SURVEYING METRO

Metro Area Mapping

Current Programs and need for 1:2000 Maps

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In 1958 the works engineers of the various municipalities in the Metropolitan Toronto area met at the Scarborough office to discuss the need for a common vertical control or bench mark system. As a result of that meeting the Metropolitan Council approved of the establishment of an overall bench mark system for Metropolitan Toronto area. This was to be a joint effort with the Metropolitan Corporation working in conjunction with the Federal government to establish the first and second order bench marks and with the local municipalities to establish the third order bench marks system.

In 1959 approval was obtained from the Council of Metropolitan Toronto to initiate the establishment of a horizontal control system. Arrangements were made with the Federal government to establish the first and second order stations about one mile apart. The Metropolitan Corporation established a series of stations approximately 2,000 feet apart and the local municipalities have joined with the Metropolitan Corporation in establishing stations approximately 700 feet apart.

These two networks act as the reference framework for the controlling of individual engineering projects and property surveys and as the foundation for base mapping and geocoding systems for Metropolitan Toronto.

In 1963 a proposal was submitted to the area works engineers recommending the establishment of a base mapping program including maps at scales of 1:500, 1:2,000, and 1:10,000. This proposal was later modified and work was initiated in 1966 on a series of 1"=40' base maps to cover the Borough areas. These maps were to serve as the basis for engineering design and implementation of engineering projects. From this series smaller scale maps would be derived at a later date, for example 1"=200' for administration and planning. In the City of Toronto area the 1"=40' base map program was not adopted. The city works and utility engineers used 1"=20' maps and they felt it would be too expensive to have a series, at this scale, covering the city. The City planners used both 1"=100' and 1"=200' maps rather than just 1"=200' maps. The City proceeded with a series of planning base maps at the scale of 1"=100'.

In 1967 a paper was presented to the Government Processors Data Users group for the Metropolitan Region setting out the application of geocoded values in the development of urban data banks containing all types of socio-economic data. Several municipalities have been proceeding towards such a system and during the past year the City of Toronto has derived para centroid values for the land parcels in the city. These values are co-ordinates at the approximate center of the individual parcels.

In 1968 the Metropolitan Toronto Public Utilities Co-ordinating Committee recommended to Metropolitan Council:—

(a) the production of municipal base maps
(b) an acceleration in the establishment of survey control monuments
(c) the computerization of survey data

As a result of the report a committee of public works commissioners was established to review and report on mapping in Metro.

The committee found the expertise to quality control large mapping and control surveying programs was not available in all of the local municipalities. The horizontal control program involves the establishment of approximately 16,000 control markers costing $400.00 each and the subsequent maintenance and updating of the system. The 1"=40' base mapping program involves approximately 7,000 topographic base maps costing $1,000.00 each. Similarly the City was being covered by about 170 maps at 1"=100'. The property and utility overlays to the base maps were also to be prepared. Thus there were three basic maps: (1) the topographic map, showing the above ground features and ground contours; (2) the cadastral map, showing street lines, lot lines and the boundaries of municipal lands; and (3) the underground map, showing the locations of utilities, subways and other underground structures. Other maps were to be derived at the scales of 1"=200' and 1"=1,000' with additional supplementary scales available as needed at 1"=100' and 1"=400'. This represents a large library of maps needed to be kept up-to-date. In addition para centroids were to be developed for the individual parcels.

In 1973 recognizing the need for better quality control over the products being produced, the need to centralize part of the technical activities involved, and the possible need to computerize survey data, the public works engineers for the various municipalities recommended to the Metropolitan Toronto Council that the Central Mapping Agency be established. In 1975 the Central Mapping Agency was created. An advisory committee was established which was composed of the senior public works engineer from each of the area municipalities and representatives of the Metropolitan Departments. The goals of the agency as concurred in by the advisory committee in 1975 were as follows:—

1. To act as a co-ordinating body for all control surveying and mapping functions; and
2. To provide in the most effective manner possible the necessary information related to the physical and boundary features for planning, design and administration of the physical resources within Metropolitan Toronto.

