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TUCSON SOLAR VILLAGE: PROJECT MANAGEMENT

*A Project in Sustainable
Community Development*

**Energy Task Force of
the Urban Consortium**

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PIMA COUNTY, ARIZONA
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MASTER

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PREFACE

1991 URBAN CONSORTIUM ENERGY TASK FORCE RESEARCH

THE URBAN CONSORTIUM (UC) is a special network of the Nation's largest cities and urban counties brought together by PTI to find new solutions to their common concerns. The UC provides a creative forum where elected and appointed officials can identify, test, and validate practical ways to improve the provision of public services while generating new revenue opportunities. With staff, management, and business services provided by PTI, the UC addresses the critical needs of large local governments through its three task forces: Energy, Environment, and Telecommunications and Information.

The Urban Consortium Energy Task (UCETF) has 20 members and was established to improve urban energy management and decision-making through applied research and technology transfer. The UCETF focuses on developing and sharing new approaches and innovative solutions to energy management problems with local governments. Projects are organized in thematic units and co-managed by a member of the Task Force.

A description of the 1991 program Units and projects are:

ALTERNATIVE VEHICLE FUELS AND TECHNOLOGIES (AVF)

Alternative vehicle fuels offer a very strong potential to aid in the reduction of U.S. dependence on foreign oil supplies, with the resulting benefits of decreased air pollution in urban areas. Local governments can play an instrumental role in realizing this potential through practical applied research and highly visible demonstrations of alternative fuels and technologies. Issues addressed this year include identifying (a) intensive and credible market development efforts based on an applied research and demonstration program that combines reliable technology with experience-tested applications, (b) environmental and energy diversity benefits, and (c) institutional and infrastructure barriers. The 1991 AVF unit consists of:

Broward County, FL -- *Dual-Fuel Conversion Demonstration and Technology Transfer Project*

New York City, NY -- *Alternative Fuel Vehicle: Financing Issues*

Denver, CO -- *Technical and Market Comparison Between H₂/CNG (Hythane), Electric Hybrid, and CNG Fueled Vehicles*

Denver, CO -- *An Alternative Fuels Fleet Evaluation System -- A Transfer Project*

Detroit, MI -- *Analysis of Institutional and International Limitations for Alternative Fuel Vehicles*

Washington, DC -- *Comparison of Energy Consumption, Energy Savings, and Environmental Effects of EV/PV vs. Conventional Gasoline Vehicle*

ELECTRICITY MANAGEMENT

Urban interests for electricity management focus on means to maintain stable, secure and reasonably priced supplies of electric energy. Approaches include procedures for better demand management, application of "least cost" planning concepts, appropriate use of decentralized and/or small power production facilities, improved end-use efficiency, and developing sound structures for cooperative action among municipalities and energy utilities. Urban strategies include support for decentralized "small" power production, along with better demand management and improved end-use energy efficiency. The successful development and implementation of such strategies will require close cooperation with the utility industry and will address topics in areas of institutional relations, source flexibility, and demand-side management. The 1991 Electricity Management Unit consists of:

Albuquerque, NM -- *Alternatives to Traditional Rate Setting*

Chicago, IL -- *Integrating Innovative Supply and Efficiency Techniques*

Chicago, IL -- *The Chicago Energy Management Cooperative*

Dade County, FL -- *Energy Cost Reduction Through Resource Recovery*

Detroit, MI -- Hydraulic Waste Energy Recovery (Phase II) City of Detroit Water Distribution System

San Jose, CA -- Utility/Local Government Partnership to Increase Energy Conservation in New Construction

ENERGY EFFICIENT FACILITIES

Activities involving energy efficient facilities are at present, part of a national effort to achieve maximum cost-effective energy productivity in the building sector. There exists a need for collaboration between local government officials responsible for energy and environmental programs and other local government officials responsible for facilities, as well as the Federal officials and private sector groups, e.g. utilities. New technologies and management/administration practices to advance energy efficiency in facilities require major partnership efforts and transfer programs. Multi-family housing that has a large concentration of low-income families presents a unique challenge to lowering energy costs and maintaining energy efficient facilities. Projects in this unit are:

Boston, MA -- Neighborhood Energy Efficiency Outreach Partnership

Columbus, OH -- Energy Efficiency and Indoor Air Quality: Solutions for Fire Stations

Louisville, KY -- Partnership Approach to Energy Efficiency in Non-Profit Facilities

Montgomery County, MD -- Technology Transfer of Building Energy Design Guidelines

New Orleans, LA -- Residential Utility Costs Comparative Study

Phoenix, AZ -- Variable Frequency Drive Applications Guide

Portland, OR -- Energy Savings Through Operation and Maintenance Training in the Low-Income Multi-Family Sector

Washington, DC -- Comparison of Two Techniques for Identifying Energy Conservation Measures in Low Income Homes

ENERGY, ENVIRONMENT and ECONOMIC DEVELOPMENT

This an area that has both visionary and immediate practical emphases on the definition and evaluation of realistic strategies and actions to support energy-sustainable and

environmentally responsible communities. Emphases include uses for renewable energy, practical domestic supply and conservation alternatives, and the synthesis of energy concerns with wider local government interests in economic development, environmental quality, and internal cost control. Urban strategies to improve energy-sustainability require attention to both broad based institutional changes, as well as specific projects designed to encourage the application of appropriate technology and community development practices. The "Sustainable Communities" project has involved three municipalities with State agency, Lawrence Berkeley National Laboratory, and a formal advisory committee with broad national representation. Projects under this unit are:

Austin, TX -- Energy Star Sustainable Rating Program

Phoenix, AZ -- Impact of Heat Island on Cooling and Environment: A Demonstration Project

Pima County, AZ -- Tucson Solar Village - Project Management

Portland, OR -- Sustainable City Transfer Project

San Francisco, CA -- Neighborhood Energy/Economic Development at South Bayshore

San Francisco, CA -- Sustainable City Transfer Project --

San Jose, CA -- Sustainable City Transfer Project

Seattle, WA -- Coordination of Energy and Air Quality (CEAM)

Seattle, WA -- Bicycle Program -- Urban Trails System

Tucson, AZ -- Local Government Involvement in Long Term Resource Planning for Community Energy Services

Reports from each of these research projects, including this report, are specifically designed to aid the transfer of proven experience to other local governments. Readers interested in obtaining any additional reports or further information about the Urban Consortium Energy Task Force and the Urban Consortium should contact:

**Energy R&D Program
Public Technology, Inc.
1301 Pennsylvania Avenue, NW
Washington, DC 20004
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ACKNOWLEDGEMENTS

The outstanding success of this project would not have been possible without the leadership of the Tucson-Pima County Metropolitan Energy Commission (MEC). The members of the MEC Steering Committee were persistent in their dedication to this Project and are commended for many hours of volunteer time.

METROPOLITAN ENERGY COMMISSION 1989 - 1991

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This Project has been conducted with the unanimous support of the Pima County Board of Supervisors and the Tucson Mayor and Council - at a time when other demands were heavy. The Project Team is particularly indebted to Pima County Supervisors: Reg Morrison, Chairman, Ed Moore, Raul Grijalva, Dan Eckstrom, Greg Lunn;

Mayor Thomas Volgy, Vice Mayor Janet Marcus, and Councilpersons: Roger Sedlmayr, Bruce Wheeler, Molly McKasson, Steve Leal, George Miller, and Mike Haggerty.

