

Environmental Planning Element

EXECUTIVE SUMMARY

The Environmental Planning element recommends ways to promote community sustainability that will ensure long-term quality of life and community viability. It addresses protecting the natural environment and managing and conserving resources. This element addresses human impacts on the environment. The Natural Resources Conservation element addresses protection of natural resources.

Air quality: restore the quality of the air through a variety of air pollution reduction strategies.

Brownfields: reclaim and redevelop brownfield sites with real or perceived environmental contamination.

Community gardens and small urban farms: explore opportunities for community gardens and small urban farms as a source of food, business and preservation of examples of our agricultural heritage.

Energy efficient planning and design: encourage efficient use of energy resources.

Green buildings: encourage green building techniques (use of construction materials that minimize the environmental impacts from the production of new materials).

Urban heat island: explore options to minimize the impacts of the urban heat island (heat being released from the ground and buildings that raises the average temperature).

Noise mitigation: reduce urban noise levels.

Pollution prevention and waste minimalization: reduce the environmental impacts of city operations.

Solid waste: promote recycling, develop environmentally sound landfills and explore alternative solutions to waste disposal.

The Natural Resources Conservation element addresses four topics: flooding, erosion, preservation of vegetation, and wildlife protection.

Flooding protection: protect people and property from the threat and damage of flooding.

Erosion protection: eliminate or minimize on-site or down slope erosion.

Vegetation protection: protect native plants from extinction and use them to preserve the character of the Sonoran desert.

Wildlife protection: maintain large, intact patches of native vegetation to protect wildlife habitat and take steps to protect wildlife corridors.

INTRODUCTION

The Sonoran Desert is a unique ecosystem. Of the world's deserts, the Sonoran is the most diverse for both animal and plant life. However, the natural desert environment of Phoenix also is fragile and requires special considerations. Our natural resources can be damaged or destroyed through over-use, mis-use or negligence. The city of Phoenix is committed to being a leader in sound environmental practices through appropriate regulations, programs, policies and initiatives.

Of fundamental importance are the protection and conservation of our water, air, and energy and a focus on creating long-term community sustainability for current and future residents. This obligation rests with both government and the private sector. Phoenix strives for clean air, usable land (suitable for the appropriate use), adequate and safe water supply, opportunities to use renewable energy resources, and protection of natural resources. A vision to develop strategies for long-term community sustainability is essential for maintaining and improving our quality of life and sustaining our community.

The city recognizes that long-term economic development and community vitality cannot exist without environmental quality. Furthermore, a clean and attractive physical environment enhances property values.

Community goals in this Environmental Planning element include improving and protecting the environment, managing and conserving resources, preserving open space, and managing growth to ensure healthy and vibrant neighborhoods.

Because environmental concerns fall under the jurisdiction of federal, state, and local authorities, and because the city must comply with their laws and regulations, the city places a high priority on interagency communication and cooperation. This element focuses on a variety of topics, recognizing that related topics may be addressed in other elements such as Natural Resources Conservation, Water Resources, and Circulation. Wherever appropriate, a reference is made to those topics that are not addressed in this element so that the reader can easily locate the related information.

This element begins with a discussion of community sustainability, recognizing the important role that it plays in long-term viability and quality of life.

COMMUNITY SUSTAINABILITY

Sustainable communities provide a business climate where better goods and services are produced using less energy, with less waste and less pollution.

As a community, there is a need to support a sustainable way of life both locally and globally, through safeguarding and enhancing our natural resources and preventing harm to human health. The community impacts on the natural environment must not jeopardize it for future generations. Phoenix is committed to preserving and restoring the natural environment and creating a balance with new urban development. In achieving a healthy environment, inequitable burdens should not be placed on any one geographic or socioeconomic sector of the population.

Sustainability is most frequently thought of as a community's ability to protect and maintain the quality and quantity of its natural resources: air, water, vegetation and wildlife, and unique open spaces. A broader definition would include a community's ability to protect its built environment from blight and deterioration and reduce consumption of resources. Every community has different measures of sustainability. The following components of sustainability are included in this General Plan:

Environmental Planning Element

- Natural physical environment: addresses the human impacts on the natural physical environment.
- Air quality: addresses the issues that contribute to degradation of air quality.
- Brownfields reclamation: increases the amount of developable land served by infrastructure and eliminates blighted conditions. Restores the quality of the soils.
- Community gardens: provide green spaces, preserve a small part of Arizona's agricultural heritage, and provide residents with agricultural experiences.

- ❑ Energy efficient planning and design: reduces need for energy resources including the production of energy that generates pollution in its use or generation.
- ❑ Green building techniques: encourage the use and reuse of materials and products that have been produced with minimal use of resources.
- ❑ Noise mitigation: reduces the negative impacts from human-generated noise in the physical environment.
- ❑ Pollution prevention: reduces the use of hazardous materials and hazardous wastes.
- ❑ Recycling of solid waste: reduces the need for landfills and increases the amount of recycled materials. The Water Resources element addresses use of reclaimed water.
- ❑ Urban heat island: modifies the built environment to reduce the amount of heat absorbed by man-made surfaces and later released.

Growth Element

- ❑ Urban service areas: provides for more efficient use of public infrastructure.

