PRIVATE STORMWATER MANAGEMENT:

City reliance on property owners requires review of risks and results

July 2018

PORTLAND CITY AUDITOR
Audit Services

CITY OF PORTLAND, OREGON 1851

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Cover Photo

Audit Services Division / Stormwater Structures

Private Stormwater Management

City reliance on property owners requires review of risk and results

Summary

Bioswales, ecoroofs, pervious pavers. These private stormwater structures are as much a part of Portland as raincoats and rubber boots. The City relies on these structures to manage rain runoff from roofs and pavement to help avoid the sewer overflows that polluted the Willamette until the 2000s. Despite spending a billion dollars on the big pipe project to collect and treat stormwater, the pipe alone is not enough. The City requires and incentivizes stormwater management on private property to protect Portland's water resources to benefit human health, fish and wildlife, recreational resources, and drinking water.

But relying on structures on private property was a change in the way the Bureau of Environmental Services approached stormwater management. The Bureau's asset management program is suited to analyzing data on large-scale infrastructure, like pipes and treatment plants, to determine risk, plan new infrastructure, and evaluate outcomes. Private structures are not as easily incorporated into an asset management program because the City has less control over structures on private property and they require more oversight. We found shortcomings with data collection and management, inspections, and program evaluation for Bureau programs related to private stormwater structures.

Background

The Bureau of Environmental Services provides sewer and stormwater services. It operates systems to collect and treat both sewage and water runoff from roofs and pavement. If not properly managed, stormwater can cause local flooding, sewer system back-ups and overflows, erosion, and pollution in natural waterways.

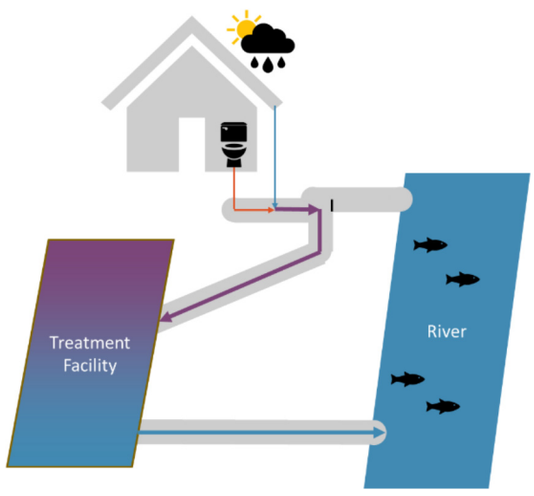
Environmental Services relies mostly on ratepayer funding rather than General-Fund dollars raised through taxes. In 2018, its budget was 11 percent of the City's total with $265 million capital and operating expenses. It employed 572 people.

Combined sewer system designed to overflow to rivers

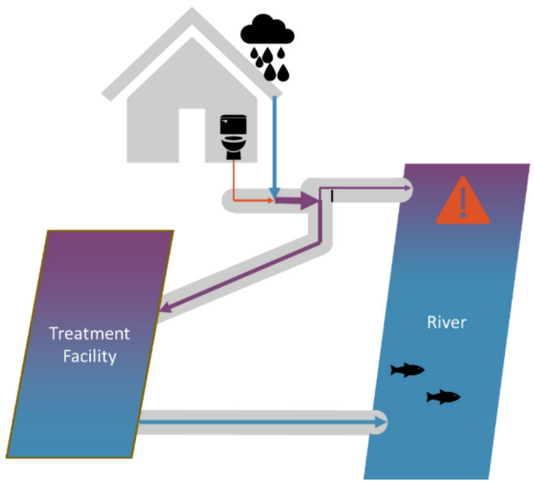
In addition to a separate stormwater collection system in some parts of the city, the Bureau operates a combined sewer system which is designed to collect and treat both sewage and stormwater in the same pipes and treatment facilities. In 2017, the system was composed of 98 pump stations, two treatment facilities and 2,500 miles of pipe. It processed 30 billion gallons of sewage a year.