Mr. Arlan Colton, Director of the Tucson office of the Arizona State Land Department and Mr. Wayne Moody, Principal, of Community Design Associates who represented P&D Technologies and The Planning Center have both been outstanding contributors. These individuals gave superb attention to a myriad of details necessary to produce the Development Plan and successfully rezone the property.

And, finally, to the other projects in the Urban Consortium - Energy Task Force we owe much for their critique and encouragement. The professional interface and camaraderie at the Review Meetings was both enlightening and refreshing.

Gwyn Sanders, Project Director

Wilson W. Orr, Project Manager

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CHAPTER 1 - OVERVIEW

ABSTRACT.

This nation's economic viability is increasingly threatened by the enormous throughput of resources necessary to sustain our communities and businesses. Currently, the United States consumes twice the energy and raw materials per unit of Gross National Product as do Japan and West Germany¹. This rate of consumption is a fundamental threat to our sustainability as an economically competitive nation. The linkage between economic health and environmental sustainability is elemental and becoming increasingly apparent.

The ability of an urban jurisdiction to design its growth in accordance with principles of sustainability has been demonstrated by this project. The elected official and general public support necessary to adopt a Development Plan and complete the rezoning indicates growing support for sustainable development. Increasing costs for energy and the attendant environmental penalties are strong motivations for better management of community growth. Further incentives derive from resource use problems in solid waste management, water consumption, air quality, and economic development.

The Tucson Solar Village is a **Design/Build Project in Sustainable Community Development** which responds to a broad spectrum of energy, environmental, and economic challenges. This project is designed for 820 acres of undeveloped State Trust Land within the Tucson city limits; residential population will be five to six thousand persons with internal employment provided for 1200. This is a 15 year project (for complete buildout and sales) with an estimated cost of \$500 million.

The objective for this 2 year program was to produce a Development Plan and rezone 820 acres for the Tucson Solar Village. The Project Team recognized that private sector builders are probably 20 years from voluntarily producing "sustainable communities." The public sector role in this case was to initiate the process and determine those incentives necessary to catalyze private builder action.

The Project Team decided early in the process to:

1. Set performance targets for energy use reduction and environmental mitigation.
2. Build a working public/private partnership involving the citizens, builders, elected persons, and the business sectors in the design of this community.
3. Design the best community that could be built. Anything less would not attract the necessary support.

This project has been an outstanding success, completing a sustainable community design and rezoning 820 acres within 22 months. This is a significant achievement in a community which usually opposes development...of any type. The City of Tucson Zoning Hearing Examiner stated in his September 13, 1991, report to Mayor and Council:

"The Tucson Solar Village is an extremely innovative and creative project that not only holds great promise for the Tucson community, but will also act as an international model and prototype for the development of environmentally sensitive communities where energy use and waste will be reduced while economic efficiency is increased. Incorporated and integrated in (this project) are environmental, economic and social planning concepts and community objectives.

In addition to the superior quality work associated with the project components, the project team managers are commended for their progressive participatory planning process which actively and successfully involved numerous individuals and agencies from both the private and public sectors. This success is reflected in the extensive and almost universal community support of the project."²

This project should be of significant help to other jurisdictions in the transition to a sustainable society.

Following sections of this Report will address details of the project, with emphasis on the process and comments on its transferrability.

CHAPTER 2 - GENERAL BACKGROUND AND DESCRIPTIONS

INTRODUCTION

An evaluation of the Tucson metropolitan economy in 1984 indicated an annual energy bill of \$800 million³. Eighty percent of this amount left not only the local economy, but departed the State within 48 hours. The Metropolitan Energy Commission calculated the savings from efficient residential space conditioning and alternative transportation methods could approach \$175 million annually⁴ using proven technologies and alternative land use planning concepts. To achieve this savings a new type of mixed use community would have to be built. Our research indicated the technologies, techniques, and products to achieve this goal were available. However, they had never been integrated into a single community development project.

Several local builders expressed interest and with the help of the Governor's office, the State Land Department, and the State Energy Office the Metropolitan Energy Commission was able to obtain over \$1 million in oil overcharge restitution funding. The Urban Consortium - Energy Task Force grant to Pima County, AZ, in November of 1989, provided the funding for Project Management; contract work began immediately on the planning and rezoning process.

This Project required the integration of multiple jurisdictions and their internal departments. Further complicating the process were stakeholders external to the jurisdictions such as the neighborhood associations, environmental groups, neighbors to the project site, and the local home builders.

All parties to this Project agreed on the need for acceptable alternatives to "urban sprawl." The burdens faced by local governments in mitigating for intensive energy and resource use were increasingly onerous and unpredictable.

The Solar Village Project has provided a unique forum for definition of alternatives to urban sprawl which are acceptable to the entire community. As cited in Table 1, below, page 7, the potential for hard dollar savings is impressive, approximating \$1,000 per resident per year.

GENERAL BACKGROUND AND DESCRIPTIONS.

The Project Team was led by the Metropolitan Energy Commission utilizing the Urban Consortium funding for the Project Manager's position. General organization of principal stakeholders is illustrated in Figure 1, page 10, of Chapter 3.

The Team early recognized the need for more than just an "energy efficient community" and investigated other criteria of sustainability within the three major categories of the economic, environmental, and social impacts of urban growth. A major contributor to the success of the project was the selection of high, but achievable, Performance Targets for the community:

PERFORMANCE TARGETS

Energy consumption REDUCE by 75%

Further, balance the community carbon budget by offsetting CO₂ emissions with the installation of an architecturally integrated, utility owned photovoltaic system.

Water consumption REDUCE by 65%

In part, by using reclaimed water for outdoor irrigation use and indoor toilet flushing.

Solid Waste REDUCE by 90%

Through aggressive reduction, reuse, recycling, and composting programs.

Air pollution REDUCE by 40%

From a reduction in vehicle pollutant sources.

Jobs/Housing balance 1 new job/2 housing units

Develop a business center within the central community for pedestrian/biking accessibility.

This strategy of setting performance targets that no one could object to was an essential ingredient in obtaining both elected official and neighborhood group support. This was done early in the Project and captured the visionary "high ground" for the development plan and rezoning process.

Later (in year 2) of the Project we were able to quantify the benefits of achieving these performance targets. Table 1, below, summarizes these in dollars assuming a 75 year useful life for the community and its infrastructure, which we felt was conservative.

TABLE 1.**S A V I N G S**

Saved resource	Savings/yr	75 yr savings	Avoided costs (Millions of \$)
Energy (elec)	30,000 Mwh	2.25 Gw-hrs	\$180.00
Gasoline	990,000 gal	67 million gal	75.00
CO2 (combined)	34,459 Tons	2.6 mil. Tons	78.00
SO2	89.49 Tons	6712 Tons	10.59
NOx	89.58 Tons	6719 Tons	45.93
Water	144 mil. gal	10.8 bil. gal	17.60
Solid waste	1535 Tons	115,000 Tons	2.07
TOTAL AVOIDED COSTS in Constant 1991 dollars: (over 75 years)			\$409.19 Million

Electricity savings are based on \$.08/kwh avg. over 75 years. Gasoline calculations with 20 mpg, city avg. and a Carbon intensity of 6.1 #/gal. constant. Pollution costs are those adopted by Massachusetts for evaluation of electrical utility environmental impact.

