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The Journal for Surface Water Quality Professionals

Stormwater

FEATURES

Street Sweeping



PHOTO: TYMCO

City managers talk about their schedules, budgets, and public education.

By Carol Brzozowski

Four years ago, the City of San Antonio, TX, had been picking up 0.36 tons per gutter mile in its street sweeping program. These days, the number has been reduced to 0.23 tons per gutter mile, something that Nancy Beward, stormwater operations manager for San Antonio, attributes to an aggressive public education program.

"Essentially, what those numbers are telling us is that our programs with stormwater management are effective, because the tons per gutter mile are going down, yet we are sweeping very consistently the same areas the same time of the year, year after year after year," says Beward, pointing out that all

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along, San Antonio continues to be a growing city - thus generating more debris.

Although she knows of no city that is able to quantify the difference in runoff quality with or without sweeping, she points out that the Texas Commission on Environmental Quality's Clean River Program recently released an annual report stating San Antonio's rivers and streams are improving.

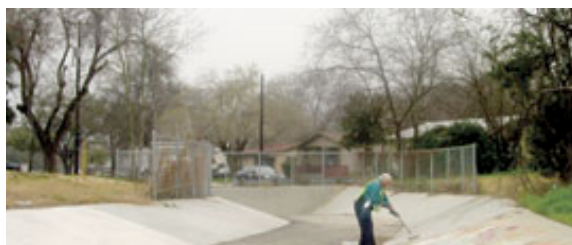
"The water quality is improving, so if you put those two things together and look at the education program and drive around, I can't necessarily say it is having a significant impact, but I can tell you that what we are doing is working, so let's continue what we are doing," she says.

Meanwhile, when Kyle Schneider, street cleaning supervisor with Champaign, IL, drives around town, he is proud to see clean streets.

"I'm a firm believer in sweeping," he says. "I think our city, compared to a lot of cities around us, is very clean. When I drive into a town, the first thing I notice is trash in the gutter lines. When ours gets dirty, I am really conscious of gutter lines. We do make our new construction areas use silt fences so that stuff does not leach into the roadway, and we keep after them. If we see mud being tracked out, we'll get after the contractor and run a loader to get the big stuff out, because the sweepers have a hard time with muddy chunks; they'll just smear it."



PHOTO: CITY OF SAN ANTONIO



Each year in the United States, tons of debris are being swept up. And while the practice beautifies streets, it serves another purpose in the era of the National Pollutant Discharge Elimination System (NPDES) Phase II: It acts as a nonstructural BMP to capture debris such as trash, silt, and fallen leaves before it enters the storm sewer. Such debris can carry with it oil, hydrocarbons, and trace metals from brake linings.

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PHOTO: CITY OF SAN ANTONIO

assistant city manager for the City of Champaign, says

sweeping reduces sediment in the storm sewers and streams. "Heavy metals and other contaminants bind to the sediment, so removing them improves the runoff water quality," she notes. "Also, sweeping reduces storm sewer cleaning requirements by reducing the amount of debris that settles out into the storm sewers."

Champaign last year brought in 4,554 yd.³ of material in sweeping 4,000 mi. in 3,000 labor hours. Additionally, sweepers picked up 8,000 yd.³ of leaves in 3,000 mi. with 2,000 labor hours.

In Milwaukee, WI, city employees collected 7,300 tons of debris through street sweeping. Additionally, some 14,500 tons of leaves are collected annually, and that number grows as urban forests begin to mature.

Beward says street sweeping is more effective with fine silt. "That's the majority of what we are picking up," she says. "Like any municipality, during the fall you will have a lot of leaves, but for the most part our street sweeping efforts are out there to pick up the fine stuff."

Yet in Champaign, Schneider finds that sweeping is most effective at cleaning large debris. "As far as very, very fine particles, it does pretty good - but not as good as a vacuum would," he says, adding that a vacuum system, however, has problems with larger debris.

Mike Engelbart, manager of sanitation services for Milwaukee, says street sweeping is most effective in the spring when cleaning up winter debris. In the spring, the city engages in an extensive program in which 22 brooms are used throughout the night to clean every street in the city.

"We pick up litter as well as anything else that may happen in the course of winter, such as debris created from potholes," he says. "Our judge as to how effective we've been is our public satisfaction and complaints that we get." There have been few complaints, Engelbart notes.

"We've had a flurry of requests for sweeping this spring, and we've been able to satisfy all of the demands from the public," he says.

