# State of the Municipal Infrastructure

## Summary Status Through End of Year 2007


## City of Shreveport

## Department of Operational Services

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## February 2008

# UNDERLYING ASSUMPTIONS RELATED TO INFRASTRUCTURE ASSETS VALUATION AND CONDITION

This report represents a summary of the current methodology and approach used by the Department of Operational Services to provide a basic level of infrastructure asset management. This asset management program involves development and analyses of data related to infrastructure assets inventory, condition, and valuation parameters.

Over time these parameters change due to inflation, construction cost increases, deteriorating physical assets, etc. Since it is not possible with existing programs and tools to monitor and adjust all the parameters due to these changes, the information reflected in this report should be viewed as the best available data resulting from a reasonable amount of data development and analysis.

The data provided in this document should be considered as representative of trends in infrastructure assets renewal and expenditures.

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## PROJECTS OF SPECIAL CONCERN

The following are special or high priority infrastructure projects or concerns which are identified here to highlight their unique characteristics and to emphasize the importance in timing for addressing these projects.

While these specific projects are identified as high priority, other projects identified by the Department of Operational Services (DOS) must also be addressed as scheduled to prevent deterioration of the infrastructure categories to levels which will affect the City's ability to meet customer expectations.

### CROSS LAKE DAM

The Cross Lake Dam was built in the late 1920's. At the time the dam was built, the existing embankment was used as a railroad bridge over Cross Bayou. The spillway was constructed in 1928 to replace this embankment structure and form Cross Lake. The combined usage of the Cross Lake Dam as both a containment structure for raw water supply to the City of Shreveport's only water treatment facility and as structural support for two existing rail lines for Kansas City Southern Railroad provide an unusual situation requiring a unique balance of responsibilities and accountability related to caretaking of the dam structure and surrounding area.

### INCREASED WATER TREATMENT CAPACITY

The T. L. Amiss Water Treatment Facility (WTF), originally built in the early 1930's, is aging and requires significant investment to maintain its treatment capacity of 90 million gallons per day (mgd). This plant takes water from Cross Lake and is the City's only source of drinking water.

One alternative for assuring that the City has adequate water treatment capacity for the next 20 to 50 years would be to construct additional water treatment capacity of between 30 mgd and 60 mgd. The intent would be to construct this additional capacity in two locations, one near southeast Shreveport on the Red River, and a second one at the existing water treatment facility site. By constructing two 30 mgd water treatment plants the City could see relief in water pressure issues in the southern part of the City as well as provide redundancy (of water treatment capacity) in case one plant should become inoperable. These two plants are estimated to cost approximately $150 million each to construct.

Alternative water treatment pilot testing will need to be conducted to provide data for use in optimizing the capacity; source raw water; and physical location of a second water treatment plant. The estimated cost of this preliminary pilot testing of water treatment technologies and associated engineering analysis is $1,000,000.

## SOUTHEAST REGION WATER PRESSURE AND SUPPLY PROBLEMS

Low water pressure in Southeast Shreveport is due to a combination of inadequate water transmission capacity to specific zones of the water distribution system and inadequate pumping/pressuring capacity for specific elevation differentials in some of these zones.

The following projects, as recommended in the 1999 Water Distribution System Report prepared by Black and Veatch LLP, have been identified to address these low water pressure problems. These projects are currently under design and will begin construction mid 2008:

1) Southern Loop Water Distribution Mains

   The Southern Loop Water Main project consists of approximately 16,000 feet of 24" water main and includes a crossing of I-49 in the vicinity of the Southern Loop/I-49 interchange. The Linwood Avenue Water Main will consist of approximately 13,500 feet of 16" water main constructed between Flournoy Lucas Road and the Southern Loop. The Wallace Lake Road Water Main will consist of approximately 13,500 feet of 16" water main constructed between Flournoy Lucas Road and the Southern Loop. The estimated budget for this project is $4,500,000.

2) 36” Water Transmission Main and Inner Loop Ground Storage and Pump Station

   This project includes the installation of approximately 31,000 linear feet of 36” water main from the existing 36” water main at Walker Road and Meriwether along the Inner Loop to Bert Kouns Industrial Loop and a new ground storage tank and a pumping facility. The storage tank and pumping facility will be located at the Slack Industrial Park and will tie to the proposed 36” pipeline. The facility will include two 10 mgd pumps, one 5 mgd pump, a 5 million gallon storage reservoir, and rechlorination facilities. The pipeline project will require the acquisition of servitudes, Right-of-Way, and Special Permit Agreements from DOTD and other property owners along the proposed route. Because this project is a transmission main, there will be no direct connections to individual meters or subdivisions, but will connect directly to the City’s nearby large distribution mains. This project will provide a stronger hydraulic connection between the Amiss WTF and the southeast portion of Shreveport. The estimated budget for this project is $21,000,000.

3) 60” Water Main from the Amiss Water Treatment Facility to West College:

This project includes the installation of approximately 6,200 linear feet of 60” water main from the Amiss WTF High Service Pumping Station to the existing 60 inch water main on West College. This will require the acquisition of servitudes/Right-of-Way from KCS Railroad and other property owners along the proposed route. The estimated project budget is $5,100,000.

Subdivisions in the high-growth area of southeast Shreveport are particularly vulnerable to continuing low water pressure problems. It is recommended that no additional subdivisions be added to the water system in this area until adequate water pressures are realized through these projects.

