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Funding Strategies for Non-Traditional University MS4 Stormwater Programs

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FUNDING STRATEGIES FOR NON-TRADITIONAL UNIVERSITY MS4 STORMWATER PROGRAMS

by

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FUNDING STRATEGIES FOR NON-TRADITIONAL UNIVERSITY MS4

STORMWATER PERMIT PROGRAMS

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Stormwater programs have historically been stymied by lack of proper funding resources. Unlike drinking water and sanitary sewer utility services that long ago transitioned to enterprise funds, a stormwater utility continues to evade stable and direct revenue sources throughout much of the United States. Inefficiently funded stormwater programs utilizing general funding practices leaves stormwater management programs unable to properly plan for long-term improvement, management, regulatory compliance, and maintenance. Funding research has established that forms of direct funding sources are crucial for successful stormwater programs, however, focus has been directed to strategies for municipalities. This paper will attempt to analyze, through primary case study research obtained from personal interviews, how several universities have successfully taken direct funding strategies and implemented them at the university level. From this case study research, a broad funding strategy that requires stakeholder planning and development, has been recommended for the University of Nebraska-Lincoln.

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ABSTRACT

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Chapter I: Introduction

The management of fresh water resources has become one of the critical global concerns of the twenty-first century. The United Nations Environment Programme concludes that every year, lakes, rivers, and deltas receive equal to the weight of the entire human population – nearly seven billion people – in the form of pollution (Palaniappan, et al. 2010). Urban runoff is a contributor to this water quality problem. In order to better understand how urban runoff creates a pollution problem, it is best to understand the water cycle. Water is continually moving from a gas to a liquid through the cycle of precipitation, infiltration, evapotranspiration, and storage in the ground and in surface water bodies (NRDC, 1999). Modern urban areas have been built to function on a piped network. This conventional stormwater management system has consisted of infrastructure meant almost exclusively to divert the flow of water off of impervious cover and into a surface waterbody as quickly as possible, decreasing the amount of water that can infiltrate into the ground (See figure 1.1). The United States Environmental Protection Agency (EPA) identified urban runoff pollutants in the Clean Water Act (CWA) by developing the National Pollution Discharge Elimination System (NPDES) and creating the Municipal Separate Storm Sewer System (MS4) permit program. Through this regulatory driver, permitted entities must take action to control urban pollution into waters of the state.

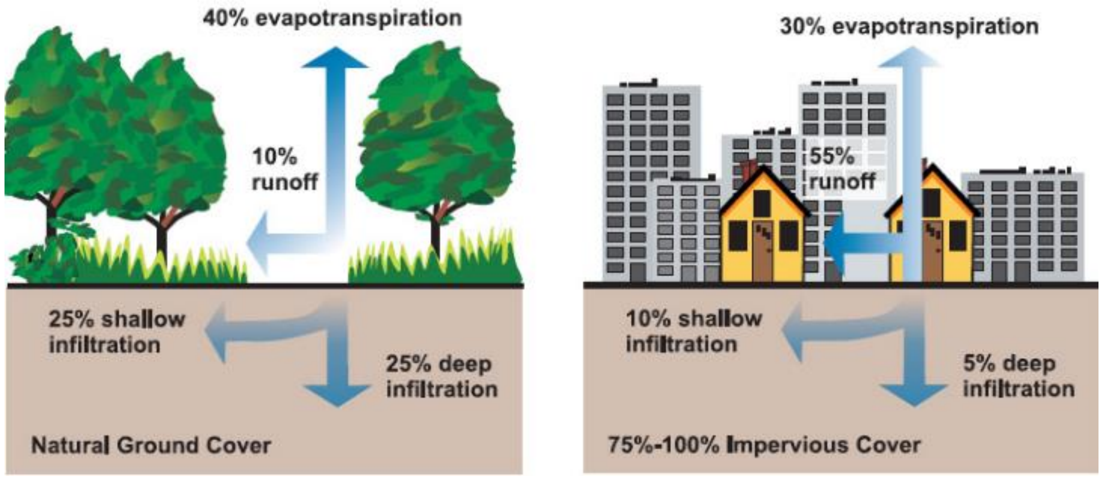

Figure 1.1 How Urbanization Changes the Water Cycle (EPA, 2003)