These cost savings accrue to the residents, the business owners, and the jurisdictions/utilities providing services. The selection of Performance Targets providing this benefit stream was critical in setting the stage for a successful (and timely) rezoning.

Established above is the need for better management of urban growth. This should lead to the construction of more sustainable communities. "Sustainability" is customarily defined as meeting the needs of current generations without endangering the ability of future generations to meet theirs. The adoption of Performance Targets helped us quantify sustainability (we acknowledge that true sustainability is not achievable). The Targets were selected after determining the best that could be done using existing products, technologies, and techniques. We were careful not to include any provisions which would require extreme shifts in individual lifestyles since this community will have to compete in the open marketplace for its buyers/residents.

Two subsequent decisions were critical:

1. To fully involve all parties in an "open planning" process, and,
2. To identify the Economic Development potential for Tucson as part of this Project.

The next Chapter will provide more detail.

CHAPTER 3 - PROJECT DESCRIPTION

INTRODUCTION

Major jurisdictional relationships are shown in Figure 1, following. The Project Manager is an employee of Pima County with the City of Tucson providing office, clerical, telephone, and computer support. The Metropolitan Energy Commission (MEC) is a joint agency of the City and County and concerns with energy issues for a metropolitan population of some 650,000 persons. The Solar Village Project has been the major work effort for the Commission since 1989.

• PROJECT ORGANIZATION •

FIGURE 1.

The Tucson populace is environmentally literate and active. Several development projects have been blockaded by citizen group lawsuits on environmental grounds. This project was launched into an arena usually cluttered with intense debate and frequent litigation. Thorough detail is given to the planning process below.

With the City and County, via the MEC and the Urban Consortium grant, providing basic management, and the Land made available from the State Land Department and planning funds of over \$1 million from the State Energy Office, the stage was set for action.

PROJECT DEVELOPMENT AND APPLICATION

The Planning Process.

(The following section was jointly written by the Energy Task Force Project Manager and Mr. Wayne Moody, of COMMUNITY DESIGN ASSOCIATES, the Project's principal planner)

We worked for *continuous consensus*: a method to assure that all stakeholders have the opportunity/ability and encouragement to both shape and participate in achieving the objectives of the Solar Village design. Accordingly, we worked with our planning contractor to complete the Site and Area Analysis (a summary of design opportunities & constraints) for the Solar Village and prepare a public design forum. The forum was to ask the public for specific concepts/features they would like to see in the Solar Village.

Our series of open public meetings began in March of 1990, all except one being held at the public school closest to the site. The first meeting was a half-day workshop designed to present a summary of the Site and Area Analysis and to request the public's thoughts and ideas about what values should be used to plan the site, what should be developed on the site, and how. Because the group was large (40-50 people), it was broken into two groups with a facilitator in each group who took notes and focused discussion. This information was given to the participants of the design charette⁵ which was conducted in April, 1990.

The Design Charette

Following the first public meeting the MEC convened a Design Team (over a long weekend) to incorporate the general concepts into a specific design concept for the site. This interdisciplinary team merged local and national experts in the areas of urban design, solar-oriented architecture, social psychology, economics, urban development, art, legal, and solar technology issues. A specific team was assembled, small enough to be manageable and large enough to include the appropriate disciplines. Many local resource people, including architectural students from the University of Arizona, were included in the process, but did not have responsibility nor authority to develop the final plan. The product of this effort was a sketch concept plan. Intangible results may have been more important: the MEC and local participants felt that certain desired environmental concepts were verified by experts in the design, economic, and development professions; local participants developed a stronger sense of pride and enthusiasm for the project, which enthusiasm "rubbed off" onto their network of associates; the planning consultants responsible for developing additional alternatives and a final development plan were given a target and set of goals to achieve and hopefully exceed.

The second meeting was held after the design charette, so that the participants could be briefed on the results of their initial input as well as make comments on the results of the charette. A third meeting was held during the development of alternative concept plans for input to three additional plan concepts. The fourth open public meeting was held as a Solar Village Steering Committee meeting, primarily to observe the synthesis process of the Steering Committee and its consultant and also to provide comments to the process as guided by the consultant and the steering committee. A fifth open meeting was held to solicit final input on the draft final concept plan before detailing the various elements.

At each of these meetings, a summary of past actions was given, with emphasis on the elements of public input which have been included and discussing reasons why some elements were not. Over time, attendance at these meetings became smaller, partially due to the inclusion of input and the impression that the process was going well. On the other hand, some may have dropped out of the process because it did not lead to a fruitful forum for their specific point of view. In addition, the process developed into more one-on-one because of the attention that the Project Manager was giving to this process -ie. citizens felt their voice could be "heard" without attending a lengthy design meeting.

This process produced a handful of quite dedicated individuals who were very instrumental during the various public hearings.

Alternative Development Concepts

The planning process required the presentation of three alternative development concepts with a cursory cost analysis of each concept based upon economic feasibility, energy considerations, and marketability. Because the MEC, through its Solar Village Steering Committee, strongly favored the results from the design charette, this was one of the most difficult assignments for the planning contractor.

A series of substantially different concepts had to be developed with sufficient detail for evaluation. The contractor was required to withhold the charette design from his staff and subconsultants, allowing them to develop fresh alternatives uninfluenced by the earlier design effort.

This became an opportunity to test in a more public forum a number of concepts: overall density, amount and intensity of clustering, relationship of land uses to automobile and other alternative transportation modes, and specific land use and open space locations and mix.

Alternatives were developed which ranged from relatively normal subdivision practices, low density, and normal automobile relationships to those which pushed the limit of conceivable densities, land use mixes, and alternative transportation modes. Within the alternatives were also developed various concepts for centers of activity, from one central village focus to multi-nucleated centers to a series of independent neighborhood centers. Within the three basic alternatives developed, considerations for phasing relative to the Marketability Study were also pointed out.

The primary function of these alternatives was as a focus for extensive public review providing much more "contact time" than customary during the State Land planning process. Information meetings and workshops were held with the Solar Village Steering Committee, the Metropolitan Energy Commission, a specially appointed committee of the Southern Arizona Homebuilders' Association, City staff, County staff, the State Energy Office, the State Land Department (including the State Land Commissioner), open public meetings and others. Summary reports of key concepts and assumptions were developed for these meetings, verbal and graphic presentations were made, and ample opportunity was given for open exchange of reactions, ideas, and suggestions. This process was not viewed as advocacy for any one concept, but to honestly solicit input and reaction which would be integrated into the concepts, in order to make the project publicly responsive. At each workshop, it was noted that no one anticipated that any single concept would emerge intact; the final outcome would most likely be a combination of elements from each concept, moderated by the body of various inputs and reactions. In this way, each participant was hopefully made to feel that his or her comments could influence the final outcome.

Success of this process depends upon it *not being overly guided* and "orchestrated." If the public and various reviewers feel manipulated then the sanctity of personal opinion and input will be stifled and guarded, finally ceasing. There is no substitute for honesty and openness in building a relationship with the public.

