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The Projected Impact of Oil Shale Development on Housing in Uintah County, Utah

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THE PROJECTED IMPACT OF OIL SHALE DEVELOPMENT ON HOUSING IN UINTAH COUNTY, UTAH

by

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Roland K. Roberts

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ABSTRACT

The Projected Impact of Oil Shale Development

on Housing in Uintah County, Utah

by

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Utah State University, 1975

Major Professor: Dr. Robert F. Logan
Department: Economics

The purpose of this paper is to project the demand for housing due to oil shale development in Uintah County, Utah. An overview of the present housing conditions is presented to give a better understanding of the housing situation as it exists at the present time. The demand for housing due to oil shale development is based upon a set of assumptions which was derived from data collected by the author and from a review of the literature.

The demand for all housing units due to oil shale is estimated by subtracting the working wives of the employees from local service employment. The demand by type of structure (single, wife-family, multiple-family, and mobile homes) is estimated by making some assumptions about the types of housing each employment group (construction, operation, and local service) will demand.

(202 pages)

CHAPTER I

INTRODUCTION AND CURRENT CHARACTERISTICS

Introduction

Over the past two or three decades, there has been a shift in our national priorities away from concentration on national and international problems toward a focus on the problems of geographic sectors, regions, and counties and other forms of local governments. This is not to say that national and international priorities have become less important, but that the problems of the "subeconomies" within the nation have become more noticeable as some of our national goals have been reached.

Since the Great Depression, one of our national goals has been to achieve continuous prosperity by the use of fiscal and monetary policies. The period since World War II has been unique in that it has been marked as a period of prosperity with the exception of a few minor recessions. In this nation of prosperity, the subeconomies have not only attracted purely academic interest but they have also gained increased political notice. It has finally been recognized that achieving national prosperity has not eradicated the pockets of poverty and/or underdevelopment that exist in some regions of the United States. The realization that a nation which appears to be healthy and prosperous on the surface can have many internal difficulties within its various regions has been one of the main factors in shifting attention to the problems of the subeconomies.

These subeconomies and the national economy resemble each other in many ways. Aside from these similarities, there are a few characteristics which are peculiar only to the subeconomy. Regional and county economies have different industrial structures, trade with other regions or counties, different climates, and large and different varieties of tax structures. Also, as a whole, statistical information for these subeconomies is less adequate and less reliable than for the nation.[1]

In recent years many of our national and international goals have affected or have been directed toward the subeconomies of the United States. Examples are urban renewal, low-income housing programs, agricultural programs for the purpose of lifting income levels of the rural poor, and energy self-sufficiency for the nation. This paper will deal mainly with the goal of energy self-sufficiency, which is a national goal set up to make us more secure on the international front, and its effect upon the subeconomy of Uintah County, Utah.

The energy crisis and the Arab oil cartel have increased the belief among the leaders of the United States that to be dependent upon other nations for energy is to put ourselves at their mercy. The Arab oil embargo following the October War in Palestine is witness to this fact. In order to make this nation energy self-sufficient, various energy policies have been proposed. The leasing of government lands and mineral rights for oil shale development is one of them.

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[1]Ceanne Mitchell, Gordon S. Thompson, and Lynn A. Clements, *Uintah County, Utah: An Economic Study* (Salt Lake City, Utah: Center for Economic and Community Development, University of Utah, 1968), p. 11.

Increased domestic demand for energy, a desire to become energy self-sufficient, and increased foreign oil prices have directed the attention of this nation toward developing alternative energy sources. Oil shale provides great potential as a source of oil that can be refined into useable products. As the price of oil has gone up, oil shale development has become economically feasible.

If the world price of oil is above $11 a barrel, development at rapid rates is expected. The rate of return on investment would be about 20 percent, which would attract large amounts of capital. If the world price of crude oil were $7 a barrel, a minimum rate of return on investment of 15 percent would be expected. A price of $4 per barrel is not expected to attract the capital necessary to develop the oil shale resources.[2]

Many large oil companies have leased tracts of oil shale land in the Green River Formation of Utah, Colorado, and Wyoming. It is estimated that at least 1,800 billion barrels of oil lie in the oil shale reserves of the Green River Formation. About 10 percent of the higher grade reserves are located in the Uinta Basin of Utah, with 84 percent in Colorado and 6 percent in Wyoming.[3]

The law requires that before actual production can take place, environmental and socio-economic impact analyses must be made to assess the possible impacts on the environment and the people of the area in which production is to occur. The oil shale reserves of Utah

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[2]U.S., Department of the Interior, *Potential Future Role of Oil Shale: Prospects and Constraints*, Final Task Force Report, Federal Energy Administration Project Independence Blueprint (Washington, D.C.: Government Printing Office, 1974), pp. 3-4.

[3]*Ibid.*, p. 1.

lie in the Uinta Basin. The tracts of land which have been leased by the government to oil companies are located in the southern portion of Uintah County. A major portion of the socio-economic impact of the development of these Utah oil shale reserves will occur in Uintah County and most of that will occur in the Vernal area. Rio Blanco County, Colorado, and the city of Rangely are expected to absorb another large portion of the impact and Duchesne County, Utah, will probably receive a slight impact.

This study projects the impact of oil shale development in Uintah County, Utah, on housing. Since the oil shale reserves are located in Uintah County, the main emphasis of this study will be on Uintah County.

In order to understand and get a proper perspective of the impact of oil shale on housing, a review of the current housing situation and variables such as population, income, and employment which affect housing is needed. Much of the latest information about Uintah County can only be found in the 1970 census. The census information along with some more recent information gathered by the author and others is presented in the rest of this chapter. The first section is devoted to general characteristics of the county. A short overview of its geographic and economic setting is presented, followed by discussions of the county's climate, population, employment, and income characteristics. The second section presents the most recent housing information available to the author, most of which is obtained from the 1970 *Census of Housing*. The third section presents an overview of the land that is available and suitable for

residential development based upon land ownership, soil characteristics, degree of slope, drainage limitations, and access and service limitations.

The methodology used to project housing demand due to energy-related projects will be considered in Chapter II. Other factors that influence the demand for housing will also be discussed in Chapter II in order to help the author arrive at some assumptions for projecting the demand for housing due to oil shale development.

The assumptions about the characteristics of the project-related employees and their demand for housing will be presented in Chapter III. These assumptions will be derived from the literature reviewed in Chapter II and the data collected by the author for various counties which have experienced similar problems to those Uintah County might experience if oil shale is developed.

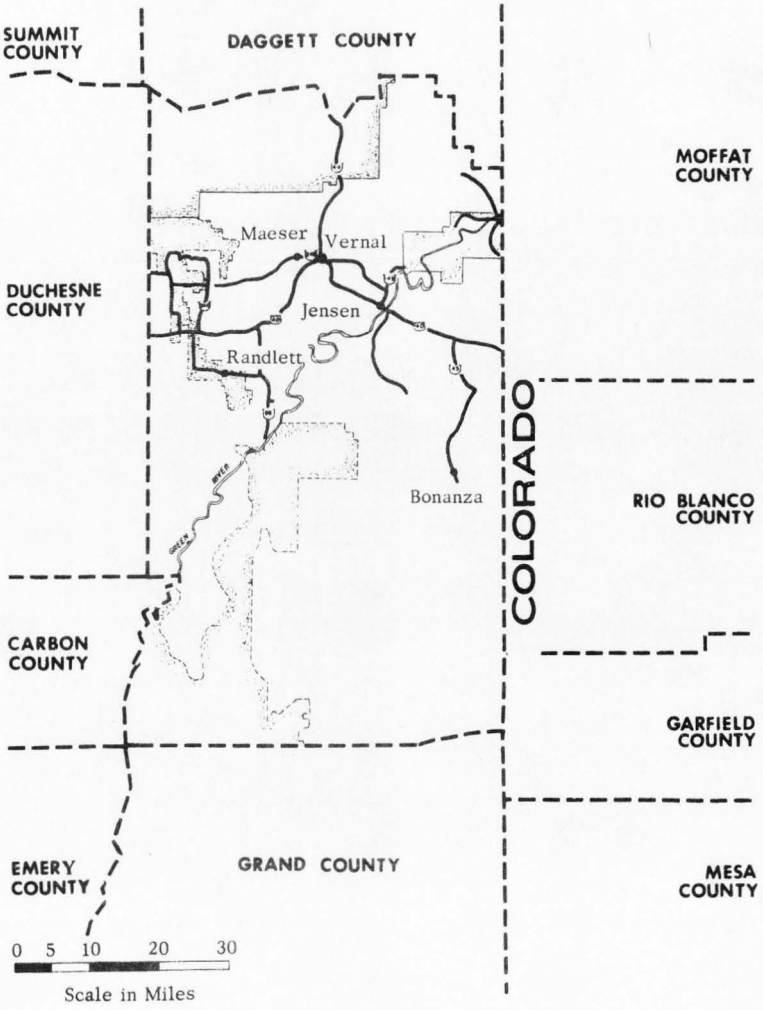
Chapter IV will present the projections of housing demand for a 20-year period based upon the assumptions of Chapter III, and the employment estimates presented to the author. The total demand and demand by type of structure will be estimated so that estimates of land use requirements and residential tax revenues due to the project can be projected. Land use requirements will be projected by the author, while residential tax revenues will be estimated in another study.

General Characteristics

Current perspective

Figure 1 shows Uintah County in its geographic setting. It is situated in the northeast portion of Utah. Its area is 4,476

orientation map
uintah county, utah



square miles. Its bordering areas are Colorado on the east, Daggett County on the north, Grand County on the south, and Carbon and Duchesne Counties on the west.[4]

The industries upon which the economy of Uintah County is based are oil production, mining, livestock, dairying, agriculture, and lumbering. The major mining products are gilsonite and phosphate rock. Eighty-five percent of the known gilsonite deposits of the world are found in Duchesne and Uintah Counties. Of these reserves, two-thirds are found in Uintah County and one-third is found in Duchesne County. Gilsonite is a hydrocarbon mineral which until recently was used mostly in paints, varnishes, and asphalt roads. In more recent years, with modern refining techniques, oils and raw gasoline have been produced from it. The gilsonite deposits as well as oil deposits were discovered around the turn of the century. Up until approximately 1961, gilsonite was the main product of the mining industry. In 1961, large deposits of phosphate rock were discovered close to Vernal. In 1948, the Ashley Valley Oil Field was discovered. Since then oil production has grown in relative importance each year. The recent oil boom started with the advent of the "Energy Crisis" in 1972 and 1973. Exploration drilling and the discovery of new oil fields in Uintah and Duchesne Counties have brought with them increases in population and a higher degree of economic activity.

The Bureau of Reclamation completed the Flaming Gorge Dam just north of Uintah County in 1962. It is true that the ninety-one-mile

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[4]Mitchell, Thompson, and Clements, *Uintah County, Utah*, p. 7.

long reservoir is not in Uintah County, but indications are that the tourist and recreational industries of the county have been stimulated by its presence in neighboring Daggett County.

A significant portion of the Uintah and Ouray Indian Reservation extends into the southwest region of Uintah County. The tribal headquarters are located at Fort Duchesne in Uintah County even though the majority of the reservation is located in Duchesne County. Economic conditions for the Indians on the reservation are below average. This is a problem that is being worked on by various federal and state government agencies which are operating within the reservation to assist in economic development.[5]

Climate

Uintah County is one of two counties which are included in the Uinta Basin. Duchesne County which borders Uintah County on the west is the other. The Uinta Basin has typically a semi-arid environment which is characterized by low relative humidity and temperatures that cover a wide range. In the summer during the hottest times of day, temperatures reach the 80's and 90's, but generally drop to the low 50's at night. Temperatures reach the other extreme during the winters with average January temperatures ranging from 20 F to 28 F. The mean annual temperature is 45 F.[6]

Agriculture has always been one of the county's leading industries. Growing seasons range from 90 days to 218 days during which

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[5] *Ibid.*, pp. 7-8.

[6] U.S., Bureau of Reclamation, Department of the Interior, *Final Environmental Statement for the Prototype Oil-Shale Leasing Program*, 2400-00785, Vol. I (Washington, D.C.: Government Printing Office, 1973), p. II-215.

records show frost-free conditions. The average growing season is about four months, beginning in late May and running into late September.[7]

In the lower elevations, precipitation averages 7 inches per year. The higher elevations average slightly more than twice as much as in the lower areas. About 55 percent of all precipitation falls during the growing season as rain, while the remaining 45 percent falls as snow during the winter. Most rainfall during the growing season comes from thunderstorms, which are short-lived but of high intensity. Most of the moisture resulting from these thunderstorms is lost through rapid runoff and evaporation. The Uinta Basin is characterized by light snowfall of about 30 inches per year. The soil is able to absorb most of the moisture because the spring snow melt is slow which lengthens the duration of the runoff.[8]

The Basin has little problem with wind erosion. Winds are strongest during the thunderstorms, but are irregular and light in general. Because of the semi-arid nature of the Basin, winds tend to evaporate moisture from the soil before it becomes available for plant use.[9]

Population and employment

Uintah County has only two racial classifications, Indian and white. Table 1 shows population trends at ten-year intervals from

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[7] *Ibid.*

[8] *Ibid.*

[9] *Ibid.*

1920 to 1970 for the Indian population and for the total population of Uintah County.

Table 1. Indian, total, and percent Indian population at ten-year intervals, 1920 to 1970

	1920	1930	1940	1950	1960	1970
Indian	1,133	783	1,031	1,076	1,190	1,337
Total	8,470	9,035	9,898	10,300	11,582	12,684
Percent Indian	13.4	8.7	10.4	10.4	10.3	10.5

Source: U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Population* (Washington, D.C.: Government Printing Office, 1920-1970).

As can be seen from Table 1, the Indian population has remained at about 10.4 percent of the total population for the last thirty years. The majority of the Indian population lives on reservation lands.

In order to understand changes in population trends, it is necessary to know what has happened in the economy. Table 2 shows what has happened to nonagricultural employment in the various industries between 1960 and 1970.

There was a slight increase in employment for most industries from 1960 to 1962. Total employment increased from 3,001 to 3,382 in this short period. Most of the increase was due to mining, service, and government employment. After 1962, employment in most industries declined or was relatively constant until 1968 when employment began to increase again. The whole ten-year period on the average can be

Table 2. Average yearly employees on nonagricultural payroll by industry, 1960 to 1970

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Manufacturing	165	151	144	151	131	117	114	121	125	189	249
Mining	838	977	1,095	898	862	884	805	795	712	817	711
Contract construction	376	224	181	90	118	132	179	152	157	188	180
Transportation, communications, & public util.	166	170	172	156	154	143	141	154	162	172	177
Trade	523	596	657	631	631	615	659	691	660	691	711
Finance, insurance, & real estate	59	55	57	62	68	66	84	81	74	72	74
Services	225	265	336	298	247	260	340	360	377	449	548
Government	649	646	740	794	789	806	864	867	896	841	860
Total	3,001	3,084	3,382	3,080	3,000	3,023	3,186	3,221	3,163	3,419	3,510

Source: Utah Department of Employment Security, *Utah Labor Market Information by Planning District and County, 1950-1973* (Salt Lake City, Utah: Utah Department of Employment Security, 1974), p. 116.

characterized as one of economic stagnation as indicated by these data which indicate constant or downward trends over most of the period.

During this same decade, the population as shown in Table 3 tended to be correlated fairly well with total nonagricultural employment. Population estimates increased from 11,700 in 1960 to 13,000 in 1963 and remained at approximately the same level or declined slightly until 1970 when an increase in population of 400 over that of 1969 was observed. The end result was a gain in population for the decade of 1,102.

Table 3. Annual population estimates for Uintah County, 1960 to 1970

Date	Population
April 1, 1960[a]	11,582
1960	11,700
1961	12,400
1962	12,800
1963	13,000
1964	12,800
1965	12,800
1966	12,600
1967	12,500
1968	12,400
1969	12,400
April 1, 1970[a]	12,684
1970	12,800

[a]U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Population* (Washington, D.C.: Government Printing Office, 1960, 1970).

Other source: James E. Crismon, *The 1971 Utah Population Report* (Salt Lake City, Utah: Utah Department of Employment Security, 1972).

The statistics of Table 1 show that total population has been increasing at a steady rate of about 1 percent per year between 1920 and 1970. Between 1950 and 1960, the population growth rate was a low 1.2 percent. The growth rate fell even lower between 1960 and 1970 to an annual average increase in population of 0.95 percent. This can also be taken as an indication that the economy in these years was somewhat stagnant. When the economy of a rural county stagnates, it becomes difficult for young people to find jobs, so they move to other areas where jobs are more plentiful. The fact that this has happened in Uintah County between 1960 and 1970 can be shown by the use of the information presented in Table 4.

Table 4. Net migration for Uintah County, 1960 to 1970

	Population
Population, April 1, 1970	12,684
Population, April 1, 1960	11,582
Net change in population, 1960-1970	1,102
Births, 1960-1970	3,178
Deaths, 1960-1970	886
Net natural increase	2,292
Net migration: Net population change minus net natural increase	-1,190
Net migration rate: Net migration as a percentage of population in 1960	-10.3%

Sources: U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Population* (Washington, D.C.: Government Printing Office, 1960, 1970); Utah State Department of Health, *Utah Vital Statistics, Annual Report* (Salt Lake City, Utah: Utah State Department of Health, 1960-1969).

Table 4 indicates that during this ten-year period there were 3,178 births by women residing in Uintah County and only 886 deaths, giving the county a net natural increase for the period of 2,292. Table 5 shows the trends in births and deaths between 1960 and 1970. During the decade, population grew by only 1,102. Therefore, net migration out of the county was -1,190, or at a rate of -10.3 percent for the entire period. An economy that would have sustained a 2 percent[10] growth rate in population instead of the actual economy that sustained a 0.95 percent growth rate was needed to achieve a net migration level of zero between 1960 and 1970.

Table 5. Annual number of births and deaths in Uintah County, 1960 to 1971

Year	Births	Deaths
1960	363	88
1961	419	103
1962	371	91
1963	354	92
1964	312	90
1965	282	91
1966	262	86
1967	262	83
1968	282	81
1969	271	81
1970	300	79
1971	343	82

Source: Utah State Department of Health, *Utah Vital Statistics, Annual Report* (Salt Lake City, Utah: Utah State Department of Health, 1960-1969).

[10]Net natural increase (2,292)/1960 population (11,582) = 2 percent.

The migration data above help explain the decline in average household size from 4.13 to 3.69 as shown in Table 6 for Uintah County. During periods of net out-migration, young people of the child-rearing age tend to leave the area to look for better jobs, while their parents who are already established tend to stay in the area to retire. This is borne out by the fact that median age increased from 20.7 in 1960 to 22.4 in 1970.[11] Also, as can be seen in Table 5, the number of births and deaths per year have declined between 1960 and 1970. As the birth rate declines, average household size tends to decline because there are less children per family. The declining death rate means that average household size will decline because people live longer and more housing units will be occupied by elderly couples or widowed elderly people who have no children living at home.

Average household size is an important variable for making population and housing estimates. If any two of the variables, population, number of housing units, and average household size are known or can be estimated, then the third can be derived from them. Trends in household size from 1960 to 1970 as shown in Table 6 indicate that average household size has been falling in the nation from 3.29 to 3.10 and that the state of Utah has been following this trend closely, although its averages are slightly larger. Uintah County is no exception to the state and national trends. Average household size has fallen, but as was stated above it has fallen considerably more

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[11] U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Population* (Washington, D.C.: Government Printing Office, 1960, 1970).

Table 6. Trends in average household size for the United States, Utah, and Uintah County, 1960 to 1970

	1970	1960	Total change	Annual change
Uintah County:				
Total	3.69	3.96	-0.27	-0.027
Owner	3.8	4.2	-0.4	
Renter	3.3	3.8	-0.5	
Utah:				
Total	3.46	3.62	-0.16	-0.016
Owner	3.7	3.9	-0.2	
Renter	2.8	3.0	-0.2	
United States:				
Total	3.10	3.29	-0.19	-0.019

Source: U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Housing* (Washington, D.C.: Government Printing Office, 1960, 1970).

than state and national averages because of net out-migration and declining birth and death rates.

Table 7 shows the trends in population, nonagricultural employment, births, and deaths for Uintah County from 1970 to 1974. Since 1970, population growth has increased rapidly. Table 7 shows that between April, 1970, when the Census of Population was taken and July, 1974, population grew from 12,684 to 16,000. This represents a growth rate of 26.1 percent for this period. The average annual growth rate comes to be 6.2 percent which is well above the annual growth rate of 2 percent that would have been required to have zero net migration during the 1960's. It can be seen, however, that this population increase has been accompanied by an increase in the birth rate in 1970 of twenty-nine over 1969 and another forty-three in 1971. The death rate has remained approximately constant since

1967. Because of these changes in trends, the zero net migration population growth rate since 1970 would probably be higher than 2 percent, assuming that the trend in births continued to increase from 1972 to 1974 as it did in 1970 and 1971. Unfortunately, data on births and deaths for Utah counties are not yet available since 1971 nor is an accurate census-type population figure for 1974 available. These limitations make it difficult to calculate net migration rates as was done between 1960 and 1970. It can be concluded, however, that the recent annual growth rate of 6.2 percent is well above the zero net migration rate, and that for the first time in many years there is net in-migration into Uintah County. In general, young people undoubtedly find it less necessary to leave the county to find acceptable jobs.

The largest jump in population since 1970 came between 1971 and 1972 with an increase of 1,100. There were increases of 800 between 1972 and 1973 and between 1973 and 1974. The increase between 1971 and 1972 represents an increase of 8.3 percent as compared to 3.9 percent the year before and 5.6 percent the year after. This coincides quite closely with the beginning of the energy crisis in 1972 and the renewed interest in the oil fields of Duchesne and Uintah Counties.

No accurate information exists on the trend in average household size, but there are several factors that would tend to lower it. Although in-migration means that more young people of the working and child-rearing age have come into the county to find work, it is not clear that average household size has increased because of it. On the contrary, many of the new people have been associated with

Table 7. Annual estimates of population, nonagricultural employment, and births and deaths for Uintah County, 1970 to 1974

	1970	1971	1972	1973	1974
Population[a]	12,684[b]	13,300	14,400	15,200	16,000
Nonagricultural employment[c]	3,510	3,852	4,655	4,909	5,439
Births[d]	300	343	NA[e]	NA	NA
Deaths[d]	79	82	NA	NA	NA

[a]Bureau of Economics and Business Review, "County Population Estimates for July 1, 1974," *Utah Economics and Business Review*, XXXIV, No. 12 (December, 1974), 6.
[b]U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Population* (Washington, D.C.: Government Printing Office, 1970).
[c]Utah Department of Employment Security, *Utah Labor Market Information by Planning District and County, 1950-1973* (Salt Lake City, Utah: Utah Department of Employment Security, 1974).
[d]Utah State Department of Health, *Utah Vital Statistics, Annual Report* (Salt Lake City, Utah: Utah State Department of Health, 1971.
[e]NA = not available.

oil-related jobs. Many of these people are single or have small families. Some, because of their transient nature, leave their families behind when they come for construction or oil work. Many of these highly mobile workers live in mobile homes. A field survey of forty mobile homes done in August, 1974, by the author in the area showed that 76 percent of the breadwinners of those mobile homes surveyed had employment associated with oil production. The average household size was 3.18, which is considerably lower than the 1970 census average household size of all units which was 3.69. Since mobile homes have accounted for 35.5 percent of the increase in

housing units between 1970 and 1975,[12] it can be said that average household size has probably decreased.

Table 7 also shows that nonagricultural employment began to increase more rapidly during the first half of the 1970's than it did during the 1960's, with the largest increase showing up between 1971 and 1972. A large portion of this increase was due to mining which includes oil production. However, employment in all industry classifications showed increases during this period.

Table 8 shows the age dependency ratio for Uintah County, Utah, and the United States in 1970. In general, people under eighteen years of age attend school and are therefore not in the labor force most of the time. People over sixty-five are generally retired and, therefore, excluded from the labor force. Many of those people over sixty-five receive social security or have saved money for retirement and are not dependent upon younger local people for support. But generally speaking, the people of these two groups contribute less to the local economy and therefore are supported by those people between eighteen and sixty-five years of age. In 1970, Uintah County had 51.4 percent of its population under eighteen or over sixty-five. This is 4.1 percent higher than the state average of 47.3 and 7.3 percent higher than the national average of 44.1. Given the high rate of net out-migration, these results are not surprising. We would expect a higher than average age dependency ratio during the 1960's because of out-migration of young working-age people.

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[12]See page 23.

Table 8. Age dependency ratio for the United States, Utah, and Uintah County, 1970

	Uintah County	Utah	United States
Persons under 18:			
Number	5,637	423,850	69,644,081
Percent	44.4	40.0	34.3
Persons over 65:			
Number	877	77,561	20,065,502
Percent	6.9	7.3	9.9
Total:			
Number	6,514	501,411	89,709,583
Percent	51.4	47.3	44.1
Median age	22.4	23.1	28.1

Source: U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Population* (Washington, D.C.: Government Printing Office, 1970), Tables 20, 35.

Table 8 also shows that the median age for Uintah County, 22.4, was lower than the state median age of 23.1 and much lower than the national median age of 28.1.

Table 9 shows mobility of households for the state of Utah, Uintah County, and Vernal City as measured by the numbers and percentages of households that moved into owner or renter occupied units between January 1, 1965, and March, 1970. As would be expected, mobility of renters was much higher than mobility of home owners. Of the renters, 91.6 percent moved in the five-year period as compared to 39.3 percent for home owners. Uintah County was more mobile than the state as a whole in all categories: 39.3 as compared to 33.7 for home owners, 91.6 percent as compared to 86.8 for renters, and 52.5 percent as compared to 49.9 percent for all occupants.

Vernal City was more mobile than the county for renters and the total, but less mobile for owner occupants. The United States as a whole had lower percentages of renter occupants move in the five-year period than did the other three areas.

Table 9. Mobility of households for the United States, Utah, Uintah County, and Vernal City as measured by changes of residence between 1965 and 1970

Area	Number and percent of households that moved in last 5 years					
	Owner occupied		Renter occupied		Total	
	Number	%	Number	%	Number	%
United States	14,386,605	36.1	17,481,720	74.2	31,868,325	50.2
Utah	69,603	33.7	79,194	86.8	148,797	49.9
Uintah County	1,008	39.3	795	91.6	1,803	52.5
Vernal	292	38.0	409	93.2	701	58.1

Source: U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Housing* (Washington, D.C.: Government Printing Office, 1970), Tables 36, 58, and 62.

Income

The Housing and Urban Development Act of 1968 provides that rent in public housing projects may not exceed 25 percent of a family's income.[13] Also, most institutions that provide mortgage loans generally will not lend more than 2.5 times the individual's

[13] Agricultural Experiment Station, *Housing in Rural Communities in the Four Corners Economic Development Region*, Special Report No. 15 to the Four Corners Regional Commission (Las Cruces, New Mexico: New Mexico State University, 1972), p. 21.

income.[14] Therefore, a knowledge of the income status of families is essential to enable a proper evaluation of housing demand.

Table 10 shows that Uintah County has a higher percentage of families who earn less than $10,000 a year (65.8 percent) as compared to the state average of 45.3 percent. Many of these families are unable to obtain mortgage loans for a permanent site housing unit. They therefore turn to mobile or modular units. Table 10 also shows that 13.9 percent of the families in the county are below the "poverty level," while only 9.1 percent are below the poverty level for the state. The poverty index is calculated by the Bureau of the Census. It takes into account not only income levels but size of family, sex of family head, number of children under eighteen years of age, and farm and nonfarm residence. The definition of poverty is derived on a national basis and does not reflect regional or state differences.[15]

Uintah County median income was $8,082 when the census was taken in 1970. This was $1,238 lower than the state median income of $9,320. Mean family income for Uintah County, $8,925, was $1,503 lower than the state average.

Housing

This study, having as a main goal the estimation of the projected impact on housing of oil shale development, must be based upon a

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[14] John C. Willis and Associates, *Kaiparowits New Town Study. II. An Update of the Kaiparowits New Town Study Prepared for the Kane County Commission, Kanab, Utah* (St. George, Utah: John C. Willis and Associates, August 20, 1974), p. 82.

[15] James M. Bowers and Associates, *Housing Report*, Prepared for Colorado West Area Council of Governments (Denver, Colorado: James M. Bowers and Associates, January, 1974), p. 57.

Table 10. Income characteristics of families for Utah and Uintah County, 1970

Annual income	Uintah County		Utah	
	Number of families	%	Number of families	%
Less than $3,000	303	10.1	22,031	8.8
$3,000-$5,999	525	17.4	38,459	15.4
$6,000-$9,999	1,154	38.3	77,728	21.1
$10,000-$14,999	700	23.2	69,116	27.7
$15,000 and over	331	11.0	42,407	17.0
All families	3,013	100.0	249,741	100.0
Median family income	$8,082		$9,320	
Mean family income	$8,925		$10,428	
Less than poverty level	419	13.9	22,802	9.1

Source: U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Population* (Washington, D.C.: Government Printing Office, 1970), Tables 57, 58, 124.

knowledge of housing characteristics which are taken from the most recent surveys, studies, and census. Most of the available information can only be found for 1970 from the Census of Housing. However, some information about housing characteristics in 1974 and 1975 has been gathered by the author and others.

