April 1965

EMO

NATIONAL DIGEST

Alberta Pilot Protection Survey

National Fallout Shelter Survey

United States Defense Program

Statement on U. K. Defence Estimates 1965

Urban Characteristics Survey

Report on Ville LaSalle Explosion

EMERGENCY MEASURES ORGANIZATION

EMO NATIONAL DIGEST

Vol. 5 • No. 2

April, 1965

Published by

The Emergency Measures Organization, Ottawa, Ont.

Contents

The EMO NATIONAL DIGEST publishes six editions annually to provide current information on a broad range of subjects dealing with civil emergency planning. The magazine is published in English and French and may be obtained by writing to the Emergency Measures Organization, Daly Bldg., Ottawa.

In addition to publishing articles which reflect Canadian Government policy the Digest may also publish articles by private individuals on subjects of current interest to the emergency measures programme. The views of these contributors are not necessarily subscribed to by the Federal Government.

Director: P. A. FAGUY *Editor:* A. M. STIRTON

ROGER DUHAMEL, F.R.S.C.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1965

ALBERTA PILOT FALLOUT PROTECTION SURVEY

By S. N. WHITE,
Survival Planning (Technical)
Emergency Measures Organization

IN FEBRUARY, 1964, the Canadian government authorized the Emergency Measures Organization to conduct a pilot survey of existing and potential fallout protection available throughout the Province of Alberta. The survey was completed during the summer months of 1964.

The two main aims of the survey were to develop techniques of fallout protection survey which would be applied to a national survey and to determine the amount of fallout protection in the Province of Alberta, in terms of protection factors and space available, that could be available for public use.

Scope:

The survey was intended to cover all categories of buildings having a minimum protection factor of 10 and a minimum floor area of 1,000 sq. ft., excepting the following:

a. All buildings owned and operated by the Department of National Defence (these had already been surveyed by that Department).
b. All privately-owned dwellings of the one and two-family style.

Above ground as well as below ground space was considered for each building.

The existence of water power, sanitation and ventilation facilities was recorded for each building surveyed.

Planning:

It had been agreed that the Department of Public Works would organize and conduct the survey and so a joint EMO/DPW planning group was formed as soon as authority to proceed was granted. This group met at frequent intervals from January to May, 1964, and co-ordinated the development of the detailed planning. One of the major tools in the co-ordinating process was a critical path schedule of the many interlocking activities and this was of great assistance to the group in maintaining planning impetus.

Activities which had to be co-ordinated and fitted into this schedule were:

a. The development of data processing methods.
b. Development of calculating routines for the computer.
c. Writing the computer programme.
d. Recruiting survey staff.
e. Training the management and survey staff.
f. Public relations programmes.
g. Development of reporting techniques and procedures.
h. Administrative arrangements, and
i. planning the organization and deployment of survey teams.

Because so much of the organization and training depended upon the format in which data was to be collected and this in turn depended upon the nature of the computational routine, almost all the functions related to data processing and computation were on the critical path of the planning schedule. This put those working in this area under some pressure, but in all cases the planning schedules were in fact met. In addition to the technical programme, there were two other major programmes to be planned. First, was the organization and training of the survey personnel and second, the preparation and implementation of a public relations programme within the Province of Alberta.

The organization and recruiting was carried out entirely by the Department of Public Works. The training was conducted in two distinct phases. In the first, professional engineers, who would become zone directors and group leaders and who would, therefore, be required to exercise direction over the survey crews and some judgment with respect to special problems, received detailed and professional training in shielding analysis techniques together with a briefing on all aspects of conducting the survey. In the second phase, the survey teams were trained to fill out correctly the data collection sheets, either from building plans or building inspection. They were shown how to deal with special cases such as setbacks in buildings, mutual shielding and similar commonly occurring conditions. The survey crews were in all cases expected to refer unusual building problems to the group leader for decision and were, therefore, not required to exercise the same degree of judgment.

The public relations aspects of the survey were handled within the province and mainly by direct contact between the Department of Public Works and the various authorities. There were, however, some notable exceptions to this which are worthy of mention. The initial press release was from the Federal Ministers responsible for survey. At the same time, the Director of the Emergency Measures Organization undertook to write to all the national organizations having establishments within the Province of Alberta asking for their sanction to enter their premises for survey purposes. This was an immensely successful step and the support which was received as a result of this move was virtually complete, most of the organizations so addressed welcoming the survey as a realistic and practical step.

91959—1

In addition, arrangements were made to keep the Members of Parliament from the Province of Alberta and the Members of the Alberta Legislature informed, first, as to the purpose and scope of the survey, second, to answer any questions that they might have with respect to it during the course of the survey and, finally, to make available to them summaries of the results.

Finally, an identity card was prepared for each surveyor, and building owners were advised, through the press, on the radio and by other means, that surveyors were in possession of, and could identify themselves by means of, this card.

Method:

Field Organization

The Province of Alberta was divided into two zones each having a zone director in charge reporting to the deputy director of the survey at the provincial headquarters. Each zone director had under him at least three group leaders and each group leader was responsible for two or three survey parties consisting of two men each.

Method of Operation

It was found that in most cases it was desirable to undertake a detailed reconnaissance of an area prior to sending survey teams into it. Such a reconnaissance enabled an appropriate number of teams to be allocated to the area and the time required for the survey to be estimated. In addition, it was found extremely desirable to accumulate other information such as maps and aerial photos which would help the planned deployment of survey crews.

The survey was commenced in the two major cities of Edmonton and Calgary and, with this underway, standard information packages were prepared and forwarded to local news media approximately two weeks before survey crews were due to enter a new area. One of the first jobs of the group leader on entering a new area was to provide the personal follow-up with the news media. This usually occurred after he had contacted the local mayor, chief of police and city officials.

It was found that there are essentially two types of field operation—urban and rural. Larger towns can be surveyed over a period of time by crews stationed in them, whereas smaller centres and rural areas can be surveyed either from a zone or temporary headquarters. The travel time involved in these two types of operation causes slightly different survey procedures. It was found, for example, that in the central business district of Edmonton, a two man crew in the course of an 8½ hour day normally examined approximately 15 buildings, rejecting 10 and completing data sheets on 5. In a light industrial or fringe business district, the same crew examined between 50 and 100 per day obtaining data sheets on only two or three.

By comparison, the planning of rural work could not be as detailed since the buildings for which data sheets were ultimately compiled were often widely spaced between small villages and hamlets.

The technique involved in surveying buildings develops with experience and many could be rejected as not meeting the basic criteria after a quick visual examination. Others could be rejected as soon as the building was entered. Once it was considered that the building met the basic criteria, the first inspection was an exterior inspection to note dimensions, irregularities of construction, contaminated planes and the construction of walls. On entering the building, the survey teams' first commitment was to consult the owner, manager or person in charge before making the interior inspection. Building plans formed a most desirable adjunct to the visual inspection.

Data Processing

The data sheet which was filled out by the survey crew was one which was designed to pass through an electronic mark sensing device designed to transfer the recorded information to tapes which were the input to the main computer. The nature of this form of data processing made it essential to have the sheets checked prior to sending them for computation, since any error or inconsistency in the sheet resulted in the sheet being rejected by the machine. Checking was done by the group leader and at this stage the building received its identification number (KEMOLL No.). It was then listed on a master index sheet prior to forwarding for processing.

The mark sensing device which was used to process the data sheets had in fact been designed for statistical purposes and this gave rise to some problems. The scientific accuracy demanded in the computational process was easily upset by smudged entries on the data sheet or entries omitted or placed only slightly out of line. This was discovered when during the first run of the machine there were a very high percentage of sheets rejected. Many of these were easily and readily corrected but the process was time consuming. Furthermore, an unavoidable delay in getting the process into operation meant that by the time the forms had been passed through the machine and any rejections observed, the field crews had already left the area concerned. Corrections to the field data sheets therefore had to be carried out at survey headquarters.

The output of the mark sensing machine became the input to the computer. This was an IBM 7044, the programme for which had been written according to computational routines prepared in the Engineering Section, Emergency Measures Organization. They followed procedures developed in that office. In order to simplify the computer programme, a number of decisions had to be taken with respect to problems such as; what percentage of the available floor space constitutes useable shelter; at what point does it become unnecessary to apply height correction factors to radiation from distant contaminated planes; and how to deal with building setbacks. Decisions were taken on these and

similar problems and the results incorporated in the report on computer routines (EMO TR 100-1) which has been prepared separately.

Results:

It was found that in the Province of Alberta, which has a population of approximately 1,400,000, that there were approximately 275,000 buildings. Of these 90% could be rejected as not meeting the basic criteria, leaving 10% or roughly 28,000 to be inspected. Out of these 28,000, data sheets were completed for 3,800 buildings, but because of the necessity of considering some buildings in several parts, a total number of 4,500 data sheets were compiled and processed. The results of the computation of these data sheets are tabulated in various ways and are shown in accompanying charts:

Chart 1.—Summary of Results.

Chart 2.—Shelter spaces by protection factor category as percentages of the total.

Chart 3.—Shelter spaces by P.F. category for various types of ownership.

Chart 4.—Shelter spaces by P.F. category for various types of building.

Conclusions:

General

The survey results apart from indicating the number of shelter spaces available in the Province of Alberta may be used in a number of other ways. First, they can be used to assess the cost of the development of shelter on a provincial basis. This has been the subject of the first analysis study now completed. Second, they will facilitate the study of the relationship of available shelter to the potential fallout hazard. Such a study has been commenced but is not yet complete. In addition to this, the KEMOLL Number Code is the key to picking out and classifying the available shelter spaces under any one of a number of headings, such as the type of building, the type of ownership, the location of the buildings with respect to civil defence control areas, or their UTM Co-ordinates. In consequence, planning staffs both of the Federal Government and of the Province of Alberta will be able to analyze more closely their shelter requirements and planning objectives.