Parallel participation from the political sector

Elected officials prefer not to be surprised. Most want to be kept informed about issues and processes, particularly if they will be expected to take some future action in the public eye. Usually they will not want to publicly commit themselves to supporting a project unless they know it has rather universal support, at which time they may want to be a "champion" for the idea. We made every effort to involve them in the process and to provide periodic status reports personally, or to their aides as the project progressed. As with all contacts, personal is better. If there begins to emerge significant public issues surrounding the particular project, either positive or negative, affected politicians must be kept informed.

Parallel participation from jurisdictional agency departments

Each staff agency and department is different because of its disciplinary focus, personalities, agenda, and source of funding within the jurisdiction. We met with staff at the highest levels possible and, thereafter, as many levels as necessary during all stages of the Project, not only to obtain guidance, but also to make certain that the various procedural steps and time needed to obtain key decisions are well understood. Frequent meetings with appropriate staff not only help them understand needed actions but also assist the Project Team in identifying difficulties early. This will promote not only understanding, but support for the project. Staff members *do* talk to each other and those that do tend to support each other's points of view. The value of staff reinforcement of positive identification with the issues of a particular project cannot be underestimated.

Economic Development Process

A key concept for the Solar Village is internal employment. The Performance Target to create one job within the community for every 2 residential units is perhaps the most challenging Target. Several strategies were developed:

1. Identify and seek those industries/businesses providing products to help meet the Performance Targets. The Solar Village can be a literal showcase for their product line. Help these businesses locate other markets in the larger community. Public sector markets can be very large and attractive.
2. Identify research/development needed to bring new products into the market that are energy or environmentally related. Work with local educational or other research capabilities to locate some portion of this new capacity at the Project.
3. Work with other local/state economic development agencies; they are very focused on new business development. Do not try to compete with these agencies.
4. Establish ties with several Commercial Real Estate Brokers. They do much of the "in the trenches" work of economic development. Their advice can be excellent in creating an attractive setting for new businesses.
5. Develop a Home and Apartment Office concept to encourage new homebased businesses. Customary zoning and ordinances are highly restrictive of this activity. Many of today's new jobs will be created in this new sector.
6. Build in Telecommuting as an option for even one day/week. Include fiber optic access and teleconferencing capabilities. In fact, this can be very attractive for any business.

RESULTS AND FUTURE PLANS

The 820 acres for the Tucson Solar Village was rezoned with the adoption of the Final Development Plan on October 7, 1991. Action was unanimous by Mayor and Council. Newspaper articles at this time focused on the unusual nature of unified support:

"Council unites to OK Civano Solar Village"

"Developers of the Solar Village were given cheers seldom afforded private developers who go before the City Council or Pima County Board of Supervisors."

"Councilman Steve Leal said he was 'tantalized' by the Solar Village [concepts]."

"Councilwoman Molly McKasson praised the coalitions the planners of the village forged and called them 'brilliant.'"

—Arizona Daily Star, October 8, 1991

"Solar plan radiates support--Few protest 820-acre Civano development"

"Proposed solar village avoids Rocking K woes"

"It has housing densities greater than those of the planned Rocking K development. It's twice the acreage of the Sabino Springs and the Silverado Hills developments on the North and East sides of Tucson..."

"...But unlike private developments, this government-sponsored project is expected to sail through the rezoning process."⁶ —Tucson Citizen, October 5, 1991

"Brave New Solar Village--Plans are underway for an eastside development in the shadow of the Rincons--that everyone loves"

"Like Rocking K, this development lies in the shadow of the Rincon Mountains, a short hike from the boundary of Saguaro National Monument East and 12 miles from the heart of downtown Tucson. This one, too, will be home to a large number of people: 5,000 on 820 acres. It'll have retail shops, a school, maybe even a manufacturing plant. Desert will be displaced.

"Despite all that, the environmentalists, neighborhood activists and eastside residents--those pesky saboteurs of developers' bankrolls--*still* like this development. That's because it's going to be different. *Very different.*"

—Tucson Weekly, September 18-24, 1991

A successful rezoning was the major objective of the 2 year work program. This was achieved in 22 months. Implementation of this Project will save each household and business over \$1000 per year in avoided energy and environmental costs. This savings stream for a 75 year period will exceed \$400 million.

Future plans are for a 2 year implementation phase to:

1. Assemble the financing necessary for development, and,
2. Obtain the business commitments to "lease up" the commercial property.

The Project is expected to transition to the private sector in 1992, begin construction in 1994, and be completed in 2010.

CHAPTER 4 - SUMMARY AND SUGGESTIONS FOR APPLICATION

LESSONS LEARNED

Comments following are by the Urban Consortium - Energy Task Force Project Manager and result from 2 year's experience with the Tucson Solar Village Project. These comments are intended to assist other jurisdictions in the process of Sustainable Community Development.

Major problems may stem from personality differences. Effective resolution of conflicts within the Project Team can be difficult since no one really works for any one else and agreements must be negotiated rather than dictated. This will require "matrix management" skills from many on the Team, recognizing that for the entire effort to move forward some compromise is necessary.

Obtain early elected official support. This will not come quickly, but sustainable community development is not something they can easily say "no" to. A good way to begin is by asking for their input prior to the design phase. What would they like their community to look like in 25 years? What services should be public sector provided?

Be sure the project is adequately budgeted for at least 24 months at the outset. The initial 2 year commitment of funding from the Urban Consortium was critical to this Project's success. It takes that long to build the credibility to obtain other funds. It may be possible to do this within local jurisdiction budgets, but a 2 year commitment is advisable. It will take time, and lots of it, to move a multi-agency project forward.

Project complexity is both bane and blessing. Multiple stakeholders and disciplines are challenging to coordinate; but, if this integration can be accomplished then the diversity of support becomes a very real strength.

Involve the business community and economic development agencies. There are new jobs to be created in all aspects of sustainability. No one can say no to a project which can deliver new jobs in clean industries...particularly industries which help to improve the local environment.

Comments following are from Mr. Wayne Moody, COMMUNITY DESIGN ASSOCIATES of Tucson and result from his 2 year's experience as the Planning Contractor for the Tucson Solar Village Project. These comments are also intended to assist other jurisdictions in the process of Sustainable Community Development.

Important considerations for a successful public participation process are identified below. Each community has its unique culture, economic structure, environmental assets/liabilities, and energy costs. Questions to be addressed at the outset may be:

- Local issues and related activities: is there sufficiently broad interest on the part of public and private leadership for the issues of sustainable community design? Are there business leaders who will commit to the project?
- Political structure and agenda: is the interrelated local and state political structure capable of agreement on common goals related to economic and environmental harmony? Can a sustained political commitment be obtained and survive near term elections?
- Personalities: is there in place a handful of qualified and influential people who can sufficiently subdue individual egos and work together toward higher common goals?

First, at least a cursory assessment of the above elements should be made. This would require someone to take the initiative, have discussions with leadership, and prepare documentation of related efforts.