Brief History of Stormwater Management

Water Quantity

The management of fresh water in the United States has gone through many different paradigm shifts. Each shift has attempted to solve the problems of the last strategy, while inadvertently causing its own set of problems in doing so. Water quantity as a hazard has been the major driver behind the beginning of historical changes. In the nineteenth century, as the country began to move from the farm to the city, stormwater problems were solved by the solution used in the country—run liquid into ditches. But what works in the country doesn't work in the city. To solve the problem of muddy ditches overflowing onto roads, the standard shifted to moving water into a single pipe. However, the method of a combined sanitary and stormwater pipe solution led to raw sewage overflows[1]. To solve that problem, the modern practice emerged to divert flows into pipes meant exclusively for stormwater to discharge into the nearest water body. This is the traditional approach still fundamentally being used today. However, this method causes channel erosion, downstream flooding, and continues to cause urban runoff pollution. The solution to the water quantity portion of the problem in the early 1970s was to begin detaining stormwater into regional detention ponds to ease peak flows. Unfortunately, regional detention created its own unintended flooding problems because it does not take into account the entire watershed when considering peak flow. The solution to the problem was watershed hydrology and hydraulics modeling. Computer advancements created the ability to generate master plans founded in data models that, if implemented, could improve or alleviate the problems municipalities were facing (Debo, Reese, 2003).

Water Quality

Water quantity is not the only problem shifts in stormwater management strategies have created. Where water quantity from a hazard perspective was originally the motivator for change, the modern water quality problem encountered with the storm sewer pipe method has created its own challenges. As water flows across impervious surfaces before it enters a storm sewer, it increases in velocity, creating localized flooding and erosion. The water also picks up pollutants along the way, creating water quality problems. One acre of paved parking space creates sixteen times more runoff than a natural green space of the same size (Schueler, 1996). Where a green space will have

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[1] Combined Sewer Overflow (CSO) is a problem cities around the United States are still paying for. The US EPA has an unfunded mandate requiring disconnection of combined sewers across the United States, costing municipalities billions.

very little sources for pollutants, a paved parking lot will have exponentially more polluted urban runoff potential. In an urban environment, pollutants such as heavy metals from vehicle brakes, fluids leaking from cars, and trash and debris are all examples of pollutants an impervious surface in an urban environment can accumulate. Even heightened water temperatures from rain hitting hot concrete and entering a waterway can have devastating consequences to the ecology of some U.S. bodies of water. The United States Environmental Protection Agency considers non-point source pollution the largest water quality problem facing the United States (EPA, 1996). Table 1.1 gives an overview of the impacts from increases to impervious surfaces as stated by the EPA.

Table 1.1 Impacts from Increases in Impervious Surfaces

Increased Imperviousness leads to:	Flooding	Habitat loss (e.g., inadequate substrate loss of riparian areas, etc.)	Erosion	Channel Widening	Streambed Alteration
Increased Volume	✓	✓	✓	✓	✓
Increased Peak Flow	✓	✓	✓	✓	✓
Increased Peak Flow Duration	✓	✓	✓	✓	✓
Increased Stream Temperature		✓			
Decreased Base Flow		✓			
Changes in Sediment Loadings	✓	✓	✓	✓	✓

(EPA, 1997)

History of Stormwater Management Funding

Very early in the modern changing character of stormwater management, cost was recognized as a major hurdle to the shifting paradigm. Even before the beginning of the NPDES legislation in 1987, the American Public Works Association and researchers asserted in the early 1980s that long-range comprehensive planning for urban runoff throughout the United States had been stymied in large part due to one major obstacle: the lack of stable and adequate local financing (American Public Works Association, 1981). Programs which focus on long-term, capital intensive, public facilities construction and maintenance have historically found it very hard to compete effectively in an annual municipal budget process to secure funding through general appropriations. It takes many years and the ability to procure substantial investment in analysis, planning, and design before water, sewer, or stormwater drainage facilities are ready for construction (Cyre, 1982).

As Philip Favero with the University of Maryland Environmental Finance Center asserts, "Public sector financing in general, and stormwater financing specifically, often appear to be inaccessibly complicated and technical to even experienced public officials" (Favero, 2014, p.3). Within the last century, municipalities identified and successfully transitioned funding for drinking water and sanitary sewer away from general revenue financing to enterprise utility financing. Stormwater control remains the only utility to be most commonly financed through a general fund (Cyre, 1982). This 1982 study still holds true today. The Western Kentucky University Survey showed that, although the number is increasing every year, in 2016 only 1,517 stormwater utilities existed amongst all regulated municipalities in the USA (Campbell, 2016).

