

AN INVESTIGATION OF THE
RELATIONSHIP BETWEEN POPULATION
AND BUSINESS FLOOR AREAS
IN MANITOBA SERVICE CENTRES

A Thesis

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Introduction

The purpose of this thesis is to investigate the relationship between the urban population, the trade area population and the size of the Central Business District in Manitoba service centres.

In the course of his work in a planning office, the writer was faced with the task of preparing a development plan for the Central Business District (CBD) of the Town of Dauphin. This led to an investigation of the existing research related to the CBD, which had been carried out in the past, as well as to an investigation of the methods currently used for the projection of business area requirements in service centres.

In recent years, a considerable number of studies was published relating to the Central Business District. The CBD has been analyzed for land values, certain specific aspects of spatial demand, its retail structure and the delineation of the CBD area.¹ However, most of these studies were centered on purely economic or geographical aspects of the CBD with little consideration given either to spatial requirements or to cause and effect relationships² other than could be deduced from an

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1. Richard V. Ratcliff, "Demand for Non-residential Space and Internal Arrangement of Land Uses"; Raymond E. Murphy and J.E. Vance Jr., "Delineating the CBD"; reprinted in: Harold M. Mayer and Clyde F. Kohn, Readings in Urban Geography, the University of Chicago Press, Chicago, Ill., 1959.
 2. eg. the effect of population, incomes or shopping patterns on the spatial demands in a CBD.

economic model. Although a planner, in his background work, may make use of the information provided by these studies, he may find very little in it to guide him in physical planning. Furthermore, a planner dealing with agricultural service centres may not be able to make full use of this body of research because most studies concentrate on large metropolitan centres and the small town seems to have been overlooked.

More often than not, the immediate concern of the planner is to arrive at a reasonable projection of the spatial needs of a CBD required to serve an increasing population. For this purpose three methods are generally used, each subject to varying degrees of refinement and sophistication:³

- (a) A certain number of square feet of business space may be allotted per 1000 population;
- (b) An estimate could be made of the aggregate floor space required for CBD uses and increased by an appropriate "multiplier" which reflects the expected increase in population, per capita expenditures or employment;
- (c) CBD uses may be classified by categories and sub-categories. The required change in floor space may then be calculated individually for each category and sub-category and increased by a "multiplier".

3. F. Stuart Chapin Jr., Urban Land Use Planning, University of Illinois Press, Urbana, 1965, pp. 405, 406 & 409.

The aggregate floor space may be obtained by simple addition.

The first method invites a subjective estimate of projected space requirements since shopping habits may vary from one place to another;⁴ it also does not make allowances for the shopping needs of the people of the unland or trade area who may only occasionally make use of the CBD.

The second method, although relatively simple, is only an approximation. It is at best suited to a very rough preliminary estimate of future needs of a CBD.

The third method requires a considerable amount of research and background work as well as accurate and involved calculations. In the final analysis, the increments applied to each category or sub-category of CBD use would be adjusted by a percentage based on a population projection. In interviewing practicing planners on the subject of population projections, the author had the opportunity to realize how inaccurate some projections may be. Further study of old population projections and their comparison with the actual figures of the 1966 census showed to what degree these projections can be inaccurate. The following is but one

4. This has occurred in the Town of Thompson, Manitoba. The CBD requirements were designed on the basis of a certain area per 1000 population. However, the figure used was that applying to densely populated areas. The remoteness of Thompson, which is a northern mining town, causes a need for more shelf and storage space due to infrequent deliveries. Also shopping is performing the function of a social activity. Hence the applied criterion proved to be inadequate. At present Thompson's CBD is extremely congested.

illustrative example of many of the population projections studied by the author. It refers to a population projection for a Manitoba town:⁵

Projected population increase 1959-1966:	550
Actual population increase 1959-1966:	880
Percent error in 8 year period:	45%

It is thus evident that population projections for service centres are not reliable (although the author does not dispute their accuracy when applied to large cities and metropolitan centres). If this is the case, then why rely on a time consuming and intricate method (such as the third method outlined above) to obtain very accurate floor space requirements, and then apply an inaccurate "multiplier"?

It was the author's belief that a method could be devised, which would avoid the involved calculations of the third method, but also would yield more positive results than the second method. At the same time it could incorporate some elements of the first method.

It was suspected that a study of existing business floor area in a given number of service centres, if subjected to statistical treatment, could show whether a relationship exists between the business floor area and the population of a service centre as well as the population of the trade area tributary to the service centre. It was further suspected

5. Draft Development Plan for the Town of Morden 1959-1980, prepared by the Municipal Planning Branch, Department of Municipal Affairs, Government of Manitoba, October 1959, for the Morden Town Planning Commission.

that if such relationship exists and is consistent, it could be simulated by a mathematical model, which in turn could be used by a planning office for projecting spatial requirements of the CBD in service centres in development plans and urban renewal schemes.

In order to analyze the relationships which were suspected to exist, a pilot study of twenty-five service centres in the Interlake and Dauphin-Swan River Regions was carried out and the following hypotheses were formulated:

- (1) The business floor area of a CBD varies with the population of service centre.
- (2) The larger the service centre, the more efficient the use of the business floor area.
- (3) The population of the umland of a service centre will affect the business floor area independently of the population of the service centre itself.
- (4) The proximity of a major town or city to the service centre will affect the aggregate business floor area.
- (5) The size of the umland will affect the business floor area of a CBD.

Before proceeding with the actual calculations and tests of the above hypotheses, the trade areas of service centres had to be delineated. The author believes that sufficient evidence exists to show that the methods to be used in delineating trade areas have been proven in the

field, and that sufficient research has been conducted to establish their validity.⁶

6. Among the studies where various methods of outlining or delineating a trade area were used, the following were investigated by the author: Howard L. Green, "Hinterland Boundaries of New York City and Boston in Southern New England"; Edward Ullman, "A Theory of Location for Cities"; John E. Bush and Howard E. Bracey, "Rural Service Centres in Southwestern Wisconsin and Southern England"; Brian J.L. Berry and William L. Garrison, "The Functional Bases of the Central Place Hierarchy"; reprinted in Harold M. Mayer and Clyde F. Kohn, Readings in Urban Geography, The University of Chicago Press, Chicago, Ill., 1959. Karl A. Fox and T. Krishna Kumar, "Delineating Functional Economic Areas"; Brian J.L. Berry, "Reflections on the Functional Economic Areas"; published in: Research and Education for Regional and Area Development, Iowa State University Press, Ames, Ia, 1966. Robert E. Dickinson, City and Region, Rutledge and Kegan Paul, London, 1964, Ch. 3.



CHAPTER I

CHAPTER IDELINEATION OF TRADE AREAS

"Every urban settlement, large or small is in some degree headquarters of trades and institutions, for the very essence of urban character is the provision of goods and services for tributary area."⁷

Robert E. Dickinson

For the purpose of this study, service centres in Manitoba having a population of 300 and over were used. However, twelve smaller service centres were also considered, because, in spite of their size, they performed the function of a central place for a well defined region.⁸

In this phase of study the author made use of some of the principles of Christaller's Central Place Theory and of the concept of the Hierarchy of Services⁹ (See Fig. 1). A set of criteria was considered not unlike some of those advocated by L.J. Lebret.¹⁰ These criteria are discussed in the following paragraphs.

7. Robert E. Dickinson, Op.Cit., p. 49.

8. See Table I.

9. Robert E. Dickinson, Op.Cit., Ch. 3.
Brian G.L. Berry and William L. Garrison, Op.Cit.

10. L.J. Lebret, Dynamique Concrete due Developpement, Les Editions Ouvrieres, Flers (Orne), France, 1961, pp. 91-117. In the chapter titled, "Prealable aux analyses: Le contact global et la macro-analyse preliminaires", Lebret sets forth the steps necessary for the geographic and economic analysis of an area for purposes of development as well as the delineation of economic regions. Among the criteria he used are: geographical features, transportation and communications, ethnography, political boundary, and resources.

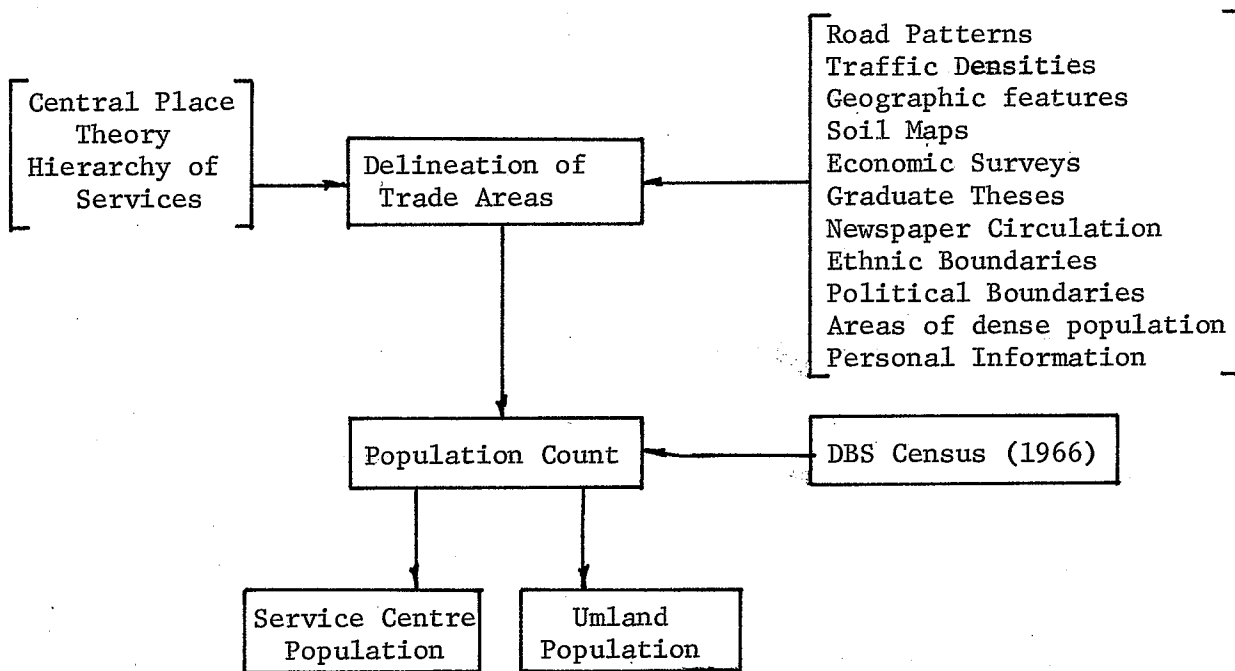
Principles AppliedProcessData Used

Fig. 1

Diagram showing the process of determining trade area populations (Type "A" Services).

Road Patterns

By and large, the road patterns,¹¹ type of surfacing and number of lanes, are indicative of the use and traffic densities on roads serving the service centre and its umland. It has been found that a new road may enlarge the umland of a service centre to the detriment of a neighbouring centre. The policy of the Manitoba Government is to provide adequate highways wherever traffic warrants it. Hence a road pattern converging towards a service centre would suggest the extent of its umland.

Traffic Densities

However, road patterns alone are not sufficient to indicate the shape and extent of a service centre's umland. Sometimes roads are built for other than economic reasons as attested by the expression "political road" commonly used in Rural Manitoba. A thorough study of traffic densities on Provincial Trunk Highways and Provincial Roads was therefore undertaken. It was found that nodes of dense traffic tend to appear at service centres especially where the service centre is surrounded by an umland of considerable size.

11. Road patterns, as understood in this study, are not to be confused with the pattern of road allowances existing throughout most of the Rural Manitoba which has been surveyed according to the Dominion Land Survey System. Road patterns are to be construed as the system of Provincial Trunk Highways, Provincial Roads and Municipal Roads as related to the service centre they serve.

Geographical Features

Very often natural or man-made barriers present a very definite boundary to a trade area. Such barriers are lakes, a national or provincial park, or rivers.

Soil Maps

Provincial and ARDA soil maps were useful in pinpointing fertile valeys, marginal lands, and other existing or potential land uses. If a single service centre is located within the confines of a well defined arable region, it may indicate that this centre is the "headquarters" for a tributary area whose boundaries coincide with that of the arable land. Marginal lands often represent a barrier between two tributary areas of service centres.

Economic Surveys

The Manitoba Department of Industry and Commerce has undertaken several economic surveys of selected service centres in the Province. Such studies exist for some of the major centres. However, the frame of reference of these studies was slightly different from that of the present study and therefore the boundaries had to be somewhat adjusted.¹²

12. The Department of Industry & Commerce of the Government of Manitoba has conducted a series of "Drawing Power Surveys" outlining trade areas. Of the material available, surveys for the following towns were used: Altona, Beausejour, Brandon, Carman, Neepawa, Roblin, Ste. Anne, Selkirk, Souris, Steinbach. Each town under study was assigned three zones according to the percentage of shopping done in this town by its umland population: Zone of Dominance (50-100%), Zone of Influence (25-50%), Fringe Area (less than 25%). It seemed

Graduate Research Projects

Two M.A. Theses, one prepared by T.G. Sosa¹³ pertaining to the Interlake Area and another by John Warkentin¹⁴ dealing with the Dauphin-Swan River area were most useful in the delineation of some trade areas. Warkentin did some subsequent work on Mennonite settlements in Southern Manitoba which was also of some assistance.¹⁵

Newspaper Circulation

Study of newspaper circulation has long been a favourite tool among geographers for the delineation of trade areas. Although the circulation of small local newspapers encompasses areas slightly larger

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12. (cont.) appropriate to consider the limit of the Zone of Dominance as the limit of the trade area of a service centre since the majority of the shopping beyond this limit would be done in the next neighbouring service centre. Checking this assumed boundary against the other criteria used in this thesis, it was found that it is not so. Firstly, some of the boundaries obtained in these studies were based on spot interviews and therefore were at times inaccurate; secondly, some of the people in the "Zone of Influence", rather than shop in the nearest service centre, would prefer to drive the nearest regional centre, thus rendering the task of assessing the field data more difficult. It was found in the present study that the actual boundary of trade areas lies somewhere between the Zone of Dominance and the Fringe Area.
13. T.G. Sosa, Service Centre Study of the Interlake Region, Manitoba, M.A. Thesis, University of Manitoba, Department of Geography, 1963.
14. J.H. Warkentin, The Geography of the Dauphin Area, M.A. Thesis, University of Toronto, Department of Geography, 1951.
15. J.H. Warkentin, The Mennonite Settlements of Southern Manitoba, Unpublished Ph.D. Dissertation, University of Toronto, 1960.

than those considered in this part of the study,¹⁶ the distribution areas for local newspapers provided some indication of the size of immediate trade areas especially in the case of ethnic newspapers and more particularly those of the German language.

Ethnic Boundaries

The Province of Manitoba has carried out periodic studies on ethnic population distribution in various areas of the Province and presented the data in map form¹⁷. A study of these maps permitted a precise and unequivocal delineation of some trade areas. Ethnic ties and loyalties seem to be very strong in Rural Manitoba. If two neighbouring centres are of different ethnic background, a clear boundary will exist between their umlands¹⁸. In some cases this boundary would coincide with some natural feature such as a river or a creek, in others

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16. Manitoba Weekly Newspaper Association, 1966 Directory and Rate Book. Most weekly newspapers are distributed over somewhat larger trade areas than the ones dealt with in this chapter, although their trade area delineation was of assistance in this phase of the project.
 17. Economic Atlas of Manitoba, Department of Industry & Commerce, Province of Manitoba, Winnipeg 1960, p. 37.
 18. St. Lazare, a French community in Western Manitoba reflects this tendency in the shopping habits of people. Steinbach is a large regional centre in Southern Manitoba with a predominantly Mennonite and German population, yet, Ste. Anne, a neighbouring French community, duplicates many of the functions performed by Steinbach just a few miles away for no apparent economic reason. The Provincial ethnic map shows contiguous concentrations of French and German population.

no such natural feature exists. The dividing line is nevertheless very abrupt and easily identifiable.

Political Boundaries

In some cases municipal boundaries represent well defined boundaries for a trade area especially if they coincide with some geographical feature or ethnic boundary. Provincial boundaries were invariably considered as trade area boundaries¹⁹.

Dense Population Areas

Population distribution maps were found very useful in locating small pockets of dense population. People congregate where there is good arable land and the population density increases where soil maps (see p, 12) indicate prime agricultural areas. On the other hand, some resources may be present which encourage denser population on marginal lands or lands less suitable for agriculture. This situation may arise in the case of some resort areas or of some towns possessing basic activities other than the servicing of the tributary areas.

19. The differences in tax structures between Manitoba and its neighbouring provinces (Ontario and Saskatchewan) have been found to discourage the extension of umlands beyond Provincial boundaries. The introduction of the 5% Provincial Revenue Tax in June 1967 may or may not introduce some changes in the trade area boundaries at some future date.

Personal Information

Personal knowledge of the areas involved was of considerable assistance in selecting those of the above criteria which were particularly relevant to the delineation of the trade areas. Although the author is not familiar with all the areas involved, it was possible to enlist the collaboration of some people whose intimate knowledge of the Province was invaluable in providing information of which the author was not aware. As a final check, a map of the delineated trade areas was submitted to officials of the Department of Industry and Commerce for comments. (See Map No. 1).

The economic areas outlined on Map No. 1 fit a rectangular pattern. The reason for this seems to be twofold:

1. Most of Manitoba has been surveyed on a grid pattern with road allowances running North-South and East-West. It follows that this road pattern, together with an historical pattern of development along railways, will be naturally reflected in the communication systems and would therefore tend to give the areas an approximately rectangular shape.²⁰

20. These findings seem to disagree with those of Fox and Kumar, ("Delineating Functional Economic Areas", see footnote 6) who, in delineating trade areas in Iowa, have arrived at diamond shaped areas. They attributed these shapes to a rectilinear road pattern.

2. Since the shape of the areas was nearly rectangular, it was judged possible to shift the boundaries slightly without noticeably affecting population figures. By shifting the boundaries to conform to municipal or township boundaries, the task of counting the population in the trade areas was considerably simplified, because most census data conform to a rectilinear pattern along township lines or municipal boundaries.

On the basis of the above criteria, one hundred and twelve trade areas were delineated, each consisting of a service centre and its tributary area or umland (See Map No. 1).



CHAPTER IIFUNCTIONAL STUDY OF THE CBD
AND OF ITS TRIBUTARY POPULATION

One characteristic of a service centre for an agricultural area is that most of its business and commercial activities take place within the confines of the CBD. This does not hold true for large cities where satellite centres tend to develop. Furthermore, the shopping patterns and needs of large cities are different from those of small service centres. These were among the reasons for not including Greater Winnipeg and Brandon in this study²¹. Northern mining communities and "company towns" of Manitoba do not possess any significant agricultural umland. Hence Churchill, Flin Flon, Pinawa, The Pas and Thompson were also omitted from this study.

Hierarchy of Services

A service centre provides a varying range of services. These services can be ranked according to the size of the market required to make any one of them viable. Such ranking of services was a necessary step in this study and will be henceforth referred to as "hierarchical level of services" or simply "level of services".

21. Another reason for not including Greater Winnipeg and Brandon in this study is that neither of these centres is performing the function of a rural service centre to a significant degree. Their economic base is entirely different, (industry, warehousing, etc.). Hence, they could not be treated as any other rural service centre.

The ranking of services according to levels was based on the pilot study the author conducted in the Interlake and Dauphin-Swan River areas. Lists were compiled of all the business establishments in twenty-five service centres in these areas, (See Appendix 1). The information was obtained from field sheets of the Provincial Assessment Branch²². The data were set up in form of a matrix not unlike the one developed by Berry and Garrison²³ (See Appendix 2). Lists of business establishments were subsequently compiled for the remaining service centres of Manitoba although of the hundred and twelve service centres which were intended for this study, twelve were omitted because the data were either not available or were unreliable.

From the matrix it became apparent that some services were ubiquitous, others existed only in larger centres. Three levels of services were readily identifiable and were designated as Type A, Type B and Type C:

- (1) "Ubiquitous services" i.e. services not requiring a large market and present in most of the small service centres were designated as Type A.
- (2) Business establishments performing on a higher hierarchical level are more numerous in the larger centres. They require a much larger

22. The field sheets of the Provincial Assessment Branch are kept at their regional offices in Dauphin, Minnedosa, Morden, Souris and Winnipeg.

23. Brian J.L. Berry and William L. Garrison, op. cit., p. 222.

trade area because they provide more specialized services which are not an everyday requirement. Such services were designated as Type B.

- (3) Wholesale distribution and highly specialized services require a trade even larger than that required for Type B services. Services in this level were designated as Type C.

Lists of services according to their hierarchical level were compiled (see Appendix 3) to be used in a later phase of this study²⁴.

Having acquired a perspective of the levels of functions performed by the service centres, it became apparent that various levels of trade areas with a corresponding service centre had to be considered:

- (1) A tributary area for Type A services which shall be referred to as "local trade area", and its service centre - a "local service centre";
- (2) A tributary area for Type B services or simply a "region" and its service centre - a "regional service centre";
- (3) A tributary area for Type C services or "wholesale distribution area" and its service centre - "wholesale distribution centre".

24. When the author expanded his study from 25 to 112 service centres, the matrix had to be adjusted slightly in view of the additional data available. The nature of these adjustments is described in an explanatory note (see Appendix 2).