Table 11 shows that there were 3,700 year-round housing units in Uintah County in 1970 and that total year-round housing increased by 1,913 units to 5,613 in 1975. This represents an increase of 51.7 percent for the five-year period, or 10.3 percent per year. Mobile

Table 11. Selected housing characteristics for Uintah County and Utah, 1970 and 1975

	Uintah County		Utah
	1970[a]	Jan. 1975	1970[a]
Total year-round housing units	3,700	5,613[b]	311,814
Single family units:			
Number	3,130[c]	NA[d]	234,484[c]
Percent	84.6	NA	75.2
Multiple family units:			
Number	570	NA	77,330
Percent	15.4	NA	24.8
Mobile homes:			
Number	297	976[b]	8,232
Percent	8.0	17.4	2.6
Owner occupied:			
Number	2,565	NA	206,570
Percent	69.3	NA	66.2
Renter occupied:			
Number	868	NA	91,364
Percent	23.5	NA	29.3
Vacant for sale only or for rent:			
Number	73	NA	6,947
Percent	2.0	NA	2.2
Other vacant:			
Number	194	NA	6,933[e]
Percent	5.2	NA	2.2

[a]U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Housing* (Washington, D.C.: Government Printing Office, 1970), Part 46, Tables 1, 2, 29, 60.
[b]From an unpublished study done by Mr. Jerrol L. Syme, Planning Advisor for Uintah Basin Association of Governments.
[c]Includes only occupied mobile homes.
[d]NA = not available.
[e]Includes units rented or sold, awaiting occupancy, and units held for occasional use and other vacant units.

homes accounted for 679 of the new units, which represents 35.5 percent of the growth in housing units. In 1975, mobile homes accounted for 17.4 percent of all housing units. It is also interesting to compare the 1970 percent of mobile homes in Uintah County (8.0 percent) with the state figure of only 2.6 percent. It seems reasonable to believe that this gap has grown even wider in 1975 even though data for the state are not available.[16]

Of the 3,700 housing units that existed in Uintah County in 1970, 3,130 (84.6 percent) were in single-family structures. This is much higher than the state percentage of 75.2. Total multiple family units were 570, or 15.4 percent of all housing units as compared to 24.8 percent for the state. It is also shown that 2,565 (69.3 percent) year-round housing units were owner-occupied, which is only about 3 percent higher than for the state. Renter-occupied units accounted for 23.5 percent of all units compared with 29.3 percent for the state.

In 1970, vacancy rates for units that were for sale only or for rent were 2.0 percent for Uintah County, which is only slightly lower than the state vacancy rate. The "other vacant" category for the state includes units that were rented or sold which were waiting occupancy and units that were held for occasional use as well as other vacant units. The category "other vacant" is composed of mostly dilapidated housing units which lack plumbing facilities and are undesirable to most people as dwelling units. As can be seen, the percentage of "other vacant" units in Uintah County is higher than that of the state. The difference would be even greater if units

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[16]For more information about the causes of growth in mobile home sales, see Appendix A.

held vacant for occasional use and units sold or rented but not yet occupied were eliminated from the state's "other vacant" category.

Field observation by the author and interviews with real estate agents in Vernal in August, 1974, and June, 1975, indicate that vacancy rates are near zero. People sell their housing units or rent them before they move out. This is frequently done without the use of real estate agents. The new owners or renters move in a day or two after the old owners leave. A unit is seldom vacant for longer than a day or two. There is evidence, however, that vacancies in mobile home parks in Vernal City were becoming evident as of March, 1975. Vernal City Planner, Ken Fisher, indicated, "the demand for mobile-home spaces has slackened during the past few weeks because of a recent slowing in oil production."[17] Real estate agents, however, indicate that vacancies in permanent housing units were still close to zero as of June, 1975.

Table 12 shows the median number of rooms per housing unit for Uintah County, for Utah, and for the United States. Owner-occupied units tend to be one room larger than renter-occupied units for Uintah County. The median number of rooms is 5.3 for owner-occupied and 4.3 for rental units.

Table 12 also shows that Uintah County had a larger degree of overcrowding than did the state or the United States. It had 17.0 percent of its occupied units with 1.01 or more persons per room, while the state had only 10.6 of its occupied units overcrowded.

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[17]"The Mobile-Home Situation: In Transit," *Shale Country*, April, 1975, p. 16.

Table 12. Median number of rooms per unit, number of overcrowded units, and overcrowding as a percent of all occupied units for the United States, Utah, and Uintah County, 1970

	Uintah County	Utah	United States
Median number of rooms[a]	5.3/4.3	5.4/3.9	5.6/4.0
Overcrowding 1.01 or more persons/room (number)	583	31,581	5,210,874
Overcrowding as a percent of all occupied units	17.0	10.6	8.2

[a]The first number is for owner-occupied units and the second is for renter-occupied units.

Source: U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Housing* (Washington, D.C.: Government Printing Office, 1970), Tables 2, 3, 29, 60.

The United States as a whole only had 8.2 percent of its housing units overcrowded. Information from the 1970 Census of Housing presented in Table 13 indicates that 5.8 percent of all year-round housing units in Uintah County lacked some or all plumbing facilities. This was somewhat above the state average of 2.5 percent, which is what might be expected based upon the rural nature of the county and the higher vacancy rate in the "other vacant" category of Table 7. The United States had more of its housing units lacking plumbing facilities than did either Uintah County or Utah. This table also shows that 3.3 percent of the housing units in Uintah County lacked any kind of running water in the structure and 1.1 percent only had cold running water in the structure. Five and one-half percent of the units lacked a flush toilet and 5.5 percent lacked a bathtub or a shower.

Table 13. Plumbing characteristics of all year-round housing units for the United States, Utah, and Uintah County, 1970

	Uintah County		Utah		United States	
	Number	%	Number	%	Number	%
Plumbing facilities						
With all plumbing facilities	3,484	94.2	304,312	97.5	62,984,221	93.1
Lacking some or all plumbing facilities	216	5.8	7,670	2.5	4,672,345	6.9
Lacking only hot water	0	0	983	.3	557,571	.8
Lacking other plumbing facilities	216	5.8	6,687	2.1	4,114,774	6.1
Piped water in structure						
Hot and cold	3,540	95.7	308,039	98.7	64,436,305	95.2
Cold only	39	1.1	1,849	.6	1,550,954	2.3
None	121	3.3	2,094	.7	1,669,307	2.5
Flush toilet						
For exclusive use of household	3,495	94.5	306,231	98.2	64,304,275	95.0
Also used by another household	0	0	2,278	.7	650,039	1.0
None	205	5.5	3,473	1.1	2,702,252	4.0
Bathtub or shower						
For exclusive use of household	3,497	94.5	305,660	98.0	63,741,678	94.2
Also used by another household	0	0	2,431	.8	659,789	1.0
None	203	5.5	3,891	1.2	3,255,099	4.8

Source: U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Housing* (Washington, D.C.: Government Printing Office, 1970).

Median contract rent, as indicated in Table 14, was $14 a month higher in Utah as a whole ($80) than it is for Uintah County ($66). Median value of an owner-occupied unit for the state was $16,800, which was $1,100 higher than the median value in Uintah County. Both Uintah County and Utah fell below the median rents and values for the United States. Vernal and Maeser had about the same median contract rents, but these were about $4 a month higher than for the county. Median value was highest in Vernal, dropping by $1,100 in Maeser and another $1,100 for the county as a whole. These statistics indicate that median value and contract rents are higher in the more densely populated areas of the county.

Table 14. Median value and contract rent for the United States, Utah, Uintah County, Vernal, and Maeser, 1970

	Maeser	Vernal	Uintah County	Utah	United States
Median contract rent[a]	69	70	66	80	89
Median value[b]	14,600	15,700	13,500	16,800	17,000

[a]Excludes single family homes on lots 10 acres or larger.
[b]Single family units on less than 10 acres.
Source: U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Housing* (Washington, D.C.: Government Printing Office, 1970).

The detailed breakdown of values and rents shown in Table 15 demonstrates that in 1970, 422 (27.5 percent) of the owner-occupied single family housing units on less than ten acres for Uintah County were valued at less than $10,000 as compared to 13.6 percent for Utah

Table 15. Value and contract rent breakdowns for the United States, Utah, and Uintah County, 1970

Value/contract rent	Uintah County		Utah		United States	
	Number	Percent	Number	Percent	Number	Percent
Value						
Specified owner occupied[a]	1,535	100.0	177,901	100.0	31,890,651	100.0
Less than $5,000	97	6.3	4,862	2.7	1,934,383	6.1
$5,000 to $9,999	325	21.2	19,434	10.9	4,966,494	15.6
$10,000 to $14,999	383	25.0	43,918	24.7	6,402,856	20.1
$15,000 to $19,999	447	29.1	50,407	28.3	6,435,399	20.2
$20,000 to $24,999	142	9.3	28,284	15.9	4,673,780	14.7
$25,000 to $34,999	83	5.4	20,522	11.5	4,436,325	13.9
$35,000 or more	58	3.8	10,474	5.9	3,041,414	9.5
Contract rent						
Specified renter occupied[b]	783	100.0	89,163	100.0	22,334,002	100.0
Less than $30	22	2.8	1,610	1.8	998,513	4.5
$30 to $39	54	6.9	3,080	3.5	865,910	3.9
$40 to $59	114	14.6	13,140	14.7	2,924,847	13.1
$60 to $79	251	32.1	23,004	25.8	4,097,994	18.3
$80 to $99	135	17.2	17,892	20.1	3,300,903	14.8
$100 to $149	65	8.3	19,768	22.2	5,544,673	24.8
$150 or more	--	0.0	5,272	5.9	3,273,591	14.7
No cash rent	142	18.1	5,397	6.1	1,327,571	5.9

[a]Limited to one-family homes on less than 10 acres.
[b]Excludes one-family homes on 10 acres or more.
Source: U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Housing* (Washington, D.C.: Government Printing Office, 1970), Table 61.

and 21.7 percent for the nation, and 52.4 percent were valued at less than $15,000 as compared with 38.3 for the state and 41.8 for the nation. Also, the table indicates that 441 (56.3 percent) of all renter-occupied units on less than 10 acres had monthly rents of less than $80 for Uintah County as compared with 39.8 percent for the United States. With the recent increase in economic activity and population, as well as nation-wide inflation, these values and rents are below 1975 levels, but more recent data are not currently available.

Table 16 gives the year the structure was built, the number built during that period, and the percentage of the total. For Uintah County, 30.8 percent of the housing units were built before 1940, which is lower than the state average of 34.9 percent, and still lower than the national average of 40.6. There were 26.8 percent of the structures built after 1960 in Uintah County, which compares quite closely to the percentage of 26.7 percent for the state and is higher than 25.0 percent for the nation. These percentages indicate that housing in Uintah County was slightly newer than for the state and the nation in 1970. In fact, if the rate of housing construction since 1970 has been faster in the county than the state, the average age of housing in the county may now be considerably less than in the state.

The number and percentage of housing units on public or private water systems, on public sewer systems, and with some form of central heating are shown in Table 17 for the United States, Utah, and Uintah County along with these as percentages of year-round housing units.

Table 16. Age of housing for the United States, Utah, and Uintah County, 1970

Year structure built	Uintah County		Utah		United States	
	Number	Percent	Number	Percent	Number	Percent
1969-3/1970	128	3.5	9,250	3.0	2,326,245	3.4
1965-1968	358	9.7	28,112	9.0	6,548,043	9.7
1960-1964	504	13.6	45,984	14.7	8,081,787	11.9
1950-1959	810	21.9	73,471	23.5	14,499,157	21.4
1940-1949	759	20.9	46,228	14.8	8,785,986	13.0
1939 or earlier	1,141	30.8	108,937	34.9	27,457,866	40.6

Source: U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Housing* (Washington, D.C.: Government Printing Office, 1970), Tables 35, 62.

Table 17. Water, sewage disposal, and heating characteristics for the United States, Utah, and Uintah County, 1970

	Uintah County			Utah			United States		
	Total	Rural only	Occupied rural farm	Total	Rural only	Occupied rural farm	Total	Rural only	Occupied rural farm
Units on water system (number)	3,057	1,772	301	296,114	48,989	4,425	55,293,575	6,781,412	333,675
As a percent of year-round housing	82.6	73.9	54.3	94.9	79.5	52.3	81.7	38.3	10.8
Units on sewer system (number)	1,622	389	26	258,649	18,307	1,060	48,187,675	3,291,284	77,759
(Percent)	43.8	16.2	4.7	82.9	29.7	12.5	71.2	18.6	2.5
Units with central heating (number)[a]	2,056	1,132	302	254,634	42,729	6,149	46,112,272	9,580,807	1,600,304
(Percent)	55.6	47.2	54.5	81.6	69.3	72.6	68.1	54.2	51.7
Total year-round housing units	3,700	2,397	554	311,982	61,620	8,465	67,699,084	17,696,604	3,094,679

[a]Includes steam or hot water heat, warm air furnaces, and built-in electric units.
Source: U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Housing* (Washington, D.C.: Government Printing Office, 1970).

Information for rural and occupied rural farm units is also shown. The table shows that 82.6 percent of all units in Uintah County were on water systems and that large percentages of rural (73.9) and occupied rural farms (54.3) were on water systems. Smaller percentages were shown to have been on public sewer systems, with only 16.2 percent of the rural and 4.7 percent of the occupied rural farm units on sewer systems. The method of sewage disposal in areas other than Vernal is predominantly septic tank or cesspool. The Vernal City sewage treatment plant is currently running to capacity, if not overloaded. Plans are being made that would provide a sewer system for the whole of Ashley Valley, which is where a large portion of the Uintah County population resides. At the present time, many of the new housing units or mobile homes that have moved into the valley but outside of Vernal are unable to meet the health standards required for building permit authorization because their septic tanks or cesspools would be below the water table.

As the table demonstrates, 55.6 percent of the housing units have some form of central heating, with 47.2 percent for rural and 54.5 percent for occupied rural farm.

Land

The suitability of land for residential development is an important consideration when growth is expected. What is the condition of the land in Uintah County and how much is suitable for development? This is the main concern of this section.

Five criteria for residential development of land will be considered. They are: (1) land ownership, (2) soil characteristics,

(3) the degree of slope, (4) drainage limitations, and (5) access and service limitations.

Table 18 shows the breakdown of land ownership and percentages for Uintah County as compared with the percentage breakdown for Utah as of 1969. Uintah County is composed of 2,862,080 acres of land. Sixty-four and nine-tenths percent of that is owned by the federal government, which is slightly lower than for the state (67.1 percent). Uintah County has a large Indian reservation and therefore has a higher percent of Indian lands of 14.4 percent compared with 4.1 percent for the state. State-owned lands compose 8.1 percent of Uintah County's land area and 7.2 percent for the state as a whole. The residential development that will take place as a result of oil shale will occur on private lands. Uintah County has a lower percentage of privately owned land than does the state of Utah. The percentages are 21.5 for Utah and 12.2 (349,931 acres) for Uintah County. This is low compared with neighboring Duchesne County with 37.6 percent private land and Rio Blanco County, Colorado, with 27.2 percent private land. Cities, towns, railroads, and small water areas make up 0.4 percent of Uintah County and 0.8 percent of the state.[18]

Figure 2 shows the geographic location of the land in Uintah County by ownership.[19] As can be seen, a large portion of the private

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[18]Berry Crawford, Herbert H. Fullerton, and W. Cris Lewis, *Baseline Description of Socio-Economic Conditions in the Uintah Basin*, Prepared for White River Shale Oil Project (Logan, Utah: Everton Printing, 1975), p. 98.

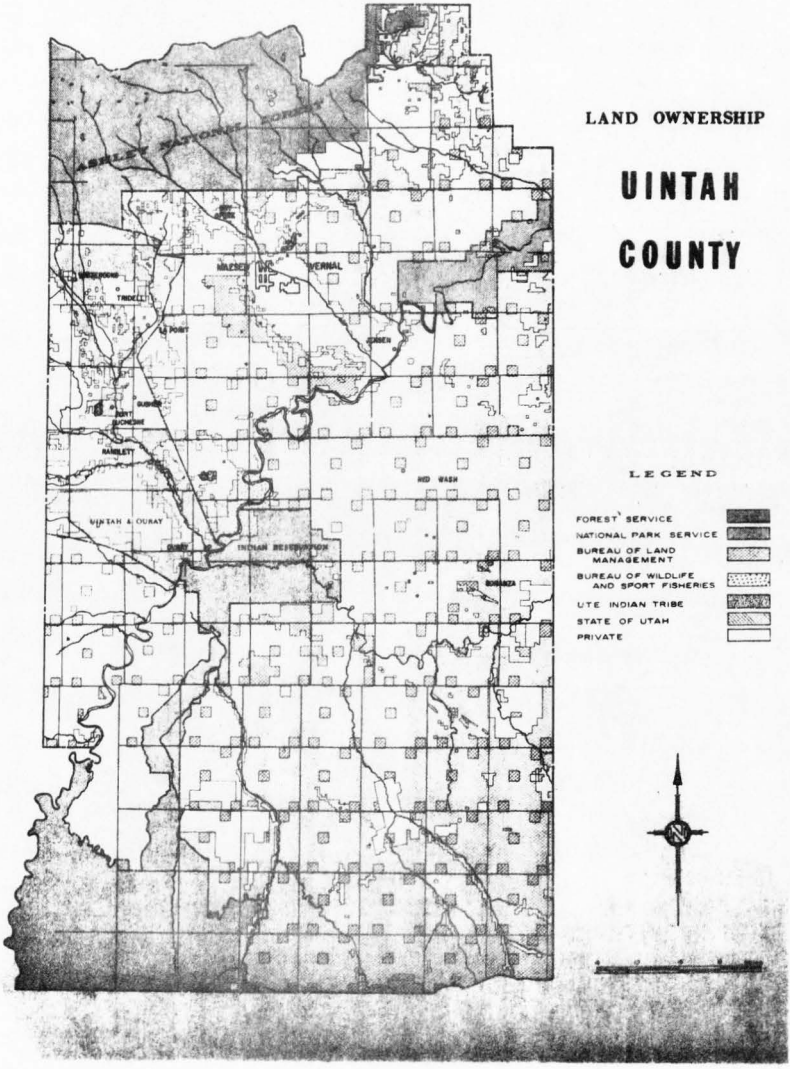
[19]Dale Despain and Associates Planning Consultants, *Comprehensive Plan Uintah County 1970-1990* (Provo, Utah: Dale Despain and Associates Planning Consultants, 1970).

Table 18. Land area in Uintah County by ownership

Ownership	Utah	Uintah County	
	Percent	Acres	Percent
Federal land	67.1	1,856,529	64.9
National forest		268,053	
Bureau of Land Management		1,438,404	
Department of Defense		93,376	
Sport fishing and wildlife		7,448	
National Park Service		47,989	
Bureau of Reclamation		1,258	
Indian land	4.1	411,023	14.4
State land	7.2	232,675	8.1
State Land Board		230,775	
State Fish and Game		1,848	
State Parks and Recreation		2	
Private land	21.5	349,931	12.2
Other	0.8	11,972	0.4
Cities, towns, and railroads		10,576	
Small water areas		1,396	
Total	100.0	2,862,080	100.0

Source: Berry Crawford, Herbert H. Fullerton, and W. Cris Lewis, *Baseline Description of Socio-Economic Conditions in the Uintah Basin*, Prepared for White River Shale Oil Project (Logan, Utah: Everton Printing, 1975), p. 98.

Figure 2. Land ownership in Uintah County. Source: Dale Despain and Associates Planning Consultants, *Comprehensive Plan Uintah County 1970-1990* (Provo, Utah: Dale Despain and Associates Planning Consultants, 1970).



LAND OWNERSHIP

UINTAH COUNTY

land is located in the Ashley Valley around Vernal. This is the area where the most growth due to oil shale is expected to take place.

Figure 3 divides Uintah County into nineteen different soil association areas.[20] Figure 4 describes the depth, type, and texture of the soil as well as the topography, elevation, and annual precipitation associated with the nineteen areas of Figure 3. This type of information is necessary when the land is being considered for residential development.

Figure 5 and Table 19 (which describes the criteria upon which the map was formulated) contain information about the limitations of the land in the Ashley Valley and other towns in the county for the support of small building foundations.[21] The limitations are described as slight, moderate, and severe. There are five criteria upon which the judgment is based. They are: texture, shrink-swell potential, permeability in inches per hour, depth to water table in inches, and the slope in percent.

Slope is not a factor which affects foundations to any great degree, but it is taken into consideration in Figure 4 because it does limit development. Slopes of 15 percent or less are considered as prime areas for development if they meet other criteria. Small scale low-density development can be undertaken on slopes of 15 percent to 20 percent. It is generally thought that slopes of over 20 percent are undesirable for development due to limitations on planning, relatively high development costs, and higher percentages of marginally

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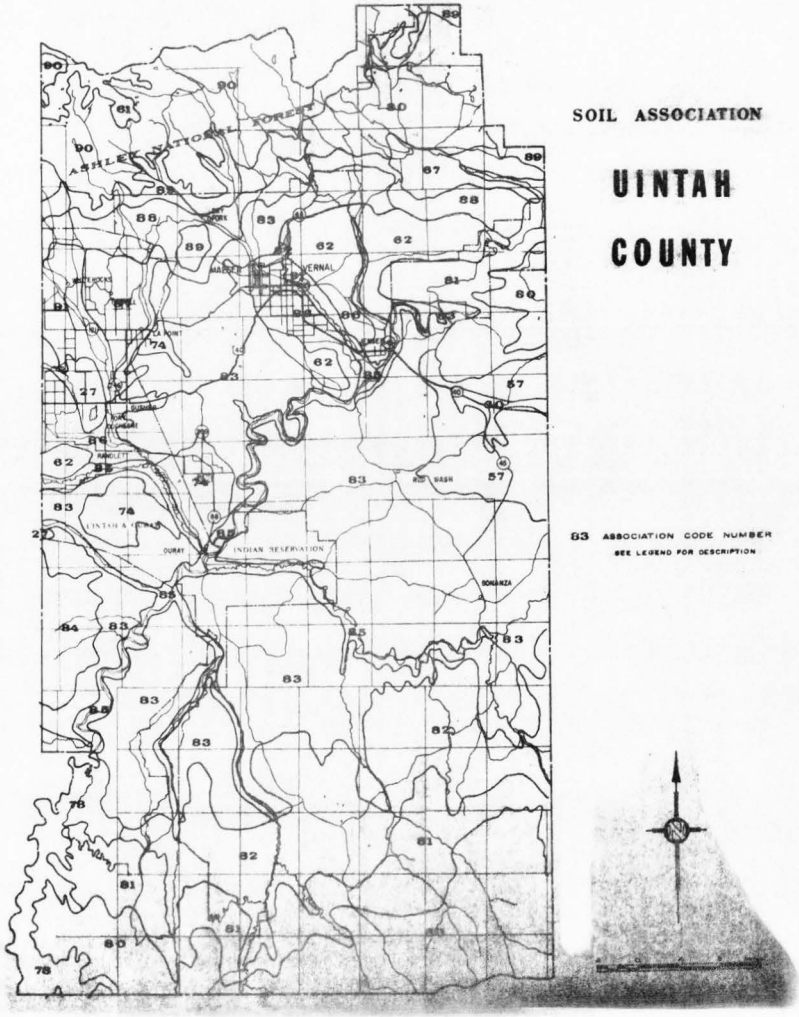
[20] *Ibid.*

[21] *Ibid.*

Figure 3. Soil Association, Uintah County. Source: Dale Despain and Associates Planning Consultants, *Comprehensive Plan Uintah County 1970-1990* (Provo, Utah: Dale Despain and Associates Planning Consultants, 1970).



SOIL ASSOCIATION

UINTAH COUNTY

83 ASSOCIATION CODE NUMBER
SEE LEGEND FOR DESCRIPTION

Figure 4. Legend for soil association map of Uintah County, Utah. Source: Dale Despain and Associates Planning Consultants, *Comprehensive Plan Uintah County 1970-1190* (Provo, Utah: Dale Despain and Associates Planning Consultants, 1970).

No. 81.
Shallow to moderately deep, clay loams and sandy loam textured soil; common shale and sandstone outcrops; rolling to steep mountain slopes; upper part of pinyon-juniper belt in Book Cliffs area. Elevation 6,500 - 7,200 feet. Mean annual precipitation 12 to 16 inches.

No. 82.
Shallow and very shallow, loam and sandy loam textured soils on rolling to steep upland slopes; common shale and sandstone outcrop; semi-desert; low part of pinyon-juniper belt in the Book Cliffs area. Elevation 6,000 - 6,800 feet. Mean annual precipitation 8 to 12 inches.

No. 83.
Shallow and very shallow, loam and clay loam textured soils on rolling hills and steep breaks; sandstone and shale outcrop and bad lands are common. Large desert area extending from the asphalt ridge to the pinyon-juniper belt of the Book Cliffs. Elevation 4,800 - 5,500 feet. Mean annual precipitation 6 to 9 inches.

No. 84.
Shallow to deep, loamy and clayey soils on broad terraces and rolling hills; considerable alkali effect; Eight-Mile Flat area. Elevation 4,900 - 5,300 feet. Mean annual precipitation 6 to 8 inches.

No. 85.
Deep, well drained to poorly drained, clayey to sandy textured, mixed alluvial soils along major streams and drainageways. Slopes are nearly level to gently rolling. Elevation 4,800 - 5,300 feet. Mean annual precipitation 6 to 9 inches.

No. 86.
Deep, moderately well to well drained, medium to fine textured soils; on valley flood plains in the Jensen Brush Creek and Ashley Valley areas. Elevation 5,200 - 5,500 feet. Mean annual precipitation 6 to 8 inches.

No. 88.
Shallow, stony loamy textured soils on rolling uplands and steep breaks; sandstone outcrop is common; pinyon-juniper belt at base of Uinta Mountains. Elevation 6,400 - 7,400 feet. Mean annual precipitation 12 to 16 inches.

No. 89.
Shallow to deep, clay loam to sandy loam textured soils on steep mountain slopes; sandstone outcrop is common; intermediate mountain slopes on south face of Uinta Mountains. Elevation 7,400 - 8,400 feet. Mean annual precipitation 16 to 20 inches.

No. 90.
Shallow to seep, medium to loam and clay loam textured soils on rolling to steep mountain slopes. Spruce-fir-aspen belt of the Uinta Mountains. Elevation 8,400 - 11,000 feet. Mean annual precipitation 20 to 40 inches.

No. 91.
Deep, well to poorly drained, very cobbly and very gravelly soils; on outwash fans and stream bottoms along the Uintah and Whiterocks Rivers. Elevation 5,400 - 6,000 feet. Mean annual precipitation 8 to 10 inches.

No. 27.
Moderately deep and deep, loamy textured soils with gravelly subsoils; poorly drained where improperly irrigated; Indian Bench and Leland Bench areas. Elevation 4,800 - 5,200 feet. Mean annual precipitation, 6 to 8 inches.

No. 57.
Shallow to moderately deep, loamy textured soils; on mesas and plateaus in Bonanza turnoff area; includes some deep alluvial soils and some rock land. Elevation 5,200 - 5,800 feet. Mean annual precipitation, 9 to 11 inches.

No. 60.
Deep, medium and moderately fine textured soils; on alluvial flood plains in the Bonanza turnoff area. Mostly greasewood flats, severe gully erosion. Elevation 5,200 to 5,600 feet. Mean annual precipitation 9 to 11 inches.

No. 61.
Mostly slide rock and rock outcrop with thin soil mantle in places; quartsite formation above timber line in Uinta Mountains. Sparse alpine vegetation. Elevation 11,000 - 13,500 feet. Mean annual precipitation, over 35 inches.

No. 62.
Shallow, loamy and clayey soils with common shale and sandstone outcrops; Asphalt Ridge, Buckskin Hills, Echo Park, and Independence areas. Elevation 5,000 - 6,200 feet. Mean annual precipitation, 6 to 9 inches.

No. 67.
Deep, loamy and clay loam textured soils, with gravelly and cobbly subsoils. Diamond Mountain. Elevation 7,000 - 8,000 feet. Mean annual precipitation, 12 to 18 inches.

No. 74.
Moderately deep to deep, loam and sandy loam textured soils with gravelly or sandy subsoils, containing a zone of lime accumulation. Leland Bench and Ouray Valley areas. Elevation 5,000 to 5,400 feet. Mean annual precipitation, 7 to 9 inches.

No. 78.
Steep rock outcrop with small inclusions of very shallow soil material. Green River breaks in Book Cliffs and Split Mountain areas. Elevation 5,000 - 8,000 feet. Mean annual precipitation 6 to 14 inches.

No. 80.
Shallow to deep, loamy to clayey soils on steep mountain slopes. Diamond Mountain and Blue Mountain areas. Elevation 7,000 - 8,000 feet. Mean annual precipitation 16 to 20 inches.

Figure 5. Limitations for small building foundations. Source: Dale Despain and Associates Planning Consultants, *Comprehensive Plan Uintah County 1970-1990* (Provo, Utah: Dale Despain and Associates Planning Consultants, 1970).