On sunny days and days with light rain, the Bureau collects and treats all wastewater. But on days with heavy rain, the system may not have the capacity to treat all wastewater and is designed to discharge the overflow into the Willamette River without treatment. In a 1994 report, the City wrote that it discharged raw sewage into the Willamette River up to 120 times a year.

On sunny days, or days with light rain, the system collects and treat all sewage and stormwater.



On days with heavy rain, untreated mixed wastewater can overflow into the river.



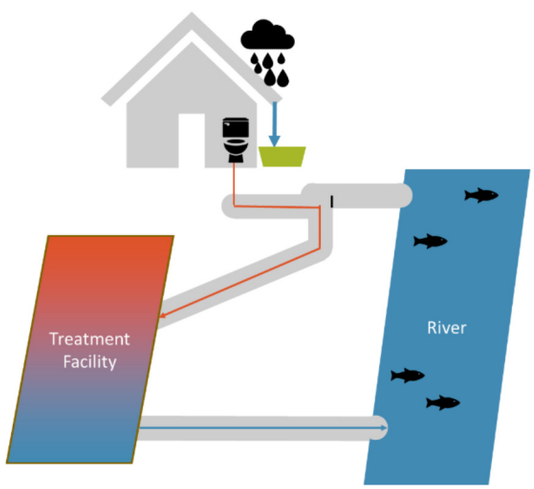
In 1991, the Oregon Department of Environmental Quality and the City signed an agreement to limit discharges of untreated sewage. The Bureau adopted two approaches to solve the problem: increasing the capacity for treatment and limiting the amount of stormwater that entered the collection system. To increase capacity, the Bureau embarked on a 20-year, $1.4 billion capital project. The project included drilling tunnels across the city, some wider than 20 feet, to collect and store wastewater before diverting it to the treatment facility. Since then, the Bureau has continued to add to and maintain its stormwater infrastructure.

Private management reduces capacity needs

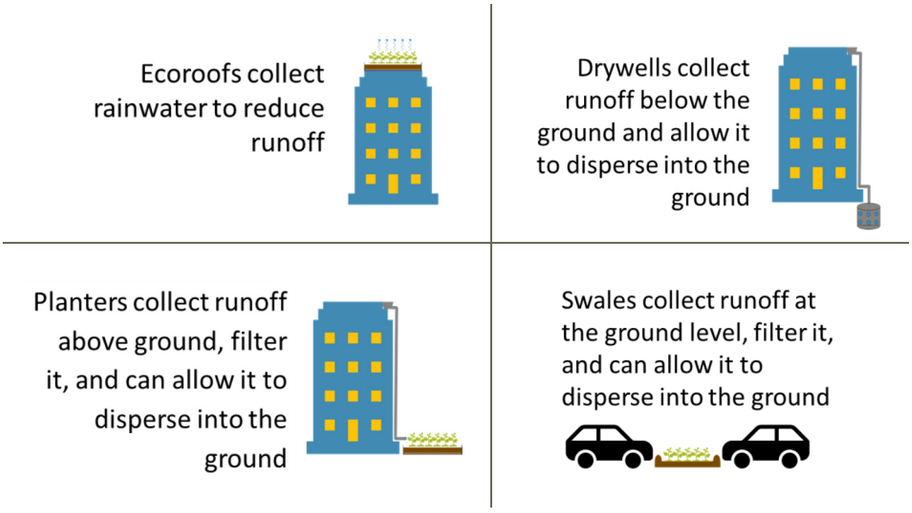
In addition to increasing treatment capacity, the City also implemented programs to remove some stormwater from the collection system. One of these was a program to divert stormwater by disconnecting downspouts so that rainwater previously piped into the combined wastewater system was dispersed into soil instead. Around the time of the agreement, the Bureau estimated that disconnecting nearly half of the City's downspouts reduced required stormwater management capacity by 800 million gallons.

