

**DEPARTMENT  
OF GEOGRAPHY  
DISCUSSION  
PAPER SERIES**

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**GEOGRAPHY**  
*A COMPARATIVE ANALYSIS OF  
CHANGE IN RESIDENTIAL ACREAGE  
FOR GREATER VANCOUVER  
1961 - 1976*  
*J. T. Pierce*



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A Comparative Analysis of Change  
in Residential Acreage for Greater Vancouver,  
1961 - 1976

by

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Appendix 1

## A) Introduction

Urban growth, measured in economic and demographic terms, is a well documented feature of Canadian society. The increasing concentration of population and the continued prosperity of large scale urban centres are perhaps the most familiar and documented forms of this growth. There are of course many other expressions and measurements of urban growth but it was not until more widespread concern developed over the cost of urban expansion, including the loss of agricultural land, that academic attention focussed on one of these, the spatial dimension (and consequences) of urban growth. The expansion in the productive capacity of cities and the concomitant increase and/or redistribution in population all have their spatial expressions. Despite the recent interest devoted to this problem, particularly by Bourne (1973, 1974, 1976), many questions, both general to metropolitan centres and specific to Vancouver, remain unanswered. How much land is being consumed by various activities within Vancouver? In what way do the quantity and intensity of land consumed for new development vary between areas or districts of Greater Vancouver? What role do economic, demographic and institutional forces play in affecting rates of land conversion? To what degree does the spatial pattern of growth in Vancouver conform to that occurring in other metropolitan centres?

Within the context of these questions this paper focuses upon one aspect of the land conversion process, change in residential acreage, and upon one urban region, Greater Vancouver. More precisely the objective is to systematically analyse the variation in the rates of residential land conversion between thirteen districts and municipalities

within the Greater Vancouver Regional District (GVRD) over a fifteen year period, 1961-1976. This analysis is concerned as much with the underlying forces and conditions for change in residential acreage as it is with documenting the nature of these changes.

Urban land conversion represents the end product of a complex decision making process. As Gibson (1976, p. 41) has observed, "it's the action of individuals in pursuit of three principle values: monetary profit; competitive position; and economic growth." If these are the motivations of the developer-promoter, equally complex concerns characterize the planner and householder. Together these individuals or groups act within a constantly changing frame of reference, in which the interplay of institutional, economic, social and geographic factors shape the environment of choice. Certainly the role of institutional forces is becoming increasingly significant as municipal, regional, provincial and federal efforts regulate directly or indirectly the quantity and intensity of land consumed for residential purposes. These efforts are often in response to real or perceived failures of the market mechanism in allocating housing and land in a socially and environmentally just manner.

This wide gamut of forces precludes the possibility of presenting a complete explanation of the variation in the rates of residential land consumption, much less a production function of the process. Notwithstanding this and the aggregate nature of the analysis, the study serves as a useful synopsis of the behavior of the residential sector and associated parameters of change during one of the most formative and expansionary periods in Greater Vancouver's history.

## B) Data Sources and Measurement Techniques

Change in residential acreage has two basic dimensions - horizontal and vertical. The former refers to the quantity of land consumed for residential purposes and the latter to the intensity (or density) of this conversion. Using raw land use data supplied by the GVRD<sup>1</sup> for 1961, 1966, 1971 and 1976<sup>2</sup> change in aggregate residential acreage was measured as the net difference for three successive time periods. The same net change calculations were repeated for disaggregated residential acreage according to three categories: single family, duplex and apartment.<sup>3</sup> Changes in population and number of dwelling units were also measured in terms of the net difference over each given quinquennial

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<sup>1</sup> Although the GVRD did not exist prior to 1967 and did not have a land use planning section until 1969, land use data for 1961 and 1966 were made available by the GVRD which corresponded to its present jurisdictional area. Electoral Areas A, B, and C as well as Lions Bay were not examined.

<sup>2</sup> 1976 data was estimated on the basis of 1971 and 1975 data using the formula of  $A_2 = A_1 (1 + r)^n$  where

$A_1$  = the area of the unit at the time of the first inventory

$A_2$  = the area of the unit at the time of the second inventory

$r$  = rate of change per year

$n$  = number of years between inventories

This is the same method used by D.M. Gierman in Rural to Urban Land Conversion, Occasional Paper No. 16, Lands Directorate, Fisheries and Environment, Ottawa, 1977.

<sup>3</sup> 1961 residential acreage data were unavailable for the city of Vancouver. An estimate of aggregate residential acreage was made by interpolation between 1956 and 1966 figures. Given this constraint, it was not possible to provide further breakdowns, or types of acreage for that year.

time period. Population data were derived from the Canadian Census and number of dwelling units from data collected by the GVRD.

Using this data set a number of calculations were made to create variables that reflect the basic dimensions of the residential land conversion process. In general, these calculations were applied to the aggregated as well as the disaggregated residential land use data. The exact form of the calculations is summarized in Table 1.

Information was also collected relating to factors underlying the conversion process. In addition to population data alluded to above, data on average lot prices, zoning bylaws, dates of major changes in accessibility, servicing completions and costs, attitudes of municipalities towards types of growth as well as various provincial and federal housing related programs were collected from the GVRD, the Vancouver Real Estate Board, the Central Mortgage and Housing Corporation and a questionnaire sent to the thirteen district municipalities and cities comprising the greater part of the GVRD.<sup>1</sup>

Inevitably, there were weaknesses in the choice of data sources and measurement techniques. Most significantly, the use of aggregate net change data in the analysis tended to conceal some land use variations in both areal and temporal terms. This problem could have been reduced through the use of more finely grained data. However because of the time involved and the incompatibility with census data this was beyond the scope of the paper. Two further problems are worth noting. Although three land use types were used it was not possible to provide corresponding disaggregated

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<sup>1</sup> The terms district municipality and city will, unless otherwise specified, be subsumed henceforth by the term municipality.



Table 1

Measures of Land Conversion

A) Quantity of Land Consumed

- i) Absolute Rates of Change in Residential Acreage =  
acreage in time  $t_1$  - acreage in time  $t$
- ii) Relative Rates of Change in Residential Acreage =  
$$\frac{\text{acreage in time } t_1 - \text{acreage in time } t}{\text{acreage in time } t} \times 100$$

B) Intensity of Land Consumed (Per Capita Rates of Change)

- i) Change in Acreage Per 1000 Change in Population =  
$$\frac{\text{acreage in time } t_1 - \text{acreage in time } t}{\text{population in time } t_1 - \text{population in time } t} \times 1000$$
- ii) Change in Acreage Per 1000 Change in Dwelling Units =  
$$\frac{\text{acreage in time } t_1 - \text{acreage in time } t}{\text{dwelling units in time } t_1 - \text{dwelling units in time } t} \times 1000$$

C) Comparative Measures of Change

- i) Ratio of Change in Residential Acreage to Change in Population =  
$$\frac{\text{relative rates of change in residential acreage}}{\text{relative rates of change in population}}$$
- ii) Ratio of Change in Residential Acreage to Change in Developed Acreage =  
$$\frac{\text{relative rates of change in residential acreage}}{\text{relative rates of change in developed acreage}}$$

population figures. In addition, the adjustments made to the 1975 Land use data may have exaggerated the magnitude of growth or decline in residential acreage for a particular municipality and time period.

C) Cross Sectional and Longitudinal Analysis

The following sections analyse the variation in the rates of residential land conversion in terms of areas or districts of the city (cross sectional) and in terms of time (longitudinal). By combining different scales relating to time and space as well as types of residential development it is possible to present three analytical perspectives.

1) Rates of Change in Aggregate Residential Acreage for the Entire GVRD

The most obvious manifestation of the land conversion process is the quantity of land consumed. During the fifteen years between 1961 and 1976 Greater Vancouver consumed over 13,000 acres for residential purposes (Table 2). This area is roughly equivalent to the size of the total developed area of St. John's, Newfoundland or Saskatoon, Saskatchewan and represents a relative rate of growth of 39 per cent at an average intensity of 46 acres per 1000 population increase. Perhaps most significant, these very aggregate figures reveal that residential acreage expanded at a faster rate than population.

While these figures provide a general impression of the quantity and intensity of land consumed for residential purposes, they tend to conceal as much as they reveal. Before proceeding with a discussion of the growth behavior of individual municipalities the variation in rates of growth over time is highlighted.

Population growth during the last half of the 1960's clearly exceeded

Table 2

Change in Aggregate Residential Acreage and Associated Measures for the Entire GVRD

Time Periods	Change in Residential Acreage						Change in Population		Change in Dwelling Units	
	Quantity of Land Consumed		Intensity of Land Consumed		Comparative Measures of Change		Absolute	Relative (%)	Absolute	Relative (%)
	Absolute	Relative (%)	$\frac{\Delta \text{ Acres}}{\Delta \text{ Population}}$	$\frac{\Delta \text{ Acres}}{\Delta \text{ Dwelling Units}}$	$\frac{\% \Delta \text{ Acres}}{\% \Delta \text{ Population}}$	$\frac{\% \Delta \text{ Res. Acres}}{\% \Delta \text{ Dev. Acres}}$				
1961-1966	3481.7	10.1	33.70	85.14	.770	N.A.	103,310	13.7	40,890	17.9
1966-1971	4633.9	12.2	34.41	69.00	.807	1.871	134617	15.1	67,229	26.6
1971-1976	5434.8	12.7	105.35	60.73	2.540	.870	51585	5.0	89,481	27.9
1961-1976	13550.4	39.3	46.80	68.57	1.067	N.A.	289512	36.8	197,600	86.7

N.A. - not available

$\Delta$  - change in

the growth rates for preceeding and succeeding periods. Despite the lower rates of growth in population in the 1971-1976 period, residential acreage continued to expand at rates comparable to the preceeding period. This phenomenon led to a dramatic increase in the number of acres converted per 1000 population increase and hence to a lowering of overall densities. However this is only one way to measure the average intensity of land converted. The second measure, residential acres converted per 1000 increase in dwelling units, reveals a different trend - a trend more in keeping with the rapid increase in the price of land (Table 3). Despite the decline in the rates of population growth the number of dwelling units continued to expand and at a faster rate than residential acreage. Predictably, this led to a steady decline in residential acres converted per 1000 increase in dwelling units.

