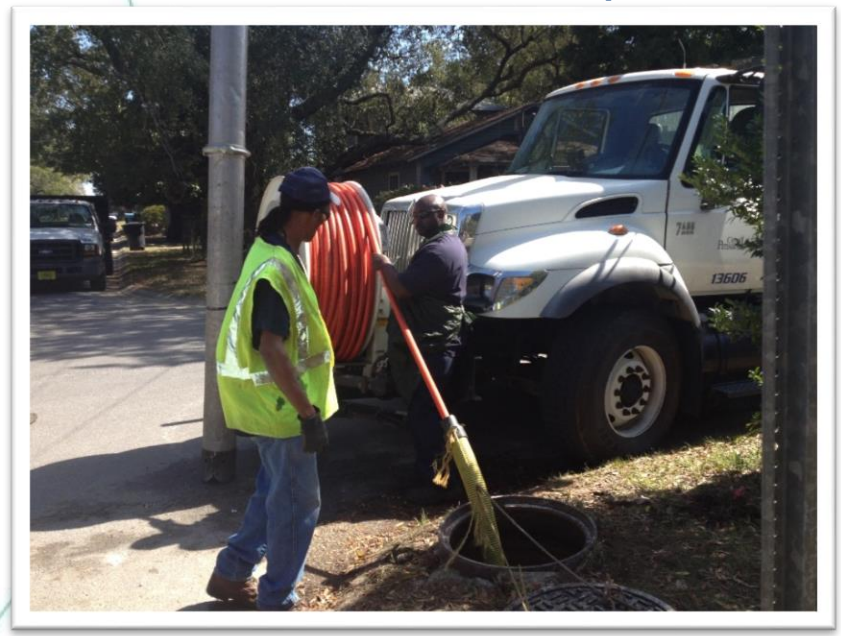
# Maintenance Cost Analysis and Techniques

**Public Works and Facilities Department**

**September 2019**

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# Introduction

- **"We can and should do better at ensuring that all BMPs not only meet our water quality goals when first installed, but also continue to do so over time with maintenance. Willfully installing infrastructure that cannot be reasonably maintained and restored to full functionality is a waste of limited storm water dollars. We have a number of highly effective BMPs available, but moving forward, we must remain mindful that the BMPs we implement also must be reasonably accessible for maintenance. Additionally, we must continue to develop innovative BMPs that effectively address pollutants of concern, are maintainable and operate at the lowest possible lifecycle cost." – Berg, Derek. *Bound for Failure,* SWS Magazine, August 2019**

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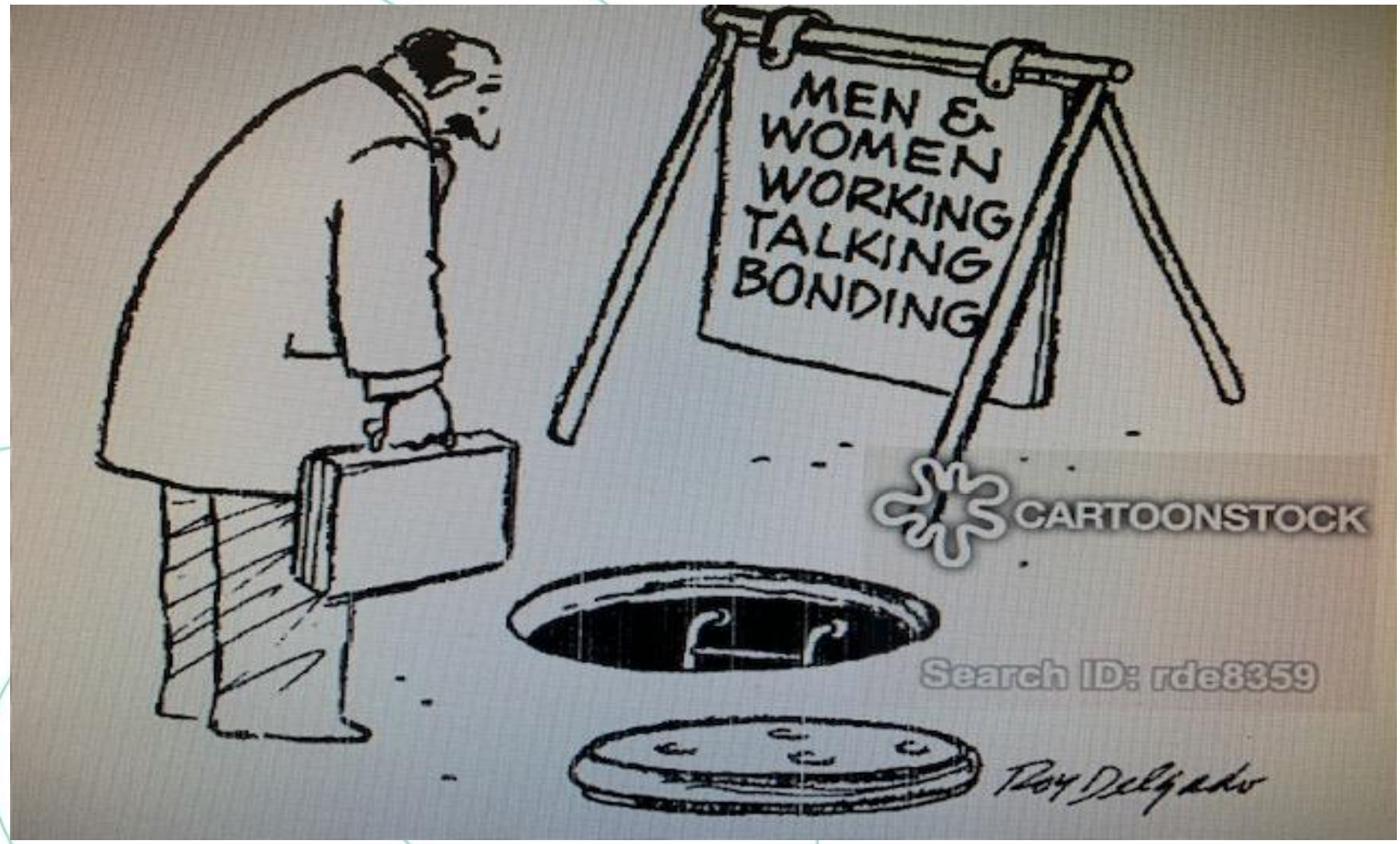
# Introduction

