Water System
Facilities Replacement Plan
(Life Cycle)

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INTRODUCTION

The Truckee Donner Public Utility District (District) provides water service to portions of the Town of Truckee, California, along with adjacent unincorporated areas of Nevada and Placer Counties. The population served is about 15,000 permanent residents with significant increases in population during holiday periods.

The District's water system is reasonably complicated, consisting of:

- 44 pressure zones
- 21 active wells, six inactive wells and one well dedicated to serving irrigation demand
- 39 storage tanks
- 26 pumping stations
- About 186 miles of pipeline from 2-inches to 24-inches in diameter
- 30 pressure reducing stations

These water system facilities do not have an infinite life span. Over time, facilities require maintenance and/or replacement. The type of maintenance varies with the facility. Storage tanks require periodic cleaning and painting. Pipelines require leak repair, flushing and valve exercising. Pump stations and wells require building maintenance, lubrication and rebuilding of pumps and motors and upgrading of electrical equipment.

Eventually, the costs to perform ongoing maintenance and repair on a facility exceed the value of that facility and it becomes more cost-effective to simply replace it with a new facility. Ideally, the need for such replacement can be identified years in advance and funding can be secured so that facilities are replaced in a planned systematic manner with a minimal impact upon the District's finances and operations.

INDUSTRY STUDIES

The topic of aging infrastructure has been the subject of public debates and a number of reports have been written on the subject recently. Among them are:

- *Clean and Safe Water for the 21st Century.* Prepared by the Water Information Network. Washington, DC. April 2000.

- *Dawn of the Replacement Era: Reinvesting in Drinking Water Infrastructure.* Prepared by the AWWA Water Industry Technical Action Fund. Denver, Colorado. May 2001.

- *Future Investment in Drinking Water and Wastewater Infrastructure.* Prepared by the US Congressional Budget Office. Washington, DC. November 2002.

- *The Clean Water and Drinking Water Infrastructure Gap Analysis.* Prepared by the US Environmental Protection Agency. Washington, DC. September 2002.

- *Water Infrastructure: Information on Federal and State Financial Assistance.* Prepared by the US General Accounting Office. Washington, DC. November 2001.

While these studies address nationwide issues regarding water and wastewater systems, many of the findings and recommendations are applicable to issues facing the District. The AWWA study contains information most relevant to Truckee. This study examined the infrastructure investment needs of 20 large and medium sized drinking water utilities. This study identified the following findings:

- Water utilities must make a substantial reinvestment in infrastructure over the next 30 years. The oldest cast iron pipes, dating to the late 1800s, have an average life expectancy of about 120 years. Because of changing materials and manufacturing techniques, pipes laid in the 1920s have an average life expectancy of about 100 years, and pipes laid in the post-World War II boom can be expected to last about 75 years. The replacement bill for these pipes will be hard on us for the next three decades and beyond.

- On average, the replacement cost value of water mains is about $6,300 per household in today's dollars in the relatively large utilities studied. If water treatment plants, pumps, etc., are included, the replacement cost value rises to just under $10,000 per household, on average.

- Demographic shifts are a significant factor in the economics of reinvestment. In some older cities, the per-capita replacement value of mains is more than three times higher than the average in this sample due to population declines since 1950.

- By 2030, the average utility in the sample will have to spend about three and a half times as much on pipe replacement due to wear-out as it spends today. Even so, the average utility will also spend three times as much on repairs in that year as it spends today, as the pipes get older and more prone to breakage.

- The water utilities studied concurrently face the need to replace infrastructure and upgrade treatment plants to comply with a number of new regulations to be implemented under the Safe Drinking Water Act. Many municipalities also face significant needs for investments in wastewater infrastructure and compliance. This concurrent demand significantly increases the financial challenge they face.

- Overall, in the 20 utilities studied, infrastructure repair and replacement requires additional revenue totaling about $6 billion above current spending over the next 30 years. This ranges from about $550 per household to almost $2,300 per household over the period. These household impact figures do not include compliance with new regulations or the cost of infrastructure replacement and compliance for wastewater.

- The pattern and timing of the need for additional capital will be different in each community, depending on its demographically driven replacement "wave."

- Household impacts will be two to three times greater in smaller water systems ($1,100 to $6,900 per household over 30 years) due to disadvantages of small scale and the tendency for replacement needs to be less spread out over time.

- Because of demographic changes, rate increases will fall disproportionately on the poor, intensifying the challenge that many utilities face keeping water affordable to their customers.

SCOPE OF THIS STUDY

The 2001 Water Master Plan and the Draft 2003 Water Master Plan address the orderly expansion of the District's water system in order to accommodate the anticipated buildout water demands within the existing service area. The Master Plan gives a description of the existing facilities and develops alternatives to serve the anticipated future growth. The Master Plan also identifies needs within the existing system. The Master Plan also includes a discussion of pipeline leaks and develops some priorities for replacement of leaking pipelines. The Master Plan also gives recommendations regarding Connection Fees and Facility Fees.

The Master Plans assume that all existing infrastructure will be maintained in service in perpetuity. This assumption ignores the fact that facilities will eventually become old and worn out. Repair and maintenance of these facilities will, at some point, not be cost effective and it will be necessary to replace those facilities with new ones. In the case of pipelines, this will often mean construction of a new pipeline along a street and abandonment of the existing pipeline. Pump stations and storage tanks will likely require complete demolition and reconstruction, often at the same site.

This study addresses the anticipated replacement needs of the water system related to aging of the infrastructure. The expected useful life of the water system is discussed, along with the financial impact of this aging infrastructure. For the purposes of this study, the Truckee and Hirschdale systems are combined into a single entity.

It is expected that this study will be updated every few years to ensure that the construction of new facilities and the replacement of old facilities is included in the District's budgeting.

PREVIOUS REPLACEMENT PROJECTS

Since 1985, the District has undertaken a number of pipeline replacement projects to remove failed and leaking pipelines from the water system. These projects have been undertaken on an "As Needed" basis and the District has not had a systematic approach to facility replacement. Previous projects include:

1985: 1985 Pipeline Replacement Project
1987: 1987 Pipeline Replacement Project
1989: Alder Creek Drive Pipeline Replacement
1991: Tahoe Donner Pipeline Replacement (Contracts A, B and C)
1992: Downtown Pipeline Replacement
1994: Pipeline Replacement Project – Sierra Meadows and Tahoe Donner Phase 2
1996: Pipeline Replacement Project – Donner Trails and Tahoe Donner Phase 3
1998: Telemark Place Pipeline Replacement
1999: Brookstone Drive Pipeline Replacement
2002: Tahoe Donner Pipeline Replacement – 2002

In addition, the District undertook a significant pipeline replacement program at Donner Lake. When the District acquired the Donner Lake Water System (DLWS), the system was severely deteriorated and a complete rehabilitation of the DLWS was necessary. In order to fund this rehabilitation, the Donner Lake Assessment District No. 1 was created. However, the life span of the Assessment District is limited, and all of the facilities constructed by the Assessment District will be included in the District's Replacement Program for replacement at the end of their useful life.

SECTION 2

METHODOLOGY

SECTION 2
METHODOLOGY

This section provides a discussion of the methodology used in developing the Life-Cycle Replacement Plan. It also includes cost estimating criteria used in developing cost estimates and determining the financial impact of the recommended plan.

DEFINITION OF USEFUL LIFE

The most critical term used in this study is ***Useful Life***. In order to prevent confusion, a definition is given below:

***Useful Life*:** The number of years between the time of installation of facility and the time of its retirement from service.

The expected useful life would therefore be:

***Expected Useful Life*:** The anticipated number of years between the time of installation of facility and the time of its retirement from service measured at the time of installation.

Some facilities require periodic maintenance in order reach their expected useful life. For pipelines that are properly installed, minimal maintenance efforts can be expected. Storage tanks will require periodic cleaning every five years and repainting about every 25 years. For pump stations and wells, different components will have a different expected useful life. A pump station building may be expected to last up 50 years. However, the pumps inside that building may have an expected useful life of only 15 years. These ongoing maintenance items are not included in this Life-Cycle Replacement Plan but are included in the Water Department's Operations Budget

Based upon the District's current construction requirements and using industry data, the expected useful life for new construction is given in **Table 2-1**.

Table 2-1. Expected Useful Life for New Construction

Facility	Expected Useful Life
Pipelines	75 years
Pressure Reducing Stations	75 years
Pump Stations	75 years
Storage Tanks	75 years
Wells	75 years

In many cases, the installation of existing facilities does not meet the current construction standards. As such, the expected useful life is less than that given in **Table 2-1**. The most obvious example is the steel water pipelines throughout the water system that were installed prior to 1976. Many of the steel pipelines in the Tahoe Donner subdivision were not properly installed and have experienced premature failure. In some other locations, such as Sierra Meadows, high groundwater levels have led to accelerated corrosion and premature failure.

After 1976, the District installed some asbestos-cement (AC) pipelines and then switched to primarily ductile iron pipe. The majority of pipe installed in 2002 and 2003 has been poly-vinyl chloride (PVC) and it is expected that most small diameter pipe will be PVC in the near future. A large portion of the former Glenshire Mutual Water Company System was installed in the 1970s using AC. It is expected that the change in pipe material, along with more diligent construction inspection will extend the useful life of pipeline facilities.

The District has not experienced premature failure of other facilities for the most part. The only facility that may require premature replacement is the Airport Well. The wellhole and casing are not plumb and District has had experienced premature failure of well pumps due added stresses on the well shaft. Based on the condition of the existing facilities, **Table 2-2** gives expected useful life for existing facilities.

Table 2-2. Expected Useful Life for Old Construction

Facility	Expected Useful Life
Pipelines Installed After to 1976	75 years
Pipelines Installed Prior to 1976	50 years
Pressure Reducing Stations	50/75 years – PRV stations are expected to have a Useful Life of 75 years, but will likely be replaced when the adjacent piping requires replacement (50 years in most cases)
Pump Stations – Concrete Construction	75 years
Pump Stations – Wood Construction	50 years
Storage Tanks	75 years
Wells	75 years

It should also be noted that the expected useful life for operational purposes and the useful life as related to accounting and depreciation are likely different values. As an example, the District's accounting procedures depreciate pump stations over 33.33 years (400 months) when operationally, such a facility should last at least 50 years with proper maintenance.

METHODOLOGY

The first step in developing the Life-Cycle Replacement Plan is the development of an inventory of the existing facilities. This inventory must include and assessment of the facility condition and the year in which it was installed.

Pipelines

For pipelines, the condition of a facility is based upon the Leak Replacement Value (LRV) described in the Master Plan. Current LRVs range from 0 to 22.7 with the higher values representing pipelines that are in the poorest condition. An LRV of zero represents a pipeline that is in good condition with no history of leaks.

The next step is to determine the remaining life of a given pipeline segment. For each segment, the remaining life was determined as follows:

Remaining Life = ***Expected Useful Life*** x ***Age Factor*** x ***Condition Factor***

Expected useful life for previous construction is taken from **Table 2-2**. The ***Age Factor*** is the percentage of the expected useful life that remains without considering the condition of the pipe. As an example, a pipeline with an Expected Useful Life of 50 years that was installed 25 years ago would have an Age Factor of 0.5. The same pipeline installed 40 years ago would have an Age Factor of 0.2. The ***Condition Factor*** for pipelines is given in **Table 2-3.**

Table 2-3. Condition Factor of Pipelines

Leak Replacement Value	Condition Factor
0-1	1
1-2	0.7
2-3	0.6
3-4	0.5
4-5	0.4
5-6	0.3
6-7	0.2
7-8	0.1
Greater than 8	0

Calculation of the remaining life of a pipe segment is given in the following examples:

1) Steel pipeline installed in 1971 with a LRV of 6.

Remaining Life = ***Expected Useful Life*** x ***Age Factor*** x ***Condition Factor***
Remaining Life = 50 x 1-(32/50) x 0.3
Remaining Life = 50 x 0.36 x 0.3
Remaining Life = 5.4 years → Use 5 years

2) Ductile iron pipeline installed in 1996 with a LRV of 0.

Remaining Life = ***Expected Useful Life*** x ***Age Factor*** x ***Condition Factor***
Remaining Life = 75 x 1-(7/75) x 1
Remaining Life = 75 x 0.91 x 1
Remaining Life = 68.25 years → Use 68 years

Finally, the estimated replacement cost for the pipe segment is calculated. It is assumed this money will be spent at the end of the remaining life of the facility.