It is easy to forget about stormwater management as a need. Traditional systems were built to keep stormwater out of sight and out of mind. Until severe flooding occurs, public support for stormwater management often falls through the cracks when competing for limited funding against other needs such as schools, fire, police, etc. (Pasquel et al., 2010). Substantial research and guidance has been produced on strategies for municipalities to fund new stormwater infrastructure and regulatory objectives. The Water Environment Federation (WEF), Watershed & Wet Weather Technical Bulletin, published an article on "Fifty Ways to Fund a Watershed Management Program" (Rogers, et al. 1998). The EPA has published financial guidance such as the "Guidebook of Financial Tools" which includes over three hundred different tools for local level funding. The EPA identifies "need" as the key driver behind any funding approach undertaken. Further, they determined that the most successful stormwater programs may be from blended sources, however they must be dedicated and stable sources, such as an enterprise or special revenue account. That way, funding use can be limited to stormwater management and accumulate from one year to the next (NAFSMA, 2006). The Western Kentucky Stormwater survey believes that eventually surveying how many stormwater programs utilize direct funding strategies will be unnecessary because every MS4 will have some form of appropriate and direct stormwater funding (Campbell, 2016).

As research has established, forms of direct funding sources are crucial. However, focus has been directed to strategies for municipalities. This paper will analyze, through case study research gleaned from personal interviews, how universities with similar stormwater regulatory drivers as municipalities have successfully taken funding strategies and implemented them at the university level by answering the following questions:

a. What are the regulatory components of a stormwater program?
b. What types of basic direct funding mechanisms can be used to fund MS4 programs?
c. What are the strength and weaknesses of these approaches?

d. Based on case studies, what are some examples of universities using direct revenue sources to finance stormwater programs?

e. Based on the analysis, what are the recommended best financing approaches for the advancement of the MS4 program at the University of Nebraska-Lincoln?

Chapter II: Regulatory Overview of a Stormwater Management Program

The Federal Water Pollution Control Act was enacted in 1948. The Federal Water Pollution Control Act Amendments of 1972 modernized the original law. In 1977 and 1987 major changes took effect in the form of the Clean Water Act (1977) and the Water Quality Act (1987). The statute is now collectively referred to as The Clean Water Act (CWA). The National Pollutant Discharge Elimination System (NPDES) is a provision of the 1977 and 1987 amendment to the Clean Water Act and requires most stormwater discharges to be permitted through the NPDES program. For municipalities and non-traditional entities this permit is called a NPDES Municipal Separate Storm Sewer System (MS4) permit. These programs cost considerable money and resources that need funding to function on a continuing basis.

The objective of the Clean Water Act is to minimize or eliminate pollutants from waters of the state. The EPA administers the NPDES permit program as specified primarily in 40 C.F.R. §122. Its scope is simple: “the NPDES program requires permits for the discharge of ‘pollutants’ from any ‘point source' into 'waters of the United States'" (40 C.F.R, §122 (1)(b)(1)). In the case of municipalities, the storm sewer outfall pipe is considered the point-source where pollutants enter a water of the state. It was the 1987 amendment to the CWA section 402(b) that started a phased process for the MS4 permit program as we see it today. Generally, the distinction is as follows:

- Phase I MS4s: consist of populated areas greater than 100,000. Part I of the permit requires definition of priority pollutants and development of controls. Part II requires a program to control defined pollutants to the maximum extent practicable (EPA, 2010).

- Phase II MS4s: any other municipal separate storm sewer that is not already covered by a Phase I stormwater program. However, an MS4 is only regulated if it is within an urbanized area as defined as having a population of 50,000 or more. In addition, a stormwater jurisdiction may potentially be regulated if the storm sewer system has the potential to discharge to sensitive waters, is within a highly dense area (population of 10,000 and a population density of at least 1,000 people/square mile), has a high growth potential, is a significant contributor of pollutants, or is considered ineffective to protect water quality with other programs (EPA, 2012). The NPDES permitting authority has jurisdiction to evaluate potential MS4s and designate them if they see fit (EPA, 2000).

Phase II permittees must meet six minimum control measures (MCM) and establish best management practices (BMPs) that have measurable goals for each MCM (EPA, 2010).

Published in the Federal Register the minimum control measures are as follows (National Pollutant Discharge Elimination System—Regulations for Revision of the Water Pollution Control Program Addressing Storm Water Discharges, 1999):

a. Public Awareness: The permittee must create ways in which to inform the public on stormwater management.
b. Outreach and Involvement: The permittee must create ways to actively involve the public in stormwater management.

c. Illicit Discharge Detection Elimination: The permittee must adopt a strategy to find, prevent, and clean up any illicit discharges reaching waters of the state.

d. Construction Management: The permittee must provide oversight, inspection, and enforcement of all construction projects within its jurisdiction.

e. Post-Construction Runoff Control: The permittee must adopt an ordinance or other regulatory mechanism that requires new development and redevelopment to construct some combination of structural and/or non-structural BMPs on development of at least one acre or more. There also must be a strategy to account for adequate long-term operation and maintenance (EPA, 2005).

f. Pollution Prevention/Good Housekeeping: The permittee must develop strategies of pollution prevention within the permit holder's own facilities.

