

INFRASTRUCTURE ELEMENT

The **Infrastructure Element** is an optional General Plan Element. In some respects it is similar to the **Circulation Element**. Just as the Circulation Element addresses the movement of people and goods, the Infrastructure Element addresses the physical facilities needed for the conveyance of vital services and functions such as water, sewage, energy, stormwater, communications, and solid waste reduction and recycling.

The Infrastructure Element also reflects Guiding Principle #1 which is also addressed in the **Conservation** and **Water Supply Elements** and states:

- ❖ *Plan for sustainability within our finite resources including, but not limited to open space, water, energy, and air quality.*

An efficient and reliable infrastructure is also vital to any city's health, safety, livability, and particularly its economic well-being. For this reason, the Infrastructure Element reflects Guiding Principle #3 which states:

- ❖ *Strengthen economic vitality to provide jobs, services, revenues, and opportunities.*

This Element addresses the infrastructure that serves Redwood City and the specific functions they perform:

- Water Storage and Distribution
- Wastewater Collection and Treatment
- Recycled Water
- Storm Drainage and Flood Control
- Energy
- Communications
- Solid Waste and Recycling

Much of the infrastructure described in this Element is located underground. Any construction activity that involves digging, trenching, grading or other type of excavation can potentially cause damage to underground conduits, pipelines, and other underground equipment resulting in serious disruptions to important services and require costly repairs. In the case of underground gas and fuel pipelines, any damage from excavation can pose serious safety hazards such as explosions and fires.

Damage to underground infrastructure from various types of excavation activity has been due largely to not knowing where it is located. For this reason, Underground Service Alert (USA) was created to provide information to anyone involved in excavation activities about the specific location of all types of underground utilities. USA is made up of municipalities (including Redwood City), public agencies, and private companies that own and maintain underground infrastructure.

Water Storage and Distribution

The Hetch Hetchy System

As described in the **Water Supply Element**, Redwood City obtains all of its potable water from the San Francisco Public Utilities Commission (SFPUC) through the Hetch Hetchy regional water system. The supply is predominantly from the Sierra Nevada, delivered through the Hetch Hetchy aqueducts, but also includes treated water produced by the SFPUC from its local watersheds and facilities in Alameda and San Mateo Counties. These facilities include Calaveras Reservoir in southern Alameda County and San Andreas, Crystal Springs, and Pilarcitos Reservoirs on the Peninsula. In the event of an interruption to the water delivery system, these holding reservoirs can serve as an emergency water supply. The Hetch Hetchy system includes over 280 miles of pipelines, 60 miles of tunnels, five pumping stations, and two water treatment plants. Map I-1 illustrates the extent of the Hetch Hetchy system.

Hetch Hetchy has four main water pipelines, called the Bay Division Pipelines, which run underground through Redwood City. These pipelines run between the Irvington Portal located on the east side of Fremont in the East Bay and the Pulgas Portal located near Edgewood Road in San Mateo County. Bay Division Pipelines (BDPL) 1 and 2 run under the Dumbarton Straits then proceed up the Peninsula in a northwesterly direction. In Redwood City, BDPL 1 and 2 are located in SFPUC right-of-way that runs diagonally across the street grid through the City's residential area west of El Camino Real, then parallels Edgewood Road before entering Pulgas Portal.

BDPL 3 and 4 run from Irvington Portal around the south end of San Francisco Bay and the Peninsula. In Redwood City, they run roughly parallel to Alameda de las Pulgas and Fernside Street, and eventually join up with BDPL 1 and 2 at Edgewood Road before entering Pulgas

Portal. Map I-2 shows the alignment of both pipeline corridors through Redwood City.

Hetch Hetchy water delivered to the Bay Area holding reservoirs receive filtration and disinfection treatment at either of the two filtration plants. Filtered water from these treatment plants is commingled with unfiltered Hetch Hetchy water in Bay Area water transmission pipelines. The water that the City draws from the Hetch Hetchy pipelines is monitored for quality and treated by the SFPUC before it reaches Redwood City.

Under the revised Surface Water Treatment Regulations that became effective in July 1998, public water systems that obtain water from Hetch Hetchy must demonstrate to the California Department of Health Services (DHS) that the water supply meets State criteria for filtration avoidance. Redwood City maintains its certification with DHS that water obtained from Hetch Hetchy will comply with the State criteria.

Scheduled Improvements

In mid-2002, the SFPUC approved a \$3.6 billion Capital Improvement Program known as the Water System Improvement Program (WSIP), to repair and upgrade the Hetch Hetchy water system. The WSIP includes improvements to pipelines, dams, tunnels, pumping stations and other facilities to maintain and improve operational and seismic reliability and water quality. The program is scheduled for completion in 2016.

As part of the WSIP, a fifth Bay Division pipeline (BDPL 5) will be constructed between the Irvington and Pulgas Portals. The pipeline will share the right-of-way with BDPL 1 and 2. Construction of the portion of BDPL through Redwood City is tentatively scheduled to begin some time in 2010. The portion of BPDFL 5 within Redwood

City will include the pipeline itself and two new valve vaults. One will be located just west of El Camino Real and the other will be located along Edgewood Road. These vaults will allow isolation of the pipelines for inspection and maintenance as well as provide operational flexibility in the event of a shutdown.

The Local Water System

Redwood City's water system is operated by the Public Works Services Department's Water Services Division. The system's service area is approximately 14 square miles and includes all of Redwood City's incorporated area, portions of San Carlos and Woodside and some adjacent unincorporated areas that include the Emerald Hills area, portions of the Fair Oaks area and Canada College. The service area ranges in elevation from near sea level in the Bayfront area to over 800 feet in the higher elevations to the west.