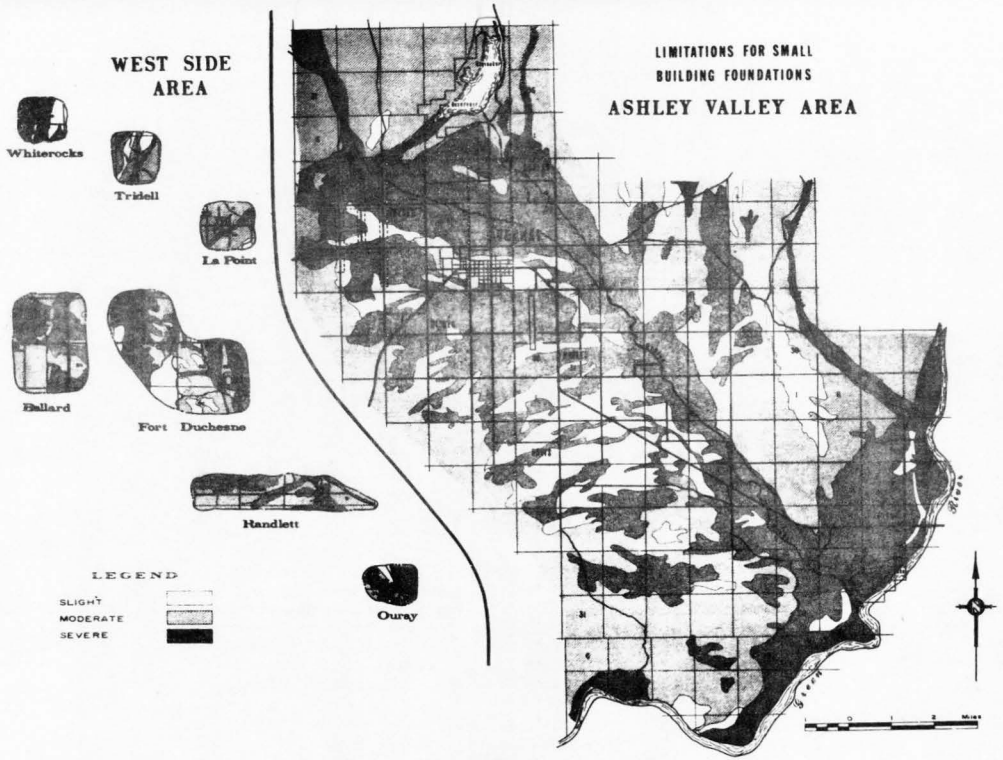

WEST SIDE
AREA
Whiterocks
Tridell
La Point
Ballard
Fort Duchesne
Randlett
Ouray
LEGEND
SLIGHT
MODERATE
SEVERE
LIMITATIONS FOR SMALL
BUILDING FOUNDATIONS
ASHLEY VALLEY AREA

Table 19. Criteria for soil limitations for small building foundations

Criteria	Degree of limitations		
	Slight	Moderate	Severe
Texture	Sand	Loamy sand	Loam
	Graveled sand	Loamy fine sand	Silt loam
		Sandy loam	Silty clay
		Fine sandy loam	Clay
		Very fine sandy loam	
		Heavy loam	
		Heavy silt loam	
		Sandy clay loam	
		Clay loam	
		Silty clay loam	
		Sandy clay	
Shrink-swell potential	Low	Moderate	Moderate to high
Permeability inches/hour	Greater than 2.0	0.63 to 2.0	0.063 to 0.63
Depth to water table in inches	Greater than 60	40 to 50	Less than 40
Slope in percent	Less than 10	10 to 20	20 to 30

Source: Dale Despain and Associates Planning Consultants, *Comprehensive Plan Uintah County 1970-1990* (Provo, Utah: Dale Despain and Associates Planning Consultants, 1970).

usable and unusable land.[22] These areas also have severe limitations as to sewage disposal and water supply.

Figure 6 shows the topography of Uintah County with contour lines representing 500 feet. The county is divided into three areas. The northern portion contains the western portion of the Uinta Mountains with elevations ranging from 6,000 to 12,000 feet. This is a rugged area and has changed little from its natural condition. It is an unpopulated area.[23]

The central portion is part of what is referred to as the Uinta Basin. The Basin extends into Duchesne and Rio Blanco Counties. It is designated as the Uinta Basin because all land slopes upward from the center. Most of the urbanization and irrigated cropland of the county is located in the Basin.[24] The area around Vernal in the Ashley Valley is a relatively flat area. Contour lines are smooth, indicating that the land is evenly distributed with few cliffs such as are typical to the north and south of the Uinta Basin.

The Tavaputs Plateau is the southern and third physical area of the county. It is a dry area characterized by a highly dissected topography. Urbanization and irrigation are practically nonexistent. It is mostly used for grazing and mining. Figure 7 shows that most

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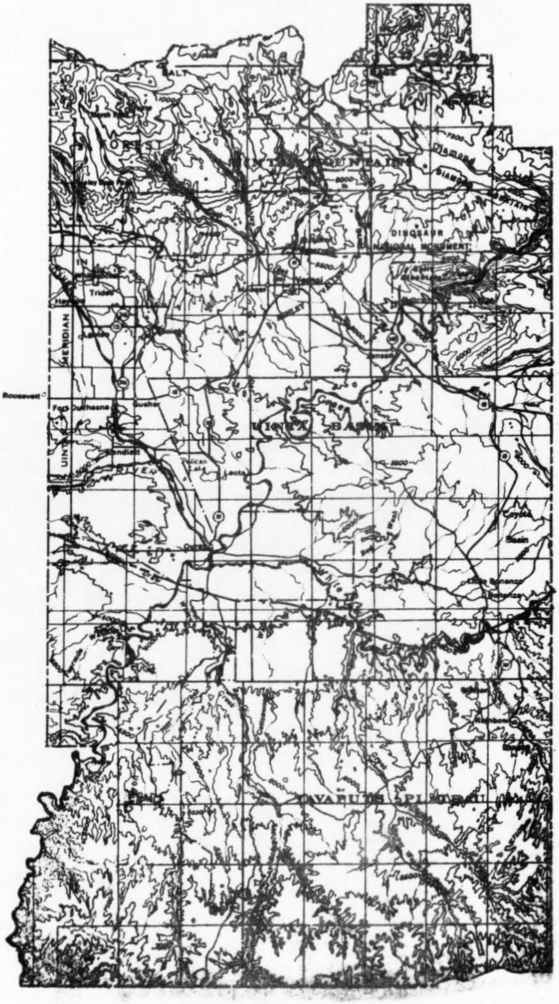
[22]THK Associates, Inc., *Impact Analysis and Development Patterns Related to an Oil Shale Industry* (Denver, Colorado: THK Associates, Inc., 1974), p. 54.

[23]Despain and Associates, *Comprehensive Plan*, p. 54.

[24]*Ibid.*

Figure 6. Topography of Uintah County. Source: Dale Despain and Associates Planning Consultants, *Comprehensive Plan Uintah County 1970-1990* (Provo, Utah: Dale Despain and Associates Planning Consultants, 1970).

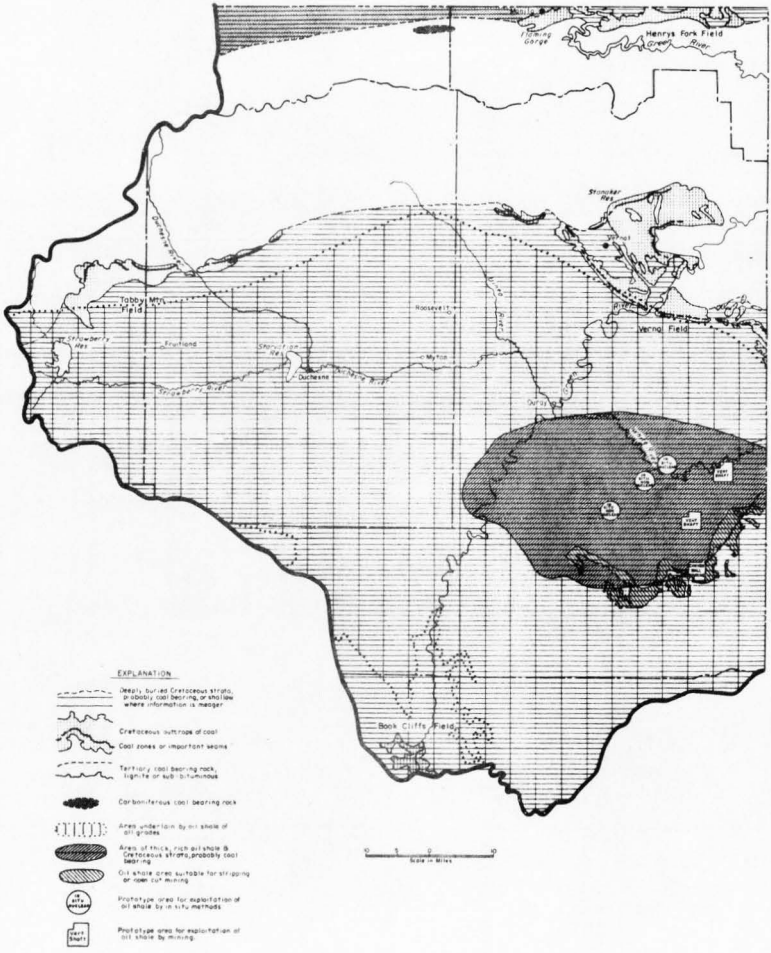


UINTAH COUNTY

TOPOGRAPHY

Figure 7. Coal fields and oil shale deposits. Source: Berry Crawford, Herbert H. Fullerton, and W. Cris Lewis, *Baseline Description of Socio-Economic Conditions in the Uintah Basin*, Prepared for White River Shale Oil Project (Logan, Utah: Everton Printing, 1975).

COAL FIELDS AND OIL SHALE DEPOSITS



of the rich oil shale that is proposed for development is located in this portion of the county.[25]

While most of the mining will occur in the dry rugged Tavaputs Plateau area, it is unlikely that this area will support the large population that will result if the oil shale is developed. It is expected that most of the population will locate in the Ashley Valley around Vernal where conditions are much better. Although the possibility of building a new town near the oil shale area is being considered at the present time, the present study assumes that Uintah County will absorb a large portion of the population increase, and that most of it will be located in the Ashley Valley.

Another factor which gives an indication of the desirability of land for development is drainage limitations and overflow hazard. Figure 8 shows this information for the Ashley Valley area and various towns to the west of it.[26] In the immediate area around Vernal, soil drainage ranges from well drained on the east to somewhat poorly drained in Vernal to the west and poorly drained on both the north and the south. The southwestern area around Maeser and in Maeser contains land that is well and moderately well drained. The area around Jensen is well drained, but it has some potential overflow hazard to the south.

Well drained areas generally have water tables below 60 inches from the surface except after irrigation. Moderately well drained areas have water tables between 40 and 60 inches part of the year.

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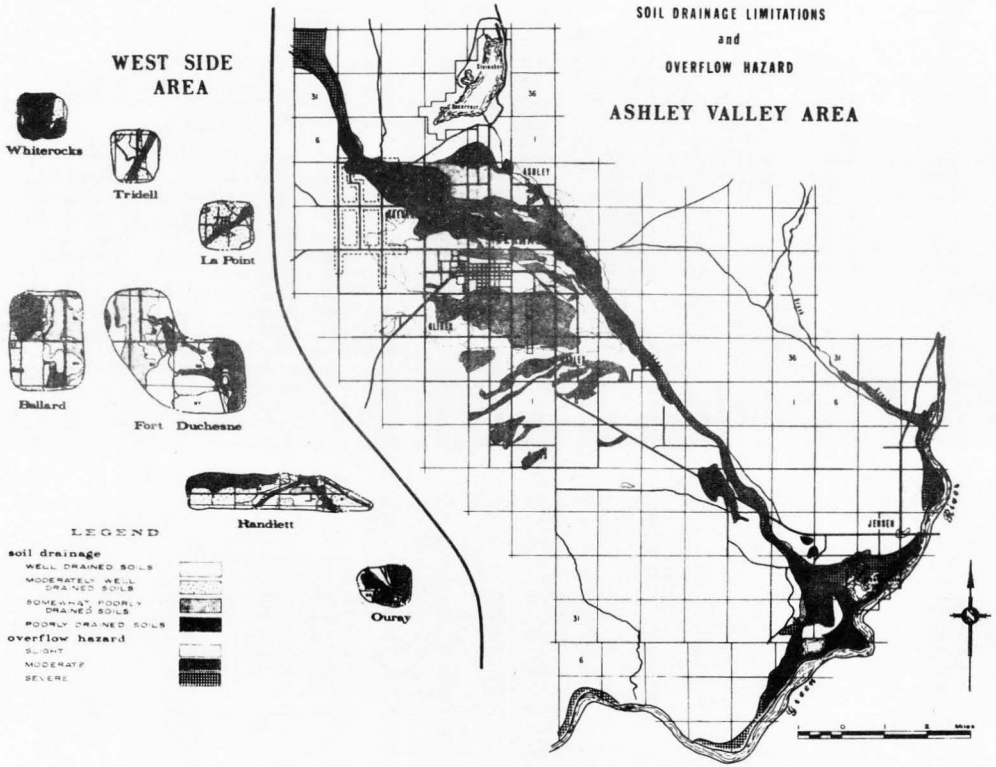
[25]Crawford, Fullerton, and Lewis, *Socio-Economic Conditions.*

[26]Despain and Associates, *Comprehensive Plan.*

Figure 8. Soil drainage limitations and overflow hazard. Source: Dale Despain and Associates Planning Consultants, *Comprehensive Plan Uintah County 1970-1990* (Provo, Utah: Dale Despain and Associates Planning Consultants, 1970), p. 197.


SOIL DRAINAGE LIMITATIONS
and
OVERFLOW HAZARD
ASHLEY VALLEY AREA
WEST SIDE
AREA
Whiterocks
Tridell
La Point
Ballard
Fort Duchesne
Randlett
Ouray
LEGEND
soil drainage
WELL DRAINED SOILS
MODERATELY WELL DRAINED SOILS
SOMEWHAT POORLY DRAINED SOILS
POORLY DRAINED SOILS
overflow hazard
SLIGHT
MODERATE
SEVERE
ASHLEY
JENSEN
Green River
Uintah River
0 1 2 Miles

Water tables for the somewhat poorly drained areas are from 20 to 40 inches, while they are from 0 to 20 inches for poorly drained areas.[27]

The implications of Figure 8 are that most of the land around Vernal is not suited for basements because of high water tables. Few houses in Vernal have basements, which means that more surface area is needed to build a house with the same number and size of rooms than if a basement could be built. This will have to be taken into consideration when considering residential land use potential from oil shale development.

Figure 9 shows limitations for septic tank filter fields for Ashley Valley and other areas.[28] The soil characteristics and qualities considered in this figure are depth to impervious material, permeability, drainage, water table, flooding frequency, and slope. The areas indicated on the map are general classifications and may contain slight portions of other limitation classifications.[29]

Most of the Ashley Valley is classified as having severe limitations to septic tank use. In these areas the water table is too high and the soil too permeable, which results in water pollution.

Vernal City has a sewage system and is included in an area of moderate limitations. Maeser is also included in an area of slight to moderate limitations. Outside of Vernal the main form of waste disposal is by septic tank. Residential building permits many times cannot be issued for areas outside of Vernal because the building

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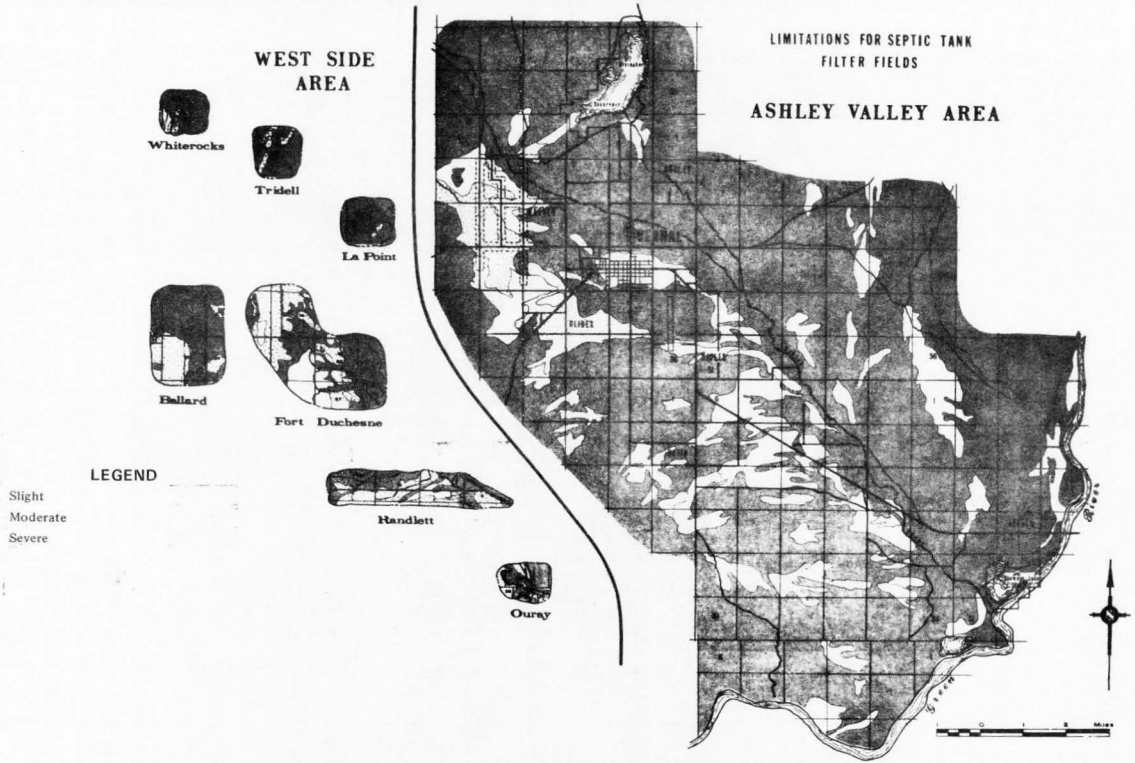
[27] *Ibid.*

[28] *Ibid.*

[29] *Ibid.*, p. 19.

Figure 9. Limitations for septic tank filter fields. Source: Despain and Associates, *Comprehensive Plan*, 1970).


LIMITATIONS FOR SEPTIC TANK
FILTER FIELDS
ASHLEY VALLEY AREA
WEST SIDE
AREA
Whiterocks
Tridell
La Point
Ballard
Fort Duchesne
Randlett
Ouray
LEGEND
Slight
Moderate
Severe
Miles

sites fail to pass health standards with respect to sewage disposal. The Vernal sewage treatment plant is currently running at capacity, but plans are being made to build a plant that would service all of the Ashley Valley. When and if it is completed, it would make the valley more desirable for development.

Another limitation to development is the accessibility of the land and the presence of services for the people. Much of the land in Uintah County that is classified as good land for residential construction under the other criteria will not be developed because there is not a suitable transportation system to link it with the oil shale fields and other public services. It may be found, upon studying the costs and benefits, that transportation systems to these areas are not feasible to build. Also, in some areas around Vernal development may not be feasible depending upon whether services such as sewer, water, and police protection can be extended to service new subdivisions. At the present time and as of October 1, 1974, water connections onto the Vernal system are not authorized if an extension of the water line is required to service the connection. Conditions such as these have to be taken into consideration when lands are being considered for residential development. The Ashley Valley qualifies as the prime area based upon access and the provision of services. Still, if most of the development is to occur there as a result of oil shale, the provision of public services will have to be extended. This aspect is currently being taken up by Nancy Robertson in a Master of Science thesis at Utah State University.[30]

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[30]Nancy Robertson, "The Projected Impact on Local Government Services Resulting from Oil Shale" (unpublished MS thesis, Utah State University, Logan, Utah, 1975).

The land in the Ashley Valley has several limitations for residential development because of drainage and septic tank problems. Most of these problems could be eliminated by the construction of a sewer system which would include a larger portion of the valley. It appears that there is more than enough land in Uintah County and the Ashley Valley to accommodate the development that will occur if oil shale is developed. There is suitable land in other areas closer to the oil shale fields, but services would have to be provided before development could occur. An analysis of the costs and benefits of these two alternatives would prove quite useful.

Conclusion

This chapter has presented present and past characteristics of housing, population, employment, income, and other relevant information pertinent to housing in Uintah County. If oil shale is developed in southern Uintah County, this information will be useful in evaluating the demand for housing by oil shale-related employees.

CHAPTER II

REVIEW OF LITERATURE

Regional Impact Studies

Several different approaches have been taken to projecting housing needs resulting from large-scale projects similar to oil shale development. This chapter will discuss the methods used in some studies that have recently been completed.

The Navajo coal gasification project

One of the recent impact studies was prepared by Development Research Associates and Gruen Associates for El Paso Natural Gas Company and Western Gasification Company to study the feasibility of two coal gasification complexes and accompanying coal mines on the Navajo Reservation south of Farmington, New Mexico.[1] The study projects housing needs for both Navajo and non-Navajo families for a new town based on three sets of assumptions about the basic economy of the new town:

1. The new town will serve one coal gasification plant and accompanying mine.

2. The new town will serve two coal gasification plants and mines.

3. The new town will serve two gasification plants and mines, and the Navajo Indian Irrigation Project.

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[1]Development Research Associates, *Housing and Community Services for Coal Gasification Complex Proposed on the Navajo Reservation* (El Paso, Texas: Gruen Associates, April, 1974)

The projected housing needs for these sets of assumptions are derived from an economic systems model which uses the flow of dollars between different sectors of the new town's economy and the outside world.

Total population is calculated by determining the number of non-basic employees required to supply adequate goods and services to the basic employees and their families. Further goods and services are required for the non-basic employees which generates more non-basic employment. This cycle is repeated until a balance between non-basic and basic employment is reached.

Average household size is also an important element in determining housing needs. Household size is calculated by inspecting trends and making an assumption of size based on the best information. Average household size becomes an input into the model. By combining it and total population, the model will produce results showing the number of households in the new town for Navajos and non-Navajos. By combining total population, number of households, average household size, and Navajo to non-Navajo mix, projected impacts on housing are calculated for the three project alternatives.

The potential housing requirements are calculated by establishing the different types and sizes of housing units to be provided. These include three single-family sizes of two, three, and four bedrooms; two multiple-family sizes of one and two bedrooms; two sizes of mobile homes of single-wide and double-wide; and group quarters. The next step was to estimate the percentages of households and individuals who would desire each type of housing. This was not estimated by

considering ability to pay, but rather it was estimated by the space and number of bedrooms required for various family sizes. For example, those workers who would be single or commute home on weekends would live in group quarters. Space and bedroom requirements are based upon trends, interviews, and assumptions made by the authors. It was concluded that non-Navajos on the average require larger housing units than Navajos because of the different housing background. Navajos come from a large family single-room structure culture and, therefore, prefer less bedrooms.

The study concluded that conventional housing would be priced out of the range of almost all families. Therefore, modular housing would be required for single-family units at a cost of $15 per square foot instead of the alternative $25 per square foot for conventional housing. Multiple-family dwellings were assumed to be provided by conventional construction at $19 per square foot. Mobile homes would be provided at $10 per square foot. Monthly payments were calculated using interest rates that the authors felt would be prevailing at the time of construction. Modular unit payments were calculated from terms of thirty years at 8 percent interest. Payments ranged from $126 for two bedrooms to $187 for four bedrooms. Monthly payments for multiple-family units would be $105 for one bedroom and $126 for two bedrooms. Single-wide mobile homes were assumed to have terms of fifteen years at 11 percent interest per year. Monthly payments would be $82 for the single-wide and $114 for the double-wide with the same terms. All monthly payments include only interest and principal payments and exclude maintenance, park rent, and other costs.

A housing-money gap was calculated by assuming that each income group would spend only a certain percentage of its income on housing per year. Three scenarios of assumptions were made. Scenario A was an upper limit with the upper income group averaging 14 percent of income for non-Navajos and 12 percent for Navajos. Scenario B was the moderate estimate, and scenario C was the lower limit with upper income groups averaging 10 percent for non-Navajos and 9 percent for Navajos. Total funds from households were calculated for each scenario. The difference between this and total housing costs was called the housing-money gap and was assumed to be the amount of subsidy required if housing needs were to be met.

The Navajo Gasification Plant study is applicable in many ways to the study done in this paper, but there are several differences. First, the Navajo study deals with two racial groups, Navajos and non-Navajos. It is true that Uintah County has a large Indian population, but only a negligible portion of the employment will be Indian. Therefore, racial differences will be disregarded in the present study.

Another difference is the way population and household projections are used to project housing demand. The Navajo study divides the households up and assigns them to a type of housing unit according to family size. Whether the family can afford the unit is not taken into consideration. In contrast, the present study will take total population and household figures and assign them to a type of housing according to the ability to pay of the household, as well as according to some assumptions that will be made about the preferences of

the various types of employees. For example, construction workers in the past have always demanded larger percentages of mobile homes than other employees because of their transient nature. Therefore, many of them purchase mobile homes rather than spend more for housing even though they could afford it.

The housing-money gap will not be applicable because families will demand the housing they can afford or, in the case of construction workers, something less than they can afford. No government subsidy will be needed to fill the cost gap between desired housing that meets assumed needs and the ability to pay of households.

The Kaiparowitz Socio-Economic Study

The Kaiparowitz Socio-Economic Study prepared by the Center for Business and Economic Research of Brigham Young University for Bechtel Power Corporation contains an analysis of the impact on housing of a proposed 3,000 megawatt power plant in Kane County, Utah.[2] The study makes three different estimates for employment, population, and housing, etc., based upon whether an optimistic, pessimistic, or expected outlook is taken. This approach gives lower and upper limits to the expected outlook.

The study estimates housing requirements for both the construction phase and the operation phase. The construction phase would run from 1975 to 1980 with population associated with the project going from 1,100 in 1975 to about 13,400 in 1980. Population would level off to 14,000 by 1986 during the operation phase. It is expected that some

[2]Center for Business and Economic Research, *Kaiparowitz Socio-Economic Study* (Provo, Utah: Brigham Young University, February, 1973).

of this increased population would occupy housing units vacated as basic employment at the Navajo project decreases to its operating level in 1978. Other households would locate in Page or other areas.

Housing requirements are estimated based upon the population over nineteen years of age. The 1970 census indicates that 0.55 is the ratio of heads of household to population over nineteen for urban areas, excluding SMSA's, over 10,000 people. The population over nineteen for the Kaiparowitz area is projected and multiplied by the ratio 0.55 on the assumption that this ratio would hold for the Kaiparowitz project. This operation gives estimated total units required for the project.

The estimates of total units are broken down into two types of housing: mobile homes, and conventional homes and multiple dwelling units. These divisions are made based upon the following assumptions: (1) all construction workers would live in mobile homes, and (2) in the early stages, large proportions of the operation and indirect employees would also live in mobile homes. By 1986, however, only about 30 percent would live in mobile homes and the rest would live in multiple family or conventional units. Based upon these assumptions, the study projects that about 30 percent of all housing units would be mobile homes.

The Kaiparowitz New Town Study II

The Kaiparowitz New Town Study II,[3] which is an update of a previous new town study for the same project, was prepared for the Kane

[3]Willis and Associates, *Kaiparowitz New Town Study*.

County Commission in August, 1974. It uses the housing estimates of the Kaiparowitz Socio-Economic Study and considers whether the employees associated with the project will be able to afford the needed housing.

In the United States, most banks and savings and loan institutions will not lend more than 2.5 times a person's annual income for housing. A person with an income of $12,000 could borrow $30,000, which under existing conditions would make it possible for him to buy any type of housing unit he desires. The study presents a table of monthly payments per $1,000 of mortgage debt at various interest rates, which is used to estimate prices people can afford to pay. Suppose a family could afford a monthly payment of $155 for housing. At 9.0 percent interest, the monthly payment per $1,000 of debt would be $8.39. By dividing $155 by $8.39, the amount of money a family could afford to borrow would be 18.474 times $1,000, or $18.474.

The above study does not use the information it presents to draw any conclusions about the mix of housing units that will be demanded. If prices of the various types of housing were available, along with incomes of employees resulting from oil shale development, then lower limits could be set on the number of mobile homes demanded. For example, if it were assumed that all housing units with prices less than $20,000 were mobile homes, then it could be said that at 9 percent interest, people who could not afford to pay over $168 a month would buy mobile homes or possibly modular homes. This would be true given the assumptions, but it could not be inferred that

people who could afford over $168 a month would buy conventional single-family units. These people may choose the lower monthly payment required by a mobile home and spend less than 25 percent of their income on housing.

The THK Associates study

Another study prepared by THK Associates, Incorporated,[4] in February, 1974, adds insight into how housing impact analyses concerning oil shale have been done in the past. The *Impact Analysis and Development Patterns Related to an Oil Shale Industry* was prepared for Colorado West Area Council of Governments and the Oil Shale Regional Planning Commission. It studies the impact of oil shale development upon Rio Blanco, Garfield, and Mesa Counties in Colorado. A moderate and an intensive profile are used with respect to the intensity of oil shale development and a multiplier of two is assumed in the projection of total employment and population with real incomes assumed to rise at a rate of 3.5 percent per annum.

Estimates of housing are made based upon three assumptions:

1. It is assumed that permanent or site housing, which includes both renter and owner-occupied units, will be made available to those who desire it as soon as they move into the area. If the required permanent housing is not provided, more mobile homes will be demanded.