Other Facilities

For pipelines, the condition of a facility was based upon the LRV. The LRV is meant to account for the condition of those facilities that are experiencing accelerated deterioration. In contrast to the pipelines, the District has not been experiencing accelerated deterioration of pump stations, storage tanks and similar facilities. For the purposes of this document, the acronym PPTW (PRV, Pump, Tank, Well) is used to refer to non-pipeline facilities as a group.

Similar to pipelines, the remaining life for PPTW was determined from the following formula:

Remaining Life = ***Expected Useful Life*** x ***Age Factor*** x ***Condition Factor***

Expected useful life for existing construction is taken from **Table 2-2**. The ***Age Factor*** is the percentage of the expected useful life that remains without considering the condition of the facility. The ***Condition Factor*** for PPTW is given in **Table 2-4.**

Table 2-4. Condition Factor for PPTW

Condition	Condition Factor
Excellent	1.5
Good	1.25
Average	1.0
Fair	0.75
Poor	0.5
Failing	0

For PPTW, the condition of a facility is considered relative to its age. For example, the recently constructed Bridge Street 6170 is considered in *Average* condition for a one-year old steel tank (with a ***Condition Factor*** of 1.0), even through it is in "excellent" condition when compared to a steel thank that was constructed 30 years ago.

All of the PPTW are considered in average condition for their age. However, the methodology described herein is flexible enough that future revisions to this Life Cycle Replacement Plan will be able to consider if a PPTW is in better or worse condition than would be expected when considering its age.

The calculation of the remaining life of PPTW is given in the following examples:

1) Steel storage tank installed in 1972 in average condition.

   Remaining Life = ***Expected Useful Life*** x ***Age Factor*** x ***Condition Factor***
   Remaining Life = 75 x 1-(31/75) x 1.0
   Remaining Life = 75 x 0.586 x 1
   Remaining Life = 44.0 years → Use 44 years

2) Pump Station (Wood Frame Construction) installed in 1979 in fair condition.

   Remaining Life = ***Expected Useful Life*** x ***Age Factor*** x ***Condition Factor***
   Remaining Life = 50 x 1-(24/50) x 0.75
   Remaining Life = 50 x 0.52 x 0.75
   Remaining Life = 19.5 years → Use 20 years

The estimated replacement cost for the facility is then calculated. It is assumed this money will be spent at the end of the remaining life of the facility.

COST ESTIMATING CRITERIA

Project cost is defined as the total capital investment necessary to complete a project. This includes expenditures for construction, engineering services, contingencies and overhead items such as legal and administrative services and financing. For this study, total capital cost includes planning level estimates of construction cost, plus construction contingencies of 20 percent. Added to this is an allowance for other costs such as engineering, legal and administration totaling an additional 20 percent. The various components of project costs are discussed below. This study uses the same cost criteria given in the Draft 2003 Water Master Plan.

Land Acquisition

This plan is addresses the replacement of existing facilities. It is assumed that all such replacement will occur at the same location where the existing facility is located. Therefore, the acquisition of additional property is not anticipated.

Construction Costs

Construction costs cover the materials, labor and services necessary to build the proposed project. The cost criteria listed below is based on construction projects previously undertaken by the District and has been adjusted for inflation to the year 2002. Cost estimates given for future projects are also given in current costs and are not adjusted for inflation.

Pipelines. Unit costs for the construction of new water mains are given in **Table 2-2**. These costs are based upon cement-lined ductile iron or polyvinyl chloride (PVC) pipe for all mains. These pipeline cost figures cover preparation of right-of-way, trenching, installing and joining of pipe, installing fittings and valves, imported backfill and repaving after construction. As noted above, a minimum pipe size of 8-inch diameter is used for new construction.

Table 2-5. Pipeline Construction Cost Criteria

Existing Pipe Diameter, inches	Replacement Pipe Diameter, inches	Replacement Pipe Cost Per Linear Foot, dollars
2-inch	8-inch	110
4-inch	8-inch	110
6-inch	8-inch	110
8-inch	8-inch	110
10-inch	10-inch	120
12-inch	12-inch	140
14-inch	14-inch	150
16-inch	16-inch	165
20-inch	20-inch	200
24-inch	24-inch	250

Storage Reservoirs. Costs for ground-level steel tanks are estimated at $0.50 per gallon. This cost is lower than new construction since all of the earthwork and site preparation have already been performed. This cost assumes that the tank will be installed at the same site.

Pumping Stations. Pumping station costs mainly vary with the size of the pumps and their associated switchgear and piping. Certain elements do not change significantly with pump size such as sitework, building construction and electrical service to the site. Considering these issues, there is a certain minimum cost involved in constructing a pump station. Cost estimates are developed with a base cost of $150,000 and an incremental cost of $600 per installed horsepower. Installed horsepower is calculated from the formula below with actual pumps based on standard motor sizes.

$$HP = \frac{Q * H}{3960 * E}$$

Q = flow in gallons per minute
H = Head in feet
E = Pump Efficiency (assumed to be 75%)

These estimates include the cost of the pump station structure along with pumps, motors, piping and appurtenances, architectural treatment, instrumentation and controls.

Wells. In developing cost estimates for replacement well installations, wells are assumed to be at the same site and with the same capacity as the existing facility. Construction of a replacement well would consist of drilling, installing casing, developing the well and installing the necessary building, piping, pumping equipment and control equipment. The replacement cost for transmission piping from wells is not included in the well costs but is included in the discussion of pipeline replacement.

Replacement costs for a large capacity well (1,700-2,300 gpm) are estimated at $1,000,000. Replacement costs for a medium capacity well (500-1,000 gpm) are estimated at $750,000. It is assumed that the small capacity wells (less than 500 gpm) will be maintained in service until the end of their useful live, but will not be replaced since it would not be cost effective.

The Donner Creek Irrigation Well is considered a special case. This well is only 180 feet deep and draws from a shallow aquifer. The cost of replacing this well is significantly lower due to the shorter depth. A replacement cost of $500,000 is assumed for this well.

Contingencies

A contingency allowance covers uncertainties associated with preliminary planning. Factors such as unusual foundation or soil conditions, special construction methods, variation in final lengths or average depths of pipeline, and construction adjacent to existing facilities are just a few of many items which may increase contract costs and for which some allowance must be made in the preliminary design cost estimates. An allowance of 20 percent of total construction cost has been assumed to cover such contingencies.

Engineering and Administration

The cost of engineering services for construction projects includes some or all of the following: special investigations, pre-design reports, surveys, foundation explorations, location of interfering utilities, detailed design, preparation of contract drawings, construction inspection, materials testing, final inspection and start-up of the completed project. Depending on the size and type of project, total engineering, legal and administrative costs can range from 7 to 40 percent of the construction cost. The lower percentage applies to relatively large, simple projects not requiring large amounts of preliminary investigation. The higher percentage applies to smaller projects requiring a great deal of engineering effort, or those which require a relatively large amount of preliminary work. A value of 15 percent is assumed for this study.

Administration charges cover items such as legal fees, financing expenses and administrative costs. The cost of these items can vary, but for the purpose of this study, administration charges are assumed to equal five percent of construction cost.

The average total cost of all necessary engineering services plus administrative costs is estimated to be 20 percent of the construction cost for each project.

SECTION 3

PIPELINES

SECTION 3
PIPELINES

The District's existing distribution system consists of about 186 miles of pipeline ranging from 2-inches to 24 inches in diameter. The majority of the pipelines are between 4-inches and 8-inches in diameter. The oldest piping in the system dates to the 1940s, with the great majority of the system having been installed in the late 1960s and early 1970s. There are a number of different pipeline materials throughout the system. The majority of the distribution pipelines are steel, with large portions of ductile iron pipe as well. **Tables 3-1, 3-2** and **3-3** give summaries of pipeline characteristics.

Table 3-1. Summary of Pipelines by Diameter

Diameter, inches	Length, feet	Length, miles
2	15,770	3.0
3	726	0.1
4	32,294	6.1
6	442,564	83.8
8	326,868	61.9
10	62,752	11.9
12	32,997	6.2
14	31,608	6.0
16	25,738	4.9
18	2,508	0.5
24	6,711	1.3
Grand Total	980,536	185.7

Table 3-2. Summary of Pipelines by Year Installed

Decade	Length, feet	Length, miles
1940 – 1949	7,181	1.4
1950 – 1959	9,554	1.8
1960 – 1969	117,538	22.3
1970 – 1979	428,846	81.2
1980 – 1989	91,053	17.2
1990 – 1999	170,049	32.2
2000 – Present	108,202	20.5
Date Unknown	48,113	9.1
Grand Total	980,536	185.7

Table 3-3. Summary of Pipelines by Pipe Material

Material	Length, feet	Length, miles
Asbestos-Cement	109,131	20.7
Ductile Iron	306,788	58.1
Galvanized Iron	518	0.1
High-density Polyethylene	1,039	0.2
Polyvinyl Chloride (PVC)	51,323	9.7
Steel	503,142	95.3
Material Unknown	8,595	1.6
Grand Total	980,536	185.7

Figure 3-1 shows a breakdown of pipeline footage by year installed. A review of this Figure shows a number of useful pieces of information:

1) A significant portion of the water system was installed during the early 1970s. Construction was occurring in the Prosser Lakeview, Tahoe Donner, Glenshire and Ponderosa Palisades subdivisions during this time.

2) A significant amount of pipe was installed in 1991. The District's largest pipeline replacement occurred in 1991, when about 20 miles of replacement pipe was installed in the Tahoe Donner subdivision.

3) Large amounts of pipe were installed in 2001 and 2002. Most of this footage in 2001 represents replacement projects undertaken at Donner Lake by the Donner Lake Assessment District. Most of the footage for 2002 represents new construction such as Pine Forest, Old Greenwood, Pioneer Commerce Center and Cambridge Estates.

The data given in **Figure 3-1** was then adjusted to eliminate the date unknown category. Assumptions regarding the year installed were made based on development of surrounding areas. It was also assumed that all remaining pipeline work at Donner Lake would be completed within the next two years.

This revised data results in **Figure 3-2**. Please note that facilities constructed during 2003 are not given in this figure and that future construction will increase the values given for 2004 and 2005, which only represent Donner Lake at this time.

Based on the expected useful lifetimes given and described in Section 2, the anticipated cost to replace all pipeline segments at the end of their life is given in **Figure 3-3**. This graph shows very uneven expenditures from year to year, with values ranging from $0 to almost $21 million. **Table 3-4** gives this data in tabular form. The costs in this table assume that all new piping will be a minimum 8-inch diameter. Existing 2-inch piping would be replaced with 8-inch piping as an example.