However, the original 112 trade areas (See Map No. 1) were "local trade areas" outlined on the basis of the criteria discussed in Chapter 1. A study of the level of services which exist in each service centre would reveal whether the service centre is performing as a "local service centre" or is also functioning as a "regional" or "wholesale distribution centre". This chapter will confine itself to the study of the "local service centre" and "Type A" services.

Business Floor Areas

The field data gathered from the Assessment Branch included floor areas of all business premises in the hundred service centres which were finally selected (See Appendix 1). With the help of the list of services classified according to levels (Appendix 3), it was possible to identify the business according to Type (A, B, or C). Total aggregate floor areas for Type "A" services were calculated for each service centre. Of the businesses listed, only those which are unmistakably a CBD use were used in the totals,²⁵ Therefore, industrial, institutional and highway commercial uses were not included in the total floor areas.

25. Most Planning Schemes in the Province of Manitoba contain a section dealing with "C2" zoning where all CBD uses are listed. These planning schemes are modelled after a standard scheme for a hypothetical town called "Planning Scheme for the Town of Ajax, Manitoba" and are therefore quite consistent throughout the Province. Non-CBD uses which are physically located in a CBD were omitted because, ultimately, the methods suggested in this thesis may be used for calculation of future CBD requirements.

Population Counts

"Advance Population Statistics" of The Dominion Bureau of Statistics for the 1966 Census were used to obtain the population figures for the service centres and their respective unlands²⁶, along with a map prepared by the Provincial Department of Agriculture and Conservation showing the distribution of population by townships for the 1941, 1951 and 1961 Censuses - Because the "Advance Population Statistics" did not supply any information on population distribution by townships nor any population data for non-incorporated villages, calculations for isolated townships, portions of municipalities and non-incorporated villages had to be based on previous census data with some pro-rata corrections to approximate as closely as possible the 1966 Census. It was assumed that the change in population in any part of a municipality was directly proportional to the population change in the whole municipality. The error thus introduced was deemed insignificant because examination of census data over the past 20 years showed that trends in population change were fairly constant²⁷.

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26. At the time this thesis was written complete results of the 1966 Census were not available from the Dominion Bureau of Statistics. However "Advance Population Statistics" were obtained from the DBS, listing census data for Cities, Towns, Villages and Municipalities. Figures for non-incorporated villages were not available.
 27. It will not be possible to assess the extent of the error introduced until complete statistics are available for the 1966 Census.

Estimates for non-incorporated villages were based on projection of existing trends. A check of this method was carried out with available data and proved to be fairly accurate (less than 10% error)²⁸. Because the changes in population in both urban and rural areas were rather small, it is believed that the inaccuracies introduced in using the above method for population counts were not of sufficient magnitude to significantly affect the findings presented in this thesis.

28. There are two reasons for the 10% error to be considered reasonably accurate: (a) in office practice an accuracy of 30% on a population projection for a small service centre is deemed satisfactory; (b) 10% is well within the limits of accuracy of this study.

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CHAPTER III

CHAPTER IIIRELATIONSHIP BETWEEN BUSINESS FLOOR
AREA AND POPULATION FOR TYPE A SERVICES

A flow diagram (Figure 2) outlines a proposed method for calculating a CBD area. In order to subject to statistical analysis the hypotheses stated in the Introduction, they had to be expressed in mathematical form. Hence in the very process of testing these hypotheses a set of mathematical formulae were devised which express the suspected relationships. This Chapter deals with the various relationships in the "local service centres" (Type "A" Services, Phase I in the flow diagram).

Standard Mathematical Model

The first step in studying the relationship between business floor area and population for "local service centre" (Type A services) was to test two of the hypotheses²⁹, namely:

- (a) "The business floor area of a CBD varies with the population of a service centre".
- (b) "The larger the service centre, the more efficient is the use of the business floor area".

29. In the pilot study, the following hypothesis was at first formulated: "the business floor area of a CBD varies with the population of the trade area". However, critical analysis and comparative study of trade areas showed that although two trade areas may have the same total population, the ratio of unland population to service centre population may differ. Invariably, the larger service centre had the larger business floor area. Hence the service centre population rather than the trade area population has the greatest influence on business floor area for Type "A" Services.

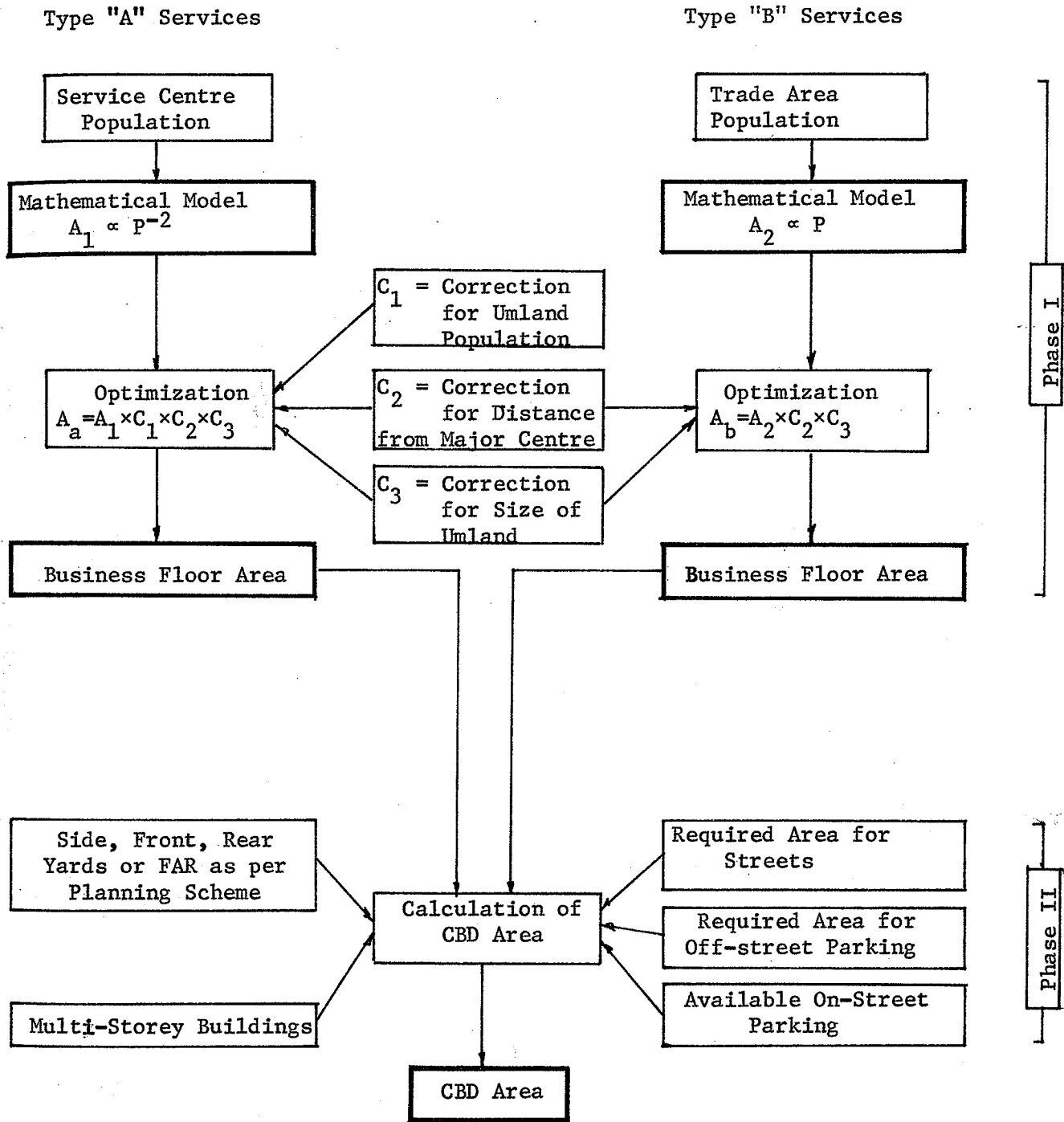


Fig. 2

Flow Diagram showing proposed method of calculating the required CBD Area

TABLE I

Population and Business Floor Area for
Type A Services in Manitoba Service Centres

<u>Service Centre</u>	A	
	<u>Population</u> (1966 Census)	<u>Business Floor Area</u>
1. Portage la Prairie	12,784	340,381
2. Selkirk	9,078	201,472
3. Dauphin	8,440	321,304
4. Steinbach	4,596	240,657
5. Swan River	3,419	181,217
6. Neepawa	3,170	198,077
7. Morden	3,041	170,921
8. Virden	2,882	200,124
9. Winkler	2,533	104,984
10. Minnedosa	2,286	142,885
11. Gimli	2,205	95,180
12. Beausejour	2,181	137,710
13. Altona	2,088	88,122
14. Carman	1,888	136,435
15. Killarney	1,810	145,535
16. Souris	1,801	113,983
17. Rivers	1,624	94,774
18. Roblin	1,582	138,080
19. Stonewall	1,552	91,897
20. Russell	1,495	122,623
21. Boissevain	1,453	139,719
22. Morris	1,322	87,586
23. Carberry	1,249	78,652
24. Melita	1,082	105,375
25. Grandview	991	108,364
26. Gladstone	925	77,925
27. Gilbert Plains	920	80,151
28. Ste. Anne	913	49,645
29. Deloraine	905	67,032

TABLE I (cont.)

<u>Service Centre</u>	<u>P</u> <u>Population</u> <u>(1966 Census)</u>	<u>A</u> <u>Business Floor Area</u>
30. Arborg	886	71,400
31. Winnipegosis	883	58,707
32. Manitou	879	83,747
33. St. Laurent	879	23,396
34. Lac du Bonnet	873	112,088
35. Birch River	859	54,370
36. Birtle	852	79,156
37. Powerview	837	21,643
38. St. Pierre	833	55,237
39. Shoal Lake	823	70,382
40. Hamiota	820	59,769
41. Teulon	810	44,263
42. Ste. Rose	782	79,837
43. Glenboro	766	64,143
44. Pilot Mound	761	88,565
45. Emerson	725	32,416
46. Camperville	690	12,097
47. Ninette	675	20,686
48. Rossburn	629	55,867
49. St. Malo	625	17,052
50. Hartney	624	56,860
51. St. Claude	622	39,419
52. Minitonas	616	35,230
53. Crystal City	586	57,929
54. Notre Dame de Lourdes	575	35,230
55. Gretna	560	33,725
56. Bowsman	552	44,044
57. McCreary	551	54,293
58. Erickson	532	55,538
59. Plum Coulee	530	43,401

TABLE I (cont.)

<u>Service Centre</u>	P <u>Population</u> <u>(1966 Census)</u>	A <u>Business Floor Area</u>
60. Reston	520	10,699
61. Ethelbert	502	49,309
62. Dominion City	500	57,663
63. Wawanesa	498	33,186
64. Niverville	495	28,782
65. Benito	485	53,150
66. Binscarth	478	41,331
67. Strathclair	470	31,033
68. Whitemouth	450	40,235
69. Holland	440	35,447
70. Rapid City	439	37,078
71. Cartwright	405	45,639
72. Mafeking	400	12,646
73. Elphinstone	400	25,543
74. Sandy Lake	400	45,955
75. Oak Lake	388	32,822
76. St. Lazare	378	52,034
77. Onanole	375	14,271
78. Fisher Branch	365	57,055
79. Plumas	350	32,478
80. Baldur	350	39,909
81. Ashern	350	53,103
82. Roland	334	36,224
83. Elm Creek	330	24,417
84. Miami	330	46,167
85. Belmont	322	33,009
86. Inglis	310	23,146
87. Grunthal	307	32,967

TABLE I (cont.)

<u>Service Centre</u>	P Population (1966) Census	A <u>Business Floor Area</u>
88. La Broquerie	300	10,998
89. Lunder	297	33,525
90. Lowe Farm	290	18,005
91. Rosenfeld	279	25,527
92. Waskada	277	31,282
93. Erikdale	260	36,260
94. Gypsumville	250	17,309
95. Rorketon	250	37,291
96. Letellier	248	23,648
97. Langruth	210	36,093
98. Glenella	200	29,271
99. Newdale	190	31,966
100. Amaranth	120	9,069

Service Centres Omitted from this Study:

- Austin
- Elkhorn
- McGregor
- Miniota
- Pierson
- Pine River
- Piney
- Riverton
- Somerset
- Sprague
- Treherne
- Vita

The hypotheses were investigated as follows: service centres were tabulated together with their population and Type A business floor area (Table I) and the points plotted on a graph (Figs. 3 and 4). A pattern of point distribution emerged which suggested a curvilinear regression. A second degree curve was fitted by the method of least squares:

$$a \Sigma A^4 + b \Sigma A^3 + c \Sigma A^2 = \Sigma A^2 P$$

$$a \Sigma A^3 + b \Sigma A^2 + c \Sigma A = \Sigma AP$$

$$a \Sigma A^2 + b \Sigma A + cN = \Sigma P$$

Where $A =$ Business floor area in 10^4 sq. ft.

$P =$ Population in 10^3

$N = 100$

Solving

$$P = 0.0091A^2 + 0.0117A + 0.306 \quad (I)$$

It will be noted (see Fig. 4) that the curve did not pass through the point of origin. However, it was postulated that if the population is zero the business floor area would be zero. Thus a portion of the curve would be rectilinear.³⁰ This was calculated in the following manner:

30. The property of a second degree is such that forcing it through the point (0.0) would introduce a considerable distortion of the legs of the curve.

$$P = 0.0091A^2 + .0017A + .306 \quad (1)$$

$$P = mA \quad (2)$$

$$\frac{dP}{dA} = .0182A + .234 \quad (3)$$

$$\frac{dP}{dA} = m \quad (4)$$

$$\text{Solving } P = 0.117A \quad (II)$$

$$\text{Hence } P = 0.0091A^2 + 0.0117A + 0.306; \text{ for } P .700; \quad (I)$$

$$P = 0.117A \quad \text{for } P .700; \quad (II)$$

These formulae can be expressed in terms of P as follows:

$$A = \sqrt{110P - 33.2} - 0.643; \text{ for } P .700 \quad (IA)$$

$$A = 8.547P \quad \text{for } P .700 \quad (IIA)$$

The close grouping of points on the graph (Fig. 3) was construed as strong evidence of the validity of the first hypothesis set forth in this section. The curvature of the regression seemed to substantiate the second hypothesis.

However, some reasons had to be found to account for the deviation of the points from the curve to which we shall henceforth refer as the "Standard Mathematical Model" or SMM. This was attempted in the following sections of this chapter and corresponded to the portion of the flow diagram labelled "optimization" (see Fig. 2).

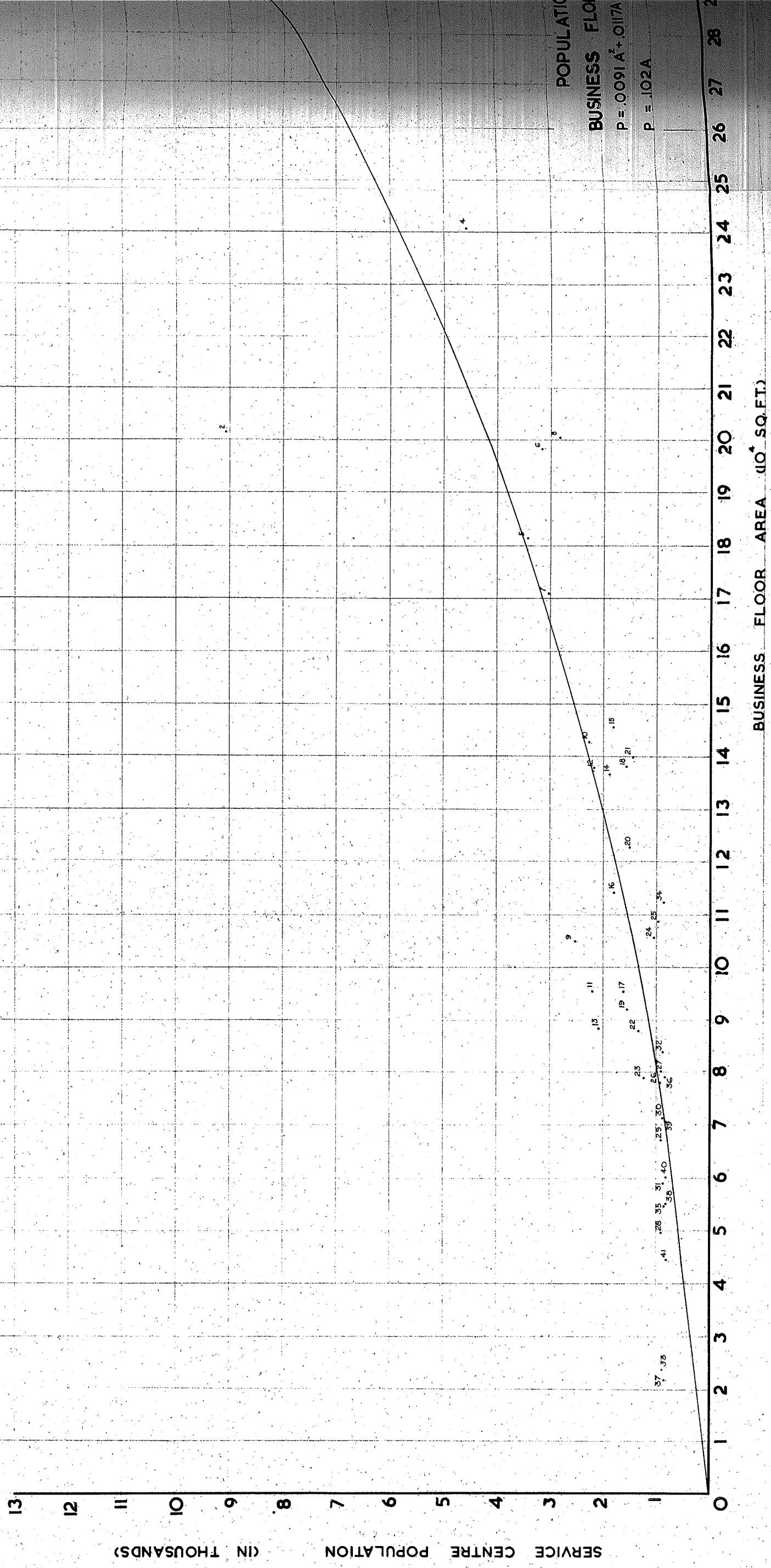
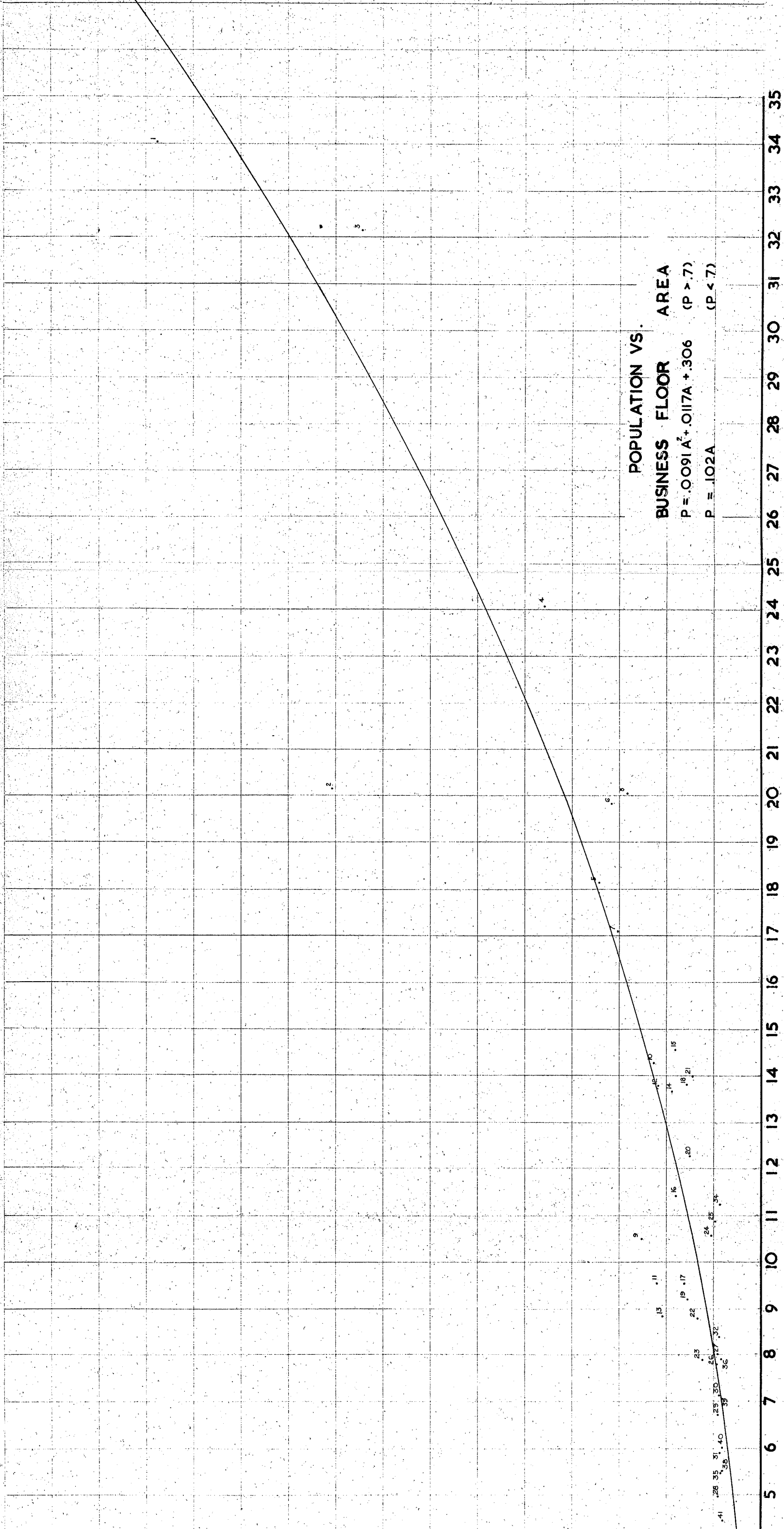


FIG.3 - STANDARD MATHEMATICAL MODEL



POPULATION VS.
 BUSINESS FLOOR AREA
 $P = .0091A^2 + .0117A + .306$ ($P > .7$)
 $P = .102A$ ($P < .7$)

BUSINESS FLOOR AREA (10⁴ SQ. FT.)