Land Use Element

- ❑ Infill development: provides for use of existing infrastructure and facilities. Accommodates some projected development on less land.
- ❑ Mixed land use development: decreases the number and length of auto trips, thereby reducing traffic congestion, air pollution, and the need for parking spaces.
- ❑ Pedestrian-oriented development: encourages the creation of physical environments that are people-friendly, minimizes pedestrian-vehicular conflicts, and creates pedestrian connections between diverse land uses.
- ❑ Transit-oriented development: facilitates use of public transit for trips and more

pedestrian activity, thereby reducing traffic congestion, air pollution, and the need for parking spaces. Also addressed in the Circulation element.

Circulation Element

- ❑ Alternative modes of transportation: reduce the use of fossil fuels, thereby decreasing air pollution and reducing traffic congestion. Also addressed in the Bicycling element.

Open Space Element

- ❑ Open space: provides recreational opportunities and preserves natural resources.

Natural Resources Conservation Element

- ❑ Erosion control: preserves soils and vegetation.
- ❑ Flooding protection: protects people, property, and the natural environment from damage or destruction.
- ❑ Vegetation protection: preserves native plants for aesthetic and functional purposes.
- ❑ Wildlife habitat protection: preserves the natural environment necessary for wildlife survival.

Water Resources Element

- ❑ Water supply availability: ensures water to meet projected needs.
- ❑ Reclaimed water use: increases water supply through reuse.
- ❑ Groundwater use and artificial recharge: stores excess water for future use.
- ❑ Water quality: ensures compliance with health standards.
- ❑ Water demand management (Water Conservation): saves water, reducing groundwater use.

GOAL 1 NATURAL PHYSICAL ENVIRONMENT: THE NATURAL PHYSICAL ENVIRONMENT SHOULD BE PRESERVED AND CONSERVED WHILE ACKNOWLEDGING THAT DEVELOPMENT WILL OCCUR IN SOME AREAS.

Recognizing that development will continue to occur, the city supports development that considers both the short-term and long-term impacts on the natural physical environment.

Policies:

1. Promote the most efficient use of the community's resources and minimize potential impacts on the natural physical environment.

Recommendation:

- A. Continue and expand educational programs that address environmental protection and conservation techniques.
2. Encourage the design and location of buildings to respond to the desert climate and promote energy and water conservation.

Recommendation:

- A. Prior to rezoning, identify and encourage the use of mitigation techniques that minimize the potential environmental impacts of new developments. (Nothing in this element is intended to require environmental assessments or impact statements for individual properties.)
3. Protect wildlife, vegetation, natural washes, hillsides and viewsheds where deemed appropriate in developing areas based on an analysis of existing site conditions.

Recommendation:

- A. Review existing development requirements, including city policies to encourage new development to be sensitive to the unique climatic characteristics of the Sonoran Desert.

4. Support national efforts to reduce or eliminate emissions that contribute to global warming, acid rain and ozone depletion in the upper atmosphere.

5. Support efforts to minimize the production and use of pollutants that deplete natural barriers to ultraviolet ray penetration of the atmosphere, or leave greenhouse gases.

GOAL 2 AIR QUALITY: IMPROVE SIGNIFICANTLY THE QUALITY OF THE AIR WE BREATHE.

Air pollution affects individual health, quality of life, and the economic potential for our region. In the last years of the 20th Century, the number of days with unhealthful levels of carbon monoxide and ozone were dramatically reduced in the Phoenix metropolitan area. However, the region may have difficulty meeting more stringent ozone standards proposed by the federal Environmental Protection Agency. While progress has been made in reducing carbon monoxide and ozone, the region continues to experience several days each year with unhealthful levels of particulate pollution.

Although pollens are not considered to be air pollutants under the federal Clean Air Act, they can trigger asthma, allergic reactions, and other health problems. The widespread introduction of non-native plant species and the year-round growing season contribute to the problem.

A brown haze sometimes obscures our beautiful vistas - even on days when health standards are met. Poor visibility is primarily caused by tiny particles generated from gasoline and diesel engines and other fuel combustion activities. Dust and gaseous air pollutants also contribute to the problem. In 2000, the Governor created the Brown Cloud Summit to begin to address this issue. The Summit recommended programs that would reduce pollutants that affect public health and contribute to the brown cloud.

Sources: The primary sources of air pollution in the urban area are gasoline and diesel engines. Computer modeling conducted by the Arizona Department of Environmental Quality (ADEQ) in 2000 indicates that tailpipe emissions from on-road vehicle use are responsible for approximately 65 percent of the carbon monoxide pollution of the area. Non-road engines (i.e., utility, lawn and garden

and construction equipment) add another 30 percent to the carbon monoxide emissions.

ADEQ estimates that vehicle use and refueling account for over 30 percent of the area's volatile organic compound (VOC) emissions, the principal cause of ozone pollution. Gasoline and diesel non-road equipment contributes approximately another 26 percent to the total ozone emissions.

Particulate pollution comes primarily from dust, including construction (38 percent), vehicle traffic (31 percent), and agricultural and vacant lots (18 percent). Engine exhaust and other sources have a smaller but important impact.

The city of Phoenix is committed to continuing its aggressive efforts to improve air quality and protect public health.

DESCRIPTION OF CURRENT CITY AIR QUALITY EFFORTS

State government has primary responsibility for regulating air quality in Arizona. In Maricopa County, the State of Arizona has delegated much of the regulatory responsibility to the County Environmental Services Department. State and local governments routinely work together to develop Regional Air Quality Plans, which define the programs necessary to meet federal air quality standards. The city of Phoenix contributes to the region's air quality effort through programs discussed below.

