

## History of the Santa Cruz City Water Department

*By Santa Cruz City Water Department*

### Historical Background

For Santa Cruz, the beginning of water supply development took place in 1792 when the Padres of the Mission Santa Cruz directed the Mission's Indian residents to dig a ditch from the natural springs near the present University of Santa Cruz entrance to the Mission site. That ditch and the adjacent path became High Street. Especially useful during the summer months, this small aqueduct enabled the Padres to occupy a location of superiority above the village and yet not be burdened with the labor of gathering water from the river a hundred feet below.

For the next half century, this water supply system is known to have supplied the Mission's building and household needs but reached its limit in 1844 when the Mexican-appointed mayor [alcalde], Don Manuel Rodriguez, apportioned the aqueduct water to eight landholders and the Mission by decree.

During this time, community growth in the "Flats" (Pacific Avenue area) sustained by water from freshets, shallow wells, and the river, advanced to proportions which made it profitable for Mr. E. M. Morgan to take up rights to water from the San Lorenzo River and install some pipework in exercise of his franchise to serve the City of Santa Cruz subsequent to its incorporation in 1866.

Mr. Morgan's franchise and water works were purchased in 1876 by Mr. H. K. Lowe, a San Francisco financier. Mr. Lowe then organized the Santa Cruz Water Company with a capital stock of \$100,000, and Mr. Morgan, with 50 shares and his knowledge of the system, was hired as Superintendent at a salary of \$80 per month. Before the year was out, a lower reservoir holding 350,000 gallons had been built at the foot of School Street and another on High Street holding 200,000 gallons. The town had a distribution system installed by a crew of 100 men, and had installed steam pumping equipment on the river to fill both reservoirs. By November 1876, 200 customers were being served and 100 more were being connected. A \$50,000 bond issue was authorized in July 1878, and a second of the same amount was sold in May of the following year.

The company developed other water sources as the town grew. By late 1876, it had installed a diversion on Branciforte Creek that could deliver water to the School Street reservoir by gravity. In September 1881, it applied for and received an appropriation of 500 miner's inches from Majors Creek and Coho Creek. This accomplished, the company sold the "pump works" (house, lot, and boiler) on the San Lorenzo River for \$800, "there being no further use of the San Lorenzo River."

In August 1886, the company and its entire holdings were sold to the City of Santa Cruz for \$85,000, financed through the City's sale of Bonds to the Bank of Santa Cruz, the Anglo-Californian Bank, and to Mr. Lowe. However, as the result of a suit by a Mr. Steen, the Superior Court ruled that the "Mayor and the Common Council" did not have the authority to issue bonds. The whole transaction was voided and the bond issue was retracted.

The company was now deeply in debt and so sold its holdings to Mr. F. A. Hihn who, between 1890 and 1916, operated and expanded the system to the Seabright area.[1]

Santa Cruz is situated at the mouth of the San Lorenzo River, but this stream does not furnish an adequate source of supply of domestic water in exceptionally dry years. In 1890, after unsuccessful attempts to purchase an existing private water company, the City bought the water rights on Laguna Creek and undertook the construction of a dam, reservoir, and pipeline extending about twelve miles to Santa Cruz. In 1916, the purchase of the water company was finally effected, and the two systems were consolidated under municipal ownership. One of the sources of supply thus acquired is still in use, though the others have been abandoned. In 1923, funds were provided by general obligation bonds for a 39 million gallon reservoir and improvements to the distribution system and, in 1928, a pumping plant on the San Lorenzo River was constructed. In 1950, Santa Cruz authorized another general obligation bond issue in the amount of \$600,000 for improvements to the transmission and feeder mains of the water system.[2]

In 1958, revenue bonds in the amount of \$5,500,000 were authorized to provide additional storage facilities, to construct a modern water treatment plant, and to augment existing pipelines, pumping facilities and related system works. These bonds, the 1959 Water Revenue Bonds, were sold in two series: \$3,000,000 Bonds of Series A in 1959, and \$2,500,000 Bonds of Series B in 1960. Proceeds from these sales were used to construct major facilities, principally the Newell Creek Dam, Loch Lomond Reservoir, and the Graham Hill Water Treatment Plant. In 1963, additional revenue bonds in the amount of \$1,300,000 were authorized by the voters and were sold later that year for more improvements to the system, including acquisition of land for Zayante Reservoir, development of new facilities to serve the University and adjacent area, and modifications to the existing system.[3]

