
The Affordable Housing Demonstration

A Case Study

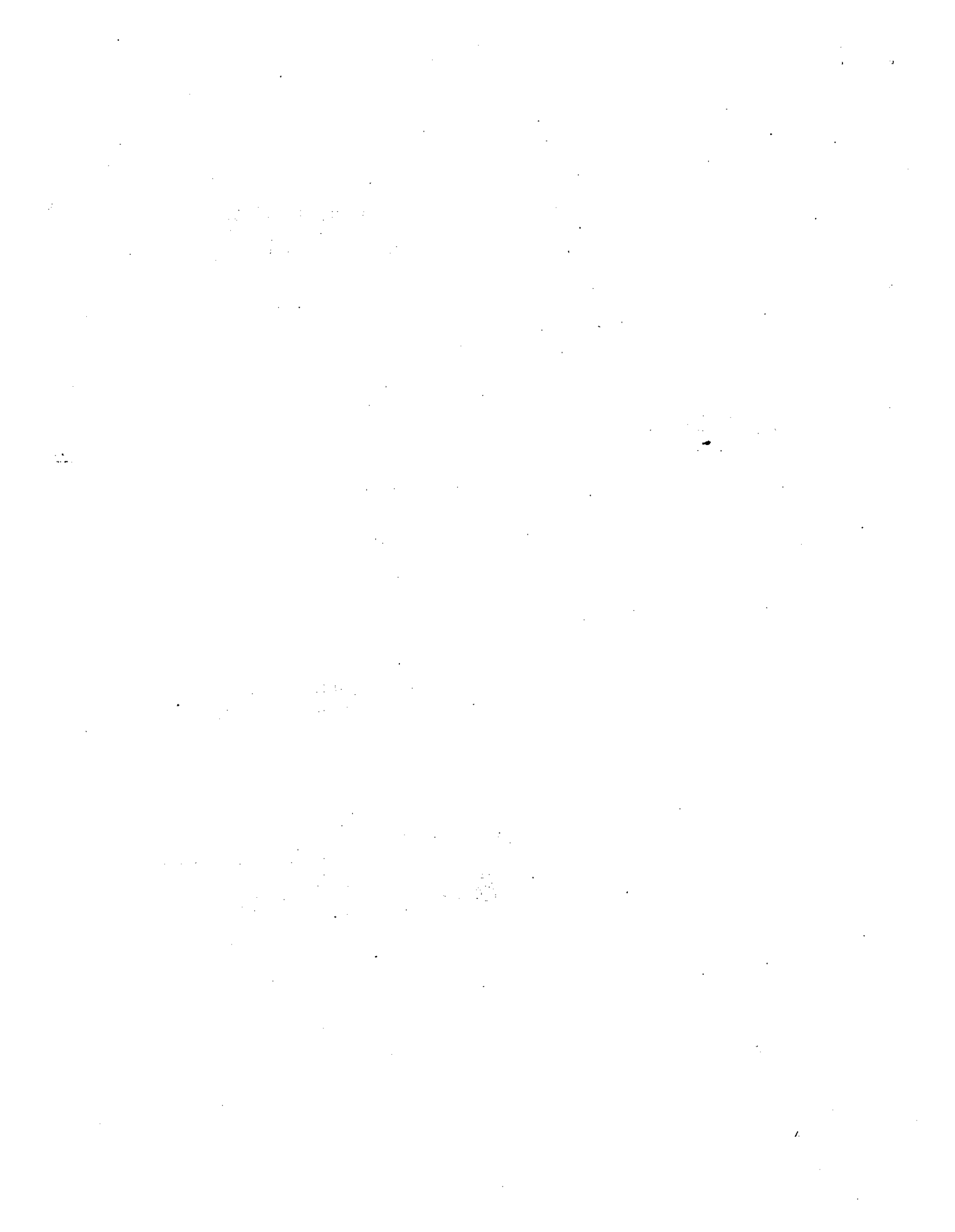
Phoenix, Arizona

Prepared for:
U.S. Department of
Housing and Urban Development



By:
NAHB Research Foundation, Inc.
P.O. Box 1627
Rockville, Md. 20850

January 1984



This report was produced by the NAHB Research Foundation, Inc., for the U.S. Department of Housing and Urban Development. The views and conclusions contained herein are those of the authors and should not be interpreted as necessarily representing the official view or policies of the United States Government.

Table of Contents

Summary	iii
Preface	iv
Introduction	1
The Joint Venture for Affordable Housing	1
The Affordable Housing Demonstrations	1
The Case Study Approach	2
Chapter 1: Project Description - Phoenix	3
The Community - Phoenix	3
The Builder - Knoell Homes, Inc.	3
The Project - Cimarron	4
Chapter 2: Project History	7
Chapter 3: Innovations and Their Impact on Costs	11
Change List and Approval Process	11
Administrative and Processing Changes	14
Site Planning and Development Changes	15
Building Design and Construction	17
Chapter 4: Details of Changes and Their Costs	19
Comparison Costs	19
Administrative and Processing Changes	19
Site Planning and Development Changes	20
Building Design and Construction Changes	30
Cost Saving Summary	31
Appendix I - Project Schedule	37
Appendix II - Floor Plans	39
Appendix III - Resources (people and publications)	43

Summary

Phoenix Mayor Margaret Hance, committed to controlling rising development costs through improving city policies and procedures, encouraged the participation of Phoenix in the Affordable Housing Demonstration as a test of the city's effectiveness in deregulation. Knoell Homes, Inc., a well known and respected builder in the Phoenix area for more than 35 years, was selected by the city as developer of the Demonstration project.

Phoenix, capital of Arizona, is a sun-belt city located in the center of the state with a 1982 corporate population of 823,000 and a metropolitan area population of approximately 1,500,000. It has grown 35.8 percent in the last ten years, and is now the ninth largest city in the country.

Effective household buying income in Phoenix in 1981 was \$21,477. Average home price was \$85,300 in July 1982. Almost 60 percent of the residents are homeowners. Vacancy rate in individually owned homes in 1980 was 2.4 percent, and among rental units, 11 percent.

The city operates under a Mayor/Council/City-Manager form of government and is well known for its progressive attitude toward business and property development. Long-range planning and regulation reform have been stressed since the late 1970's. The City Planning Commission recently completed a study, "Phoenix Concept Plan 2000", a conceptual guide for land use development. The Development Coordination Office, which implements the plan and oversees all residential subdivisions, reduced the total development approval process by almost 50 percent since the early 1980's.

The Affordable Housing Demonstration project is Cimarron, a 255-unit subdivision on a 38-acre crescent-shaped parcel of land six miles southeast of downtown Phoenix. The development includes: 107 townhouses with 770 to 912 square feet, selling for \$45,000 to \$50,300; and 148 single-family detached homes from 948 to 1163 square feet, which sell for \$59,000 to \$63,000. Over 12 percent of the site is open space, attractively landscaped and including utility rights-of-way, a jogging exercise course, common areas, and retention ponds. The homes are creatively designed to emphasize an indoor/outdoor living concept and a feeling of spaciousness. Six model homes are professionally decorated to appeal to the target market group -- 25- to 35-year old, single and married professionals eager to buy their first homes.

Costs saved through changes in processing procedures and other requirements and using some building practices not normally followed in Phoenix are estimated at a total of \$1,360,047 for the entire project, or \$8,039 per unit. These savings include: \$560,500 or \$2,198 per unit saved by reduction in processing time, elimination of off-site bonding requirements, and use of Planned Residential Development (PRD) options; \$247,442 or \$3,676 per unit saved in land development and \$552,105 or \$2,165 per unit saved in building design and construction.

The Grand Opening of Cimarron, showing six model homes fully decorated, was in mid-January 1983, approximately 13 months after Knoell Homes, Inc., joined the Affordable Housing Demonstration. By the end of January 1983, 101 units were sold, attesting to the marketability of the development!

Preface



THE SECRETARY OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, D.C. 20410

In January 1982 I announced the formation of the Joint Venture for Affordable Housing, a public-private partnership established to combat the problem of high housing costs. The President's Commission on Housing and the HUD Task Force on Affordable Housing both found that this problem results largely from outdated and unnecessary building and land use regulations.

One of the most important elements of the Joint Venture program is the series of affordable housing demonstrations now under way in twenty States. These demonstrations are being carried out through the cooperative efforts of builders, developers, and local officials to show how regulatory reform can cut housing costs.

This case study reports on one of the first group of demonstration projects to have units ready for sale. Each project has its own story to tell. The individual case studies describe various ways that innovative site planning and development, and new methods and materials of construction, have cut the cost of the demonstration housing by as much as twenty percent. I urge you to read these studies and to use the ideas described in them to reduce the cost of housing in your communities. It can be done ... we've proved it!

Very sincerely yours,

A handwritten signature in cursive script that reads "Samuel R. Pierce, Jr.".

Samuel R. Pierce, Jr.

The Joint Venture for Affordable Housing

Housing costs have risen dramatically in recent years, so that many people have been unable to buy a home. Part of this cost increase was due to the high rate of interest on home mortgages, which reached almost 20 percent in some areas of the country before dropping under 14 percent in 1983.

A large part of the increase, however, was due to other factors -- inflation in the cost of materials and labor, a reduction in the amount of land available for housing which has drastically increased lot prices, and changes in market patterns leading to larger homes on larger lots. Recent studies by the President's Commission on Housing and by a special Department of Housing and Urban Development (HUD) Task Force on Housing Costs confirm the findings of earlier studies which show that ways exist to cut the cost of housing, if they are used. Too often, these studies show, out-of-date regulations and building practices prevent these ideas from being applied. In fact, the studies pointed out that many builders and local officials do not even know about many of the ways that exist to reduce housing costs.

The Joint Venture for Affordable Housing was initiated by HUD Secretary Samuel R. Pierce, Jr., to correct this situation. Since affordable housing is a problem which involves all levels of government as well as the rest of the housing industry, finding an answer requires the participation of all of these elements. The Joint Venture, therefore, is a real partnership of the following organizations, all of whom have an interest in making housing more affordable:

American Planning Association
Council of State Community
Affairs Agencies
International City Management
Association

National Association of Counties
National Conference of State
Legislatures
National Governors' Association
Urban Land Institute
National Association of Home
Builders and the NAHB
Research Foundation
U. S. Department of Housing and
Urban Development

Through conferences, workshops, demonstrations, publications, and similar activities, each of these organizations is helping to identify ways to cut construction costs through more effective and efficient planning, site development, and building procedures, and to provide this information to its members.

The Affordable Housing Demonstrations

Home builders learn from other builders; successful ideas are copied and used in new ways by other builders in many different areas of the country. The affordable housing demonstrations have been developed to test ideas for reducing housing costs in real projects and to provide information on the cost savings that resulted.

The central theme of the demonstration program is that a builder and those local officials responsible for regulatory approval can, together, identify ways to reduce the cost of housing and to modify or interpret local building codes and site development regulations so that these methods can be used. In the demonstration program, no Federal funds are provided either to the builder or to the community to support the demonstration projects. HUD and the NAHB Research Foundation do provide technical assistance through various publications documenting previous research studies and through suggestions to the project designers, but it is the builder's responsibility to develop a list

of possible cost-cutting ideas and it is the responsibility of local officials to accept those which are reasonable for that community.

Participating builders and communities were selected for the demonstration program in several ways. Before the Joint Venture was announced in January 1982, HUD approached a number of communities which had already demonstrated, in other activities, a willingness to modify regulations and to take other steps to encourage local development. As these communities agreed to participate in the program, the National Association of Home Builders worked through its local associations to identify builders in the communities with reputations for quality and records of innovation. Following announcement of the first twelve communities and builders selected to participate in the demonstration program, many other communities and other builders expressed interest in joining the program. In each case, HUD required a formal commitment by the highest elected official that the local government would support the program.

Once a project was accepted, HUD and the NAHB Research Foundation assisted the builder to identify cost-cutting ideas and to develop a workable, attractive site plan. The cost-cutting measures used in the various demonstrations vary widely. In some projects, unit densities were increased to reduce the impact of land cost on the final price, while good site planning and design made this increased density acceptable to the community. In other projects, street widths, street design

standards, and utility system requirements were changed to reduce costs. Housing materials and construction methods were changed in many projects. In addition to these changes in materials and methods, many projects benefited from improvements in local administrative procedures which reduced the time and effort needed to obtain building and land use approvals.

The Case Study Approach

Each project undertaken as an Affordable Housing Demonstration during 1982 and 1983 as part of the Joint Venture for Affordable Housing is being described in a case study report. The case studies are intended to be learning tools to help homebuilders, local officials, and others concerned about affordable housing to recognize and seize opportunities to reduce housing costs through regulatory reform and the use of innovative planning and construction techniques.

Information on the changes and their impact on costs has been collected by the NAHB Research Foundation. Each case study describes the community, outlines the builder's experience, and discusses the specific project characteristics and history. Where possible, the cost savings resulting from the use of the various procedural, planning, development, and construction changes are calculated and reported in the case studies.

The following material provides this information on the Affordable Housing Demonstration project in Phoenix, Arizona.