This finding suggests that the trend toward higher land prices has encouraged a more intensive use of the land even though population pressure or active aggregate demand for residential space declined. A variety of other factors could also have precipitated these trends, four of which are worth noting: 1) The declining availability of land for development has an adverse effect upon the competitive position of less intense or lower rent yielding forms of urban land use. For example Table 2 reveals that since 1971 other urban land uses, namely commercial, institutional and industrial, grew at a faster rate than residential use; 2) The rapid growth of the late sixties may have influenced the development decisions of the early seventies; 3) More easily documented is the fact that average number of persons per dwelling consistently declined during the study period; and 4) This trend can be related to the

Table 3

Land Values for Typical Lot Sizes

Municipality	*Average Residential Land Values (\$000)				*Percentage Increase in Residential Land Values		
	1961	1966	1971	1976	1961-66	1966-71	1971-76
Vancouver	6.38	8.7 (8.1)	14.75 (11.7)	49.3 (25.6)	36.4 (27.1)	69.5 (44.4)	234.2 (118.8)
Burnaby	5	5.6 (5.2)	12.5 (9.9)	34.5 (17.9)	12.0 (4.0)	123.32 (90.4)	176.0 (80.8)
North Vancouver	3.65	5.35 (5.0)	9.3 (7.3)	35 (18.2)	46.6 (37.2)	73.8 (46.6)	276.3 (149.3)
West Vancouver	-	8.1 (7.5)	17.5 (13.8)	49.3 (25.6)	-	116.1 (84.2)	181.7 (85.5)
Coquitlam	2.75	4.15 (3.9)	10.8 (8.5)	30.75 (16.0)	50.9 (41.8)	160.2 (117.9)	184.7 (88.2)
Richmond	2.9	4.1 (3.8)	9.35 (7.4)	30.95 (16.1)	41.4 (31.4)	128.1 (94.7)	231.0 (117.6)
Surrey		2.0 (1.9)	6.7 (5.3)	25.1 (13.1)	-	235.0 (178.9)	274.6 (147.2)
Delta	1.85	3.75 (3.5)	8.15 (6.7)	28.1 (14.6)	102.7 (89.2)	117.3 (82.9)	244.8 (128.1)

\* Source: Real Estate Board of Greater Vancouver.  
 ( ) adjusted according to consumer price index for Vancouver

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often diverse and opposing policies of municipalities.

2) Rates of Change in Aggregate Residential Acreage Among  
Municipalities of the GVRD<sup>1</sup>

The response to various growth stimuli among municipalities and districts of the GVRD was as varied as were the forces behind it. As with other Canadian metropolitan centres the scene of Vancouver's most active residential development was the suburban municipalities, that is, Surrey, Delta, Richmond, Port Coquitlam, Port Moody, West Vancouver, North Vancouver District and Coquitlam. The availability of land, its relatively low price, improvements in accessibility - particularly the expanded water crossings during the 1960's - and the willingness of municipalities to accept and even encourage low density development have contributed in no small measure to this centrifugal growth process. These and other correlates of land use change will be discussed in more detail later.

Of immediate interest was the growth in population and its relation to the land resource base. Table 4 provides a summary of the quantity and intensity of land consumed and population change by municipality for the entire study period. Using the average rates of change in residential acreage for the GVRD as a reference point it can be seen that for the entire study period the central and older municipalities of Vancouver, N. Vancouver City, New Westminster and Burnaby experienced rates of change in population and residential acreage far below the regional average. At the same time, these same four centres shared the most intensive development measured in terms of population and dwelling units.

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<sup>1</sup> Appendix I contains a reference map of the GVRD.

Table 4

Change in Residential Acreage and Population Among  
Municipalities of the GVRD  
1961-1976

Municipalities	Quantity of Land Consumed		Intensity of Land Consumed		Change in Population	
	Absolute	Relative (%)	Δ Acres/1000 Δ Population	Δ Acres/1000 Δ Population	Absolute	Relative (%)
Burnaby	720.70	15.73	22.93	32.48	31442	31.39
Coquitlam	1150.80	67.64	43.57	121.34	26411	90.91
Delta	2584.44	252.76	51.80	172.72	49895	341.82
New Westminster	154.18	13.64	32.53	15.34	4739	14.08
North Vancouver City	99.47	11.80	12.01	12.71	8278	34.99
North Vancouver District	1211.31	49.81	49.44	114.09	24500	62.87
Port Coquitlam	599.59	112.24	37.91	118.58	15815	194.98
Port Moody	284.47	108.80	41.47	126.65	6860	143.24
Richmond	1742.72	65.62	47.47	111.41	36711	84.74
Surrey	3607.58	66.90	79.01	201.05	45659	64.46
West Vancouver	1106.70	49.13	102.81	198.90	10764	42.29
White Rock	258.26	56.45	42.73	55.80	6044	93.66
Vancouver	33.00	.29	1.47	.46	22394	5.77
GVRD	13553.32	39.37	46.81	70.21	289512	36.79

For instance, although residential development within these centres represented only seven per cent of total acreage converted for housing within the GVRD during the entire study period, the increase in the number of their dwelling units represented 57 per cent of the total increase. The nature of the residential land conversion process in these municipalities is a product of a number of countervailing forces such as high demand for land resources from a variety of users, exigencies of space, good accessibility, high land prices and, paralleling these conditions, high maximum floor space ratios allowed by local zoning bylaws.

The growth performance of the outer or suburban municipalities of the GVRD is tied to a number of factors. Predominant among these may be a major supply-demand imbalance between population and land within the older municipalities of the GVRD. In all cases suburban population expanded at a faster rate and development occurred at a lower intensity than for the GVRD as a whole. Surrey, Delta, Richmond, North Vancouver District and Coquitlam displayed the greatest changes in residential acreage.

To determine the consistency of these figures through time the land use data for each municipality were analyzed according to three time intervals. A useful way of illustrating the relative growth performance of each municipality and the dynamics of intra-city growth is to use composite rank profiles.<sup>1</sup> Figure 1 ranks each municipality's share of total growth in residential acreage for each time period. While Vancouver captured the greatest share of total growth in acreage between 1961 and 1966 it was reduced to last place during the 1971-76 period.

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<sup>1</sup> This term was created specifically for the technique used in Figures 1 and 2.



Figure 1

Municipal Shares of Total Growth in  
Residential Acreage within the GVRD for Three Time Intervals