At the time the \$1,300,000 revenue bonds were sold, \$5,335,000 subordinated Refunding Water Revenue Bonds also were offered. These bonds were issued to take advantage of a lower borrowing rate than the average of the revenue bonds sold in 1959 and 1960. Since the earlier issues were not callable until June 1, 1970, proceeds from the refunding bonds were used to purchase sufficient U.S. Treasury 4% bonds which, together with reserves and revenues, were used to retire the outstanding bonds issued in 1959 and 1960 on January 1, 1971.[4]

The City Water Commission had given considerable study to the long-range financing and development plans of the water system. As a result of the Commission's deliberations, a recommendation was made to the City Council that a comprehensive 12-year program be presented to the voters in the form of a water revenue bond issue. The City Council accepted the Water Commission's recommendation and placed on the April 1967 municipal election ballot a proposal authorizing the issuance of \$9,600,000 in water revenue bonds. The voters approved this measure by a 3 to 1 vote, and the City is now in a position to sell revenue bonds for improvements as they are required. Of this authorization, \$2,100,000 was earmarked for the purchase of Zayante watershed land and \$3,400,000 was earmarked for the construction of Zayante Dam.

Proceeds from the sale of the First Series 1967 bonds were used for various system improvements, including expansion of the Graham Hill Water Treatment Plant, acquisition of Zayante watershed land, purchase of the Beltz Water Company, and transmission main improvements. Proceeds from the Second Series were used in the construction of the Beltz Iron Removal Plant and additional watershed land acquisitions for the Zayante Project. Third Series Bond proceeds were used for the construction of the Felton Diversion Station and Bay Street Reservoir Roof projects. There remains a balance of \$4,400,000 in authorized but unsold bonds.[5]

On July 1, 1967, following a year of negotiations, the City took ownership of the Beltz Water Company, a private water utility. The main extension agreements entered into by Beltz Water Company with developers were assumed by the City. This purchase added approximately one square mile to the service area and the 1,500 customers represented about \$100,000 in annual revenue in 1967 dollars to the City water system. The acquisition also provided the City with an additional ground water supply source.[6]

Two additional water systems were purchased during calendar year 1969: Rolling Woods Utilities, Inc., for \$33,250 and the Pestana Water System for \$36,615. These systems were serving subdivision developments on the fringe area of the City of Santa Cruz Water System and provided 360 additional customers and \$40,000 in revenue to the City's operation. The systems were integrated into the existing water system without additional personnel.

In 1984, \$11,700,000 were obtained through Certificates of Participation, a private source of funding. These funds were to be used for:

- Refurbishing the Graham Hill Water Treatment Plant, bringing it up to modern standards.
- Constructing needed additional treated water storage tank serving the Pasatiempo/Carbonera and Rolling Woods areas.
- Replacing deteriorated water transmission and distribution mains, primarily a one and three quarter mile section of the Coast Main from Bay Street Reservoir west.
- Doubling the capacity of the Beltz Water Treatment Plant from one to two million gallons per day.
- Constructing a new water quality laboratory.
- Providing for additional groundwater exploration.
- Installation of a permanent aeration system in Loch Lomond.
- Several other maintenance and construction projects.

## **Water Supply**

The City has available both surface and underground sources of water, with the former by far the most important. Three main production systems are now in use, each arising from the source of water available at the time facilities were acquired or constructed. The systems included those designated Coastal Streams, San Lorenzo River, and Loch Lomond, which together accounted for nearly 90% of production in 1985-86. The Beltz Wells, reclaimed filter wash water, and the Tait Street Wells accounted for the balance.

The Coastal Streams comprise water diverted from Laguna Creek, Reggiardo Creek, Liddell Spring and Majors Creek, located approximately six miles northwest of the westerly city limits. Laguna Creek was acquired as a source in 1890, Liddell Spring in 1913, and Majors Creek in 1916. Water from this system flows by a combination of gravity and low lift pumping to the Graham Hill Water Treatment Plant. The production from this source has varied from 593 to 1,240 MG (million gallons) (1,819 to 2,807 acre-feet) in recent years and has supplied almost 28% of City needs. Without storage reservoirs, the safe yield is limited to the flow during a dry year, or to an estimated 443 MG (1,360 acre-feet) in 1931, the driest year on record.

The San Lorenzo River flows through the City and the water intake from this source is located on the west bank of the river near the northern City limits. The intake was redesigned and relocated from the east bank of the river to the west bank in 1984. At the same time all electrical controls and switch gear were converted to modern equipment and raised above historical flood levels. Surface diversion rights date back to 1924. Three wells are also situated here, at depths between 85 and 104 feet, and produce water at the rate of 2 MGD (million gallons per day). Water from the San Lorenzo system is pumped to the Graham Hill Water Treatment Plant, a distance of nine-tenths of a mile, where it is processed. The safe yield of the San Lorenzo system, using the 1931 year, is 2,017 MG (6,190 acre-feet) from this surface flow and 147 MG (450 acre-feet) from wells.