Water Distribution

Redwood City draws its water from the Hetch Hetchy pipelines at 13 metered connections. There are seven connections on BDPL 1 and 2, five connections on BDPL 3 and 4, and one connection on BDPL 1, 2, and 3 near Edgewood Road. Redwood City's water distribution system is made up of 282 miles of distribution mains, 10 pump stations, 2,341 fire hydrants, and 46 pressure reducing valves. There are 10 emergency interconnections with adjacent water systems that include the California Water Service Company, Belmont County Water District and the City of Menlo Park.

Water Storage and Pumping Facilities

Redwood City has 12 water storage facilities which vary in size from 100,000 gallons to four million gallons (MG) with a combined storage capacity of 21.24 MG. Ten storage facilities are located in the higher elevations in the western part of Redwood City, and two are located in Redwood Shores. Ten pump stations are located throughout the distribution system, four of which have permanent stand-by generators.

Two portable generators are available for emergency use. Depending on such factors as funding, site constraints, and priorities, some additional pump stations will eventually receive permanent generators. Most of the pump stations are housed in structures to protect equipment from vandalism and exposure to the elements. Pumps and emergency back-up generators are kept in working order and are regularly maintained to assure reliability in the event of an emergency.

System Maintenance

Redwood City continues to refine and improve its water system and operation procedures to assure reliability. Maintenance crews survey at least 15 miles of main and service lines per year on an ongoing basis. Redwood City's water distribution system is maintained on a repair/replace/upgrade basis on a 50-year cycle. Under the Redwood City Water System Capital Improvement Program, an average of one to 1 ½ miles of deteriorated water line is replaced per year. Since much of Redwood City's water distribution system is at or near its 50-year life, it will be necessary to increase the rate of pipeline replacement.

Storage tanks and reservoirs are cleaned and inspected every five years. The tanks are treated with cathodic protection to prevent corrosion. Maintenance activities are performed on an as-needed basis.

The City's maintenance practices reduce water losses from leakage in the distribution system. Redwood City's 'unaccounted for' water rate is about 4% which is significantly below the industry standard of 10%. Unaccounted for water includes water used for fire suppression, distribution main flushing, storage tank cleaning, under-reported meters, and system leaks. When system leaks are detected, they are repaired immediately. Private water connections are not monitored, since they are metered.

Water Quality

Just as the SFPUC is responsible for monitoring water quality before the water reaches Redwood City, the City is responsible for monitoring water quality in its distribution system. The water consistently meets primary and secondary drinking water standards. Distribution pipelines are regularly flushed to remove deposits, sediments, encrustations and other materials. Flushing is suspended during water shortages to conserve water. Backflow from individual water users may contain pollutants that can enter the City's distribution pipelines. The City has a backflow prevention program that is carried out under contract with the San Mateo County Environmental Health Department. The County's certified staff regularly tests backflow prevention devices on an annual basis.

Emergency Water Storage

Redwood City has undertaken a series of improvements to its storage and distribution system to assure that an emergency water supply is available if the Hetch Hetchy system is required to shut down due to an earthquake or other disaster. Until recently, there were four separate pressure zones within Redwood City's water service area that drew their water directly from Hetch Hetchy pipelines and were not connected to the rest of Redwood City's water system, and lacked any storage capability. These zones are now connected to existing storage tanks to provide water if the Hetch Hetchy supply is not available. Emergency water supply is addressed in the **Safety and Water Supply Elements**.

Future Local Water Storage Improvements

Future improvements proposed for Redwood City's water system include new storage tanks in Friendly Acres, and the Bayfront area. The proposed tanks will provide more capacity and water pressure for these areas which are susceptible to low service pressure during prolonged interruptions. The tanks would also provide additional emergency water storage capacity. These tanks are expected to be constructed when sufficient funding is made available.

GOAL FOR WATER STORAGE AND DISTRIBUTION

Goal I-1: To provide a safe and reliable water storage and distribution system that will meet current and future needs.

Policies:

I-P1.1: Redwood City's Capital Improvement Program shall emphasize increased funding to improve the level of service and life cycle of its water storage and distribution system including upgrades and/or replacement of pipes, storage tanks, and pump stations, monitoring for water losses, carrying out preventive measures to avoid major disruptions or water losses to its water storage and distribution system.

I-P1.2: Redwood City shall attempt to maintain its water system to assure an adequate fire flow.

I-P1.3: New capital-intensive water storage and distribution facilities, particularly storage tanks, shall be located and designed in a manner that minimizes visual and environmental impacts to the surrounding area.

I-P1.4: Redwood City's water storage and distribution system shall be designed to provide a reliable and sufficient emergency water supply in the event of a disaster including interconnections, redundancy, adequate water storage capacity, and pump facilities.

I-P1.5: All new development shall be required to pay for its share of necessary improvements to provide a reliable water supply.

Actions:

I-A1.1: Continue and enhance the City's maintenance program for the water storage and delivery system to provide a reliable supply of potable water, including monitoring to detect water leakage and making repairs in an expeditious manner.

I-A1.2: Redwood City shall encourage the SFPUC to minimize any adverse environmental impacts that may result from major capital improvements to the Hetch Hetchy system in Redwood City and to provide appropriate mitigation measures.

I-A1.3: Prioritize investment in water supply delivery upgrades in areas where sub-standard size water mains currently exist.

I-A1.4: Redwood City shall cooperate with the SFPUC in carrying out its Water System Improvement Program to upgrade the Hetch Hetchy water storage and delivery infrastructure to improve reliability.

I-A1.5: Efforts shall be made to further reduce Redwood City's 4% unaccounted for water rate.

Wastewater Collection and Treatment

Wastewater in Redwood City is collected and conveyed through a sewer pipeline system that is operated and maintained by the Public Works Services Department's Sewer Service Division. The system is made up of 280 miles of sewer mains and 31 sewer lift stations. As of 2006, there were 16,373 residential connections, 1,077 commercial connections, 103 connections for public and institutional uses, and 29 for other uses (industrial, hospitals, etc.) for a total of 17,582 sewer connections. The sewer system is made up of a hierarchy of pipelines based on capacity. Residences, commercial establishments, industrial

uses, etc. have individual pipeline connections sometimes called laterals that connect to larger sewer pipes or mains.