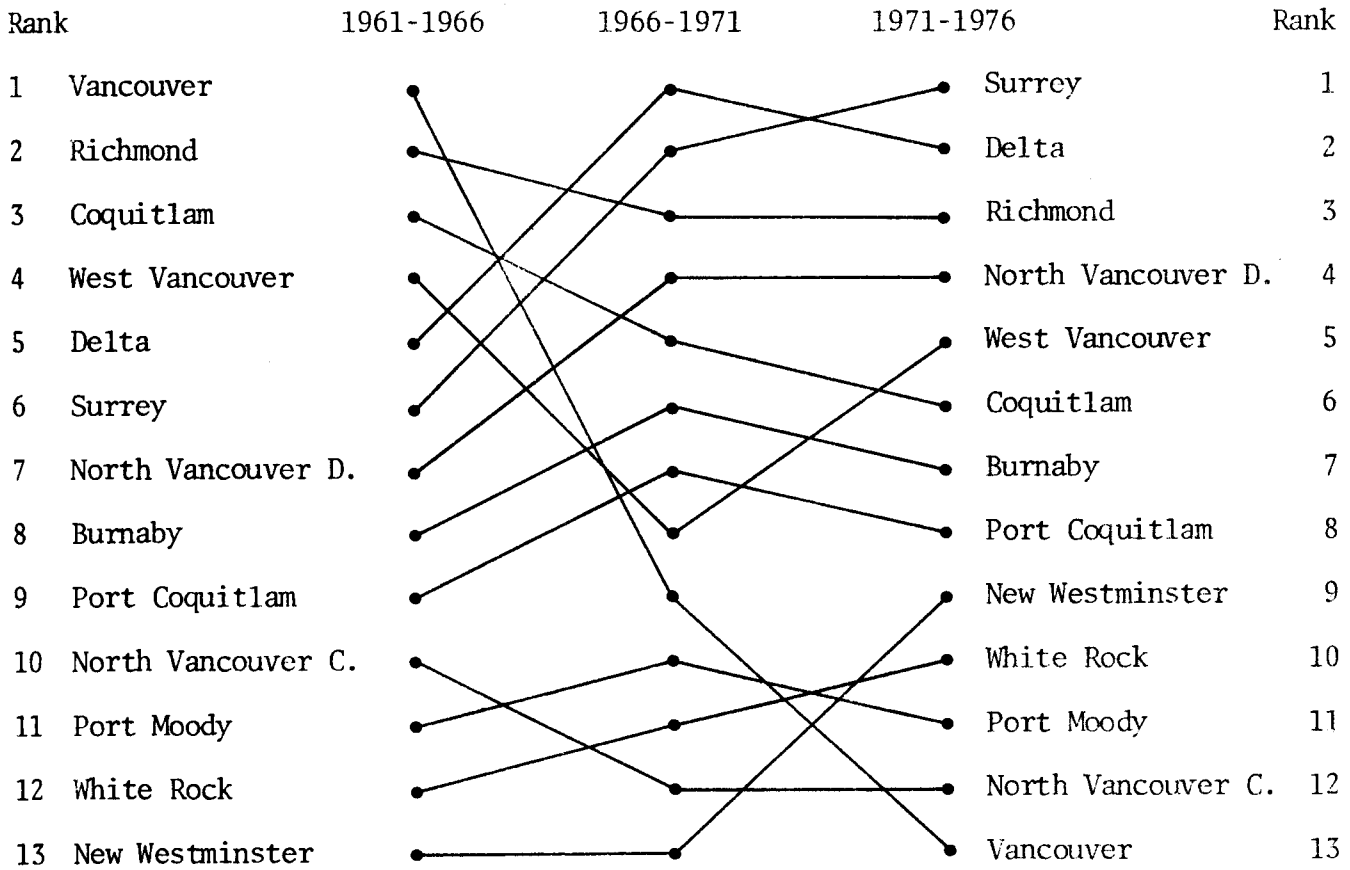
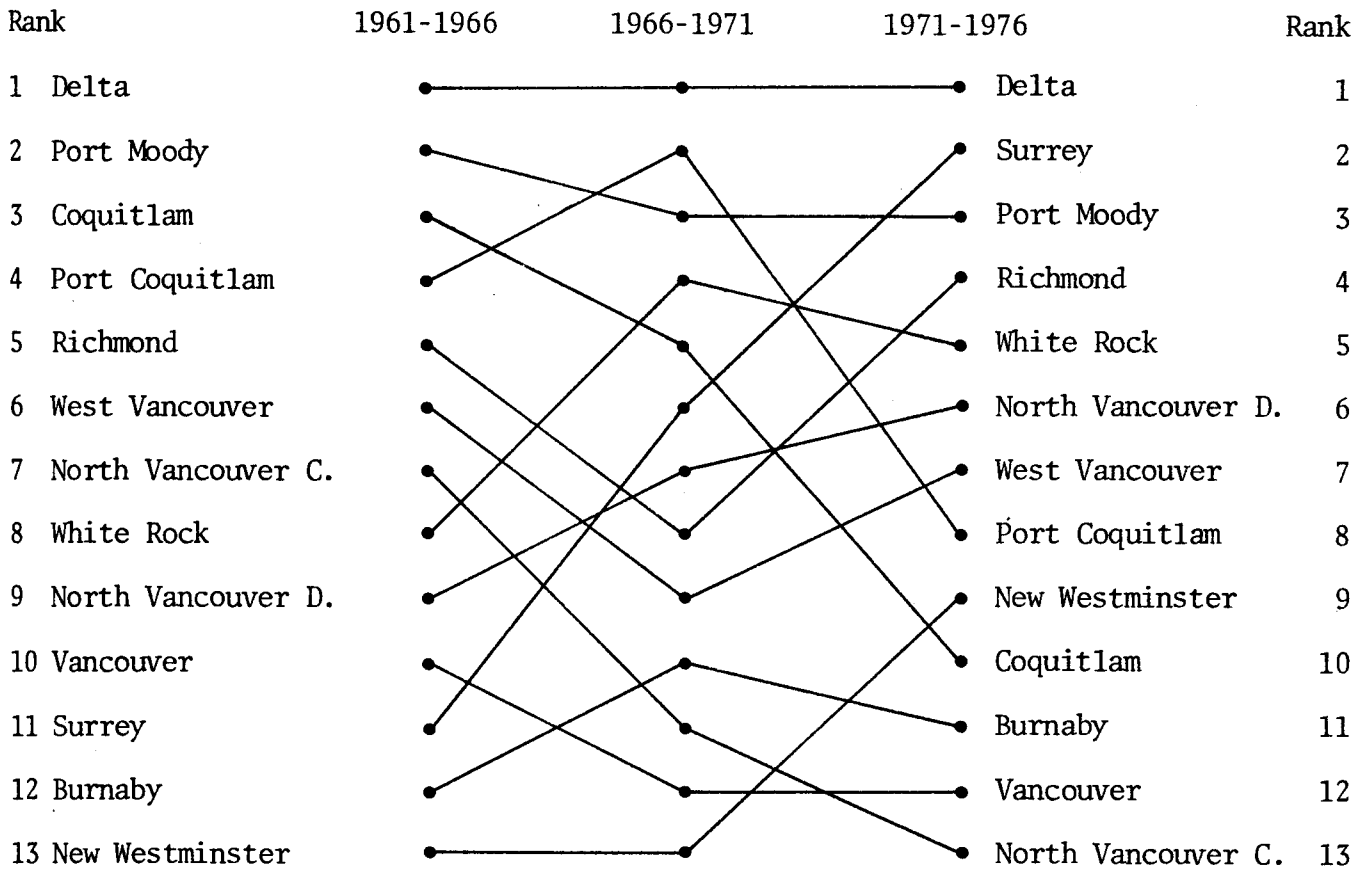


Figure 2  
Municipal Rates of Growth in  
Residential Acreage for Three Time Intervals



The dramatic change in the growth of residential acreage in Vancouver is largely a result of two factors: 1) land use competition from non-residential and more competitive activities especially in and around the central business district; and 2) the urban renewal and redevelopment programs initiated during the 1960's. With the exception of New Westminster, the smaller municipalities (North Vancouver City, Port Moody and White Rock) experienced relatively stable shares of growth. In contrast, the larger municipalities particularly those furthest away from the City of Vancouver experienced some of the greatest changes in their share of growth for each time period. Surrey and Delta's ascension from positions 6 and 5 to positions 1 and 2 respectively is generally supportive of the importance of improvements of accessibility and the availability of land in affecting the sequence of land use development. For example, the construction of the Deas Tunnel in 1962 and the Port Mann Bridge in 1963 were instrumental in improving accessibility. In addition, the extension of trunk sewers in Delta in 1964 and in Surrey in 1971 ensured sufficient low cost land for development and hence contributed further to their locational attractiveness. Richmond's stable and continued large share of expansion is due to the opening of the Oak Street and Knight Street Bridges in 1957 and 1974 respectively, to comparatively low land prices - lowest of all municipalities adjacent to the city of Vancouver - and to the availability of NHA mortgage financing for residential building.

An important ingredient in permitting the rapid and low density subdivision development in the three municipalities of Surrey, Richmond and Delta is the flat land and associated low servicing costs. Its

absence, in the case of the north shore municipalities of West Vancouver and North Vancouver District, their attractive setting, plus their close proximity to the city of Vancouver had a decisive influence in contributing to their high lot prices and hence to their lower rates of residential development. West Vancouver's share of total growth dropped dramatically during the 1966-1971 period as its average lot price exceeded all other municipalities shown in Table 3. While in West Vancouver, lot prices tempered rates of development, in Coquitlam the introduction in 1967 of more vigorous servicing requirements had a similar impact. To be sure, scale factors or the actual size of the municipalities also affected the relative position of each municipality within the rank profiles. A second set of rank profiles was calculated using rates of growth as the criterion variable (Figure 2). In general, these confirm the major upward or downward shifts revealed in Figure 1.

To extend and simplify our comparative discussion of areal growth by municipality, shift analysis was applied.<sup>1</sup> This procedure is based on the assumption that growth was evenly distributed throughout the GVRD. The expected growth rate as set by the average rate of growth for the GVRD, is calculated for each municipality. The difference if any between the municipality's expected growth rate and its actual growth rate is then classified according to three change categories. If the difference is positive, the municipality has had more than a proportionate share of growth in residential acreage (positive relative shift).

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<sup>1</sup> For a discussion of a similar application of shift analysis see Drewett, R., et.al.(1974), Isard (1960) and Perloff, et. al. (1960).

However, if the difference is negative, then growth in that municipality has been less than the regional (GVRD) average either in relative terms (relative negative shift) or in some cases in absolute terms (absolute negative shift).

Figures 3, 4 and 5 provide a chorographic description of the results of the analysis. During 1961-1966 (Figure 3) a number of municipalities experienced growth in residential acreage below the regional rate. As previously noted, in the case of Vancouver, Burnaby, and New Westminster, the relatively limited supply of land precluded extensive areal development in residential acreage. North Vancouver City was added to this category of municipalities during the 1966-71 period. On the other hand, in 1961-66 Surrey and White Rock which experienced similar negative relative shifts reflect lower demand for land because of poorer accessibility. This situation however was shortlived since the succeeding time periods showed relative positive shifts.

The shift pattern for the 1971-76 period represents a spatial extension and further outgrowth of the preceding pattern of development. Vancouver and North Vancouver City experienced absolute negative shifts whereas Coquitlam, a former high growth or positive relative shift area, expanded at a rate lower than the regional average. The outlying municipalities such as Surrey, White Rock, Richmond and Delta continued to display a higher than average rate of growth in residential acreage largely because of their form of development.