Project Description

The Community - Phoenix

Phoenix, Arizona, a sunbelt city located in the center of the state, had a 1982 corporate population of 823,000 and an SMSA population of approximately 1,500,000. Growing 35.8 percent in the last ten years, it is now the ninth largest city in the United States. The city covers 9,127 square miles and has a mild dry climate with a mean of 11 days with temperatures below 32 degrees F. and normal daily maximum temperatures in August of 102 degrees F..

The city operates under a Mayor/Council/City-Manager form of government. The city manager, appointed by the mayor with approval of the city council, is responsible for daily administration. Those government offices most involved in residential development include: Development Services Manager, City Planning Commission, Planning Director, and Development Coordinator.

Phoenix is the second largest center for electronic equipment manufacturing in the country and is the headquarters for several service industries. As capital of the state, Phoenix employs many government workers and those indirectly associated with the government. It is the wholesale-retail center for the state and the transportation center of the Southwest. Annual growth in jobs for 1979-90 is projected as 3.7 percent.

Effective household buying income in Phoenix in 1981 was \$21,477; the average home price was \$85,300 in July 1982. Approximately 60 percent of the people in Phoenix are homeowners. The city issued 22,479 new residential building permits in 1982, representing a total value of \$1.5 billion.

Phoenix is known for its progressive attitude toward business and property development. The city does not

regulate needlessly, thereby obstructing development, but has effectively guided growth and controlled sprawl. Long range planning and regulation reform have been stressed since the late 1970's.

"Phoenix Concept Plan 2000 - A Program for Planning," a Planning Commission study, defines the conceptual intent for future land use and provides guidance for coordinating land use, transportation, housing, economic stability, and government responsiveness. Plan 2000 encourages the design of urban villages which have a clearly definable core, a mix of housing types, and a variety of employment, shopping, recreational, and educational facilities.

The Development Coordination Office (DCO) implements Plan 2000 and oversees all residential subdivisions. That office processes all development approvals and recently reduced the total approval period by almost 50 percent. A policy and procedures manual explains requirements and procedures from pre-application conferences through the final reviews by various city departments.

The Builder - Knoell Homes, Inc.

Knoell Homes, Inc., has been a single-family home builder in the Phoenix area for more than 35 years. In 1982, the company built 285 single-family detached homes averaging 1350 square feet of living space. They sold for \$19 million: 5 percent for \$45,000 to \$54,999, 40 percent for \$55,000 to \$64,999, 25 percent for \$65,000 to \$84,999, and 30 percent for \$85,000 to \$100,000.

Professional Builder cited Knoell Homes as the 221st largest builder in the country in July 1983. Marketing Vice President Don Liem explained that Knoell was in step with other local builders catering to the single-family

market, staying conservative, and not gambling with anything unusual or "innovative." However, during the 1982 depressed housing market, Knoell reassessed its product and clients, searching for a fresh, new approach. Their survey concluded that the largest market for their homes was single and married professionals, 25 to 35 years old, who desired homes close to employment centers. This group believed the existing housing market was beyond their financial means.

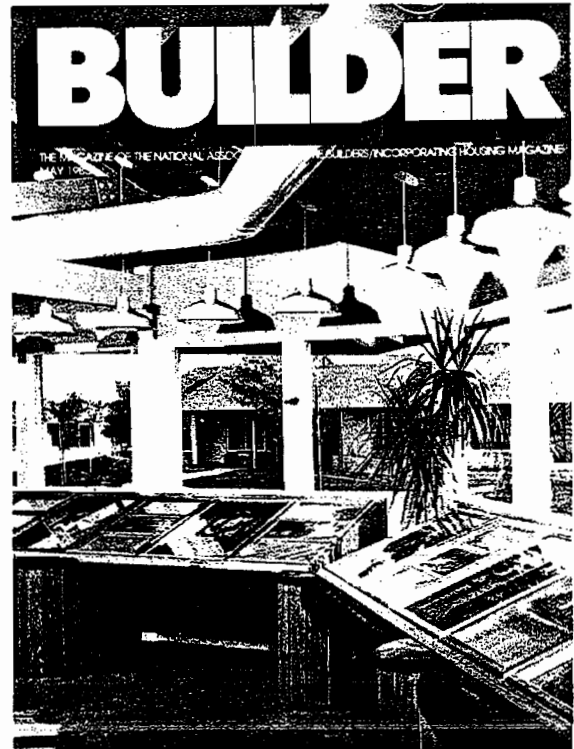
A marketing study conducted specifically for the Affordable Housing Demonstration Project confirmed the Knoell study and more clearly defined the target market for the project.

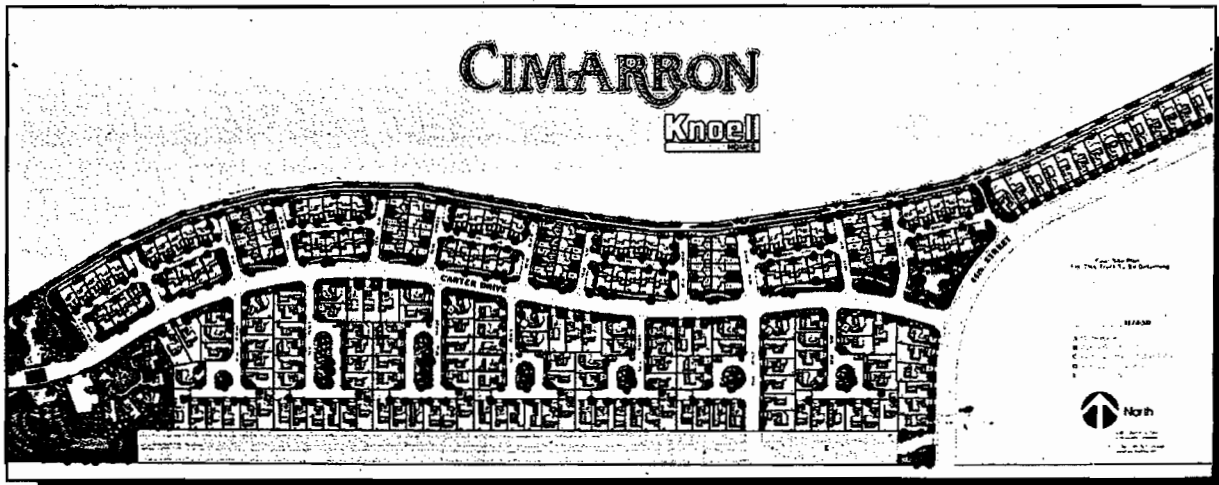
The Project - Cimarron

The original Knoell site was a 57.4-acre crescent-shaped parcel of land located 6 miles southeast of downtown Phoenix planned for a 200 unit subdivision, Knoell Garden Groves 7. Knoell designed the units to meet all standard land development requirements.

When Knoell joined the Affordable Housing Demonstration, the company developed a new plan, Cimarron. The Demonstration site was 19.4 acres smaller than the Knoell Garden Groves 7 plan, and added 106 units to the 149 originally planned for the remaining 38 acres. The 19.4 acre parcel was held for future development. The new plan required additional total lineal feet of streets, curbs, gutters, sidewalks, water service, and sanitary sewers due to the higher density. It introduced changes to existing practices and standards in land development and building materials, and was designed according to Planned Residential Development (PRD) Standards, a relatively new concept in Phoenix.

Cimarron is located on an elevated site with a panoramic view and is easily accessible to downtown and "hightech"





Cimarron Site Plan

employment in Phoenix, Tempe, and Mesa. The 255 unit development consists of 107 townhouses and 148 single-family detached homes. The townhouses range from 770 to 912 square feet and sell for \$45,000 to \$50,300. The single-family detached homes vary from 948 to 1163 square feet and sell for \$59,000 to \$63,000. The homes have private parking, yards, and unique architectural designs. A neighborhood feeling is created through an area of common space in each hamlet (sub-neighborhood). Over 7 acres, or 18.4 percent of the site, is open-space, including landscaped areas, utility rights-of-way (ROW), a jogging exercise course, and common areas. Innovative use of on-site retention ponds to alleviate potential storm water problems adds interest to the entry and entire subdivision.

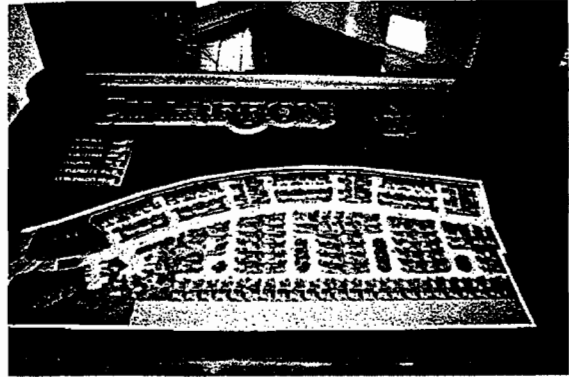
The target market for the homes is 25- to 35-year-old single and married professionals buying homes for the first time, with a median family income over \$20,000. To attract this group, Knoell emphasized an open-space design and an indoor/outdoor living concept, and designed creative, attractive, tasteful model homes. Although Cimarron is located in a physically attractive area of Phoenix, homebuilders had overlooked it because of a relatively poor neighborhood image.



Sales Office and Model Homes - Courtesy Builder Magazine

Development of Cimarron from conception to the opening of six model homes covered approximately 13 months. Knoell joined the Affordable Housing Demonstration in late 1981 and in early 1982 sent to the city its list of requests for changes from standard development and building practices.

Shortly after, Knoell concurrently submitted its preliminary subdivision plan and its building construction plans to the Development Coordination Office. Final site plan approval was granted in October 1982 and preconstruction sales began. The Grand Opening, showing six model units fully decorated, was in mid-January 1983 and by the end of the month, 101 units were sold, confirming Knoell's market forecast.



Sales Office Site Layout

Project History

Mayor Margaret Hance has been personally committed to control rising development costs through improving city policies and procedures and was pursuing an aggressive regulatory relief campaign immediately prior to the initiation of the Affordable Housing Demonstration. She saw the demonstration as a test of the city's effectiveness in the area of deregulation and accepted the challenge from HUD to participate. Knoell Homes, Inc., well-known and respected within the community, was selected as the developer for the Demonstration.

Phoenix officials welcomed the project as an opportunity for teamwork, not as an additional chore. Confident in Knoell, with whom they had worked in the past, city staff knew their efforts would contribute to the affordability of a quality residential neighborhood. They were assured successful results would help in implementing the housing goals of "Phoenix Concept Plan 2000."

City staff members worked closely with the developer on policy interpretation, development details, and Demonstration documentation. Those involved on the project include: C. A. Howlett, Special Assistant to the Mayor; Richard Counts, Director of Planning; Jon Wendt, Development Services Assistant; George Krempl, Deputy Planning Director, Development Coordination Office; and V. Warner Leipprandt, Jr., Deputy Planning Director of D.C.O.

Initially, Knoell was asked by city staff to present an ideally affordable residential development plan without regard to the constraints of existing regulations. Specific proposals submitted by Knoell were evaluated by city staff solely on the basis of protecting legitimate public interest, relevance to the affordability objectives, and safety of future residents in the development.



V. Warner Leipprandt, Jr., Deputy Planning Director; George Krempl, Deputy Planning Director; Richard Counts, Director of Planning - Helpful City Officials.

The site chosen for the demonstration was a 57.4-acre crescent-shaped parcel of land 6 miles southeast of downtown Phoenix on which Knoell had planned to build a 200-unit subdivision of single-family, detached homes, to be called "Knoell Garden Groves 7". The project had been designed to meet all the then current standard land development requirements.

After selection as developer for the Phoenix Affordable Housing Demonstration, Knoell eliminated 19.4 acres from his original plan and added 106 units to the 149 units originally planned for the remaining 38 acres. The subdivision was renamed Cimarron.

The company chose the Planned Residential District (PRD) Plan for developing Cimarron. Rezoning approval for PRD's has not been necessary in Phoenix since adoption of the 1981 Residential Revisions regulations. Six months in total processing time were saved by avoiding rezoning. The real purpose of the PRD, however, is to promote increased flexibility in exchange for preserving natural features and creating open spaces within the residential development. The option encourages varying housing types and lot sizes, setbacks, and private accessways for interior circulation. There are no minimum lot sizes. A 5 percent density bonus is automatic for a required 5 percent open space. A 20 percent density bonus is possible depending on the type and amount of additional landscaping.

The target market was the group of 25- to 35-year-old single and married professionals identified in the two earlier Knoell studies as being priced out of the existing housing market.

After agreeing on the site and target market group, Knoell presented a list of items with cost-saving potential to the Development Coordination Office (DCO) staff during a preapplication conference. The Demonstration Techni-



Cimarron entrance accentuates surroundings.



Open space has been preserved in Cimarron.



cal Assistance Team from HUD and the NAHB Research Foundation suggested additional items which had been proven in other cities but were not being used in Phoenix. DCO staff approved some of the items in accordance with the PRD ordinance. Other items the builder requested received closer scrutiny -- requiring either expanded documentation by Knoell or specific action of the City Council. Of the 37 originally requested items, the city staff found 28 acceptable or acceptable on a demonstration basis only. The staff agreed to some variations on a "one-time only" basis, until they could be confident the changes would add no expenses to the city nor sacrifice quality and safety.