A process defined by CWA section 402(b) and NPDES regulation §123 allows the EPA to grant authorization to the state to administer all or part of its own NPDES permitting program. States are required to write permits that meet or exceed the federal rules and administer permits to qualifying entities. Regulated Phase I and II permit holders, through established legal authority, must commit to strategies and procedures to meet these minimum requirements in a management plan. In addition, permittees must adopt rules and strategies to meet water quality standards where the EPA has established Total Maximum Daily Loads (TMDLs) of pollutants into impaired waters of the state.

Meeting these requirements, along with maintaining stormwater infrastructure, requires substantial resources and funding.

Chapter III: Types of Funding Mechanisms

Municipalities have several types of funding options available to generate revenue. Below is an overview of options available to municipalities. Generally, municipalities can find sources of funding for stormwater through bonds, regulatory fees, taxes, grants, loans, and utility fees (Favaro, 2014).

SOURCES OF FUNDING	CAPITAL COSTS	OPERATION & MAINTENANCE COSTS
Bonds	Yes	Yes
Fees for Permit Review and Inspection	No	Yes
General Property Taxes and Special District Assessments	Yes	Yes
Grants	Yes	No
Loans	Yes	No
Utility Fee	Yes	Yes

Figure 3.1 Funding Options for Stormwater Programs (Favaro, 2014)

As another example, the City of Durham has a broad range of funding mechanisms at its disposal. The University of North Carolina Environmental Finance Center lists the following fundamental revenue sources the City uses as building blocks towards successful debt repayment and operation and maintenance of its stormwater program (Hughes, 2014):

1. City stormwater fees
2. New county stormwater fees for unincorporated areas
3. Existing property taxes
4. Sales tax

5. New municipal service stormwater district tax
6. Business Improvement District (BID) tax
7. New County Watershed Improvement District tax
8. New County Special Services District tax
9. Watershed Protection Utility fee
10. Non-designated water or wastewater utility customer charges
11. Utility collected donation
12. Non-profit collected donation
13. Property assessments
14. Private property owner direct payments
15. Impact fees
16. Crowd source payments/donations

Unlike municipalities, it is not in the best interest of an institution to utilize some of these exact same practices in order to garner a stable and direct revenue source. It would make no sense for a university to charge property taxes on itself, for instance. Grants and loans are generally not effective as stable long-term funding streams on their own and can be supplemental sources of funding alongside general appropriations or direct funding streams. Universities don't have the same tax base or revenue sources that a municipality would have at their disposal and therefore must take municipal funding strategies and adjust them to fit within a university system.

The traditional approach to funding a stormwater program is through general appropriations. Capital improvement project budgets enter into the equation through a regulatory driver in the NPDES permit found in Minimum Control Measure 5: Post-

Construction Stormwater Controls. Utility fees, utility mark-ups, and offset banking represent alternative funding options that have been successfully replicated at the university level, as the case studies in Chapter 5 will show.

General Appropriations

As Favero has found, the advantage of using general appropriations is that local leaders are familiar with the use of supporting programs through a general fund and consider it an uncomplicated way to get things done. A disadvantage of this method is that stormwater regulatory programs must compete with all other general fund priorities for funds. In order to be able to satisfy need, taxes must increase, or funding for other programs must be cut. In addition, it does not tend to allow for ease of transparency regarding use of funds. Nor is it an equitable or fair funding system. General funds are primarily supported through property taxes based on assessed value. Assessed value does not have direct or implied correlation to the need for stormwater management. In addition, tax-exempt properties such as churches, government properties, and schools significantly contribute to stormwater runoff, yet do not contribute to tax-funded general funds (Favero, 2014). Under a state university structure, the majority of general fund revenue is state appropriations and student fees. State appropriations ebb and flow as state budgets fluctuate. For these reasons, the use of general funds as an exclusive funding source often leaves the stormwater program unable to support efficient growth, fully meet regulatory compliance, or sufficiently plan for the future due to the lack of continued and secured funding.

Table 3.1 Funding Mechanism: General Appropriations	
Description	• A method of using a percentage of money from a general pool of money. In the case of state universities, this comes from state appropriations and student fees.
Strength	• Easy for administrators to earmark funds for certain needs.
Weakness	• Appropriation fluctuates with budget demands, no guaranteed money every year. • Must compete for funds against programs that may have more popular opinion such as police and safety. • Competition of funding and fluctuation of dollars makes it difficult to produce long-range construction projects that infrastructure requires.

