

Final Draft
Source Reduction and Recycling Element
City of Palo Alto, California

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City of Palo Alto
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EXECUTIVE SUMMARY

Introduction

Legislative Basis for the Plan

The California Integrated Waste Management Act of 1989 (Assembly Bill [AB] 939), mandates that by January 1, 1995, each California city and county must divert 25 percent of all solid waste from landfill or transformation facilities through source reduction, recycling, and composting activities. By January 1, 2000, the required waste diversion is 50 percent. AB 939 responds to the pressing need to divert materials from landfills in order to preserve decreasing site capacity and diminishing natural resources.

AB 939 requires that each city prepare, adopt, and submit to the county a source reduction and recycling element (SRRE) that includes the following:

- a waste generation study
- a source reduction component
- a recycling component
- a composting component
- a special waste component
- a household hazardous waste component¹
- an education and public information component
- a solid waste disposal facility capacity component

¹ Following the enactment of AB 2707, the household hazardous waste component was elevated to the status of an element, to be prepared as a separate document. This element is therefore presented under separate cover.

- a funding component
- an integration component

The integrated waste management hierarchy established by AB 939 is the following:

- Source reduction to reduce generation of wastes
- Recycling and composting of materials
- Environmentally safe transformation of wastes, such as incineration, distillation, and pyrolysis
- Environmentally safe landfilling

The City of Palo Alto's SRRE applies this hierarchy as a planning tool in the selection of programs designed to meet the 25 and 50 percent diversion goals by 1995 and 2000, respectively.

Existing Material Recovery Programs

Since 1971, the City of Palo Alto has operated several nationally recognized, award-winning material recovery programs. Mounting public concern for protection of the environment and the apparent problems associated with a growing volume of solid waste provided a strong basis for Palo Alto's decision to commit to material recovery. Currently, 39 percent of the City's residential waste stream and 11 percent of its commercial/industrial waste stream is recycled, resulting in a diversion rate of 17.5 percent for the total waste stream.

Goals for SRRE

The primary goal of the City of Palo Alto's SRRE is to meet the state-mandated waste diversion goals of 25 and 50 percent by 1995 and 2000, respectively. As noted above, the City is currently diverting 17.5 percent of its solid waste stream by a variety of programs.

The following goals have guided the development of the City's SRRE:

1. Meet or exceed state-mandated waste diversion rates through source reduction, recycling, and composting.
2. Support and encourage regional solutions to solid waste management problems.

3. Maximize recycling and composting opportunities within the City of Palo Alto.
4. Expand community awareness in order to maximize participation in source reduction, recycling, and composting programs.
5. Ensure sufficient landfill capacity to dispose of wastes that cannot be reduced, reused, recycled, or composted.
6. Develop and expand local and regional markets for diverted materials.
7. Minimize adverse environmental impacts and ensure public health and safety.

Mandated Format of SRRE

Title 14, Chapter 9 of the California Code of Regulations (CCR) specifies the required substance and format of the SRREs to be prepared by each city and county in California. The components of the SRRE that address source reduction, recycling, composting, and special waste must contain the following sections:

- Objectives
- Existing Conditions Description
- Evaluation of Alternatives
- Program Implementation
- Monitoring and Evaluation

The regulations dictate that the alternatives considered for these four components must be evaluated in accordance with ten criteria that reflect a wide range of technical, economic, institutional, and socio-political issues.

The remaining four components of the City's SRRE—education/public information, disposal facility capacity, funding, and integration—deviate somewhat in format from the first four, as will be noted from a review of the SRRE. The apparent lack of consistency in the format is thus dictated by the regulations for Planning Guidelines and Procedures for Preparing

and Revising Countywide Integrated Waste Management Plan (Title 14, CCR, Division 7, Chapter 9, Articles 3, 6.1, 6.2, 7, and 8).

Waste Generation Study

In compliance with AB 939, the City of Palo Alto conducted a waste generation study to estimate the quantities of solid waste that are being disposed of (and those quantities diverted from disposal) in the City's landfill. The composition of the City's solid waste stream was also a focus of this study. The results of the waste generation study provided the basis for identifying programs to help the City meet diversion targets of 25 percent in 1995 and 50 percent in 2000.

Waste Disposal Characterization

Palo Alto's waste disposal characterization, conducted in August, 1990, and again in January, 1991, consisted of two elements: (1) the quantities of waste disposed of, and (2) an estimate of the waste composition for various sources of waste generation.

The waste quantities were based on scalehouse records and expressed on a weight basis. Waste composition was measured by sampling and sorting waste that arrived at the Palo Alto Landfill. A total of 105 samples were collected and sorted. The samples were sorted into categories of materials that included paper, plastics, glass, metals, yard waste, other organics, and special wastes. The samples were further subdivided into types of materials within each category. In addition, 71 vehicle-loads were surveyed visually. Based on the results of this study, approximately 25 percent of the waste generated in the City are residential; the remaining 75 percent are nonresidential.

A summary of waste quantities disposed of at the Palo Alto landfill is presented in Table ES-1; the composition of the City's wastestream is shown in Table ES-2. The results of the waste characterization study indicate that paper currently represents over 50 percent of the City's residential and commercial waste stream.

A total of 115,255 tons were disposed of at the Palo Alto landfill in 1990.

Waste Diversion

In compliance with AB 939, the City also conducted a waste diversion study to estimate the quantities of materials diverted from the Palo Alto landfill through recycling, composting, and source reduction.

The diversion results were obtained from (1) City records, (2) the collectors of recyclable materials, and (3) a survey of 691 businesses in the City concerning their waste diversion activities.

The data from the City records and from the surveys were assumed to reflect the total diverted quantities for the City (i.e., the data were not extrapolated). Thus, the study results reflect a conservative diversion estimate total of 17.5 percent.

Materials Targeted for Diversion

The following categories of materials currently disposed of in the City are targeted for diversion through programs identified in the source reduction, recycling, composting, and special waste components of the SRRE: paper, plastics, glass, metals, yard waste, other organics, and selected other wastes, including inert solids such as asphalt, concrete, and soil.

Overview of SRRE Components

Source Reduction

Source reduction activities reduce or prevent the generation of solid wastes that must otherwise be managed by recycling, composting, transformation, and disposal. Source reduction is achieved by changing production, packaging, and consumption practices, resulting in decreased consumption, reduced material weight and volume, and increased product durability. Production and packaging practices are changed at the state or national level, while consumption patterns are targeted locally.

The source reduction programs selected to help meet Palo Alto's diversion goals have the potential to effectively change consumption patterns. Palo Alto proposes to implement public education programs that focus on increasing the consumer's level of awareness. Specifically, the programs selected include (1) waste evaluations, (2) technical assistance, (3) education programs, and (4) public recognition and awards.

The estimated diversion from source reduction programs is 0.41 percent annually. This is a very conservative estimate that reflects the fact that source reduction efforts to a large degree occur on the national level. Manufacturers of products marketed nationally continue to reduce and modify their packaging, thereby impacting the generation of wastes on the local level.

Palo Alto's state-mandated diversion rates will be met primarily through recycling, composting, and special waste programs. In addition, Palo Alto intends to emphasize implementing available national source reduction programs and educating the public concerning these programs. The success of the source reduction program will have positive impacts on consumption, production and packaging patterns that will ultimately contribute to a decrease in the quantity of wastes landfilled.

Recycling

As defined by the EPA-sponsored national Recycling Advisory Council (RAC), recycling is the result of "a series of activities by which materials that would become or otherwise remain waste are diverted from the solid waste stream for collection, separation, and processing and are used as raw materials or feedstocks in lieu of, or in addition to, virgin materials in the manufacture of goods sold or distributed in commerce, or the reuse of such materials as substitutes for goods made from virgin materials."

The City of Palo Alto currently has a number of recycling programs in place; these focus on various types of materials generated by the public and private sectors. The success of these programs led to a City diversion rate of 17.5 percent in 1990. In order for the City to reach the diversion goals mandated by AB 939, additional recycling programs are proposed:

- Expand the multi-family dwelling recycling program participation. Expected diversion:² 0.2 to 0.3 percent.
- Expand commercial/industrial recycling programs around the City. Expected diversion: 3 to 5 percent
- Establish a mechanized material recovery facility. Expected diversion: 11 percent.

² Diversion refers to the portion of the City's total waste stream that is diverted from landfilling.

- Divert inert solids to a materials' processor. Expected diversion: 6 to 12 percent.
- Expand drop-off facility to include additional materials. Expected diversion: 0.1 to 0.3 percent.
- Expand residential curbside recycling program to include additional materials. Expected diversion: 2.0 to 2.7 percent.

The recycling programs selected to help meet the City's mandated diversion goals focus on the segments of the wastestream that offer the greatest opportunity for diverting wastes from landfilling. For instance, 75 percent of Palo Alto's waste stream comes from the commercial/industrial sector, yet only 11 percent of it is currently recycled. Collection programs by businesses are therefore an important component of the City's approach to meeting mandated diversion goals.

Palo Alto's recycling component also includes a discussion of markets for a variety of waste types: newspaper, high-grade paper (e.g., ledger paper), mixed waste paper, corrugated cardboard, aluminum cans, steel cans, glass, polystyrene, and plastics.

Composting

Composting is a process of biological decomposition of solid organic debris, such as leaves, grass clippings, and other organic materials commonly found in the municipal waste stream. The end product of composting is a stable humus or soil-like material that can be used as a soil conditioner, mulch, or fertilizer, depending on its physical properties.

Yard wastes make up a very large percent of the wastestream in Palo Alto, comprising approximately 14.9 percent by weight of the total wastestream. Composting therefore makes an important contribution to reducing the amount of waste that is disposed of at the Palo Alto Sanitary Landfill.

Palo Alto's existing yard waste compost program was evaluated to determine whether changes could enhance its effectiveness. Currently the City's composting program diverts about 7.7 percent of the total solid wastestream from landfilling. It was determined that by increasing participation in the existing yard waste program, the City could ultimately divert

an additional 3.6 percent of the total wastestream, resulting in an increased diversion of approximately 5,000 tons per year.

A second composting activity selected by the City involves an enhancement of the existing program that is geared toward producing a higher grade compost than is currently generated. By enhancing the quality of the compost produced, the City anticipates significantly increasing its marketability.

Special Waste

Special waste is solid waste requiring collection, processing, and disposal procedures that differ from those typically needed for other municipal solid wastes. Examples are sewage sludge, ash, asbestos, tires, white goods, mattresses, abandoned vehicles, and dead animals. Mattresses and white goods are the only special waste currently being disposed of in the Palo Alto landfill. Therefore mattresses and white goods can be counted toward diversion, as defined in Section 41781 of the Public Resources Code. Special wastes currently being diverted from landfilling in Palo Alto include ash, white goods, mattresses, abandoned vehicles, and dead animals. Sewage sludge and tires are being transformed (combusted).

The special waste program selected to help meet Palo Alto's diversion goals is the salvaging of white goods at the City's landfill. Although white goods are currently collected and stockpiled at the landfill, they are also disposed of at the site. By salvaging white goods at the active dumping area at the landfill, disposal facility staff can divert from 279 to 419 tons of material annually, or 0.3 to 0.4 percent of the total solid waste stream in the City.

Education and Public Information

Education and public information are essential to the successful implementation of the recycling, source reduction, and composting components. To reach waste diversion goals of 25 and 50 percent, Palo Alto will target the non-participating sectors of the community to ensure the success of selected waste diversion programs. The City will also inform the entire community about expansions and modifications to existing programs so that the City can effectively reach its stated diversion goals.

The education and public information component presented in the City's SRRE describes a wide variety of City programs that focus on educating

and informing the community about solid waste issues. Education and public information programs promoted by businesses and community groups in the City are also described.

The education and public information activities selected to enhance existing programs are multi-faceted in scope, encompassing media, community outreach, campaigns, and school curricula.

Disposal Facility Capacity

The Integrated Waste Management Act of 1989 requires that jurisdictions identify their current and future solid waste disposal capacity needs in the SRRE. Specifically, the City of Palo Alto is required to identify its disposal capacity needs over the 15 year period, 1991 through 2005. In Palo Alto the only permitted solid waste disposal facility is the City's landfill located at the eastern end of Embarcadero Road. Accepting refuse only from the incorporated areas of the City of Palo Alto, the landfill receives about 320 tons per day of refuse (115,255 tons per year).

Even without additional waste diversion stemming from selected programs described in this SRRE, the Palo Alto landfill has refuse capacity to 2002. Therefore there is no plan to phase out or close the City's landfill during the short-term (1991-1995) or medium term (1996-2000) periods.

Assuming the successful implementation of source reduction, recycling, composting, and other programs identified in the City's SRRE, the site life of the landfill could be extended to the year 2029. Included in the SRRE programs is the diversion of two thirds of Palo Alto's waste to the SMaRT Station in Sunnyvale, beginning in 1993. Final contract negotiations are underway concerning the implementation of the SMaRT Station. The outcome of these discussions will determine the role that this proposed material recovery facility will play in conserving additional landfill capacity for the City of Palo Alto.

Funding

Solid waste management programs in the City of Palo Alto are principally funded by the Refuse Enterprise Fund. Collection and tipping fees charged to residential and commercial customers represent the major source of income for this fund.

Collection fees for refuse in Palo Alto are approximately \$44.00 per ton; disposal costs, about \$45.00 per ton. The minimum charge is based upon the collection of refuse from one 32-gallon container.

Programs selected by Palo Alto to help meet mandated diversion goals will be funded by the Refuse Enterprise Fund and revenue-generating programs.

Additional City staff will be required to help implement source reduction, recycling, composting, and public education programs. A solid waste manager, two recycling coordinators, and a composting attendant at the landfill are recommended to be added to the City's staff; their salaries will be funded through the Refuse Enterprise Fund.

Integration

To reach the waste diversion goals mandated by AB 939, the City of Palo Alto must integrate source reduction, recycling, composting and special waste programs and activities following the integrated waste management hierarchy of (1) reduction, (2) recycling and composting, and (3) environmentally safe transformation and disposal. A combination of existing waste diversion programs, planned expansions of existing programs, and new source reduction, recycling and composting programs and activities together will contribute to the City's achieving the diversion targets mandated by law.

Currently Palo Alto diverts an estimated 17.5 percent of its solid wastes from landfilling. By 1995, the city projects a minimum diversion rate of 38 percent; by 2000, a minimum rate of 50 percent. These projected diversion rates meet or exceed the mandated levels of 25 percent in 1995 and 50 percent in the year 2000.

Summary of Diversion Programs

Summarized in Table ES-3 are the source reduction, recycling, special waste, and composting diversion programs selected for the City of Palo Alto. Included is (1) date of implementation, (2) percent diversion of the total waste stream each program would achieve, (3) planning and capital costs, (4) annual operating and monitoring costs, and (5) additional staff needed for each of the programs.

Table ES-1
 Summary of Waste Disposal Quantities
 City of Palo Alto (1990)

Source	Tons Per Day-7 (1)	Tons Per Year	Percent
Residential	57.7	21,069	18.3
Commercial	95.7	34,933	30.3
Industrial/Roll-off	88.5	32,310	28.0
Self-Haul	19.0	6,953	6.0
City/CIP (2)	54.8	19,990	17.3
Total	315.8	115,255	100.0

1. Based on a 7-day week.
 2. Capital Improvement Programs

Table ES - 3
Summary of Diversion Programs for the Short- and Medium-Term Planning Periods (1991 - 2000)

SRRE Program	Program Implementation Date	Estimated Percent Diversion of Total Waste Stream (By 1995)	Estimated Percent Diversion of Total Waste Stream (By 2000)	Additional Costs ¹		Staff Time ² for Program Implementation (Person years)
				Planning and Capital (\$)	Annual Operating and Monitoring (\$)	
Source Reduction				Included in Education and Public Information		
• Technical assistance	7/92	0.4	0.4			
• Educational efforts	7/92					
• Public recognition and awards	7/92					
• Local procurement ordinance	7/92					
Recycling						
• Expand participation in multifamily recycling program	7/92	0.2 - 0.3	0.2 - 0.3	220,000	126,000	0.15
• Expand commercial/industrial recycling programs	7/92	3 - 5	3 - 5	260,000	150,000	0.40
• SMaRT Station	7/93	11	11	0	166,000 ⁵	0.05
• Divert inert solids to a materials processor	7/95	6 - 12	6 - 12	0	70,000-	0.05
• Add additional material to drop-off facility	7/96			103,000	140,000	0.05
• Add additional material to residential curbside	7/96			460,000	20,000	0.05
Composting						
• Increase participation in existing program	7/91	3.6	3.6	0	0	0.20
• Increase processing activities	7/92	N/A ³	N/A ³	300,000	53,500-	1
Special Waste						
• White goods salvaging at landfill	7/91	0.3 - 0.4	0.3 - 0.4	0	60,000	0.05
Education and Public Information	7/91	0	0	0	160,000-	1.56
					188,500	
	7/91	N/A	N/A	0	37,000	0.5
Management of all New Diversion Programs						
Total, Based on New Programs		24.5 - 32.7	26.6 - 35.7	1,343,000	1,022,500-	4.00
Total Diversion, Existing Programs		17.5	17.5		1,127,500⁵	
Total Diversion, New and Existing Program		42.0 - 50.2	44.1 - 53.2⁴			

1. Costs shown are in 1991 dollars.

2. Includes city staff time only.

3. Additional processing activities will not increase diversion, but will produce a higher grade compost.

4. Percent diversion by 2000 will meet or exceed 50 percent; the lower range shown here reflects a "worst case scenario."

5. The SMaRT Station functions as a transfer station as well as recycling center; only the recycling function is reflected in this estimate.

6. Includes 0.5 person years for HHW public education.

1 INTRODUCTION

1.1 Legislative Basis for the Plan

In September 1989, the California House and Senate passed Assembly Bill (AB) 939, the California Integrated Waste Management Act of 1989. This statute legislation was drafted in response to the need to divert materials from landfills in order to preserve decreasing landfill capacity and natural resources. AB 939 mandates that, by January 1, 1995, each California city and county must divert 25 percent of all solid waste from landfill or transformation facilities through source reduction, recycling, and composting activities. By January 1, 2000, the required diversion is 50 percent.

AB 939 replaces the existing County Solid Waste Management Plan (CoSWMP) process with a source reduction and recycling element (SRRE) for each city and county and an Integrated Waste Management Plan (IWMP) for each county. AB 939 dramatically restructures the solid waste management program in California with the objective of implementing an aggressive integrated waste management program, promoting, in order of priority, the following waste management practices:

- source reduction
- recycling and composting
- environmentally safe transformation (incineration, pyrolysis, biological conversion)
- environmentally safe land disposal

1.1.1 City Requirements

By July 1, 1991, each city must prepare, adopt, and submit to the county an SRRE that includes all of the following components for management of solid waste generated within the city:

- a waste generation study
- a source reduction component
- a recycling component
- a composting component
- a disposal facility capacity component
- an education and public information component
- a funding component
- a special waste component
- an integration component

1.1.2 County Requirements

By July 1, 1991, each county must prepare a SRRE for its unincorporated area with components the same as those in the city elements. Each county must also prepare a countywide integrated waste management plan and a countywide siting element specifying areas for transformation or disposal sites to provide capacity needed for a 15-year period, so that solid wastes generated in the county that cannot be reduced or recycled will be handled safely.

1.1.3 General Requirements

The required waste diversion amounts will be based on the calculated amount of solid waste existing on the date of approval of the city or county SRRE.

To determine the base rate of solid waste from which these recycling levels will be calculated, "solid waste" includes only

- materials that are normally disposed of at a landfill or transformation facility
- solid wastes currently diverted from a landfill or transformation facility because of source reduction, recycling, or composting programs

Agricultural wastes, and other wastes not normally disposed of at landfills are not included in this base rate calculation.

For any plan submitted after January 1, 1995, the 50 percent diversion may include up to 10 percent transformation, provided that the front-end removal of recyclable materials and other specified conditions are met.

1.1.4 Other Provisions of AB 939

Revisions to existing law in AB 939 include (1) replacement of the current Waste Management Board by an Integrated Waste Management Board with six full-time members, (2) implementation of new requirements in the city and county waste management planning process, (3) recasting of the waste management framework, and (4) various funding mechanisms for the required programs and plans. Other provisions include the following:

Solid Waste Facilities. AB 939 establishes a comprehensive statewide system of permitting, inspections, enforcement, cleanup, maintenance, and closure for solid waste facilities. While the system will continue to be implemented by local jurisdictions where applicable, the state's role has generally been strengthened. Specifically, local enforcement agencies (LEA) will be subject to Board certification. The Board will prepare and adopt certification regulations specifying requirements that a local enforcement shall meet before being designated as an enforcement agency.

The Board will also adopt minimum standards for solid waste handling and disposal to protect air, water, and land from pollution. Owners or operators of solid waste landfills must also provide financial assurances for closure and postclosure maintenance.

Enforcement. AB 939 outlines a system of civil penalties, corrective actions, appeals, and judicial review for the enforcement of terms and conditions of solid waste facility permits. The Board may issue a cease and desist or cleanup and abatement order if (1) the LEA fails to issue such orders and (2) the Board agrees that such orders need to be imposed.

Solid Waste Disposal Site Cleanup and Maintenance. Every operator of a solid waste landfill required to have a permit will be assessed a fee, which will be placed in the existing Solid Waste Disposal Site Cleanup and Maintenance Account in the Solid Waste Management Fund. Money in the account will be controlled by the Board and allocated to cities and counties for uses regarding the safe operation, closure, and maintenance of solid waste landfills.

Household Hazardous Wastes. AB 939 requires the Board to develop and implement a public information program to provide information on the proper disposal of household hazardous wastes, and technical assistance to local public agencies to establish household hazardous waste management programs.

Finances. Every operator of a solid waste landfill shall pay a quarterly fee to the Board of Equalization, based on all solid waste disposed of at each disposal site on or after January 1, 1990. The money will be used for administration and other purposes specified by the legislature, which will appropriate funds from the account.

Garbage and Refuse Disposal. AB 939 establishes criteria for (1) the formation of garbage disposal districts, funded by property taxes, (2) franchise waste management within a county, (3) contract waste management within a city, and (4) solid waste enterprises to operate within a community. It also contains restrictions on burning garbage.

1.1.5 Relationship of AB 939 to Other Legislation

Several pieces of cleanup legislation related to AB 939 have passed that modify the impact of the legislation. These bills include

Senate Bill (SB) 1322. This bill establishes a comprehensive set of state programs to promote (1) integrated waste management, (2) source reduction, and (3) market development for recovered materials. SB 1322 will establish recycling market development zones with regulatory and fiscal incentives. In addition, the Board will be required to provide technical assistance to enable LEAs to conduct waste reduction evaluations and implement recovery of high-grade white office paper. A state-wide public information and education program will be initiated to encourage participation by the general public, business, government, and industry in all phases of integrated waste management.

Assembly Bill (AB) 1820. AB 1820 permits the use of preexisting data or studies that accurately characterize the waste generated and disposed of within the jurisdiction. This bill requires (1) only the amount of seasonal sampling necessary to achieve the 25 percent diversion target for the 1995 deadline (rather than the "maximum extent possible"), (2) the constituent materials identified in the waste characterization to be representative of the solid waste generated (in contrast to the former language: to be representative "to the maximum extent feasible," and (3) waste

quantities to be "as accurate as possible" to enable the Board to accurately measure the diversion requirements.

Assembly Bill (AB) 2707. This bill requires each city to submit a separate household hazardous waste element to the county by July 1, 1991. AB 939 had included a household hazardous waste component in the SRRE.; as a result of AB 2707, this component was elevated to the status of an "Element."

Assembly Bill (AB) 3992. This bill defines "solid waste" for the purpose of determining the base amount from which diversion levels shall be calculated. It also requires the Board to consider only relevant circumstances in determining civil penalties for any city or county which fails to implement its SRRE.

1.2 City of Palo Alto's Waste Diversion Efforts

The City of Palo Alto operates several nationally recognized, award-winning material recovery programs, the first of which began operation in 1971. Palo Alto's Recycling Program was voluntary, and was established long before any state requirements mandated such activity. Mounting public concern for protection of the environment and the apparent problems associated with a growing volume of solid waste in the City provided a strong basis for Palo Alto's decision to commit to resource recovery. Palo Alto's experience underscores the importance of strong community support obtained through an active public awareness program. Also important to the program's continued success are its secondary materials markets and strong support from the City.

Currently 39 percent of Palo Alto's residential wastestream and 11 percent of the City's commercial/industrial wastestream is diverted via source reduction, recycling, and composting. The programs developed by the City that are responsible for these impressive recycling rates include

- Drop-off Recycling Center
- Curbside Collection of Recyclables
- Restaurant-Bar Glass Collection
- High-Grade Office Paper Collection
- Commercial/Industrial Recycling Consulting Services

- Commercial and Retail Cardboard Collection
- Yard Waste Composting Program
- Mattress, Tire, and White Goods Recycling
- War On Waste Citizens' Committee
- Junk Mail Survival Packet

In addition, two non-profit recycling groups collect recyclables in the City. The Community Association for the Retarded collects white paper and maintains a drop-off box for newspapers. The Peninsula Conservation Center maintains a drop-off bin for magazines.

Due to the significant volume of materials collected, the program has yielded several direct and indirect benefits. Direct benefits refer to revenues received from the sale of the recyclables, whereas indirect benefits include extended landfill life, avoided landfill disposal costs, avoided refuse collection costs, and energy savings. Palo Altans have shown their concern for the environment by participating in the respective programs and that support has contributed to a strong community spirit.

Since 1983, the City of Palo Alto has received much recognition for its waste diversion efforts, including eight national, state, or industry awards, four of them from the National Recycling Coalition (NRC):

- 1990** Recycling Merit Award, California Department of Conservation
- 1989** Best Recycling Drop-off Center, NRC
- 1989** Recycler of the Year-Julio Saucedo, Palo Alto Sanitation Company Recycling Supervisor, NRC
- 1988** Best Multi-Material Recycling Center, California Waste Management Board
- 1987** Best Recycling Vehicle Design, *World Wastes*
- 1986** Outstanding Curbside Recycling Program, NRC
- 1985** Best Comprehensive Recycling Program, California Resource Recovery Association
- 1983** Outstanding Compost Program, NRC

1.3 City of Palo Alto Program History

The following is a brief history of the waste diversion programs implemented in Palo Alto during the past 20 years.

- 1971** A drop-off recycling center was opened by the City at the entrance to the landfill. The center accepts tin, aluminum and bi-metal cans, glass, newspaper, cardboard, white paper, and scrap metal. The center is operated on City property by Palo Alto Sanitation Company (PASCO), the refuse collection company.
- 1978** A pilot curbside recycling program was initiated by the City to collect cans, glass, newspaper, corrugated cardboard, motor oil, and small scrap-metal items on garbage collection day.
- 1979** A wood recovery area at the landfill was established to accept clean, untreated construction wood and pallets. The wood was available free of charge to the public. Because of the danger involved with nails in the wood, and treated and painted wood, the recovery area was discontinued. Wood is sporadically available from the City's tree maintenance program.
- 1980** The curbside recycling program was expanded to serve all of Palo Alto's single-family homes. PASCO assumed operation of the curbside program.
- 1981** Palo Alto began a pilot collection program for recyclables for several large multiple-family dwellings. Curbside routes were adjusted to include most small and medium-sized apartment buildings.
- 1984** Apartment recycling program began. Renewed publicity encourages apartment residents to recycle at the curb. Volunteer "Apartment Recycling Coordinator" program began.
- 1985** Restaurant/bar glass recycling program began. The City solicited locations to participate in glass recycling operated by Circo Glass. At present, 50 businesses are recycling mixed-colored glass.

1986 Commercial/industrial recycling program began. The City offered free consulting services to assist large Palo Alto businesses to establish in-house recycling and waste reduction programs

Office paper recycling program began. White paper and computer paper were collected. Currently, 133 businesses, schools, and City facilities participate.

1987 Pilot Yard Debris Collection Program began; 1,000 households participated for 3 months.

Polyethylene terephthalate (PET) plastics are added to the materials collected in the curbside program and drop-off center.

1989 A cardboard collection program for commercial and retail establishments began. Bins were purchased by the City of Palo Alto for shared use in downtown areas.

1990 A yard debris collection program began. Leaves, grass, and plant and tree trimmings are collected weekly at the curbside.

Pilot program for styrofoam collection began. Molded and loose fill styrofoam packaging are accepted at the City drop-off center and at other designated locations.

City held a one-time curbside collection of styrofoam during the week after December 25.

City held first annual Christmas tree recycling program. Trees were collected with the weekly yard debris collection.

1.4 Goals for City of Palo Alto SRRE

Definition of Goals and Objectives

The primary goal of the City of Palo Alto SRRE is to meet the state-mandated waste diversion goals of 25 and 50 percent by 1995 and 2000, respectively.

Goals are stated in general terms and are not quantified by target dates, waste types, or volumes. Goals are general statements of policy and will be used to guide the overall direction of the solid waste management program within the City of Palo Alto.

Objectives are more specific and serve to target certain aspects of the overall goals. Objectives are based in part on local considerations necessary to achieve state-mandated diversion rates. Generally, objectives are stated in measurable and quantifiable terms. Objectives for programs are presented in their respective components.

Goals for the City of Palo Alto

1. Meet or exceed state-mandated waste diversion rates through source reduction, recycling, and composting.
2. Support and encourage regional solutions to solid waste management problems.
3. Maximize recycling and composting opportunities within the City of Palo Alto.
4. Expand the sense of community awareness in order to maximize participation in source reduction, recycling, and composting programs.
5. Ensure sufficient landfill capacity to dispose of wastes that cannot be reduced, reused, recycled, or composted.
6. Help to develop and expand local and regional markets for diverted materials.
7. Minimize adverse environmental impacts and ensure public health and safety.

1.5 Mandated Format of SRRE

Title 14, Chapter 9 of the California Code of Regulations (CCR) specifies the required substance and format of the SRREs to be prepared by each city and county in California. The components of the SRRE that address source reduction, recycling, composting, and special waste must contain the following sections:

- Objectives

- Existing Conditions Description
- Evaluation of Alternatives
- Selection of Programs
- Program Implementation
- Monitoring and Evaluation

The regulations dictate that the alternatives considered for these four components must be evaluated in accordance with ten criteria that reflect a wide range of technical, economic, institutional, and socio-political issues.

The remaining four components of the City's SRRE—education/public information, disposal facility capacity, funding, and integration—deviate somewhat in format from the first four, as will be noted from a review of the SRRE. The apparent lack of consistency in the format is thus dictated by the regulations for Planning Guidelines and Procedures for Preparing and Revising Countywide Integrated Waste Management Plan (Title 14, CCR, Division 7, Chapter 9, Articles 3, 6.1, 6.2, 7, and 8).

1.6 Evaluation of Alternatives in the SRRE

The Planning Guidelines and Procedures for Preparing and Revising Countywide Integrated Waste Management Plans, Section 18733.3, Chapter 9, Division 7, Title 14, California Code of Regulations, require certain criteria to be used in evaluating alternative programs that identified in the source reduction, recycling, composting, and special wastes components. These criteria reflect a broad range of technical, economic, and socio-political considerations. As presented in Section 18733.3 of Article 6.2 of Title 14, the evaluation criteria are as follows:

- Waste Diversion Potential
- Absence of Hazard
- Flexibility
- Limited Shift in Waste Type Generation
- Ease of Implementation
- Facility Needs

- Consistency with Local Policies
- Absence of Institutional Barriers
- Estimated Cost
- End Uses

A detailed discussion of the evaluation criteria and the method used to rank their impact on the alternatives for each component is presented in Appendix A of this SRRE.

1.7 Organization of the SRRE

In accordance with the regulations implementing AB 939, the SRRE is presented in the following sections:

- Solid Waste Generation Study Section 2
- Source Reduction Component Section 3
- Recycling Component Section 4
- Composting Component Section 5
- Special Waste Component Section 6
- Education and Public Information Component Section 7
- Disposal Facility Capacity Component Section 8
- Funding Component Section 9
- Integration Component Section 10
- Acronyms
- Glossary of Terms
- Appendix A - Evaluation Approach
- Appendix B - Waste Material Categories: Definitions
- Appendix C - Diversion Survey Forms
- Appendix D - National Recycling Coalition Densities for Recyclables
- Appendix E - Refuse Enterprise Fund Summary

The organization of topics within each component generally follows the format presented below. The format deviates slightly between components, however, as applicable to each respective component.

- Introduction
- Objectives
- Existing Conditions Description
- Evaluation of Alternatives¹
- Selection of Programs
- Program Implementation
- Monitoring and Evaluation

¹ A description of the criteria used to evaluate the alternatives is included in Appendix A.

2 WASTE GENERATION STUDY

2.1 Introduction

This section presents the results of a waste disposal and diversion characterization study performed for the City of Palo Alto. The waste characterization was conducted to satisfy the requirements of an AB 939 initial study. As required by AB 939, the study was divided into two parts: a waste disposal characterization and a waste diversion characterization. When combined, the results of the disposal and diversion characterization yield the total amount of solid waste generated in Palo Alto according to the equation defined by AB 939:

$$\text{GEN} = \text{DISP} + \text{DIVERT}$$

where: GEN = the total quantity of solid waste generated within the jurisdiction

DISP = the total quantity of solid waste, generated within the jurisdiction, which is transformed or disposed in permitted solid waste facilities

DIVERT = the total quantity of solid waste, generated within the jurisdiction, which is diverted from permitted solid waste transformation and disposal facilities, through existing source reduction, recycling, and composting programs.

The waste disposal characterization was performed using a quantitative field methodology. Waste diversion quantities were determined using jurisdiction-specific data from a material accounting system that collected information from both the generators of diverted materials and from the collectors of those materials. When combined, the information from the two sources amounted to a comprehensive accounting of solid wastes diverted from the Palo Alto waste stream. Moreover, in many cases, the

combined information provided a cross-check of reported quantities from two sources.

The waste generation study also attempted to measure the amount of source reduction occurring in Palo Alto. As with the diversion study, a survey technique was developed to estimate the amount of source reduction occurring with several clearly defined materials or products. Details of the source reduction, waste disposal, and waste diversion studies are presented in the following sections.

2.2 Waste Stream Flow

In keeping with the requirements of AB 939, Palo Alto's waste stream has been segmented into the following sources:

- **Residential:** waste originating from single- and multiple-family dwellings.
- **Commercial:** waste originating from wholesale and retail distribution operations, institutions (hospitals, education facilities, etc.), service operations (offices and repair facilities), and governmental operations.
- **Industrial/roll-off:** wastes collected in roll-off containers and typically originating from industrial, commercial, construction/demolition, and other sources.
- **Other:** AB 939 allows other source categories to be defined. For this study, self-haul wastes were defined as a separate category; these are wastes self-hauled by residents or businesses directly to the Palo Alto landfill.

Because Palo Alto has considerable commercial/industrial activity, the residential waste segment is relatively small compared to the nonresidential segments (i.e., commercial, industrial, construction, demolition, and self haul). The City of Palo Alto has a residential population estimated at 57,336; most of the population resides in single-family dwellings. Census data indicate that approximately 66 percent of the estimated 26,000 dwellings in Palo Alto are single-family units. During weekdays the population increases to 108,000, due to worker influx.

Solid wastes flow from the generators of Palo Alto's wastes into disposal or recovery channels through a variety of flowpaths, including

- City-contracted residential and nonresidential garbage collection (via Palo Alto Sanitation Company [PASCO])
- City-sponsored curbside collection of selected recyclables, including yard waste, for all single-family and approximately 50 percent of the multifamily dwellings in the City
- refuse self-hauled to the landfill
- a landfill drop-off facility that accepts a variety of materials dropped off by self-haulers
- numerous nonprofit and private collectors that collect a variety of recyclable materials

No marine wastes are generated in Palo Alto.

After collection, wastes generated in the City of Palo Alto enter one of four channels: landfill disposal, transformation via incineration, composting, or recycling. Under the present regulations, channeling waste into recycling and composting qualifies as waste diversion. Details of the waste disposal and diversion studies are presented in the following subsections.

2.3 Solid Waste Disposal Characterization Study

The purpose of the solid waste disposal study was to estimate the quantities of materials that were generated by the residential and business segments within the City of Palo Alto and are being disposed of by landfilling. The characterization was performed consistent with AB 939 and the *Workplan for Field Characterization at the Palo Alto Landfill* (July 1990) prepared specifically for this study by EMCON.

2.3.1 Current Waste Collection and Disposal Practices

Most of the solid waste destined for disposal is collected by the City's franchised hauler, PASCO. PASCO collects both residential and non-residential garbage, including commercial, industrial, and construction/demolition wastes. All wastes collected by PASCO for disposal are landfilled at the City-owned and operated Palo Alto landfill. A small quantity of waste destined for landfilling is delivered to the site by the City or other governmental agencies (including Caltrans and the County). Small haulers, residents, and contractors also self haul wastes directly to the

landfill. Self-haul wastes generally consist of bulky items that are not suitable for collection by PASCO's fleet of trucks.

Because of the type of waste-collection contract in Palo Alto, very little solid waste is imported or exported across the City limits. Unlike several other jurisdictions in the San Francisco Bay Area, Palo Alto exports little, if any, waste to other nearby landfills, nor does the City import waste from adjacent jurisdictions for disposal at its landfill. PASCO's routes collect waste only from within the City limits; no other commercial waste haulers are permitted to operate in Palo Alto, except self-haulers. Since the Palo Alto watershed corresponds with the City boundaries, waste quantities reported from the landfill scalehouse represent actual measurements rather than estimates.

2.3.2 Methodology

The waste disposal characterization consists of two elements of information that, when combined, yield the results required by AB 939. The first element is an estimate of the composition of each of the waste stream segments defined in Section 2.2, which are residential, commercial, industrial/roll-off, and self-haul waste. Waste composition is a description of the proportions by weight of various materials in a waste stream. Waste composition was measured using random sampling.

The second element measures the total flowrate of each waste stream segment. Flowrate is based on scalehouse records and is expressed in units of weight per time, such as tons per day.

Multiplying the flowrate for a waste stream segment by the corresponding segment's composition yields an estimate of flowrate by material types for that segment, such as the number of tons per day of newspaper or aluminum cans.

One problem that was addressed in the initial stages of the waste generation study was the difference between the waste hauler's definitions of commercial waste and AB 939's definitions. Waste collected from apartment buildings in the City are defined as commercial; however, these same wastes are defined as residential in the regulations governing AB 939. In order to comply with the regulations and to collect the most useful information for planners, the study team estimated the quantity of residential waste from apartment buildings that was collected from com-

mercial routes and added that quantity to the amount collected from residential routes.

The waste disposal characterization was conducted using the draft American Society of Testing Materials (ASTM) method. Waste composition and quantities were estimated based on the results of two one-week surveys. In order to capture seasonal effects, the first survey was performed during the dry summer season during the week of August 13 through 18, 1990, and the second survey was conducted during the wet winter season during the week of January 14 through 19, 1991.

Waste Quantity Investigations. The waste quantity investigation was conducted concurrently with the waste composition study. During the two one-week studies, scalehouse weight records were collected and summarized according to waste source. Quantities for commercial routes that also included apartment building waste were kept separately by route. Waste quantities from those mixed commercial and residential routes were then apportioned based on estimated weight and the apportioned quantities were added to the appropriate source category. Annual quantities were estimated by linear extrapolation.

Waste Composition Investigation. A sampling schedule was developed following the recommendations presented in the draft ASTM method and in the AB 939 regulations. For each of the waste segments defined in the study, a minimum number of samples was scheduled, based on the following assumptions:

1. Paper is the governing waste category for use in sampling level-of-effort calculations.
2. The coefficient of variation (COV) for paper was assumed to be 0.2 for residential waste, 0.3 for commercial and industrial waste, and 0.5 for self-haul waste.
3. The desired precision level (δ) is 0.15 (15 percent) at the 90 percent confidence level.

The minimum number of samples was calculated using the following equation:

$$n = \frac{t(\text{COV})^2}{\delta}$$

where: n = minimum number of samples budgeted for the waste segment
 t = student's t statistic
COV = Coefficient of Variation
 δ = precision level

The results of the calculations to determine the minimum number of samples are presented in Table 2-1.

Waste composition was measured by sampling and sorting waste that arrived at the City's landfill. During the first sampling period, a total of 66 samples were collected and sorted from the vehicle loads arriving at the landfill, including 12 residential, 14 commercial, 15 industrial/roll-off, and 25 self-haul samples. During the second sampling period, a total of 39 samples were collected and sorted including 20 residential and 19 commercial samples. In addition, 37 industrial loads and 34 self-haul loads were surveyed using a visual estimation technique.

Samples were generally collected from randomly selected vehicle loads. The exceptions involved commercial route vehicle loads that also contained significant quantities of waste from apartment buildings. Vehicle loads that were selected at random and found to contain both commercial and apartment building waste were either (1) abandoned and not sampled or (2) sampled only in a portion entirely representative of either apartment waste or commercial waste, but not both.

Waste loads identified for sampling and sorting were tipped in an area adjacent to the active zone of filling. Each entire load from a compacting vehicle was discharged in a linear pile. Sample collection followed the requirements of the ASTM method, except that samples were not collected by cleaving the sample from along the entire length of the pile. Instead, samples were collected using a random grid sampling technique. Each sample was taken from four to six random grid sections. The location of the sampling was determined by a random number table, so that approximately 1 cubic yard (or 200 to 400 pounds) was collected for sorting. Samples were collected by hand. Large objects that would interfere with sampling, such as furniture and appliances, were noted separately. Since samples were collected outdoors on a soil surface, care was taken to avoid introducing soil into the samples. The samples were then hand-

sorted into the material categories listed in Table 2-2 and the net weights determined. Definitions of the material categories are presented in Appendix B.

Visual Surveys. Beginning with the second season's sampling effort, waste composition for industrial and self-haul loads was estimated using a visual technique. Since industrial and self-haul loads typically contain a much smaller number of materials than are carried by residential and commercial loads, visual estimation was used to more rapidly survey a large number of vehicle loads. The visual technique was also useful for industrial and self-haul loads due to the frequency of large objects in those loads that cannot be sorted by hand. Using the visual technique, waste composition was estimated in terms of weight percent, based on the same list of material types as was used in the sorting effort.

2.3.3 Results

Waste Quantities. Results of the disposed of quantity investigation are presented in Table 2-3. In addition to the disposed-of quantities from residential, commercial, industrial/roll-off, and self-haul wastes, a separate quantity is listed for inert pavement materials that are currently being delivered to the landfill and are separately accounted for by the City. A summary of landfilled quantities yields a total of 115,255 tons annually, which amounts to 11.0 pounds per person per day (based on an estimated residential population of 57,336). Assuming an in-place landfill density of 1,200 lb/yd³, the 115,225 tons would displace 192,042 yd³.

During the two 1-week sampling periods, approximately 10 tons of waste were manually sorted from 105 vehicle samples. In addition, 71 vehicle-loads were surveyed visually. The average weight percentages for component materials found in residential, commercial, industrial/roll-off, and self-haul waste are presented in Tables 2-4 through 2-11. The composition data are presented on a net (wet weight) basis and represent the composition of the sampled refuse as it arrived at the landfill.

Waste Composition. The compositions presented in this report are component proportions expressed as percentages. For each sorted sample, the percentage of each component (e.g., newsprint) was calculated by dividing the amount of the component by the total sample weight, and then multiplying by 100. To avoid implying excessive precision, the results have been rounded to the nearest 0.01 percent. As a result of rounding,

the component proportions listed in the tables may not add up to exactly 100.0 percent.

A summary of waste composition data is presented in Table 2-12. The average "disposed of" waste composition presented in the Table 2-12 was computed by weighting the individual segment compositions by the flowrate proportions listed in Table 2-3. In Table 2-13, annual waste quantity estimates are presented for each segments by material type.

Seasonality. A comparison of the results of the summer and winter waste characterization studies yields a higher estimate of annual landfilled quantities using January data (116,482 tons) vs. August data (114,029 tons). These two studies indicate a seasonal variation of ± 1.1 percent of the mean value.

A seasonal comparison of the proportion of yard waste (the waste category that is often cited as an indicator of seasonality) indicates an annual average of 8.65 percent in Palo Alto's waste stream, with a higher proportion during the summer season (9.1 percent), and a lower proportion during the winter season (8.2 percent). Although a seasonal difference in the proportion of yard waste in the waste stream is discernable from the data, the difference is only approximately ± 5 percent of the mean value. Seasonal differences in waste composition may occur for materials other than yard waste; however, the differences are not so large as to be statistically significant at the 90 percent level.

2.4 Solid Waste Diversion Characterization

2.4.1 Objective of the Study

The objective of the waste diversion characterization study is to determine the quantity and types of materials that are currently being diverted from permitted solid waste disposal facilities. The diversion quantities reflect the amount of materials that are generated in the City and diverted from the landfill via source reduction, recycling, and composting. Only those materials normally disposed of at permitted solid waste landfills, representing at least 0.001 percent of the waste stream, count towards diversion. It is essential to document the existing level of waste reduction in order to determine what type of programs need to be implemented to reach state mandated diversion rates of 25 percent by 1995 and 50 percent by 2000.

2.4.2 Current Solid Waste Diversion Practices

The flow of materials diverted from the waste stream is more complex than that for materials destined for landfilling. This complexity occurs because the various materials follow different routes of collection and processing and are handled by many different operators. There are two California redemption centers, a curbside collection program for recyclables and yard waste, a drop-off center at the landfill, a City-sponsored office paper collection program, a cardboard collection program, a privately run bar and restaurant glass collection program, a non-profit program specializing in magazine recycling, and another non-profit program which collects newspapers and California redemption value recyclables. In addition, many private collectors divert paper, plastic, glass, metals and organic material.

The various diversion programs are described in Sections 3, 4, 5, and 6 of this document.

2.4.3 Methodology

The solid waste diversion characterization used a multi-prong approach to estimate the quantity and types of materials that were diverted from disposal in the City in 1990. Waste diversion data were obtained by (1) a survey of commercial and industrial businesses, (2) a survey of collectors and processors of recyclable materials, (3) a review of City data, and (4) telephone interviews to develop a comprehensive accounting of materials diverted from the waste stream. Records from City-sponsored collection programs (curbside, drop-off, office paper, and cardboard collection) provided data on the residential waste stream and a portion of the commercial waste stream.

Mail Survey. Since the City has no business licenses from which to generate a list of businesses to survey, the study team developed the mailing list from a variety of sources. These consisted of the Palo Alto Chamber of Commerce, the Santa Clara County Commerce and Industry Directory, the Peninsula Industrial and Business Association, and telephone listings of schools, landscapers, and nurseries. A copy of the survey forms is presented in Appendix C. A total of 691 businesses and 89 private collectors of recyclables were sent surveys; information was collected from 30 percent and 17 percent of these populations, respectively.

Cross Checking. To avoid double counting, the material flow was charted for each waste type. The survey requested that (1) the generators

report the collectors of their recyclables, and (2) the City identify the purchasers of their recyclable material. Data from generators that reported collectors for a waste type were eliminated from tabulation when those collectors also reported data for that same waste type. This approach was based on the assumption that the collectors' weight records were more accurate. The purchasers of the City recyclables who also reported data were contacted to clarify the source of their data. This approach allowed material to be counted only once and quantities to be determined with the best available data.

Source reduction data were obtained through a survey which accompanied the business recycling survey and through telephone and fax communication with a large diaper service operating in the city. Surveys documented the use of double-sided photocopying by requesting the percentage of two-sided copies made and the total amount of paper purchased yearly. A large number of businesses reported substituting ceramic coffee mugs for disposable cups, but there were insufficient data to quantify this activity.

Conversion Factors. Survey data reported as volumes were converted to weight using conversion factors from *The National Recycling Coalition Measurement Standards and Reporting Guidelines*, October 31, 1989, as shown in Appendix D, in addition to conversion factors obtained during the waste disposal characterization.

2.4.4 Results

The results of the waste diversion characterization reflect a conservative estimate of 17.5 percent. The data from the City records and from the surveys were assumed to be the total diversion characterization for the City; there was no extrapolation. The results of the diversion characterization are presented in Table 2-14 for the residential waste stream, and in Table 2-15 for the commercial/industrial waste stream. The quantities listed in these tables are estimates in annual tons for 1990. A brief discussion of the results is presented below.

Source Reduction. The surveys indicate that a total of 561 tons were source reduced in the City. A total of 447 tons of single-use diapers were diverted from the Palo Alto residential waste stream in 1990 through the use of reusable cotton diapers. The diaper service operating in the City estimated a weekly total diversion of 8.6 tons as a result of cotton diaper

usage, assuming 4,500 single-use diapers per ton of garbage.¹ The company reported serving about half of the Palo Alto cotton diaper market or 360 households, with 14 of these having 2 children in diapers, each using 50 diapers per week. In addition, the company reported serving one day care facility that uses 600 diapers per week. Therefore, the total market for cloth diapers is estimated as $2 [(360+14) 50+600] 52 = 2,007,200$ per year. Dividing this number of diapers by 4,500 disposable diapers per ton yields an estimate of 447 tons per year that are source reduced. With approximately 2,880 births annually in Palo Alto, there are approximately 7,200 children of diaper age. This results in an annual generation of 18.7 million diapers. This indicates that cloth diapers account for roughly 10 percent of the total diaper market.

A total of 114 tons of paper from commercial sources were source reduced. The surveys reported a total of 279.6 tons of paper purchased and percentages of two-sided copies made ranging from less than 1 percent to 100 percent. Each company's reported amount of paper purchased was multiplied by the percentage of two-sided copies reportedly made; the sum of each of those results was then calculated.

Residential Recycling. Based on (1) the survey of recyclers and (2) data on the City's recycling program, an estimated 7,753 tons of solid wastes were diverted by the City in 1990 by residential recycling programs. These programs include (but are not limited to) curbside recycling (6,470 tons), drop-off center recycling (776 tons), and AB 2020 (California redemption) programs (60 tons). The estimated amounts by material type are listed separately in Table 2-14 for the various residential programs.