After implementing these approaches, the number of sewer discharges decreased. In 2017, there were only four.

When stormwater is managed on private property, the system is less likely to overflow during heavy rains.



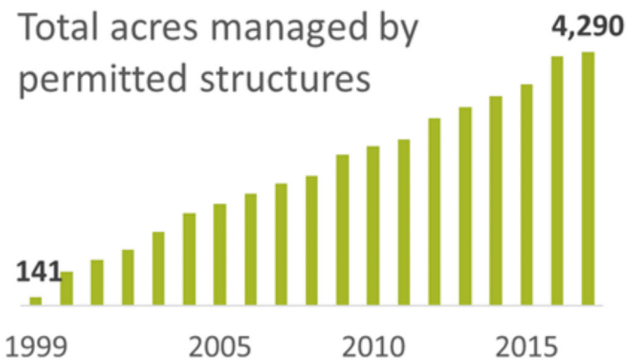
Since the agreement, the Bureau has continued to rely on private stormwater structures to limit the burden on the combined collection system. The Bureau allows installation of a variety of stormwater structures, including ecoroofs, planters, drywells, and swales.



Two programs for private stormwater structures

The Bureau had two major programs in place to require or encourage private stormwater management: permit requirements for new development and fee discounts.

Permit requirements for new development: The Bureau requires stormwater management for new development. Since the program began in 1999, the total acres of private property managed by permitted stormwater structures increased from 141 to 4,290.



Source: Audit Services analysis of Bureau data

The Stormwater Management Manual defines requirements that include a variety of stormwater options a developer must include in a project before a permit will be granted. The Bureau requires stormwater management for numerous development processes, including any projects that develop or redevelop more than 500 square feet of impervious or impenetrable surfaces. The requirements add costs for inspection and construction to the total cost of development.

Fee discounts: The Bureau charges ratepayers for the cost of managing stormwater that originates on their property. It offers discounts through Clean River Rewards for account holders who manage their own stormwater. The discount can apply to accounts associated with new development or accounts with existing development where owners have added stormwater management options, such as raingardens, mature trees or disconnected downspouts. To qualify for the program, account holders complete an application that describes any stormwater structures, agree to maintenance activities, and grant the Bureau the right to inspect for compliance. Since the program began in 2006, the total acres where stormwater is managed by Clean River Rewards structures increased from 273 to 3,101.

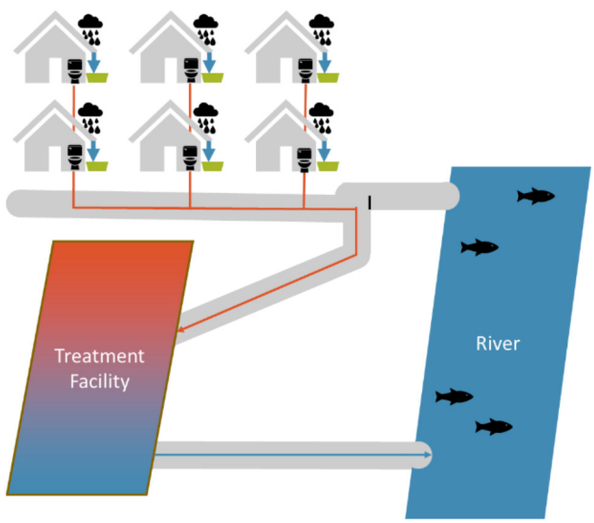
Source: Audit Services analysis of Bureau data

Audit Results

Decisions about a system as large and complex as the City's for sewer and stormwater control should be based on reliable data to identify risks for failure that could result in street flooding, sewage backups into residential or commercial basements, or sewage being discharged into the Willamette River or Columbia Slough.