The Loch Lomond system was financed by the 1959 bonds. Newell Creek, a tributary of the San Lorenzo River, was dammed about ten miles north of the city limits to create the Loch Lomond Reservoir. Drawing from a watershed of over eight square miles, and with storage capacity of 2,812 MG (8,600 acre-feet), run-off that was previously lost to the ocean is now usable. The Newell Creek Dam is an earthfill barricade, 190 feet high and 750 feet in length. Completed in the Fall of 1960, impounded water first ran over the spillway in March 1963. The California Division of Safety of Dams of the Department of Water Resources has investigated the seismic safety of Newell Creek Dam. They concluded that the

structure is safe against the maximum probable earthquake of 8.4 on the San Andreas Fault but that the capacity of the spillway needed to be increased. Model studies of the spillway, completed in 1984, determined that the required additional capacity could be obtained by raising the height of the westerly wall of the spillway. This work was completed in 1985. The City is entitled to storage of 8,300 acre-feet of water here. The San Lorenzo Valley County Water District has a right to receive up to 12-1/2% of the safe annual yield of the reservoir, and fish releases require 244 MG (750 acre-feet) per year, much of which can be recovered at the San Lorenzo intake downstream. Using the driest year, the safe yield to the City from the reservoir, and thus the Newell Creek system, is estimated at 749 MG (2,300 acre-feet) per year.

With the acquisition of the Beltz Water System in 1967, the City obtained a further source of groundwater. With proceeds from the sale of the 1967 bonds, First Series, the City completed construction of a 1 MGD iron and manganese removal treatment plant in the Beltz area which receives water from #1, #2, #4, #5, #6, and #7 Wells. These wells have a combined capacity of 2 MGD per day. Well #4, out of production for several years, was reconstructed in 1985. With the acquisition of the Pestana Water System serving the Santa Cruz Gardens subdivision, three minor wells were obtained which are being kept on a standby basis for use if required.

At the end of fiscal year 1984–1985, the consulting firm of Kennedy-Jenks had completed design of necessary improvements to the Beltz Treatment Plant to double its capacity to match the combined output of the Beltz area wells. Construction of the new facilities was nearly complete by the end of fiscal year 1985-86. These improvements will bring its capacity to 2 MG, providing an additional 1 MGD capacity to meet peak demands in the Beltz service area and match existing well capacity. This system can contribute 245 MG of water to the system.

It became evident in 1983 that groundwater was to play an increasing role in City water supplies. At that time, an accelerated search was begun to find and develop more groundwater supplies. Test drilling began in the summer of 1985. Four locations within the service area are being investigated: along the North Coast, north of town in the industrial area, the general area around Harvey West Park, and in the Live Oak area.[7]

During the year [1984–1985], the City retained the services of Luhdorff and Scalmanini of Davis, California, to perform an in-depth evaluation of existing hydrogeologic data to determine feasibility of development of additional groundwater from the North Coastal and Live Oak areas. After considerable study, the consultant recommended an extensive program of field exploration, including test drilling of two sites on the North Coast and two sites in the Live Oak area. The City Council authorized the consultant to perform this work, with the exception of one test well site in the Live Oak area, which [was to] be explored at a later date.

In addition, Luhdorff and Scalmanini was retained to evaluate existing Beltz Well #4, which [was] inoperable, to determine the cause of failure and to recommend and implement measures to rehabilitate the well and place it back in service. This project was successfully completed by abandoning the existing well and installing a completely redesigned replacement well of larger capacity and yield on the same site.[8]

Under an agreement with Soquel Creek County Water District and the City, the USGS performed a safe yield study of the Soquel-Aptos aquifer system. The study was completed in the spring of 1979, and concluded that the yield of the basin for domestic use was far less than had been earlier supposed. Earlier USGS estimates had placed the yield at 7,500-acre-feet for the entire basin, which is shared with Soquel Creek County Water District, private irrigators, and others. The recent USGS estimate of safe yield indicated that only approximately 4,400 acre-feet is available for domestic use from the basin. Total withdrawals were estimated to be approximately 6,000 acre-feet which indicated that groundwater was being mined at the rate of approximately 1,600 acre-feet per year.