Figure 3-1
Existing Pipeline Inventory (Dec 31, 2002)

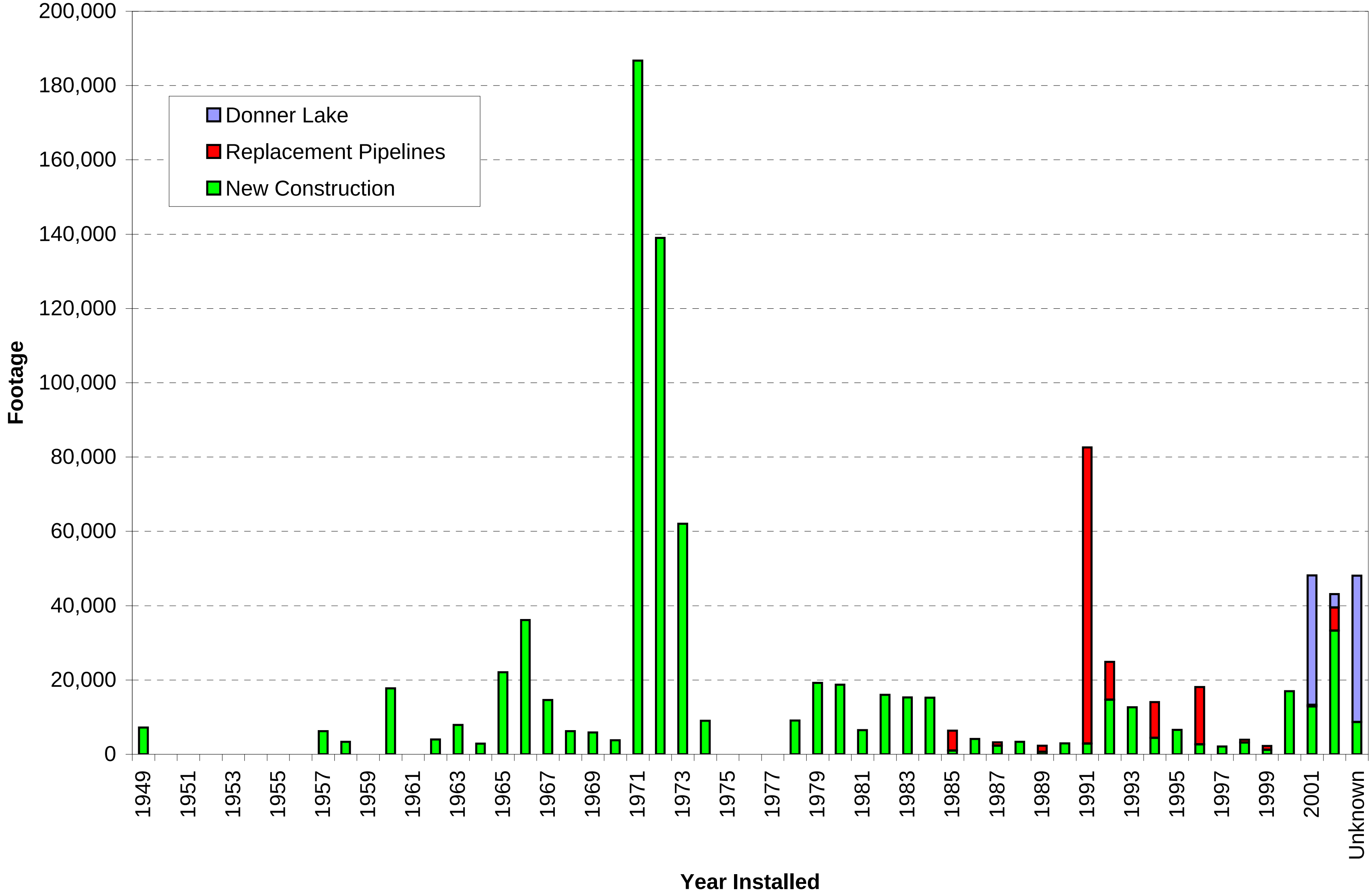

Figure 3-2
Existing Pipeline Inventory (Dec. 31, 2002) After Adjustments

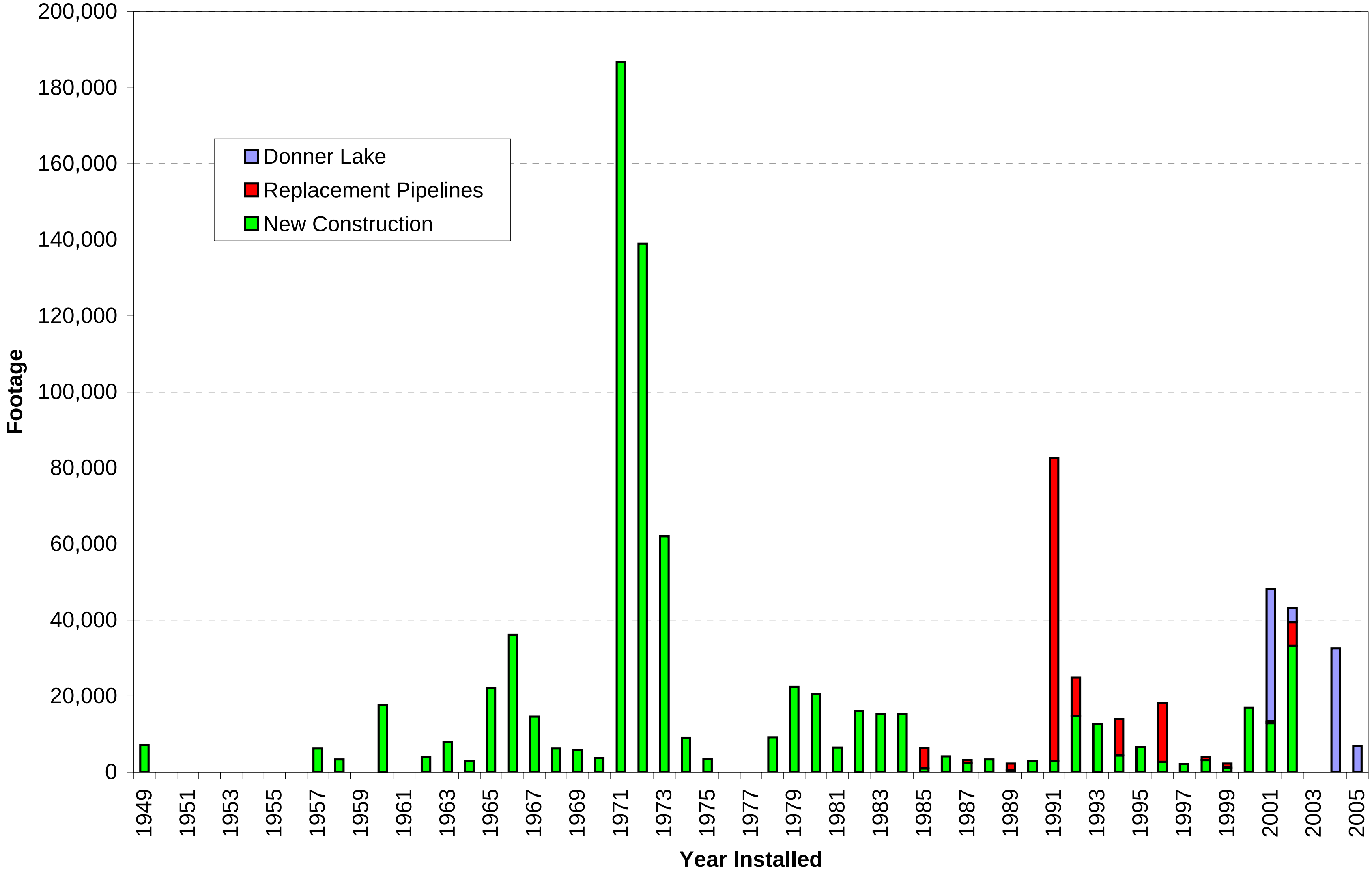

Figure 3-3
Projected Replacement Costs Assuming 50 or 75-year Useful Life for All Pipelines

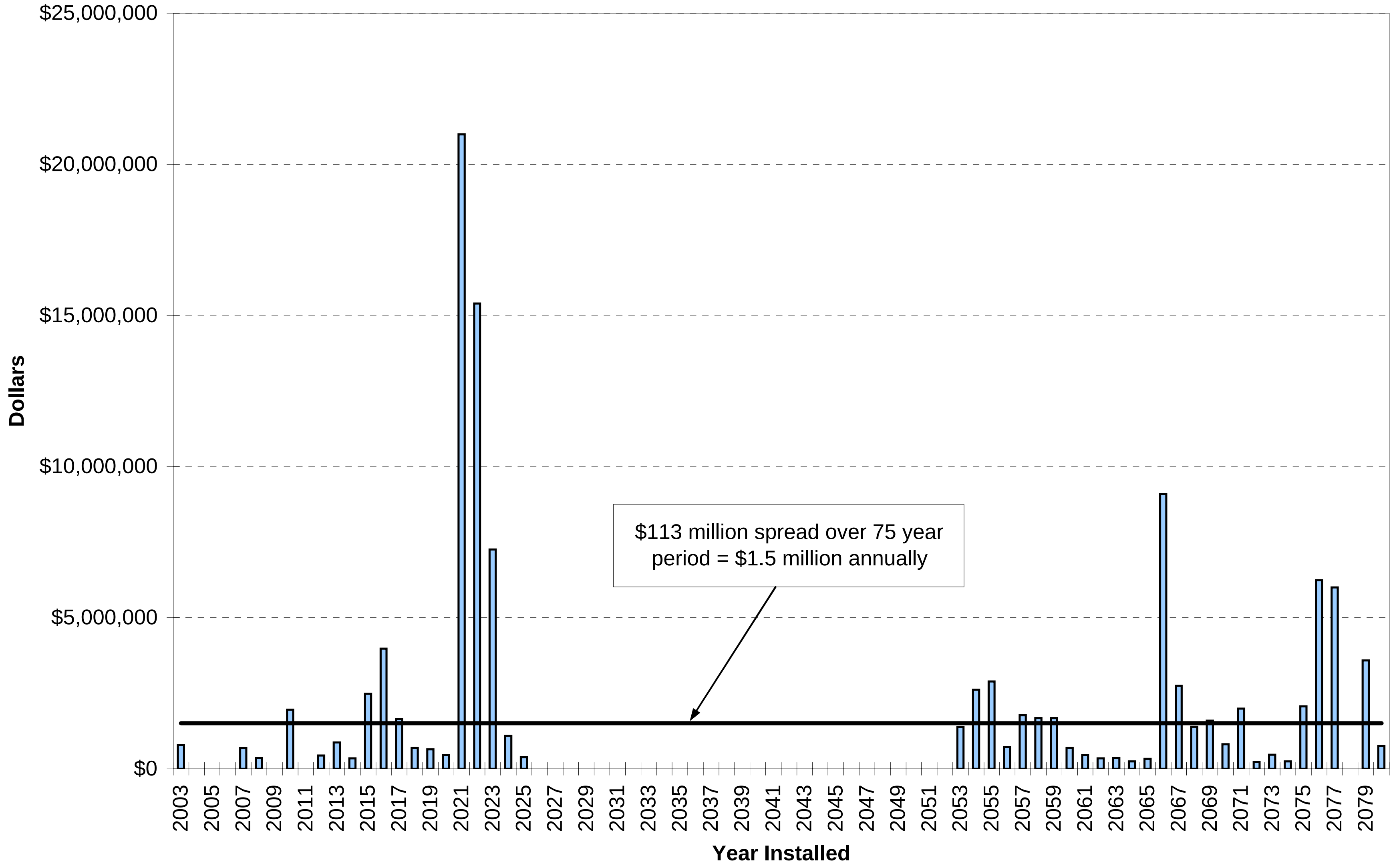

Table 3-4. Anticipated Pipeline Replacement Expenditures Not Considering Facility Condition

Year	Footage Installed	Replacement Year	Replacement Cost (2003 Dollars)
1949	7,181	2003	$791,529
1950	0	2003	$0
1951	0	2003	$0
1952	0	2003	$0
1953	0	2003	$0
1954	0	2004	$0
1955	0	2005	$0
1956	0	2006	$0
1957	6,207	2007	$690,835
1958	3,348	2008	$368,234
1959	0	2009	$0
1960	17,781	2010	$1,955,963
1961	0	2011	$0
1962	3,967	2012	$442,958
1963	7,927	2013	$871,974
1964	2,874	2014	$343,568
1965	22,106	2015	$2,487,033
1966	36,146	2016	$3,976,073
1967	14,604	2017	$1,648,142
1968	6,251	2018	$692,586
1969	5,882	2019	$646,999
1970	3,763	2020	$451,586
1971	186,731	2021	$20,993,949
1972	138,995	2022	$15,394,313
1973	62,071	2023	$7,254,889
1974	8,990	2024	$1,095,045
1975	3,500	2025	$384,958
1976	0	2026	$0
1977	0	2052	$0
1978	9,064	2053	$1,385,870
1979	22,497	2054	$2,615,884
1980	20,630	2055	$2,891,369
1981	6,518	2056	$717,000
1982	16,035	2057	$1,769,374
1983	15,289	2058	$1,681,833
1984	15,239	2059	$1,676,335
1985	6,341	2060	$697,519
1986	4,137	2061	$458,309
1987	3,183	2062	$350,092
1988	3,326	2063	$365,831
1989	2,273	2064	$250,020
1990	2,947	2065	$327,979
1991	82,633	2066	$9,092,541
1992	24,852	2067	$2,750,487
1993	12,627	2068	$1,390,443

Year	Footage Installed	Replacement Year	Replacement Cost (2003 Dollars)
1994	14,021	2069	$1,591,425
1995	6,600	2070	$811,979
1996	18,079	2071	$1,995,866
1997	2,099	2072	$230,889
1998	3,943	2073	$469,292
1999	2,248	2074	$247,312
2000	16,951	2075	$2,064,943
2001	48,119	2076	$6,239,617
2002	43,133	2077	$5,998,117
2003	0	2078	$0
2004	32,596	2079	$3,585,600
2005	6,833	2080	$751,663
Total	980,536		$112,900,226

The total cost to replace all water system pipelines is about $113 million. Taking the $113 million and spreading it evenly over the 75 year expected useful life results in expenditures of just over $1.5 million annually.