FIG.3 - STANDARD MATHEMATICAL MODEL

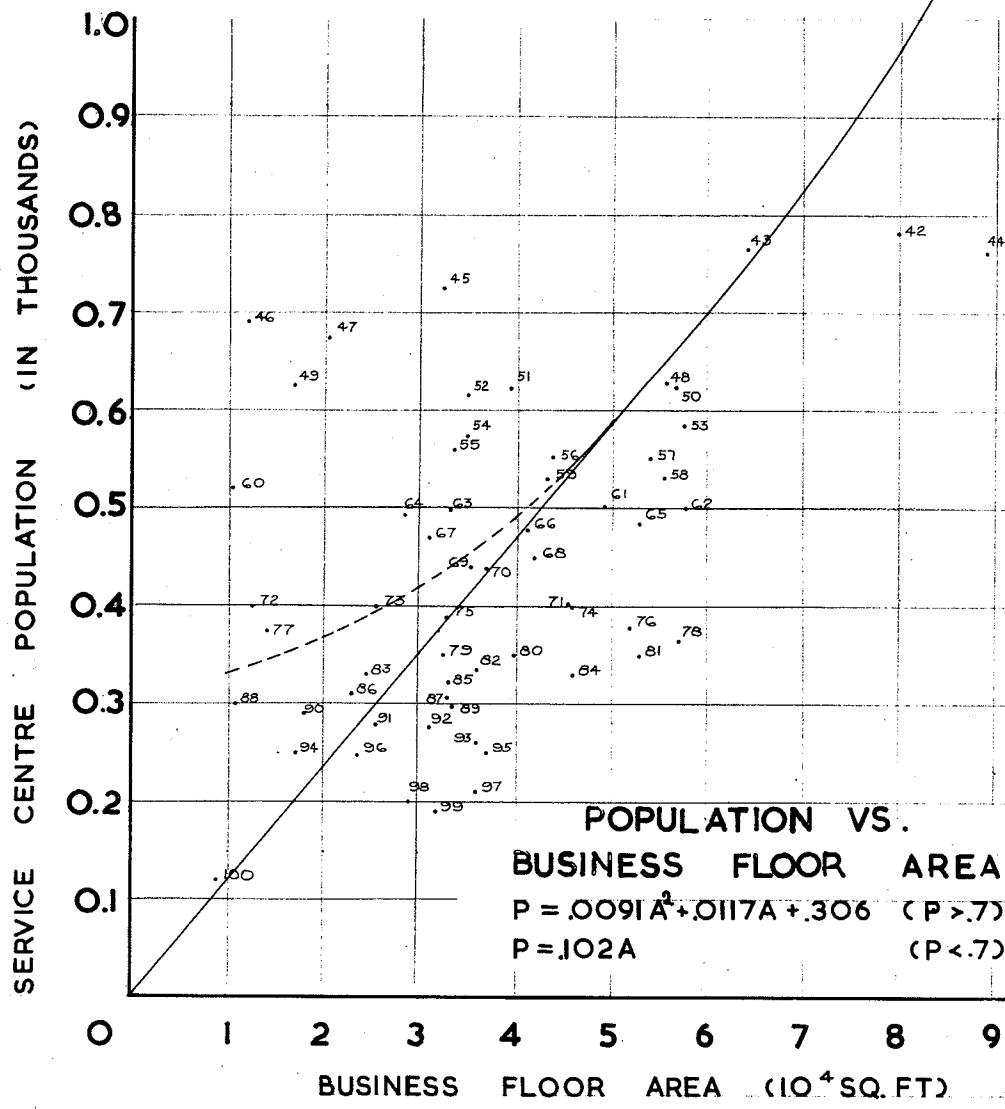


FIG. 4
STANDARD MATHEMATICAL MODEL
EXPANDED FOR POPULATION 0 TO 1000

Effect of the Umland Population

There are several possible causes for the non-conformity of the points to the standard mathematical model. After careful consideration of possible alternatives, these causes were narrowed down to the following: effect of the umland population, distance from a major centre and size of the hinterland. A decision was reached intuitively that the first of these causes is the one having the greatest effect upon the non-conformity of the business floor area to that of the mathematical model.³¹ Hence the following hypothesis was tested:

"The population of the umland of a service centre will affect the business floor area independently of the size of the population of the service centre."

To test this hypothesis some common denominator had to be devised to analyze individual service centres irrespective of the absolute size of their population and that of their umland, as well as the aggregate business floor area. To this effect, in each of the hundred service centres, the deviation of the business floor area from the "standard mathematical model" was expressed in terms of ratio of "actual area" to

31. It was surmised that, although the proximity of a major centre may draw some of the business away from the service centre, and an extensive umland may cause some small shopping facilities to develop in hamlets and at crossroads, the bulk of convenience shopping (say once or twice a week) would be done in the service centre.

"calculated area" and the size of the umland population in terms of ratio of umland population to service centre population. The former could be readily obtained from the graph and the latter from the population study. The data thus processed were tabulated (see Table 2) and points plotted on a graph. (Fig. 5). A considerable scatter of points became apparent, but due mostly to the distortion of the vertical scale. A correlation coefficient was calculated using the following formula:

$$r = \frac{\Sigma D_1 R}{\sqrt{(\Sigma D_1^2)(\Sigma R^2)}}$$

Where r = correlation coefficient

D_1 = deviation from "standard mathematical model"

$R = (P_u/P_s)_1$ = ratio of umland population to service centre population.

Solving $r = 0.840$

This points to a fairly high correlation between D_1 and R and seemed to substantiate the hypothesis. A curve was calculated by the method of least squares using the following formulae:

$$a \Sigma R^2 + b \Sigma R = \Sigma DR$$

$$a \Sigma R + bn = \Sigma D$$

Hence $C_1 = 0.04R + 0.92$ (III)

Where C_1 = correction to be applied to the "standard mathematical model".

It is apparent from the graph (Fig. 5) that ideally, if the ratio of umland population to service centre population is above 2.0, the business

TABLE 2

Effect of Umland Population
on Business Floor Area for
Type A Services.

Service Centre	P_s Service Centre Population	P_u Umland Pop- ulation	R	D_1	C_1	$\delta = D_1 - C_1$
1. Portage la Prairie	12,784	8,524	0.67	0.93	0.95	-0.02
2. Selkirk	9,078	12,066	1.32	0.66	0.97	-0.31
3. Dauphin	8,440	5,678	0.67	1.10	0.95	0.15
4. Steinbach	4,596	6,247	1.36	1.15	0.98	0.17
5. Swan River	3,419	2,614	0.76	1.01	0.95	0.06
6. Neepawa	3,170	5,150	1.62	1.17	0.98	0.19
7. Morden	3,041	3,320	1.09	1.03	0.96	0.07
8. Virden	2,882	4,662	1.60	1.26	0.98	0.28
9. Winkler	2,533	2,534	1.00	0.71	0.96	-0.25
10. Minnedosa	2,286	2,119	0.93	1.02	0.96	0.06
11. Gimli	2,205	4,471	2.03	0.69	1.00	-0.31
12. Beausejour	2,181	4,212	1.93	1.09	1.00	0.09
13. Altona	2,088	2,030	0.97	0.60	0.96	-0.36
14. Carman	1,888	2,895	1.53	1.10	0.98	0.12
15. Killarney	1,810	2,058	1.14	1.20	0.97	0.23
16. Souris	1,801	1,987	1.10	0.48	0.96	0.02
17. Rivers	1,624	3,397	2.09	0.85	1.00	-0.15
18. Roblin	1,582	4,699	2.97	1.24	1.04	0.20
19. Stonewall	1,552	3,450	2.22	0.84	1.01	-0.17
20. Russell	1,495	1,708	1.14	1.13	0.97	0.16
21. Boissevain	1,453	2,066	1.42	1.32	0.98	0.34
22. Morris	1,322	2,104	1.59	0.88	0.98	-0.10

Table 2 (cont.)

Service Centre	P _s Service Centre Population	P _u Umland Pop- ulation	R	D ₁	C ₁	$\delta = D_1 - C_1$
23. Carberry	1,249	2,346	1.88	0.83	1.00	-0.17
24. Melita	1,082	2,180	2.01	1.25	1.00	0.25
25. Grandview	991	1,752	1.77	1.52	0.99	0.53
26. Gladstone	925	1,658	1.79	1.04	0.99	0.05
27. Gilbert Plains	920	1,117	1.21	1.05	0.97	0.08
28. Ste. Anne	913	3,059	3.35	0.66	1.06	-0.40
29. Deloraine	905	2,051	2.27	0.89	1.01	-0.12
30. Arborg	886	4,078	4.60	0.96	1.10	0.14
31. Winnipegosis	883	1,804	2.04	0.80	1.00	-0.20
32. Manitou	879	2,125	2.42	1.14	1.02	0.12
33. St. Laurent	879	760	0.86	0.32	0.96	-0.64
34. Lac du Bonnet	873	1,861	2.13	1.55	1.00	0.55
35. Birch River	859	493	0.57	0.76	0.94	-0.18
36. Birtle	852	1,703	2.00	1.12	1.00	0.12
37. Powerview	837	2,075	2.48	0.30	1.02	-0.72
38. St. Pierre	833	1,624	1.95	0.81	1.00	-0.19
39. Shoal Lake	823	1,279	1.55	1.02	0.98	0.04
40. Hamiota	820	2,990	3.65	0.86	1.07	-0.21
41. Teulon	810	3,396	4.19	0.64	1.09	-0.45
42. Ste. Rose du Lac	782	2,181	2.79	1.20	1.03	0.17
43. Glenboro	766	973	1.27	0.99	0.97	0.02
44. Pilot Mound	761	665	0.87	1.37	0.96	0.41
45. Emerson	725	457	0.63	0.53	0.95	-0.42
46. Camperville	690	909	1.32	0.21	0.97	-0.76
47. Ninette	675	749	1.11	0.36	0.96	-0.60

Table 2 (cont.)

Service Centre	P _s Service Centre Population	P _u Umland Pop- ulation	R	D ₁	C ₁	$\delta = D_1 - C_1$
48. Rosburn	629	1,278	2.03	1.04	1.00	0.04
49. St. Malo	625	874	1.40	0.32	0.98	-0.66
50. Hartney	624	788	1.26	1.06	0.97	0.09
51. St. Claude	622	2,547	4.09	0.74	1.08	-0.34
52. Minitonas	616	956	1.55	0.67	0.98	-0.31
53. Crystal City	586	1,222	2.09	1.09	1.00	0.09
54. Notre Dame de Lourdes	575	841	1.46	0.73	0.98	-0.25
55. Gretna	560	724	1.29	0.71	0.97	-0.26
56. Bowsman	552	990	1.76	0.95	0.99	-0.04
57. McCreary	551	1,789	3.25	1.18	1.05	0.13
58. Erickson	532	1,076	2.02	1.23	1.00	0.23
59. Plum Coulee	530	1,867	3.52	0.96	1.06	-0.10
60. Reston	520	1,176	2.26	0.24	1.01	-0.77
61. Ethelbert	502	1,338	2.67	1.15	1.03	0.12
62. Dominion City	500	2,086	4.17	1.34	1.09	0.25
63. Wawanesa	498	507	1.02	0.78	0.96	-0.18
64. Niverville	495	2,026	4.09	0.69	1.08	-0.39
65. Benito	485	1,468	3.03	1.08	1.04	0.04
66. Binscarth	478	988	2.07	1.01	1.00	0.01
67. Strathclair	470	407	0.87	0.78	0.96	-0.18
68. Whitemouth	450	1,998	4.44	1.05	1.10	-0.05
69. Holland	440	1,049	2.38	0.94	1.01	-0.05
70. Rapid City	439	626	1.43	0.99	0.98	0.01
71. Cartwright	405	1,069	2.64	1.34	1.03	0.31

Table 2 (cont.)

Service Centre	P _s Service Centre Population	P _u Umland Pop- ulation	R	D ₁	C ₁	$\delta = D_1 - C_1$
72. Mafeking	400	629	4.57	0.37	0.98	-0.61
73. Elphinstone	400	926	2.32	0.75	1.01	-0.26
74. Sandy Lake	400	461	1.15	1.35	0.97	0.38
75. Oak Lake	388	662	1.71	1.00	0.99	0.01
76. St. Lazare	378	951	2.52	1.60	1.02	0.58
77. Onanole	375	216	0.58	0.45	0.94	-0.49
78. Fisher Branch	365	1,726	4.73	1.82	1.11	0.71
79. Plumas	350	625	1.79	1.08	0.99	0.09
80. Baldur	350	1,193	3.41	1.33	1.06	0.27
81. Ashern	350	3,214	9.18	1.79	1.28	0.51
82. Roland	334	537	1.61	1.27	0.98	0.29
83. Elm Creek	330	1,045	3.17	0.87	1.05	-0.18
84. Miami	330	916	2.78	1.65	1.03	0.62
85. Belmont	322	636	1.98	1.20	1.00	0.20
86. Inglis	310	1,191	3.84	0.89	1.08	-0.19
87. Grunthal	307	1,723	5.64	1.25	1.15	0.10
88. La Broquerie	300	808	2.69	0.43	1.03	-0.60
89. Lundar	297	1,361	4.58	1.32	1.10	0.22
90. Lowe Farm	290	1,113	3.84	0.73	1.07	-0.34
91. Rosenfeld	279	643	2.30	1.07	1.01	0.06
92. Waskada	277	491	1.77	0.93	0.99	-0.06
93. Eriksdale	260	860	3.31	1.64	1.05	0.59
94. Gypsumville	250	812	3.25	0.82	1.05	-0.23

Table 2 (cont.)

Service Centre	P _s Service Centre Population	P _u Umland Pop- ulation	R	D _l	σ _l	δ = D _l - C _l
95. Rorketon	250	1,416	5.66	1.76	1.15	0.61
96. Letellier	248	1,575	6.35	1.12	1.17	-0.05
97. Langruth	210	324	1.54	2.01	0.98	1.03
98. Glenella	200	877	4.34	1.72	1.09	0.63
99. Newdale	190	411	2.16	2.00	1.01	0.99
100. Amaranth	120	730	6.08	0.91	1.16	-0.25

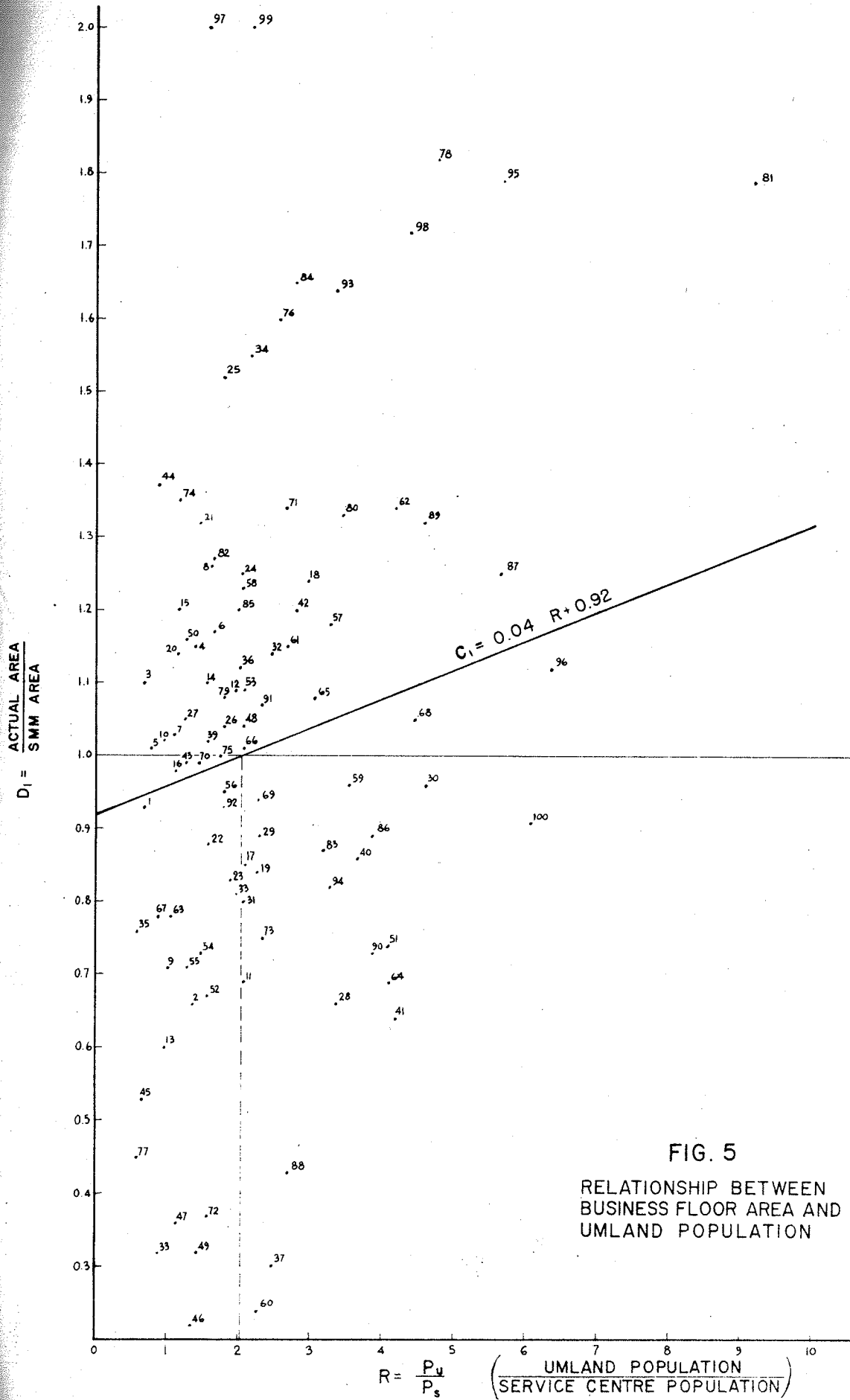


FIG. 5
 RELATIONSHIP BETWEEN
 BUSINESS FLOOR AREA AND
 UMLAND POPULATION

floor area will be greater than that suggested by the mathematical model. If the ratio is below 2.0, the floor area will be smaller than that suggested by the model.³²

The next step was to isolate those service centres to which the correction for umland population did not apply. It was assumed that for some service centres, their distance from a major centre and the size of their umland had more effect on their CBD floor area than their umland population. Thus, in order to identify such service centres, corrections to the "standard mathematical model", i.e. those deviations obtained from the graph (C), were subtracted from the actual deviations (D_1). It was surmised that if a service centre conforms to this correction, it will very nearly coincide with the mathematical model, i.e. the deviation from the SMM would be zero. These calculations were performed (see $\delta_1 = D_1 - C_1$ in Table 2) and the results plotted on a graph (Fig. 6).

The standard deviation was calculated. To establish the degree of accuracy of the SMM as well to isolate those points which were the least affected by the correction for umland population:

32. In view of the fact that four independent variables existed, a multiple regression would have provided a more elegant solution. However, since the intent of this study was to derive a simple method which would lend itself to graphical solutions and which would conceivably be used by planners who do not possess a sufficient mathematical background, a two-dimensional solution was favoured by the author. Hence the use of the SMM and optimization factors.