Capital Projects

It is a requirement of the NPDES program that MS4s enact ordinances or other regulatory mechanism requiring all new development and redevelopment to adhere to stormwater performance standards set in the permittee's management plan. From a university perspective, this is a regulatory driver that requires stormwater quantity and quality best management practices be incorporated into capital improvement projects.

Table 3.2 Funding Mechanism: Capital Projects (New and Redevelopment)	
Description	• A method requiring new and redevelopment projects to pay for and maintain stormwater management performance standards set by the local MS4.
Strength	• Requires development to take responsibility and ownership for its contribution to the storm sewer system in sustainable ways.
Weaknesses	• By itself, it puts the burden of stormwater management on development through small, incremental pieces of stormwater infrastructure growth. • Does not allow for long-range planning of entire watersheds. • Maintenance of these management practices are required. Must be able to properly fund.

Utility Fee

A utility fee requires the user to pay for the service. Stormwater management is a utility just like sanitary sewers and potable water. However, it has not been historically viewed as such, and, therefore, not billed to the user effectively. A utility fee has grown in popularity across municipal permit holders in the United States. Western Kentucky University has produced a stormwater utility fee survey every year since 2007. The latest 2016 survey identifies 1,571 United States Stormwater Utilities (SWU) and 21 Canadian

SWUs. Nationally, the median monthly fee is $4.00 (Campbell, 2016). There are strengths and weaknesses to a utility fee approach broadly identified in Table 3.3. The consultant Fuss & O'Neal identified the potential weaknesses to a utility fee when the State of Connecticut formed a partnership to evaluate low impact development funding within the state general permit (Fuss & O'Neal, 2010).

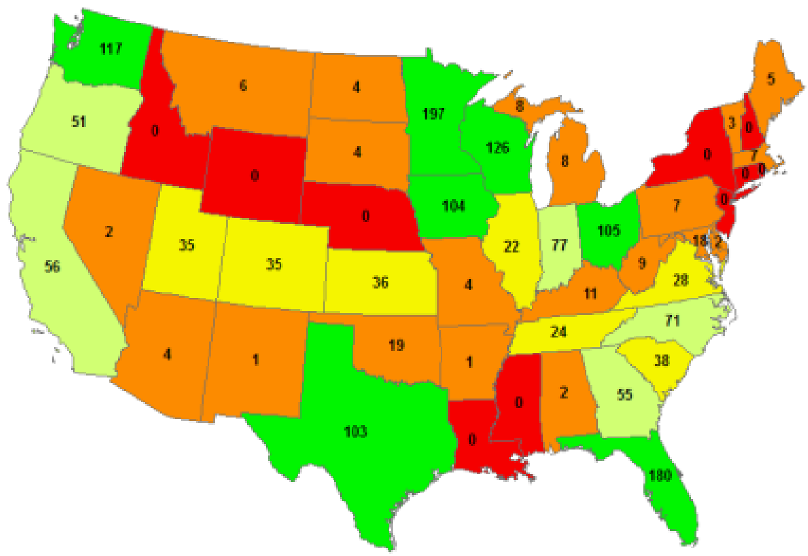

Figure 3.2 Number of Utilities by State in 2016 (Campbell, 2016)

Table 3.3 Funding Mechanism: Utility Fee	
Description	• Dedicated funding source whereby users pay based on how much runoff they contribute to the storm sewer system.
Strengths	• Fair funding structure: the user pays for the cost, similar to the way users pay other utilities such as power, sewer, and drinking water. • Encourages more green infrastructure and less impervious surface growth.
Weaknesses	• Increased bureaucracy may be required to put the billing system in place. • Requires a significant public education campaign to gain support. • Politically, new fees have been perceived as taxes. • If proper public education is not instituted, the basis for fees can be unclear and, therefore, considered unreasonable. • Stormwater utilities have been politically indefensible. • May require enabling legislation.

Utility Mark-Up

A utility mark-up approach simply puts an increase on utility fees for which users are already being billed. From a municipal perspective, in 2017 the city of Kearney, Nebraska began charging $1/month for residences, and $3/month for industry on existing monthly bills, according to Dan Lillis, City of Kearney Stormwater Program Manager at the 2017 Spring Stormwater Symposium in Omaha, Nebraska. By doing this, Kearney has been able to find an approach to funding without the need for enabling legislation that a stormwater utility fee would otherwise require in the State of Nebraska..

Table 3.4 Funding Mechanism: Utility Mark-Up	
Description	• A direct funding mechanism that increases existing user utility bills to pay for stormwater management.
Strength	• Easy to implement. It takes very little administrative effort to raise rates on an existing billing system as opposed to creating an entirely new utility fee. • May not technically need enabling legislation to execute.
Weakness	• Not equitable: marking-up sewer and water fees is not an equitable burden on the user.