Redwood City has agreements with sewer districts in adjacent unincorporated areas to collect and convey wastewater for treatment. These districts include the Emerald Hills, Fair Oaks, Kensington, Oak Knoll and Edgewood Sewer Districts. Redwood City also has an agreement with the Town of Woodside to convey its wastewater.

For most of Redwood City, wastewater flows by gravity. Pump stations are necessary in the flat, lower-lying eastern portions of the City, particularly Redwood Shores and the Bayfront area, to effectively convey wastewater flow.

Redwood City's sewer mains drain into larger-diameter sewer trunk lines which eventually drain into a force main interceptor. The force main interceptor is a pipeline varying from 48" to 54" in diameter that runs roughly parallel to the 101 Freeway. It conveys wastewater to the South Bayside System Authority (SBSA) treatment plant located at the eastern end of Redwood Shores. In addition to Redwood City, the force main interceptor collects wastewater from San Carlos, Belmont, and the West Bay Sanitary District, which serves Menlo Park, Atherton, Portola Valley, and parts of East Palo Alto. Redwood Shores has its own wastewater interceptor which connects directly with the treatment plant.

The main interceptor pipeline, pump stations and the treatment plant are owned and operated by SBSA which is a Joint Powers Authority (JPA) made up of Redwood City, San Carlos, Belmont and the West Bay Sanitary District. Redwood City's share of ownership in SBSA facilities is approximately 47%.

The SBSA treatment plant has an operating capacity of 29 million gallons per day (mgd) average dry weather flow. After treatment, the

wastewater (called effluent) is discharged through an outfall into San Francisco Bay. The SBSA is permitted to discharge tertiary-treated wastewater into the Bay by the San Francisco Regional Water Quality Control Board (RWQCB).

Redwood City has a finite capacity allotment with SBSA. Currently, that allotment is sufficient for anticipated future developments. However, Redwood City should actively be aware of capacity issues and take a conservative approach with regard to wastewater collection and conveyance agreements with parties outside of its service area. Continued monitoring and maintenance of its sewer system to reduce the amount of groundwater infiltration and inflow can reduce the quantity of wastewater flow to the SBSA plant during periods of wet weather. Redwood City should also explore other possible options to reduce peak wet weather flow.

Redwood City's sewer system is monitored to detect pipeline conditions. Typical problems include pipeline cracks and improperly sealed joints which can cause groundwater infiltration during periods of wet weather. Excessive groundwater infiltration into sewer pipelines can overtax the capacity of the sewer system and treatment plant. Tree roots can intrude into pipelines causing blockage. Accumulations of fats, oils, and grease can coagulate and block sewage flow.

Most of Redwood City's sewer maintenance procedures employ trenchless technology. This is a series of techniques for repairing and rehabilitating underground utilities that minimizes the need to excavate which can be costly, disruptive and time-consuming. For example, instead of replacing a damaged sewer pipeline, the pipeline can be re-lined in its existing place, using specially designed equipment. Other examples of routine trenchless maintenance include rodding or chemical treatments to eliminate tree roots that penetrate into sewer lines. Fat, oil, and grease accumulation is eliminated through routine flushing and chemical applications.

GOAL FOR WASTEWATER COLLECTION AND TREATMENT

Goal I-2: To provide adequate and reliable wastewater collection and treatment facilities that meet current and future needs.

Policies:

I-P2.1: Redwood City's wastewater collection and treatment facilities shall have adequate capacity and shall be maintained in a manner that protects water quality and public health while minimizing adverse impacts to the environment.

I-P2.2: Redwood City's wastewater collection system shall be maintained and, where necessary, upgraded, to efficiently handle the conveyance of wastewater.

I-P2.3: Redwood City shall work with other cities and jurisdictions that are SBSA members to assure that the treatment facility has sufficient capacity to meet future wastewater treatment needs.

I-P2.4: Redwood City shall explore various options to prevent its wastewater output from exceeding the capacity of SBSA's treatment facilities.

Actions:

I-A2.2: Maintenance of Redwood City's sewer system shall include minimizing groundwater infiltration and inflow to maintain sufficient peak wet weather capacity.

I-A2.3: Enforce regulations that restrict the discharge of substances into the sewer system such as grease, oil, mud, silt, and pollutants.

I-A2.4: Redwood City shall conduct outreach and education programs to residents, businesses, and industries in partnership with SBSA to minimize the discharge of pollutants to the sewer system.

Recycled Water

As described in the **Conservation Element**, Redwood City is building a recycled water system to reduce its demand on the Hetch Hetchy system. Recycled water can be used for a variety of applications, including landscape irrigation, industrial processes, firefighting, and dust control. This section of the Infrastructure Element describes the existing and planned recycled water facilities.

The source of Redwood City's recycled water is the SBSA wastewater treatment plant, described in the Wastewater Collection and Treatment section. The recycled water treatment facility at the SBSA plant was completed in 2006. The recycling facility filters and disinfects the treated wastewater to meet water quality standards in accordance with Title 22 of the California Administrative Code. The recycled water disinfection, storage and pumping facilities are contained within a concrete structure on the north side of SBSA's main plant. SBSA is responsible for treating the wastewater for recycling, while Redwood City is responsible for distributing the recycled water.

The planned recycled water distribution system includes pipelines and customers in Redwood Shores, the Bayfront area, the Port of Redwood City, and much of the remaining portions of Redwood City. The first phase of the distribution system will be completed in 2006-2007 to serve most of Redwood Shores. This system has been designed to

build on the existing recycled water infrastructure developed in 1999 – 2000 as part of a pilot program.

In 2007, work is scheduled to begin on extending the main transmission pipeline from Redwood Shores to the Bayfront area. A section of this pipeline extension was installed in 2004 beneath a new bicycle path that parallels the 101 Freeway as part of the freeway's auxiliary lanes project. This phase of the project is estimated to be completed in 2008 – 2009.