Second, if it appears that sufficient interest exists, a project will need to be identified. This may be either public or private. As part of a project selection process, leadership and funding potentials must be defined. Specific goals should be outlined and an assessment made, matching these goals to specific interest groups and "stakeholders". Perhaps a project should be selected which satisfies these criteria:

- Are the goals broad enough and far-reaching enough to both elicit sustained interest and enthusiasm and also solve common problems?
- Is there a high degree of "match" between these goals and those of the groups and individuals who will be required participants in the success of the project?
- Is there sufficient willingness to share resources (funding, people and time) among those groups and individuals necessary for the success of the project?
- Can specific individuals be identified to lead the process and who have an ability to work altruistically to make the project successful?

Third, once a project is selected, a specific work program should be developed--sort of a "plan for the plan"--in sufficient detail to integrate the goals and objectives with the resources available (or at least to identify the resources needed). It is probable that a sustained amount of energy will need to be devoted to fundraising so that sufficient commitments are on the table to complete the project.

SUGGESTIONS FOR APPLICATION

We are faced today with unprecedented opportunities for Sustainable Development. Many of the technologies, products, and techniques exist to aid the transition to sustainability.

Energy uncertainties and environmental problems are receiving a higher priority on most jurisdictional agenda. These concerns are likely to escalate as we fend off our own environmental impacts while competing economically with countries using less resources per unit of GNP.

Nourishing those businesses which assist in mitigating environmental/energy problems can be very good business indeed. A larger program, however, for community wide conversion to sustainability will insure a community's economic viability into the future. The trend of internalizing environmental costs to the product beneficiary will certainly continue; this begins to level the economic playing field and reveal the actual costs of goods and services.

Sustainable Community Development is not risky. In fact, this is the conservative approach to management of urban growth and the restructure of our business activity. To not develop sustainably is risky and bets the farm against very high odds.

Any urban jurisdiction will benefit from a well executed project in sustainable development.

APPENDICES

Technical appendices

1. Excerpts from the FINAL DEVELOPMENT PLAN.
2. Excerpts from the ECONOMIC FEASIBILITY ANALYSIS.

These excerpts are intended to give the reader an indication of the site specific products generated during this project. They are only representative of the extensive documentation necessary to complete a sustainable community design & rezoning in Tucson, AZ, during 1990 and 1991.

3. Promotional Poster.

Appendix #1

**CIVANO: TUCSON SOLAR VILLAGE
FINAL DEVELOPMENT PLAN**

• •

Tucson-Pima County
Metropolitan Energy Commission

***FINAL DEVELOPMENT PLAN
CIVANO - TUCSON SOLAR VILLAGE***

***submitted to:
Arizona State Land Department***

***submitted by:
The Planning Center with Community Design Associates***

December, 1991

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The consultant team responsible for the preparation of this document has been directed by Wayne Moody, Principal Project Manager for **Community Design Associates**, in cooperation with the Arizona State Land Department under Planning Permit #47-97327, issued to the Tucson-Pima County Metropolitan Energy Commission and has included substantial inputs from the following consulting firms and individuals:

- **The Planning Center** (Tucson office)
- **P&D Technologies**
(Tucson, Phoenix, Orange and San Diego offices)
- **SWCA, Inc, Environmental Consultants**
(Tucson office)
- **Simons, Li & Associates** (Tucson office)
- **The Environmental Research Laboratory,**
University of Arizona
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<i>Exhibit A11, State Plat for Civano: Tucson Solar Village</i>

BACKGROUND SUMMARY

Project Objectives

For several years, enlightened leaders in Tucson and throughout the State of Arizona have acknowledged that the way we design and build our communities must focus on principles of sustainability: the use of the Sun as our primary source of energy; the conservation and multiple uses of water; the configuration of uses on the land which minimizes the use of fossil fuel- and time-consuming automobile travel; the reduction of waste in both product and time; and the development of a sense of community, social interaction, and place. The development of the Village of Civano is an attempt to demonstrate our ability to accomplish these broad goals. Specific performance targets relating to these goals have been developed and are enumerated in this document as well as the Development Plan approved by the City of Tucson as part of the adopted zoning of the site.

The Village of Civano is being planned within a highly cooperative framework of public, private, and community interests at the local, state and national levels, with leadership by the Tucson-Pima County Metropolitan Energy Commission. It is the hope and aspiration of all participants that the development of Civano will light the way for future generations to plan and build more in harmony with natural forces.

Regional Setting

The Tucson Metropolitan Area lies within the upper Sonoran Desert and is primarily confined within a gently sloping alluvial valley between 2200 and 3000 feet elevation, almost totally surrounded by mountain ranges. This valley generally slopes from the southeast toward the northwest. The project site is located in the southeast quadrant of the developing Tucson Metropolitan Area, within the City Limits of the City of Tucson and ranges between approximately 2780 and 2900 feet elevation.

Surrounding Zoning and Development

Development within the southeast quadrant of the Tucson Metropolitan Area, primarily to the northwest of the site, was developed between the late 1950s and the early 1980s and is generally characterized by square mile neighborhood patterns, with an elementary school and neighborhood park near the center of each. These developed neighborhoods are generally characterized by single family homes on 6,000 to 8,000 square foot lots. Multifamily housing is interspersed, generally on the edges of the square mile, next to commercial uses and along the arterial street system. The area to the north and east of the site is characterized by larger lots of 1 acre or more, in a more natural setting, reflecting the proximity to the Saguaro National Monument. Areas to the south of the site are primarily undeveloped and are part of the State Trust holdings. These areas are generally zoned SR, viewed by the City of Tucson as a "holding" zone.

TABLE 1: CIVANO MARKET & MARKETABILITY SUMMARY**FOR-SALE RESIDENTIAL:**

- 40-50 Units/year absorption
- First time and first move-up buyers

UNIT TYPE	UNIT SIZE	AVERAGE BASE SALES PRICE	VALUE RATIO
3 BR/2.0 BA	1250 S.F.	\$81,250	\$65/S.F.
3 BR/2.5 BA	1500 S.F.	\$89,990	\$60/S.F.
4 BR/2.5 BA	1800 S.F.	\$99,990	\$56/S.F.
4 BR/2.5 BA	2100 S.F.	\$109,500	\$52/S.F.

MULTI-FAMILY RENTAL:

- 60-80 Units/year absorption
- Singles & young couples with no children

UNIT TYPE	UNIT SIZE	AVERAGE BASE RENTAL RATE	VALUE RATIO
STUDIO	425 S.F.	\$325	\$0.76/S.F.
1 BR/1 BA	625 S.F.	\$450	\$0.72/S.F.
2 BR/1 BA	750 S.F.	\$495	\$0.66/S.F.
2 BR/2 BA	925 S.F.	\$550	\$0.59/S.F.

COMMERCIAL OFFICE:

- Community service orientation
- Developed as community grows

ANNUAL ABSORPTION	PRODUCT TYPE	LEASE DATA
5,000-7,500 S.F.	Two-Story Garden	\$1.20-\$1.25/S.F./Month (Full Service Gross)

INDUSTRIAL:

- R&D and flex space
- Developed as community grows

ANNUAL ABSORPTION	PRODUCT TYPE	LEASE DATA
5,000-6,000 S.F.	One-Story Tilt-Up	\$0.75-\$0.85/S.F./Month (Industrial Gross)

NEIGHBORHOOD RETAIL:

- One center to serve subject site and surrounding area

TOTAL SIZE	ANCHORS	ANCHOR SIZE	MALL SPACE	RENT
90,000 S.F.	FOOD	40,000 S.F.	20,000 S.F.	\$0.85-\$1.00/ S.F./Month
	DRUG	10,000 S.F.		
	BUILDING	20,000 S.F.		(Triple Net)

Source: P&D Technologies

ENERGY AND CONSERVATION FEATURES AND TECHNIQUES

Those responsible for guiding the planning of Civano have developed specific goals which are intended to be performance targets for energy and other resource conservation (see Table 2). All future decisions and actions relative to the implementation of the Civano Master Development Plan should be judged against these performance targets.