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# Introduction

- It's no secret that most municipalities do a less than an exemplary job of maintaining their roadways and stormwater infrastructure.

- This is typically a result of staffing shortages, budget shortages, failure to consider maintenance difficulty and cost in the conceptual design process.

- Staffing shortages and maintenance cost force municipalities to perform cost-benefit analysis on performing maintenance operations that extend the life of infrastructure and promote cost savings.

- Street sweeping is one such maintenance operation.

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# Introduction


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# Introduction

- **Most municipalities like the City of Pensacola have limited staff available for in-house maintenance of Stormwater infrastructure.**

- **Being “proactive” and addressing issues up-front at the source can significantly reduce maintenance costs down the line.**

- **Street sweeping is one of the most important front-line measures that can be utilized to save wear/tear on BMP infrastructure and protect the environment.**

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- City currently has a fleet of seven (7) street sweepers with five (5) that are actively utilized on schedule
- City has 326 miles of paved roadway that is swept every four (4) weeks
- Sweep about 60 miles of FDOT roadway through a JPA
- Perform contract sweeping for public/private venues and events throughout the City

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## Benefits

- **Street sweeping promotes roadway safety (vehicular, bike and pedestrian)**
- **Street sweeping significantly reduces pollutant loading in MS4 systems**
- **Street sweeping increases aesthetic appeal**
- **Street sweeping increases the longevity of roadway infrastructure and drainage systems**
- **REDUCE LANDFILL DISPOSAL COSTS FOR SOLIDS DISPATCH**

