and funding matters are to rest with TISC. The committee delegated the technical responsibility to the Transportation Tomorrow Survey Technical Committee with representation from all participating agencies and gave management responsibility to a Management Team associated with the DMG. The participating agencies include the following:

City of Barrie	GO Transit
City of Guelph	Ministry of Transportation, Ontario
City of Hamilton	Regional Municipality of Durham
City of Orillia	Regional Municipality of Halton
City of Peterborough	Regional Municipality of Niagara
City of Toronto	Regional Municipality of Peel
County of Peterborough	Regional Municipality of York
County of Simcoe	Toronto Transit Commission
County of Kawartha Lakes	Town of Orangeville
County of Wellington	

The technical committee met for the first time in early 2000 and approved a work plan for the first phase of data collection and gave approval for the use of the same data collection methods as previous TTS with the same 5% random sample of households as used in the 1996 TTS. The strategy selected was to conduct the interviews for outside agencies in the fall of 2000 from a single site located close to subway access in central Toronto. The smaller survey in 2000, with 22,500 completed interviews, allowed for fine tuning the survey procedures before the larger stage in the fall of 2001. The larger phase of the survey took place in the fall of 2001 with successful interviews from 101,200 households at a site in the same building as the earlier phase. The management team discovered a discrepancy between the number of apartments contained in the sample and the total number of apartments in the GTA when checking the results in preparation of the final data base. A team decided to conduct a supplementary interviewing phase of the project to correct this problem. More than 14,000 households living in apartments and town houses in the GTA were interviewed in a six week period in May and June of 2002.

The data from all three interviewing phases of the project were combined and an intensive checking and validation process was undertaken. Results of the 2001 Census relating to the total number of dwelling units in the survey area became available in the summer of 2002. The 2001 TTS data were then expanded to

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represent the universe of households in the survey area and a preliminary data base was released in October 2002. On the basis of the preliminary data base, a presentation of results was given at the Hart House Theatre, University of Toronto on October 31, 2002.

A final expansion of the data base was carried out when the count of 'occupied' dwelling units became available from Statistics Canada in November 2002. The final version of the data base was released in January 2003. The data base was then available to anyone requesting access to the iDRS system mentioned in a previous section of this report.

Complete documentation of the 2001 Transportation Tomorrow Survey was carried out in the later part of 2002 and is to be completed in early 2003. The TTS Management Team undertook the preparation of the following reports:

"Interview Manual", 2001 Transportation Tomorrow Survey Working Paper 7, December 2002

"Coding Manual", 2001 Transportation Tomorrow Survey Working Paper 8, December 2002

"Data Expansion" 2001 Transportation Tomorrow Survey Working Paper 9, January 2003

"Seminar Presentation" 2001 Transportation Tomorrow Survey Working Paper 10, November 2002

The above reports are available in PDF format on the web site <http://www.jpint.utoronto.ca/reports.html>. Staff at the Data Management Group undertook the preparation of the following reports as part of their normal work program:

"2001 Transportation Tomorrow Survey: 2001, 1996 & 1986 Summary Report of the GTA", Report 99, Joint Program in Transportation, (March 2003)

"2001 Transportation Tomorrow Survey: 2001 & 1996 Travel Survey Summaries" Report 98, Joint Program in Transportation (March 2003)

"2001 Transportation Tomorrow Survey: Data Validation" Report 97, Joint Program in Transportation February 2003

"2001 Transportation Tomorrow Survey: Data Guide" Report 96, Joint Program in Transportation (January 2003)

"2001 Transportation Tomorrow Survey: Design & Conduct of the Survey", Report 95, Joint Program in Transportation, (January 2003)

"2001 Traffic Zone Boundaries" Report 94, Joint Program in Transportation (January 2003)

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Publications and Research

DMG PUBLICATIONS

Publications generated by the activities of the DMG are placed on our web site at <<http://www.jpint.utoronto.ca>> in a format suitable for access and printing by the user. The following publications were created in the year 2002.

"2001 Transportation Tomorrow Survey: Data Validation", Report 97, (February 2003)

"2001 Transportation Tomorrow Survey: Data Guide", Report 96, (January 2003)

"2001 Transportation Tomorrow Survey: Design & Conduct of the Survey", Report 95, (January 2003)

"2001 Traffic Zone Boundaries", Report 94, (January 2003)

"Greater Toronto Area - 2001 Cordon Count Program : Analysis of Peak Periods", Report 93, (November 2002)

"Greater Toronto Area - 2001 Cordon Count Summary : Analysis of Traffic Trends 1985 to 2001", Report 92, (November 2002)

"Data Management Group Annual Report 2001", Report 91 (June 2001)

UNIVERSITY RESEARCH

A portion of the funding provided to the DMG is allocated to unspecified research on topics related to urban transportation. In addition to these funds, the very research nature of the DMG's activities is conducive to the development of other research projects, some of which receive funding from other sources. The research support that is made possible by the existence of the DMG include: access to the data bases, access to the EMME/2 network and modelling system, access to software (ArcInfo, Oracle, SAS, etc.) and technical support in the use of these data and software.