2. Employees are less likely to demand site housing in the early stages of oil shale development because the employees will be less likely to perceive the industry as permanent. To cope with this

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[4]THK Associates, Inc., *Impact Analysis.*

problem, the fourteen-year period studied was divided into two phases. In the first eight to ten years, it is assumed that residents will not perceive the industry as totally permanent. The following four to six years will bring a growing awareness that the industry is a success and that it will be around for a long while. During phase II, some mobile home residents will desire site housing.

3. Incremental increases in demand were calculated on a gradual increase basis. This takes into account that supply of housing usually lags behind demand for housing, sometimes by several years. This can cause great fluctuations in incremental housing needs. The study assumes that good planning and the market will smooth out these fluctuations. It was assumed that these fluctuations in incremental requirements would be no more than 5 to 10 percent per year.

Some further assumptions about the type of housing (mobile homes or permanent site housing) demand by the employees associated with the project were also made. At least 80 percent of the construction workers were assumed to come without families during phase I of the project. These people would bring campers, trailers, or mobile homes, or would be seeking boarding-type housing. This high percentage results from the transient nature of most construction workers. The workers would also assume that site housing would not be available in such isolated rural areas. Also, in phase I the industry would not be perceived as permanent by the workers.

During phase II, as the industry began to be looked at as a permanent part of the area, more construction workers would bring their families and seek site housing. By the fourteenth year, they

estimate that 60 percent would seek site housing if the industry appears to continue to grow.

Plant employees are assumed to perceive their situation as more permanent. Therefore, 75 to 80 percent will bring their families and seek site housing. Ninety percent of plant management was assumed to buy or rent site housing within three years after arrival. The total demand for housing by plant management was entered as a total in the third year after arrival.

It was believed that a large portion of the local service employment represented two workers per family, and that many were spouses of plant employees. Based on these assumptions, housing demand was estimated at 50 percent of local service employment. During phase I, 25 percent of this 50 percent was assumed to demand mobile homes. This was reduced to 20 percent during phase II, with the remainder seeking site housing.

The THK study[5] mentions ability to pay, but does not take it into account as a determinant of the type of housing unit demanded. Rather, it assumes that if people desire a certain type of housing, it will be made available to them and they will be able to buy it. Certainly the quantity demanded at any given price is related to the consumers' willingness to pay, but it is also dependent upon whether the consumers are able to pay.

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[5] *Ibid.*

The Bowers and Associates study

James M. Bowers and Associates prepared a report for the Colorado West Area Council of Governments in 1974 entitled *Housing Report*.[6] Due to the growth of various industries within a four-county area of western Colorado, population has been expanding rapidly. Moffat County is being affected mostly by a coal generated power plant at Craig; while Rio Blanco, Garfield, and Mesa Counties are being affected by oil shale development. The study projects housing needs for these four counties according to the industry which is proposed to be developed within each county.

For Moffat County, employment projections were made for 1971, 1977, and 1982 for both permanent and temporary basic employment and for local service employment. The year 1971 was used as a base year before the power plant would be constructed. The study projected an increase of 1,668 workers between 1971 and 1977 and a decrease from 1977 to 1982 of 1,058, giving a net increase of 610 between 1971 and 1982.

It was assumed in the study that the ratio of new jobs to demand for new housing units would be about 90 percent. The rationale for this was that in the 1970 Census of Population and Housing the ratio of occupied housing units to employment averaged about 90 percent for the four-county region. The estimates of total housing demand for 1977 and 1982 were made by simply multiplying the increase in employment in 1977 and 1982 over the employment in 1971 by 0.90. The result was 1,501 units for 1977 and 549 for 1982. This represents

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[6]Bowers and Associates, *Housing Report*.

952 units required in 1977 that would not be required in 1982. If permanent housing were encouraged at the peak in 1977, it could result in a great deal of overbuilding as the population declines to 1982. Therefore, the study puts great emphasis on mobile homes during the first years with emphasis shifting away from mobile homes in the later years. Mobile homes in effect take up the slack in demand because they can be moved in and out as needed.

The method of projecting housing demand as discussed in the Bowers study[7] uses the conditions that existed when the 1970 census was taken and projects housing demand based upon these conditions. As was stated above, the ratio of occupied housing units to employment was 90 percent. Conditions may have changed drastically since then. This percentage will change depending upon economic and other conditions which affect the employment status of family members other than household heads.

The study also takes into account depreciation and upgrading of the existing housing stock at a rate of 9.6 to 12.8 percent per year. This means that about 170 units above those demanded by new workers will be demanded during the ten-year period from 1972 to 1982.

Adding in depreciation is valid if one is addressing the task of projecting the demand for new construction. The present study is concerned with projecting the housing requirements of the population due to a large scale energy project. Depreciation is therefore not considered.

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[7] *Ibid.*

The Parachute Creek study

An impact study was prepared by Colony Development Operations which discusses the impacts of oil shale development upon Mesa, Rio Blanco, and Garfield Counties, Colorado.[8] The study estimates total employment due to oil shale development by the use of multipliers which estimate local service employment resulting from basic employment changes. It is assumed that 300 basic employees come from existing households and are subtracted out of total employment to arrive at the number of new households. No provision is made for subtracting working wives from local service employment.

Given the number of new households resulting from the project, it was simple to calculate the distribution of total housing requirement by type of unit based upon a few assumptions. The whole time period was divided into two phases. Phase I was the construction phase and phase II was the operation and more permanent phase. The assumptions for phase I were: 50 percent of all new housing units would be mobile homes; units in multiple-family structures would be 20 percent of all new units. It was assumed that 30 percent of the households would choose single-family structures.

The assumptions for phase II were as follows: 60 percent would be single-family structures; 20 percent would be multiple-family structures; the remaining 20 percent would be mobile homes.

The land use requirement and expansion of various towns in the three-county area was based upon the assumptions that there would be

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[8]Colony Development Operation, *An Environmental Impact Analysis for a Shale Oil Complex at Parachute Creek, Colorado*, Vol. III (Denver, Colorado: Colony Development Operation, 1974).

two single-unit structures per acre, twenty multiple structure units per acre, and twelve mobile homes per acre.

The housing section of the study concludes by saying that these assumptions all depend upon the price of housing. If the price of a single-family unit increases because of inflated building costs and/or because of inflated building demand and low vacancy rates, then more mobile homes and multiple-family units will be demanded. The lower the price, presumably the more single-family units will be demanded and the less mobile homes and rental units will be demanded.

The U.S. Department of the Interior study

Under the direction of the U.S. Department of the Interior, a study which reviewed the potential role of oil shale development in obtaining energy independence in the United States was completed in November, 1974.[9] The study reviews conditions in Utah, Colorado, and Wyoming, and makes impact projections.

The multiplier used to project population was calculated from conditions existing before oil shale development and adjusted according to estimates of time lag in building up local service activities and according to other factors relating to oil shale development.

The impact on housing was estimated by dividing the development into two phases: phase I covers the time period when the construction work force was expected to dominate; phase II covers the remaining years in which the operating work force was expected to dominate. Various assumptions were made as to the type of housing unit demanded

[9]U.S., Department of the Interior, *Future Role of Oil Shale*.

by each type of employment during each phase. Housing was divided up into permanent and temporary units. Permanent units were single and multiple-family units, while temporary units were mobile homes.

During phase I, it was assumed that 70 percent of the construction force would demand temporary housing and 30 percent would demand permanent housing. It was assumed that 33 percent of the service employment would come from the local area. Of the remaining 66 percent, 50 percent were assumed to demand permanent housing. Fifty-five percent of the plant or operation employees were assumed to demand permanent housing.

The assumptions for phase II were 50 percent temporary and 50 percent permanent for construction employment; 20 percent temporary and 46 percent permanent, with 33 percent coming from the local area and not demanding new housing for service employment; 15 percent temporary and 85 percent permanent for plant workers. Based upon these assumptions and some assumptions about the marital status of the employees, housing requirements were estimated for the three states at five-year intervals.

Besides excluding assumption based upon the ability of families to pay, the above study differs from the one presented in this paper in that it makes estimates only at five-year intervals. The projections made in the present study will be made on a yearly basis, which will help coordinate population and housing with taxes for government service needs.

The Craig, Colorado, Yampa Power Plant study

A study done for the Yampa Project near Craig, Colorado, roughly estimates tax revenues that might accrue to Moffat County or Craig City as a result of a coal powered electric power plant.[10] It estimates housing demand due to the project. A simulation model which takes into consideration birth and death rates as well as employment-related migration is used to project population. Once population is estimated, total demand for housing is estimated by dividing population due to the project by three. This assumes that average household size will be approximately three persons per unit.

The breakdown of mobile homes and site homes is made by assuming that the ratio of mobile homes to site homes starts in 1974 at fifty mobile/fifty site and shifts in the following manner between 1975 and 1977: sixty/forty, seventy/thirty, eighty/twenty. This assumes that as demand for housing is increasing year after year, more and more people will demand mobile homes. It is also assumed that as demand for housing decreases thereafter, all of the decrease is taken out of the mobile home category. Also during decreasing demand periods, it is assumed that 10 percent per year of those people living in mobile homes will demand site housing.

Tax revenues are calculated for both types of housing on an ad valorem basis. The assessed valuation of mobile homes is reduced

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[10]David Monarchi and Charles Rake, *A Study of the Social and Economic Needs Created by the Proposed Craig Power Plant Installation* (Boulder, Colorado: Graduate School of Business Administration, University of Colorado, n.d.).

further by 20 percent to take into account personal property that is not taxable.

Table 20 shows estimates of housing and of revenues that might accrue to Moffat County and the city of Craig. Total demand for housing units decreases from 1977 to 1980 as construction is completed and the operation employees move in. As can be seen, the demand for mobile homes declines during this period and site housing increases according to the above assumptions. The total assessed valuation, however, increases even though total housing decreases. This increase is attributed to the movement from mobile homes, which pay less taxes toward site housing.

The Eastern Powder River Coal Basin study

An impact analysis done for the development of coal resources in the Eastern Powder River Coal Basin of Wyoming makes projections of housing demand between 1980 and 1990 at five-year intervals.[11] It estimates total housing demand for a particular year such as 1985 and subtracts the 1970 housing stock from it to estimate the number of new units that will be demanded between 1970 and 1985. These projections are made for eight counties within the impact area and each county is further separated into rural and urban areas.

The assumptions upon which the projections are made are as follows: (1) employees working in a given county also reside in that county; (2) the new employees will choose to locate in urban and rural areas

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[11]Bureau of Land Management, *Draft Environmental Impact Statement Regional Analysis Development of Coal Resources in the Eastern Powder River Coal Basin of Wyoming*, Vol. II (Denver, Colorado: Bureau of Land Management, 1974).

Table 20. Estimated housing units by type and estimated assessed valuation and property tax revenue attributable to population related to the Yampa Project, Craig, Colorado, 1974-1980

Year	Population attributable to plant	Housing units attributable to plant			Assessed valuation (in thousands)		
		Mobile homes[a]	Site homes[a]	Both	Mobile homes[b]	Site homes[b]	Both
1974	102	17	17	34	40.8	153.0	193.8
1975	165	31	24	55	74.4	216.0	290.4
1976	2,459	569	251	820	1,365.6	2,259.0	3,624.0
1977	5,519	1,407	433	1,840	3,376.8	3,897.0	7,273.0
1978	4,889	995	635	1,630	2,388.0	5,715.0	8,103.0
1979	3,922	370	937	1,307	88.0	8,433.0	9,321.0
1980	4,038	325	1,021	1,346	780.0	9,189.0	9,969.0

[a]Based upon the assumptions stated in the text.
[b]Mobile homes are priced at $10,000 and site housing at $30,000.
Source: David Monarchi and Charles Rake, *A Study of the Social and Economic Needs Created by the Proposed Craig Power Plant Installation* (Boulder, Colorado: Graduate School of Business Administration, University of Colorado, n.d.).

in similar patterns to those that existed in 1970; (3) percentages of urban and rural housing by county for the future have been projected at 1970 levels; and (4) housing demand is projected based on 1970 household size for each respective city, rural area, and county. It is mentioned in the study that estimates of the demand for housing based upon these assumptions are understated because they do not take into account vacancy ratios which are likely to occur in the market.

The estimates are not broken down by type of structure, but an explanation of what types of movements might occur between permanent housing and mobile homes is presented. With the rapid influx of workers and insufficient housing stock to supply them all with a permanent unit, the price of permanent housing will be bid up. Less of the incoming workers will be able to afford a permanent unit. Those who will not be able to afford a permanent unit will look for alternatives such as the mobile home. The higher the price of conventional units relative to mobile homes, the more mobile homes will be demanded.

Final environmental statement for the prototype oil shale leasing program

An impact statement prepared by the Department of the Interior entitled *Final Environmental Statement for the Prototype Oil-Shale Leasing Program* estimates the demand for housing for all three states by estimating population and dividing by average household size.[12] Total population due to oil shale development is estimated at 48,200

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[12]U.S., Bureau of Reclamation, *Final Environmental Statement*, p. II-215.

people and is divided by an average household size of 3.7 to give a demand for 13,000 dwelling units.

The above method of estimation differs from the methodology that will be developed in the next chapter of the present study in several ways. The present study will break total units demanded down by type of structure. It will be done based upon some assumed percentages of each housing type (single family, multiple family, and mobile homes) demanded by each type of employment group. These percentages will be assumed upon considering each employment group's (construction, operation, and local service) preferences, the price of housing, and their ability to pay.

The assumption of 3.7 persons per household seems high. The study for the Yampa Project near Craig, Colorado, assumes an average household size of three persons per unit, which would seem to be a more realistic assumption. It is true that the average household size for Uintah County in 1970 was 3.69.[13] If trends between 1960 and 1970 continue, the average household size in 1976 would be about 3.5. This is still too high. In estimating the demand for housing for the population created by the project, the average household size of the new population should be used. Many of the workers associated with oil shale development will be single, will come without wives, or will be married without children. The 1960 and 1970 Census of Housing indicates that for eleven counties that had population growth rates of greater than 3 percent, the change in population in occupied housing units over the change in total housing units was about

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[13] U.S., Department of Commerce, *Census of Population*, 1970.

2.88.[14] The present study does not estimate total housing units by dividing population by average household size, rather some assumptions about the incoming employment and population are made and an assumption about average household size is implied which is consistent with about three persons per household.

The Call Engineering study

A study prepared by Call Engineering, Incorporated, in March, 1975, studies the impact of the Kaiparowitz project and the feasibility of a new town.[15] Total demand for housing units due to the project is estimated from employment data broken down by construction, operating, and local service employment groups. It is assumed that all working wives are employed in local service jobs. Because working wives do not create a demand for housing, they are subtracted out of the local service employment. In year 0 (1975), it is assumed that 12 percent of the total employment due to the project constitutes working wives. In that year, new households will be 88 percent of total employment. The percentage of working wives is assumed to increase gradually to 33 percent in year 20, meaning that households will constitute 67 percent of total employment. These percentages are much lower than the 90 percent assumed in the Bowers study for the four-county region in Colorado.[16]

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[14]U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Housing* (Washington, D.C.: Government Printing Office, 1960, 1970).

[15]Call Engineering, Inc., *Marketability Economic Feasibility and Socio-Economic Impact of Proposed Kaiparowitz New Town Kane County, Utah* (Salt Lake City, Utah: Call Engineering, Inc., March, 1975).

[16]Bowers and Associates, *Housing Report*, p. 4.

The study also assumes that each construction and operation employee will demand a housing unit. It is indicated, however, that many of the single employees will double up as roommates, thus reducing the demand still further. No clear method for estimating these double-ups was available to them. They base their assumption on the statement that the percentages of working wives is assumed high enough to take into account double-ups as well as working wives.

Summary of impact studies

There are two approaches that have been reviewed in this section for breaking down the total demand for housing units by employment group. The first assumes that households constitute a certain percent of total nonagricultural employment. The Bowers study assumes that households constitute 90 percent of employment.[17] Other percentages might be assumed based upon other data. This method would give a good estimate of total housing demand if the percentage were correct, but it does not take into account the fact that most working wives and family members other than household heads are employed in local service jobs. Therefore, an accurate mix of total demand by type of employment group is difficult to estimate.

The second approach assumes that a certain percentage of local service employment comes from the existing households of the community or are working wives of incoming employees. The THK study assumes that 50 percent of the local service employment creates a

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[17] *Ibid.*

demand for new housing.[18] The Task Force Report assumes that 37 percent will be from the existing households of the area.[19] The study by Call Engineering assumes certain percentages of working wives will be employed in local service jobs and, therefore, will not create a demand for housing.[20] All of these studies assume that all construction and operation employees will demand a housing unit. Even with its limitations, this approach seems to be more reasonable because it allows a more reasonable breakdown of total housing by type of unit if certain assumptions are made about the percentages of each type of units demanded by each employment group.

National Models

A review of the literature at the national level is appropriate at this time. Much of the discussion at the national level does not apply at the regional or county level. Many of the variables that affect the demand for housing at the national level are not as important at the county level, and many important variables such as migration that are important at the county level are insignificant at the national level. The discussion which follows will attempt to review the national literature and present information that could be applicable to the present study. Because of limitations on data and time the elasticities discussed below will not be estimated for Uintah County, but the concepts will be used in deriving some of the

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[18]THK Associates, Inc., *Impact Analysis*, p. 12.

[19]U.S., Department of the Interior, *Future Role of Oil Shale*, p. 238.

[20]Call Engineering, Inc., *Marketability Feasibility*, p. II-20.

assumptions used in projecting housing requirements due to oil shale development.

In 1949 Sherman J. Maisel discussed the variables that had commonly been left out of housing demand analyses.[21] His main concern was that the demand for new construction was not only a function of the growth in population and other demographic variables, but also of price, income, and other economic variables.

In his articles Maisel was mainly concerned with the effect of income changes upon the demand for housing. If price and other variables are held constant, what will happen to housing demand as income changes? *Ceteris paribus*, as the income rises, families will demand more housing in quantity and quality. In addition, as incomes increase in times of prosperity, more housing units are demanded because marriages take place sooner, because people who were living together can afford to split up to improve space and privacy, and because immigration from lower income areas to higher income areas increases.

Maisel's study assumes that supply of new construction is perfectly elastic and that all units demanded at a given price will be supplied. This is a long-run situation. In areas such as Uintah County where population is increasing at about 6 percent a year due to rapid in-migration, the supply of new construction is not perfectly elastic in the short run. Some of the increase in demand would be absorbed by increasing prices so people may actually demand less housing per family until the population growth subsides.

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[21] S. J. Maisel, "Variables Commonly Ignored in Housing Demand Analysis," *Land Economics*, XXV (August, 1949), 260-274.

A study done by Richard F. Muth[22] in 1960 contains some information that might explain what has happened in Uintah County since 1970 and what might be expected to happen as a result of oil shale development. He used a durable goods model and estimated the responsiveness of housing demand to changes in income and price. Not much had been done on income and price elasticities of housing demand prior to Muth's study. Much of the recent literature uses his study as a reference.

Housing demand in his study is related to housing services. Since at any point in time housing services are provided by the stock of housing units in existence, Muth attempts to show variations in the stock of housing and how much it will change with changes in price and income. New construction is viewed as the means whereby the stock of housing is adjusted to changing conditions.

In evaluating new construction, it is assumed that a certain fraction (d) of the gap between actual and desired stock will be filled in a year. If d is close to 1.0, adjustment is rapid; if d is close to 0, it is sluggish. Desired stock is a condition of long-run equilibrium in which the quantity of stock (per capita) has no tendency to change over time. This condition would be met if new construction is only sufficient to offset depreciation and to provide for additions to population. Actual stock is the stock of housing existing at any instant in time. An excess of desired over actual

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[22]Richard F. Muth, "The Demand for Non-Farm Housing," in *The Demand for Durable Goods*, ed. by Arnold C. Harbarger (Chicago, Illinois: University of Chicago Press, 1960), pp. 27-96.

stock can result from a fall in price, a rise in income, a fall in the rate of interest or in taxes, or increases in population.

The rate of adjustment (d) may be affected on the demand side. An increase in income may give 10 percent of the households incentive to buy new homes, but because housing decisions are usually accompanied by other events such as marriage, birth, or death of family members, etc., the full 10 percent of the families may not move in the first year. In this case d would be less than one.

The supply side may also affect d if mortgage rates rise, and competition for resources increases. Muth expresses the relationship of the supply side to the demand for new construction in the following manner:

> The changes in demand which follow upon such price changes are governed by a mechanism quite distinct from the long-run price elasticity of demand for housing. ... It is my contention that desired stock demand is determined by the "long-run normal" price of housing, while short-run deviations of price from the long-run normal price govern in part the rate at which this desired stock is approached. Short-run price fluctuations about their long-run normal level are by their nature temporary. Houses may be "artificially" dear for a time after demand has risen, but, when sufficient additions have been made to stock, the normal price will be restored.[23]

In Uintah County and other counties which have experienced increased demand for housing units, this can be seen in part. Vacancy rates have gone down close to zero and prices have gone up, rationing housing units. The tension has been eased by mobile homes whose prices have not increased as fast as conventional housing. In earlier years when mobile homes were not as acceptable to as many people,

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[23] *Ibid.*

the tension would have been eased more by doubling up and postponement of marriage, etc., as people waited for housing to become more available in the long run. In many cases mobile homes take on the same role as doubling up in the short run. This effect can already be seen in Uintah County. In 1972, when population increased rapidly, 251 mobile homes were bought in the county and 120 conventional units were authorized by building permit. It is reported that the oil boom has recently peaked out. This is supported by Table 21 which shows an increase in the unemployment rate from 3.5 in 1973 to 4.7 in 1974. Employment Security officials report that unemployment in the first quarter of 1975 was up to about 7 percent.[24] During 1974 the number of new mobile homes bought dropped to 183, while conventional units authorized by building permits increased to 212.

Table 21. Yearly unemployment rates, building permits, and mobile homes for Uintah County, 1971 to 1974

Year	Unemployment rate[a]	Permits for conventional units[b]	Mobile homes[c]
1971	6.0	74	88
1972	4.4	120	257
1973	3.5	127	235
1974	4.7	212	183

[a]Utah Department of Employment Security, *Employment Newsletter*, February, 1975, pp. 1-4.
[b]U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40.
[c]Count of county tax records made by the author.

[24]Carol Edmonds, "Carol Edmonds, Shale Country Regional Editor Responds," *Shale Country*, June, 1975, p. 20.

New construction, according to Muth,[25] is responsive to the rent-price ratio. As rents go up relative to the price of an average housing unit, it becomes relatively profitable to build rental units, so relatively more are built. At the same time, it becomes more efficient for families to buy or build a new unit than to rent. This results in increased construction of single-family units. New construction increases on both rental and home-owner fronts. Muth concludes that the demand for housing is considerably more elastic with respect to price and income than was commonly believed. He obtained estimates for desired stock demand elasticities for both price and income of about unity.

Further evidence demonstrating that the supply schedule for new residential construction in the short run is not perfectly elastic is presented in an article by Richard Pollock.[26]

The main thrust of his article is to show that the supply of new residential construction at the national level is inelastic. If it is inelastic, then government policies that have been oriented toward increasing the demand for new construction have little effect upon the quantity of new units constructed. These policies will simply tend to increase the price of housing. In much of the housing economics literature, there has been an implicit assumption that supply is perfectly elastic and that a housing unit would be provided for each and every additional family that is willing and able to

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[25] Muth, "Demand for Non-Farm Housing."

[26] R. Pollock, "Supply of Residential Construction: A Cross-Section Examination of Recent Housing Market Behavior," *Land Economics*, XL (February, 1973), 57-66.

pay the going price. This assumption leads to demand-oriented government policies.

Pollock attempts to show that the supply of new residential construction is inelastic by using cross-sectional data on the housing market for the years 1965 and 1968 for a sample of SMSA's. It is hypothesized that the short-run supply function is price inelastic and that the position of the supply function of new residential construction in one peak period relative to the previous peak will be determined by the relative level of non-residential construction in the new peak period. This means the larger the increase in non-residential construction at the new peak, the smaller the recovery in residential construction volume relative to the peak level obtained prior to the decline. Many of the same resources are used in both residential and nonresidential construction. The position and shape of the supply curve for new residential construction is affected by shifts of resources between residential and nonresidential construction. The price elasticity of demand for nonresidential construction is lower than that for residential construction. This means that during periods of growing business investment a larger portion of the fixed level of construction resources available in the short run will be bid away from residential construction to nonresidential construction.

This confirms what has been said earlier. The supply of residential construction in the short run is not perfectly elastic; therefore, it cannot be assumed that one conventional unit will be provided for each new household in the short run. In making

projections of housing demand in Uintah County due to oil shale development, mobile homes will be assumed to ease the pressures and take up the slack on housing demand. Some new households will choose mobile homes during periods of pressure on the market and during periods of slack some mobile home owners will move into permanent units.

Alan R. Winger attempts to show that basic demand factors have a larger impact upon short-term residential construction cycles than has commonly been believed.[27] Earlier studies of residential fluctuation have pointed to supply-induced credit market changes which are reflected in the activities of major institutional lenders supplying funds to mortgage borrowers and builders, as the most important determinants of residential construction fluctuations. But Winger points out that the impact of changes in the supply of residential mortgage funds on new construction depends partly on the response of households and potential households to the induced change in mortgage credit terms or that basic demand factors do play a role in new construction demand.

In prior studies, variables such as the change in household formation, the change in housing inventory (all vacant units plus units currently under construction), and replacement were used as basic demand factors, but these factors are not significant in the short run. Winger uses mobility, or the number of changes in household residence, as the basic demand factor, and found it to be significant.

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[27]Alan R. Winger, "Demand and Residential Fluctuations," *Nebraska Journal of Economic Business*, X (Summer, 1971), 51-71.

It was found that when mobility was replaced by traditional basic demand factors such as income and household formation, the regression equation explained less of the variability in new construction.

If mobility is included as a basic demand factor, drastic changes in the relative price of new housing units to old ones could affect the variability in new construction. For example, if the price of newly constructed units decreases relative to old units, then more of those households that move will want old units and new construction will consequently decline. Winger finds $\frac{PE}{PN}$ to be significant, as well as improving the fit. $\frac{PE}{PN}$ is the ratio of the price of existing housing units to the price of new housing units. If this ratio increases, more of those households that move each year will search for previously occupied housing units, therefore the demand for new construction will decline.

These results indicate that basic demand factors play a significant role in determining the level of new construction. This does not take away from the role of credit supply factors in determining the level of new construction.

In another article, Winger is interested in demonstrating that there are regional differences in residential construction cycles.[28] The magnitude of a decline in residential construction in one area may not be the same as for another area in the U.S. He sets forth the theory that follows: $HS \equiv \Delta HH - T - R + \Delta I$. Housing starts (HS) equal the change in non-institutional household population

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[28]A. R. Winger, "Short-term Activity in Residential Construction Markets: Some Regional Considerations," *Southern Economics Journal*, XXXVI (April, 1970), 390-403.

(ΔHH) minus the number of mobile homes built (T) minus removals from the stock (R) plus changes in housing inventories (ΔI); i.e., vacancies plus units currently under construction. The housing stock is assumed to be both fixed-site houses and mobile homes. Changes in this stock come about through HS, T, and R. ΔHH and ΔI are ways of looking at the disposition of these changes.

Winger suggests that the change in credit conditions which affects residential construction is a change in the supply of mortgage funds. The major variables in the national mortgage supply functions are suggested to be flexibility in the selection of assets by major mortgage lenders and the variability in the savings inflow of several of these institutions. The mortgage supply has a certain amount of stickiness; therefore, flexibility of the major lenders is used. The savings inflow variable is easily explained. Banks tend to be more flexible in rearranging their portfolios than other mortgage lenders, so if banks receive greater portions of the savings inflow, the supply of mortgage funds will change faster.

Winger shows that there are regional differences in residential construction cycles. It is reasonable to believe that if there are regional differences between the mix of mortgage lenders and the change in the amount of savings held by these institutions, there will be differences in residential construction cycles. Also, regions within the U.S. are different from the whole. Household population among regions may be affected by out- or in-migration, depending upon the economic condition of the region. It can now be written that $HS = f(\Delta E, \Delta SD, FM)$, where ΔE is employment change, a

proxy for migration, ΔSD is savings inflows, and FM is the mix of lenders within the region.

It was found that changes in non-agricultural employment play a substantial role in explaining regional differences in construction cycles even though they do not for the nation as a whole. It was also found that regional differences in mortgage markets cause differences in regional short-run construction cycles. These estimates were made using fifty regions represented by the fifty states from 1959 to 1966. If smaller regions such as counties were used, demographic variables would probably play an even larger role in determining the level of new housing units. Also, in counties with similar characteristics to those of Uintah County, mobile homes make up a significant portion of the housing stock and the demand for new units. They cannot be ignored in the present study, as they were in Winger's study.

The mobile home industry seems to more closely reflect the effective demand for housing. During the housing fluctuations of the 60's, shipments of mobile homes showed little fluctuation as they steadily increased. This would seem to confirm Pollock's hypothesis because the mobile home industry does not compete for the same resources as do the residential and nonresidential construction industries.[29] Mobile homes are built in factories where more women and unskilled labor can be used, as well as different noncompeting building materials such as tin.

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[29]Pollock, "Residential Construction."

Conclusion

All of the impact analyses examined in this chapter put major emphasis on demographic variables in determining housing demand resulting from a project. Economic variables such as price, incomes of households, mortgage rate, and the availability of mortgage funds are given second place or they are not considered at all. Housing needs or requirements are estimated assuming that a certain set of economic conditions will prevail.