Approval of the remaining 10 items was either beyond staff discretion or the cost involved was insignificant enough to warrant dropping the request. The list of requested changes is discussed in detail in Chapters 3 and 4.

Design and merchandising of Cimarron was geared to the population segment identified by the two early market studies by Knoell. And it worked! Architecture, creative land planning, and attractive sales prices made Cimarron an overwhelming success. Wise down-sizing in the units and carefully managed open spaces suggest a comfortable indoor-outdoor living concept; skylights and cathedral ceilings open-up living space. Volume spaces, lofts and dining areas appealed to the target market of entry-level home buyers.

Knoell invested considerable money in Cimarron's sales office and model complex. The well-designed modern sales office at the entry to the development introduced potential customers to the attractive style of the community. A nationally recognized interior decorator, Beverly Trupp, decorated the models, using affordable built-ins, pastels with touches of bright colors, and full-sized furniture.



Vaulted ceilings, built-ins, and light create attractive interiors.



Uniquely designed sales office.

Major newspaper coverage, local TV, ground-breaking ceremonies, VIPs in attendance, magazine articles, radio promotions -- all were part of Knoell's strategy to announce its special new product to first-time buyers. By joining with local businesses to inform employees; sending comprehensive, but plain English, fliers, "You're still renting?"; and blitzing all local media - - Knoell's sales traffic grew.

After the young, first-time buyers moved in, they were asked, "What influenced you to buy?" "What amenities did you want most?"

Some results were surprising. For example, the living room was chosen as the most important room. The kitchen was ranked second in importance. They were willing to give up some amenities, but not a wood-burning fireplace. "Small space is okay," they said, according to Ms. Trupp, "but that's no excuse for it to be boring... and it's not an excuse to be spartan. Give them the feeling of luxury. These people are active. They entertain. They require an up-beat environment."

"They're competitive buyers, savvy, looking for quality, and at the same time, a manageable mortgage. Their homes have to have a certain design flair—make a statement about who they are," said Rich Eneim, Knoell Vice President of Production and the primary Demonstration contact.



Interior design of sales office allowed study of plans while looking at landscaped models.



Well decorated Sales Office set tone for project.



Creatively designed interiors inspire decorating possibilities.

Innovations and Their Impact on Costs

One purpose of the Affordable Housing Demonstration was to collect and evaluate sound cost data on residential development practices and construction techniques. The following analysis seeks to identify the costs of regulations, standards, or time delays and to determine what these mean in terms of excess costs to new home buyers.

Change List and Approval Process

As mentioned in Chapter 2, the City of Phoenix was extremely cooperative and viewed the Affordable Housing Demonstration as an opportunity to review regulations and process procedures with an eye toward regulatory modernization and streamlining city processing. In fact, the city had already made changes in its regulations and procedures for processing such as:

1. A Developers Assistance Office was established within the City Manager's office to minimize red tape and resolve conflicts among city regulations. Further, an interdepartmental Development Coordination Office was set up to provide "one-step" service for developers of major projects. This "fast-tracking" capability can reduce up to one half the lead time required prior to construction for eligible projects.
2. Approval authority for certain types of property development plans was delegated to department and division heads to eliminate the need to obtain waivers, variances, rezoning, use permits, special permits, etc.
3. Limited adjustments in regulations can be made by administrative hearing officers on: site plans and subdivision plats, rights-of-way abandonments, grading and drainage, off-site improvements, zoning ordinance requirements, construction code requirements, driveways, sign ordinances, and flood plains when warranted by special circumstances. The hearing officers can save a project a few weeks to several months.
4. Administrative Regulations for rezoning cases, such as double advertising in local newspapers and property posting, were revised; this has reduced processing time for certain zoning actions by up to 50 percent.
5. A customized construction code was developed to focus principally on life-safety issues and to minimize cosmetic regulations; it is half the size of the Uniform Building Code.
6. A single-construction-permit system was established to eliminate four separate permits, thereby reducing paper work by 50 percent.
7. Building permit issuance by telephone is available for eligible projects. Conditional permits are issued if the remaining processes are administrative and minor in nature.
8. All residential inspections are now conducted by general inspectors, eliminating the need for four separate inspectors on each project. Besides reducing construction inspection delays for the builder, this system saves Phoenix \$750,000 a year.

-
9. A "gold-tag" system permits builders to continue construction work if an unsatisfactory notice is received, provided that the unsatisfactory work is not covered before reinspection.

Against this background of progressive Phoenix regulations, Cimarron was developed as a test of regulatory reforms and to identify potential additional changes.

In February 1982, Knoell submitted a list of changes in regulations and procedures to further cost efficient development of Cimarron. Some of the items were acceptable under the PRD ordinance; others were accepted because of engineering data or logic presented by the builder. Some items were accepted for the Demonstration project only and a few were disapproved.

Some of Knoell's list already allowed by the PRD ordinance were: a mix of single-family detached homes and townhouses, a minimum 10-foot setback, no minimum lot size, reduced property line setback standards, two off-street parking spaces per unit, and increased valve and fire hydrant spacing.

The City also allowed reduced curb radius from 25 to 20-feet based on a written discussion of the logic from Knoell. They also approved reduction in speed limit from 35 mph to 25 mph on collector streets. Their acceptance of a reduced speed limit provided the city with a further reason for accepting a reduced curb return radius. The City approved 4-inch-thick, 4-foot-wide valley street gutters instead of the standard 8-inch-thick, 6-foot-wide valley gutters (See details in Chapter 4).

Items that were approved for the Affordable Housing Demonstration only include: reduction of collector street rights-of-way to 50 feet from 60 feet, a meandering 8-foot-wide sidewalk on one side of collector streets versus the

"Concurrently with the Affordable Housing Demonstration project," commented Jon Wendt, "Phoenix was pursuing an aggressive regulatory relief campaign under the leadership of Mayor Hance. Cimarron provided tangible evidence of the benefits to citizens of government deregulation. From the start, our primary interest in the project was to field test deregulation ideas to see if they worked, and, if they did, to incorporate them as permanent changes."

city standard of 4-foot-wide sidewalks on both sides of the street, elimination of all sidewalks on residential access streets, flat or ribbon curbs versus roll curbs, use of 6-inch polyvinylchloride (PVC) sewer mains instead of 8-inch vitrified clay pipe (VCP), 4-inch asbestos cement water main pipe (ACP) instead of 6-inch ACP, and a polyethylene drip irrigation system instead of PVC piping with sprinkler heads.

Items that were requested but not accepted include: 200-foot-spacing of sewer cleanouts instead of the city standard of 150 feet, 500 to 600-foot sewer manhole spacing instead of 400 feet (the city had no cleanout equipment for the increased spacing), elimination of paving saw cuts, midblock mercury vapor street-lights at 200- to 240-foot spacing instead of high pressure sodium streetlights at intersections, public sidewalk ramps for the handicapped to the Metropolitan Governments (MAG) standards, and sewer saddle "T" connections versus the city standard saddle "Y" connections.

The city at first denied a request to suspend a 3 percent off-site performance bond requirement. Later this requirement was dropped city-wide. In addition, the city originally denied a request for a decomposed granite base for recreational vehicle parking space but later accepted it instead of the "chip and seal" (stone chips/bituminous sealer) Phoenix standard.

HUD Assistant Secretary for Housing Philip Abrams (now HUD Under Secretary) asked all local HUD offices to cooperate with the Affordable Housing Demonstration participants, to speed reviews for FHA insurance subdivision appraisals and unit appraisals, and to permit variances to any "unnecessary or burdensome requirements which did not affect health or safety." The Phoenix Service Office cooperated fully. It had already approved the City of Phoenix as a Local Acceptable Community (LAC),

According to Rick Counts, "Cimarron is the answer to a planner's dream. Its satisfied residents have made our ordinance streamlining efforts worthwhile, and encouraged other builders to the public-private teamwork approach."

meaning HUD would accept what the city approved in their analysis of a proposal (this replaces about 90 percent of the FHA subdivision approval process).

The Phoenix Service Office granted a number of variances for Cimarron:

- ✓ Presale requirements were eliminated which require that 50 percent of the units be sold before any unit can be closed. This permitted a more advantageous marketing situation.
- ✓ Site drainage areas were permitted to be maintained by the Homeowner's Association instead of the City of Phoenix.
- ✓ Higher-than-normal Homeowner's Association fees were approved.
- ✓ Escrow funds were not required for landscaping.
- ✓ Side yard requirements were eliminated, deferring to Phoenix PRD requirements.
- ✓ The aggregate base course under concrete driveways was eliminated because of an excellent natural base.
- ✓ Price changes were permitted more frequently than normal to allow prices to remain closer to market conditions.

The HUD Office believed that the largest time savings from their normal process resulted from their decision not to independently review documents submitted by Knoell.

The following sections contain discussions of each of the accepted requested changes (except FHA items).

Administrative and Processing Changes

Converting Cimarron from a standard subdivision option to a PRD eliminated the need for rezoning. Rezoning would have delayed completion of approvals by at least 6 months. The 6-month time saving reduced interest costs by approximately \$106,000.

The city accelerated standard processing through the Development Coordination Office by scheduling special staff meetings on administrative changes requested by Knoell. By shortening the review time by 3 months, interest costs were reduced by an additional \$57,800. (The City is now considering hiring private consultants such as land planners, engineers, and architects to review and approve specifications and plans during peak periods).

The total interest savings was \$163,800 due to the reduction in processing. The time reduction also resulted in an estimated savings of \$380,000 in overhead costs, property taxes, and material and labor costs due to inflation, based on a modest 5 percent annual inflation rate.

Typically, the City of Phoenix required a 3 percent bond for guaranteeing off-site improvements. In June 1982, the City Council, City Manager's Office, and Development Coordination Office, agreed to waive bonding requirements for Cimarron. The waiver tied final inspection clearance to completion of all public improvements, subject to approval by the Building Safety Department. The savings for Cimarron were \$16,700. In August, the City waived the bond requirement for all local developers.

The use of PRD options, the reduction in processing time, and the elimination of off-site bonding requirements amounted to a total savings of approximately \$560,500 or about \$2,200 per unit.

Site Planning and Development Changes

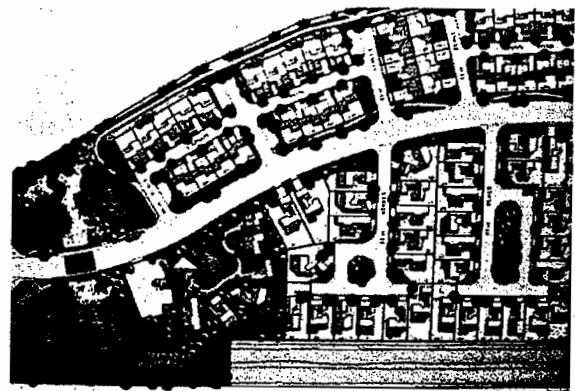
Site planning and land development represent major areas of potential cost reduction for most builder/developers. These costs are often in direct proportion to the complexity of local regulations, zoning ordinances, and levels of required standards. Because the city of Phoenix allowed the PRD option and was cooperative, Knoell was able to cut the costs of developed land in Cimarron substantially.

The Phoenix PRD ordinance allows a mix of townhouses and single-family detached units and no minimum lot size enabling Knoell to increase density by 71 percent over standard subdivision requirements. The PRD also allows less expensive site development techniques, such as 10-foot front setbacks, only two off-street parking spaces per unit, 800 feet maximum fire hydrant spacing, and 800 feet maximum water valve spacing.