**COMPREHENSIVE CITY-WIDE ASSET MANAGEMENT SYSTEM**

Since 1997 DOS has utilized a general form of infrastructure asset management for water and wastewater and has recently added roadway and drainage infrastructure. While this has allowed DOS to develop trends of renewal expenditures by infrastructure asset category, it has not allowed for detailed development of inventory tracking, asset valuation, condition assessments, maintenance work order systems, and budget management. Until this type of comprehensive program is implemented, infrastructure asset planning activities will continue to indicate a range of needed expenditures rather than allowing for more efficient management and spending.

A comprehensive City-wide infrastructure asset management program is a long term project that will require careful planning and development. Critical asset systems would be addressed first and over time, all asset categories would be included for a complete system. A project of this magnitude will take several years and potentially several million dollars to implement. While this seems like a large amount of capital to spend, the savings from the application of this type of program for asset renewal projects will ultimately pay for the project many times over.

# EXECUTIVE SUMMARY

## HISTORY

The state of our infrastructure is a very important issue that has a significant impact on our citizen's daily lives. As a City government, it is our business to design, construct, operate and maintain the infrastructure (roads, bridges, pipes and pumps, etc.) to facilitate the development of our City. As a practical matter, all of the facilities we put in have a life cycle. Within that life cycle it is implied that resources for the expected maintenance and the eventual replacement are required. Some facilities have different life expectancies and different maintenance requirements.

For planning purposes, we have to take into account the capital cost of a project, its life expectancy and the years between preventive maintenance and replacement. The problem is when our aging facilities were designed and built; an implied covenant was made to expend the capital to provide for preventive maintenance and replacement when the service life comes to an end. What we are witnessing today symptomatically is the advanced and sometimes premature decay of our infrastructure and the breaking of that covenant made many years ago.

Infrastructure asset management has been given understandable emphasis at the national level (U.S. Environmental Protection Agency (EPA), the General Accounting Office (GAO), American Society of Civil Engineers (ASCE)) and at the local and state levels. [1]

The emphasis on infrastructure asset management is being driven by the widely accepted fact that cities historically have managed their infrastructure poorly. This has resulted in a national concern for municipal infrastructure which is in poor condition and is continuing to deteriorate to the point of negatively impacting the economic strength of cities, as well as health concerns of citizens. [2] [3]

When implemented and managed properly, an infrastructure assets management program can provide a municipality with an infrastructure which meets expected performance levels **at the lowest possible cost**.

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[1] 'Water Infrastructure: Comprehensive Asset Management Has Potential to Help Utilities Better Identify Needs and Plan Future Investments', GAO: United States General Accounting Office: Report to the Ranking Minority Member, Committee on Environment and Public Works, U. S. Senate, March 2004.

[2] Report Card for America's Infrastructure, 2003 Progress Report: An Update to the 2001 Report Card, American Society of Civil Engineers.

[3] Report Card for America's Infrastructure, 2005 Progress Report. An update to the 2003 Report Card, American Society of Civil Engineers.

Minimization of expenditures on municipal infrastructure is not the least cost alternative to infrastructure management—it only defers needed expenditures until infrastructure assets' failure require their replacement—almost always at a much greater cost due to parts, labor, method of repair and collateral damages. These increased costs are often hidden but are real costs that unnecessarily increase the amount that citizens pay and can negatively affect the quality of services provided.

The Department of Operational Services has utilized a general form of infrastructure asset management which dates back to 1997. [4] Since that time, numerous reports on the status of the water and sewer infrastructure have been produced for the U. S. Environmental Protection Agency (EPA) and the Louisiana Department of Environmental Quality (DEQ), and for internal City use.

In 2003, the Infrastructure Committee of the City Council requested that streets and drainage be added to the monitoring of infrastructure status. It is one of the Department of Operational Services' highest priorities to implement a comprehensive infrastructure asset management program for water, sewer, streets, and drainage infrastructure that will build on what was initiated in 1997.

This document summarizes the general asset management approach used by the Department of Operational Services to report the current infrastructure expenditures and estimated renewal rates for the City's municipal infrastructure and to make recommendations about the most cost effective actions which will continue to improve that infrastructure.

[4] 'State of the Water and Sewer Infrastructure Report: City of Shreveport, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006'.

# STATE OF THE MUNICIPAL INFRASTRUCTURE

The following sections summarize the status of investment in the water, sewer, streets, and stormwater drainage infrastructure in the City of Shreveport. The information is updated through end of year 2007.

## TOTAL MUNICIPAL INFRASTRUCTURE

For the purposes of this report, the total municipal infrastructure consists of (1) water and sewer infrastructure assets; (2) roadways infrastructure assets; and (3) stormwater drainage infrastructure assets.

The following are brief discussions and explanations of specific asset categories with graphs of the annual investment expenditure in infrastructure by those categories.