Some city officials say that wet sweeping is most effective at helping reduce air pollution by picking up particles rather than stirring them up. "Wet sweeping definitely does improve it,"

says Bob Rehm, Milwaukee's stormwater manager. "Dry sweeping has got to stir up dust, but it depends on what you are sweeping, and there are a lot of factors involved before you can make a blanket statement."

Schneider maintains that water-assisted sweeping equipment helps keep dust down, except in new construction areas where it seems to kick up dust, but he'll compensate by turning up the water. "That's why we use the water assist, so that it's spraying at the broom levels to try to keep the dust down," he says.

Although Beward says she is unable to quantify whether sweeping significantly helps reduce air pollution by collecting fine dust particles in San Antonio, she reports that the city is cautious in that regard, and that operators are required to clean out their hoppers on a regular basis and to make sure the seals are good.

"I don't want a kind of 'Pigpen' when a sweeper goes down the street with a cloud of dust around it," she says. "We are very cautious about that. We have worked with Tymco in the past couple of years to make sure our dust suppression inside the hoppers is as effective as it can be and that we are putting the water down on the street to keep the dust down in the neighborhood.

"We don't have a lot of complaints about dust. It's a constant training effort, and that's one of the responsibilities of the sweepers to be seeing if their machines need to go in for maintenance."

Scheduling: Seasons and Traffic Patterns

Effectiveness of street sweeping is tied to its frequency. In Champaign, the sweeping cycle is set up so that every area of town is swept once a month; areas that have a heavy concentration of trees are swept twice monthly. In the business district and the downtown University of Illinois campus area, a greater amount of litter requires that, for eight months out of the year, an employee be assigned to sweep there five nights a week.

It's not unusual in the spring to have all three of the city's sweepers running. During the summer, the city will usually run two. Schneider explains that he doesn't have enough personnel to run more than that, because in the summer someone has to be mowing.

In Milwaukee, street sweeping is done on a graduated system, according to need and traffic patterns. The business district is swept weekly. That graduates into outlying areas that are swept on a monthly basis.

"The outlying areas don't need to be swept more than once a month, because the traffic is not as heavy, and there is less litter in the outlying areas. They are more suburban in nature," Engelbart notes.

In residential areas, another deciding factor on how often sweeping is done depends on whether the majority of homes in the neighborhood are owned by the occupants or rented. "If you are a renter, it's not your property and you may not be keeping it up as much as the rest of the neighborhood would hope," Engelbart says. "We have different sweeps there. Same thing with our alleys - we do sweep alleys in the outlying areas once a month, and in other areas it may be every other week, or weekly, depending on need."

In San Antonio, street sweeping is tied into the stormwater management plan whereby all arterials and collectors are scheduled to be swept four times a year and all residential streets are swept twice a year at a minimum.



PHOTO: CITY OF SAN ANTONIO

"If a citizen calls and says after a terrible storm that there is a lot of debris in the street, we'll do an evaluation if it's a safety issue," says Beward. "If the street is really, really bad, we'll schedule an extra sweeping. But for the most part, they are scheduled twice a year and, by following the brush pickup, it seems to be very effective as far as the residents are concerned."

Beward says the city replaces its sweepers on a regular basis so they are effective in picking up the debris. "We monitor it per area to make sure we are getting a productive effort versus just going over a gutter mile and moving on," Beward says.

There is an exception to San Antonio's sweeping frequency: Beward points out that San Antonio likes to hold parties, and the Riverwalk is the main meeting place.

"We have 15 people who work every night, seven days a week, from 9 p.m. to 5 a.m. cleaning our downtown area. That's one of the things that keeps the downtown area clean and helps keep the debris from entering into the San Antonio River, since downtown has an immediate effect on water quality because the river runs directly through downtown," she says. That cleaning entails sweeping about 60 gutter miles of streets.

"We have crews who clean the sidewalks and the inlets, they'll do power washing around the bus stops, and they'll pick up the trash if the downtown businesses put their trash out after the garbage collections have already gone through. They'll clean the whole downtown area, and they really do a fantastic job."

Types of Sweepers

Many varieties of street sweepers are available, and the choice often depends on the type of debris that is of most concern in a typical area, as well as on a city's budget. Sweepers include these:

- *Vacuum: wet and dry.* The dry combines a mechanical broom-sweeping process with a vacuum to capture small particles that are stirred up. The wet uses water for dust suppression. Scrubber-type machines apply water to the pavement and fine particles are suspended and vacuumed into the mixture.
- *Regenerative air* blows air onto the road surface and vacuums fine particles and sediments that rise as a result.
- *Mechanical* uses a broom rather than a vacuum; material is swept onto a conveyor to load into a hopper. Mechanical sweepers are the most commonly used in the United States and the least expensive. Some mechanical units have fugitive dust control features.