TABLE 2: CIVANO PERFORMANCE TARGETS

I.	<u>Energy:</u>	Passive solar design, conservation, and efficiency will reduce internal energy needs by 75%. Solar energy systems (grid connected) shall supply the internal energy required by this community on a net annual basis.
II.	<u>Water:</u>	Residential consumption shall not exceed 40 gallons per capita per day. (The 1989 average for Tucson was 112 gallons per capita per day.)
III.	<u>Solid Waste:</u>	Landfill destined residential solid waste shall be 75% lower than the Tucson 1989 average at project startup and 90% lower at 50% occupancy.
IV.	<u>Transportation:</u>	Internal circulation shall be pedestrian, bicycle, or (with permit) electric golf cart. For external transportation, the following apply:

A. Air Quality

1) Employment vehicle trip miles per capita shall be 40% lower than the 1989 Tucson average.

2) Electricity shall be used as the motive energy for 40% of the local trip mileage.

B. Energy - Electrical motive energy shall be:

1) Solar sourced, or

2) Grid supplied, off-peak |
| V. | <u>Employment:</u> | One job, within the community, shall be generated for every 2 residential units built. The average wage shall match the average cost of housing. |
-

Source: Tucson-Pima County Metropolitan Energy Commission

Several concepts and techniques are proposed to implement these targets, including the organization of land uses and circulation systems, the application of specific design guidelines for both the Master Developer and individual builders, the implementation of CC&Rs which will guide individual property-owner actions, and the establishment of implementing organizations which will carry out the necessary oversight and guidance functions throughout the development and life of the project.

Organization of Land Uses and Circulation Systems

There are several key concepts and features embodied in the organization of land uses and circulation systems which result in significantly less energy consumption. Taken together, as compared to traditional Tucson neighborhood design, the average distance between home and neighborhood shopping is reduced by 64% and between home and school by 22.3%, allowing walking and bicycling to substitute for most automobile trips. Depending upon the success in encouraging on-site residence-job relationship, the home to work trip can average a minimum 20% reduction up to over a 40% reduction.

- Land uses are organized into a range of intensities, with the highest intensity at the Village Center and decreasing intensities in successive rings around the Village Center. Within ¼ mile of the Village Center approximately 50% of the total population resides and 70% of the jobs are located. The outer ring is low residential density, preserved natural open space, and a more formal landscaped belt delineating the major roadways and defining the boundaries of Civano.
- A "Resource Conservation/Management Area", including the highest value natural areas as well as adjacent additions to support community recreation, agriculture, and recycling is preserved and enhanced, and is located to be immediately accessible from the Village Center and the neighborhoods.
- All significant washes and minor drainage areas are preserved and enhanced and used as the main Civano drainage, water harvesting, and pedestrian circulation system, designed to be maintained in as natural a condition as possible.
- Three major development phases, or neighborhoods, of approximately 700-1000 residences each are planned, projected to be constructed over 5-7 years each, with the majority of the Village Center and the Loop Road (Civano Boulevard) to be included in the first phase (each succeeding phase places less emphasis on private automobile access to the Village Center, supplemented by community tram, pedestrian, and bicycle access).
- Neighborhood Centers are provided for each of the three development phases, each of which contains neighborhood recreation facilities and meeting areas and are directly linked to the Village Center by pedestrian and bicycle pathways.
- Each neighborhood consists of several smaller residential enclaves, organized around cul-de-sacs or small loop roads for auto and bicycle access, integrated with the main natural drainage system to provide enhanced native vegetation through the control of runoff, and designed to provide for a variety of housing types, lot sizes and ownership patterns, all with direct access to the main pedestrian and bicycle system.
- The first phase includes a centrally-located Village Center which contains most of the Civano civic, neighborhood commercial, educational, and professional office uses and is directly linked by a pedestrian/bicycle system to the adjacent Employment Center and surrounding neighborhoods.
- A major loop road gives automobile access from the Houghton Road Urban Gateway to the Village Center and all of the first phase of development and is designed to handle not only automobile traffic but also City bus service, local tram service as available, and bicycle traffic.
- A multi-modal transportation system is designed to include priority linkages for pedestrian and bicycle access between residential, civic, commercial and employment activities, and provides for the highest residential densities to be in closest proximity to the main pedestrian pathways.
- A routing for a potential community tram system is provided and designed to be accessible within an average of approximately 600 feet and a maximum of ½ mile of any household, service and employment area.

DEVELOPMENT PLAN SUMMARY

Land Use

The development plan is the result of a combination of factors: the constraints and opportunities established from the Site and Area Analysis, the marketable uses from the Market and Marketability Analysis, and the results of many public and private meetings during the analysis of the Alternative Concept Plans, all in response to the basic goals and established performance targets. The development plan integrates the open space systems, the circulation systems, land use and zoning. Key land use concepts have been enumerated in the previous section discussing energy conservation features and techniques. Areas designated for the development of active land uses and circulation systems have been configured into as compact an area as feasible, in accordance with the key concepts and features as outlined previously, and given the need to market product types which will be acceptable to a large percentage of potential buyers. The following table outlines the projected resulting land uses, densities, building product types, acreage, numbers of units, population, and jobs provided for.

TABLE 3: ESTIMATED LAND USE STATISTICS

Use Type	Units/ Acre	Acres	%	Private Open Space	Units	Floor Area	Population	Total Jobs	
Public Open Space		401.8	49.0%						
Public R/W		57.9	7.1%						
SF Detached	3.0	73.9	9.0%	29.6	199	437,800	587		
SF Mixed	8.0	150.1	18.3%	30.0	1,201	1,921,685	3,074		
Townhouses	10.0	13.7	1.7%	2.7	137	205,427	302		
Garden Apts	16.0	13.3	1.6%	1.3	213	256,024	404		
MF Apartments	22.0	14.0	1.7%	0.7	308	308,089	522		
Ped Terrace Apts		30.0	5.9	0.7%	0.3	176	140,864	263	
Office Apartments		36.0	8.1	1.0%	0.4	293	175,710	438	
Neighborhood Centers		6.1	0.7%	1.2	0	53,143		11	
Office/Employment		51.8	6.3%	5.2	0	564,102		752	
Service/Employment		10.2	1.2%	0.5	0	111,078		222	
Civic/Retail		13.1	1.6%	0.7	0	285,847		572	
TOTALS	Gross	3.1	820.0		72.6	2,527	4,459,769	5,609	1,557
	Net	7.0	360.3	20.2%		12.5%	2.22	0.62	per unit