Undergraduate Theses Completed in 2002

Guan, J., "Simulating Family Relationships Between Individuals for the ILUTE Micro-Simulation Model", B.A.Sc. (Toronto, Professor E.J.Miller)

Seegobin, A., "Study of GO Rail Ridership", B.A.Sc. (Toronto, Professor E.J.Miller)

Tsang, F., "A Comparison of Travel Characteristics between Emerging Suburban Activity Centres and Downtown Toronto", B.A.Sc. (Toronto, Professor A.S.Shalaby)

Wu, T., "A Route Level Ridership Model of a TTC Bus Link", B.A.Sc. (Toronto, Professor A.S.Shalaby)

Ye, S., "Analysis of the Spatial Distribution of GTA Household Daily Vehicle Emissions", B.A.Sc. (Toronto, Professor E.J.Miller)

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Publications and Research

Graduate Theses Completed or in Progress in 2002

Ciavarro, M., "GO Transit: Oakville Station Parking, Economic Feasibility and Options", M.Sc.PL, (Toronto, Professor E.J.Miller)

Eberhard, L., "A 24-Hour Household-Level Activity-Based Travel Demand Model for the GTA", M.A.Sc., (Toronto, Professor E.J.Miller)

Houde, R., "Pricing Public Transit: A Model Based Evaluation", M.Sc.PL, (Toronto, Professor E.J.Miller)

Lee, A., "Analysis of Personal-Use Vehicle Emissions in the Greater Toronto Area, 1986-1996", M.A.Sc., (Toronto, Professor E.J.Miller)

Poon, W., "An Investigation into Residential Relocation Rules and Processes", M.A.Sc., (Toronto, Professor E.J.Miller)

Carrasco, J., "Advanced Travel Modelling Methods", Ph.D., (Toronto, Professor E.J.Miller) in progress.

Gibson, A., "Integrated Mobility System Implementation in York Region", M.Sc.PL, (Toronto, Professor E.J.Miller) in progress.

Haider, M., "Spatio-Temporal Modelling of Housing Starts in the Greater Toronto Area", Ph.D., (Toronto, Professor E.J.Miller) in progress.

Haroun, A., "Microsimulating Residential Housing Markets", Ph.D., (Toronto, Professor E.J.Miller) in progress.

Mamun, S., "Modelling Express Bus Services", M.A.Sc., (Toronto, Professor E.J.Miller) in progress.

Peiravian, F., "Road Network Modelling for Environmental Impact Analysis", Ph.D., (Toronto, Professor E.J.Miller) in progress.

Roorda, M., "Activity-Based Household Travel Modelling", Ph.D., (Toronto, Professor E.J.Miller) in progress.

Salvini, P., "Design and Development of the ILUTE Operational Prototype: A Comprehensive Microsimulation Model of Urban Systems", Ph.D., (Toronto, Professor E.J.Miller) in progress.

NSERC Post-Doctoral Fellow 2002

Mohammadian, A. "Dynamic Modelling of Household Automobile Transactions"

Reports, Publications and Presentations in 2002

Shalaby, A., "A Simplified Approach for the Historical Analysis of Urban Person Travel", *Canadian Journal of Civil Engineering* (29), no. 5, pp. 702-712, 2002.

Shalaby, A., "Socioeconomic, Land Use and Travel Characteristics of the Toronto Area", CD *Proceedings of the ASCE's Second International Conference on Urban Public Transportation Systems*, Virginia, April 2002.

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Reports, Publications and Presentations in 2002 (continued)

Mohammadian, A. and E.J. Miller, "Nested Logit Models and Artificial Neural Networks for Predicting Household Automobile Choices: Comparison of Performance", *Journal of Transportation Research Record* 1807, pp. 92-100, 2002.

Mohammadian, A. and E.J. Miller, "Estimating Expected Price of Vehicles in a Transportation Microsimulation Modeling System", *Journal of Transportation*, 2002, pp. 537-541.

