

HOUSING REQUIREMENTS

OF

FAIRBANKS AREA

YEAR-END 1969

by

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TABLE OF CONTENTS

SUMMARY . . . . .	1
METHODOLOGY . . . . .	2
DATA . . . . .	3
ANALYSIS AND RESULTS . . . . .	4
CONCLUDING REMARKS . . . . .	6
STATISTICAL APPENDIX . . . . .	7
<u>SAMPLE CALCULATION</u> . . . . .	7
TABLE I: 1968 Covered Employment . . . . .	9
TABLE II: Covered Employment Projections . . . . .	10
TABLE III: Transportation, Communications, and Public Utilities . . . . .	11
TABLE IV: Intermediate Computational Data . . . . .	12
FIGURE 1 - Employment Trends . . . . .	13

SUMMARY

This report presents the results of an analysis of the housing requirements of the Fairbanks area projected to year-end, 1969. The methodology adopted was designed to provide the best possible forecasts subject to extreme limitations imposed by time and resources. The housing requirements have been projected on the basis of recent employment trends and therefore may be considered minimum requirements in that certain sectors of the Fairbanks economy may be expected to experience relatively more rapid growth in 1969 than in 1968.

This analysis indicates that between year-end 1968 and December, 1969, the number of new dwelling units required in the Fairbanks area will be approximately between 1,498 and 2,345.

## METHODOLOGY

It was considered that for such a short-range projection, the optimal approach would be to identify recent trends in employment in the Fairbanks area and utilize these to estimate employment at year-end 1969. Since no data describing employment in 1969 were available other than through a highly sophisticated and costly program of data compilation, it was decided to use employment data for 1968. It was assumed that employment trends in 1968 will continue through 1969.

Data describing covered employment in Fairbanks in 1968 were compiled. It was found that seven categories of covered employment included 88.4 per cent of all employed persons. Linear trends were fitted to the 1968 employment data in six of the seven cases. Extreme seasonality in contract construction employment required that additional data be compiled for the years 1966 and 1967 and a special year-end trend be determined. The linear trends thus identified and associated standard errors of estimate were then utilized in projecting an estimated employment range for year-end 1969. These forecasts of covered employment were then increased by 11.6 per cent to derive estimates of projected total employment in the Fairbanks area at year-end 1969.

In order to determine the population increase associated with the projected employment level, the Participation Rate, which is a measure of the relationship between the population of an area and the number of jobs available, for Fairbanks in 1968 was computed and applied to the employment increase to establish a projected range of population increase. The housing requirements on this population could therefore be determined from the median number of persons per occupied housing unit in Alaska as given in the 1960 census. Thus a range of housing demand could be estimated.

## DATA

The data describing covered employment in the Fairbanks area for seven categories of employment in 1968 and for contract construction in 1967 and 1966 are shown in Table I. This table indicates the number of employees by month for each category of covered employment. All types of employment except manufacturing exhibit increased employment during the 1968 calendar year. These data also reveal different degrees of cyclic variation due to the strong seasonal component of economic activity in the Fairbanks area. For such a short-range projection, this cyclicality was regarded as not significant except in the case of contract construction where special measures were taken in making the employment projection.

## ANALYSIS AND RESULTS

Linear trends and associated standard errors of estimate were determined for the seven categories of covered employment as described previously. Projected ranges of employment were computed for year-end 1969. The results are shown in Table II. The estimates of total covered employment shown in this table were then increased by 11.6 per cent to obtain estimates of total employment as follows (in these computations, the first figure represents the lower limit and the second figure the upper limit of the 68 per cent range described in Table II):

covered employment	13,860	14,759
(plus 11.6%)	<u>x1.116</u>	<u>x1.116</u>
total employment	15,468	16,471

The Participation Rate which was used to determine the population increase associated with the employment forecasts was derived from total civilian population and the total employment in the Fairbanks area for 1968 as follows:

total civilian population	36,400	
<hr/>	<hr/>	= 2.62
total employment (1968 average)	13,905	

This Participation Rate of 2.62 indicates that for every one hundred persons employed in the Fairbanks area, there are 262 (or 162 additional) residents. Applying the Participation Rate to the estimated employment increase, we obtain the population increase thus:

projected employment	15,468	16,471
<u>total employment, Dec., 1968</u>	<u>- 13,696</u>	<u>- 13,696</u>
projected increase	1,772	2,775
<u>participation rate</u>	<u>x 2.62</u>	<u>x 2.62</u>
population increase	4,643	7,270

From the 1960 census of housing it was determined that the median number of persons per occupied housing unit in Alaska is 3.1. Applying this factor to the estimated population increase above, the required number of housing units may be determined.