Commercial/Industrial Recycling. The total estimate for commercial/industrial recycling was 5,758 tons. The City commercial/industrial recycling programs divert 658 tons, including cardboard, white ledger paper, metals, and special wastes. The private collectors account for 5,100 tons. This amount was reported primarily by collectors, with the remainder being reported by the waste generating companies surveyed.

Composting Program. Based on the results of the two one-week surveys, an estimated 10,810 tons of yard wastes were collected at the land-fill for composting. This data include 5,454 tons collected by the curbside

¹ Lehrburger, C. "Diapers in the Waste Stream," Beaudry Communications, Washington D.C., December 1988.

collection program, as well as 5,356 tons delivered directly to the landfill composting area.

Quantities Diverted and Disposed. Table 2-16 lists, by waste category, the estimated quantities of materials that are currently being diverted and disposed of. The table indicates a total waste stream flow rate of 139,690 tons per year for the City of Palo Alto and a total diversion rate of 17.5 percent. Summarized in graphical form in Figure 2-1 is the waste composition generated in Palo Alto in 1990.

2.5 Solid Waste Generation Projections

The planning guidelines for preparing solid waste generation studies require a forecast of solid waste to be generated with Palo Alto and that portion to be diverted and disposed of. A 15-year projection is specified following local adoption of the SRRE. Since the SRRE is due in 1991, the forecast period extends to the year 2005.

The planning guidelines specify acceptable sources of information on which to base forecasts. From the list of acceptable sources, Palo Alto elected to base projected growth in waste generation on the State Department of Finance's forecast for population growth. The Department of Finance projects a population growth rate of 1 percent per year. Assuming no change in the rate of waste generation per person, the study team has projected a growth rate in the waste stream of 1 percent per year.

Waste generation projections are presented in Tables 2-17 and 2-18. Table 2-17 presents projections of waste diverted and disposed of, assuming continuation of current programs. Table 2-18 presents projections based on assuming implementation of the programs selected in the SRRE.

2.6 Waste Generation Analysis

2.6.1 Introduction

The solid waste generation analysis undertaken for the City was based on the results of the solid waste generation study. It identified the quantities of materials generated in the City of Palo Alto, by waste category, that are currently being diverted and disposed.

The waste generation analysis contains a list of the materials that are currently being disposed of that will be diverted through the programs identified in Sections 4 through 7 of the SRRE. The materials which will not be diverted from disposal and a justification of why are also included.

2.6.2 Quantities Diverted and Disposed

Table 2-16 lists, by waste category, the quantities of materials that are currently being diverted and disposed. Only those materials that are defined by AB 939 as "solid waste" are included in the quantities. Some special waste generated in Palo Alto are not considered as "solid waste" under AB 939. Therefore, those quantities are not shown in the table.

2.6.3 Materials Targeted for Diversion

The following is a list of materials that are currently disposed of in Palo Alto that are targeted for potential through the diversion programs identified in the Source Reduction, Recycling, Composting, and Special Wastes components (Sections 4 through 7). Only those materials that can be counted towards the AB 939 diversion mandates are shown.

Paper:

- corrugated containers
- mixed paper
- newspaper
- high-grade ledger paper

Metals:

- aluminum cans
- other ferrous
- non-ferrous, incl. alum. scrap
- bi-metal containers
- white goods
- steel food and bev. cans

Plastics:

- polystyrene
- PET containers
- HDPE containers

Other organics:

- yard waste
- tires/rubber
- wood wastes
- textiles/leather

Glass:

- CA Redemption Value
- other recyclable glass
- refillable beverage containers

Other wastes:

- inert solids

2.6.4 Materials Targeted for Disposal

The following list identifies the materials that are currently being disposed of in Palo Alto that will not be diverted from disposal by the programs identified in Sections 4 through 7. The programs identified in Sections 4 through 7 do not target the following list of materials because (1) the materials are nonrecyclable, (2) the quantity being disposed of is insignificant, or (3) there is no market (existing or future). Only those materials that qualify as solid waste under AB 939 are shown.

Paper:

other paper

Glass:

other non-recyclable glass

Plastics:

film plastics

other plastics

Other organics:

food waste

Table 2-1
Calculation of Sampling Level of Effort

Waste Segment	Assumed Parameters			Number of Samples n
	δ	t ¹	COV	
Residential	0.15	1.87	0.2	7
Commercial/Industrial	0.15	1.77	0.3	13
Self-Haul	0.15	1.67	0.6	45
1. Student's t-statistic.				

Table 2-2
Waste Types For Sampling

PAPER

Corrugated
Newspaper
High grade paper
Mixed paper
Magazines
Other paper (non-recyclable)

PLASTICS

HDPE containers
PET containers
Film plastics
Polystyrene foam
Other plastics

YARD WASTES

Grass, leaves
Branches, brush

OTHER ORGANICS

Food waste
Tires/rubber
Wood
Agri. Crop Residue
Manure
Textiles/leather
Diapers
Misc. organics

GLASS

CA Redemption Value
Refillable bev. containers
Other recyclable glass
Other non-recyclable glass

METALS

Aluminum cans
Aluminium scrap
Tin cans
Ferrous metals
Bi-metal cans
Non-ferrous
White goods

OTHER WASTES

Misc. inorganics
HHW
Appliances

SPECIAL WASTES

Table 2-3
 Summary of Waste Disposal Quantities
 City of Palo Alto (1990)

Source	Tons Per Day-7 (1)	Tons Per Year	Percent
Residential	57.7	21,069	18.3
Commercial	95.7	34,933	30.3
Industrial/Roll-off	88.5	32,310	28.0
Self-Haul	19.0	6,953	6.0
City/CIP (2)	54.8	19,990	17.3
Total	315.8	115,255	100.0

1. Based on a 7-day week.
 2. Capital Improvement Programs

Table 2-4
 Statistical Summary of Waste Disposal Composition
 City of Palo Alto-Residential Waste-Study (August 1990)

Samples collected =12

Component	Average Composition (weight percent)	Sample Standard Deviation (percent)	90% Confidence Interval (+/-percent)
PAPER: (total)	54.84		
OCC/Kraft	5.70	11.58	6.00
Mixed paper	23.31	13.27	6.88
Newspaper	5.29	5.10	2.65
High Grade	3.71	6.99	3.62
Other Paper	16.84	13.37	6.93
PLASTICS: (total)	9.52		
HDPE	0.78	1.14	0.59
PET	0.70	1.84	0.96
Film	4.10	3.38	1.75
Polystyrene	0.60	0.45	0.23
Other Plastics	3.34	2.91	1.51
GLASS: (total)	3.10		
Refillable Beverage	0.41	0.98	0.51
CA Redemption Value	0.45	0.63	0.33
Other Recyclable	0.90	0.98	0.51
Other Non-Recyclable	1.32	2.07	1.07
METALS: (total)	3.12		
Aluminum Cans	0.52	0.75	0.39
Bi-metal containers	0.03	0.09	0.05
Ferrous metals and tin cans	1.67	1.17	0.61
Non-ferrous	0.91	2.36	1.22
White goods	0.00	0.00	0.00
YARD WASTE: (total)	13.27	13.27	9.33
OTHER ORGANICS: (total)	14.82		
Food	8.60	7.08	3.67
Tires/Rubber	0.56	1.57	0.81
Wood	3.18	5.38	2.79
Agri. Crop Residues	0.00	0.00	0.00
Manure	0.00	0.00	0.00
Textiles/Leather	2.47	3.70	1.92
OTHER WASTES: (total)	1.34		
Inert Solids	0.68	2.10	1.09
Hazardous Waste	0.66	1.97	1.02
SPECIAL WASTES: (total)	0.00		
Ash	0.00	0.00	0.00
Sewage Sludge	0.00	0.00	0.00
Industrial Sludge	0.00	0.00	0.00
Asbestos	0.00	0.00	0.00
Auto shredder waste	0.00	0.00	0.00
Auto bodies	0.00	0.00	0.00
Stuffed furn./Mattresses	0.00	0.00	0.00
TOTAL	100.00		

Table 2-5
 Statistical Summary of Waste Disposal Composition
 City of Palo Alto-Commercial Waste-Study (August 1990)

Component	Average Composition (weight percent)	Sample Standard Deviation (percent)	90% Confidence Interval (+/-percent)
Samples collected= 18			
PAPER: (total)	40.16		
OCC/Kraft	6.57	4.73	1.94
Mixed paper	17.06	15.53	6.37
Newspaper	4.13	3.27	1.34
High Grade	6.19	11.12	0.00
Other Paper	5.86	9.64	3.95
PLASTICS: (total)	9.55		
HDPE	1.32	1.94	0.80
PET	0.06	0.13	0.05
Film	3.41	4.34	1.78
Polystyrene	0.69	0.94	0.39
Other Plastics	4.07	4.98	2.04
GLASS: (total)	2.43		
Refillable Beverage	0.00	0.00	0.00
CA Redemption Value	1.16	1.67	0.69
Other Recyclable	0.44	1.16	0.47
Other Non-Recyclable	0.84	1.81	0.74
METALS: (total)	7.66		
Aluminum Cans	0.30	0.38	0.16
Bi-metal containers	0.22	0.75	0.31
Ferrous metals and tin cans	5.58	8.83	3.62
Non-ferrous	0.19	0.53	0.22
White goods	1.37	0.00	0.00
YARD WASTE: (total)	14.83	14.83	27.17
OTHER ORGANICS: (total)	19.06		
Food	4.87	4.95	2.03
Tires/Rubber	0.77	1.83	0.75
Wood	5.44	10.43	4.28
Agri. Crop Residues	0.00	0.00	0.00
Manure	0.00	0.00	0.00
Textiles/Leather	7.97	23.85	9.78
OTHER WASTES: (total)	6.30		
Inert Solids	6.23	17.51	7.18
Hazardous Waste	0.08	0.20	0.08
SPECIAL WASTES: (total)	0.00		
Ash	0.00	0.00	0.00
Sewage Sludge	0.00	0.00	0.00
Industrial Sludge	0.00	0.00	0.00
Asbestos	0.00	0.00	0.00
Auto shredder waste	0.00	0.00	0.00
Auto bodies	0.00	0.00	0.00
Stuffed furn./Mattresses	0.00	0.00	0.00
TOTAL	100.00		

Table 2-6
Statistical Summary of Waste Disposal Composition
City of Palo Alto-Industrial Waste-Study (August 1990)

Samples Collected = 11			Sample	90%
	Average	Standard	Deviation	Confidence
COMPONENT	Composition	(percent)	(+/-	percent)
	(weight percent)			
PAPER: (total)	22.55			
OCC/Kraft	7.25	0.10		5.46
Mixed paper	7.92	0.17		9.23
Newspaper	2.56	0.07		3.63
High Grade	1.93	0.06		3.21
Other Paper	2.90	0.05		2.62
PLASTICS: (total)	6.38			
HDPE	0.00	0.00		0.00
PET	0.05	0.00		0.09
Film	2.42	0.04		2.13
Polystyrene	2.25	0.07		3.61
Other Plastics	1.65	0.03		1.54
GLASS: (total)	1.37			
Refillable Beverage	0.01	0.00		0.01
CA Redemption Value	0.09	0.00		0.15
Other Recyclable	0.08	0.00		0.15
Other Non-Recyclable	1.18	0.02		1.26
METALS: (total)	19.73			
Aluminum Cans	0.06	0.00		0.08
Bi-metal containers	0.00	0.00		0.00
Ferrous metals and tin cans	18.43	0.25		13.55
Non-ferrous	1.23	0.04		2.12
White goods	0.00	0.00		0.00
YARD WASTE: (total)	1.97	1.97	0.05	2.48
OTHER ORGANICS: (total)	32.14			
Food	0.42	0.01		0.76
Tires/Rubber	0.00	0.00		0.00
Wood	29.16	0.31		16.76
Agri. Crop Residues	0.00	0.00		0.00
Manure	0.00	0.00		0.00
Textiles/Leather	2.56	0.05		2.55
OTHER WASTES: (total)	15.88			
Inert Solids	15.80	0.32		17.45
Hazardous Waste	0.07	0.00		0.13
SPECIAL WASTES: (total)	0.00			
Ash	0.00	0.00		0.00
Sewage Sludge	0.00	0.00		0.00
Industrial Sludge	0.00	0.00		0.00
Asbestos	0.00	0.00		0.00
Auto shredder waste	0.00	0.00		0.00
Auto bodies	0.00	0.00		0.00
Stuffed furn./Mattresses	0.00	0.00		0.00
TOTAL	100.00			

Table 2-7
Statistical Summary of Waste Disposal Composition
City of Palo Alto-Self Haul Waste-Study (August 1990)

Samples collected = 26				
COMPONENT	Average Composition (weight percent)	Sample Standard Deviation (percent)	90% Confidence Interval (+/-percent)	
PAPER: (total)	2.56			
OCC/Kraft	0.85	3.80	1.51	
Mixed paper	0.66	2.40	0.95	
Newspaper	0.12	0.53	0.21	
High Grade	0.00	0.00	0.00	
Other Paper	0.93	3.30	1.31	
PLASTICS: (total)	3.73			
HDPE	0.00	0.00	0.00	
PET	0.01	0.06	0.03	
Film	0.19	0.85	0.34	
Polystyrene	0.36	1.62	0.64	
Other Plastics	3.16	14.16	5.62	
GLASS: (total)	0.05			
Refillable Beverage	0.00	0.00	0.00	
CA Redemption Value	0.00	0.00	0.00	
Other Recyclable	0.00	0.00	0.00	
Other Non-Recyclable	0.05	0.22	0.09	
METALS: (total)	13.89			
Aluminum Cans	0.02	0.11	0.04	
Bi-metal containers	0.00	0.00	0.00	
Ferrous metals and tin cans	12.79	29.38	11.66	
Non-ferrous	1.07	3.70	146.75	
White goods	0.00	0.00	0.00	
YARD WASTE: (total)	18.26	18.26	37.67	14.95
OTHER ORGANICS: (total)	38.00			
Food	0.80	3.56	1.41	
Tires/Rubber	0.00	0.00	0.00	
Wood	18.25	31.12	12.35	
Agri. Crop Residues	0.00	0.00	0.00	
Manure	0.00	0.00	0.00	
Textiles/Leather	18.95	42.30	16.79	0.00
OTHER WASTES: (total)	23.52			
Inert Solids	23.52	46.17	18.33	
Hazardous Waste	0.00	0.00	0.00	
SPECIAL WASTES: (total)	0.00			
Ash	0.00	0.00	0.00	
Sewage Sludge	0.00	0.00	0.00	
Industrial Sludge	0.00	0.00	0.00	
Asbestos	0.00	0.00	0.00	
Auto shredder waste	0.00	0.00	0.00	
Auto bodies	0.00	0.00	0.00	
Stuffed furn./Mattresses	0.00	0.00	0.00	
TOTAL	100.00			

Table 2-8
 Statistical Summary of Waste Disposal Composition
 City of Palo Alto-Residential Waste-Study (January 1991)

Samples collected = 20

Material	Average Composition (weight percent)	Sample Standard Deviation (percent)	90% Confidence Interval (+/- percent)
Paper: (total)	42.67	8.87	3.43
OCC/Kraft	6.23	3.28	1.27
Magazines	4.64	3.90	1.51
Mixed Paper	16.64	6.29	2.43
Newsprint	5.37	2.90	1.12
High Grade	2.55	2.35	0.91
Other Paper	7.24	3.45	1.33
Plastic: (total)	8.90	2.93	1.14
HDPE	0.86	0.48	0.19
PET	0.32	0.23	0.09
Film	3.30	1.38	0.53
Polystyrene Foam	0.72	1.08	0.42
Other Plastic	3.70	1.98	0.77
Glass: (total)	5.17	3.38	1.31
Refillable Beverage	0.11	0.51	0.20
CA Redemption Value	1.29	1.48	0.57
Other Recyclable	3.48	3.21	1.24
Other Non-Recyclable	0.28	0.42	0.16
Metals: (total)	6.71	5.98	2.31
Aluminum Cans	0.28	0.26	0.10
Other Aluminum	0.50	0.58	0.23
Bi-metal Cans	0.07	0.31	0.12
Steel Food & Bev. Cans	2.04	1.22	0.47
Other Ferrous	2.29	3.98	1.54
Other Non-ferrous	0.54	1.14	0.44
White Goods	0.98	4.39	1.70
Yard Waste: (total)	7.86	7.63	2.95
Leaves and Grass	7.45	7.71	2.98
Branches and Brush	0.42	1.14	0.44
Other Organics: (total)	26.63	10.04	3.88
Food	14.54	6.83	2.64
Rubber/Tires	0.86	1.83	0.71
Wood	2.84	5.62	2.18
Agri. Crop Residue	0.08	0.35	0.14
Manure	0.00	0.00	0.00
Textiles/Leather	3.45	3.16	1.22
Diapers	2.59	2.80	1.08
Other Organics	2.28	2.20	0.85
Other Waste: (total)	0.97	1.86	0.72
Inert Solids	0.85	1.69	0.65
Hazardous Waste	0.07	0.12	0.05
Appliances	0.04	0.18	0.07
Special Wastes: (total)	1.09	4.86	1.88
Ash	0.00	0.00	0.00
Sewage Sludge	0.00	0.00	0.00
Industrial Sludge	0.00	0.00	0.00
Asbestos	0.00	0.00	0.00
Auto Shredder Waste	0.00	0.00	0.00
Auto Bodies	1.09	4.86	1.88
Stuffed Furn./Mattresses	0.00	0.00	0.00
Total	100.00		

Table 2-9
Statistical Summary of Waste Disposal Composition
City of Palo Alto-Commercial Waste-Study (January 1991)

Samples collected = 19

Material	Average Composition (weight percent)	Sample Standard Deviation (percent)	90% Confidence Interval (+/- percent)
Paper: (total)	55.53	12.51	4.97
OCC/Kraft	10.93	6.46	2.57
Magazines	5.19	4.29	1.70
Mixed Paper	13.04	4.76	1.89
Newsprint	5.22	3.12	1.24
High Grade	11.35	7.95	3.16
Other Paper	9.80	4.15	1.65
Plastic: (total)	10.53	6.20	2.46
HDPE	0.58	0.93	0.37
PET	0.13	0.25	0.10
Film	2.84	1.71	0.68
Polystyrene Foam	1.23	1.78	0.71
Other Plastic	5.74	5.37	2.13
Glass: (total)	4.12	4.84	1.92
Refillable Beverage	0.00	0.00	0.00
CA Redemption Value	1.75	1.93	0.77
Other Recyclable	2.16	3.95	1.57
Other Non-Recyclable	0.21	0.35	0.14
Metals: (total)	2.59	1.67	0.66
Aluminum Cans	0.35	0.31	0.12
Other Aluminum	0.29	0.37	0.15
Bi-metal Cans	0.00	0.01	0.01
Steel Food & Bev. Cans	0.83	0.86	0.34
Other Ferrous	0.89	1.07	0.43
Other Non-ferrous	0.23	0.83	0.33
White Goods	0.00	0.00	0.00
Yard Wastes: (total)	4.59	6.69	2.65
Leaves and Grass	3.88	6.39	2.53
Branches and Brush	0.72	3.12	1.24
Other Organics: (total)	18.99	11.07	4.39
Food	9.70	7.53	2.99
Rubber/Tires	1.38	2.54	1.01
Wood	4.19	6.49	2.57
Agri. Crop Residue	0.00	0.00	0.00
Manure	0.00	0.00	0.00
Textiles/Leather	0.72	0.98	0.39
Diapers	0.68	1.30	0.52
Other Organics	2.34	3.95	1.57
Other Wastes: (total)	1.56	3.97	1.58
Inert Solids	0.74	1.46	0.58
Hazardous Waste	0.01	0.02	0.01
Appliances	0.81	3.49	1.38
Special Wastes: (total)	2.09	7.39	2.93
Ash	0.00	0.00	0.00
Sewage Sludge	0.00	0.00	0.00
Industrial Sludge	0.00	0.00	0.00
Asbestos	0.00	0.00	0.00
Auto Shredder Waste	0.00	0.00	0.00
Auto Bodies	2.09	7.39	2.93
Stuffed Furn./Mattresses	0.00	0.00	0.00
Total	100.00		

Table 2-10
Statistical Summary of Waste Disposal Composition
City of Palo Alto-Industrial Waste-Study (January 1991)

Samples collected = 37

Material	Average Composition (weight percent)	Sample Standard Deviation (percent)	90% Confidence Interval (+/- percent)
Paper: (total)	10.72	21.33	5.89
OCC/Kraft	7.54	16.68	4.11
Magazines	0.03	0.16	0.03
Mixed Paper	0.96	2.23	0.57
Newsprint	0.08	0.36	0.09
High Grade	0.35	1.67	0.46
Other Paper	1.76	5.43	1.50
Plastic: (total)	4.33	8.02	2.21
HDPE	0.08	0.36	0.10
PET	0.00	0.00	0.00
Film	0.45	1.16	0.32
Polystyrene Foam	0.26	0.93	0.26
Other Plastic	3.54	7.11	1.96
Glass: (total)	0.04	0.18	0.05
Refillable Beverage	0.00	0.00	0.00
CA Redemption Value	0.01	0.08	0.02
Other Recyclable	0.00	0.00	0.00
Other Non-Recyclable	0.03	0.16	0.05
Metals: (total)	6.95	12.28	3.39
Aluminum Cans	0.00	0.00	0.00
Other Aluminum	0.00	0.00	0.00
Bi-metal Cans	0.00	0.00	0.00
Steel Food & Bev. Cans	0.89	4.94	1.37
Other Ferrous	6.03	11.73	3.24
Other Non-ferrous	0.03	0.16	0.05
White Goods	0.00	0.00	0.00
Yard Wastes: (total)	13.11	29.04	8.02
Leaves and Grass	2.16	8.86	2.45
Branches and Brush	10.95	28.52	7.88
Other Organics: (total)	30.03	28.49	7.87
Food	0.00	0.00	0.00
Rubber/Tires	2.65	11.53	3.18
Wood	24.87	28.24	7.80
Agri. Crop Residue	0.00	0.00	0.00
Manure	0.00	0.00	0.00
Textiles/Leather	2.38	10.04	2.77
Diapers	0.00	0.00	0.00
Other Organics	0.14	0.82	0.23
Other Wastes: (total)	33.45	35.57	9.82
Inert Solids	33.42	36.20	10.00
Hazardous Waste	0.00	0.00	0.00
Appliances	0.03	0.16	0.05
Special Wastes: (total)	1.38	1.81	0.50
Ash	0.00	0.00	0.00
Sewage Sludge	0.00	0.00	0.00
Industrial Sludge	0.00	0.00	0.00
Asbestos	0.00	0.00	0.00
Auto Shredder Waste	0.00	0.00	0.00
Auto Bodies	0.30	1.81	0.50
Stuffed Furn./Mattresses	1.08	5.16	1.42
Total	100.00		

Table 2-11
 Statistical Summary of Waste Disposal Composition
 City of Palo Alto-Self Haul Waste-Study (January 1991)

Samples collected = 34

Material	Average Composition (weight percent)	Sample Standard Deviation (percent)	90% Confidence Interval (+/- percent)
Paper: (total)	7.53	19.70	5.74
OCC/Kraft	3.17	8.41	2.45
Magazines	0.02	0.08	0.02
Mixed Paper	4.03	16.29	4.75
Newsprint	0.08	0.34	0.10
High Grade	0.03	0.14	0.04
Other Paper	0.20	0.88	0.26
Plastic: (total)	3.24	11.28	3.29
HDPE	0.01	0.03	0.01
PET	0.00	0.02	0.00
Film	0.33	1.12	0.33
Polystyrene Foam	0.09	0.37	0.11
Other Plastic	2.81	11.26	3.28
Glass: (total)	0.20	0.88	0.26
Refillable Beverage	0.00	0.00	0.00
CA Redemption Value	0.03	0.14	0.04
Other Recyclable	0.02	0.08	0.02
Other Non-Recyclable	0.15	0.86	0.25
Metals: (total)	2.88	8.61	2.51
Aluminum Cans	0.00	0.02	0.01
Other Aluminum	0.00	0.00	0.00
Bi-metal Cans	0.02	0.08	0.02
Steel Food & Bev. Cans	0.01	0.03	0.01
Other Ferrous	2.85	8.62	2.51
Other Non-ferrous	0.00	0.00	0.00
White Goods	0.00	0.00	0.00
Yard Wastes: (total)	36.91	42.50	12.39
Leaves and Grass	9.48	24.74	7.21
Branches and Brush	27.42	41.22	12.02
Other Organics: (total)	24.10	35.25	10.28
Food	2.35	12.85	3.75
Rubber/Tires	0.38	1.78	0.52
Wood	17.75	34.29	10.00
Agri. Crop Residue	0.00	0.00	0.00
Manure	0.88	5.14	1.50
Textiles/Leather	1.52	4.38	1.28
Diapers	0.02	0.08	0.02
Other Organics	1.20	5.23	1.52
Other Wastes: (total)	13.13	37.53	10.94
Inert Solids	13.13	31.65	9.23
Hazardous Waste	0.00	0.01	0.00
Appliances	0.00	0.00	0.00
Special Wastes: (total)	12.00	22.72	6.62
Ash	0.00	0.00	0.00
Sewage Sludge	0.00	0.00	0.00
Industrial Sludge	0.00	0.00	0.00
Asbestos	0.00	0.00	0.00
Auto Shredder Waste	0.00	0.00	0.00
Auto Bodies	5.97	22.72	6.62
Stuffed Furn./Mattresses	6.03	23.86	6.96
Total	100.00		

Table 2-12
Summary Of Waste Disposal Composition Results (Weight Percent)
 City of Palo Alto

	Residential	Commercial	Industrial	Self Haul	City Public Works/CIP*	Total
PAPER (total)	48.78	47.84	18.83	5.05	0.00	28.38
OCC/Kraft	5.96	8.75	7.40	2.01	0.00	5.94
Magazines	4.86	5.03	0.12	0.01	0.00	2.45
Mixed Paper	17.43	12.62	4.33	2.34	0.00	8.37
Newsprint	5.33	4.67	1.32	0.10	0.00	2.77
High Grade	3.13	8.77	1.14	0.02	0.00	3.55
Other Paper	12.04	8.00	2.33	0.57	0.00	5.31
PLASTICS (total)	8.21	10.04	5.35	3.48	0.00	6.44
HDPE	0.82	0.95	0.04	0.00	0.00	0.45
PET	0.51	0.10	0.03	0.01	0.00	0.13
Film	3.70	3.13	1.44	0.26	0.00	2.04
Polystyrene Foam	0.66	0.96	1.25	0.23	0.00	0.78
Other Plastic	3.52	4.91	2.60	2.99	0.00	3.04
GLASS (total)	4.13	3.28	0.71	0.13	0.00	1.95
Refillable Beverage	0.26	0.00	0.00	0.00	0.00	0.05
CA Redemption Value	0.87	1.46	0.05	0.02	0.00	0.62
Other Recyclable	2.19	1.30	0.04	0.01	0.00	0.81
Other Non-Recyclable	0.80	0.52	0.61	0.10	0.00	0.48
METALS (total)	4.31	4.44	13.34	7.05	0.00	6.46
Aluminum Cans	0.40	0.33	0.03	0.01	0.00	0.18
Other Aluminum	0.47	0.20	0.00	0.00	0.00	0.15
Bi-metal Cans	0.05	0.11	0.00	0.01	0.00	0.04
Steel Food & Bev. Cans	1.41	1.77	1.63	0.02	0.00	1.25
Other Ferrous	1.58	1.88	11.04	7.81	0.00	4.43
Other Non-ferrous	0.51	0.16	0.63	0.00	0.00	0.32
White Goods	0.49	0.00	0.00	0.00	0.00	0.09
YARD WASTE (total)	10.57	8.71	7.54	27.38	0.00	8.65
Leaves and Grass	10.01	8.20	1.24	7.09	0.00	5.09
Branches and Brush	0.56	1.52	6.29	20.50	0.00	3.56
OTHER ORGANICS (total)	20.72	19.02	31.08	31.59	0.00	20.17
Food	10.99	6.81	0.00	1.44	0.00	4.16
Rubber/Tires	0.71	1.07	1.32	0.19	0.00	0.84
Wood	3.01	4.81	27.01	18.00	0.00	10.67
Agri. Crop Residue	0.04	0.00	0.00	0.00	0.00	0.01
Manure	0.00	0.00	0.00	0.44	0.00	0.03
Textiles/Leather	2.43	2.42	2.47	10.12	0.00	2.48
Diapers	1.82	2.27	0.00	0.12	0.00	1.03
Other Organics	1.72	1.64	0.28	1.27	0.00	0.97
OTHER WASTES (total)	1.18	4.62	24.88	18.32	0.00	26.97
Inert Solids	0.76	3.48	24.61	18.32	100.00	26.54
Hazardous Waste	0.37	0.04	0.04	0.00	0.00	0.09
Appliances	0.02	1.09	0.01	0.00	0.00	0.34
SPECIAL WASTES (total)	0.54	1.05	0.58	6.00	0.00	0.97
Ash	0.00	0.00	0.00	0.00	0.00	0.00
Sewage Sludge	0.00	0.00	0.00	0.00	0.00	0.00
Industrial Sludge	0.00	0.00	0.00	0.00	0.00	0.00
Asbestos	0.00	0.00	0.00	0.00	0.00	0.00
Auto Shredder Waste	0.00	0.00	0.00	0.00	0.00	0.00
Auto Bodies	0.54	1.05	0.15	2.99	0.00	0.64
Stuffed Furn./Mattresses	0.00	0.00	0.54	3.01	0.00	0.33
TOTAL	180.00	180.00	180.00	100.00	100.00	100.00

Table 2-13
Summary Of Waste Disposal Quantities (Tons, 1990)
 City of Palo Alto

	Residential	Commercial	Industrial	Self Haul	City Public Works/CIP	Total
PAPER (total)	10,272	16,713	5,374	351	0	32,711
OCC/Kraft	1,257	3,057	2,390	140	0	6,844
Magazines	1,024	1,756	39	1	0	2,820
Mixed Paper	3,673	4,409	1,399	163	0	9,645
Newsprint	1,123	1,632	426	7	0	3,188
High Grade	659	3,063	368	1	0	4,092
Other Paper	2,537	2,796	752	39	0	6,123
PLASTICS (total)	1,341	3,506	1,730	242	0	7,419
HDPE	173	332	13	0	0	518
PET	107	34	8	1	0	150
Film	779	1,092	464	18	0	2,353
Polystyrene Foam	139	395	405	16	0	895
Other Plastic	742	1,714	839	208	0	3,502
GLASS (total)	878	1,145	228	8	0	2,252
Refillable Beverage	55	0	1	0	0	57
CA Redemption Value	184	509	17	1	0	711
Other Recyclable	462	453	14	1	0	930
Other Non-Recyclable	169	183	196	7	0	555
METALS (total)	1,035	1,552	4,308	546	0	7,442
Aluminum Cans	84	114	10	1	0	209
Other Aluminum	99	69	0	0	0	168
Bi-metal Cans	10	39	0	1	0	49
Steel Food & Bev. Cans	298	617	528	1	0	1,444
Other Ferrous	334	658	3,568	543	0	5,103
Other Non-ferrous	107	55	204	0	0	366
White Goods	103	0	0	0	0	103
YARD WASTE (total)	2,226	3,333	2,433	1,918	0	9,372
Leaves and Grass	2,108	2,863	402	493	0	5,866
Branches and Brush	118	530	2,033	1,425	0	4,106
OTHER ORGANICS (total)	4,366	6,646	10,033	2,196	0	23,251
Food	2,315	2,390	0	100	0	4,794
Rubber/Tires	150	376	428	13	0	967
Wood	635	1,681	8,728	1,252	0	12,296
Agr. Crop Residue	8	0	0	0	0	8
Manure	0	0	0	31	0	31
Textiles/Leather	511	844	798	704	0	2,857
Diapers	384	792	0	9	0	1,185
Other Organics	363	573	90	88	0	1,114
OTHER WASTES (total)	243	1,619	7,858	1,274	18,890	31,088
Inert Solids	161	1,217	7,952	1,274	19,990	30,594
Hazardous Waste	77	14	12	0	0	104
Appliances	5	381	4	0	0	390
SPECIAL WASTES (total)	114	385	223	417	0	1,119
Ash	0	0	0	0	0	0
Sewage Sludge	0	0	0	0	0	0
Industrial Sludge	0	0	0	0	0	0
Asbestos	0	0	0	0	0	0
Auto Shredder Waste	0	0	0	0	0	0
Auto Bodies	114	365	48	208	0	735
Stuffed Furn./Mattresses	0	0	175	210	0	384
TOTAL	21,069	34,933	32,310	6,953	18,990	115,255

Table 2-14
 Diversion Rates By Material For Residential Waste (Tons, 1990)
 City of Palo Alto

MATERIAL	DISPOSED	DIVERTED				GENERATED	DIVERSION RATE (%)
		Source Reduction	Curbside	Lndfl. Dropoff Programs	20/20 Composting Programs		
PAPER (total)	10,272					13,285	
OCC/Kraft	1,257	0	280	0	0	1,537	18
Magazines	1,024	0	0	0	0	1,024	0
Mixed Paper	3,673	0	0	0	0	3,673	0
Newsprint	1,123	0	4,232	481	0	5,836	81
High Grade	659	0	0	0	0	659	0
Other Paper	2,537	0	0	0	0	2,537	0
PLASTICS (total)	1,341					1,950	
HDPE	173	0	0	0	0	173	0
PET	107	0	7	1	0	116	8
Polystyrene Foam	779	0	0	0	0	779	0
Film	139	0	0	0	0	139	0
Other Plastic	742	0	0	0	0	742	0
GLASS (total)	870					2,540	
Refillable Beverage	55	0	0	0	0	55	0
CA Redemption Value	184	0	669	280	53	1,186	84
Other Recyclable	462	0	668	0	0	1,130	59
Other Non-Recyclable	169	0	0	0	0	169	0
METALS (total)	1,035					1,569	
Aluminum Cans	84	0	50	6	0	146	42
Other Aluminum	99	0	0	8	0	107	7
Bi-metal Cans	10	0	0	0	0	10	0
Steel Food & Bev. Cans	298	0	87	0	0	385	23
Other Ferrous	334	0	475	0	0	809	59
Other Non-ferrous	107	0	0	0	0	107	0
White Goods	103	0	2	0	0	105	2
YARD WASTE (total)	2,225					7,680	
Leaves and Grass	2,108	0	0	0	5,151	7,259	71
Branches and Brush	118	0	0	0	303	421	72
OTHER ORGANICS (total)	4,366					4,813	
Food	2,315	0	0	0	0	2,315	0
Rubber/Tires	150	0	0	0	0	150	0
Wood	635	0	0	0	0	635	0
Agri. Crop Residue	8	0	0	0	0	8	0
Manure	0	0	0	0	0	0	0
Textiles/Leather	511	0	0	0	0	511	0
Diapers	384	447	0	0	0	831	54
Other Organics	363	0	0	0	0	363	0
OTHER WASTES (total)	243					243	
Inert Solids	161	0	0	0	0	161	0
Hazardous Waste	77	0	0	0	0	77	0
Appliances	5	0	0	0	0	5	0
SPECIAL WASTES (total)	114					114	
Ash	0	0	0	0	0	0	0
Sewage Sludge	0	0	0	0	0	0	0
Industrial Sludge	0	0	0	0	0	0	0
Asbestos	0	0	0	0	0	0	0
Auto Shredder Waste	0	0	0	0	0	0	0
Auto Bodies	114	0	0	0	0	114	0
Stuffed Furn./Mattresses	0	0	0	0	0	0	0
TOTAL	21,089	447	6,470	778	60	34,278	33
					5,454		
					13,207		

Table 2-15
 Diversion Rates By Material For Non-Residential Waste (Tons, 1990)
 City of Palo Alto

MATERIAL	DISPOSED	DIVERTED			GENERATED	DIVERSION RATE (%)
		Source Reduction	City C/I** Programs	Other C/I Diversion		
PAPER (total)	22,439				26,332	
OCC/Kraft	5,587	0	495	1,410	0	1,905
Magazines	1,796	0	0	0	0	0
Mixed Paper	5,971	0	0	1,320	0	1,320
Newsprint	2,066	0	0	3	0	3
High Grade	3,432	114	103	448	0	665
Other Paper	3,586	0	0	0	0	0
PLASTICS (total)	6,779					
HDPE	345	0	0	1	0	1
PET	42	0	0	0	0	0
Polystyrene Foam	1,574	0	0	0	0	0
Film	756	0	0	2	0	2
Other Plastic	2,761	0	0	53	0	53
GLASS (total)	1,362					
Refillable Beverage	1	0	0	0	0	0
CA Redemption Value	527	0	0	555	0	555
Other Recyclable	468	0	0	45	0	45
Other Non-Recyclable	386	0	0	0	0	0
METALS (total)	6,407					
Aluminum Cans	124	0	0	2	0	2
Other Aluminum	69	0	0	195	0	195
Bi-metal Cans	39	0	0	0	0	0
Steel Food & Bev. Cans	1,146	0	0	0	0	0
Other Ferrous	4,769	0	0	356	0	356
Other Non-ferrous	259	0	0	0	0	0
White Goods	0	0	46	0	0	46
YARD WASTE (total)	7,748					
Leaves and Grass	3,758	0	0	0	2,678	2,678
Branches and Brush	3,988	0	0	0	2,678	2,678
OTHER ORGANICS (total)	18,885					
Food	2,479	0	0	0	0	0
Rubber/Tires	817	0	0	0	0	0
Wood	11,661	0	0	210	0	210
Agri. Crop Residue	0	0	0	0	0	0
Manure	31	0	0	0	0	0
Textiles/Leather	2,345	0	0	0	0	0
Diapers	801	0	0	0	0	0
Other Organics	751	0	0	0	0	0
OTHER WASTES (total)	20,845					
Inert Solids	30,433	0	0	500	0	500
Hazardous Waste	26	0	0	0	0	0
Appliances	385	0	0	0	0	0
SPECIAL WASTES (total)	1,205					
Ash	0	0	0	0	0	0
Sewage Sludge	0	0	0	0	0	0
Industrial Sludge	0	0	0	0	0	0
Asbestos	0	0	0	0	0	0
Auto Shredder Waste	0	0	0	0	0	0
Auto Bodies	621	0	0	0	0	0
Stuffed Furn. Mattresses	384	0	14	0	0	14
TOTAL	94,185	114	633	3,100	5,358	11,228
						11

*Capital Improvement Programs
 **Commercial and industrial

Table 2-16
 Summary Of Wastes Disposed, Diverted And Generated (1990)
 City of Palo Alto

WASTE CATEGORY	DISPOSED		DIVERTED		GENERATED	
	Tons	%*	Tons	%*	Tons	%*
Paper	32,711	23.4	8,886	6.4	41,597	29.8
Plastics	7,419	5.3	65	0.0	7,484	5.4
Glass	2,252	1.6	2,270	1.6	4,522	3.2
Metals	7,442	5.3	1,233	0.9	8,675	6.2
Yard Wastes	9,972	7.1	10,810	7.7	20,782	14.9
Other Organics	23,251	16.6	657	0.5	23,908	17.1
Other Wastes	31,088	22.3	500	0.4	31,588	22.6
Special Wastes	1,119	0.8	14	0.0	1,133	0.8
Total	115,255	82.5	24,435	17.5	139,690	100.0

*Percent of total waste stream.

Table 2-17

Disposed Of And Diverted Quantities Projection
With Current Diversion Programs

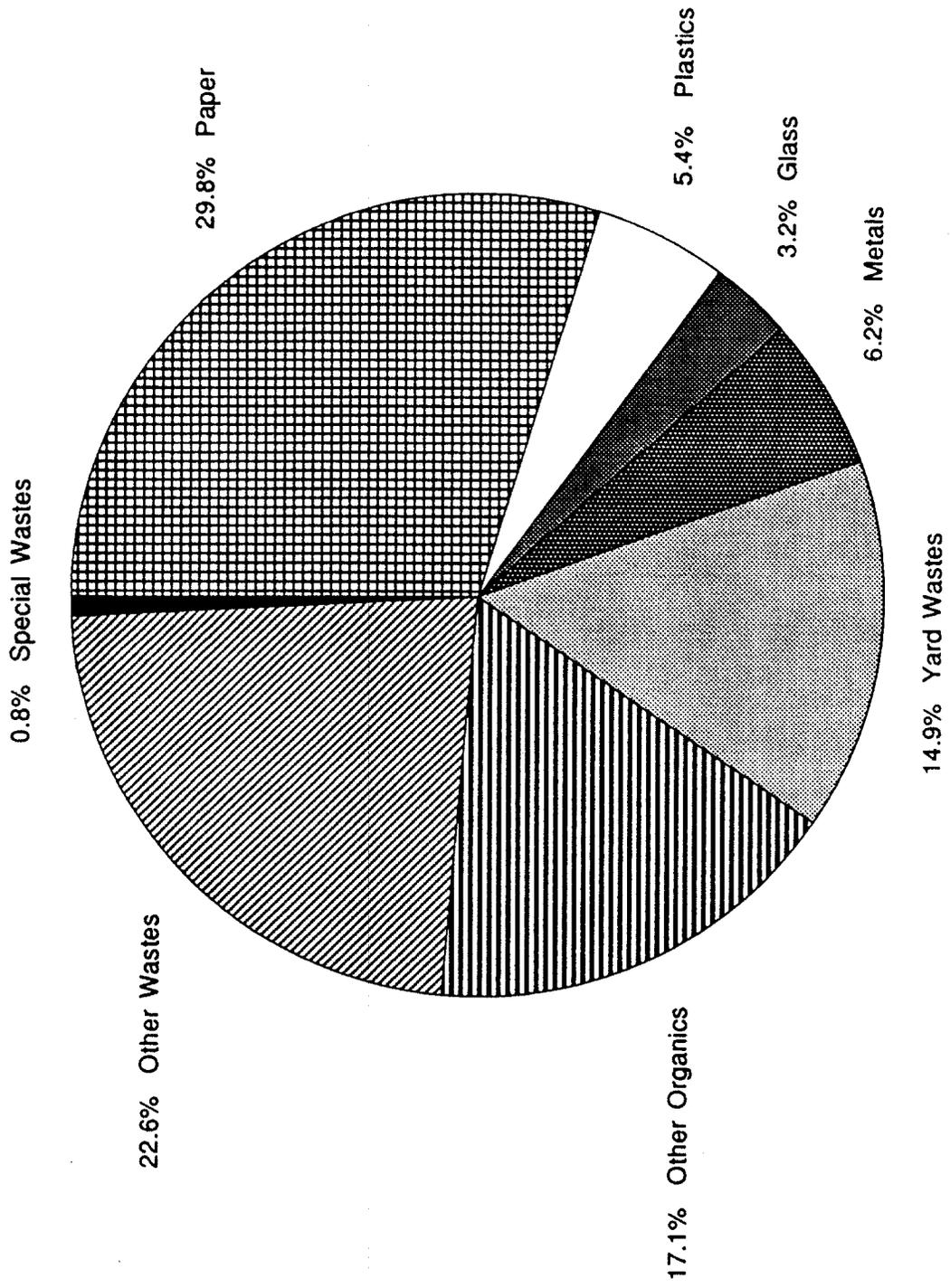
Year	Projected Growth Rate* (%)	Annual Waste Generated (tons)	Annual Waste Diverted from Landfilling (tons)	% Waste Diverted	Total Annual Refuse Disposed (tons)
1990	1.00	139,690	24,435	17.5	115,255
1991	1.00	141,087	24,690	17.5	116,397
1992	1.00	142,498	24,937	17.5	117,561
1993	1.00	143,923	25,186	17.5	118,736
1994	1.00	145,362	25,438	17.5	119,924
1995	1.00	146,816	25,693	17.5	121,123
1996	1.00	148,284	25,950	17.5	122,334
1997	1.00	149,767	26,209	17.5	123,557
1998	1.00	151,264	26,471	17.5	124,793
1999	1.00	152,777	26,736	17.5	126,041
2000	1.00	154,305	27,003	17.5	127,301
2001	1.00	155,848	27,273	17.5	128,574
2002	1.00	157,406	27,546	17.5	129,860
2003	1.00	158,980	27,822	17.5	131,159
2004	1.00	160,570	28,100	17.5	132,470
2005	1.00	162,176	28,381	17.5	133,795

Table 2-18

Disposed Of And Diverted Quantities Projection
With SRRE Implementation

Year	Projected Growth Rate* (%)	Annual Waste Generated (tons)	Annual Waste Diverted from Landfilling (tons)	% Waste Diverted	Total Annual Refuse Disposed (tons)
1990	1.00	139,690	24,435	17.5	115,255
1991	1.00	141,087	41,903	29.7	99,184
1992	1.00	142,498	50,444	35.4	92,054
1993	1.00	143,923	66,348	46.1	77,574
1994	1.00	145,362	68,029	46.8	77,333
1995	1.00	146,816	69,884	47.6	76,931
1996	1.00	148,284	76,070	51.3	72,214
1997	1.00	149,767	76,830	51.3	72,936
1998	1.00	151,264	77,599	51.3	73,666
1999	1.00	152,777	78,375	51.3	74,402
2000	1.00	154,305	79,158	51.3	75,146
2001	1.00	155,848	79,950	51.3	75,898
2002	1.00	157,406	80,749	51.3	76,657
2003	1.00	158,980	81,557	51.3	77,423
2004	1.00	160,570	82,372	51.3	78,198
2005	1.00	162,176	83,196	51.3	78,980

Figure 2-1
SOLID WASTE STREAM COMPOSITION
City of Palo Alto



3 SOURCE REDUCTION COMPONENT

3.1 Introduction

Assembly Bill 939 places source reduction at the top of the integrated waste management hierarchy. Unlike recycling, composting, disposal, and transformation (the other constituents of an integrated waste management system), source reduction activities work to reduce or prevent the generation of solid wastes that must be managed by an integrated waste management system. Source reduction, when considered beyond its effect on solid waste, can also conserve resources and energy, and reduce land, air, and water impacts.

Source reduction activities fall into some broad categories, including

- decreased consumption
- reduced material weight and volume
- material reuse
- increased product durability

Table 3-1 lists some examples of decreased consumption and material reuse. Recycled materials use normally refers to purchasing materials that have been produced with some content of recycled materials. Using products with a recycled materials content can reduce the amount of virgin materials entering the integrated solid waste management system.

For source reduction to be effective, production, packaging, and consumption practices must change. Only a few production and packaging practices can probably be changed at the local level; such changes commonly require actions at a state or national level. In contrast, however, changes to consumption patterns *must* begin at the local level. Changes in consumption patterns may, in the long term, also affect production and packaging practices.

This component presents source reduction objectives for the City of Palo Alto, evaluates alternatives that may be used to achieve those objectives, and identifies a plan of action that will be used by the City of Palo Alto to address source reduction.

3.2 Objectives

The source reduction objectives selected by the City of Palo Alto have been developed to meet the goal of reducing the amount of solid waste being generated in the City. These objectives apply to both the short-term planning period (1991-1995) and the medium-term planning period (1996-2000). Through the following objectives, Palo Alto can expect to divert up to 1.0 percent of its total wastestream:

- reduce the use of nonrecyclable materials
- replace disposable materials and products with reusable materials and products
- reduce packaging
- purchase repaired or repairable products
- purchase durable products
- encourage product substitution toward less toxic materials
- increase the efficiency of materials use in the commercial and industrial sectors
- promote backyard or on-site composting

Target waste types for source reduction have been identified based on (1) the results of the Solid Waste Generation Study, (2) the effectiveness of meeting the source reduction objectives, and (3) criteria that include the volume and weight of the material; the hazard created by the material; materials, products, or packages made of nonrenewable resources; and the recyclability of the material.

- packaging materials, including plastics (film and LDPE) and paper products (corrugated and other)
- construction materials, including concrete, asphalt, lumber, metals, and other inert solids

- single-use products, including disposable diapers, plastic and paper cups, plastic and paper utensils, office supplies, and personal care products
- repairable products, including appliances and electronic goods
- paper, including office paper and mixed waste paper such as paper napkins, disposable bags, and nonrecyclable junk mail
- yard waste, including grass clippings, leaves, branches, and brush

Alternative source reduction activities, targeting the above waste types, are evaluated in Section 3.4 based on their effectiveness in meeting the source reduction objectives.

3.3 Existing Conditions Description

This section describes the current source reduction activities in the City of Palo Alto, including the City's waste audit program, junk mail survival packet, composting public information, backyard composting workshops, procurement practices, private business source reduction activities, and national source reduction efforts. The existing source reduction diversion rate is 0.41 percent. The quantitative effectiveness of most current source reduction activities is difficult to assess because records and data are not available. The description of existing conditions for some source reduction activities is therefore qualitative.

3.3.1 Waste Audit Program

The City of Palo Alto, through the Public Works Department, offers free waste auditing services to private businesses in the City. The auditing services are designed to evaluate a business for recycling and source reduction potentials, and to provide implementation assistance. In 1989, the City mailed information regarding the waste audit program to businesses in the City. Few companies have since contacted the City with a waste audit service request. A reminder of the waste audit services available from the City was included in a recent recycling brochure mailed to businesses in the City.

An average of one waste audit per month is currently performed by the City. Both a lack of requests and City staffing have prevented implementation of the waste audit program on a large scale. Additional promotion of the program and increased City staffing could increase the effectiveness of this program.

3.3.2 Package Labeling Campaign (Discontinued)

During the 1970s, Palo Alto implemented a program designed to reduce the amount of MSW generated by households in the community. The program, through labeling and posters at local grocery stores, encouraged consumers to purchase durable and reusable products. The program was undertaken by city officials, a chain of four Co-op grocery stores, and the Community Association for the Retarded. The program was discontinued after an approximately 3-month period because not enough volunteers were available.

3.3.3 Junk Mail Survival Packet

The City of Palo Alto, in cooperation with the Palo Alto War on Waste, a Citizens' Advisory Committee, devised a junk mail reduction strategy that was designed to provide residents with a means of reducing the amount of junk mail they received. The junk mail survival packet, advertised through a City utility bill mailing, is available on request. Residents must only provide a self-addressed stamped envelope to the City to receive the packet.