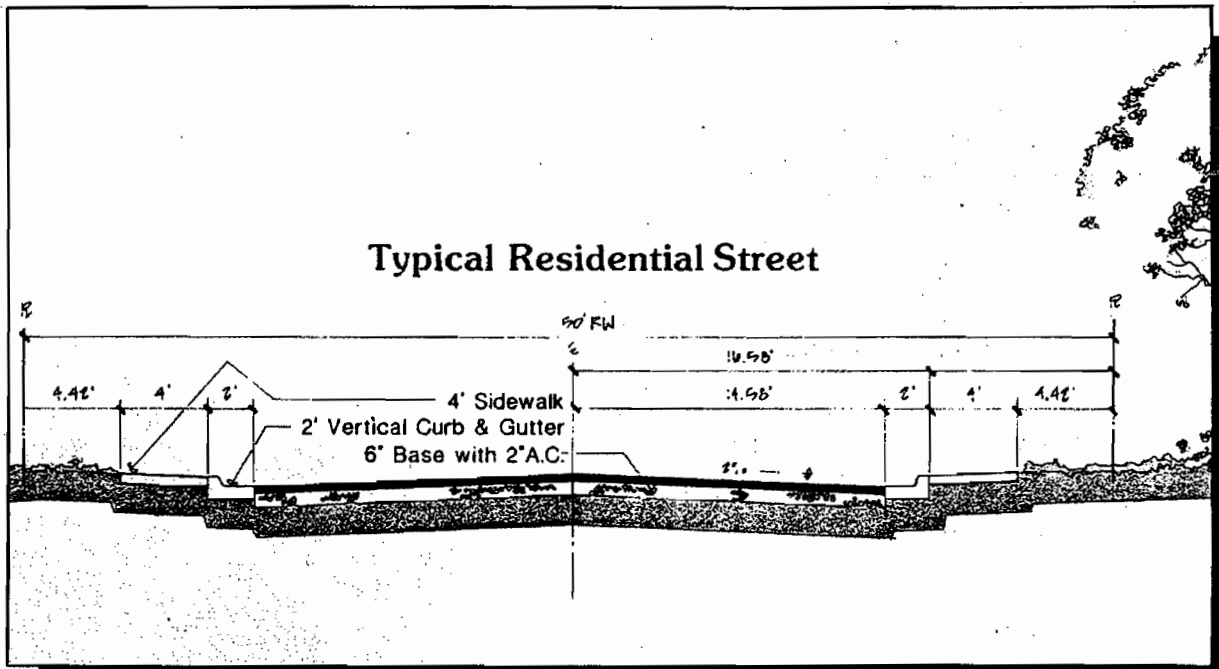
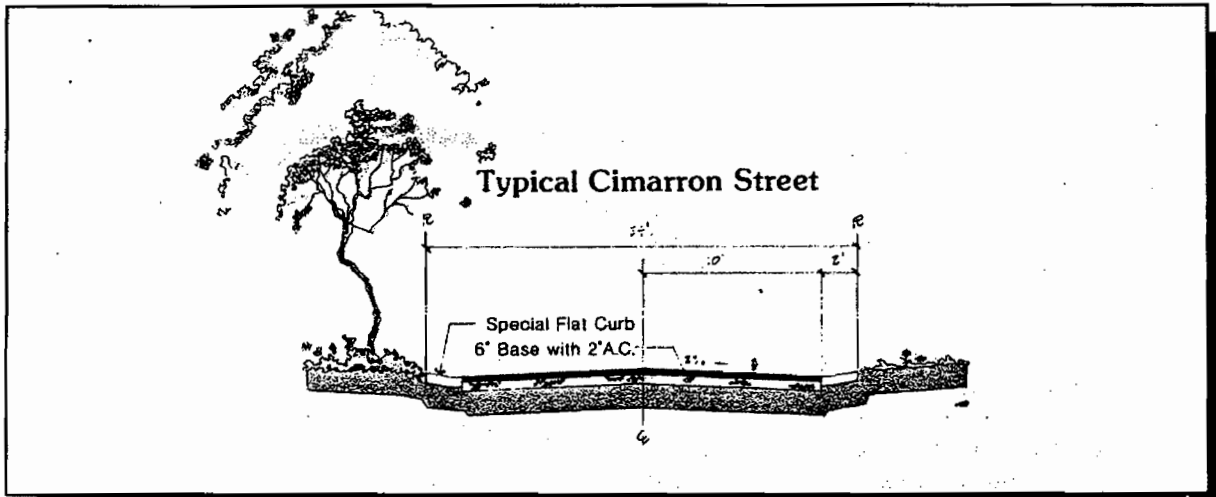
Savings were realized in every phase of land development - - curbs and gutters, streets, sidewalks, sanitary sewer, drainage, water service, electrical service, and irrigation. Some savings were due to regulatory variances while others were due to the use of techniques and materials not normally used in the Phoenix area.

On residential access streets, flat curbs and ribbon curbs were used instead of roll curbs with integral sidewalks. Redesign reduced the lengths of vertical curbs required for arterial and collector streets.

For the Demonstration, the city allowed 20-foot-wide interior residential access streets instead of standard 25-foot streets. For collector streets, rights-of-way (ROW) were reduced from 60 feet to 50 feet and paving widths were reduced from 40 feet to 36 feet.



Entrance to Cimarron



All sidewalks were eliminated along residential access streets. One meandering 8-foot-wide sidewalk was allowed for the Demonstration instead of 4-foot-wide sidewalks on both sides of collector streets except at the entrance area of Cimarron. Total savings for curbs, gutters, sidewalks, and streets were \$82,096.

Polyvinylchloride (PVC) pipe was used instead of the standard vitrified clay

pipe (VCP) for sanitary sewers. Sewer pipe size was reduced from 8 inches to 6 inches for much of the system based upon Knoell's calculations of sewage quantity. Direct taps instead of 4-inch wyes were used. Because of the lower slope required for PVC versus that required for VCP, trenches would have been an average of 2 feet deeper had VCP been used. Total savings were \$59,671.

Knoell requested and received permission to down-size water mains in some areas from 6 inch to 4 inch based upon demand calculations. Savings amounted to \$3,163.

Electrical service entrance costs, charged by the city-owned utility, were reduced because the city "fast-tracked" the project. Installation costs are based on an estimate of the time required before the utility can begin collecting revenue. Because the project was built 9 months sooner than normal, revenue from usage began 9 months earlier. Therefore the installation fee was lowered substantially, to \$96 from \$180 per unit.

Storm water drainage costs were reduced primarily because of innovative land planning techniques. Use of concrete valley street gutters and normal street curbs and gutters to direct water flow to retention basins resulted in a less expensive drainage system than had been originally planned. The original plan had more underground drainage. Grading and other drainage considerations resulted in the elimination of a \$50,000 pumping station. A. Wayne Smith, A.I.A., Knoell's landscape architect, developed a drainage plan that not only resulted in substantial cost savings but provided an attractive entrance to the project, setting the tone for Cimarron. Drainage costs were reduced by \$70,578.

For irrigation, the City of Phoenix originally required PVC piping with sprinkler heads. However, Knoell's

landscape architect developed data and information that convinced the city that polyethylene piping and low pressure emitters (drip system) are equal if not superior to PVC with sprinkler heads, saving \$8,624.

The techniques used by Knoell in land development in no way jeopardized the health, safety, or welfare of the occupants of Cimarron. In fact, most of the changes from standard practice contributed to higher value at lower cost and created a sense of community.

Building Design and Construction

The architectural firm of Knoell and Quidort designed the house plans with the goal of making the small units attractive and saleable while paying attention to production efficiencies.

The innovative use of interior space, such as vaulted ceilings and living areas opening onto outdoor patios, created a feeling of openness.



Models accentuate open, indoor/outdoor feeling at Cimarron.

Three models of townhomes were built in Cimarron, ranging from 770 to 912 square feet. The three basic models of single-family detached homes ranged from 948 to 1295 square feet. The largest detached home had alternative floor plans providing two or three bedrooms.

Knoell and Quidort did an outstanding job of combining design with produc-

ibility by designing to standard material dimensions (modular dimensioning). For example, major outside dimensions were in multiples of 4 feet, and minor dimensions were in multiples of 2 feet. Since siding materials come in 4-foot widths and framing materials are supplied in increments of 2 feet, there was very little scrap, and labor time for cutting and fitting time was reduced.

The builder tested several innovative construction techniques only on model homes; others were incorporated into all homes. Some of the cost-saving techniques were directly associated with deviations from Knoell's normal design and construction practices, while others were due to exceptions by the City of Phoenix. No material, system, or technique was used that had not been proven in other parts of the country. Health, safety, and welfare of the occupants were primary considerations

when each new practice was discussed for possible inclusion. Another major concern of Knoell Homes was providing housing value while insuring a quality environment.

Details of construction cost reductions are in Chapter 4. Basically, the methods were: reduction of driveway paving by elimination or reduction of set-back requirements, use of hardboard siding applied directly to framing, reduction in size of electrical service entrance panels, elimination of roof overhangs, reduction of fence lengths, careful spacing of electrical outlets, elimination of soffits over kitchen cabinets, use of attractive but less expensive cabinets, elimination of bathroom exhaust fans, reduction in thickness of concrete slabs-on-grade, more efficient use of framing lumber, and use of polybutylene water supply piping instead of copper.

Details of Changes and Their Costs

Comparison Costs

In this chapter, costs of each change in Phoenix standards and Knoell Homes typical practice are discussed and compared. The objective of the analysis is to show how much costs were reduced by comparing Cimarron "as-built" to existing standards and practices.

In the hierarchy of cost reducing techniques, density is most important where land costs are high. Even in areas with low or moderate land costs, increased density may be the single most important element of cost reduction, especially where higher density does not require substantially higher site improvement costs. In Cimarron, the land was available for 60 additional units because of reduced street widths, elimination of some sidewalks, rights-of-way elimination, and reduction of curb return radii.

ADMINISTRATIVE AND PROCESSING CHANGES

If Knoell had applied for rezoning under existing Phoenix subdivision ordinances, at least 6 months time would have been lost. The use of the PRD option saved approximately \$106,000 in interest. In addition, the City of Phoenix "fast-tracked" Cimarron, accelerating standard processing by an additional 3 months, saving \$57,800 in interest. At an annual inflation rate of 5 percent, \$380,000 was saved because of 9 months reduction in indirect expenses, property taxes, and material and labor cost inflation. The City of Phoenix waived a 3 percent performance bond requirement for off-site improvements, reducing costs by another \$16,700. Total cost savings are shown below:

	Cost Savings	
	Total	Per Unit*
PRD vs. standard subdivision option	\$106,000	\$ 416
"Fast-track" processing	57,800	227
Indirect, taxes, and material and labor increases	380,000	1,490
Waiver of 3% performance bond	16,700	65
TOTALS	\$560,500	\$2,198
* - 255 dwelling units.		

SITE PLANNING AND DEVELOPMENT CHANGES

Presented in this section are land development cost comparisons of Cimarron (as built) versus the same project if built according to existing standards and practices. Some 60 building lots were added because of new standards and practices. If old standards for streets, sidewalks, curbs, and gutters were used on the 38 acres, only 195 units could have been built if the average lot size of 3600 square feet was maintained. Cost savings per unit are based on these 195 units compared to the new 255 which reflects the over 217,000 square feet of land area made available by reduction of standards and practices. Following is a summary of land development cost savings. Detailed analyses of each development phase follow within this section.

Land Development Summary

	<u>As Built</u>	<u>Comparison</u>	<u>Savings</u>
Raw land	\$1,254,000	\$1,254,000	\$ -
Vertical curbs	31,212	50,039	18,827
Roll curbs & sidewalks	53,065	71,544	18,479
Curb return radius	18,363	26,808	8,445
Streets	183,240	219,585	36,345
Storm water drainage	36,853	107,431	70,578
Water service	109,162	112,325	3,163
Sanitary sewer	112,208	171,879	59,671
Electrical service	24,541	35,168	10,627
Driveway entrances	11,978	24,661	12,683
Landscaping, irrigation	159,828	168,452	8,624
TOTALS	\$1,994,450	\$2,241,892	\$247,442
COST PER UNIT	\$7,821*	\$11,497**	\$3,676

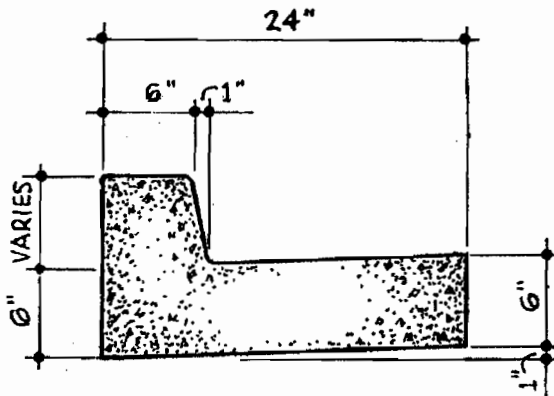
* - 255 units as built

** - 195 units if built to existing standards

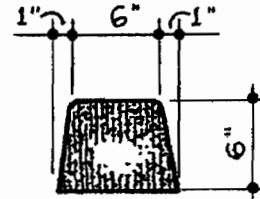
Vertical Curbs

In Cimarron, Knoell installed 1522 lineal feet of 2-foot wide, 7-inch high concrete-formed (c.f.) vertical curb on one side of 40th Street, 44th Street, and Vineyard Road. The City allowed an extruded 6-inch asphalt curb on the undeveloped side of 44th and Vineyard Road rather than previously required vertical curbs on both sides. Had

Knoell built to existing standards, the project would have contained 8,336 lineal feet of 2-foot, 6-inch c.f. curb. As built, Cimarron had less than half this amount -- 3,950 feet of 2-foot, 6-inch c.f. curb. Instead, 2-foot, 4-inch c.f. curb was used around islands and around all three sides of off-street parking areas. Cost savings are shown below.