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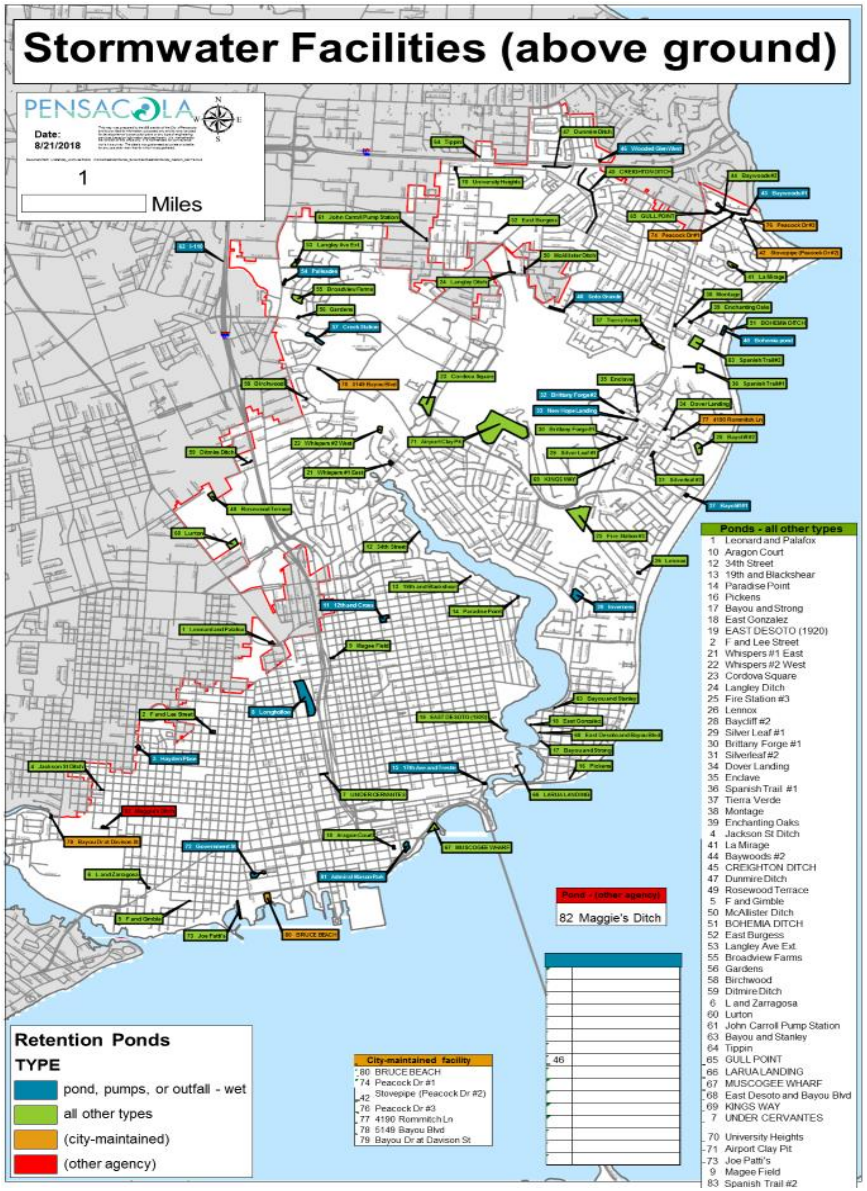
# ABOVE GROUND MAINTENANCE
# (Ponds, Swales, Ditches, Outfalls, Etc.)




- **The City currently has 57 “retention” stormwater ponds**
- **Requires that ponds and ditches be “cleaned” approximately every 5 years to remove blinding materials (solids, oils, etc.).**
- **Street sweeping is very effective in removing materials from roadways, parking lots, etc., BEFORE the materials enter ponds and ditches.**

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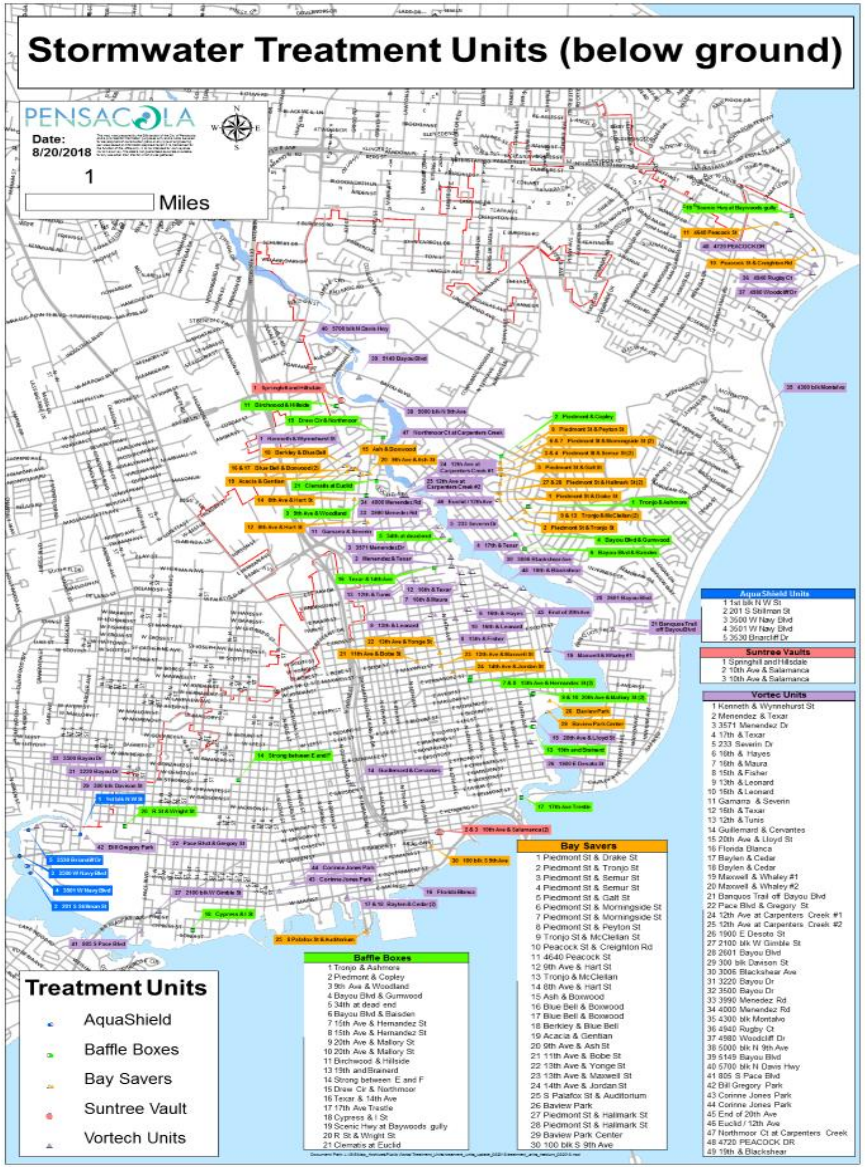
# BELOW GROUND MAINTENANCE
# (treatment units and lift stations)