Encouraging private property owners to control their runoff helped allow the City to build a smaller stormwater system, which reduced construction and maintenance costs. However, it is difficult to incorporate private stormwater structures into an asset management program. Multiple, small structures on private property:

- Create more data to manage
- Are each subject to unique site conditions that make them more difficult to incorporate in system capacity models
- Require more oversight to ensure they are built and maintained as promised



We conducted this audit to verify that the Bureau had taken steps to overcome the risks associated with stormwater management by property owners and protect the reliability of the its system planning tools. We found shortcomings with data collection and management, inspections, and program evaluation related to the Bureau's programs for private stormwater management.

Incomplete information created risk of over-spending

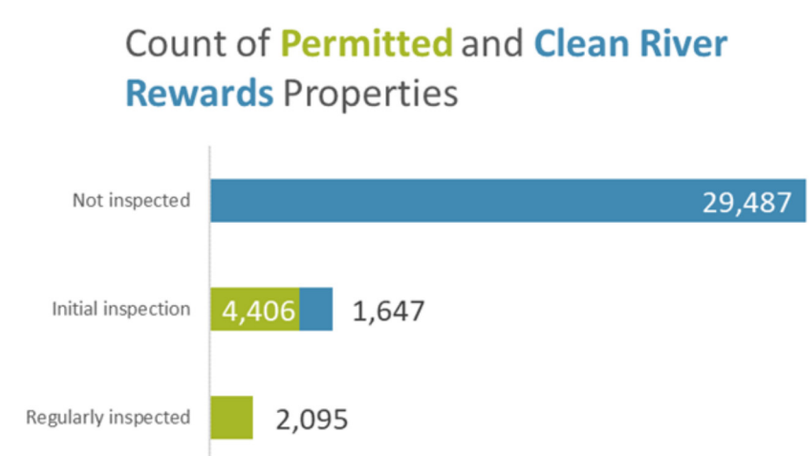
The Bureau risked spending too much by building too much capacity into its public infrastructure because private stormwater structure data systems were incomplete. The Bureau's data processes and practices were not adequate for gathering information on private structures to use in risk analysis and system planning. The Bureau compensated for unreliable data with field inspections, but the process could be less time consuming if it had better data on location and condition of stormwater structures on private property.

The Bureau must rely on a variety of data collection methods that are not organized into a coherent system:

- Information is stored in three data systems, each managed by a separate group
- Data collection involved a manual transaction between two systems, introducing the potential for data entry errors or missing records
- The Clean River Rewards program relied on a geographic information systems layer that did not include some participating accounts
- Clean River Rewards information was not shared with the inspection or systems planning programs

As a result, staff could not rely on the data systems to make decisions about the priorities for public stormwater projects without making assumptions.

In addition to the data issues listed above, the Bureau had limited information on the condition or existence of structures on private property because staff did not regularly inspect most of them. Staff regularly inspected only permitted stormwater structures on commercial, industrial, and multi-family development and inspected commercial, industrial, and multi-family Clean River Rewards properties and single-family permit properties only during the initial application process. Staff did not inspect Clean River Rewards single-family residential properties unless property owners requested.



Source: Audit Services analysis of Bureau data

We selected 30 properties listed as having stormwater structures to verify their existence and condition. We located most of them. Overall, permitted structures were more likely to exist and were in better condition than those enrolled in the Clean River Rewards program. Eight of 15 properties in the Clean River Rewards program that were listed as having a disconnected downspout to drain stormwater into the yard were either connected or drained onto an impervious surface. Stormwater from those properties eventually would end up in the sewer collection system, defeating the primary purpose of providing the discount to the property owner.

To compensate for incomplete data, the Bureau relied on field research. Stormwater structures on private property affected the models the Bureau used to measure system risks and design public stormwater projects. Therefore, the Bureau employed a team of four staff members to collect field data about existing private stormwater structures not included in the Bureau's data systems. In one case, the Woodlawn-King capital project, the team identified so many private structures that were in operation but not included in the risk assessment that the Bureau decreased the project budget from $6.4 to $2.2 million.