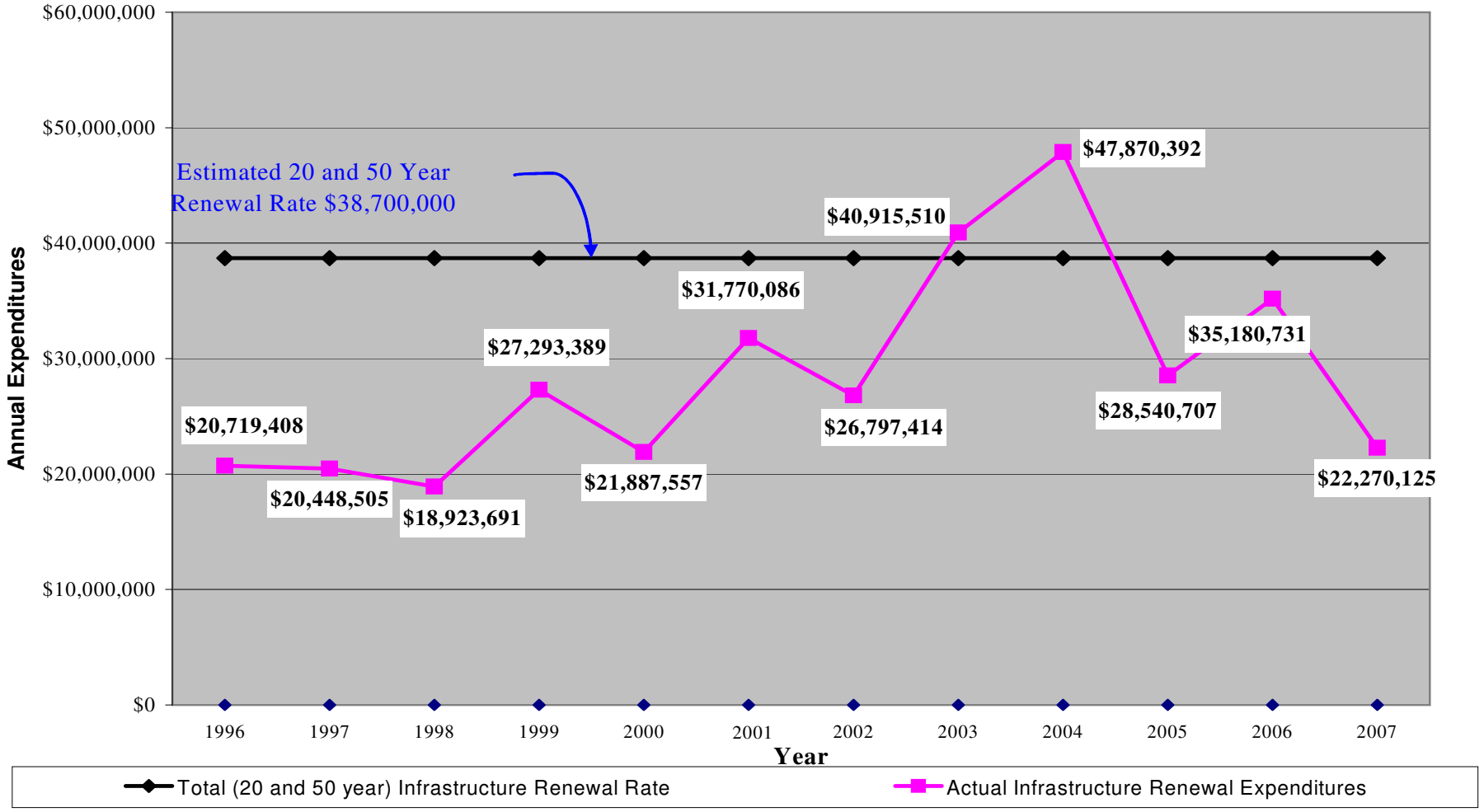
The process described below was utilized to develop the information shown on the graphs:

1) The intent of the graphs is to indicate the yearly expenditure by category as compared to the target annual infrastructure asset renewal rate by that same category.

2) The annual infrastructure asset renewal rate is intended to represent a best estimate of the percentage of infrastructure assets which will become economically inoperable each year and therefore will need to be replaced. For most assets, an economic life is typically 50 years. For assets that include equipment, an economic life of 20 years is utilized. 50 years, corresponds to an estimated infrastructure asset annual renewal rate of 2% and 20 years corresponds to a renewal rate of 5%.

3) The annual asset renewal rate (2% or 5% as indicated above) is applied to the estimated infrastructure replacement value to calculate the amount of investment needed each year for assets which need to be replaced. Conservative replacement values have been used to calculate an estimated annual replacement rate of $38,700,000 for the total municipal infrastructure.

The better the infrastructure asset management system implemented by the City, the more realistic the annual renewal expenditure the City will be able to use while improving and sustaining its infrastructure at planned operability levels. A more detailed, comprehensive asset management system will allow for less interpretation and estimation of data and will rely more heavily on actual values of existing infrastructure. This will result in more accurate estimations of infrastructure renewal rates which in turn will provide for realistic budgeting of capital improvements well as future financing plans.




**TOTAL MUNICIPAL ANNUAL INFRASTRUCTURE RENEWAL**

## WATER AND SEWER INFRASTRUCTURE

Water and sewer infrastructure assets are physical structures with related equipment, piping, and appurtenances which treat and transport water and wastewater.