The intensity of residential development is equally varied. Table 2 revealed the disparity between the two intensity of development measures. It was observed that even though the rate of population

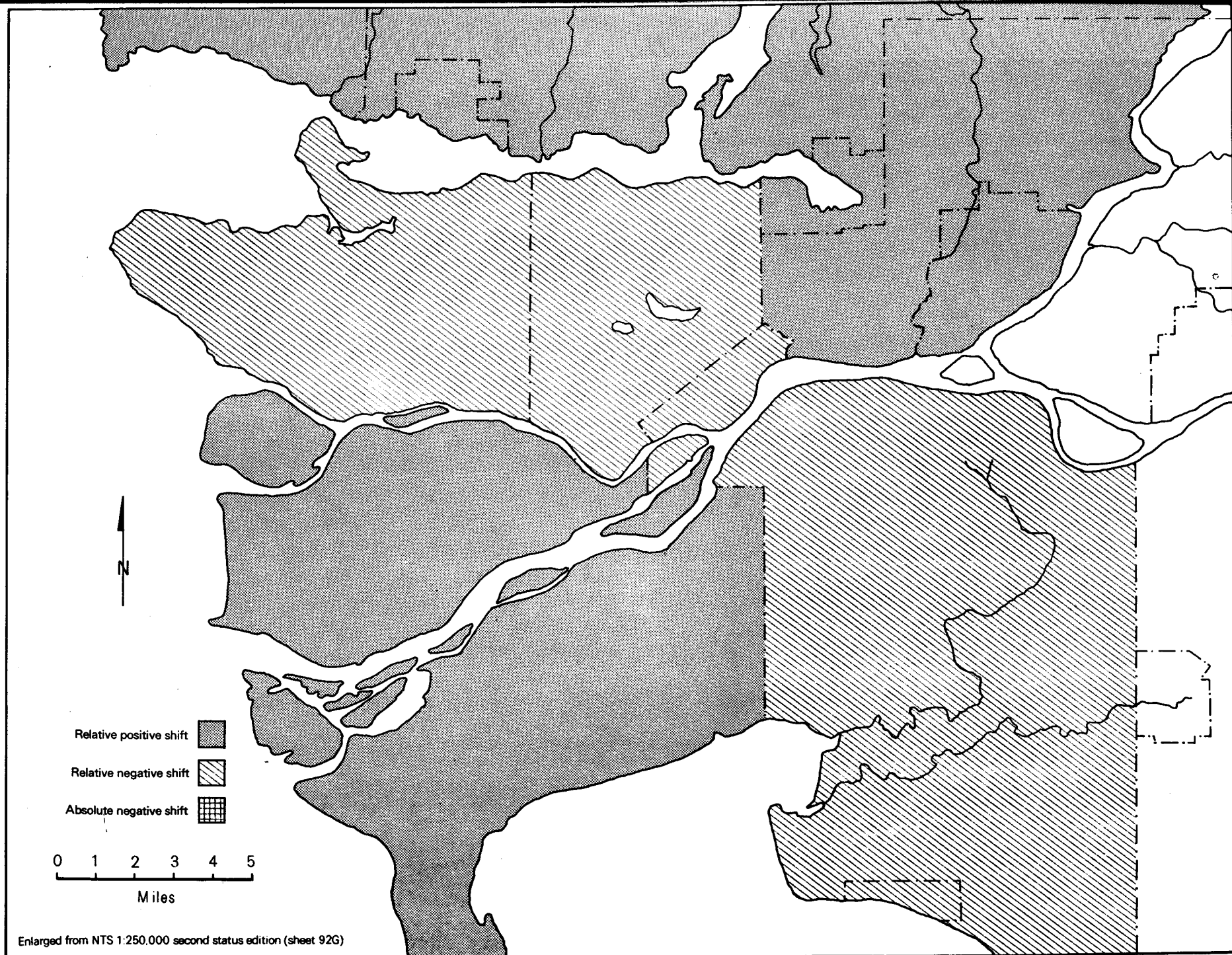


Figure 3: Net Shift in Rates of Change in Residential Acreage, 1961-1966

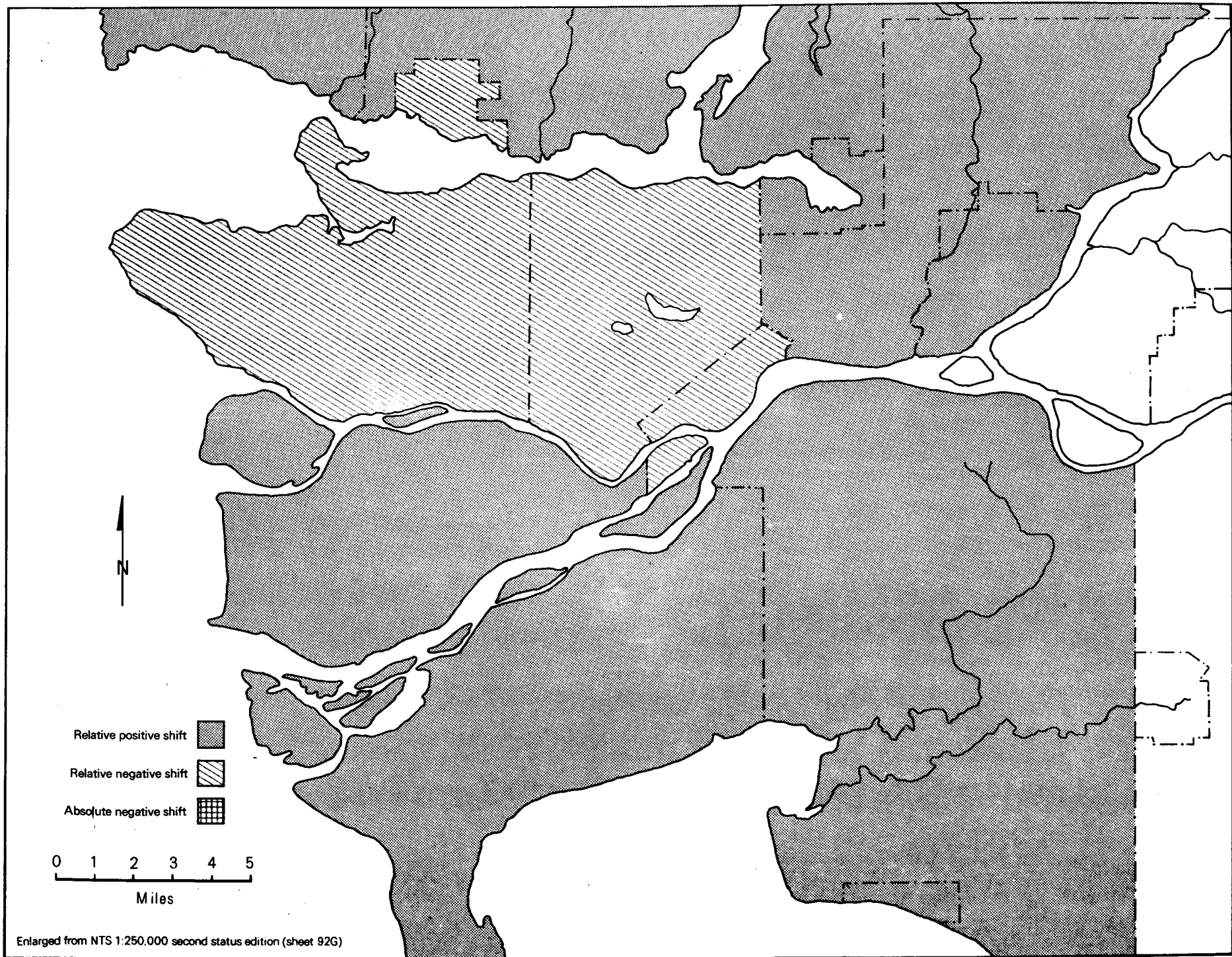


Figure 4: Net Shift in Rates of Change in Residential Acreage, 1966-1971



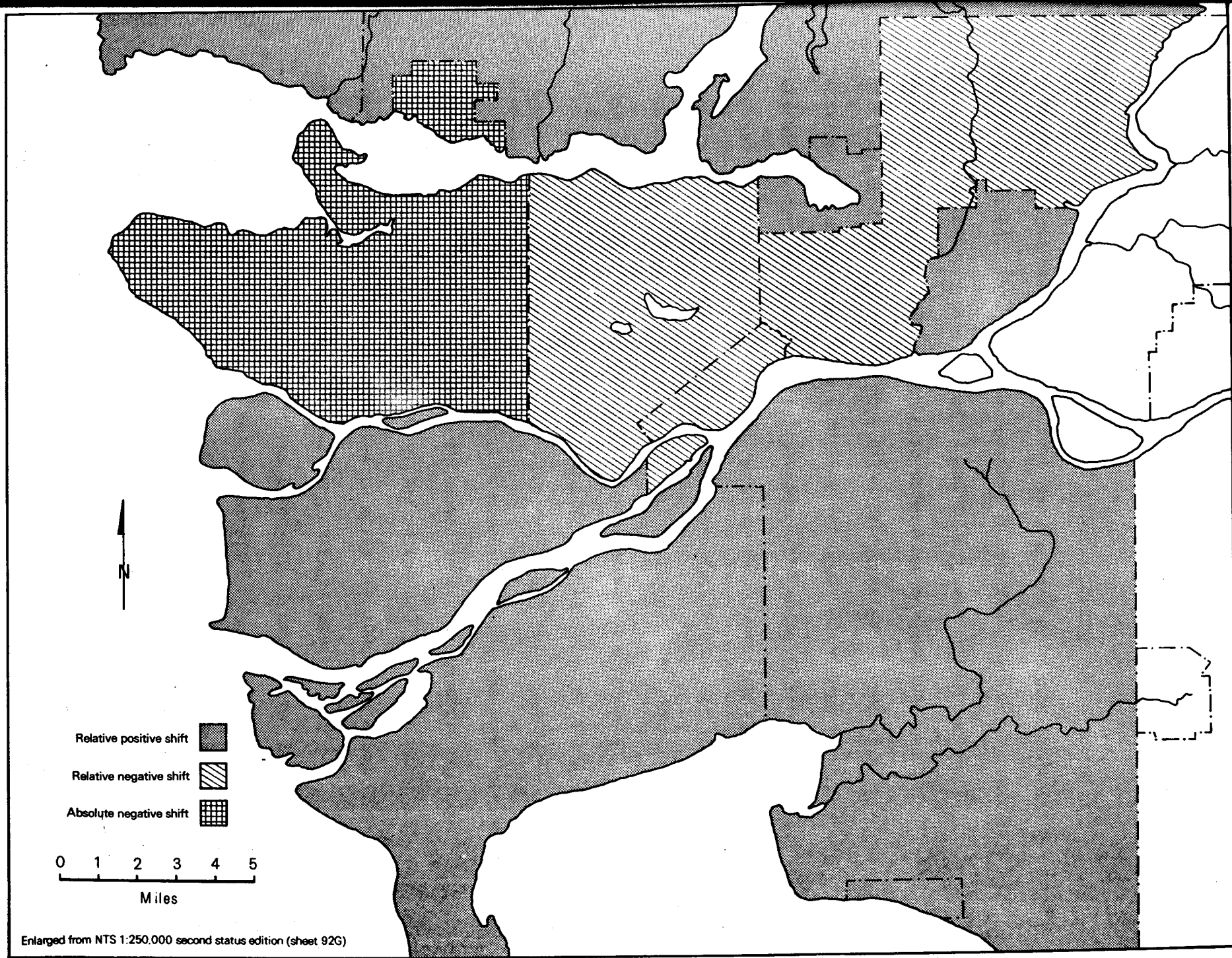


Figure 5: Net Shift in Rates of Change in Residential Acreage, 1971-1976



growth declined over the period, areal rates of change in residential acreage remained essentially constant and the rate of change in dwelling units increased. This led to a decrease in the number of acres converted per 1000 increase in dwelling units and an increase in the number of acres converted per 1000 increase in population between 1961 and 1976. The increased density of new physical development was allied with an increase in land prices, with a decline in number of persons per household and with a decline in residential development's share of total growth. The shift analysis illustrated the problems of aggregation since the trends of the whole region were not necessarily those of the individual parts. When