<u>population increase</u>	<u>4,643</u>	<u>7,270</u>
persons/unit	3.1	3.1
required housing units	1,498	2,345

#### CONCLUDING REMARKS

The housing requirements as determined in this analysis represent minimum demands at year-end 1969. The assumption that employment trends will continue through 1969 probably results in an underestimate. Whereas the assumption of linear growth disregards the apparent cyclic component of the employment trends, the use of the standard error of estimate to determine projected ranges does take this factor into account. Although covered and total employment may not be in the same proportions in 1968 and 1969, there is no evidence to suggest that the proportions will shift significantly during 1969. The Participation Rate which was used to translate the employment projections into population projections was based on the civilian population so that possible changes in military personnel are not included as there is no basis for doing so. The median number of persons per housing unit as given in the 1960 census may be slightly lower than the actual value for Fairbanks in 1968. However, it may be thought of as representing a more optimal situation for housing than that which presently exists in this area.

The estimated housing requirement in the Fairbanks area by year-end 1969, 1,498 to 2,345 units, is therefore thought to be a reliable, though conservative estimate.



## STATISTICAL APPENDIX

SAMPLE CALCULATION: Transportation, Communications, and Public Utilities

The data utilized in the projection of employment in Transportation, Communications, and Public Utilities are presented in Table III. The linear trend (where Y represents employment and X is time) used to forecast employment was fitted by the least-squares technique as follows:

$$Y = a + bX$$

$$b = \frac{N\sum XY - \sum X \sum Y}{N\sum X^2 - (\sum X)^2}$$

$$= \frac{(12)(97,376) - (78)(14,366)}{(12)(650) - (78)^2}$$

$$= 27.95$$

$$a = \frac{\sum Y - b\sum X}{N}$$

$$= \frac{14,366 - (27.95)(78)}{12}$$

$$= 1,015.5$$

Thus the linear trend is:  $Y = 1,015.5 + 27.95X$ . This equation was then used to derive computed trend values of employment ( $Y_c$ ) as shown in the fifth column of Table III. The standard error of estimate was then determined to indicate how the trend values may be expected to differ from actual employment as follows:

$$\begin{aligned}
 S_{y \cdot x} &= \frac{\sqrt{\sum (Y - Y_c)^2}}{\sqrt{N}} \\
 &= \frac{\sqrt{27,919.15}}{\sqrt{12}} \\
 &= 48.2
 \end{aligned}$$

The trend equation was then utilized to estimate employment at year-end 1969 (X = 24) as follows:

$$\begin{aligned}
 Y &= 1,015.5 + (27.95) (24) \\
 &= 1,686.3
 \end{aligned}$$

The standard error of estimate was then used to establish a projected range of employment such that in 68 cases out of one hundred the true 1969 value might be expected to fall within this range. The estimate thus is:

$$\begin{aligned}
 (1,686.3 - 48.2) &< n < (1,686.3 + 48.2) \\
 1,638 &< n < 1,735
 \end{aligned}$$

where n is the number employed in Transportation, Communications, and Public Utilities.