The survey was initiated as a pilot survey, that is, one from which we could learn lessons and deduce methods for improving techniques. In this respect, too,

CHART 1

SUMMARY OF RESULTS—ALBERTA SURVEY

Protection (*a*) Factor (PF)	Existing Spaces: (*b*)		Improvement Potential: (*c*)		
	No.	% of Total better than PF 100	No. of Spaces	% Improvement	% of Total better than PF 10
over 1,000	142,210	8.6	189,088	32	7.9
500–1,000	70,558	4.3	123,240	43	5.1
200–499	131,183	7.9	175,943	34	7.3
100–199	98,625	6.0	170,923	73	7.1
better than 100 (*c*)	442,576	27.0	659,194	49	29
50–99	185,697	11.2	361,219	94	15
better than 50	628,273	38	1,020,413	62	43.0
20–49	463,751	28	534,586	15	22
10–19	558,970	34	835,779	49	35
better than 10	1,650,994	100	2,390,778	45	100
2–9	1,409,214	—	825,818	—	—

NOTES:

(*a*) A protection factor of 100 is the figure recommended by EMO as being adequate for all but extreme cases of fallout, a PF of 500 is more than adequate, and PFs lower than 100 may have significant value in areas of lower fallout intensities, but will, in any case, always afford some protection.

(*b*) A shelter space represents 12 sq. ft. of floor space and at least 80 cu. ft. of free air space.

(*c*) Improvement Potential shows the number of spaces which could be obtained by raising the protection factors of suitable areas from the category immediately below: this would naturally involve additional building modification.

91959—2

CHART 2

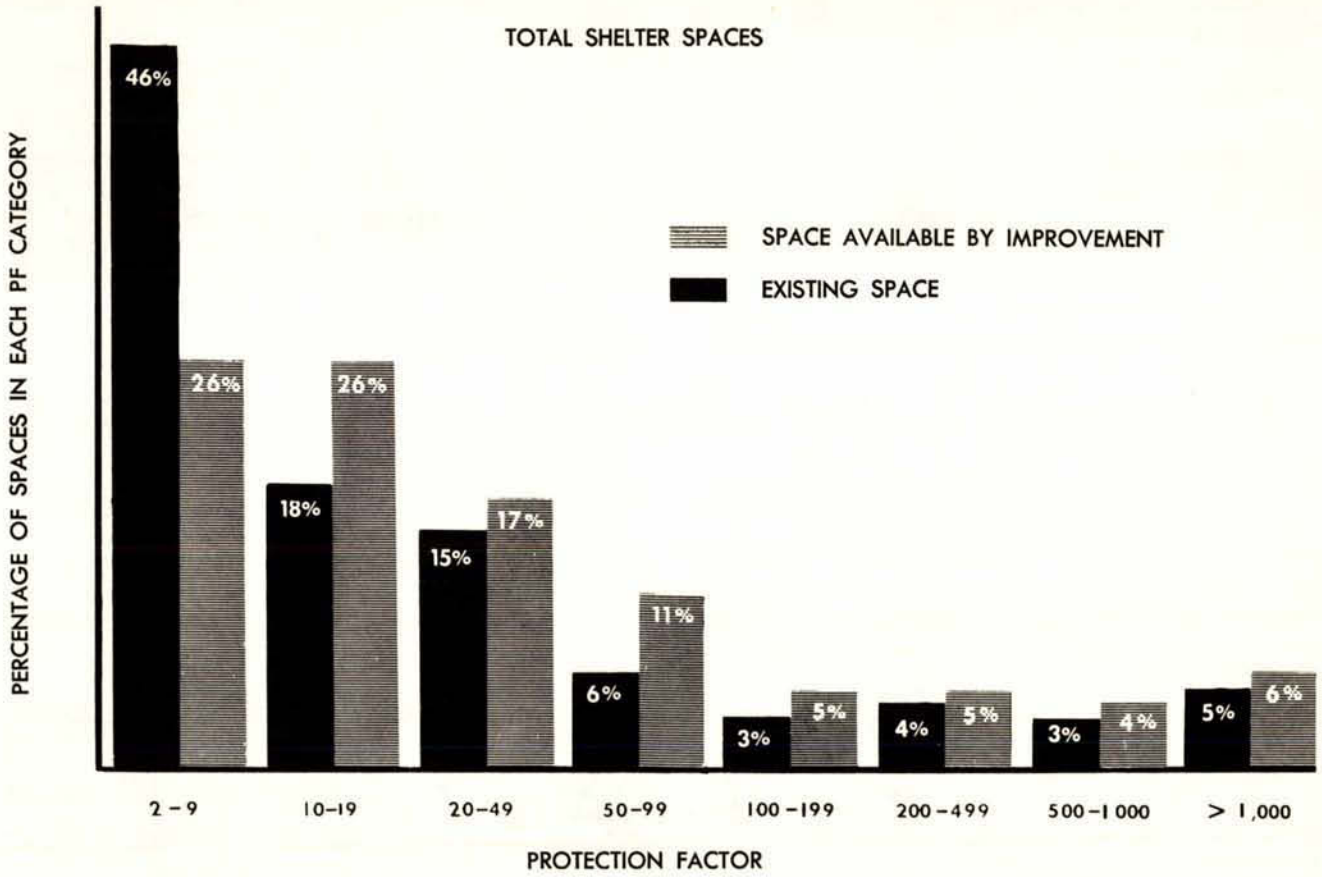
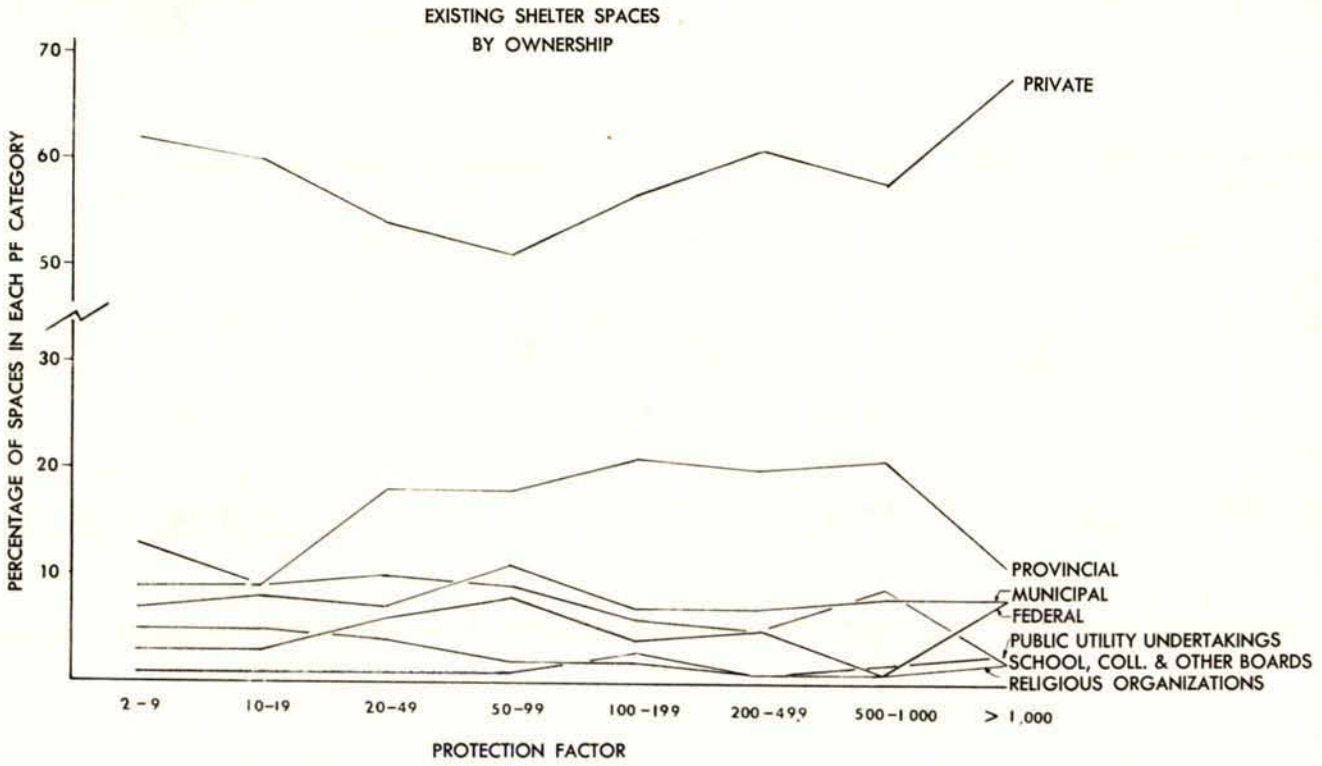


CHART 3



the survey has served its purpose because, not only has it shown how the field organization and techniques can be improved, but it has also indicated where the data processing should be amended. The more significant of these points are set out below.

Organization

Detailed recommendations relating to the organizational part of the survey have been prepared by the Department of Public Works in "A Study of Procedures and Techniques". Probably the most important of these recommendations may be summarized by stating that the Department of Public Works is now in a position to draw up firm and proven directives for the following:

a. Advanced planning of the survey.
b. Recruitment and administration.
c. Organization of field survey teams.
d. Detailed duties of various key personnel.

This is now of major importance because a Canadian National Survey has recently been authorized and the efficient management of this survey will have a considerable effect on the overall cost.

Technical

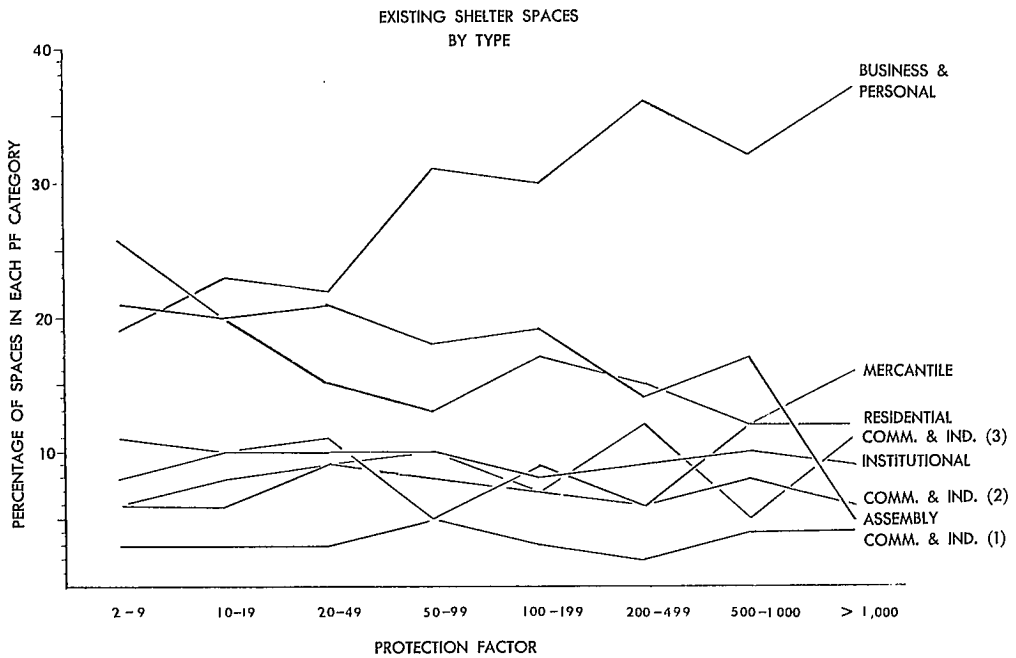
Probably the most significant technical lesson learned was that a large and complicated field data sheet causes the surveyors to spend longer in the field than should be necessary. Furthermore, surveyors' expenses constitute the greater proportion of the survey costs. A simplified data sheet which can be filled out more rapidly and yet checked easily is an obvious requirement and such a sheet is now being designed for the national survey. Similarly, increased emphasis on checking by the group leader is essential since rejected data sheets result in time consuming search of records and perhaps revisiting the site. All of this adds unnecessary expense. A corollary of this is that additional time spent in training the survey teams would result in fewer errors.