Sweepers of all types can be "PM10 certified," based on their ability to pick up and capture small dust particles (PM10 indicates particles of 10 microns or smaller).

Wet sweepers are being used in Milwaukee, San Antonio, and Champaign. Milwaukee uses all wet sweepers, Engelbart says, and operates 29 Pelican street sweepers with mechanical drive gutter brooms and pickup broom, manufactured by Elgin Sweeper Company, a division of the Federal Signal Corporation. Each sweeper has a 3.5 yd³ debris hopper, says Jeffrey Tews, equipment acquisition and disposal supervisor for the city. The sweepers have a water capacity of 180 gal. and a 10 ft. maximum sweeping path.

Champaign uses three mechanical Elgin truck-style sweepers with water assist - two are Eagles and one is a Pelican. The Eagle features a 4.5 yd³ hopper capacity and 280 gal. water capacity and has a 10 ft. maximum sweeping path.

San Antonio uses 30 Tymco 600 series regenerative air sweepers with water suppression. The hopper has a capacity of 7.3 yd³, and the hydraulic system offers a capacity of 8 GPM with a reservoir of 25 gal. Twenty-two units are run on a daily

basis. Suction hoses on the back of the sweepers allow them, as they move through a residential neighborhood, to pop an inlet cover and pick up debris inside.

"We're going to continue enhancing that program," Beward says. "If it's compacted, we have to bring a vacuum truck in, but if it's just leaves because of our residential sweeping, that's something the suction hoses are able to get relatively easily and quickly."

Paying for Clean Streets

Many cities handle street sweeping entirely in-house rather than contracting for the service. Champaign does its own street sweeping because it's less expensive and enables the city to take ownership of problems, Schneider notes.

"We have a lot of things happen on the spur of the moment, like when we get streets that are flooding. We'll run the sweepers even with it pouring rain so that it's bringing debris away from the inlets and gutter lines - we'll take it to the middle of the streets so they keep draining, and then as the rain stops, we'll just go back over and pick it up," he says.

Champaign's street sweeping program is not part of the stormwater budget but has its own separate budget. Schneider says each sweeper costs between \$109,000 and \$160,000, and the city is on a five- to six-year replacement cycle for them.

"They are high maintenance in the sense that there are a lot of moving parts, so we don't like to keep them long because of breakdowns, but we do a lot of preventive maintenance," he says, adding that the sweepers are cleaned up each night.

In San Antonio, street sweeping accounts for \$3.5 million out of the \$21 million stormwater budget. The sweeping is done exclusively by the municipality.

"That covers personnel, disposal costs, and equipment," Beward says. "We have a buyback, so I charge myself so much money each month so at the end of five or seven years, when we want to turn in our sweepers, we've got money to replace them.

"We get people requesting we sweep something and we'll put together what we call a special project report," she adds. "We are probably the cheapest people in town when it comes to sweeping. We are always amazed at how low our cost is to sweep an area or a gutter mile compared to what contractors charge. A lot of contractors are still using the brush brooms, which we don't condone. As far as I'm concerned, that's not really sweeping. All you are doing is moving it from one place to

another."

Popular With the Public

Street sweeping is received positively by the public, municipal officials say, and even the inconvenience of residents having to move cars parked along the street seems to be worth it for the cleaner neighborhoods they get in return. Engelbart notes that Milwaukee residents not only welcome street sweeping but actually want more of it.

"We have a couple of test projects out there now where we sweep on designated days around our university, so we posted these second and fourth Fridays of each month where cars must be moved," he says.

Schneider says Champaign residents are also very open to the idea of street sweeping. "I have people wanting me to tell them exactly what time and day we are going to be in front of their house so they can move their cars, which is hard for me to do," he says. "But we work around it, and if they have a big buildup, they will call me and I'll tell them to move the cars and that we'll be in the area about a certain time."

In areas with heavy parking traffic, the city will post notices to have vehicles moved. Most people comply, Schneider says. Other than a few complaints on the campus when cars get towed for not complying with notices, he doesn't receive many complaints. "They like it that we're out there," he says.

Related "Good Housekeeping" Programs

San Antonio's Beward says she's told the city council members and others that the streets are getting cleaner because of a combination of education, making responsible parties pick up their own mess, and the city's inspection program over construction sites. San Antonio's successful education program focuses on informing residents about not blowing yard debris into the street. Neighborhood meetings are conducted, and even children are educated on the topic through school programs. Adults are educated through their children, Beward says.