TABLE I

## 1968 COVERED EMPLOYMENT

## FAIRBANKS AREA\*

INDUSTRY	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Manufacturing	231	241	244	282	307	298	346	353	359	240	196	184
Transportation, Communication & Public Utilities	995	1,043	1,050	1,129	1,206	1,255	1,271	1,298	1,293	1,241	1,279	1,306
Trade	1,831	1,849	1,928	2,011	2,095	2,177	2,224	2,242	2,234	2,216	2,226	2,221
Finance, Insurance & Real Estate	425	424	431	431	456	463	494	492	514	486	440	440
Service	1,300	1,300	1,314	1,391	1,470	1,637	1,645	1,674	1,595	1,554	1,526	1,504
Government	5,588	5,764	5,723	5,925	5,872	5,922	6,030	5,995	5,950	6,092	5,996	5,953
Contract												
Construction 1968	429	412	455	569	791	1,072	1,275	1,407	1,397	1,128	852	633
1967	490	489	614	769	1,033	1,181	1,259	1,246	1,850	1,147	756	664
1966	550	539	637	838	1,275	1,651	1,772	1,979	1,940	1,520	916	580

\* Source: Alaska Department of Labor

TABLE II  
COVERED EMPLOYMENT PROJECTIONS\*  
FAIRBANKS AREA

INDUSTRY	a	b	Standard Error	Low	High
Manufacturing	282	-1.3	57	194	308
Transportation, Communication & Public Utilities	1,016	27.9	48	1,638	1,735
Trade	1,848	39.5	66	2,730	2,862
Finance, Insurance & Real Estate	429	4.4	26	509	561
Service	1,320	26.6	95	1,863	2,053
Government	5,690	32.5	79	6,390	6,549
Contract Construction	522	1.9	77	536	691
TOTAL Covered Employment				13,860	14,759

\* The employment projections have been computed such that there exists a 68 per cent chance that the actual year-end 1969 employment will fall within this range.

TABLE III  
 TRANSPORTATION, COMMUNICATIONS, AND PUBLIC UTILITIES  
 COMPUTATIONAL DATA\*

	X	Y	XY	X <sup>2</sup>	Y <sub>c</sub>	(Y-Y <sub>c</sub> )	(Y-Y <sub>c</sub> ) <sup>2</sup>
January	1	995	995	1	1,043.5	-48.5	2,352.25
February	2	1,043	2,086	4	1,071.4	-28.4	806.56
March	3	1,050	3,150	9	1,099.3	-49.3	2,430.49
April	4	1,129	4,516	16	1,127.3	+1.7	2.89
May	5	1,206	6,030	25	1,155.3	+50.7	2,570.49
June	6	1,255	7,530	36	1,183.2	+71.8	5,155.24
July	7	1,271	8,897	49	1,211.1	+59.9	3,588.01
August	8	1,298	10,384	64	1,239.1	+58.9	3,469.21
September	9	1,293	11,637	81	1,267.0	+26.0	676.00
October	10	1,241	12,410	100	1,295.0	-54.0	2,916.00
November	11	1,279	14,069	121	1,323.0	-44.0	1,936.00
December	12	1,306	15,672	144	1,350.0	-44.9	2,016.01
TOTALS	78	14,366	97,376	650			27,919.15

\* X represents time scale

Y represents number of persons employed

Y<sub>c</sub> is the computed trend value

TABLE IV  
INTERMEDIATE COMPUTATIONAL DATA

INDUSTRY	N	$\Sigma X$	$\Sigma Y$	$\Sigma XY$	$\Sigma X^2$	$\Sigma (Y - Y_c)^2$
Manufacturing	12	78	3,281	21,137	650	39,301.90
Transportation, Communication & Public Utilities	12	78	14,366	97,376	650	27,919.15
Trade	12	78	25,254	169,802	650	52,733.78
Finance, Insurance & Real Estate	12	78	5,496	36,348	650	8,029.28
Service	12	78	17,910	120,214	650	108,479.28
Government	12	78	70,810	464,909	650	75,551.42
Contract Construction	6	111	3,346	63,329	2,811	35,981.51