To its credit, the Bureau's field research meant that the City incorporated information on private stormwater structures into project planning and did not build more pipes and system upgrades than needed. However, the process could have been faster and easier if information was available through well-managed data systems.

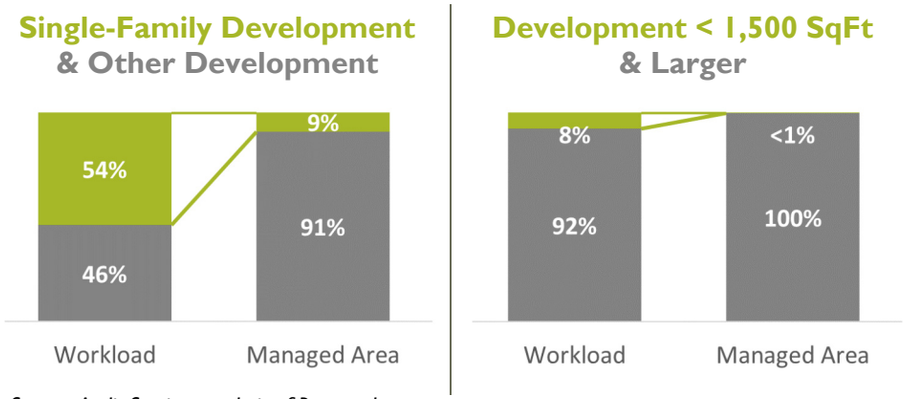
Evaluation needed to adjust program requirements

Since the Bureau adopted the permitting program almost 20 years ago and the Clean River Rewards program over 10 years ago, it has not gone back to assess whether the programs meet goals for stormwater management. This is in part because of the data limitations described above. Staff said that they were unable to quantify the effects of private property structures on the entire system without investing a couple of months of work. The Bureau could use data to review permitting and Clean River Rewards requirements to ensure programs are accomplishing intended outcomes.

For example, stormwater management on private property is required for all developments that are 500-square-feet or larger. According to staff, that threshold is among the smallest in the county. It also is unusual to apply requirements to single-family residential development. This low permit threshold may have a high cost with little benefit for stormwater control. Thresholds for requiring stormwater management could be set to balance costs such as staff workload and the financial cost to property owners with the benefit of the area of land with stormwater managed.

Our analysis of Bureau data since the inception of the permit program indicated that changing thresholds could decrease costs without large impacts on the area managed. Single-family residential development accounted for 54 percent of permits, but only 9 percent of total area with stormwater management. The Bureau did not have information on the cost of private stormwater structures, so we could not calculate potential savings associated with adjusting thresholds. Development below 1,500 square feet accounted for 8 percent of permits, but less than 1 percent of area managed.

Since the inception of requirements in 1999, permit requirements for single-family and small developments were proportionally more work for less benefit.



Source: Audit Services analysis of Bureau data

By not analyzing the information, the Bureau is unable to make program adjustments that might benefit both the Bureau and private property owners. Better information on the effect of permitting requirements could allow the Bureau to revise the permitting program to ensure that the goal of removing stormwater from the public system is achieved at a reasonable cost.

Similarly, the Bureau has not evaluated whether the Clean River Rewards program is meeting the goal of rate fairness. Administrative rules for the Clean River Rewards program include fairness in stormwater charges as the first policy goal. Staff said rate fairness was a more important consideration than a desire to motivate private stormwater management. Despite its importance, the Bureau did not report or evaluate its progress towards meeting this goal.