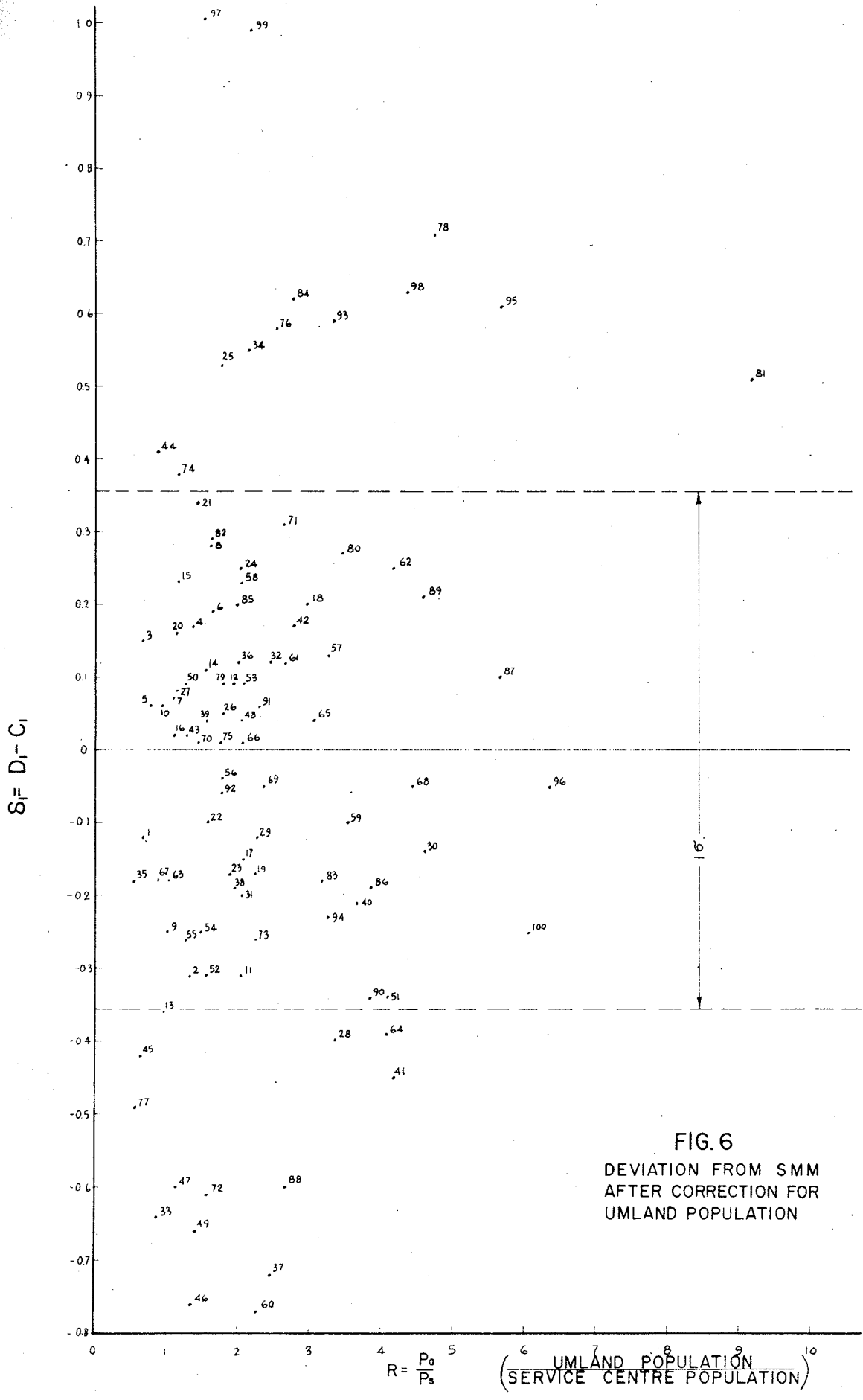


FIG. 6
 DEVIATION FROM SMM
 AFTER CORRECTION FOR
 UMLAND POPULATION

$$\sigma = \sqrt{\frac{\sum (\delta_1 - \bar{\delta}_1)^2}{n-1}}$$

Where $\delta_1 = D_1 - C_1$

$n = 100$

Solving $\sigma = 35.75$

Applying the above criteria, the business floor areas of service centres which deviated by more than $\pm 35.75\%$ from the SMM where assumed to be affected very little by the unland population. Twenty seven services were thus isolated (see Table 3).

Distance from Major Centre

The Province of Manitoba has three major centres³³ within its agricultural area; Winnipeg, Brandon and Dauphin. These major centres are not necessarily the most populated towns in Manitoba. Dauphin rates fifth in terms of population.³⁴

From a study of the patterns of wholesale distribution³⁵ in the Province of Manitoba and a check on the range of services available in these centres, it became apparent that they also performed the function of "wholesale distribution centres."

In the previous section, a number of service centres were isolated, which did not conform to the trend of the majority of service centres.

33. The term "major centre" as used in this thesis applies to centres which occupy a predominant position in the Province of Manitoba for social, cultural, administrative and cultural as well as commercial and manufacturing activities.

34. Portage la Prairie and Selkirk have larger populations than Dauphin, but their proximity to Winnipeg prevents them from performing the functions of a major centre.

35. Studies were carried out in the "food and beverage" group of services.

TABLE 3

Distance of Manitoba Towns from Major Centre vs. Deviation from SMM.

Service Centre	Major Centre ^a	d (Miles)	D _{2a}	D _{2b} ^c (D ₂)	C ₂	$\delta_2 = D_2 - C_2$
25. Grandview	D	30	1.52	1.53	0.92	0.61
28. Ste. Anne	W	28	0.66	0.60	0.91	-0.31
33. St. Laurent	W	53	0.32	0.36	0.98	-0.62
34. Lac du Bonnet	W	74	1.55	1.55	1.04	0.51
37. Powerview	W	96	0.30	0.28	1.10	-0.82
41. Teulon	W	38	0.64	0.55	0.94	-0.39
44. Pilot Mound	W	115	1.37	1.41	1.15	0.26
45. Emerson	W	70	0.56	0.58	1.03	-0.45
46. Camperville	D	68	0.21	0.24	1.02	-0.78
47. Ninette	B	47	0.36	0.40	0.96	-0.56
49. St. Malo	W	45	0.32	0.34	0.95	-0.61
60. Reston	B	69	0.24	0.23	1.03	-0.80
64. Niverville	W	31	0.69	0.61	0.92	-0.31
72. Mafeking	D	140	0.37	0.39	1.23	-0.64
73. Elphinstone	B	63	0.75	0.74	1.01	-0.27
74. Sandy Lake	B	57	1.35	1.38	0.99	0.93
76. St. Lazare	B	104	1.60	1.58	1.12	0.46
77. Onanole	B	59	0.45	0.51	0.99	-0.48
78. Fisher Branch	W	101	1.82	1.71	1.11	0.60
81. Ashern	W	113	1.79	1.51	1.15	0.36
84. Miami	W	71	1.65	1.62	1.03	0.29
88. La Broquerie	W	47	0.43	0.40	0.96	-0.56
93. Eriksdab	W	87	1.64	1.59	1.07	0.52

TABLE 3 (cont.)

Service Centre	Major Centre ^a	d (Miles)	D _{2a}	D _{2b} ^c (D ₂)	C ₂	$\delta_2 = D_2 - C_2$
95. Rorketon	D _b	55	1.76	1.61	0.98	0.63
97. Langruth	P	42	2.01	2.03	0.95	1.08
98. Glenella	D	73	1.72	1.63	1.04	0.32
99. Newdale	B	48	2.00	1.99	0.96	1.03

a - Major Centres: W - Winnipeg
 B - Brandon
 D - Dauphin
 P - Portage la Prairie

b - Investigation of shopping habits in the Langruth area showed that in this case Portage la Prairie may be considered as a major centre with respect to Langruth.

c - $D_{2b} = \delta_1 + 1$; δ_1 (from Table 2) = $\frac{\% \text{ deviation from SMM}}{100}$. Adding 1 changes the

deviation from the SMM into a form consistent with the method used in this thesis to derive a correction coefficient (C₁).

A cursory study of the non-conforming service centres tended to indicate that the service centres which were more distant from a major centre possessed a larger business floor area. Thus, the following hypothesis was tested:

"The major centre influences the business floor area of a service centre in direct proportion to the distance in road-miles of a service centre from a major centre."³⁶

There are two ways in which the above hypothesis could be tested. First, it may be assumed that the correction for the size of the umland population did not apply and the deviation from the mathematical model would serve as a basis of the study. Second, it may be assumed that the deviation from the mathematical model was corrected for the influence of the umland population. Both tests were carried out. The deviation from the standard mathematical model was plotted against the distance from major centres on two separate graphs (see Table 3; Figs. 7, 8), each representing one of the above conditions. A correlation coefficient of 0.815 was obtained in the first case and 0.816 in the second case.

Curves were calculated by the method of least squares; both were very similar:

$$C_{2a} = 0.0033d + 0.82; \quad r = 0.815 \quad (a)$$

$$C_{2b} = 0.0029d + 0.82; \quad r = 0.816 \quad (b)$$

36. The farther the service centre from a major centre, the less frequent the deliveries. Hence, more storage stockpiling of goods. This was observed by the author, among others, in Arborg and Fisher Branch.

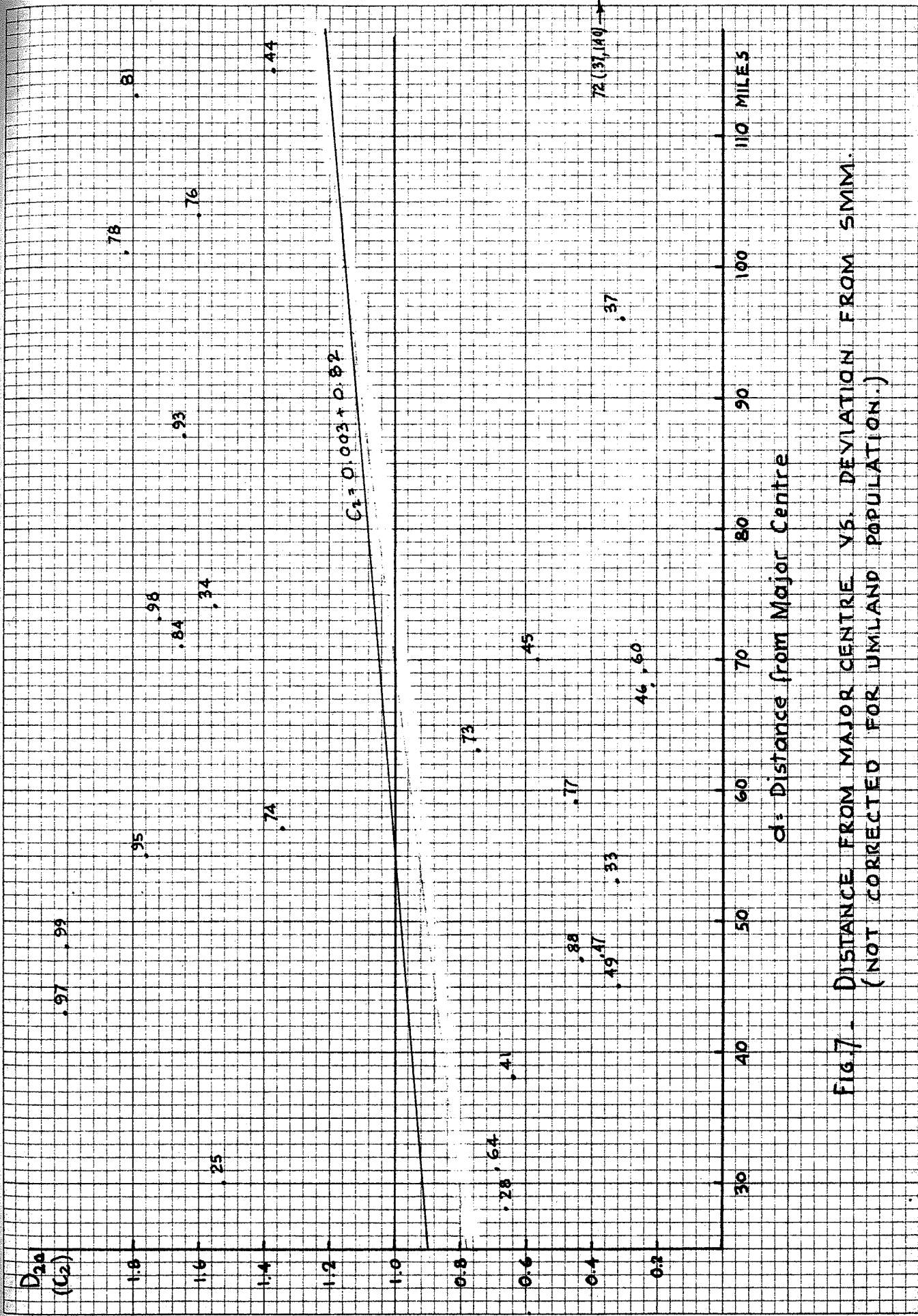


FIG. 7 - DISTANCE FROM MAJOR CENTRE VS. DEVIATION FROM SMIM.
 (NOT CORRECTED FOR UMLAND POPULATION.)

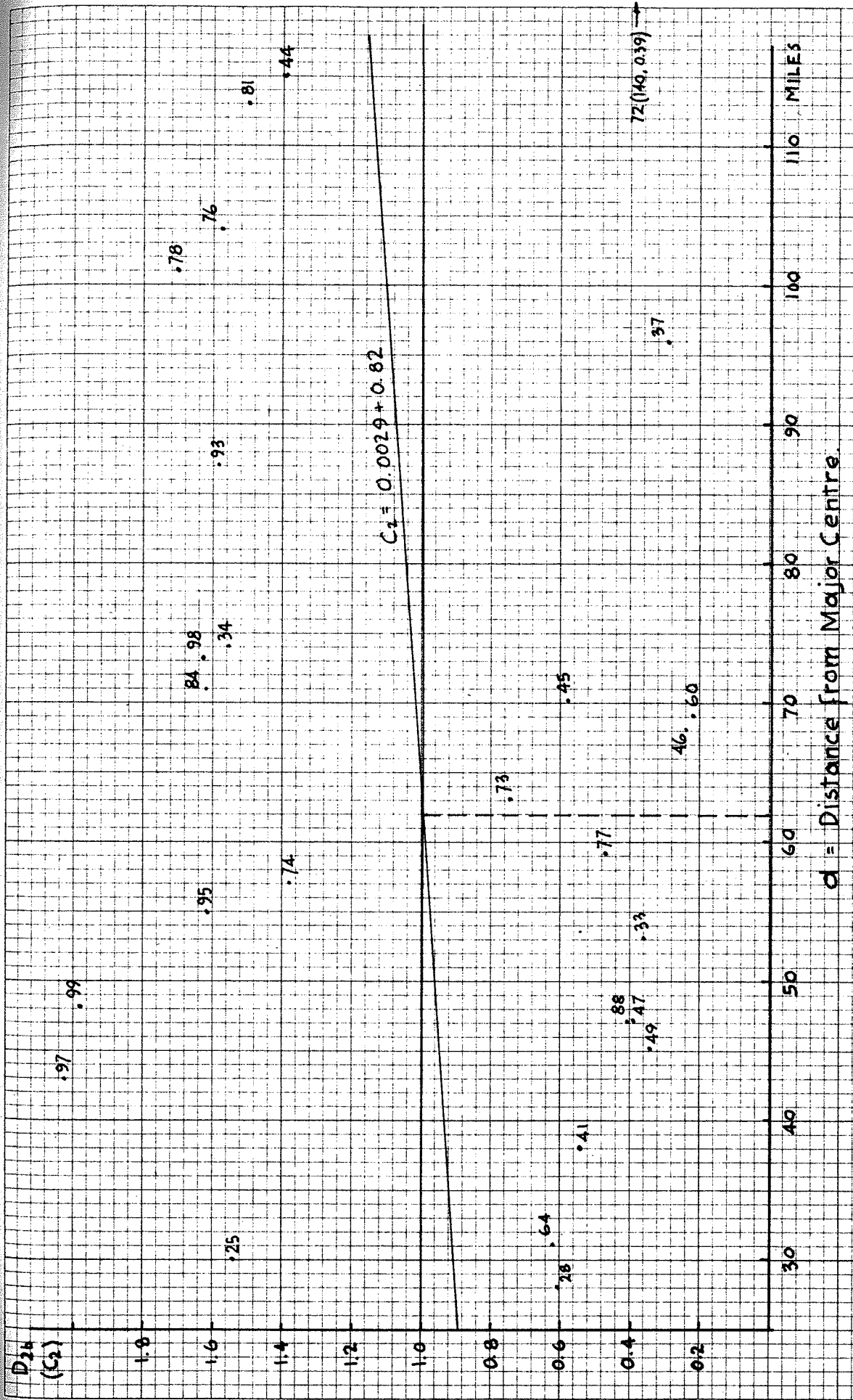


Fig 8 - DISTANCE FROM MAJOR CENTRE VS. DEVIATION FROM 5MM.
 (CORRECTED FOR UMLAND POPULATION.)

Although the difference in correlation coefficient seems hardly significant, a comparison of the two graphs (Figs. 7 and 8) shows that in the graph which has been corrected for the influence of the umland population (Fig. 8) some points are considerably nearer the calculated curve (namely points 81 and 95) others varied but slightly. Formula (b) was therefore preferred.

Hence

$$C_2 = 0.0029d + 0.82 \quad (IV)$$

A significant fact is that the point $C_2 = 1$ is at a distance of nearly 60 miles from a major centre. This corresponds to an economical trucking distance of 60 to 65 miles indicated by some local businessmen in the trucking and wholesale distribution field, which the author had interviewed. This additional fact, together with a high correlation coefficient, seems to substantiate the hypothesis that the distance of a service centre from a major centre influences the business floor area in the service centre.

It is interesting to note that most of the twenty-seven service centres which were isolated in our sample all present some problem or peculiarity obvious to anyone familiar with Manitoba towns. Some service centres such as Camperville have a predominantly Indian and Metis urban and umland population; this fact is reflected by the extremely low amount of business floor space. The same could be said of some centres which derive most of their livelihood from seasonal tourist trade such as St. Laurent and Onanole. In this respect the centres are only partially per-

forming their function as a service centre. Other centres such as St. Lazare are isolated ethnic communities which try to keep most businesses within its boundaries. Many of these service centres have above average business floor area due either to the distance (beyond the 60 mile point) or to outstanding entrepreneurship.

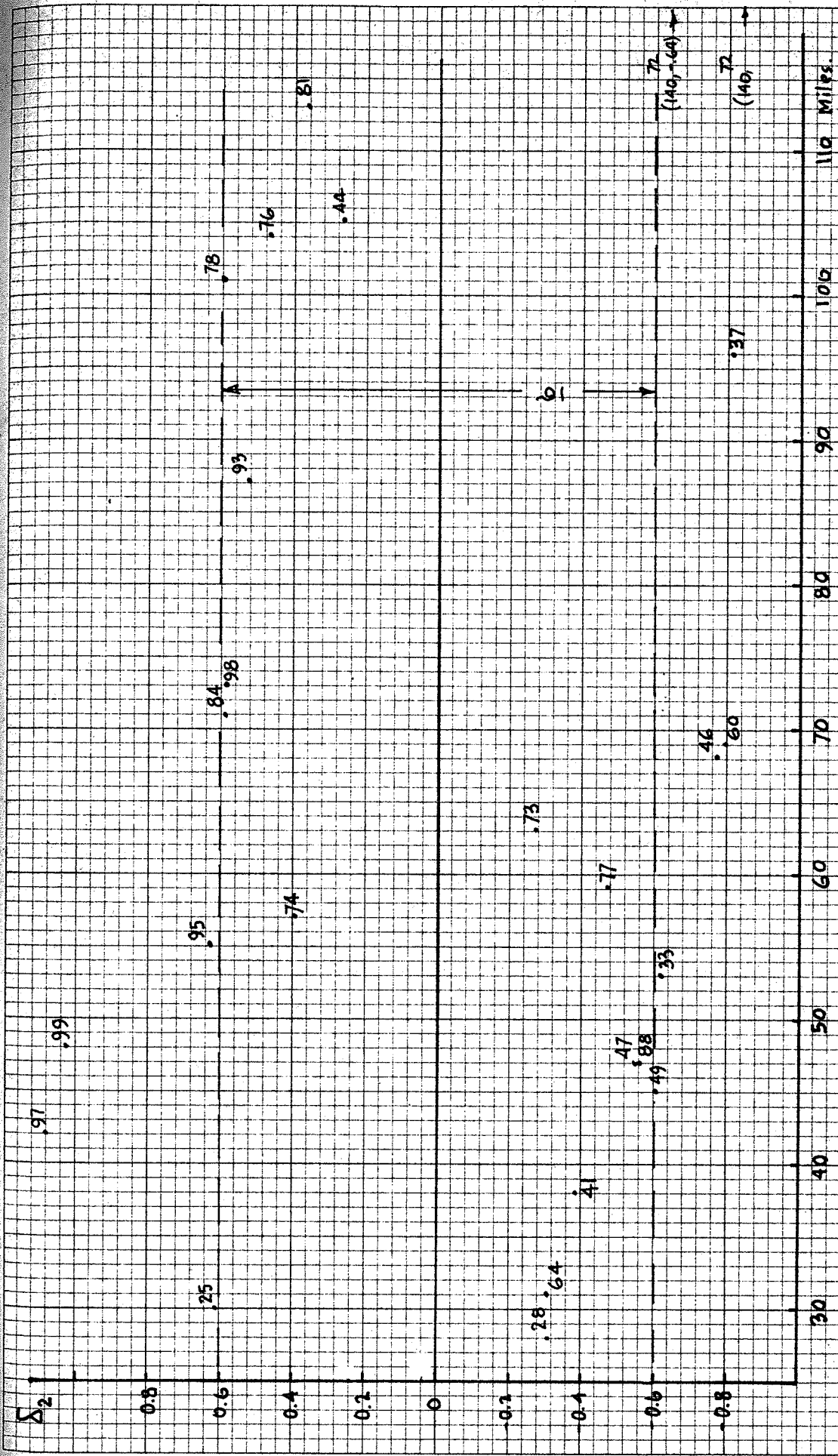
Size of Umland.