3.3.4 Composting Public Information

The City provides, upon request, a *Guide to Composting*, which provides information on home composting. The brochure also publicizes backyard composting workshops offered periodically. Information on garden chipper and shredders is also available from the City upon request.

3.3.5 Backyard Composting Workshops

Common Ground Ecology Action, a non-profit gardening store, offers backyard composting workshops quarterly. According to Common Ground, approximately 100 Palo Alto residents attend these workshops annually. Backyard composting workshops have been offered by Common Ground for almost twenty years.

3.3.6 City's Procurement Policy

The City adopted a procurement ordinance on October 4, 1990 that establishes a 5 percent price preference for materials and products produced with recycled materials. The procurement of recycled products also encourages the purchase of reusable and recyclable products. Prior to the adoption of this ordinance, Palo Alto had implemented a procurement ordinance that specifies a 10 percent price preference for paper with recycled content.

3.3.7 City's Source Reduction Activities

The City of Palo Alto has implemented a number of source reduction measures, including

- Requiring the use of double-sided copy for all reports to City Council
- Providing electronic mail for staff
- Providing recycling stations at most City facilities
- Eliminating the use of colored paper stock for City Council reports
- Requiring re-use of styrofoam materials used by the vendors of the City's office supplies

3.3.8 Private Business Source Reduction Activities

Private business source reduction activities were identified by the source reduction survey, conducted as part of the Solid Waste Generation Study (Section 2). Most businesses that responded to the survey reported they were using some type of source reduction including

- purchasing material/products with recycled content
- purchasing durable materials
- purchasing recyclable materials
- purchasing reusable materials.

More specifically, the source reduction survey found that

- using double-sided copies reduces high-grade paper waste by 114.6 tons per year
- 65 percent of the business respondents (129 businesses) provide ceramic mugs, reusable silverware, or both for employee use

The survey indicated that many Palo Alto businesses are also aggressively pursuing source reduction through a variety of innovative methods, shown below. These activities can provide information for other businesses exploring the idea of source reduction:

- reusing packaging material
- creating scratch pads from blank sides of paper
- using cloth towels and sponges in the cafeteria
- routing memos
- reusing file folders
- posting source reduction and recycling reminders on bulletin boards and memos
- using refillable pens and mechanical pencils
- using scrap paper for interoffice communications
- renting equipment instead of purchasing
- donating old equipment to schools and charities
- storing reports on microfiche instead of paper
- using reusable coffee filters
- keeping binders of information shelved in the library for general staff use instead of providing copies for personal files
- using shredded paper for packaging material
- reusing cardboard boxes
- instituting electronic mail

3.3.9 National Source Reduction Efforts

Many of the source reduction activities impacting the waste generated by the City of Palo Alto are actually being conducted on a national scale. These national efforts affect the products purchased in Palo Alto stores and used by Palo Alto residences and businesses. Following is a summary of major national source reduction efforts.¹

- Some manufacturers offer concentrated versions of products which use less packaging (e.g., frozen juices, concentrated pesticides, and concentrated soaps).
- Packaging changes initiated by Proctor & Gamble include
 - Pampers and Luvs diapers and diaper packages changed so that net total amount of materials in product and package was 50 percent less than preceding design.
 - Jif peanut butter and Scope mouthwash packages changed from glass to PET, reducing weight of packaging by 80 and 90 percent, respectively.
 - Tide with Bleach eliminates need for separate purchase of bleach.
- Half-gallon ice cream cartons hold the same quantity, but their weight has been reduced by about 30 percent by changing the materials used.
- Shrink and stretch wrap plastic materials are replacing higher volume corrugated paper in many applications.
- General Electric changed the tub of a dishwasher from enameled steel to engineered plastic, which enables the warranty on the dishwasher to be increased because the tub is more durable.
- A new blow-molding tool for plastic (HDPE) milk bottles reduces their weight 10 percent while increasing strength.

¹ This summary is based on information from U.S. Congress, Office of Technology Assessment, *Facing America's Trash - What Next for Municipal Solid Waste*, OTA-0-424, Washington, D.C.: U.S. Government Printing Office, October 1989.

- A heat-set technology makes it possible to use PET containers for liquids that must be hot-filled. The new technology allowed a juice company to switch from glass to plastic bottles, resulting in a 25 percent reduction in weight. The change was made to appeal to consumers' desire for lighter weight and safer bottles and to affect long-term cost savings in bottling and shipping.
- Magazines are often shipped in plastic instead of heavy paper wrappers.
- Neutrogena has made a single-bar shampoo soap since about 1960; while this product requires some packaging, it avoids the use of larger containers.
- Plastic bags bought by McDonald's to ship products to its stores are designed to be reused as garbage bags.
- A large video rental and sales chain, on the East Coast, trains its sales people to reuse the distinctive plastic bags that tapes are carried in and to ask customers to return tapes in the bags, in the process saving about \$1 million and over 25 million bags annually.

3.4 Evaluation of Alternatives

This section presents an evaluation of alternative activities that can be used in the City of Palo Alto to meet the source reduction objectives presented in Section 3.2. The target materials are also identified in Section 3.2. The alternative source reduction activities have been grouped into four general categories. The categories, along with their respective alternative activities, are as follows:

- rate structure modifications, including local waste disposal fee modification and quantity-based local user fees
- economic incentives, including loans, grants, and loan guarantees, reduced business license fees, and deposits, refunds, and rebates
- technical assistance and public education, including waste audits technical assistance to industry and consumer organizations, and source reduction businesses, educa-

tional efforts, public recognition activities, and nonprocurement programs

- regulatory programs, including adoption of local ordinances to enhance recycling and source reduction, incentives and disincentives, recycling and source reduction planning requirements by waste generators, and product bans.

The alternative source reduction activities are evaluated within their respective category. The results of the evaluation are summarized in Table 3-2.

3.4.1 Category 1 - Rate Structure Modifications

Source reduction activities can be encouraged through rate structure modifications including disposal fees and quantity-based user fees for garbage collection services. Rate structure modifications, described below, address all source reduction objectives identified in Section 3.2.

Disposal fees at the landfill could be modified to promote source reduction by making the cost of disposal for nonrecyclable and nonreusable wastes relatively high.

Quantity-based user fees, such as variable can rates and volume-based pricing, should be combined with a strong collection program for recycling in order to promote source reduction. A variable can rate, or volume-based pricing, rather than a flat fee, for collection services can make the cost of collecting nonrecyclable and nonreusable wastes for disposal relatively high. Quantity-based user fees are most successful when free or low cost collection of recyclables is provided in addition to collection of nonrecyclables for disposal.

Waste Diversion Potential. Rate structure modifications can be very effective in encouraging source reduction, since the cost of disposal or collection of disposables can be high. Studies have shown that, during the first year of operation, a volume-based rate system can reduce the volume of waste requiring disposal by 25 to 50 percent, although the weight of the waste tends to increase. This assumes that no recycling programs are in effect. In Palo Alto the rate of reduction would likely be significantly less because collection programs for recyclables are already in place.

Absence of Hazards. Increased disposal and collection costs could lead to potential hazard related to an increase in illegal disposal and related health and safety concerns.

Flexibility. In Palo Alto, disposal and collection fees are moderately inflexible because such fees are tied to contracts and landfill operations. Additionally, once volume-based rates are established, any subsequent changes to the rates would require city council approval. However, the City has the ability to alter the rate structure if it so chooses.

Limited Shift in Waste Type Generation. Rate structure modifications would be designed to reduce waste at the source, and avoid substitution of a product or material that results in an equivalent or greater amount of waste being generated. Some shifting of wastes will occur in conversion to a volume-based system as more waste is stuffed into each can (thus making the average weight of individual cans higher).

Ease of Implementation. Potential opposition from the community and city council could preclude implementation in the short-term planning period.

Facility Needs. No facilities are needed to implement rate structure modifications in the City of Palo Alto.

Consistency with Local Policies. Modifying the rate structure to achieve a reduction in the amount of wastes requiring disposal is not consistent with City policies and practices. The success of the City's current diversion programs is based on the cooperative and voluntary efforts of the community.

Absence of Institutional Barriers. Disposal and collection fees are tied to funding requirements for solid waste activities, and are reviewed annually.

Estimated Cost. Costs would be incurred for staff time and outside service fees during a rate structure modification approval process. Costs for an automated data collection system to record data such as customer ID, date, container size, and weight, would average between \$1,500 and \$2,500 per refuse vehicle, according to one manufacturer. Additional costs for installation are \$5,000 to \$6,000.

End Uses. Not applicable

3.4.2 Category 2 - Economic Incentives

Source reduction activities can be encouraged through economic incentives, including tax credits and exemptions, grants, loans, loan guarantees, deposits, refunds, rebates, and reduced business license fees. Economic incentives, which can be directed at consumers and businesses, are designed to encourage source reduction by linking an economic benefit to the implementation of source reduction activities. Economic incentives, described below, address all source reduction objectives identified in Section 3.2.

Tax credits/exemptions can be given to businesses that implement formal source reduction activities for manufacturing or consuming.

Loans, grants, and loan guarantees can provide direct economic assistance to businesses for the purpose of implementing source reduction activities. Funds can be used to purchase copy machines that produce double-sided copies, and source reduction and recycling education materials.

Deposits, refunds, and rebates can include deposits on hard to recycle materials or materials that are nondurable, and refunds and rebates on recycled or recyclable materials.

Reduced business license fees can be granted to businesses that implement source reduction activities; however, Palo Alto has no business licenses.

The following evaluation of economic incentives for source reduction includes tax credits and exemptions, loans, grants, and loan guarantees, and deposits, refunds, and rebates. Reduced business license fees are not considered because there are no business licenses in the City of Palo Alto.

Waste Diversion Potential. The potential benefits of economic incentives are difficult to quantify.

Absence of Hazards. Economic incentives would not create a hazard in the City of Palo Alto.

Flexibility. Economic incentives can be modified to accommodate changes in consumption patterns, availability of materials, and the economy.

Limited Shift in Waste Type Generation. Economic incentives would be designed to reduce waste at the source, and avoid substitution of a product or material that results in an equivalent or greater amount of waste being generated.

Ease of Implementation. Economic incentives must be approved by the City Council. The amount of time required for the approval process and implementation of the program can range from 2 to 3 months to years. Modifications to any economic incentive activities would undergo the same approval process.

Facility Needs. No facilities are needed to implement economic incentives in the City of Palo Alto.

Consistency with Local Policies. Providing economic assistance to businesses in the City is not consistent with local policies. No plans or ordinances to provide economic incentives are in place.

Absence of Institutional Barriers. The City of Palo Alto would have to fund economic incentives from the Enterprise fund, which could result in rate increases.

Estimated Cost. Costs for economic incentives depend on what the City chooses to spend, and would likely range from \$50,000 to \$75,000 per year for loans, grants, and loan guarantees, and deposits, refunds, and rebates. Additional costs would include to the use of staff resources to develop and administer the incentive and disincentive programs. Staff resources would be necessary to develop, approve, implement, and administer each community project funded by the jurisdiction.

End Uses. Not applicable.

3.4.3 Category 3 - Technical Assistance, Education, and Promotion

Alternative source reduction activities included in this category are waste evaluations, technical assistance, educational efforts, and public recognition and awards. Technical assistance, education, and promotion, described below, address all source reduction objectives identified in Section 3.2.

Waste evaluations serve to identify what waste types generated by a business can be targeted by that business for source reduction activities and recycling.

Technical assistance to businesses and consumers can be accomplished through workshops and seminars that address practical ways businesses and consumers can reduce the quantity of wastes generated. Topics can include decreased consumption, reuse of materials, procurement practices, increased manufacturing efficiency, and composting of yard wastes at the site of generation.

Educational efforts by the City would be an invaluable means of developing consumer awareness about the benefits of source reduction. Consumer awareness can bring about changes in consumption patterns. A state-wide public opinion survey sponsored by the California Integrated Waste Management Board on source reduction and recycling indicated that only 35 percent of Californians were aware of the term "source reduction." Sixty-five percent of the respondents believe that source reduction should be the responsibility of government, manufacturers, and consumers rather than any single group.

Public recognition and awards can be used by the City to publicly acknowledge businesses that have implemented source reduction activities. Awards could also be presented to community groups or individuals that are promoting source reduction in the community either through example or through education.

The following evaluation of technical assistance, education, and promotion activities for source reduction includes technical assistance, educational efforts, public recognition and awards, and waste evaluations.

Waste Diversion Potential. An effective technical assistance program combined with education and promotion can effectively reduce solid waste volume and weight, although actual quantities are difficult to estimate.

Absence of Hazards. Technical assistance, education, and promotional activities would not create hazards.

Flexibility. Technical assistance, education, and promotional activities can be relatively easily adapted to accommodate changes.

Limited Shift in Waste Type Generation. Technical assistance, education, and promotional activities would be designed to reduce waste at the source, and avoid substitution of a product or material that results in an equivalent or greater amount of waste being generated.

Ease of Implementation. Technical assistance, education, and promotional activities can be implemented in the short-term planning period. The need for additional staffing is the main factor that could delay implementation.

Facility Needs. No additional facilities in the City would probably be required. Existing educational facilities could serve as locations for seminars and educational workshops.

Consistency with Local Policies. Technical assistance, education, and promotional activities are consistent with current City policy. The City of Palo Alto has historically considered technical assistance and education activities for waste management to be superior to regulatory controls.

Absence of Institutional Barriers. There are no institutional barriers to implementing technical assistance, education, and promotional activities for source reduction.

Estimated Cost. The costs for technical assistance, education, and promotion can vary depending on the City's commitment to funding a broad spectrum of programs. Staffing would constitute the majority of the costs of implementing technical assistance, education, and promotional activities. To provide adequate education and public awareness to the community, the City will need approximately \$60,000 to \$75,000 per year, including staffing and direct costs for materials.

End Uses. Not applicable.

3.4.4 Category 4 - Regulatory Programs

Several alternative regulatory programs are available to the City that address the source reduction objectives (Section 3.2). These programs include local procurement ordinances, required waste reduction planning and reporting, and local adoption of product bans. Regulatory programs require continuous enforcement efforts.

Local procurement ordinances that specify minimum criteria for local government purchases including durability, recyclability, reusability, and recycled content, can be implemented.

Waste reduction planning and reporting would require each business to establish a source reduction plan outlining what source reduction activities

will be implemented. Businesses would also be required to report quantities of waste source reduced.

Product bans can be used by the City to eliminate specific products from being generated in the City, thereby eliminating the product's waste from the waste stream. Product bans for products which are identified as unnecessarily wasteful, are being established in several communities. Product bans are not useful unless a less wasteful alternative exists.

Waste Diversion Potential. The effectiveness of regulatory programs would depend on the level of regulation imposed by the City, the materials targeted, adherence to the regulations by the community, and enforcement efforts by the City.

Absence of Hazards. Regulatory programs would not create a hazard.

Flexibility. Regulatory measures are not readily adaptable to changing social and economic conditions because of the city council approval process that must be followed in order to affect change.

Limited Shift in Waste Type Generation. Regulatory programs would be designed to reduce waste at the source, and avoid substitution of a product or material that results in an equivalent or greater amount of waste being generated.

Ease of Implementation. A complex approval process, and anticipated resistance by businesses to further regulation by the City, would prohibit implementing regulatory programs.

Facility Needs. Not applicable.

Consistency with Local Policies. Regulatory programs are not consistent with City policy and plans for implementing voluntary waste management programs, especially for waste diversion programs. The City has had successful participation in waste diversion programs from the community in the absence of regulatory action.

Regulations requiring reuse may conflict with other local policies regarding water conservation measures employed throughout the region.

Absence of Institutional Barriers. Regulatory actions for source reduction which require more paperwork or increased operating costs on the part of businesses would probably encounter some resistance. Previous

considerations of product bans have resulted in much opposition from businesses.

Estimated Cost. Costs associated with legal fees and staffing would be incurred during the approval process. Costs for regulatory programs largely depend on the level of regulatory programs that the City chooses to pursue. Each of the programs outlined in this alternative would require resources from the City for developing, implementing, administering, and monitoring the program. Direct costs for staffing this alternative range from \$16,000 to \$24,000 in the first year and \$8,000 to \$12,000 per year thereafter. Costs associated with public information materials to introduce regulatory programs can be found in the public information and education component.

End Uses. Not applicable

3.5 Selection of Program

Source reduction programs were selected based on the results of the evaluation and the ease of implementation in the City of Palo Alto. Table 3-3 identifies the evaluation point totals for each category of alternatives.

3.5.1 Alternatives Selected

The alternative source reduction activities included in Category 3 (technical assistance, education, and promotion), and one source reduction activity included in Category 4 (local procurement ordinances) have been selected to be implemented in the City of Palo Alto. The activities are to be pursued throughout the short-term and medium-term planning periods.

Source reduction as a method of reducing the amount of waste generated is currently not a widely known concept. A state-wide public opinion survey sponsored by the California Integrated Waste Management Board found that only 35 percent of residents in the state are aware of what source reduction is. When one realizes that effective source reduction requires the cooperation of business, industry, consumers, and local, state, and federal governments, the lack of knowledge about source reduction is not encouraging.

Palo Alto has achieved a high level of community involvement in waste diversion programs through public education and technical assistance. The most effective source reduction activities for consumers and business that can be implemented in the City of Palo Alto are those activities included in Category 3 (Section 3.4) and described below.

Local governments can participate in national source reduction programs by changing consumption patterns that will impact production and packaging practices. Encouraging local manufacturers to consider source reduction in their production practices is also an effective measure that is implementable at the local level, during waste audits, workshops, and presentations by manufacturers who have incorporated source reduction through decreased volume, increased durability, or decreased packaging in production practices.

Waste evaluations will be conducted by the City of Palo Alto, at the request of a business. The evaluation will serve to identify what waste types generated by the business can be targeted for source reduction activities and recycling by that business.

Technical assistance can be provided by the City of Palo Alto, private businesses, community organizations, and nonprofit organizations to businesses and consumers. Technical assistance can be provided through workshops, seminars, and informational publications that address practical ways for businesses and consumers to reduce the quantity of wastes generated. Topics can include decreased consumption, reuse of materials, procurement practices, increased manufacturing efficiency, and composting of yard wastes at the generation site.

Educational efforts will be coordinated by the City. The educational efforts will be geared towards developing consumer awareness about the benefits of source reduction. Consumer awareness can bring about changes in consumption patterns, and subsequent changes in production and packaging processes by manufacturers.

Public recognition and awards will be used by the City to publicly acknowledge businesses that have implemented source reduction activities. Awards can also be presented to community groups or individuals that are promoting source reduction in the community either through example or through education.

Although Category 4, regulatory programs, received a low point total, the City of Palo Alto has adopted a local procurement ordinance because the City understands the need to take the lead in promoting source reduction in order for this waste diversion method to be effective. The local procurement ordinance requires all government agencies in the City to purchase materials, when possible, that are made of recycled material, and promotes the purchase of reusable and recyclable products. A 5 percent price preference is given to recycled products.

3.5.2 Types and Quantities of Materials Anticipated to be Source Reduced through Proposed Programs.

The types of materials anticipated to be reduced through source reduction activities in the City of Palo Alto include

- packaging materials, including plastics and paper products
- construction materials
- single-use products, including disposable diapers and disposable cups
- repairable products, including appliances and electronics
- paper, including mixed waste paper such as paper napkins, disposable bags, and non-recyclable junk mail
- yard waste
- household hazardous materials

Approximately 0.4 percent of the wastestream can be quantified for credit under AB 939 as waste diverted due to source reduction. Assessing the actual quantities that can be reduced through source reduction activities is difficult. Potential future waste diversion surveys in the City of Palo Alto may be able to quantify source reduction activities as the community becomes more aware of the concept and becomes conscious of quantities that are source reduced.

How much waste can be source reduced by the procurement policy is not yet possible to assess since the policy was only recently adopted.

3.5.3 Cooperative or Multijurisdictional Program Implementation Efforts, Actions, and Activities

National Efforts. Source reduction is generally considered a national policy requiring the cooperation of business, industry, consumers, and government. Source reduction requires manufacturers to design products with durability, reusability, and recyclability in mind. Source reduction involves changing the way products are manufactured and packaged. Palo Alto needs to be aware of the product trends occurring on a national level in order to effectively encourage source reduction efforts locally.

State Efforts. On the state level, efforts are underway to implement source reduction practices in government agencies, including (1) making double sided copies, (2) using electronic mail, and (3) modifying procurement practices to reduce material volume and increase product durability. In California, the CIWMB is currently investigating the feasibility of imposing "advanced disposal fees" on certain products that are either non-recyclable or non-reusable. Products with excess packaging could also be made economically unattractive.

Background research into this type of program has recently been completed for the CIWMB and is under consideration². A fee would be imposed on products that meet the following criteria: disposable, non-recyclable, or non-reusable; substitutes that were durable, reusable, or recyclable would need to be available. For example, a fee could be placed on disposable products such as pens, razors, cameras, beverage containers, utensils, personal care products, and disposable diapers. These fees could also be applied to products with a range of useful lifespans, with the fee applied to products with shorter lifespans to induce the consumer to purchase the longer-lasting alternatives. Examples of these kinds of products are tires, batteries, and appliances.

The advanced disposal fee concept involves creating a hierarchy of incentives to alter consumer behavior, as follows: (1) buy reusable, recyclable, and durable products; (2) repair older items such as white goods (replacement appliances may entail a fee); and finally, (3) purchase only what is necessary of products that are disposable and have no substitutes. Finally, deposits, refunds, and rebates can be provided for hard-to-recycle materials or materials that are non-durable, as well as for recycled or

² The CIWMB submitted the *Disposal Cost Fee Study Final Report* (Tellus Institute, Boston, Mass.) to the California Legislature and the Governor on March 1, 1991.

recyclable materials. This provides a positive incentive to grant purchase preferences to durable, reusable, recyclable products.

Cooperative Activities. The City of Palo Alto can benefit from technical assistance and educational materials developed by other jurisdictions. The City can also benefit from free educational materials produced by the State Department of Conservation and the CIWMB. Public information efforts involving public service announcements and televised programming should also be coordinated and funded jointly with nearby cities and counties.

Technical assistance is offered by several nonprofit organizations in Palo Alto. For example, Common Ground offers backyard composting workshops, and the Peninsula Conservation Center assists with community outreach programs and workshops on solid waste.

3.5.4 Facilities Needed for Implementation

The programs selected do not require new or expanded facilities. Existing city and institutional facilities can be used for conducting the technical assistance seminars and workshops.

3.6 Program Implementation

3.6.1 Government Agencies Responsible for Implementation

The City of Palo Alto, through the Public Works Department, will be responsible for implementing the waste evaluations and presenting public recognition and awards. The City will also be responsible for coordinating the education efforts, and will play a large role in providing and coordinating technical assistance.

The Public Works Department does not currently have a staff person specifically for implementing source reduction. An additional staff person is needed to oversee and implement source reduction programs.

3.6.2 Tasks Necessary to Implement Source Reduction Activities

The tasks necessary to implement the selected source reduction activities in the City of Palo Alto include public education and information, promotional and technical assistance activities. Before Palo Alto can expand its

public education program, additional staffing is needed. The City must hire an additional staff person dedicated to source reduction programs.

The activities associated with public education and information, and promotions and technical assistance are presented in Section 7. These activities include an environmental shopping campaign, a media program, workshops and seminars, composting assistance, recognition awards, and coordination with community groups.

3.6.3 Short-term and Medium-term Planning Period Implementation Schedule

All of the source reduction activities selected for the City of Palo Alto can be implemented during the short-term planning period; they will continue through the medium-term planning period.

3.6.4 Implementation Costs

The costs for technical assistance, education, and promotion are included in the Education and Public Information component in Table 7-4. Staffing would constitute most of the cost of implementing technical assistance, education, and promotional activities. Technical assistance and education materials have been developed by several states and are available, sometimes at no cost.

3.7 Monitoring and Evaluation

3.7.1 Methods to Quantify and Monitor Achievement of Objectives

The following methods will be used to monitor the achievement of the objectives identified in Section 3.2:

- Survey Palo Alto businesses and City divisions annually to monitor procurement practices. Specifically, identify reductions in the purchase of nonrecyclable materials and products, as compared to the previous year's purchasing practices, and monitor trends towards replacing less durable and single-use materials with more durable and reusable products, materials, and equipment.
- Survey the residents of Palo Alto annually to ascertain the percentage of residents participating in backyard com-

posting, and the residents' understanding of the concept of source reduction.

Trends in production and packaging practices have resulted in volume and weight reduction. For example, less aluminum is used in beverage containers and concentrated versions of products are constantly being developed. Palo Alto needs to monitor the source reduction efforts occurring on a national level in order to receive "credit" for these waste diversion activities and to modify local public education programs so that purchasing of such products is encouraged.

3.7.2 Written Criteria for Evaluating the Program's Effectiveness

Palo Alto will evaluate the success of the source reduction activities by the following criteria:

- Are the source reduction objectives being achieved?
- Were the activities implemented on schedule?
- Do residents have a greater understanding of the concept of source reduction?
- Have businesses' procurement practices changed?

3.7.3 Agencies, Organizations, Persons (or a Combination) Responsible for the Program's Monitoring, Evaluation, and Reporting

The City's Department of Public Works is responsible for monitoring and evaluating the effectiveness of source reduction activities in the City.

3.7.4 Monitoring and Evaluation Funding Requirements

Funding for monitoring source reduction activities is shown in the Education and Public Information Component (Table 7.4). The principal monitoring activities will be for conducting annual source reduction surveys of businesses and residents.

3.7.5 Measures to be Implemented if There is a Shortfall in the Diversion Objectives

The following measures will be implemented if the source reduction objectives identified in Section 3.2 are not achieved:

- consider the development and implementation of regulatory programs, including product bans, mandatory waste reduction planning and reporting, and procurement requirements
- identify the need to expand the scope of the local procurement ordinance to address other materials



Table 3-1

WHAT IS SOURCE REDUCTION ?

DECREASED CONSUMPTION	MATERIAL REUSE
<p><u>Reduce Material Volume</u></p> <ul style="list-style-type: none">• Make two-sided copies• Use routing slips• Use electronic mail• Buy in bulk• Offer waste reduction incentives to employees <p><u>Increase Product Durability</u></p> <ul style="list-style-type: none">• Purchase durable goods• Design durable products• Provide/use maintenance contracts to extend the life of equipment	<ul style="list-style-type: none">• Use cloth towels, retreaded tires, refillable pens, reusable air filters, returnable bottles• Reuse packaging or packing material• Provide/use returnable packaging containers• Donate used equipment• Use ceramic coffee mugs• Reuse blank sides of paper for scratch• Use silverware and dishes in the cafeteria• Compost, mulch or chip on site• Rent equipment rather than buying• Use a waste exchange program• Design for reuse or recyclability

Table 3-2
Alternatives Evaluation

Program Categories	Evaluation Criteria					
	Waste Diversion Potential	Absence of Hazard	Flexibility	Limited Shift in Waste Type Generation	Ease of Implementation	Facility Needs
Category 1						
Rate Structure Modifications	high	low	medium	medium	medium	high
Category 2						
Economic Incentives	low	high	high	high	high	high
Category 3						
Technical Assist. & Education	high	high	high	high	high	high
Category 4						
Regulatory Programs	low	high	low	medium	medium	high

Program Categories	Additional Considerations			
	Consistency With Local Policies	Absence of Institutional Barriers	Estimated Cost	End Uses
Category 1				
Rate Structure Modifications	low	medium	low	N/A
Category 2				
Economic Incentives	medium	medium	medium	N/A
Category 3				
Technical Assist. & Education	high	high	medium	N/A
Category 4				
Regulatory Programs	low	low	low	N/A

Note: The criteria have been assigned a scale of high, medium, and low, with high being positive. See Appendix A for an explanation of the rating with respect to each criteria.

Table 3-3
Source Reduction Alternatives
Point Totals

CRITERIA	Rate Structure		Economic		Technical	
	Modifications	Incentives	Assistance & Education	Regulatory Programs		
Waste Diversion Potential	3	1	3	1		
Absence of Hazard	1	3	3	3		
Flexibility	2	3	3	1		
Limited Shift in Waste Type Generation	2	3	3	2		
Ease of Implementation	2	3	3	2		
Facility Needs	3	3	3	3		
Consistency with Local Policies	1	2	3	1		
Absence of Institutional Barriers	2	2	3	1		
Estimated Cost	1	2	2	1		
End Uses	N/A	N/A	N/A	N/A		
TOTAL	17	22	26	15		

Note: The ranking system on which this table is based is explained in Appendix A, Evaluation Approach.

4 RECYCLING COMPONENT

4.1 Introduction

Recycling is defined by the National Recycling Coalition as the series of activities by which materials that would otherwise remain wastes are collected, separated, or processed and used in the form of raw materials. Recycling is an old practice that is taking on an increasingly important role in today's solid waste management programs. This form of waste diversion helps preserve natural resources and reduces the environmental impacts associated with waste disposal.

As stated in the definition, recycling goes far beyond merely collecting and separating post-consumer waste; in order to truly recycle, the materials must be remade into new products. Thus, markets are critical for the full recycling process to be complete. Accordingly, recycling planning must include market development along with program development.

The City of Palo Alto has for years recognized the value of recycling and has supported many programs and services dedicated to the recycling of a broad range of materials. These programs, which represent the first step in recycling--separation and collection--are described in the following pages. In addition to the description of existing programs, this section includes an evaluation of recycling program alternatives, the selection of recommended alternatives, a discussion of end markets, and plans for implementing and monitoring recycling programs.

4.2 Objectives

The City of Palo Alto selected the objectives listed in section 4.2.1 to increase the amount of solid waste being recycled. The objectives were based on the results of the waste generation study, current recycling programs in the City, and an assessment of appropriate new programs that fit the City's needs and characteristics. These objectives are organized

according to the short-term (1991-1995) and medium-term (1996-2000) planning periods.

4.2.1 Short-Term Planning Period

Residential

Residential wastes represent approximately 25 percent of the solid waste stream generated in the City. Approximately 39 percent of the residential waste stream is currently being recycled in Palo Alto. During the short-term planning period, the recycling rate target for the residential waste stream is 40 percent (equivalent to approximately 9 to 10 percent of the total waste stream). This diversion rate will be achieved via the following objectives:

- Continue existing curbside, drop-off, and other recycling programs to provide convenient recycling for residents.
- Increase participation in existing multi-family dwelling recycling program

Commercial/Industrial

Nonresidential wastes account for approximately 75 percent of the City's solid waste stream. Approximately 11 percent of these wastes (commercial/industrial, self-haul, and City generated) is currently being recycled. During the short-term planning period, the recycling rate target for this sector is 30 to 40 percent (equivalent to approximately 24 to 32 percent of the total waste stream). The following objectives have been established to reach these recycling rates:

- Continue existing commercial/industrial programs to provide convenient recycling for businesses.
- Increase the number of material types collected from the commercial sector outside of the Downtown Environmental Action Project area
- Increase participation in the existing commercial recycling program
- Divert materials currently being collected via the industrial debris boxes.

- Divert inert solids generated by the City Public Works Department, the City Utilities Department, and capital improvement projects from the landfill
- Increase local markets for materials made from post-consumer waste

4.2.2 Medium-Term Planning Period

During the medium-term planning period, an additional diversion rate of 2.3 to 3.3 percent of Palo Alto's total wastestream is expected to be achieved as a result of meeting the following objectives:

Residential

- Increase the number of material types separated

Commercial/Industrial

- Increase the number of material types separated
- Increase local markets for materials made from post-consumer waste

4.3 Waste Categories Targeted for Diversion

Based on the results of the waste generation study, the following materials are targeted for diversion. Most of these materials are currently being collected through Palo Alto's recycling programs; these programs will be expanded to increase the quantities collected in some cases, or to maintain current collection levels.

- corrugated cardboard
- newspaper
- high-grade office paper
- mixed paper
- wood wastes
- PET
- glass
- aluminum cans

- tin cans
- small household appliances
- other scrap metal
- inert solids

4.4 Existing Conditions Description

The City of Palo Alto's waste stream was comprised of an estimated 34,275 tons of residential waste and 105,415 tons of nonresidential (i.e., commercial, industrial, and self-haul) waste during 1990. Expressed as a fraction of the total generated waste stream, approximately 25 percent is residential and 75 percent is non-residential in origin. Currently, 39 percent of the residential and 11 percent of the nonresidential waste stream is recycled. The City has established a variety of programs for the collection of recyclable materials; the programs serve the residential sector and the commercial/industrial sector. These programs will be continued, or expanded, as described in Section 4.5, during the short-term and medium-term planning periods. In addition, Palo Alto is in contractual negotiations for involvement with the planned Sunnyvale Materials Recovery and Transfer Station (SMaRT).

Tables 4-1 and 4-2 summarize recycling rates by material for residential waste and non-residential waste, respectively. A summary of recycled quantities by program is presented in Table 4-3, for the programs listed below.

4.4.1 Residential Programs

Curbside collection of recyclables. Palo Alto's curbside recycling collection program for single-family homes and duplexes began in 1978. The City provides each household with two burlap bags: one is for collecting aluminum cans, tin cans, and PET; the other is for glass. Newspaper and corrugated cardboard must be flat and bundled and motor oil must be placed inside an unbreakable one-gallon container with a tight-fitting lid. A separate yard waste collection program is also in place. Yard debris must be contained in garbage cans, 30-gallon Kraft bags, cardboard boxes, or bundles. Another item picked up at the curb is scrap metal. Small scrap metal items must be boxed; large items can remain loose (maximum size:

30" x 18" x 2"). Items larger than the curbside limit need to be delivered to the City's drop-off recycling center.

The City will also provide curbside pickup upon request to businesses located along a residential route. The businesses follow the same schedule and guidelines as the residents in these cases.

Apartment and condominium recycling. The City has offered weekly pickup of recyclable materials from apartment and condominium complexes since 1984. Pickup of materials is either at the curb or at refuse disposal areas within the complex. A set of three wheeled bins is rented to managers/owners of apartment/condominium complexes for \$6.20 per month, including collection. Some complexes have regularly-scheduled pick-ups; others are on an on-call basis. Materials accepted for collection are newspaper, tin and aluminum cans, glass, PET, corrugated cardboard, motor oil, scrap metal, and small household appliances.

Recycling center staff estimate that approximately one half, or 4,400 apartment and condominium units in Palo Alto, participate in the collection program. This number also includes duplexes and triplexes, although these units' refuse and recyclables are collected like the single-family homes.

Recycling drop-off center. A recycling drop-off center opened in 1971 and is operated on City property by Palo Alto Sanitation Company (PASCO), the City's refuse collection contractor. The center is available to both residents and businesses.

Two PASCO employees staff the center. There is a drive-up area for unloading recyclables. There is no buy-back service. Materials accepted at the center include those collected at the curb, plus used lawn mowers, bicycles, small appliances, motors, high-grade office paper, and auto batteries. Other items accepted for an additional fee are tires, mattresses and boxsprings, and large appliances.

4.4.2 Commercial/Industrial Programs

Restaurant/bar glass collection. Since 1985, Circo Glass of Newark, California has collected glass from restaurants, bars, and hotels in Palo Alto. Circo provides bins and regular pickups for the glass.

High-grade office paper collection. The office paper recycling program, which is available to private businesses as well as City government offices

and other City facilities, began in 1986. An employee of PASCO picks up paper two days per week. In addition to offering free pickup, the City provides participants with desktide containers and sample informational materials for employees, as well as other assistance in establishing an office paper recycling program. Other useful information includes a white paper recycling worksheet designed to help businesses and government offices determine the benefits of office paper recycling. In 1990, a program began for large businesses in which they are offered large bins or wheeled carts for white paper.

Commercial and retail corrugated cardboard collection. In 1989, the City began a corrugated cardboard collection recycling program. Businesses are charged a monthly fee for rental of the bin and collection is provided free of charge by PASCO. Corrugated cardboard is collected from businesses up to five days per week, depending on the amount generated. Cardboard collection is also offered by the City in the two downtown areas. Twenty-three bins were placed at no charge for shared use by businesses in the area.

Commercial/industrial consulting services program. The City also provides a Commercial/Industrial Consulting Services Program. Please see the Education and Public Information Component in Section 7 for a discussion of this program.

Inert solids. Asphalt and concrete, primarily from the City's Public Works Department, Utilities Department, and capital improvement projects, are being collected and stockpiled at the landfill. Approximately 20,000 tons per year are currently being stockpiled. In the future, the City plans to divert the inert solids to a material recycling processor.

4.4.3 Programs Serving Residential and Commercial/Industrial Sectors

Polystyrene foam collection. In November 1990, the City began a three-month polystyrene foam recycling pilot program for cups, plates, and take-out and fast-food containers; molded packaging (e.g., what is used to cushion small appliances, TV's, etc.); loose packing materials; and meat trays from the grocery. Polystyrene foam can be taken to the recycling drop-off center or to three other sites throughout the City. In addition to the drop-off sites for polystyrene foam, the City planned a one-week curbside recycling day for polystyrene foam following Christmas 1990.

4.4.4 Other Recycling Programs Available (Not Sponsored by the City of Palo Alto).

Peninsula Conservation Center (PCC). Magazine recycling is provided by the PCC at 2448 Watson Court, Palo Alto. The Center is open Monday through Saturday from 9 am to 5 pm and the magazine collection bin is always open. The PCC accepts glossy magazines and glossy-paged catalogs only.

Downtown Environmental Action Project (DEAP). DEAP was started to encourage recycling by downtown Palo Alto businesses. It is funded by downtown businesses and has a steering committee made up of business owners, managers, and volunteers. Approximately thirty recycling sites have been designated in downtown Palo Alto for collection of newspaper, glass, aluminum, white paper, cardboard, and PET. Each site consists of wheeled bins for newspaper, glass, aluminum/PET combined, and white paper. In addition, corrugated cardboard is collected by the City in large bins at each recycling site.

Collections by PASCO began in November 1990. One thousand businesses have been approached by DEAP block captains and volunteers and provided information about the collection program. At this writing, DEAP does not have a number on how many of the 1,000 businesses are actually participating in the program.

Stanford Shopping Center Recycling Program. The shopping center has established recycling programs for its merchants as well as its customers. For the merchant recycling program, PASCO provides bins and dumpsters for cardboard; these are located throughout the shopping center. Glass is collected once per week by Circo Glass and corrugated cardboard is picked up daily by PASCO. The shopping center is also currently considering beginning its own collection program for styrofoam packing material. For customers, specially-marked receptacles have been placed to collect cans and bottles. The shopping center's own maintenance persons will take the collected material to a recycling facility.

Community Association for the Retarded (CAR). The CAR collects newspaper, cans, and bottles from the public through drop-off bins located at its facility on East Charleston Avenue. The collected materials are sold approximately every 2 to 3 weeks.

Goodwill Industries. California redemption value beverage containers (under AB 2020) are collected at two buy-back centers operated by Goodwill in Palo Alto.

4.5 Evaluation of Program Alternatives

Palo Alto has evaluated nine recycling alternatives for meeting its diversion goals. For ease of evaluation, these have been divided into alternatives for the residential sector, the commercial/industrial sector, and other. The results of the alternatives evaluation are summarized in Table 4-4. The alternatives are as follows:

Residential Alternative 1 - Expand existing drop-off center to include additional material

Residential Alternative 2 - Convert landfill drop-off center into a buy-back center

Residential Alternative 3 - Expand multi-family dwelling recycling program participation

Residential Alternative 4 - Expand residential curbside recycling program to include additional materials

Residential Alternative 5 - Establish a mobile collection system

Commercial/Industrial Alternative 1 - Establish/add to collection programs for businesses around the City

Commercial/Industrial Alternative 2 - Establish a manual material recovery operation

Commercial/Industrial Alternative 3 - Establish a mechanized material recovery operation

Other Alternative 1 - Divert inert solids to a construction material recycling facility

4.5.1 Residential Alternatives

Alternative 1 - Expand Existing Drop-Off Center to Include Additional Materials

This alternative addresses the objective of increasing the number of materials that are diverted from the waste stream. The drop-off center at the

landfill has been operating since 1971 and currently accepts a wide range of materials as described in Section 4.4, "Existing Conditions Description." However, many materials common to residential and commercial refuse are not accepted. When markets are identified for materials not currently accepted, these materials could be added to the list of those accepted. Examples of such materials include mixed paper and HDPE. In this study, mixed paper comprises various paper grades, including paperboard, magazines, clay-coated paper, colored ledger, books, ground-wood paper, other than newspaper, and telephone books.

Waste Diversion Potential. Adding mixed paper to the materials collected at the drop-off center could be expected to divert between 0.1 and 0.3 percent of the total wastestream, assuming a capture rate similar to newspaper.

Absence of Hazard. The hazard potential of adding materials collected at the existing drop-off center is virtually insignificant. However, paper should be stored properly to prevent fires.

Flexibility. Changing conditions can be accommodated by adding more bins to collect the additional materials and by adding more staff, as needed.

Limited Shift In Waste Type Generation. Collecting additional materials is expected to have no impact on shifts in waste type generation.

Ease of Implementation. Collecting additional materials at the existing drop-off center could be implemented very quickly; it would primarily be a matter of informing the public that they can now bring these materials to the drop-off center, and providing a means for storing the materials.

Facility Needs. Adding materials at the drop-off center can be integrated fairly easily into the existing operation. If mixed paper is collected, additional equipment would be required, possibly including a baler.

Consistency with Local Policies. Collecting additional materials at the existing drop-off center is consistent with City policies.

Absence of Institutional Barriers. No institutional barriers are expected to impact this alternative.

Estimated Cost. Costs depend upon the additional materials collected. Assuming the collection of mixed paper, capital costs are estimated at \$103,000 (\$18,000 for the purchase of additional storage containers and

\$85,000 for a small baler with auxiliary equipment). Operating costs are estimated at \$20,000 per year for additional labor, electric power, and maintenance.

End Uses. Please see Section 4.5.7, "Market Conditions."

Public vs. Private Operation. The drop-off center would continue to be City-owned and privately operated.

Alternative 2 - Convert Landfill Drop-Off Center into a Buy-Back Center

Under AB 939, the City is required to evaluate both drop-off center and buy-back center alternatives. Because establishing new buy-back centers would have minor impacts on waste diversion, and a drop-off center already exists in Palo Alto, the two alternatives were combined. This alternative does not specifically address any of Palo Alto's recycling objectives, although it may have some minor impacts on waste diversion. A buy-back center is essentially a drop-off center at which participants are paid for the materials they bring in. These materials typically include aluminum cans, newspaper, glass, corrugated cardboard, and high-grade office paper. Because of the nature of the programs, buy-back centers must have regular business hours and be staffed full-time; they are often more labor intensive than drop-off centers and can require equipment not needed at drop-off centers. Palo Alto currently has two buy-back centers; in addition to these, the landfill drop-off center could be expanded to become a buy-back center. Both the drop-off center and the two buy-back centers in Palo Alto are described in Section 4.4, "Existing Conditions Description."

Waste Diversion Potential. The buy-back centers in Palo Alto currently collect only California Redemption Value beverage containers. If the landfill drop-off center becomes a buy-back center, the potential for a change in waste diverted from the landfill would be low. If anything, the waste would just be transferred from another recycling program, such as curbside, where the generator is not paid for it.

Absence of Hazard. The hazard potential of converting the landfill drop-off center to a buy-back center is virtually insignificant.

Flexibility. Converting the landfill drop-off center to a buy-back center can accommodate changing conditions by adding more staff or equipment.

Limited Shift in Waste Type Generation. Converting the landfill drop-off center to a buy-back center is expected to have no impact on shifts in waste type generation.

Ease of Implementation. PASCO estimates that adding the equipment necessary for converting the landfill drop-off center into a buy-back center (e.g., scales, cash register) could take as little as a few weeks, but getting the program fully operational could take three to six months. This is the time PASCO estimates it will need to learn how to run a buy-back center, retrain its staff, set up new systems (e.g. for cash auditing), etc.

Facility Needs. Modifying the landfill drop-off center to operate as a buy-back center would require the addition of scales, a cash register, and security fencing. In PASCO's estimation, there would be no need for a building to house the additional equipment.

Consistency with Local Policies. Converting the landfill drop-off center to a buy-back center is not consistent with City policies.

Absence of Institutional Barriers. Converting the landfill drop-off center into a buy-back center could cause conflicts with other recycling organizations in the City--many non-profit--who make money on collecting and selling recyclable materials. These groups would likely see a drop in the materials they collect because the generator would have an opportunity to be paid for his/her materials. In addition, the drop-off center would have to be certified by the State Department of Conservation (DOC) as a buy-back center for California Redemption Value beverage containers under AB 2020. According to the DOC, this would require filing an application to become a certified recycling center. Lastly, PASCO's contract would potentially have to be amended in order to incorporate the City's cash-handling procedures.

Estimated Cost. Capital costs are estimated to range from \$5,000 to \$20,000 depending on the type of equipment purchased and the extent of security improvements. An additional staff person would be required to operate scales and pay customers. Labor costs are estimated to be \$30,000 per year.

End Uses. Please see Section 4.5.7, "Market Conditions."

Public vs. Private Operation. The buy-back center would be City-owned and privately operated, similar to the current drop-off center.

Alternative 3 - Expand Multi-Family Dwelling Recycling Program Participation

This alternative would address the objective of increasing participation in the existing multi-family dwelling recycling program. The City currently distributes informational/educational materials about the existing recycling program to managers of apartments and condominiums who have already decided to begin a recycling program. In order to reach the remaining managers, informational/educational brochures or fliers need to be mailed or delivered and a follow-up telephone call made to answer questions and encourage the owner/manager to begin participating in the program. The City has made contact with apartment and condominium complexes in the past, but follow-up has been difficult, due to limited staff time. The City is currently compiling a new mailing list of apartment and condominium complexes; this is the first step in expanding this program.

After the managers are contacted and a decision has been made for that complex to begin a recycling collection program, public information/education efforts aimed at residents of those complexes will begin (please see the Education and Public Information Component in Section 7 for a discussion of this program).

Waste Diversion Potential. Currently, the City estimates that 50 percent of the existing multi-family dwellings, or 4,400 units, participate in collection of recyclables. This sector of the population is estimated to be responsible for about 1 percent of the total residential waste currently diverted. If there is total participation by all multi-family dwellings, diversion would increase by another 1 percent of the residential waste stream or 0.2 to 0.3 percent of the total waste stream.

Absence of Hazard. The hazard potential of the informational/educational program or increases in participation in the multi-family recycling program is nonexistent.

Flexibility. Expansion of the multi-family recycling program can accommodate changing conditions.

Limited Shift in Waste Type Generation. Expansion of the multi-family dwelling recycling program is expected to have no impact on shifts in waste type generation.

Ease of Implementation. Depending on the nature of the program, an informational/educational program could be implemented in anywhere

from a matter of days to weeks. The schedule is dependent on the techniques selected. Additional recycling carts will be required, as may additional collection equipment, but assuming a gradual increase in participation, this should not present any implementation difficulties. Implementing this program would occupy approximately 10 percent of one staff person's time for a one-year period.

Facility needs. Expansion of the multi-family recycling program can be integrated fairly easily into the existing operation.

Consistency with Local Policies. Expansion of the multi-family recycling program is consistent with City policies.

Absence of Institutional Barriers. City staff has encountered resistance in the past from managers of apartment and condominium complexes to recycling, due to it being perceived as messy. When the City began the bin program, the resistance lessened.

Estimated Cost. Costs for the informational/educational program aimed at managers of apartments and condominiums will depend on what information/education tools are selected; please see cost table in Education and Public Information Component in Section 7 for programs aimed at residents of apartments and condominiums.

Participation by all of the remaining 4,400 multi-family units, would require additional collection capacity of approximately one full-time truck crew. Estimated capital costs include approximately \$120,000 for a suitable collection vehicle and \$100,000 for bins. Operating costs with full participation are estimated at \$125,000 per year.

End Uses. Please see Section 4.5.7, "Market Conditions."

Public vs. Private Operation. The information/education efforts will be primarily City sponsored. The additional recyclable materials will be collected by the programs private operator, PASCO.

Alternative 4 - Expand Residential Curbside Recycling Program to Include Additional Materials

This alternative addresses the objective to increase the number of materials being diverted from the waste stream. Currently, mixed paper and HDPE containers are not being collected from any sector in Palo Alto. In this study, mixed paper comprises various recyclable grades, including

paperboard, magazines, clay-coated paper, colored ledger, books, ground-wood paper other than newspaper, and telephone books. The paper grades targeted for collection by the program would include only those grades that could be marketed. The mixed paper grades could then either be sold commingled or sorted by grade and sold for higher prices. The program would require the resident to place separated recyclable mixed paper at the curbside for collection.

Waste Diversion Potential. Adding mixed paper to curbside pick-up could be expected to divert between 2.0 and 2.7 percent of the total waste stream, assuming a capture rate similar to newspaper.

Absence of Hazard. The hazard potential of adding mixed paper to curbside pickup is insignificant. Collected paper should be stored properly to prevent fire hazards.

Flexibility. Adding materials to curbside pickup can accommodate some changing conditions by adjusting collection and processing operations. Recycling collection truck design may limit expansion of a multi-container curbside system and necessitate conversion to a commingled system at some point.

Limited Shift in Waste Type Generation. Adding materials to curbside pickup is expected to have no impact on shifts in waste type generation.

Ease of Implementation. PASCO estimates it would take a maximum of three months to incorporate additional materials pick-up into the current curbside program.

Facility Needs. Currently, two trucks make three trips to pick up refuse and recyclable materials on Palo Alto streets. One truck picks up refuse and then returns for the compost materials; the second truck picks up the other recyclable materials. PASCO estimates that, given the current operations, it would be most efficient and cost-effective to handle additional material collection via a separate truck run. The other option is to collect the other materials with the newspaper, which would require new equipment and significant changes to the existing operation. The collection of additional materials may require some processing via sorting; this will depend on the specifications of the market. If PASCO handles all of the processing, it may require the purchase of a baler, conveyor system, and a loader/forklift as a minimum. In addition, it may require the construction of a new building to house the equipment and provide collected material

storage. This may not be cost-effective for Palo Alto. The City may opt, instead, to contract the processing and transportation of the materials (e.g., with the SMaRT Station in Sunnyvale).