FIGURE 1 - Employment Trends

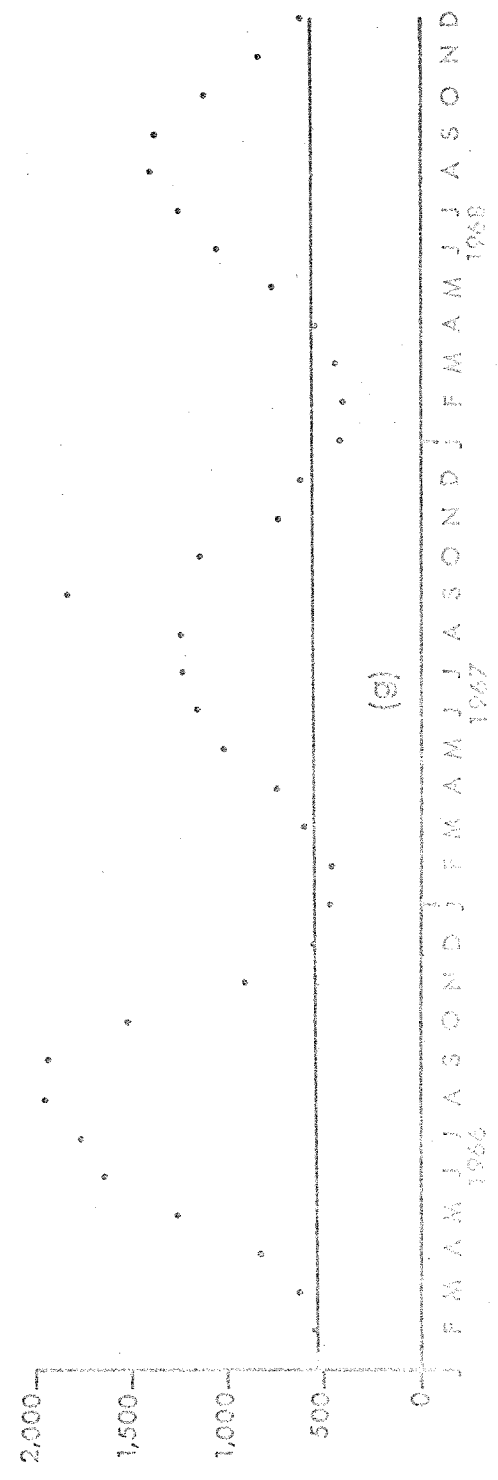
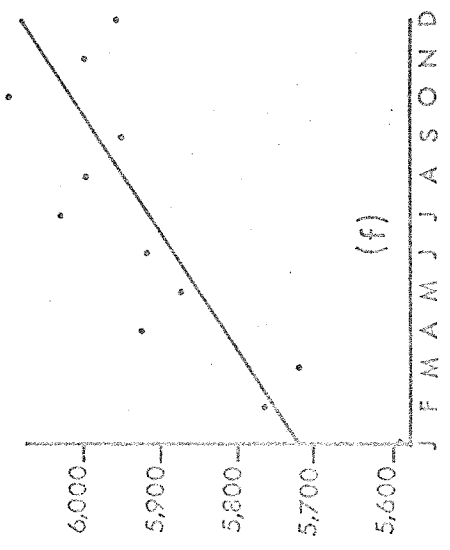
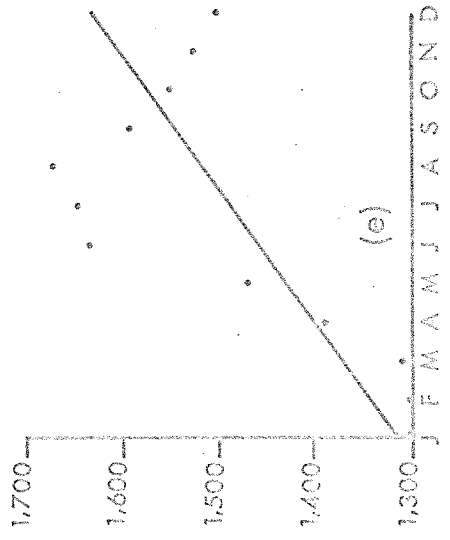
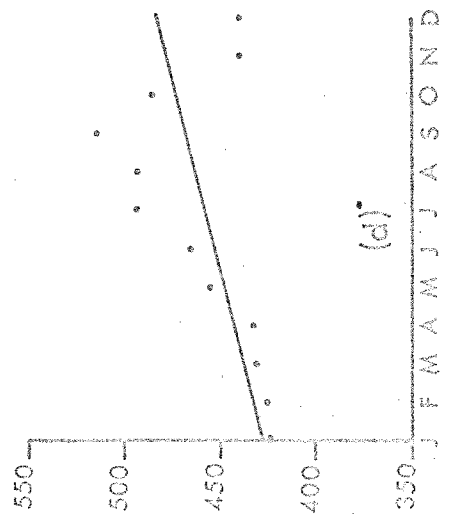
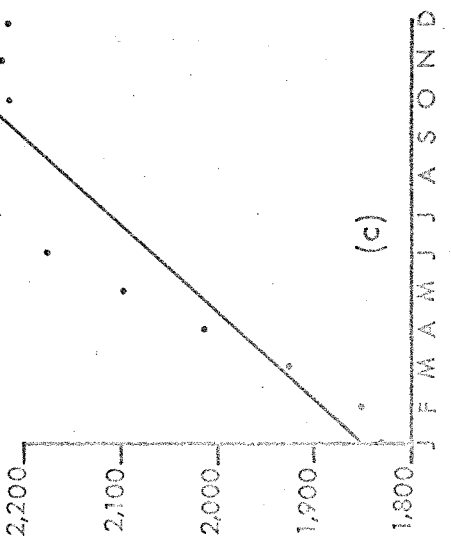
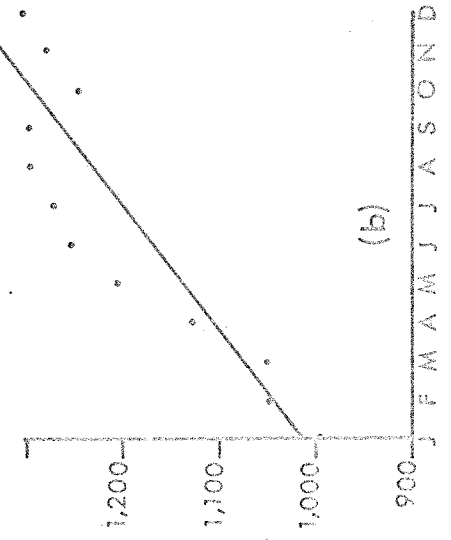
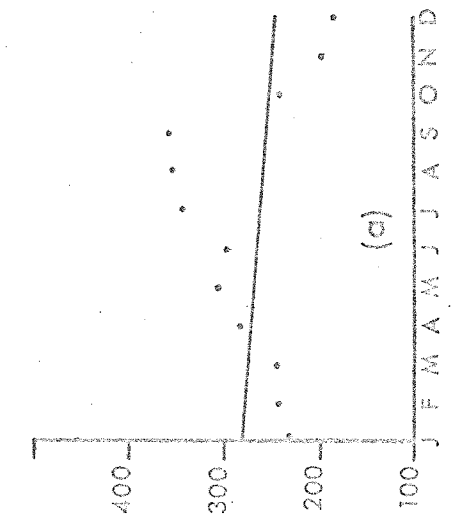


Figure 1 (a): 1968 employment trend in Manufacturing sector

$$Y = 282 - 1.3X$$

Figure 1 (b): 1968 employment trend in Transportation, Communications, and Public Utilities sector

$$Y = 1,016 + 27.9X$$

Figure 1 (c): 1968 employment trend in Trade sector

$$Y = 1,848 + 39.5X$$

Figure 1 (d): 1968 employment trend in Finance, Insurance and Real Estate sector

$$Y = 429 + 4.4X$$

Figure 1 (e): 1968 employment trend in Service sector

$$Y = 1,320 + 26.6X$$

Figure 1 (f): 1968 employment trend in Government sector

$$Y = 5,690 + 32.5X$$

Figure 1 (g): 1966-1968 year-end trend in Contract Construction sector

$$Y = 522 + 1.9X$$

In all the graphs the ordinate is the number of employees and the abscissa is in units of time. These graphs illustrate well the seasonal nature of employment in Fairbanks.