To complete the analysis of the variables which were assumed to affect the relationship of the service centre population to business floor areas, a final hypothesis was tested:

"The size of the umland will affect the business floor area in the CBD of a service centre. The larger the umland, the less CBD area will be required to serve the local trade area population."

The same procedure was used as in the preceding section: the deviation from the SMM was subtracted from the actual deviation ascribed to the distance from a major centre. (see Table 3). A standard deviation was calculated and the points which fell outside one standard deviation were used to test the above hypothesis. (see Fig. 9).

It was suspected that for a large umland the driving distance to the service centre would so increase that secondary centres would develop in the form of a general store or other facility at crossroads or other convenient location. Secondary centres of this kind are known to exist (eg: "Seddon's Corner", eleven miles east of Beausejour).



ol = Distance from Major Centre

Fig. 9 - DISTANCE FROM MAJOR CENTRE VS. DEVIATION FROM SMM.
(CORRECTED UMLAND POPULATION & DISTANCE FROM MAJOR CENTRE).

Deviations from the SMM and sizes of local trade areas in square miles were tabulated (see Table 4). A correlation coefficient of 0.726 was obtained, which indicated that the curve had a positive slope. This was contrary to the hypothesis that a large umland will reduce the CBD floor area for if this were true, the slope of the curve would be negative. The deviation from the SMM of service centres selected for this test were plotted against the size of the corresponding local trade areas in square miles and a curve calculated to illustrate the slope of the curve and the lack of meaningful information which this graph yields. (Fig. 10).

A check of the characteristics of some of these non-conforming service centres indicated as before that there existing conditions peculiar to these towns, causing the non-conformity.³⁷

37. eg. Camperville and St. Laurent have predominantly Indian and Metis population in both the service centre and the umland and a very poor agricultural base. They lag in entrepreneurship and aggressiveness. Newdale and Langruth are service centres in areas of marginal lands and dwindling urban and rural population.

TABLE 4

Size of Umlands of Selected Manitoba Towns vs. Deviation from SMM.

Service Centres	^a (Sq. Mi.)	\bar{X} D_3
25. Grandview	444	1.61
33. St. Laurent	203	.38
37. Powerview	285	.18
46. Camperville	294	.22
49. St. Malo	96	.39
60. Reston	324	.20
72. Mafeking	266	.16
78. Fisher Branch	720	1.60
95. Rorketon	464	1.63
97. Langruth	149	2.08
99. Newdale	90	2.03

\bar{X} , $D_3 = \delta_2 \pm 1$; δ_2 : See Table 3

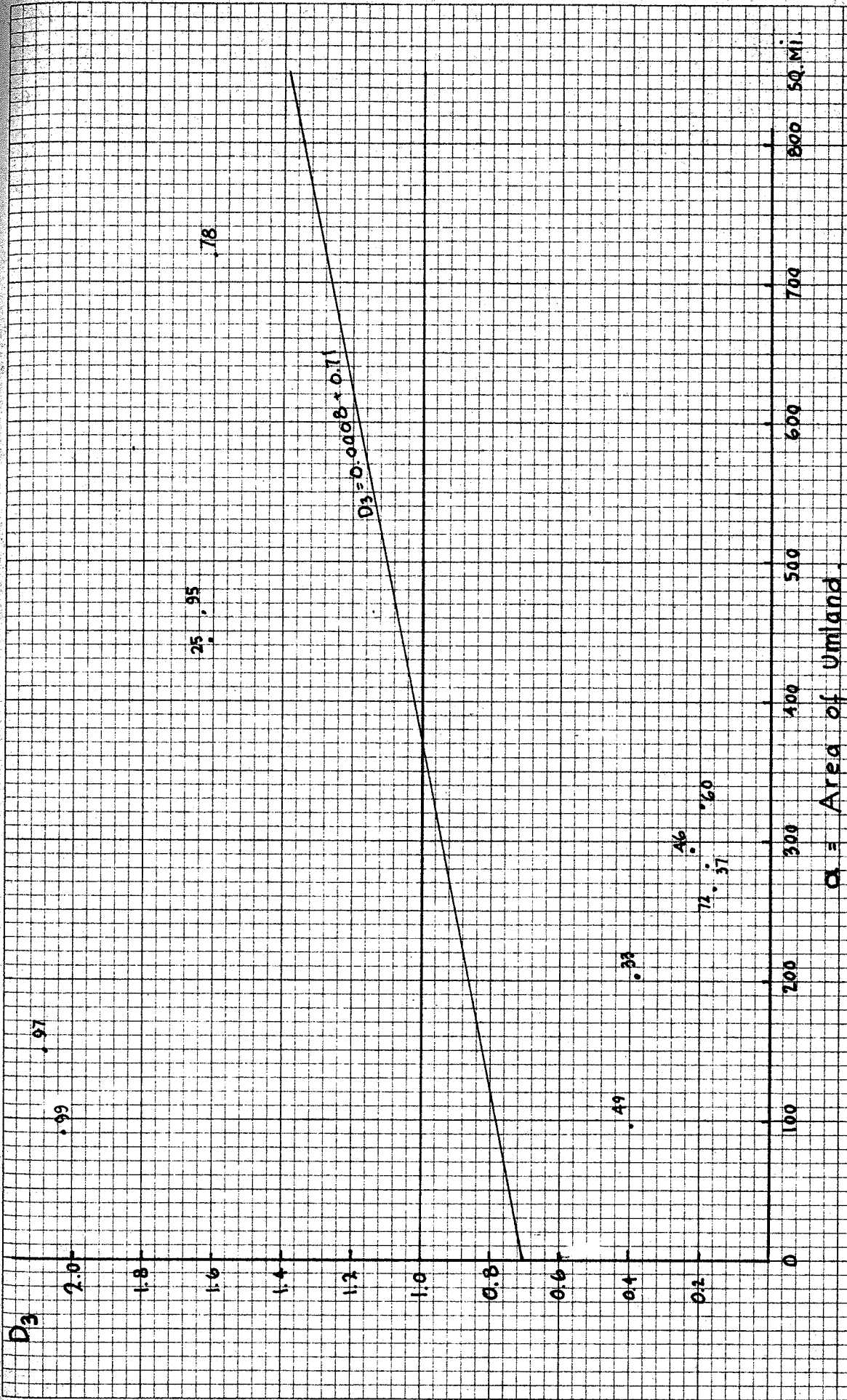


Fig 10 - AREA OF UMLAND VS. DEVIATION FROM SYM.



CHAPTER IV

CHAPTER IVRELATIONSHIP BETWEEN BUSINESS FLOOR AREA
AND POPULATION FOR TYPE B & TYPE C SERVICES

The previous chapter dealt with Type "A" services, which are provided by the local service centre. Higher levels of services require a larger market and therefore depend on a larger trade area. In carrying out the field work, it became apparent that some of the larger service centres had a considerable amount of business floor area devoted to services other than that of the Type "A". This chapter deals with the relationship between the business floor area of Type "B" and Type "C" services and the respective trade area population.

1. Type "B" ServicesSelection of Towns

The selection of service centres performing a significant regional function required some yardstick to measure the relative importance of Type "B" services located in these service centres. This measure of relative importance was provided by taking a ratio of floor areas of Type "B" to Type "A" services³⁸: $R = \frac{B}{A}$ (see Table 5). Examination of existing trade area studies³⁹ and primary sources indicated that with the exception

38. The symbols used in this formula do not correspond to identical symbols used elsewhere in this thesis.

39. The studies used for this part of the thesis were: (1) Newspaper circulation; (2) "Drawing Power Surveys", see footnote 15, p. 12; (3) Preliminary mail order distribution maps prepared by a large mail order store which wished to remain anonymous; (4) Regions delineated in a study (which was not completed) done by the Manitoba Department of Industry and Commerce in 1961.

TABLE 5

TYPE "B" SERVICES

Regional Service Centre	P		B		A		R= $\frac{B}{A}$
	Trade Area Population	Floor Area Type "B"	Floor Area Type "A"	Floor Area Type "A"	Floor Area Type "A"		
1. Portage la Prairie	26,969	180,175	340,381	0.53			
2. Selkirk	21,144	136,936	201,472	0.68			
3. Dauphin	32,013	209,162	321,304	0.65			
4. Steinbach	18,949	153,842	240,657	0.64			
5. Swan River	14,198	140,997	181,217	0.78			
6. Neepawa	9,857	138,379	198,077	0.70			
7. Morden	9,357	70,155	170,921	0.41			
8. Virden	11,784	84,444	200,124	0.42			
9. Winkler	7,162	59,511	104,984	0.56			
10. Minnedosa	9,752	52,017	142,885	0.36			
12. Beausejour	14,394	67,296	137,710	0.48			
13. Altona	6,589	66,295	88,122	0.75			
14. Carman	10,077	81,352	136,435	0.60			
15. Killarney	6,124	65,944	145,535	0.45			
16. Souris	4,880	59,594	113,983	0.52			
18. Roblin	6,876	57,440	138,080	0.41			
20. Russell	7,727	54,780	122,623	0.45			
21. Boissevain	3,375	34,428	139,719	0.25			
22. Morris	4,582	32,230	87,586	0.37			
24. Melita	5,167	38,359	105,375	0.36			
26. Gladstone	3,367	24,026	77,925	0.31			
29. Deloraine	3,521	20,105	67,032	0.30			

of Boissevain⁴⁰, a service centre having a ratio of 0.30 or more performs regional functions. It was found that all service centres of population 2,000 and over performed a regional function within the limits of the above definition. Most centres of population 1,000 to 2,000 also performed a regional function with the exception of Gladstone and Deloraine which have a $\frac{B}{A}$ ratio of 0.31 and 0.30 respectively, although their population is less than 1,000.⁴¹

In some areas (shaded on Map No. 2) no strong regional centre could be defined. This lack of a well established centre may be attributed to many reasons, most of which could not be pin-pointed without thorough research. However, four reasons were readily identifiable.

- (a) In many areas two or more competing centres vie for predominance with the result that each one has some share of the regional trade (eg. Pilot Mound and Crystal City).
 - (b) There is a tendency for a disappearance of smaller, weaker centres and the emergence of stronger centres encompassing a broader region.
- This trend is very much in evidence throughout the Canadian Prairies.⁴²

40. Although Boissevain has a B/A ratio of 0.25, it provides a great variety of regional service, eg. weekly newspaper, apparel shops, lawyers, etc. The region thus served is well defined.

41. Gladstone, Pop. 935; Deloraine, Pop. 905. There may be a variety of reasons for the regional importance of these centres. For example, Deloraine has a very aggressive weekly newspaper (The Deloraine Times and Stars). It is suspected that this fact may have some influence on the strength of Deloraine as a regional centre.

42. Gerald Hodge, "The Prediction of Trade Centre Viability in the Great Plains", The Regional Science Association Papers. Volume 15, 1965.

- (c) Some areas may be sparsely populated and therefore do not provide a sufficient market for regional services of the Type "B".
(eg. South-eastern Manitoba).
- (d) The proximity or accessibility of a very large major centre may prevent a regional centre from asserting itself (eg. the Interlake Area⁴³).

Delineation of Trade Areas

The criteria used for determining the trade area for a regional service centre providing Type "B" services were the same as those used for local service centres providing Type "A" services (Fig. 11) and regions were plotted (Map No. 2). As expected, the regions covered an area larger than the local trade areas, although in some instances the boundaries of the local trade area were further removed from a service centre than the boundaries of the region. This was attributed to the stronger drawing power of a neighbouring regional centre. In other words, a service centre may exert more drawing power at the local service level (Type "A" services) than at the regional level (Type "B" services).⁴⁴

Population Counts

"Advance Population Statistics" for the 1966 Census of the Dominion Bureau of Statistics were used to determine trade area populations of regional service centres. The totals included the population of the service

43. Parts of the Interlake Area may also be affected by (c). Hence a combination of these reasons together with a weak agricultural base may cause the lack of strong regional centres in that area.

44. It is possible that such a service centre is in the process of losing its regional significance and that many of the Type "B" services now existing may soon disappear.

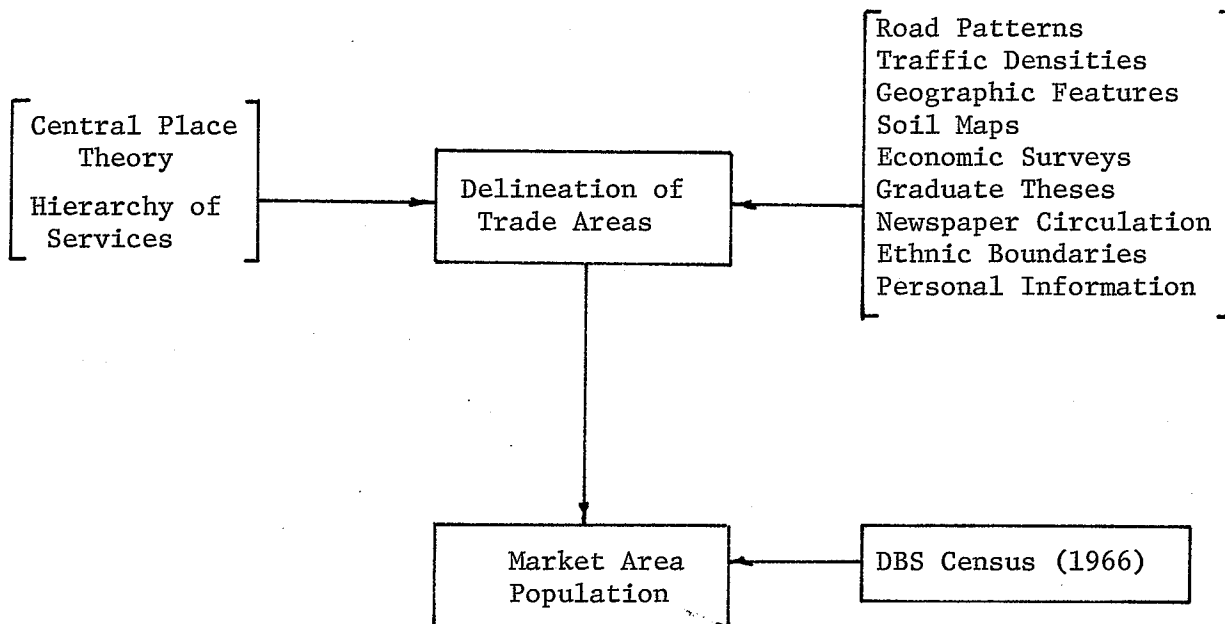
Principles AppliedProcessData Used

Fig. 11

Diagram showing the process of determining trade area populations. (Type "B" Services)

centres as well as that of their respective umlands as delineated in this part of the study (Map No. 2). It was observed that the population of a region determines the business floor area requirements for Type "B" services, rather than the actual area of the region. This means that some small regions such as Winkler (288 square miles) may have a service centre with considerably more Type "B" services than larger regions such as Killarney (936 square miles). It was also noted that the population of a region tends to vary directly with the population of the corresponding regional centre.

Relationship between Population and Business Floor Area

Trade area populations and business floor areas for Type "B" services were tabulated (Table 5) and a correlation coefficient of 0.974 was obtained. This suggested a very strong correlation between the trade area population and the Type "B" business floor area, and indicated that the regression is linear. The points were plotted on a graph (Fig. 12) and a curve calculated:

$$P = 1.25A - 0.4 \quad (\text{IV})$$

Re-arranging this formula in terms of population:

$$A = 0.8P + 0.32 \quad (\text{IVA})$$

Where A = Business Floor Area in 10,000 sq.ft.

P = Population in thousands.

It was concluded that the regression is sufficiently well defined and does not present enough variations to try and optimize the results obtained from the graph. A careful study of the points plotted showed:

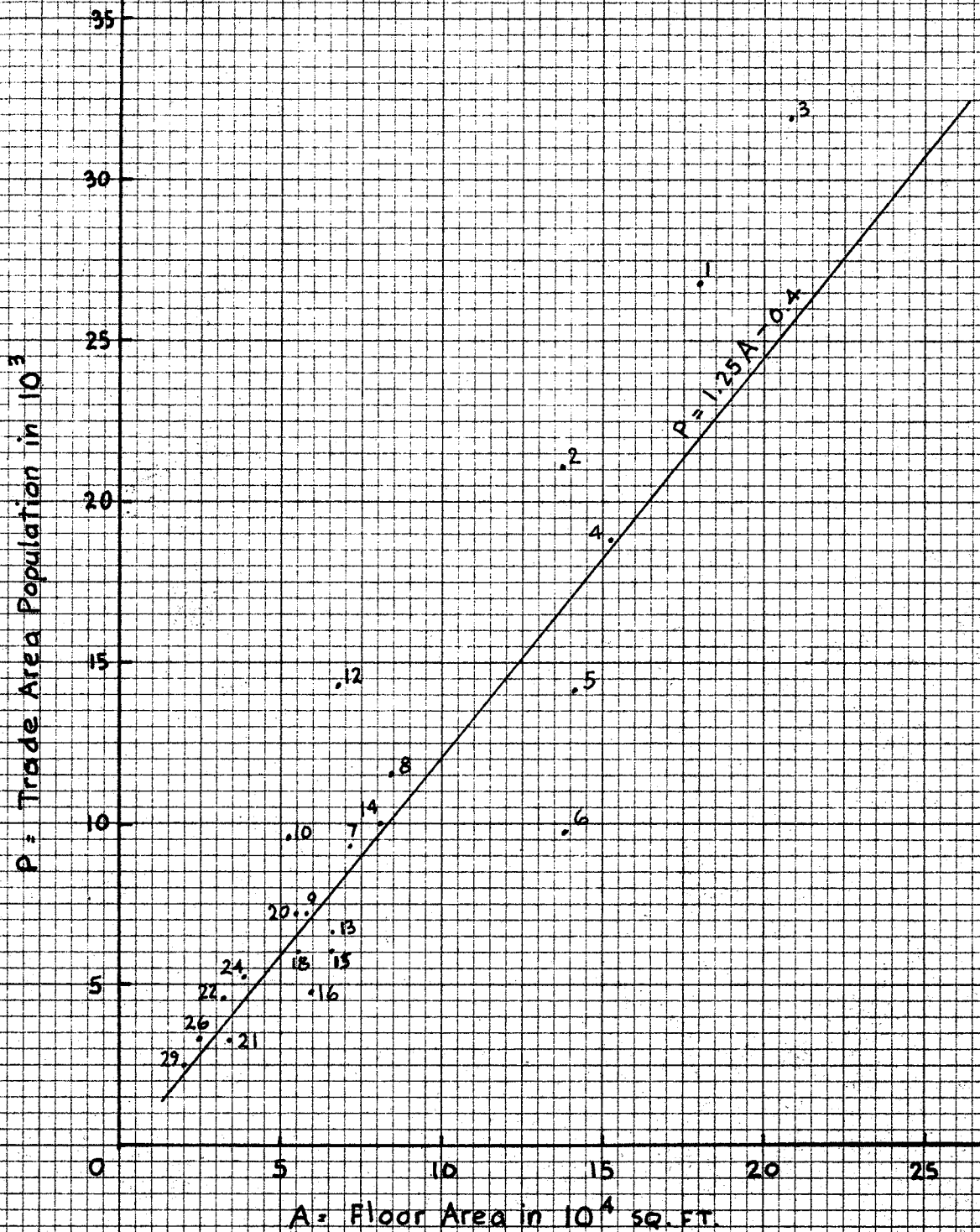


Fig. 12 TYPE "B" FLOOR AREA VS. REGIONAL POPULATION

- (a) That no correlation could be detected between the total business floor area of Type "B" services and the distance from a major centre;
- (b) That the area of a region does not affect the floor area of Type "B" services. This seems to correspond with the findings of the previous chapter.

It may be noted that most service centres perform some regional functions. Some businessmen may prefer to run their business from a smaller town either because of personal preference, or because this is their home town, or because of a lower taxation structure. On the other hand, some local trade areas may provide a sufficient market to sustain a number of regional services of the Type "B", eg. lawyers, dentist, veterinarian, apparel, etc. Although the matter has not been pursued in any detail, there are indications that a curve could possibly be drawn for Type "B" business floor areas in local service centres. However, Type "B" floor area would represent only a small portion of the total business floor area and therefore was not deemed relevant to this study.⁴⁵

2. Type "C" Services

In calculating the business floor areas for Type "C" services,

45. It will be recalled that, with a few exceptions, only service centres with a B/A ratio higher than 0.30 were considered. This eliminates all service centres where the floor area devoted to Type "B" services is less than 25% of the total area. These 25% are well within the confidence limits established in Chapter III of $\pm 35.75\%$, and possibly account for most of it.

it was observed that:

- (a) Most services of the Type "C" were not a CBD use.
- (b) The portion of CBD floor area devoted to Type "C" services was very small (1 to 2%).

Hence, although Type "C" services were used in the hierarchical ranking of services, they represented a negligible value in terms of business floor area and therefore were found to be outside of the scope of this study.



CHAPTER VA CASE STUDY

The purpose of the preceding chapters was to investigate the various relationships which were suspected to exist between the service centre and its trade area population. It was found that some of the assumed relationships did not exist and therefore the proposed flow diagram (Fig. 2) had to be amended to correspond to the findings of this study⁴⁶. The amended diagram (Fig. 13) shows the process which was followed in the case study presented in this chapter as an illustration of the application of the principles developed in this thesis. For the sake of clarity, the flow diagram was divided into two phases. Phase I deals with the calculation of the required business floor areas. Phase II is the conventional method of developing the total acreage required for the projected CBD from a given total business floor area⁴⁷. The subject of this case study is the projection of the CBD spacial requirements of the Town of Dauphin for the year 1986.

