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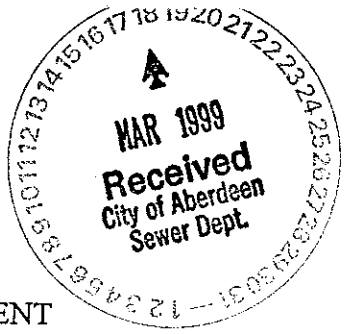

CITY OF ABERDEEN.....LEGISLATIVE DEPARTMENT

MR. MAYOR:

The Members of
Your Committee on: PUBLIC WORKS AND THE PUBLIC WORKS DIRECTOR

To Whom was Referred: Infiltration/Inflow Reduction Incentive Program

REPORTS AS FOLLOWS: In order to avoid the expenditure of millions of dollars in wastewater treatment system expansion costs, the amount of rainwater inflow into our sewer system needs to be drastically reduced. The attached report outlines a procedure recommendation to reduce rainfall-related flows to the sewer system.

IT IS RECOMMENDED: That the Council approve the concept of the Incentive Program; authorize Corporation Counsel to draft amendments to the sewer rate ordinance; authorize the Staff to explore financing program options; and to direct the Staff to notify all customers of the Incentive Program and rate changes. It is also recommended that the Council direct the Staff to do a complete re-inspection of the system for illegal drainers, send special corrective notices to illegal drainers, and direct the Staff to take action to minimize inflow related to manholes.

Larry D. Bledsoe, P.E.
Public Works Director

_____
Chairman

Reported:_____1999

Adopted:_____1999

City of Aberdeen

1999 Infiltration & Inflow Reduction Program

Prepared for

The Honorable Mayor Gurrad
and
Aberdeen City Council

Prepared by

Larry D. Bledsoe, P.E.
Public Works Director

March 18, 1999

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Executive Summary

An extensive audit of Aberdeen's Waste Treatment Plant and the infiltration/inflow (I&I) problems with our sewage collection system has recently been completed. The studies show that massive amounts of I&I enters our waste system from groundwater and during rainfall events. The I&I causes the flow to the sewer treatment plant to increase from around 2.4 million gallons per day (mgd) in dryer portions of the summer to around 6 mgd during the winter. During rainfall events, the flow can increase to over 20 mgd.

Our treatment plant was designed for average monthly flows of 8 mgd and peak flows of 13 mgd. The high I&I flows related to rainfall events have created problems both in the collection and treatment systems. Problems have included surcharged sewers, sewer backups and substandard sewer treatment levels at the plant. In order to have an adequately sized waste treatment plant to handle the peak flows, either peak flows need to be reduced or major plant improvements will be required. Although that portion of the sewer study which outlines the treatment alternatives and their costs have not been completed, based on preliminary estimates, the cost of improvements for a plant expansion will be in the range of $15-20 million and pump station improvements would cost $5,300,000.

The I&I report concluded that if a traditional approach were taken for I&I reduction and the past pattern of success were maintained, the inflow reduction would not be enough to ward off the need for massive expansion expenditures at the plant. Over the years, the City has maintained an aggressive program of testing sewer lines, repairing leaks and separating the stormwater system from the sanitary sewer system. Although the total I&I has been reduced, there has been insufficient reduction during rainfall events to ward off problems.

It is felt that the major part of the rainfall-induced I&I is created by problems on private property. Typical problems would include faulty side sewers, improperly abandoned sewer stubs, roof drains, sump pumps, yard drains or foundation drains improperly connected to the sanitary sewer, faulty plumping in crawl spaces, open inspection tees, and a number of ingenious methods used to drain rain water from private property to the sanitary sewer. The City has corrected many of these problems in the past, but there are many we were not aware of and many that have reconnected the connections to the sanitary sewer after the initial corrections were made.

The City is legally bound to have an improvement plan schedule prepared by January 15, 2000, of sewer system components deemed inadequate. Construction plans must be completed by July 2000 with construction completed by July 2001. A one-year extension on completion of the construction can be obtained, but during that time, the City would pay a $1,000 fine for any day that it did not meet its EPA permit. If the City is to have any impact on reducing the cost of improvements, the peak I&I will need to be reduced by October 1999,

so that the winter flows of November/December 1999 can be monitored to determine the effectiveness of the reduction.