Offset Banking System

The basic premise of an offset system is that if a source wishes to either create new pollutant loads or increase existing loads, it must first offset its escalation by reductions in pollutant loading from other sources or areas (Morrison, 2002). The purchase of credits can then be put into a fund to build offsetting best management practices and fund maintenance. This offset banking system can create credits so that there are theoretically no net increases in pollutant loading into waters of the state. This can prove to be difficult for a municipality because they do not have ownership over all land within municipal boundaries. However, a university has much more control of its land use, and exists within a smaller watershed. With careful planning, a banking system can offset pollutant loading at a university without drastic structural funding changes.

Table 3.5 Funding Mechanism: Offset Banking System

Description	• A credit system that offsets pollutant loading by decreasing pollutants from one source to offset new or increased sources elsewhere.
Strength	• Within the same watershed, offsetting does not increase pollutant loading into the MS4 system. • Allows for development in areas that would otherwise make best management practices impractical or inefficient.
Weakness	• Estimating non-point source load equivalencies can prove difficult. • Offsets must be pollutant-specific so that the pollutant of concern is properly offset elsewhere. • When a TMDL is present, a source will not be able to increase pollutant loading into an impaired water body by decreasing the pollutant into non-impaired water somewhere else.

Chapter V: Case Studies

Selection of Case Studies

The case studies that follow are meant to show examples of how some large state universities have met the growing need for direct funding of stormwater programs through mechanisms other than the traditional primary method of general appropriation funding. The case studies were chosen based on the following criteria:

a. Required by federal and state law to abide by a MS4 NPDES permit.
b. Own their storm sewer system in full, or in part.
c. A public university
d. Funding for the stormwater program utilizes methods other than strictly general appropriations or capital improvement project performance standards.

An assessment of universities that had a high “green” ranking within U.S. News and World Report did not offer a correlation between being “green” and having direct and stable stormwater funding mechanisms. Universities that have policies to use LEED building certifications don’t necessarily have strong stormwater programs. One reason may be that stormwater quality and quantity construction receive very few points on the LEED certification scale. Other research may find using the Association for the Advancement of Sustainability in Higher Education (AASHE) Sustainability Tracking, Assessment & Rating System (STARS) a good way to find universities that could possibly practice direct and stable stormwater funding strategies. The case studies selected were chosen based on their use of funding methods other than general appropriations, regardless of whether the funding practices produced positive or negative results or fully captured all of the institutions stormwater funding needs through those established methods.

The University of Nebraska-Lincoln (UNL) in this instance will be used as the "control institution" as it uses the traditional means of funding stormwater management programs through general appropriations. The case studies will help lead to recommendations for UNL to consider additional and/or alternative funding strategies.

The method used to gather information from each of the institutions regarding funding strategies was acquired through direct staff phone and email interview communication.

Overview of Case Studies

Figure 5.1 describes the funding mechanisms used by each university case study.

Overview of Case Study Funding Strategies						
Institution	General Appropriations	Capital Projects (regulatory requirement)	Utility Fee	Utility Mark-Up	Banking System	Maintenance Fund
University of North Carolina-Chapel Hill	✓	✓	✓	✓		
University of Virginia	✓	✓	✓	✓		
University of Michigan	✓	✓		✓		
Michigan State University	✓	✓			✓	✓
University of Nebraska-Lincoln	✓	✓				

Figure 5.1 Overview of Case Study Funding Strategies

University of North Carolina-Chapel Hill

The University of North Carolina-Chapel Hill (UNC-CH) was established in 1789 and is situated on 729 acres with a total enrollment of 29,469 as of Fall 2016 (OIRA, 2016). As communicated by S. Hoyt, Stormwater Engineer at UNC-Chapel Hill (personal communication October 13, 2016) the institution utilizes a blended funding mechanism approach. Together they combine general appropriated funds, sewer mark-up, and a utility fee approach. Capital projects must adhere to minimum control measure for post construction run-off control within the MS4 NPDES permit.

a. General Appropriations

In 2002 when the university was first required to become a MS4 permitted entity, UNC-CH administration appropriated funds for maintaining grounds and managing the stormwater permit.

b. Sewer Mark-Up

As the program requirements began to intensify in 2006 due to EPA and state standards, it was decided that water and sewer bills from the City of Chapel Hill would be marked up by 5%. This method funds four positions at UNC-CH.

c. Utility Fee

When the post-construction BMP minimum control measure regulatory requirement escalated, UNC-CH knew that maintenance of BMPs would need more funding. They first decided to compare simply increasing the mark-up rate on water and sewer bills versus instituting a utility fee. By comparing the two funding mechanisms, they were able to consider how each method would impact users and what was actually fair. For instance, a hospital uses much more potable and sanitary water versus a parking lot. However, parking lot runoff contributes greatly to stormwater in both quantity and quality. UNC-CH decided that instituting a utility fee was the most balanced approach to meet funding needs. The University decided to structure a monthly fee at \$2.40/1000 ft^2 of impervious surface. The fee will be raised 5% per year for the first five years in a phased approach to meet UNC-CH needs. Future rate raises will require the University to conduct a rate structure analysis.