The national housing models show that for the whole economy the economic variables are most important in determining the demand for new units. Demographic variables are found to be relatively unimportant in the short run because the demographic variables in the short run are fixed. The short run in the housing market can be several years. In the long run, changes in the demographic variables are considered most important in national models.

The problem of projecting housing demand due to oil shale development is a short-run problem. As was pointed out, however, regional levels of new construction are influenced largely by demographic variables in the short run. The smaller the region, the more changes in population affect the demand for housing.

In projecting the total housing impact of oil shale development on Uintah County, demographic variables, specifically changes in nonagricultural employment, will be considered the most important variables. Economic variables will be taken into account.

The mix of the new housing units will be determined by the uses of economic variables, specifically the incomes of the new employees and their ability to pay. Housing preferences of each employment group will also be taken into account. Mobile homes will play a major role along with single and multiple-family units. The pressure and slack in demand for newly constructed site units will be taken up by mobile homes.

CHAPTER III

PRESENTATION OF THE DATA AND THE ASSUMPTIONS

Housing data for several counties have been collected by the author. These counties were chosen because it is believed that they have had experiences similar to those that Uintah County might encounter as a result of oil shale development. The assumptions upon which the impact of oil shale development on housing will be based are derived from these data in conjunction with the literature which has been cited earlier.

This chapter is divided into three sections with the second section having two parts. The first section presents the data, assumptions, and methodology for estimating total demand for housing units due to oil shale development. The second section presents the data, assumptions, and methodology for estimating the mix of total demand among single-family units, multiple-family units, and mobile homes. The first part of section two presents the data used to derive the assumptions about the mix of permanent housing units between multiple-family units and single-family units. The second part presents the data used to arrive at the assumptions about the mix of total demand for housing units among permanent units and mobile homes. The third section presents a summary of all the assumptions which are used to estimate the demand for housing units due to oil shale development.

Assumption of Total Housing Demand

The data on population and employment from eleven western counties were used by Kakish to derive estimates of the multipliers that will be used to project Uintah County indirect employment and population resulting from oil shale development.[1] These counties were chosen because their population growth rates between 1960 and 1970 were in excess of 3 percent per year. It is believed that if oil shale is developed the population of Uintah County will grow at a rate greater than 3 percent per year. The counties chosen were: Mohave, Arizona; Calaveras and El Dorado, California; Madison, Idaho; Lincoln, Montana; Deschutes, Oregon; Hayes, Montgomery, Palo Pinto, Parker, and Randall, Texas. Table 42 of Appendix B gives information on population and employment for these counties.

The employment estimates are used here to arrive at a breakdown of the demand for total housing units by employment class (construction, operation, and local service). Total housing demand can be expressed as follows: THD = DCW + DOW + DSW, where THD is total demand for housing units, DCW equals the demand for housing units by construction workers, DOW equals the demand by operation workers, and DSW is the demand by local service workers.

It will be assumed that all construction and operation employees are males and that all working wives obtain local service employment. Information from the 1970 Census of Population indicates that

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[1]Muin Kakish, "Projected Employment and Population Impacts of Oil Shale Development in Uintah County, Utah" (unpublished MS thesis, Utah State University, Logan, Utah, 1975).

38 percent of the males with wives present between twenty and forty-four years of age who moved to a different county between April 1, 1965, and April 1, 1970, had wives who worked.[2] In this study the number of working wives will be assumed to be 38 percent of all married households. The 1970 Census of Population also presents information which indicates that 36 percent of the twenty to forty-four-year-old males who moved between 1965 and 1970 were single or without their wives.[3] Operation and local service jobs due to oil shale will be considered by many as permanent employment. More of the incoming employees will bring their wives and families than will construction workers. It will be assumed that 36 percent of the operation and local service employees will be without wives for one reason or another.

Construction workers without wives will constitute a higher percentage than other workers due to the temporary nature of their work. The Task Force Report prepared by the Department of the Interior assumes that 50 percent of the construction employees will be without wives.[4] The same assumption will be made in the present study.

Based upon the above assumptions, total housing demand will be as follows: THD = CW + OW + (SW - WW), where CW equals the number of construction workers, OW equals the number of operation workers, SW equals the number of local service employees, and WW equals the number of working wives. Working wives associated with construction

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[2]U.S., Department of Commerce, Bureau of the Census, *Mobility for States and the Nation*, Subject Reports PC(2)-2B, June, 1973, p. 12.

[3]*Ibid.*, p. 124.

[4]U.S., Department of the Interior, *Future Role of Oil Shale*, p. 238.

workers (CWW) equals .50 X CW X .38 and working wives associated with operation workers (OWW) equals .64 X OW X .38. Determining the number of working wives associated with the local service employment is more difficult. An iterative process has to be used. The first step can be expressed as follows: NSW = SW - (CWW + OWW), where NSW equals the estimate of local service employment given by Kakish minus the working wives of the construction and operating work force. Now by the assumptions an estimate of working wives associated with local service employment (SWW1) will be .64 X NSW X .38 and FNSW1 = NSW - SWW1, where FNSW1 is the first round estimate of the demand for housing units by local service employment and SWW1 is a first round estimate of working wives associated with local service employment. The second round estimates are obtained in the following manner: SWW2 = .64 X FNSW1 X .38 and FNSW2 = NSW - SWW2. The process converges after about five iterations producing FNSW and SWW which is the demand for housing by local service employment and the working wives associated with local service employment, respectively. It follows that WW = CWW + OWW + SWW and that FNSW = SW - WW, therefore THD = CW + OW + FNSW, where all symbols are defined as above.

An example might be helpful at this point. Suppose estimates are presented which show that the oil shale project will employ 500 construction workers, 300 operation workers, and 840 local service employees. CWW would be .50 X 500 X .38 = 95 and OWW would be .64 X 300 X .38 = 73, therefore NSW = 840 - 168 = 672. SWW1 = .64 X 672 X .38 = 163 and FNSW1 = 672 - 163 = 509. The second round estimate SWW2 = .64 X 509 X .38 = 124 and FNSW2 = 672 - 142 =

548. After about five iterations, SWW = 132 and FNSW = 540. In this example the demand for total housing units equals 500 + 300 + 540 or 1,340 units. These estimates are based on the assumption that all male employees will demand housing units.

Based upon the above assumptions, total housing demand will be as follows: THD = CW + OW + (SW - WW), where THD is total housing demand, CW equals the number of operation workers, SW equals the number of local service employees associated with the project, and WW equals the number of working wives of all employees associated with the project.

Estimates of CW, OW, and SW are available and the number of working wives associated with these employees can be calculated and subtracted from SW to give the demand for housing by local service employees (FNSW). Therefore, THD = CW + OW + FNSW, where FNSW = SW - WW and all other symbols are as described above.

An estimate of WW can be arrived at by finding the number of working wives associated with each employment group. The number of working wives of construction workers, denoted by CWW, equals the number of construction workers who brought their wives multiplied by .38, which is the percentage of wives who work. Therefore, CWW = .50 X CW X .38. The number of working wives of operation workers is calculated as follows: OWW = .64 X OW X .38, where OWW is the number of working wives associated with operation workers. Both CWW and OWW are then subtracted from local service employment (SW) to give NSW. NSW is not the demand for housing by local service employees because some of the local service employees also have working wives

who must be subtracted out of NSW. The demand for housing units by local service employees is calculated as follows: FNSW = NSW - SWW, where SWW equals working wives of local service employees and other symbols are as described above.

The calculation of SWW is not as straightforward as the calculation of CWW and OWW because SWW is dependent upon the size of FNSW. An iterative process can be used to obtain an estimate of SWW and FNSW. The first round estimate of working wives of local service employees (SWW1) is calculated as follows: SWW1 = .64 X NSW X .38. The first round estimate of the demand for housing by local service employees (FNSW1) is then calculated as follows: FNSW1 = NSW - SWW1. Since SWW is dependent upon the size of FNSW, a second round estimate can be calculated as follows: SWW2 = .64 X FNSW1 X .38 and the second round estimate of FNSW becomes FNSW2 = NSW - SWW2. Third round estimates are calculated as follows: SWW3 = .64 X FNSW2 X .38 and FNSW3 = NSW - SWW3. The process continues until it converges after about five iterations. Estimates of FNSW and SWW are the result.

From the above calculations total housing demand can be calculated as follows: THD = CW + OW + FNSW, where FNSW = SW - CWW - OWW - SWW, and all symbols are as described above.

An example might be helpful at this point. Suppose estimates are presented that show the oil shale project will employ 500 construction workers, 300 operation workers, and 840 local service employees in a certain year. Working wives of construction workers (CWW) would equal 95 or .50 X 500 X .38. Working wives of operation

workers would equal 73 or .64 X 300 X .38. Local service employees minus the working wives of construction and operation employees (NSW) would equal 672 or 840 - 95 - 72. The first round estimate of working wives of local service employees (SWW1) would be 163 or .64 X 672 X .38 and the first round estimate of the demand for housing units by local service employees (FNSW1) would be 509 or 672 - 163. The second round estimate gives SWW2 equal to 124 or .64 X 509 X .38 and FNSW2 equals 672 - 148 = 548. After about five iterations SWW equals 132 and FNSW equals 540. In this example the demand for housing units would be 500 + 300 + 540 or 1,340 units. The estimates are based on the assumption that all male employees will demand housing units.

Implicit in the above discussion is an assumption about average household size. The population estimate associated with the above example as presented by Kakish is 4,100.[5] Average household size of the new population is implicitly assumed to be 3.06 and is obtained by dividing the total population by the number of housing units that will be demanded. The average household size implied by the assumptions will be discussed further in the next chapter.

Data and Assumptions for Housing Mix

The mix of permanent housing units

Table 22, which summarizes the building permit data for the eleven growth counties contained in Tables 43 through 53 of Appendix B, can be useful in making assumptions about the mix of permanent

[5]Kakish, "Projected Employment."

Table 22. Units authorized by type between 1960 and 1969 for eleven growth counties[a]

	Total	Total by type	1-Family	% 1-Family	Multi-family	% Multi-family
Mohave	1,964	1,261	986	79.2	275	21.8
Calaveras	2,369	1,878	1,786	95.3	89	4.7
El Dorado	9,105	7,347	5,302	72.2	2,045	27.8
Madison	505	400	145	36.2	255	63.8
Lincoln	62	45	17	37.4	28	62.6
Deschutes	999	743	521	70.1	222	29.9
Hays	1,171	908	397	43.7	511	56.3
Montgomery	685	446	352	78.9	94	21.1
Palo Pinto	1,386	1,182	988	83.6	194	16.4
Parker	732	419	318	75.9	101	24.1
Randall	976	873	509	58.3	364	41.7
Total all counties	19,954	15,502	11,324	73.0	4,178	27.0

[a]Includes only years for which permits are denoted by type of structure.
Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1969.

housing units between single-family structures and units in multiple-family structures. The eleven counties which comprise the table grew at rates greater than 3 percent between 1960 and 1970. During this period of growth housing units in multiple-family structures varied largely among counties. Madison had the high of 63.8 percent and Calaveras had the low of 4.7 percent. If total units in multiple-family structures for the eleven counties are taken as a percentage of total units authorized by building permits from 1960 to 1970, it is found that 27.0 percent were housing units in multiple-family structures.

Tables 54 through 58 of Appendix B contain information about building permit authorization for five counties that have experienced energy-related booms since 1970. The counties are Moffat, Colorado; Sweetwater, Wyoming; and Duchesne, Carbon, and Uintah Counties in Utah. Growth rates have been in excess of 3 percent per year since 1970.

Table 23 summarizes Tables 54 through 58. The percentage of multiple-family housing units for the five counties combined was 28.2, which compares quite closely with the eleven counties reviewed earlier. The figure for Uintah County was 20.1 percent from 1970 to 1974. Between 1972 and 1974 multiple-family housing units accounted for 27.5 percent of all permanent housing units authorized for construction in Uintah County. The higher percentage since 1972 can be accounted for because of the present oil boom which started in 1972 with the energy shortage. In that year population increased by 1,100 over 1971, which represented a growth rate of 8.3 percent. This growth stimulated a greater demand for multiple-family housing units.

The percentage of 27.5 lies between the 27.0 for the eleven counties and the 28.2 for the five counties. It will be assumed that 27.5 percent of all permanent housing units demanded as a result of oil shale will be in multiple-family structures.

Table 23. Units authorized by type between 1970 and 1974 for five growth counties

	Total by type	One-family	% One-family	Multi-family	% Multi-family
Moffatt	153	95	62.1	58	37.9
Sweetwater	1,395	934	67.0	461	33.0
Duchesne	263	189	71.9	74	28.1
Carbon	315	257	81.6	58	18.4
Uintah	628	502	79.9	126	20.1
Total all counties	2,754	1,977	71.8	777	28.2

Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1970-1974.

The mix of total housing units

Tables 59 through 62 of Appendix B present information about trends in population, employment, and income for Emery, Carbon, Duchesne, and Uintah Counties. These tables in conjunction with Table 63 of Appendix B are useful for showing the effects of the energy crisis upon housing in these counties. Table 63 compares building permits for permanent housing units (single and

multiple-family units) with the number of mobile homes showing upon the county tax records in 1975 for each year since 1960. Changes in total units are also shown. This information is useful in arriving at assumptions about the mix of total housing units among permanent units and mobile homes.

Table 59 shows when and how the energy shortage affected Emery County. Employment in Emery County vacillated between 1960 to 1971. Then in 1972 nonagricultural employment increased sharply by 508 and then again in 1973 by 553, only to decline slightly in 1974 by 60. It is interesting to note that population in 1972 declined by 1.9 percent even with the large increase in employment. A possible explanation is that the Huntington Canyon Power Plant began to employ large numbers of workers who worked on the project in Emery County while they lived a few miles away in Price which is situated in Carbon County. Also, the unemployment rate declined from 12.9 in 1971 to 8.3 in 1972, indicating that many of the 508 new employees resulted as many of the unemployed found work.

The increase in nonagricultural employment in 1973 brought with it an increase in population of 17.3 percent over 1972 and a further reduction in the unemployment rate to 5.9. This increase was probably due to the reopening of many of the old coal mines in Emery County as coal became more profitable as an energy resource.

The energy crisis has brought with it a great deal of prosperity. Total personal income increased from $11,918,000 in 1971 to $37,082,000 in 1974, representing an increase of 211.1 percent. Per capita income increased from $2,290 to $5,980, for an increase of 161.1 percent.

Table 63 shows the effects of the energy shortage upon mobile homes in Emery County. Since about 1970 mobile homes have become more popular in Emery County. This is partly due to high costs of conventional units, high mortgage rates, and wider acceptance of mobile homes as dwelling units.[6] These figures are also closely correlated with changes in nonagricultural employment with larger increases of mobile homes in 1972 and 1973 and declining in 1974 to reflect the decline in employment in that year.

Table 60 shows the same information for Carbon County. Employment decreased steadily between 1960 and 1970 and increased steadily between 1970 and 1974. These increases, however, are not as sharp as in the other counties. Population since 1970 has grown at an average of 3.0 percent per year. The unemployment rate has declined from 11.3 in 1971 to a low of 8.0 in 1973. Per capita income has only increased by $880 since 1970. The increase in population of Carbon County is probably due to the spillover from the Huntington Power Plant and some revival of the coal industry.

Table 63 shows the effect on housing in Carbon County due to the energy shortage and the Huntington Canyon Project. The number of mobile homes follows the pattern of Emery County, giving additional support to the idea that the employment at the Huntington Canyon Project affected both counties in a similar manner. Mobile homes in both counties increased in 1972, peaked out in 1973, and declined in 1974. This reflects the nature of the coal mining operations in the

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[6]For more information on causes of growth in the mobile home industry see Appendix A on mobile homes.

area. With the beginning of construction on the Huntington Power Plant in 1972, mobile homes were used by construction workers in both counties. With the realization in 1973 that the energy shortage would make coal mining profitable again, many coal mines were reopened causing further increases in population and employment and an increase in the demand for mobile homes which reached a high in 1973.

The yearly number of permits for permanent housing units has increased in Carbon County since 1970. The increase was thirty-two from 1973 to 1974 as compared with increases of six from 1972 to 1973 and three from 1971 to 1972. This supports the hypothesis that mobile homes are used during periods of great pressure on the demand for housing. In the short run, supply of permanent housing is not perfectly elastic. Percentage increases in mobile homes in Carbon County were greater than percentage increases in permanent housing units up to 1973. In 1974 mobile homes decreased while the demand for permanent units increased more than before. This indicates that permanent housing is becoming more available, causing a decrease in the demand for mobile homes.

Table 61 shows that Duchesne County had increases in population of 22.8 percent in 1972 and 15.5 percent in 1973. The rate of population growth slowed down to 3.6 percent in 1974. Employment showed sharp increases of 808 in 1972, 843 in 1973, and only 69 in 1974, indicating that perhaps the oil boom is peaking out in that county. The unemployment rate reached 3.8 in 1973, dropping from 8.4 in 1971. It increased to 4.7 in 1974. Personal income increased 175.9 percent from 1971 to 1974, while per capita income increased from 2,430 to 4,560 during the same period.

Table 63 shows that mobile homes jumped from 69 in 1971 to 224 in 1972. Permanent dwellings increased from forty-two to seventy-five. Both permanent and mobile units decreased in 1973, but permanent dwellings began to increase again in 1974 while mobile homes continued to decline substantially. Again it can be seen that during periods of extreme pressure on the housing market mobile homes ease the pressure, but as demand slackens and permanent housing becomes more available people tend to demand site housing over mobile homes.

The data for Uintah County in Table 62 show high annual growth rates in population, with the largest increases in population and employment occurring in 1972. Growth in Uintah County seems to be more sustained than in Duchesne County. Employment in 1974 increased by 496 over 1973, while it only increased by 69 in Duchesne County. The unemployment rate fell from 6.0 in 1971 to 3.8 in 1973, but showed an increase in 1974 to 4.7. Increases in personal and per capita incomes show that the oil boom has brought with it a great deal of prosperity.

Table 63 again shows mobile homes reaching a peak in 1972 of 257 after increasing from 88 the year before. Permits for permanent housing increased from 74 in 1971 to 120 in 1972, and continued to increase with a jump from 127 in 1973 to 212 in 1974.

The increase in permanent housing units and the decrease in mobile homes again demonstrated that after the initial period of increased demand for housing, more people will choose permanent housing as it becomes more available. The large increase in permanent housing in Uintah County in 1974 also reflects the effects of the water connection restrictions placed upon mobile homes by Vernal City.

Uintah and Duchesne Counties have played different roles in the energy crisis than have Emery and Carbon Counties. The boom in Uintah and Duchesne Counties is due mostly to oil drilling as contrasted to coal mining. These counties show sharp increases in 1972 in all the data reflecting the early emphasis on oil during the energy crisis. Emery and Carbon Counties in contrast show large increases in 1972 related to Huntington Canyon, with even larger increases in 1973 from coal mining. These trends can be seen by examining what happened to the demand for mobile homes.

Assumptions of Housing Mix

Some tentative conclusions about housing related to oil shale development can be drawn from the above data. In times of pressure on the housing market in the short run, the supply of permanent housing units is inelastic, causing prices of permanent housing units to increase. As the price of permanent housing increases relative to the price of mobile homes, more people demand mobile homes. But as Muth has suggested, after the period of pressure on the housing market is over long-run price trends are restored and people demand more permanent housing and less mobile homes.[7] This seems to be what has happened in Uintah County and other boom counties in Utah since 1970. The initial pressure in the counties was felt in 1972 and 1973, with mobile home sales increasing greatly. Mobile homes have declined in 1974, while permanent housing units have increased faster than they did in 1972 and 1973. This indicates that permanent housing

[7]Muth, "Non-Farm Housing," pp. 36-37.

is becoming more available as resources which affect the supply of housing become more available and as the oil and gas exploration boom seems to have peaked out as demonstrated by increasing unemployment rates and decreasing levels of nonagricultural employment in most cases.

The following assumptions will be made to take into account the short-run inelastic supply of housing:

1. The period of time between year 1 and year 12 will be considered as a period characterized by pressure as the demand for housing increases. This period will be characterized by an inelastic supply of housing as the construction adjusts incompletely to the increased demand. During this period prices of permanent housing will be bid up relative to mobile homes. Each employment group (construction, operation, and local service) will demand high percentages of mobile homes relative to the period of time between years 13 and 20.

2. The period of time between year 13 and year 20 will be a period when equilibrium long-run trends will be re-established. Prices relative to incomes will return to long-run equilibrium. Those people related to oil shale development will be able to afford more site housing relative to mobile homes than they could during earlier years. It will be assumed that the percentage of mobile homes to total units will fall starting in year 13 as mobile home owners buy site housing until it reaches an expected level of 25 percent[8] in year 20 with a possible range of from 30 to 20 percent.[9]

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[8]THK Associates, *Impact Analysis*, p. 11.

[9]Center for Business and Economic Research, *Kaiparowits*, p. 84. Twenty percent is close to the actual percentage of mobile homes to total housing units in Uintah County in 1975.

The building permit and mobile home data used in deriving the above conclusions have several limitations. Uintah County is the only county which has all of its land area included within permit-issuing places. The rest have less than 90 percent of their populations within permit-issuing places. This could account for the large variance among counties as to the percentage of multiple-family units to total units authorized.

The authorization of a building permit does not signify completion of the structure. A correct estimate of the percentage of housing units authorized for construction which are completed is not available. It must be taken into account that when building permit data are used the numbers slightly overstate the actual number of completions.

Building permits are issued before construction takes place. A lag of three months for single-family structures and six to eighteen months for multiple-family structures is considered reasonable.[10] Unfortunately, the U.S. Construction Report only presents annual data for most of the counties reviewed. Therefore, the lags in completion are not taken into account.

The data on mobile homes were collected by the author in June, 1975. For tax purposes each county keeps a record of each mobile home and the year it was built. In June, 1975, the total number of mobile homes that existed on the tax records at that time was broken down by year of manufacture from 1960 to 1974. It is not known,

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[10]Department of Housing and Urban Development, *FHA Techniques of Housing Market Analysis*, Attachment to FHA Circular No. 1380.3, 1970, p. 268.

however, how many mobile homes which were manufactured in a certain year were bought used and moved into the county in a later year. In other words, a 1970 model could have moved into the county in 1974 or any other year after 1970. This causes the data to understate years closer to 1974 and overstate years closer to 1960 relative to any given year.

Another problem is that the data do not take into account mobile homes that were bought in a given year, but moved out of the county before June, 1975. This would cause each year to be understated, with those years closer to 1960 being understated more than those years closer to 1974.

The building permit and mobile home data obviously have limitations. Better data are not available on a county level. With all their limitations, the data still have served as a guidepost, along with the literature reviewed earlier, for arriving at the above assumptions.

Before actually projecting the demand for housing due to oil shale, further assumptions about the mix of total housing between mobile homes and permanent units have to be made. The following assumptions are based upon the data presented above, as well as the best information available to the author from the impact analysis and journal articles reviewed earlier.

During periods of pressure on the housing market, construction workers will demand as high as 100[11] percent mobile homes and as

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[11]Center for Business and Economic Research, *Kaiparowits*, p. 84.

low as 70[12] percent mobile homes with the expected percentage being 80.[13] These high percentages are assumed because of the nature of construction workers and their work. They will consider Uintah County as only a temporary home to be left behind as the oil shale plant is completed. High percentages of these workers will be single or will leave their wives and families behind. Because of these characteristics, many construction workers demand mobile homes instead of site housing, even though they could afford the latter.

The operating employees could demand as high as 45[14] percent mobile homes and as low as 25[15] percent, with the expected percentage being 30[16] during periods of pressure on the housing market. Operation workers demand less mobile homes because they tend to view their jobs as more permanent than do construction workers. A lower percentage of them is without families than construction workers, which makes mobile home living less desirable for more of them.

The households created by local service employment could demand as high as 67[17] percent and mobile homes as low as 40[18] percent, with the expected level demanded during periods of pressure on the housing

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[12]U.S., Department of the Interior, *Future Role of Oil Shale*, p. 238.

[13]THK Associates, *Impact Analysis*, p. 11.

[14]U.S., Department of the Interior, *Future Role of Oil Shale*, p. 238.

[15]THK Associates, *Impact Analysis*, p. 12.

[16]An assumption made by the author.

[17]Call Engineering, *Marketability Feasibility*, p. IV-25.

[18]An assumption made by the author.

market of 50[19] percent. These percentages are lower than those for construction workers for the same reasons that operation workers demand less mobile homes than construction. Local service employees demand higher percentages of mobile homes than the operating work force because their incomes are lower and therefore a lower percentage of them can afford permanent housing.

Summary

The assumptions of this chapter can be summarized as follows: (1) all construction and operation employees will be males; (2) all working wives of married male employees will be employed in local service-type employment; (3) 38 percent of the wives associated with married male employees will work; (4) 50 percent of the construction work force will be single or without families; (5) 36 percent of the operation and local service work force will be single or without families; (6) all construction, operation, and local service employees other than working wives will demand housing units; (7) 27.5 percent of all permanent housing units will be in multiple-family structures; (8) during periods of pressure on the housing market, high percentages of each employment group will demand mobile homes relative to other periods (the percentages for assumptions 7 and 8 are summarized in Table 24); (9) during the period of time between years 13 and 20, mobile homes as a percent of total housing units will decline until they become 25 percent of all housing units due to oil shale (the possible range is from 30 to 20 percent); (10) all the slack in demand will be taken up by a reduction in the demand for mobile homes.

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[19]THK Associates, *Impact Analysis*, p. 12.

Table 24. Summary of the mix of housing units among single-family units, multiple-family units, and mobile homes during demand pressure years by employment group

Type of employee	Total (%)	Total permanent as a percent of total			Single family as % of permanent	Multiple family as % of permanent	Mobile homes as a percent of total		
		Low	Expected	High			High	Expected	Low
Construction	100	0	20	30	72.5	27.5	100	80	70
Operation	100	55	70	75	72.5	27.5	45	30	25
Local service	100	33	50	60	72.5	27.5	67	50	40

Source: Assumptions arrived at by the author based upon the data collected and the literature reviewed.

CHAPTER IV

THE PROJECTED IMPACT OF OIL SHALE DEVELOPMENT ON HOUSING AND LAND USE

This chapter is concerned with the actual projection of housing demand. The assumptions of the previous chapter in conjunction with the estimates of population and employment prepared by Kakish are used.[1] Residential land use requirements are also estimated based upon assumptions that appear later in this chapter.

Total Demand for Housing Units

Table 25 presents information on employment and population which is the basis for projections of total housing units demanded. Total employment and population reach a peak in year 8 of 4,840 and 12,100, respectively. They dip down in year 10 as construction comes to an end, but increase to equilibrium levels of 4,500 for total employment and 11,250 for total population in year 12. These levels of employment and population continue until year 20.

Table 26 contains the projections of total housing demand made by the author from the information provided in Table 25 and based upon the assumptions of the previous chapter. The change in total units demanded starts in year 1 with 484 and decreases to 32 in year 3. From year 4 to year 8 the number of new units demanded increases and reaches a peak in year 8 of 1,518. The peak is caused

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[1] Kakish, "Projected Employment."

Table 25. Summary of estimated total employment and population due to oil shale development for years 1 through 20

Year	Construction force[a]	Operating force[b]	Local service employment[b]	Total employ-ment	Total population[b]
1	400	--	180	580	1,450
2	400	--	340	740	1,850
3	--	300	500	200	2,000
4	--	300	660	960	2,400
5	500	300	840	1,640	4,100
6	1,000	300	1,000	2,300	5,750
7	1,500	300	1,180	2,980	7,450
8	2,000	1,500	1,340	4,840	12,100
9	1,500	1,500	1,500	4,500	11,250
10	500	1,500	1,680	3,680	9,200
11	--	2,500	1,840	4,340	10,850
12	--	2,500	2,000	4,500	11,250
13-20	--	2,500	2,000	4,500	11,250

[a]White River Oil Shale Project.
[b]Muin Kakish, "Projected Employment and Population Impacts of Oil Shale Development in Uintah County, Utah" (unpublished MS thesis, Utah State University, Logan, Utah, 1975).

Table 26. Estimated total demand for housing units by employment group due to oil shale development for years 1 through 20

Year	DCW[a]	DOW[b]	DSW[c]	Total demand	Annual change in total demand	Average household size
1	400	--	84	484	484	3.00
2	400	--	212	612	128	3.02
3	--	300	344	644	32	3.11
4	--	300	472	772	128	3.11
5	500	300	541	1,341	569	3.06
6	1,000	300	593	1,893	552	3.04
7	1,500	300	661	2,461	568	3.03
8	2,000	1,500	479	3,979	1,518	3.04
9	1,500	1,500	684	3,684	-295	3.05
10	500	1,500	981	2,981	-703	3.09
11	--	2,500	991	3,491	510	3.11
12	--	2,500	1,120	3,620	129	3.11
13-20	--	2,500	1,120	3,620	0	3.11

[a]DCW = Demand for housing units by construction workers.
[b]DOW = Demand for housing units by operation workers.
[c]DSW = Demand for housing units by local service workers.
Source: Estimation made by the author based upon the assumptions of the previous chapter.

by the peak in construction employment of 2,000 and an increase in operation workers from 300 in year 7 to 1,500 in year 8. Years 9 and 10 are characterized by decreases in the demand for new housing units as construction tapers off. Years 11 and 12 bring an increase as 1,000 new operation employees are added to the work force. The period of time between year 13 and year 20 is characterized by no changes in the demand for new housing units by oil shale-related employment.