Longer-range plans call for extending the recycled water pipelines to central Redwood City south and west of the 101 Freeway. When it is completed, the recycled water system will serve most of Redwood City east of Alameda de las Pulgas. There are currently no plans to serve the higher elevations to the west due to the lack of large landscaped areas that could be irrigated with recycled water and the expense of installing pumping facilities. Map I-3 shows the area that will ultimately be served by the recycled water system when it is completed.

The pipelines that convey the recycled water are made of PVC and are purple in color to distinguish the recycled water system from the potable water supply system. Other equipment used in the recycled water system such as valves and fittings have identification tagging and an advisory signing system to prevent inappropriate use of recycled water. The system also includes on-site customer facilities, including lateral piping, valves and irrigation facilities. The City provides educational materials and training for commercial and industrial users.

In addition to supplying recycled water to meet Redwood City's needs, it is anticipated that additional recycled water could be made available to neighboring cities and water districts. These entities would likely install their own pipelines and connections and would buy into the recycled water system for a specified fee.

GOAL FOR RECYCLED WATER

Goal I-3: To complete and possibly expand the recycled water distribution system in order to reduce demand on the Hetch Hetchy system and provide customers with an alternative and sustainable source of water.

Policies:

I-P3.1: Require new projects to provide dual plumbing and landscape irrigation systems that can use recycled water when it is available.

I-P3.2: Recycled water shall be used for those uses permitted by State regulations (Title 22) governing the quality and use of recycled water.

Actions:

I-P3.1: Explore all potential applications of recycled water that will make expansion of the recycled water system more cost-effective.

I-P3.2: Adopt an ordinance requiring dual plumbing in all new commercial construction and large-scale residential projects.

I-P3.3: Investigate the feasibility of providing recycled water to neighboring water retailers such as municipalities and water districts.

Storm Drainage and Flood Control

Storm Drain System

Redwood City's storm drain system is made up of roadway improvements (which include gutters and drainage inlets), an underground pipeline network, pump stations, and levees. Most of the water that is collected during periods of rainfall enters the storm drain system through the entry drains that are usually located in gutters. The storm drain pipelines then convey the runoff into creeks, canals, or stormwater pump stations where the water is discharged into San Francisco Bay. Major portions of Redwood City's creeks have been reconstructed and relocated into concrete-lined channels or placed in underground culverts to handle the increased volume and velocity of stormwater runoff and to prevent stream bank erosion and flooding.

In general, stormwater flows in the storm drainage system by gravity. Similar to wastewater flow, pump stations are needed in the flat lower-lying portions of eastern Redwood City to facilitate drainage. Map I-4 shows Redwood City's storm drain system. In Redwood Shores, storm drains empty into the central lagoon area, which ultimately discharge to either Belmont or Steinberger Slough through one of three outfalls.

As stated in the **Water Quality** sub-section of the **Conservation Element**, urban stormwater that flows to water bodies has been found to be a major contributor to water pollution. The Conservation Element describes alternative approaches to reduce the volume of excess runoff while reducing pollution. These techniques include retaining and absorbing rainwater on-site and reducing the amount of runoff primarily by reducing the amount of impervious surface area. This can also reduce runoff that can contribute to flooding.

The **Creeks and Streams** sub-section of the **Conservation Element** describes a series of techniques to restore portions of creeks and

streams to a more natural state that, when carefully designed, can actually reduce flooding, erosion, and pollutant loading.

Flooding

Flooding has historically occurred in the lower-lying portions of Redwood City near the Bayfront, as described in the **Safety Element**. Flooding usually occurs when periods of heavy rainfall coincide with high bay tides that can impede the flow of excess runoff entering the Bay. Two other areas that have been subject to flooding are portions of the Friendly Acres/East Bayshore neighborhood and the northwestern portion of Redwood City's Centennial Neighborhood adjacent to Cordilleras Creek. These areas and possible improvements to address flooding are described in greater detail below.

Flooding in the Friendly Acres/East Bayshore neighborhood has been due largely to increased runoff resulting from newer development in the upper elevations of the watershed areas west and southwest of the City. Most of the existing storm drainage system serving the Friendly Acres/East Bayshore neighborhood was constructed over fifty years ago and does not have enough capacity to handle the increased runoff.

The current storm drain system in this area includes a sub-drainage basin located beneath the Fifth Avenue/Hoover Street intersection where stormwater is temporarily stored. From there the water flows through a 48" pipeline beneath the 101 Freeway to the Fifth Avenue Pump Station which drains into the Bayfront Canal. The Bayfront Canal discharges the stormwater into San Francisco Bay, but is limited in its storage capacity and is dependent on a single tide gate located on the Menlo Park border.

The Strategy to Address Flooding Problems was prepared in 2000 by Redwood City's Public Works Services Department and the Engineering and Construction Division. The Strategy proposed an

incremental approach to mitigate flooding in the Friendly Acres/Fifth Avenue neighborhood. One of these mitigations, which is currently being implemented, has been to increase the capacity of the stormwater

transmission and distribution pipes in the Friendly Acres neighborhood.

Two other proposals outlined in the Strategy call for upgrading the Fifth Avenue Pump Station to increase capacity and raising the levee of the Bayfront Canal to increase the canal's capacity to store and convey stormwater. These improvements would be done in phases over a period of several years. When these improvements are completed, they will provide a 30-year storm level of flood protection.

For Cordilleras Creek, the **Conservation Element** describes several "low-impact" approaches to alleviate flooding. One of these approaches includes educating creekside property owners in low-cost, ecologically enhancing methods to maintain and improve creek bank stability and prevent bank erosion thereby reducing sedimentation that can block creek flow and obstruct culverts. Redwood City has also established a 30-foot setback line from the center line of creeks where new building will no longer be allowed.