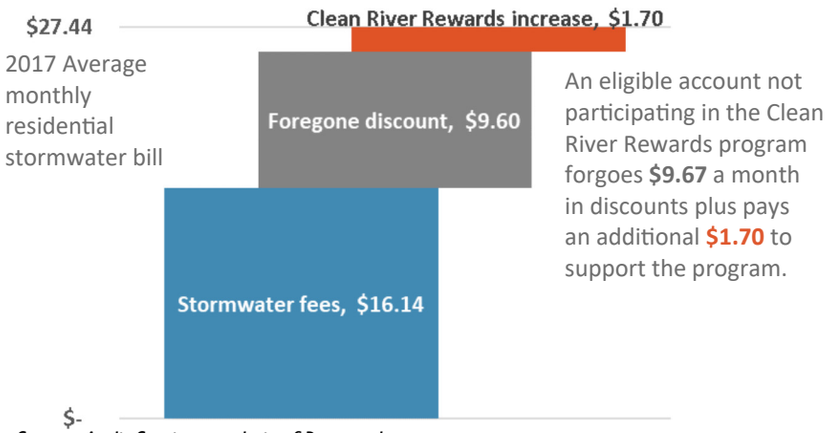
86%

of **permitted** properties did not participate in the **Clean River Rewards** program

The program was not successful in promoting rate fairness because most of the eligible properties were not participating. Staff estimated that 90,000 accounts were eligible for the Clean River Rewards program when it began, but only 30,000 accounts participated. Our assessment of account holders with permitted structures confirmed the Bureau's estimation that there were eligible account holders not taking advantage of the program: 86 percent of permitted properties were not participating in the Clean River Rewards program, though they should have been eligible because all permitted facilities qualify for Clean River Rewards credit.

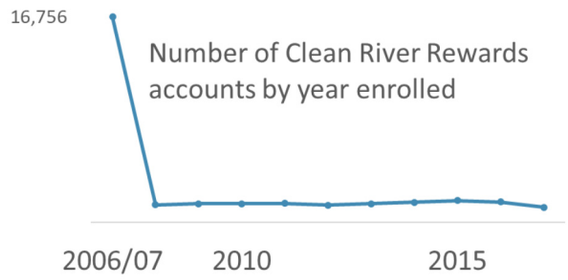
According to Bureau data, 60,000 ratepayers managed stormwater on their property and were eligible for the Clean River Rewards program, but did not participate. These 60,000 ratepayers had higher rates than they otherwise would have had if the program didn't exist.

The Bureau estimated that the Clean River Rewards program added $1.70 to the average residential monthly bill. The Bureau calculated stormwater rates by first deciding on a fixed amount needed for construction and maintenance for the year. Amounts not paid by ratepayers getting the Clean River Rewards discounts must be shifted to other ratepayers.



Source: Audit Services analysis of Bureau data

Limited on-going outreach and advertisement affected participation in the program. When the program began in 2006, it performed extensive outreach, but the Bureau reduced program resources after the first year. As a result, half of participants enrolled in the first year of the program and new enrollment has remained at about 1,500 per year since then.



Source: Audit Services analysis of Bureau data

Staff said that the Bureau considered expanding outreach activities to encourage participation by underserved communities. It did not proceed because staff were concerned that the Clean River Rewards program would be discontinued. Staff also said that any efforts to expand outreach would require more resources.

There could be barriers other than limited outreach that prevent an eligible account holder from participating. The account holder could:

- Be too busy to apply
- Not speak English
- Not have a computer
- Not understand the program

Some of these barriers may have disproportionate outcomes for vulnerable communities. Identifying which communities non-participating account holders belong to and identifying which barriers are limiting participation may help the Bureau achieve its goal that Portlanders share the benefits and burdens of its work equitably.

Conclusion

It has been almost 20 years since the adoption of the Stormwater Management Manual. Private structures have become a more significant part of the infrastructure the Bureau relies on to manage stormwater. Impervious land area managed by permitted structures increased from 141 acres in 1999 to 4,290. As new construction and redevelopment continues, this number will continue to increase.