Consistency with Local Policies. Curbside pickup of mixed paper would be consistent with existing policies in Palo Alto.

Absence of Institutional Barriers. No institutional barriers are expected.

Estimated Cost. It would cost approximately \$240,000 per year in collection costs to add mixed paper to Palo Alto's curbside collection. This includes capital costs of \$240,000 for two new trucks, plus salaries for two drivers and operation and maintenance costs. Capital costs for processing (baler, conveyor system, loader/forklift) would be approximately \$120,000. In addition, there may be costs of \$100,000 for a foundation for the baler and conveyor system, and for a new building, if required.

End Uses. Please see Section 4.5.7, "Market Conditions."

Public vs. Private Operation. Curbside collection of additional materials would be privately operated as part of the City's existing curbside program.

Alternative 5 - Establish a Mobile Collection System

A mobile collection system, by definition, is one which moves and can service more than one area. Under AB 939, the City is required to evaluate this alternative. Establishing a mobile collection system does not specifically address any of the City's recycling objectives, although it could serve in the collection of mixed paper. Mobile systems are ideal for rural areas with low-density populations. Because Palo Alto has a fairly dense population and also has many recycling collection programs in place, it is served more efficiently by promoting and expanding current recycling programs.

Waste Diversion Potential. Because Palo Alto has many recycling collection systems in place, a mobile collection system is expected to have negligible effects on reducing the amount of waste diverted.

Absence of Hazard. The hazard potential of establishing a mobile collection system is virtually insignificant.

Flexibility. Establishing a mobile collection system can accommodate readily to changing conditions.

Limited Shift in Waste Type Generation. Establishing a mobile collection system is expected to have no impact on shifts in waste type generation.

Ease of Implementation. A mobile collection system would take less than a year to implement.

Facility Needs. A mobile collection system would require a trailer for customer transactions and a storage area for material collected. The collection site should be secured at night to prevent scavenging.

Consistency with Local Policies. A mobile collection system would not be consistent with local plans in Palo Alto since they already have an effective curbside collection program.

Absence of Institutional Barriers. Palo Alto has many collection systems in place, both City-sponsored and privately-sponsored. Establishing a mobile collection system could potentially impact the success of the existing operations.

Estimated Cost. Capital costs to establish a mobile collection system are estimated to range from \$50,000 to \$100,000 for a suitable truck and tractor rig. Assuming 1 1/2 operators on a full-time equivalent basis, annual operating costs are expected to be about \$60,000.

End Uses. Please see Section 4.5.7, "Market Conditions."

Public vs. Private Operation. A mobile collection program would likely be City managed and privately operated, in keeping with the City's practice of public/private cooperation.

4.5.2 Commercial/Industrial Alternatives

Alternative 1- Expand Commercial/Industrial Recycling Program

This alternative addresses the objectives of increasing the number of material types collected from the commercial sector and increasing participation in the existing commercial recycling programs (please see Section 4.4, "Existing Conditions Description"). Commercial/industrial and self-haul waste represents 75 percent of Palo Alto's waste stream, but only 11 percent is recycled. In order to collect more of the commercial/industrial waste, more programs will have to be established and a broader range of materials collected. This alternative would exclude the

Downtown Environmental Action Project, which offers a broad collection program already (please see Section 4.4.4). With the additions, the materials collected through the commercial/industrial program are newspaper, PET, glass, tin and aluminum cans, high-grade office paper, and corrugated cardboard. Other materials that could be considered are HDPE, film, plastic, ferrous metals, and wood.

Before instituting a City-wide commercial/industrial collection program, a one-year pilot program would be undertaken to determine the best method of collection (e.g., a two-bin system, a multi-bin system, etc.)

Waste Diversion Potential. Increasing the number of material types collected from the commercial sector and increasing the participation rate in the existing commercial recycling programs is expected to divert an additional 3 to 5 percent of the total waste stream. This assumes a capture rate of 50 percent of the currently disposed tons of the materials proposed for the program. (Based on discussions with the CIWMB, this capture rate is considered reasonable.)

Absence of Hazard. The hazard potential of expanding the commercial recycling programs is low.

Flexibility. Commercial collection programs are readily adaptable to changing conditions such as increased participation rate or the addition of another material type for collection. Additional trucks could be added or more frequent collection of materials could occur to accommodate changing conditions.

Limited Shift in Waste Type Generation. Expanding the commercial recycling programs is expected to have no impact on shifts in waste type generation.

Ease of Implementation. The implementation schedule is dependent on the amount of materials added to the program and the number of businesses targeted to participate in the program. However, most commercial programs could be implemented in less than a year.

Facility Needs. Facility needs for expansion of the commercial sector recycling program include additional trucks, drivers, and collection containers. In addition, a material recovery facility (e.g., the SMaRT Station) will be needed to process the additional volume of materials collected. Lastly, increasing the participation rate may require public education materials and staff to disseminate the information.

Consistency with Local Policies. Commercial recycling programs already exist in Palo Alto; therefore, expanding the programs is consistent with City policies.

Absence of Institutional Barriers. One of the major problems associated with increasing the number of material types collected from the commercial sector is the need for markets for the additional materials collected. In addition, some businesses are unwilling to partake in recycling programs, as these programs are generally not revenue-producing, and often even cost the company. Also, space constraints for waste collection at commercial/industrial facilities are often a barrier.

Estimated Cost. The cost to expand the commercial sector recycling programs is dependent on the number of additional materials added and the increase in the area to be included. In order to separately collect approximately 5,000 tons per year of targeted materials, additional collection effort would be required for the recyclables, and less effort would be required for conventional garbage collection. In total, an estimated one additional truck would be required plus a complement of bins. Estimated capital costs are \$260,000 for an anticipated extra collection truck plus a complement of bins. Annual operating costs are estimated at \$150,000.

End Uses. Please see Section 4.5.7, "Market Conditions."

Public vs. Private Operation. An expanded collection program for businesses would likely continue to involve both the public and private sectors, with the latter handling the majority, if not all, of the operations.

Alternative 2 - Establish a Manual Material Recovery Operation

A manual material recovery operation involves the recovery of loads that are left at a designated site, such as a landfill or transfer station, often from uncompacted commercial debris boxes. This process, which is sometimes referred to as a "dump and pick" operation, would be set up at the Palo Alto Landfill. For this type of an operation, a concrete pad for sorting the materials is preferable, though not required. A concrete pad would require a dedicated picking area.

Waste Diversion Potential. A manual material recovery operation could divert an additional 4 percent of the total waste stream.

Absence of Hazard. Workers at the facility face possible hazardous situations, as they are at a safety risk from the exposure to potentially hazardous materials in the waste stream and working around large, moving equipment such as loaders, dozers, and compactors.

Flexibility. Increased recovery of materials or the recovery of additional materials may require expansion of the manual material recovery facility or change in processing methods.

Limited Shift in Waste Type Generation. A manual material recovery operation is expected to have no impact on shifts in waste type generation.

Ease of Implementation. Approximately six months to one year would be needed to implement a manual material recovery operation.

Facility Needs. A manual material recovery operation requires a facility with an area for sorting, storage and collection; this could be at the landfill.

Consistency with Local Policies. A manual material recovery facility is consistent with City policies.

Absence of Institutional Barriers. Once the SMaRT Station or an alternative is operational, there will be no need for a "dump and pick" operation, as materials will go directly to the SMaRT Station.

Estimated Cost. It would cost approximately \$25/ton to process the waste at a manual material recovery facility.

End Uses. Please see Section 4.5.7, "Market Conditions."

Public vs. Private Operation. A manual recovery station would likely be City managed and privately operated.

Alternative 3 - Establish a Mechanized Material Recovery Operation

Palo Alto is currently negotiating a contract for involvement with the cities of Sunnyvale and Mountain View in the SMaRT Station. Facilities like the SMaRT Station are designed to be centrally located for the collection, processing, and marketing of recyclable materials from several cities or regions. When up and running, the SMaRT Station will collect paper, metals, glass, wood wastes, and yard wastes. If the SMaRT Station is not built, the City will investigate an alternative to processing of commer-

cial/industrial recyclables, potentially through cooperation with another jurisdiction.

Waste Diversion Potential. The SMaRT Station is anticipated to receive about 75,500 tons per year and divert approximately 20 percent of the incoming refuse. This would amount to diversion of 11 percent of the total waste stream.

Absence of Hazard. There are several potential hazards associated with the SMaRT station. There is the possibility of fire and explosion from the shredder operations and the possibility of explosion when compacting the residual load. Because some of the materials that will be collected at the facility are combustible, there is a minor fire hazard associated with their storage. In addition, workers at the facility will be at safety risks from the handling of materials, exposure to potentially hazardous materials, and moving equipment.

Flexibility. The SMaRT Station will moderately accommodate changing conditions; however, the flexibility is limited. Some changes may require facility modifications.

Limited Shift in Waste Type Generation. The implementation of the SMaRT Station is expected to have no impact on shifts in waste type generation.

Ease of Implementation. It is estimated that the SMaRT Station will be completed and operational in 1993; however, the facility has been subject to substantial delays already.

Facility Needs. The SMaRT Station will meet all of the facility needs for this alternative.

Consistency with Local Policies. The SMaRT Station is consistent with City policies.

Absence of Institutional Barriers. There are no known institutional barriers.

Estimated Cost. The SMaRT Station will be paid for by an increase in garbage rates to Palo Alto residents. In addition, the City will pay tipping fees of \$2 per ton for 75,700 tons or \$116,180 per year.

End uses Please see Section 4.5.7, "Market Conditions."

Public vs. Private Operation. A facility like the SMaRT Station can be operated by either a public or private entity. Current plans (in negotiation) are for the SMaRT Station to be privately operated.

4.4.3 Other Alternatives

Alternative 1- Divert Inert Solids to a Construction Material Recycling Facility

Inert solids in most areas are disposed of in landfills, although they often contain recyclable materials. Palo Alto currently generates 27,420 tons per year of asphalt and concrete, of which 19,990 tons is generated through the City Public Works Department, the City Utilities Department, and capital improvement projects. All but 500 tons per year is landfilled. The City is aware of the need to divert inert solids; one way to recycle concrete, for instance, is to use it as road base. This alternative addresses the objective of diverting materials currently collected in industrial debris boxes and diverting inert solids generated by the City Public Works Department, the City Utilities Department, and capital improvement projects.

Waste Diversion Potential. This alternative is estimated to divert 6 to 12 percent of the total waste generated in Palo Alto.

Absence of Hazard. Diverting inert solids creates no known hazards.

Flexibility Because the market for materials made from inert solids is fairly strong, it would accommodate changing conditions.

Limited Shift in Waste Type Generation. Diverting inert solids is expected to have no impact on shifts in waste type generation.

Ease of Implementation. This program is scheduled to be underway in 1991. Two existing inert solids recycling facilities, Raish Products in Sunnyvale and S.R.D.C. in Redwood City, are located within 20 miles roundtrip of Palo Alto. Minimal effort is needed to include recycling requirements in the City's CIP specifications and to implement inert solids recycling within the City's departments.

Facility Needs. An area of the Palo Alto Sanitary Landfill must be designated for the stockpiling of materials generated by the City's department.

Consistency with Local Policies. Diverting inert solids is consistent with City policies.

Absence of Institutional Barriers. Diverting inert solids has no known institutional barriers.

Estimated Cost. Costs for recycling inert solids will be limited to payments to Contractors for those services detailed above. At this time, the estimated cost is \$10.00 per ton including loading, transportation, and tipping fees, or an annual cost of \$70,000 (6 percent diversion) and \$140,000 (12 percent diversion).

End Uses. Please see Section 4.5.7, "Market Conditions."

Public vs. Private Operation. Diverting inert solids can involve both the City and private companies (i.e., the City would locate the processor and PASCO would work with that processor) or can be handled completely by private companies (i.e., PASCO locates the processor and works directly with them). However, the market will almost certainly be a private operation.

4.4.5 Other Program Considerations

A. Zoning and building code practices. The City of Palo Alto is aware of Recycling Market Development Zones established under SB 1322 and is considering this option. In addition, the City is currently preparing a zoning ordinance that would require recycling collection areas to be set aside in all new construction (with the exception of single family homes).

B. Solid waste disposal rate structure. Palo Alto will evaluate the solid waste disposal rate structure in 1991.

C. Methods to increase markets. During the short-term planning period, the Local Procurement Ordinance in Palo Alto (see Source Reduction Component) will contribute to an increase in the local market for products made from post-consumer waste. In addition, the waste audits performed by the City for businesses provide an opportunity for the City to disseminate information about purchasing products made from post-consumer waste, which will also increase local markets. The City will also look to the state for markets developed at that level through the Integrated Waste Management Board.

D. Handling methods. Because Palo Alto recognizes the necessity of preserving the integrity of recovered materials for end use, it encourages source separation of recyclable materials through its many collection programs. In addition, the City and PASCO have considered re-routing

commercial collection runs in order to preserve the integrity of recyclables that will go to the SMaRT Station. This would enable the separate collection of wet wastes from grocery stores, for instance, and dry wastes from other businesses.

4.5 Selection of Recycling Program

Palo Alto currently has many recycling programs in place that will continue. The programs selected and listed below are either new programs, or additions to successful existing programs. The selection of programs was based on the evaluation criteria and the ease of implementation in the City of Palo Alto.

Table 4-4 summarizes in a qualitative manner the findings of the alternatives evaluation; Table 4-5 assigns a numerical value to the evaluation presented.

4.5.1 Alternatives Selected

Short-term planning period. The programs selected to reduce the amount of waste being landfilled or incinerated during the short-term planning period include:

- Expand multi-family dwelling recycling program participation
- Expand commercial/industrial recycling program
- Establish a mechanized material recovery facility
- Divert inert solids to a construction material recycling facility

Expand Multi-Family Dwelling Recycling Program Participation - Residential Alternative 3. Palo Alto's waste stream is primarily made up of commercial/industrial waste, but residential recycling collection programs have been quite successful, particularly with single family homes. Among multi-family dwellings, the participation rate is estimated at just 50 percent and it is also estimated that the remaining 50 percent could be brought on board with relatively little effort and expense. Given this scenario, the largest residential sector remaining that is not currently participating in recycling should be included in the program.

Expand Commercial/Industrial Recycling Program - Commercial/Industrial Alternative 1. Commercial and industrial waste makes up the majority of Palo Alto's waste stream, but this sector participates the least in recycling collections. This seems to be due to the fact that, although there are many recycling collection programs in place for business, they are either regional (e.g., Stanford Shopping Center's program or the DEAP) or, in the case of City-sponsored programs, are sometimes met with limited participation. There is known resistance to recycling from businesses, as it usually is not revenue-producing and often costs businesses. For this reason, recycling collection needs to be made as appealing as possible for businesses, in order to get widespread participation. A coordinated program including, for instance, collection centers along the lines of DEAP's, has the potential to be very successful. Alternatively, for some commercial generators, the placement of one or more extra bins may be feasible. The key is to make recycling as convenient as possible for the businesses. The pilot program for the commercial/industrial sector will determine which type of program would be most successful in Palo Alto. The results on the pilot program for the commercial industrial sector will determine which type of program would be most successful in Palo Alto.

Establish a Mechanized Material Recovery Facility - Commercial/Industrial Alternative 3. In order to handle a large quantity of collected materials (e.g., City-wide commercial/industrial collection programs), a material recovery facility like the SMaRT Station is needed. This makes it possible to collect recyclable materials from many regions and to process them in the same location, which is critical in meeting market specifications for recovered materials.

Divert Inert Solids to a Construction Material Recycling Facility - Other Alternative 1. Currently, 26,830 tons per year of asphalt and concrete are being brought to the City's landfill. The market for products made from these materials is fairly strong, and material recycling processors have been located. This is a relatively straightforward way to recycle these materials and divert a large quantity from the landfill.

Medium-term planning period. The programs selected to reduce the amount of waste being landfilled or incinerated during the medium-term planning period are:

- Expand existing drop-off facility to include mixed paper

- Expand residential curbside recycling program to include mixed paper

Expand Existing Drop-Off Facility to Include Additional Materials - Residential Alternative 1. Mixed paper, for example, represents a sizeable portion of Palo Alto's waste stream that is not currently being collected. In order to achieve the 50 percent diversion goal, the City will need to begin collecting mixed paper in 1995. Mixed paper is an assemblage of recyclable paper grades. Depending upon the marketing situation in the medium term period, mixed paper may be accepted by brokers in a commingled form and/or for a higher price, the grades could be sorted and sold by grade.

Expand Residential Curbside Recycling Program to Include Additional Materials - Residential Alternative 4. This alternative was selected for the reasons described in the previous selection. Mixed paper, including magazines, makes up 22 percent of Palo Alto's total residential waste stream, so collecting this would contribute greatly to meeting the 50 percent diversion goal. In addition, mixed paper is fairly easy for residents to collect, so participation should be very high.

4.5.2 Estimated Diversion Quantities

The recycling programs selected are expected to divert the following additional percentages from Palo Alto's total waste stream:

Short-term planning period

Expand multi-family dwelling recycling program participation: 0.2 to 0.3 percent (waste types included: newspaper, tin and aluminum cans, glass, PET, corrugated cardboard, motor oil, metal scrap, small household appliances).

Expand commercial/industrial recycling program: 3 to 5 percent (waste types included: newspaper, PET, glass, tin and aluminum cans, high grade office paper, and corrugated cardboard).

Establish a mechanized material recovery facility: 11 percent (waste types included: paper, metals, glass, wood wastes, and yard wastes).

Divert inert solids to a construction material recycling facility: 6 to 12 percent (waste types included: asphalt and concrete).

Medium-term planning period

Expand drop-off facility to include additional materials: 0.1 to 0.3 percent (waste types included: mixed paper; tin, aluminum, and steel cans; PET glass; newspapers; aluminum foil trays; metal scrap; motor oil; car batteries; corrugated cardboard; yard debris; and other miscellaneous items [e.g., lawn mowers, small appliances, motors]).

Expand residential curbside recycling program to include additional materials: 2.0 to 2.7 percent (waste types included: same as drop-off facility, except for other miscellaneous items).

4.5.3 End-markets, End uses, and Back-up Markets for Diverted Materials.

See Market Conditions (Section 4.5.7.)

4.5.4 Materials Handling and Disposal Needs

See Section 4.4.5, Other Program Considerations, part D.

4.5.5 Facility Needs.

Short-term planning period.

Expand multi-family dwelling recycling program participation: no new facilities needed.

Expand commercial/industrial recycling program: additional trucks, drivers, collection containers, among other things. Also, a material recovery facility (e.g. the SMaRT Station) is needed.

Establish a mechanized material recovery facility: the SMaRT Station is scheduled to be operational by 1993.

Divert inert solids to a construction material recycling facility: No new facility needed, except for a storage area at the landfill.

Medium-term planning period.

Expand existing drop-off facility to include additional materials: may need a conveyor system and dedicated staff person.

Expand residential curbside recycling program to include additional materials: new trucks and drivers will be needed for collection. If PASCO han-

dles the processing, a baler, conveyor system, and a loader/forklift will be needed. In addition, a new building may be needed.

4.5.6 Identification of Measures to be Taken if Requirements Cannot Be Met.

In the event of unfavorable market conditions which could prevent the City from meeting its diversion goals, the City plans to employ the following measures

- consider pooling resources with other cities in order to market materials cooperatively.
- investigate the existing collection and processing activities to be sure that materials are being prepared properly to meet buyer's specifications.
- conduct broad research to locate markets or end uses not previously found, both on a local level and beyond.

To the extent possible, the City will coordinate its efforts with Santa Clara County to ensure the development of favorable markets for recyclable materials.

If negotiations for the SMaRT Station cannot be completed, the City has contingency plans for a mandatory commercial/industrial recycling program targeted to collect corrugated cardboard, white ledger, and newsprint, and several grades of mixed papers. Estimates developed by PASCO indicate collection costs of \$801,435 per year to recover an amount similar to that which would have been diverted through the SMaRT Station.

4.5.7 Market Conditions

In order to truly *recycle*, and not just collect materials, there needs to exist viable markets for the recovered materials. For this reason, this section addresses the existing market conditions local to the City of Palo Alto, as well as on a broader scale (e.g., regional, statewide, national, and international). The focus is on those materials most often collected through recycling programs, such as various paper grades, plastics, metals, and glass.

In addition, the City of Palo Alto is aware of the Recycling Market Development Zones established under SB 1322 (see introduction of this plan for description of SB 1322) and will consider this option.

Paper

Old Newspaper (ONP) ONP is the main grade of waste paper collected in the residential sector. ONP collected in Palo Alto is taken to Container Corporation in San Jose. A number of other ONP markets are available in northern California.

Currently, the amount of ONP that is available nationwide for recycling far exceeds the demand. However, this situation is expected to change. It is estimated that the demand for ONP will almost double by 1995 due to increased export of ONP, increase in the paper board market and other factors.

Because ONP is contaminated with printing inks, it is necessary to de-ink this raw material before it can be recycled. The primary reason for excess ONP is the shortage in newsprint facilities that can de-ink the newspaper, or use it. The deinking capacity in the U.S. is expected to increase in the future to meet the anticipated demand and help to equalize the supply and demand balance. California passed legislation effective January 1, 1991 (Assembly Bill 1305), requiring newspaper publishers to use 25 percent post consumer material. This is expected to stimulate the expansion of de-inking facilities in the northwest.

End uses for ONP include newsprint, insulation, packing, building materials and animal bedding. Newsprint manufacture is anticipated to be the largest market for ONP and is anticipated to increase significantly through the year 2000. Other end uses are anticipated to increase only marginally.

Current market prices paid for ONP in California range from \$25 to \$40 per ton FOB mill. However, the market price for ONP is cyclical due to decreased collection in the winter months, paper mill shutdown for maintenance repair in the summer months, economic conditions, international exchange rates and other factors.

High-grade Waste Paper High-grade paper is a general description of various long-fiber grades of paper. High-grade paper includes high-grade, computer paper, and tab cards. These grades are more valuable

for recycling because of their strength, and thus command a higher price than other paper grades.

Market prices for high-grade paper are dependent on the price of pulp. High-grade wastepaper is often used as a substitute for pulp, so when pulp prices drop so does the price of high-grade paper. The market prices for different paper grades vary independently. However, the market price for higher grades are generally more stable than that paid for lower grades. The higher the degree of separation from the source, the higher the price paid for the paper. High-grade paper can be used in making writing paper, computer paper, napkins, facial tissues and paper towels.

High-grade paper collected in Palo Alto is taken to Weyerhaeuser in San Jose.

Mixed Waste Paper

As implied in its name, mixed paper refers to a paper stream containing more than one grade. Mixed paper is defined in this study as a mixture, unsegregated by color or quality, of at least two of the following paper wastes: paperboard, clay-coated paper, ground-wood paper other than newsprint, colored ledger, books, and telephone books. The housing industry and the value of the U.S. dollar overseas greatly affect the demand for wastepaper. A strong dollar overseas means a decrease in the demand for waste paper. Secondary markets for recovered paper can be found in the U.S and abroad. Mixed paper export has increased significantly and has allowed for growth in mixed paper recycling, particularly in the western U.S. Local domestic markets, however, are fairly well saturated. Potential buyers for wastepaper in the Bay Area include: Weyerhaeuser in San Jose and DAI EI Papers USA Corp. in Burlingame, but other markets need to be identified in order for recycling of mixed paper to be feasible in Palo Alto. The City will address market development for mixed paper and will also look to the State for development of mixed paper markets.

The primary use of mixed waste paper is in the manufacture of combination boxboard which is used to make boxes for shoes, clothing, and dry foods. Other uses for mixed waste paper include the manufacture of roofing felt, and construction paper building materials. Markets also exist for each of the separate grades that are included in mixed paper.

Old Corrugated Containers (OCC) The amount of OCC consumed in the U.S. is significant, approximately 15 million tons per year, due to its use in shipping packaging for most consumer products. The quantity of OCC in the waste stream is greater in the commercial sector than in the residential sector. OCC that has been separated properly can be used in the manufacture of new corrugated containers, cereal boxes, pad bases, and wallboard.

The market for OCC in California is very strong; more than one half of the collected OCC in California is used by mills within the state. Current market prices for OCC range from \$43 to \$65 per ton. OCC collected in Palo Alto is taken to Jefferson Smurfit in San Jose. Other potential buyers for OCC generated in Palo Alto include Weyerhaeuser in San Jose and DAI EI Papers USA Corporation in Burlingame.

Metals

Aluminum cans (UBC) Approximately half of the aluminum disposed of in solid waste is in the form of cans. The waste recovery system for aluminum cans is highly successful. Compared to other recyclables, aluminum cans command the greatest price per pound. The recovery rate for UBC is in excess of 61 percent.

Aluminum cans that have been separated can be used by the primary producers. They are remelted and made directly into can stock. Aluminum scrap is used primarily by secondary aluminum producers. Current scrap value market prices for aluminum cans range from \$.40 to \$.55 per pound. The addition to the AB 2020 redemption value raises the total market price. Markets for aluminum cans exist in the U.S. and abroad. Aluminum cans that are recovered in Palo Alto are collected by Markovits and Fox in San Jose.

Steel food and beverage containers Tin cans that are used as food containers are actually steel cans with a thin coating of tin. The percentage of tin in steel cans usually totals about 0.25 percent and is worth approximately \$3 to \$4 per pound. This small amount of tin can cause contamination in steelmaking. Detinning recovers tin and also increases the quality of steel scrap. However, due to decreasing amounts of tin in steel cans, along with a weak scrap market for tin, some detinning operations are closing.

Growth in curbside collection of steel cans has been an important element in the expansion of steel can recycling. Tin and bimetal cans recovered in Palo Alto are collected by Markovits and Fox in San Jose.

Glass

Cullet, or waste glass usage in the U.S. is estimated at 25 to 30 percent of the glass. Cullet is primarily traded on the U.S. market, so its market price remains fairly constant.

A primary concern for end use markets is the quality of the material. In the glass plant, contaminants can cause damage to equipment or result in poor quality product. One of the problems with curbside collection of commingled glass is that it produces multi-colored shards of glass. Markets for mixed-color cullet are not as stable or lucrative as that for color sorted containers.

The two primary end uses for recovered waste glass are cullet for new glass; and as a raw material for making secondary products, such as glasphalt (highway paving material), foamed insulation, and construction material.

Most of the glass recovered in Palo Alto is taken to Owens-Brockway in Tracy and a small amount is taken to Circo Glass in Newark. The glass market has become problematic for many recyclers recently due to the increased quality standards being imposed and the request for color-sorted materials. Current market prices for sorted California redemption value glass range from \$0.03 to \$0.06 per pound. The addition to the AB 2020 redemption values raises the total market price.

Plastics

Markets for plastics are fairly new, but the EPA predicts that as processing technologies are developed, plastics recycling will grow and new markets will develop.

Polyethylene terephthalate (PET) Most soda containers are made out of PET, which is the most recycled of all plastics. Over 160 million pounds of PET bottles were recycled in 1988. Post-consumer PET is prohibited for use in new food containers because of FDA restrictions. The primary end use for PET is fiberfill, which is used in pillows, sleeping bags, and ski jacket insulation, among other things. The most desirable market for recy-

pled PET is compounded, extruded, and molded plastic makers. PET collected in Palo Alto is taken to Jefferson Smurfit in San Jose.

High-density polyethylene (HDPE) and Low-density polyethylene (LDPE)

HDPE is used in the manufacture of jugs (e.g., milk, cider, distilled water) and bottles (e.g., laundry and dish detergent, motor oil, antifreeze) and the market for recycled HDPE is growing. However, because of sanitary restrictions, these items are not recycled back into food packaging. Major potential markets for recycled HDPE are soft drink basecups, plastics lumber, containers, drums, pails and various types of pipes.

Palo Alto does not currently collect HDPE, but it is a commonly targeted item in other curbside recycling programs due to its easily identifiable resin. An estimated 75 million pounds of HDPE bottles were recovered for recycling in 1989.

LDPE is used in clear film wrap to package products and in many plastic bags and some bottles. The use of LDPE in the manufacture of bags adds strength to the film.

Polystyrene

There are various forms of polystyrene, the most familiar being the foamed or expanded polystyrene foam (EPS), commonly referred to as styrofoam. The uses for EPS foam include fast-food single serve cups and trays; and packing materials in both rigid, molded form and in loose form or "peanuts," as EPS is sometimes called.

A three-month polystyrene collection program was instituted in Palo Alto in November 1990 and the material sold to Free-Flow Packaging Corporation in Redwood City, California and Bay Polymer Corporation in Fremont, California. Recovered polystyrene can be used in the manufacture of toys, office equipment, insulation, and cassette casings.

4.6 Recycling Program Implementation

The following sections describe the tasks necessary to implement the selected recycling programs.

4.6.1 Government Agencies Responsible for Implementation

Listed below are the government and private entities responsible for implementing the recycling programs selected by Palo Alto.

Expand multi-family dwelling recycling program participation

- City Department of Public Works

Expand commercial/industrial recycling program

- City Department of Public Works
- PASCO

Establish a mechanized material recovery facility

- City Department of Public Works
- Other Bay Area cities involved with SMaRT Station (Sunnyvale, Mountain View)

Divert inert solids to a construction material recycling facility

- City Department of Public Works
- General contractor

Expand existing drop-off facility to include additional materials

- City Department of Public Works
- PASCO

Expand residential curbside recycling program to include additional materials

- City Department of Public Works
- PASCO

4.6.2 Tasks Necessary to Implement Programs

The City has had recycling programs in place for many years; these programs (see Section 4.4, Existing Conditions) will continue. Listed below

are the tasks necessary to implement the new programs selected and described previously in Section 4.5.

Expand multi-family dwelling recycling program participation

(Note: Multi-family dwellings have been contacted in the past, but additional efforts are required in order to involve the remaining approximately 50 percent of complexes).

- Identify multi-family dwellings currently not participating in the recycling program, develop a mailing list,* and mail informational material to the manager of each complex.
- Follow up the mailing with a telephone call or visit to encourage the manager to begin participating.
- Once manager has agreed to participate, begin public education and information efforts aimed at residents (see Public Information and Education Component).
- Schedule and order additional recycling carts.

Expand commercial/industrial recycling program

- Identify companies to target, compile or obtain mailing list, and send letter or phone each company to assess interest in participating in pilot program for commercial recycling.
- Determine which materials will be collected during pilot program.
- Make arrangements with a hauler to collect, process, and sell recovered materials during a one-year pilot program.
- Purchase collection containers and identify location sites.
- Begin one-year pilot program to ascertain feasibility of City-wide commercial recycling and to refine program.

Establish a mechanized material recovery facility

- Finalize contract between other cities and Waste Management, Inc.

* Per Recycling Center, this was completed in January 1991.

- Coordinate with PASCO regarding any modifications that would have to be made in its operations in order to incorporate the SMaRT Station; this will more than likely require a review of the contractual agreement between the City and PASCO.
- In 1993, begin taking materials to the SMaRT Station.

Divert inert solids to a construction material recycling facility

- Revise CIP's specifications to include a bid item for recycling of inert solids.
- Contract out the removal of inert solids generated by City's departments.

Expand existing drop-off facility to include additional materials

- Coordinate with PASCO and review/adjust contract if necessary, to incorporate mixed paper collection and processing.
- Establish a market for either commingled or grade-sorted mixed paper and other materials.
- Inform the public (see Public Information and Education Component) that mixed paper can now be taken to the drop-off facility.

Expand residential curbside recycling program to include additional materials

- Coordinate with PASCO and review/adjust contract, if necessary, to incorporate mixed paper collection and processing into existing curbside program.
- Determine whether PASCO will be responsible for processing as well as collection. If no, make arrangements with a local company to contract the processing of the materials and transportation to the buyer(s).
- Establish a market for either commingled or grade-sorted mixed paper and other materials (see Section 4.5.7 for a discussion of Market Conditions for these materials).

- Purchase and distribute mixed paper collection containers for residents.
- Inform residents (see Public Information and Education Component) about mixed paper collection at the curb.

4.6.3 Short-term and Medium-term Planning Period Implementation Schedule

Please see Figures 10-12 to 10-16 in the Integration Component (Section 10) for the implementation schedule.

4.6.4 Implementation Costs

Please see the Funding Component (Section 9).

4.6.5 Actions Planned to Deter Scavenging

The most effective means for deterring unauthorized removal of recyclable materials is through an ordinance prohibiting this activity. The City of Palo Alto has such an ordinance on the books.

4.7 Recycling Program Monitoring and Evaluation

The City of Palo Alto recognizes the need to monitor and evaluate recycling programs in order to ascertain whether diversion goals are being met. The following section includes the steps that will be taken to monitor and evaluate the selected recycling programs.

4.7.1 Methods to Quantify and Monitor Achievement of Objectives

The following tasks will be used to effectively monitor the success of the recycling programs. Solid waste diversion will be quantified by tons.

Recordkeeping. Accurate recordkeeping will be the key to determining whether recycling objectives are being met. The City will coordinate with PASCO to begin keeping separate records for each collection program. Currently, PASCO is combining most of its collection data, so that it is not possible to determine, for instance, how many tons of waste are collected from multi-family dwellings. The City and/or PASCO will have to set up a more detailed database to store data such as the number of tons of waste collected through *each program, by waste type*. PASCO could potentially re-route its collection runs in order to facilitate the gathering of this data.

This information will be tracked on a monthly basis and will allow the City to regularly monitor the recycling programs and progress toward meeting diversion goals. In addition, the operators of residential and commercial collection programs should collect information regarding household and business participation in order to monitor this measure of program effectiveness.

Waste generation study. In addition to the recordkeeping, a future waste generation study should be conducted in order to gauge the changes in the City's waste stream and the effectiveness of the programs.

Surveys. Mailed questionnaires or telephone surveys will be conducted approximately yearly with sample groups from both the residential and commercial/industrial sectors to determine (a) the awareness level about recycling programs, and (b) among those already participating, what the satisfaction level is. For instance, are recycling programs convenient? Are they being used to their capacity? Through the surveys, obstacles to recycling can be identified and participation increased.

4.7.2 Written Criteria for Evaluating Program's Effectiveness

The effectiveness of each recycling program will be evaluated using the following written criteria.

- Are the recycling objectives being achieved
- **Total solid waste collected.** Through the recordkeeping system and the waste generation study, a determination will be made as to whether the program is successful in achieving the estimated reduction in solid waste volume and weight.
- **Participation rate.** Information from curbside and commercial collection program operators regarding participation will give the City an idea about the numbers of residents and businesses participating in recycling programs over time. An increase in the number of households or businesses participating over time is one measure of the success of these programs.

4.7.3 Parties Responsible for Monitoring, Evaluation, and Reporting

The City Public Works Department will oversee the monitoring and evaluation of recycling programs and will be ultimately responsible for their execution. In addition, PASCO will provide operational information for the programs it is running. Volunteers will be utilized for tasks such as conducting surveys.

4.7.4 Monitoring and Evaluation Funding Requirements

A budget will need to be set aside for the follow-up waste generation study and for surveying costs (primarily staff time and printing/ mailing costs for questionnaires). Two recycling coordinators will be added to the staff; they will be responsible for planning, developing, and implementing the new and expanded programs that are identified in this document. Annual monitoring costs in the short-term planning period for the selected programs are estimated to be as follows:

- Expand Multi-family program \$1,000
- Expand Commercial/Industrial program \$1,000

Table 9-1 presents a summary of costs (including monitoring for all selected programs).

4.7.5 Measures to be Implemented if Monitoring Shows a Shortfall

If monitoring efforts indicate that diversion objectives are not being met, the following measures will be employed.

- re-evaluate diversion goals to determine their feasibility, given empirical data.
- evaluate public education efforts to determine whether these need to be increased to broaden awareness of, and participation in, recycling programs.
- evaluate alternative markets for recovered materials.
- provide incentives to the commercial/industrial sector for recycling.

- address issues resulting from surveys that could potentially be affecting diversion goals.
- establish a City ordinance making recycling mandatory.

Table 4-1
 Diversion Rates By Material For Residential Waste (Tons, 1990)
 City of Palo Alto

MATERIAL	DISPOSED	DIVERTED				GENERATED	DIVERSION RATE (%)
		Source Reduction	Curbside Programs	Lndfl. Dropoff Programs	20/20 Composting Programs		
PAPER (total)	10,272					15,285	
OCC/Kraft	1,257	0	280	0	0	1,537	18
Magazines	1,024	0	0	0	0	1,024	0
Mixed Paper	3,673	0	0	0	0	3,673	0
Newsprint	1,123	0	4,232	0	0	5,836	81
High Grade	659	0	0	0	0	659	0
Other Paper	2,537	0	0	0	0	2,537	0
PLASTICS (total)	1,371					1,950	
HDPE	173	0	0	0	0	173	0
PET	107	0	7	1	0	116	8
Polystyrene Foam	779	0	0	0	0	779	0
Film	139	0	0	0	0	139	0
Other Plastic	742	0	0	0	0	742	0
GLASS (total)	870					2,540	
Refillable Beverage	55	0	0	0	0	55	0
CA Redemption Value	184	0	669	280	53	1,186	84
Other Recyclable	462	0	668	0	0	1,130	59
Other Non-Recyclable	169	0	0	0	0	169	0
METALS (total)	1,033					1,860	
Aluminum Cans	84	0	50	6	0	146	42
Other Aluminum	99	0	0	8	0	107	7
Bi-metal Cans	10	0	0	0	0	10	0
Steel Food & Bev. Cans	298	0	87	0	0	385	23
Other Ferrous	394	0	475	0	0	809	59
Other Non-ferrous	107	0	0	0	0	107	0
White Goods	103	0	2	0	0	105	2
YARD WASTE (total)	2,226					7,680	
Leaves and Grass	2,108	0	0	0	0	2,108	0
Branches and Brush	118	0	0	0	0	118	0
OTHER ORGANICS (total)	4,365					4,813	
Food	2,315	0	0	0	0	2,315	0
Rubber/Tires	150	0	0	0	0	150	0
Wood	635	0	0	0	0	635	0
Agri. Crop Residue	8	0	0	0	0	8	0
Manure	0	0	0	0	0	0	0
Textiles/Leather	511	0	0	0	0	511	0
Diapers	384	447	0	0	0	831	54
Other Organics	363	0	0	0	0	363	0
OTHER WASTES (total)	243					243	
Inert Solids	161	0	0	0	0	161	0
Hazardous Waste	77	0	0	0	0	77	0
Appliances	5	0	0	0	0	5	0
SPECIAL WASTES (total)	114					114	
Ash	0	0	0	0	0	0	0
Sewage Sludge	0	0	0	0	0	0	0
Industrial Sludge	0	0	0	0	0	0	0
Asbestos	0	0	0	0	0	0	0
Auto Shredder Waste	0	0	0	0	0	0	0
Auto Bodies	114	0	0	0	0	114	0
Stuffed Furn. Mattresses	0	0	0	0	0	0	0
TOTAL	21,069	447	6,870	776	60	34,276	39
					5,454	13,207	

Table 4-2
 Diversion Rates By Material For Non-Residential Waste (Tons, 1990)
 City of Palo Alto

MATERIAL	DISPOSED	Source Reduction			DIVERTED		GENERATED	DIVERSION RATE (%)
		City Programs	C/I**	Other C/I	Composting	Diversion Subtotal		
PAPER (total)	22,439	0	495	1,410	0	1,905	26,392	25
OCC/Kraft	5,587	0	0	0	0	0	7,492	0
Magazines	1,796	0	0	0	0	0	1,796	0
Mixed Paper	5,971	0	0	1,320	0	1,320	7,291	18
Newsprint	2,066	0	0	3	0	3	2,069	0
High Grade	3,432	114	103	448	0	665	4,097	16
Other Paper	3,586	0	0	0	0	0	3,586	0
PLASTICS (total)	3,479	0	0	1	0	1	3,435	0
HDPE	345	0	0	0	0	0	346	0
PET	42	0	0	0	0	0	42	0
Polystyrene Foam	1,574	0	0	0	0	0	1,574	0
Film	756	0	0	2	0	2	758	0
Other Plastic	2,761	0	0	53	0	53	2,814	2
GLASS (total)	1,282	0	0	0	0	0	1,082	51
Refillable Beverage	1	0	0	0	0	0	1	0
CA Redemption Value	527	0	0	555	0	555	1,082	51
Other Recyclable	468	0	0	45	0	45	513	9
Other Non-Recyclable	366	0	0	0	0	0	366	0
METALS (total)	6,407	0	0	2	0	2	7,006	2
Aluminum Cans	124	0	0	195	0	195	264	74
Other Aluminum	69	0	0	0	0	0	39	0
BI-metal Cans	39	0	0	0	0	0	1,146	0
Steel Food & Bev. Cans	1,146	0	0	0	0	0	5,125	7
Other Ferrous	4,769	0	0	356	0	356	259	0
Other Non-ferrous	259	0	0	0	0	0	46	100
White Goods	0	0	46	0	0	46	0	0
YARD WASTE (total)	7,748	0	0	0	2,678	2,678	6,436	42
Leaves and Grass	3,758	0	0	0	2,678	2,678	6,666	40
Branches and Brush	3,988	0	0	0	0	0	0	0
OTHER ORGANICS (total)	18,885	0	0	0	0	0	19,095	0
Food	2,479	0	0	0	0	0	2,479	0
Rubber/Tires	817	0	0	0	0	0	817	0
Wood	11,661	0	0	210	0	210	11,871	2
Agri. Crop Residue	0	0	0	0	0	0	0	0
Manure	31	0	0	0	0	0	31	0
Textiles/Leather	2,345	0	0	0	0	0	2,345	0
Diapers	801	0	0	0	0	0	801	0
Other Organics	751	0	0	0	0	0	751	0
OTHER WASTES (total)	26,245	0	0	500	0	500	31,345	2
Inert Solids	30,433	0	0	500	0	500	30,933	0
Hazardous Waste	26	0	0	0	0	0	26	0
Appliances	385	0	0	0	0	0	385	0
SPECIAL WASTES (total)	1,005	0	0	0	0	0	1,019	0
Ash	0	0	0	0	0	0	0	0
Sewage Sludge	0	0	0	0	0	0	0	0
Industrial Sludge	0	0	0	0	0	0	0	0
Asbestos	0	0	0	0	0	0	0	0
Auto Shredder Waste	0	0	0	0	0	0	0	0
Auto Bodies	621	0	0	0	0	0	621	0
Stuffed Furn./Mattresses	384	0	14	0	0	14	398	4
TOTAL	92,166	114	658	5,100	5,356	11,238	105,414	11

*Capital Improvement Programs

**Commercial and industrial

Table 4-3
Summary of Existing Recycling Conditions

Recycling Programs	Estimated Annual Tons Diverted	Percentage of Waste Diversion*
Residential Recycling Programs		
Curbside collection of recyclables	6,470	4.6
Landfill drop-off center	776	0.6
Other drop-off	60	0.04
City-Sponsored Commercial/Industrial Programs		
Restaurant/bar glass collection	370	0.3
High-grade office paper collection	103	0.07
Commercial and retail cardboard collection	495	0.4
Other Recycling Programs (Not City Sponsored)	4,790	3.4
Total	13,064	9.35
* Of total waste stream in Palo Alto.		

Program Alternatives	Additional Considerations				Available Markets
	Consistency with Local Policies	Absence of Institutional Barriers	Estimated Cost (\$)		
RESIDENTIAL					
Alternative 1					
Add'l Materials to Drop-Off	high	high	low		low - medium
Alternative 2					
Buy-Back At Landfill	medium	medium	low		high
Alternative 3					
Promote Multi-Family Recycling	high	high	low		high
Alternative 4					
Add'l Materials to Curbside	high	high	low		low - medium
Alternative 5					
Mobile Collection System	low	medium	medium		high
COMMERCIAL					
Alternative 1					
Commercial Program Expansion	high	high	low		high
Alternative 2					
Manual MRF	medium	medium	high		high
Alternative 3					
Mechanized MRF	medium	medium	high		high
OTHER					
Alternative 1					
Inert Solids	high	high	high		medium

Note: The criteria have been assigned a scale of high, medium, and low, with high being positive. See Appendix A for an explanation of the rating with respect to each criteria.

Table 4 - 5

RECYCLING ALTERNATIVES
POINT TOTALS

CRITERIA	RESIDENTIAL				COMMERCIAL		OTHER Inert Solids		
	Add'l to Drop-Off	Buyback at Landfill	Expand Mult. Fam. Parti.	Add'l Materials to Curb	Mobile Coll. System	Exp. Commercial Collection		Manual MFF	Mechanized MFF
Waste Diversion Potential	1	1	1	1	1	2	1	3	3
Absence of Hazard	3	3	3	3	3	3	2	3	3
Flexibility	3	3	3	3	3	3	2	2	3
Limited Shift in Waste Type Generation	2	2	2	2	2	2	2	2	3
Ease of Implementation	2	3	3	3	3	3	3	3	3
Facility Needs	2	1	2	1	1	2	1	1	3
Consistency with Local Policies	3	2	3	3	1	3	2	2	3
Absence of Institutional Barriers	3	2	3	3	2	3	2	2	3
Estimated Cost	1	1	1	1	2	1	3	3	3
End Uses	1	3	3	1	3	3	3	3	2
TOTAL	21	21	24	21	21	25	21	24	29

Note: The ranking system on which this table is based is explained in Appendix A, Evaluation Approach.

5 COMPOSTING COMPONENT

5.1 Introduction

Composting is the controlled biological decomposition of solid organic materials. Such materials include leaves, grass clippings, food waste, and other organic materials commonly found in the municipal waste stream. The end product of composting is a stable humus or soil-like material that can be used as soil conditioner, mulch, or fertilizer, depending on its physical properties. Although biological decomposition occurs naturally, several physical and chemical parameters must be controlled to maximize the rate of microbial activity and to minimize environmental impacts. These parameters include temperature, oxygen, nutrient availability, moisture, and pH. With proper controls, composting can occur rapidly, yield a quality product, and reduce the original volume of the organic material by 50 percent or greater.

Composting can play a key role in an integrated waste management program. Composting such waste can significantly reduce the amount of waste that goes to landfills or other disposal facilities. It also allows for more efficient waste collection and reduces gas and leachate problems associated with the landfilling of organic wastes.

Yard wastes have been found to make up a very large percent of the waste streams in Palo Alto, comprising approximately 14.9 percent by weight. This has made composting an obvious choice as a focus for meeting AB 939 diversion goals.

This component presents composting objectives for the City of Palo Alto and identifies existing and proposed activities for achieving these objectives.

5.2 Objectives

Approximately 7.7 percent of the City's waste stream is currently being composted. During the short-term and medium-term planning periods the target rate for composting the City's wastes is in the range of 10 to 12 percent. This increased diversion rate will be achieved via the following objectives, which were selected based on the results of the waste generation study and an assessment of the City's needs and characteristics:

- Increase the marketability of the currently produced compost product and develop local public and private sector markets and uses for compost.
- Improve or expand current programs to increase the diversion of yard waste for composting.
- Divert yard waste from the landfill by composting.
- Promote diversion techniques that emphasize source separation of organic wastes from the municipal waste stream.

Based on the results of the solid waste disposal characterization, yard wastes are targeted for diversion by composting.

5.3 Existing Conditions Description

The City of Palo Alto has been operating a successful yard waste composting program since 1979. It was one of only a few such programs in the nation at the time it was initiated. The goals of the program are to increase the life of the Palo Alto landfill by diverting a portion of the waste stream and to produce a high-grade topsoil at low cost. Following the closure of the City's 137-acre landfill, this top soil will be used in the process of converting this site to a park. Finished compost currently being stockpiled at the landfill will be subsequently blended with soil and various soil amendments to create a topsoil, for use as final cover in landscaping this park.

Initially, yard wastes were delivered to the composting site at the Palo Alto landfill by residents, nonresidents, businesses, gardeners, refuse vehicles, and city-contracted landscaping, tree-trimming, and street sweeping services. Customers delivering uncontaminated loads of yard waste to the

site were charged reduced tipping fees. A pilot yard debris collection program was implemented from September 1988 through November 1988; these wastes were collected at the curbside from selected residential areas. In 1990, the City initiated city-wide residential curbside collection of compostable yard waste. The City has also maintained its policy of using a reduced tipping fee to encourage dropping off loads of uncontaminated yard waste at the landfill.

The yard waste collection and processing program is managed by the City. Residents place an unlimited quantity of yard waste in garbage cans, 30-gallon kraft paper bags, cardboard boxes, or bundles not exceeding 4 feet in length. These wastes are then collected at the curb on the refuse pick up day at no additional fee. Acceptable yard wastes include grass clippings, plant trimmings, tree prunings (up to 2 inches in diameter), leaves, brush, weeds, shrubs, and nonhazardous wood wastes. PASCO vehicles collect the yard waste on a second run after the initial refuse collection route. The City is currently recovering approximately 50 percent of the total yard waste generated in the City.

Located on the west side of the refuse disposal area, the composting operations site consists of approximately 10 acres. After an initial grinding process, the material is pushed into windrows approximately 250-feet long, 15-feet wide, and 8-feet high. Approximately 8 to 12 windrows are active at any one time. Water is added to maintain moisture levels, and the windrows are turned about every 3 to 4 weeks to provide aeration. The composting operation employs one full-time equipment operator with additional part-time assistance from a heavy equipment operator, refuse disposal attendant, and supervisor. The equipment used in the composting operation consists of a W.H.O. wood waste grinder, a CAT 920 loader, a CAT D-8 dozer, a 30-yard debris box for disposing of noncompostable contaminants, and an irrigation system to maintain proper moisture in the windrows.

The irrigation system operates on an "as needed" basis. Four soaker hoses run along each windrow, dispersing water during the active composting phase. Reclaimed water from the Water Quality Control Plant is used. An estimated 121 gallons of water per cubic yard of compostable material is required to maintain a satisfactory moisture content during the composting process.