- **The City currently has 109 proprietary treatment units in-place and is approximately 96% built-out.**
- **Due to the very limited availability of open land for new stormwater ponds, proprietary units are most commonly used in retro-fit treatment projects.**
- **Program has removed approx. 6,100 cubic yards or 16M lbs (8000 tons) over the past five (5) years.**

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# Cost Analysis of Street Sweeping Benefits

**Objectives**

- **Identify annual costs of sweeping program**
- **Identify annual costs of material disposal from proprietary treatment units**
- **Estimate approximate budgetary savings due to sweeper program**
- **Reveal efficiencies and synergies**

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# Cost Analysis of Street Sweeping Benefits

| Data (Sweeping-Base Cost) | | | |
|---|---|---|---|
| Year | Swept (tons) | Cost (manhours/capital) | Cost/Ton |
| • 2018 | 3423 | $716,034 | 209.18 |
| • 2017 | 3280 | $690,816 | 210.61 |
| • 2016 | 3750 | $757,146 | 201.91 |
| • 2015 | 3600 | $715,818 | 198.84 |
| • 2014 | 3486 | $681,064 | 195.37 |
| • 2013 | 3478 | $656,268 | 188.69 |

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# Cost Analysis of Street Sweeping Benefits

## Data
## (Treatment Vault Cleaning)

| Year | Solids (Tons) | Removal | Disposal ($68 Tip) | Cost/Ton |
|---|---|---|---|---|
| • 2018 | 1654 | $198,000 | 232,764 | 260.44 |
| • 2017 | 1639 | $198,000 | 223,040 | 256.89 |
| • 2016 | 1643 | $198,000 | 255,000 | 275.72 |
| • 2015 | 1621 | $182,252 | 244,800 | 263.45 |
| • 2014 | 1595 | $182,252 | 237,048 | 262.88 |
| • 2013 | 1578 | $182,252 | 236,504 | 265.37 |

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# Cost Analysis of Street Sweeping Benefits

| Data (Sweeping-Savings) | | |
|---|---|---|
| **Year** | **Swept (tons)** | **Savings (Treatment Vault Cleaning Rate)** |
| • 2018 | 3423 | $891,486 |
| • 2017 | 3280 | $842,599 |
| • 2016 | 3750 | $1,033,950 |
| • 2015 | 3600 | $948,420 |
| • 2014 | 3486 | $916,400 |
| • 2013 | 3478 | $922,957 |

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# Cost Analysis of Street Sweeping Benefits

| Data (Sweeping Cost Summary) | | | |
|---|---|---|---|
| **Year** | **Base Cost** | **Savings** | **Actual Cost** |
| • 2018 | $716,034 | $891,486 | (175,452) |
| • 2017 | $690,816 | $842,599 | (151,783) |
| • 2016 | $757,146 | $1,033,950 | (276,804) |
| • 2015 | $715,818 | $948,420 | (232,602) |
| • 2014 | $681,064 | $916,400 | (235,336) |
| • 2013 | $656,268 | $922,957 | (266,688) |

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# Cost Analysis of Street Sweeping Benefits