DUST CONTROL

1. The city conducts routine reviews of all city vacant properties (more than 300) to control dust. This includes buffer areas around airports and water treatment plants, undeveloped parks, etc.
2. The city has paved or implemented dust control programs for all city-owned parking lots.
3. All city-owned public roads have been paved, and the city is committed to continue that program as Phoenix expands.
4. The city is conducting pilot programs to evaluate paving and other methods to

reduce dust emissions from alleys and road shoulders.

5. The city has adopted several ordinances to address dust emissions from private property and other non-government activity, including:
 - Prohibiting the use of alleys as thoroughfares
 - Prohibiting vehicles on vacant lots
 - Prohibiting vehicles for sale on dirt lots
 - Prohibiting the use of off-road vehicles in city parks
 - Prohibiting parking on unpaved commercial, industrial, and multi-family lots

OTHER AIR QUALITY EFFORTS

1. In 2000, Phoenix voters overwhelmingly endorsed a wide-ranging plan for the city to expand bus service and to construct a light-rail transit system. Construction of the initial segment of light-rail transit, from Sky Harbor International Airport through downtown Phoenix to Bethany Home Road, is expected to be completed in 2006.
2. Sky Harbor International Airport uses direct power supply at all terminal gates to eliminate the need for diesel generators, which provide power for air conditioning and other aircraft systems. The city also ensures that inter-terminal buses use alternative fuels.
3. The city's Infill Program helps increase residential development in the central portion of the city by waiving a portion of the city construction fees in the targeted area. From 1995-2000, approximately 1,725 homes were constructed under the program. This program helps reduce vehicle travel.
4. All city-owned cars are required to go through emissions testing.
5. The city has adopted an ordinance to prohibit the sale and planting of olive and male mulberry trees to reduce airborne

pollen and help provide relief to allergy sufferers.

AIR QUALITY PROGRAMS IN WHICH THE CITY PARTICIPATES

Because the State of Arizona and Maricopa County have the primary legal responsibility for ensuring healthful air quality, many of the city's efforts to reduce air pollution are part of comprehensive regional programs.

1. Phoenix continues to be a leader in the state alternative fuels program through the progressive conversion of its fleet vehicles to alternative fuels. By the end of 2000, nearly 1,300 vehicles had been converted to Compressed Natural Gas and can refuel at any of 10 city CNG refueling sites.
2. The city is an active member of the Maricopa Association of Governments (MAG) Air Quality Technical Advisory Committee, which recommends new programs for Regional Air Quality Plans.
3. The city's transit fleet is transitioning from diesel fuel to liquefied natural gas (LNG). In 2000, approximately 45 percent of the buses used alternative fuel. The goals for transition to alternative fuels include 75 percent of the fleet by 2005, and 100 percent by 2010.
4. The city of Phoenix is regarded as a leader in developing air quality strategies that ultimately become implemented regionally. The Phoenix Environmental Quality Commission spent two years developing a city fireplace ordinance, which now applies to all Valley cities through state legislative action.
5. Results from city-funded research on appropriate dust control strategies for parking lots were distributed to other local governments to help build a regional coordinated dust control effort.
6. The city participates in the Regional Rideshare Program and helps reduce traffic pollution through the following programs:

- The city provides its employees with a 100 percent bus subsidy and more than 1,300 city employees ride the bus regularly.
- In 2000, approximately 80 percent of city employees worked alternative schedules to help reduce rush-hour congestion and related air pollution.
- High-Pollution Advisories, issued by Maricopa County, are e-mailed immediately to city employees to encourage alternative modes of travel the next day.

Policies:

1. Continue to implement the city air pollution reduction strategies contained in the regional air quality plans.

Recommendation:

- A. Periodically review the city's air pollution reduction strategies contained in the regional air quality plans and consider additional programs.
2. Continue to participate in the regional air quality planning process.

Recommendation:

- A. Continue to participate in air quality planning processes coordinated by the Maricopa Association of Governments (MAG) and the Arizona Department of Environmental Quality (ADEQ). Assist in developing regional and local strategies to reduce air pollution.
3. Implement dust control programs for streets, alleys, and street shoulders.

Recommendation:

- A. Continue and expand the city program to pave or control dust from city-owned unpaved roads, unpaved road shoulders, and alleys to help reduce particulates.

4. Implement programs to control dust from city-owned parking lots and vacant lots.

Recommendation:

- A. Continue to monitor, pave, or control dust from city-owned vacant lots and parking lots.

5. Consider enhancements to city policies and ordinances that regulate dust from parking lots, vacant lots, and other sources.

Recommendation:

- A. Periodically review and consistently enforce City Codes that regulate dust from vacant lots and parking lots. Study and explore options for developing new dust control policies and ordinances as appropriate.

6. Promote coordinated enforcement of air pollution rules through continuing cooperation and communication with other governmental agencies.