City staff have estimated that by producing its own compost rather than buying topsoil, the City will save \$500,000 on final closure costs. This includes the savings in landfill space at current costs. Compost has already been used in developing the park that is slated for development on the site of the landfill after it is closed.

The City has not initiated any market development activities, local government procurement programs, economic development activities, or consumer incentives for compost.

According to the Solid Waste Generation Study, the current yard waste collection and composting program diverted a total of 10,810 tons of yard waste from Palo Alto's landfill during 1990¹. A summary of the effectiveness of the yard waste collection program is presented in Table 5-1. Out of a total of 7,680 tons of yard waste generated by residences, an estimated 5,454 tons were diverted through composting in 1990. This amounts to a yard waste diversion rate of approximately 71 percent for the residential sector. A similar calculation for the non-residential (i.e., combined commercial, industrial, and self-haul) sectors yields a yard waste diversion rate, of approximately 41 percent. Table 5-1 indicates a rate of 52 percent for the City as a whole. Composting of yard waste accounts for a diversion of approximately 7.7 percent of the total solid waste stream.

No composting programs will be decreased or phased out in the short- or medium-term planning periods.

5.4 Evaluation of Program Alternatives

Every composting program consists of three parts: collecting the organic materials, processing the materials, and marketing the finished compost product. In some instances, each of these parts may be selected for implementation independently and without consideration of the others. The choice of other alternatives may depend on the options selected. Because of this dilemma, and a desire to optimize the combination of these parts, alternatives will be presented with similar activities and subsequently matched in Section 5.5, "Selection of Program." Figure 5-1, "Composting Alternatives and Dependent Options," depicts the relationships between these options.

¹ Data provided by City Public Works Department.

Palo Alto evaluated the following alternatives and related options to effectively divert its compostable material from landfill disposal or transformation.

- Alternative 1 - Implement Collection Alternatives
 - Option 1—Increase participation in existing program
 - Option 2—Develop commercial/industrial yard waste program
 - Option 3—Collect alternative feedstocks
 - Option 4—Utilize SMaRT station yard waste separation
 - Option 5—Enact a city ordinance to ban yard waste from disposal
- Alternative 2 - Implement Processing Alternatives
 - Option 1—Increase processing activities
 - Option 2—Develop an in-vessel composting system

An evaluation of the alternatives is presented in the following sections. A summary of the evaluation results is presented in Table 5-2.

5.4.1 Alternative 1 - Collection Alternatives

Option 1—Increase Participation in Existing Program

This option proposes that participation in the existing residential curbside program, as well as the drop-off program at the compost area, could be improved by developing an on-going education/promotional program targeting Palo Alto residents and businesses. For a description of this program see Section 7, "Education and Public Information Component."

This option meets the component objective of improving or expanding the current program to increase diversion quantities for compostable materials.

Waste Diversion Potential. The current yard waste diversion rate of 52 percent could ultimately be increased to approximately 75 percent, amounting to an additional 5,000 tons per year. This increase would amount to about 3.6 percent of the entire waste stream.

The promotion of backyard composting does not conflict with the expansion of the municipal composting program. Promotion of the backyard composting program consists of sending fliers to citizens requesting information. The requests for the fliers are few. The municipal compost pick-up program enables citizens to divert the materials from the landfill at no extra charge and in a much easier manner than starting their own compost programs. The anticipated reduction through backyard composting will, therefore, be minimal.

Absence of Hazards. No potential hazards are associated with this option. The existing composting program is capable of collecting the anticipated increase in yard waste feedstock quantities without creating a hazard.

Flexibility. Because the education program would be on-going, it will be capable of great flexibility in accommodating changing economic, technological, and social conditions.

Limited Shift in Waste Type Generation. This option does not shift solid waste generation from one type of solid waste production to another.

Ease of Implementation. This option will be implemented in the short-term and continued in the medium-term planning periods.

Facility Needs. To existing 10-acre composting facility can process from 35,000 to 45,000 cubic yards of yard waste. The site is therefore adequate to handle the 10,810 tons or 32,030 cubic yards of yard waste collected per year. Unused or unsold finished compost will be stored at another area within the landfill for use in landfill partial closure activities (i.e., placement of vegetative layer) and park development at cessation of all landfilling activities. No additional significant facility needs are required except some minor grading for finished compost storage.

Consistency with Local Policies. This option is consistent with local policies and does not affect existing plans or ordinances. The City's diversion programs, including the residential yard waste collection program, recycling programs, and the household hazardous waste events, are all currently promoted by the City.

Absence of Institutional Barriers. Institutional barriers are anticipated to have little or no impact on this option.

Estimated Cost. There are no additional collection costs for this alternative; the only requirement is for additional public education. These costs are included in the Education and Public Information component (see Table 7-4). The estimated cost per ton for compost collection is \$44, which is the same as the cost of the garbage collection. The same types of trucks are used for both.

End Uses. End uses are discussed in Section 5.4.3.¹

Option 2—Develop Commercial/Industrial Yard Waste Program

Option 2 involves the expansion of the residential yard waste curbside collection program to include commercial and industrial businesses that contract with the City for scheduled collection. Separate bins would be provided for each participating customer. Yard wastes would be collected on the same day as the regular refuse collection day. However, yard wastes would probably be picked up only once a week if the company were scheduled for more than one collection per week. Yard waste collection vehicles would deposit the yard wastes at the composting area at the Palo Alto landfill. Only companies that regularly dispose of significant quantities of yard waste would be targeted for this program.

This option meets the component objective of improving or expanding the current program to increase diversion quantities for compostable materials.

Waste Diversion Potential. Providing bins for separate collection of yard waste from yard waste-generating businesses could divert up to an additional 3,000 tons per year, which would amount to an additional 1 to 2 percent of the waste stream.

Absence of Hazards. No potential hazards are associated with this option.

Flexibility. As a collection program, this option would have the flexibility to adjust to changing waste quantities.

Limited Shift in Waste Type Generation. This option does not shift solid waste generation from one type of solid waste to another.

Ease of Implementation. This option would be implemented in the short-term and continued in the medium-term planning periods. Some difficul-

ties in implementation may be encountered due to lack of additional bin space at some commercial and industrial businesses.

Facility Needs. This option works with existing collection vehicles. However, additional bins and program monitoring would be required.

Consistency with Local Policies. This option is consistent with local policies, plans, and ordinances. A similar program currently exists for the residential sector.

Absence of Institutional Barriers. Building codes have not been written to require space for additional bins at businesses. A lack of space may prevent the placement of additional bins at some locations.

Estimated Cost. Additional collection truck trips would be required for the participating businesses. Additional costs would be roughly similar to the current costs of about \$44 per additional ton.

End Uses. End uses are discussed in Section 5.4.3.

Option 3—Collect Alternative Feedstocks

This option involves the special collection by the City of food wastes from commercial businesses such as restaurants and grocery stores. These wastes will then be transported to a processing facility, such as an in-vessel composting facility, to be co-processed with yard wastes into a high-grade compost product. This program will include promotional activities/literature to encourage participation.

This option meets the component objectives of improving or expanding the current program to increase diversion quantities for compostable materials and increasing the marketability of the compost product.

Waste Diversion Potential. Approximately 1,500 additional tons per year could be source-separated and collected, which amounts to roughly 1 percent of the waste stream.

Absence of Hazards. Assuming that the wastes would be composted in an in-vessel system, there are no additional health hazards associated with this option, provided that current regulations regarding the collection and storage of food wastes are adhered to. Composting such wastes in a windrow system would likely increase vector problems. For further discussion on this issue, see Consistency With Local Policies below.

Flexibility. Public acceptance for this option is uncertain. Changing technologies are unlikely to affect the feasibility of this option. A food-waste collection program provides the necessary feedstock to develop a high-grade, readily marketable compost.

Limited Shift in Waste Type Generation. This option does not shift solid waste generation from one type of solid waste to another.

Ease of Implementation. This option would be implemented in the medium-term planning period.

Facility Needs. This option cannot be implemented in conjunction with the existing windrow processing system, but is dependent on the selection of the in-vessel composting facility processing option. This option can be implemented with existing collection equipment, however, additional dedicated containers (bins) may be required.

Consistency with Local Policies. This option is consistent with local policies, plans, and ordinances. The implementation of this option will comply with the Santa Clara County Health Department's requirements, including (1) food establishments must have a minimum twice weekly collection, or more frequent depending on the size of the business; and (2) food wastes must be stored in tight, leak-proof containers to prevent access to flies and rodents.

Absence of Institutional Barriers. Alternative handling and storage procedures for food wastes must be implemented by participating businesses. A lack of space for additional bins may also restrict the implementation of this option.

Estimated Cost. Additional collection truck trips would be required for the participating businesses. Additional costs would be roughly similar to current costs of about \$44 per additional ton.

End Uses. This option provides the necessary feedstock to produce a high-grade compost product. End uses are discussed in Section 5.4.3.

Option 4—Utilize SMaRT Station Yard Waste Separation

This option involves the diversion of yard wastes from a material recovery facility, such as the proposed SMaRT station. Yard wastes would be diverted by directing loads of relatively uncontaminated yard wastes to a special tipping area. There, yard waste would be segregated from other

waste materials and transported to a processing facility. With regard to yard waste collection, the SMaRT station would function as a drop-off facility much like the existing yard waste drop-off at the Palo Alto Landfill.

Waste Diversion Potential. The effectiveness of the SMaRT station as a yard waste diversion facility would be similar to that of the existing yard waste drop-off program. The effectiveness would be somewhat improved since tipping and some sorting would occur under cover of roof and on a concrete floor. However, without incentives or programs to source-separate and deliver yard waste to the SMaRT station, it is unlikely that quantities in excess of 1,000 tons per year of additional material could be collected. This quantity would account for an additional 0.7 percent of the waste stream. No policy incentives have been developed at this time for the SMaRT station operations.

Absence of Hazards. There are no additional health hazards associated with this option.

Flexibility. Once implemented, collection of yard waste could be increased by incorporating other program options, such as reducing the tipping fee for clean loads of yard waste or by adding yard waste as a material to collect from mixed wastes. Similarly, yard waste quantities could be reduced by diverting less material.

Limited Shift in Waste Type Generation. This option does not shift solid waste generation from one type to another.

Ease of Implementation. This option would be implemented over the short-term planning period. Additional travel of approximately 18 miles roundtrip would be required.

Facility Needs. This option requires the construction of the proposed SMaRT station with a dedicated yard waste separation area and the development of a processing facility.

Consistency with Local Policies. This option is consistent with current local and regional planning efforts.

Absence of Institutional Barriers. Institutional barriers are anticipated to have little impact on this option.

Estimated Cost. Since the SMaRT station relies on the existing collection system to deliver wastes to the facility, collection costs are estimated to remain approximately the same. The cost of constructing and operating

the SMaRT station as well as other costs would be reflected in the facility tipping fee. Tipping fees are expected to be in the range of \$11 per ton. Since the SMaRT station would provide other functions in addition to yard waste segregation, the costs attributed to the processing of yard waste cannot be estimated precisely.

End Uses. End uses are discussed in Section 5.4.3.

Option 4—Enact a City Ordinance to Ban Yard Waste from Disposal

This option proposes the enactment of a City ordinance to ban yard waste from landfill disposal. A comprehensive ban on yard waste represents an effort to increase the diversion for all yard debris generated by both residents and commercial businesses. Residents will continue to have the option of participating in the yard waste curbside collection program operated by the City, or to haul their yard wastes directly to the composting area at the Palo Alto landfill. Commercial businesses and landscapers will be required to deliver yard wastes to the composting area at the landfill or out of the jurisdiction. There would be a reduced tipping fee for "clean" yard waste delivered to the compost area.

A total of ten states nationwide, and many counties, have legislation banning at least some types of yard wastes from landfilling. Regulations range from banning only the landfilling of leaves to banning leaves and grass clippings, tree stumps, or all yard debris.

The ordinance could include the following language regarding residential compliance:

"... leaves, grass, prunings, and garden waste cannot be collected with mixed municipal waste if that waste is going to be disposed of or processed in the metro area." Carver County, Minnesota.

This option meets the component objective of improving or expanding the current program to increase diversion quantities for compostable materials.

Waste Diversion Potential. Bans have been demonstrated to be effective in reducing the quantities of yard waste landfilled. During the month directly following the enactment of the yard waste ban in Dakota County, Minnesota, 25 percent more yard waste was delivered to the compost site than the highest rate for any previous month. However, this rate of

increase may not apply directly to Palo Alto due to a successful yard waste program already in place.

A yard waste ban could increase the current yard waste diversion rate from the current 52 percent to perhaps 85 percent. This would amount to an additional diversion of approximately 7,000 tons per year, which would account for roughly 5 percent additional diversion from the entire waste stream.

Absence of Hazards. Potential hazards associated with this option include vector and fire hazards due to stockpiling or illegal dumping of yard waste.

Flexibility. Public acceptance of this option is uncertain. However, while such a ban has a limited ability to accommodate changing conditions, flexibility is a greater factor for the processing option chosen in conjunction with this option.

Limited Shift in Waste Type Generation. This option does not shift solid waste generation from one type of solid waste production to another.

Ease of Implementation. This option will be implemented in the short-term planning period.

Facility Needs. This option is dependent on the continuation of the existing program or a comparable program. No new facilities or programs are required for the implementation of this option.

Consistency with Local Policies. Consistency of this option with local policies is low. All of the City's current recycling programs have remained voluntary and hence experienced exemplary participation rates. An enforcement mechanism would have to be developed for Palo Alto since there is no such program in place. The new enforcement mechanism might be similar to that used by the City-wide water restriction program enacted in 1990. A "Gush Buster" patrol was developed to cite water-use offenders; several warnings were issued before any citation.

The City could develop a random "audit" policy for enforcement of the yard waste ban. Residential refuse containers could be inspected at random to determine compliance. Warnings would be issued prior to a citation. A similar procedure targeting commercial, industrial, and self-haul vehicles would be implemented at the Palo Alto landfill.

Absence of Institutional Barriers. Institutional barriers are anticipated to have little or no impact on this option.

Estimated Cost. Collection costs would increase due to the required separate collection of yard waste. However, a collection system is in place for the residential sector. For commercial/industrial generators, additional costs would be similar to those for Option 2.

End Uses. End uses are discussed in Section 5.4.3.

5.4.2 Alternative 2 - Processing Alternatives

Option 1—Increase Processing Activities

This option proposes the use of the existing windrow system with the addition of increased turning and post-processing activities to develop a high-grade compost, including improvement to meet market specifications.

During the active compost stage, materials will be turned 2 to 4 times monthly to increase aeration, utilizing a compost turner made especially for this purpose. This activity will facilitate improvements to the existing turning methods by increasing the efficiency of the equipment operator, thus providing time for the operation of the screening process. The windrows are currently turned by means of a dozer, an operation requiring more time than that required if proposed equipment were used. Following a curing period when the compost is sufficiently stabilized, the compost will be subjected to an additional stage of processing (referred to as post-processing) in which the material would be screened in preparation for producing marketable products. The fine material passing the 1/4 inch-screen will be transferred to the finished compost stockpile, and oversize material will be returned to the active compost windrows, or segregated and marketed as additional products, such as mulch or wood chips.

This option meets the component objectives of improving or expanding the current program to increase diversion quantities for compostable materials and increasing the marketability of the compost product.

Waste Diversion Potential. This criterion is not applicable to the processing alternatives. See Section 5.4.1, Alternative 1—Collection Alternatives.

Absence of Hazards. Potential hazards associated with this option are minimal. Normally, fire hazard is low, due to the interior moisture content

of the composting material. Thus, if the surface materials were ignited, a major fire would be unlikely. Fire safety is improved through the ready availability of water through the existing irrigation system and the provision of open aisles between windrows.

Flexibility. Public acceptance for this option is anticipated to be high. Changing technologies are unlikely to affect the feasibility of the existing composting program. Turning and screening will improve the marketability of the product. In addition to creating a more desirable consistency, the screening process also reduces visual contamination. Visual contaminants affect the appearance of the compost and include particles of waste, such as glass, plastics, or metals, which decrease the product's marketability.

Limited Shift in Waste Type Generation. Screening the compost will create a variety of end-products, including mulch and wood chips. Whether the production and subsequent use of these materials counts toward AB 939 goals (i.e., as diversion) depends on their use. The use of wood chips as fuel, for example, is not allowable under AB 939 as a diversion measure. This would result in a shift of some solid waste generation from one type of solid waste management practice to another, since wood chips are not currently produced by the City's program.

Implementation. This option will be implemented in the short-term planning period.

Facility Needs. This option requires the purchase of turning and screening equipment for implementation. Necessary equipment includes a compost turner, hoppers, conveyors, and a screen. Site preparation activities, such as paving roadways, may also be required. An additional composting attendant will be needed at the site to aid in the loading and sales of compost product, if sales are made to the public. Regular lab analyses of the finished product will increase the products' marketability. See Section 5.4.3 for further discussion of this issue.

Consistency with Local Policies. This option is consistent with local policies, plans, and ordinances.

Absence of Institutional Barriers. AB 939 does not allow the use of transformation as a diversion measure. Therefore, AB 939 impacts the decision whether to utilize wood chips as fuel.

Estimated Cost. Planning and capital costs are expected to be approximately \$300,000. Costs could be higher or lower depending on the specific types of equipment purchased and site preparation requirements. Annual operating costs, including labor, maintenance and materials, are estimated at \$52,500 to \$59,000 per year. Of this, (1) \$18,500 to \$25,000 is estimated for fuel, equipment maintenance (parts and labor), and lab analyses, excluding operating expenses for the continuation of the existing program and (2) \$34,000 per year for additional labor costs. Expressed on a cost per ton of yard waste basis, these capital and operating costs would amount to approximately \$25 per ton.

End Uses. This option produces a variety of compost products and by-products, including composted fines, mulch, and wood chips. The option has the capability of producing a high-quality compost. See also Section 5.4.3.

Option 2—Develop an In-vessel Composting System

This option proposes the development of an in-vessel bin-type system for the processing of yard waste. An in-vessel system provides an enclosed or semi-enclosed environment for the composting process.

The bin system consists of one or more rectangular troughs into which feedstock is fed by way of conveyor belts. Air is forced into the composting material through perforations in the floor of the bin. A tiller-like device, in conjunction with a travelling belt, may also be used to mix the material periodically and to discharge the material from the bins. After an initial in-vessel composting period, all in-vessel systems require some "curing" or "maturation" time in order for the compost to stabilize.

The retention time of materials in the active composting stage is approximately 21 days. At that time, materials will be substantially stabilized. Then they will be moved to the curing stage where they will be further stabilized for another 42 days. Following the curing stage, the compost will be screened in a post-processing stage to prepare the material for market. The fine material passing a 1/4-inch screen will be transferred to the finished compost stockpile, and oversize material will be returned to the active composting stage.

This option meets the component objectives of improving or expanding the current program to increase diversion quantities for compostable materials and increasing the marketability of the compost product.

Waste Diversion Potential. This is not applicable to the processing alternatives. See Section 5.4.2, Alternative 1—Collection Alternatives.

Absence of Hazards. There are no potential hazards associated with this option.

Flexibility. Public acceptance of this option is anticipated to be high. In-vessel composting has several technological advantages, including excellent capabilities to control the physical parameters of composting (e.g., oxygen content, moisture content, and temperature), high decomposition rates, reduced land requirements in comparison to windrow systems, and minimized environmental impacts. A variety of bin systems are operating successfully in the United States.

Changing technologies are unlikely to affect the feasibility of this option. Post-processing will improve the marketability of the product. In addition to creating a more desirable consistency, post-processing also reduces visual contamination. Visual contaminants, which affect the appearance of the compost, include particles of waste, such as glass, plastics, or metals; the presence of these contaminants decreases the product's marketability.

Limited Shift in Waste Type Generation. Screening the compost during post-processing will create a variety of end-products, including mulch and wood chips. See Option 1—Increase Post-Processing Activities above for further discussion of this issue.

Implementation. This option will be implemented in the medium-term planning period.

Facility Needs. In-vessel systems are more machine intensive, thus less labor is required in their operation. A bin-type composting facility must be sited and constructed prior to implementation. This option also requires the purchase of screening equipment for post-processing activities. Necessary equipment includes a hoppers, conveyors, and a screen.

Consistency with Local Policies. This option is consistent with local policies, plans, and ordinances.

Absence of Institutional Barriers. AB 939 does not allow the use of transformation as a diversion measure. Therefore, AB 939 impacts the decision whether to utilize wood chips as fuel.

Estimated Cost. The disadvantages of the in-vessel composting system are cost and equipment maintenance. The cost of an in-vessel system

can be prohibitive for use in yard waste composting. In addition to significant capital costs, an in-vessel system can also incur large operating costs. Equipment maintenance may be time consuming and costly for an in-vessel system depending on the equipment and system design. Capital costs for an in-vessel facility could be as high as \$2 million, with annual operating expenses of approximately \$36,000 (not including labor). Expressing capital and operating expenses on a cost-per-input ton of yard waste, an in-vessel bin system could range from \$40 to \$80 per ton.

End Uses. This option produces a variety of compost products and by-products including composted fines, mulch, and wood chips. The in-vessel system has the capability of producing a high-quality compost. See also Section 5.4.3.

5.4.3 End Uses²

The availability of compost markets is a key requirement in the successful development of a composting program. Local markets should be identified whenever possible. Transportation costs are also an important consideration, because the greater the distance to market, the higher the price of the product. However, this also works in reducing outside competition when there is a local source available. The price of the product is critical in its marketability.

Potential markets include soil brokers, garden supply stores, nurseries, landscape contractors, sod growers, tree farms, and golf courses. On-site direct marketing to residents has not been found to be a reliable end-use. Most homeowners seek a high-quality product in small quantities, usually preferring a bagged product. Residents may lack appropriate containers or means of transport for bulk distribution of the product.

Soil brokers are typically the largest buyers of organic materials on the wholesale market. This market is currently very promising and especially strong for locally produced organic materials. Many of these organic materials currently purchased by soil brokers are transported, sometimes great distances, from lumber mills and other industrial processing facilities. For the most part, local soil brokers rely on imported sawdust, wood chips, bark dust, and bark chips for organic materials. Local production of com-

² This section presents a discussion of end uses for compost that applies to the alternatives discussed in Section 5.4.2.

post and other organic materials could substitute for the large quantities of imported organic materials.³

Public agency markets, although generally smaller than the private sector markets, are also worth considering. The City could implement procurement policies giving preference to the use of compost products in place of commercial fertilizers and soil amendments when these are purchased. Although the City estimates its use of these products to be quite low, the value of such a decision may prove worthwhile, especially in encouraging landscapers and other businesses to use compost products.

The aim of several pieces of legislation passed in California last year was to increase public sector demand for compost. Beginning in 1991, the State's highway landscape maintenance programs will use compost in place of, or in addition to, commercial fertilizers. Beginning in 1993, the State will initiate programs to restore public lands using composted materials. In addition to these measures, any procuring agency that requests a bid for commercial fertilizer or soil amendment must document the determination that the use of compost was not feasible. Future markets for compost may be identified by a state-funded study evaluating uses for compost. These efforts may further expand markets for the City's compost for use by the Department of Transportation, the Department of General Services, and other State and local public agencies. In addition, the City could re-evaluate the quantity of compost required for final cover in the development of the park that will be sited over the City's landfill, or other land reclamation uses. These are generally one-time uses and should not be relied on in a long-term market strategy.

Flexibility in production is a key for reliable distribution of the compost product. There is currently demand for a number of different compost grades for a variety of uses. Production of varying particle sizes for the compost product using coarser to finer screens during post-processing, allows better pricing flexibility in meeting differing market needs.

There are at least four distinct products that could result from yard waste processing activities: composted fines, mulch, wood chips, and low-grade compost. The composted fines, a higher grade compost, could be defined as mature compost with 98 percent of the particles passing through a 1/4-inch screen. Mulch consists of either mature composted or uncom-

³ Personal communication with Larry Ciardella with Ciardella Garden Supply, Palo Alto, December 7, 1990.

posted materials, slightly larger than the fines, ranging from 1/2 to 2 inches in particle size. Wood chips are not composted and can range in size from 1 to 3 inches. Low-grade compost is a product in which there has been no screening to differentiate between the particle sizes described above or one that contains contaminants. The City is currently producing low-grade compost. The production of uncomposted mulch and wood chips does not involve controlled biological decomposition and therefore is not considered composting under AB 939. However, credit for the diversion of such materials can be given as a form of recycling.

The market for wood chips processed and sold as fuel is exceptional. Even though this method of diversion constitutes transformation and is therefore not countable toward the 1995 AB 939 goals, it is a viable alternative to landfill disposal. It will also count 10 percent towards the year 2000 AB 939 goals. Avoided landfill disposal costs, as well as revenues gained from the sale of wood chips, may make this an attractive option. These revenues then could be used to support AB 939 diversion programs. Marketing wood chips for mulch or other landscape dressing is not advisable unless the product is uniform in particle size and is aesthetically consistent in appearance. Bark chips are typically used by landscapers because of the consistency of these qualities, while chipped yard waste tends to appear mottled in color and inconsistent in size. This is primarily dependent on the composition of feedstock and such marketing should be considered if a consistent high-quality material is produced.

Levels of contamination, stability, nutrient content, and physical appearance also affect the quality, and thus the marketability, of compost. Market studies have indicated that the quality of the product is a primary concern for commercial buyers. Conducting regular laboratory analyses, including a Soil Fertility and Micronutrient Analysis and an Organic Amendment Analysis, is highly recommended. Laboratory results and testing parameters should be made available to potential buyers to assure them that the finished product maintains consistent levels of quality and content.

The market for compost produced from feedstocks other than yard debris (such as MSW and food-waste compost) may be limited in Palo Alto and the Bay Area. Although the appearance, consistency, and nutrient content demonstrated by food-waste compost may be preferred by many landscapers and nurseries, its marketability could be limited by health concerns including disease transmission, contamination, and an uncertainty as to its

contents. The production of this material has the potential of improving the yield and quality of high-grade compost; however, processing complications, perhaps combined with an uncertain reception from potential buyers, may result in a limited ability to distribute the product.

There are some risks associated with identifying end uses for compost. The quantity of compost products on the market in California within the next few years is unknown, although it is expected to increase rapidly. Competition among composting programs in a number of localities could be significant. Although it is too early to project the saturation level of the compost market, flexibility in product specifications and pricing could be the key to a successful marketing strategy. The risks associated with marketing low-grade compost may be somewhat higher than those associated with high-grade compost. Compost marketing is anticipated to be competitive if adjacent communities are also compost-producers. If high-grade yard waste compost is readily available, this will out-compete a program that offers only a low-grade compost product. Finished compost, that is unused or unsold at the end of the year, will be offered to residents.

5.5 Selection of Program

The selection of programs was based on the application of evaluation criteria with respect to the City of Palo Alto. Although the existing compost program would compare very well in an evaluation process, the programs selected reflect some additional improvements to the existing composting activities. Table 5-3 identifies the evaluation totals for the composting alternatives described above.

5.5.1 Alternatives Selected

The following alternatives were selected for implementation in the short-term planning period and will continue during the medium-term planning period.

Increase Processing Activities (Alternative 2, Option 1). This program was selected to improve a currently successful composting program, which is diverting approximately 52 percent of the yard waste generated in the City at present. Implementation will be in the short-term planning period. Costs of the program are estimated to include \$300,000 in capital for process equipment and annual expenses of \$50,000 and \$25,000 for public education and process operations, respectively. These alternatives

meet the objectives of increasing diversion and marketability, and therefore rank very high during the evaluation process. After the yard waste has been completely composted through the existing windrow system, the compost will be screened to create a variety of products and enhance its marketability.

Increase Participation in the Existing Program (Alternative 1, Option 1).
See Section 7, "Education and Public Information Component," for a full description of the selected education program.

5.5.2 Estimated Diversion Quantities

By increasing participation in the existing residential curbside collection program and increasing the use of the landfill drop-off site, yard waste diversion could ultimately increase by roughly 5,000 tons per year. This equates to a 3.6 percent increase over the City's current composting rate of 7.7 percent, representing 11.3 percent of the City's solid waste stream. It appears feasible to meet this diversion goal within the short-term planning period

5.5.3 End Markets and End Uses

Area soil brokers will be targeted as the primary market for compost and mulch products. Although brokers are anticipated to provide a reliable market, secondary markets will also be identified. Secondary markets consist of additional potential large-scale users and buyers of organic material in the Bay Area, including soil brokers, garden supply stores, nurseries, landscape contractors, sod growers, tree farms, and golf courses. The development of agriculture as a significant market should also be considered.

The City will implement appropriate procurement measures for composted materials. In addition, the City will re-evaluate the quantity of low-grade and high-grade compost targeted for use in developing the park upon closure of the landfill. These "internal markets" will be reliable and relatively stable during periods of fluctuation in other markets.

The strategy for marketing wood chips generated as a result of the screening operations will be dependent on the size and appearance of the product. If the wood chips are not marketable as a landscape dressing, they will be marketed as fuel. Although the diversion of wood chips for incineration does not contribute to diversion credits under AB 939,

revenue from the sale of wood chips will help to defray the costs of the increased processing program. In addition, up to 10 percent transformation (as incineration is defined by AB 939) is allowed diversion credit under extreme circumstance in meeting the 50 percent diversion goal by 2000. For further discussion of end uses, see Section 5.4.3.

5.5.4 Materials Handling and Disposal Needs

The existing program of yard waste collection and processing will be utilized with increased processing activities. Additional contaminants resulting from the screening process (including particles of glass, plastics, or metals) is anticipated to be minimal, but will be disposed of in the Palo Alto landfill. Aside from the need to dispose of the small quantity of screened contaminants that are anticipated as a result of increased processing, no special materials handling or disposal needs are anticipated.

5.5.5 Facility Needs

The composting program selected for the City of Palo Alto requires the purchase of turning and screening equipment for implementation. Necessary equipment includes a compost turner, hoppers, conveyors, and a screen. Minor site preparation activities, such as installation of all weather roadways, may also be required. An additional composting attendant is recommended to coordinate the acceptance of the incoming yard wastes and the distribution of the resulting compost. Regular lab analyses of the finished product will increase the products' marketability. With the proposed process improvements, the existing 10 acre site will have adequate capacity for processing the existing 10,810 tons per year plus the proposed increase of 5,000 tons per year of yard waste. See Section 5.4.3 for further discussion of end uses.

The cost of screening equipment is approximately \$125,000. Manufacturers of screening equipment include Heil Engineered Systems, Hobbs-Adams Engineering Co., Lindemann Recycling Equipment, Parker Manufacturing, Powerscreen of America, and Recycling Systems, Inc. The cost of a compost turner can range from \$100,000 to \$200,000. Manufacturers of turning equipment include Brown Bear Corp.; Eagle Crusher Co., Inc.; Kolman/Athey; Resource Recovery Systems of Nebraska, Inc.; Royer Industries; Scarab Manufacturing; Scat Engineering; and Wildcat Manufacturing Co., Inc.

5.5.6 Measures to Be Taken if Diversion Rate Requirements Cannot Be Met.

In the event that the compost market is not viable for the diversion of organic materials, the City will have several options. These alternatives include (1) stockpiling compost until the emergence of more favorable market conditions, (2) re-evaluating the use of alternative compost feedstocks to further improve compost quality and thus marketability, and (3) significantly increasing the quantities of compost utilized by the City to absorb compost stockpiles. While none of these options is currently recommended for implementation, these alternatives may be put into place as emergency measures to achieve the mandated diversion requirements.

5.6 Program Implementation

The following section describes the tasks necessary to implement the selected program.

5.6.1 Government Agencies Responsible for Implementation.

The City's Department of Public Works is currently responsible for operating Palo Alto's composting programs, including the drop-off site at the landfill and the residential yard waste curbside collection program. The Department of Public Works will also be responsible for implementing the selected programs. See Section 7, "Education and Public Information Component," for a discussion of the implementation of the selected education program.

5.6.2 Tasks Necessary to Implement Program

In addition to operating the existing composting programs, the City will expand processing operations to include increased processing activities. The processing and public education programs will be implemented in the short-term planning period. The implementation of a marketing program for the improved compost product will continue into the medium-term planning period.

Several steps will be required for implementation of the screening program:

- determine compost product specifications
- develop compost process and facility design

- obtain funding
- perform facility/site improvements
- purchase and install screening equipment
- start-up
- perform lab analyses
- test market compost products

5.6.3 Short-term and Medium-term Planning Period Implementation Schedule

Please see Figures 10-12 to 10-16 in the Integration Component (section 10) for the implementation schedule.

5.6.4 Implementation Costs

Table 5-4 summarizes the implementation costs for the selected program.

5.7 Monitoring and Evaluation

5.7.1 Methods to Quantify and Monitor Achievement of Objectives

To effectively monitor the achievement of the program in meeting the objectives, the following tasks should be undertaken:

- Record incoming yard waste quantities from the City's curbside and drop-off composting programs.
- Compare and analyze records from before and after the implementation of the selected program.
- Monitor market demand and trends
- If the above data is not conclusive, perform periodic updates to the Waste Generation Study, as needed.

5.7.2 Written Criteria for Evaluating Program's Effectiveness

The City will evaluate the achievement of the selected composting program by the following criteria:

- Incoming yard waste will be monitored for increases in diversion quantities.
- Marketing strategies will be evaluated for effectiveness in moving compost products and whether additional markets of specifications are needed.

5.7.3 Agencies Responsible for Monitoring, Evaluation, and Reporting

The City's Department of Public Works will manage and operate the composting program, including monitoring, evaluating, and reporting.

5.7.4 Monitoring and Evaluation Funding Requirements

Additional funding needed to monitor and evaluate the effectiveness of the increased processing alternative is \$1,000 per year for labor costs. Funding required to monitor increased participation in the City's existing curbside program is included in the Education and Public Information component (see Table 7.4).

5.7.5 Measures to be Implemented if there is a Short-fall in the Diversion Objectives

If the diversion objectives for composting are not met, or there is a short-fall in attaining the diversion mandate, the following measures may be implemented:

- See Section 5.5.6, Identification of Measures to be Taken if Requirement Cannot Be Met, for alternatives in the event of a marketing short-fall.
- Increase the level of effort for public education
- Increase staffing for the purpose of salvaging yard waste at the active dumping area of the landfill.

Table 5-1. Performance Summary of Existing Yard Waste Diversion Programs

	Residential Sector	Comm/Ind Self Haul	Combined Sector
Yard Waste Disposed (tons/year)	2839	7605	10444
Yard Waste Collected (tons/year)	5062 (a)	3595 (b)	8657
Total Yard Waste Generated (tons/year)	7901	11200	19101
Yard Waste Diversion Rate (%)	64	32	45

a) Collected by the residential curbside program and dropped off at the landfill by residents
 b) Dropped off at the landfill and other composting sites by commercial gardeners and landscapers

Table 5-2
SUMMARY OF ALTERNATIVES EVALUATION

Program Alternatives	Evaluation Criteria					
	Waste Diversion Potential	Absence of Hazard	Flexibility	Limited Shift in Waste Type Generation	Ease of Implementation	Facility Needs
Alternative 1						
Increased Participation	Medium	High	High	High	High	Medium
Comm/Ind Program	Low	High	Medium	High	Low	Medium
Alternative Feedstocks	Low	Medium	Medium	High	Medium	Low
SMaRT Station	Low	High	High	High	Low	Low
Yard Waste Ban	Medium	High	Low	High	High	Medium
Alternative 2						
Increased Processing	N/A	High	High	Medium	High	Medium
In-vessel System	N/A	High	High	Medium	Medium	Low

Program Alternatives	Additional Considerations			
	Consistent Policies	Absence of Institutional Barriers	Estimated Cost (\$)	Available Markets
Alternative 1				
Increased Participation	High	High	Medium	N/A
Comm/Ind Program	High	Low	Low	N/A
Alternative Feedstocks	Low	Medium	Low	N/A
SMaRT Station	High	High	Low	N/A
Yard Waste Ban	Low	High	Low	N/A
Alternative 2				
Increased Processing	High	Medium	Medium	High
In-vessel System	High	Medium	Low	High

Table 5-3

Composting Alternatives
Point Totals

CRITERIA	ALTERNATIVES						
	ALTERNATIVE 1				SMaRT Station	Yard Waste Ban	Increased Processing
	Increased Participation	Comm./Ind. Program	Alternative Feedstocks	SMaRT Station	Yard Waste Ban	Increased Processing	ALTERNATIVE 2 In-Vessel System
Waste Diversion Potential	2	1	1	1	2	N/A	N/A
Absence of Hazard	3	3	2	3	3	3	3
Flexibility	3	2	2	3	1	3	3
Limited Shift in Waste Type Generation	3	3	3	3	3	2	2
Ease of Implementation	3	1	2	1	3	3	2
Facility Needs	2	2	1	1	2	2	1
Consistency with Local Policies	3	3	1	3	1	3	3
Absence of Institutional Barriers	3	1	2	3	3	2	2
Estimated Cost	2	1	1	1	1	2	1
End Uses	N/A	N/A	N/A	N/A	N/A	3	3
TOTAL	24	17	15	19	19	20	17

Note:
The ranking system on which this table is based is explained in Appendix A, Evaluation Approach.

Table 5-4
Implementation Costs for Selected Programs

Programs	Estimated Costs
Alternative 1	
Option 1 - Increased participation in existing collection program	\$ N/A ¹
Alternative 2	
Option 1 - Improved process system	\$260,000 capital \$ 25,000 per year
1. Costs for program included in Education and Public Information Component.	

6 SPECIAL WASTE COMPONENT

6.1 Introduction

Special waste is solid waste that requires unique handling and disposal methods because of health hazard, environmental impact, or physical characteristics. Special wastes are defined in Section 18720, Article 3, Chapter 9, Title 14, California Code of Regulations.

As defined in Section 18720, special waste is any hazardous waste listed in Section 66740 of Title 22 of the CCR, or any waste that has been classified as a special waste pursuant to Section 66744 of Title 22 of the CCR, or "has been granted a variance for the purpose of storage, transportation, treatment, or disposal by the Department of Health Services (DHS) pursuant to Section 66310 of Title 22 of the CCR. Special waste also includes any solid waste which, because of its source of generation, physical, chemical or biological characteristics or unique disposal practices, is specifically conditioned in a solid waste facility permit for handling and/or disposal."

The special wastes addressed in this component are sewage sludge, ash, asbestos, tires, white goods, mattresses, abandoned vehicles, and dead animals. The Solid Waste Generation Study identified that these waste types are generated in Palo Alto. Some of these special wastes have recycling potential, although markets and end uses may be limited. Special wastes that can be recovered count toward the AB 939 diversion targets of 25 percent by 1995 and 50 percent by 2000.

6.2 Objectives

Based on data from the Solid Waste Generation Study and existing special waste handling and disposal practices, objectives have been developed for the special wastes currently generated in Palo Alto. The following objectives apply to the short-term planning period (1991-1995) and continue during the medium-term (1996-2000) planning periods:

- continue existing diversion of recyclable special wastes from landfilling
- continue to provide for environmentally safe management or disposal of special wastes that cannot be recycled.
- expand operations to remove all recyclable special wastes from the disposal waste stream.

A diversion rate for special wastes of 0.3 to 0.4 percent of the total wastestream should be achieved if the above objectives are met.

Targeted Materials

Based on the results of the solid waste disposal characterization conducted at the Palo Alto landfill, sewage sludge, ash, asbestos, tires, mattresses, abandoned vehicles, dead animals, and white goods are targeted for diversion from landfilling due to their weight and potential hazards.

6.3 Existing Conditions Description

This section describes the current special waste management practices in the City of Palo Alto. Also included is a discussion of those special wastes for which Palo Alto does not have a permitted handling or disposal facility. All current special waste management practices will be continued through the short-term and medium-term planning periods; this information is summarized in Table 6-1.

6.3.1 Sewage Sludge

Approximately 45 tons per day (16,425 tons per year) of sewage sludge are generated by the Palo Alto Regional Water Quality Control Plant. Located adjacent to the Palo Alto landfill, the plant is within the incorporated limits of the City. Sewage generated at the plant is incinerated for volume reduction purposes; the resulting ash is considered by the California DHS to be a California Hazardous Waste. Disposal of the ash at the Palo Alto landfill is therefore prohibited. Management of the ash is described below in Section 6.3.2.

6.3.2 Ash

Approximately 3 tons per day (1,095 tons per year) of ash are produced from the incineration of sewage sludge. The ash is collected by a licensed

hauler and taken to an Arizona copper smelting facility for use as a fluxing agent. Metals are removed from the ash at the Arizona facility.

6.3.3 Asbestos

Before 1970, asbestos was in widespread use in products such as ceiling and floor tiles, and insulation for pipes, boilers, and ducts. Asbestos is generally classified as friable (hazardous) or nonfriable (nonhazardous). Friable, or air-borne asbestos is known to have adverse effects on the human lungs and poses a potential public health risk when inhaled. It becomes available for inhalation when the material is disturbed in processes such as building repair or maintenance. Friable asbestos in the waste stream is considered a hazardous material and requires special handling and disposal; it can not be disposed of in a Class III landfill such as Palo Alto's¹.

In accordance with Sections 2520 and 2522 of Subchapter 15, Title 23, Chapter 3, nonfriable asbestos can be disposed of in a Class III landfill, provided the facility has waste discharge requirements allowing its disposal. However, the Palo Alto landfill does not accept friable or nonfriable asbestos waste. The Solid Waste Generation Study confirmed that asbestos is not being disposed of at the landfill.

Waste asbestos generated in Palo Alto must be manifested and taken to a waste disposal facility permitted to accept asbestos. The City provides waste asbestos management information to interested parties. However, it is not known how much waste asbestos is generated in the City each year.

6.3.4 Tires

Used tires pose special handling and disposal problems because of potential environmental and public health impacts. For example, stockpiled used tires can collect rainwater and serve as breeding grounds for disease vectors and can also be a fire hazard. Tires disposed of in a landfill tend to "float" to the surface, thereby interrupting landfill cover. They can also cause differential landfill settlement if concentrated in one area in the landfill. Nevertheless, in compliance with current regulations, tires are

¹ A Class III landfill accepts only nonhazardous solid waste.

considered nonputrescible waste and can therefore be accepted at Class III or unclassified landfills.

The Palo Alto landfill accepts used tires for a fee of \$2.00 per tire; these are stockpiled near the entrance to the facility. Through the load-checking program at the landfill, used tires are also pulled from the active face of the landfill and placed in the stockpile. Oxford Tire Recycling of Northern California (Oxford) removes the tire stockpile once every 6 months. At the time of the tires' removal, the stockpile contains an average of 800 tires. The City pays \$0.90 per tire to Oxford for this service.

Oxford transports the tires to its facility in Union City, California, where the tires are separated for ultimate delivery to an appropriate end use. Tires in resalable condition and casings that can be used for retreaded tires are taken to tire distributors. The tires can also be used to obtain tire-derived products such as playground covering, floor mats, dock bumpers, floor tiles, asphalt rubber, and rubber modified asphalt. Tires are also taken to a shredding facility in Sacramento, California, shredded tires can be used as playground cover material or as tire-derived fuel.

Tires that are not reused (or those used for tire-derived products or shredded fuel) are taken to the Tire-to-Energy Plant in Westley, California. Operated by the Oxford Energy Company, this facility incinerates whole tires to produce steam to generate electricity. The plant recovers incineration by-products including fly ash and gypsum. Fly ash containing zinc is shipped to a smelting facility and gypsum is used for nonagricultural land applications. Slag from the steel and fiberglass belts in the tires is recovered and used for road base (i.e., under asphalt).

Tires are also collected and stockpiled at service stations, tire dealers, and retail stores in Palo Alto. The results of solid waste diversion study conducted for the City indicated that the majority of stockpiled used tires are sent to Oxford in Union City.

As shown in the Solid Waste Generation Study (Section 2), approximately 625 tons of used tires were generated and diverted from the disposal in Palo Alto in 1990. It is not known what percentage of the tires that are diverted are transformed at the Tire-to-Energy Plant.

6.3.5 White Goods

"White goods" are large appliances (such as washers, dryers, and refrigerators) that have entered the waste stream. White goods have special handling requirements because of their sheer size and weight; in addition, they may contain (1) polychlorinated biphenyls (PCBs) in electrical capacitors, (2) chlorofluorocarbons (CFCs) in cooling and refrigeration units, and (3) lubricating oils. PCBs are a known human carcinogen, and CFCs have been shown to break down the stratospheric ozone layer.

The electrical capacitors and cooling units must be removed before the white goods are placed in a landfill. The appliances must be thoroughly crushed before burial to avoid refuse bridging, which can cause uneven compaction of the refuse fill. If the electrical capacitors and cooling units are not removed before crushing, PCBs and CFCs could be released into the environment.

White goods are accepted at the Palo Alto landfill for a fee that varies according to the type of item disposed of. The fee ranges from \$14.50 to \$30.00. Drop-off facility personnel remove electrical capacitors and cooling units from the white goods, which are then stockpiled at the Drop-off facility. Insulation and wiring are removed and landfilled. The electrical capacitors and cooling units are taken to City Metals in Berryessa, California for eventual shipment overseas for recycling. PASCO transports the stockpiled white goods, along with other scrap metal, to Markovits and Fox in San Jose, California. The City currently receives \$25 per ton for the scrap metal. Last year 484 tons of scrap were taken to Markovits and Fox. Of this amount, approximately 10 percent (48.4 tons) was white goods; Palo Alto receives approximately \$1,200 per year for the white goods. This money is placed in the City's Refuse Enterprise Fund.

Despite diversion efforts at the landfill, the Solid Waste Generation Study shows that approximately 435 tons of white goods per year are disposed of at the Palo Alto landfill.

6.3.6 Mattresses

Mattresses, including box springs, are accepted at the Palo Alto landfill for a fee of \$9.00 each; landfill personnel estimate that, on average, eight mattresses per week are stockpiled. They are removed from and stockpiled at the active dumping area of the landfill. Select sizes of mattresses are removed weekly from the stockpile by a Fremont, California scav-

enger, who pays the City \$1.00 per mattress. The money is placed in the City's Refuse Enterprise Fund. Mattresses not taken by the scavenger are landfilled. According to landfill personnel, the scavenger reuses the wood frame and metal springs of the mattresses. However, no foam mattresses or unacceptable sizes of mattresses are removed by the scavenger.

For this component, it was assumed that the scavenger accepted only 75 percent of the stockpiled mattresses. Based on an estimated stockpile of 14 mattresses per week, and an average weight of 50 pounds per mattress or box spring, approximately 14 tons of mattresses are recycled annually.

6.3.7 Abandoned Vehicles

Under California regulations abandoned vehicles are considered unclassified waste, disposable in a Class III landfill; however, the Palo Alto landfill does not accept auto bodies for disposal.

Abandoned vehicles generated in Palo Alto are picked up by Ellison's Towing, Lloyd's Towing, or National Towing and Road Service. Almost all abandoned vehicles collected by these companies are processed for scrap. In the fiscal year 1989-1990, approximately 218 abandoned vehicles collected in Palo Alto were processed for scrap. Using an average weight of 1.5 tons per vehicle, approximately 325 tons of scrap were recovered from abandoned vehicles.

6.3.8 Dead Animals

The Palo Alto landfill is permitted to accept large dead animals or large quantities of small animals, provided approval is obtained from the County of Santa Clara Department of Health. Current practice in Palo Alto is for the City of Palo Alto Animal Shelter to properly handle all dead animals generated in the City. The Animal Shelter contracts with Koefran Services of Sacramento for management of dead animals. Koefran provides a freezer at the animal shelter for storage of animal remains. Koefran collects the remains once a week and transports them to Sacramento, where the remains are recycled into bone meal and used in fertilizer by a rendering company. Large animals must be collected and processed by a rendering plant within 48 hours of death. Approximately 15 tons of dead animals per year are diverted from the Palo Alto landfill.

6.4 Evaluation of Alternatives

The existing management practices described in Section 6.3 for those special wastes that can be recycled satisfy the objective of continuing to divert recyclable special wastes. The current management practices reflect the current marketing potential and end uses for recyclable special wastes. In Palo Alto, recyclable special wastes are ash, sewage sludge, tires, white goods, mattresses, abandoned vehicles, and dead animals.

Additionally, current management practice for asbestos, described in Section 6.3.3, satisfies the objective of continuing to provide for environmentally safe management of nonrecyclable special wastes.

This section addresses the objective of eliminating all recyclable special wastes from the waste stream disposed of at the Palo Alto landfill. The only special wastes currently being disposed of at the Palo Alto landfill are mattresses and white goods. However, the mattresses that are landfilled cannot currently be recycled.

The special waste alternative evaluated below is salvaging white goods at the dumping area of the Palo Alto landfill.

6.4.1 Alternative - White Goods Salvaging and Recycling

Landfill personnel will remove white goods from the Palo Alto landfill waste stream at the active dumping area. This can be accomplished as the loads are discharged, and the contents of the load are visible to the spotter and to the equipment operator working at the dumping area. Working together, the two landfill personnel can separate any white goods from the load and place them in a location that will not interfere with landfill operations. At the end of each day, the collected white goods can be moved to the designated white goods stockpile area near the landfill entrance. Electrical capacitors and cooling units will then be removed. As discussed in Section 6.3.5, the stockpiled white goods are removed once every week and sold as scrap metal, and electrical capacitors and cooling units are removed from the Drop-off Center periodically for recycling.

Waste Diversion Potential. This alternative can annually divert 279 to 419 tons of white goods that are currently being landfilled. This is less than 1 percent of the waste stream currently being landfilled.

Absence of Hazards. Potential hazards include risk of injury to landfill personnel from removing the white goods or from working around heavy

equipment, and exposure to PCBs. To reduce the potential for hazard, workers will be properly equipped and trained in handling PCBs.

Flexibility. The scrap metal market is affected by changing social, technical, or economic conditions. This alternative has a moderate level of flexibility.

Limited Shift In Waste Type Generation. This alternative is not anticipated to create shifts in waste type generation.

Ease of Implementation. Immediate implementation is possible, using assets that are currently available at the landfill.