Much of the watershed areas where stormwater runoff originates is located in jurisdictions outside of Redwood City or in the County. For this reason the cost of financing flood-control improvements should not be borne entirely by Redwood City. Other jurisdictions, including San Mateo County, San Carlos, Atherton, Menlo Park and Woodside should also be required to contribute.

Redwood Shores

Redwood Shores is located on low-lying bayfront land surrounded by a levee system which protects this area from high tides (see Map I-5).

Between 1998 and 2001 levee heights were increased to withstand a 100-year high tide. In addition to providing protection against high tides, paved pathways along portions of the levee tops are available for walking, bicycling and jogging. Most of these levee-top pathways are part of Redwood City's bikeway system as described in the **Circulation Element**.

Redwood Shores was designed around a series of lagoons which provide an aesthetic water feature and water-based recreation. The lagoons also function as storm drain holding ponds where excess storm water eventually drains. The water level in these lagoons is controlled by two pump stations along Steinburger Slough, and a gravity discharge outfall at Belmont Slough which pumps out excess water.

GOAL FOR STORM DRAINAGE AND FLOOD CONTROL

I-4: To provide adequate and appropriately-designed storm drainage and flood control facilities to minimize the risk of flooding while reducing pollution from stormwater runoff.

Policies:

I-P4.1: Prioritize improvements to Redwood City's storm drain system in areas that are prone to flooding by various means including preventive and low-impact measures as well as maintaining, upgrading, and constructing new flood prevention infrastructure.

I-P4.2: Redwood City shall implement policies CO-P1.1 – P1.4 in the Conservation Element under Water Quality sub-section. These measures include reducing the amount of impervious surface area, using Best Management Practices, maximizing on-site infiltration of stormwater runoff in areas of new development

and redevelopment, and prohibiting the discharge of pollutants into storm drains, creeks, and other water bodies.

I-P4.3: Redwood City shall work with other cities located within its watershed area, **including San Carlos, Woodside, Menlo Park, and Atherton**, along with San Mateo County to pursue policies and measures to reduce flooding while sharing the costs of major capital improvements to reduce flooding.

I-P4.4: Support volunteer efforts by property owners and other interested parties to maintain, restore, and enhance urban creeks and riparian habitat through periodic clean-ups and planting of riparian vegetation.

I-P4.5: Redwood City's storm drain system shall be maintained and upgraded to effectively handle runoff while eliminating the potential for flooding.

I-P4.6: The levees in Redwood Shores that face San Francisco Bay shall be maintained to withstand a 100-year flood.

Actions:

I-A4.1: Redwood City shall implement Actions CO-A1.1 – A1.12 as described in the Conservation Element under the Water Quality sub-section, which are intended to reduce and/or eliminate stormwater runoff. These actions include enforcing Best Management Practices for new development, eliminating runoff from areas where toxic waste and materials are stored, elimination of sedimentation, and reducing the amount of impervious surface.

I-A4.2: Enforce restrictions on new buildings, grading, and disturbance of land within 30 feet of creek center lines or 25 feet

from the top of the creek's banks as specified in Article 32, Section 32.12(F) of the Redwood City Zoning Ordinance.

I-A4.3: Pursue efforts to maintain and restore creeks and streams to a more natural state through such measures as daylighting, restoration of riparian habitat, and creating linear parks along creeks.

Energy

Electricity

Redwood City's electric service is provided by Pacific Gas and Electric Company (PG&E), which has supplied much of Northern California with gas and electricity since the early twentieth century. PG&E obtains electricity from different generation sources that include hydroelectric, fossil fuels, nuclear, wind, and geothermal.

The electricity that is generated from these sources is moved through the transmission grid, a complex network of high-voltage transmission lines, switching facilities, and substations. PG&E's transmission grid is interconnected with those of other electric utility companies and public power agencies in western North America that includes portions of Canada and Mexico, enabling PG&E to import and export electricity to and from outside of its service area.

The high-voltage transmission lines that deliver electricity to Redwood City and the surrounding Bay Area are rated at 230kv, 115kv and 60kv (1kv=1,000 volts). They are supported on steel lattice towers, steel poles, or tall wood poles. Several local substations located in or adjacent to Redwood City receive the high voltage electricity (Map I-6) where it is reduced to 12kv or 4kv distribution voltages.

Distribution lines are supported overhead on wood poles or in underground conduits. Transformers reduce the distribution voltages to 480, 220, or 120 volts to serve businesses, industries, and individual residences. Transformers are mounted on poles, or if the lines are underground, on surface concrete pads or in underground vaults.

Most of the electric utility lines (as well as cable TV and telephone lines) are routed along city streets or other city-owned rights-of-way. PG&E and other utilities are permitted to use these rights-of-way under franchise agreements with the City. Franchise agreements usually require a fee paid by the utility to the City. The franchise might also include a series of conditions which the utility must comply with.

The high-voltage transmission grid and local distribution system must have sufficient capacity and reliability to prevent the likelihood of overloads and resulting blackouts. If a new project is planned that requires additional electric demand, PG&E will upgrade or extend its connecting distribution lines to provide reliable power delivery.

Constructing new high-voltage transmission lines to improve capacity and reliability is expensive and can be particularly difficult in densely-developed urbanized areas. In order to reduce the need to construct new transmission lines, PG&E has increased electric transmission capacity on some of its existing lines, replacing older electric cables with cables designed for more capacity. Some transmission line circuits have been upgraded to higher voltages.

In 2006 a new 230kv transmission line circuit was completed between Jefferson Substation, located just west of Redwood City on Canada Road, and Martin Substation near San Francisco. Most of the transmission line was placed underground for aesthetic reasons and because of land use constraints. Currently, no new major transmission lines are planned that will pass through Redwood City.