S. Hoyt, Stormwater Engineer at UNC-Chapel Hill (personal communication October 13, 2016), noted a key component to UNC-CH's funding success was having leadership that acknowledged and championed the need for additional funding commitments. The Associate Vice Chancellor went to the budget committee and explained what it would cost to sustain the program, how it was underfunded, and proposed new strategies.

University of Virginia

The University of Virginia (UVA) was founded in 1819 and is situated on a 1,682 acre campus with a total enrollment of 22,391 as of Fall 2016 ("University of Virginia", n.d.). Capital projects must adhere to minimum control measures for post construction run-off control within the MS4 NPDES permit. UVA employs the following direct funding strategies:

a. General Appropriations

Salaries towards stormwater maintenance and management come from the general fund. In some cases, the utility fee does not always cover all the project work needed and money will be moved from the other general fund sources.

b. Utility Fee

According to K. Carter, UVA (personal communication October 18, 2016), the City of Charlottesville began developing a stormwater utility several years ago and was under the impression that the city was going to bill the university. This potential bill from the city was the driver to create a separate university stormwater utility fee. At UVA, the Facilities Management (FM) department receives all utility bills (electricity, gas, water, sewer, etc.), and then assesses the buildings at a higher rate to cover management and infrastructure expenses. UVA decided to create a distinct line in monthly bills to address stormwater utility fees, which also added transparency to customer billing statements. UVA decided not to collect any more money to cover stormwater than before the utility. This was achieved by reducing mark-ups on other utility fees and adding the stormwater fee for a near net-zero change to money brought in to the Facilities Management Department across all utility bills. Individual customers, such as Parking & Transportation, are more severely impacted if they are responsible for greater amounts of impervious area.

Ultimately, the city could not impose a stormwater utility on UVA because of an existing state regulation prohibiting one MS4 from billing another MS4 for stormwater utility fees. Nevertheless, the UVA administration elected to keep the fee as it provided a mechanism to help collect and manage money specifically earmarked for stormwater related programs.

Every year, Facilities Management managers and accountants determine the new fees bases on the actual costs for each utility. The stormwater fee is set in this way also. UVA estimates the total cost to run the program based on the previous year and divide that by the impervious area to get the fee. The stormwater fee only pays for piping maintenance and repairs, stormwater improvements, some overhead expenses, and permitting fees and expenses.

For fiscal year 2015-2016, the UVA stormwater billing rate was $0.0856/SF and generated about $618,000. The rate for FY 2016-2017 was $0.0909/SF. The UVA Facilities Management Department bills the stormwater utility monthly. The utility fee is applied based on the impervious footprint of individual buildings and parking areas. Individual building fees are aggregated for individual customers (e.g., hospital, auxiliaries, various academic groupings). When analyzing the square footage for billing purposes, facility-based impervious cover is for building footprint only, excluding walkways. Parking areas include only the individual spaces, excluding thruways. If multiple customers share a building, the fee is split amongst the customers based on how much of the building is "owned."

University of Michigan

Originally founded in 1817, the University of Michigan, located in Ann Arbor, sits on 3,177 acres and had 44,718 students as of Fall 2016 ("University of Michigan", n.d.). Capital projects must adhere to minimum control measures for post-construction run-off control within the MS4 NPDES permit. University of Michigan uses the following funding mechanisms:

a. General appropriations

A stormwater liability account funded from the general appropriations fund contributes to large-budget maintenance issues such as clean-outs and EHS staff needed to meet regulatory requirements.

b. Utility Mark-Up

According to Michael Swanson, Utility Service Manager at the University of Michigan (personal communication October 21, 2016), the University of Michigan operates the water utility as an enterprise fund. This means they recover cost of operations, maintenance, repair, and capital project funding through these rates. The city of Ann Arbor charges a stormwater utility fee by parcel at $425 per impervious acre, charged quarterly. The university then bills this city fee to the end users within the university and adds a 28% service charge to the billing received from the City of Ann Arbor water utility metering/billing. This total maintenance budget is ~$1.6M/yr and the University averages capital funding ~$1.5M/yr. This budget is recovered through the service charge (28%). The maintenance budget is apportioned based on the various systems they support. However, the storm water system receives about 40% of the funding for activities such as catch basin and manhole cleaning, jetting, and system maintenance and repair. The University can cut the utility fee cost through a credit system with the city by reducing the amount of impervious surfaces they have and installing BMPs.