Recommendation:

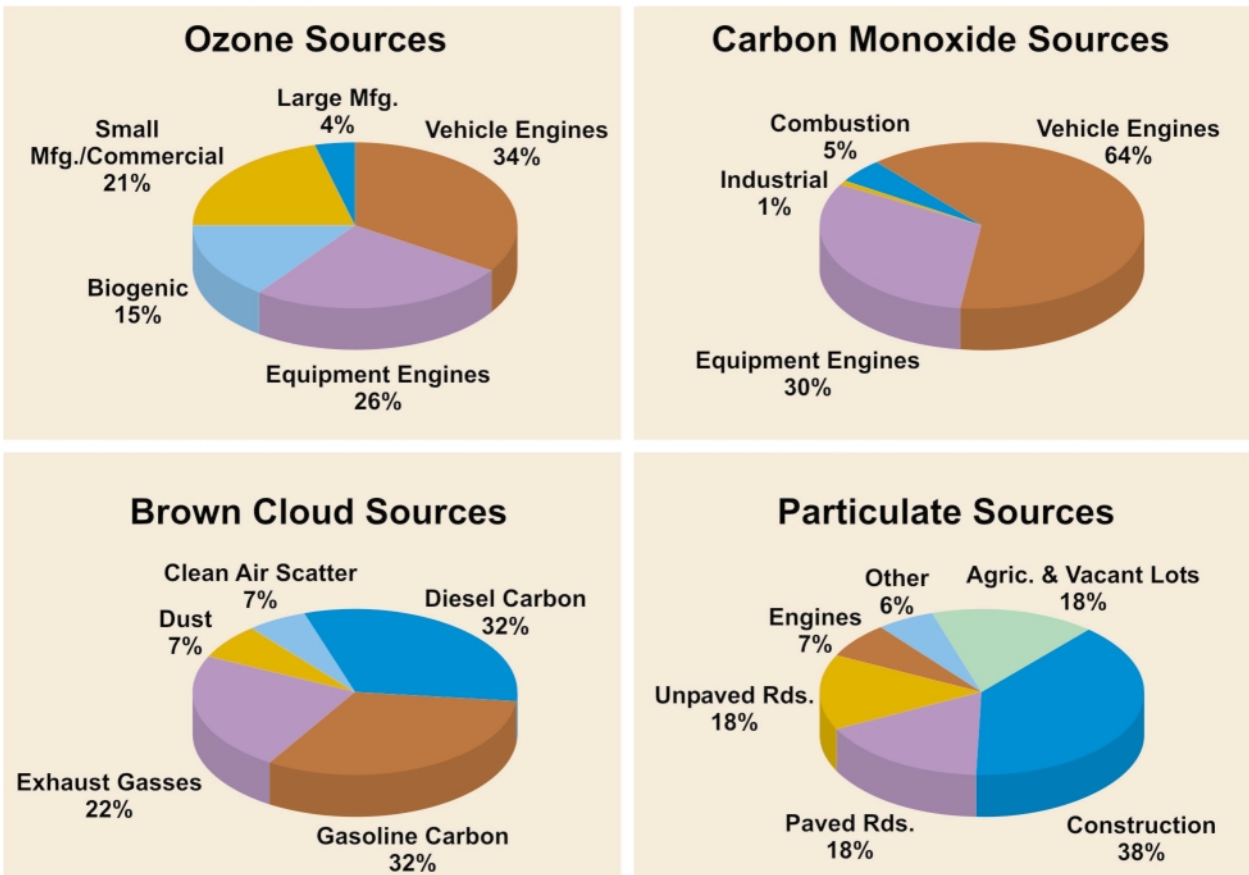
- A. Work with Maricopa County and other agencies to coordinate programs including dust regulation and enforcement.

7. Promote public understanding of air quality issues.

Recommendation:

- A. Coordinate with other agencies and groups to provide information to the public about air quality problems and measures that individuals can take to improve air quality.

**FIGURE 1
CHARTS BASED ON MODELING DONE BY ADEQ IN 2000**



8. Support regional efforts to reduce airborne pollens.

Recommendation:

- A. Encourage additional regional efforts to reduce airborne pollens and restrictions on plants that produce high levels of allergens and pollens.

9. Support state and county efforts to reduce pollution from gasoline and diesel engines.

Recommendation:

- A. Continue to work with state and county agencies and affected industries, to consider additional programs for reducing emissions from gasoline and diesel engines. Include both on-road vehicles and off-road equipment.

10. Encourage efforts to reduce air pollution by extending the availability of alternative fuel programs and supporting the use of less polluting alternative modes of transportation.

Recommendation:

- A. Continue to work with the state and regional agencies to develop private alternative fuel programs.

GOAL 3 BROWNFIELDS: STRIVE TO RECLAIM AND REDEVELOP BROWNFIELDS.

Brownfields are abandoned, unused, or under-used industrial and commercial sites, where expansion or redevelopment is complicated by real or perceived environmental contamination. Examples of brownfields include abandoned gas stations, landfills, dry cleaners, car repair shops, and former industrial operations (see Figures 2-10). These properties are not being cleaned up and redeveloped because of the uncertainty of environmental conditions, the risks associated with environmental liability, the high cost of cleanup, the longer timeframe needed for completion, and the higher cost of capital for development.

The city of Phoenix initiated a Brownfield's Land Recycling Program in 1998 to stimulate reinvestment

in one of the city's greatest assets: the available commercial land base in the inner city. The city's goal is to encourage the private sector to examine the advantages of renovating or developing infill properties. The program's approach offers various forms of assistance to property owners and developers as they confront obstacles resulting from environmental contamination. Limited financial assistance is available to the private sector for grants for public infrastructure improvements and development fees. Public infrastructure improvements include curbs, gutters, sidewalks, utilities, and landscaping in city-owned easements and right-of-way. Development fees include construction plan review and permit fees. The city also partners with the Arizona Department of Environmental Quality's Brownfields Program to facilitate projects and has received funding and technical assistance from the U.S. Environmental Protection Agency Brownfields Initiative Programs.