Private stormwater management allowed the Bureau to invest in and build fewer regional facilities to keep costs down for ratepayers. However private stormwater management comes with challenges that make it difficult to track and incorporate into system planning. We found that the Bureau did not have reliable data about structures on private property to contribute to system planning and that it did not evaluate and adjust programs related to private stormwater management to achieve program objectives.

Recommendations

To make data available for system planning the Bureau should:

1) Develop a single information system to inventory private stormwater structures.

2) Develop additional risk-based monitoring programs for single-family residential permit structures and all Clean River Rewards structures like the existing program used to monitor non-single-family residential permit structures.

To regularly assess the performance of the Bureau's approach to encouraging private stormwater management, it should:

3) Create a schedule and assign staff to periodically evaluate outcomes of the permitting and Clean River Rewards programs against stated goals.

4) Use the results of evaluations to ensure the achievement of program goals and expectations.

Objective, Scope, and Methodology

Our audit objectives were to determine whether the Bureau had reliable data available to support the risk assessments used to prioritize projects and whether it performed evaluations of the permit and Clean River Rewards programs.

Our scope included all permitted and Clean River Rewards structures included in Bureau databases on the day we received information. For permit structures that was March 22, 2018. For Clean River Rewards structures that was February 15, 2018.

To accomplish our audit objectives, we:

- Interviewed staff involved in program implementation, planning, and evaluation including staff in the Business Services, Engineering Services, Watershed Services, and Pollution Prevention groups.
- Observed staff implement the permit and Clean River Rewards programs. For the permit program, we observed development review staff interact with customers at the permit counter and conduct permit inspections. We also observed staff conduct maintenance inspections for existing commercial and multi-family properties. For the Clean River Rewards program, we observed staff conduct initial inspections of commercial and multi-family properties.
- Conducted observations of permit and Clean River Rewards structures at 30 randomly selected properties across Portland.
- Reviewed policies and procedures related to each program to document program goals and evaluation requirements. We relied on the Stormwater Management Manual for the permit program and administrative rules ENB 4.16 for the Clean River Rewards program.
- Reviewed data on permit and Clean River Rewards structures. We observed the process for collecting and analyzing data. Based on our observations, we found significant data reliability issues, which are discussed in this report. Any data about structures in this report is for general descriptions and context only.

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

RESPONSE TO THE AUDIT

Commissioner Nick Fish
City of Portland

DATE: July 18, 2018

TO: Mary Hull Caballero, City Auditor

FROM: Nick Fish, Commissioner
Michael Jordan, Director, Bureau of Environmental Services

SUBJECT: Response to "Private Stormwater Management: City reliance on property owners requires review of risks and results"

Thank you for your thoughtful audit of the Bureau of Environmental Services' (BES) programs related to private stormwater management.

BES manages the City's stormwater system and works with community members, businesses and property owners to protect public health and the environment, and improve the ecological function of Portland's watersheds. Right-sizing the level of investment from the private and public sectors allows BES investments to be more cost-effective and efficient.

The Bureau is committed to implementing your recommendations for private stormwater management process and program improvements to enhance our stormwater system's reliability and meet the needs and expectations of our customers.

Through our stormwater investments and programs, BES ensures that the City is compliant with state and federal permits. This includes regulations under the Clean Water Act to protect rivers and streams, the Safe Drinking Water Act to protect groundwater, and the Endangered Species Act to protect threatened and endangered salmon and steelhead.

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Consistent with your audit recommendations, the Bureau is committed to conducting a comprehensive rate study of our fees, incentives and discounts; assessing the condition of public and private stormwater infrastructure; and collecting and managing data to inform risk-based decision making. The Stormwater Management Manual is periodically updated to reflect changes in system needs and regulations. The Bureau's stormwater and combined sewer system planning is currently underway, and we anticipate being able to evaluate private property stormwater management outcomes as a result of these efforts.

Thank you again for your thorough audit. BES looks forward to sharing updates with you and the community as this work proceeds.

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Report #512A, July 20, 2018

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