In spot checking the computer printouts of certain buildings against manual analysis of the same buildings, it was found that in certain cases the protection factors of above ground areas were being underestimated. The necessary changes, together with other minor but desirable alterations, are now reflected in the computer routines.

The design facility which was included in the computer programme indicated the additional wall mass thickness necessary to raise the protection factor into the next higher category. It is now considered that a more valuable estimate can be calculated; and now that a cost basis has been established for shelter development, it is intended to change this process to one which will indicate the protection factor to which the shelter could be raised economically.

The pilot survey has most certainly met the aims established for it. It has contributed to the development of techniques which can be applied with confidence to the national survey and it has provided the Province of Alberta with a comprehensive estimate of fallout protection available. The effectiveness of the survey was a major factor in the decision to proceed with a national survey in which all the indicated improvements and desirable techniques will now be incorporated. ▲

CHART 4



91959—2½

National Fallout Shelter Survey

EDITOR'S NOTE: *Federal government approval to a national survey of fallout shelter spaces was announced by the Hon. C. M. Drury, Chairman, Cabinet Committee on Emergency Plans, on February 23rd, 1965. The following is the government announcement.*

HON. CHARLES M. DRURY, Minister of Industry, today announced the government has approved a nation-wide survey of buildings to determine the number of fallout shelter spaces which could be made available for public use in the event of nuclear attack on North America.

The long-term survey, similar to that carried out in the Province of Alberta last year, will identify and locate buildings containing potential shelter spaces, estimate capacities, and determine existing protection against radioactive fallout. It will also reveal what buildings would require additional shielding, light, water or sanitary facilities to bring them to suitable standard.

In announcing commencement of the survey Mr. Drury emphasized that the Emergency Measures Organization sponsored project is part of the national programme of "taking stock" for an emergency. It will complement past surveys started in 1961 of federal buildings and mines and the Alberta survey of 1964.

The Department of Public Works will organize, administer and conduct the survey for the Emergency Measures Organization.

To obtain details for computer and manual analysis survey teams will record space and protection factors of provincial and municipal buildings, apartments, office buildings, schools, institutions, churches, and all other suitable privately-owned structures. The survey will not include private residences. Shelter factors such as public capacity, radiation protection afforded above and below ground level, ventilation, water, electric power, sanitary facilities, and location, will be listed.

The 1965 phase of the survey is slated to include areas of southern Ontario, southern Quebec and part of New Brunswick. Other parts of Canada will be surveyed in future phases.

Techniques developed in last year's Alberta pilot survey will be used. The first computer analysis of that survey has pin-pointed more than 1,650,000 existing shelter spaces which have a protection factor greater than 10. Included in this figure are 442,500 with a factor of more than 100, the figure recommended by E.M.O. as being adequate for all but extreme fallout, 185,600 with a factor of 50 to 99, and 1,022,700 with a factor of 10 to 49.

Protection factor is the term used to indicate shielding. A factor of 100 reduces inside exposure to 1/100th of the roentgen rate outside, 50 reduces it to 1/50th and 10 to 1/10th.

The Alberta survey has also revealed that another 740,000 spaces with a potential factor of 10 or more could be made available if some improvements were made.

Though the Alberta survey showed that the number of potential spaces is greater than the population of the province, locations do not coincide with population distribution. Subsequent analysis of the findings will determine location of spaces with reference to population densities.

Each shelter space is defined as 12 sq. ft. with at least 80 cu. ft. of free air space.

In announcing the national fallout shelter survey, Mr. Drury stated that current plans do not include public designation of shelter areas nor alterations to buildings to bring them up to suitable standard. ▲

U.S. PRESIDENTIAL C.D. STATEMENT

EDITOR'S NOTE: *The following is an extract of President Johnson's message on defence which was presented to the Congress of the United States on 18th January, 1965.*

"While confident that our present strength will continue to deter a thermonuclear war, we must always be alert to the possibilities for limiting destruction which might be inflicted upon our people, cities and industry, should such a war be forced upon us. Many proposals have been advanced for means of limiting damage and destruction to the United States in the event of a thermonuclear war. Shifting strategy and advancing technology make the programme of building adequate defences against nuclear attack extremely complex.

Decisions with respect to further limitation of damage require complex calculations concerning the effectiveness of many inter-related elements. Any comprehensive programme would involve the expenditure of tens of billions of dollars. We must not shrink from any expense that is justified by its effectiveness, but we must not hastily expend vast sums on massive programmes that do not meet this test.

It is already clear that without fallout shelter protection for our citizens, all defence weapons lose much of their effectiveness in saving lives. This also appears to be the least expensive way of saving millions of lives, and the one which has clear value even without other systems. We will continue our existing programmes and start a programme to increase the total inventory of shelters through a survey of private homes and other small structures."

United States Defense Programme

Following are excerpts from the Statement of Secretary of Defense, Robert S. McNamara, before the House Armed Services Committee on the Fiscal Year 1966-70 Defense Program and 1966 Defense Budget, delivered February 18, 1965.

Strategic Offensive and Defensive Forces

THIS YEAR for the first time we are including in a single chapter the discussion of the three major programs which constitute our general nuclear war forces: The Strategic Offensive Forces, the Continental Air and Missile Defense Forces, and Civil Defense.

I have made this change, not as a matter of style, but, rather to facilitate our analysis of the general nuclear war problem. It was clear last year that because of the close inter-relationship and, indeed, the inter-action of the three major components of our general nuclear war posture, the only practical way to deal with this problem is to incorporate all three components in a single analytical framework. Only then can the true character of the general nuclear war problem in all its dimensions be fully grasped and the relative merits of available alternatives be properly evaluated.

Nature of the General Nuclear War Problem

. . . In the event of general nuclear war, attacks might be directed against military targets only, against cities only, or against both types of targets, either simultaneously or with a delay. They might be selective in terms of specific targets or they might be general. In this regard, it is important to bear in mind that the types of situations I shall be discussing are illustrative. They reflect the way we go about determining our requirements. They do not necessarily reflect all the ways in which a general nuclear war might be fought.

In such a war, the following types of U.S. strategic forces would be involved:

1. **Strategic Offensive Forces**

   Manned bombers, strategic reconnaissance aircraft, intercontinental ballistic missiles and submarine-launched missiles, and their associated support forces and command and control systems.

2. **Strategic Defensive Forces**

   Anti-aircraft defenses: manned interceptors; surface-to-air missiles; and their associated warning and control systems (including a capability against air breathing missiles).

   Anti-ballistic missile defenses: anti-missile missiles together with the associated sensing, data processing and communications systems; and the anti-submarine warfare forces directed against enemy missile launching submarines, together with the associated sound surveillance systems.

   Anti-satellite defenses: Interceptor missiles and the space detection and tracking systems.

3. **Civil Defense Programs**

   Fallout shelters, warning, etc.

The strategic objectives of our general nuclear war forces are:

1. To deter a deliberate nuclear attack upon the United States and its allies by maintaining a clear and convincing capability to inflict unacceptable damage on an attacker, even were that attacker to strike first;
2. In the event such a war should nevertheless occur, to limit damage to our populations and industrial capacities.

Capabilities of the Programed Forces for Damage Limitation

The ultimate deterrent to a deliberate nuclear attack on the United States and its Allies is our clear and unmistakable ability to destroy an aggressor as a viable society, even after our forces have been attacked. But if deterrence fails, whether by accident or miscalculation, it is essential that forces be available to limit the damage of such an attack to ourselves and our Allies. . .

Since we have no way of knowing how the enemy would execute a nuclear attack upon the United States, we must also intensively explore alternative "defensive" systems as means of limiting damage to ourselves. The problem here is to achieve an optimum balance among all the elements of the general nuclear war forces, particularly in their Damage Limiting role. This is what we mean by "balanced" defense.

Although a deliberate nuclear attack upon the United States may seem a highly unlikely contingency in view of our unmistakable Assured Destruction capability, it must receive our urgent attention because of the enormous consequences it would have. . .

Several points are evident from our analysis of this problem. First, it is clear that with limited fallout protection, an enemy attack on our urban areas would cause great loss of life, chiefly because of the heavy concentration of population in our large cities which I noted earlier. Second, the analysis clearly demonstrates the distinct utility of a nationwide fallout shelter program in reducing fatalities, at all levels of attack. Third, the analysis shows that the attack would destroy a large percentage of our industrial capacity. Each successive doubling of the number of delivered warheads would increase the destruction of our population and industrial capacity by proportionately smaller amounts, since smaller and smaller cities would have to be attacked.

In order to assess the potentials of various Damage Limiting programs we have examined a number of "balanced" defense postures at different budget levels. These postures are designed to defend against the assumed threat in the early 1970s. To illustrate the critical nature of the timing of the attack, we used two limiting cases. First, we assumed that the enemy would initiate nuclear war with a simultaneous attack against our cities and military targets. Second, we assumed that the attack against our cities would be delayed long enough for us to retaliate against the aggressor's military targets with our missiles. In both cases, we assumed that all new systems will perform essentially as estimated since our main purpose here was to gain an insight into the overall problem of limiting damage. The results of this analysis are summarized in the table below.