A comprehensive program will be needed to reduce I&I. In order to obtain customer compliance with eliminating improper connections and special problems, an incentive program would be initiated. A program in which customers who correct their problems would receive an incentive payment of up to $300.00 and customers who do not correct their problems will pay double rate sewer bills. The details of these programs are outlined later in the report.

In parallel with the incentive program, the City Staff will have a stepped-up inspection program and take steps to eliminate problems associated with leaking manholes.

The current approved sewer budget of $2,934,728 projected a year-end cash balance of $349,376. It is anticipated that approximately $250,000 of this amount will be used on this program.

Results of I&I Study and Treatment Plant Audit

Attached is the Executive Summary of the I&I report. Additional detailed information can be provided.

The treatment plant audit report is in draft form and its Executive Summary has not yet been written. The report does show that during peak flow periods, the following treatment plant components have capacity problems: influent pumps, aeration system and secondary sedimentation tanks. Also in the planning period, the following additional components will have capacity problems: influent bar screens, comminuters, RAS pumps, chlorine system and effluent measurements.

CITY *of* ABERDEEN
INFILTRATION AND INFLOW STUDY
Executive Summary

The City of Aberdeen perceived the need for a study of infiltration and inflow into the sewer collection system to address several specific, long-term problems experienced throughout the community, despite extensive I/I correction efforts by the City extending back many years:

- Peak flows at the treatment plant exceeded capacity and occasionally resulted in NPDES exceedences.
- Flow volumes within the sewer collection system were so great that overflows occurred at times that resulted in discharges to the local rivers.
- High wastewater flows surcharge the sewer collection system so some connected plumbing fixture operations are impaired, and even causing sewage to back up into some homes.
- Future wastewater flows from the Stafford Creek Correction Center and other anticipated growth requires capacity be provided within the sewer system that necessitates better use be made of existing facilities.

Historical data assembled by the Sewer Utility personnel indicates that the average day flow is approximately 2.4 mgd in dry weather, and the maximum month average day flows at the wastewater treatment plant reach 16 mgd. The ability of the treatment facility to meet permitted effluent limits at these high flows is compromised; yet Pump Station No. 1, the influent station to the plant, is often surcharged to a depth of many feet by even larger flow volumes unable to reach the plant.

Existing data was collected for this Study from a number of City sources including the Hansen database, interviews of Sewer Utility staff, television inspection records, annual I/I Reports to DOE, Daily Monitoring Reports of the treatment plant, pump station operating records, and sewer system reconstruction records from the 1970s.

Additional data was developed by continuous wastewater flow monitoring at 21 key locations throughout the sewer collection system. Precipitation data was collected at two locations with recording gauges. Goundwater levels were measured through a series of piezometers installed in the lower lying areas of the system. Tide levels were collected with a recording gauge. Selected points of the system were physically inspected during peak flow events to observe actual conditions and performance.

Analysis of all collected data began by reducing monitored flow records in each of the 21 basins to identify the extraneous flow above the normal sewage component, and then defining extraneous flow in gallons per day (gpd) per inch of pipe diameter per miles of sewer main. This approach normalized differences in land use and area among the 21 basins to better display

relative differences, and to identify where most of the extraneous flow originated. The analysis disclosed a number of interesting facts:

- Peak flow to average flow ratios within individual basins ranged from 2 to 60, with the higher values indicating which basins had the most extraneous flow.
- Extraneous flow rates ranges from about 10,000 gpd per inch-mile to nearly 70,000.
- Peak flow into the treatment plant reached an instantaneous rate of 20 million gallons per day (mgd).
- Groundwater levels in the lower parts of the City are always above the sewer mains, and are above the sewer stubs and side sewers during wet weather.
- Extreme high tides do affect the depth of flow in some sewer mains.
- Infiltration of groundwater into sewer mains even during the winter only totals 2 or 3 mgd and does not significantly affect the capacity of either the collection sewers or the treatment plant, so long as there is little or no rain.
- Rainstorms, particularly heavy rains of 2 or more inches within 24 hours, causes a rapid increase in flow through the system that soon approaches the hydraulic capacity of the plant; and may continue for a day more even after rainfall ceases.
- Extraneous flows result from a combination of direct storm inflows to the sewer as well as infiltration leaking into manholes and side sewers.

Evaluation of the precipitation data indicates that a 24-hour rain-storm of just over 3 inches approximates a 2-year return interval. Flow monitoring data during such a rain storm indicates that the peak day flow through the sewer would be about 23.0 mgd, if capacity were available.