• VERTICAL CURB & GUTTER •



• EXTRUDED ASPHALT CURB •

Vertical Curb Cost Comparison

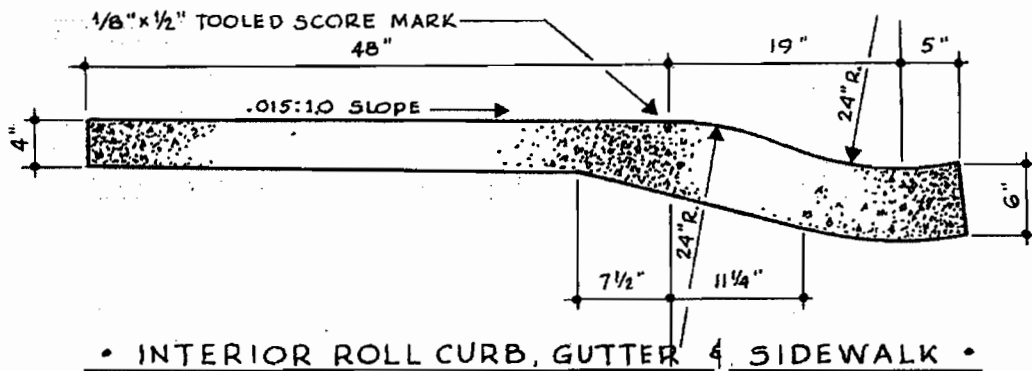
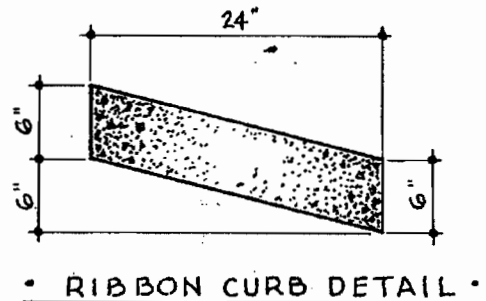
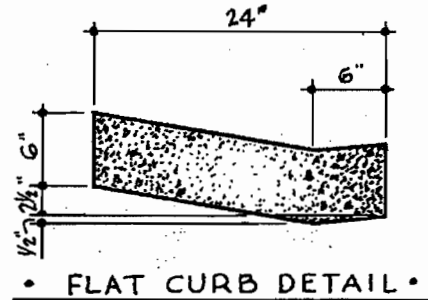
	As Built	Comparison	Savings
Vertical curb, 7" c.f.	\$ 6,088	\$14,744	\$ 8,656
Vertical curb, 6" c.f.	14,813	31,260	16,447
Vertical curb, 4" c.f.	8,946	4,035	(4,911)
Extruded asphalt curb	1,365	-	(1,365)
TOTALS	\$31,212	\$50,039	\$18,827
COST PER UNIT	\$122*	\$257**	\$135

* - 255 units

** - 195 units

Roll Curbs and Sidewalks

Under existing Phoenix standards, Knoell would have built most residential access streets with 2-foot wide roll curbs with integral 4-foot wide sidewalks on both sides. About 7,615 feet of such curbs and sidewalks would have been required. Another 8,500 lineal feet of 4-foot wide sidewalk would have been required along both sides of the collector streets. Most Cimarron residential access streets had a special flat curb and roll curb and no sidewalk. Instead of 4-foot wide sidewalks on both sides of the collector streets, one 1,830-lineal-foot, 8-foot wide meandering sidewalk was installed. Sidewalk ramp returns remained the same as did sidewalks at the entry and alongside 40th Street. A cost comparison follows.



Roll Curb and Sidewalk Cost Comparison

	As Built	Comparison	Savings
2' roll curb	\$ 446	\$ -	\$ (446)
2' roll curb w/ 4' sidewalk	-	42,644	42,644
2' flat curb	35,274	-	(32,274)
2' ribbon curb	2,516	-	(2,516)
4' sidewalk	2,380	28,900	26,520
8' meandering sidewalk	12,449	-	(12,449)
TOTALS	\$53,065	\$71,544	\$18,479
COST PER UNIT	\$208*	\$367**	\$159

* - 255 units

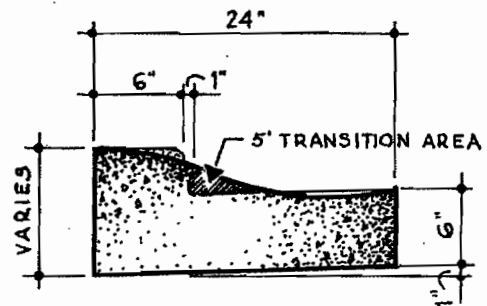
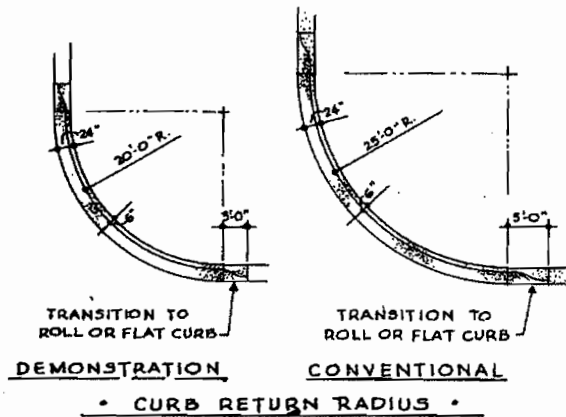
** - 195 units

Curb Return Radius

The builder reduced the curb return radius at each street intersection from 25 feet to 20 feet. Some points that persuaded authorities to allow the reduced radius included these:

- ✓ When a car reduces its speed to a safe limit to travel on private accessways (10 mph), it can negotiate safely a 20-foot curb return radius. A 25-foot radius encourages a higher speed turn.
- ✓ The townhouse and hamlet portions of Cimarron will have low levels of traffic at each intersection.
- ✓ The 25-foot curb return radius and 5-foot transition severely restricts platting of corner lots.

Cost savings follow:



• CURB TRANSITION DETAIL •

Curb Return Radius Cost Comparison

	<u>As Built</u>	<u>Comparison</u>	<u>Savings</u>
25' curb return radius			
6" vertical curb	-	\$ 5,926	\$ 5,926
Apron	-	19,932	19,932
5' transition	-	950	950
20' curb return radius			
6" vertical curb	\$ 4,725	-	(4,725)
Apron	13,068	-	(13,068)
3' transition	570	-	(570)
TOTALS	\$18,363	\$26,808	\$ 8,445
COST PER UNIT	\$72*	\$137**	\$65

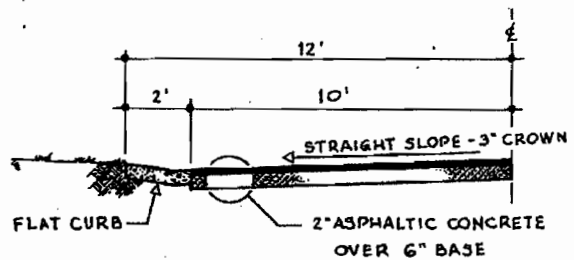
* - 255 units

** - 195 units

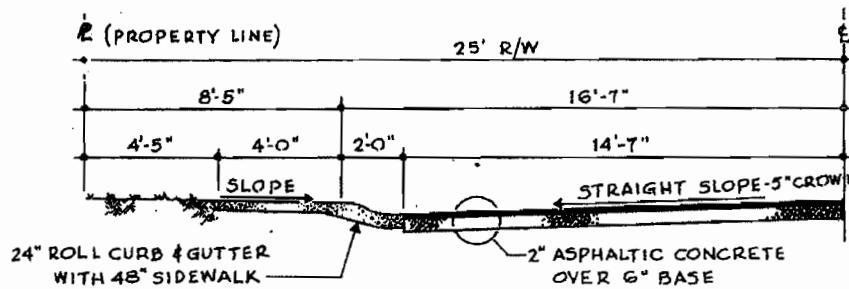
Streets

If Knoell had built the streets in Cimarron in accord with standard subdivision options, total street costs would have been increased almost 20 percent. Paving for the arterial street (40th Street) and collector streets (Carter Drive, 44th Street, and Vineyard Road) would have remained unchanged as would paving for off-street parking. The new plan, however, reduced the width of most of the private access streets from 29 to 20 feet. Out of a total of 12,780 lineal feet of street paving in Cimarron, the

width reduction affected 7,900 lineal feet or 62 percent of the total. Cost savings from changes in streets follow.



• DEMONSTRATION RESIDENTIAL ACCESS STREET •



• CONVENTIONAL RESIDENTIAL ACCESS STREET •

Street Cost Comparison

	As Built	Comparison	Savings
Arterial and collector Streets and parking	\$102,487	\$102,487	-
6" base, 2" A.C., 29' wide	-	117,098	\$117,098
6" base, 2" A.C., 20' wide	80,753	-	(80,753)
TOTALS	\$183,240	\$219,585	\$ 36,345
COST PER UNIT	\$719*	\$1,126**	\$407

* - 255 units

** - 195 units

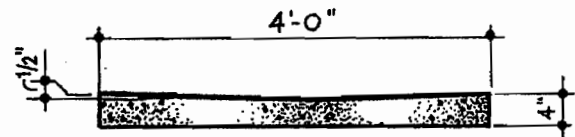
Storm Water Drainage

Drainage for Cimarron was primarily above ground. Concrete valley gutters were used in some streets and normal street curbs and gutters in other streets to direct storm water flow to a channel and then to retention basins near the entrance of the subdivision. The previously platted project also drained primarily above ground but with some underground drainage through 18-inch concrete pipe. The old drainage plan would have required approximately \$50,000 for a pumping station to lift storm water from low areas to an existing canal. Although no regulatory change was made (both drainage systems were considered adequate by the City), Knoell's landscape architect, A Wayne Smith, provided a more cost effective solution to the drainage problem. His plan saved over \$70,000 and added to the

attractive entrance to Cimarron. Following are cost comparisons.



Retention ponds at project entrance.



• VALLEY GUTTER •

Storm Water Drainage Cost Comparison

	As Built	Comparison	Savings
Concrete scuppers	\$ 920	\$ 1,840	\$ 920
Concrete valley gutter	18,189	27,473	9,284
Concrete drainage channel	-	7,025	7,025
Concrete grouted rip-rap	-	1,560	1,560
Rubble stone	8,020	-	(8,020)
Concrete cut-off wall	460	700	240
Concrete drop inlet box	800	-	(800)
Barricades and railroad ties	6,475	875	(5,600)
18" concrete pipe	-	15,593	15,593
18" rubber gasket reinforced concrete pipe (RGRCP)	-	2,365	2,365
12" Class III reinforced concrete pipe	750	-	(750)
12" Class IV RGRCP	1,239	-	(1,239)
Pumping station	-	50,000	50,000
TOTALS	\$36,853	\$107,431	\$70,578
COST PER UNIT	\$145*	\$551**	\$406

* - 255 units

** - 195 units

Water Service

Had Cimarron been built according to existing Phoenix water service standards, total costs would have been about 3 percent higher. Knoell's engineers calculated demands based on anticipated occupancy and flow rates and convinced the city that smaller pipe would be adequate in many areas of the project. This reduced much of the 6-inch water main to 4 inches without impairing service and water pressure. Cost comparisons follow.

Water Service Cost Comparison

	<u>As Built</u>	<u>Comparison</u>	<u>Savings</u>
8" asbestos cement pipe	\$ 9,800	\$ 9,800	-
6" asbestos cement pipe	29,052	45,552	\$16,500
4" asbestos cement pipe	19,859	5,628	(14,231)
8" valve, box, and cover	632	632	-
6" valve, box, and cover	3,927	6,237	2,310
4" valve, box, and cover	2,145	585	(1,560)
12" x 6" valve, box, and cover	1,168	1,168	-
6" fire hydrant	11,913	11,913	-
3/4" service	30,666	30,210	(456)
1" service	-	600	600
TOTALS	\$109,162	\$112,325	\$ 3,163
COST PER UNIT	\$428*	\$576**	\$148

* - 255 unit

** - 195 units

Sanitary Sewer Service

The builder realized savings of 35 percent in construction of sanitary sewer service because of several major changes including:

- ✓ Use of polyvinylchloride (P.V.C.) pipe instead of vitrified clay pipe (V.C.P.);
- ✓ Downsizing pipe diameters accepted on the basis of Knoell's demand calculations;
- ✓ Elimination of off-site extension of 10-inch hookups to main;
- ✓ Use of direct taps instead of 4-inch wyes; and

- ✓ Shallower trench (2-foot average) requirements for P.V.C.

A cost analysis of the sanitary system follows.



Polyvinylchloride sanitary sewer pipe.

Sanitary Sewer Cost Comparison

	<u>As Built</u>	<u>Comparison</u>	<u>Savings</u>
10" P.V.C. pipe and fittings	\$ 15,701	-	\$15,701
8" P.V.C. pipe and fittings	19,160	-	(19,160)
6" P.V.C. pipe and fittings	15,787	-	(15,787)
10" V.C.P. pipe and fittings	-	\$ 48,461	48,461
8" V.C.P. pipe and fittings	-	40,039	40,039
Manholes and cleanouts	34,096	34,096	-
Taps	27,304	2,741	(24,563)
4" wyes	-	33,880	33,880
Pavement replacement	160	160	-
Off-site extension of 10" V.C.P.			
Boring	-	5,100	5,100
10" V.C.P. pipe	-	2,938	2,938
Manholes	-	1,284	1,384
Pavement replacement	-	3,180	3,180
TOTALS	\$112,208	\$171,879	\$59,671
COST PER UNIT	\$440*	\$881**	\$441

* - 255 units

** - 195 units

Electrical Service

Electrical service costs in Phoenix do not necessarily reflect actual installation costs of the utility company but rather a formula used by them based upon the time to begin to recapture their installation investment. Because the city "fast-tracked" Cimarron and because Knoell used the PRD option,

total time from start of electrical service entrance to occupancy was reduced by 9 months. The electric utility company could start recapturing installation costs through monthly use fees 9 months earlier than originally anticipated. Accordingly, the installation charge was reduced from \$180.35 to \$96.24 per unit.