There are a few issues that become apparent when examining **Table 3-4**. First of all, the District has been experiencing numerous leaks on pipelines that were installed in the late 1960s and early 1970s. It is unlikely that all of the pipelines can remain in operation until the end of their expected useful life. In addition, there may be other reasons to replace pipelines that are not directly related to the deterioration of the pipe as it approaches the end of its useful life. The existing pipelines in the Meadow Park, Gateway Park and Olympic Heights areas are in good condition and require minimal attention from District crews. However, these pipes are typically 2-inch and 4-inch in diameter and are severely undersized when considering fire flow requirements. It may be desirable to replace these pipelines earlier than necessary due to these fire flow issues.

SECTION 4

OTHER FACILITIES

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OTHER FACILITIES

In addition to pipelines, the District maintains a number of pressure reducing stations, pump stations, storage tanks and wells. These facilities are collectively referred to as PPTW. The following discussions address these facilities from the Life-Cycle Replacement standpoint.

PRESSURE REDUCING STATIONS

There are currently 30 pressure reducing stations located at various locations throughout the District's water system. These stations provide service to small pressure zones, allow a means to relieve pressure in zones not directly served by a reservoir and provide additional water for fire flow demands.

The majority of these facilities were installed in the 1960s and 1970s. **Figure 4-1** gives an inventory of the existing stations. Four of these stations are located at Donner Lake and will be abandoned as part of the reconstruction of the Donner Lake Water System. These facilities were removed from the list of stations requiring replacement and **Figure 4-2** gives an inventory of the facilities that will be maintained and will require replacement in the future.

Based on expected useful lifetimes of 75 years as described in Section 2, the anticipated cost to replace all of the pressure reducing stations is given in **Figure 4-3**. This graph shows very uneven expenditures from year to year, with values ranging from $0 to $160,000. The total cost to replace all of the stations is $520,000. It should be noted that pressure reducing stations will likely be replaced at the same time that the adjacent distribution system piping requires replacement. Due to this interrelationship with the piping, it is possible that some facilities will be replaced prior to reaching the end of their expected 75 year useful life.

PUMP STATIONS

There are currently 26 pump stations located at various locations throughout the water system. These pumping stations move water from lower pressure zones to higher pressure zones to serve the demands in the higher elevations of the service area.

The majority of these facilities were installed in the 1960s and 1970s. **Figure 4-4** gives an inventory of the existing stations. Two of these stations are located at Donner Lake and will be replaced with new pump stations as part of the reconstruction of the Donner Lake Water System. These new pump stations are scheduled for construction during the summer of 2004. The existing Glenshire Pump Station is located at the corner of Donnington Lane and Royal Way. The District is currently constructing a replacement for this pump station that will be located at the end of the Town-maintained portion of The Strand. This facility should be operational in the spring of 2004.

The existing facility inventory was adjusted to consider these new facilities and **Figure 4-5** gives an inventory of the facilities that will be maintained and will require replacement in the future. Based on expected useful lifetimes of 50 or 75 years as described in Section 2, the anticipated cost to replace all of the pump stations is given in **Figure 4-6**. This graph shows very uneven expenditures from year to year, with values ranging from $0 to just over $2 million. The total cost to replace all of the stations is $5.8 million.

Figure 4-1
Existing Pressure Reducing Station Inventory (as of December 31, 2002)