The total demand for housing units reaches a maximum of 3,979 in year 8 as accommodations for 2,000 construction workers, 1,500 operation employees, and related local service employees are needed. The decrease in total demand in years 9 and 10 will be taken up by mobile homes, as will be seen in the next section. An equilibrium level of 3,620 housing units will be demanded from years 12 to 20.

The average household size implied by these projections is not 3.69 as shown in the U.S. Census of Housing 1970; it is lower, reflecting the high percentages of single migrants associated with high population growth rates.

Demand for Housing by Type of Structure

The breakdown of the total demand for housing units by type of structure is important for making projections of land use and assessed valuation for tax purposes. Land use requirements will be projected in this study.

Table 27 shows the expected demand for mobile homes and permanent housing units, with permanent units being separated into single-family and multiple-family dwellings. The demand for mobile homes reaches a peak in year 8 of 2,289 as the construction force reaches its maximum and operation employment increases by 1,200. Mobile homes constitute 58 percent of all housing units in that year.

Years 3, 8, and 11 are years of large increases in the demand for new permanent housing units. These are the years of large increases in the operation work force. Permanent housing increases continuously from years 1 through 20, until in year 20, 1,968 permanent units and 905 mobile homes will be demanded.

Year 10 would have registered a decrease in the demand for permanent units of fifty-one if the assumption that mobile homes take up the slack in demand had not been in force. This assumption is based on the assumption that as permanent housing is vacated, some mobile home owners will sell their mobile homes and move into the permanent units.

Table 28 shows the demand for housing units by type of structure if high percentages of mobile homes are assumed for each employment group. According to these assumptions, the demand for permanent housing will be 28 in year 1 and the demand for mobile homes will be 456, or 94 percent of the total. In year 8, 2,996 mobile homes will be demanded and 983 permanent units will be demanded. Mobile homes will constitute 75 percent of total units. Year 20 will bring a demand for 2,534 permanent units and 1,086 mobile homes, or 30 percent mobile homes.

Table 27. Estimated housing demand by type of structure assuming *expected* percentages of mobile homes due to oil shale development for years 1 through 20

Year	Permanent housing units						Mobile homes	Mobile homes as percent of total	Annual change in mobile homes
	One-family	Annual change in one-family	Multi-family	Annual change in multi-family	Total	Annual change in total			
1	88	88	34	34	122	122	362	75	362
2	135	47	51	17	186	64	426	70	64
3	277	142	105	54	382	196	261	41	-165
4	323	46	123	18	446	64	326	42	65
5	421	98	160	35	580	134	761	57	435
6	513	92	194	34	707	127	1,186	63	425
7	610	97	231	37	841	134	1,620	66	434
8	1,225	615	465	234	1,690	849	2,289	58	669
9	1,227	2	465	0	1,692	2	1,992	54	-297
10	1,227	0	465	0	1,692	0	1,289	43	-703
11	1,628	401	617	152	2,245	553	1,246	36	-43
12	1,675	47	635	18	2,310	65	1,310	36	64
13	1,712	37	649	14	2,361	51	1,254	35	-51
14	1,749	37	663	14	2,412	51	1,208	33	-51
15	1,786	37	677	14	2,463	51	1,152	32	-51
16	1,827	37	691	14	2,514	51	1,106	31	-51
17	1,860	37	705	14	2,565	51	1,055	29	-51
18	1,897	37	719	14	2,616	51	1,004	28	-51
19	1,934	37	733	14	2,667	51	953	26	-51
20	1,968	34	747	14	2,715	48	905	25	-48

Source: Projections made by the author.

Table 28. Estimated housing demand by type of structure assuming *high* percentages of mobile homes due to oil shale development for years 1 through 20

Year	Permanent housing units						Mobile homes	Mobile homes as percent of total	Annual change in mobile homes
	One-family	Annual change in one-family	Multi-family	Annual change in multi-family	Total	Annual change in total			
1	20	20	8	8	28	28	456	94	456
2	51	31	19	11	70	42	542	89	86
3	202	151	77	58	279	209	365	57	-177
4	233	31	88	11	321	42	451	58	86
5	249	16	95	7	344	23	997	74	546
6	262	13	99	4	361	17	1,532	81	536
7	278	16	105	6	383	22	2,078	84	546
8	713	435	270	165	983	600	2,996	75	918
9	762	49	289	19	1,051	68	2,633	71	-363
10	833	71	316	27	1,148	98	1,832	61	-801
11	1,234	401	468	152	1,702	553	1,789	51	-43
12	1,265	31	480	12	1,745	43	1,875	52	86
13	1,337	72	507	27	1,844	99	1,776	49	-99
14	1,409	72	534	27	1,943	99	1,677	46	-99
15	1,480	71	562	28	2,042	99	1,578	44	-99
16	1,552	72	589	27	2,141	99	1,479	41	-99
17	1,624	72	616	27	2,240	99	1,380	38	-99
18	1,696	72	643	27	2,339	99	1,281	35	-99
19	1,768	72	670	27	2,438	99	1,182	33	-99
20	1,837	69	697	27	2,534	96	1,086	30	-96

Source: Projections made by the author.

Table 29 shows the demand for housing units by type of structure with low percentages of mobile homes assumed. As would be expected, larger demands for permanent units are shown. Mobile homes as a percent of total reaches a high of 65 percent in year 1, with 49 percent mobile homes in year 8. Year 20 shows a demand for 2,899 permanent units and 721 mobile homes, or 20 percent of the total. Years 9 and 10 are years of slackening demand for permanent units. Again the slack is taken up by mobile homes.

Ability to Pay

The range of percentages of mobile homes demanded is designed to take into account both ability to pay and housing preferences of each employment group. This section will deal with what type of housing each employment group could afford to buy if they desired.

The number of permanent housing units demanded depends upon the price of permanent units relative to the price of mobile homes and the incomes of each employment group. If the price of conventional housing units increases faster than the price of mobile homes and incomes, then each employment group will demand less conventional units and more mobile homes. The range of percentages used to calculate the estimates of housing demand presented earlier are designed to take into account increases in the prices of conventional units relative to mobile homes and incomes. If during periods of pressure on the housing market the average price of site housing increases to a certain level relative to the average price of mobile homes and what people can afford, then the expected percentage of mobile homes

Table 29. Estimated housing demand by type of structure assuming *low* percentages of mobile homes due to oil shale development for years 1 through 20

Year	Permanent housing units						Mobile homes	Mobile homes percent of total	Changes in mobile homes
	One-family	Change in one-family	Multi-family	Change in multi-family	Total	Change in total			
1	123	123	47	47	170	170	314	65	314
2	179	56	68	21	247	77	365	60	51
3	312	133	119	51	431	184	213	33	-152
4	367	55	139	20	506	75	264	34	51
5	508	141	192	53	700	194	641	48	377
6	639	131	242	50	881	181	1,012	53	371
7	776	137	295	53	1,071	190	1,389	56	377
8	1,459	683	553	258	2,012	941	1,967	49	578
9	1,459	-0	553	-0	2,012	-0	1,672	45	-295
10	1,459	-0	553	-0	2,012	-0	996	33	-676
11	1,791	332	679	126	2,470	458	1,021	29	25
12	1,847	56	700	21	2,547	77	1,073	30	52
13	1,878	31	713	13	2,591	44	1,029	28	-44
14	1,910	32	725	12	2,635	44	985	27	-44
15	1,942	32	737	12	2,679	44	941	26	-44
16	1,974	32	749	12	2,727	44	897	25	-44
17	2,006	32	761	12	2,767	44	853	24	-44
18	2,038	32	773	12	2,811	44	809	22	-44
19	2,070	32	785	12	2,835	44	765	21	-44
20	2,102	32	797	12	2,899	44	721	20	-44

Source: Projections made by the author.

to total units will be demanded. If the average price of conventional units increases more than expected, then each employment group will demand a percentage of mobile homes somewhere between the high and the expected percentages and vice versa for lower than expected prices.

Table 30 presents information on monthly payments per $1,000 of mortgage debt for a twenty-five-year mortgage at various rates of interest for a conventional housing unit. At 8.0 percent interest a person would pay $7.72 for every $1,000 of mortgage debt per month. A person with an annual income of $7,680 could afford to pay $160 per month on housing if it is assumed that the maximum a person can afford to spend is 25 percent of his monthly income.[2] This person could afford to buy a housing unit at a price of $20,725 at 8.0 percent interest. More expensive housing can be afforded if a down payment is taken into account.

Table 31 shows average annual wages, monthly payments, and the price of housing that the average employee of each employment group will be able to afford. The average construction worker will be able to afford a $73,964 housing unit in year 1. The average operation and local service employee will be able to afford $39,896 and $28,368 housing units, respectively. More expensive housing units could be afforded if down payments and incomes of other family members were taken into account. It must be realized that the income figures are averages, therefore some employees will not be able to afford housing costing this much.

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[2]Agricultural Experiment Station, *Housing in Rural Communities*, p. 21.

Table 30. Monthly payment on a twenty-five-year mortgage per $1,000 of mortgage credit at various interest rates

Interest rate	Monthly payment
4.0	$5.28
4.5	5.56
5.0	5.85
5.5	6.14
6.0	6.44
6.5	6.75
7.0	7.07
7.5	7.39
8.0	7.72
9.0	8.39
10.0	9.09

Source: Willis and Associates, *Kaiparowitz New Town Study*, pp. 86-87.

The average employee of each employment group will be able to afford housing of any type (single-family, multiple-family, or mobile home) if they spend 25 percent of their income. Single-family units in Uintah County can be constructed at the present time (1975) for between $20,000 and $25,000. These are two and three-bedroom units with no garage or basement.

An important factor in the demand for housing is how much people are willing to pay. Development Research Associates, who prepared the study on housing and community services for the Navajo Coal Gasification Complexes, estimate that the non-Navajos with incomes

Table 31. Estimated annual incomes, monthly payments, and prices of housing that can be afforded by oil shale-related employees for years 1 through 20

Year	Construction			Operation			Local service		
	Annual income[a]	Monthly payment[b]	Price of unit[c]	Annual income[a]	Monthly payment[b]	Price of unit[c]	Annual income[a]	Monthly payment[b]	Price of unit[c]
1	$27,400	$571	$73,964	$14,800	$308	$39,896	$10,500	$219	$28,368
2	28,100	585	75,777	15,200	317	41,062	10,800	225	29,145
3				15,600	325	42,098	11,100	231	29,922
4				16,000	333	43,135	11,300	235	30,440
5	30,400	633	81,995	16,400	342	44,301	11,600	242	31,347
6	31,200	650	84,197	16,800	350	45,337	11,900	248	32,124
7	32,000	667	86,399	17,300	360	46,632	12,200	254	32,902
8	32,800	683	88,472	17,700	369	47,798	12,600	263	34,067
9	33,600	700	90,674	18,200	379	49,093	12,900	269	34,845
10	34,500	719	93,135	18,600	388	50,259	13,200	313	40,544
15				21,200	442	57,254	15,000	313	40,544
20				24,100	502	65,026	17,100	356	46,114

[a]White River Oil Shale Project.
[b]Assumes people can afford 25 percent of gross income for housing.
[c]Assumes twenty-five-year mortgage at 8.0 percent interest.

between $11,000 and $13,000 would spend 15 percent of their incomes on housing and that those with incomes of over $17,000 would spend 13 percent.[3] Table 32 shows monthly payments and the prices that the average employee might pay if these percentages are assumed.

Construction workers would pay $38,472 for a housing unit if these assumptions were correct; but because of the temporary nature of their work, construction workers generally spend even less of their income on housing than the average person. This is taken into account in the percentages used to calculate the mix between mobile homes and permanent units.

In 1972 it was found that 67 percent of the single-family units under $20,000 were mobile homes,[4] and that 95 percent of the homes under $15,000 were mobile homes.[5] In year 1 the average operation worker could pay $22,409 for a housing unit. As was stated earlier, a house can be built for $20,000 to $25,000. This is consistent with the assumption that 70 percent of the operation workers will demand permanent housing units. The average price that local service employees could pay in year 1 is $15,933, which is consistent with the assumption that higher percentages of local service employees will demand mobile homes than operation employees.

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[3]Development Research Associates, *Housing and Community Services*, p. IV-21.

[4]Lucie Krassa, "Mobile Homes," *Family Economics Review*, December, 1972, p. 3.

[5]"Mobile Homes Capture the Low-Cost Market," *Business Week*, May 13, 1972, p. 146.

Table 32. Estimated monthly payments and prices according to willingness to pay for employees related to oil shale development for years 1 through 20

Year	Construction		Operation		Local service	
	Monthly payment[a]	Price of unit[b]	Monthly payment[a]	Price of unit[b]	Monthly payment[a]	Price of unit[b]
1	$297	$38,472	$173	$22,409	$123	$15,933
2	304	39,378	177	22,927	126	16,321
3	--	--	182	23,575	130	16,839
4	--	--	173	22,409	132	17,098
5	329	42,617	178	23,057	135	17,487
6	339	43,912	182	23,575	139	18,005
7	347	44,948	187	24,223	142	18,394
8	355	45,984	192	24,870	147	19,041
9	364	47,150	197	25,518	151	19,560
10	374	48,446	202	26,166	154	19,948
15	--	--	230	29,793	175	22,668
20	--	--	261	33,808	185	23,964

[a]Assumes people spend 14 percent of gross income if income is $10,000 to $16,000 per year and 13 percent if it is over $16,000.
[b]Assumes a twenty-five-year mortgage at 8 percent interest.

In conclusion it might be said that the validity of the assumptions that project the mix of housing units between mobile homes and permanent housing units depends upon the price of housing and incomes. If the price of conventional units increases relative to mobile homes, more mobile homes will be demanded by each employment group.

Land Use Requirements

Tables 33, 34, and 35 show projected land use requirements by type of housing unit. For the purposes of these projections, the assumptions made by THK Associates have been used.[6] It is assumed that there will be an average of five single-family units per acre, fourteen multiple-family units per acre, and eight mobile homes per acre.

Years 8 and 20 are of special interest because the number of mobile homes demanded is a maximum at year 8 and year 20 represents the final mix due to the project. As shown in Table 33, in year 8 the expected acreage requirement for permanent housing is 278.2 acres. Mobile homes are expected to require another 286.1 acres. Year 20 brings an increase in acres to 447.0 for permanent housing and a decrease in acres for mobile homes to 113.1 acres for a total land use requirement of 560.1, which is just four acres less than the land required in year 8.

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[6]THK Associates, *Impact Analysis*, p. 28.

Table 33. Estimated land use requirements in acres for *expected* percentages of mobile homes for years 1 through 20[a]

Year	Total acres required	Acres required for permanent housing			Acres required for mobile homes
		Single-family	Multiple-family	Total	
1	65.3	17.6	2.4	20.0	45.3
2	83.9	27.0	3.6	30.6	53.3
3	95.5	55.4	7.5	62.9	32.6
4	114.2	64.6	8.8	73.4	40.8
5	190.7	84.2	11.4	95.6	95.1
6	264.8	102.6	13.9	116.5	148.3
7	341.0	122.0	16.5	138.5	202.5
8	564.3	245.0	33.2	278.2	286.1
9	527.6	245.4	33.2	278.6	249.0
10	439.7	245.4	33.2	278.6	161.1
11	525.5	325.6	44.1	369.7	155.8
12	544.2	335.0	45.4	380.4	163.8
13	545.6	342.4	46.4	388.8	156.8
14	548.2	349.8	47.4	397.2	151.0
15	549.6	357.2	48.4	405.6	144.0
16	553.1	365.4	49.4	414.8	138.3
17	554.3	372.0	50.4	422.4	131.9
18	556.3	379.4	51.4	430.8	125.5
19	558.3	386.8	52.4	439.2	119.1
20	560.1	393.6	53.4	447.0	113.1

[a]Assumes: Single-family = 5/acre.
Multiple-family = 14/acre.
Mobile homes = 8/acre.

Source: Estimates made by the author.

Table 34. Estimated land use requirements in acres for *high* percentages of mobile homes for years 1 through 20[a]

Year	Total acres required	Acres required for permanent housing			Acres required for mobile homes
		Single-family	Multiple-family	Total	
1	61.6	4.0	.6	4.6	57.0
2	79.4	10.2	1.4	11.6	67.8
3	91.5	40.4	5.5	45.9	45.6
4	109.3	46.6	6.3	52.9	56.4
5	181.2	49.8	6.8	56.6	124.6
6	251.0	52.4	7.1	59.5	191.5
7	322.9	55.6	7.5	63.1	259.8
8	536.4	142.6	19.3	161.9	374.5
9	502.1	152.4	20.6	173.0	329.1
10	418.2	166.6	22.6	189.2	229.0
11	503.8	246.8	33.4	280.2	223.6
12	521.7	253.0	34.3	287.3	234.4
13	525.6	267.4	36.2	303.6	222.0
14	529.5	281.8	38.1	319.9	209.6
15	533.4	296.0	40.1	336.1	197.3
16	537.4	310.4	42.1	352.5	184.9
17	541.3	324.8	44.0	368.8	172.5
18	545.2	339.2	45.9	385.1	160.1
19	549.3	353.6	47.9	401.5	147.8
20	553.0	367.4	49.8	417.2	135.8

[a]Assumes: Single-family = 5/acre.
Multiple-family = 14/acre.
Mobile homes = 8/acre.

Source: Estimates made by the author.

Table 35. Estimated land use requirements in acres for low percentages of mobile homes for years 1 through 20[a]

Year	Total acres required	Acres required for permenent housing			Acres required for mobile homes
		Single-family	Multiple-family	Total	
1	73.3	24.6	3.4	28.0	45.3
2	94.0	35.8	4.9	40.7	53.3
3	103.5	62.4	8.5	70.9	32.6
4	124.1	73.4	9.9	83.3	40.8
5	210.4	101.6	13.7	115.3	95.1
6	293.4	127.8	17.3	145.1	148.3
7	378.8	155.2	21.1	176.3	202.5
8	617.4	291.8	39.5	331.3	286.1
9	580.3	291.8	39.5	331.3	249.0
10	492.4	291.8	39.5	331.3	161.1
11	562.5	358.2	48.5	406.7	155.8
12	583.2	369.4	50.0	419.4	163.8
13	583.3	375.6	50.9	426.5	156.8
14	584.8	382.0	51.8	433.8	151.0
15	585.0	388.4	52.6	441.0	144.0
16	586.6	394.8	53.5	448.3	138.3
17	587.5	401.2	54.4	455.6	131.9
18	588.3	407.6	55.2	462.8	125.5
19	589.2	414.0	56.1	470.1	119.1
20	590.4	420.4	56.9	477.3	113.1

[a]Assumes: Single-family = 5/acre.
Multiple-family = 14/acre.
Mobile homes = 8/acre.
Source: Estimates made by the author.

Summary

This chapter has presented estimates of housing demand associated with oil shale development based upon assumptions derived in a previous chapter. The assumptions were developed after careful consideration of data collected by the author and other. The most current literature which treats problems similar to those addressed in this paper was reviewed and also used as a guidepost for the assumptions presented in this paper. Estimates for three levels of demand for mobile homes were made. Under the assumption that certain prices and costs would prevail, an expected level of demand was projected. Lower and upper bounds were also projected to take into account lower than expected and higher than expected demands for mobile homes.

The estimates of expected demand show that the total housing demand in year 1 is 484 units and that a peak is reached in year 8 of 3,979 units due to a peak in construction employees. The equilibrium level is 3,620 from year 12 to year 20. Seventy-five percent of the units demanded in year 1 are estimated to be mobile homes. The figure drops to 58 percent in year 8 and declines gradually to 25 percent mobile homes in year 20.

Estimates of ability to pay indicate that construction workers will generally occupy less expensive housing units than they can generally afford to purchase. They are generally not constrained by the level of their incomes, but rather by their desires to be more mobile because of their temporary work.

Operation and local service employees have more permanent employment but lower incomes. Most of these people prefer permanent housing, but many cannot afford it. Local service employees on the average have lower incomes than do operation workers. Therefore, a higher percentage of local service employees demand mobile homes.

From the information on land characteristics presented in Chapter I, it appears that there is more than enough land which is suitable for residential development in Uintah County to accommodate the increased population due to oil shale. The expected land requirement in year 8 is 564.3 acres and 560.1 acres in year 20. These estimates do not include streets and parks that would require an additional amount of land.

An interesting question not discussed in this paper is where the development should occur if costs are minimized. Will costs be minimized if a new town is built close to the plant, or would it be less costly to let the market operate so that the population were distributed among the already populated areas closest to the plant such as Vernal and Rangely? Should funds be invested to improve travel between Rangely and the oil shale plant? Other alternatives might also be studied.

The estimates of projected housing demand presented in this paper could be used along with estimates of public service, school classroom requirements and other activities, and their costs to answer some of these questions.

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APPENDIXES

Appendix A

Mobile Homes

The mobile home is an alternative for providing some of the housing that will be demanded as a result of oil shale development in Uintah County. Mobile home as used in this paper can be defined as "a complete dwelling unit built on a chassis and capable at time of purchase of being towed over the highway by truck but not by car; travel trailers are excluded."[1] Travel trailers are excluded because they are not generally used as permanent places of residence. They are used most frequently for vacations and camping.

This chapter will discuss mobile homes in detail. First, the growth of the industry will be discussed along with factors that might have caused such growth. Problems and disadvantages of mobile home ownership and their use as a housing alternative in Uintah County will also be discussed.

Growth in the Industry

Since 1940, the growth in the mobile home industry has been more rapid than growth in the conventional housing industry. In 1940, there were about 170,000[2] mobile homes in the United States which represented 0.4 percent of the total housing stock. Twenty years later, in 1960, there were 770,000[3] or 1.4 percent of the total

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[1]Katharyne P. Reil, "Bank Financing of Mobile Homes," *Federal Reserve Bulletin*, LVII (March, 1971), 179.

[2]Camping trailers are excluded.

[3]This figure included railroad cars, tents, and shacks used as residences.

housing units in the United States.[4] Just ten years later in 1970, there were 2,072,887 mobile homes which constituted 3.1 percent of all housing units. The national figures for 1970 can be compared with 2.6 percent for Utah and 8.0 percent for Uintah County.[5]

Another indication of the growth in the mobile home industry can be seen in Table 36. This table shows total expenditures on mobile homes. It is broken down into personal consumption expenditures and producers' durable equipment. The figures are presented in constant 1958 dollars. As can be seen, between 1968 and 1973 expenditures on mobile homes have doubled, the total growing from 2.1 to 4.2 billion dollars.[6]

Shipments of mobile homes accounted for just less than 8 percent of all housing starts in 1970 and were up to almost 20 percent in 1972. Since 1961, shipments of mobile homes in the United States have increased by an average of 18 percent per year compared to 6.4 percent for all private housing starts.[7]

If multiple family structures are excluded, it is found that in the first six months of 1972 mobile homes accounted for 31 percent of

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[4]R. M. French and J. Hadden, "An Analysis of the Distribution and Characteristics of Mobile Homes in America," *Land Economics*, XL (1965), 131.

[5]U.S., Department of Commerce, *U.S. Census of Housing*, 1970, Tables 2, 62.

[6]"Mobile Homes in the National Income and Product Accounts," *Survey of Current Business*, July, 1972, p. 38.

[7]Lynda McDonnell, "Mobile Boxes of Ticky-Tacky," *Progressive*, XXXVIII (May, 1974), pp. 25-28.

Table 36. Yearly expenditures on mobile homes, 1968 through 1973

1958 Dollars	Billions of dollars[a]					
	1968	1969	1970	1971	1972	1973
Total	2.1	2.4	2.5	3.3	4.1	4.2
Personal consumption expenditures[b]	1.9	2.2	2.2	2.9	3.7	3.8
Producers' durable equipment[c]	0.2	0.2	0.2	0.3	0.4	0.4

[a]The dollar amount is derived by multiplying total shipments by average retail price.
[b]Ninety percent of total is assumed to be personal consumption expenditures and 10 percent producers' durable equipment.
[c]Purchased for rental or other business use.
Source: *Survey of Current Business*, July, 1972, p. 38; July, 1974, Table 5.8, p. 35.

the production of single-family structures, which is up substantially from 16 percent in 1964.[8]

Since 1968, the production of new mobile homes has outnumbered the number of conventional single-family units selling for under $20,000. Sixty-seven percent of the one-family structures for less than $20,000 were mobile homes in 1972.[9] In that same year, it was found that the mobile home industry had captured 95 percent of the market for homes under $15,000.[10] Between October 1, 1970, and March 31, 1971, it was found that 99.6 percent of the mobile homes insured by FHA were under $15,000.[11]

[8]Krassa, "Mobile Homes," p. 3.

[9]*Ibid.*

[10]"Mobile Homes Capture the Low-Cost Market," p. 146.

[11]Krassa, "Mobile Homes," p. 3.

The trend of growth in the mobile home industry slowed down to a 5 percent increase in 1973, while conventional housing starts fell by 14 percent.[12] The mobile home industry in 1974 began to suffer losses along with most other industries as a result of the recession. It was expected that sales would fall to $425,000, which is down 25 percent from 1973 sales.[13] Still mobile homes are increasing as a percentage of the total because all housing starts are down even further. In 1974, one-family detached housing accounted for under 50 percent of all housing starts. This is a 20 percent decline from 70 percent in 1960.[14]

Causes of Growth

Several reasons for the growth of the mobile home industry will be presented in this section. They include the following:

1. Over the past few years the average mobile home has evolved into a larger, more elaborate, and plush looking place of residence which has made it acceptable to a large portion of the population.

2. Mobile homes are being thought of as permanent housing by more people than in the past.

3. The cost of building the average mobile home has decreased since 1960, while the cost of building a conventional unit has increased. (This contributes to the lower price of a mobile home relative to a conventional housing unit.)

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[12] McDonnell, "Mobile Boxes," pp. 25-28.

[13] "The Great American House Party is Over," *Forbes*, CXIV (November, 1974), 26.

[14] *Ibid.*, p. 24.

4. The average mobile home requires a lower down payment, as well as lower monthly payments than the average conventional unit.

In the 1940's, the mobile home industry produced 8-foot x 24-38-foot trailers that could be pulled behind a car.[15] These were truly mobile homes and were owned by low-income transient people who moved from place to place as their work changed.

> Historically, houses on wheels have been thought of as abodes for a small minority of the population that are not integrated into the larger society. Gypsies, tinkers, displaced and migrant workers are examples of people who have lived in houses on wheels and were not really integrated into the societies within which they moved.[16]

The mobile home industry has been attempting to create a new thinking about their product which would make them more acceptable to a larger portion of the population. This they have succeeded in doing to a certain extent by increasing the size of the home itself and by increasing the quality of the appliances and other inside conveniences. Many mobile homes are sold with all the modern appliances, with plush wall paneling, and with expensive-looking carpet which their owners would otherwise not be able to afford. Because of these qualities, mobile homes are appealing to more and more moderate to middle-income families.

Table 37 shows changes between 1970 and 1971 in the size of mobile homes shipped. The trend is away from the smaller 12-foot by 60-70-foot home toward the larger 14-foot by 50-70-foot home and the double-wide home. In 1972 the trend continued. Double-wide

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[15] French and Hadden, "Mobile Homes in America," p. 132.

[16] *Ibid.*

shipments were up to 24.7 percent of all mobile homes shipped and the 12-foot mobile home decreased proportionally. The trend continued toward larger units in 1973.[17]

Table 37. Size of mobile homes produced

Width	Average length	Percent of total shipment 1970	1971
8' to 10'	35' to 60'	0.8	1.1
12'	60' to 70'	78.6	69.6
14'	50' to 70'	8.1	16.2
16'	50' to 70'	0.1	0.1
Expandables	50' to 70'	2.6	1.0
Double-wides	50' to 70'	9.6	12.0
Triple-wides	50' to 70'	0.2	--
		100.0	100.0

Source: Mobile Home Manufacturers Association, "Flash Facts, Mobile, Modular, and Sectional Homes (Chicago, Illinois: Mobile Home Manufacturers Association, 1972). (Pamphlet.)

Along with increasing the size and making the interiors more enticing to moderate and middle-income groups, the parks and facilities where most mobile homes are placed are improving in quality and are appealing to higher and higher income groups. There are approximately 2.8 million mobile home families in the United States. Of these, over half are located in mobile home parks or communities.[18]

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[17] Bowers, *Housing Report.*

[18] *Ibid.*, p. 77.

The conditions in mobile home parks have not and do not always contribute to a good reputation for mobile homes. In the past, many developers built poor quality mobile home parks with very little landscaping and very little space between homes. These conditions have given the mobile home community the reputation of being only for low-income people. Conventional home owners often protested the development of such parks close to their homes, fearing that the value of their land would decrease with such an unsightly conglomeration of tin boxes so close by.