Undergrounding

The proliferation of overhead utility lines and poles has long been cited as a source of urban visual pollution. Since the mid-1960s most new developments have been built with underground electric and telephone service. This was largely due to technical advances that reduced the cost of undergrounding utility lines. However, undergrounding existing overhead utilities can be complicated and expensive. Current City codes require new building projects to underground overhead utilities that are located within their property or on their frontage. Undergrounding overhead utilities is also done in conjunction with major street improvements.

Unlike local electric distribution lines and telephone cables, undergrounding high-voltage transmission lines is an expensive undertaking, because of more stringent insulation requirements. In general, undergrounding high voltage lines is mostly done in built-up urban areas that lack the space for sufficient right-of-way clearance for overhead high-voltage lines.

In Redwood City, portions of some existing high-voltage transmission lines could potentially be placed underground. An example is the Inner Bayfront area which is traversed by two parallel double-circuit transmission lines supported on steel towers. Placing these lines underground would improve the attractiveness of this area for new development, particularly new residential development.

Electromagnetic Fields

Electromagnetic fields (EMF) result from electric current passing through a conductor. EMFs can be emitted from high-voltage transmission lines and household appliances. There have been concerns over the possible adverse health effects of exposure to EMF emitted by high-voltage transmission lines including leukemia, certain types of cancer, and miscarriages. Research directly correlating EMF

exposure to serious health problems has so far been inconclusive, however.

Despite the uncertainties of health risks from exposure to high-voltage transmission lines, several electric utility companies, including PG&E, have taken steps to reduce EMF exposure when designing new and upgraded electrical facilities. PG&E provides customers with the latest information on EMF and will conduct EMF measurements on request. Since magnetic field strength decreases significantly with distance from the source, establishing minimum distances from high-voltage transmission lines for potentially sensitive uses such as residences, schools, hospitals, and day-care centers may be appropriate.

Energy Conservation and Distributed Generation

The **Conservation Element** describes measures to reduce energy consumption, including the use of energy-efficient household appliances. The use of green building techniques and improved insulation can also reduce electricity needs for air conditioning, which can put a major strain on power demand during periods of hot weather. In addition, the development of small-scale distributed electric power generation sources such as solar power and cogeneration can provide locally produced power which can provide some degree of energy self-sufficiency while reducing the amount of electricity that must be imported.

Natural Gas

Like electricity, natural gas is supplied by PG&E. Natural gas is conveyed through a network of pipelines that connect gas fields located hundreds of miles away with major population centers, including the San Francisco Bay Area. Natural gas fields are located in the southwestern states, particularly New Mexico and western Texas, southern Wyoming and western Canada. Smaller natural gas fields are located in the southern San Joaquin Valley and parts of southern California.

Three main PG&E gas pipelines originating from a transmission pipeline terminal in Milpitas run the length of the Peninsula, terminating in San Francisco. One pipeline parallels the 101 Freeway and two parallel pipelines run adjacent to Interstate 280. A cross-connection between these pipelines runs through San Carlos. A regulator station draws the gas from this pipeline to supply Redwood City. A lateral network of smaller diameter pipelines distributes the gas for local use to individual customers.

GOAL FOR ENERGY INFRASTRUCTURE

Goal I-5: To work with PG&E and other energy suppliers and state and federal energy regulatory agencies to assure that the City's electric and gas distribution systems are safe, reliable, and environmentally sound and meet current and future needs.

Policies:

I-P5.1: Reduce the visual impact of overhead utilities, including electric lines, by working with PG&E to maximize opportunities to place them underground.

I-P5.2: Implement energy conservation measures as described in the Energy sub-section of the Conservation Element and efforts to develop small-scale, distributed energy (e.g. solar power, cogeneration, biomass) to reduce the amount of electricity drawn from the regional power grid, while providing Redwood City with a degree of energy self-sufficiency.

I-P5.3: Require that improvements and maintenance to electric and gas transmission and distribution systems to accommodate new growth are performed in a manner that maintains safety, reliability, and environmental compatibility.

I-P5.4: Underground high-pressure gas pipelines shall be protected from new development and construction and maintained to assure maximum safety.

Actions:

I-A5.1: Redwood City shall coordinate with PG&E to analyze the feasibility and cost of undergrounding portions of its overhead high-voltage transmission lines within existing developed areas and areas designated for new development.

I-A5.2: Continue to enforce policies for undergrounding utilities in conjunction with new development as well as major street and roadway improvements.

I-A5.3: Review proposed new utility projects to assure that they are safe, environmentally sound, and compatible with surrounding land uses.

Communications and Information Technology

An effective communications system is essential to the efficient operation of business, government, and for individual convenience. Improvements in communications and information technologies during the latter half of the twentieth century such as satellites, the internet and the widespread use of personal computers and cellular telephones has radically changed how daily affairs are conducted. These newer technologies require an infrastructure capable of providing sufficient capacity capable of providing fast and reliable communications.

Telephone Service

Telephone service in Redwood City is provided by American Telegraph and Telephone (AT&T). Telephone cables are supported on utility poles or placed underground. AT&T maintains and upgrades its facilities in conformance with California Public Utilities Commission regulations.

In addition to its traditional role of providing telephone service, AT&T has branched out to provide a variety of communications services, including internet service, wireless telephone service, and satellite television.

The widespread use of cell phones for business and personal communications has resulted in the proliferation of telecommunications antennas. These antennas are typically supported on freestanding pole structures varying in heights of 100 to 200 feet or more or on existing structures such as rooftops, church steeples, and flagpoles. These facilities also include a small enclosure near the base of the structure to house switching and control equipment.

Telecommunication antennas are not without their visual impacts. Like overhead utility lines, poorly-sited antennas can contribute to visual pollution. Utilizing existing structures for installing communications antennas rather than freestanding towers can reduce visual impacts. At the same time, efforts must be made to make these installations as uncluttered and unobtrusive as possible. This can mean camouflaging equipment and carefully integrating it into the building's architecture.