Facility Needs. No additional facilities are required to implement this alternative.

Consistency with Local Policies. This alternative has a high level of consistency with local policies.

Absence of Institutional Barriers. Changes to the union contract and landfill personnel job descriptions would be necessary. Also, laws concerning hazardous wastes (PCBs and CFCs) can impact the economics of this alternative. This alternative has a medium level of absence of institutional barriers.

Estimated Cost. Staff time to salvage and transport white goods can take place with current landfill staff and equipment. Processing of the white goods can be done with current Drop-Off Facility personnel. An additional \$2,500 per year has been estimated for miscellaneous tasks associated with increased labor effort.

End Uses. A strong market is available locally for scrap metal.

6.5 Selection of Program

The program selection is based on the evaluation criteria and the ease of implementation in the City of Palo Alto.

6.5.1 Alternative Selected

White goods salvaging and recycling. The short-term (1990-1995) program selected for the City of Palo Alto is white goods salvaging and recycling. This alternative received a total of 23 points (Table 6-3). Palo Alto currently collects and stockpiles white goods at the landfill. White goods

are, however, still present in the wastes being disposed of at the Palo Alto landfill. Salvaging white goods at the active dumping area would help to eliminate white goods from the landfill waste stream.

6.5.2 Types and Quantities of Special Waste Anticipated to be Collected, Recycled, and/or Disposed

Implementation of the alternative is estimated to divert 279 to 419 tons of materials annually.

6.5.3 Recycling and/or Reuse Efforts

White goods that are pulled from the active dumping area will be stock-piled. The electrical capacitors and cooling units will be removed and recycled; the remaining portion, excluding plastic components and insulation, will be sold as scrap metal.

6.5.4 Public Education Programs

No public education programs would be necessary to achieve the special waste short- and medium-term objectives.

6.5.5 Multi-Jurisdictional Special Waste Efforts

The selected special waste programs are specific to the City of Palo Alto. No multijurisdictional special waste efforts are needed.

6.5.6 Facilities Needed for Implementation

No new facilities would need to be built or expanded in order to implement the alternative. Assets currently available at the landfill would be used to salvage the white goods from the waste stream.

6.5.7 Handling and Disposal Methods

Salvaging white goods at the active dumping area of the Palo Alto landfill will require that the landfill spotter and the landfill equipment operator work together to remove white goods from incoming loads dumped at the active face. White goods removed from incoming loads and collected near the active dumping face can be moved to the white goods stockpile area near the landfill entrance using the landfill's loader or by spotting a roll-off box near the face.

6.6 Program Implementation

6.6.1 Organizations Responsible for Implementation

The Department of Public Works is responsible for operations at the City's landfill; this department would be responsible for implementing the alternative. PASCO would process the recovered white goods for market (e.g., removal of capacitors and refrigeration units).

6.6.2 Tasks Necessary to Implement Program

Implementation of the alternative would require the landfill spotter and equipment operator to coordinate removal of white goods from the incoming loads. This may require training of personnel in safety precautions. A change in the job descriptions and union contracts of the personnel would also be necessary. Since white goods are currently stockpiled at the landfill entrance and electrical capacitors and cooling units are currently being removed, no additional training would be needed for the selected program.

6.6.3 Short-term and Medium-term Planning Period Implementation Schedule

The white goods salvaging program could be implemented immediately using personnel and equipment that are currently available at the landfill.

6.6.4 Implementation costs

Salvaging can take place with current landfill site personnel and equipment. Processing of the white goods can be done with current Drop-Off Facility staff. No new costs would be incurred.

6.7 Monitoring and Evaluation

6.7.1 Methods to Quantify and Monitor Achievement of Objectives

The following methods will be used to monitor the achievement of the objectives identified in Section 6.2:

- Periodically inspect special waste handling methods to
(1) determine whether waste handling methods required by the regulatory agencies are being implemented,
(2) check to ensure that facility staff is properly outfitted

and equipped to handle specific "problem" wastes, and (3) verify that staff is properly trained in safety and special waste handling methods.

- Track the quantity of white goods diverted for recycling by means of accurate recordkeeping practices. (The total weight of white goods diverted should be approximately 650 tons per year at present waste quantities.)
- Monitor the markets to which special wastes are currently diverted to ensure that these diverted materials are not being disposed of.
- Perform a waste disposal characterization in the future.

6.7.2 Written Criteria for Evaluating Program's Effectiveness

Palo Alto will evaluate the success of the special waste programs based on the following criteria:

- Are the objectives of the special waste component being achieved?
- Was implementation of the alternatives accomplished on schedule?
- Are special wastes being managed in a way that minimizes hazards to public health and safety and the environment?
- Are special wastes managed in accordance with applicable permits and regulations?

6.7.3 Responsible Parties for Monitoring, Evaluation, and Reporting

The City's Department of Public Works is responsible for managing solid waste, including special wastes. This department is also responsible for monitoring and evaluating the effectiveness of the alternative program implemented.

6.7.4 Monitoring and Evaluation Funding Requirements

The City's Department of Public Works is responsible for administering funds from the Refuse Enterprise Fund, from which funding for special

waste management is available. An estimated \$500 per year has been included for recordkeeping associated with monitoring this program.

6.7.5 Measures to be Implemented if Special Waste Objectives are Not Achieved

The following measures will be implemented if the objectives identified in Section 6.2 are not achieved:

- Implement additional waste acceptance procedures at the Palo Alto landfill in order to remove all special wastes.
- Increase staffing at the landfill for removing salvaging materials at the active dumping area of the landfill.
- Accept white goods at the landfill, but ban disposal. Stockpile these wastes at the landfill entrance for ultimate processing and recycling.
- Analyze existing programs to determine if there are obstacles to successful implementation.

The City's Department of Public Works is responsible for monitoring and evaluating the effectiveness of the special waste management practices. Staff time required for monitoring and evaluation is funded through the Refuse Enterprise Fund.

Table 6-1
Existing Special Wastes Conditions

Special Waste Type	Accepted at Palo Alto Landfill	Handling Practice	Estimated Annual Tons Generated	Estimated Annual Tons Diverted	End Use/ Markets
Sewage sludge	No	Incinerated	16,425	See ash below	Not applicable
Ash	No	Transported to an Arizona copper smelting facility	1,095	1,095	Ash is used as a fluxing agent at a copper smelting facility
Asbestos	No	Manifested and hauled by licensed hauler	Unknown	Unknown	Disposal
Abandoned vehicles	No	Collected by towing companies	325	325	Scrap metal
Dead animals	Yes	Collected at Palo Alto Animal Shelter	15	15	Bone meal and fertilizer
Tires	Yes	Stockpiled at Palo Alto Sanitary Landfill	625	625	Re-use, tire-derived products, and energy
White goods	Yes	Stockpiled at Palo Alto Sanitary Landfill	644	48	Scrap metal
Mattresses	Yes	Stockpiled at Palo Alto Sanitary Landfill	18	14	Used mattresses

Table 6-2

Summary of Alternatives Evaluation

Program Alternatives	Evaluation Criteria				
	Waste Diversion Potential	Absence of Hazard	Flexibility	Limited Shift in Waste Type Generation	Ease of Impelmentation
White Goods Salvaging	Low	Medium	Medium	High	High

Program Alternatives	Additional Considerations				
	Facility Needs	Consistency with Local Policies	Absence of Institutional Barriers	Estimated Cost	Available Markets
White Goods Salvaging	High	High	Medium	High	High

Note:
The criteria have been assigned a scale of high, medium, and low, with high being positive. See Appendix A for an explanation of the rating with respect to each of the criterion.

Table 6-3

Special Waste Alternatives
Point Totals

CRITERIA	ALTERNATIVES
	WHITE GOODS SALVAGE
Waste Diversion Potential	1
Absence of Hazard	2
Flexibility	2
Limited Shift in Waste Type Generation	3
Ease of Implementation	3
Facility Needs	3
Consistency with Local Policies	3
Absence of Institutional Barriers	2
Estimated Cost	3
End Uses	3
TOTAL	25
<p>Note: The ranking system on which this table is based is explained in Appendix A, Evaluation Approach.</p>	

7 EDUCATION AND PUBLIC INFORMATION COMPONENT

7.1 Introduction

Education and public information are separate mechanisms that work together towards a common goal. Education is an ongoing activity that explains, through knowledge and awareness, *why* waste reduction programs are necessary. Public information is a method of letting the public know *how* to effectively participate in programs. Both ongoing education and public information are essential to the successful implementation of the recycling, source reduction, composting, funding, special waste, facility capacity, and integration components of the SRRE. The education and public information component is thus the mechanism that facilitates the success of all the other components.

A community could fall short of the mandated waste diversion goals if it merely selects programs without providing methods of informing and educating the people who generate the waste. Changing the behavior of the community as a whole is an essential component of these programs. In order to reach state-mandated waste reduction goals of 25 and 50 percent, Palo Alto must go beyond the existing network of education and public information activities to reach the non-participating sectors of the community. The community as a whole must also be informed about modifications to existing programs so that these programs effectively reach their stated objectives.

For years, Palo Alto has encouraged citizens to develop "waste reduction" behavior. Drawing upon a sense of community and a desire to create a viable environment for future generations, Palo Alto has had successful participation rates, without using mandatory actions. Education and public information about the solid waste issue have played significant roles in the success of the existing programs.

This component presents education and public information objectives and identifies existing and proposed education and public information activities for achieving those objectives.

7.2 Objectives

The City of Palo Alto developed education and public information objectives to help implement the selected waste diversion programs; these objectives are based on the City's needs and socioeconomic characteristics. The following objectives apply to the short-term planning period (1991-1995) and continue during the medium-term planning period (1996-2000).

- increase the number of people participating in diversion programs
- increase awareness of the need to reduce, reuse, compost, and recycle
- increase the total volume and weight of diverted material

7.3 Existing Conditions Description

Since it began recycling operations in 1971, the City of Palo Alto has implemented a variety of education and public information tools to publicize its waste management programs. The City's approach to education and public information is multifaceted: it involves many sectors of the public, focuses on a variety of subjects, and takes many different forms. The City currently provides education and public information to businesses; schools; and residents of apartments, condominiums, and single family homes. Subjects covered by these informational programs include, but are not limited to

- composting
- high-grade paper recycling
- commercial/industrial recycling brochure
- reduction of unwanted junk mail
- apartment/condominium curbside and drop-off recycling
- residential curbside recycling

The City's education and public information efforts consist of visits to schools, utility bill inserts, newsletters, and direct mail pieces sent to businesses.

In addition to the programs sponsored by the City, education and public information programs are promoted by businesses and community groups. The following section provides a brief description of each education and public information program in Palo Alto; these programs target residents, commercial/industrial businesses, and private organizations. These and the City's existing public education programs are described below.

7.3.1 City-Sponsored Residential Programs

Utility Bill Inserts. Educational and informational materials are included with Palo Alto residents' utility bills approximately twice a year. Sent to all utility customers, these inserts are typically one-page, two-sided flyers (sometimes called *Palo Alto Recycling News*) that contain recycling information and announcements about upcoming events.

Junk Mail Survival Packet. This material was coproduced by the City and the Palo Alto War on Waste Citizens' Advisory Committee. It was originally advertised via a radio public service announcement and then through a utility bill insert; interested persons were to send a self-addressed, stamped envelope to receive the information. Since the original radio announcement around 1985, the information has been disseminated by many different organizations; the City continues to receive requests for the material.

Residential Recycling Information. The City mailed *Recycling - The Palo Alto Way* to all city residents when the brochure was first developed. This brochure is now sent to new residents upon request.

Composting Public Information. The City provides, upon request, a *Guide to Composting*, which provides information on home composting. The brochure also publicizes the backyard composting workshops offered periodically. All single family residents also received a brochure in spring 1990 describing the City's new curbside collection of compostable material and a list of what types of materials the City will pick up. Information on garden chippers and shredders is also available from the City upon request.

Recycling Center Tours. Informational tours of the City's Recycling Center are offered regularly by the Recycling Coordinator to interested individuals and groups.

Public Presentations. Presentations about recycling are given upon request to community groups and schools by the Project Coordinator and Recycling Coordinator. As part of the school presentation, children are given an activity project about recycling; at community presentations, participants are given either a brochure called *Recycling...The Palo Alto Way* or a report called *The Palo Alto Materials Recovery Program: A Summary Report*. Both give an overview of the types of recycling programs sponsored by the City; the Summary Report gives details on quantities collected and program history.

Newspaper Advertisements. The City runs a full page newspaper ad once a year in the *Palo Alto Weekly*. The ad provides general information about the City's recycling and other waste management programs. Other ads are run periodically to announce new programs or services.

Apartment and Condominium Public Education. An *Apartment/Condominium Recycling Guide* is provided to residents at apartment and condominium complexes that are participating in the City's recycling program. The *Guide* gives information on pickup times, what can be picked up, and when. In 1989 the City contacted the manager or homeowners' president of complexes with over 100 units. Initially the response was limited; however, the City now rents a set of three wheeled carts for \$6.20 per month to any apartment or condominium complex that wishes to participate. The City estimates that approximately 50 percent of the apartments and condominiums in Palo Alto participate in the recycling collection program.

Curbside Recycling Public Education. A *Refuse and Recycling Collection Handbook* is published by PASCO and hand delivered or mailed to all its customers yearly, as well as to new residents throughout the year. The *Handbook* contains information on PASCO's curbside pickup services, as well as on its backyard garbage can collection services and on the City's landfill.

7.3.2 Other Residential Programs (Not Sponsored by the City)

Sierra Club Public Information. The Loma Prieta Chapter of the Sierra Club publishes information on where to find recycled paper products and

where to recycle in Santa Clara County. This information includes a table, by city, of recycling facilities for glass, aluminum cans, tin cans, plastic, newspaper, and other materials.

War on Waste Public Information. The War on Waste Citizen's Advisory Committee co-sponsored the Junk Mail Survival Packet described above.

Community Group Workshops. To help celebrate Earth Day, some churches and other community groups in the City sponsored workshops or offered information on effective waste management practices to encourage their members to more environmentally aware. This will likely be an annual occurrence.

7.3.3 City-Sponsored Commercial/Industrial Public Education

Business Recycling Public Education. In November 1990, the City published *Business Recycling the Palo Alto Way*, a folder containing ten inserts describing the City's recycling programs for businesses. Included in the folder is information about broker services available to those businesses for whom selling directly to a materials broker would be most economical. In addition to being distributed at presentations made to businesses, the City plans to direct mail the new folder to Palo Alto businesses, beginning with the largest companies.

Public Presentations. The City will give presentations to interested businesses upon request. *Business Recycling the Palo Alto Way* is distributed at these presentations.

Commercial/Industrial Consulting Services Program. The City offers free consulting services to businesses interested in beginning a recycling program. Through the program, businesses are encouraged to recycle, whether via City programs or directly through brokers if volumes merit. Services offered through the program include a visual waste composition analysis, an identification of recyclable materials, a cost/benefit analysis of a recycling option versus disposal of wastes, and recommendations on how to begin and operate a recycling program.

High-Grade Paper Recycling Program. The City offers businesses a white and computer paper recycling program. The City publishes an informational brochure that explains how businesses can participate. The program is periodically publicized in the local newspaper.

Public Recognition and Awards. Public recognition and awards are used by the City to acknowledge businesses that have implemented source reduction activities. The City will consider expanding the recipients of these awards to community groups or individuals who are promoting source reduction in the community either through example or education. A "Recycler of the Month" award is proposed to strengthen the public's awareness of the need to recycle and continue to provide opportunities to educate the community about waste diversion targets.

7.3.4 Other Commercial/Industrial Programs (Not Sponsored by the City)

Downtown Environmental Action Project (DEAP). In November 1990, DEAP, funded by downtown businesses, initiated a recycling program downtown. Information about the program is disseminated by block captains and volunteers to businesses (as of December 1990, the 1,000 businesses targeted had been contacted). DEAP has divided the downtown area into 13 precincts, with at least 1 block captain per precinct.

Peninsula Conservation Center (PCC) Public Information. The PCC has available for use the *Recycled Products Guide*, which is a binder updated quarterly that can be used at the PCC library. In addition, subscriptions can be ordered through the PCC. The *Guide* contains information on products made from recycled consumer products, office products, construction materials, industrial commodities, and more. PCC also gives awards yearly to business for environmentally responsible projects, including recycling and source reduction activities. PCC sponsors brown bag seminars for people interested in waste reduction and other environmental issues. The ongoing lecture series covers waste reduction programs, including recycling and source reduction.

Syntex Public Education. Syntex, which began its recycling program in 1983, received the "Recycler of the Year" award from the City in 1985. In an effort to encourage fellow businesses to develop recycling programs, Syntex's recycling program coordinator gives regular tours of the Syntex recycling facilities to interested businesses. Syntex's recycling program coordinator will also give presentations at other businesses upon request.

Santa Clara Manufacturing Group Recycling Guide. The Santa Clara County Manufacturing Group publishes a recycling guide for businesses that emphasizes the importance of waste reduction and identifies how to

implement a recycling program and resources available to assist with locating recycled products, markets, and technical assistance.

Chamber of Commerce Recycling Committee. The Chamber of Commerce initiated a recycling committee that addresses solid waste issues of importance to its members. The committee discusses issues involved in implementing business recycling programs.

7.4 Selected Programs

The following section provides a summary of additional education and public information programs selected to augment the existing education and public information programs.

7.4.1 Media Programs

Public Service Announcements. Radio and television are effective media for educating large groups of people about waste management issues. Virtually every Bay Area radio and television station offers free air time to non-profit organizations to announce an event or present an issue. The City can take advantage of this by working with non-profit organizations to sponsor public service announcements (PSAs). Radio and television broadcasts received in Palo Alto also cover many other jurisdictions in the Bay Area, which makes PSAs an effective tool for educating the public about the benefits of source reduction, recycling, and composting.

Televised Programs. The City can work with other cities in Santa Clara County, and with other Bay Area counties, including San Francisco, San Mateo, Contra Costa, and Marin, to fund a series of public education videos and paid advertisements to air on cable or public television.

The videos can also be shared between communities for use at schools, churches, meetings, and other places where large groups of people congregate. Many communities and organizations have produced video programs on various waste management issues. For example, the League of Women Voters has produced a household hazardous waste video, and the Sierra Club has prepared a recycling video that features Palo Alto. There is also an NBC video and a Cable Channel video on Palo Alto recycling. The City will evaluate the feasibility of producing its own videos with the assistance of student production crews from local universities which would provide excellent experience for the students.

Currently, the City has two videos that focus on its recycling program; one was developed by Cable Co-op, the other by an independent producer.

News Releases. The City will prepare news releases for local papers and magazines concerning waste management issues and waste reduction efforts by the City, businesses, schools, and so on. Often newspapers and magazines will run news releases as a story feature. With a little follow-up, these releases can provide the catalyst for larger features.

7.4.2 Outreach

Coordination with Palo Alto Community Groups. The City will work closely with the War on Waste committee, the Downtown Environmental Action Project, churches, and other community groups to disseminate information about waste management. The name recognition and credibility of these community groups foster the likelihood of broad acceptance of AB 939 programs by the community.

Coordination with Non-Profit Organizations. The City will consider the volunteer services from non-profit organizations for community outreach. Organizations could augment the public education program, including Common Ground Ecology Action, the San Jose Conservation Corps, the Sierra Club, youth groups, and the Peninsula Conservation Center. For example, a public education program on recycling, source reduction, and composting could be integrated into the Boy Scouts of America, Eagle Scout's community service project.

Coordination with the County of Santa Clara. The City will participate in public education and technical assistance efforts organized by the County of Santa Clara. Examples include the establishment of a recycling information hotline and the annual recycling booth at the County fair. The City of Palo Alto pays fees to the County of Santa Clara based on tonnages of solid waste disposed. These fees support countywide solid waste management activities.

Internship Program. Funding an internship program for students from surrounding universities is a cost-effective method of operating public education programs. The City will consider sponsoring a waste reduction internship to assist with education and public information programs.

Participation in Local Events. Participating in local events is a highly visible method of reaching the community about waste reduction pro-

grams. The City will target events such as Earth Day, the Art and Wine Festival, and the Safety Fair at Stanford Shopping Center as opportunities to incorporate waste reduction practices.

7.4.3 Communication

Newsletter. The City will consider developing an "Environmental Newsletter" that contains information on solid waste issues, as well as other environmental issues including water and energy conservation, transportation, and pollution. The broader the scope of the newsletter, the more likely residents are to read it. For example, someone who is not particularly interested in recycling may read the newsletter for water conservation information and learn about solid waste issues as a side benefit.

Recycling Displays. The City places displays on recycling and on the Household Hazardous Waste Program at fairs and other events. Displays are prepared for such events as Earth Day, business/environmental fairs, the Peninsula Conservation Center Conference, and the Palo Alto Art and Wine Festival.

Chamber of Commerce. The City of Palo Alto will enlist the assistance of the Chamber of Commerce and other business organizations with newsletters to inform members about waste reduction services offered by the City. This is an effective method of informing businesses in the City about source reduction and recycling.

Workshops. The City will evaluate the feasibility of offering workshops and seminars to each targeted waste generator addressing practical ways of reducing the quantity of wastes generated. Proposed workshop topics include decreased consumption, procurement practices, increased manufacturing efficiency, and composting of yard wastes at the site of generation.

Speakers Bureau. The City will organize a speakers' bureau that includes volunteer speakers for solid waste issues. The list of speakers will be distributed to community groups, schools, businesses, government offices, and churches interested in sponsoring a workshop or seminar on waste management.

7.4.4 Campaigns

Environmental Shopping Campaign. The City will prepare a "Buy Recycled" pamphlet to be distributed with other recycling information to urge residents to "complete the loop" by buying recycled products whenever possible. The City will also consider creating a source reduction shopping checklist for consumers. The checklist would focus on criteria consumers can use when buying products, including durability, reusability, recyclability, and minimal packaging.

Contests and Displays. The City places displays on recycling and the household hazardous waste program at fairs and other events throughout the year. Examples of events the City has participated in include: Earth Day, business/environmental fairs, the Peninsula Conservation Center Conference, and the Palo Alto Art and Wine Festival. The City will also consider sponsoring and promoting a "No Garbage Lunch Day," poster contests, school contests, and library displays, targeting businesses, government, schools, and residents.

Waste Diversion Thermometer. The City will publicize the 25 percent and 50 percent diversion targets for 1995 and 2000, respectively, of AB 939 to keep the community involved in the waste reduction issue. A poster board tracking the City's waste diversion percentage should be placed in highly visible areas around the community, such as the City Hall and the library. The tracking "thermometer" would serve as a constant reminder that the City is striving for a 50 percent reduction in solid waste disposal by the year 2000.

Promotional Materials. The City will disseminate waste reduction promotional materials targeted at all age groups. Effective materials available from the State Department of Conservation and from other sources include door hangers, bookcovers, posters, bookmarks, stickers, yo-yo's, recycled paper notepads, certificates, recycled plastic frisbees, buttons, pencils, and magnets. These materials could be incorporated into many of the public information and education activities described above in this section.

7.4.5 Education

Environmental Education Curriculum. Solid waste education curricula (many of them free) are available for all ages from several sources. For example, the EPA publishes free educational materials about solid waste

generation and management for grades K through 12. Posters and comic books are also available. The *Mr. Rogers Neighborhood* recycling program and guide book are also available to educate children.

On the federal level, EPA has prepared a number of curricula that are available at no charge. These include:

- "Adventures of the Garbage Gremlin" EPA/530-SW-90-024
- "Let's Reduce and Recycle" Curriculum For Solid Waste Awareness EPA/530-SW-90-005
- Recycle Today: Educational Materials for Grades K-12 EPA/530-SW-90-025
- "Ride the Wave of the Future Recycle Today!" EPA/530-SW-90-010
- School Recycling Programs: A Handbook for Educators EPA/530-SW-90-023

California and other states have also developed waste management curricula that are available to school systems at all educational levels. Examples of these state-developed programs include:

- CIWMB's "Sweep Program" (features the "Trash Monster" and "The Wizard of Waste")
- "A-Way with Waste," Washington Department of Ecology
- "Rethinking Recycling," Oregon
- Super Saver Investigators," Ohio
- "Oscar's Options," Rhode Island
- "Waste Information Series for Educators" (WISE) Program, Michigan Department of Natural Resources

The CIWMB's education coordinator has information on how to obtain copies of these educational programs; for further information, call (916) 322-0330.

New Residents Program. The City will prepare educational materials for new residents explaining (1) the waste reduction goals of the City, and

(2) how the resident can assist by participating in the recycling, composting, and source reduction programs available.

7.5 Targeted Generators

As described above in Section 7.3, the City of Palo Alto has a range of education and public information programs in place. The City has also used many different types of programs in the past to educate and inform its population about solid waste issues. As a result, the City has much experience in education and public information techniques and in what programs are most successful. This background will serve as a springboard for the education and public information techniques selected to augment the existing programs in meeting the waste diversion targets.

The City of Palo Alto recognizes the need for ongoing, consistent education and public information programs. Although the City has had, and continues to have, many programs in place, these have tended to be intermittent, due to insufficient staffing. The City proposes to elevate these programs to an ongoing status.

After reviewing waste characterization data from the solid waste generation study and the solid waste generation analysis, the City proposes to target the following solid waste generators as recipients of the City's education and public information programs:

- Commercial/industrial, including institutional and local government
- Residential, including single-family and multifamily dwellings
- Schools, including education curricula for grades Kindergarten through twelfth

The commercial and residential sectors generate different quantities and types of waste. Each sector also has its own unique needs; these differing needs will be addressed in the City's education and public information program.

7.6 Program Implementation

7.6.1 Government Agencies Responsible for Implementation

The City of Palo Alto, through the Public Works Department, will be responsible for implementing education and public information activities. The Public Works Department will be responsible for coordinating the outreach, communication, and media programs with other organizations and cities.

The Public Works Department does not have a position specifically for education and public information. The information and education activities have been primarily the responsibility of City staff responsible for running the recycling, composting, and household hazardous waste programs. An additional staff person is needed to oversee the education and information aspects of recycling and composting.

7.6.2 Tasks Necessary to Implement Activities

Before Palo Alto can expand its public education program, additional staffing is needed.

The tasks necessary to implement the education and public information activities are summarized in Tables 7-1 through 7-3. The implementation tasks are presented for source reduction, recycling, and composting by selected waste reduction programs.

The City will hire an additional staff person dedicated to education and public information to meet the implementation schedule for program activities.

7.6.3 Implementation Schedule

The implementation schedule for the education and public information activities is also presented in Tables 7-1 through 7-3. The implementation schedule for public and education information is presented by each component's selected waste reduction programs.

7.6.4 Implementation Costs

Costs for implementing the tasks summarized in Tables 7-1 through 7-3 are estimated at \$160,000. A breakdown of costs for education and public information is presented in Table 7-4.

7.7 Monitoring and Evaluation

7.7.1 Methods to Quantify and Monitor Achievement of Objectives

The objectives of Palo Alto's education and public information program are to increase the public's participation in waste diversion programs and to heighten awareness of the need to reduce, reuse, compost, and recycle. To monitor the achievement of these objectives, residents will be randomly surveyed by phone and/or at major shopping centers in the City. The random survey will target a representative sample of the public and will focus on the public's awareness of various waste diversion programs available in the City. In addition, the survey will assist in identifying the relative effectiveness of alternative education and public information techniques.

Surveys will also be conducted at the Drop Off Center to determine if the number of new residents utilizing the services is increasing. The number of businesses requesting waste audits or technical assistance will also be recorded to determine if the participation rate in each respective program has increased. Monitoring can also take the form of mail-in response coupons in newspaper ads, surveys of events, periodic surveys, and phone calls. Measurement tools will be an integrated component of public information and education activities, whenever possible.

7.7.2 Written Criteria for Evaluating the Program's Effectiveness

Palo Alto will evaluate the effectiveness of the education and public information program by addressing the following issues:

- Have the participation rates in respective waste diversion programs increased?
- Has the City received more inquiries about waste diversion services available?
- Was there sufficient City staffing to implement the education and public information programs?
- Do the targeted generators have a greater awareness of the importance of diverting wastes from land disposal?

7.7.3 Agencies, Organization, Persons (or a Combination) Responsible for the Program's Monitoring, Evaluation, and Reporting

The City of Palo Alto Department of Public Works is responsible for monitoring and evaluating the effectiveness of the education and public information programs.

7.7.4 Monitoring and Evaluation Funding Requirements

Funding is needed for staffing and support services to monitor the effectiveness of the education and information programs implemented in Palo Alto. Specifically, funding is needed for recordkeeping and surveying the participation rates of respective waste reduction programs.

7.7.5 Measures to be Implemented if there is a Shortfall in the Diversion Objectives

The following measures will be implemented if the education and information objectives identified in Section 7.2 are not achieved:

- evaluate the need for increased staffing, including a contract employee, additional interns, or part-time/full-time permanent staffing
- revise the job descriptions of staff responsible for education and information
- evaluate the need for increased funding for education and information programs
- modify the education and public information programs that seem to be inadequate
- identify additional education and public information programs for consideration

7.7.6 Monitoring and Reporting Schedule

The City of Palo Alto will evaluate the timeline for implementing education and information programs to determine if programs are implementable on schedule. The following items will be addressed:

- time modifications needed to increase staffing levels, including the proposed public education specialist, and interns
- time modifications needed to coordinate with volunteer organizations, and other jurisdictions for specific programs
- time modifications needed to secure City Council approval for funding and operation of selected programs

Table 7-1
Source Reduction
Public Education Activities

RESIDENTIAL Program	Program Activities*	Activity Implementation Tasks	Schedule
Technical Assistance	<ul style="list-style-type: none"> •back yard composting •junk mail survival packet •newsletter •workshops and seminars •environmental shopping campaign •coordination with community groups 	<ul style="list-style-type: none"> •publicize technical assistance services and junk mail reduction pamphlet in newsletter •publicize back yard composting and source reduction workshops •disseminate source reduction shopping checklist •coordinate above with assistance from community groups 	Beginning July 1992
Public Education	<ul style="list-style-type: none"> •workshops and seminars •speakers bureau •shopping campaign •pledge drive •media program •promotional materials •newsletter •contests and displays •diversion thermometer •local events participation •environmental curriculum •internship program •community organizations and non-profit groups 	<ul style="list-style-type: none"> •conduct workshops and seminars utilizing speakers bureau •disseminate shopping tips •disseminate pledge certificates •develop media program •purchase and disseminate promotional materials •develop and print newsletter articles •sponsor source reduction contests •display waste diversion thermometer •publicize source reduction activities at events •work with school districts to implement curriculum for K-12 •develop internship program •coordinate above activities with assistance from community groups 	Beginning July 1992
Public Information	<ul style="list-style-type: none"> •newsletter •utility bill inserts •new resident program •community groups 	<ul style="list-style-type: none"> •publicize education and assistance programs via inserts and newsletter •establish new resident information program •coordinate above activities with assistance from schools and community groups 	Beginning July 1992

* Program activities are described in detail in the text.

Table 7-1
Source Reduction
Public Education Activities
(Continued)

COMMERCIAL/INDUSTRIAL Program	Program Activities*	Activity Implementation Tasks	Schedule
Technical Assistance	<ul style="list-style-type: none"> •on-site composting assistance •workshops and seminars •speakers bureau •internship program 	<ul style="list-style-type: none"> •offer businesses and landscapers assistance with on-site composting •sponsor workshops using speakers bureau •develop internship program 	Beginning July 1992
Public Education	<ul style="list-style-type: none"> •promotional materials •workshops and seminars •Chamber of Commerce 	<ul style="list-style-type: none"> •disseminate promotional materials to all businesses •offer businesses brown bag seminars at company cafeteria •coordinate above efforts with Chamber of Commerce 	Beginning July 1992
Waste Evaluations	<ul style="list-style-type: none"> •commercial/industrial consulting services program •Chamber of Commerce 	<ul style="list-style-type: none"> •publicize waste audits via newsletters and direct contacts with businesses 	Existing program
Promotion Activities	<ul style="list-style-type: none"> •public recognition and awards •promotional materials 	<ul style="list-style-type: none"> •establish a high visibility source reduction "company of the year" award •provide promotional materials for employees 	Beginning December 1992

* Program activities are described in detail in the text.

Table 7-2
 Recycling
 Public Education Activities

RESIDENTIAL Program	Program Activities*	Activity Implementation Tasks	Schedule
Recycling Center	<ul style="list-style-type: none"> • Recycling Center tours • promotional materials • newsletter 	<ul style="list-style-type: none"> • disseminate promotional materials and informational pamphlets at Recycling Center • include articles on the Recycling Center in the newsletter 	Beginning January 1991
Single-Family Curbside Collection	<ul style="list-style-type: none"> • curbside recycling public education • new residents program • public presentations • promotional materials • environmental education curriculum • pledge drive • environmental campaign • diversion thermometer • contests and displays • utility bill inserts • advertisements • newsletter 	<ul style="list-style-type: none"> • disseminate the <i>Refuse and Recycling Collection Handbook</i> • establish a "New resident" information program • conduct public presentations more frequently • disseminate promotional materials via schools and community organizations • work with school districts to implement curriculum for K-12 • organize a pledge drive with the help of volunteers, stores, and schools • implement a "Buy Recycled" campaign • display the waste diversion thermometer • develop school displays and poster contests • publicize program via inserts, advertisements, and newsletter 	Beginning July 1991
Multi-Family Residential recycling	<ul style="list-style-type: none"> • Apartment and Condominium public education • promotional materials • environmental education curriculum • environmental campaign • pledge drive • new residents program; • diversion thermometer • contests and displays • utility bill inserts • newspaper advertisements • newsletter 	<ul style="list-style-type: none"> • distribute <i>Apartment/Condominium Recycling Guide</i> and informational brochures • telephone landlords and home owners associations to offer technical assistance • disseminate promotional materials via schools and community organizations • work with school districts to implement K-12 curriculum • implement a "Buy Recycled" campaign • organize a pledge drive with the help of volunteers, stores, and schools • establish a new resident program • display the waste diversion thermometer • implement school and poster contests • publicize above activities via inserts, advertisements, and newsletter 	Beginning July 1991
Buy-Back Centers	<ul style="list-style-type: none"> • newsletter 	<ul style="list-style-type: none"> • publicize location and hours in newsletter 	July 1991

* Program activities are described in detail in the text

Recycling
Public Education Activities
(Continued)

COMMERCIAL/INDUSTRIAL

Program	Program Activities*	Activity Implementation Tasks	Schedule
Recycling Center	<ul style="list-style-type: none"> • Recycling Center tours • promotional materials 	<ul style="list-style-type: none"> • provide tours of facility • disseminate promotional materials and information about recycling services 	ongoing program
Restaurant bar glass collection program	<ul style="list-style-type: none"> • promotional materials • business recycling public education • public recognition and awards 	<ul style="list-style-type: none"> • disseminate promotional materials to restaurants and bars in the City • disseminate <i>Business Recycling the Palo Alto Way</i> • implement high publicity "Business Recycler of the Month" awards 	Beginning July 1991
High grade office paper collection	<ul style="list-style-type: none"> • business recycling public education • workshops and seminars • waste audit evaluation • public recognition and awards • Chamber of Commerce 	<ul style="list-style-type: none"> • disseminate <i>Business Recycling the Palo Alto Way</i> • invite businesses to recycling workshops • advertise waste audit services • implement high publicity "Business Recycler of the Month" awards • develop articles for newsletter 	Beginning July 1991
Commercial and retail cardboard collection	<ul style="list-style-type: none"> • business recycling public education • workshops and seminars • waste audit evaluation • public recognition and awards • Chamber of Commerce 	<ul style="list-style-type: none"> • disseminate <i>Business Recycling the Palo Alto Way</i> • invite businesses to recycling workshops • advertise waste audit services • implement high publicity "Business Recycler of the Month" awards • develop and print newsletter articles 	Beginning July 1991
Styrofoam Collection	<ul style="list-style-type: none"> • newsletter 	<ul style="list-style-type: none"> • develop and disseminate information on Styrofoam recycling 	Beginning July 1991

* Program activities are described in detail in the text.

Table 7-3
Composting
Public Education Activities

RESIDENTIAL Program	Program Activities*	Activity Implementation Tasks	Schedule
Residential Curbside Program	<ul style="list-style-type: none"> •composting public information •newsletter •utility bill inserts; •promotional materials •new residents program 	<ul style="list-style-type: none"> •disseminate pamphlets on curbside program to interested parties •publicize program in newsletter and utility bill inserts •disseminate promotional materials at garden stores, co-op food stores, natural food stores and other interested organizations •include information on curbside program in new resident information program 	Beginning January 1991
Self-Haul	<ul style="list-style-type: none"> •composting public information •promotional materials 	<ul style="list-style-type: none"> •develop and disseminate a flyer at the landfill to increase awareness of curbside program among self-haulers •disseminate promotional materials at the landfill 	July 1991

* Program activities are described in detail in the text

Table 7-3
Composting
Public Education Activities
(Continued)

COMMERCIAL/INDUSTRIAL	Program	Program Activities*	Activity Implementation Tasks	Schedule
Commercial haulers and landscapers		<ul style="list-style-type: none"> •composting public education 	<ul style="list-style-type: none"> •develop and disseminate a flyer at the landfill promoting the reduced tipping fee for clean yard waste 	Beginning July 1991
Business assistance		<ul style="list-style-type: none"> •sample composting contract •composting education •waste audit evaluations •Chamber of Commerce 	<ul style="list-style-type: none"> •develop and disseminate sample composting contracts that require landscapers to deliver clean yard waste to the landfill for composting •promote composting as a method to reduce landfill tipping costs •promote above activities through Chamber of Commerce newsletter and during waste audits 	Beginning July 1991

* Program activities are described in detail in the text.

Table 7-4
Implementation Costs¹ for
Selected Education and Public Information Programs

Public Information	
Planning	\$ 1,500
Implementation	3,000
Operation	6,000
Monitoring	<u>500</u>
Subtotal	11,000
Outreach	
Planning	2,000
Implementation	3,500
Operation	6,000
Monitoring	<u>500</u>
Subtotal	12,000
Technical Assistance	
Planning	2,000
Implementation	25,000
Operation	27,500
Monitoring	<u>1,500</u>
Subtotal	56,000
Public Awareness	
Planning	2,500
Implementation	10,000
Operation	6,000
Monitoring	<u>500</u>
Subtotal	19,000
Education	
Planning	8,000
Implementation	25,000
Operation	27,500
Monitoring	<u>1,500</u>
Subtotal	62,000
TOTAL²	\$160,000
<p>1. Includes costs for one additional staff person.</p> <p>2. Costs include source reduction activities described in Section 3, as well as public education costs for increasing participation in recycling and composting programs. (Sections 4 and 5).</p>	

LANDFILL SPECIFICATIONS AND DESIGN PARAMETERS

SIZE

LANDFILL AREA	185 ACRES
ENTRANCE FACILITIES	15 ACRES
PERIMETER BUFFER	30 ACRES
RIVER AREA	90 ACRES

TOTAL PROPERTY AREA 320 ACRES

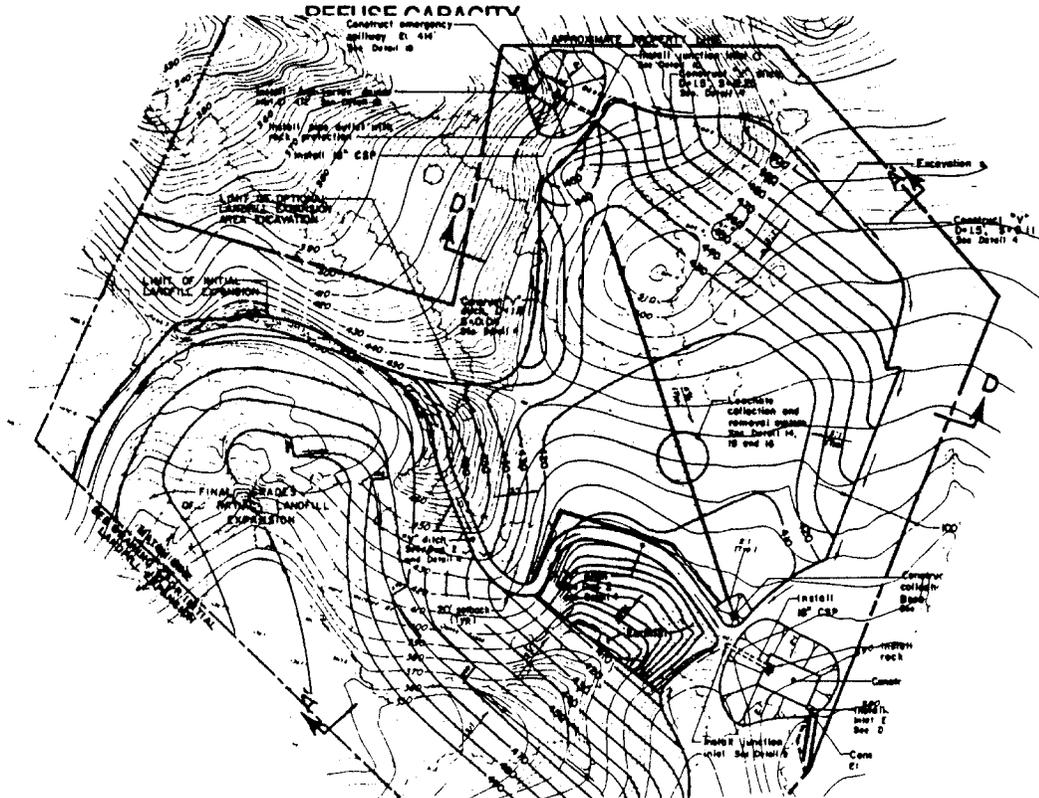
CAPACITY

ABOVE GROUND AIRSPACE	11,125,000 CY
QUARRY MATERIAL	10,557,000 CY

TOTAL AIRSPACE 21,682,000 CY

REFUSE CAPACITY

21,882,000 CY
13,129,000 TONS



46 YEARS
31 YEARS
23 YEARS

26 YEARS
20 YEARS
16 YEARS

5,470,000 CY
896,000 CY
1,493,000 CY
200,000 CY

3,000,000 CY
5,059,000 CY

63 FEET
32 FEET

DISPOSAL CAPACITY

8 DISPOSAL FACILITY CAPACITY COMPONENT

Integrated waste management includes the environmentally safe disposal of solid wastes that cannot be feasibly diverted from landfilling. Because of the diminishing landfill capacity in the state of California, the Integrated Waste Management Act of 1989 requires that jurisdictions identify their current and future solid waste disposal capacity needs (in their Source Reduction and Recycling Elements).

This component contains (1) a description of the permitted solid waste disposal facilities within the City of Palo Alto, (2) identification of the needed landfill capacity for 15 years, (3) identification of any disposal facility that will be closed during the next 10 years, and (4) reference to any plans for establishing new or expanded disposal facilities during the next 10 years.

8.1 Existing Permitted Solid Waste Disposal Facilities

The Palo Alto Refuse Disposal Site is the sole permitted solid waste disposal facility within the jurisdiction of the City of Palo Alto. A Class III landfill, it is located at the eastern end of Embarcadero Road in the City of Palo Alto. The landfill is on an approximately 1,500-acre parcel owned by the City; the total area permitted for landfilling is approximately 137 acres. As of May 31, 1989, the landfill had a remaining refuse capacity of approximately 2,677,000 cubic yards.

Operated by the City's Department of Public Works, the landfill accepts nonhazardous municipal solid waste, including wood, paper, plastics, glass, food waste, vegetative waste, construction and demolition debris, inert waste, and other nonhazardous waste. A complete characterization of the incoming waste stream is included in the Waste Generation Study (Section 2).

The landfill receives refuse from only the general public and the City's contract waste hauler in incorporated areas of the City.

The landfill currently receives approximately 320 tons per day of refuse, for an annual total of approximately 115,255 tons. Approximately 24,500 tons (17.5 percent) of the wastes generated in the City are diverted annually from the City's landfill. Disposal fees for the Palo Alto landfill are shown in Table 8-1.

The City's landfill has a remaining refuse capacity of approximately 1,606,000 tons (2,677,000 cubics yards). Disposal fees for the Palo Alto landfill are shown in Table 8-1. Based on a disposal rate of 320 tons per day in 1990 for 360 days per year, an annual waste generation growth rate of 1 percent, an average unit weight of 1,200 pounds per cubic yard for compacted refuse, and a 5:1 refuse to soil ratio, the landfill is estimated to reach capacity in July 2002 (Table 8-2). This anticipated closure date does not account for the anticipated reduction in daily disposal rates due to implementation of the City's SRRE. Table 8-3 shows the anticipated life of the landfill assuming that the diversion rates of the SRRE are met.

As a component of the SRRE, the City also plans to divert approximately two-thirds of its solid waste stream to the Sunnyvale Materials Recovery and Transfer Station (SMaRT Station) beginning in 1993. Final plans for construction of the SMaRT Station are currently being negotiated by the City of Sunnyvale and the contractor. The site life of the Palo Alto landfill with the diversion to the SMaRT Station is reflected in Table 8-3.

8.2 Solid Waste Disposal Facility Needs Projection

The needs projection for the solid waste disposal facility provides an estimate of the disposal capacity which (in addition to that provided by the Palo Alto landfill), is needed to accommodate projected solid waste generation within the City for a 15-year period commencing in 1991. The projected solid waste generation for this 15-year period is discussed in Section 2, the Solid Waste Generation Study.

The capacity required for disposal of solid waste generated within the City, and for waste imported to the City, was calculated using the following equation developed by the CIWMB:

$$\text{Additional Capacity}_{\text{Year } n} = [(G + I) - (D + TC + LF + E)]_{\text{Year } n}$$

where

G = The amount of solid waste projected to be generated in Palo Alto.

The amount of solid waste generated in Palo Alto in 1990 was approximately 139,690 tons. Accounting for projections of population growth, the estimated annual waste generation rates for the City were calculated.

I = The amount of solid waste that is expected to be imported to Palo Alto and disposed of in the Palo Alto landfill.

Currently no solid waste is imported from another jurisdiction to the Palo Alto landfill.

D = The amount diverted through current and proposed source reduction, recycling, and composting programs.

The amount of solid waste diverted from the landfill through existing source reduction, recycling, and composting and transformation programs in Palo Alto in 1990 was approximately 24,435 tons.

TC = The amount of volume reduction occurring through permitted transformation facilities.

Approximately 630 tons, of wastes generated in the City were transformed in 1990.

LF = The amount of permitted solid waste disposal capacity that is available for solid waste generated within Palo Alto.

Based on a May 31, 1989 topographic base map, the Palo Alto landfill has approximately 1,606,000 tons of refuse capacity remaining.

E = The amount of solid waste generated in Palo Alto that is exported to solid waste disposal facilities in another jurisdiction.

Beginning in 1992, two-thirds of the solid waste generated in Palo Alto will be diverted to the SMaRT Station after recoverable materials have been removed.

n = Each year of a 15-year period commencing in 1991.

Results of the solid waste disposal facility needs projection are shown in Tables 8-4 through 8-5. Results indicate that Palo Alto will not require additional disposal capacity during the 15-year planning period if AB 939 diversion goals of the City's SRRE are met and two-thirds of the solid

waste generated in Palo Alto is diverted to the SMaRT Station beginning in 1993.

8.3 Disposal Facility Phase-Out or Closure

The Palo Alto landfill is not scheduled to be phased out or closed during the short-term or medium-term planning periods. Even without additional waste diversion through source reduction, recycling, and composting programs, and diversion to the SMaRT Station, the Palo Alto Sanitary Landfill has refuse capacity to 2002.

8.4 New or Expanded Disposal Facility

There are currently no plans to establish a new disposal facility in Palo Alto during the short- and medium-term planning periods nor are there any plans to expand the City's landfill.

Table 8-1
Proposed Fee Schedule*

Classification	Resident	Commercial
Passenger (Minimum charge)	\$2.00/pass (Minimum charge)	\$16.00
Other Two Axle Vehicle or Trailer	\$7.00/cubic yard	\$16.00/cubic yard
Three or More Axle Vehicles	\$22.00/cubic yard	\$22.00/cubic yard
Any Fraction Over Cubic Yard	\$3.50	\$8.00
Compostable Materials	\$4.00/cubic yard	\$9.00/cubic yard
ADDITIONAL FEES		
Tires - 36" dia. or less	\$2.00 each	\$2.00 each
Mattresses/Boxsprings	\$5.00 each	\$5.00 each
Upholstered or Stuffed Furniture	\$5.00 each	\$5.00 each
Appliances	\$20.00 each	\$20.00 each
Washer/Dryer/Stove		
Refrigerator/Water Heater		
Freezer		
Special Burials	\$10.00 + Regular Fee	\$20.00 + regular fee
* If approved, fee schedule will become effective July 1, 1991.		

Table 8-2

Palo Alto Sanitary Landfill
 Site Life Projection
 Current Diversion Level

Year	Projected Growth Rate* (%)	Annual Waste Generated (tons)	Annual Waste Diverted from Disposal (tons)	% Waste Diverted	Total Annual Refuse Landfilled (tons)	Remaining Capacity (beginning of year) (tons)
1990	1.00	139,690	24,435	17.5	115,255	1,535,043
1991	1.00	141,087	24,690	17.5	116,397	1,419,788
1992	1.00	142,498	24,937	17.5	117,561	1,303,391
1993	1.00	143,923	25,186	17.5	118,736	1,185,831
1994	1.00	145,362	25,438	17.5	119,924	1,067,094
1995	1.00	146,816	25,693	17.5	121,123	947,171
1996	1.00	148,284	25,950	17.5	122,334	826,048
1997	1.00	149,767	26,209	17.5	123,557	703,714
1998	1.00	151,264	26,471	17.5	124,793	580,156
1999	1.00	152,777	26,736	17.5	126,041	455,363
2000	1.00	154,305	27,003	17.5	127,301	329,322
2001	1.00	155,848	27,273	17.5	128,574	202,021
2002	1.00	157,406	27,546	17.5	129,860	73,447
2003	1.00	158,980	27,822	17.5	131,159	-56,413

Total tonnage capacity remaining from May 31, 1989 = 1,606,600 tons

* Growth rate based on State Department of Finance population projections, assuming a constant per capita waste generation rate.