These conditions have contributed to the substandard image of mobile homes. It is hard to keep the quality of mobile home parks up in times when sales of mobile homes are booming. Good and bad parks will be filled to capacity. Well planned parks with landscaping and more space between units many times can be less profitable than the poorly planned overcrowded parks that contribute to the bad reputation of mobile homes as dwelling units.[19]

In recent years, however, the quality of the parks on the average has been improving because of new regulations imposed on mobile home parks by communities and because of an effort on the part of many mobile home community developers to attract higher income people. Advertisements in newspapers and on television can be seen which portray park life as the epitome of middle class living. One and a half million dollar facility parks with swimming pools, golf courses, and bars are being advertised. All of this has tended to increase

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[19]Frank Fogarty, "Trailer Parks: The Wheeled Suburbs," *Architectural Forum*, July, 1959, p. 128.

the sales of mobile homes and enhance their reputation as dwelling units.

Other conditions have been improving in mobile home park life. Recently some states have passed laws restricting the absolute power of mobile home park landlords. Many landlords have no laws governing eviction of tenants. This has been taken advantage of by some owners. Landlords can evict tenants because of personal disagreements or for the purpose of collecting an entry fee from the newcomers. In Minnesota, tenants are protected against eviction for complaining to government officials about poor conditions, or for exercising any other constitutional right. New York has restricted eviction to the following cases: default in past rent, bankruptcy, the use of premises for illegal business, the breaking of laws which poses a threat to other dwellers, the persistent violation of park rules, or the breaking of the terms of the lease.[20]

Laws such as the above improve the conditions under which people live and, therefore, the desirability of living in a mobile home park.

It has also been the opinion of many in the past that mobile homes are substandard housing. It was found in 1960 that 90 percent of the mobile homes in the United States were classified as sound, with only 10 percent deteriorating or dilapidated; while only 83 percent of all housing was classified as sound and 17 percent as deteriorating or dilapidated.[21]

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[20]"States Act to Reduce Mobile Home Park Tyranny," *Consumer Report*, XXXVIII (October, 1973), 600.

[21]French and Hadden, "Mobile Homes in America," p. 136.

Another condition usually associated with substandard housing is a high proportion of absentee-owner rental units. Again this criterion tends to support the idea that mobile homes are not as substandard as their reputation has dictated in the past. It was found that 88 percent of mobile home dwellers owned their own unit as compared with 62 percent for permanent housing.[22]

Overcrowding can also be used as a measure of the adequacy of mobile homes. It is true that the average number of rooms per unit is less than that of permanent housing, but this is compensated for by a lower average persons per household figure. The net result is only a slightly higher room density.[23]

The above characteristics which indicate that mobile homes are no more substandard than conventional housing are obviously not all-inclusive. Many consider mobile homes to be substandard because of the materials used in their production. The Uniform Building Code requires that, among other things, the siding be of certain specified material. Tin is not one of these materials. Virtually all mobile homes are built with tin siding and, therefore, would be classified as substandard under the Uniform Building Code. It will be noted, however, that mobile homes are not held to this code and, therefore, it might not be meaningful to classify them using it as a base.

The mobile home industry itself is trying to set up its own building standards to improve the quality of homes and hence the reputation of mobile homes as a dwelling unit. With improving

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[22] *Ibid.*, pp. 135-136.

[23] *Ibid.*, p. 135.

conditions, quality, and higher standards, the life expectancy for the average mobile home is increasing and is now above 15 years.[24] This has caused a shift away from thinking of them only as temporary housing and has been one of the contributing factors to the growth of the industry.

As was stated earlier, the mobile home has been thought of as a place of residence for transient, irresponsible people who travel from place to place and from job to job pulling a silvery trailer behind a dilapidated automobile. Their owners were typically thought of as rural low-income people. The reputation of mobile homes as transient housing has also come partly because they were used during World War II to house servicemen and as temporary housing during the housing shortage after the war.[25]

The feeling that mobile homes are temporary housing has changed over the years, as is indicated by a study done by French and Hadden.[26] They made three hypotheses: (1) that mobile homes were an urban phenomenon, (2) that the percentage of mobile homes of all housing units was inversely related to population density, and (3) that the percentage of mobile homes to total housing units is positively related to the rate of population growth.

They found by using the 1950 and 1960 Census of Housing that the percentage of all mobile homes located in urban areas had dropped from 55 percent to 43 percent. This was a disturbing result in a

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[24]"Mobile Homes in the National Income and Product Accounts," pp. 11, 38.

[25]French and Hadden, "Mobile Homes in America," p. 132.

[26]*Ibid.*

time when large numbers of people were migrating from rural areas to urban areas.[27]

Standard Metropolitan Statistical Areas (SMSA's) were used in place of urban places to see if mobile homes locate in rural areas around urban places. It was found that 64 percent of the United States' mobile home population was located around urban areas. These later results led them to believe that mobile homes were an urban phenomenon. For one reason or another the mobile home population locates around urban places instead of in them. Strict zoning ordinances and difficulty of transportation in high density areas were cited as possible reasons for this trend.[28]

The study found an inverse relationship between population density in SMSA's and location of mobile homes. Forty percent of all mobile homes in SMSA's were located in rural areas, while 36 percent were located in urban other than central city and 24 percent were located in central cities. The same inverse relationship was found when the population per square mile was compared with the percentage of mobile homes to all housing units. These results confirm their hypothesis that lower population density provides more attraction to mobile home dwellers.[29] The implications of their findings concerning population density help explain why Utah and the Mountain West have higher percentages of mobile homes than other states and why Uintah County has an even higher percentage.

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[27] *Ibid.*, p. 133.

[28] *Ibid.*

[29] *Ibid.*, pp. 133-134.

The third hypothesis of a positive relation between population growth and the presence of mobile homes also helps explain the increases in the use of mobile homes in Uintah County. Table 38 divides the fifty states into three categories of growth rates and shows that states with slower population growth have less mobile homes than those with higher population growth rates. Both Utah and Uintah County fall in the third category and show high percentages of mobile homes relative to other areas.

Table 38. Percent mobile homes by population increase by states, 1950-1960

Rate of population increase	Number of states	Percent mobile homes
0.0-10.0	18	1.2
10.1-25.0	20	1.7
25.1-50.0 plus	12	3.0

Source: U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Housing* (Washington, D.C.: Government Printing Office, 1960), Table A-6.

The finding in the above study indicates that mobile homes are not a rural phenomenon, but that they follow closely the rural to urban trend in the United States. The positive correlation between population increase and percentage of mobile homes does not necessarily mean that mobile homes are being used as temporary housing on the whole in the United States.[30] It may mean that conventional housing

[30] *Ibid.*, p. 134.

is scarce in areas where population grows fast and many people choose mobile homes as an alternative. Once they make the decision, it is just about as permanent as if they had chosen a more preferred alternative. With better mobile homes and facilities, more people will make this choice.

The term mobile home does not accurately describe the average mobile home. Most of them are only moved once, from the dealer to the mobile home park.[31] In 1964, a study was done in Arizona which found that the average family had lived in the park where they were surveyed for about three years.[32] According to a housing survey prepared by James Browers and Associates in Denver, Colorado, for the Colorado West Area Council of Governments, mobile home dwellers move at the same frequency as conventional home dwellers; that is, once every five years.[33] The findings of the Department of Housing and Urban Development confirmed these results. Twenty percent of mobile home families move once a year on the average. It was also found that 81 of 100 household heads planned to continue living in their present mobile homes. Of the remaining 19 percent who planned on moving, 25 percent planned to move within a year, 25 percent planned to move in one to three years, and 50 percent did not plan on moving before the fourth year.[34]

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[31]"The Mobile-Home Situation: In Transit," p. 16.

[32]Robert E. Berney and Arlyn J. Larson, "Micro-Analysis of Mobile Home Characteristics with Implications for Tax Policy," *Land Economics*, XL (1966), 455.

[33]"The Mobile-Home Situation: In Transit," p. 16.

[34]Bowers and Associates, *Housing Report*, p. 62.

These studies certainly indicate that mobile homes are at the present time considered more and more as permanent housing. It is obvious that transient seasonal workers who have in the past been associated with mobile homes could not afford the frequent moves of a large mobile homes as required by their work. In fact, most of these people would not be able to afford a modern mobile home.[35] On the other hand, construction workers and oil workers, who are temporary in the sense that their jobs last for two or three years until the job is finished or the oil field begins to decline, may not have other alternatives available to them because of high population growth rates and other considerations. This seems to be what has happened in Uintah County.

In many counties which are experiencing higher than average growth rates, mobile homes are being thought of as a solution to the housing shortage to meet both temporary and long-term housing demands. Most planners are considering mobile homes less and less as temporary housing and more and more as a necessary part of their communities. Still, many communities are apprehensive about possible eyesores in the form of mobile home parks. Proper planning and regulation of these parks can promote landscaping and other beautification schemes that could make mobile home parks an integral part of the city as well as provide a solution to housing pressures.

At the present time, Vernal City is taking an approach which is promoting permanent conventional housing in the city and surrounding areas. The following is a portion of a letter sent out to applicants

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[35]French and Hadden, "Mobile Homes in America," p. 137.

for water connections on the Vernal water system following a water shortage during the summer of 1974.

> Before selling you a water connection, it will be understood that the following conditions have been met:
> 1. For each individual water connection, the petitioner shall sell to Vernal City 1/20th share of Ashley Central Irrigation Water Stock, or 1/10th share of Ashley Upper Irrigation Stock, or 1/8th share of Rock Point Canal Company stock, or 2-1/4th share of Ashley Valley Reservoir Stock.
> 2. Individual water connections will be made only to permanent structures which meet the National Building Code and are placed on a permanent foundation.
> 3. No water line extension will be required to service the new connection. These conditions have been instituted to provide a more equitable and uniform water policy for all Ashley Valley residents--those within the city as well as those without.[36]

This went into effect October 1, 1974, and may have had some effect on the number of mobile homes authorized by building permits in the county. The peak of 123 mobile home permits was reached in 1973.[37] It dropped thereafter to 101 in 1974 and up to the last of April, there were 11 permits authorized for mobile homes in the county for 1975. If this trend continues for the year, only thirty-three mobile homes will be authorized.[38]

There are advantages and disadvantages to this kind of policy. The advantages are that it promotes conventional housing construction and reduces unsightly mobile homes in the city. This can also be taken as a disadvantage in a boom-bust situation. Because of the nature of oil fields, many of these people will only stay two or

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[36]Letter to water connection applicants from Glade I. Nelson, City Manager of Vernal.

[37]"County Building Permits Reach 4-Year High," *Vernal Express*, May 8, 1975, p. 12.

[38]Counts done by the author.

three years, after which they will move on to another oil field. The above policy could promote overbuilding of conventional housing when oil or construction workers are involved, such as in Uintah County at the present and to a greater extent if oil shale is developed.

As for excluding unsightly mobile homes from the area, maybe it would be better under the circumstances of a housing shortage if other regulations such as landscaping requirements and mobile home quality standards were used rather than restricting completely the entry of mobile homes.

There is also the worry of overbuilding of mobile homes. If the mobile home owners are mostly oil and construction workers, what will happen when and if they leave? Will mobile home graveyards develop like those for automobiles? This is a possibility, but as of yet no mobile home graveyards exist in the country. Also, even though the mobile home is less mobile today than in the past, it is still mobile. Families can take them along as they move to a new job, although it is usually unprofitable to transport a mobile home more than 300 to 500 miles because of high transportation costs. Interviews with mobile home dealers indicate that transportation cost for used mobile homes is from $1.80 to $1.90 per mile for a long haul. There is also a minimum movement charge of about $100 for any move whatsoever. While mobile homes can be moved, conventional housing would have to stand vacant or be removed because of its permanent nature.

The third cause of the expansion in the mobile home industry is that the costs of producing them are the same or have declined over the years, while the costs of building the average conventional

housing unit have increased. The square foot cost of building a mobile home has gone from $11 in 1964 to $8.50 in 1972 for a fully furnished mobile home with all the modern applicances.[39] In 1974, the cost was $8.84[40] per square foot for a mobile home compared with $20-$21 per square foot for the average Farmer's Home Administration-sponsored house, as revealed by an interview with Ralph Dart, the Director of FHA in Vernal. He indicated also that the average house ran between $28 and $29 thousand dollars with no brick, no garage, and no fireplace. The cost per square foot for these homes was nearly two and one-half times that for a mobile home. Lafayette, Indiana, National Homes Chairman Frank P. Flynn says, "We can still build single-family homes for under $30,000, but we'd have to do away with extra bathrooms, large garages, and basements."[41]

One of the major factors contributing to the differential in cost is labor. Less than 12 percent of the cost of building a mobile home is in direct labor, as compared to 50 percent for an on-site constructed house.[42] The difference in labor costs results from the fact that unskilled labor can work in a mobile home factory, while only trained carpenters and other skilled laborers with higher wages are used for on-site construction.

One cost that has gone up for mobile home people is the cost of transportation. For a new 14 x 70-foot home, it costs about $1.30

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[39]"Mobile Homes Capture the Low-Cost Market," p. 146.

[40]"The Great American House Party is Over," p. 24.

[41]*Ibid.*

[42]*Ibid.*, p. 26.

per mile for a long haul, along with a minimum moving charge of $100. The 12-foot home would run about thirty cents less per mile and have a slightly lower minimum moving cost. Costs of transportation have increased due to larger sizes for the average mobile homes.

The increase in transportation costs has been more than compensated for by locating factories closer to areas where mobile homes are used most. There is a mobile home factory in nearly every state, which makes it possible for more people to take advantage of mobile units.[43]

Another major factor contributing to the growth in the industry is the difference in financing a mobile home as compared to a conventional unit. An important reason for selecting one housing unit over another is economic. The amount of money available to a family largely determines the location, style, and size of the housing unit and whether to buy a mobile home, rent, or buy a house.[44] Therefore, recent trends in the mobile home industry can be explained to a large extent by raising costs of building materials, the high price of site housing, and the high interest rates. A combination of these factors, along with an improved reputation, makes a mobile home the best buy for many people. Robert De Rose, Chairman of the Mobile Home Manufacturers' Association, said, "We're giving the consumer a tremendous value--a home he can afford to own."[45]

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[43]"Mobile Homes Capture the Low-Cost Market," pp. 146, 148.

[44]Bowers and Associates, *Housing Report*, pp. 64-65.

[45]"Mobile Homes Capture the Low-Cost Market," p. 146.

Mobile homes dominate the low price housing market because low and moderate-income families can better afford them. In 1971, mobile homes accounted for 96 percent of all new construction of homes under $15,000, 75 percent of those under $20,000, and 62 percent of those under $25,000.[46] Incomes of families have a lot to do with these percentages, as well as increased housing prices.

The federal government has a rule of thumb that a family should not have to spend more than 25 percent of its monthly income on housing. In order to afford the $248 monthly cost under an FHA-insured mortgage for a $24,000 conventional housing unit as shown in Table 40, a family would have to have an income of at least $12,000. For the average $7,000 mobile home with monthly payments of $162, a family's income would have to be $7,800 a year.[47] Since a conventional unit for less than $24,000 is rare in Uintah County, many of those families with incomes less than $12,000 would have to buy mobile homes or modular homes if they were to spend less than 25 percent of their incomes.

Roderick Carpenter, who is the housing analyst for Paine, Webber, Jackson and Curtis, believes that of the 72 million households in the United States today, only 19 million (26 percent) have an annual income of $15,000 a year, which is the annual income required to buy the median housing unit at $36,000.[48] The average incomes of mobile home owners under FHA-insured loans was $8,188, which was well below

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[46]Bowers and Associates, *Housing Report*, p. 69.

[47]*Ibid.*

[48]"The Great American House Party is Over," p. 24.

the average of $13,160 for conventional units in 1971.[49] In spite of lower average incomes of mobile home dwellers, the percentage of monthly income paid in 1972 for mobile home dwellers was 11 percent, while that for a conventional unit on an FHA-insured mortgage was 18 percent. This is due to the low average monthly payments in that year of $94.[50]

Monthly payments are lower because the price of the average mobile home is so much lower than that of a conventional unit. Table 39 gives price ranges and average prices of mobile homes as estimated by James M. Bowers and Associates. The average price of a single-wide is about $7,000, that for expandables is about $10,000, and that for double-wide is about $10,780.[51] The average retail price in 1971 was about $7,500 compared with $28,300 for the average conventional unit.[52]

Table 39. Average mobile home prices, 1973

Type of unit	Retail price	Average price
Single-wide	$5,000 to $15,000	$ 7,000
Expandable	$7,500 to $17,000	$10,000
Double-wide	$8,500 to $20,500	$10,780

Source: James M. Bowers and Associates, *Housing Report*, Prepared for Colorado West Area Council of Governments (Denver, Colorado: James M. Bowers and Associates, January, 1974).

[49]"Mobile Homes Capture the Low-Cost Market," p. 146.

[50]Krassa, "Mobile Homes," p. 7.

[51]Bowers and Associates, *Housing Report*, p. 65.

[52]Krassa, "Mobile Homes," pp. 3, 5.

The trend toward larger mobile homes has caused average prices to increase to about $10,000 in 1974 as compared to the average price of a conventional unit of well over $30,000.

Although the price of a mobile home is lower, the interest rate used to finance it is higher. The financing of mobile homes is different from that of conventional housing. Mobile homes are considered a durable consumer good and are classified under the same category as automobiles. The most common loan is the chattel-mortgage loan which is derived from the auto installment loan. The interest rate is administered in an add-on fashion.[53] If the prevailing interest rate were 8 percent add-on, the simple annual rate would be 12.78 percent, as compared with an interest rate for conventional units of 8 or 8.5 percent. The term of the loan would fall between seven and twelve years, while the term for a conventional loan would more likely be twenty-five to thirty years.[54]

Most loans for mobile homes are made by banks and finance companies. Savings and loans have also been given the power to give mobile home loans.[55] In May, 1970, the FHA began insuring loans for mobile homes and in 1971 the VA began guaranteeing mobile home purchases.[56] This has released large quantities of funds that otherwise would not have been available for mobile home purchases. The

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[53]An add-on loan is one in which the total interest for the whole period is included as part of what is owed from the beginning. (See "A Mobile Home vs. a House: How the Costs Compare," *Changing Times, The Kiplinger Magazine*, XXV (January, 1971), 19.

[54]Bowers and Associates, *Housing Report*, p. 66.

[55]Krassa, "Mobile Homes," p. 7.

[56]*Ibid.*

FHA has also eased regulations to permit fifteen and twenty-year financing for mobile homes purchased along with lots.[57]

The FHA will insure a maximum of $10,000 on a single-wide unit with terms not exceeding twelve years and thirty-two days. The maximum for a double-wide is $15,000 with terms up to fifteen years. For the first $6,000, the minimum down payment is 5 percent, and 10 percent for the portion over $6,000.[58]

The Veterans' Administration will guarantee a maximum of $10,000 for twelve years at lower than average interest rates and down payments.[59]

Both of these organizations require the mobile homes to meet the standards of the American National Standards Institute. They also have certain requirements for the park or site where the home will be located.[60]

The following information shows average FHA loan amounts and terms between April 1, 1971, and March 31, 1972, for mobile homes:

Amount of loan	$7,823
Acquisition cost[61]	$9,085
Interest rate, range	7.6-10.5 percent
Maturity	10.5 years

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[57] "The Great American House Party is Over," p. 36.

[58] Bowers and Associates, *Housing Report*, p. 66.

[59] *Ibid.*

[60] *Ibid.*

[61] Includes sales price, transportation costs, sales tax, and other costs of transaction. (See Krassa, "Mobile Homes," p. 7.)

Table 40 compares the monthly cost of a $7,000 mobile home with that of a $24,000 conventional single-family unit for the first five years. As can be seen, the initial cost of $1,060 for a mobile home which includes the down payment and sales tax is less than half that for an FHA-insured mortgage and about one-sixth that for a conventional mortgage. Thus, mobile homes have a distinct advantage at the outset. The mobile home owner has to pay less for maintenance, taxes, and utilities, but he has to pay $65 for park rent that is not paid by the house buyer. The net monthly cost after deducting income tax savings due to interest payment deductions is $161.54 for a mobile, $248.12 for an FHA-insured home, and $221.35 for a conventional mortgage.[62] Obviously, if a family's biggest concern is the size of their monthly payment, then a mobile home is the best buy as long as the family only plans on living in it for five years. Over a seven-year period, mobile homes are no longer the best buy on a monthly basis. Monthly costs would be $165 compared with $185 for the FHA-insured home and $160 for the conventional mortgage home.[63]

Still, at seven years the mobile home has the advantage of the lower down payment and the ease of obtaining a loan. In periods when mortgage money is scarce, people are more easily able to obtain an installment-type loan to buy a mobile home.

There are other advantages that people might see. Mobile homes are easier to maintain than are conventional houses on both the interior and the exterior. Also, there is a certain amount of pride

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[62]Bowers and Associates, *Housing Report*, p. 68.

[63]"A Mobile Home vs. a House," pp. 20-21.

Table 40. Compared costs of mobile home and conventional house (1972 base), first five years

Financing terms / Type of loan	12' x 70' mobile home (816 sq. ft.) $7,000--consumer installation loan	House $24,000 (800-900 sq. ft.) FHA mortgage	House $24,000 (800-900 sq. ft.) Conventional mortgage
Maturity	10 years	30 years	30 years
Interest rate	8% add-on/12.78 A.P.R.	8.5%	8%
Down payment	$780	$2,400[a]	$6,000[a]
Sales tax	$280	--	--
Monthly costs:			
Loan repayment and interest	$150.77	$165.32	$132.08
Park rent	65.00	--	--
Maintenance[b]	5.00	15.00	15.00
Taxes[c]	8.23	50.00	50.00
Heating and utilities[a]	25.00	50.00	50.00
Insurance	Included in loan ($8.20)	10.00	10.00
	$208.00	$290.32	$257.35
Income tax savings			
Deduct interest payments	- 46.46	- 42.20	- 35.73
Net monthly cost	$161.54	$248.12	$221.35

[a]Closing costs, which vary, are also a factor.
[b]Estimates.
[c]Assumes ad valorum tax on both mobile home and conventional house, with mobile home at first year value.

Source: Robert E. Berney and Arlyn J. Larson, "Micro-Analysis of Mobile Home Characteristics with Implications for Tax Policy," *Land Economics*, XL (1966), 453-463; James M. Bowers and Associates, *Housing Report*, Prepared for Colorado West Area Council of Governments (Denver, Colorado: James M. Bowers and Associates, January, 1974).

that goes along with owning a home rather than perpetually renting, and for many a mobile home is the only type of home that it is feasible to own.[64]

In the long run, however, the mobile home depreciates in value, while the conventional house does not. The conventional house may even appreciate in value, leaving the owner with a valuable asset. At the same time, the mobile home owner will have simply experienced a few years of inexpensive shelter, which for many is a worthy achievement.[65] If they were renting, in many cases they would have to pay more per month and have even less to show for it.

There is no fixed formula for the computation of depreciation. Some use wholesale cost as the base, while others use retail price. An example of one formula is 20 percent of the retail price for the first year, 10 percent for the second and third years, and 5 percent for the following years.[66] As can be seen, the resale value is low after it has been used for several years. Nevertheless, mobile home dealers say that they are unable to keep a used mobile home on their lot for more than a few days in Uintah County.

The improvement and financing of mobile home parks has also stimulated the industry. Table 41 shows the costs of developing a good quality mobile home park as estimated by James M. Bowers and Associates.[67] The total cost per space is estimated at $3,930 and the

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[64]Bowers and Associates, *Housing Report*, p. 71.

[65]"A Mobile Home vs. a House," p. 21.

[66]*Ibid.*, p. 19.

[67]Bowers and Associates, *Housing Report*, p. 78.

cost of the whole 100-unit project is estimated at $391,800. This is quite a substantial amount of money. Realizing the need for more and better mobile home facilities, the FHA eased its programs for insuring mobile home park developments in 1969. The result was a spurt in park developments in 1970 and 1971. The number of new spaces went up by 58,000 during the two years.[68] This represents a marked change in thinking about mobile homes as a solution to low and moderate income housing.

Table 41. Development cost of a 20-acre mobile home park with five homes per acre

	Cost per space	Cost for 100 spaces
San. storm sewer	$ 390	$ 39,200
Water distribution system	390	39,200
Grading	140	14,000
Street, drive, and sidewalk	950	95,200
Other paving	270	26,600
Electrical system	340	33,600
Gas system	130	12,600
Landscaping	200	19,600
Building construction	390	39,200
Miscellaneous	130	12,600
	$3,330	$331,800
Land	600	60,000
Total	$3,930	$391,800

Source: Western Federal Savings and Loan Association, *Colorado Mobile Home Industry* (Denver, Colorado: Western Federal Savings and Loan Association, August, 1972).

[68] Krassa, "Mobile Homes," p. 5.

The thinking of the American people toward mobile homes has changed substantially over the years due to the move toward increased size and luxury of the average mobile home and away from emphasis on mobility. As emphasis was taken off mobility, their reputation has improved as more and more moderate and middle-income people became associated with them. They are no longer thought of as transient housing for low-income migrant workers. The change in thinking has been made possible by low costs due largely to factory assembly and the use of unskilled labor. Lower costs made possible the appealing and expensive-looking interiors coupled with low prices. The low prices relative to those of conventional units, as well as the relative ease in obtaining financial arrangements, has made ownership possible for many people who otherwise would not have been able to afford such plush surroundings. Even if these people had been able to afford a new house or to rent, perhaps they would not have been able to afford such middle-class-looking dwelling units.

Mobile Home Problems

Even though many improvements have been made in the quality of mobile homes, there are still several unique problems associated with them that are not confronted when conventional housing is used. There are still problems of quality concerning wind, fire, and construction requirements. There are also questions about taxing and whether the owner pays his fair share in the community. Zoning regulations are another area of conflict in many cities. These problems will be discussed in this section.

High winds can be the cause of much damage to mobile homes. Because of the lack of a secure foundation and because of the lightness of the material used and the rectangular shape, they are easily blown over in high winds. These problems can be overcome in part by good planning of mobile home parks. In areas where high winds usually come from one direction, mobile homes could be placed with a short end facing that direction. Many communities have tried to solve this problem by requiring that mobile homes be securely tied down to a solid foundation. Skirts around the bottoms is also a good measure because it prevents winds from getting under the home and lifting it over.[69] High winds, however, are not a major problem in Uintah County. Winds are usually regular and low except in times of thunderstorms. Measures could be taken to prevent wind damage due to these storms if the community sees fit.

Loss due to fire is another problem. In a study done in Oregon, the average financial loss due to fire in mobile homes was 25.96 percent, as compared with 6.27 percent of the value of the average conventional unit. The high loss is due to the fact that mobile homes burn faster and the point of total destruction is reached sooner. This is due to several construction qualities which are peculiar to mobile homes. First, the interior and the exterior are not separated by space or insulation to impede the spread of fire. Second, many mobile homes are built with interior wood paneling, which is highly flammable. Third, insulation around the heating compartment may not

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[69]Bowers and Associates, *Housing Report*, p. 72.

be sufficient or effective. Fourth, enough magnesium is often contained in the outside paneling to make it combustible.[70]

The death ratio for mobile homes was found to be 2.74 times that per conventional unit fire. On the good side, however, it was found that conventional units have a higher percentage of fires by a ratio of 1.93 to 1.[71]

Many of the problems associated with fires can be improved as the quality of mobile homes improves. As has been stated earlier, the quality of construction has been improving over the years as national standards have been adopted by the industry. As of July 1, 1970, Utah adopted what it calls the American Standard, which is a standard published by the United States of America Standards Institute (ANSI) and the National Fire Protection Association No. 501B. Every mobile home sold, offered for sale, or manufactured after July 1, 1970, in Utah has to be inspected and have a seal placed on it certifying that it meets the plumbing, heating, and electrical requirements of the American Standard.[72]

If the American Standard were met in Uintah County the quality of mobile home living could increase substantially, depending upon the level of abuse. It is likely that the majority of mobile homes do not meet and satisfy standards. Neighboring Duchesne County, which has had similar growth problems as Uintah County, has a problem

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[70] *Ibid.*, pp. 72-73.

[71] *Ibid.*, p. 73.

[72] Utah, *Utah Code*, Annotated 1953, Replacement Volumes 5A, 6B, 1970, Title 41, Section 20, Paragraph 3, pp. 430-431.

with substandard mobile homes. On Monday, June 30, 1975, an article appearing in the *Uintah Basin Standard*[73] gave insight into problems that could occur in Uintah County. State building inspectors inspected scores of mobile homes in Duchesne County and found that almost 100 percent failed to meet health or safety standards or both. Most of the problem was due to unsafe electrical wiring hookups. To meet the problem head-on, the state will soon establish two offices in the Uintah Basin to keep closer tabs on mobile homes and contractors. Duchesne County officials were advised to revise their inspection system and to hire another building inspector so that health and safety regulations can be met.

If oil shale is developed in Uintah County, mobile homes will play a big part in meeting the demand for housing. In order to insure that safety and health hazards do not develop, a system of inspection that will catch substandard conditions will be needed. Planning for this should begin as soon as possible so that present conditions can be improved and further abuse can be prevented if oil shale is developed.

The ANSI is a code established by the mobile home industry to regulate the quality of its product. It establishes certain performance requirements to which manufacturers must conform using any materials that meet the requirements. The requirements range from plumbing system requirements to design requirements to construction

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[73]"Building Inspectors Needed for County Says State Officials," *Uintah Basin Standard*, LXIII, No. 34 (June, 1975), p. 1.

requirements.[74] The Uniform Building Code, on the other hand, is a specification code which specifies materials to be used as well as a set of standards of performance. The difference between the two allows mobile home manufacturers to be flexible with materials to keep costs down, but it also allows at times a reduction of quality of construction.[75] Even though improvements in quality have been achieved by the application of this law, the consistency of quality varies greatly.