Because of a lack of available research data in many aspects of planning in small service centres, assumptions and intuitive judgement had to be substituted.

46. It was found in Ch. III that the correction for the area of the unland for Type "A" services was not required. In Ch. IV, all corrections could be omitted for Type "B" services and no area had to be set aside for Type "C" services.

47. F. Stuart Chapin Jr., op. cit., p. 406.

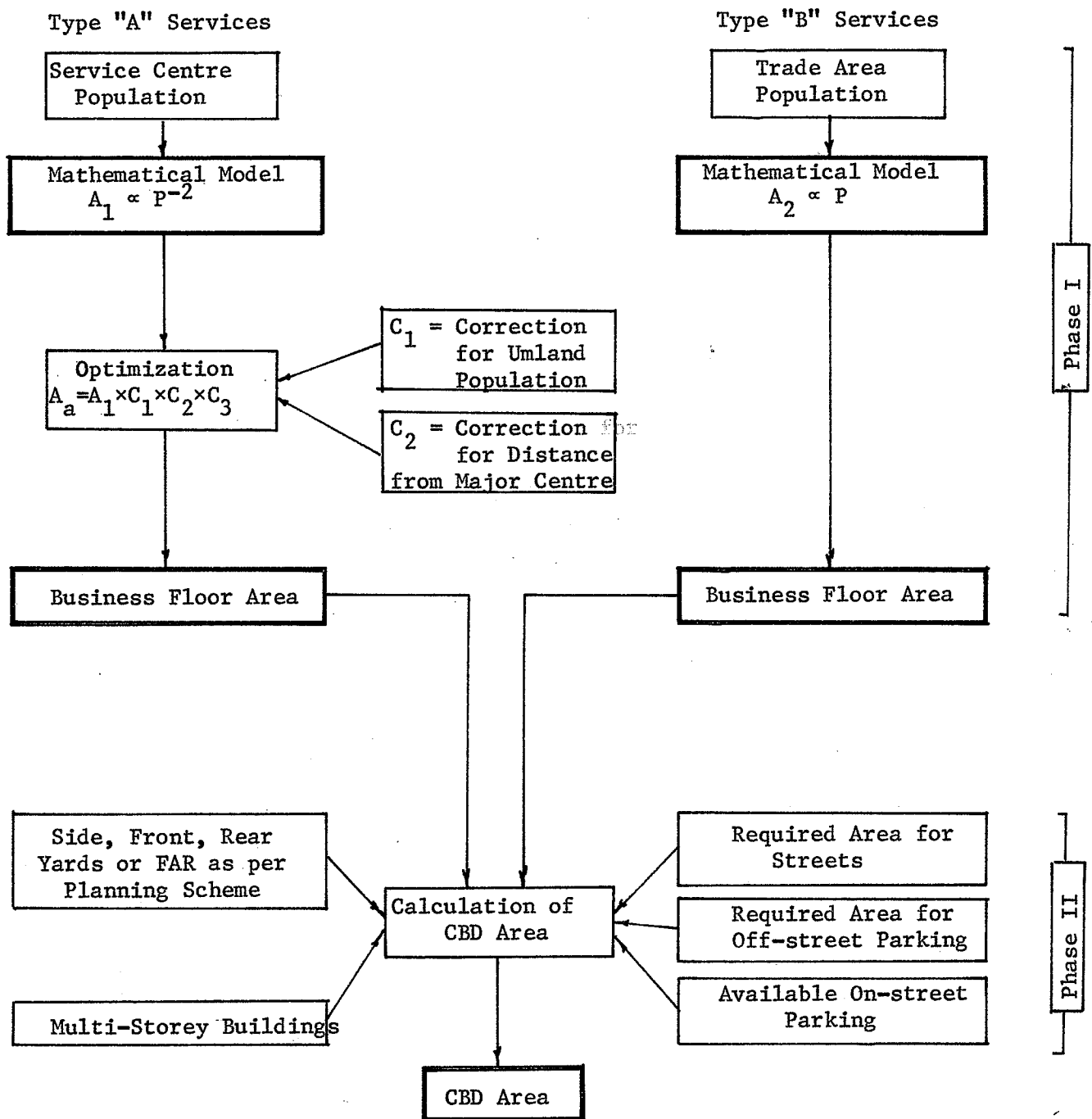


Fig. 13

Flow Diagram showing proposed method of calculating the required CBD Area.

1. Phase I

Delineation of Trade Areas

For lack of any research or information on the shift of the boundaries of the trade areas with time, it was assumed that Dauphin's local trade area and region will remain the same in 1986 as they were in 1966⁴⁸.

Population projections were taken for Dauphin, its local trade area and its region for the year 1986⁴⁹.

Projected population for Dauphin	12,000
Projected population in local trading area	7,600
Projected population in region	41,700

Business floor area calculations

Business floor areas were calculated from the above population projections as follows:

1. Type "A" Services

The business floor area for Type "A" services was obtained by solving the formula derived for the standard mathematical model

(Formula IA, p. 33):

-
48. The Dauphin area has been fairly stable over the past 15 - 20 years due to the diversity of Dauphin's economic base and the stability of the respective hierarchy of service centres in the Dauphin region.
 49. A projection by the cohort survival method has been prepared for the Town of Dauphin by the Municipal Planning Branch of the Department of Urban Development and Municipal Affairs of the Province of Manitoba. Projected trends for urban and rural population were used in estimating the trade area population for 1986.
 50. Rather than solving the formulae, the solutions could be obtained directly from graphs.

$$A_1 = [(110 \times 12) - 33.2]^{-2} = 0.643$$

Hence $A_1 = 352,180$ sq. ft.

To adjust A_1 for the influence of the local trade area population, a ratio of service centre population to umland population was calculated:

$$R = \frac{7,600}{12,000} = 0.633$$

therefore, the correction to A_1 (Formula III, p. 37):

$$C_1 = 0.04 \times 0.633 + 0.92$$

Hence $C_1 = 0.95$

Since Dauphin is itself a major centre, no correction for distance from a major centre was calculated. The business floor area for Type "A" services was derived as follows:

$$A_a = A_1 \times C_1$$

substituting

$$A_a = 352,180 \times 0.95$$

$$A_a = 334,600 \text{ sq. ft.}$$

2. Type "B" Services

Calculation of the business floor area for Type "B" services was performed as follows (Formula IVA, p. 64):

$$A_b = 0.8 \times 41.7 + 0.32$$

Hence $A_b = 336,800$ sq. ft.

It was shown in Chapter IV of this thesis that no optimization was required for the calculation of Type "B" business floor area.

From the above areas, the total business floor area was calculated as follows:

$$A_t = A_a + A_b$$

where A_t = total business floor area

hence $A_t = 671,400$ sq. ft.

2. Phase II

Calculation of the C.B.D. Area

Phase II of the flow diagram (Fig. 13) shows the operations to be performed in order to calculate the required area for the C.B.D. of a service centre. In the calculation of the CBD, the following factors had to be taken into account:

- (a) Side, front and rear yard requirements or floor area ratios as per planning scheme.
- (b) Some floor area has to be assigned for multi-storey buildings and basements.
- (c) A portion of the gross area of the CBD should be set aside for streets.

(e) Space should be set aside for off street parking.

No comprehensive study has been carried out to establish what percentage of the land area is actually occupied by buildings in central business districts of Manitoba service centres. A study of land use maps and aerial photographs of some Manitoba towns as well as the requirements of Manitoba planning schemes suggested that 65% of the privately owned land is occupied by buildings. This percentage has been arrived at intuitively, rather than by rigorous tests, but was deemed sufficiently accurate by officials of the Municipal Planning Branch of the Provincial Government of Manitoba. Therefore the business floor area had to be increased by a factor of 1.35 in the calculation of the total CBD area.

Accurate data were also lacking with respect to the percentage of business floor area located in basements or in upper storeys. Here again a percentage had to be estimated. Land use studies seem to indicate that approximately 10% of the floor area of a typical CBD in a Manitoba service centre is located in basements or in upper storeys. Hence, the business floor area was reduced by a factor of 0.9.

Since it was not possible to estimate accurately the portion of the gross area of the CBD required for streets unless a comprehensive plan for the development of Dauphin were prepared, a "rule of thumb" had to be adopted. It is generally accepted that between 20 and 25% of a gross area is devoted to streets. In this case a factor of 1.25 was used to afford a certain safety factor.

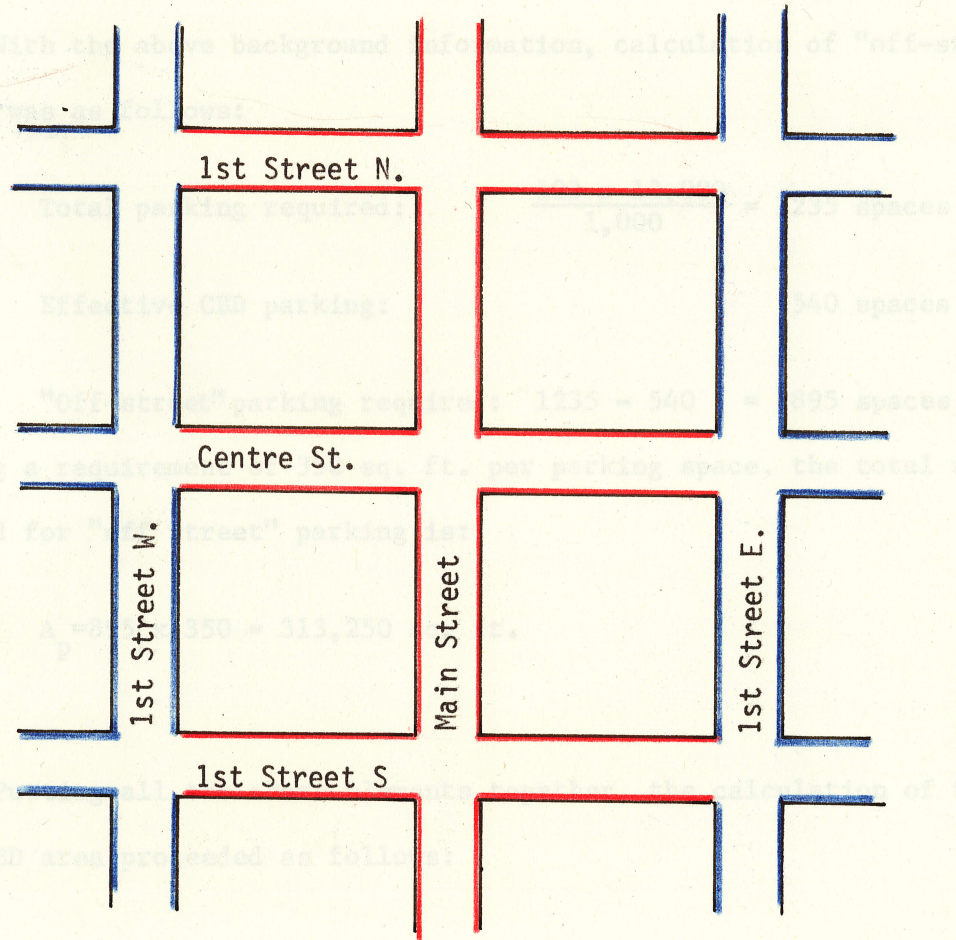
Very little research has been done on traffic and parking patterns in small service centres. Some statistics have been compiled by the

ENO Foundation for Highway Traffic Control, but these are obsolete and based on too small a sample to be called statistically reliable⁵¹. For lack of more recent and reliable data, ENO's table showing the "Relation of Parking Space Supply to Area of CBD and to Population" had to be used. According to this table, towns between 10,000 and 25,000 population require 94 parking spaces per thousand. Since the per capita car ownership figures in the United States in 1957 are approximately equivalent to those of Canada in 1966-67, the figure of 93 parking spaces per 1,000 was adopted as a basis for the prediction. From projected increases in car ownership in Manitoba⁵², it was assumed that the number of parking spaces required per 1,000 population will increase in proportion to the increase in car ownership. Thus, in 1987, there will be a requirement of 103 parking spaces per 1,000.

It would be wrong to assume that all the curb parking could be considered as CBD parking. Observation of many business districts show that people would tend to park for the most part on the main traffic artery and, possibly for three quarters to one block on adjacent streets. Anything beyond these favoured areas cannot be included in the calculation of available parking space for a CBD: at best they may be used as occasional parking when dealing with some particular business located on the side street or as overflow parking at such peak times as Christmas shopping. A diagram of a hypothetical CBD (Fig. 14) shows the areas which

51. Robert H. Burrage and Edward G. Mogren, Parking, The ENO Foundation for Highway and Traffic Control, Saugatuk, Ct., 1957, p. 33.

52. Wilbur Smith, Report on Traffic, Transit, Parking - Metropolitan Winnipeg, New Haven, Conn. 1957, p. 10.



LEGEND:

- Effective CBD Parking
- Occasional CBD Parking

Fig. 14

CBD parking patterns
in rural service centres

could be considered as CBD parking in a final count of available parking space. Off street parking would have to be provided for all vehicles which cannot be accommodated by these favoured "on-street" parking areas.

With the above background information, calculation of "off-street" parking was as follows:

$$\text{Total parking required: } \frac{103 \times 12,000}{1,000} = 1235 \text{ spaces}$$

$$\text{Effective CBD parking: } 540 \text{ spaces}$$

$$\text{"Off-street" parking required: } 1235 - 540 = 895 \text{ spaces.}$$

Assuming a requirement of 350 sq. ft. per parking space, the total area required for "off street" parking is:

$$A_p = 895 \times 350 = 313,250 \text{ sq. ft.}$$

Putting all the above elements together, the calculation of the total CBD area proceeded as follows:

$$A_{\text{CBD}} = [(A_t \times 1.35 \times 0.9) + A_p] 1.25$$

$$A_{\text{CBD}} = [(671,400 \times 1.35 \times 0.9) + 313,250] 1.25$$

$$A_{\text{CBD}} = 1,411,251 \text{ sq. ft.}$$

Or expressed in acres.

$$A_{\text{CBD}} = 32.5 \text{ ac.}$$

CONCLUSIONS

CONCLUSION

The data developed in this study are best summarized in the form of a flow diagram (Fig. 13, p. 70). The following hypotheses were found valid with respect to local convenience services designated under

Type "A":

- (a) "The business floor area of a CBD is proportional to the square root of the population of a service centre".
- (b) "The larger the service centre, the more efficient is the use of the business floor area, i.e., larger service centres require less per-capita business space than small service centres."
- (c) "The population of the umland of a service centre will affect the business floor area independently of the size of the population of the service centre".
- (d) "The major centre influences the business floor area of a service centre in direct proportion to the distance in road-miles of the service centre from the major centre".
- (e) "The size of the umland (in square miles) will not affect the business floor area of a CBD".

With respect to regional services designated as Type "B", it was found that these hypotheses may be reduced to the following:

- (f) "The business floor area devoted to regional services varies directly with the total population of the trade area".

It was further shown in the case study that mathematical expressions of these hypotheses may be used for projections of CBD requirements for service centres on the basis of a population projection. The method thus developed, although very speedy, yields results comparable to those obtained by using time-consuming conventional methods⁵³.

Although the method developed in this study was based on static data, the dynamic element was introduced by basing the projections of CBD areas on population projections. A further dynamic element was introduced by the underlying belief that economic forces at work caused the spatial needs of service centres to be reflected in the business floor areas in use when the field work for this study was carried out.

It was observed in several instances that there are many areas which lack a sound body of research. Research is needed on the dynamics of Manitoba service centres and their umlands, similar to that undertaken in Saskatchewan⁵⁴. Not much is known on the effect living standards may have upon shopping patterns and needs and what effect some technological breakthroughs may have on the CBD⁵⁵. Studies of the same

53. Louis Plotkin and Associates, Altona Urban Renewal Study, Winnipeg, Manitoba, 1966. In this study, using conventional methods, a CBD area of 11 acres was recommended. A check was made applying the method developed in this thesis. The required CBD area was 10.5 acres. Time of calculation: less than one hour.

54. Gerald Hodge, op. cit.

55. Shopping from home by closed circuit television or the broader acceptance of supermarket shopping in rural areas may be a future possibility with increased advances in communications and transportation technologies.

nature as the one presented in this thesis, if carried out periodically, could supply some data which would define the dynamic elements much more precisely than a mere belief in economic forces⁵⁶. Another area which bears investigation is the traffic and parking in service centres.

However, this lack of research plagues any conventional method of projecting CBD requirements to the same extent than the one presently developed.

It is hoped that the findings of this thesis may provide a useful tool in planning for Manitoba service centres. It might also be adapted beyond the boundaries of the Province.

56. It was noted that when the population of a service centre decreases at a constant rate, the business floor area will remain constant for some time and then decrease suddenly to a level consistent with the mathematical model developed in this study. The explanation is that store owners are "hanging on" in the hope that business will improve against odds until such time that too many stores vie for too little customers. A number of stores close their doors and the service centre regains its economic equilibrium. e.g. Lundar.

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APPENDICES

PLANNING BRANCH

COMMERCIAL STUDY FOR Lac Du Bonnet

Prepared by: *L. J. [unclear]*Date: *Feb 27*

Lot No. (Sect.)	Block (Twp.)	Plan No. (Rg.)	Description	Owner	Classification	Area (Sq. ft.)		Remarks
						Floor	Storage	
1	1	686	Laundramat	James Petrus		532		
2	1	686	Garage	Augustine Bros. Ltd.		1500		
4	1	686	Gen. Merchant	Andrew Kost		1120		
5	1	686	Contractors	Brincheski Bros.		1700		
6	1	686	Cafe	Emil & Lillian Kaprawy		1518		<i>1100 27 5/16</i>
7 & 8	1	686	Motel	Michael & Peter Kakaluk		2544		<i>1100 5 3/4</i>
7 & 8	1	686	Beauty Parlor	Mrs. Irene Kabaluk		260		
9	1	686	Hotel	Michael & Peter Kabuluk		10,698		
10	1	686	Cafe & Confec.	Kim Poon		2132		
10 & 11	1	686	Store	Van's Allied Hardware Ltd.		5494		
11	1	686	Cafe & Confec.	Arthur Mar		1344		
10 & 11	1	686	Barber	Don Sellers		116		
10 & 11	1	686	Surveyor	J.H. Smith		100		<i>YANCOU</i>
10 & 11	1	686	Store	Mat. Skoglund		1090		
12 & 13	1	686	Hardware & Lumber	Beaver Lumber		6796		<i>IND.</i>

APPENDIX 2

FUNCTIONAL CLASSIFICATION OF SERVICES FOR INTERLAKE AND DAUPHIN - SWAN RIVER AREAS.

Service Centre	Population	Service Centre No. (a)	TYPE "A" SERVICES																				TOTAL
			Appliances, Radio, TV.	Banks, Credit Union	Barber, Hairdresser	Bowling Alley, Billiards	Drugstore	Eating Places	General Store	Grocery Stores	Hardware	Hotels	Locker Plants	Lumber Yards	Machine Shops	Meat Markets (b)	Physicians (b)	Plumbing & Heating (b)	Real Estate, Insurance	Service Stations	Shoe Repair	Theatres	
Dauphin	8440	3	11	7	17	4	4	2	4	2	5	2	2	2	2	2	14	16	1	1	1	3	143
Swan River	3419	5	4	2	5	2	2	1	3	1	3	1	1	1	1	1	3	13	1	1	1	1	66
Gimli	2205	11	3	2	3	2	2	1	2	1	2	1	1	1	1	1	1	5	1	1	2	1	31
Roblin	1582	18	2	2	6	1	2	1	2	1	1	1	1	1	1	1	3	9	2	2	1	1	43
Stonewall	1552	19	1	2	5	1	1	1	3	1	3	2	1	1	1	1	1	6	1	1	1	1	41
Russell	1495	20	5	2	4	2	2	1	3	1	2	1	1	1	1	1	3	6	2	2	1	1	42
Grandview	991	25	1	2	4	1	1	1	1	1	1	1	1	1	1	1	2	7	1	1	1	1	40
Gilbert Plains	920	27	2	2	2	2	1	1	2	1	2	1	1	1	1	1	3	5	1	1	1	1	32
Arborg	886	30	2	2	2	2	1	1	3	1	1	1	1	1	1	1	2	5	1	1	1	1	31
Winnipegosis	883	31	1	1	3	1	1	1	2	1	1	1	1	1	1	1	1	4	1	1	1	1	33
Birch River	859	35	1	1	1	1	1	1	3	1	1	1	1	1	1	1	1	7	1	1	1	1	37
Teulon	810	41	2	1	2	1	1	1	3	1	1	1	1	1	1	1	1	7	1	1	1	1	43
Ste. Rose du Lac	782	42	4	2	3	1	1	1	3	1	2	1	1	1	1	1	1	6	1	1	1	1	36
Camperville	690	46	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	37
Mintonas	616	52	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	3	42
Bowsman	552	56	1	1	1	1	2	3	2	1	3	1	1	1	1	1	1	4	1	1	1	1	41
McCreary	551	51	1	1	2	1	1	1	3	1	1	1	1	2	1	1	1	6	1	1	1	1	37
Ethelbert	502	61	1	2	2	2	1	1	3	1	2	2	1	1	1	1	2	4	1	1	1	1	37
Benito	485	65	1	1	1	1	1	1	2	1	2	2	1	1	1	1	2	7	1	1	1	1	38
Maekiag	400	72	2	1	3	1	1	1	3	1	1	1	1	1	1	1	1	2	1	1	1	1	40
Fisher Branch	365	78	1	1	3	1	1	1	3	2	1	1	1	1	1	1	1	9	1	1	1	1	50
Ashern	350	81	1	1	4	1	1	2	2	1	1	1	1	1	1	1	1	6	1	1	1	1	30
Laurdar	297	89	1	1	1	1	1	1	2	1	2	1	1	1	1	1	1	3	1	1	1	1	19
Eriksdale	260	93	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	4	1	1	1	1	17
Rorketon	250	95	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	16

APPENDIX 3

Type "A" Services

Appliances, Radio, TV.	Lumber Yards.
Banks, Credit Union.	Machine Shops.
Barber, Hairdresser.	Meat Markets.
Bowling Alley, Billiards.	Physicians.
Drugstore.	Plumbing and Heating.
Eating Places.	Real Estate, Insurance.
General Store.	Service Stations.
Grocery Stores.	Shoe Repair.
Hardware.	Theatres.
Hotels.	Woodworking.
Locker Plants.	