**Calculations**

- **Base Sweeping Cost = Manpower + Capital Equipment/Maint/Repair**
- **Disposal Cost = Tonnage x Tipping Fee***
  - Tipping Fee “average” of $68/Ton
- **Savings = Sweep Tonnage x Treatment Unit Solids Disposal Rate**
- **Actual Sweeping Cost = Base Cost – Treatment Unit Cleaning/Disposal Cost (Savings)**

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# Considerations

**Proactively consider factors that can positively impact STREET SWEEPING cost:**

- **Public education on littering**
- **Ensure developments have proper BMP's that minimize soil/sediment contributions to roadways**
- **Promote effective "natural" roadside vegetative stabilization**
- **Consider shade trees that shed less foliage annually**

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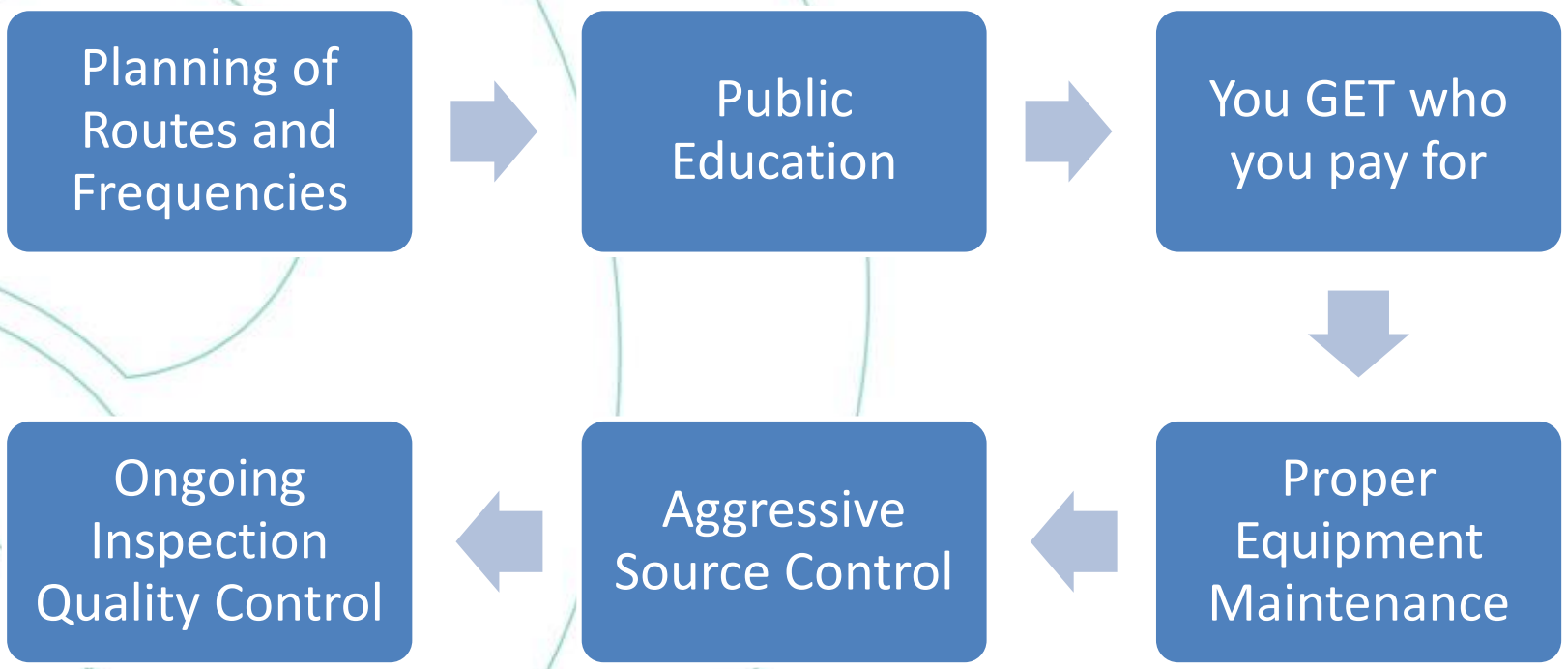
# Proactive Approach to Effective Street Sweeping Program

**It is critical to recognize that an efficient and cost-effective sweeping program involves more than just machinery**

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# Summary

- **Data and Calculations demonstrate that primary removal of solids via Sweeping BEFORE they enter an MS4 can actually be a “cost-saving” measure.**
- **Program effectiveness depends on many variables and proper planning and public education are critical.**
- **Sweeping has MANY ancillary benefits for the community and environment that cannot really be labeled with a dollar value.**
- **DON’T PUT THE THING ON THE ROAD IF IT CAN’T BE PROPERLY MAINTAINED!!**

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# Discussion