Brownfields are a resource and a liability for the city. They are a resource because their redevelopment contributes to community revitalization by cleaning up and creating use of blighted, contaminated properties; creating jobs; bringing services to the community; and generating tax revenues. Brownfields are a liability because they pose a risk to public health, waste expensive infrastructure, have unknown environmental conditions and liability, and may have high cleanup costs. (Note: Soil contamination is addressed in the Safety element, Goal 2.)

The city should encourage redevelopment of brownfields. Site redevelopment can provide the city with an opportunity to build its tax base, and revitalize decaying infrastructure and depressed communities within the general vicinity of a brownfield. Brownfields should be seen as an opportunity to improve the city as a whole. Brownfields create neighborhood blight, pose risk to public health, and contribute to the loss of jobs and tax revenue. Examples of brownfields are shown in Figures 2-4.

EXAMPLES OF REDEVELOPED BROWNFIELDS



FIGURE 2 - Abandoned Site with Soil Contaminated with Hazardous Wastes

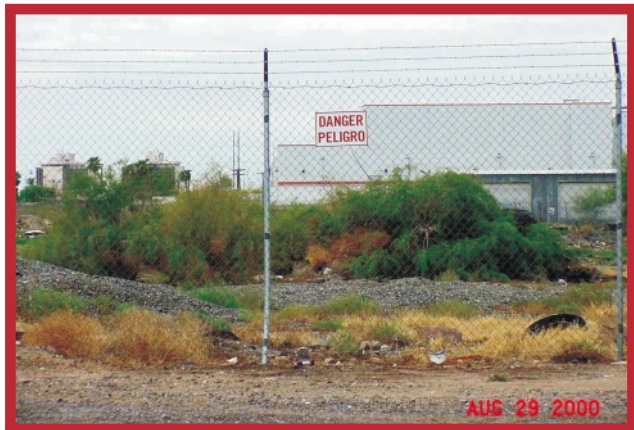


FIGURE 3 - Vacant Land with Evidence of Illegal Dumping



FIGURE 4 - Vacant Former Industrial Warehouse Operations

EXAMPLES OF REDEVELOPMENT BROWNFIELDS

Figure 4 shows a brownfield site, and Figures 5-10 are examples of completed projects that were assisted through the city's Brownfields Land Recycling Program.

Peoria Avenue Project, 23rd & Peoria Avenues



FIGURE 5 - Former Industrial Business Operations that Created Groundwater Contamination at this Property



FIGURE 6 - Property redeveloped into Commercial Use

Desert Market Project, 19th Avenue & Greenway Parkway



FIGURE 7 - Former Landfill Site



FIGURE 8 - Property Redeveloped into Retail Use

Metro North Corporate Park Project, I-17 and Thunderbird Road



FIGURE 9 - Former Industrial Operations that Created Soil and Groundwater Contamination



FIGURE 10 - Property Redeveloped into Office, Retail, Light Industrial and Residential Uses

Policies:

1. Recommend land-use actions that promote restoration and more efficient use of brownfields within Phoenix.

Recommendations:

- A. Create and implement general guidelines for identifying and redeveloping brownfield areas.
 - B. Enhance the city's existing Brownfields Land Recycling Program by creating more incentives to encourage the private sector to reuse brownfields.
2. Protect the environmental quality and integrity of wildlife and vegetation habitats that are impacted by brownfields.
 3. Continue to promote programs to help return brownfields to productive use.

Recommendations:

- A. Promote cleanup and redevelopment of brownfields by incorporating known brownfields into existing informational resources provided to the public.
- B. Coordinate and work with other state and federal agencies concerning proper handling and redevelopment techniques for brownfields.
- C. Encourage community involvement by creating opportunities for public input on the Brownfield's Program and on specific brownfield projects.

GOAL 4 COMMUNITY GARDENS: EXPLORE OPPORTUNITIES FOR COMMUNITY GARDENS AND SMALL URBAN FARMS.

Historically, development in Phoenix has included agricultural land uses. However, urban development has eliminated, or over time will eliminate much of the agricultural land, which is replaced by housing subdivisions and shopping centers.

In a rapidly developing urban community, it is difficult to preserve large tracts of agricultural land. As urban development encroaches on agricultural uses, conflicts arise between the agricultural use and the urban neighborhoods.

In many urban areas, community gardens and/or community farms have continued to operate and

provide a source of food for the community. Community gardens are typically small tracts of land sometimes no larger than a residential lot used by the neighborhood residents to grow their own food. Community gardens could also be utilized within new developments as a source of food for the residents of the development. Small urban farms are generally a commercial operation located on a 5 to 10-acre tract that raises food for sale. Community gardens, small urban farms, and local nurseries allow the land to be both preserved and productive, while providing residents with agricultural experiences.

MIXED USE AGRICULTURE ZONING DISTRICT

The Mixed Use Agriculture Zoning District provides opportunities to incorporate recreational and commercial agricultural uses in a mixed-use development.

Policies:

1. Promote the most appropriate use of agricultural land when that land is converted to urban uses.

Recommendations:

- A. Investigate the potential for agricultural land protection and incentive programs similar to those developed in other parts of the country: land trusts, agricultural conservation easements, acquiring development rights, and assistance with creating and/or identifying potential markets.
 - B. Use agricultural land as a transition and buffer around incompatible uses, such as wastewater treatment facilities.
2. Promote neighborhood designs that incorporate community gardens in areas of Phoenix with an agricultural heritage, and in other areas where they would provide a benefit to residents.