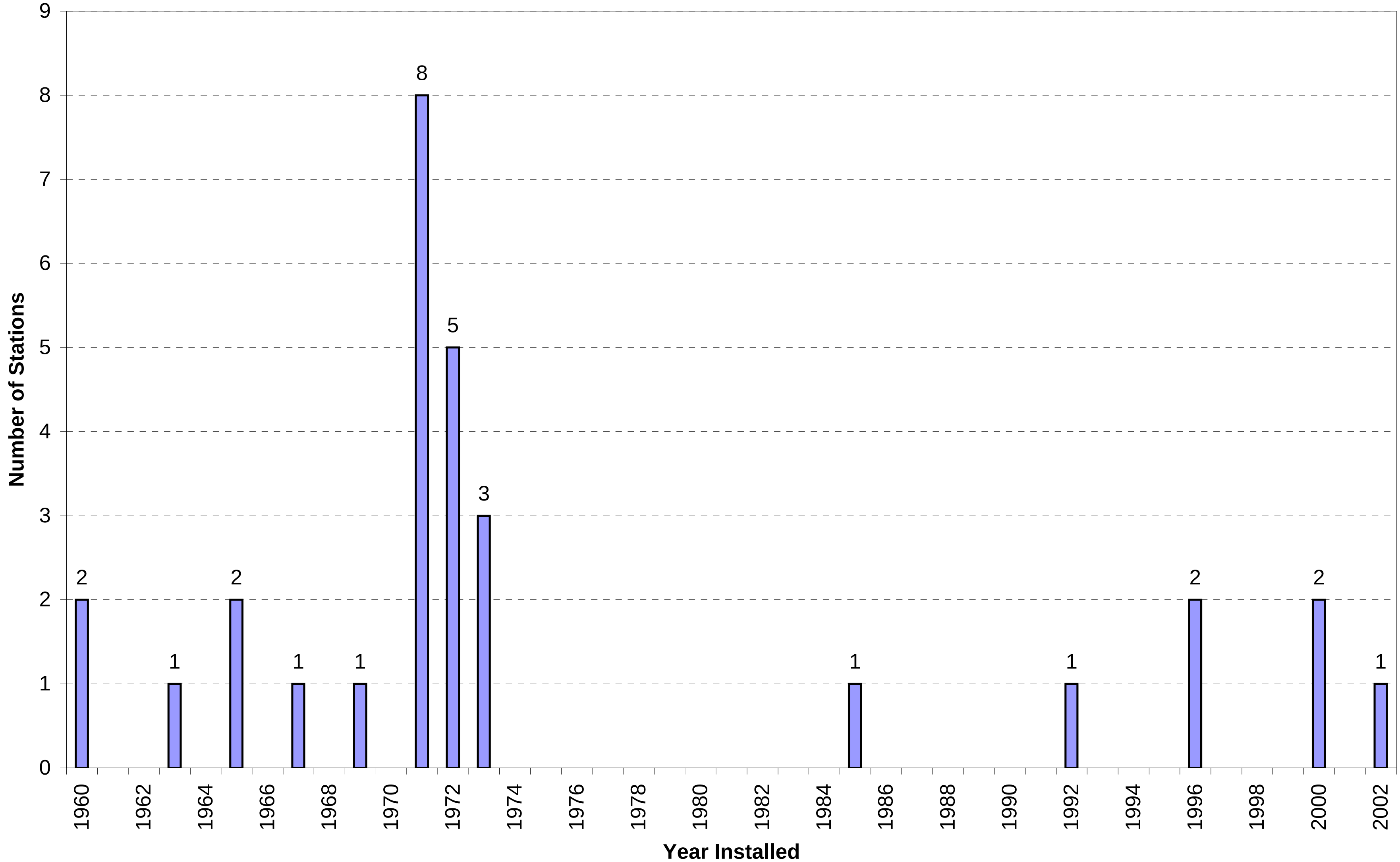


Figure 4-2
Adjusted Pressure Reducing Station Inventory

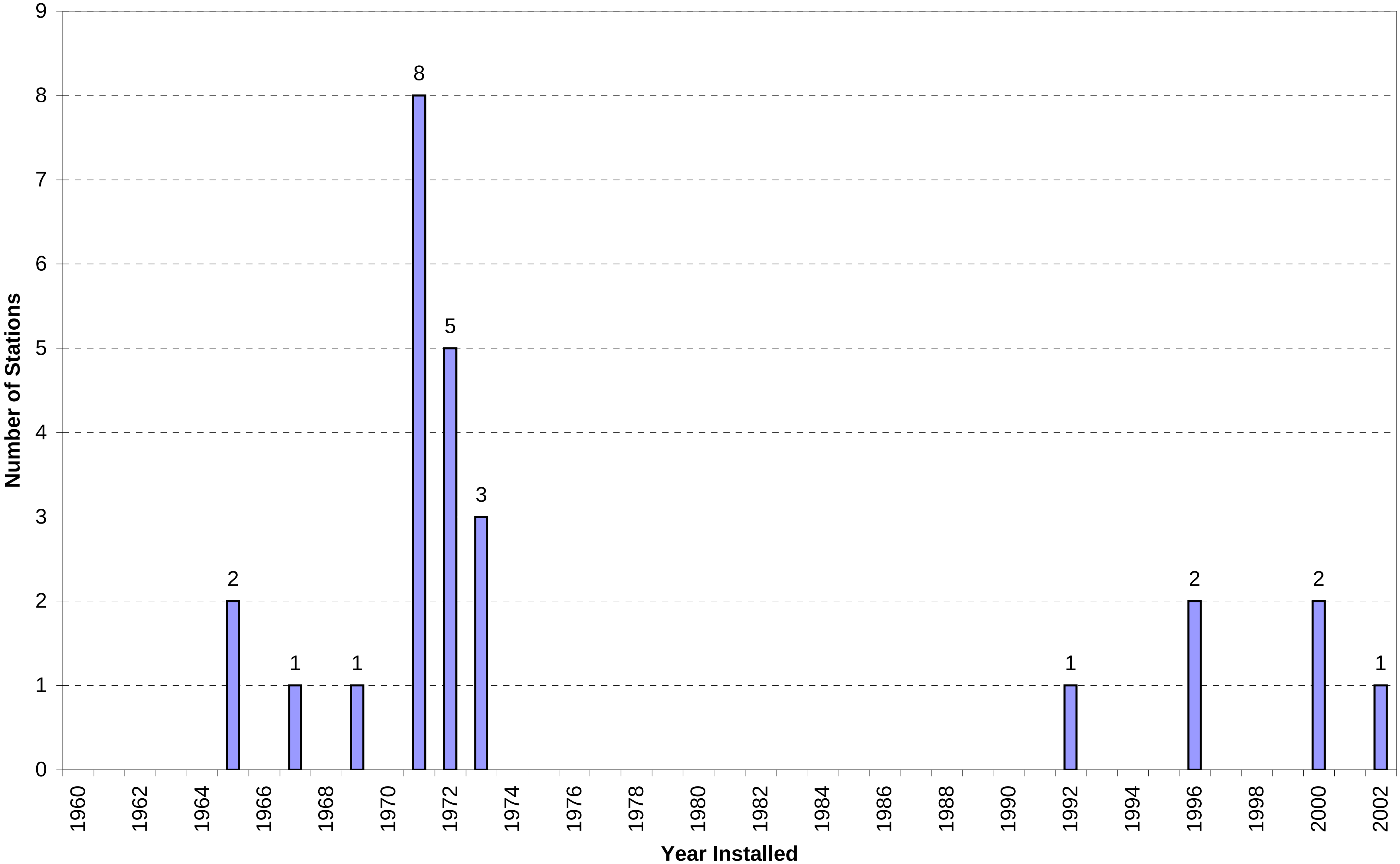


Figure 4-3
PRV Station Replacement Costs

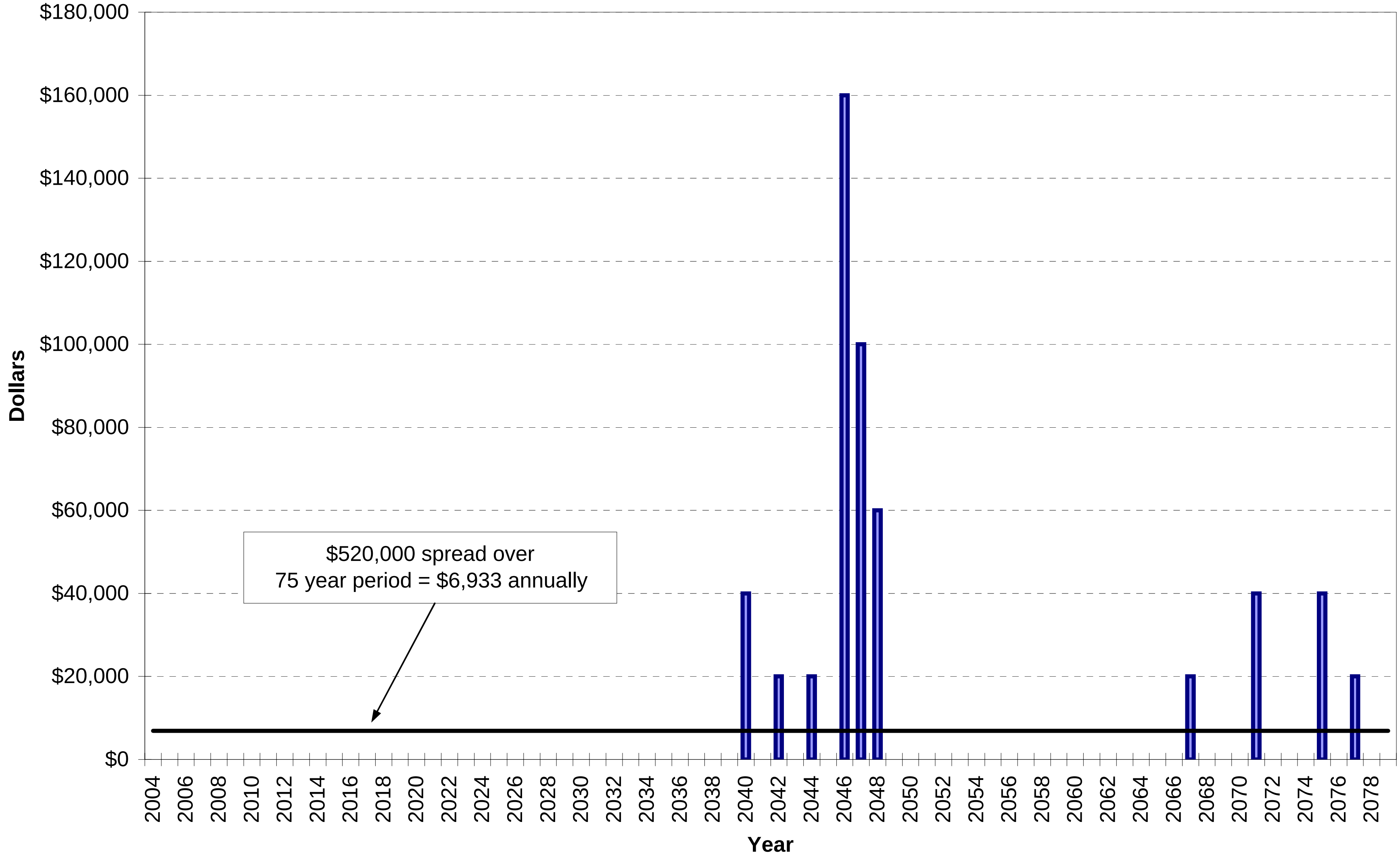


Figure 4-4
Existing Pump Station Inventory (as of December 31, 2002)

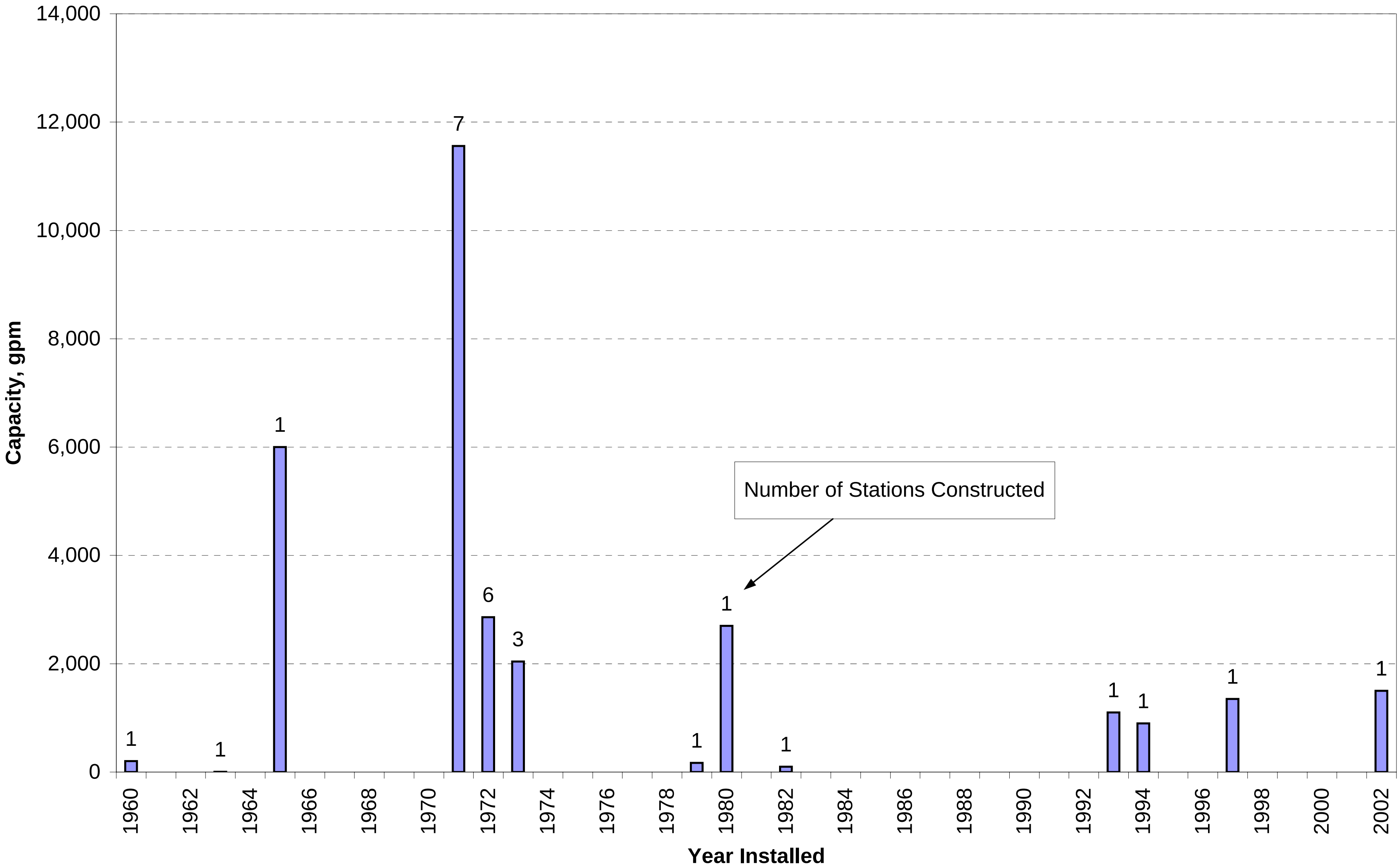


Figure 4-5
Adjusted Pump Station Inventory

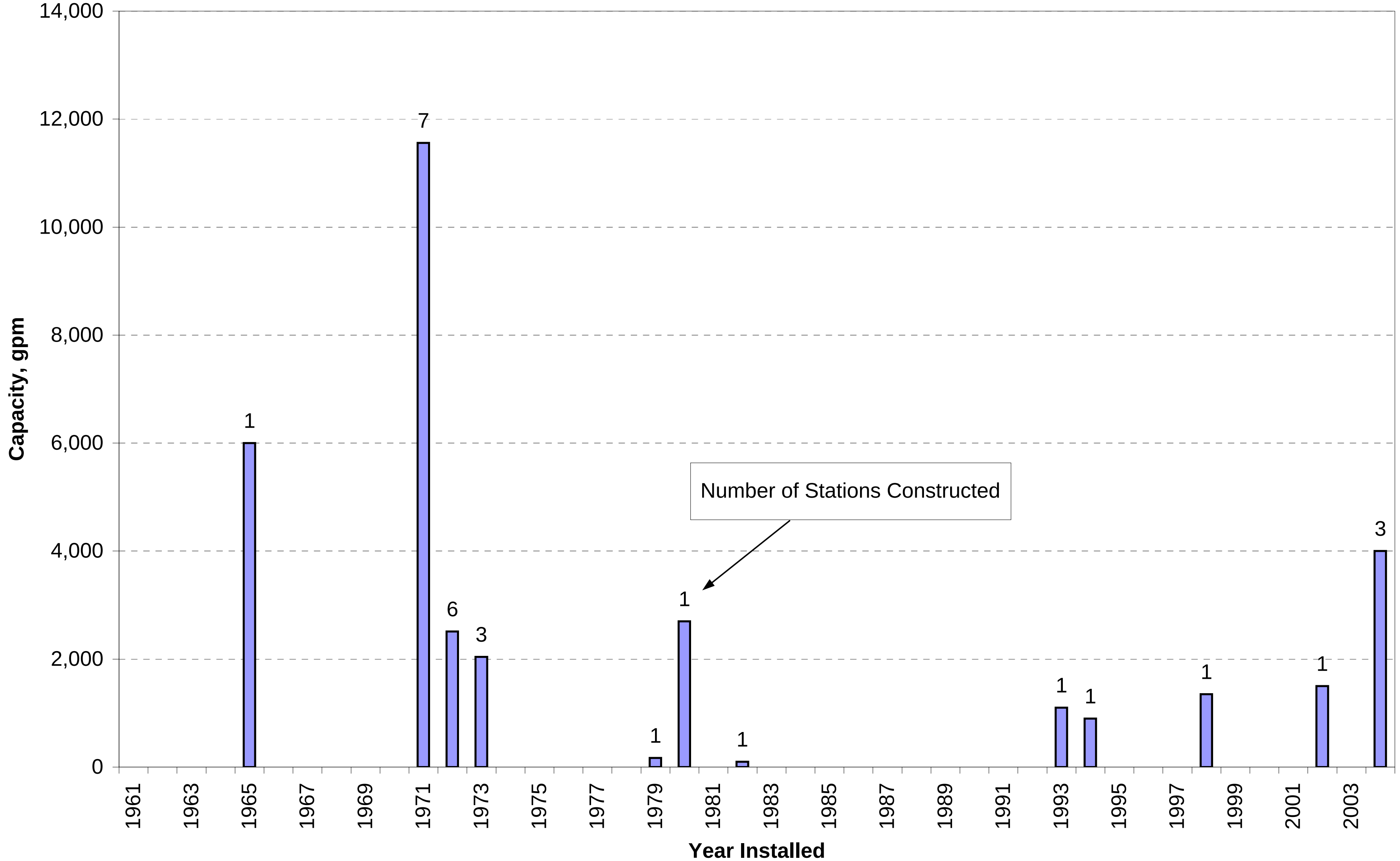
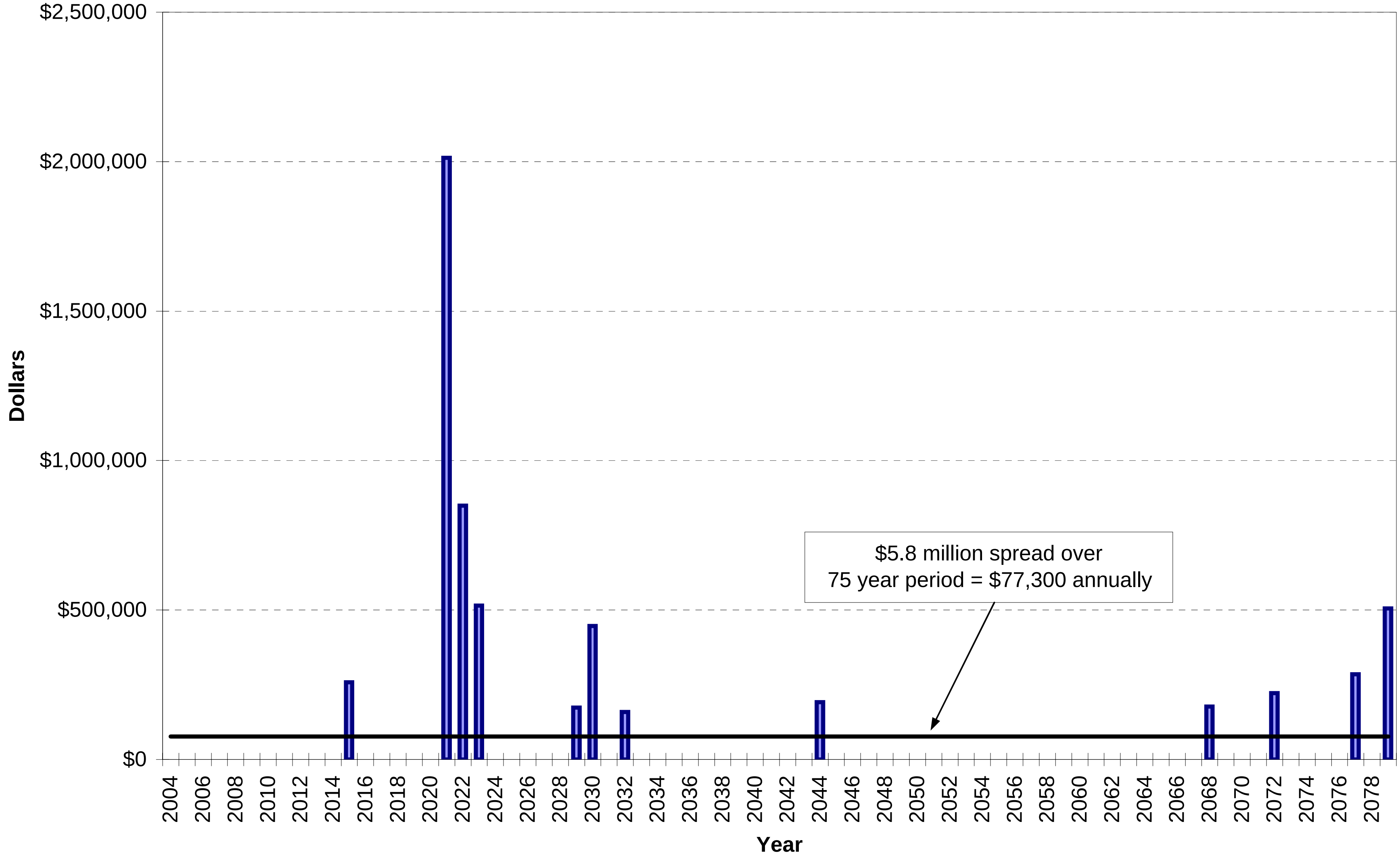