In addition to their visual impacts, these installations can also emanate low levels of noise from the control equipment. Although this may not be a problem in commercial and industrial areas, it can create potential problems in residential areas. Consequently, residential installations must not exceed ambient noise levels within existing residential neighborhoods (refer to the **Noise Element**).

Telecommunications facilities, regardless of where they are located, must comply with Federal Communications Commission (FCC) regulations so that they do not interfere with other communications systems such as radio, television, and computer communications. Furthermore, these installations must also comply with state and federal requirements governing telecommunications facilities including regulations governing EMF and radiation exposure.

Cable Television

Redwood City's cable television service is provided by Comcast Corporation and RCN via a franchise agreement with the City. Under these franchise agreements Comcast, Redwood City receives 5% of its gross revenues generated by its cable television operations in Redwood City. The City also receives public, educational, and governmental capital grants. Comcast will install a new fiber optic network, by the end of 2007, connecting different public facilities in Redwood City for video, voice, and data communication.

In addition to cable television, these entities provide other communications services that include digital cable, high-speed internet connections, and digital phone lines.

Internet Communications

Data and information via the internet can be transmitted in a number of ways. Existing telephone lines have been the most common means of transmission infrastructure for internet communications, but this is being supplanted by fiber optic cable technology. Unlike conventional telephone lines, fiber optic cables are thinner, lighter, and have a greater bandwidth for more capacity. Fiber optic cables can be routed underground or placed on existing overhead utility lines. In recent years PG&E has installed fiber optic cables on its towers in some of its existing electric transmission line corridors. At least three underground fiber optic communications lines run along the CalTrain right-of-way through Redwood City which include Sprint, AT&T, and MCL.

Wireless Technology

Wireless internet communications known as “wireless fidelity” or simply wi-fi, are becoming a more common means of accessing the internet. A number of cities have or are investing in wireless systems or wi-fi zones. Within these zones, a series of access points or “hot spots” are available where anyone with a computer can access the internet at no cost. All of the public libraries in San Mateo County, including those in Redwood City, currently have wireless internet access.

The major advantage of a wireless infrastructure is its flexibility. In addition to providing individual internet access, it can be used for a number of other purposes. Private businesses and public agencies that employ mobile workers in the field can benefit greatly from wireless communications. Communications are simplified and employee productivity can be improved significantly and various economies can also be realized. Dispatching, troubleshooting, and work orders can be handled in the field using laptops, thereby reducing the need to make vehicular trips and resulting in fuel savings.

Wireless communications are particularly beneficial to law enforcement, fire departments, and other public safety agencies, and can be indispensable in emergency situations. Utilities can use wireless devices for reading gas and electric meters and to monitor gas and electric lines. Schools and libraries can also benefit from wireless networks. Presently, all libraries in San Mateo County provide free wireless connections for patrons. Some local high schools and community colleges have developed their own wireless networks.

Access points for use by the general public are usually located in a public area such as a library or other public building. In some instances, public social spaces have also been utilized as hot spots. This can enhance the viability of the public realm, particular if they are

located in specific **social spaces** described in the **Parks and Open Space Element**.

Wireless Silicon Valley

Wireless Silicon Valley is a program to develop a large-scale wireless network covering an area of approximately 1,500 square miles that would include most of the Peninsula, and portions of Santa Clara, Santa Cruz, and Alameda counties. Redwood City is one of 39 cities participating in this program. The project is being sponsored by Joint Venture, an organization made up of representatives from business, government, labor, and education that was established to identify issues or problems impeding competitiveness in the Silicon Valley region and developing solutions to address these problems. The wireless network would provide free or low-cost internet access. Developing such a network will involve placing transmitters at intervals sufficient enough to allow for uninterrupted reception. The transmitter resembles a small box that can be mounted on light poles or building rooftops.

GOAL FOR COMMUNICATIONS INFRASTRUCTURE

Goal: I-6: To facilitate development of communications technologies that will allow for efficient and affordable communications for individuals, business, education and government functions.

Policies:

I-P6.1: Redwood City shall support efforts to develop improved communications technology in a manner that can provide affordable communications to Redwood City’s population while benefiting government, business, education and public safety.

I-P6.2: New buildings, particularly taller buildings, shall have sufficient space to accommodate wireless communications equipment.

I-P6.3: New freestanding telecommunications towers shall only be permitted when there are no feasible alternatives.

I-P6.4: Redwood City shall make efforts to accommodate future communications and information technologies as they develop.

Actions:

I-A6.1: The City shall modify the Zoning Ordinance as necessary to allow for installation of improved telecommunications and wireless infrastructure while minimizing visual, noise, and other impacts of such installations.

I-A6.2: Redwood City shall support the goals of Joint Venture's Wireless Silicon Valley project to obtain quality wireless internet access to benefit business, government, and education while providing improved communications opportunities for all of Redwood City's population.

I-A6.3: Telecommunications facilities including antennas, cables, and appurtenant equipment shall be located and installed in a manner that minimizes adverse impacts on adjacent land uses.

I-A6.4: Redwood City will review the installation of new communications infrastructure to assure that it is compatible with its surroundings and have a minimum of visual impact or other adverse nuisance (such as noise).

I-A6.5: Social Spaces, as defined in the Parks and Open Space

Element shall be designated access points for wireless internet access.

Solid Waste and Recycling

Local Waste Reduction and Recycling Programs

Redwood City is one of 12 member agencies that make up the South Bayside Waste Management Authority (SBWMA). The SBWMA is a Joint Powers Authority that was created in 1982 to facilitate and manage recycling and other waste management programs. The SBWMA contracts with private companies who are responsible for collecting, hauling and disposing household and commercial solid waste. SBWMA currently has a 10-year contract with Allied Waste, which collects and hauls waste to its transfer station in San Carlos where it is sorted. The contract will expire in 2010. Refuse that cannot be recycled is hauled to the Ox Mountain landfill near Half Moon Bay or the Hillside landfill in Colma. Refuse is sometimes shipped to other landfill sites farther away, depending on shipping costs and the type of material to be disposed.