ESTIMATED EFFECT ON U.S. FATALITIES OF ADDITIONS TO THE APPROVED DAMAGE LIMITING PROGRAM
(Based on 1970 population of 210 million)

Additional Investment	Millions of U.S. Fatalities: Early Urban Attack	Delayed Urban Attack
$ 0 billion	149	122
5 billion	120	90
15 billion	96	59
25 billion	78	41

The $5 billion of additional investment (of which about $2 billion would come from non-Federal sources) would provide a full fallout shelter program for the entire population. The $15 billion level would add about $8½ billion for a limited deployment of a low cost configuration of a missile defense system, plus about $1½ billion for new manned bomber defenses. The $25 billion level would provide an additional $8½ billion for anti-missile defenses (for a total of about $17 billion) and another $1½ billion for improved manned bomber defenses (for a total of $3 billion). . .

The high utility of a full nation-wide fallout shelter program in the Damage Limiting role is apparent from the foregoing table . . . a transfer of resources from fallout shelters to other defensive systems would result in substantially less effective defense postures for any given budget level. . .

. . . any Damage Limiting program which excludes a complete fallout shelter system would cost at least twice as much as a program which includes such a system—even under the favorable assumption that the enemy would not exploit our lack of fallout protection by surface bursting his weapons upwind of the fallout areas. In addition, fallout shelters should have the highest priority of any defensive system because they decrease the vulnerability of the population to nuclear contamination under *all* types of attack. . .

In summary, several tentative conclusions may be drawn from our examination of the Damage Limiting problem:

1. With no new U.S. defenses against nuclear attack in the early 1970s, the strategic offensive forces likely to confront us could inflict a very high level of fatalities on the United States.
2. A nation-wide civil defense program costing about $5 billion could reduce fatalities by about 30 million.
3. If active defense systems operate as estimated, a large, balanced Damage Limiting program for an additional $20 billion could reduce fatalities associated with an early urban attack by another 40 million.
4. There is no defense program within this general range of expenditures which would reduce fatalities to a level much below 80 million unless the enemy delayed his attack on our cities long enough for our missile forces to play a major Damage Limiting role. . .

In the light of the foregoing analysis, it seems to me that there are six major issues involved in our FY 1966-1970 general nuclear war programs. These issues concern:

1. The development and deployment of a new manned bomber (estimated five-year systems cost—$8.9 to $11.5 billion).
2. The size of the strategic missile force (estimated five-year cost for an additional 200 MINUTEMAN II missiles—$1.3 billion).
3. The overall level of the anti-bomber defense program (estimated five-year cost if units proposed for phase out are retained in the forces—$300 to $350 million).
4. The production and deployment of a new manned interceptor (estimated five-year cost—$4 billion).
5. The production and deployment of the NIKE X anti-missile system (estimated five-year cost—$24 billion).
6. The construction of fallout shelters for the entire population (estimated cost to individuals, state, local and Federal Government—$5 billion).

The first two issues are related to the Strategic Offensive Forces, the next three to the Strategic Defensive Forces and the last to the Civil Defense Program. . .

(As part of his discussion of the Strategic Defensive Forces, Secretary McNamara made the following statement on the position of NIKE X in the ballistic missile defense program):

NIKE X

The major issue in the ballistic missile defense program concerns the production and deployment of the NIKE X system. In my appearance before this Committee last year, I described the NIKE X system and its problems in considerable detail. Since that time, we have greatly expanded our knowledge of anti-missile

defense with regard to both the relative costs and effectiveness of alternative deployments and the technical aspects of the system.

Although the NIKE X development is progressing satisfactorily, there are many technical problems still to be solved and I believe it is still premature to make any commitment to production and deployment at this time. Over and above the technical problems there are even greater uncertainties concerning the preferred concept of deployment, the relationship of the NIKE X system to other elements of a balanced Damage Limiting effort, the timing of the attainment of an effective nation-wide fallout shelter system and the nature and effect of an opponent's possible reaction to our NIKE X deployment. Accordingly, we propose to continue the development of the NIKE X system on an urgent basis and a total of about $400 million has been provided in the FY 1966 budget for that purpose, including $10 million for some preliminary production engineering. We plan to reexamine the question of production and deployment of the NIKE X system again next year. Considering the vast amount of development, test and evaluation work still to be accomplished, deferral of this decision to the FY 1967 budget should not delay an initial operational capability by many months beyond what we could expect to achieve if we were to start production in FY 1966.

Civil Defense

The major issue in this area concerns the construction of a complete nation-wide fallout shelter system. As I noted earlier, such a system would provide the greatest return, in terms of lives saved, from any additional funds spent on damage limiting measures. The 5-year systems cost for full fallout shelter protection for the entire population has been estimated at roughly $5 billion—about $3 billion from the Federal Government, $1 billion from State and local governments and $1 billion from private sources.

Most of the approximately 240 million shelter spaces needed by the early 1970s can be obtained relatively cheaply, simply by identifying, marking and stocking the fallout shelter inherent in existing or planned structures. The residual requirement, however, will have to be met by providing for dual-purpose fallout shelter areas in new construction and this we believe, would require Federal cost sharing with State and local governments and non-profit institutions. Such a cost sharing program would, of course, require the enactment of legislation authorizing the Defense Department to participate on behalf of the Federal Government. The Executive Branch has recommended such legislation to the Congress for three years running, but it was not enacted. Since this dual purpose shelter subsidy proposal is directed only to meeting the residual requirement, we propose in FY 1966 to concentrate our efforts on exploiting fully all of the existing potential for fallout protection and to determining more precisely the exact nature of the residual shelter requirement. To this end, we intend to emphasize four aspects of the program during FY 1965 and FY 1966:

- Expansion of the present shelter survey program to include structures too small to qualify as public fallout shelters, i.e., small business facilities, duplexes and single family residences.
- Provision of architectural and engineering advice and assistance to stimulate the development of dual-purpose low cost, fallout shelters in new construction or major structural modification projects, through the application of various design techniques.
- Development of plans to identify more precisely the residual shelter requirements and to ensure the efficient use of currently available shelter by matching individuals with specific shelter spaces.
- Provision of portable ventilation kits which will significantly increase the capacity of existing shelter space.

I will discuss each of these measures in context with the FY 1966 Civil Defense Program summarized on Table 1.

1. Shelter Survey and Marking

The continuing survey of existing structures has already identified about 127 million shelter spaces with a minimum protection factor of 40 or better. More than 79 million shelter spaces in 94,000 structures have actually been licensed or marked. By the end of FY 1965, we estimate about 130 million spaces will have been identified and a total of 90 million spaces actually licensed or marked.

As shown on Table 1, $36.3 million has been included in the FY 1966 request for shelter surveys. Of this amount, $13.3 million is requested to support the continuing survey and marking program which, during FY 1966, should add about 6 million additional spaces to the inventory. Prior to FY 1965, we limited our survey efforts to structures having potential as "public" fallout shelters—i.e., structures capable of sheltering 50 people or more. During the current year we expanded the shelter survey to include smaller structures other than single family homes.

In the case of single family homes, a pilot test using a questionnaire type technique is already underway. Many private homes, just as the larger structures covered by the National Fallout Shelter Survey, are presently capable of providing significant protection. The purpose of the "single family home survey" is to inform the homeowner of the existing protection already available to him. In addition, the results will be most useful to communities in determining more precisely the availability of suitable shelter. The initial survey is tentatively planned for completion in FY 1968 and could result in the identification of as many as 11 million shelter spaces which can be applied against the total requirement.

TABLE 1—FINANCIAL SUMMARY OF CIVIL DEFENSE

(TOA,* $ in millions)

	FY 62	FY 63	FY 64	FY 65	FY 66
A. Shelter Survey	58.4	9.3	7.8	11.7	36.3
B. Shelter Development	—	—	—	5.8	3.0
C. Shelter in Federal Buildings	19.8[a]	—	—	—	7.8
D. Shelter Provisions	90.3	32.7	23.5	2.8	52.6
E. Warning	6.8	4.1[b]	1.8	2.4	1.3
F. Emergency Operations	19.8	13.1[b]	13.1	12.5	13.3
G. Financial Assistance to States	18.9	27.5	23.7	27.0	30.5
H. Research and Development	19.0	11.0	10.0	10.0	15.0
I. Management	12.4	13.6	13.9	14.5	14.6
J. Public Information	4.0	4.3	2.7	3.2	4.0
K. Training and Education	2.9	9.9	14.1	15.4	15.5
TOTAL	252.3	125.4	110.5	105.2	193.9

[a] Includes $2.3 millions transferred from OCDM for construction of a Regional Center.
[b] Excludes $2.2 millions transferred to Army for civil defense warning and communications networks.
Note: Totals may not add due to rounding.
* Total Obligational Authority.

In total, $23 million is requested in FY 1966 for a full scale effort in these two new phases of the survey program.

2. Shelter Development

Experience indicates that a large amount of suitable shelter area could be obtained at little or no cost with minor changes in the design of new buildings such as by reducing window areas, placing first floors below ground level, and by using partitions, stairwells, retaining walls and high density materials to reduce radiation. We propose in FY 1966 to expand the provision of architectural and engineering advice on such matters to a level of $3 million, compared with $1.8 million programed for the current fiscal year. The U.S. Government will apply the same techniques to its own construction.

As previously mentioned, the shelter survey program has already identified a large amount of potential fallout shelter. Before we can truly realize this potential or know for certain the size and location of the residual shelter requirement, it will be necessary to develop specific shelter use plans countrywide. Beginning last year, we undertook pilot community shelter planning studies in 57 cities. These studies, managed by the Corps of Engineers, are done under contract with city planning agencies. During the current year, we are extending this program nation-wide, and work will continue into FY 1966 using $4 million of FY 1965 funds. Pending an analysis of our experience with this segment of the program, we are not requesting additional funds for community shelter planning at this time. As I will discuss later, however, we are requesting increased funding in FY 1966 to support the emergency operations systems development programs which are related to this community shelter programing effort. When this necessary analysis is completed, we will be prepared to extend further the community shelter planning program.

3. Regional Operations Centers

In order to provide essential emergency management and direction facilities in wartime and to house regional Civil Defense and other agency personnel in peace time, eight regional centers have been planned. These centers have been designed to provide adequate radiation and minimal blast protection. The first center at Denton, Texas, authorized prior to DOD assumption of Civil Defense responsibility, has already been completed at a cost of $2.7 million. The cost of constructing the remaining seven facilities on a more austere basis is estimated at $9.9 million, of which $2.1 million is already available from prior year appropriations. The remaining $7.8 million has been included in the FY 1966 budget.