The above gives you a brief history and background on the mapping activities in Metropolitan Toronto and the establishment of the Central Mapping Agency.

Current Activities

Approximately 5,400 bench marks have been established and there are about 1,000 more to be established. Approximately 11,000 horizontal control markers have been established and there are about 5,000 additional markers required. Approximately 5,000 of the 1"=40' topographic base maps have been completed and about 2,000 are yet to be done. In the City of Toronto they have completed all of their maps at 1"=100'. You can see that a large part of the initial program has been completed. However, little or no progress has been made to satisfy the need for smaller scale maps for planning, administration, etc.

Short term objectives

There is sufficient activity in the Metropolitan Toronto area to warrant having 1:2,000 maps. The statistics set out on Figure 1 illustrate the activities in Metro that need maps and cause maps to change.

This scale of mapping is used by many municipal departments and is of value to many Provincial ministries and agencies. It is a conceptual scale, a planning scale, an administrative scale, an operations scale, an engineering design scale, and it is used for transportation planning, land assessment, land use, planning and zoning, and environmental impact studies, etc. It is a scale that satisfies many, many users. Each user may have a particular interest in certain features which he needs. Some users may require the maps to be oriented in a certain direction to suit his project. The maps may even need to be at a slightly different scale but they all contain the same basic data.

Map features do not move, a building is in the same location, relative to the grid, whether it is displayed at 1:500 or 1:2,000 or 1:5,000 or 1:10,000. We are merely talking about the display of the same basic information at different scales. Many agencies have recognized this and they are now proceeding with the development of computer data banks or digital maps. The information concerning the locations of buildings, roads, structures and property boundaries is stored on a computer as grid co-ordinates to the accuracy needed. The advisory committee has agreed that we should proceed with the 1:2,000 maps.

Municipal 1:2,000 Digital Map

We could prepare the 1:2,000 digital maps from new aerial photography and remeasure the position of all buildings, features, etc. within the Metropolitan area. This information could be stored on a computer. Maps to the appropriate scale and orientation could be produced to satisfy many users. These maps could be updated as new buildings are constructed and new boundary lines are registered. However these maps would only be accurate to 1:2,000 standards. **Or,** we could take our existing 1"=40' and 1"=100' maps and digitize the information directly from them. This would save remeasuring it and digitizing it from aerial photography. In this case the accuracies inherent in the larger scale maps could be preserved. This map could satisfy the needs of most map users including the municipal engineers. One common data bank would be developed which could satisfy all users of the information. In those areas where the large scale maps are not available, aerial surveys could be performed, at the smaller scale, and the information memorized into the data bank. At a later date as the engineer finds he needs more accurate data he could upgrade the quality of the information in the data bank.

A survey data bank is the current technological method of satisfying the needs of many users for maps at varying scales and accuracies. It would also allow engineers to extract terrain models for computer design and would provide the land surveyor with a computational cadastre for boundary locations. Parcel para centroids could be stored in the system to provide the parcel geographical indentifier for land information systems.

Provincial Contribution

We feel the 1:2,000 map series has a wide use and application at both the Provincial and Municipal level. It is our hope that some joint effort, both technical and financial, can be undertaken to develop the initial 1:2,000 digital map series of Metro. These maps are needed by municipal Departments, Provincial Ministries, Government Agencies and the private sector the government is to serve. A policy on development and cost sharing is needed.

Once the basic map is developed, consideration will need to be given to the updating and upgrading of the map. On the surface it appears the municipal engineers would be the most discriminating users of the topographic data. The municipalities issue building permits, and could receive co-ordinated or gridded as-built location plans and may therefore be in the best position to keep the topographic map up-to-date. Similarly the Provincial ministries would appear to be the most discriminating users of the property map. They operate both the land registration and land assessment systems which requires in addition to lot lines and street lines, individual property boundaries. The registry office receives all boundary changes and could require them to be co-ordinated and keep the property map up-to-date.

I believe that this is the ideal time for those involved in mapping programs to co-ordinate our efforts and receive the best return for our investments. Metropolitan Toronto would appreciate our financial and technical support in the development of a series of 1:2,000 maps in a digital form.