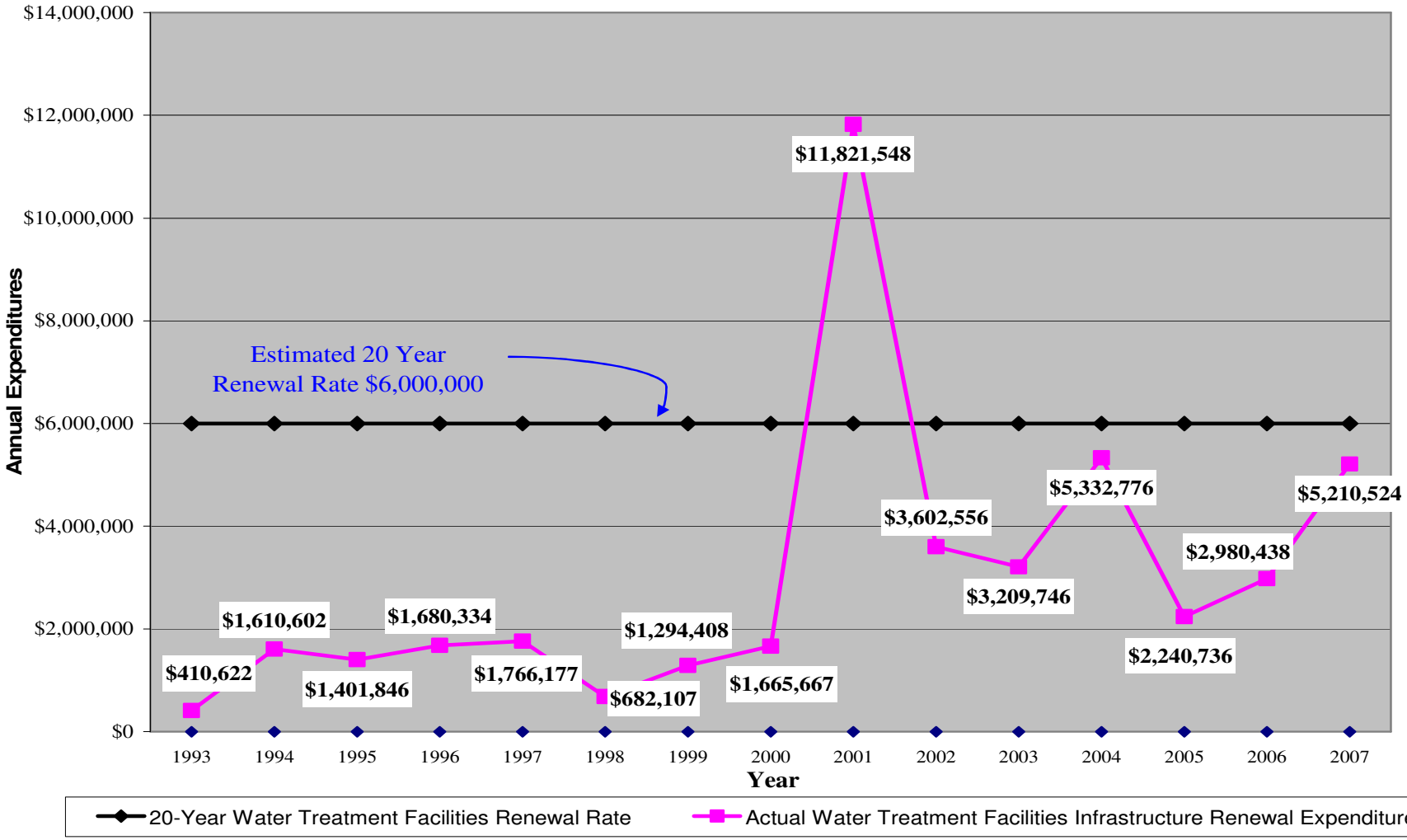
The level of water and sewer service is highly dependent upon the condition and functional capability of the water and sewer infrastructure assets.