	<u>As Built</u>	<u>Comparison</u>	<u>Savings</u>
Electrical service	\$24,541	\$35,168	\$10,627
COST PER UNIT	\$96.24*	\$180.35**	\$84.11
* - 255 units			
** - 195 units			

Off-Site Driveway Entrances

Cimarron was platted specifically to reduce the number of driveway entrances from streets that had vertical curbs and right-of-way setback requirements. Out of 255 lots, entry to 221 were from streets with flat, roll, and ribbon curbs with no right-of-way setback restrictions. If Knoell had built Cimarron according to more traditional standards, many more lots would have faced the collector street with vertical curbs. Also, the builder would have had to extend those driveways over the rights-of-way. Changes in the new plan reduced access over vertical

curbs and rights-of-way by 70 lots. Cost savings follow.



Driveway entrance over vertical curb.

	<u>As Built</u>	<u>Comparison</u>	<u>Savings</u>
Concrete driveway entrances	\$ 3,818	\$ 7,861	\$ 4,043
Driveways	8,160	16,800	8,640
TOTALS	\$11,978	\$24,661	\$12,683
COST PER UNIT	\$47*	\$126**	\$79
* - 255 units			
** - 195 units			

Landscaping

The city of Phoenix originally required polyvinylchloride (P.V.C.) irrigation piping with sprinkler heads. Knoell pointed out that polyethylene piping and low pressure emitters (drip system) are equal, if not superior, to conventional P.V.C. piping and sprinkler heads. The city agreed to allow the drip irrigation system in the Demonstration project. Cost savings were as follows.



Well planned open space and landscaping of Cimarron.

Landscaping Cost Comparisons			
	<u>As Built</u>	<u>Comparison</u>	<u>Savings</u>
Landscaping	\$ 99,832	\$ 99,832	-
Landscaping irrigation	59,996	68,620	\$8,624
TOTALS	\$159,828	\$168,452	\$8,624
COST PER UNIT	\$627*	\$864**	\$237
* - 255 units			
** - 195 units			

BUILDING DESIGN AND CONSTRUCTION CHANGES

This section contains discussions of cost saving techniques in direct construction. As mentioned in Chapter 3, the units were designed for production efficiencies as well as marketing. The 107 townhouses ranged in size from 770 to 912 square feet while the 148 detached homes varied from 948 to 1295 square feet.

The builder tested some innovative construction techniques only in the model homes; others were incorporated into all homes. For example, the builder used 24-inch on-center framing in the model homes but decided to return to 16-inch on-center framing for production homes. He did this because hardboard siding required for 24-inches o.c. was substantially higher in cost



Homes under construction.

than the siding specified for 16 inches on center. Also, the builder claimed that the dry Phoenix climate tended to warp even "dry" studs and made flat plane walls more difficult with 24-inch spacing. In addition, cathedral rafter framed ceilings in some units were not aligned with the 24-inch wall framing.

Construction Cost Saving Summary

<u>As Built</u>	<u>Comparison</u>	<u>Cost Savings</u>	
		<u>Total</u>	<u>Per unit</u>
Elimination of r.o.w. on 219 units, decreased setback requirements	R.o.w. plus setback requirements on all streets	\$ 52,560	\$ 206
Hardboard siding, single layer	Stucco or masonry exterior with shutters	114,750	450
Electrical - 100 amp service	Electrical - 200 amp service	15,300	60
Reduced fencing because of zero lot line	Sideyards on both sides	31,110	122
Kitchen:	Kitchen:		
- elimination of soffits over cabinets	- soffits typically used	20,400	80
- plastic laminate	- wood cabinets	49,725	195
Roof - zero overhangs	Roof - 2' overhangs typical	54,315	213
Mechanical - no exhaust fans in utility and bathrooms.	Mechanical - exhaust fans in utility and baths required	36,975	145
Electrical - spaced outlets based on use	Electrical - 12' minimum spacing required	12,240	48
Concrete - 2-1/2" thick slab, no gravel fill under exterior concrete	Concrete - 3-1/2" thick slab, gravel fill under exterior concrete	49,725	195
Carpentry - elimination of structural headers in non-bearing walls	Carpentry - structural headers over all openings	47,430	186
Plumbing - polybutylene pipe (supply)	Plumbing - copper pipe (supply)	16,575	65
Indirect - contractual benefits because contractors were able to negotiate materials in quantity; e.g., one paint color, one roofing material, etc. Also, field supervision reduced because of standardization		51,000	200
TOTALS		\$552,105	\$2,165

Following are item-by-item discussions of the methods used by Knoell to reduce on-site direct construction costs. All are proven methods that have no effect on the health, safety, and welfare of the occupants.

On-Site Driveways

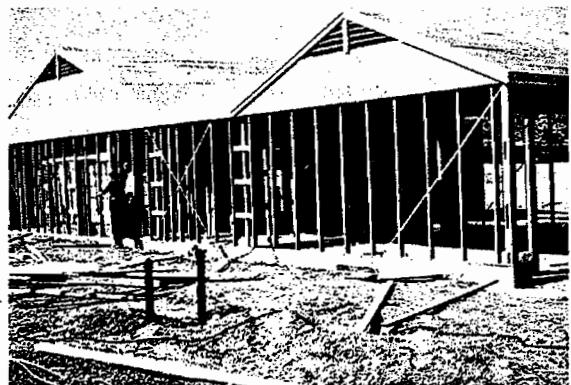
Because of elimination of rights-of-way on residential access streets and reduction of setback requirements on all streets, on-site driveway paving costs were reduced by an average of \$206 per dwelling unit.

Concrete

Normal concrete slabs-on-grade in Phoenix are a minimum of 3-1/2 inches thick. Based on soil-bearing capacity tests conducted by Knoell, the City allowed 2-1/2-inch-thick slabs-on-grade on well compacted fill. In addition, gravel fill is normally required in Phoenix under all exterior concrete such as patios and sidewalks. Knoell pointed out that the natural soil condition was sandy gravel. So, the city eliminated the gravel fill requirement. Total savings averaged \$195 per unit.

Carpentry

Although 24-inch on-center framing was not used in production homes for reasons listed above, other optimum value engineered lumber saving techniques were incorporated. Structural headers, for example, were eliminated in non-load-bearing walls, and the use of 4-foot and 2-foot design modules reduced excessive framing. Total lumber and installation costs were reduced by \$186 per house.



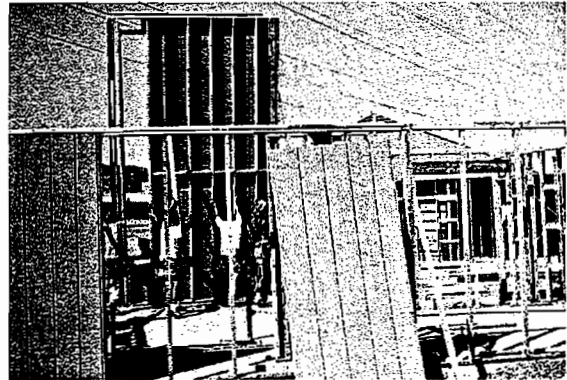
Efficient framing

Mechanical

Exhaust fans in bathrooms and utility rooms are typically installed in Knoell homes. They were eliminated in Cimarron for an average cost reduction of \$145 per unit.

Siding

Hardboard and other panel siding, applied directly to the studs, is a method of reducing costs that has become common in many parts of the country. Use of this method was a major deviation from Knoell's normal practice. Typically, stucco or masonry veneer would have been used. Hardboard without sheathing (which is unnecessary with structural panel siding) saved an average of \$450 per dwelling over typical practice.



Single-layer hardboard siding.

Plumbing

The builder used polybutylene hot- and cold-water supply plumbing instead of the more typical copper. The average savings were \$65.00 per house at the time of construction. However, at that time, copper prices in Phoenix were unrealistically depressed, and the builder believed cost savings would be substantially higher under "normal" conditions. Studies have shown that supply rough plumbing can be reduced by about 40 percent by using polybutylene pipe.



Polybutylene supply pipe.

Electrical

Electrical outlets were spaced according to expected use instead of the arbitrary 12 foot minimum spacing requirement, saving about 3 outlets per house. Extra care was taken not to eliminate useful outlets nor to endanger safety of the occupants. Average cost savings were \$48.00 per house.

In addition, because the houses in Cimarron were small and expansion possibilities were few, electrical service entrance panel sizes were reduced to from 200 to 100 amps, saving an average of \$60.00 per unit.

Fencing

Since the zero-lot-line configuration of the single-family homes let one wall of each house replace a substantial portion of fencing, costs were reduced by an average of \$122 per house.

Roof Overhangs

The design of Cimarron homes made elimination of roof overhangs feasible, reducing costs of framing, trim, and roofing by an average of \$213 per unit.

Kitchens

Soffits over kitchen cabinets are typical in the Phoenix market. They were eliminated in Cimarron for an average cost reduction of \$80.00 per unit. Also, the builder used plastic-laminate-covered cabinets instead of the typical wood cabinets, reducing cost by \$195.00 per unit. According to the builder, no prospective buyer commented on this change.

Indirect Construction Costs

Knoell architects designed the unit exteriors carefully to enhance their overall appearance. Standardized roof lines, a single color for siding and trim on each home, one fencing material, and all dark grey roofing shingles gave an overall effect of larger units. According to Knoell, cost savings realized from these considerations were about \$200.00 per house, since subcontractors could negotiate materials in large quantities and field supervision was substantially reduced.

COST SAVING SUMMARY

Following is a summary of cost savings in Cimarron because of reduced governmental regulations and builder/developer changes to typical practice in the City of Phoenix.

<u>Total Cost Savings</u>	<u>Cost Savings per Unit</u>
Administrative and processing	\$2,198
Land development	3,676
Direct construction	2,165
TOTAL	\$8,039



Project Schedule

Relevant Dates in Project Development

July 1979 - Phoenix Concept Plan 2000 passed by City Council.

September 1981 - New zoning ordinance adopted by City Council into the city code, allowing higher density, zero lot line construction, and performance standards, in the form of a Planned Residential Development.

December 1981 - Knoell sent a letter of interest to HUD and was subsequently asked to join the Affordable Housing Demonstration.

January 1982 - Affordable Housing Demonstration kick-off meeting in Las Vegas at NAHB Convention.

February 2, 1982 - List of requested changes in requirements and practices developed by Hugh Knoell; sent to George Krempf in the city for consideration and written response.

February 16, 1982 - First conceptual meetings and first draft list of requested changes.

February 25, 1982 - Preapplication conference with Development Coordination Office and key staff. Submitted the written list of requested changes.

March 1982 - Press conference announcing the official pledge for a successful Joint Venture. Attended by Mayor Margaret Hance, HUD Under Secretary

Donald Hovde, HUD Division Director Joseph Sherman, and the local press.

March 16, 1982 - Submitted preliminary Subdivision Plan to the Development Coordination Office. Building Construction Plans submitted concurrently.

April 1, 1982 - City of Phoenix approved plans subject to stipulations presented by staff in a letter from the Development Coordination Office. Phoenix issued Model Home Permits in advance of plat recordation. Issuance of Grading and Drainage Permit (in advance of site plan approval, plat recordation and building permit approval).

June 8, 1982 - City Council approved the Plat of Dedication, showing public streets. Official Ground Breaking Ceremony.