Figure 4-6
Pump Station Replacement Costs



STORAGE TANKS

There are currently 39 storage tanks in the water system. The majority of these facilities were installed in the 1960s and 1970s. More recently, fewer tanks have been constructed, but those tanks have been significantly larger in capacity. **Figure 4-7** gives an inventory of the existing storage tanks.

Six of these tanks are located at Donner Lake. The Biltz and Red Mountain Tanks have been removed from service but have not yet been demolished. The other four tanks will be removed as part of the reconstruction of the Donner Lake Water System. Three new tanks will also be constructed at Donner Lake. These new tanks are scheduled for construction during the summer of 2004.

The existing facility inventory was adjusted to consider these new facilities and **Figure 4-8** gives an inventory of the facilities that will be maintained and will require replacement in the future. Based on an expected useful lifetime of 75 years as described in Section 2, the anticipated cost to replace all of the storage tanks is given in **Figure 4-9**. This graph shows very uneven expenditures from year to year, with values ranging from $0 to just over $1 million. The total cost to replace all of the tanks is about $5.8 million.

WELLS

There are currently 29 wells in the water system. Six of these wells are currently inactive and one is a dedicated irrigation well not connected to the potable water system. **Figure 4-10** gives an inventory of the existing wells.

Three of the inactive wells are located at Donner Lake and one is located adjacent to the Ski Hill in Tahoe Donner. It is not expected that these wells will be used for any purpose in the future. Another inactive well is located at the District's Southside property across from the Truckee Regional Park. The District has a long-term goal of using this well to supply irrigation water to the park.

The last inactive well is located in the Glenshire Area. Eleven active wells were acquired with the Glenshire Water System. In the Fall of 2003, 10 of the 11 active wells along with the inactive well were removed from service and abandoned in accordance with State of California standards.

This leaves a total of 12 wells that will be maintained into the future. Five of these wells have capacities of 350 gpm or less and it is expected that these wells will not be replaced at the end of their useful lives. The capacity supplied by these wells will be offset by construction of new wells at different locations.

Figure 4-11 shows the inventory of these 12 wells that will be maintained and will require replacement in the future. Based on an expected useful lifetime of 75 years as described in Section 2, the anticipated cost to replace all of the wells is given in **Figure 4-12**. This graph shows very uneven expenditures from year to year, with values ranging from $0 to $1 million. The total cost to replace all of the wells is about $5.75 million.

Figure 4-7
Existing Storage Tank Inventory (December 31, 2002)