### Categories of Water and Sewer Infrastructure Assets

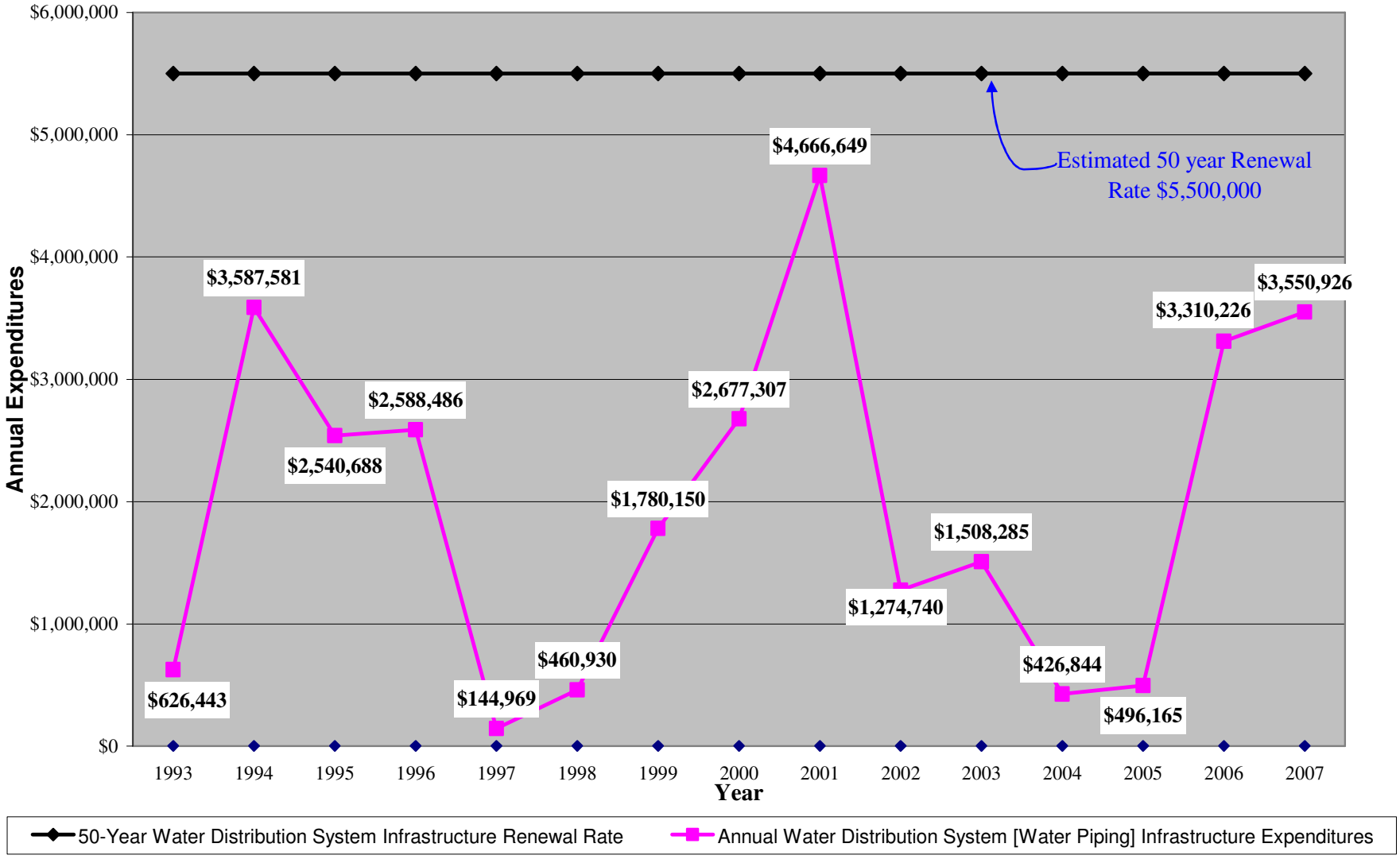
The four major categories of water and wastewater infrastructure assets are:

1) Water Supply, Treatment and Pumping Facilities.
2) Water Distribution System (Piping).
3) Wastewater Collection System (Piping).
4) Wastewater Treatment and Pumping Facilities.

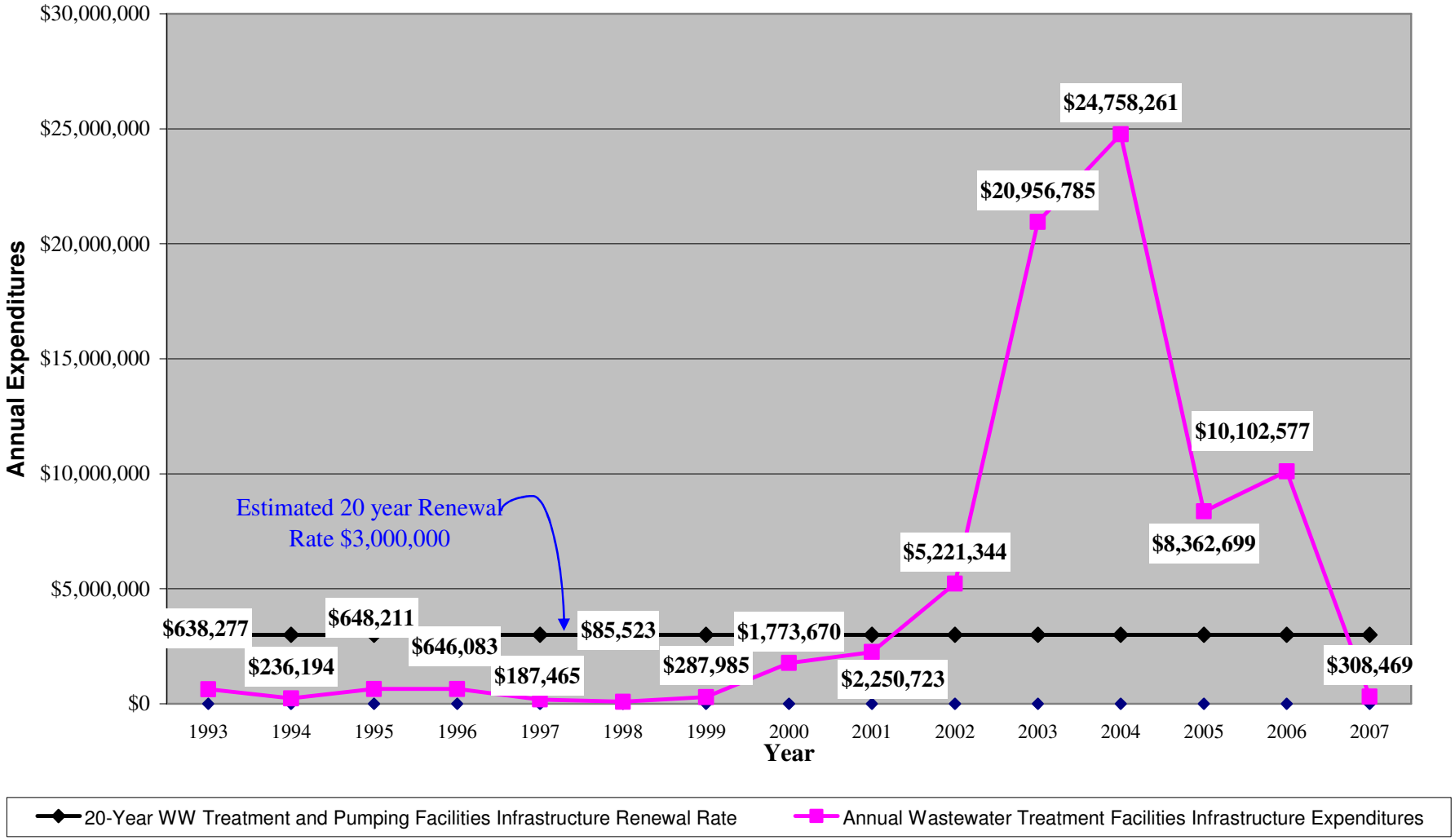
The following graphs indicate the historical investment in infrastructure for each of the above water and wastewater infrastructure asset categories.