each municipality was examined it was found that only five experienced the divergent trends outlined above - Vancouver, Burnaby, North Vancouver District, Coquitlam and White Rock (Figures 6 and 7). Unlike these five, North Vancouver City, Richmond, Delta and Port Coquitlam experienced declines in both measures during the study period; Port Moody and Surrey experienced increases in acres converted per 1000 increase in both population and dwelling units; and New Westminster and West Vancouver experienced decreases in acres per 1000 population increase and increases in acres per 1000 dwelling units increase.

Although the two indices of the intensity of development are abstract measures and therefore possess no counterpart in reality, these concepts nonetheless permit the establishment of general benchmarks from which to trace change in residential acreage and the parameters underlying this change. With respect to these two objectives the common denominator among the municipalities and districts with the exception of Surrey and Port Moody was the decline in acres converted per 1000 increase in dwelling

Figure 6: Change in Residential Acreage Per 1000 Change in Population

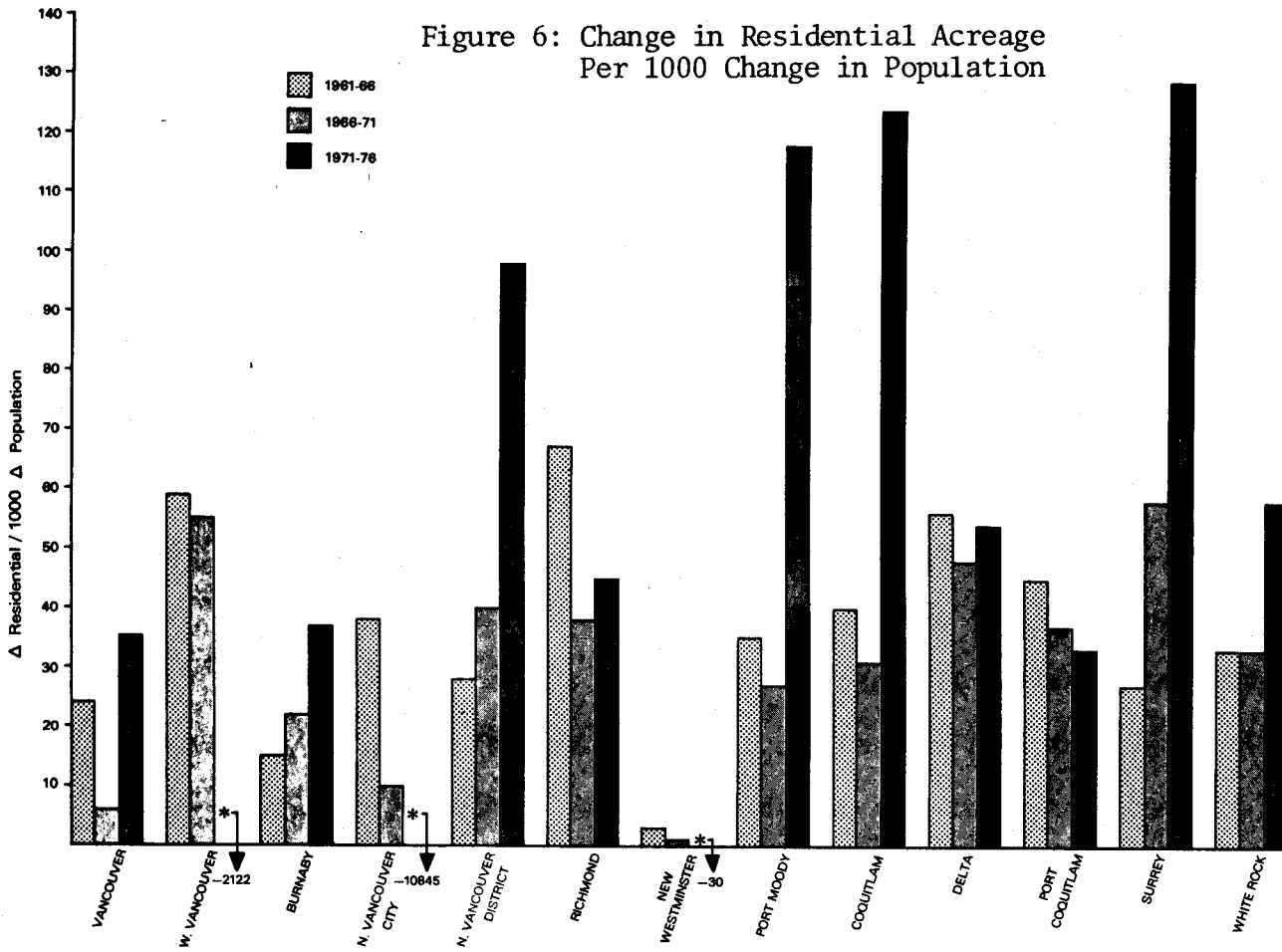
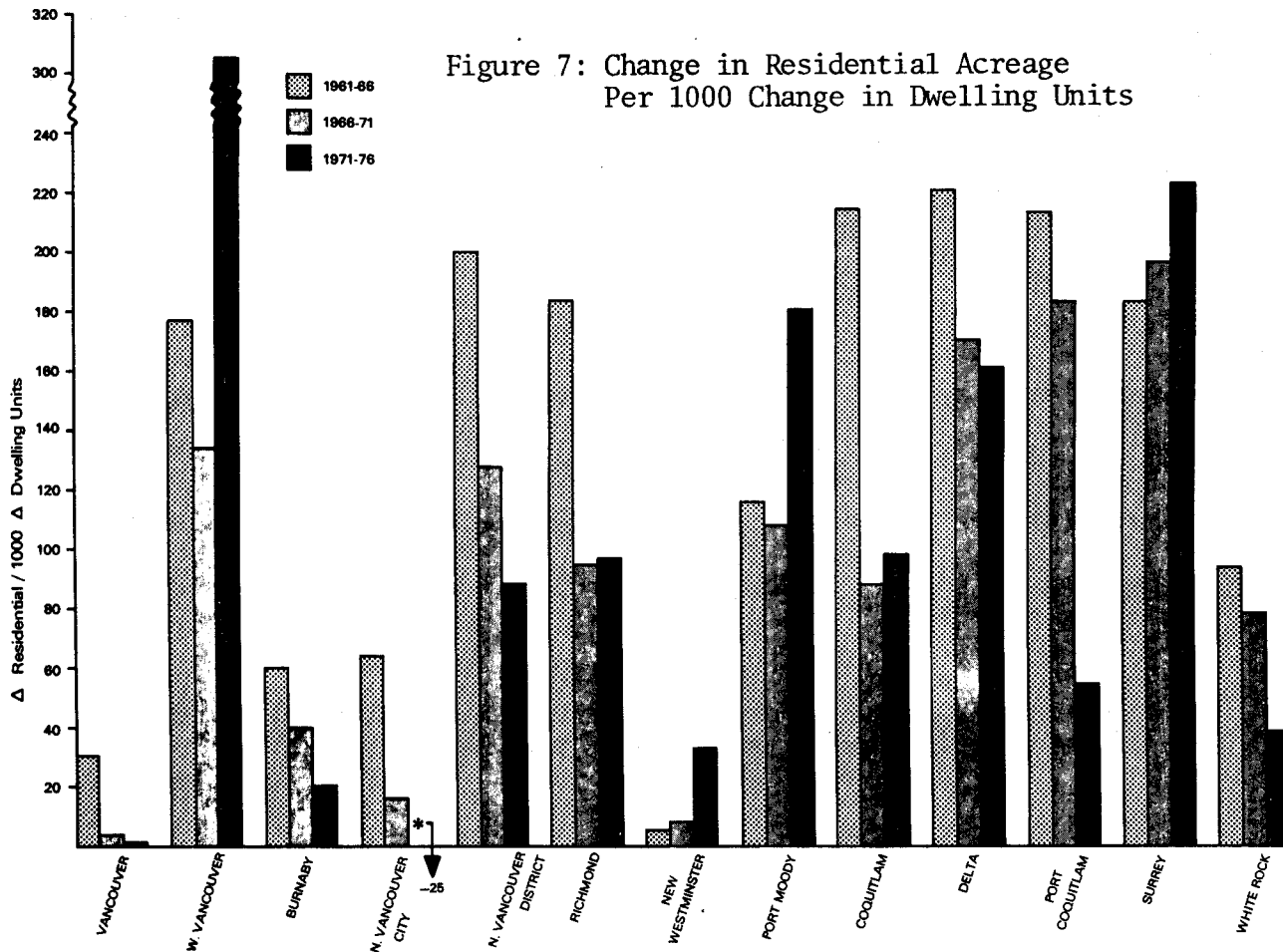