Mohammadian, A. and E.J. Miller, "Understanding and Modeling Dynamics of Household Automobile Ownership Decisions: A Canadian Experience", *proceedings of the ASCE Applications of Advanced Technology in Transportation Conference, Boston, August 3-5, 2002.*

Miller, E.J., M.J. Roorda, M. Haider, A. Mohammadian, J. Hoss and W.W.L. Wong, "Travel and Housing Costs in the Greater Toronto Area: An Empirical Analysis, 1986-1996", report to the Neptis Foundation, Toronto: Joint Program in Transportation, University of Toronto, December, 2002, 78 pages plus appendices.

Miller, E.J. and R.M. Soberman, "Travel Demand and Urban Form: An Issues Paper", report to the Neptis Foundation and the Central Ontario Smart Growth Strategy Sub-Panel, Toronto: Joint Program in Transportation, University of Toronto, December, 2002, 76 pages.

Miller, E.J., T. Litman and M.J. Roorda, *Study of the Environmental Benefits of an Integrated Mobility System (IMS) in the Greater Toronto Area*, report to Transportation Options and Moving The Economy, Toronto: Joint Program in Transportation, University of Toronto, November, 2002, 56 pages.

Miller, E.J., "Estimating CO2 Emissions and Other Transportation Impacts of Alternative Urban Forms, Report I: Summary of Modelling Method, in *Growing Together: Prospects for Renewal in the Toronto Region, Background Reports*", report to the City of Toronto, Toronto: GHK Canada, May, 2002, pp 3-16.

Miller, E.J. and M. Roorda, "Estimating CO2 Emissions and Other Transportation Impacts of Alternative Urban Forms, Report II: Summary of Base Network Model Test Results, in *Growing Together: Prospects for Renewal in the Toronto Region*", *Background Reports*, report to the City of Toronto, Toronto: GHK Canada, May, 2002, pp 17-40.

Miller, E.J. and A. Lee, "A Personal Use Vehicle Emissions Audit for the Greater Toronto Area", final project report to the Toronto Atmospheric Fund, Toronto: Joint Program in Transportation, University of Toronto, January, 2002, 33 pages.

Miller, E.J., "GTA Travel Trends and Their Relationship with Urban Sprawl", invited presentation, *Pragma Council Conference, Urban Sprawl (Part 2) "The Transportation Crisis in the Decade Ahead"*, Waterloo, November 28-29, 2002.

Mohammadian, A. and E.J. Miller, "Towards a Dynamic Automobile Transaction Modelling System", presented at the Annual Meeting of the Canadian Regional Science Association, Toronto, May 31-June 1, 2002.

Roorda, M.J., S. Doherty and E.J. Miller, "Operationalizing Activity Scheduling Models: Addressing Assumptions and the Use of New Sources of Behavioural Data", presented at the International Colloquium on The Behavioural Foundations of Integrated Land-use and Transportation Models: Assumptions and New Conceptual Frameworks, Quebec City: June 16-19, 2002.

Miller, E.J., "Emerging Urban Travel Demand Modelling Needs and Methods", presented at the GEOTec Event, Toronto, April 11, 2002.

Miller, E.J., "An Activity-Based Model of Household Weekday Travel", presented at the Center for Urban Transportation Research, University of South Florida, Tampa, April 4, 2002.

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Reports, Publications and Presentations in 2002 (continued)

Miller, E.J., M.J. Roorda, L. Eberhard and M. Litwin, "A Microsimulation Model of Daily Household Activity and Travel", presented at the "Understanding and Modeling Travel Behavior" session of the 98th Annual Meeting of the Association of American Geographers, Los Angeles, March 19-23, 2002.

Shalaby, A.S. and E.J. Miller, "Long Term Travel Trends in the Greater Toronto Area", presented at the "Trends in the Geography of Mobility" session of the 98th Annual Meeting of the Association of American Geographers, Los Angeles, March 19-23, 2002.

APPENDIX A COMPLEX DATA REQUESTS

In addition to the data requests that are served directly through the on-line interactive TTS Data Retrieval System (DRS), the DMG staff processed the following requests.

Ministry of Transportation requested number of GO rail trips broken down by traffic zone of destination and egress station from the 1987, 1991, 1997 and 1999 GO Rail Surveys.

Professor Eric Miller from the University of Toronto requested household and person records from the 1986 TTS database for his MCRI Project 2.3 research work.

Professor Eric Miller from the University of Toronto requested household, person, trip and transit records from the 1986 and 1991 TTS databases for the project "Transportation & Housing Costs in the Greater Toronto Area: An Empirical Analysis, 1986 and 2001".