Future population increases forecasted from the State Office of Financial Management data and the Stafford Creek Correction Center indicate that approximately 2.0 mgd in additional flow can be expected by the year 2020. Thus, the peak day flow in the sewer system, without any rehabilitation to remove extraneous flow, would be about 25.0 mgd in 2020.

A capacity analysis of the sewer collection system indicates that the pipe system can convey about 27 mgd. However, the existing pump stations can not accommodate such volumes. Seven stations need improvements at an estimated project cost of about $5,300,000.

An evaluation of extraneous flow rehabilitation costs and expected effectiveness indicated that about 2.9 mgd in peak day flow may be removed at an estimated cost of about $3,000,000. This work would include specific repairs on the pending work orders on file in the City Hansen database that contribute significant extraneous flow. Additional work would focus further investigation to specifically locate defects and to repair them in four of the 21 monitored basins within the sewer system. We recommend that the City initiate the above rehabilitation program with a pilot program in Basin 2. The pilot program would verify the methods, costs, and anticipated removal efficiencies presented in Section 7. Basin 2 is selected because it is the smallest basin with the most severe problems. After completion of the pilot program, further

rehabilitation should be pursued in Basins 3B, 19 and 6, then continuing with such adjustments as are found appropriate.

Following rehabilitation of the pending work orders and the four basins, the rehabilitated peak day wastewater flow in the year 2020 is expected to be about 22.1 mgd.

Incentive Program

1. All customers will receive notice of the program.

2. Special additional notices will be sent to all property owners and customers where a problem is known to exist.

3. As additional testing is done and problems are found, additional notices will be sent to owners and customers where problems are found.

4. Pre-work inspections will be made at all locations after a customer calls and reports a problem.

5. After corrective action is taken, the City will make incentive payments as follows:

   a. If a licensed contractor other than the customer performs work: the amount of the invoice not to exceed $300.00 with a minimum of $100.00.

   b. If work is performed by someone other than a licensed contractor: twice the value of materials used and equipment rental not to exceed $300.00 but a minimum of $100.00.

   c. City is to inspect work to determine that it is a permanent solution.

   d. Property owner to sign a certification that if they make any illegal connections in the future, the full amount of the incentive payment will become a lien on the property at the rate of 10% interest from the date the illegal connection is determined. The City will have the right to make re-inspections for one year.

6. Incentive work must be completed by October 1, 1999.

Financing Program

Need:

There will be customers who will need to make corrections but do not have the financial resources to do so, and may not qualify for conventional financing. If alternative financing is not provided, the work may not get done.

Legality:

State Code has been modified to allow cities to provide financing for private improvements for conservation and pollution control type projects.

Basic Program:

Anyone utilizing city financing will **not be eligible** for an incentive payment. Financing will be at $0 down, 1% interest, monthly payments for a maximum of five years, minimum monthly payments of $25.00 and a maximum loan of $3,000.00.

Loans will be made to owner-occupied or rental property. No loans will be made for vacant property or property which, in it's current condition, cannot legally be inhabited or occupied. Loans will be liens on the property. The actual procedure for accomplishing such a program needs to be developed by Staff with final approval by the Council.

Non-Compliance Program

It is recognized that not all property owners will respond positively to correcting their problems within the time frame allotted. The following actions are recommended be taken in case of non-compliance:

1. For occupied structures where corrective action is not completed or underway within 60 days of Notice to Correct, the sewer rate will be doubled, and will remain so until the problem is corrected.

2. For undeveloped or uninhabitable property where corrective action is not completed or underway within 60 days of Notice to Correct, the City will dig up and cap the sewer stub at or near the property line.

3. For all other vacant property where corrective action is not completed or underway within 60 days of Notice to Correct, the City will place a plug in the sewer line at or near the clean-out and water service will not be provided until the problem is corrected.

Staff Activities

In order to combat the I&I problem and implement the Incentive Program, the City Staff will do the following:

1. Send letters to all currently known and suspect problem properties.
2. Re-smoke test the entire city within two months and document problems.
3. Send letters to all problem properties discovered.
4. Meet with individuals to give technical advice when requested.
5. Meet with individuals who voluntarily request participation in the program.
6. Plug all holes in manhole lids.
7. Inspect and seal problem manholes.
8. Take corrective action on problems where the City has responsibility.
9. Re-smoke test the entire city a second time during a drier portion of the year.
10. Determine status of State Street line.
11. Perform other additional testing as outlined in the I&I report.