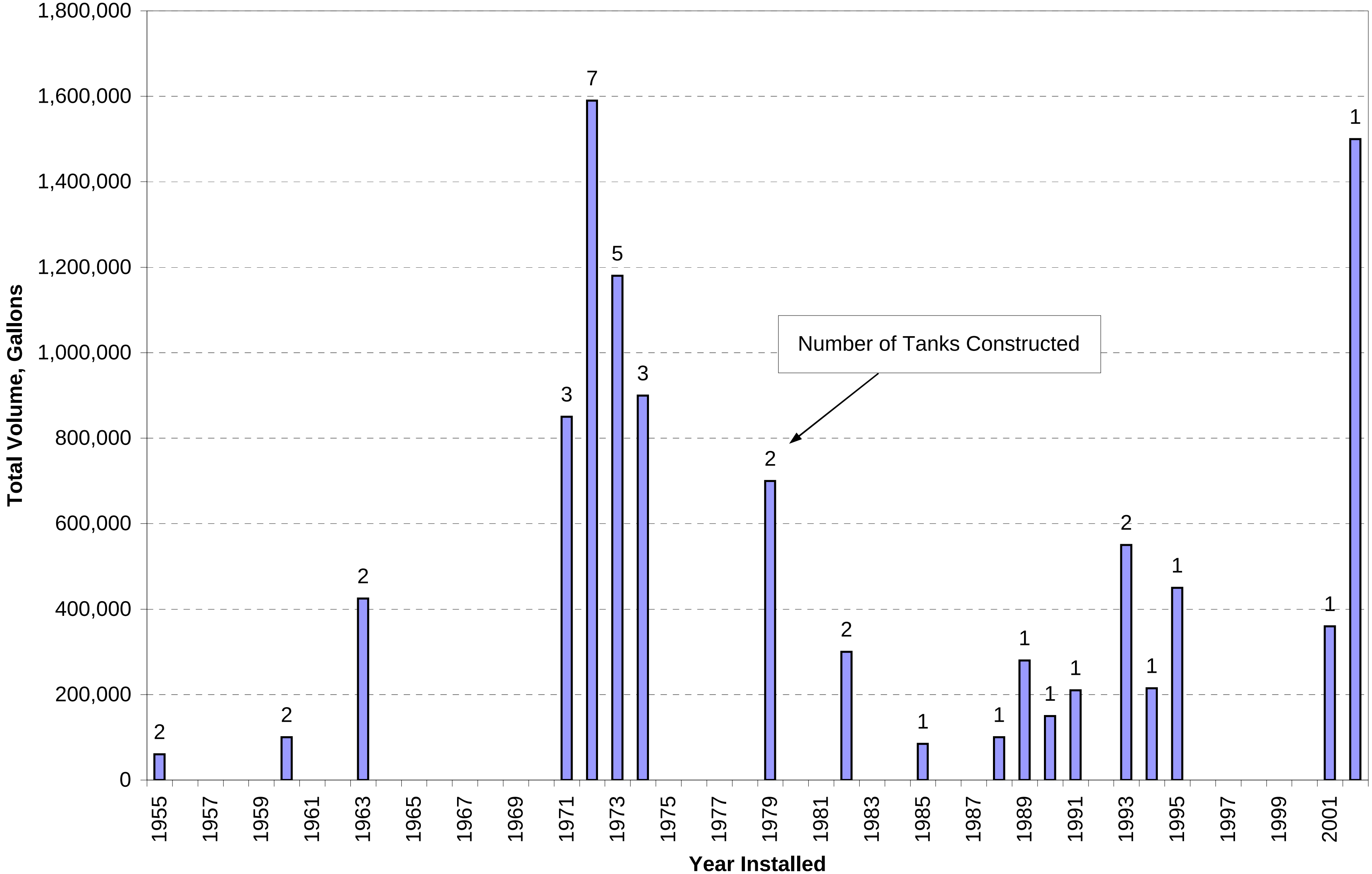


Figure 4-8
Adjusted Storage Tank Inventory

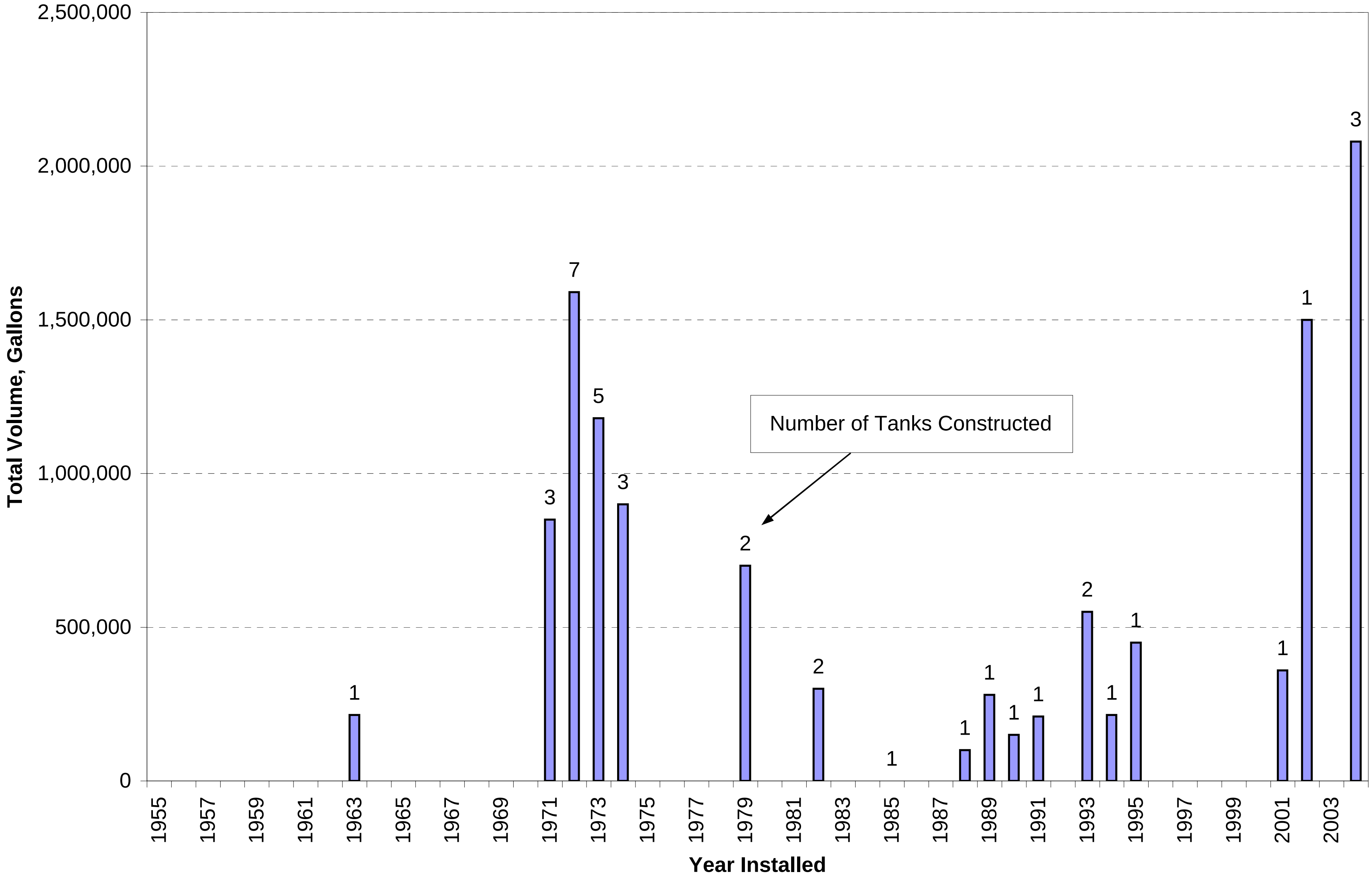


Figure 4-9
Storage Tank Replacement Costs

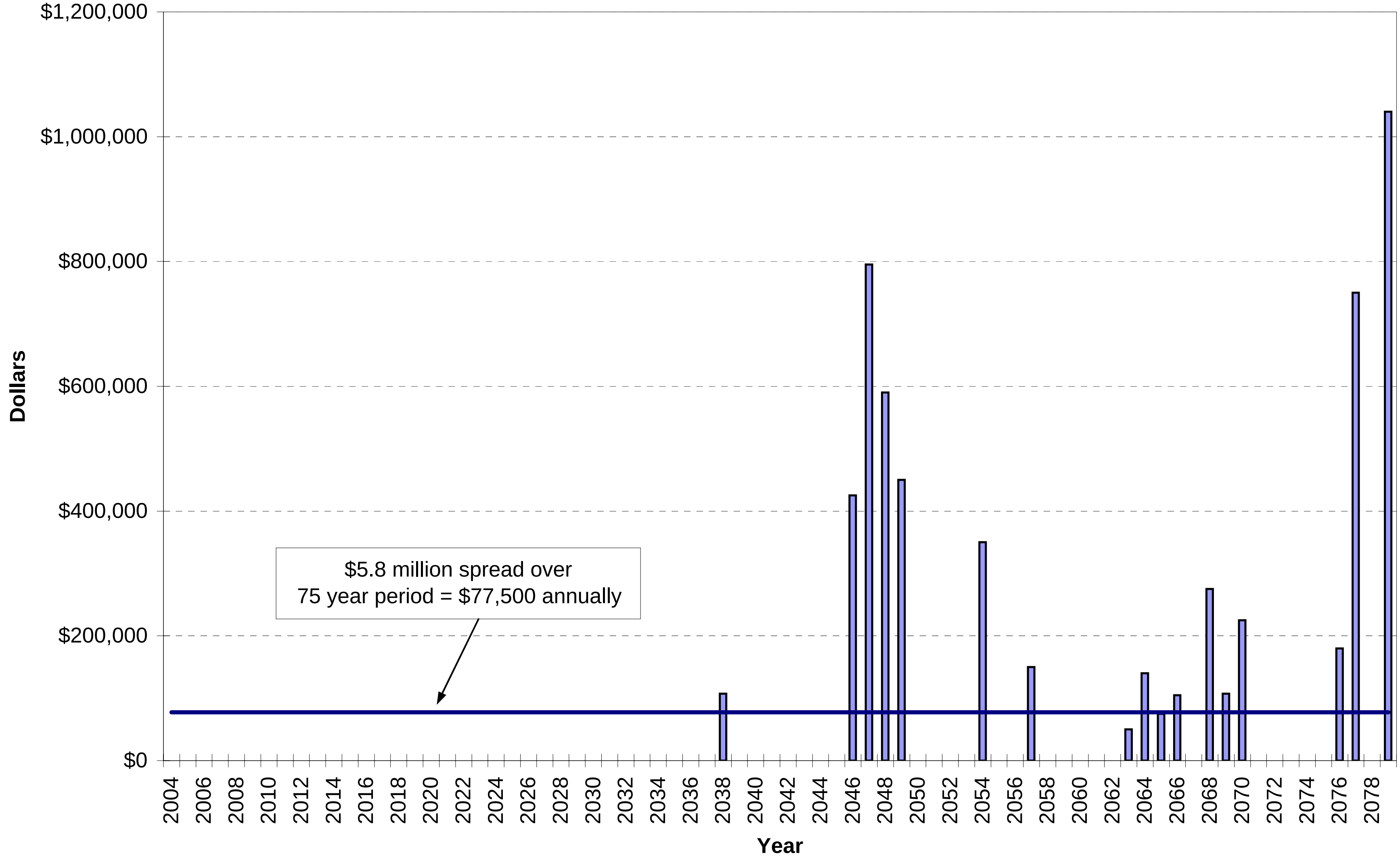


Figure 4-10
Existing Production Well Inventory (December 31, 2002)

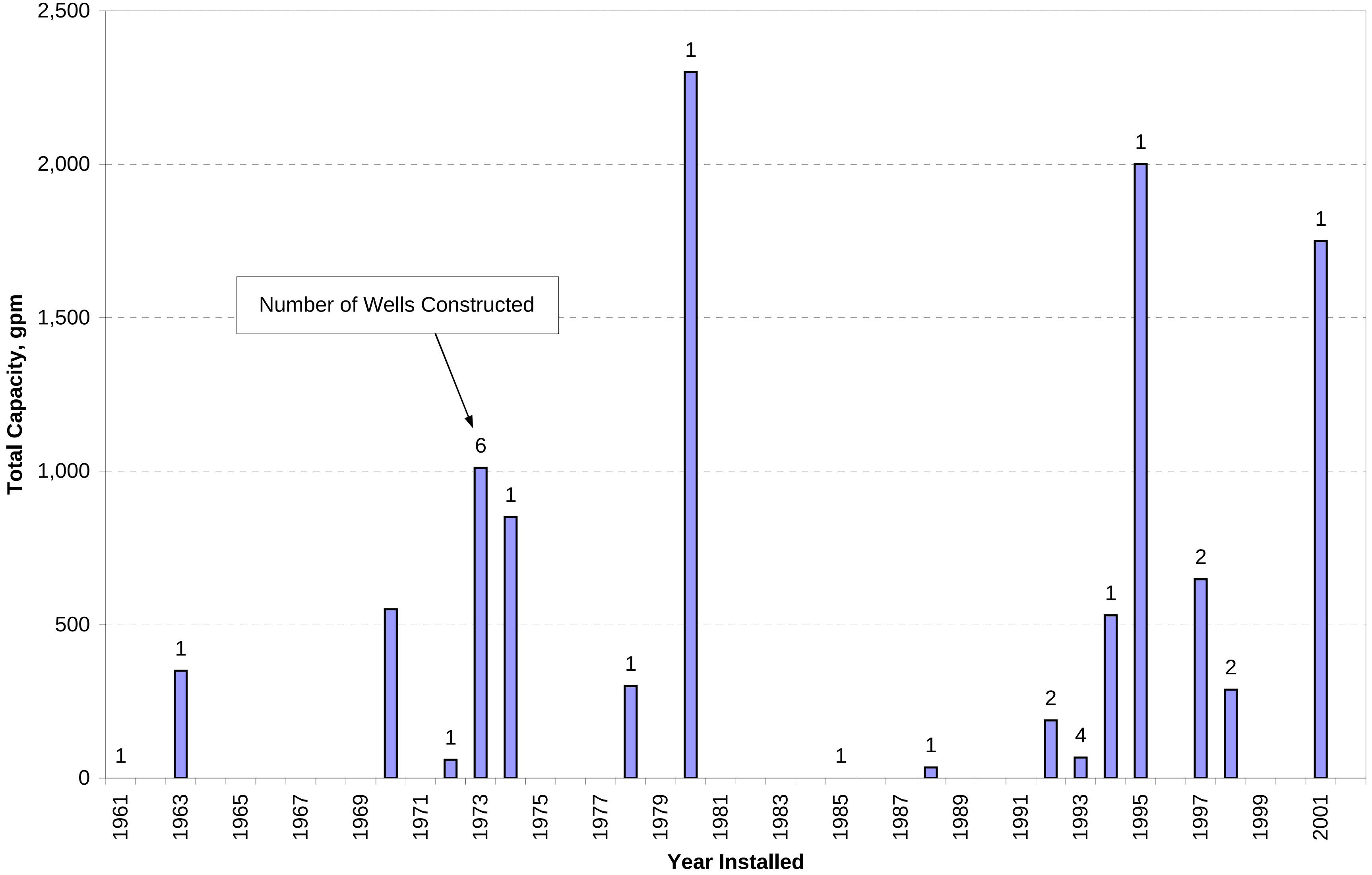


Figure 4-11
Adjusted Production Well Inventory

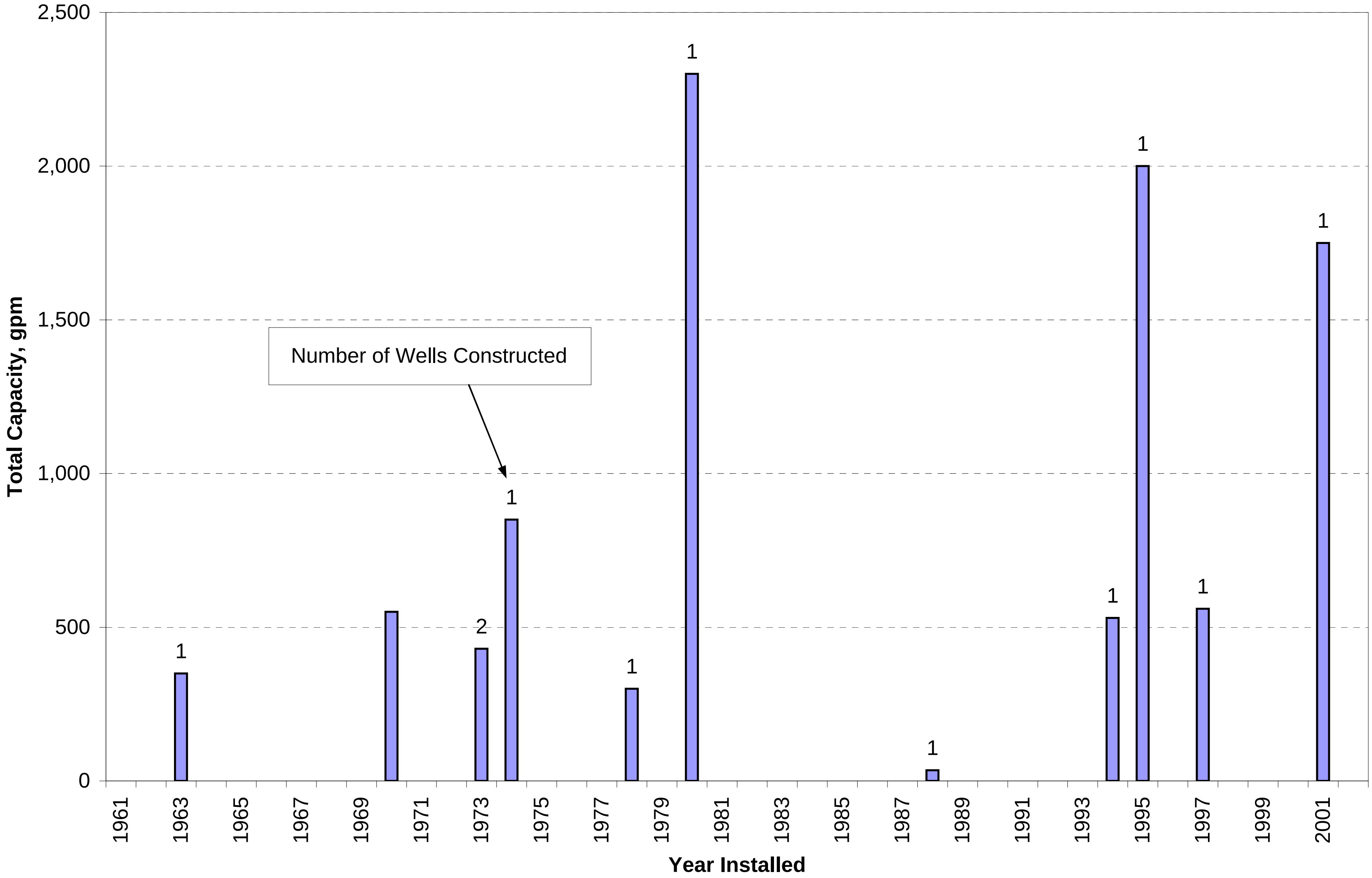
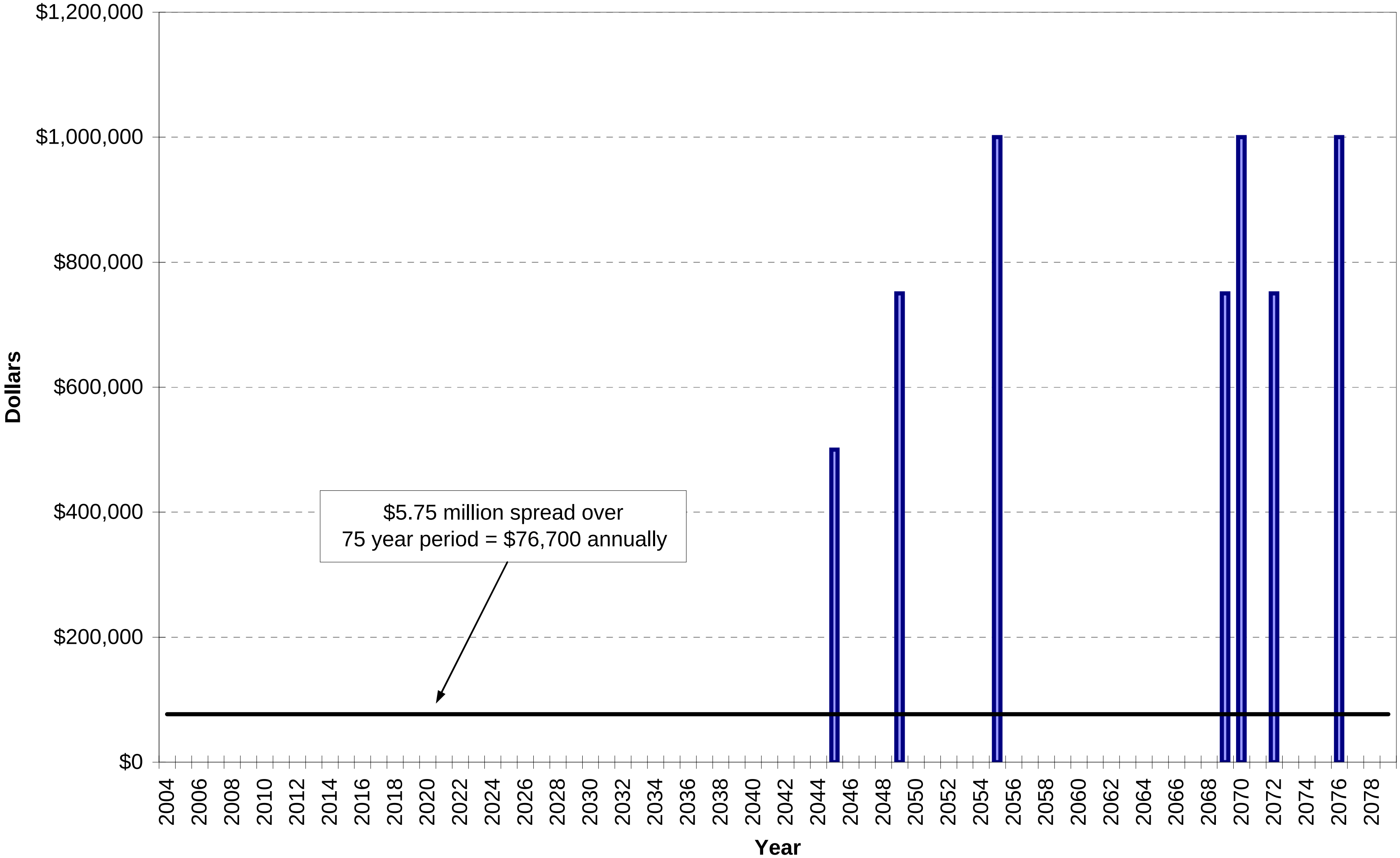


