COLLECTION SYSTEM OPERATING COST REDUCTION

Utilize the attached spreadsheet to organize operational data into a financial evaluation. The results will provide the basis for shifting money from reoccurring losses to improvement projects that make the collection system more efficient for less money. The information will give your decision makers the basis for making sound financial decisions irrespective of regulatory fines and penalties.

Three primary components are involved in reducing the cost to operate; 1) reduce inflow and infiltration (I/I) to restore capacity in the existing system; 2) reduce SSO and maintenance costs; and 3) repair system structural damage. Start with projects that reduce reoccurring operational losses by a "Payback Factor" on the investment, greater than 2:1.

The following explains how to use the attached spreadsheet to calculate the "Payback Factor" reflecting how many times the project cost is paid back with loss reduction over a 10 year period. Additionally, the "Payback Period" reflects how many years it takes to recover the project cost with losses saved. Only fill in blank spaces marked with asterisks (*). The remaining spaces are automatically calculated.

To simplify the analysis, a 10 year period is used. Even though the improvements are normally designed to last 50 years, and financing can be over a longer period, this approach simplifies the analysis. The spreadsheet shows sample figures for the three Components.

Component 1. Reduce Inflow and Infiltration (I/I) to Restore the Capacity in the Existing System

Inflow and Infiltration (I/I) control reduces the amount of wet weather flow conveyed and the cost to transport and to treat storm water, reduces the number and volume of Sanitary Sewer Overflows (SSOs) and costs associated with clean-up and damage. Begin filling out the spreadsheet at (*A) through (*O). Reducing I/I also provides the benefit of reducing SSOs and maintenance costs, so also include calculation (*Q) through (*U) to get the total "Payback Factor" at (KK) and the "Payback Period" at (LL).

Action Required: Block manhole openings to reduce inflow. Select a barrier that will allow controlled overflow release. Avoid bolting cover

to prevent redirecting the overflow into homes and businesses. Rebuild the leaking pipe system by lining or replacement and repair/seal joints to reduce infiltration. Redirect unauthorized private rainwater connections such as roof and back yard drains. Reanalyze the need for downstream relief projects due to increased or restored capacity in existing system.

Formula to Calculate Costs Savings vs. Improvement Costs:

-To compare the annual wet and dry weather flow treated at the plant, enter flow during dry weather on the spreadsheet at (*A) and wet weather at (*B) to find the difference (C) in the amount of flow. Enter the number of wet months at (*D). Enter the cost to transport at (*E) and to treat at (*F) to find the loss to transport and treat I/I at (G). Analysis is based on SSO reports, flow monitoring, hydraulic modeling, leak detection, work orders, and vendor records.

- Calculate the annual cost to clean-up SSOs and repair damage during wet weather caused by I/I and enter on the spreadsheet at (*H), to find the savings (L) if improvements are made. SSOs should not occur after the project is completed, however entry (*K) is provided in the event that this project alone will not be able to fully eliminate all SSOs. Look at typical crew and equipment time for response, site remediation costs and costs of public notification and reporting, property damage (from back-ups into homes and businesses) and clean-up costs.

- Calculate the cost of the downstream relief project needed if nothing is done to restore capacity in the existing system and enter at (*O).

-Reducing I/I to restore the capacity in the existing system also provides the benefit of reducing maintenance and dumping related SSOs, so include calculation (*Q) through (*U). Continue to follow Component 2 Formula to Calculate Cost Savings.

-The money saved over a 10 year period, by not transporting and treating storm water during wet weather, the reduced number of SSO clean-up costs and damage, plus money saved by not building downstream relief projects, together with money saved in reduced maintenance, appears on the spreadsheet at (X).

-Calculate and insert the estimated cost of the improvements within the project area at the end of the spreadsheet and enter at (*HH).

-The total 10 years of savings is divided by the cost of improvements to obtain the "Payback Factor" (KK).

-The "Payback Period" (LL) indicates the period of time required to pay for the Project cost by loss recovery.

Component 2. Reduce the Cost to Maintain

If the Agency is not experiencing cost associated with I/I, but rather with SSOs caused by roots, dumping in manholes, debris, and grease costs can be reduced by improving the system to remove the cause of the SSOs.

Savings is realized by reducing the number of times the system needs to be maintained during a given period for example from as often as monthly, to once a year or even to once every three years. Maintenance becomes an internal function of sewage conveyance and not increased by external factors such as the need to unclog pipes blocked by material dumped into the manholes and from grease interceptors. Complete the portion of the spreadsheet (*Q) through (*U) to get the total "Payback Factor" at (KK) and the "Payback Period" at (LL).

Action Required: Secure the manholes to prevent dumping. Select a barrier that will release controlled outflow. Avoid bolting cover to prevent potential overflows into homes and businesses. Remove grease, debris, and roots from the pipe system. Enforce pre-treatment requirements for restaurants and other commercial contributors. Line damaged pipes where necessary.

Formula to Calculate Costs Savings vs. Improvement Costs:

- Calculate the cost to clean-up SSOs and repair damage caused by dumping, roots and debris, and enter on the spreadsheet at (*Q), to find the savings at (S) if improvements are made. SSOs should not occur after the project is completed, however entry (*R) is provided in the event that this project alone will not be able to fully eliminate all SSOs. Look at typical crew and equipment time for response, site remediation costs and costs of public notification and reporting, property damage (from back-ups into homes and businesses) and clean-up costs.