Recommendation:

- A. Develop guidelines that encourage creating community gardens and community farms.

3. Consider including community gardens or incorporating agricultural land into master-planned communities.

Recommendations:

- A. Promote continued irrigation of land preserved for a community garden or urban farm.
- B. Promote the Mixed-Use Agriculture Land Use Classification and Zoning District as a means of preserving agricultural land.

GOAL 5 ENERGY EFFICIENCY PLANNING AND DESIGN: ENCOURAGE THE EFFICIENT USE OF ENERGY RESOURCES.

Emerging research on global warming suggests that burning fossil fuels and the resulting release of carbon dioxide contributes to increasing temperatures and the greenhouse effect. Energy conservation reduces utility bills and reduces carbon dioxide and other emissions. Using conservation measures and technologies impacts the environment less than building new power plants. Energy-efficient planning and development help use less energy.

Land development, and the arrangement of various land uses, may have an impact on energy consumption. The urban village model promotes energy conservation by providing living, working and shopping opportunities within each village. Benefits include reduced automobile use, reduced trip lengths and more feasible mass transportation.

Specific design principles and site design techniques that recognize the immediate environment of a small area may be incorporated into site plans. Building and street orientation can reduce energy demands for heating and cooling. Vegetation and landscaping, as well as building design and topography, are other factors to consider on a project-by-project basis.

Policies:

1. Continue efforts to improve energy efficiency for the city of Phoenix facilities and equipment operations.

2. Explore the potential for using renewable energy and energy-efficient resources.

Recommendations:

- A. Support energy efficient and renewable energy technology demonstration projects.
- B. Research available sources of funding and technical assistance for energy-efficient projects for city facilities.

3. Promote developments that include energy-efficient features and technologies:

- Shade trees
- Building orientation
- Light-colored roofs
- Architectural shading
- High-efficiency appliances
- Windows and window treatments
- Energy-efficient building techniques

Recommendations:

- A. Support the State of Arizona's effort to educate the public about energy-efficient products and equipment and renewable energy resources.
- B. Support legislation to protect solar access for property owners, builders and developers who are investing in solar energy systems.
- C. Support legislation requiring homeowner associations to apply reasonable architectural standards for photovoltaic and solar heating systems.

4. Explore energy-efficiency guidelines for city buildings.

Recommendations:

- A. Coordinate with state and federal agencies to encourage coordinated energy policies.
- B. Study and explore options for supporting legislation that provides incentives for solar industries.

- C. Support development of solar power generation at the beginning of the existing power grid and infrastructure, i.e. at the power plants.

GOAL 6 GREEN BUILDINGS: ENCOURAGE GREEN BUILDING CONSTRUCTION TECHNIQUES.

Over the past several years, private and public sector groups have begun to recognize that the impact of buildings on the environment is significant. Green building programs are emerging as a tool to measure energy consumption, water conservation, and environmentally-friendly building materials, and the production of solid and hazardous waste materials. These issues can be evaluated in both the short-term construction phase and the long-term operation of the building.

Emerging green buildings programs in other cities are very diverse. They can become very complex if they attempt to address life-cycle issues such as manufacturing waste or energy used to produce products.

The city has been a leader in designing municipal buildings that conserve energy and consider environmental issues. City Hall and the Municipal Courthouse reflect this commitment through an innovative district cooling unit, an effective energy management system, sunscreens and other techniques. The city also has adopted a policy to pay up to 10 percent more for recycled products and materials to help create a market for recycling.

While it appears that green building techniques can have a beneficial impact on the environment and may save in long-term energy and water costs, the initial increase in cost must also be considered in developing guidelines or standards.

Policies:

1. Study and explore options for using green building techniques and goals when designing and constructing city facilities.

Recommendations:

- A. Study and consider developing options for expanding the city's use of green building techniques in the construction and remodeling of city facilities.

- B. Review the city of Phoenix's green building approach for municipal buildings as well as green building programs in other jurisdictions.

2. Study and consider options for encouraging green building techniques in private construction projects.

Recommendations:

- A. Study the initial and long-term cost of various green building techniques and the environmental and economic impacts.
- B. Study and consider options for developing a green building program for private-sector construction.
- C. Study and explore options for developing a public education program about the benefits and costs of using green building techniques.

GOAL 7 URBAN HEAT ISLAND: EXPLORE OPTIONS TO MINIMIZE THE IMPACTS OF THE URBAN HEAT ISLAND EFFECT.

The environmental impacts resulting from the urban heat island effect are not totally understood, but research and human experience seem to indicate that there is the potential for higher temperatures in the urban area. Heat islands are created when trees, shrubs and other natural groundcover are removed and replaced by structures that are both darker and have more surface area. Darker surfaces of buildings, streets and parking lots, absorb heat during the day, raising temperatures (both during the day and night).