Figure 7: Change in Residential Acreage Per 1000 Change in Dwelling Units



units. This reflects among other things the general agreement among municipalities to encourage higher density development through such means as higher maximum floor space ratios, restrictions on the supply of serviceable land and enlargement of areas for multiple family units. As well as these conscious decisions on the part of municipalities, the parallel advance in land values coupled with physical shortages of land have also contributed to this trend. In the case of Surrey, low land values, large quantities of serviced land and a twenty-three per cent tax on income properties<sup>1</sup> tended to discourage higher density development more than would otherwise have been the case. It was less clear why Port Moody experienced the trends that it did between 1971 and 1976. Changes in the life cycle of families resulting in outmigration and incomplete townhouse developments may have contributed to these figures.

3) Rates of Change in Disaggregated Residential Acreage Among  
Municipalities of the GVRD

i) Single Family Acreage

Traditionally, single family dwellings have represented the most extensive and popular form of residential development and as a result provided the major impetus to rapid and large scale rates of growth in the residential sector. However the viability of this form of development has not gone unchallenged. In 1962 a pivotal point was reached in the development of the spatial structure of the GVRD as a whole when multiple family starts exceeded single family. On the disaggregated

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<sup>1</sup> The tax on income properties in most other municipalities was between 14 and 18 per cent, (Thompson, Berwick, Pratt, and Partners, 1973).

level it was found that those municipalities with relatively low rates of change in overall residential acreage experienced correspondingly low (if not negative) changes in single family residences, that is, the residential growth which did occur was medium and high density. Typical of these trends in the single family sector were Vancouver, Burnaby, New Westminster (from 1961-1971 only) and North Vancouver City (Table 5). As well, the rate of growth in population declined in three of these municipalities; Vancouver, New Westminster and North Vancouver City captured declining shares of the GVRD's population growth. The explanation for these trends is multi-faceted. First, incipient or advanced decentralization of the GVRD must be considered a prime factor. As well, the high premium placed on developable land by other land use activities in these inner city areas coupled with its limited supply have ensured the rapid and sustained increase in the price of land. Since land represents the single largest expenditure for single family housing, much larger than for other forms of housing, the opportunities for growth in the single family sector were severely limited.

This interpretation tends to stress the supply side of land and housing. Interacting with changes in land prices, and therefore effective supply of land for single family housing, is the problem of change in disposable income and its relation to changes in the cost of housing. Findings of earlier studies are often incomplete and contradictory because of ideological and methodological differences. In Canada, as a whole between 1961 and 1971, income rose at a faster rate than the cost of housing (George, 1973). However a study of

Table 5

Rates of Change for Disaggregate Residential Acreage

SINGLE FAMILY	1961-1966		1966-1971		1971-1976**		1961-1976	
	Absolute	Relative	Absolute	Relative	Absolute	Relative	Absolute	Relative
Burnaby	110.19	2.49	116.39	2.57	-20.29	-.44	206.29	4.66
Coquitlam	467.7	27.86	318.92	14.87	225.12	9.12	1016.44	60.59
Delta	333.11	32.91	1166.66	86.72	936.85	37.29	2436.62	240.73
New Westminster	-24.33	-2.53	-25.02	-2.67	12.35	1.35	-37.00	-3.84
North Vancouver C.	76.21	9.75	.69	.08	-89.50	-10.42	-12.60	-1.61
North Vancouver D.	247.93	10.32	318.64	12.03	380.85	12.83	947.42	39.45
Port Coquitlam	136.37	25.84	286.96	43.21	80.71	8.49	504.04	95.50
Port Moody	55.1	21.86	78.51	25.56	19.72	5.63	153.33	60.83
Richmond	460.05	17.85	304.41	10.02	560.60	16.77	1325.06	51.41
Surrey	254.59	4.77	867.54	15.51	1870.83	28.96	2992.96	56.41
West Vancouver	363.41	16.82	239.67	9.50	477.25	17.27	1080.33	50.00
White Rock	38.33	8.90	72.55	15.47	68.11	12.58	178.99	41.56
* Vancouver	N.A.	-	-299.82	-2.75	-1441.27	-13.61	N.A.	-
GVRD	N.A.	-	3451.10	9.60	3081.33	7.82	N.A.	-

\* 1961 disaggregate data for single family, duplex apartment acreages were unavailable.  
See footnote 3 on page 3.

\*\* The 1971-1976 absolute totals for single family, duplex and apartment acreages may not equal the aggregate totals in Table 2. The difference is due to rounding errors resulting from the application of the estimation technique, outlined on page 3, to the aggregated data itself and to the disaggregated data.

Table 5 (continued)

DUPLEX	1961-1966		1966-1971		1971-1976		1961-1976	
	Absolute	Relative	Absolute	Relative	Absolute	Relative	Absolute	Relative
Burnaby	23.42	24.12	44.99	37.33	45.59	27.55	114.00	117.40
Coquitlam	3.22	17.99	9.64	45.64	23.26	75.62	36.12	201.79
Delta	5.05	100.00	22.72	224.95	63.06	192.14	90.83	1798.61
New Westminster	23.64	41.19	-5.28	-6.52	125.05	165.08	143.41	249.89
North Vancouver C.	5.05	18.19	2.30	7.01	1.17	3.33	8.52	30.68
North Vancouver D.	1.61	24.21	-.92	-11.14	39.86	543.05	40.44	609.77
Port Coquitlam	1.38	54.76	11.71	300.26	21.02	134.66	34.11	1353.57
Port Moody	.69	16.71	1.60	33.20	.87	11.85	3.16	76.51
Richmond	20.43	33.97	43.62	54.14	54.84	44.16	118.89	197.69
Surrey	8.04	20.60	33.97	72.18	105.94	130.74	147.95	379.16
West Vancouver	-3.21	-4.92	-3.90	-6.29	-40.28	-69.35	-47.39	-72.70
White Rock	.92	-4.72	1.14	5.58	6.21	28.79	8.27	42.39
Vancouver	N.A.	-	245.64	414.79	896.75	294.15	N.A.	-
GVRD	N.A.	-	407.23	73.80	1343.34	140.07	N.A.	-

Table 5 (continued)

APARTMENTS	1961-1966		1966-1971		1971-1976		1961-1976	
	Absolute	Relative	Absolute	Relative	Absolute	Relative	Absolute	Relative
Burnaby	55.55	97.58	132.92	118.17	228.94	93.29	417.41	733.20
Coquitlam	6.20	104.03	42.93	353.04	56.15	101.92	105.28	1766.44
Delta	2.06	39.02	31.91	434.74	31.09	79.21	65.06	1232.30
New Westminster	18.59	16.91	32.60	25.36	15.46	9.59	66.65	60.61
North Vancouver C.	41.09	121.78	50.05	66.88	14.21	11.38	105.35	312.24
North Vancouver D.	2.07	8.84	69.10	271.19	168.04	177.67	239.21	1021.83
Port Coquitlam	.69	17.69	15.15	330.07	51.25	259.63	67.09	1720.26
Port Moody	22.95	434.66	22.04	78.07	89.22	197.67	134.36	2734.09
Richmond	.92	5.08	100.09	525.41	235.54	197.70	336.55	1856.32
Surrey	28.15	191.63	83.57	190.62	449.65	352.92	562.37	3828.25
West Vancouver	27.32	101.75	12.17	22.47	42.83	64.56	82.32	306.59
White Rock	5.97	81.34	14.00	105.18	61.87	226.55	81.84	1114.99
Vancouver	N.A.	-	164.60	20.45	104.16	10.74	N.A.	-
GVRD	N.A.	-	771.13	58.03	1558.56	74.22	N.A.	-

Burnaby revealed that between 1963 and 1973 the average monthly payment of principal, interest and taxes increased by 243 per cent while disposable income rose by 85 per cent (United Community Services, 1973). Certainly, the tripling in average land prices within most municipalities of the GVRD for a similar period and land's increasingly large share of the cost of housing lends support to this finding.

Reacting to and anticipating these market forces were the responses of individual municipalities. Reference has already been made to Vancouver's urban renewal scheme which replaced single family with multiple family units. Burnaby's and North Vancouver City's absolute decline in single family acreage between 1971 and 1976 may have been partly the result of the expansion of their apartment zones. The sudden expansion of New Westminster's single family sector during the 1971-76 period and therefore the reversal of the 1961-1971 trend was due in part to development of 3 acre parcels on Lulu Island.

The remaining municipalities operate under a different set of exigencies. Surrey experienced the greatest growth, in both relative and absolute terms, in the acreage of single family dwellings. Even though all of the remaining municipalities displayed active growth in single family acreage the process of suburbanization did not occur with the same consistency and magnitude as in Surrey. It is felt that Surrey's attitude toward low density development and its relatively low lot prices, a product in part of a continued expansion in the supply of developable land<sup>1</sup>, have been contributing factors to its growth. More recent was

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<sup>1</sup> The 1972 Urban Growth Policy suggested that in order to stabilize prices the supply of land should exceed three times the need of the next five years.



the effect of NHA financed construction. Although information was scarce, Surrey appears to be capturing a large share of AHOP projects, which by and large, have been in the form of single detached dwellings.