-Savings is computed based on the difference between the frequency of an SSO or stoppage with and without the improvement times the cost of an SSO stoppage response.

- Calculate the annual maintenance cost to clean the lines in the project area (every 6-12 months) and enter at (*T). Enter the amount of maintenance cost if lines cleaned every 3 years at (*U). Annual maintenance cost savings after project is complete appears at (V).

-The money saved over a 10 year period, reflects the reduced number of SSO clean-up costs and damage, plus money saved by reducing maintenance, and appears on the spreadsheet at (W).

-Calculate the cost of the improvements within the project area and enter at (*HH). Include the cost to remove the roots, debris and grease clogging the system, and to lock the manholes to prevent dumping, and line the pipes if necessary.

-The total 10 years of savings is divided by the cost of improvements to obtain the "Payback Factor" (KK). The maintenance costs saved annually document the financial benefit of the project.

-The "Payback Period" (LL) indicates the period of time required to pay for the Project cost by loss recovery.

Component 3. Repair Structural Damage

Analyze structural damage resulting from aging system, root damage, exfiltration from blockages, from dumping, and construction related activities. Cost associated with structure failure are larger than with SSOs and result from open cut excavation, structural replacement, surface restoration costs (pavement), as well as community and customer impacts like loss of service costs, reduced traffic flow and traffic control costs and public health and property damage risks. The structural failure may include catastrophic loss costing more than spot repair damage cost.

If the project involves rebuilding structural damage, fill out the spread sheet from (*A) through (*DD). Structural repair provides the benefit of controlling I/I and reducing SSOs and maintenance costs, so include Component 1 and Component 2 Formulas to Calculate Cost Savings to get the total "Payback Factor" at (KK) and the "Payback Period" at (LL).

Action Required: Secure the manholes to prevent dumping. Select barrier that releases controlled overflow. Avoid bolting cover to prevent backing up sewage into homes and businesses. Replace or line deteriorated pipes, manholes, lift stations, and other related system components. Prioritize funding to rebuild the portions of the system that are most likely to have a catastrophic failure with the greatest impact on the public and with the greatest loss reduction to investment ratio. Use sub-basin analysis with standard condition class codes to estimate the potential system failure based on historic information. Use the data collected for SSMPs, WDRs, and Vulnerability Assessments, work orders, vendor invoices, staff experiences, the probability of potential system failure, and other internal records to determine which projects provide the most benefit from investment made.

Formula to Calculate Costs Savings vs. Improvement Costs:

-Enter on the spreadsheet at (*Y) an estimate of the number of structural failures likely to occur in the 10 year period that requires spot repairs. Enter the construction costs of the spot repairs required at (*Z), and the cost associated with property damage, clean up and restoration at (*AA). The 10 year cost savings appears at (BB).

-Estimate the number of catastrophic events likely in the 10 year period and enter at (*CC). Select projects that are expected to have at least 1.

-Calculate the cost of catastrophic structure failure and enter at (*DD). The catastrophic loss total appears at (EE), with the total 10 year loss for spot repairs and catastrophic damage at (FF).

-Continue to utilize the spread sheet by entering calculations to include reduced I/I, beginning at (*A), and to reduce maintenance costs, beginning at (*Q). See the above sections for information.

-Calculate the cost of the improvements within the project area and enter at (*HH).

-The total 10 years of savings (GG) is divided by the cost of improvements to obtain the "Payback Factor" (KK). Compare the cost to improve the most probable failure locations with the cost of failure.

-The "Payback Period" (LL) indicates the period of time required to pay for the Project Cost by loss recovery.

Implementation and Conclusion

Individualize the priority to tailor results to the agencies worst problems first, or to meet grant requirements. For example, if dumping in areas adjacent to commercial building loading docks is producing large clean-up costs, lock the manholes at that location first and justify the project cost by comparing the investment to the savings in clean-up costs and damage related claims. If wet weather is producing a 40% increase in storm water conveyed and treated at the plant, rehabilitate the low lying areas with the greatest volume of storm water inflow. Use the SSO data to supplement the cost of treating storm water. If televising lines reveal eminent structural failure, the agency will save costs from spot repairs, catastrophic loss, reduced I/I, SSOs and frequency of maintenance required. Start with the most deteriorated first, to realize the fastest benefit from the investment.

Accepted financial principles are used to demonstrate that applying the money lost annually to an improvement project can result in a decreased budget in a few short years. Repairing the aging infrastructure before the cost to maintain exceeds the improvement costs only makes sound business sense. Taking steps to protect the infrastructure from intentional and unintentional acts that cause damage and losses is important to reduce the impact on the community and the environment.

Managers can use this financial model in conjunction with asset management programs, based on the recently collected information required for environmental compliance. Use the money available to fix the problems instead of paying unnecessary maintenance and cleanup costs, SSO fines and penalties, staff time, court costs and attorney's fees.

This is an information sharing document intended to assist you. If you have questions, need assistance, or have suggestions call (408-761-5882) or email dave@sewerlock.com. Dave Ross served as manager-engineer for sewage conveyance agencies and is now at SewerLock.