Recyclable household waste is picked up every other week. Redwood City and San Mateo County also have a number of different types of recycling programs available for different types of solid waste where recyclable material can be dropped off, and in some cases sold. Some of these programs are City or County sponsored while others may be run by private and non-profit organizations.

Redwood City, along with a number of local organizations sponsors information and education programs for both residential and commercial recycling. There are also County-wide and regional programs that promote and implement various recycling programs. San Mateo County sponsors Recycleworks, administered by the County Public Works Department. Recycleworks promotes recycling,

composting, waste prevention, and green building programs for residents and employees by sponsoring education programs and information on how and where to dispose of recyclable solid waste.

Large-scale recycling of materials that once would have been considered just another form of solid waste has become common practice. There are businesses that salvage, purchase, and sell recycled materials, or reprocess recycled materials for resale. Much of this large scale or industrial recycling is done by private companies located in Redwood City. For example, a number of plants crush and recycle old concrete salvaged from building demolition. Large quantities of scrap metal, much of which is derived from abandoned automobiles, are exported to steel plants in China and India from Redwood City's port facilities.

In 1995 Redwood City began a program to recycle its own solid waste generated from various City operations and activities. Most of this recycled material is collected and stored in the Redwood City Corporation yard where it is eventually sent out for recycling. Some material such as tree trimmings and other green waste is used to make compost.

A considerable amount of solid waste is made up of hazardous materials. A typical household may contain a large quantity of toxic substances like paint, cleaners, pesticides, batteries, oil, and fluorescent tubes that can pose a hazard if they are improperly disposed. San Mateo County sponsors the Household Hazardous Waste (HHW) Program, which educates the public about the dangers of toxic household waste and how they should be properly disposed. Handling hazardous waste and hazardous materials are addressed in the **Safety Element**.

Waste Reduction and Diversion

In order to reduce the amount of solid waste generated in California, the California Integrated Waste Management Board (CIWMB) was created in 1989 to oversee the reporting of solid waste disposal by cities and counties. The CIWMB required a 50% reduction in the amount of solid waste that cities and counties send to landfills by the year 2000. In response to the 50% requirement, cities and counties implemented a series of programs for recycling materials that would otherwise be disposed. Redwood City's waste diversion rate in 2000 was 47%, but exceeded the 50% reduction goal in 2003.

Benefits of Recycling

Using recycled materials can reduce the need to extract raw materials, thereby conserving resources. Recycling can also reduce energy consumption. Manufacturing new products made from recycled materials often uses less energy than from raw materials. For example, 95% less energy is used to make a can from recycled aluminum than from extracting and processing bauxite ore to make 'new' aluminum. Manufacturing glass products from recycled glass requires less heating for processing so that furnaces can run at lower temperatures, thereby saving energy and prolonging equipment life.

In addition to using disposed material for recycling, organic solid waste such as food scraps, fallen leaves, grass clippings and plant and tree trimmings can be used for compost. This can further reduce the amount of solid waste that would otherwise go to landfills.

Debris from construction and building demolition produces large quantities of solid waste, much of which can be recycled or processed for reuse. Old concrete from a demolished structure can be pulverized to make cement. Structural steel members and rebar can be reprocessed to make new steel products. Other salvaged metals like copper, aluminum and brass can also be processed for reuse. One of the basic principles of "Green Building" **which is described in detail in**

the **Conservation Element** is to use recycled materials in new construction. In many respects, recycling building material from demolitions is becoming less expensive than hauling it away to landfills.

Electronic Waste

Electronic waste or E-waste has become an increasingly significant solid waste source in recent years. Continued improvements in electronic technologies result in rapid obsolescence of electronic equipment including personal computers, television sets, stereo equipment, and cell phones, which are being discarded at an increasing rate. A major problem with E-waste is that it contains significant amounts of hazardous material such as lead, mercury and cadmium.

Some recycling centers will accept E-waste, and there are special days where E-waste can be dropped off. However, more effort must be made to provide opportunities to control E-waste and avoid potential pollution problems. Some computer manufacturers have started buy-back programs of obsolete equipment for its customers. Some manufacturers are designing equipment that can be easily disassembled for recycling. Given the problems associated with E-waste, legislation may be necessary to regulate and control E-waste while requiring recycling.

GOAL FOR SOLID WASTE AND RECYCLING

I-5: *To reduce the generation of solid waste by continuing to implement programs such as recycling, composting, source reduction, and the appropriate disposal of household hazardous waste.*

Policies:

I5-P1: Redwood City shall continue reducing the amount of solid waste that it sends to landfills and will attempt to exceed the

required 50% minimum landfill diversion rate as specified in the California Waste Management Act of 1989.

I5-P2: Redwood City shall promote green building practices with respect to recycling material from building demolition and using recycled building materials in new construction.

I5-P3: Support retention of businesses and industries in Redwood City involved in recycling materials.

I5-P4: Redwood City shall take the lead in waste reduction by promoting recycling and composting, purchasing post-consumer recycled products, using recycled materials in all City operations, and reducing the overall amount of solid waste that is produced.

I5-P5: Promote recycling by supporting local public and private recycling programs that provide opportunities for businesses and the general public to recycle refuse.

Actions:

I5-A1: Implement green building programs that require salvaging and recycling material from building demolition and the use of recycled building materials in new construction.

I5-A2: On-site space to store recyclable materials shall be incorporated into new building construction as specified by City Ordinance.

I5-A3: Provide educational programs to schools, businesses, and the general public on the benefits of recycling and the various recycling opportunities available in San Mateo County.

I5-A4: Redwood City shall encourage local school districts to participate in recycling programs.

I5-A5: Redwood City shall explore the feasibility of developing a city-wide recycling program that provides convenient and accessible recycling opportunities for all of its residents for all types of recyclable materials.