Some of the potential impacts from increased temperatures include the following:

- Increased human discomfort causing both physical and psychological stress
- Increased energy costs resulting from higher temperatures during the cooling season and lengthening of the cooling season
- Increased stress on vegetation

- Increased water usage (both locally and at the power plants)

Policies:

1. Study options for building materials and paving surfaces that minimize the absorption of heat.

Recommendations:

- A. Study and explore options to increase shade canopy, by developing street design standards to increase the number of trees planted along all new public streets.
- B. Retrofit existing streets where possible, to increase the shade canopy along each side of the street for both pedestrians and vehicles.
- C. Encourage the use of light-colored building and roofing materials on municipal, commercial, industrial, and multiunit residential structures. Consider a recommended standard for solar reflectivity for roof systems.
- D. Research alternative paving materials that absorb less heat.
- E. Explore methods for restricting the use of reflective glass on commercial properties above the second floor, whenever the commercial structure is adjacent to a residential area.
- F. Consider amended street cross sections, which decrease the amount of paving required.

2. Encourage the planting of mature trees (and other vegetation) as a method to provide shade and help reduce temperatures.

Recommendations:

- A. Study an ordinance change that would require public and private development to plant and maintain an adequate number of trees that will achieve 50

percent shading on parking lots and the non-building portion of a site in 15 years.

- B. Encourage constructing medians with size-appropriate shrubs and trees in new streets of four or more lanes.
- C. Encourage shaded open space in private development to reduce heat impacts.
- D. Develop a program to educate the public regarding the heat island effect.
- E. Explore developing a citywide program to promote tree planting as a method to help reduce the urban heat island effect.

GOAL 8 NOISE MITIGATION: IMPROVE THE QUALITY OF LIFE BY REDUCING URBAN NOISE LEVELS.

Noise pollution can be defined as unwanted or offensive sounds that unreasonably intrude into our daily activities. Noise can be from many sources, most of which include urban development, various transportation modes, industrial areas, neighborhoods and recreational areas.

Policy:

1. Consider options to mitigate excessive noise.

Recommendations:

- A. Develop design guidelines for streets and residential development that help reduce or soften road noise, particularly from freeways and major arterial streets.
- B. Develop guidelines for the light rail system that will reduce potential noise problems.
- C. Study and explore developing methods for identifying and reducing neighborhood noise.
- D. Coordinate with Phoenix school districts to identify methods for reducing noise affecting schools where it has been identified as a problem for students and adjacent neighborhoods.

- E. Continue and expand, where appropriate, the Freeway Noise Mitigation Program (see Neighborhood element).

GOAL 9 POLLUTION PREVENTION AND WASTE MINIMALIZATION: USE POLLUTION PREVENTION AND WASTE MINIMIZATION TECHNIQUES TO HELP REDUCE THE ENVIRONMENTAL IMPACT OF CITY OPERATIONS.

In December 1994, the City Council approved a citywide Pollution Prevention (P2) Program to help reduce the city's use of hazardous chemicals and generation of hazardous waste. The program, coordinated within the city's Office of Environmental Programs, was developed by a large interdepartmental team over a period of two years.

The program provides training to encourage employee participation in the P2 Program and meet regulatory requirements. Training is accomplished through Pollution Prevention University (P2-U), with classes that highlight hazardous chemical management and disposal. In addition, P2 outreach efforts complement training by raising employee awareness about pollution prevention. The P2 Program's employee communication plan includes a bimonthly newsletter (EnviroNotes), monthly flyers, incentive awards, and a P2 Web site accessible through the city's intranet, to help increase employee participation.

Facility assessments identify opportunities for minimizing waste, preventing pollution, and determining compliance with existing requirements. A citywide environmental database has been implemented to assist in hazardous materials management.

P2 Program services to city departments include interdepartmental trades of surplus material through the Trading Post as an alternative to disposal, and reviewing chemical products for environmental preferability. The P2 Program is designed to increase operational efficiency, reduce hazardous waste disposal costs, ensure regulatory compliance, and establish a voluntary standard for long-term environmental management.

Policies:

1. Enhance the city's pollution prevention programs.

Recommendations:

- A. Identify and prioritize chemical pollutants at city facilities and develop approaches to reduce them. Through this process, develop or review goals to minimize waste and reduce toxins.
 - B. Encourage city departments to develop contract language that takes into account the effect that requested products and services will have on the environment.
 - C. Expand the city database of Material Safety Data Sheets (MSDS) and environmentally preferable products.
2. Promote coordinated pollution prevention programs through continuing cooperation and communication with other government entities.
 3. Raise city awareness of P2 programs, activities, and policies.

Recommendation:

- A. Conduct additional outreach, training, and assessments to ensure city employee understanding of compliance and P2 issues.

GOAL 10 SOLID WASTE: UTILIZE ECONOMICAL, SAFE AND FEASIBLE RECYCLING AND DISPOSAL OF SOLID WASTE.

The city operates two Solid Waste Management Facilities- the 27th Avenue Solid Waste Management Facility and the Skunk Creek Landfill. In order to provide the most economical, safe, and feasible means of solid waste disposal, the city operates city landfills, promotes recycling citywide, and assists residents with household hazardous waste disposal.

Until it closed in 1995, the 27th Avenue Landfill, at 27th Avenue and Lower Buckeye Road, was operated jointly by the city of Phoenix and Waste

Management, Inc., in a public/private partnership. The landfill served the central and southern areas of Phoenix. Now, the 27th Avenue Solid Waste Management Facility accepts 56 percent of the city's annual solid waste or approximately 1,700 tons per day, six days per week. It serves as a transfer station for transporting solid waste from residential collection vehicles to semi-trailers that haul refuse to the Skunk Creek Landfill. The facility also includes one of the city's Materials Recovery Facilities (MRF), which is overseen by the Recycling Contracts Management Division of the Public Works Department. The facility also has a self-haul drop-off area, a vegetation mulching area, and public education programs.