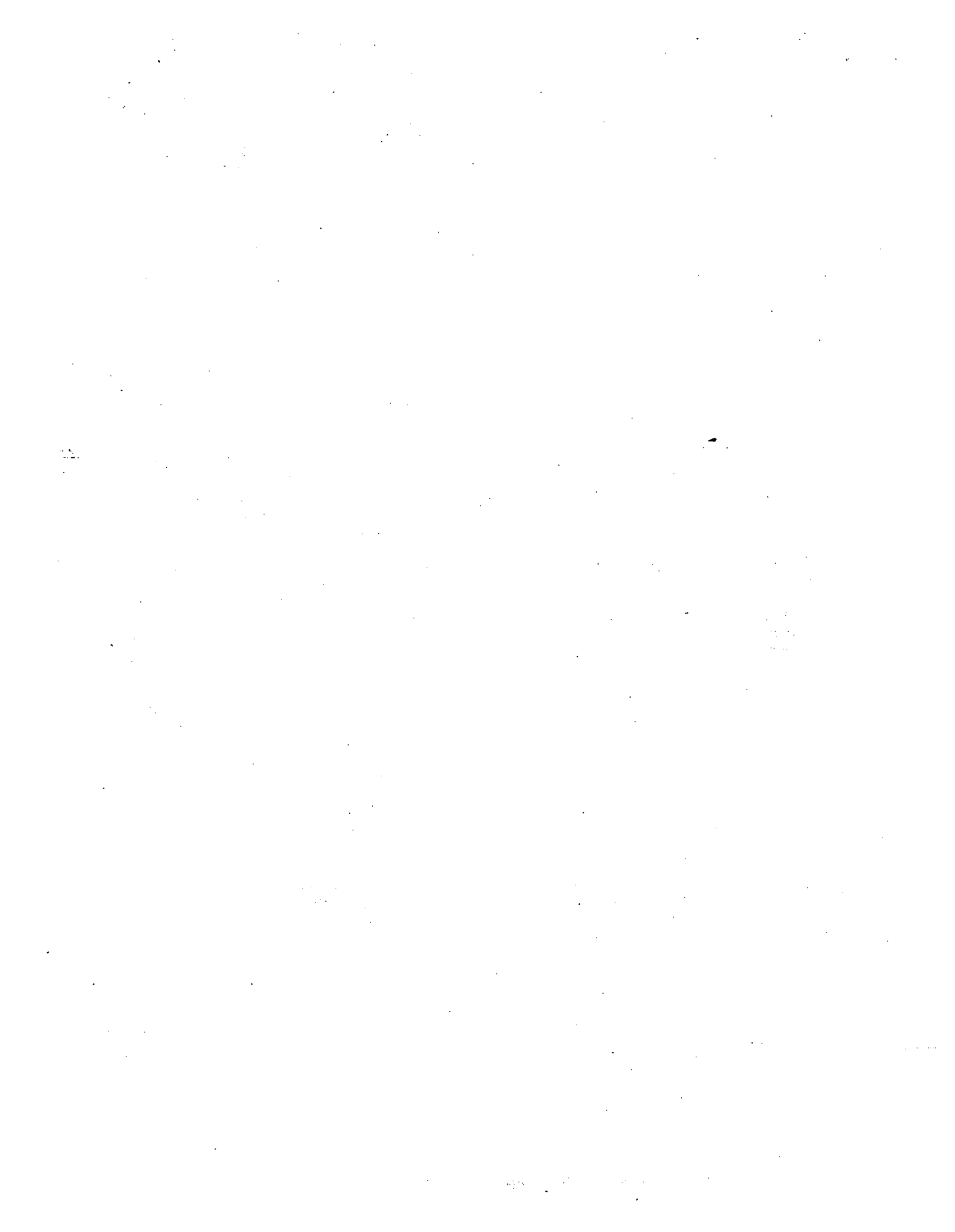
August 1982 - City Council removed bonding requirements for all developers.

October 1982 - Start of preconstruction sales.

October 29, 1982 - Final Site Plan Approval.

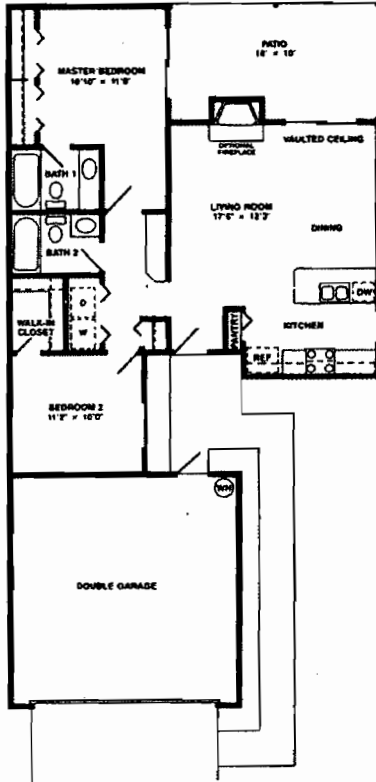
January 16, 1983 - Grand opening - six model units fully decorated.

January 25, 1983 - NAHB Convention in Houston. Program on Affordable Housing given by Rich Eneim - 101 units sold.



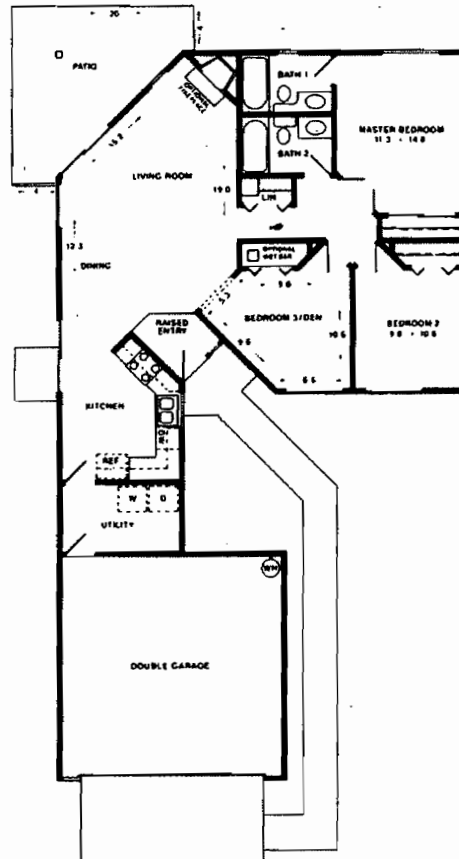
Plans

MODELS* DETACHED



The Coronado
plan CM 25-2

CORONADO -- \$59,500
Two Bedrooms
Two Baths
948 Sq. Ft.

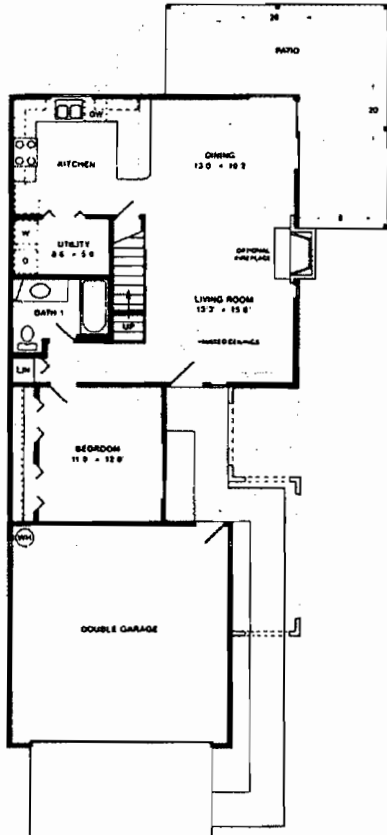


The Balboa
plan CM 26-3

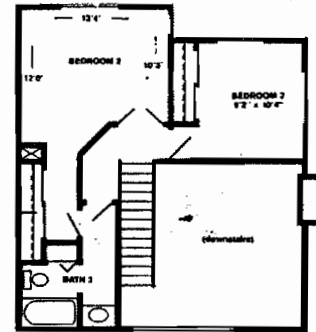
BALBOA -- \$63,700
Three Bedrooms
Two Baths
1163 Sq. Ft.

*Prices are as of 6/6/83.

MODELS - DETACHED

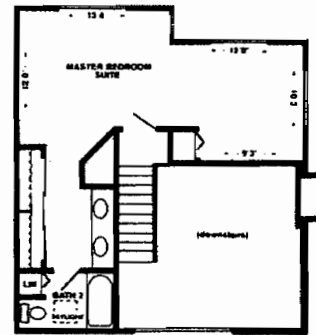


The Celebrity
 plan CM-28-3
 with master
 bedroom suite



CM-28-3 2nd Floor

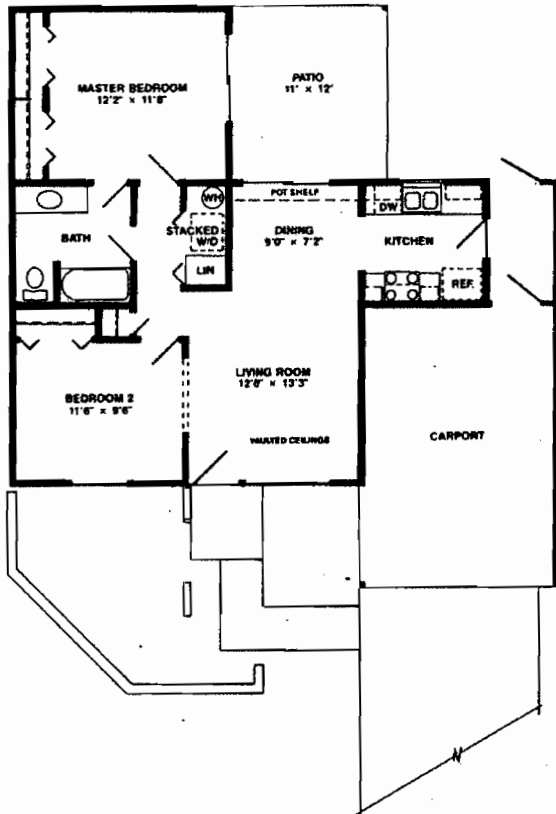
CELEBRITY — \$70,500
 Two Bedrooms/Master Suite
 Two Baths
 1295 Sq. Ft.



CM-28-3 2nd Floor
 with master bedroom suite

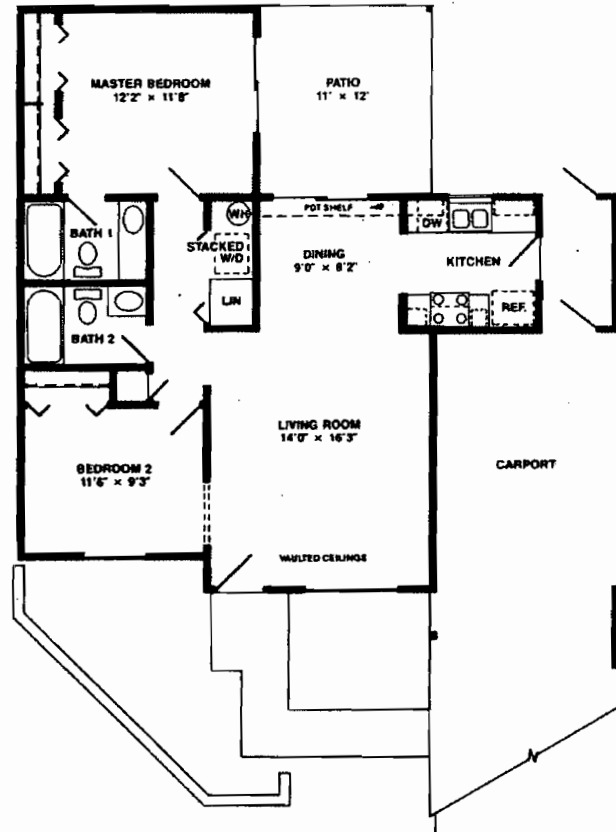
CELEBRITY — \$69,900
 Three Bedrooms
 Two Baths
 1295 Sq. Ft.
 (Model Not Shown)

MODELS - TOWNHOUSES



The Sonora
plan CM 21-2

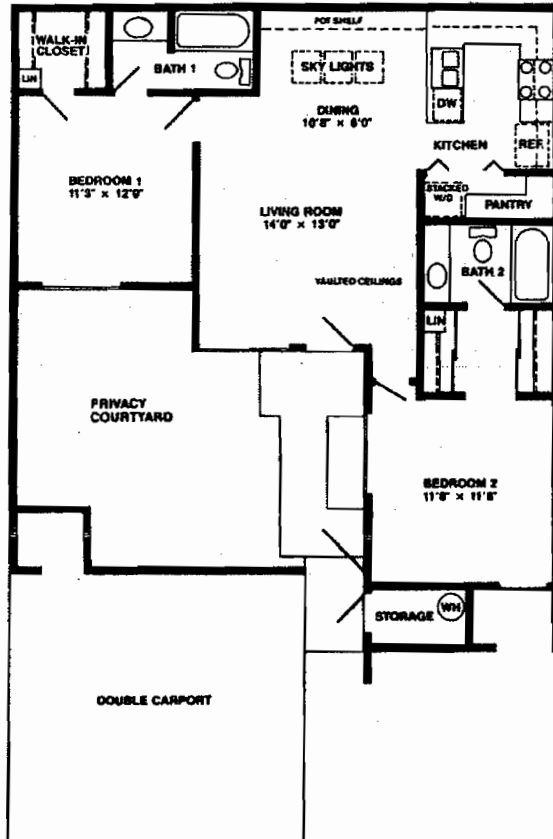
SONORA — \$45,500
Two Bedrooms
One Bath
770 Sq. Ft.



The Granada
plan CM 22-2

GRANADA — \$49,300
Two Bedrooms
Two Baths
875 Sq. Ft.

MODELS - TOWNHOUSES



The Saratoga
plan CM 23-2

SARATOGA -- \$50,300

Two Bedrooms

Two Baths

912 Sq. Ft.

Resources

City of Phoenix (Principal Contacts)

Richard Counts, Director of Planning

Jon Wendt, Development Services
Assistant

C. A. Howlett, Special Assistant to the
Mayor

George Krempf, Deputy Planning Direc-
tor, Development Coordination Office

Knoell Homes, Inc. (Principal Contacts)

Rich Eneim, Vice President for
Production

Barbara Nigro, Assistant to Vice Presi-
dent of Production

Bonnie Hicks, Phoenix Division Manager

Les Conway, Project Manager

BIBLIOGRAPHY OF COST EFFECTIVE CONSTRUCTION PUBLICATIONS

An Approach for the 80's: Affordable
Housing Demonstration, National As-
sociation of Home Builders Research
Foundation (NAHB/RF), for U. S.
Department of Housing and Urban
Development, Office of Policy
Development and Research
(HUD/PD&R), Washington, D. C. 20410

Building Affordable Homes: A Cost
Savings Guide for Builder/Developers,
NAHB/RF for HUD/PD&R, Washington,
D.C. 20410

Cost Effective Site Planning: Single
Family Development, NAHB/RF for
HUD/PD&R, Washington, D. C. 20410.

