



STAFF REPORT

Sewer Rehabilitation Program

Honorable Mayor and City Council:

Summary

Belmont's sanitary sewer collection system is an indispensable asset of the City that draws almost no notice from the community when it functions as designed. It consists of a network of over 400,000 feet (78 miles) of sewer pipe, 1500 manholes, and eleven pump stations and it serves virtually every residence and business within the City. The components of the existing system range in age from 40 to 100 years and are reaching the end of their service life. Thirteen years ago, the Public Works Department embarked on a systematic program to rehabilitate the sewer collection system. This report describes the accomplishments of the program and plans for future work.

Background and Discussion

1. Description and History of Belmont's Sewer Collection System

Well-built sewers, installed in stable soils, and adequately maintained, have service lives of 50 to 100 years. This is a long time for an engineered system, but Belmont has many sewer components that are at least this old. The Belmont Historical Society notes that the first sewer was installed in 1891 by William Reid to serve his Belmont Boys School near the Alameda de las Pulgas and Ralston intersection. This sewer ran beneath Ralston Avenue to an outfall in the bay. Downtown neighborhoods (Sunnyslope, Homeview, and parts of Central and Sterling Downs) were sewered by the early 1900s. The County Club Estates subdivisions in north central Belmont were developed and sewered in the late 1920s, while the San Juan Canyon was not fully sewered until the late 1950s when the San Juan Pump Station was constructed. Even Belmont's newest developments in the Hallmark and Western Hills neighborhoods were largely constructed in the 1960s.

Sewer system components begin to fail as they reach the end of their service life. Brittle clay sewer pipes crack and collapse and the joints are offset by earth movement and tree root

intrusion. Mechanical and electrical components in the pump stations wear out. The system design capacity becomes overtaxed by the cumulative addition of service connections and excessive infiltration of groundwater through cracks and inflow of rainwater (I/I). At this point, the system requires rehabilitation if it is to continue to provide adequate service.

2. Belmont's Sanitary Sewer Rehabilitation Program

The Public Works Department began a systematic program to inspect and rehabilitate the sanitary sewer collection system in 1991. This program consists of restoring or replacing failing sewer lines and rebuilding pump stations. The purpose of the program is to cost-effectively maintain system performance and extend the service life of the City's sewer system. Specifically, the program is designed to:

1. Improve the performance and reliability of the system,
2. Reduce ongoing maintenance costs,
3. Reduce groundwater infiltration and stormwater inflow (I/I),
4. Provide adequate capacity to reduce incidents of overflow,
5. Maintain the value and extend the service life of this publicly owned asset, and
6. Comply with current and anticipated future public health and environmental regulations.

The rehabilitation process consists of the following steps:

1. Clearing and cleaning: Sewer lines are cleared and cleaned to remove tree roots and other debris as the first step to video inspection and pipe restoration. Roots are removed through the process of root foaming with an herbicide developed and approved for this purpose. Large woody roots, sand, and grit are removed by hydrojetting, cutting, and flushing.
2. Video inspection and smoke testing: An operator draws a sewer camera through the sewer lines to photograph the condition of the sewer. The camera is connected to a computer system that generates mpeg-format recording of the video. The operator also makes inspection notes that are used to generate a log of cracks, breaks, and other defects. Smoke is used to test for unpermitted cross connection of roof leaders and area drains.
3. Condition and capacity assessments: A design engineer reviews the inspection results to assess the condition of the sewer and identify needed repairs. The engineer also calculates design flows for the pipes to determine which segments need enlargement.
4. Rehabilitation design: The design engineer clusters the sewer segments into rehabilitation projects according to the needed improvement. Pipes that are still generally in good condition and adequately sized can be restored through lining. Pipes that are severely

cracked, collapsed and/or or undersized must be replaced, typically through pipebursting. Other spot repairs may be needed to address unusual failures.

5. Construction of improvements. Pipelining adds a structural PVC plastic pipe or resin-impregnated fiber inside the original clay pipe to restore its strength and capacity. The capacity loss due to pipe diameter reduction is more than offset by the capacity increase from reduction in pipe wall friction. For installation, the liner material is heated to give it sufficient flexibility to insert into the pipe and then pressurized while warm to form it tightly against the existing clay pipe. Once cooled, it sets to a rigid, strong, and smooth lining that stabilizes further deterioration of the clay pipe. Pipebursting consists of drawing a ram through an insertion pit into the existing sewer to break and radially push out the old clay pipe while simultaneously pulling a new high-density polyethylene plastic sewer pipe into place. Both pipelining and bursting are less expensive and disruptive to pavement surfaces and traffic than open trench installation. Pipelining costs average \$30 per foot and pipebursting averages \$40 per foot. This compares to \$100 per foot for new sewer installation by open trenching.

4. Current Status of the Rehabilitation Program

To date, the City has invested approximately \$7.5 million to complete the first round of rehabilitation, restoring or replacing approximately 150,000 feet or about one third of the collection lines and to rebuild and expand the three largest pump stations. Rehabilitation began with pipelining and pipebursting projects in the Homeview and Sterling Downs neighborhoods in 1993-1994. The County Club (Notre Dame and Cipriani) neighborhoods were rehabilitated in 1996-1998. San Juan Canyon was rehabilitated in 1998-2001. The Skymont, Hallmark and Western Hills were started in 2002 with the final pipebursting project accepted by Council last month. Projects to line and burst sewers in the Sunnyslope, Downtown, and Central neighborhoods are currently out to bid with construction expected to be complete by early 2005. City staff will have maps summarizing the completed and planned projects as part of the City Council presentation.

5. Planned Future Work

The Public Works Department is planning a second round of sewer rehabilitation projects at an anticipated cost of \$4.5 million to be completed over the next five years. This second round will restore or replace another third of the City's original collection lines and refurbish another four of the older pump stations. Upon completion, this rehabilitation work is expected to extend the service life of the collection system at least 50 years, although ongoing maintenance, repair and minor upgrades will continue to be necessary.

The City is planning to contract for a new sewer system master plan this spring. This plan will provide a comprehensive review of the system I/I and capacity, and make recommendations for a

service lateral repair policy. This plan will also provide a process to integrate the collection system characteristics and condition assessments into the City geographical information system.

6. Funding the Rehabilitation Program

From 1991 through 2001, capital sewer rehabilitation work was funded by sewer fees. In 2001, the City Council approved issuance of \$15 million of bonds to fund the sewer and storm drain capital improvements. The City sold \$7.5 million of bonds in 2001 and plans a second \$7.5 million bond sale in Fall 2004. The proceeds will provide a total of \$9 million for the sewer rehabilitation program and \$6 million for the stormdrain capital program. This timely investment into the City's sewer infrastructure ensures its lasting value and continued service for the next 50 years.

Respectfully submitted,

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