4. Shelter Provisions

Funds appropriated through FY 1965 will provide supplies for about 63 million shelter spaces and $23.4 million is requested for FY 1966 to procure stocks for an additional 12 million spaces. The estimated cost per space in the FY 1966 program is somewhat lower than in the past since we believe that some of the provisioning requirements can be met through other means. The continuing shelter survey program has been expanded to determine the amount of food and water and sanitation facilities already present in buildings in which shelter has been identified and marked. To the extent such supplies and facilities are available or can be made so easily, the requirement for Federally-supported provisioning is reduced.

Frequently, in those cases when water is not already available to the shelter area, it can be made available by minor adaptations to the existing plumbing system. Accordingly, the FY 1966 request includes $3.6 million to defray the cost of modifying the water systems in some 18,000 buildings containing several million shelter spaces.

The $52.6 million shown on Table 1 for shelter provisions includes $25 million for the procurement of portable ventilation kits which would substantially increase the capacity of existing non-ventilated shelter space. Use of these kits would make it possible to accommodate another 10 million persons in shelter spaces already identified and marked.

5. Warning

Of the $1.3 million requested in the FY 1966 budget for this category, $0.4 million supports the maintenance and improvement of the Washington area warning system. The remaining $0.9 million provides for fallout protection at an additional 228 State and local warning points in the national warning system, making a total of 483 protected warning points.

6. Emergency Operations

The $13.3 million included in the FY 1966 budget for emergency operations covers four activities—the Emergency Broadcast System, damage assessment, radiological defense and emergency operations systems development.

The Emergency Broadcast System provides the President, the Federal Government and State and local authorities a means of communicating with the public in an emergency. Under the guidance of the Federal Communications Commission, plans are being developed at each governmental level. The necessary emergency facilities and equipment for 530 of the 658 radio stations estimated to be needed for complete national coverage have been financed through FY 1965 and prior appropriations. An additional $2 million is included in the FY 1966 budget to cover the remaining 128 stations.

Damage assessment techniques provide the informational basis for operational planning, for program evaluation and development, and for the direction of emergency operations. In FY 1966, $1.0 million is requested to operate the National Civil Defense Computer Facility and $0.4 million to maintain and update the damage assessment data base.

For radiological defense, $6.7 million is requested—$2.5 million for 500,000 dosimeters for Civil Defense emergency personnel for determining radiation exposure; $0.8 million for the technical improvement of radiological instruments; and $3.4 million for weather services, warehousing and radiological instrument maintenance and calibration.

For emergency operations systems development—i.e., the application of results of research, engineering tests and operations analyses to the development of practical civil defense doctrines and techniques—$3 million is requested for FY 1966, an increase of $2 million over the present year's level. Virtually all of the increase is related to our expanded efforts in community shelter planning, which I mentioned earlier. This kind of practical planning is required to assure that supporting civil defense systems at the local level keep pace with the increased availability of shelters.

7. Financial Assistance to States

As shown on Table 1, $30.5 million in matching funds are requested for FY 1966 for financial assistance to the States, an increase of $3.5 million over FY 1965. This increase stems from the higher demands being made upon State and local civil defense organizations for newly emphasized aspects of the program, i.e., community shelter planning, increased shelter provisioning and development of emergency operating capabilities.

8. Research and Development

The FY 1966 request includes $15 million, compared with $10 million for the current fiscal year, to expand the civil defense research and development program. These funds will enable us to intensify our efforts to obtain: fallout protection at lower costs per shelter space; better means of controlling and directing emergency operations in damaged areas; an improved technical base for post-attack survival and recuperation; and improved methods of fire control and thermal countermeasures in the nuclear attack environment.

9. Management

For overall program management, $14.6 million is requested for FY 1966—about the same as for the current fiscal year.

10. Public Information

The FY 1966 request includes $4 million for public information activities and for the encouragement of private industrial participation in civil defense activities.

11. Training and Education

For civil defense training and education, $15.5 million is requested in FY 1966—about the same as FY 1965. This amount will permit a continuation of the University Extension Program which was significantly expanded this year. This program provides high quality civil defense training through the state university and "land-grant" college systems.

FINANCIAL SUMMARY

The Strategic Offensive Forces, The Strategic Defensive Forces and The Civil Defense Program I have outlined will require Total Obligational Authority of $6.3 billion in FY 1966. A comparison with prior years is shown below:

	($ Billions, Fiscal Years)					
	1962 Orig.	1962 Final	1963 Actual	1964 Actual	1965 Est.	1966 Proposed
Strategic Offensive Forces	7.6	9.0	8.4	7.3	5.3	4.5
Strategic Defensive Forces	2.2	2.0	1.9	2.0	1.7	1.6
Civil Defense		.3	.1	.1	.1	.2
TOTAL	9.8	11.3	10.4	9.4	7.1	6.3

STATEMENT ON U.K. DEFENCE ESTIMATES–1965

The following is an extract from the Statement which pertains to Civil Defence

THE THREAT

The only direct threat to our survival would be a major nuclear war arising from a direct conflict between East and West. This can be almost entirely excluded as a result of the present state of mutual deterrence, and, bearing in mind the high risk that any conflict in Europe would escalate, deliberate aggression, even on a limited scale, is unlikely in this theatre.

An evolution in both Soviet and Western thinking, brought about partly by increased understanding of the consequences of nuclear warfare, has therefore much reduced the likelihood of war between the Soviet and the Western alliances and gives grounds for hope of progress in the limitation and control of arms and of a still more stable relationship.

Nevertheless we must maintain our guard. There is always the risk of war arising out of misunderstanding or miscalculation. Moreover, outside Europe we must expect instability to continue and perhaps increase. The emergence of many newly independent countries, especially in Africa, has been accompanied by unrest and armed conflict. These countries are rightly determined not to accept foreign domination; but if our friends turn to us for help we must be ready to give it where we can, so that they may achieve security and the chance to flourish in peace. In the Far East the Chinese nuclear explosion casts a new shadow over the future, making it more difficult to forecast the trend of political development in an area where we have Commonwealth and treaty possibilities to assist our friends.

The Chinese explosion must remind us that the stability so far achieved in relations between Soviet and Western alliances might rapidly be jeopardised by the spread of nuclear weapons to countries which do not now possess them. For this reason international agreements to prevent the dissemination or acquisition of nuclear weapons must be an urgent aim of our foreign policy; our defence policy must encourage and not impede the achievement of such agreements. In the meantime our nuclear policy must help to provide some reassurance to non-nuclear powers.

PART III—CIVIL DEFENCE

- For the financial year 1965–66 £22.7m. has been provided in the Estimates for expenditure by civil departments on home defence. Details are set out in Part IV, Annex E. The form of our civil defence preparations in the years ahead is being reviewed in the light of the general reconsideration of defence.
- Arrangements have been made for an emergency system of control, for the maintenance of law and order and for the marshalling of the available resources—food, water, medical supplies and raw materials.
- An effective organisation for warning the public of an attack and for monitoring radioactivity has been established, including a communications system for the rapid transmission of warnings, and headquarters and posts for the Royal Observer Corps.
- Planning for the maintenance of essential supplies and services in an emergency continues. The system of control has been further developed and preparations are proceeding, including preparations by the local authorities.
- The full effect of the reorganisation of the Civil Defence Corps introduced in 1962 is now becoming apparent, and recruits who are prepared to accept the obligations which membership of the Corps now entails are coming in steadily. The Auxiliary Fire Service has been similarly reorganised.
- To help the police maintain law and order, plans have been made for the formation of reserve units which would be sent to stricken areas after an attack. Regular training is given for this task and for all other war-time duties of the police.
- Good progress has been made in stockpiling equipment to fight wartime fires. Planning for emergency fire-fighting continues. Arrangements were made during 1964 for selected Territorial Army units to receive training in a fire-fighting role.
- Plans for expanded war-time hospital and casualty services have been further developed, and the allocation of medical manpower in war-time is under discussion with representatives of the medical profession.
- Planning has continued for the procurement, control and distribution of food, for emergency feeding and for agricultural production after an attack. In addition, stocks of food and emergency feeding equipment are being maintained.
- Plans for the maintenance of other services include the stockpiling of equipment to enable water supplies lost by damage to installations or by contamination to be replaced. Preparations also cover the maintenance of communications and a broadcasting service in war, and the due functioning of transport.
- A pilot survey of shelter against radio-active fall-out has been carried out, and the results are being studied.
- To enable the Government of the day to put dispersal arrangements into operation if they considered it right to do so, the broad outline of a scheme was announced in 1962 for the movement of priority classes—mainly children and their mothers—away from the most densely populated parts of the country. The local authorities are engaged in working out the detailed plans. Fresh guidance has been given to them on plans to help the homeless. ▲

URBAN CHARACTERISTICS SURVEY OF SELECTED CANADIAN CITIES

By B. SHINDMAN
Urban Geographer, Geographic Branch,
Department of Mines and Technical Surveys

This new Canadian mapping development sponsored by the Emergency Measures Organization, was described to the Pan American Institute of Geography and History Technical Conference on Special Maps in Ottawa during an international meeting in January, 1965.

ALMOST EVERY facet of a people's culture is capable of being mapped. The aerial distribution of such culture facts, when shown graphically in the form of a map, can be interpreted as a use of the land. Thus land-use maps of an urban area can be construed to be more than just a presentation of functional regions within the boundaries of the mapped area.

In 1963 the Emergency Measures Organization of the federal government requested the Geographical Branch to prepare studies on the Urban Characteristics of sixteen of Canada's major cities. The results of these studies were to be presented in the form of a series of maps on each of the selected cities. Consultations were held by the Emergency Measures Organization with other federal government departments and agencies to determine what characteristics of the city should be studied. The prime consideration was that the information should be of use to as many different agencies as possible. A consensus of the characteristics to be studied was arrived at and the project outline presented to the Geographical Branch for action.