Meanwhile, the Soquel Creek County Water District was proceeding with its own analysis of the USGS Report, utilizing the services of Luhdorff and Scalmanini, consulting engineers from Sacramento, California. This firm scrutinized all of the published material pertaining to groundwater conditions, including Muir's USGS Report, Hickey's earlier USGS Report, and Thorup's review. The conclusions reached in this effort were that no evidence of seawater intrusion could be found,

existing data was insufficient to determine basin yield accurately, and that extensive groundwater monitoring should be initiated to keep track of groundwater conditions to spot and head off possible problems.

This still leaves open the question of groundwater basin yield for the purpose of determining supply system capacity. According to Luhdorff and Scalmanini, this question cannot be resolved until additional monitoring data has been collected and analyzed. Safe yield estimates previously determined are conservative and will be used until more data is available.[9]

The City's water rights to the Coastal Streams were obtained by purchase of riparian water rights of downstream landowners at the time Laguna Creek and Liddell Spring were developed and by use prior to 1914, the date of the State Water Commission Act. Rights on Majors Creek, acquired through purchase of a private water company, were established in 1881, when a predecessor company purchased downstream rights.

Since water from the Coastal Streams has been continuously used by the City, these rights are established as appropriative rights. Appropriative rights to the San Lorenzo River consist of License No. 1553 dated June 9, 1924, to divert 4.0 MGD, License No. 7200, dated July 10, 1963, to divert 3.9 MGD, and Permit No. 16601, dated July 23, 1973, to divert an additional 977 MG to offstream storage. Newell Creek water is covered by License No. 9847, dated September 17, 1971, which provides for 1,825 MG of storage per annum in Loch Lomond. The San Lorenzo appropriation covers the calendar years while the Newell Creek License is for the water year from September 1 to July 1.

The Felton Diversion Station on the San Lorenzo River diverts water from the river during high flow periods for off-stream storage in Loch Lomond Reservoir. This facility has added 977 MG of water production annually.

The sum of safe yields from existing supply sources in the driest year on record now totals 4,578 MG, summarized below:

*Water Supply Safe Yield Summary*

<b>Source</b>	<b>Yield (in millions of gallons)</b>
Coastal Streams and Springs	443
San Lorenzo River, Santa Cruz	2,017
Tait Wells	147
Loch Lomond	749
Beltz Wells	245
San Lorenzo River, Felton	977
	<b>4,578</b>

The Graham Hill Water Treatment Plant, constructed with 1959 Bond proceeds and expanded with 1967 First Series Bond proceeds, when completed had a rated capacity of 24 MGD and could be operated at 36 MGD for short periods. Since it has been completed, water quality requirements have stiffened and the plant's present capacity is 16 MGD, with temporary peaking capability just under 20 MGD. Construction began in the summer of 1986 to modernize the plant and restore its capacity to the original values. The principal plant facilities are an operations building, six flocculation tanks, three sedimentation basins, six rapid sand filters, and storage tanks for filtered water, used wash water, and sludge. Telemetering equipment remotely controls and monitors principal supply and distribution facilities, including operation of pumps to bring raw water from Loch Lomond and visual indications of distribution reservoir storage levels. The operations building and all channels and pipelines are designed for future expansion to a rated capacity of 36 MGD. Land adjacent to the plant has been acquired to permit expansion as needed.

The treatment plant can receive water produced from all sources except the Beltz Wells. Six pumps located at the Felton Booster Pumping Station can bring 11 MGD from Loch Lomond, and capacity in the pipeline will allow for an increase to 17 MGD with the installation of additional booster pumps when new water sources are developed.

Treatment at the plant consists of pre-chlorination, post-chlorination, chemical coagulation, filtration, pH control, and taste and odor control. A coagulant aid is used to permit high-rate filtration with dual media filters. The Water Quality Laboratory, which is licensed by the State Department of Health as a non-commercial laboratory, has expanded its capability for testing the chemical and physical properties of water. Routine tests are now made for all of the constituents listed in Title 22, California Administrative Code, including calcium, magnesium, fluoride, nitrate, silica, total hardness, sulfide, total alkalinity, dissolved solids, carbon dioxide, dissolved oxygen, taste and odor, pH, temperature, color, and turbidity.

Treated water from the Graham Hill plant flows into a filtered water storage tank with a capacity of 1 MG. Other covered storage facilities in the distribution system include the 39 MG Bay Street Reservoir, which is also concrete-lined, and several storage tanks holding a total of 8.5 MG. Total distribution storage capacity equals 43 MG.