The taxation of mobile homes is another important question. Should they be taxed the same as any other dwelling unit or should they be taxed differently? Few states tax them the same as conventional units. Some states use the specific-ownership tax, some use the ad-valorum tax, others use permit fees, and others use use-sales taxes.[76]

Utah uses an ad valorem assessment of all taxable property as stated in the Utah Code, Title 58. "All tangible property in this state, not exempt under the laws of the United States or under the Constitution of this state, shall be taxed in proportion to its value as hereinafter provided."[77]

Mobile homes are included in taxable property and are assessed at the same rate as real estate and improvements. They are considered personal property, however. The difference in taxation is that mobile

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[74]Frederick H. Bair, Jr., "Regulation of Modular Housing, with Special Emphasis on Mobile Homes," Report No. 271, Planning Advisory Service, 1971, pp. 17-19.

[75]Bowers and Associates, *Housing Report*, p. 72.

[76]*Ibid.*, p. 74.

[77]Utah, *Utah Code*, Title 59, Chapter 1, Section 1.

homes do not need to be appraised every five years as do real estate and improvements. Their fair market value is derived taking cost price multiplied by some depreciation factor.

The Utah Code sets the assessment rate and is stated as follows: "All taxable property, not specifically exempt under Article XIII, Section 2, of the Constitution of Utah, must be assessed at thirty percent of its reasonable fair cash value. Land and improvements must be separately assessed."[78]

In many Utah counties the rate of assessment is less than 30 percent of market value. The assessment rate in Uintah County is about 20 percent. The state keeps encouraging them to raise the rate, but it has not been done because of opposition from the residents of the county.

To find an approximation of the fair market value of a mobile home, Uintah County starts in the first year after purchase at 95 percent of original cost and decreases this at a rate of 5 percent per year until a minimum cash value of 25 percent of original cost is reached in the fifteenth year. The assessed valuation is found by taking 20 percent of the fair cash value each year.

Cache County depreciates and assesses its mobile homes in a different manner. Assessed valuation in the first year is 22 percent of the original cost. It is 19 percent for the second year and continues to fall until the minimum of 6 percent is reached in the eleventh year.

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[78] *Ibid.*, Chapter 5, Section 1.

Once the assessed valuation is found, it is multiplied by the mill levy to arrive at the tax. The mill levies are 56.66 and 68.16 for Uintah County and Vernal City, respectively.

In the first year, the tax paid by a mobile home owner who bought a home costing $10,000 originally would be calculated by taking 95 percent of $10,000 or $9,500 for the depreciated fair cash value. The assessed value would be 20 percent of $9,500, or $1,900. The tax would be $107.65 in the county and $129.50 in Vernal. In the fifteenth year, the tax would be $28.33 in the county and $34.08 in the city.

The taxes paid by a $30,000 home owner would be $339.96 and $408.96 for the county and city, respectively. In the fifteenth year, assuming a rate of appreciation of 5 percent a year, the house would be worth $52,500 and the tax would be $594.93 for the county and $715.68 for the city.

As can be seen from the above description, a mobile home owner with an average unit costing $10,000 pays $232.31 less taxes than an owner of a $30,000 home in the county and $279.46 less if he lived in the city during the first year. During the fifteenth year, the differential would be $566.60 in the county and $681.60 for the city.

The above description illustrates why conventional home owners who have resided in the community for many years feel that mobile home dwellers do not pay their fair share of taxes. The argument is that they use the same services, but pay less taxes. They pay less taxes because the original cost is about one-third that of the average conventional unit, and from there the mobile home depreciates while the conventional unit appreciates in value.

The answer to the question of whether mobile home dwellers use less services is not obvious. Average family size for mobile homes is lower, indicating that there are many childless families whose demand for school facilities is disproportionately low. Also, streets and sewers within the park may be developed considerably by the park developer. In some cases, trash disposal is handled privately by park owners.[79] It may be said that mobile homes incur a slightly smaller per unit cost for services than do conventional homes. Also, during periods of high demand for housing and low vacancy rates, mobile homes are purchased by many people because they are more readily available. During this period of time, these people pay taxes associated with new mobile homes. After a few years, as demand for housing declines, many of those mobile home dwellers who plan to stay in the area substitute their mobile homes for conventional units which are taxed at higher rates. Many of these mobile homes will be sold and/or will be taken out of the county before they depreciate very much in value. The result would be to have an increasing residential assessed value over the time of the initial growth period and after. The slack in demand would be taken up by mobile homes whose owners on the average demand less government services and who pay lower taxes. As time passes and fewer mobile homes are demanded, more conventional units will be demanded whose owners are more permanent, pay more taxes, and demand more services.

Mobile homes are still considered to be more of a burden on a community than are conventional units. Zoning laws to keep them out

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[79]French and Hadden, "Mobile Homes in America," p. 138.

are therefore enacted by the long-term residents. It is believed by many that mobile home owners locate outside of the city limits to avoid taxes while they take advantage of the services provided by the city. There is evidence that in the United States mobile homes are congregating in the rural urban fringe outside the cities. This could be to avoid taxes, but it could also be because of zoning ordinances which are designed to keep them out.[80] These laws have developed in response to the poor reputation of mobile homes. Conventional dwellers do not want tinny boxes inhabited by low-class people in their neighborhoods. Ordinances such as minimum lot size and refusal of water connections such as in the Vernal case have been used to restrict entry.

It might be suggested that in the case of oil shale development in Uintah County, where large numbers of construction, oil, and mining people will be employed, the use of mobile homes would be a viable solution to their housing needs. Zoning ordinances which encourage these people to either build a conventional home may not be the best solution to the problem. Many of these workers will only be in the county for two or three years, after which they will leave their homes, causing excessively high vacancy rates.

The Utah Code gives cities and towns the right to control the development of the areas under their jurisdiction by zoning regulations and is upheld by the courts.

> 10-9-1. Right to regulate zoning. - For the purpose of promoting health, safety, morals, and the general welfare of the community, the legislative body of cities and towns is empowered to regulate and restrict the height,

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[80] *Ibid.*

> number of stories, and size of buildings and other structures, the percentage of lots that may be occupied, the size of yards, courts, and other open spaces, the density of population and the location and use of buildings, structures, and land for trade, industry, residence, or other purposes.[81]

By applying these powers, a community could either restrict entry completely or regulate development of mobile home parks according to a plan.

Perhaps the solution would be to use zoning ordinances and other laws to regulate the appearance and location of mobile homes instead of using them to limit their entry. Certainly, the uncontrolled development of mobile home parks in Uintah County would detract from its aesthetic appeal. Laws that require landscaping, minimum lot size, and other health and safety standards would help integrate mobile home parks into the community as a respectable form of housing. At the present time, Vernal has an ordinance that prohibits mobile homes from locating in areas other than mobile home parks. This ordinance along with others that will regulate the appearance and location of new parks could be a real asset to the community in solving housing problems that might result from oil shale development.

Conclusion

The mobile home industry has grown in the last few years because of its ability to meet the needs of not only low-income groups, but also moderate and middle-income groups in the face of spiraling prices for conventional housing. This expansion and increased use has caused the reputation of mobile homes and mobile home dwellers to

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[81] Utah, *Utah Code*, Title 10, Chapter 9, Section 1.

reach higher levels. Mobile homes are being thought of more and more as permanent housing as their size increases and their mobility decreases. National standards for both mobile homes and parks have improved the quality of mobile home life. Because of these standards, conventional home owners are thinking of mobile homes and their dwellers as more of an integral part of the community. Zoning regulations and other ordinances can improve the integration of mobile homes into a community. In the case of Vernal and Uintah County, mobile homes can be used to house workers such as construction workers who will come and go with the construction of the oil shale facilities. Actions such as this may prevent overbuilding of conventional housing units that are constructed during the boom of a boom-bust cycle associated with oil fields and construction work. Mobile homes could be the solution with proper zoning and park planning.

Table 42. Population and employment between 1960 and 1970

	1970			1960		ΔP[a]	ΔT[b]	$\frac{\Delta P}{\Delta T}$	$\%\Delta P$
	Pop.	Empl.	Pop. empl.	Pop.	Empl.				
Mohave, Arizona	25,857	8,914	2.9	7,736	2,885	18,121	6,029	3.0	234.2
Calaveras, Calif.	13,585	4,278	3.2	10,289	3,658	3,296	620	5.3	32.0
El Dorado, Calif.	43,833	16,463	2.7	29,390	10,567	14,443	5,896	2.4	49.1
Madison, Idaho	13,452	4,758	2.8	9,417	3,242	4,035	1,516	2.7	42.8
Lincoln, Montana	18,063	6,007	3.0	12,537	3,625	5,526	2,382	2.3	44.1
Deschutes, Oregon	30,442	11,555	2.6	23,100	8,859	7,342	2,696	2.7	31.8
Hays, Texas	27,642	9,841	2.8	19,934	6,495	7,708	3,346	2.3	38.7
Montgomery, Texas	49,479	17,090	2.9	26,839	8,313	22,640	8,777	2.6	84.4
Palo Pinto, Texas	28,962	9,109	3.2	20,516	6,664	8,446	2,445	3.5	41.2
Parker, Texas	33,888	12,217	2.8	22,880	7,987	11,008	4,230	2.6	48.1
Randall, Texas	53,885	22,667	2.4	33,913	12,951	19,972	9,716	2.1	58.9

[a] ΔP = Change in population.
[b] ΔT = Change in total employment.
Source: U.S., Department of Commerce, Bureau of the Census, *U.S. Census of Population* (Washington, D.C.: Government Printing Office, 1960, 1970); compiled by Muin Kakish, "Projected Employment and Population Impacts of Oil Shale Development in Uintah County, Utah" (unpublished MS thesis, Utah State University, Logan, Utah, 1975).

Table 43. Units authorized by residential building permits, Mohave County, Arizona[a]

Year	Total	One-family	Two-family	Three-four-family	Five or more
1960	22	NA[b]	NA	NA	NA
1961	48	NA	NA	NA	NA
1962	69	59	2	3	5
1963	167	138	6	13	10
1964	192	165	8	9	10
1965	68	68	-	-	-
1966	74	74	-	-	-
1967	261	203	2	22	34
1968	430	279	26	27	98
1969	633	NA	NA	NA	NA
1970	757	596	90	43	28
1971	640	506	86	48	-
1972	804	603	60	39	102
1973	703	498	48	111	46
1974	718	592	26	94	6

[a]Units authorized by type of structure.
[b]NA = Not available.
Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.

Table 44. Units authorized by residential building permits, Calaveras County, California[a]

Year	Total	One-family	Two-family	Three-four-family	Five or more
1960	11	NA[b]	NA	NA	NA
1961	11	NA	NA	NA	NA
1962	228	NA	NA	NA	NA
1963	303	257	4	13	29
1964	347	325	-	22	-
1965	311	308	-	3	-
1966	332	328	4	-	-
1967	260	252	8	-	-
1968	325	319	6	-	-
1969	241	NA	NA	NA	NA
1970	260	242	2	-	16
1971	324	320	4	-	-
1972	436	383	12	-	41
1973	327	288	8	3	28
1974	210	198	12	-	-

[a]Units authorized by type of structure.
[b]NA = Not available.
Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.

Table 45. Units authorized by residential building permits, El Dorado County, California[a]

Year	Total	One-family	Two-family	Three-four-family	Five or more
1960	1,165	NA[b]	NA	NA	NA
1961	1,632	954	155	94	429
1962	1,149	883	56	44	166
1963	1,360	920	130	171	139
1964	1,096	858	78	53	109
1965	1,227	838	68	73	248
1966	464	442	4	3	15
1967	213	209	-	4	-
1968	204	198	2	4	-
1969	593	NA	NA	NA	NA
1970	771	660	8	28	75
1971	1,372	895	10	85	382
1972	1,710	1,354	22	50	284
1973	1,857	1,413	84	123	237
1974	1,580	1,313	112	71	94

[a]Units authorized by type of structure.
[b]NA = Not available.
Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.

Table 46. Units authorized by residential building permits, Madison County, Idaho[a]

Year	Total	One-family	Two-family	Three-four family	Five or more
1960	26	NA[b]	NA	NA	NA
1961	12	NA	NA	NA	NA
1962	25	NA	NA	NA	NA
1963	27	19	-	8	-
1964	40	19	2	8	11
1965	94	28	-	60	6
1966	40	14	-	8	18
1967	69	33	-	12	24
1968	134	32	4	45	53
1969	42	NA	NA	NA	NA
1970	119	17	-	4	98
1971	326	41	-	32	253
1972	33	29	4	-	-
1973	30	22	-	8	-
1974	59	57	2	-	-

[a]Units authorized by type of structure.
[b]NA = Not applicable.
Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.

Table 47. Units authorized by residential building permits, Lincoln County, Montana[a]

Year	Total	One-family	Two-family	Three-four-family	Five or more
1960	4	NA[a]	NA	NA	NA
1961	2	NA	NA	NA	NA
1962	5	NA	NA	NA	NA
1963	8	3	-	-	5
1964	3	NA	NA	NA	NA
1965	19	3	-	-	16
1966	7	2	-	-	5
1967	6	4	2	-	-
1968	5	5	-	-	-
1969	3	NA	NA	NA	NA
1970	-	-	-	-	-
1971	14	5	-	-	9
1972	50	2	-	4	44
1973	1	1	-	-	-
1974	1	1	-	-	-

[a]Units authorized by type of structure.
[b]NA = Not applicable.
Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.

Table 48. Units authorized by residential building permits, Deschutes County, Oregon[a]

Year	Total	One-family	Two-family	Three-four-family	Five or more
1960	52	NA[b]	NA	NA	NA
1961	P=2,52[c]	NA	NA	NA	NA
1962	84	68	4	-	12
1963	72	NA	NA	NA	NA
1964	145	75	6	12	42
1965	184	137	-	15	32
1966	107	60	-	27	20
1967	124	106	2	16	-
1968	109	75	4	24	6
1969	82	NA	NA	NA	NA
1970	121	87	8	-	26
1971	232	128	24	14	66
1972	559	215	52	38	254
1973	351	134	50	72	93
1974	114	83	10	4	17

[a]Units authorized by type of structure.
[b]NA = Not available.
[c]Public units are included in the total.
Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.

Table 49. Units authorized by residential building permits, Hays County, Texas[a]

Year	Total	One-family	Two-family	Three-four-family	Five or more
1960	24	NA[b]	NA	NA	NA
1961	25	NA	NA	NA	NA
1962	17	NA	NA	NA	NA
1963	75	40	-	-	35
1964	147	53	6	-	88
1965	89	73	16	-	-
1966	248	84	2	3	159
1967	187	81	-	40	66
1968	162	66	10	36	50
1969	P=125,322[c]	NA	NA	NA	NA
1970	283	109	-	4	170
1971	P=100,417	99	102	-	216
1972	237	73	4	-	148
1973	307	52	36	4	203
1974	176	38	2	-	136

[a]Units authorized by type of structure.
[b]NA = Not available.
[c]Public units included in the total.
Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.

Table 50. Units authorized by residential building permits, Montgomery County, Texas[a]

Year	Total	One-family	Two-family	Three-four-family	Five or more
1960	40	NA[b]	NA	NA	NA
1961	70	NA	NA	NA	NA
1962	64	NA	NA	NA	NA
1963	73	69	4	-	-
1964	94	86	8	-	-
1965	112	89	4	-	19
1966	69	58	2	3	6
1967	65	57	-	8	-
1968	98	50	4	-	44
1969	65	NA	NA	NA	NA
1970	71	65	2	4	-
1971	222	127	2	15	78
1972	358	119	2	71	166
1973	69	65	-	4	-
1974	62	48	4	-	10

[a]Units authorized by type of structure.
[b]NA = Not available.
Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.

Table 51. Units authorized by residential building permits, Palo Pinto County, Texas[a]

Year	Total	One-family	Two-family	Three-four-family	Five or more
1960	36	NA[b]	NA	NA	NA
1961	48	NA	NA	NA	NA
1962	138	110	-	-	28
1963	86	NA	NA	NA	NA
1964	170	133	-	-	37
1965	190	160	-	-	30
1966	184	184	-	-	-
1967	322	245	4	-	73
1968	185	156	8	7	14
1969	34	NA	NA	NA	NA
1970	72	72	-	-	-
1971	P=60,67[c]	7	60	-	-
1972	5	5	-	-	-
1973	2	2	-	-	-
1974	7	7	-	-	-

[a]Units authorized by type of structure.
[b]NA = Not available.
[c]Public units included in the total.
Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.

Table 52. Units authorized by residential building permits, Parker County, Texas[a]

Year	Total	One-family	Two-family	Three-four-family	Five or more
1960	76	NA[b]	NA	NA	NA
1961	90	NA	NA	NA	NA
1962	56	NA	NA	NA	NA
1963	85	69	-	-	6
1964	81	69	-	-	12
1965	77	73	-	4	-
1966	32	24	-	8	-
1967	61	50	2	-	9
1968	93	33	-	-	60
1969	91	NA	NA	NA	NA
1970	92	54	-	32	6
1971	119	79	28	12	-
1972	91	27	-	-	64
1973	20	20	-	-	-
1974	37	-	-	-	-

[a]Units authorized by type of structure.
[b]NA = Not available.
Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.

Table 53. Units authorized by residential building permits, Randall County, Texas[a]

Year	Total	One-family	Two-family	Three-four-family	Five or more
1960	77	NA[b]	NA	NA	NA
1961	126	122	4	-	-
1962	87	63	-	-	24
1963	193	68	2	-	123
1964	82	76	-	-	6
1965	124	58	2	-	64
1966	79	44	-	-	35
1967	131	39	-	-	92
1968	51	39	-	-	12
1969	26	NA	NA	NA	NA
1970	119	19	-	-	100
1971	64	40	6	-	18
1972	43	41	2	-	-
1973	78	78	-	-	-
1974	48	42	2	4	-

[a]Units authorized by type of structure.
[b]NA = Not available.
Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.

Table 54. Building permits authorized by type of structure for Moffat County, Colorado

Year	Total	One-family	Two-family	Three-four-family	Five or
1960	37	37	-	-	-
1961	22	22	-	-	-
1962	33	29	4	-	-
1963	16	11	2	3	-
1964	P=2,22[a]	16	2	4	-
1965	20	16	4	-	-
1966	P=1,7	P=1,7	-	-	-
1967	6	6	-	-	-
1968	3	3	-	-	-
1969	7	NA[b]	NA	NA	NA
1970	4	4	-	-	-
1971	10	4	2	4	-
1972	14	10	4	-	-
1973	80	34	4	7	35
1974	45	46	2	-	-

[a]P = Number of public units.
[b]NA = Not available.
Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.

Table 55. Building permits authorized by type of structure for Sweetwater County, Wyoming

Year	Total	One-family	Two-family	Three-four-family	Five or more
1960	55	55	-	-	-
1961	90	90	-	-	-
1962	187	157	-	20	10
1963	66	66	-	-	-
1964	47	42	-	4	-
1965	44	42	2	-	-
1966	37	21	-	16	-
1967	42	28	2	-	12
1968	57	55	2	-	-
1969	83	NA[a]	NA	NA	NA
1970	150	93	2	-	55
1971	143	107	4	8	24
1972	123	123	-	-	-
1973	510	394	10	48	58
1974	469	217	100	48	104

[a]NA = Not available.

Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.

Table 56. Units authorized by residential building permits, Duchesne County, Utah

Year	Total	One-family	Two-family	Three-four-family	Five or more
1960	6	NA[a]	NA	NA	NA
1961	7	NA	NA	NA	NA
1962	2	NA	NA	NA	NA
1963	7	NA	NA	NA	NA
1964	4	NA	NA	NA	NA
1965	8	8	-	-	-
1966	10	10	-	-	-
1967	18	18	-	-	-
1968	11	7	-	4	-
1969	2	NA	NA	NA	NA
1970	21	19	2	-	-
1971	42	22	2	6	12
1972	75	39	14	16	6
1973	56	48	4	4	-
1974	69	61	2	6	-

[a]NA = Not available.

Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.

Table 57. Units authorized by residential building permits, Carbon County, Utah

Year	Total	One-family	Two-family	Three-four-family	Five or more
1960	20	NA[a]	NA	NA	NA
1961	15	NA	NA	NA	NA
1962	12	NA	NA	NA	NA
1963	14	12	2	-	-
1964	7	NA	NA	NA	NA
1965	14	14	-	-	-
1966	10	10	-	-	-
1967	19	17	2	-	-
1968	21	19	2	-	-
1969	17	NA	NA	NA	NA
1970	34	32	2	-	-
1971	57	51	6	-	-
1972	60	48	-	4	8
1973	66	62	-	4	-
1974	98	64	2	-	32

[a]NA = Not available.

Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.

Table 58. Units authorized by residential building permits, Uintah County, Utah[a]

Year	Total	One-family	Two-family	Three-four-family	Five or more
1960	55	NA[b]	NA	NA	NA
1961	102	93	4	-	5
1962	158	140	14	4	-
1963	P=1,62[c]	58	4	-	-
1964	31	NA	NA	NA	NA
1965	P=10,51	51	-	-	-
1966	36	32	-	4	-
1967	23	23	-	-	-
1968	18	18	-	-	-
1969	P=5,19	NA	NA	NA	NA
1970	95	95	-	-	-
1971	P=71,145	145	-	-	-
1972	120	98	2	12	8
1973	127	109	6	12	-
1974	212	126	6	18	62

[a]Units authorized by type of structure.
[b]NA = Not available.
[c]P = Number of public units included in total.
Source: U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.

Table 59. Population, income, and employment, Emery County, Utah

Year	Population	% Population	Non-agric. employment	Δ Non-agric. employment	% Unemployed	Personal income 1,000's	Per capita income
1960	5,500		1,264	26	11.0	10,112	1,840
1961	5,500	0	1,189	-75	11.8	10,003	1,820
1962	5,400	-1.9	1,093	-96	12.2	7,832	1,450
1963	5,400	0	1,144	51	11.5	9,137	1,690
1964	5,400	0	1,110	-34	11.4	9,330	1,730
1965	5,400	0	1,222	112	9.4	9,663	1,790
1966	5,300	-1.9	1,022	-200	10.7	8,637	1,630
1967	5,200	-1.9	1,011	-11	7.8	9,849	1,890
1968	5,200	0	1,134	123	7.9	9,850	1,890
1969	5,100	-1.9	1,050	-84	8.2	9,660	1,890
1970	5,200	2.0	1,169	119	9.5	10,839	2,080
1971	5,300	1.9	1,080	-89	12.9	11,918	2,290
1972	5,200	-1.9	1,588	508	8.3	20,631	3,970
1973	6,100	17.3	2,141	553	5.9	34,855	5,710
1974	6,200[a]	1.6	2,136[a]	-60	8.5[a]	37,082[a]	5,980[a]

[a]Preliminary.

Source: Utah Department of Employment Security, *Utah Labor Market Information by Planning District and County, 1950-1973* (Salt Lake City, Utah: Utah Department of Employment Security, 1974; Utah Department of Employment Security, *Employment Newsletter*, February, 1975, for 1971-1974.

Table 60. Population, income, and employment, Carbon County, Utah

Year	Population	% Population	Non-agric. employment	Δ Non-agric. employment	% Unemployed	Personal income 1,000's	Per capita income
1960	21,200	-	4,969	-128	9.1	37,138	1,750
1961	20,400	-3.8	4,850	-119	9.7	37,226	1,820
1962	19,700	-3.4	4,758	-92	10.5	30,976	1,570
1963	18,700	-5.1	4,540	-218	10.0	30,148	1,610
1964	17,700	-5.3	4,526	-14	9.8	32,201	1,820
1965	17,300	-2.3	4,672	146	7.5	34,040	1,970
1966	16,900	-2.3	4,722	50	8.0	32,388	1,920
1967	16,800	-.6	4,614	-108	8.6	36,820	2,190
1968	16,400	-2.4	4,566	48	9.1	38,206	2,330
1969	16,100	-1.8	4,618	-52	8.0	41,970	2,610
1970	15,800	-1.9	4,671	-53	10.0	46,142	2,920
1971	16,100	1.9	4,820	149	11.3	50,811	3,160
1972	16,500	2.5	4,911	91	10.1	55,143	3,360
1973	17,000	3.0	5,020	109	8.0	60,480	3,560
1974	17,700[a]	4.1	5,210[a]	190	8.1[a]	67,259[a]	3,800[a]

[a]Preliminary.

Source: Utah Department of Employment Security, *Utah Labor Market Information by Planning District and County, 1950-1973* (Salt Lake City, Utah: Utah Department of Employment Security, 1974), for 1960-1970; Utah Department of Employment Security, *Employment Newsletter*, February, 1975, for 1971-1974.

Table 61. Population, income, and employment, Duchesne County, Utah

Year	Population	% Population	Non-agric. employment	Δ Non-agric. employment	% Unemployed	Personal income 1,000's	Per capita income
1960	7,200	-	1,071	61	8.3	9,811	1,360
1961	7,200	0	1,067	-4	9.7	10,385	1,440
1962	7,100	-1.4	1,087	20	9.0	9,614	1,350
1963	7,000	-1.4	1,036	-51	12.2	9,460	1,350
1964	6,700	-4.3	949	-87	9.3	8,512	1,270
1965	6,500	-3.0	988	39	8.9	9,675	1,490
1966	6,500	0	1,132	144	6.1	10,791	1,660
1967	6,700	3.1	1,343	211	7.5	13,850	2,070
1968	7,000	4.5	1,411	68	8.2	14,871	2,120
1969	7,100	1.4	1,418	7	8.7	15,682	2,210
1970	7,400	4.2	1,610	192	10.4	17,604	2,380
1971	7,900	6.8	1,800	190	8.9	19,191	2,430
1972	9,700	22.8	2,608	808	4.6	30,603	3,150
1973	11,200	15.5	3,451	843	3.8	47,506	4,240
1974	11,600[a]	3.6	3,520[a]	69	4.7[a]	52,939[a]	4,560[a]

[a]Preliminary.

Source: Utah Department of Employment Security, *Utah Labor Market Information by Planning District and County, 1950-1973* (Salt Lake City, Utah: Utah Department of Employment Security, 1974), for 1960-1970; Utah Department of Employment Security, *Employment Newsletter*, February, 1975, for 1971-1974.

Table 62. Population, income, and employment, Uintah County, Utah

Year	Population	% Population	Non-agric. employment	Δ Non-agric. employment	% Unemployed	Personal income 1,000's	Per capita income
1960	11,700		1,071	254	4.4	21,553	1,840
1961	12,400	6.0	3,084	83	3.5	22,793	1,840
1962	12,800	3.2	3,382	298	2.3	24,698	1,930
1963	13,000	1.6	3,080	-302	4.7	23,188	1,780
1964	12,800	-1.5	3,000	-80	8.3	23,720	1,850
1965	12,800	0	3,023	23	5.9	25,499	1,990
1966	12,600	-1.6	3,186	163	5.5	26,196	2,080
1967	12,500	-.8	3,221	35	5.3	27,880	2,230
1968	12,400	-.8	3,163	-58	5.1	29,438	2,370
1969	12,400	0	3,419	256	4.6	32,421	2,610
1970	12,800	3.2	3,510	91	5.9	35,620	2,780
1971	13,300	3.9	3,852	342	6.0	39,134	2,940
1972	14,400	8.3	4,655	803	4.4	50,407	3,500
1973	15,200	5.6	4,909	254	3.5	59,267	3,900
1974	16,000[a]	5.3	5,405[a]	496	4.7[a]	70,443[a]	4,400[a]

[a]Preliminary.

Source: Utah Department of Employment Security, *Utah Labor Market Information by Planning District and County, 1950-1973* (Salt Lake City, Utah: Utah Department of Employment Security, 1974), for 1960-1970; Utah Department of Employment Security, *Employment Newsletter*, February, 1975, for 1971-1974.

Table 63. Building permits and mobile homes

Year	Carbon County			Duchesne County			Uintah County			Emery County
	Permanent[a]	MH[b]	Total	Permanent[a]	MH[b]	Total	Permanent[a]	MH[b]	Total	MH[b]
1960	20	18	38	6	7	13	55	19	74	4
1961	15	12	27	7	11	18	102	16	118	6
1962	12	9	21	2	10	12	158	16	174	10
1963	14	20	34	7	8	15	P=1,61[c]	16	77	7
1964	7	11	18	4	19	23	31	11	42	7
1965	14	13	27	8	13	21	P=10,41	18	59	8
1966	10	18	28	10	14	24	36	19	55	5
1967	19	19	38	18	15	33	23	18	41	9
1968	21	25	46	11	27	38	18	38	56	16
1969	17	28	45	2	47	49	P=5,14	41	55	11
1970	34	47	81	21	50	71	95	63	158	19
1971	57	90	147	42	69	111	P=71,74	88	162	25
1972	60	160	220	75	224	299	120	257	377	51
1973	66	189	255	56	192	248	127	235	362	81
1974	98	108	206	69	104	173	212	183	395	58
Year of M++ not known		81			15			21		23
Before 1960		62			63			94		53

[a]Permanent dwelling units authorized; U.S., Department of Commerce, Bureau of the Census, *Housing Authorized by Building Permits and Public Contracts*, Construction Reports C40, 1960-1974.
[b]Year the mobile home was built as counted by the author from county tax records in June, 1975.
[c]Public units not included in total.