The Skunk Creek Landfill, located west of Interstate 17 on Happy Valley Road, serves all of Phoenix and accepts approximately 3,000 tons of solid waste per day, seven days per week. It will close in 2006 as required by a State Land Patent agreement. A recyclable materials drop-off center opened at the Skunk Creek Landfill in 1991.

The recycling transfer station at the Skunk Creek Landfill accepts residential recyclables collected from the northern half of the city. The transfer trailers bringing waste from the 27th Avenue Solid Waste Management Facility to the Skunk Creek Landfill are then loaded with these recyclables for delivery to a privately-owned facility for processing.

Due to the anticipated closure of the Skunk Creek Landfill by April 2006, the Public Works Department is looking for a site to locate both a new landfill and a new transfer station/recycling facility to ensure that residents continue to have economical garbage and recycling services for the next 50 years. A Study Team composed of city staff and consultants is undertaking the studies for locating the new landfill and transfer station/recycling facilities. Technical, environmental, cost, and public considerations will be major evaluation criteria of the siting process for both facilities.

The landfill facility study area generally consists of the area in and around metropolitan Phoenix, including all of Maricopa County and parts of northern Pinal and southern Yavapai Counties.

The transfer station/recycling facility study area consists of the area within the city of Phoenix, north of Cactus Road and south of New River Road.

Policies:

1. Establish a new landfill(s) that will be environmentally-sound and efficient to operate and be consistent and compatible with the General Plan land use designations.

Recommendation:

- A. Continue the search for a future landfill site and transfer stations to meet the growth in demand.
2. Construct additional transfer station(s) that provide cost-effective solid waste disposal.
 3. Encourage the study of alternative solutions to solid waste disposal.

Recommendations:

- A. Study appropriate uses of closed landfills.
- B. Continue efforts in methane gas recovery.

Recycling

In 1987, the Mayor and Phoenix City Council authorized a University of Arizona study of the composition of Phoenix residential refuse. This analysis, conducted in early 1988, showed that 50 percent by weight and 63 percent by volume was recyclable. With this information, a goal was established to divert as much garbage as possible from the solid waste stream headed to Phoenix landfills.

The "Phoenix Recycles" Program was created in 1989 to capture as much material as possible from the solid waste collected. In April 1989, a pilot-recycling program including 4,000 homes began in each of the eight City Council Districts. Another 6,000 homes were added in March 1990. The city's goal was to make sorting for residents simple, with all recyclables placed in a blue curbside container. The sorting process was conducted in a number of locations using a number of technologies. The participation rate citywide was then approximately 90 percent. Based on the success of the program, the Public Works Department decided to move forward, and in 1991 gained approval from the Mayor and City

Council for citywide implementation of Phoenix Recycles.

In early 1992, the Mayor and City Council approved a contract with the privately-owned company New England CRInc., to sort and market recyclable materials collected in the Phoenix Recycles program. CRInc.'s Phoenix Materials Recovery Facility (MRF), located at 1919 E. University Drive, was the first large-scale recycling facility in North America to process commingled recyclables.

In 1998 the city of Phoenix opened another MRF at the 27th Avenue Solid Waste Management Facility, 3060 South 27th Avenue. This facility was needed to help handle the amount of materials collected from all Phoenix residents serviced (approximately 100,000 tons/year). The city has contracted with USA CRInc. to operate the city-owned facility at the 27th Avenue Solid Waste Management Facility's MRF. The Phoenix Recycles program is now implemented citywide, and it is expected that revenues received will offset costs of processing materials in the program.

Policies:

4. Encourage Phoenix residents to continue and increase participation in the Phoenix Recycles residential program.

Recommendations:

- A. Continue the outreach education programs, particularly those focused on youth.
 - B. Maintain the current information available to people on the city's web site.
 - C. Encourage the recycling of green waste such as grass and tree trimmings.
5. Promote the reduction of non-recyclable materials in Phoenix Recycles barrels.

Recommendation:

- A. Encourage introducing new technologies that have the potential to reduce the waste stream to the landfill.

Household Hazardous Waste Program

The city of Phoenix has had a Household Hazardous Waste Program since 1989. The program started with one-day large-scale collections yearly. Information taken from surveys at the collection sites determined that the public would be better served with smaller, more frequent and mobile collections. It was also determined that the most materials collected were batteries, oil, paint and antifreeze (BOPA). The BOPA program started in 1997.

The BOPA collection provides residents a convenient method for disposing of household hazardous wastes. The program reduces the amount of hazardous materials entering the sewers and landfills, reduces illegal dumping of hazardous waste, promotes public awareness, and offers an alternative to hazardous waste disposal. BOPA monthly collections are held over three-day periods at various locations throughout the city. Events are held 10 times a year. Some materials collected at BOPA events are recycled. Other items are transported to a licensed hazardous waste facility for disposal. To help promote this program, the city includes BOPA in its recycling education.

In addition to the special collection events, the city collects and recycles automotive batteries and used motor oil at the Skunk Creek Landfill. The 27th Avenue Solid Waste Management Facility also collects and recycles automotive batteries.

Policy:

6. Encourage Phoenix residents to continue participating in the recycling programs and proper household hazardous waste disposal.

Recommendations:

- A. Continue to coordinate BOPA events throughout the city.
- B. Continue the outreach household hazardous waste education program.