"The funniest thing about kids is they go home and talk to their parents about what they learned and may tell their dad, who is blowing the leaves, 'Oh, Dad, you shouldn't do that. We learned what happens in school. Do you realize what those leaves do?'

"A lot of that is educating adults through the kids that leaves get into the storm drain systems of the streets and then you have water quality problems because the leaves start to break

down," she adds. "People don't realize that."

Residents in new developments are encouraged to ensure that while their lawns are being installed, any residual matter stays in the yard until work at the site is finished.

Beward says San Antonio has an aggressive neighborhood action department. For a two-week period, city services concentrates on one area, performing everything from cutting lawns to sweeping debris and picking up trash. The residents engage in the work, and city services comes in behind them and disposes of the debris.

"It's a pride-of-ownership kind of thing," Beward says. "It's like your house - if you clean up your closet, then you'll spend a while keeping it clean. That's helped with our neighborhoods and residential areas."

The program is a volunteer effort. Residents pick up trash and clean up vacant lots, and at the same time, the city sends mowers to mow drainage channels if the grass is high.

"They go through and pick up anything the citizens have cut from their trees; they'll pick up solid waste," Beward says. "We'll pick up the municipal landfill stuff that the residents put out. It's a very concentrated effort over two weeks. The last thing that happens is the sweepers come through and sweep the streets and make sure everything is picked up."

There are typically 24 sweeps a year in different neighborhoods, done in conjunction with a neighborhood organization. Neighborhoods are scheduled according to need.



PHOTO: CITY OF SAN ANTONIO

San Antonio also sends letters to lawn-mowing businesses informing them that they are being monitored. The city will follow up to complaints that lawn-mowing services are blowing debris into the street.

One program developed in San Antonio was the direct result of a public demand. "They were saying that they loved when we sweep the streets, but in some cases we would be a week ahead of brush pickup [service], and then the streets would get dirty. So they asked us why we can't get our schedules together. We finally did, and the citizens absolutely love it.

"At this point in time, we really don't have an aggressive policy

where we put a sticker on a car right before we sweep," she notes. "We do have a brush collection pickup service, and twice a year they send a flyer two weeks in advance saying the brush is going to be picked on a certain day, and the last line will indicate that sweepers will follow the brush schedule within a week."

Still, with all of the public acceptance, there are challenges. For Engelbart, it's leaves, which can present real problems in the fall.

"Leaves are collected in the city largely by having our residents rake them to curbside, and then we collect them in large garbage packing trucks in huge loads and follow it up with a thorough sweeping," Engelbart explains. "If we get a lot of rain in the middle of it, it's more problematic, and if we have an early snowfall, it becomes even more troublesome to deal with. But weather patterns lately have been for later falls and earlier springs, so our leaf collection program has been very successful."

Beward says there are no disadvantages to street sweeping, such as sediment and debris being forced into curb inlets rather than being picked up: "Not with our regenerative air sweepers, because essentially it is a vacuum cleaner going down the street," she says. "That's why we've chosen to use those. As a matter of fact, when I see a broom, I cringe and try to educate the contractor that all the contractor is going to do now is push it down into the inlet."



PHOTO: CITY OF SAN ANTONIO



PHOTO: CITY OF SAN ANTONIO

Before the city will accept a finished project from a contractor, city crews pump all of the inlets and check the catch basins to make sure the contractor hasn't pushed any debris down into those areas. "We have an underground camera that we will send through our system to make sure they didn't wash it into the underground," she adds. "We make them clean all that."

Schneider says some people, after mowing their lawn - and

even though they know they are not supposed to discharge anything into the street - will call up and say the street needs to be swept. "You go by and realize they've just mowed their lawn and they want it cleaned up in front of their house now," he says. While that can be an issue with the city, Schneider says some neighborhoods are self-policed by some of the neighbors and offending residents receive notices.

One helpful aspect of Champaign-Urbana's program is a map on which Schneider hand-marks each area as it's completed. "It gives us a visual of where we are and what's up when people call," he says. "We get the occasional call where someone says they never got their streets swept and we know that's not true."

As for success of stormwater programs in places like San Antonio, Beward attributes it to a number of program components - street sweeping is a part, and the public education program is the key. "With our NPDES permit - we are a Phase I city - between the aggressive construction inspection programs to keep the pollutants on their own construction site and making developers and responsible parties clean up and the education program overall with the citizens, I think that has to be what is contributing to our lower tons per gutter mile."

Carol Brzozowski is a journalist in Coral Springs, FL.

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