** Landfill will reach capacity in June 2002
 (Based on a refuse density of 1200 lb/cy)
 (Using August 1990 Final Grading Plan)

Table 8-3

Palo Alto Sanitary Landfill
Site Life Projection
With Implementation of the SRRE

Year	Projected Growth Rate* %	Annual Waste Generated (tons)	Annual Diverted from P.A. Landfill (tons)	Annual Waste Diverted** %	Annual Exported to SMaRT Station (tons)	Annual Refuse Landfilled at P. A. (tons)	Remaining Capacity (beginning of year) (tons)
1990	1.00	139,690	24,435	17.5	0	115,255	1,535,043
1991	1.00	141,087	41,903	29.7	0	99,184	1,419,788
1992	1.00	142,498	50,444	35.4	0	92,054	1,320,604
1993	1.00	143,923	51,956	36.1	61,311	30,656	1,228,550
1994	1.00	145,362	53,493	36.8	61,246	30,623	1,197,895
1995	1.00	146,816	55,203	37.6	61,075	30,538	1,167,272
1996	1.00	148,284	61,241	41.3	58,028	29,014	1,136,734
1997	1.00	149,767	61,854	41.3	58,609	29,304	1,107,720
1998	1.00	151,264	62,472	41.3	59,195	29,597	1,078,416
1999	1.00	152,777	63,097	41.3	59,787	29,893	1,048,818
2000	1.00	154,305	63,728	41.3	60,385	30,192	1,018,925
2001	1.00	155,848	64,365	41.3	60,988	30,494	988,733
2002	1.00	157,406	65,009	41.3	61,598	30,799	958,239
2003	1.00	158,980	65,659	41.3	62,214	31,107	927,439
2004	1.00	160,570	66,315	41.3	62,836	31,418	896,332
2005	1.00	162,176	66,979	41.3	63,465	31,732	864,914
2006	1.00	163,798	67,648	41.3	64,099	32,050	833,182
2007	1.00	165,435	68,325	41.3	64,740	32,370	801,132
2008	1.00	167,090	69,008	41.3	65,388	32,694	768,762
2009	1.00	168,761	69,698	41.3	66,042	33,021	736,068
2010	1.00	170,448	70,395	41.3	66,702	33,351	703,047
2011	1.00	172,153	71,099	41.3	67,369	33,685	669,696
2012	1.00	173,874	71,810	41.3	68,043	34,021	636,011
2013	1.00	175,613	72,528	41.3	68,723	34,362	601,990
2014	1.00	177,369	73,253	41.3	69,410	34,705	567,628
2015	1.00	179,143	73,986	41.3	70,105	35,052	532,923
2016	1.00	180,934	74,726	41.3	70,806	35,403	497,871
2017	1.00	182,744	75,473	41.3	71,514	35,757	462,468
2018	1.00	184,571	76,228	41.3	72,229	36,114	426,711
2019	1.00	186,417	76,990	41.3	72,951	36,476	390,597
2020	1.00	188,281	77,760	41.3	73,681	36,840	354,121
2021	1.00	190,164	78,538	41.3	74,417	37,209	317,281
2022	1.00	192,065	79,323	41.3	75,162	37,581	280,072
2023	1.00	193,986	80,116	41.3	75,913	37,957	242,491
2024	1.00	195,926	80,917	41.3	76,672	38,336	204,535
2025	1.00	197,885	81,727	41.3	77,439	38,720	166,198
2026	1.00	199,864	82,544	41.3	78,213	39,107	127,479
2027	1.00	201,863	83,369	41.3	78,996	39,498	88,372
2028	1.00	203,881	84,203	41.3	79,786	39,893	48,874
2029	1.00	205,920	85,045	41.3	80,583	40,292	8,982
2030	1.00	207,979	85,895	41.3	81,389	40,695	-31,310
2031	1.00	210,059	86,754	41.3	82,203	41,102	-72,005

Total capacity remaining from May 31, 1989 = 1,606,600 tons

* Growth rate based on State Department of Finance population projections, assuming a constant per capita waste generation rate.

** Does not include the diversion rate to be obtained at the SMaRT Station. Of the amount exported to the SMaRT Station, 20 percent will be diverted from disposal.

*** Landfill will reach capacity in February 2029
(Based on a refuse density of 1200 lb/cy)
(Using August 1990 Final Grading Plan)

Table 8-4

Solid Waste Disposal Facility Capacity Needs Projection (1)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Solid Waste Generated	141,087	142,498	143,923	145,362	146,816	148,284	149,767	151,264	152,777	154,305	155,848	157,406	158,980	160,570	162,176
Solid Waste Imported	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solid Waste Diverted*	24,690	24,937	25,186	25,438	25,693	25,950	26,209	26,471	26,736	27,003	27,273	27,546	27,822	28,100	28,381
Transformation Reduction	635	641	648	654	661	667	674	681	687	694	701	708	715	723	730
Remaining Permitted Disposal Capacity (end of year)	1,303,402	1,186,482	1,068,394	949,124	828,662	706,995	584,111	459,999	334,646	208,038	80,165	-48,987	-179,430	-311,178	-444,243
Solid Waste Exported	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Additional Disposal Capacity Needed (cubic yards)**	0	0	0	0	0	0	0	0	0	0	0	81,644	299,050	518,630	740,405

(1) All wastes in tons, except additional disposal capacity.

* Based on current estimated diversion rate of 16.34%.

** Based on a refuse density of 1200 lbs/cy.

Table 8-5

Solid Waste Disposal Facility Capacity Needs Projection (1)
With Implementation of the SRRE

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Solid Waste Generated	141,087	142,498	143,923	145,362	146,816	148,284	149,767	151,264	152,777	154,305	155,848	157,406	158,980	160,570	162,176
Solid Waste Imported	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solid Waste Diverted*	41,903	50,444	51,956	53,493	55,203	61,241	61,854	62,472	63,097	63,728	64,365	65,009	65,659	66,315	66,979
Transformation Reduction	635	641	648	654	661	667	674	681	687	694	701	708	715	723	730
Remaining Permitted Disposal Capacity (end of year)	1,320,615	1,290,144	1,259,705	1,229,300	1,198,982	1,170,190	1,141,111	1,111,740	1,082,076	1,052,115	1,021,855	991,292	960,423	929,246	897,756
Solid Waste Exported	0	60,942	60,879	60,810	60,635	57,584	58,159	58,741	59,328	59,922	60,521	61,126	61,737	62,355	62,978
Additional Disposal Capacity Needed (cubic yards)**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*Quantities diverted from the SMaRT Station are not included. Those quantities are included in "solid waste exported".

(1) All values in tons, except additional disposal capacity needed.

** Based on a refuse density of 1200lbs/cy.

9 FUNDING COMPONENT

Adequate and long-term funding is an essential component of a successful integrated solid waste management system. Inadequate funding can cause an otherwise effective program to fail. In California, local solid waste management systems are typically funded by one or more of the following methods:

- *Tipping fee* - the amount charged by a transfer station, landfill, or transformation facility to accept a specified amount of waste (usually expressed in terms of tons or cubic yards).
- *Property taxes* - those taxes that are levied on the person or corporation recorded on the deed of record. Property taxes have limitations such as (1) statutory ceilings on tax rates, (2) competing public services such as public education, (3) lack of income or economic activity to support higher taxes, and (4) lack of voter support.
- *User fees* - fees applied to household waste and industrial waste. User fees assess the actual user based on weight and volume or number of containers collected, instead of a flat fee and local tax-financial systems.

This component demonstrates how the City of Palo Alto has sufficient funds and allocation of resources for the planning, development, and implementation of the new and existing solid waste programs identified in this document. This section includes a description of the current mechanisms used to fund solid waste programs in the City of Palo Alto; and provides cost estimates for the planning, development, and implementation of new programs. In addition, this section lists future potential revenue sources and contingency revenue sources.

9.1 Current Funding Sources

The source of funding for solid waste management activities in Palo Alto is the Refuse Enterprise Fund. It is comprised of refuse collection fees paid by city residents and commercial collection customers, disposal area fees, interest income, lease and royalty income from Palo Alto Landfill Gas Corporation and other sources. Collection costs for garbage in Palo Alto are approximately \$44.00 per ton or \$0.02 per pound. Disposal costs for garbage are approximately \$45.00 per ton or \$0.03 per pound. The minimum charge is based upon the collection of refuse from one 32-gallon container. Collection fees charged to customers are based upon the combined net costs of City refuse collection operations, recycling collection operations, and tipping fees at the landfill. This fund adequately covers all costs for the current solid waste management system in the City.

Described below are programs funded by the Refuse Enterprise Fund. Specific information on revenues and expenditures for 1989 through 1992 for each of these programs is presented in Appendix C.

1. **Administration and General Program.** Provides for the effective planning, evaluation, and implementation of various controls and aspects of solid waste management.
2. **Material Resource Recovery Program.** Conserves landfill space by reducing municipally-generated solid waste, and by increasing the recovery of reusable materials.
3. **Disposal Operation Program.** Provides for the disposal of solid wastes in a sanitary, economic, effective, and safe manner in compliance with regulatory agencies. This program includes refuse collection and landfill disposal operations.
4. **Street Cleaning Program.** Provides for the cleaning of city streets, parking lots, and other city facilities.
5. **Systems Improvement Program.** Provides engineering and support for physical improvements at the Refuse Disposal Area so that disposal and recycling operations will be efficient, and eventual closure of the landfill will be in conformance with regulatory requirements and city policy.

6. **Environmental Control Program.** Provides environmental control programs and projects which comply with local, state, and federal mandates. This is a new program that consolidates the growing environmental protection and compliance costs associated with the closure of the landfill. These include costs for (1) the household hazardous waste program; (2) ground-water monitoring; (3) well sampling; (4) maintenance of the leachate system; (5) operation of the methane gas collection and piping system; and (6) waste discharge permits.

9.2 Estimated Program Costs

Estimated costs have been determined for each of the new or expanded programs that have been identified in Sections 3 through 7 for implementation during the short-term planning period. Table 9-1 shows the estimated capital and operating costs for each of these programs, by year, for 1991 through 1995. Capital costs include equipment purchases, and new or improved structures. Operating costs include operations and maintenance, publications, and other promotional materials, Palo Alto staff time, and other expenses. Costs shown include those costs which will be incurred by the City, and those costs, excluding staff time, that will be incurred by PASCO.

Four staff positions, one solid waste manager, two recycling coordinators, and a landfill composting attendant will be added to the City staff in 1991. These positions, along with other existing staff, will be responsible for planning, developing, and implementing the new and expanded programs as identified in this document (see Sections 3 through 7). Costs for this additional staff are included in the annual operating costs (see Table 9-1).

9.3 AB 939 Fees

The City of San Jose has imposed a fee effective July 1, 1991 on all waste landfilled in San Jose. The fee is \$0.25 per ton.

The County of Santa Clara has proposed a similar fee for all waste landfilled in the County. The proposal that has been approved in concept is currently being reviewed by the Technical ~~Assistance~~ Committee (TAC). This fee would be effective on July 1, 1992, and it may or may not be associated with the San Jose fee. Some of the revenues generated from

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the County fee would be given to local agencies to help implemented AB 939 programs.

9.4 Revenue Source for New and Expanded Programs

The new and expanded programs to be implemented during the short-term planning period in the City of Palo Alto will be funded by a proposed 20 percent maximum increase in refuse collection rates. A 20 percent increase will generate monies which will be available through the Refuse Enterprise Fund. This increase is sufficient for funding the planning, development, and implementation in the short-term planning period of the selected new and expanded programs.

9.5 Contingency Funding Sources

The System Improvement Reserve of the Refuse Fund, currently at \$6 million, will serve as the main source of contingency funds. This fund will be utilized to provide for unbudgeted and emergency expenses. It will also be used to smooth year-to-year fluctuations in capital project expenditures and to fund landfill closure costs. Further funding sources and mechanisms that could be explored by Palo Alto if a shortfall in solid waste management funds occurs are as follows:

- *Rate structure modification.* This includes a subscribed variable where the level of payment varies with a measure of the volume of waste disposed.
- *Community Development Block Grants.* All cities and counties are eligible to apply for the Economic Development Allocation for the Community Development Block Grant Program. Grants are made from the state to local government applicants, which can then loan the funds to businesses to fund specific projects, such as a particular recycling program or business that uses or manufactures products made from recyclable materials.
- *Other grant funding sources.* These include grants from the California Integrated Waste Management Board for new or existing household hazardous waste management programs or from the California Department of Commerce Office of Competitive Technology to fund technological projects that show promise for commercialization. In

1989, federal, public and private agencies and institutions were awarded 29 grants from a pool of over 240 applicants.

Funds generated from these three sources will be put back in the Reserve Fund.

Table 9-1
 Funds Required for Planning, Operation and Monitoring of Programs
 to be Implemented in the Short-Term Planning Period¹

	FY 1991-1992	FY 1992-1993	FY 1993-1994	FY 1994-1995	FY 1995-1996
Source Reduction - Technical Assistance					
Planning	2	2	2	2	2
Implementation					
Operation					
Monitoring					
Source Reduction - Public Awareness					
Planning	2	2	2	2	2
Implementation					
Operation					
Monitoring					
Recycling - Expand Multi-family (Alt. 3) P. 4-13					
Planning		220,000	131,250	137,810	144,700
Implementation		125,000	1,050	1,100	1,160
Operation		1,000			
Monitoring					
Recycling - Expand Commercial/Industrial (Alt 1) P. 4-18					
Planning		260,000	157,500	165,380	173,640
Implementation		150,000	1,050	1,100	1,160
Operation		1,000			
Monitoring					
Recycling - SMART Station					
Planning			166,180	174,490	183,210
Implementation					
Operation					
Monitoring					
Recycling - Inert Solids					
Planning		70,000 - 140,000 ³	73,500 - 147,000 ³	77,180 - 154,360 ³	81,030 - 162,060 ³
Implementation					
Operation					
Monitoring					

1. In accordance with AB 939, programs scheduled for the medium-term planning period are not included in this table. Costs for 1992 and beyond reflect a 5 percent inflation factor.

2. Costs are included in education and public information program.

3. Reflects range of diversion from 6 percent to 12 percent.

Table 9-1
Funds Required for Planning, Operation and Monitoring of Programs
to be Implemented in the Short-Term Planning Period
(Continued)

	FY 1991-1992	FY 1992-1993	FY 1993-1994	FY 1994-1995	FY 1995-1996
Composting - Increased Processing					
Planning		10,000			
Implementation		290,000			
Operation		52,500 - 59,000	55,130 - 61,950	57,880 - 65,050	60,780 - 68,300
Monitoring		1,000	1,050	1,100	1,160
Composting - Increased Participation					
Planning					
Implementation		2	2	2	2
Operation					
Monitoring					
Special Waste - White Goods Salvaging					
Planning					
Implementation		2,630	2,760	2,890	3,040
Operation	2,500	530	550	580	610
Monitoring	500				
Education and Public Information Program					
Planning	16,000	17,500	18,380	19,290	20,260
Implementation	66,500	73,000	74,000	77,700	81,590
Operation	72,500	77,500	90,000	94,500	99,230
Monitoring	5,000	5,250	7,000	7,350	7,720
TOTAL	163,000	1,356,910- 1,433,410	779,400- 859,720	818,350- 902,700	859,290- 947,840

Footnotes are presented on the first page of the table.

10 INTEGRATION COMPONENT

A jurisdiction must integrate source reduction, recycling, composting, and special wastes programs and activities to achieve the diversion requirements mandated by AB 939. These components must also be integrated as necessary so that solid waste management follows the integrated waste management hierarchy of (1) source reduction, (2) recycling and composting, and (3) environmentally safe transformation and disposal.

This component contains a description of the solid waste management practices that promote integrated waste management in the City of Palo Alto, and an explanation of how Palo Alto has integrated the source reduction, recycling, composting, and special wastes components. In addition, this component summarizes how the 25 percent and 50 percent diversion mandates will be achieved, and how priorities were established between the components consistent with the requirements of AB 939. This component also contains an integrated schedule.

10.1 Integrated Solid Waste Management Practices

The solid waste management practices described in the source reduction, recycling, composting, and special wastes components of this document (Sections 3 through 6), which are to be continued, expanded, or implemented in the City of Palo Alto, are designed to comply with the integrated waste management hierarchy established by AB 939. Consistent with this hierarchy, the City will promote source reduction activities targeted at decreasing the amount of solid wastes being generated in the City. For wastes that continue to be generated in the City, recycling and composting programs will contribute to diverting wastes from disposal to the extent feasible. For wastes that cannot be diverted, the City will ensure that they are transformed or landfilled in an environmentally safe manner.

Figure 10-1 summarizes Palo Alto's specific source reduction, recycling, composting, transformation, and disposal activities and practices that are designed to achieve integrated waste management.

10.2 Component Integration

The source reduction, recycling, composting, and special wastes components have been integrated so that the programs selected for implementation from each component achieve their maximum potential. Initially, mutually exclusive objectives and target materials for each component were developed to prevent overlapping or duplication of activities or programs selected for one component with those of another component. The objectives and target materials identified for each component also do not duplicate the existing source reduction, recycling, and composting activities in the City. With its focus on mutually exclusive programs and activities, the City of Palo Alto's SRRE maximizes the use of all feasible source reduction, recycling, and composting options.

Public education and information, and funding for source reduction, recycling, and composting activities and programs will be integrated for time efficiency and cost effectiveness. Staff time required for public education and information will be shared among the components. All funding requirements will be met by the Refuse Enterprise Fund.

10.3 Compliance with Diversion Mandates

The City of Palo Alto currently diverts approximately 16.4 percent of the solid waste generated in the City from disposal through existing diversion programs. The source reduction, recycling, composting, and special wastes activities and programs selected for implementation are designed to achieve the diversion mandates in AB 939 in coordination with existing (and planned expansions of existing) diversion programs.

Table 10-1 identifies the solid waste mass balance for 1990 which includes only existing diversion programs. Tables 10-2 through 10-11 identify the solid waste mass balances, by year, from 1991 through 2000 including diversion rates expected from new diversion programs. The diversion rates shown in Tables 10-2 through 10-11 are anticipated to be achieved by (1) existing, (2) planned expansions of existing, and (3) new source reduction, recycling, and composting activities and programs. A range of tons diverted (and the corresponding percent of waste stream) is shown to reflect the estimated diversion amounts identified in the recycling, composting, and special wastes components. Note, that the percent of waste stream diverted remains constant for source reduction because,

as stated in Section 3, future source reduction efforts are difficult to accurately quantify at this time.

10.4 Component Priorities

Some materials in the waste stream may be diverted from land disposal by a variety of methods. Paper, for example, is a target material that may be diverted from landfilling through several programs, including (but not limited to) product reuse, curbside recycling, and commercial recycling.

In developing the City of Palo Alto's SRRE, priorities had to be set between components for cases with various available diversion options. Prioritizing between the specific components and programs or activities for each target material was based on several regulatory, technical, institutional, and economic considerations. These included

- location of the activity or program in the integrated waste management hierarchy
- effectiveness in reducing the volume, weight, or hazard of the targeted wastes
- consistency with existing waste management practices
- cost effectiveness and ease of implementation

Based on these criteria, the components of Palo Alto's SRRE were prioritized to effectively achieve the mandated diversion goals of 25 percent by 1995 and 50 percent by 2000.

10.5 Integrated Schedule

The integrated schedule for the short-term planning period, shown in Tables 10-12 through 10-16, includes all implementation tasks for new and expanded programs, and identifies the agency responsible for implementation, task and milestone dates, funding source availability, and the target date for achieving the diversion. Note that Table 10-16 does not identify any new activities since all new programs and activities will be implemented by 1994.

The organization of the City of Palo Alto Public Works Department, which is the responsible entity for implementation of the SRRE, is shown in Figure 10-2. The organizational chart identifies additional staff needs that are described in Sections 4 through 7 of the SRRE.

Table 10-1

1990 Solid Waste Mass Balance

WASTE STREAM	TONS	% OF WASTE STREAM
SOLID WASTE GENERATED	139,690	100.00
SOLID WASTE DIVERTED		
Source Reduction	561	0.40
Recycling		
Residential Curbside	6,470	4.63
Drop-Off Center	776	0.56
20/20 Centers	60	0.04
Commercial Collection	5,758	4.12
Special Wastes	77	0.06
Composting		
Curbside Collection	5,454	3.90
Landfill Drop-off	<u>5,356</u>	<u>3.83</u>
Subtotal	24,512	17.55
SOLID WASTE TRANSFORMED	625	0.45
SOLID WASTE DISPOSED	114,553	82.01

Table 10-2

1991 Solid Waste Mass Balance

WASTE STREAM	TONS*	% OF WASTE STREAM*
SOLID WASTE GENERATED	141,087	100.00
SOLID WASTE DIVERTED		
Source Reduction	567	0.40
Recycling		
Residential Curbside	6,817 - 6,975	4.83 - 4.94
Drop-Off Center	784	0.56
20/20 Centers	61	0.04
Commercial Collection	6,511	4.61
Special Wastes	429 - 517	0.30 - 0.37
Inert Solids	8,295 - 16,590	5.88 - 11.76
Composting		
Curbside Collection	5,480 - 5,811	3.88 - 4.12
Landfill Drop-off	3,888 - 4,122	2.76 - 2.92
Subtotal	32,831 - 41,937	23.27 - 29.72
SOLID WASTE TRANSFORMED	631	0.45
SOLID WASTE DISPOSED	107,624 - 98,519	76.28 - 69.83
* A low and high amount is shown in order to indicate that new programs to be implemented have an estimated range of diversion amounts.		

Table 10-3

1992 Solid Waste Mass Balance

WASTE STREAM	TONS*	% OF WASTE STREAM*
SOLID WASTE GENERATED	142,498	100.00
SOLID WASTE DIVERTED		
Source Reduction	572	0.40
Recycling		
Residential Curbside	6,885 - 7,045	4.83 - 4.94
Drop-Off Center	792	0.56
20/20 Centers	61	0.04
Commercial Collection	10,765 - 13,558	7.55 - 9.51
Special Wastes	434 - 522	0.30 - 0.37
Inert Solids	8,378 - 16,756	5.88 - 11.76
SMaRT Station	14,250	10.00
Composting		
Curbside Collection	5,819 - 6,486	4.08 - 4.55
Landfill Drop-off	4,128 - 4,601	2.90 - 3.23
Subtotal	52,083 - 64,642	36.55 - 45.36
SOLID WASTE TRANSFORMED	638	0.45
SOLID WASTE DISPOSED	89,777 - 77,218	63.00 - 54.19
* A low and high amount is shown in order to indicate that new programs to be implemented have an estimated range of diversion amounts.		

Table 10-4

1993 Solid Waste Mass Balance

WASTE STREAM	TONS*	% OF WASTE STREAM*
SOLID WASTE GENERATED	143,923	100.00
SOLID WASTE DIVERTED		
Source Reduction	578	0.40
Recycling		
Residential Curbside	6,954 - 7,115	4.83 - 4.94
Drop-Off Center	800	0.56
20/20 Centers	62	0.04
Commercial Collection	10,873 - 13,694	7.55 - 9.51
Special Wastes	438 - 528	0.30 - 0.37
Inert Solids	8,462 - 16,923	5.88 - 11.76
SMaRT Station	14,392	10.00
Composting		
Curbside Collection	6,163 - 7,173	4.28 - 4.98
Landfill Drop-off	4,372 - 5,089	3.04 - 3.54
Subtotal	53,093 - 66,354	36.89 - 46.10
SOLID WASTE TRANSFORMED	644	0.45
SOLID WASTE DISPOSED	90,185 - 76,925	62.66 - 53.45
* A low and high amount is shown in order to indicate that new programs to be implemented have an estimated range of diversion amounts.		

Table 10-5

1994 Solid Waste Mass Balance

WASTE STREAM	TONS*	% OF WASTE STREAM*
SOLID WASTE GENERATED	145,362	100.00
SOLID WASTE DIVERTED		
Source Reduction	584	0.40
Recycling		
Residential Curbside	7,023 - 7,186	4.83 - 4.94
Drop-Off Center	808	0.56
20/20 Centers	62	0.04
Commercial Collection	10,982 - 13,831	7.55 - 9.51
Special Wastes	442 - 533	0.30 - 0.37
Inert Solids	8,546 - 17,093	5.88 - 11.76
SMaRT Station	14,536	10.00
Composting		
Curbside Collection	6,514 - 7,874	4.48 - 5.42
Landfill Drop-off	4,621 - 5,586	3.18 - 3.84
Subtotal	54,119 - 68,093	37.23 - 46.84
SOLID WASTE TRANSFORMED	650	0.45
SOLID WASTE DISPOSED	90,593 - 76,619	62.32 - 52.71
* A low and high amount is shown in order to indicate that new programs to be implemented have an estimated range of diversion amounts.		

Table 10-6

1995 Solid Waste Mass Balance

WASTE STREAM	TONS*	% OF WASTE STREAM*
SOLID WASTE GENERATED	146,816	100.00
SOLID WASTE DIVERTED		
Source Reduction	590	0.40
Recycling		
Residential Curbside	7,094 - 7,258	4.83 - 4.94
Drop-Off Center	816	0.56
20/20 Centers	63	0.04
Commercial Collection	11,092 - 13,969	7.55 - 9.51
Special Wastes	447 - 538	0.30 - 0.37
Inert Solids	8,632 - 17,264	5.88 - 11.76
SMaRT Station	14,682	10.00
Composting		
Curbside Collection	6,871 - 8,589	4.68 - 5.85
Landfill Drop-off	4,874 - 6,093	3.32 - 4.15
Subtotal	55,159 - 69,860	37.57 - 47.58
SOLID WASTE TRANSFORMED	657	0.45
SOLID WASTE DISPOSED	91,000 - 76,298	61.98 - 51.97
* A low and high amount is shown in order to indicate that new programs to be implemented have an estimated range of diversion amounts.		

Table 10-7

1996 Solid Waste Mass Balance

WASTE STREAM	TONS*	% OF WASTE STREAM*
SOLID WASTE GENERATED	148,284	100.00
SOLID WASTE DIVERTED		
Source Reduction	596	0.40
Recycling		
Residential Curbside	8,647 - 11,779	5.83 - 7.94
Drop-Off Center	972 - 1,269	0.66 - 0.86
20/20 Centers	64	0.04
Commercial Collection	11,203 - 14,109	7.55 - 9.51
Special Wastes	451 - 543	0.30 - 0.37
Inert Solids	8,718 - 17,436	5.88 - 11.76
SMaRT Station	14,828	10.00
Composting		
Curbside Collection	6,940 - 8,675	4.68 - 5.85
Landfill Drop-off	4,923 - 6,154	3.32 - 4.15
SOLID WASTE TRANSFORMED	<u>663</u>	<u>0.45</u>
Subtotal	58,005 - 76,116	39.12 - 51.33
SOLID WASTE DISPOSED	90,279 - 72,168	60.88 - 48.67
* A low and high amount is shown in order to indicate that new programs to be implemented have an estimated range of diversion amounts.		

Table 10-8

1997 Solid Waste Mass Balance

WASTE STREAM	TONS*	% OF WASTE STREAM*
SOLID WASTE GENERATED	149,767	100.00
SOLID WASTE DIVERTED		
Source Reduction	601	0.40
Recycling		
Residential Curbside	8,734 - 11,897	5.83 - 7.94
Drop-Off Center	982 - 1,281	0.66 - 0.86
20/20 Centers	64	0.04
Commercial Collection	11,315 - 14,250	7.55 - 9.51
Special Wastes	456 - 549	0.30 - 0.37
Inert Solids	8,805 - 17,611	5.88 - 11.76
SMaRT Station	14,977	10.00
Composting		
Curbside Collection	7,009 - 8,761	4.68 - 5.85
Landfill Drop-off	4,972 - 6,215	3.32 - 4.15
SOLID WASTE TRANSFORMED	<u>670</u>	<u>0.45</u>
Subtotal	58,585 - 76,877	39.12 - 51.33
SOLID WASTE DISPOSED	91,181 - 72,890	60.88 - 48.67
* A low and high amount is shown in order to indicate that new programs to be implemented have an estimated range of diversion amounts.		

Table 10-9

1998 Solid Waste Mass Balance

WASTE STREAM	TONS*	% OF WASTE STREAM*
SOLID WASTE GENERATED	151,264	100.00
SOLID WASTE DIVERTED		
Source Reduction	607	0.40
Recycling		
Residential Curbside	8,821 - 12,016	5.83 - 7.94
Drop-Off Center	992 - 1,294	0.66 - 0.86
20/20 Centers	65	0.04
Commercial Collection	11,428 - 14,392	7.55 - 9.51
Special Wastes	460 - 554	0.30 - 0.37
Inert Solids	8,893 - 17,787	5.88 - 11.76
SMaRT Station	15,126	10.00
Composting		
Curbside Collection	7,079 - 8,849	4.68 - 5.85
Landfill Drop-off	5,022 - 6,277	3.32 - 4.15
SOLID WASTE TRANSFORMED	<u>677</u>	<u>0.45</u>
Subtotal	59,171 - 77,646	39.12 - 51.33
SOLID WASTE DISPOSED	92,093 - 73,619	60.88 - 48.67
* A low and high amount is shown in order to indicate that new programs to be implemented have an estimated range of diversion amounts.		

Table 10-10

1999 Solid Waste Mass Balance

WASTE STREAM	TONS*	% OF WASTE STREAM*
SOLID WASTE GENERATED	152,777	100.00 100.00
SOLID WASTE DIVERTED		
Source Reduction	614	0.40
Recycling		
Residential Curbside	8,909 - 12,136	5.83 - 7.94
Drop-Off Center	1,001 - 1,307	0.66 - 0.86
20/20 Centers	66	0.04
Commercial Collection	11,542 - 14,536	7.55 - 9.51
Special Wastes	465 - 560	0.30 - 0.37
Inert Solids	8,982 - 17,965	5.88 - 11.76
SMaRT Station	15,278	10.00
Composting		
Curbside Collection	7,150 - 8,937	4.68 - 5.85
Landfill Drop-off	5,072 - 6,340	3.32 - 4.15
SOLID WASTE TRANSFORMED	684	0.45
Subtotal	59,763 - 78,422	39.12 - 51.33
SOLID WASTE DISPOSED	93,014 - 74,355	60.88 - 48.67
* A low and high amount is shown in order to indicate that new programs to be implemented have an estimated range of diversion amounts.		

Table 10-11

2000 Solid Waste Mass Balance

WASTE STREAM	TONS*	% OF WASTE STREAM*
SOLID WASTE GENERATED	154,305	100.00
SOLID WASTE DIVERTED		
Source Reduction	620	0.40
Recycling		
Residential Curbside	8,999 - 12,257	5.83 - 7.94
Drop-Off Center	1,011 - 1,320	0.66 - 0.86
20/20 Centers	66	0.04
Commercial Collection	11,657 - 14,682	7.55 - 9.51
Special Wastes	469 - 566	0.30 - 0.37
Inert Solids	9,072 - 18,144	5.88 - 11.76
SMaRT Station	15,430	10.00
Composting		
Curbside Collection	7,221 - 9,027	4.68 - 5.85
Landfill Drop-off	5,123 - 6,404	3.32 - 4.15
SOLID WASTE TRANSFORMED	690	0.45
Subtotal	60,360 - 79,206	39.12 - 51.33
SOLID WASTE DISPOSED	93,944 - 75,098	60.88 - 48.67
* A low and high amount is shown in order to indicate that new programs to be implemented have an estimated range of diversion amounts.		

Table 10-12
1991 Calendar of Implementation Tasks

Type of Diversion	Targeted Generator	Type of Program	Implementation Tasks	Date 1991	Entity Responsible	Funding Source
Recycling	Residential	Expand Multi-unit Dwelling Program	Develop and disseminate promotional materials	07/91	Palo Alto Public Works Department	Refuse Enterprise Fund
Recycling	Commercial/Industrial	Expand Existing Programs	Increase staffing to provide liaison and assistance to businesses	07/91	Palo Alto Public Works Department	Refuse Enterprise Fund
Recycling	Commercial/Industrial	Market Inert Solids	Locate markets	07/91	Palo Alto Public Works Department	Refuse Enterprise Fund
Special waste	Commercial/Industrial	White Goods Recovery	Train landfill workers for salvage operations	07/91	Palo Alto Public Works Department	Refuse Enterprise Fund
Composting	Residential	Increase Participation in Curbside Program	Increase dissemination of promotional materials Include information in new resident information program Develop and disseminate flyer at landfill	07/91	Palo Alto Public Works Department	Refuse Enterprise Fund
Composting	Commercial	Public Education	Develop and disseminate flyer promoting clean yard waste	07/91	Palo Alto Public Works Department	Refuse Enterprise Fund

Table 10-12
 1991 Calendar of Implementation Tasks
 (Continued)

Type of Diversion	Targeted Generator	Type of Program	Implementation Tasks	Date 1991	Entity Responsible	Funding Source
Composting	Commercial	Technical Assistance	Promote composting through waste audit and Chamber of Commerce newsletter	07/91	Palo Alto Public Works Department	Refuse Enterprise Fund
			Develop and disseminate sample landscaping contracts ensuring composting			
Composting	All		Determine product specifications	07/91	Palo Alto Public Works Department	Refuse Enterprise Fund
			Develop process and facility design			

Table 10-13
1992 Calendar of Implementation Tasks

Type of Diversion	Targeted Generator	Type of Program	Implementation Tasks	Date 1992	Entity Responsible	Funding Source
Source reduction	Residential	Technical Assistance	Publicize assistance services in newsletter Publicize composting and source reduction workshops Disseminate consumer shopping checklist	07/92	Palo Alto Public Works Department	Refuse Enterprise Fund
Source reduction	Residential	Public Education	Disseminate shopping tips Develop media program Purchase and disseminate promotional material Develop and print newsletter articles Publicize source reduction at local events	07/92	Palo Alto Public Works Department	Refuse Enterprise Fund
Source reduction	Residential	Public Information	Disseminate information publicizing education and assistance programs	07/92	Palo Alto Public Works Department	Refuse Enterprise Fund
Source reduction	Commercial/Industrial	Technical Assistance	Develop internship program Sponsor workshops using speakers bureau	07/92	Palo Alto Public Works Department	Refuse Enterprise Fund
Source reduction	Commercial/Industrial	Promotional Activities	Provide promotional materials for employees	10/92	Palo Alto Public Works Department	Refuse Enterprise Fund

Table 10-13
1992 Calendar of Implementation Tasks
(Continued)

Type of Diversion	Targeted Generator	Type of Program	Implementation Tasks	Date 1992	Entity Responsible	Funding Source
Source reduction	Commercial/Industrial	Public Education	Disseminate promotional materials to all businesses Coordinate above efforts with Chamber of Commerce	10/92	Palo Alto Public Works Department	Refuse Enterprise Fund
Source reduction	Commercial/Industrial	Technical Assistance	Develop volunteer speakers bureau Provide assistance with on-site composting Publicize technical assistance program	12/92	Palo Alto Public Works Department	Refuse Enterprise Fund
Source reduction	Other	Local Procurement Ordinance	Develop and adopt local ordinance	07/92	Palo Alto Public Works Department	Refuse Enterprise Fund
Compost	All	Compost Process System	Obtain funding	01/92	Palo Alto Public Works Department	Refuse Enterprise Fund
			Perform facility site improvements Purchase and install processing equipment	04/92 10/92		

Table 10-14
1993 Calendar of Implementation Tasks

Type of Diversion	Targeted Generator	Type of Program	Implementation Tasks	Date 1993	Entity Responsible	Funding Source
Source reduction	Residential	Public Information	Establish new resident information program	01/93	Palo Alto Public Works Department	Refuse Enterprise Fund
Source reduction	Residential	Public Education	Conduct workshops Coordinate pledge drive Sponsor contests	07/93	Palo Alto Public Works Department	Refuse Enterprise Fund
Source reduction	Commercial/Industrial	Public Education	Develop and present brown bag seminars	07/93	Palo Alto Public Works Department	Refuse Enterprise Fund
Recycling	All	Material Recovery System (SMaRT)	SMaRT on-line	07/93	Palo Alto Public Works Department	Refuse Enterprise Fund
Compost	All	Compost Process System	Start up system Perform lab analysis Test market compost products	01/93 04/93 04/93	Palo Alto Public Works Department	Refuse Enterprise Fund

Table 10-15
1994 Calendar of Implementation Tasks

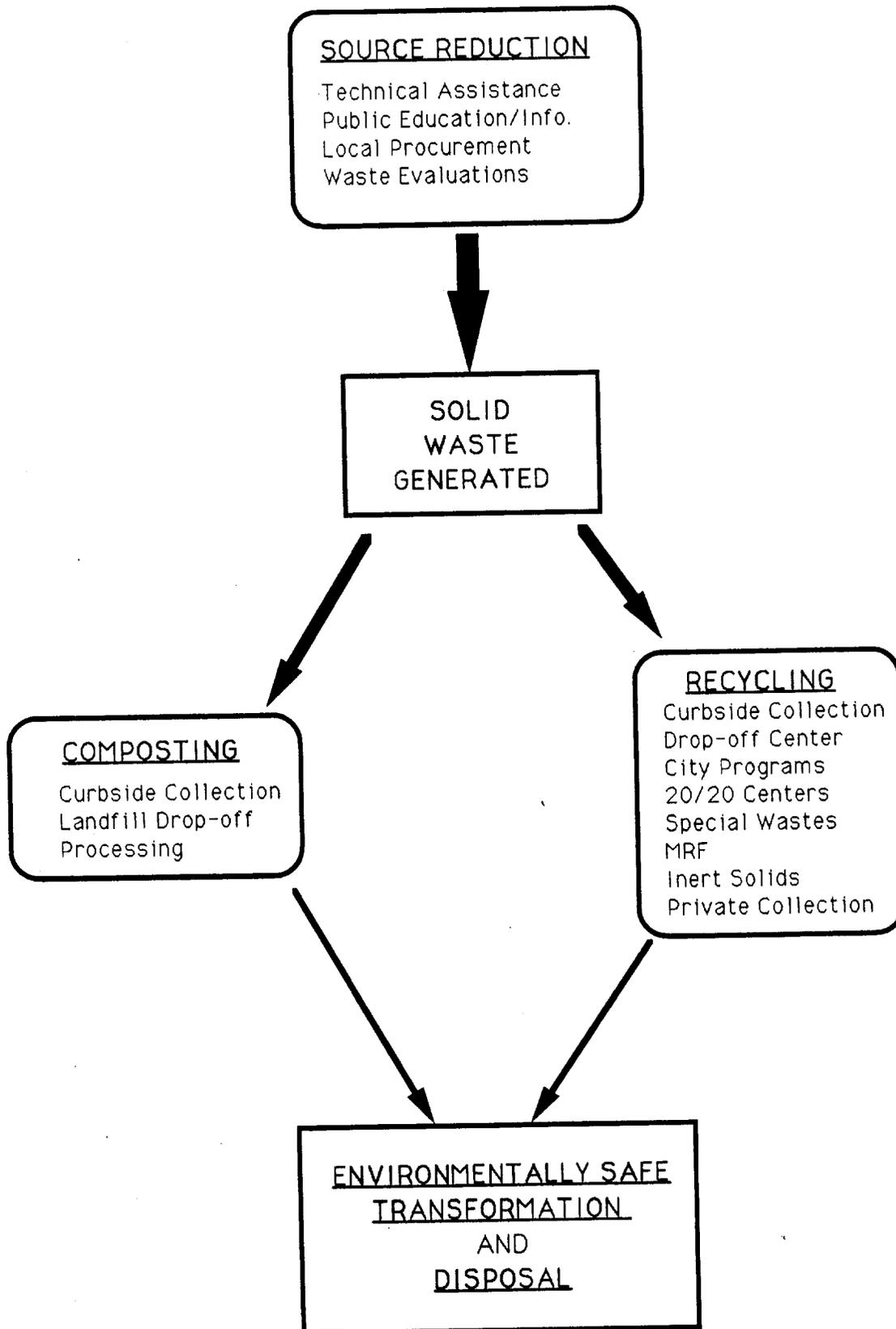
Type of Diversion	Targeted Generator	Type of Program	Implementation Tasks	Date 1994	Entity Responsible	Funding Source
Source reduction	Residential	Public Education	Coordinate school activities: Ensure source reduction is included in curriculum Conduct poster contest Provide promotional material K-12	07/94	Palo Alto Public Works Department	Refuse Enterprise Fund
Source reduction	Commercial/Industrial	Promotional Activities	Establish source reduction award	12/94	Palo Alto Public Works Department	Refuse Enterprise Fund
Recycling	All	Expand Drop-Off Facility	Expand to include mixed paper	01/94	Palo Alto Public Works Department	Refuse Enterprise Fund
Recycling	Residential	Expand Curb-side Program	Expand to include mixed paper	01/94	Palo Alto Public Works Department	Refuse Enterprise Fund
Compost	All	Compost Process System	Produce and market finished products	01/94	Palo Alto Public Works Department	Refuse Enterprise Fund

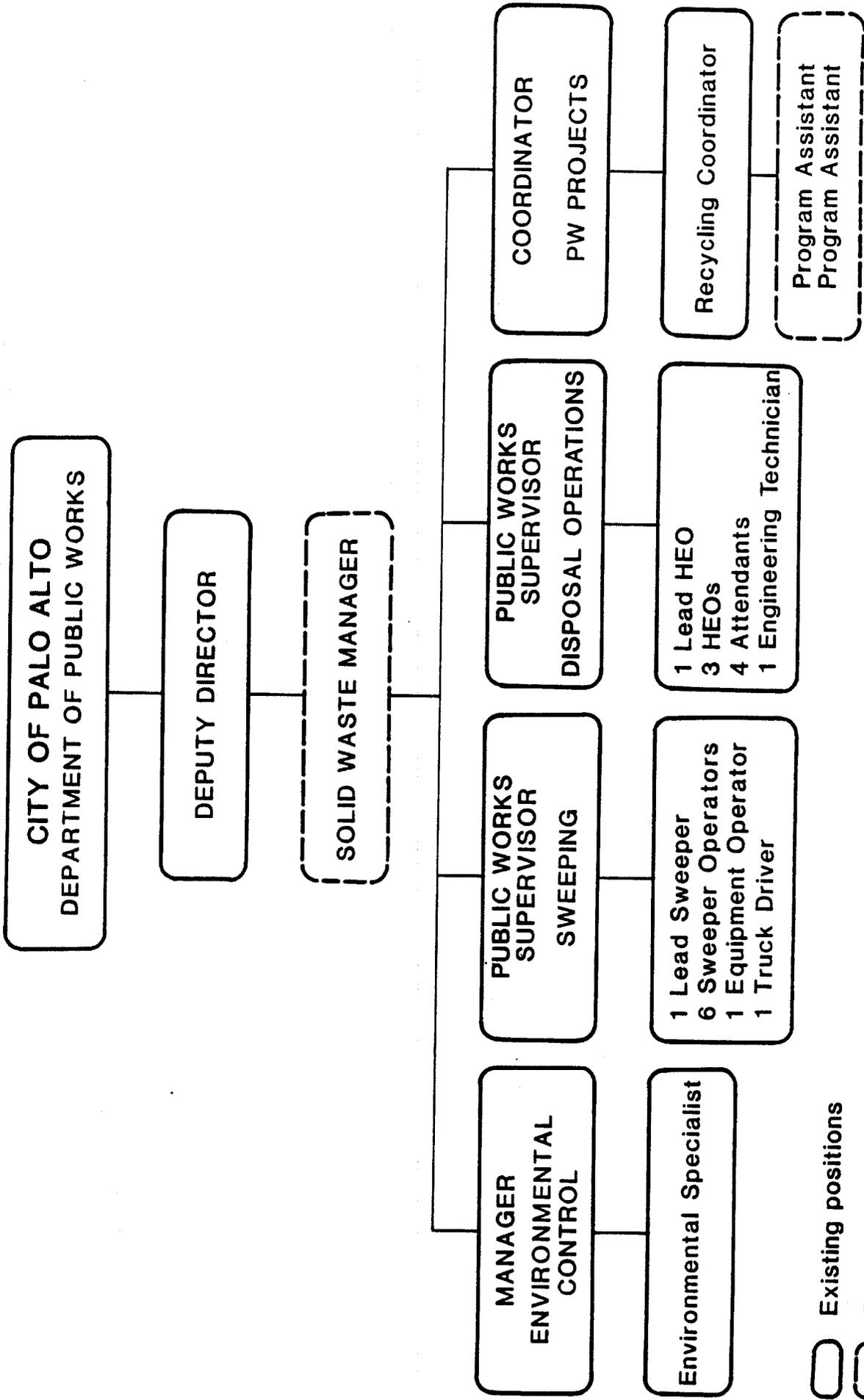
Table 10-16
1995 Calendar of Implementation Tasks

Type of Diversion	Targeted Generator	Type of Program	Implementation Tasks	Date 1995	Entity Responsible	Funding Source
			No new programs or activities to be implemented in 1995.			

Figure 10-1

INTEGRATED SOLID WASTE MANAGEMENT





 Existing positions
 Proposed positions

Figure 10-2

PROPOSED ORGANIZATIONAL STRUCTURE

ACRONYMS

AB	Assembly Bill
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFC	chlorofluorocarbons
CIP	Capital Improvement Project
CIWMB	California Integrated Waste Management Board (formerly the California Waste Management Board)
CoSWMP	County Solid Waste Management Plan
DOC	California Department of Conservation
EIR	environmental impact report
EPA	U.S. Environmental Protection Agency
EPS	expanded polystyrene foam
HDPE	high density polyethylene
HHW	household hazardous waste
HHWF	household hazardous waste facility
IWMP	Integrated Waste Management Plan
LDPE	low density polyethylene
LEA	local enforcement agency
MRF	material recovery facility
MSW	municipal solid waste
NRC	National Recycling Coalition

OCC	old corrugated containers
ONP	old newspaper
PCB	polychlorinated biphenyls
PET	polyethylene terephthalate plastic
SB	Senate Bill
SQG	small quantity generator
SRRE	Source Reduction and Recycling Element

GLOSSARY OF TERMS*

Ash - The residue from the combustion of any solid or liquid material.

Bottle Bill² - A law requiring deposits on beverage containers.

Broker² - An individual or group of individuals that act as an agent or intermediary between the sellers and buyers of recyclable materials.

Buy-Back Recycling Center - A facility which pays a fee for the delivery and transfer of ownership to the facility of source separated materials, for the purpose of recycling or composting.

Capital Costs - Those direct costs incurred in order to acquire real property assets, such as land, buildings and building additions; site improvements; machinery; and equipment.

Commercial Solid Wastes - Solid waste originating from stores, business offices, commercial warehouses, hospitals, educational, health care, military, and correctional institutions, non-profit research organizations, and government offices. Commercial solid wastes do not include construction and demolition waste.

Commercial Unit - A site zoned for a commercial business and which generates commercial solid wastes.

Commingled Recyclables² - A mixture of several recyclable materials in one container.

Composition - A set of identified solid waste materials, categorized into waste categories and waste types pursuant to 14CCR 18722.

Compost² - The relatively stable decomposed organic material resulting from the composting process; is also referred to as humus.

* Footnotes citing the source of the definitions are presented at the end of the glossary.

Composting - A method of waste treatment which produces a product meeting the definition of "compost" in Public Resources Code section 40116.

Composting Facility - A permitted solid waste facility at which composting is conducted and which produces a product meeting the definition of "compost" in Public Resources Code section 40116.

Construction and Demolition Waste - Solid wastes such as building materials and packaging and rubble resulting from construction, remodeling, repair and demolition operations on pavements, houses, commercial buildings, and other structures. Construction refers to SIC Codes 152 through 1794, 1796, and 1799. Demolition refers to SIC Code 1795.

Cost-Effective - A measurement of cost compared to an unvalued output (e.g., the cost per ton of solid waste collected) such that the lower the cost, the more cost-effective the action.

Cullet² - Clean, generally color-sorted, crushed glass used to make new glass products.

Curbside Recycling Collection³ - The separation of residential wastes into categories at its point of origin or commingled recyclable materials for the purpose of recycling pickup at the street curb.

Disposal - "The management of solid waste through landfilling or transformation at permitted solid waste facilities.

Disposal Capacity - The capacity (expressed in either weight in tons or its volumetric equivalent in cubic yards) which is (1) either currently available at a permitted solid waste landfill, or (2) will be needed for the disposal of solid waste generated within the jurisdiction over a specified period of time.

Disposal Site³ - General term used for a transfer station or landfill where waste is disposed.

Diversion Alternative - Any activity existing (or occurring in the future) which has been, is, or will be implemented by a jurisdiction and could result in or promote the diversion of solid waste through source reduction, recycling or composting.

Diversion Rate² - A measure of the amount of waste material being diverted for recycling compared with the total amount that was previously thrown away.

Drop-Off Recycling Center - A facility that accepts delivery or transfer of ownership of source separated materials for the purpose of recycling or composting, without paying a fee. Donation of materials to collection organizations, such as charitable groups, is included in this definition.

End Market or End Use - The use or uses of a diverted material or product which has been returned to the economic mainstream, whether or not this return is through sale of the material or product. The material or product can have a value which is less than the solid waste disposal cost.

Feasible - A specified program, method, or other activity can, on the basis of cost, technical requirements and time frame for accomplishment, be undertaken to achieve the objectives and tasks identified by a jurisdiction in a Countywide Integrated Waste Management Plan.

Generator⁴ - Any person, as defined by section 40170 of the Public Resource Code, whose act or process produces solid waste as defined in Public Resources Code section 40191, or whose act first causes solid waste to become subject to regulation.

Hazard - Having one or more of the characteristics that cause a substance or combination of substances to qualify as a hazardous material, as defined by section 66084 of Title 22 of the California Code of Regulations.

Industrial Solid Waste - Solid waste originating from mechanized manufacturing facilities, factories, refineries, construction and demolition projects, and publicly operated treatment works, and/or solid wastes placed in debris boxes.