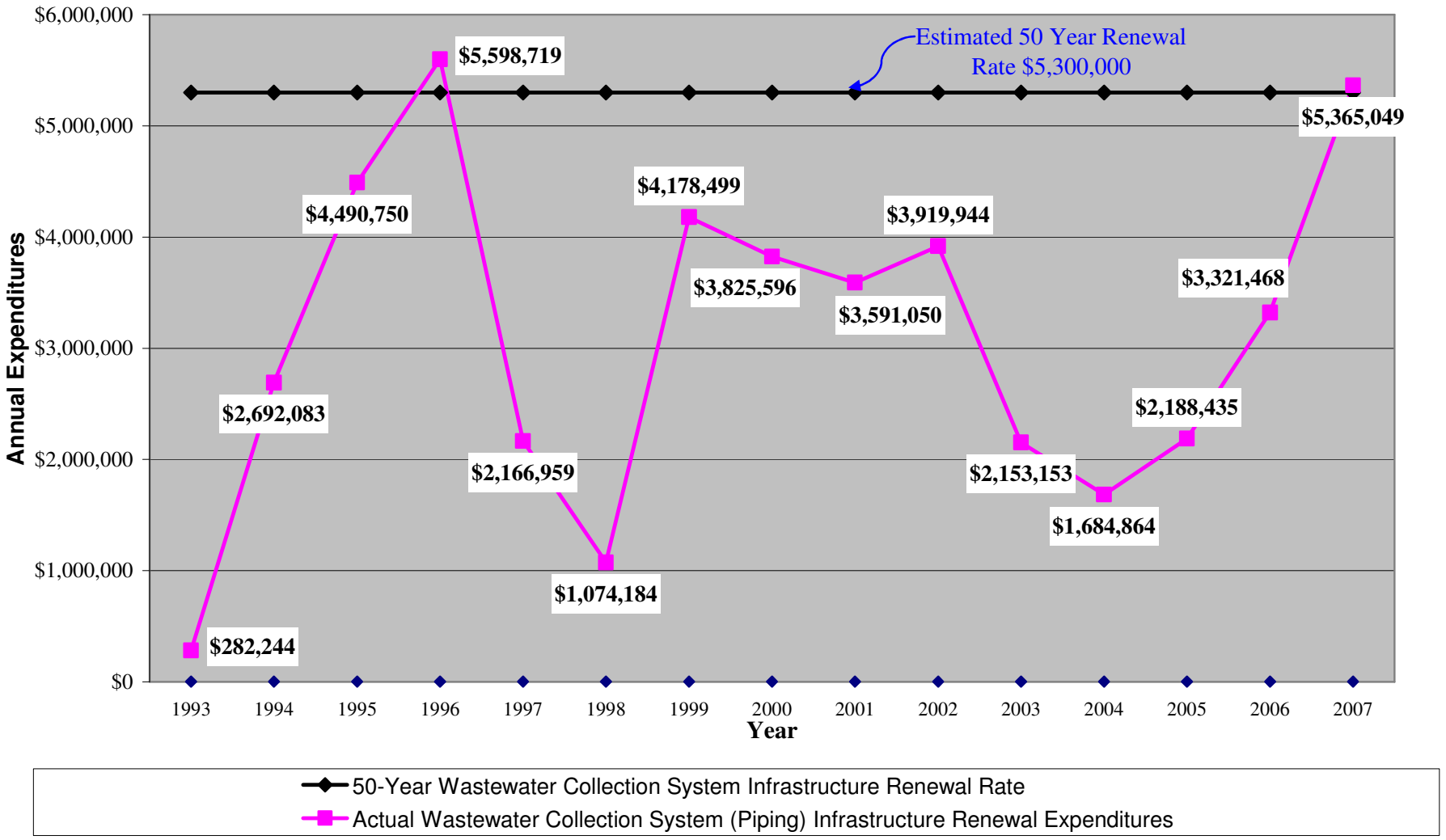

**WATER TREATMENT FACILITIES ANNUAL INFRASTRUCTURAL RENEWAL**




**WATER DISTRIBUTION SYSTEM ANNUAL INFRASTRUCTURE RENEWAL**




## WASTEWATER TREATMENT FACILITIES ANNUAL INFRASTRUCTURE RENEWAL




**WASTEWATER COLLECTION SYSTEM ANNUAL INFRASTRUCURE RENEWAL**

## ROADWAYS INFRASTRUCTURE

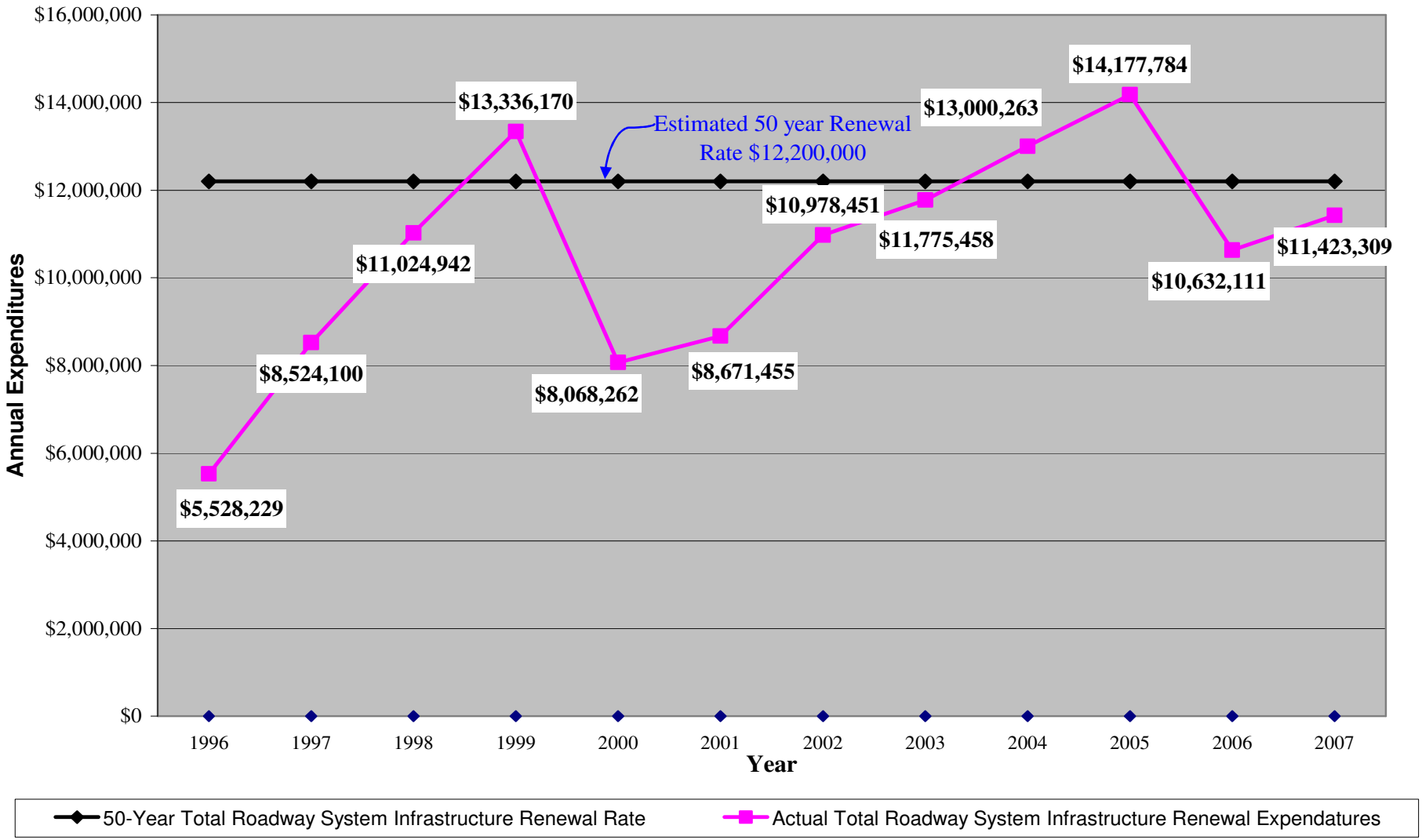
Roadways infrastructure assets are the physical road structures with related bridges, overpasses, and appurtenance which are used by vehicular traffic.

The level of operability as reflected by such parameters as lost time due to alternative routing for detours is highly dependent upon the condition and functional capability of the roadway infrastructure assets.

### Categories of Roadway Infrastructure Assets

The two major categories of roadway infrastructure assets are (1) concrete roadways and appurtenances and (2) asphalt roadways and appurtenances.

The following is a graph of roadway annual investment.