Source: Community Design Associates

Open Space

Key to the establishment of buildable areas for land use and circulation systems was the open space analysis, derived directly from the primary constraints identified in the Site and Area Analysis. The open space system is designed primarily to preserve and enhance the primary natural drainage system, maintain existing wildlife corridors, provide opportunities for community agriculture and gardening, provide visual buffers from adjacent roadways and sand/gravel operations, and provide adequate amounts of active recreation areas without unnecessary intrusion into the primary natural areas. This open space system is divided into the following categories, with estimated acreage as follows:

TABLE 4: ESTIMATED OPEN SPACE

Type of Open Space	Acres	Percent
1. Existing Prime Natural Open Space (1)	222.3	27.1%
2. Reclaimed Local Runoff/Sheetflow Areas (2)	8.5	1.0%
3. Additional Preserved Open Space (3)	213.8	26.1%
4. Total Preserved "Natural" Open Space	89.5	10.9%
5. Revegetated Open Space (4)	303.3	37.0%
6. Total Natural & Native Open Space	81.3	9.9%
7. Non-native landscaped functional Open Space (5)	384.6	46.9%
8. Hardscape Functional Open Space (6)	17.2	2.1%
9. Total Publicly Accessible Open Space (7)	12.2	1.5%
10. Private Open Space Within Developments (8)	414.0	50.5%
11. Total Open Space (9)	72.6	8.9%
	486.6	59.3%

- NOTES:
- (1) Includes 100-year floodplain, riparian habitat, and highest density and variety of vegetation communities, as identified in the Environmental Resource Report.
 - (2) Those areas in Category #1, above, which are indicated for development or removed from flooding due to other improvements.
 - (3) Includes slopes over 15%, other inaccessible natural areas, and areas deemed desirable for enhancing existing natural areas.
 - (4) Includes drainage and pedestrian circulation system specially configured and newly landscaped with native and other drought tolerant plant materials.
 - (5) Includes turf and other active recreation areas.
 - (6) Includes major community pedestrian plazas & landscaped promenades.
 - (7) Includes all open space areas accessible by the full Civano community.
 - (8) Open Space type #10 is an estimate of minimum probable reality based upon standard site design practices.
 - (9) Includes all landscaped, pervious open areas, public and private. Percentage shown is for the total site.

Source: Community Design Associates

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Appendix #2

***ECONOMIC FEASIBILITY ANALYSIS
CIVANO - TUCSON SOLAR VILLAGE***

***submitted to:
Arizona State Land Department***

***prepared by:
Community Design Associates***

November, 1991

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The consultant team responsible for the preparation of this document has been directed by Wayne Moody, Principal Project Manager with Community Design Associates, in cooperation with the Arizona State Land Department under Planning Permit #47-97327. It has been based upon the Market Analysis and Marketability Study prepared by P&D Technologies and the adopted Master Development Plan prepared by P&D Technologies and Community Design Associates in cooperation with The Planning Center.

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CIVANO ECONOMIC FEASIBILITY ANALYSIS

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CIVANO ECONOMIC FEASIBILITY ANALYSIS

INTRODUCTION

From a marketing and economic feasibility viewpoint, Civano is intended to become a highly desirable, energy- and resource-efficient community focussed toward moderate income families and individuals, demonstrating efficiencies from the homeowner level to the community and citywide level. As an Arizona State Urban Lands project, it should also provide benefits to the State Lands Trust, to the maximum extent feasible.

The project must also be viewed within the current and projected near-term local economic setting. It is an understatement that the economic situation in Arizona relative to land development is depressed. Currently, large parcels of developed land (proper zoning, infrastructure in, ready to develop) are being sold for approximately \$4,000 per acre (Continental Ranch by the Resolution Trust Corporation); developed single-family lots ($\frac{1}{4}$ - $\frac{1}{2}$ acre) are being sold for \$5,000 to \$6,000, significantly less than the infrastructure costs (Rita Ranch). This can be translated into negative land and/or infrastructure values, which losses are being assumed by previous developers, banks, and the general public. In other areas, similarly-sized developable lots are being sold for development for between \$15,000 and \$16,000, but only on "rolling options" whereby the landowner "carries" the value so that the builder does not have to "front" the costs. Private financing for large-scale land development is practically non-existent. It is unclear how long, if ever, it will take for these conditions to return to "normal."

METHODOLOGY AND ASSUMPTIONS

The Civano Master Development Plan as approved by the City of Tucson has been used as the basis for this analysis. It has been assumed that a Master Developer will purchase the land from the State Trust, design and install the necessary infrastructure, in phases consistent with market demand, in order to make smaller parcels available for sale to individual residential and commercial builders. Total number and average size of residential units and building square footage for both residential and commercial areas, as approved in the Master Development Plan, are shown in Table 1. It should be noted that commercial (retail, office and light industrial) land absorption assumes a significantly greater magnitude and absorption rate (requiring a significantly more aggressive market development program) than is recommended by the Marketability Study. In order to meet the goals of the plan relative to auto trip reduction, air pollution, and proximity and convenience between residence and employment, a highly focussed marketing program is assumed, targeted at new and emerging environmental technologies and services which pay wages equivalent to the targeted housing market (\$21,500 to \$59,500 annually; \$33,700 average).

In the absence of solid and reliable data which would normally be based upon stabilized economic conditions, the process used to determine various land values has been highly iterative: land values at various stages of development reflect basic assumptions of marketability for both residential and commercial product; these are compared with

development cost projections in an income-expense analysis to determine "reasonable" land values at various stages of development. Table 2 shows absorption rates and land value results based upon this analysis.

**TABLE 1
RESIDENTIAL AND COMMERCIAL MIX**

Use Type	Units	Average Size	Total Area
SF Detached	199	2,200	437,800
SF Mixed	1,201	1,600	1,921,685
Townhouse	137	1,500	205,427
Garden Apt	213	1,200	256,024
MF Apartment	308	1,000	308,089
Ped Terrace Apt	176	800	140,864
Office Apartment	293	600	175,710
Office/Employ			564,102
Service/Employ			111,078
Civic/Retail			285,847
TOTALS	2,527	1,364	4,459,769

Source: Community Design Associates

**TABLE 2
LAND VALUE & ABSORPTION ASSUMPTIONS**

	Value	Acres by Phase			Total Acres	Total Cost
		Phase 1	Phase 2	Phase 3		
Unimproved, Zoned Land	4,800 per ac.	160	146	119	425	2,041,920
Unimproved Open Space	1,000 per ac.	149	135	110	395	394,600
Total Absorption by Phase		309	281	229	820	2,436,520
Developable Residential Land	55,000 per ac.	137	125	99	360	19,816,500
Developable Commercial Land	140,000 per ac.	24	21	20	65	9,114,000
Total Absorption by Phase		160	146	119	425	28,930,500

Source: Community Design Associates

TABLE 5
16-YEAR DEVELOPMENT PROFORMA SUMMARY
Master Developer, Commercial and Residential Builders
Years 1993 through 2008