The City's distribution system serves an area of approximately 30 square miles and contains some 300 miles of pipeline. Elevations within the area range from sea level to about 1,000 feet, with most of the services below the 180-foot level. These are served by gravity from the Bay Street Reservoir, Delaveaga tanks or other smaller storage facilities. Water for service above this level is provided by booster pumping stations and reservoirs located at eight sites, the highest at base elevation 982 feet above sea level.[10]

Mean annual runoff at the San Lorenzo River was 104,700 acre-feet between the years 1894 and 1947, the period covered by the State Water Resources Bulletin No. 1, Water Resources of California. In a dry year, in which total runoff is approximately 15,000 acre-feet, river flow during the months of August and September average only 6 cubic feet per second. This meager flow, contrasted with the maximum flood flow recorded of 30,400 cubic feet per second in December 1955, shows the importance of adequate water storage capacity to the City.[11]

During the 1970s a number of events transpired that affected regional water planning and spurred interest in an updated comprehensive water planning and land use document. The 1976–1977 drought strained local water supplies to their limit and raised people's level of awareness of the need for water conservation. Some local water districts stopped allowing new water connections to their systems due to perceived or actual shortages of supply. At the same time, a few water districts found themselves in the position of competing for use of the same water resources. A County water crisis seemed possible, and the need for cooperative management of a limited critical resource was becoming imperative.

In 1978, the people of Santa Cruz County adopted a growth management policy ordinance which, among other things, required that the Board of Supervisors each year set an overall growth rate for the year to come. The ordinance also required that future growth be directed into well-defined urban areas. In 1979, the people of the City of Santa Cruz also adopted a growth management ordinance. In 1980 and 1982, the County adopted an updated General Plan and Local Coastal Plan, respectively. These land use policies, adopted by the two major land use agencies in North Santa Cruz County, had the potential of affecting population trends in ways unforeseen by previous land use and water planning documents.

By late 1979, there was a clear need for an updated County Water Master Plan in order to consider more recent information and trends in population growth, water demand, and water supply availability, and in order to relate water supply planning to the growth management system then in place in the County of Santa Cruz. A Water Summit Group was formed as a multi-agency committee consisting of representatives of local water purveyors and planning agencies. An initial study of existing water supplies and demand projections indicated that potential water shortages could occur by 1990, and that sufficient data was not available to provide an adequate basis for future planning.

In December 1981, the Water Summit Group recommended that the County's water purveyors and land use agencies should jointly oversee the preparation of an updated Water Master Plan. Their mission should be to develop, as a cooperative project, an effective water management program within Santa Cruz County that treats water as a countywide resource and that contemplates the management of future demand for water, by actions of the land use agencies, as a part of the overall Water Management Program.

In December 1982, the member agencies of the Water Summit Group contracted to fund the Water Master Plan Study, and appointed representatives from each agency to the Water Policy and Planning Task Force. The Task Force was authorized to oversee and manage the preparation and completion of the North County Water Master Study. The Task Force selected the consulting team of EIP/HEA—a joint venture of EIP Associates and HEA, a division of J. H. Kleinfelder & Associates—to conduct the required technical studies.

The work was completed and a final report filed in June 1985. In the course of the work 23 background reports were prepared covering the areas of Groundwater Assessment, Surface Water Assessment, Resource Problems Analysis, Water Supply Alternatives Analysis, and Water Demand Analysis.

Its final conclusions were that water demands will continue to increase in the future and additional sources of supply will be needed by Santa Cruz and Scotts Valley. These additional needs would be modest and could be satisfied by conservation, full development of existing supplies, cooperative projects between agencies, and groundwater.[12]

## Footnotes

1. Santa Cruz City Water Department Annual Report: 1985-86, pp. 2–4.
2. Santa Cruz City Water Department Annual Report: 1978-79, p. 4.
3. Santa Cruz City Water Department Annual Report: 1985-86, pp. 4–5.
4. Santa Cruz City Water Department Annual Report: 1978-79, p. 4.
5. Santa Cruz City Water Department Annual Report: 1985-86, p. 5.
6. Santa Cruz City Water Department Annual Report: 1978-79, p. 6.
7. Santa Cruz City Water Department Annual Report: 1985-86, pp. 5–8.
8. Santa Cruz City Water Department Annual Report: 1984-85, p. 9.
9. Santa Cruz City Water Department Annual Report: 1983-84, p. 9.
10. Santa Cruz City Water Department Annual Report: 1985-86, pp. 8–9.
11. Santa Cruz City Water Department Annual Report: 1978-79, p. 11.
12. Santa Cruz City Water Department Annual Report: 1985-86, pp. 10–11.

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