Landfill³ - A disposal site employing an engineered method of disposing solid wastes on land in a manner that minimizes environmental hazards by spreading solid wastes in layers, compacting the waste to the smallest practical volume and applying cover materials at the end of each operating day.

Manual Separation⁴ - The separation of wastes by hand. Sometimes called hand-picking or hand sorting, manual separation is done in the home or office by keeping food wastes separate from newspaper, or in a recovery plant by picking out large cardboard or metal objects.

Market Development - A method of increasing the demand for recovered materials so that end markets for the materials are established, improved or stabilized and thereby become more reliable.

Market Development Zones² - Areas in a community primed for the establishment of new businesses that will manufacture products made from recycled materials, i.e., an economic development zone formed specifically for manufacturing activities related to recycled products.

Materials Recovery Facility - A permitted solid waste facility where solid wastes or recyclable materials are sorted or separated, by hand or by use of machinery, for the purposes of recycling or composting.

Medium-Term Planning Period - A period beginning in the year 1996 and ending in the year 2000.

Municipal Solid Waste or MSW - All solid wastes generated by residential, commercial, and industrial sources, and all solid waste generated at construction and demolition sites, at food-processing facilities, and at treatment works for water and waste water, which are collected and transported under the authorization of a jurisdiction or are self-hauled.

Non-Recyclable Paper - Discarded paper which has no market value because of its physical or chemical or biological characteristics or properties.

Non-Renewable Resource - A resource which cannot be replenished, such as those resources derived from fossil fuels.

Normally Disposed Of - Those waste categories and waste types which: (1) have been demonstrated by the Solid Waste Generation Study, conducted pursuant to CCR, Title 14, Section 18722, to be in a solid waste stream attributed to the jurisdiction as of January 1, 1990; (2) which are deposited at permitted solid waste landfills or transformation facilities subsequent to any recycling or composting activities at those solid waste facilities; and (3) which are allowed to be considered in the establishment of the base amount of solid waste from which source reduction, recycling, and composting levels shall be calculated, pursuant to the limitations listed in Public Resources Code section 41781(b).

Permitted Capacity - That volume in cubic yards or weight in tons which a solid waste facility is allowed to receive, on a periodic basis, under the terms and conditions of that solid waste facility's current Solid Waste

Facilities Permit issued by the local enforcement agency and concurred in by the California Integrated Waste Management Board.

Permitted Landfill - A solid waste landfill for which there exists a current Solid Waste Facilities Permit issued by the local enforcement agency and concurred in by the California Integrated Waste Management Board.

Purchase Preference - A preference provided to a wholesale or retail commodity dealer which is based upon the percentage amount that the costs of products made from recycled materials may exceed that of similar non-recycled products and still be deemed the lowest bid.

Rate Structure - That set of prices established by a jurisdiction, special district (as defined in Government Code section 56036), or other rate setting authority to compensate the jurisdiction, special district or rate setting authority for the partial or full costs of the collection, processing, recycling, composting, and/or transformation or landfill disposal of solid wastes.

Re-Use - The use, in the same form as it was produced, of a material which might otherwise be discarded.

Recovered Materials - Material which has been retrieved or diverted from disposal or transformation for the purpose of recycling, re-use or composting. "Recovered material" does not include those materials generated from and reused on site for manufacturing purposes.

Recyclables² - Materials that still have useful physical or chemical properties after serving their original purpose and that can, therefore, be reused or remanufactured into additional products.

Recycling² - A series of activities by which materials that would become or otherwise remain waste are diverted from the solid waste stream for collection, separation, and processing and are used as raw materials or feedstocks in lieu of, or in addition to, virgin materials in the manufacture of goods sold or distributed in commerce, or the reuse of such materials as substitutes for goods made from virgin materials.

Repairability - The ability of a product or package to be restored to a working or usable state at a cost which is less than the replacement cost of the product or package.

Residential solid waste - Solid waste originating from single-family or multiple family dwellings.

Reusability - The ability of a product or package to be used more than once in its same form.

Roll-off Container² - A large waste container that fits onto a tractor trailer that can be dropped off and picked up hydraulically.

Salvage - The controlled removal of solid waste materials at a permitted solid waste facility for recycling re-use, composting, or transformation.

Sanitary Landfill² - Land waste disposal site that is located to minimize water pollution from runoff and leaching. Waste is spread in thin layers, compacted, and covered with a fresh layer of soil each day to minimize pest, aesthetic, disease, air pollution, and water pollution problems.

Scavenger² - One who illegally removes materials at any point in the solid waste management system.

Scrap² - Discarded or rejected industrial waste material often suitable for recycling.

Seasonal - Those periods of time during the calendar year which are identifiable by distinct cyclical patterns of local climate, demography, trade or commerce.

Short-Term Planning Period - A period beginning in the year 1991 and ending in the year 1995.

SIC Code - The standards published in the U.S. Standard Industrial Classification Manual (1987).

Source Reduction³ - The design, manufacture, acquisition, and reuse of materials so as to minimize the quantity and/or toxicity of waste produced. Source reduction prevents waste either by redesigning products or by otherwise changing societal patterns of consumption, use, and waste generation.

Source Separated - The segregation, by the generator, of materials designated for separated collection for some form of materials recovery or special handling.

Statistically Representative - Representative and random samples of units that are taken from a population sample pursuant to the procedures given in Appendix 1 of Article 6.1 of *Planning Guidelines and Procedures for Preparing and Revising Countywide Integrated Waste Management Plans*. For the purposes of this definition, population sample includes, but

is not limited to, a sample from a population of solid waste generation sites, solid waste facilities and recycling facilities, or a population of items of materials and solid wastes in a refuse vehicle load of solid waste.

Tipping Fee² - A fee, usually dollars per ton, for the unloading or dumping of waste at a landfill, transfer station, recycling center, or waste-to-energy facility, usually stated in dollars per ton; also called a disposal or service fee.

Ton - A unit of weight in the U.S. Customary System of Measurement, an avoirdupois unit equal to 2,000 pounds. Also called short ton or net ton.

Transfer Station² - A permanent facility where waste materials are taken from smaller collection vehicles and placed in larger vehicles for transport, including truck trailers, railroad cars, or barges. Recycling and some processing may also take place at transfer station.

Transformation Facility - A facility whose principal function is to convert, combust, or otherwise process solid waste by incineration, pyrolysis, destructive distillation, or gasification, or to chemically or biologically process solid wastes, for the purpose of volume reduction, synthetic fuel production, or energy recovery.

Volume - A three dimensional measurement of the capacity of a region of space or a container. Volume is commonly expressed in terms of cubic yards or cubic meters. Volume is not expressed in terms of mass or weight.

Waste⁴ - Material which is discarded by the generator as no longer useful to the generator.

Waste Categories - The grouping of solid wastes with similar properties into major solid waste classes, such as grouping together office, corrugated and newspaper as a paper waste category, as identified by the solid waste classification system contained in 14CCR 18722, except where a component-specific requirement provides an alternative means of classification.

Waste Diversion - Diversion of solid waste, in accordance with all applicable federal, state and local requirements, from disposal at solid waste landfills or transformation facilities through source reduction, recycling or composting.

Waste Stream² - A term describing the total flow of solid waste from homes, businesses, institutions and manufacturing plants that must be recycled, burned, or disposed of in landfills; or any segment thereof, such as the "residential waste stream" or the "recyclable waste stream."

Waste Type - Identified wastes having the features of a group or class of wastes which are distinguishable from any other waste type, as identified by the waste classification system contained in 14CCR, section 18722 of Article 6.1, alternative means of classification.

References

1. Unless otherwise noted, all definitions are from Section 18720, Article 3, Chapter 9, Title 14 of the California Code of Regulations.
2. As defined in the *Decision-Maker's Guide to Solid Waste Management*, U.S. Environmental Protection Agency, November 1989.
3. *Integrated Waste Reduction and Recycling Plan for the City of Lodi*, February 1991, California Waste Removal Systems.
4. *Implementing AB 939 - A Manual for Preparing Source Reduction and Recycling Elements*. Prepared for Solid Waste Management Department, Sanitation Districts of Los Angeles County, January 1991.

EVALUATION APPROACH

Evaluation Criteria

The *Planning Guidelines and Procedures for Preparing and Revising Countywide Integrated Waste Management Plans, Section 18733.3, Chapter 9, Division 7, Title 14, California Code of Regulations*, requires certain criteria to be used in evaluating alternative programs for source reduction, recycling, composting, and special wastes. All criteria have been assigned a scale of high, medium, and low, with high being positive.

The following criteria, required by the Planning Guidelines, and reworded so that all are viewed in the positive, are used for evaluating alternative programs for source reduction, recycling, composting, and special wastes.

1. Waste Diversion Potential

Waste Diversion Potential is the estimated percentage of the total waste stream by weight that the alternative reduces or diverts waste, as allowable under AB 939, from disposal. This is a measure of the alternative's diversion effectiveness.

Low: 0 - 3 percent

Medium: 3 - 7 percent

High: >7 percent

2. Absence of Hazard

Absence of Hazard reflects the extent to which hazards could impact the alternative. Hazards could include health risks, injury, fire, or others identified for the alternative.

Low: Potential hazards are not completely understood, or the alternative increases the potential hazards.

Medium: Potential hazards are known and controllable. Some impacts remain.

High: There are few or no potential hazards or unmitigated impacts.

3. Flexibility

Flexibility measures the alternative's ability to accommodate changing economic, technological, and social conditions.

Low: The alternative has a limited ability to respond to changing conditions. Limitations may include inflexible or unpredictable markets for diverted materials, operational limitations, or others identified for the alternative.

Medium: The alternative is anticipated to demonstrate a moderate ability to respond to changing conditions. Significant changes in the program may be required.

High: The alternative is anticipated to be readily adaptable in meeting changing conditions. No significant changes in the program are necessary.

4. Limited Shift in Waste Type Generation

Limited Shift in Waste Type Generation measures the alternative's ability to limit the consequences of diversion on the characterized waste, such as shifting solid waste generation from one type of solid waste to another.

Low: The alternative would significantly shift solid waste production to the generation of non-recyclable, unmarketable, or uncountable (under AB 939) materials.

Medium: The alternative would result in the creation of little non-recyclable, unmarketable, or uncountable (under AB 939) wastes.

High: The alternative would result in the creation of no non-recyclable, unmarketable, or uncountable

(under AB 939) wastes, or may shift waste production to the generation of recyclable or compostable wastes or new markets.

5. Ease of Implementation

Ease of Implementation measures the extent to which the alternative can be relatively quickly implemented, i.e. whether it can be implemented in the short-term or medium-term planning periods.

- Low: Implementation of the alternative could not be completed until after 2000.
- Medium: Implementation of the alternative is anticipated to be completed by 2000.
- High: Implementation of the alternative is anticipated to be completed by 1995.

6. Facility Needs

Facility Needs measures the need for expanding existing facilities or building new facilities to support the implementation of the alternative.

- Low: New facilities must be developed to accommodate implementation of the alternative.
- Medium: Existing facilities must be expanded or altered to accommodate implementation of the alternative.
- High: The alternative can be easily integrated into existing facilities.

7. Consistency with Local Policies

Consistency with Local Policies measures the alternative's compatibility with existing local plans, policies, and ordinances.

- Low: The alternative would require major changes to existing local plans, policies, or ordinances for implementation.
- Medium: The alternative would require minor changes to existing local plans, policies, or ordinances for implementation.

High: There are no existing local plans, policies, or ordinances that would impede the implementation of the alternative.

8. Absence of Institutional Barriers

Absence of Institutional Barriers evaluates the extent to which institutional barriers, such as long-term franchise agreements or other contracts, may impact the implementation of the alternative.

Low: The alternative is impacted by existing institutional barriers which are not under the control of the jurisdiction.

Medium: The alternative is impacted by existing institutional barriers over which the jurisdiction maintains some control.

High: There are no existing institutional barriers to the alternative.

9. Estimated Cost

Estimated Cost is the estimated cost of the alternative, including capital costs and operating costs over the lifetime of the alternative. This may also be presented by a range of costs.

Low: > \$200,000

Medium: \$50,000-200,000

High: \$0-50,000

10. End Uses

End Uses measures the short-term marketability of the diverted materials.

Low: End uses are currently non-existent or unreliable, though the potential for the development of long-term or medium-term markets may exist.

Medium: End uses exist, but are subject to moderate fluctuations. The potential for the development of short-term markets may exist.

High: Existing end uses are relatively stable.

Ranking System

A numerical system has been developed for the evaluation criteria with points assigned as follows:

- high 3 points
- medium 2 points
- low 1 point

In addition, all criteria include a fatal flaw consideration. A fatal flaw is indicated by a zero. Any alternative with a fatal flaw is eliminated from consideration and does not receive a total point score. The fatal flaw designation was developed to prevent the possibility of an infeasible alternative from being selected due to its overall point score.

The total points are summed for each alternative and the results analyzed. Working with City staff, the alternatives are selected for implementation based on the ranking system results and professional judgement.

Appendix B

WASTE MATERIAL CATEGORIES: DEFINITIONS

PAPER

Corrugated Containers - Old Corrugated Cardboard (OCC) and Kraft Paper - Kraft linerboard and containerboard cartons and shipping boxes with corrugated paper medium (unwaxed). Kraft paper bags are also included.

Magazines - Includes magazines and catalogs made exclusively with glossy, coated paper. Magazines and catalogs with groundwood paper were excluded.

Mixed Paper - Low grade recyclable paper. Includes paperboard, books, catalogs made of ground wood paper, colored ledger, construction paper, and glossy, coated paper (except magazines and catalogs). Higher grade papers were included if they were colored, or if they contained gummed labels or plastic elements.

Newsprint - Printed and unprinted ground wood newsprint; referred to as No. 1 news. This category also included some glossy paper typically used in advertisements, unless found separately.

High-Grade - Printing, writing, and computer papers. Includes white ledger, computer printouts, computer tab cards, 3 x 5 index cards, bond, copy machine paper, and envelopes (without windows or gummed labels).

Other Paper - Low-grade contaminated paper. Includes tissue paper, napkins, paper towels, paper plates, paper food cartons, milk cartons, waxed paper, and carbon paper.

PLASTICS

High Density Polyethylene (HDPE) Containers - Includes translucent and opaque HDPE bottles for drinking water, dairy products, bleach, liquid

detergents, motor oil, shampoo, and several other household and automotive products.

Polyethylene teraphthalate (PET) Containers - PET beverage and food containers, PET cups, and any other PET containers.

Film Plastics - Plastic wrapping materials, plastic bags, and flexible film and sheet plastic.

Polystyrene Foam Packaging - Expanded polystyrene foam used as a packing or packaging material. Does not include polystyrene foam used in durable goods.

Other Plastics - Includes thermosets and thermoplastics not classified above, such as plastic pipe, electrical components, automotive components, toys, and foamed plastics other than polystyrene foam packaging (such as polyurethane foam).

GLASS

Refillable Beverage Containers - Refillable glass beverage containers, returnable soda pop bottles, beer bottles.

CA Redemption Value - Bottles redeemable under California's bottle bill AB 2020.

Other Recyclable Glass - Includes recyclable glass, such as wine and liquor bottles, food jars, and other bottles.

Other Non-Recyclable Glass - Flat, pressed, and blown glass products, such as light bulbs, mirrors, decorative items and fixtures, windows, safety glass, and cooking ware.

METALS

Aluminum Cans - All aluminum beverage containers.

Other Aluminum - All aluminum materials that do not appear to be alloyed with other metals, including foil, furniture, house siding, cooking ware, and industrial scrap.

BI-metal Cans - Beverage containers fabricated with a bottom and sidewall made of steel and an aluminum top.

Steel Food and Beverage Cans - All coated and tin-free ferrous food and beverage cans.

Other Ferrous - Ferrous and alloyed ferrous scrap metals from any source except intact appliances and white goods.

Other Non-ferrous - Metals derived from materials other than iron, except aluminum, such as copper, brass, bronze, lead, zinc, and other metals to which a magnet will not adhere. Stainless steel was included from this category.

White Goods - Discarded, enamel-coated major appliances, such as washing machines, clothes dryers, hot water heaters, stoves and refrigerators.

YARD WASTE

Naturally occurring vegetative and woody material from garden, park, and lawn maintenance.

Leaves and Grass - Includes lawn clippings and leaves that are not attached to branches.

Branches and Brush - Includes trimmings from trees, bushes, shrubs and other plants.

OTHER ORGANICS

Food Waste (Putrescibles) - Material capable of being decomposed by microorganisms with sufficient rapidity as to cause nuisances from odors and gases. Kitchen wastes, dead animals, and food from containers are examples.

Tires/Rubber - Tires from vehicles, tire tubes, and rubber from other products, such as hoses and gloves.

Wood - Wood and dimensional lumber construction materials from new construction, remodeling, or demolition, including plywood, particleboard, masonite and chipboard. Also includes wood from furniture, tools, and other durable products.

Agricultural Crop Residues - Organic debris from agricultural operations, including cull fruit, cotton gin trash, straw, almond and other nut shells, and fruit pits.

Manure - Manure with or without spilled animal feed and animal bedding.

Textiles and Leathers - Fabric materials that include natural and man-made textile materials made from cottons, wools, silks, nylon, rayon, polyesters, and other materials. This category includes clothing, rags, curtains, carpets, and other fabric materials. Leather and leather goods are also included, such as shoes, belts, and wallets.

Diapers - Disposable diapers.

Other Organics - Organic materials not otherwise categorized, includes natural fibers, and non-sortable organic fines.

OTHER WASTES

Inert Solids - Includes inorganic materials not classified above, such as soil, rocks, dirt, concrete, ceramics, and gypsum wallboard.

Household Hazardous Wastes (HHW) - Wastes resulting from products purchased by the general public for household use which, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may pose a hazard to human health. Examples include paints, solvents, flammable liquids, pesticides and herbicides, batteries, acids and bases. Includes containers in which the materials are packaged.

Appliances - Typically household products fabricated from metals and plastics and not easily separable into individual materials. Examples include hair dryers, radios, and telephones.

SPECIAL WASTE

Any hazardous waste listed in section 66740 of Title 22 of the California Code of Regulations, or any waste which has been classified as a special waste pursuant to section 66744 of Title 22 of the California Code of Regulations, or which has been granted a variance for the purpose of storage, transportation, treatment, or disposal by the Department of Health Services pursuant to section 66310 of Title 22 of the California Code of Regulations. Typical examples exclude sewage sludge, ash, and asbestos.

Ash - The residue from the combustion of any solid or liquid material.

Sludge - Residual solids and semisolids resulting from the treatment of water, wastewater, and/or other liquids. Sludge includes sewage sludge

and sludge derived from industrial processes, but does not include effluent discharged from such treatment processes.

Asbestos - Fibrous forms of various hydrated minerals, including chrysotile (fibrous serpentine), crocidolite (fibrous reibeckite), amosite (fibrous cummingtonite-grunerite), fibrous tremolite, fibrous actinolite, and fibrous anthophyllite.

Auto Shredder Waste - The [non-RCRA] hazardous waste generated from the shredding of metallic materials including, but not limited to, automobiles and appliances.

Auto Bodies - Includes whole automobile bodies or body parts therefrom including hoods, fenders, and doors.

Stuffed Furniture and Mattresses - Upholstered chairs and couches, mattresses and box springs.



CITY OF PALO ALTO RECYCLING SURVEY

to
Recycling Collectors and Brokers
operating within or receiving materials from within
the City of Palo Alto

The information in this survey is to be used to prepare a report to comply with the California Code of Regulations, Chapter 9, Title 14, and will be kept confidential.

COMPANY NAME: _____

ADDRESS: _____

TELEPHONE: _____

CONTACT PERSON: _____ TITLE: _____

TYPE OF BUSINESS: (Please check all that apply.)

- | | |
|--|---|
| <input type="checkbox"/> Collector/Hauler | <input type="checkbox"/> Broker |
| <input type="checkbox"/> Dealer/Packer | <input type="checkbox"/> End market/Manufacturer |
| <input type="checkbox"/> Convenience Zone Redemption Center | <input type="checkbox"/> Scrap Metal Dealer |
| <input type="checkbox"/> Buy-Back Center | <input type="checkbox"/> Auto Wrecker |
| <input type="checkbox"/> Donation Center | <input type="checkbox"/> Asphalt/Concrete Recycler |
| <input type="checkbox"/> Non-profit Organization | <input type="checkbox"/> Demolition Debris Recycler |
| <input type="checkbox"/> Commercial Composter | <input type="checkbox"/> Wood Waste Chipper |
| <input type="checkbox"/> News Bin Operator | <input type="checkbox"/> Confidential Paper Service |
| <input type="checkbox"/> Other Commercial Recycler (Specify) _____ | |
| <input type="checkbox"/> Special Waste Recycler (See listing below; specify) _____ | |

When completed, please return this survey in the enclosed postpaid envelope to:
Katherine Dever, EMCON Associates, 1921 Ringwood Avenue, San Jose, California 95131.
If you have questions regarding this survey, call Ms. Dever at 408/453-7300.

1. On the following page, please include the **TOTAL TONS** of **MATERIAL COLLECTED, BY TYPE**, for a recent twelve month period from an aggregate of accounts **WITHIN THE CITY OF PALO ALTO jurisdiction ONLY, NOT** from other sources.

Twelve month period used is from _____ to _____.

Materials Collected

Total Tons Received

PAPER

- Corrugated cardboard
- Mixed paper
- Newspaper
- High grade ledger
- Other paper (specify)

PLASTICS

- HDPE containers
- PET containers
- Film plastics
- Laser toner cartridges
- Other plastics

GLASS

- Refillable glass beverage containers
- CA Redemption Value glass
- Other recyclable glass

METALS

- Aluminum cans
- Bi-metal containers
- Ferrous metals and tin cans
- Non-ferrous metals plus aluminum scrap
- White goods (appliances, etc.)

YARD WASTE

- including leaves, grass and prunings

OTHER ORGANICS

- Food waste
- Tires and rubber products
- Wood waste, incl. pallets
- Agricultural crop residues
- Manure
- Textiles and leather

INERT SOLIDS

- Rock
- Concrete
- Brick
- Sand
- Soil
- Fines

SPECIAL WASTES

- Ash
- Industrial sludge
- Asbestos
- Auto shredder waste
- Auto bodies
- Other wastes
 - batteries
 - oil
 - other (specify)

2. Amount of residue: _____ % of total amount collected which is not recyclable and is discarded.
- 3a. Anticipated increase in recycling tonnage for 1991: _____ % or
- 3b. Anticipated decrease in recycling tonnage for 1991: _____ %
4. Source of the material: (Please indicate % if more than one source.)
 Residents _____ Government _____ Commercial Businesses _____ Industry _____

Figure 4: Sample Weight to Volume Conversion Factors for Recyclables

<u>Material</u>	<u>Volume</u>	<u>Weight in Pounds</u>
Newsprint, Loose	one cubic yard	360 - 800
Newsprint, compacted	one cubic yard	720 - 1,000
Newsprint	12" stack	35
Corrugated cardboard, loose	one cubic yard	300
Corrugated cardboard, baled	one cubic yard	1000 - 1200
Glass, whole bottles	one cubic yard	600 - 1,000
Glass, semi crushed	one cubic yard	1,000 - 1,800
Glass, crushed (mechanically)	one cubic yard	800 - 2700
Glass, whole bottles	one full grocery bag	16
Glass, uncrushed to manually broken	55 Gallon Drum	125 - 500
PET soda bottles, whole, loose	one cubic yard	30 - 40
PET soda bottles, whole, loose	gaylord	40 - 53
PET soda bottles, baled	30" x 48" x 60"	500
PET soda bottles, granulated	gaylord*	700 - 750
PET soda bottles, granulated	semi-load	30,000
Film, baled	30" x 42" x 48"	1,100
Film, baled	semi-load	44,000
HPDE (dairy only), whole, loose	one cubic yard	24
HPDE (dairy only), baled	30" x 48 x 60"	500-800
HPDE (mixed), baled	30" x 48 x 60"	600-900
HPDE (mixed), granulated	gaylord	800 - 1,000
HPDE (mixed), granulated	semi-load	42,000
Mixed PET & Dairy, whole, loose	one cubic yard	average 32
Mixed PET, Dairy and other rigid, whole, loose	one cubic yard	average 38
Mixed rigid, no film or Dairy, whole loose	one cubic yard	average 49
Mixed rigid, no film, granulated	gaylord	500 - 1,000
Mixed rigid & film, densified by mixed plastic mold technology	one cubic foot	average 60
Aluminum cans, whole	one cubic yard	50 - 74
Aluminum cans, whole	1 one full kraft paper grocery bag	average 1.5
Aluminum cans	one 55 gal plastic bag	13 - 20

* Gaylord size most commonly used 40" x 48" x 36"

Figure 4: Sample Weight to Volume Conversion Factors for Recyclables

<u>Material</u>	<u>Volume</u>	<u>Weight in Pounds</u>
Ferrous cans, whole	one cubic yard	150
Ferrous cans, flattened	one cubic yard	850
Leaves, uncompacted ⁸	one cubic yard	250 - 500
Leaves, compacted	one cubic yard	320 - 450
Leaves, vacuumed	one cubic yard	350
Wood chips	one cubic yard	500
Grass clippings	one cubic yard	400 - 1500
Used Motor Oil	one gallon	7
Tire - Passenger Car	one	12
Tire - Truck	one	60
Food Waste, solid and liquid fats	55 gallon drum	412

VI. Conclusion

"Standard" is defined as "something considered by an authority or by general consent as a basis of comparison; an approved model; a rule or a principle that is used as a basis for judgement"⁹

While we believe that the recommendations presented here represent the best possible way of reporting and using data, we realize that complete agreement on every individual point isn't necessary for this work to serve as a "standard." Even where there may be disagreement about the application of a particular term or formula, the difference is made clearer by having a standard against which to contrast the alternative. The NRC offers these definitions, reporting guidelines, and calculation methods in that sense of the term: to serve as a common point of departure.

These concepts will have the best utility if indeed they do achieve widespread adoption, that is, if we all indeed begin to "speak the same language." To accomplish this, your participation is greatly needed to encourage the widespread testing and adoption of the NRC's National Measurement

Standards and Reporting Guidelines. Your reports of experience in applying these concepts in your programs, and your comments and criticism on this document, are invited and will be appreciated, for the preparation of future updates.

VII. Notes

1 "The National Policy on Recycling" was adopted by the National Recycling Coalition at its Fifth Annual Recycling Congress in Seattle Washington, in November of 1986. Copies of this brochure are available from the NRC.

2 At the 1989 Membership Meeting, and in workshops held during the 1989 Congress, consensus could not be reached on these terms because some members expressed the opinion that a definition for integrated waste management must also include a specified hierarchy of priorities for waste management options, whereas others argued that this should be left unspecified. Furthermore, consensus could not be reached in defining the waste management hierarchy, because of lack of agreement regarding the ranking of incineration with energy recovery versus landfilling. These comments were consistent with other comments previously received throughout several drafts of the Standards document. Unchallenged was this portion of the definition:

"The waste management hierarchy is the prioritization of waste management strategies as follows: 1. Decreasing the generation of waste through source reduction, and 2. Decreasing disposal by maximizing materials recovery. "

3 The Glossary of Recycling Terms and Acronyms, contains more than 300 terms and is available for \$5 from Resource Recycling, P.O. Box 10540, Portland, Oregon 97210; 503-227-1319

4 This description is a direct paraphrase of comments provided by the Glass Packaging Institute.

5 This is a direct paraphrase of commentary provided by Resource Integration Systems/Resource Conservation Consultants.

6 A detailed methodology for deriving current recycling rates has been developed by Gilmore Research Group and The Matrix Management Group

PUBLIC WORKS DEPARTMENT
Refuse Enterprise Fund Summary

SOURCE AND USE OF FUNDS STATEMENT

	Actual <u>1988-89</u>	Adopted Budget <u>1989-90</u>	Adjusted Budget <u>1989-90</u>	Proposed Budget <u>1990-91</u>	% Change Adjusted Budget	Proposed Budget <u>1991-92</u>	% Change Proposed Budget
REVENUE:							
Customer Service	\$6,734,001	\$ 8,709,000	\$ 8,709,000	\$ 9,118,000	4.7%	\$10,940,000	20.0%
Disposal Area Fees	271,524	290,000	290,000	315,000	8.6	315,000	0.0
Stanford Contract	423,193	407,000	407,000	0	(100.0)	0	0.0
Interest	826,567	1,000,000	1,000,000	667,567	(33.2)	665,682	(0.3)
Other Revenue	225,945	442,100	442,100	84,600	(80.9)	88,300	4.4
Allocated Revenue	<u>117,146</u>	<u>123,000</u>	<u>123,000</u>	<u>222,530</u>	<u>80.2</u>	<u>257,704</u>	<u>15.8</u>
TOTAL REVENUE	8,598,376	10,971,100	10,971,100	10,407,697	(5.1)	12,266,686	17.9
Encumbrance/Reappropriations	394,686	0	250,500	0	(100.0)	0	0.0
From Reserves:							
System Improvement	335,189	0	459,923	3,120,283	578.4	54,421	(98.3)
Debt Service	<u>280,943</u>	<u>280,943</u>	<u>280,943</u>	<u>280,943</u>	<u>0.0</u>	<u>16,225</u>	<u>(94.2)</u>
TOTAL SOURCE OF FUNDS	\$9,609,194	\$11,252,043	\$11,962,466	\$13,808,923	15.4%	\$12,337,332	(10.7)%

PUBLIC WORKS DEPARTMENT
Refuse Enterprise Fund Summary

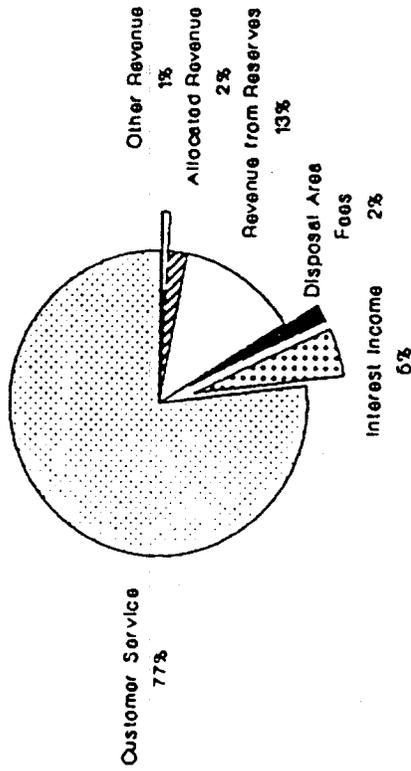
SOURCE AND USE OF FUNDS STATEMENT

	<u>Actual</u> <u>1988-89</u>	<u>Adopted</u> <u>Budget</u> <u>1989-90</u>	<u>Adjusted</u> <u>Budget</u> <u>1989-90</u>	<u>Proposed</u> <u>Budget</u> <u>1990-91</u>	<u>% Change</u> <u>Adjusted</u> <u>Budget</u>	<u>Proposed</u> <u>Budget</u> <u>1991-92</u>	<u>% Change</u> <u>Proposed</u> <u>Budget</u>
<u>APPLIED TO:</u>							
Purchases	\$4,275,105	\$ 3,708,000	\$ 3,708,000	\$ 4,223,000	13.9 %	\$ 4,392,000	4.0 %
Operating Expenditures	1,808,433	2,589,741	2,969,056	2,798,599	(5.7)	2,905,069	3.8
Capital Expenditures	792,268	290,000	753,000	1,193,316	58.5	15,359	(98.7)
Contingency	0	99,500	99,500	117,000	17.6	124,000	6.0
Allocated Charges	1,177,385	1,462,457	1,462,457	1,378,838	(5.7)	1,548,263	12.3
Debt Service	280,943	280,943	280,943	280,943	0.0	16,225	(94.2)
Transfers:							
Facilities Rent	1,275,060	2,474,100	2,474,100	2,663,781	7.7	2,796,970	5.0
Vehicle Replacement Fund				188,000	-	0	(100.0)
Other Operating Transfers	0	13,550	215,410	0	(100.0)	0	0.0
To Reserves:							
System Improvement Reserve	0	333,752	0	0	0.0	0	0.0
Advance Reserve	0	0	0	426,000	-	0	(100.0)
Landfill Closure Reserve	0	0	0	539,446	-	539,446	0.0
TOTAL USE OF FUNDS	\$9,609,194	\$11,252,043	\$11,962,466	\$13,808,923	15.4 %	\$12,337,332	(10.7)%

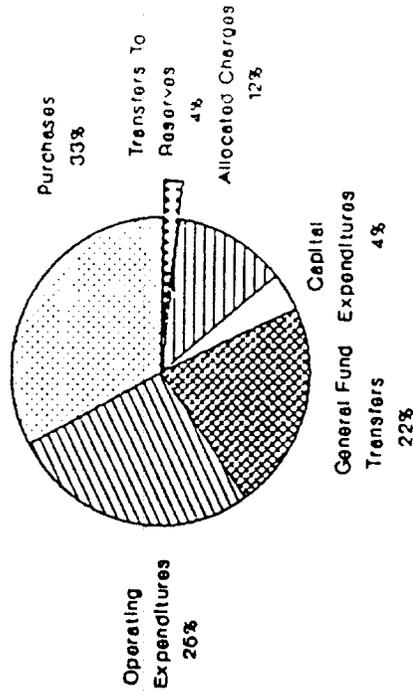
1990-91 & 1991-92

PUBLIC WORKS DEPARTMENT REFUSE FUND

SOURCE OF REVENUE



DISTRIBUTION OF EXPENDITURES



PUBLIC WORKS DEPARTMENT

Refuse Enterprise Fund Summary

EXPENDITURES

<u>BY PROGRAM</u>	<u>Actual 1988-89</u>	<u>Adopted Budget 1989-90</u>	<u>Adjusted Budget 1989-90</u>	<u>Proposed Budget 1990-91</u>	<u>% Change Adjusted Budget</u>	<u>Proposed Budget 1991-92</u>	<u>% Change Proposed Budget</u>
Administration and General	\$1,215,302	\$ 1,587,878	\$ 1,694,448	\$ 1,305,061	(23.0)%	\$ 1,379,518	5.7 %
Material Resource Recovery	183,526	293,574	326,638	471,694	44.4	502,011	6.4
Disposal Operation	871,153	1,012,473	1,034,424	825,010	(20.2)	928,245	12.5
Street Cleaning	493,822	570,773	593,603	627,548	5.7	684,165	9.0
System Improvement	221,088	587,500	782,400	154,000	(80.3)	154,000	0.0
Environmental Control	<u>0</u>	<u>0</u>	<u>0</u>	<u>794,124</u>	-	<u>805,393</u>	<u>1.4</u>
TOTAL PROGRAM EXPENSE	2,984,891	4,052,198	4,431,513	4,177,437	(5.7)	4,453,332	6.6
Contingency	0	99,500	99,500	117,000	17.6	124,000	6.0
Advance Reserve	0	0	0	426,000	-	0	(100.0)
Purchases	4,275,105	3,708,000	3,708,000	4,223,000	13.9	4,392,000	4.0
Capital Expenditures	792,268	290,000	753,000	1,193,316	58.5	15,359	(98.7)
Facilities Rental	1,275,060	2,474,100	2,474,100	2,663,781	7.7	2,796,970	5.0
Operating Transfers	0	13,550	215,410	188,000	(12.7)	0	(100.0)
Allocated Charges	927	0	0	0	0.0	0	0.0
Debt Service	<u>280,943</u>	<u>280,943</u>	<u>280,943</u>	<u>280,943</u>	<u>0.0</u>	<u>16,225</u>	<u>(94.2)</u>
TOTAL EXPENDITURES	\$9,609,194	\$10,918,291	\$11,962,466	\$13,269,477	10.9 %	\$11,797,886	(11.1)%

PUBLIC WORKS DEPARTMENT

Refuse Enterprise Fund Summary

EXPENDITURES

<u>BY CATEGORY</u>	<u>Actual</u> 1988-89	<u>Adopted</u> Budget 1989-90	<u>Adjusted</u> Budget 1989-90	<u>Proposed</u> Budget 1990-91	<u>% Change</u> <u>Adjusted</u> <u>Budget</u>	<u>Proposed</u> Budget 1991-92	<u>% Change</u> <u>Proposed</u> <u>Budget</u>
Employee Services	\$ 959,205	\$ 1,113,572	\$ 1,180,387	\$ 1,249,556	5.9 %	\$ 1,328,673	6.3 %
Contract Services	390,162	1,038,825	1,261,625	1,014,900	(19.6)	1,014,900	0.0
Supplies & Materials	166,219	231,900	268,000	204,240	(23.8)	204,240	0.0
General Expense	93,984	176,944	210,544	292,168	38.8	323,756	10.8
Rents & Leases	2,828	10,000	10,000	10,000	0.0	10,000	0.0
Fac & Equip Purchases	196,035	18,500	38,500	27,785	(27.8)	23,500	(15.4)
Capital Expenditures	792,268	290,000	753,000	1,193,316	58.5	15,359	(98.7)
Purchases	4,275,105	3,708,000	3,708,000	4,223,000	13.9	4,392,000	4.0
Debt Service	280,943	280,943	280,943	280,943	0.0	16,225	(94.2)
Contingency	0	99,500	99,500	117,000	17.6	124,000	6.0
Advance Reserve				426,000	-		(100.0)
Facilities Rental	1,275,060	2,474,100	2,474,100	2,663,781	7.7	2,796,970	5.0
Allocated Charges	1,177,385	1,462,457	1,462,457	1,378,838	(5.7)	1,548,263	12.3
Operating Transfers		<u>13,550</u>	<u>215,410</u>	<u>188,000</u>	<u>(12.7)</u>	<u>0</u>	<u>(100.0)</u>
TOTAL EXPENDITURES	\$9,609,194	\$10,918,291	\$11,962,466	\$13,269,527	10.9 %	\$11,797,886	(11.1)%

PUBLIC WORKS DEPARTMENT

Refuse Enterprise Fund Summary

EXPENDITURES

PERSONNEL

	24.00	25.00	26.00	0.00	26.00	0.00
Regular	1.00	1.00	1.00	0.00	1.00	0.00
Temporary	<u>.45</u>	<u>.45</u>	<u>.45</u>	<u>0.00</u>	<u>.45</u>	<u>0.00</u>
Overtime						
TOTAL PERSONNEL	25.45	26.45	27.45	0.00	27.45	0.00

EXPLANATION OF CHANGES

No rate increase is proposed for 1990-91, while a 20 percent rate increase is proposed for 1991-92. Customer Service Revenue is increasing in 1990-91 to correspond with actual revenue receipts from 1989-90. The rate increase in 1991-92 is required to meet costs for expanded in 1990-91 to correspond with actual revenue receipts from 1989-90. The rate increase in 1991-92 is required to fund State solid waste related environmental control and recycling mandates. New ongoing costs include a State tax on landfill tonnage to fund State solid waste related programs, as well as approximately \$539,000 annually to set up a mandated Landfill Closure and Post-closure Maintenance Reserve. The State requires landfill operators to set aside funds over time to cover all projected landfill closure and post-closure maintenance costs. Finally, a one-time study is proposed for 1990-91 to meet State mandates to reduce landfill disposal by 25 percent in 1995 and 50 percent by the year 2000.

A new program, Environmental Control, is proposed for 1990-91, consolidating various environmental costs into one program. A new position, added mid-year in 1989-90, Manager of Environmental Control, will manage the program. 1991-92 is also the last scheduled debt service payment to be made on the former Los Altos Treatment Plant site, after which the Refuse Fund will own half interest in the site.

PUBLIC WORKS DEPARTMENT
Refuse Enterprise Fund

ADMINISTRATION AND GENERAL PROGRAM

PURPOSE/GOAL:

To provide for the effective planning, evaluation, and implementation of various controls and aspects of Solid Waste Management.

EXPENDITURE CATEGORY

	<u>Actual</u> <u>1988-89</u>	<u>Adopted</u> <u>Budget</u> <u>1989-90</u>	<u>Adjusted</u> <u>Budget</u> <u>1989-90</u>	<u>Proposed</u> <u>Budget</u> <u>1990-91</u>	<u>% Change</u> <u>Adjusted</u> <u>Budget</u>	<u>Proposed</u> <u>Budget</u> <u>1991-92</u>	<u>% Change</u> <u>Proposed</u> <u>Budget</u>
Employee Services	\$ 190,473	\$ 201,162	\$ 213,232	\$ 102,556	(51.9)%	\$ 108,979	6.3%
Contract Services	137,865	231,600	293,600	2,600	(99.1)	2,600	0.0
Supplies & Materials	2,010	5,000	5,000	5,000	0.0	5,000	0.0
General Expense	67,764	162,494	194,994	221,768	13.7	253,406	14.3
Fac & Equip Purchases	9,985						
Allocated Charges	<u>807,205</u>	<u>987,622</u>	<u>987,622</u>	<u>973,137</u>	<u>(1.5)</u>	<u>1,009,533</u>	<u>3.7</u>
Total Expenditures	\$1,215,302	\$1,587,878	\$1,694,448	\$1,305,061	(23.0)%	\$1,379,518	5.7%

1990-91

EXPLANATION OF CHANGES

Proposed Employee Services funding is decreasing, as two existing positions are being transferred to the newly created Environmental Control program. Contract Services is decreasing, as funding for Household Hazardous Waste disposal is also being shifted to the new Environmental Control program. General Expenses are increasing to meet Assembly Bill 939's charges on landfills to fund State recycling efforts.

1991-92

General Expenses are increasing for a higher charge from the State for recycling in 1992.

PUBLIC WORKS DEPARTMENT

Refuse Enterprise Fund

MATERIAL RESOURCE RECOVERY PROGRAM

PURPOSE/GOAL:

To conserve landfill space by reducing municipally-generated solid waste, and by increasing the recovery of reusable materials.

<u>EXPENDITURE CATEGORY</u>	<u>Actual 1988-89</u>	<u>Adopted Budget 1989-90</u>	<u>Adjusted Budget 1989-90</u>	<u>Proposed Budget 1990-91</u>	<u>% Change Adjusted Budget</u>	<u>Proposed Budget 1991-92</u>	<u>% Change Proposed Budget</u>
Employee Services	\$ 91,093	\$184,403	\$195,467	\$196,989	0.8 %	\$209,965	6.6 %
Contract Services	4,760	42,625	43,525	192,000	341.1	192,000	0.0
Supplies & Materials	4,767	13,300	13,300	16,290	22.5	16,290	0.0
General Expense	1,822	2,450	3,550	2,850	(19.7)	2,850	0.0
Rents & Leases	572	1,000	1,000	1,000	0.0	1,000	0.0
Fac & Equip Purchase	17,133	12,500	32,500	21,785	(33.0)	17,500	(19.7)
Allocated Charges	<u>63,379</u>	<u>37,296</u>	<u>37,296</u>	<u>40,780</u>	<u>2.3</u>	<u>62,406</u>	<u>53.0</u>
Total Expenditures	\$183,526	\$293,574	\$326,638	\$471,694	44.4 %	\$502,011	6.4 %

EXPLANATION OF CHANGES

1990-91
Contract Services are increasing to fund a one-time study on options for meeting State recycling mandates. Facilities and Equipment Purchase expenses are decreasing due to one-time purchases during 1989-90 for recycling bins.

1991-92
Facilities and Equipment Purchase expenses are decreasing due to one-time purchases during 1990-91 for computer equipment. Allocated Charges are increasing for higher vehicle replacement charges.

PUBLIC WORKS DEPARTMENT

Refuse Enterprise Fund

DISPOSAL OPERATION PROGRAM

PURPOSE/GOAL:

To dispose of solid wastes in a sanitary, economical, effective and safe manner in compliance with regulatory agencies.

<u>EXPENDITURE CATEGORY</u>	<u>Actual</u> <u>1988-89</u>	<u>Adopted</u> <u>Budget</u> <u>1989-90</u>	<u>Adjusted</u> <u>Budget</u> <u>1989-90</u>	<u>Proposed</u> <u>Budget</u> <u>1990-91</u>	<u>% Change</u> <u>Adjusted</u> <u>Budget</u>	<u>Proposed</u> <u>Budget</u> <u>1991-92</u>	<u>% Change</u> <u>Proposed</u> <u>Budget</u>
Employee Services	\$ 349,358	\$ 347,512	\$ 368,363	\$ 369,969	0.4 %	\$ 393,211	6.3%
Contract Services	160,534	260,800	260,800	166,300	(36.2)	166,300	0.0
Supplies & Materials	11,622	80,850	81,950	71,600	(12.6)	71,600	0.0
General Expense	1,913	2,000	2,000	2,000	0.0	2,000	0.0
Rents & Leases	2,256	9,000	9,000	9,000	0.0	9,000	0.0
Fac & Equip Purchases	165,207	1,000	1,000	1,000	0.0	1,000	0.0
Allocated Charges	180,263	311,311	311,311	205,141	(34.1)	285,134	39.0
Subtotal	871,153	1,012,473	1,034,424	825,010	(20.2)	928,245	12.5
Payments to PASCO	4275,105	3,708,000	3,708,000	4,223,000	13.9	4,392,000	4.0
Total Expenditures	\$5,146,258	\$4,720,473	\$4,742,424	\$5,048,010	6.4 %	\$5,320,245	5.4%

EXPLANATION OF CHANGES

Contract Services are decreasing, as costs for the landfill gas collection system maintenance have been shifted to the new Environmental Control program. Supplies and Materials are decreasing, as dirt cover purchases for State performance requirements have gone down with the availability of some amounts of free dirt from various contractors. Allocated Charges are decreasing to comply with a changing methodology of spreading city overhead costs to Refuse. Payments to PASCO are increasing to fund: general salary increases; a higher rate of return target due to a higher fixed asset base; and higher operating expenses due to changes in the City's curbside compostable debris collection program.

PUBLIC WORKS DEPARTMENT

Refuse Enterprise Fund

STREET CLEANING PROGRAM

PURPOSE/GOAL:

To maintain the streets, bike paths, parking lots, alleyways, and other City facilities in a clean and safe condition.

<u>EXPENDITURE CATEGORY</u>	<u>Actual 1988-89</u>	<u>Adopted Budget 1989-90</u>	<u>Adjusted Budget 1989-90</u>	<u>Proposed Budget 1990-91</u>	<u>% Change Adjusted Budget</u>	<u>Proposed Budget 1991-92</u>	<u>% Change Proposed Budget</u>
Employee Services	\$328,281	\$380,495	\$403,325	\$400,818	(0.6)%	\$426,025	6.3%
Contract Services	24,478	46,300	46,300	49,300	6.5	49,300	0.0
Supplies & Materials	11,536	12,750	12,750	12,650	(0.8)	12,650	0.0
General Expense	206	5,000	5,000	5,000	0.0	5,000	0.0
Fac & Equip Purchase	3,710	126,228	126,228	159,780	26.6	191,190	19.7
Allocated Charges	<u>125,611</u>	<u>126,228</u>	<u>126,228</u>	<u>159,780</u>	<u>26.6</u>	<u>191,190</u>	<u>19.7</u>
Total Expenditures	\$493,822	\$570,773	\$593,603	\$627,548	5.7 %	\$684,165	9.0%

EXPLANATION OF CHANGES

1990-91 and 1991-92

Allocated Charges are increasing due to higher vehicle replacement charges for street sweeping vehicles.

PUBLIC WORKS DEPARTMENT

Refuse Enterprise Fund

SYSTEMS IMPROVEMENT PROGRAM

PURPOSE/GOAL:

To provide engineering and support for physical improvements at the Refuse Disposal area so that disposal and recycling operations will be efficient, and the eventual closure will be environmentally acceptable to regulatory agencies and the community.

<u>EXPENDITURE CATEGORY</u>	<u>Actual 1988-89</u>	<u>Adopted Budget 1989-90</u>	<u>Adjusted Budget 1989-90</u>	<u>Proposed Budget 1990-91</u>	<u>% Change Adjusted Budget</u>	<u>Proposed Budget 1991-92</u>	<u>% Change Proposed Budget</u>
Contract Services	\$ 62,525	\$457,500	\$617,400	\$ 54,000	(91.3)%	\$ 54,000	0.0%
Supplies & Materials	136,284	120,000	155,000	90,000	(41.9)	90,000	0.0
General Expense	<u>22,272</u>	<u>10,000</u>	<u>10,000</u>	<u>10,000</u>	<u>0.0</u>	<u>10,000</u>	<u>0.0</u>
Total Expenditures	\$221,088	\$587,500	\$782,400	\$154,000	(80.3)%	\$154,000	0.0%

1990-91

EXPLANATION OF CHANGES

Contract Services are decreasing, as various landfill costs have been shifted to the capital budget.

PUBLIC WORKS DEPARTMENT
Refuse Enterprise Fund

ENVIRONMENTAL CONTROL PROGRAM

PURPOSE/GOAL:

To provide environmental control programs and projects which comply with local, state and federal mandates.

<u>EXPENDITURE CATEGORY</u>	<u>Actual 1988-89</u>	<u>Adopted Budget 1989-90</u>	<u>Adjusted Budget 1989-90</u>	<u>Proposed Budget 1990-91</u>	<u>% Change Adjusted Budget</u>	<u>Proposed Budget 1991-92</u>	<u>% Change Proposed Budget</u>
Employee Services				\$179,224	-	\$190,493	6.3%
Contract Services				550,700	-	550,700	0.0
Supplies & Materials				8,700	-	8,700	0.0
General Expense				<u>55,500</u>	<u>-</u>	<u>55,500</u>	<u>0.0</u>
Total Expenditures				\$794,124	-	\$805,393	1.4%

EXPLANATION OF CHANGES

1990-91 and 1991-92

A new program is proposed, staffed by the addition of one Manager of Environmental Control, which was added mid-year in 1989-90. In addition, two positions previously budgeted in Administration and General have been shifted to this program. The program will consolidate the growing environmental protection and compliance costs facing the landfill. These costs include:

- o Household Hazardous Waste Program
- o Groundwater monitoring
- o Well sampling
- o Maintenance on the leachate system, methane gas collection and piping system.
- o Waste discharge permits