Expenses	Master Developer	Commercial Developers	Residential Developers
Land cost	\$ 2,435,000	\$ 9,114,000	\$ 19,816,500
Special Studies	1,000,000		
A&E @ 7%	1,775,880	3,591,445	9,149,863
Infrastructure	25,369,721	3,255,000	19,960,620
Buildings		48,051,350	155,052,000
Permits @ 1.5%	380,546	769,595	2,625,190
Interest, Holding		5,695,310	18,163,787
Reimbursement	280,000		
Marketing & Conveyance	361,631	503,300	1,600,060
Admin & Operations	3,750,000	3,000,000	3,000,000
Total Expenses	\$ 35,352,778	\$ 73,980,000	\$229,368,000
Income			
Capital	\$ 15,000,000		
Interest	6,901,819		
Res. Land/Bldg Sales	19,816,500		252,700,000
Comm. Land/Bldg Sales	9,114,000	81,687,295	
Total Income	\$ 50,832,219	\$ 81,687,295	\$252,700,000
Income - Expenses	\$ 15,479,541	\$ 7,707,295	\$ 23,332,000
Percent "Profit"	N/A	10.4%	10.2%

Source: Community Design Associates

TABLE 6
RESIDENTIAL SALES & RENTAL DISTRIBUTION & VALUES
Income Qualifications

Use Type	Units	Average Size	Sales Value/sf	Rental Value/sf	Average Price	Mrtg/Rent	Income Qualif.
SF Detached	199	2,200	\$ 80.00		\$176,000	\$ 1,236	\$ 59,310
SF Mixed	1,201	1,600	\$ 72.00		\$115,200	\$ 809	\$ 38,821
Townhouse	137	1,500	\$ 67.00		\$100,500	\$ 706	\$ 33,867
Garden Apt/Condo	213	1,200	\$ 70.00		\$ 0.59	\$ 84,000	\$ 590
						\$ 28,307	
MF Apartment	308	1,000	\$ 72.50	\$ 0.64	\$ 72,500	\$ 636	\$ 30,539
Ped Terrace Apt	176	800	\$ 74.00	\$ 0.65	\$ 59,200	\$ 520	\$ 24,937
Office Apartment	293	600	\$ 85.00	\$ 0.75	\$ 51,000	\$ 448	\$ 21,483
Average		1,364	\$ 73.34		\$100,013	\$ 702	\$ 33,703

Source: Community Design Associates

TABLE 7
FAMILY EXPENSE COMPARISON
Civano vs "Typical"

"Average" Homebuyers	Civano	Typical	Difference
Mortgage (20%dn; 10%i; 30yr)	\$ 702	\$ 667	\$ 35 (1)
Home Energy	\$ 20	\$ 80	(\$ 60) (2)
Auto (Payment, Gas, Maint, Insur)	\$ 450	\$ 675	(\$ 225) (3)
Trash, Water	\$ 10	\$ 30	(\$ 20)
Food	\$ 350	\$ 350	\$ 0
Clothing	\$ 100	\$ 100	\$ 0
Entertainment/Education	\$ 150	\$ 150	\$ 0
Other Spendable	\$ 1,026	\$ 756	\$ 270 (4)
Total Expenses	\$ 2,808	\$ 2,808	\$ 0

(1) Assumes 5% lower housing price for "typical" family

(2) Assumes 75% reduction in energy use/costs

(3) Assumes average 1/2-car reduction per family

(4) Some of this extra disposable income would likely be allocated to Community Association dues.

Source: Community Design Associates

Appendix #3

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5. *Charette* is French for *cart*. Architectural students in the *Ecole des Beaux Arts* were required to prepare quick design sketch problems, which would be picked up by a horse-drawn cart at appointed times to be delivered to the school by the deadline. Students, wanting to spend every possible minute on their designs, would accompany their drawings and complete them *en charette*, or "on the cart" while being delivered to the school. *Charette* has thus become known as an intensive focused and condensed design effort.
6. Rocking K, Sabino Springs, and Silverado Hills developments are recently-proposed private developments on the outskirts of Tucson which have been the subject of major controversy, pitting developers against environmentalists. All of them have been approved by the County Board of Supervisors, only to be subjected to the public referendum process because of citizen outrage and activism.

Report and Information Sources

Additional copies of this report "Tucson Solar Village - Project Management," are available from:

Publications and Distribution
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For additional information on the process and the results of the work described in this report please contact:

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City Manager's Office
Post Office Box 27210
Tucson, Arizona 85726-7210

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CIVANO

Tucson Solar Village

A model sustainable community

Civano is a vision of the future. A future where waste will be a valuable resource — not a pollution problem. Where air, water, and energy will be considered natural gifts — not unlimited commodities.

Distinctive in its sense of balance and harmony with the environment,

Civano combines solar technology, resource recycling and creative urban planning to reduce energy, resource and transportation consumption.

Civano will be a sustainable community for 5,000 people on 820 acres within the southeastern city limits of Tucson, Arizona.

CIVANO IS A PUBLIC PRIVATE PARTNERSHIP

Major Natural Open Space

Employment Center

Village Center

Highest Density Residential

Phase 2
Neighborhood

..is a community in the spirit
of the "Civano" period,
a golden era in which
the Hohokam created
a culture based on
a balance between
natural resources
and human needs.

Performance TARGETS

Energy:

To Save 75%

Solar design, conservation and efficient use will reduce energy needs by 75%.

Water:

To Save 65%

Residential consumption is planned not to exceed 40 gallons per capita per day—a saving of 65%.

Solid Waste:

To Reduce by 90%

Landfill destined solid waste will be 75% lower than the Tucson 1989 average at project start-up and 90% lower at 50% occupancy.

Air Pollution:

To Reduce by 40%

Through a circulation pattern encouraging bicycle and pedestrian use, air pollution will be reduced by 40%.

Employment:

One job will be provided for every two residential units built.

CIVANO

Tucson Solar Village

A participatory planning process

CIVANO is located on 820 acres of State Land within the southeastern city limits of Tucson, Arizona;

CIVANO is a prototype for the development of environmentally sensitive communities where energy use and waste will be reduced while economic efficiency is increased;

CIVANO is a cost-effective and energy-efficient infrastructure which will employ active and passive solar design techniques, water conservation, and waste-recycling systems;

CIVANO is a residential community planned around a compact core with a full mix of employment opportunities, recreational activities, shops and services;

CIVANO is energy-efficient homes and multi-family dwellings joined by a network of walkways, bike-ways and parks.

CIVANO demonstrates that conservation can be both economically viable and socially relevant;

CIVANO demonstrates options to traditional dependence on the automobile in a mixed-use community.

CIVANO demonstrates how a participatory planning process contributes to insure shared community goals for long-term environmental, economic and social balance.

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Graphic Design by Carl Rald, Center for Design Communication, The University of Arizona. (Recycled paper).

Market Analysis

Soils Analysis

Visual Analysis

Aerial Photo

Hydrology Analysis

Vegetation Analysis

Landscape Character

Slope Analysis

Composite Map

Analysis

With the Civano vision, Tucson becomes a leader in sustainable community planning and development where the active participation of residents, builders, government agencies and elected officials is encouraged. Tucson's traditional attitude towards controlled and environmentally accountable development, in concert with its unique desert setting, make it ideal for the Solar Village.

CIVANO is a project of Tucson-Pima County Metropolitan Energy Commission & The Arizona Energy Office

PARTICIPANTS:

AN CONSORTIUM
ate Land Department
lar Energy Advisory

ental Research Lab
cson Economic Council
esearch Center

National Association of Home
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