Type "B" Services

Accountants.	Liquor Stores.
Apparel.	Mail Order.
Bakeries.	Medical Clinic.
Chiropractors.	Optometrists.
Creameries.	Painter, Decorator.
Dentists.	Photographer.
Dry Cleaning.	Printer.
Egg Grading.	Second Hand Store.
Florists.	Specialized Automotive.
Funeral Parlours.	Supermarkets.
Furniture.	Tailors.
Hatcheries, Poultry.	Taxi.
Jewellers.	Upholsterers.
Laundromats.	Veterinarians.
Lawyers.	

Type "C" Services

Auto Wreckers.

Dental Technicians.

Department Stores.

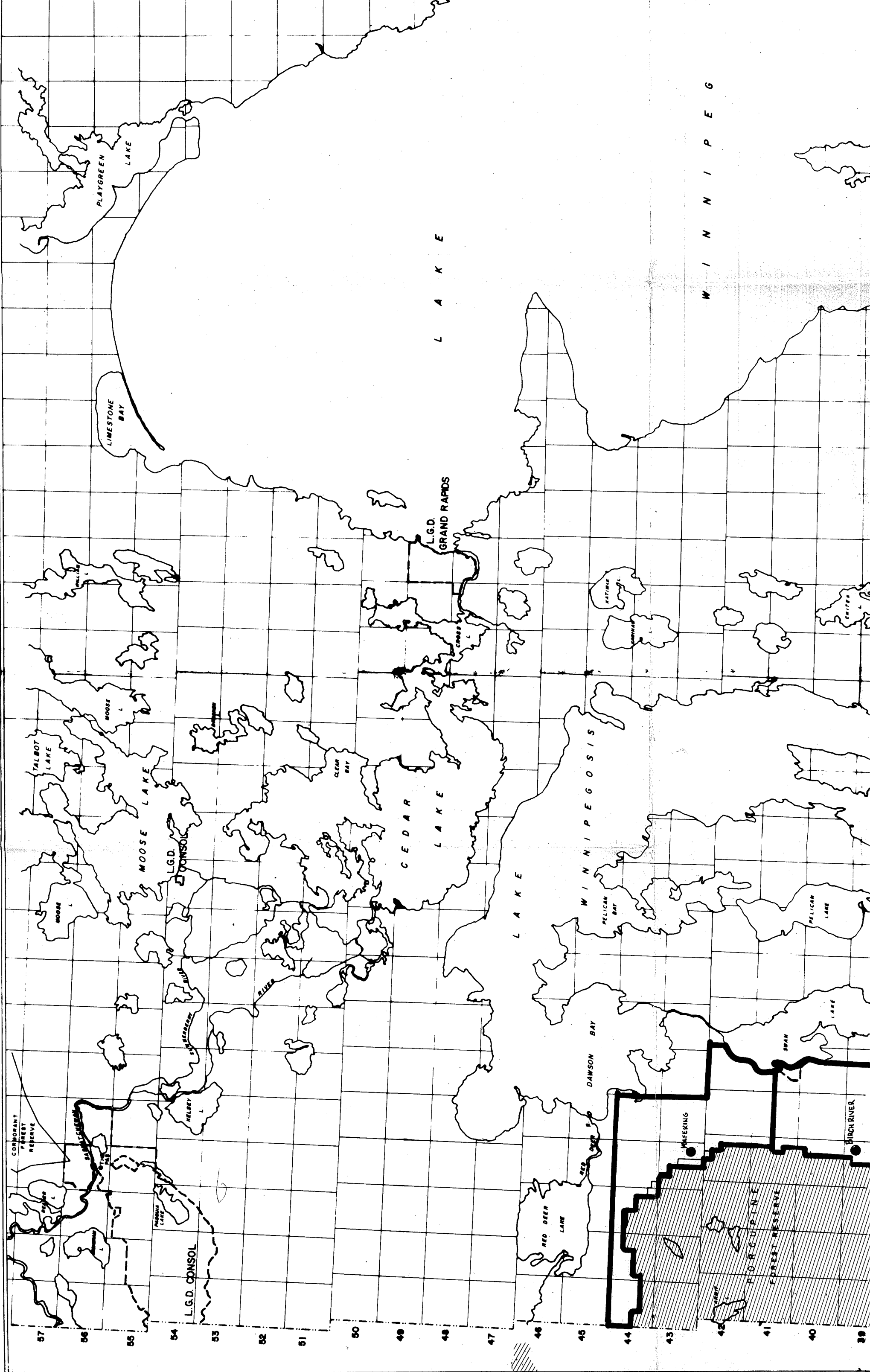
Land Surveyors.

Moving and Storage.

Scrap Iron Dealers.

Specialty Shops.

Travel Agencies.