**TOTAL ROADWAY SYSTEM ANNUAL INFRASTRUCTURE RENEWAL**

## STORMWATER DRAINAGE INFRASTRUCTURE

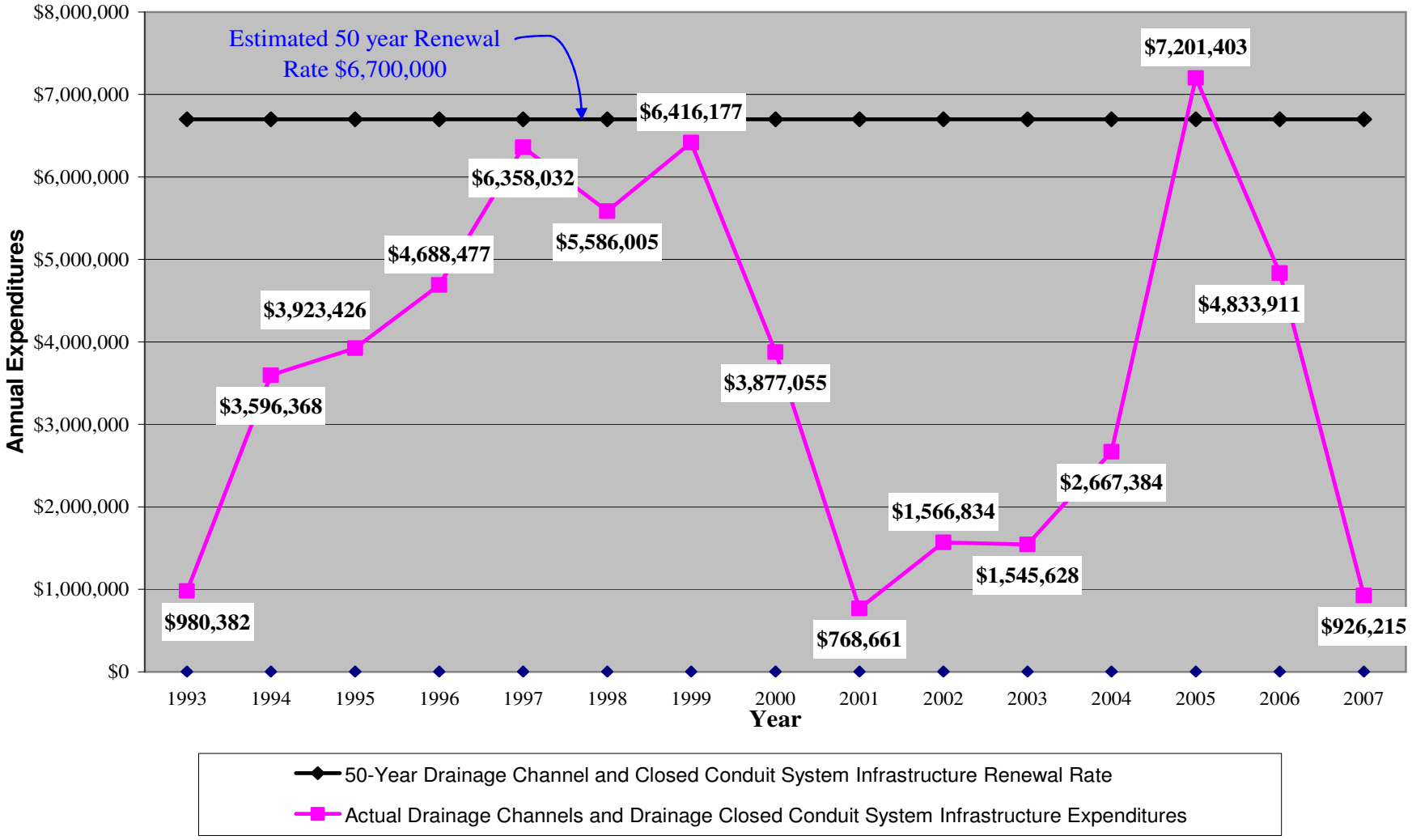
Stormwater drainage infrastructure assets are the physical structures which convey stormwater to waterways.

The level of operability as reflected by such parameters as annual liability costs due to flooding is highly dependent upon the condition and functional capability of the stormwater system.

### Categories of Stormwater Infrastructure Assets

The major categories of stormwater infrastructure assets are (1) open ditches and channels and (2) closed conduit, pumping, and piping systems.

The following is a graph of stormwater infrastructure annual investment.




**TOTAL DRAINAGE SYSTEM ANNUAL INFRASTRUCTURE RENEWAL**

## CONCLUSIONS AND RECOMMENDATIONS

The City of Shreveport municipal infrastructure assets are currently in unsustainable condition due to previous decades of neglect.

To reach a sustainable level of infrastructure condition, the City needs to:

1) Finalize implementation of City-wide asset management tools and systems to allow systematic management of the infrastructure (integrated management of operations, maintenance, and capital improvements).

2) Assure that operations/maintenance management of assets as well as ongoing evaluation of operability (i.e., adequate service level) of assets is included as integral parts of the decision process in the determination of capital improvements.

3) Invest to make infrastructure asset improvements to essentially 'catch up' on previously neglected improvements.

   As provided in documents previously, DOS had recommended an accelerated $130 million water/sewer infrastructure investment program to restore the water/sewer infrastructure to a sustainable condition which meets service level requirements for customers. At that time a total of $540 million dollars in projects were identified. Due to increases in construction costs and re-prioritization of all needed projects the accelerated program has increased to $255 million with an overall program of $615 million. Of the $255 million, $75 million was approved by the City Council in 2004 and another 26 million was approved in 2007.

4) Initiate systematic annual renewal investment of infrastructure assets which replaces assets that no longer provide an adequate service level (i.e., annually replace those assets whose condition no longer allow them to be adequately functional).

   As provided previously and as reflected in this document, it is estimated that approximately $38,700,000 annually is needed to replace water, sewer, streets and drainage infrastructure assets which become operationally obsolete.

5) Implement a budget which reflects a water, sewer, streets and drainage rate/tax structure which supports all of the above aspects of cost-effective, systematic infrastructure asset management.

## POTENTIAL FUNDING SOURCES

- Impact fees for water, sewage, and roadway infrastructure.
- Implementation of a stormwater utility enterprise fund.
- Implementation of a dedicated sales tax for infrastructure.
- Implementation of a dedicated property tax for infrastructure.
- Implementation of a taxing authority around Cross Lake for upkeep of the lake.
- General Obligation Bonds.