In contrast to the magnitude of Surrey's growth in residential acreage, it was Richmond for the period 1961-1966 and Delta for the period 1966-1976 which displayed the greatest increases in the number of single family dwellings (Table 6). The high growth rate in dwelling units combined with a lower growth rate in residential acreage produced higher development densities in Delta and Richmond than in Surrey (Table 7). This higher density development may reflect higher land prices resulting from attempts by both municipalities to restrict disorganized and fragmented development. Richmond and Delta have also been more successful than Surrey in preserving the integrity of those areas zoned agricultural in the 1968 Lower Mainland Regional Plan.

Similar quantities of land were consumed by North Vancouver District and West Vancouver for single family residences between 1961 and 1976 but the former accomplished this at a higher density than the latter despite similar minimum lot sizes in the two municipalities. These different development densities could simply be the result of data aggregation.

Lastly, the three municipalities of Port Moody, Coquitlam and Port Coquitlam experienced lower rates of increase, in both relative and absolute terms, in acreage converted during the 1971-76 period than for the preceding five year period. As well for the same period, acres converted per 1000 increase in dwelling units were also lower than for the preceding periods. These changes can be attributed to

Table 6

Rates of Change in Number of Dwelling Units

SINGLE FAMILY	<u>1961-1966</u>		<u>1966-1971</u>		<u>1971-1976</u>		<u>1961-1976</u>	
	Absolute	Relative	Absolute	Relative	Absolute	Relative	Absolute	Relative
Burnaby	951	3.97	691	2.78	786	3.07	2428	10.15
Coquitlam	2061	30.05	1512	16.95	1480	14.19	5053	73.67
Delta	1437	35.34	5965	108.40	5251	45.79	12653	31.19
New Westminster	-87	-1.35	-231	-6.63	-420	-6.85	-738	-11.44
North Vancouver C.	181	3.68	44	.86	-361	-7.03	-136	-2.77
North Vancouver D.	1221	10.95	1797	14.52	1833	12.93	4851	43.49
Port Coquitlam	623	26.92	1116	38.00	1659	40.93	3398	146.85
Port Moody	240	18.99	363	24.14	194	10.39	797	63.05
Richmond	2284	22.73	2017	16.35	3354	23.37	7655	76.17
Surrey	1243	6.18	3671	17.19	3384	13.52	8298	41.27
West Vancouver	938	13.31	591	7.40	816	9.52	2345	33.29
White Rock	168	6.65	417	15.48	290	9.32	875	34.65
Vancouver	N.A.	-	-2404	-2.97	-5974	-7.61	N.A.	-
GVRD	N.A.	-	15549	8.07	12292	5.90	N.A.	-

Table 6 (continued)

DUPLIX	1961-1966		1966-1971		1971-1976		1961-1976	
	Absolute	Relative	Absolute	Relative	Absolute	Relative	Absolute	Relative
Burnaby	227	25.53	425	38.08	434	28.16	1086	122.16
Coquitlam	25	24.04	90	69.77	198	90.41	313	300.96
Delta	28	82.35	196	316.13	209	81.01	433	1273.53
New Westminster	372	50.27	-82	-7.37	1501	145.73	1791	242.03
North Vancouver C.	47	13.58	36	9.16	4	.93	87	25.14
North Vancouver D.	15	31.25	-9	-14.29	78	144.44	84	175.00
Port Coquitlam	10	38.46	83	230.56	351	294.95	444	1707.69
Port Moody	4	13.33	9	26.47	321	74.42	45	150.00
Richmond	145	36.90	323	92.02	310	36.00	778	197.96
Surrey	65	22.73	243	69.23	229	38.55	537	187.76
West Vancouver	-40	-6.02	-16	-2.56	-436	-71.71	-492	-74.09
White Rock	16	5.97	8	2.82	10	3.42	34	12.69
Vancouver	N.A.	-	6852	894.52	8494	111.50	N.A.	-
GVRD	N.A.	-	8158	148.11	11414	83.52	N.A.	-

Table 6 (continued)

APARTMENTS	1961-1966		1966-1971		1971-1976		1961-1976	
	Absolute	Relative	Absolute	Relative	Absolute	Relative	Absolute	Relative
Burnaby	1961	280.54	6744	253.53	9966	105.98	18671	2671.10
Coquitlam	128	143.82	2625	1209.68	1365	48.03	4118	4626.97
Delta	63*	-	959	1522.22	855	83.66	1877	-
New Westminster	2111	153.75	3929	112.77	2899	39.11	8939	651.06
North Vancouver C.	1659	128.11	2895	98.00	3319	56.74	7873	607.95
North Vancouver D.	108	61.02	1265	443.86	4309	273.00	5682	3210.17
Port Coquitlam	6	11.11	496	826.67	712	128.06	1214	2248.15
Port Moody	432	1270.59	626	134.33	346	31.68	1404	4129.41
Richmond	200	270.27	2333	851.46	4675	179.19	7210	9743.24
Surrey	537	242.45	1063	223.32	7708	500.84	9103	6552.52
West Vancouver	1299	159.98	1250	59.21	1162	34.57	3711	457.10
White Rock	209	110.00	665	166.67	2845	267.39	3719	1957.37
Vancouver	N.A.	-	18672	45.67	25612	43.00	N.A.	-
GVRD	N.A.	-	43522	80.89	65775	67.21	N.A.	-

\* No recorded apartment acreage in 1961

tightened servicing requirements in Coquitlam, a restriction in the land zoned for residential purposes in Port Coquitlam, and a reduction in minimum lot size in Port Moody along with substantial increases in the price of land for all three.

ii) Duplex and Apartment Acreage

Many of the push-pull factors which operated among municipalities to shape low density residential space were also at work to affect the higher density counterpart. However, whereas in the former case a relatively clear picture emerged of large scale suburbanization and incipient or advanced decentralization of population, in the latter a less differentiated pattern appeared, particularly toward the end of the study period with respect to change in acreage (Tables 5 and 6).

In the case of duplex development, with the exception of West Vancouver, all municipalities experienced absolute increases of acreage devoted to this form of multi-family development during the study period. West Vancouver lost acreage devoted to duplexes because of the expansion of even higher density development. Noteworthy was the size of acreage increases in Burnaby, New Westminster, Vancouver, Surrey and Richmond. Vancouver captured by far the greatest share of this form of development, probably the result of conversions of existing dwellings. In contrast, the acreage devoted to this form of development was not large, in Surrey and Richmond, compared to the quantities of land consumed for single family purposes. However the change in the number of dwelling units in these two municipalities was still substantial and at a far higher intensity of development than for single family development (Tables 6 and 7).

Table 7

Intensity of Land Consumed: Change in Acreage  
Per 1000 Change in Dwelling Units

<u>SINGLE FAMILY</u>	1961-1971	1966-1971	1971-1976	1961-1976
Burnaby	115.9	168.4	-025.8**	085.0
Coquitlam	226.9	210.9	-152.1**	201.2
Delta	231.8	195.6	178.4	192.6
New Westminster	277.6 *	108.3 *	-029.4 ***	050.4 *
North Vancouver C.	421.0	015.7	247.9 *	092.6 *
North Vancouver D.	203.1	177.3	207.8	195.3
Port Coquitlam	218.9	257.1	048.6	148.3
Port Moody	229.6	216.3	101.6	192.4
Richmond	201.4	150.9	167.1	173.1
Surrey	204.8	236.3	552.8	360.7
West Vancouver	387.4	405.5	584.9	460.7
White Rock	228.2	174.0	234.9	204.6
Vancouver	N.A.	124.7 *	241.3 *	N.A.
GVRD	N.A.	221.9	250.7	N.A.
<u>DUPLEX</u>	1961-1966	1966-1971	1971-1976	1961-1976
Burnaby	103.2	105.9	104.4	105.0
Coquitlam	128.8	107.1	117.5	115.4
Delta	180.4	115.9	301.7	209.8
New Westminster	063.5	064.3 *	083.3	080.1
North Vancouver C.	107.4	063.9	292.5	097.9
North Vancouver D.	107.3	102.2	511.0	482.7
Port Coquitlam	138.0	141.1	059.9	076.8
Port Moody	172.5	177.8	027.2	070.2
Richmond	140.9	135.0	076.9	152.8
Surrey	123.7	139.8	462.6	275.5
West Vancouver	080.3 *	243.8	092.4 *	096.3 *
White Rock	-057.5 **	142.5	621.0	243.2
Vancouver	N.A.	035.8	105.6	N.A.
GVRD	N.A.	049.9	158.2	N.A.

Table 7 (continued)

<u>APARTMENTS</u>	<u>1961-1966</u>	<u>1966-1971</u>	<u>1971-1976</u>	<u>1961-1976</u>
Burnaby	028.3	019.7	023.0	022.4
Coquitlam	048.4	016.4	041.1	025.6
Delta	032.7	033.3	036.4	034.7
New Westminster	008.8	008.3	005.3	007.5
North Vancouver C.	024.8	017.3	004.3	013.4
North Vancouver D.	019.2	054.6	039.0	042.1
Port Coquitlam	115.0	030.5	072.0	055.3
Port Moody	053.1	035.2	258.0	102.8
Richmond	004.6	042.9	050.4	046.7
Surrey	083.5	078.6	058.4	061.7
West Vancouver	021.0	009.7	036.9	022.2
White Rock	028.6	021.1	021.7	022.0
Vancouver	N.A.	008.8	004.1	N.A.
GVRD	N.A.	017.7	023.5	N.A.