W I N N I P E G O S I S

L A K E

L.G.D. GRAND RAPIDS

CEDAR LAKE

L A K E

W I N N I P E G O S I S

L.G.D. CONSOL

WAKEFIELD

PORCUPINE FOREST RESERVE

BIRCH RIVER

57

56

55

54

53

52

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Flus
B. Potoff

PROVINCE OF MANITOBA



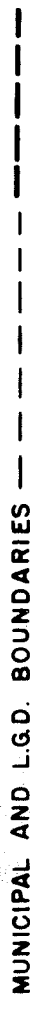


SOUTHERN PART

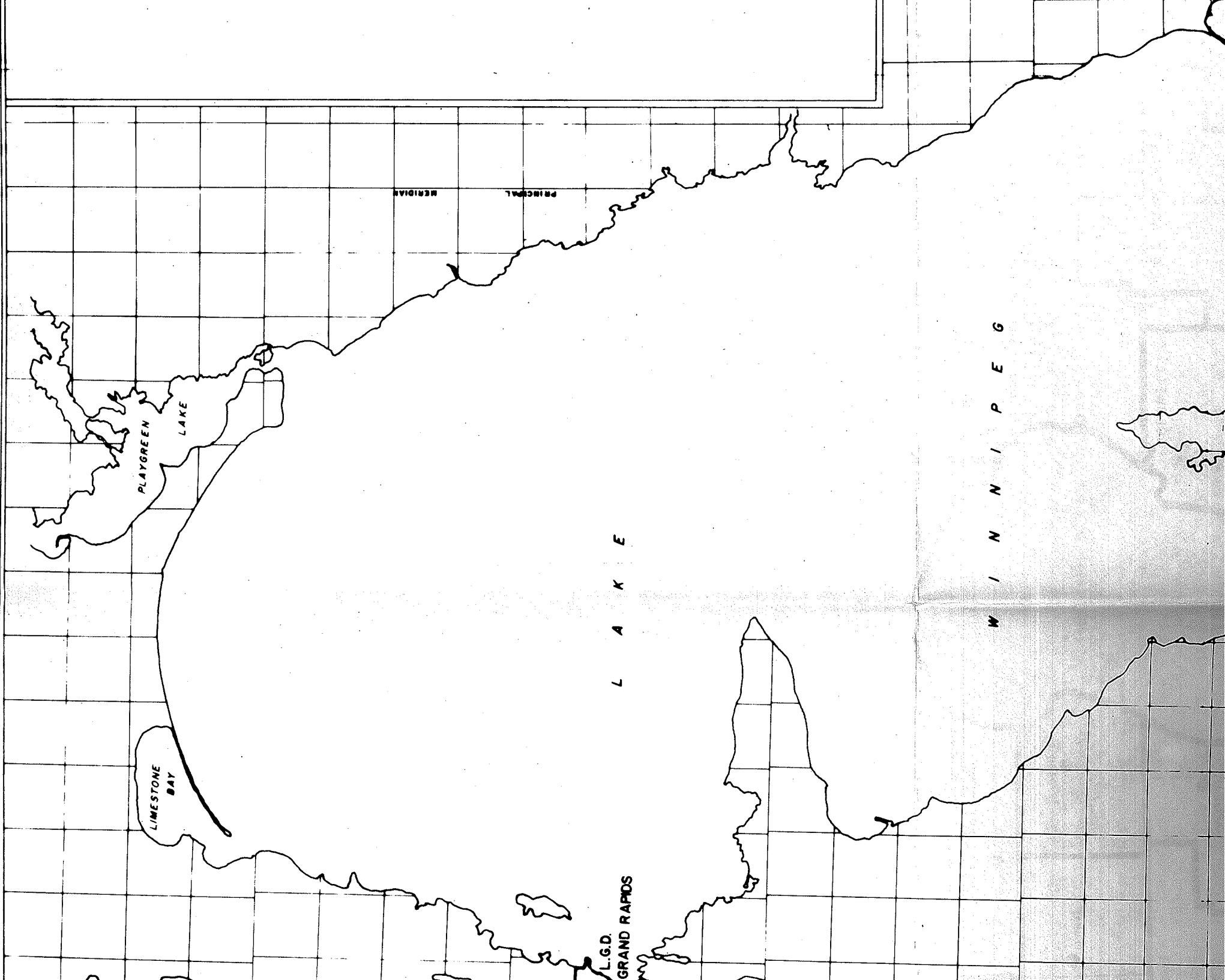
MAP N^o 1

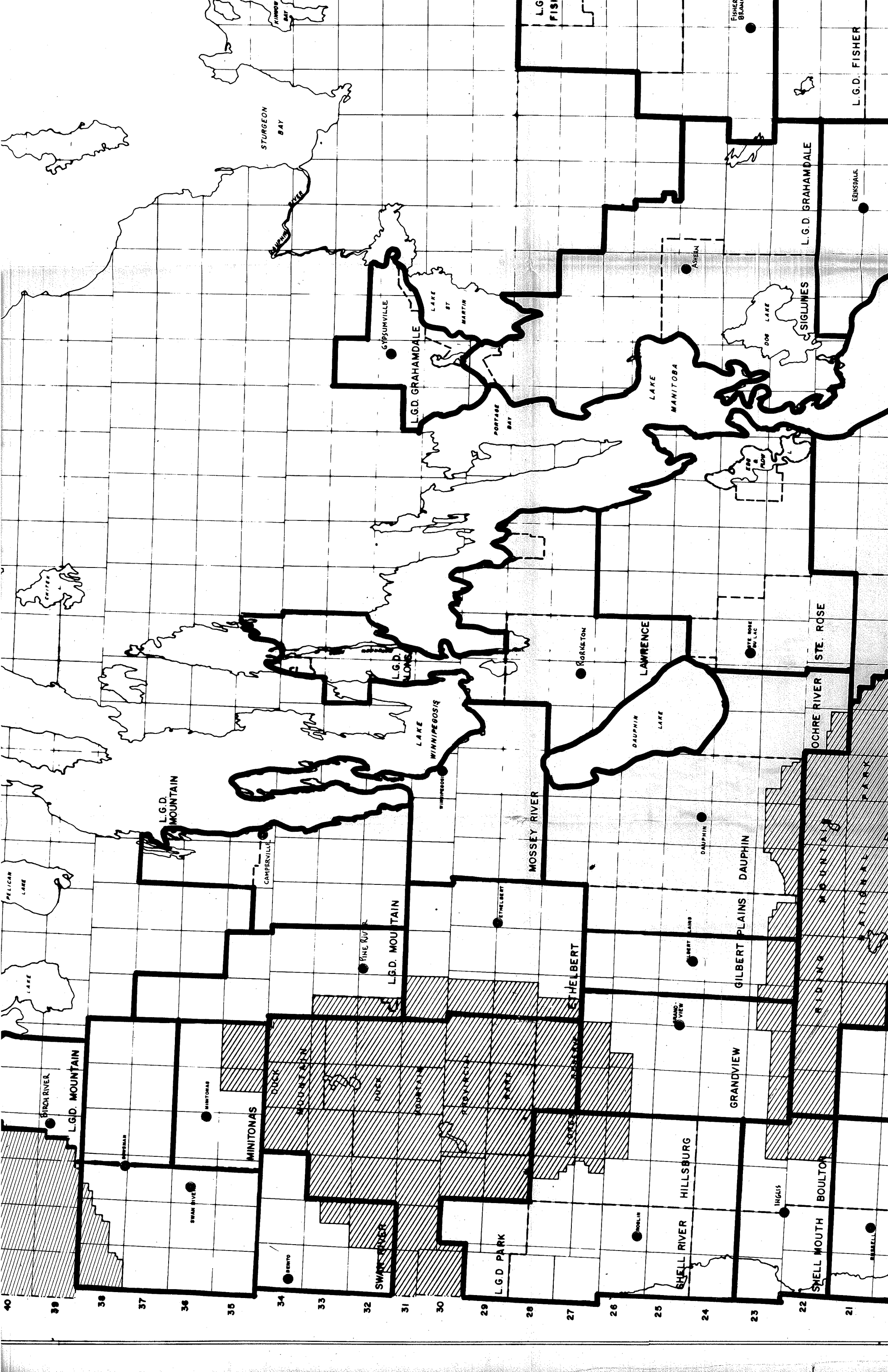
LOCAL TRADE AREAS AND LOCAL SERVICE CENTRES

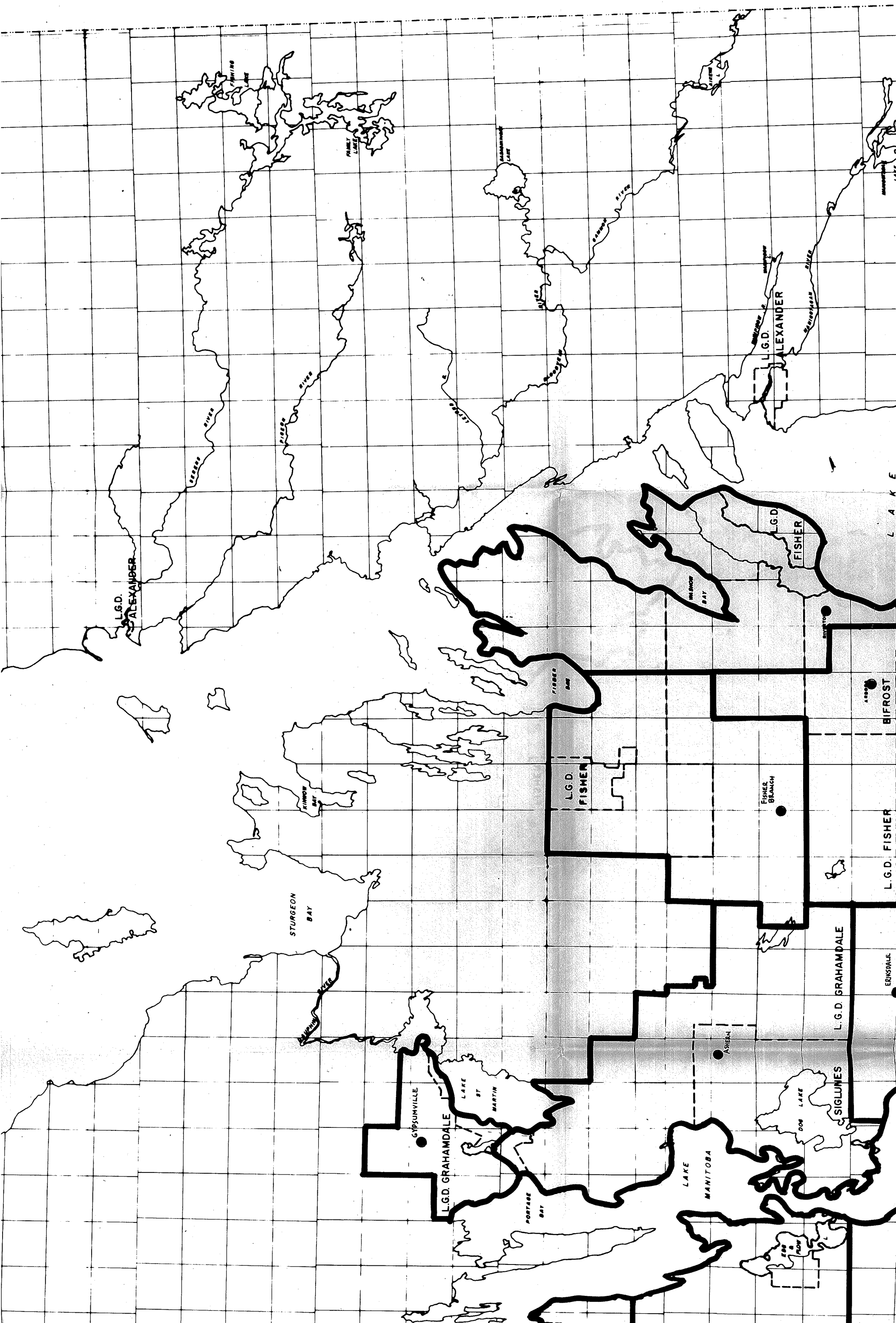
TYPE A SERVICES

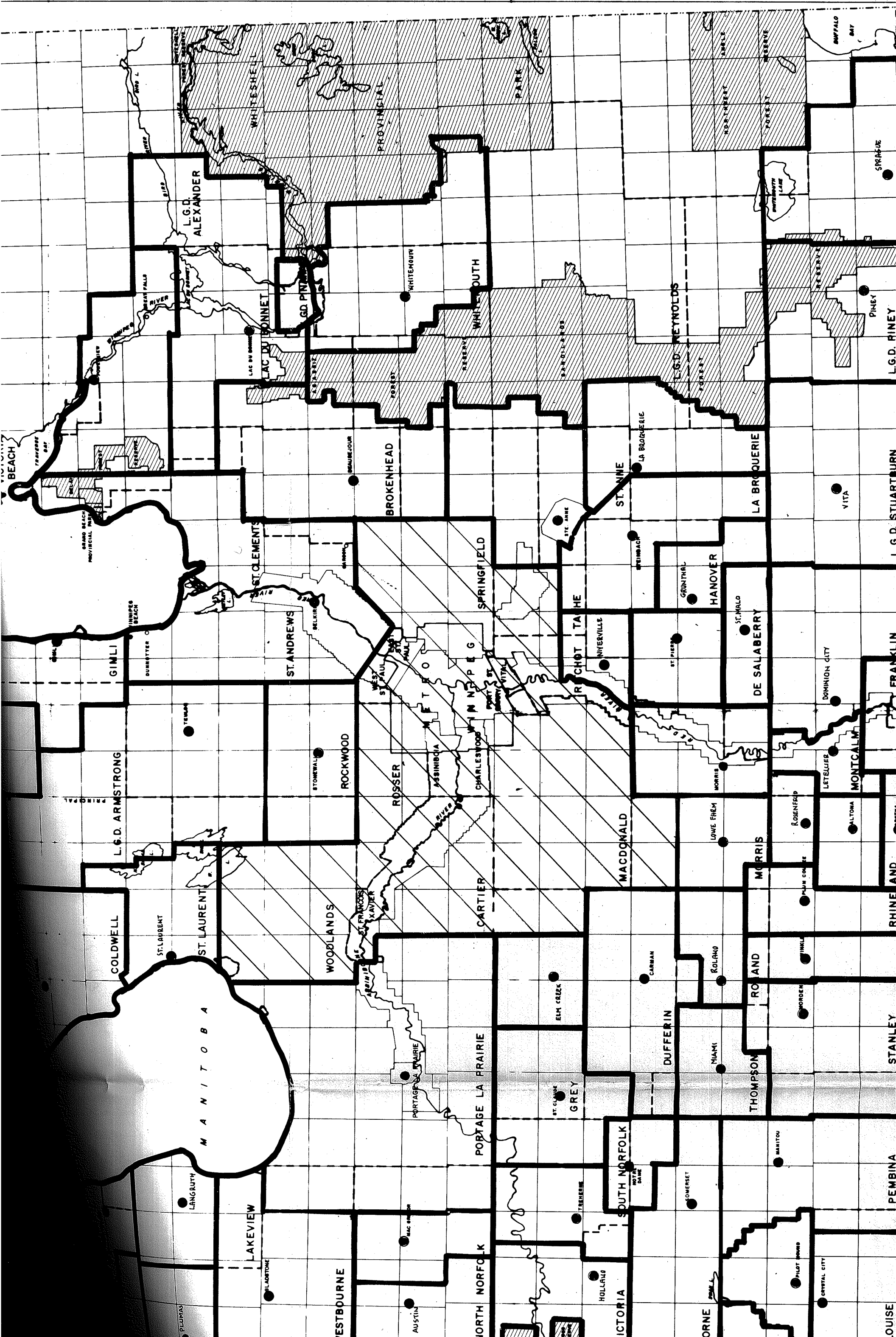
LEGEND

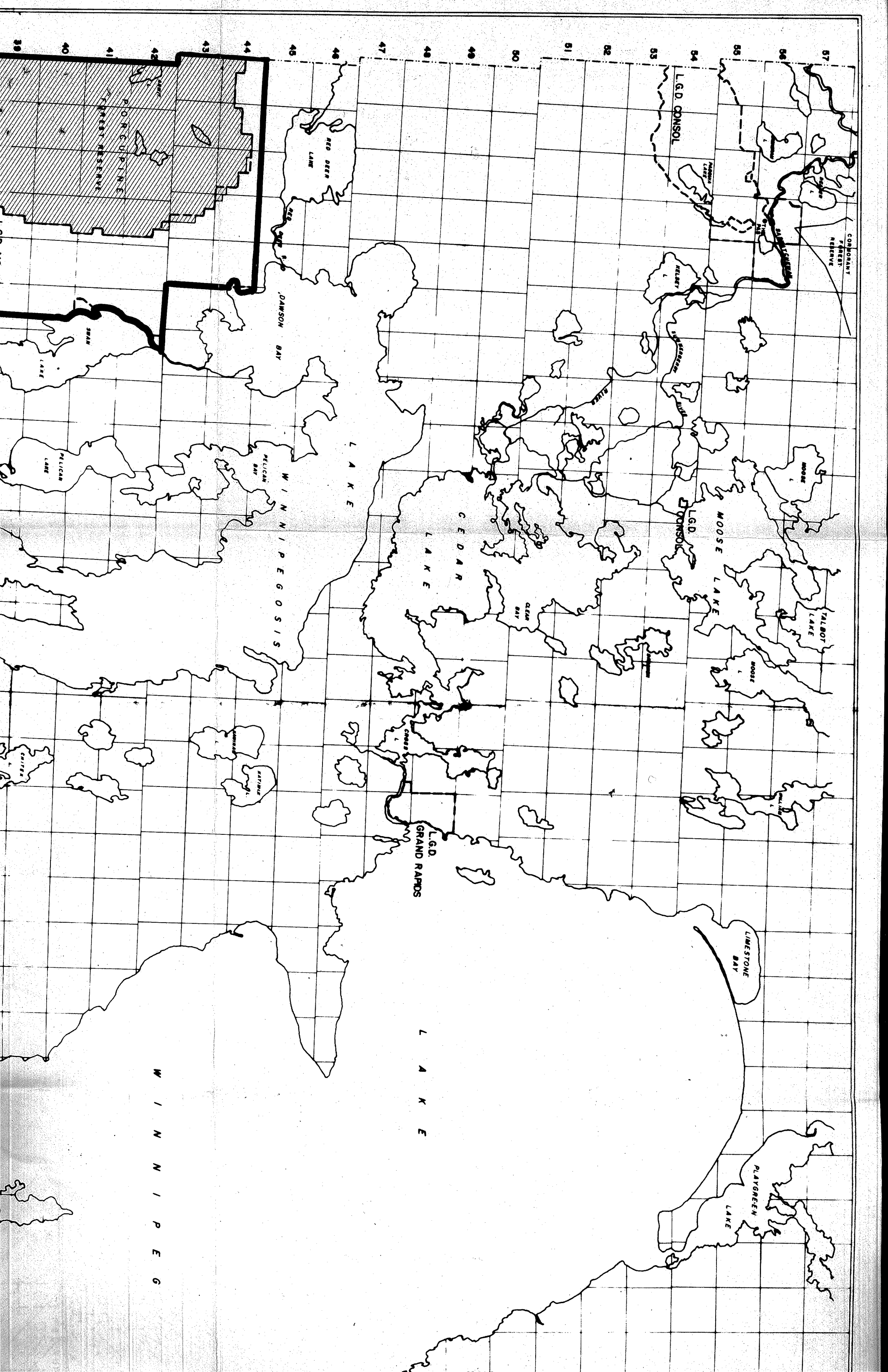
- SERVICE CENTRES  SEE PAGE
- UMLAND BOUNDARIES 
- MUNICIPAL AND L.G.D. BOUNDARIES 
- FOREST RESERVES, PROVINCIAL AND FEDERAL PARKS 
- AREAS NOT INCLUDED IN STUDY 

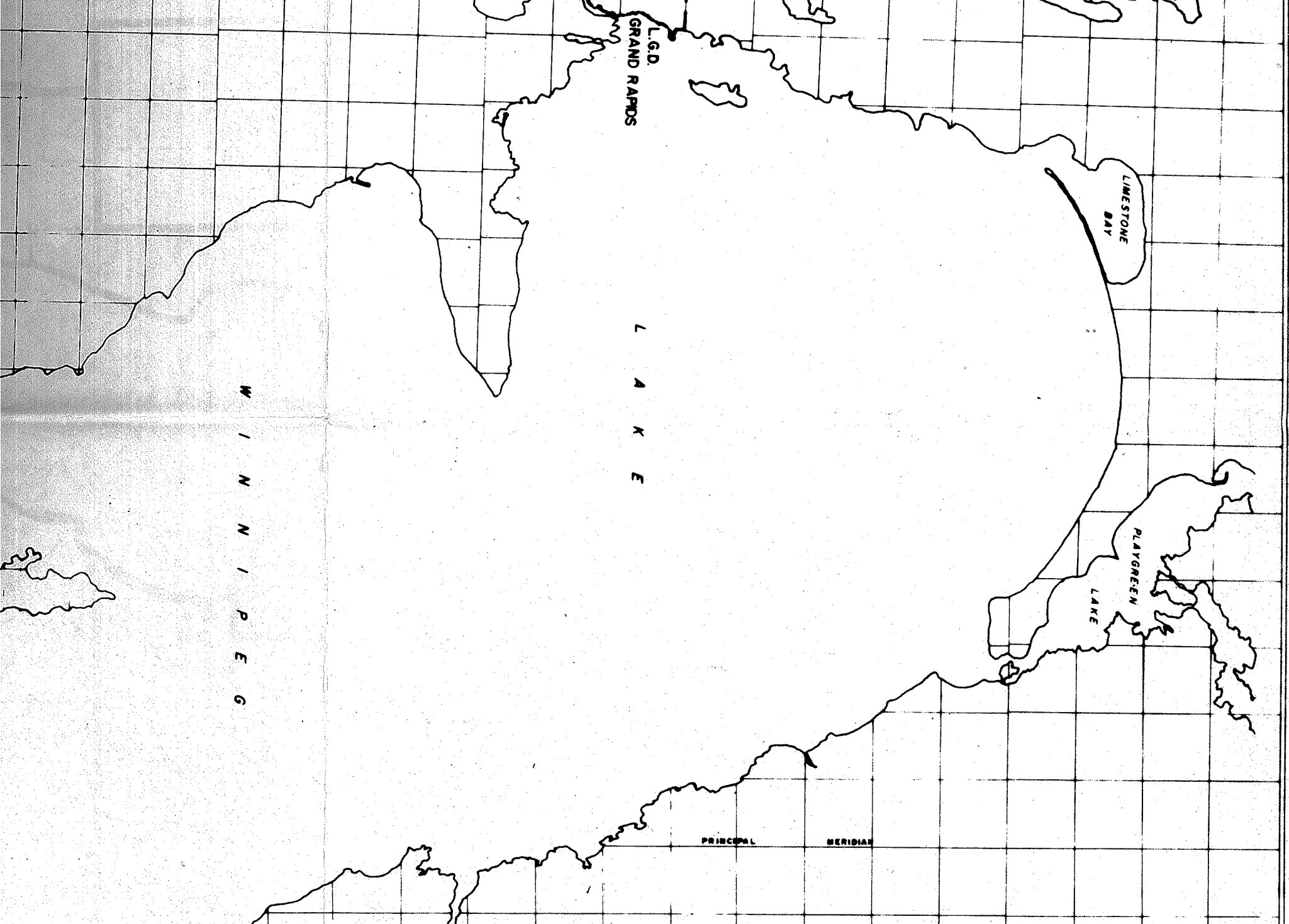












PROVINCE OF MANITOBA

SOUTHERN PART

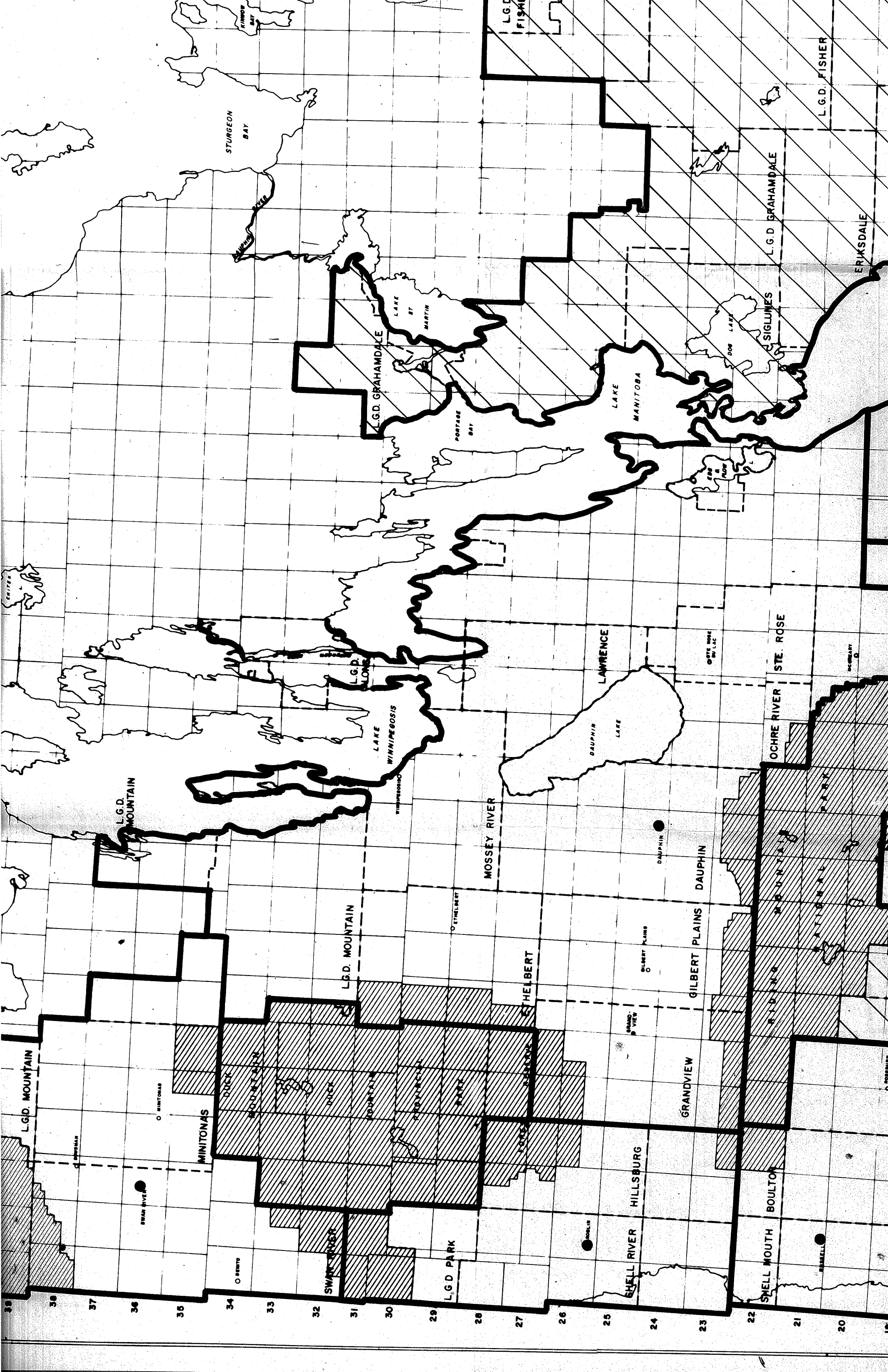
MAP N^o2

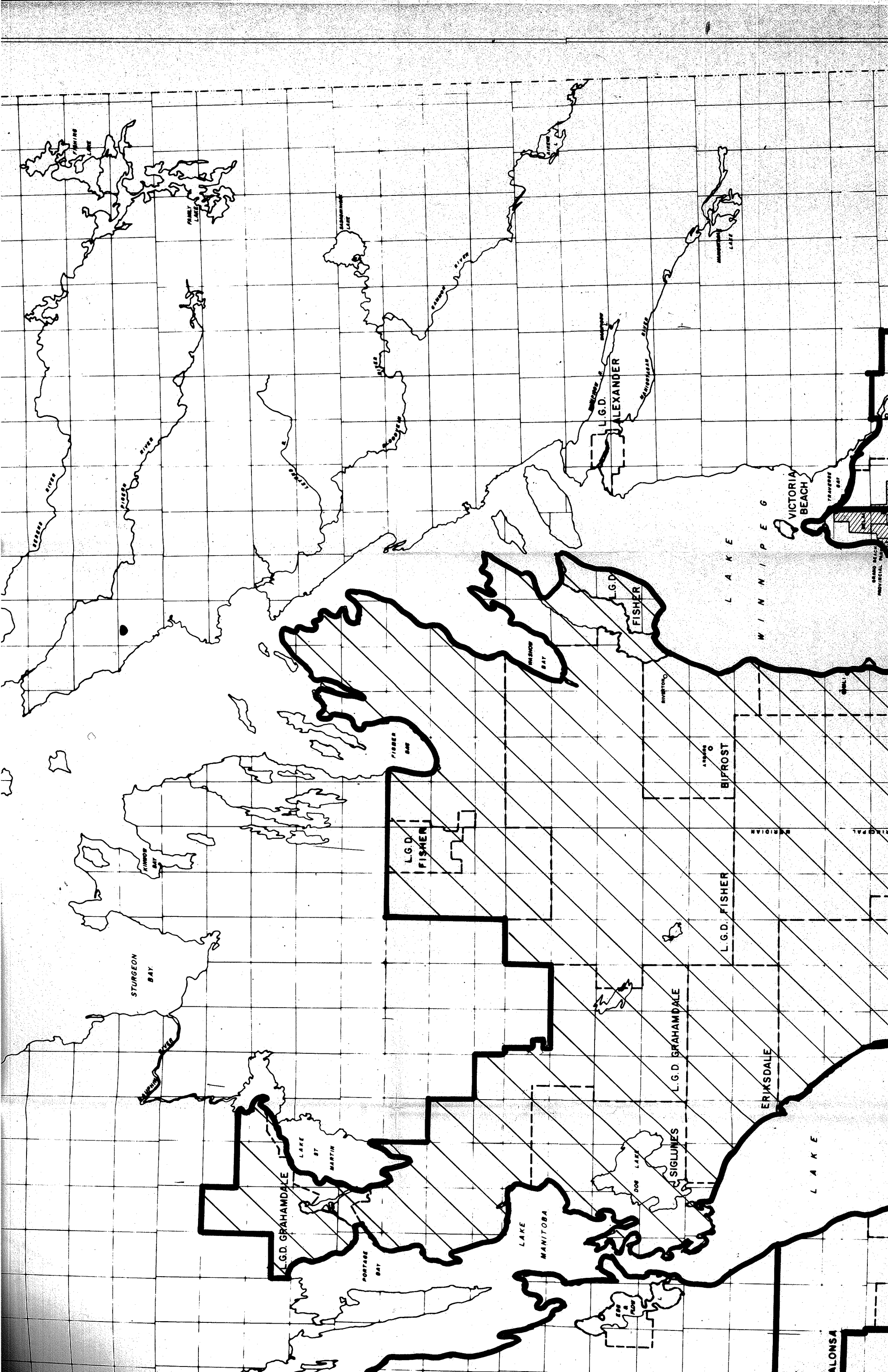
REGIONS AND REGIONAL SERVICE CENTRES

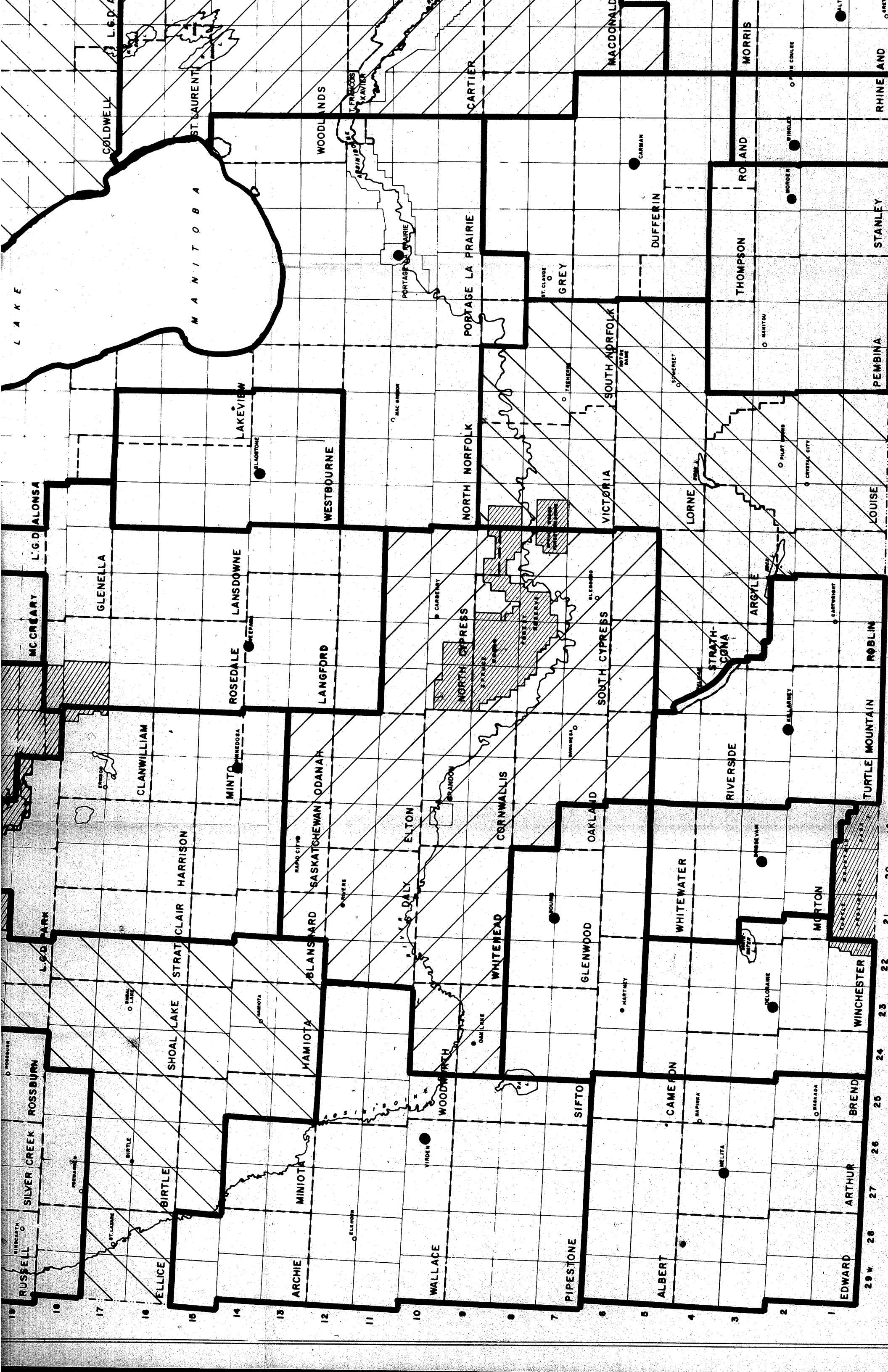
TYPE B SERVICES

— LEGEND —

- SERVICE CENTRES ———— ● ROBIN
- UMLAND BOUNDARIES ————
- MUNICIPAL AND L.G.D. BOUNDARIES ————
- FOREST RESERVES, PROVINCIAL AND FEDERAL PARKS — [diagonal hatching]
- REGIONS NOT INCLUDED IN STUDY ———— [diagonal hatching]
- INDETERMINATE AREAS ———— [diagonal hatching]







29 W 26 27 26 25 24 23 22 21 20

RUSSELL SILVER CREEK ROSSBURN SHOAL LAKE STRATCLAIR HARRISON MINTO MINNEDOSA ROSDALE LANSDOWNE WESTBOURNE LANGFORD NORTH CYPRESS SOUTH CYPRESS VICTORIA NORTH NORFOLK SOUTH NORFOLK

19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

VELLICE BIRTLE MINIOTA MAMOTA MAMOTA WOODMOUTH WALLACE PIPESTONE ALBERT CAMERON SIFTO GLENWOOD WHITEHEAD CORNWALLIS ELTON BRANDON NORTH CYPRESS SOUTH CYPRESS VICTORIA LORNE ARGYLE RIVERSIDE ROBIN

ST. LAURENT GOLDWELL WOODLANDS PORTAGE LA PRAIRIE PORTAGE LA PRAIRIE ST. CLAUDE GREY DUFFERIN THOMPSON RO AND MORRIS

MACDONALD CARMAN WINKLE MORDEN

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