Like any private consulting firm we were limited in our approach to the specific requirements of the job. Comparability of each of the maps for each of the cities was one of the essentials. Thus only one base map was to be provided for the mapping of each city. Compatability of the data mapped was to be another essential so that specific features would be indicated in a like manner for each of the cities. This factor necessitated one scale to be used for all the maps produced even though the cities varied in size from Metropolitan St. John's, Newfoundland with just over 90,000 people to Metropolitan Montreal with just under 2,000,000. One of the considerations the Branch had to keep in mind in the selection of presentation techniques was that the maps were intended for use by many people who are unfamiliar with maps and map interpretation.

Before any mapping program can be commenced, the problems of what is to be mapped and at what scale must be solved. The basic considerations of comparability, compatability and simplicity had to be kept in mind. With respect to what is to be mapped, the Branch was presented with the consensus of requirements by the Emergency Measures Organization. The Urban Characteristics to be studied fell into six broad categories.

1. The Patterns of Existing Land Use.
2. Public Utilities and Services.
3. Communications and Transportation.
4. Demographic and Social Geography.
5. Distribution of Manufacturing.
6. Distribution of Wholesale and Retail Goods.

Within each category the distribution of specific factors was studied within the frame of reference outlined above.

With respect to the base map, it was decided that all the maps were to be on the scale of 1:25,000. The base map for each city was provided by the Army Survey Establishment. Each of the cities to be studied was covered by an individual base map except Montreal and Toronto, which because of their size were covered by 2 sheets each.

The results of each of the individual city surveys is to be shown in a series of 32 maps printed in colour. The breakdown of the material mapped within the six broad categories is as follows:

1. *Patterns of Existing Land Use*—This section consists of five maps covering the basic considerations of land use, some of the physical characteristics of the area being mapped and some of the morphological characteristics of the built-up area.

Map No. 1. Land use of the map area according to 14 functional classes.
Map No. 2. Land Slope and Elevation.
Map No. 3. Density of Coverage of Land by Buildings.
Map No. 4. Structural Material of Buildings.
Map No. 5. Height of Buildings.

About the Author—Mr. Ben Shindman, M.A., age 42, is an Honours Graduate in Geography from the University of Toronto, and has obtained his M.A. in Urban Geography and Town Planning. He served in the R.C.A.F. during the war as an Air Navigator. After the war he worked for the Geographical Branch in the Toronto area, lectured in Geography at the University of Toronto and rejoined the Department of Mines and Technical Surveys, Geographical Branch, in June 1964.

2. *Public Utilities and Services*—This section is made up of four maps showing the basic public utilities and services networks.

Map No. 6. The Water Supply Trunk Main System.

Map No. 7. The Sewage and Storm Drainage. Trunk Main System.

Map No. 8. The Electric Power Trunk Distribution System.

Map No. 9. The Gas (Natural and Manufactured) Trunk Distribution System.

3. *The Communications and Transportation* section consists of three maps.

Map No. 10. A map showing the distribution of Radio and Broadcasting Facilities.

Map No. 18. Land Transportation. This map covers many facets of road and rail facilities.

Map No. 19. Port Facilities. This map illustrates the marine aspects of the transportation function.

4. *The Demographic and Social Geography* of a city is capable of being described in almost infinite variety. In this section in particular, we were limited in our approach to the specifications of the job. Seven maps were used to illustrate the characteristics studied.

Map No. 11. Population Distribution according to the 1961 Census—a dot distribution map in the ratio of 1 dot per 1,000 persons.

Map No. 12. Population Distribution up-dated—a dot distribution map in the ratio of 1 dot per 50 persons.

Map No. 13. An Estimate of the Daytime Population Distribution—a dot distribution map on the basis of 1 dot per 1,000 persons.

Map No. 14. Distribution of Children under five years of age and adults over 70 years of age.

Map No. 15. Distribution of Dwelling Units in the ratio of 1 dot to 50 dwelling units.

Map No. 16. The Distribution of Schools.

Map No. 17. The Distribution of Hospitals and Doctors' Offices.

5. *The Distribution of the Manufacturing function* as shown in a series of six maps based on groupings of manufacturing establishments defined according to the Standard Industrial Classification code of the Dominion Bureau of Statistics. Each establishment is shown by location and approximate size of employment.

Map No. 20. Manufacturing of Food and Kindred Products.

Map No. 21. Manufacturing of Textile, Apparel and Rubber Products.

Map No. 22. Manufacturing of Wood Products, Furniture, Paper and Printing.

Map No. 23. Manufacturing of Primary Metal and Fabricated Metal Products.

Map No. 24. Manufacturing of Transportation Equipment, Machinery and Instruments.

Map No. 25. Manufacturing of Non-metallic Minerals and Chemical Products.

6. The last section of the Survey deals with the Commercial Function. The only aspect we were required to show was that of the Retail and Wholesale Sales. Again the basis for the maps was the distribution of establishments by location and approximate size of employment. Unlike the Manufacturing section the trade groupings in the seven Commercial maps are compiled according to the project frame of reference.

Map No. 26. Distribution of Retail and Wholesale Food.

Map No. 27. Distribution of Retail and Wholesale Building Materials and Hardware.

Map No. 28. Distribution of Retail and Wholesale Drugs and General Merchandise.

Map No. 29. Distribution of Retail and Wholesale Apparel, Shoes and Accessories.

Map No. 30. Distribution of Retail and Wholesale Furniture and Home Furnishings.

Map No. 31. Distribution of Hotels and Eating Places.

Map No. 32. Distribution of Retail and Wholesale Automotive Sales and Service.

As one can see from the above, sections two, three, five and six are refinements and expansions of the basic land-use map. The population distribution and other features of Social Geography illustrated in section four can best be understood in the light of the functional zones and physical characteristics shown in the maps of the Land-Use section.

Once the problems of scale and content were met, the next step was to start doing the work. Because of staff and budget requirements it was decided to program the studies over a number of years. The first step was to organize the source materials required for the compilation of each of the maps. The co-operation of other federal departments and agencies, Provincial departments and agencies and the municipalities involved in each study area was solicited. In all cases assistance was immediately forthcoming. Each of the agencies at the

various governmental levels recognized the inherent usefulness of individual maps and of the whole series.

The data necessary for each map was collected by teams of geographic research workers. The criteria used and the exact type of data collected are listed later on in the article. In addition to reliance on the various published and unpublished sources of material, use was made of the latest aerial photo coverage. In the case of Vancouver which was studied in 1963-64 air photo coverage dating from the spring of 1963 was used and in the case of Montreal and Toronto, which were studied in 1964, the air photos were taken in early summer of that year. From the air photographs, corrections were applied to the base map, making it as up-to-date as possible. The individual maps were then compiled by the research workers from the gathered data and from field work where necessary. Once the compilations were completed they were checked for accuracy. (It can be understood that absolute accuracy in a project of this magnitude and of a subject that is undergoing constant change is impossible.) At all times there were checks made on the compatibility of the data gathered for each of the cities.

The compilations are thereupon turned over to the Cartography Division of the Branch. The Cartography Division tackled the job of the graphic representation in map form of the Geographer's compilations. Size and type of print; style, shape, size and colour of symbols; the use of map insets and the use of tables where necessary; legend organization; colours of the base map and of the overprints—all these had to be considered for each and every map, not only from the graphic point of view but from the point of view of clarity to the consumer. The finished compilations of the Cartography Division were then turned over to the map printing agencies of the federal government for the production of the finished product.

To date, three cities have been studied—Vancouver, Toronto and Montreal. The printing of the Vancouver map series is well underway and the compilations for the Toronto series are being processed by the Cartography Division. The compilations for the Montreal series have been completed by the Geographers. The cities of Ottawa and Windsor are being scheduled for study during the next field season.

Individual maps and individual series should be of use to all levels of government and to many individuals with particular problems. The compatibility of the mapping gives us for the first time, in Canada, a measure of comparability for many of the characteristics of our larger urban centres.

The following provides a brief description of the data included on each map.

Map No. 1. Land Use—This map shows the existing land uses of the map area according to function. At least 14 different functional zones are differentiated. The minimum area that can be shown is of course dictated by the map scale and the fineness of the graphic presentation. In the case of the maps in the Land Use Section the minimum area that could be shown was 150 ft. × 150 ft. or about ½ acre. The functions shown are listed below:

Commercial—This category includes all retail sales and service establishments, professional services, enclosed commercial entertainment and recreation establishments, hotels and motels, head offices, and parking garages.

Industrial—This function was differentiated into two categories: *Extractive* which included all aspects of mining, sand and gravel pit operations, brick making, quarries, oil fields, peat cutting, and *Manufacturing* which consists of all aspects of manufacturing not included in the Extractive category.

Storage—This category includes government and private storage facilities (in both wholly enclosed structures and in unenclosed spaces) of bulk commodities, industrial waste products, etc. Warehouse facilitites of wholesalers and manufacturers are included in this category as long as there is no processing involved.

Transportation—This category includes the land areas devoted to rail facilities, bus and truck facilities, wharves, docks and marines, vehicle parking lots, airfields, expressways.

Communications and Utilities—This category includes the production and storage facilities of water, sewage, electricity, gas, telephone, radio and television services as well as major rights-of-way such as those of the electric lines.

Institutional—This category includes all public and semi-public institutional such as schools, government buildings, churches, hospitals, museums, hostels, fraternal organization offices and halls, association offices, etc.

Residential—The residential function is divided into two categories based on the type of dwelling units. These are single-family dwelling areas and multiple-family dwelling areas.

The remaining land-use categories are concerned with the many subdivisions of Open Space. The subdivisions shown were dictated by the project frame of reference and include:

Wooded Areas—At least 25% of the area is covered by trees.

Cemeteries—

Swamps and Marshes—

Recreational Uses—This category includes drive-in theatres, golf courses, sports stadia, band shells and parks.

Agricultural Uses and Other Open Space—This category includes all cropland, horticultural and market garden land, grassland, rock outcrops, sand dunes, and any other unproductive land which is not part of any of the other land-use categories.

The boundaries of extensive military areas and Indian Reservations are shown by distinctive colours.

Map No. 2. Land Slope and Elevation—This map shows the percentage slope of the land in five stages from below 1% to over 21%, each stage being indicated by a different colour. The map is derived from the Topographic maps of the area under consideration.

Map No. 3. Density of Coverage of Land by Buildings—This map shows the density coverage on a percentage basis. Open Space and Wooded areas are first delimited. The built-up areas are then divided into 5 coverage categories, less than 10%, 10% to 25%, 26% to 50%, 51% to 75% and 75% to 100%. The minimum area considered is 1 acre and the map is prepared from the aerial photographs. The area of open space is also subdivided.