\* Net decline in acreage and dwelling units

\*\* Net decline in acreage

\*\*\* Net decline in dwelling units

The decline in the relative rate of growth but the increase in the absolute rate for duplex units during the 1971-76 period was a product of both market and institutional forces. Even though the rate of growth in population declined, the combination of increases in the price of land for single family housing encouraged the substitution of multiple family for single family forms of accomodation. This tended to favour duplex development. However, operating against this substitution were changes in the income tax act relating to capital gains effective January 1, 1972 and changes in the Landlord Tenant Act of 1974.

Similar patterns emerge for apartment development with the exception of greater variations over time and space. The central municipalities of Vancouver, Burnaby, New Westminster and North Vancouver City were the scene of consistently large changes in the number of apartment dwelling units during the 1960's. This indicates that not only were these areas the scene of high demand but also, within a planning context, they possessed the highest floor space ratios within the GVRD and a committment by municipalities to progressively increase overall density. This was exemplified by North Vancouver City's 1967 zoning bylaw and Burnaby's 1966 apartment study. During the same period, the peripheral or suburban municipalities were low demand areas displaying only limited apartment development in terms of both density and acreage converted. The popularity of single family residences coupled with low demand for multiple dwelling units, lower land values and lower floor space ratios continued to produce these conditions throughout the 1960's.

The rapid apartment development of the sixties in the central municipalities was not repeated, at least in terms of area affected,



during the first half of the seventies. While these inner city areas still dominated the apartment scene in terms of absolute change in number of dwelling units it was the suburban municipalities which gathered growth momentum in their acreages (Tables 5 and 6). Surrey and Richmond consumed more land between 1971-76 for apartments than the other municipalities. North Vancouver District was also very active. However the distinguishing characteristic between these central and suburban municipalities was the intensity at which this new development occurred. Vancouver, New Westminster and North Vancouver City had far fewer acres converted per 1000 change in dwelling units than any of the other municipalities (Table 7). Hence, even though Richmond, Surrey and North Vancouver District were committed, in varying degrees, to multiple family units, reflecting in part a major change in the conditions suitable for this development, it occurred at a relatively low density. While this was partly a function of differences in lot prices between central and suburban areas, it was also a function of changes in attitudes towards alternative forms of multiple family dwelling. In the 1970's the city of Vancouver as well became aware of these alternatives. For example, in 1972, it down-zoned prime apartment land in Kitsilano and the West End.

Much of the growth in apartment development in the suburban municipalities can be explained with reference to both the points made earlier and some additional ones. If we accept the claim that house prices rose at a faster rate than disposable income and add to that the fact that rental costs have not risen as quickly as housing costs (George, 1973), it can be concluded that the rental market becomes increasingly attractive in these areas and less of a risk for the developer. And even though

changes in laws relating to capital gains in 1972 and rent control in 1974 tended to depress the market for rental accommodation, the Strata Titles Act of 1968 had the opposite effect since it encouraged activity in the multiple dwelling market. (The data for this study unfortunately did not distinguish between types of tenure). Moreover the encouragement of higher density development by municipalities in order to consolidate new development and the improvement of employment opportunities in suburban areas have tended to reinforce these trends.

#### D) Conclusion

This study examined the spatial dimensions of aggregate urban growth within a large urban region. Conceptually it differed from previous research which focused upon the individual decision making unit and its role in affecting land conversion patterns. Operationally the study proceeded on three fronts, each one with a different combination of temporal scales, areal scales and types of residential development. The differences between each of these highlighted the problems of using aggregate data and the multiplicity of factors involved, whereas the similarities suggested the existence of scale independent features making certain tentative generalizations possible. On a superficial level the overall growth performance or behavior of residential land use within the GVRD was not unlike the growth in its counterpart in other major metropolitan centres. The residential land conversion process was analogous to the Toronto model of development in which the intensity of new development was an inverse function of distance from the city centre but the rate of development a positive function (Pierce, 1976). Spatially, successively greater quantities of land were substituted for other forms of capital with increasing distance from the city centre. Temporally, the opposite trend occurred where, on a particular parcel of land, increasing quantities of capital were invested over time. This process of substitution, then, occurred over time and space and between various intensities or types of residential development. Although the simplicity of this model provided a certain appeal it was unable to accommodate the numerous exceptions which lend distinction to any

development process, largely because of its over-emphasis on economic factors.

As we have seen throughout, the marketplace was only one factor, albeit an important one, in influencing development decisions. In the case of the GVRD, the multiple nucleated form of development, the absence of metropolitan government, and the presence of tri-level government tended to reduce the level of uniformity and predictability commonly associated with purely economic landscapes.

Institutional and planning responses to real world problems can be placed on a continuum from reactive to anticipatory. The former often serve to affect the existing conditions created by the marketplace while the latter attempt to alter the future allocation sequence of the marketplace. For instance the construction of bridges and trunk sewers represents, for the most part, a form of anticipatory planning. These tend to affect the economics of location and hence the aggregate rate of land conversion. In contrast, the modification of zoning bylaws to conform to pre-existing economic pressures is essentially reactive. However in the case of many other decisions this distinction is neither realistic nor possible because most decisions involve both reaction and anticipation to differing degrees. As well, there are difficulties in distinguishing the sequence and relative importance of factors in the land conversion process. While this situation makes generalizations regarding parameters of land use change at best tentative and at worst misleading there appear to be a number of conclusions:

- 1) A major shift in the rate of growth in population and lower density residential acreage has occurred from the central municipalities

to the suburban over the fifteen year period between 1961-1976. Higher density development continued within the central municipalities but during the late sixties and early seventies they were capturing a declining share of total growth in residential acreage.

2) The high land values, limited supply of land and the competition for land from non-residential activities encouraged high density development in the central areas. Whereas the combination of lower land values, major improvements in accessibility between the central and suburban municipalities and the willingness of suburban municipalities to accomodate in varying degrees such things as trunk sewer extensions, contributed to the rapid growth in lower density development.

3) While the Provincial Home Acquisition Act tended to stimulate development in all municipalities undergoing new house construction, assistance under the NHA tended to encourage development in those municipalities with lower land values such as Richmond, Delta and Surrey.

4) Despite the numerous similarities between Delta and Surrey in terms of the proportion of total area undeveloped, flat easily serviced land, and similar accessibility with respect to the city of Vancouver, there were considerable differences in the quantity and intensity of land consumed for residential purposes. If it can be assumed that the housing market is a very competitive one, it can be inferred that these differences are the result of other factors, primarily regulatory or institutional. Since the last half of the sixties Delta has pursued a more active role in affecting development densities and the form of

development than Surrey. For example between 1971 and 1976 population growth was greater in Delta than in Surrey but the quantity of land consumed less, producing higher density development.

5) Delta was certainly not alone in this regard. North Vancouver District, Coquitlam and Port Coquitlam have affected the supply and hence price of land through such measures as tighter servicing, a lower annual number of permissible housing starts and a moratorium on rezoning undeveloped land.

6) These timid measures which attempt to make municipalities less subordinate to the dictates of the market have been relatively successful in achieving their goal. Although by no means conclusive they suggested that relatively simple and easily formulated institutional controls, when applied, can represent a very effective means of modifying development in the residential sector. The similar policy responses among most municipalities to the exigencies of land use conflicts from 1961 to 1976 suggested that metropolitan government is not necessarily a prerequisite to more uniform development standards. In contrast to the mutual agreement of the other municipalities, Surrey's unique pattern of development would not be tenable within a metropolitan system of government.

7) Transcending the jurisdictions of the individual municipalities have been institutional decisions to improve accessibility largely through expanded water crossing. No other single factor has been as responsible for facilitating the rapid outgrowth of the GVRD. Any further improvement in accessibility will inevitably lead to a reinforcement of this development through a further decentralization of

of growth opportunities.

8) Less apparent was the effect of other institutional measures at the federal and provincial levels. Although lower interest rates made available through such NHA programs as AHOP encouraged some types of development, and changes in the income tax act and rent act discouraged other types, it is not entirely clear what impact future changes in these will have at a local level. Even more difficult to ascertain is the long term impact of the B.C. Land Commission. The areas of greatest present growth and future growth potential - the southern municipalities of Delta, Surrey and Richmond - are the areas with the greatest reserves of agricultural land with 46 per cent, 32 per cent and 19 per cent respectively. Just as Delta's restriction of the supply of land through regulatory means tended to encourage higher land values there than in Surrey, so it is reasonable to assume a similar occurrence on a larger scale. The problem of reconciling the preservation of agricultural land with the supply of low cost land is a difficult one, particularly since land represents such a large proportion of total housing costs.

Many if not all of the institutional responses discussed in this paper were formulated during a rapidly expanding high growth urban economy. The present lower rates of economic and demographic growth, high energy costs, indeed the era of 'stagflation' may require a different set of responses. What form these responses will take will depend as much upon the relative strength of the municipalities with respect to other levels of government as upon the ability of the market to accommodate changing conditions and expectations.

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WEST VANCOUVER

NORTH VANCOUVER

GREATER VANCOUVER

Appendix 1

BURRARD INLET

PORT MOODY

ENGLISH BAY

VANCOUVER

BURNABY

COQUITLAM

PORT COQUITLAM

STRAIT OF GEORGIA

SEA ISLAND

RICHMOND

FRASER RIVER

BARKINGTON ISLAND

SURREY

DELTA

FRASER RIVER

WESTHAM ISLAND

BOUNDARY BAY

MUD BAY

WHITE ROCK

SFU 6R 19

Streets and roads

Main highways

0 1 2 MILES

Base map constructed from 1:50,000 National Topographic Series

CANADA U.S.A.

CANADA U.S.A.