Figure 4-12
Well Replacement Costs



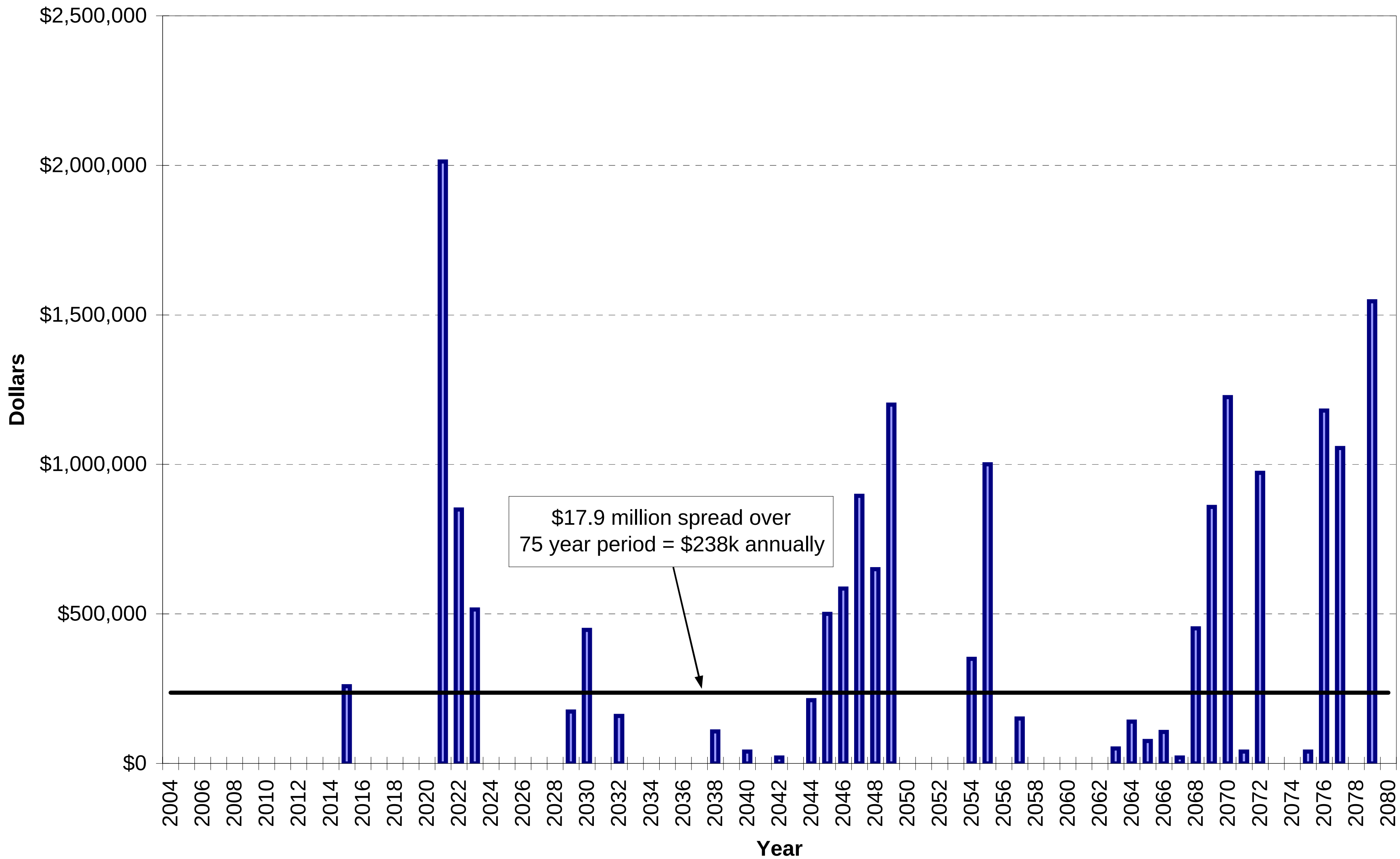
SUMMARY

Based on the costs described above, an overall program to replace all of the PPTW facilities is outlined in **Figure 4-13**. **Table 4-1** gives this data in tabular form.

Table 4-1. Anticipated Replacement Expenditures for PPTW Facilities

Year	Cost (2003 Dollars)		Year	Cost (2003 Dollars)
2004	$0		2042	$20,000
2005	$0		2043	$0
2006	$0		2044	$212,000
2007	$0		2045	$500,000
2008	$0		2046	$585,000
2009	$0		2047	$895,000
2010	$0		2048	$650,000
2011	$0		2049	$1,200,000
2012	$0		2050	$0
2013	$0		2051	$0
2014	$0		2052	$0
2015	$258,000		2053	$0
2016	$0		2054	$350,000
2017	$0		2055	$1,000,000
2018	$0		2056	$0
2019	$0		2057	$150,000
2020	$0		2058	$0
2021	$2,013,000		2059	$0
2022	$849,000		2060	$0
2023	$514,800		2061	$0
2024	$0		2062	$0
2025	$0		2063	$50,000
2026	$0		2064	$140,000
2027	$0		2065	$75,000
2028	$0		2066	$105,000
2029	$174,000		2067	$20,000
2030	$447,000		2068	$452,000
2031	$0		2069	$857,500
2032	$159,000		2070	$1,225,000
2033	$0		2071	$40,000
2034	$0		2072	$972,000
2035	$0		2073	$0
2036	$0		2074	$0
2037	$0		2075	$40,000
2038	$107,500		2076	$1,180,000
2039	$0		2077	$1,055,000
2040	$40,000		2078	$0
2041	$0		2079	$1,545,200
				$18,881,000

Figure 4-13
Summary of PPTW Replacement Costs



SECTION 5

FINANCIAL IMPACTS

SECTION 5
FINANCIAL IMPACTS

This section presents the anticipated financial impact of the proposed life-cycle replacement program.

CURRENT FACILITY REPLACEMENT EXPENDITURES

Currently, the Water Department does not have a portion of revenue dedicated for the purpose of funding facility replacement. Previous projects have been constructed by use of COPs, Proposition 55 funds, rate monies and internal loans.

Year	Pipeline Project	Funding Source
1985	1985 Pipeline Replacement Project	Rates
1987	1987 Pipeline Replacement Project	Rates
1989	Alder Creek Drive Pipeline Replacement	Rates
1991	Tahoe Donner Pipeline Replacement (Contracts A, B and C)	1991 COP issue – Last payment in 2021
1992	Downtown Pipeline Replacement	Prop 55 Bond Issue – Last payment in 2021
1994	Pipeline Replacement Project – Sierra Meadows and Tahoe Donner Phase 2	1991 COP issue – Last payment in 2021
1996	Pipeline Replacement Project – Donner Trails and Tahoe Donner Phase 3	Internal Loan from Meter Fund
1998	Telemark Place Pipeline Replacement	Rates
1999	Brookstone Drive Pipeline Replacement	Rates
2002	Tahoe Donner Pipeline Replacement – 2002	Rates

The final payments on the 1991 COP and Prop 55 Bonds will be made in the year 2021. The payments for these two bonds total just over $1.1 million. Therefore, it could be stated that the District currently spending that money on facility replacement.

OVERALL FUNDING NEEDS

As described in Section 3, about $1.5 million is needed annually to fund an ongoing program of pipeline replacement. An additional $238,000 is needed annually for tanks, wells and pumping stations. **Figure 5-1** shows the anticipated funding needs for the overall replacement program, combining the values given in **Figure 3-4** and **4-13**.

Examination of this figure shows that:

1) A funding level of $1,740,000 is needed for a fully funded Facilities Replacement Program as shown in figure 5-1.

2) The District with the 1996 COP and Prop 55 Bonds are currently funding just over $1,100,000 of Facility Replacement.

3) The 2004 Water Department budget includes $400,000 for pipeline replacement.

4) The District's current total planned expenditures for facilities replacement is $1,500,000.

5) The current planned expenditures for facilities replacement is 86% of the amount projected in this report.

6) To fully fund the Facilities Replacement Plan an additional $240,000 will be needed every year.

Future impacts on Facilities Replacement Plan:

1) New facilities constructed to accommodate growth. These facilities will increase the replacement cost, but the impact will be 75 years out.

2) The replacement costs are in 2004 dollars. The increase in construction cost will increase the cost of the replacement plan.

3) An increase in customers will provide an increase in funding for the replacement plan.

4) The Water System Master Plan calls for some of the current facilities to be replaced with larger facilities due to an increase in demand generated by growth. The District plans to fund these facility replacements with a combination of rates and facility fees.

Figure 5-1
Summary of Life Cycle Replacement Program Costs