Map No. 4. Structural Material of Buildings—The materials from which all the buildings are constructed are shown on this map. The minimum space considered is 125 feet of frontage and the presentation is on a block basis. The materials delineated are as follows:

Reinforced concrete and steel frame.

Steel construction throughout (metal siding).

Brick, stone, cement block or unreinforced concrete.

Wood construction with various wall coverings except brick, stone or cement block veneer.

Fire Resistive buildings are designated where possible.

Map No. 5. Heights of Buildings—The map area is divided into a number of categories dependent on the following height categories:

Less than 40 feet.

40 feet to 100 feet.

More than 100 feet.

Steel Storage tanks, of all types are shown and their heights, if greater than 50 feet, marked.

The Public Utilities and Services

Map No. 6. The Water Supply Trunk Main System—On this map are shown or indicated the sources of the water supply of the map area, along with the location of the trunk water mains, the water reservoirs, the pumping stations and the repair facilities. The water mains are differentiated according to size, with the minimum size shown being twelve inch diameter.

Map No. 7. The Sewage and Storm Drainage Trunk Main System—This map shows the distribution of the trunk sanitary sewer, storm sewer and combined sewer mains. Again the different size groupings of the mains are shown with the minimum diameter recorded being 30 inches. The sewage treatment plants and the sewerage area boundaries are indicated as well as such things as pumping stations and repair facilities.

Map No. 8. The Electric Power Trunk Distribution System—On this map the major transmission lines are shown, as are the location of generating stations and the sub-stations. The name, type and capacity of all of these are indicated. Storage yards and repair facilities are also located.

Map No. 9. The Gas Trunk Distribution System—The location of the trunk mains (diameter greater than 6 inches), gate stations, production centres, storage tanks, yards and repair facilities are all shown.

The Communications and Transportation Section

Map No. 10. Distribution of Broadcasting Facilities—The location of all A.M., F.M., and T.V. broadcasting stations is plotted along with their call letters, frequency and power classification. In addition to these the location of all amateur radio operators and the government, industrial or commercial base stations is recorded. It also includes stations that maintain contact with shipping.

Map No. 18. Land Transportation—This map deals with the many facets of land transportation. The location of railroad lines, yards, stations and terminals, repair facilities are all indicated and identified as to operating company. Such features as tunnels, level crossings with other transit or transportation lines and highways, bridges and overpasses are also recorded.

The urban transit system is shown in its entirety—gas bus, trolley bus, streetcar and subway routes are delineated and identified. Transit yards, repair shops, subway stations, and vehicle parking facilities are all located.

Major highways and expressways are indicated and inter-urban bus terminals and facilities located and identified. Provincial Highway, County and Municipal storage yards and repair facilities are shown. These latter, for example, are where one finds snowplows and the stocks of sand, ashes, salt, etc. which are used in winter road maintenance.

Map No. 19. Port Facilities—This particular map shows the location of wharves and docking facilities, harbour depths and soundings, anchorages and tidal flats, canals and dams and dykes. The location of the various facilities available for the complete operation of the Port are indicated and the information on them is tabulated. Such things as special type of cargo handled (for example, grain or iron ore), berthing length, depth

at low water where applicable, storage facilities, special handling facilities, etc., etc.

Air Transportation facilities are indicated and identified on all the base maps by the runway patterns so it was felt that they did not have to be shown on a separate map.

Demographic and Social Geography Section

All the population distribution maps are compiled and printed on base maps upon which an overprint of census tract boundaries has been made.

Map No. 11. Population Distribution Generalized—Each 1961 census tract number along with the tabulated population for each tract is located on the map. The distribution pattern is then generalized on the basis of one dot representing 1,000 persons.

Map No. 12. Population Distribution—The population distribution is plotted on the basis of one dot representing 50 persons. The basis for this map is the 1961 census, updated by field work and research. In this respect land-use maps, air photographs and assessment rolls are used to update the population statistics.

Map No. 13. Estimate of Daytime Population Distribution—This map is a generalized estimate of the population distribution on a weekday during the primary and high school academic season on the basis of one dot representing 1,000 persons. It is based on the data gathered for the maps included in sections one, four, five and six as well as estimates of shoppers and transients.

Map No. 14. Distribution of Children Under Five and Adults over 70—On this map the distribution of both age groups is indicated in the ratio of one dot to 50 persons. The two groups are identified by different colours. The basic information is derived from the 1961 census and is supplemented by local information as much as possible.

Map No. 15. Distribution of Dwelling Units—A dwelling unit as defined by the 1961 census is a structurally separate set of living quarters, with a private entrance either from outside the building or from a common hall inside. The entrance must not be through anyone else's living quarters. The distribution of dwelling units is plotted on the basis of one dot to 50 units. This map is also one of those with the census tract boundary overprint.

Map No. 16. The Distribution of Schools—The location of the schools technical institutes, colleges and universities, both public and private, are plotted along with the student enrollment. Business schools in Commercial zones and nursery schools are excluded.

Map No. 67. The Distribution of Hospitals and Doctors' Offices—Hospitals are identified as to type and their location and capacity plotted. The types differentiated are general, maternity, chronic, isolation and mental. All Nursing Homes are excluded from this classification and are not mapped. The location of each doctor's office is shown. If a location has more than one doctor's office, then the number of offices is tabulated and shown. For example, one building in Toronto contains the offices of 76 doctors. The locations shown are limited to medical doctors only.

The Distribution of Manufacturing

On all of these maps the industrial establishments are shown by actual location of manufacturing facilities. The approximate employment at each location is indicated by symbols of varying size since exact employment figures cannot be shown because of the confidential nature of such statistics. The size groupings used in the survey are as follows: Less than 10 employees, 10 to 25, 26 to 100, 101 to 500, more than 500.

Within the manufacturing groupings each particular industry is identified by an individual colour or shade. The groupings are based on the D.B.S. Standard Industrial Classification Code.

Map No. 20. Manufacturing of Food and Kindred Products—The following industrial groupings are shown:

- meat products
- dairy products
- canned and cured fish and seafood
- canned and preserved fruit and vegetables
- grain mill products
- bakery products
- beverage industries
- confectionery and sugar products
- miscellaneous food products (tobacco is included here.)

Map No. 21. Manufacturing of Textile, Apparel and Rubber Products—The following industrial groupings are shown:

- textile mill products
- apparel, accessories and other fabricated textile products
- leather and leather products
- rubber and miscellaneous plastic products

Map No. 22. Manufacturing of Wood Products, Furniture, Paper and Printing—The following industrial groupings are shown:

- lumber and wood products except furniture
- furniture and fixtures
- paper and allied products
- printing, publishing and allied industries

Map No. 23. Manufacturing of Primary Metal and Fabricated Metal Products—The following industrial groupings are shown:

— iron and steel production
— non-ferrous metal production
— other fabricated metal products
— miscellaneous metal products

Map No. 24. Manufacturing of Transportation Equipment, Machinery and Instruments—The following industrial groupings are shown:

— transportation equipment
— electrical machinery, equipment and supplies
— machinery other than electrical
— scientific instruments, timepieces, optical and
— photographic goods.

Map No. 25. Manufacturing of Non-Metallic Mineral and Chemical Products—The following industrial groupings are shown:

— non-metallic mineral products
— petroleum refining and related industries
— industrial organic and inorganic chemicals, miscellaneous chemical products
— plastic materials, synthetic resins, rubber and fibres, except glass
— drugs and pharmaceuticals
— cleaning and toilet preparations
— paints, varnishes and allied products

The Distribution of the Retail and Wholesale Commercial Function

The techniques used in the compilation of the maps in this section are similar to those of the Manufacturing section. Retail distributors are differentiated from wholesale distributors by symbols.

Map No. 26. Distribution of Retail and Wholesale Food—The following sales groupings are shown:

— groceries
— meat and fish
— fruits and vegetables
— candy, nut and confectionery
— bakeries
— dairy products, poultry, eggs and other food products

Map No. 27. Distribution of Retail and Wholesale Building Materials and Hardware—The following sales groupings are shown:

— lumber and building materials
— heating and plumbing equipment
— hardware and electrical supplies
— farm equipment
— paint, wallpaper and glass

Map No. 28. Distribution of Retail and Wholesale Drugs and General Merchandise—The following sales groupings are shown:

— drugs and propriety products
— department stores
— variety, dry goods and general stores

Map No. 29. Distribution of Retail and Wholesale Apparel, Shoes and Accessories—The following sales groupings are shown:

— all types of clothing and accessories
— shoes
— second-hand clothing and shoes

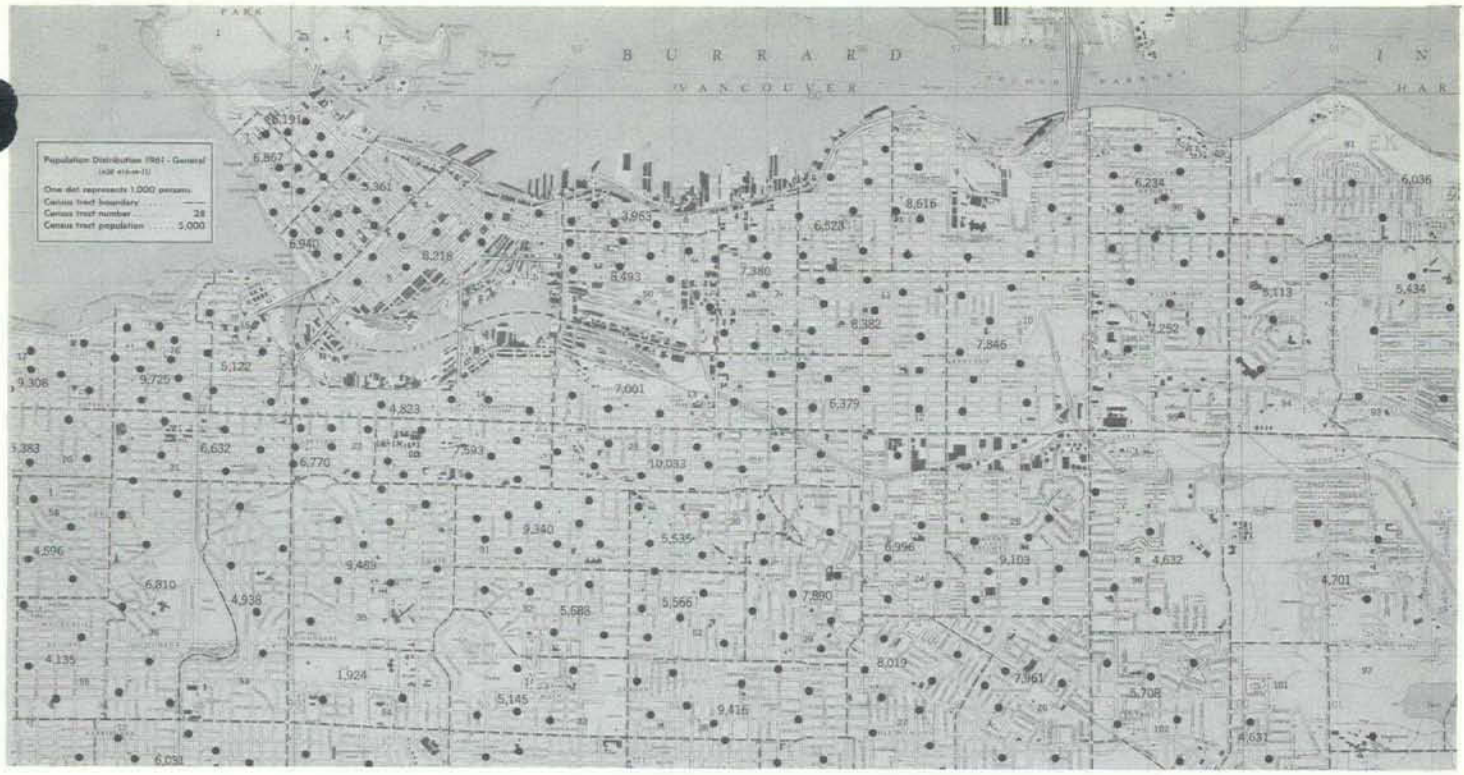
Map No. 30. Distribution of Retail and Wholesale Furniture and Home Furnishings—The following sales groupings are shown:

— furniture
— miscellaneous home furnishings
— household appliances
— radio, television, music and musical instruments
— second-hand furniture and appliances

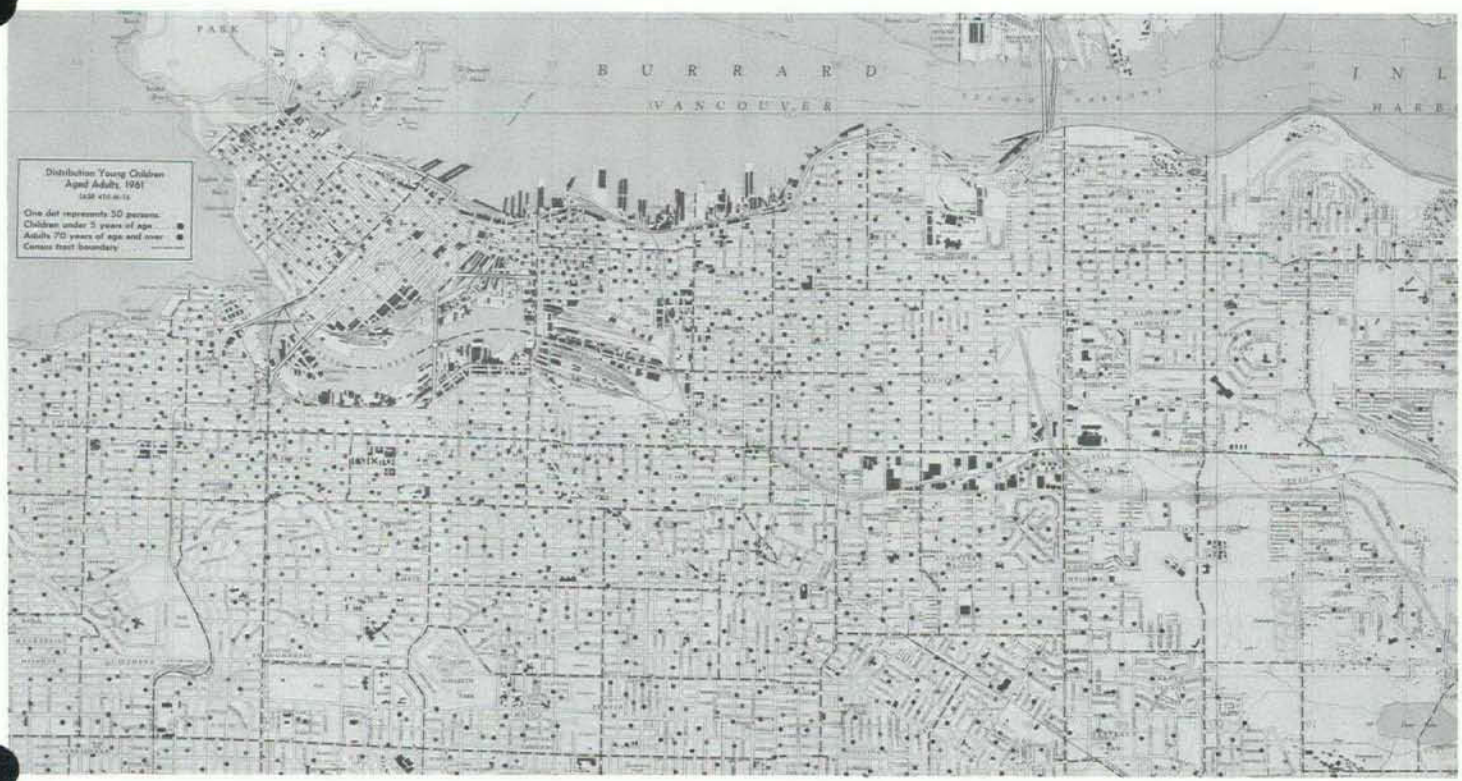
Map No. 31. Commercial Hotels and Eating Places—This map shows the distribution of all taverns, restaurants, and other eating places by location and approximate size of employment. It also shows the location of all hotels and motels by the approximate size of employment. In addition the number of rooms in each hotel is recorded.

Map No. 32. Distribution of Retail and Wholesale Automotive Sales and Service—Because this map is the most complex in the entire series in terms of graphic presentation, no employment size rankings could be applied to the plotted locations. In addition to automotive sales and service, marine and aircraft dealers were also located. The categories differentiated are as follows:

— new vehicle dealer (cars and trucks)
— used vehicle dealer
— vehicle rental service
— parts distribution and storage (new and used)
— repair facilities
— gasoline service station
— automotive wholesale distributor
— marine products dealer
— aircraft products dealer ▲



Sections of Maps ASE 416-M-11 and ASE 416-M-14
Urban Analysis Series - Vancouver, B.C.



REPORT ON VILLE LASALLE EXPLOSION

by H. J. BERNATCHEZ
E.M.O. REGIONAL DIRECTOR, QUEBEC

On Monday morning, 1st March, 1965, at 8:15 a.m., a violent explosion destroyed an apartment complex in Ville LaSalle on the outskirts of Montreal. The victims included 28 dead, 27 injured and hospitalized and approximately 75 persons made homeless. In addition, about 300 persons living in three adjacent buildings had to be evacuated and were temporarily homeless. The following is a preliminary report submitted by Mr. H. J. Bernatchez on Civil Protection activities.

Civil Protection Activities

(a) Rescue Operations

One of the first persons to arrive at the scene of the disaster was the Montreal Civil Protection Director, Major Maurice Saint-Pierre. He offered his services to Ville LaSalle civic authorities, established a small headquarters and assisted in the organization of rescue operations providing trained personnel and rescue equipment. Sixteen dead bodies and three wounded persons were rescued from the debris by Civil Protection rescuers.

(b) Traffic Control. Crowd Control. Security Patrol

In conjunction with local police authorities and with the assistance of Naval Personnel, these activities were organized by Zone 8 Director, Mr. Marcel Dame.

(c) General Coordination

The activities of the 12 Civil Protection Groups and of over 500 Civil Protection volunteers were also coordinated by the Director of Zone 8.

(d) Emergency Communications

These were provided by Montreal and Zone Civil Protection supplemented by Radio Amateurs and a few emergency telephone lines provided by Bell Telephone.

(e) Emergency Lighting

Was provided by various Civil Protection Groups and coordinated by Zone 8 Director.

(f) Emergency Welfare Services

An Emergency Welfare Reception Center was organized by Mrs. Noreen Pineo, Operations and Welfare Officer for Montreal Civil Protection. With the assistance of various Welfare Agencies and volunteers she set up the five emergency welfare services.

Among the activities of these services were:

(1) the coordination of the assistance offered by public and private industry.
(2) the answering of more than 1,000 inquiries.
(3) the verification of adequate lodging for over 75 homeless. The addresses of these people were registered.
(4) the organization of emergency feeding for C.D. workers and E.W.S. personnel. One Mobile Feeding Unit (Federal) was made available and used.
(5) the issue of passes to evacuees wanting to return home.
(6) the maintenance of an up-to-date list of the dead, wounded, missing and homeless persons.
(7) the provision of a public information service.
(8) the assignment of Emergency Clothing Services to the Salvation Army and Saint Vincent de Paul Society.

Because of the integral part taken by Mrs. Pineo during all Welfare operations, her experience, her evident leadership and her intimate knowledge of the victims' needs, she was requested to act as secretary for a month, to the Relief Fund Committee which plans to collect five hundred thousand dollars. Over $100,000 has already been subscribed. The Provincial Government has given $15,000.00 and Ville LaSalle $5,000.00.

The only serious weakness in the whole operation was the lack of adequate Civil Protection radio communications due to shortage of equipment and particular geographic location of the disaster area.

(g) Emergency Health Services

The Provincial Emergency Health Services Director, Doctor Laurent Lizotte, was available to ensure that the persons injured were receiving proper medical care and allocated them to various hospitals surrounding the disaster area. ▲

Editor's Note:

It is regretted that the cover index of the *Digest* for February, 1965 failed to list *"The Problem of Nuclear Shelters"* by ROBERT L. CORSBIE. Listing of the article will be made in the 1965 annual index.

If undelivered return to:
EMERGENCY MEASURES ORGANIZATION
Daly Building,
Ottawa, Canada

CANADA
POSTAGE PAID
PORT PAYÉ