Construction Cost Control Manual,
NAHB/RF, Washington, D. C. 20005.

Energy Efficient Residence Research
Results, NAHB/RF for HUD/PD&R,
Washington, D.C. 20410

Manual of Lumber and Plywood Saving
Techniques For Residential Light-
Framed Construction, NAHB/RF,
Rockville, Maryland 20850

Planning for Housing Development Al-
ternatives for Better Environments,
NAHB, Washington, D. C. 20005

Productivity Improvement Manual,
NAHB/RF, NAHB, Washington, D. C.
20005

Reducing Home Building Costs With
OVE Design and Construction,
NAHB/RF for HUD/PD&R, Washington,
D. C. 20410

The Accounting System for All Builders,
NAHB, Washington, D. C. 20005.

1947

1948

1949

1950

1951

1952

1953

1954

1955

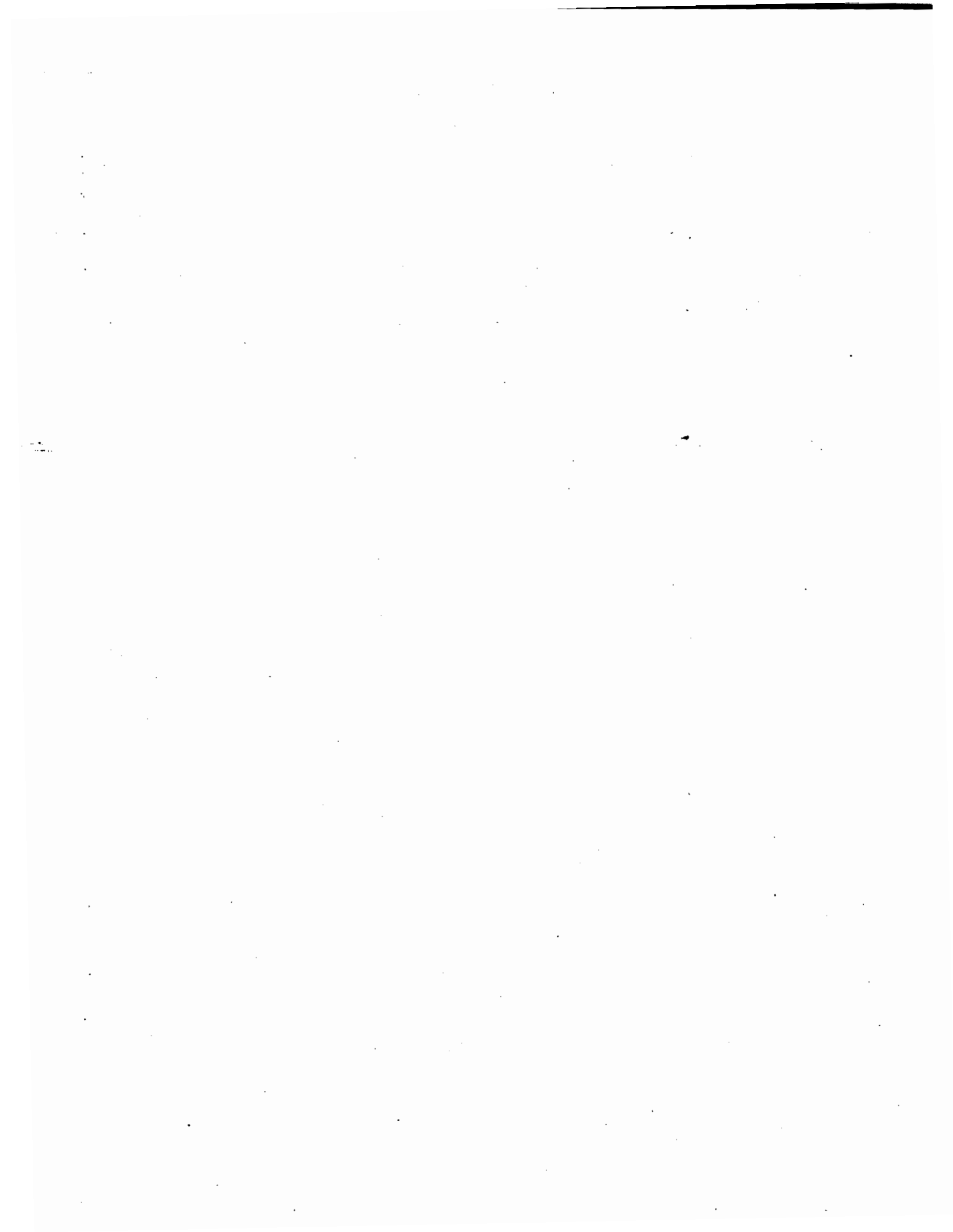
1956

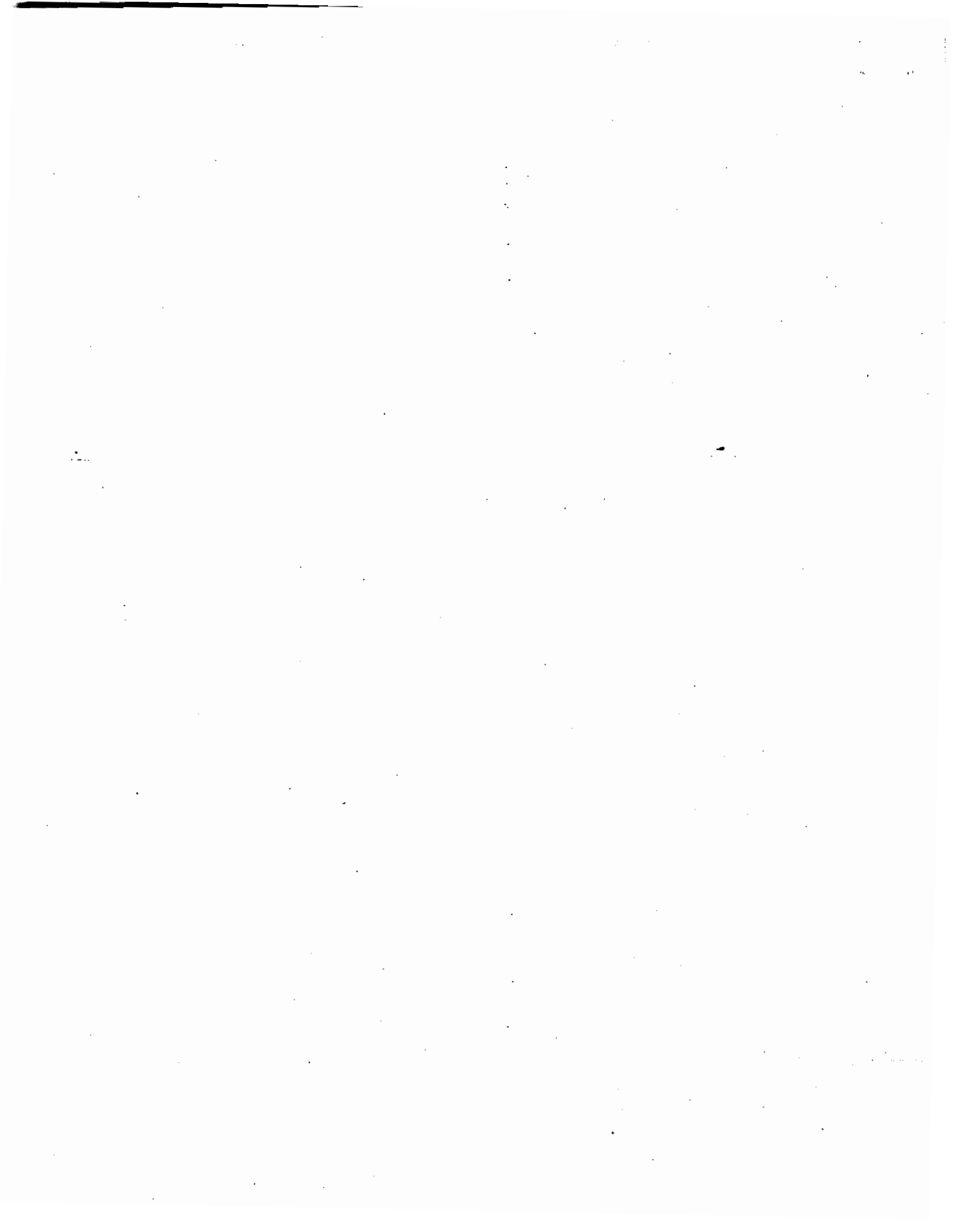
1957

1958

1959

1960







ORIGINAL

The Affordable Housing Demonstration

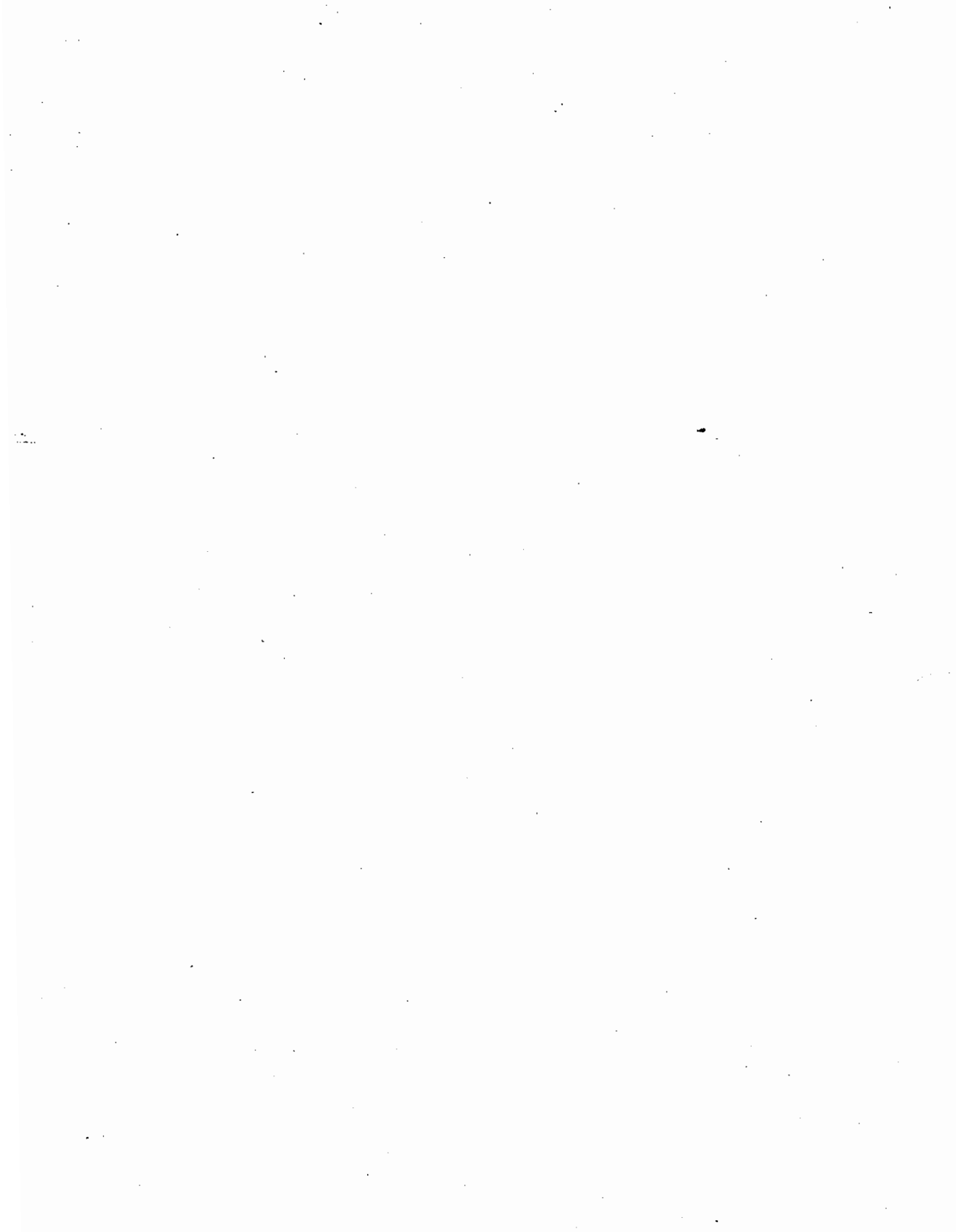
Phoenix, Arizona

a Case Study



The Joint
Venture for
Affordable
Housing

JAMES



U.S. Department of Housing and Urban Development
Washington, D.C. 20410

Official Business
Penalty for Private Use, \$300

Postage and Fees Paid
Department of Housing
and Urban Development
HUD - 401



44



HUD-PD&R-761
Dec. 1983