Michigan State University

Michigan State University (MSU), founded in 1855, has an enrollment of 50,344 as of Fall 2016 on a 5,200-acre campus with 2,100 acres in existing or planned development (Michigan State University, 2016). Michigan State University is located in Lansing, Michigan, in the Red Cedar River Watershed (MSU Water, 2016). Capital projects must adhere to minimum control measure for post construction run-off control within the MS4 NPDES permit. Michigan State University uses the following funding strategies:

a. General Appropriations

All costs to maintain the stormwater permit outside of capital improvement projects are paid for by the general fund.

b. Banking System

According to R. Nestle (personal communication October 20, 2016), Michigan State University fulfills the stormwater requirements through a banking system. In January 2008, MSU started to evaluate each upcoming construction project to see what impact the projects had on stormwater management. MSU looked at the entire campus and calculated how much impervious surface versus green space new construction would add. The calculation confirmed there would be more green space than impervious surface. The university then created a bank of green space credit. If a project creates more green space, the bank receives credit. As growth occurs, projects that create impervious surface must pay $45,000 per acre of newly created impervious surface, and credits from the bank are spent. If campus growth eventually tips the scale over to more impervious surface than green space, existing money from this account may be used to build regional BMPs to make up for the net increase in impervious surface, thereby restoring the balance.

c. Maintenance costs

Michigan State University also understands the lifespan costs of capital improvement projects. Each project commits twenty years of maintenance into an interest bearing account. The project manager and architect/engineer work with landscape services to compute annual maintenance costs by type for each BMP. When the BMP has been built, it is assigned an equipment number to be able to track real maintenance costs in the work order system.

University of Nebraska-Lincoln

The University of Nebraska-Lincoln (UNL), founded in 1869 has 25,897 students as of October 2016 (UNL, 2016). The main campus is situated on 613 acres in Lincoln, Nebraska, and feeds into the Salt Creek Watershed.

Although the funding structures within any major system such as UNL can become very convoluted with many different funding streams, ultimately there is no transparent or direct revenue source charged to a user and dedicated to stormwater management. Therefore, the university uses only two funding sources, general appropriations and the funding of green infrastructure through regulatory requirements of minimum control measure for post-construction run-off control within the MS4 NPDES permit.

a. General Appropriations

Funding for all regulatory stormwater requirements, including personnel, maintenance, and best management practices are funded through the university general fund, which ultimately comes from state appropriations. According to C. Griesen, Construction Coordinator for UNL Utility Department (personal communication

3/22/17), although the UNL Utilities Department is an enterprise fund that charges users for power, steam, and chilled water, there is no direct line item in the user fees that dedicates funds towards stormwater management.

b. Capital Projects

New and redevelopment projects are required by the Clean Water Act NPDES MS4 permit to achieve site performance standards for water quality and quantity by utilizing green infrastructure or low impact development. All projects 0.5 acre or more must build post-construction stormwater controls to filter at least the first 0.5 inch of runoff (UNL, 2017). Project funds pay for construction cost of stormwater assets. However, there is no set amount or fund the project must pay into intended strictly for the maintenance of stormwater assets that are built. Therefore, the maintenance of assets falls to the operating budget of Landscape Services or the Utility Department. As more and more projects are built, it would be beneficial to have dedicated funds to help maintain BMPs.

Chapter VI: Recommendations

In order for the University of Nebraska-Lincoln to properly meet permit expectations while sufficiently planning for the stormwater utility needs now and in the future, a blended financing mechanism from several different funding streams is recommended as is seen in the case studies cited.

First and foremost, a committee of stakeholders from various effected departments must be formed in order to fully implement any new funding system. Stakeholders should work on a progressive system that gradually implements and introduces new funding mechanisms. As was the case for the University of North Carolina-Chapel Hill, having a champion in upper administration that understands and supports the need for new stormwater funding strategies is vital. It is recommended that finding leadership that is or can be educated and supportive in this topic should be undertaken.

a. Create a Utility Mark-Up

UNL Utilities only charge for power, steam, and chilled water. The revenue for these operations go towards an operating fund that pays for any incidental maintenance fees for all utility lines, including stormwater maintenance as needed, year to year. UNL does not have a direct percentage of revenue from these funds that go towards stormwater management. With some relatively simple changes in billing structure, each bill could be charged a line item for stormwater maintenance. This percentage could be an additional charge increasing the overall rate. As is the case with the University of Virginia, UNL could benefit from simply creating a distinct line item in the bill, itemizing charges to the user without actually increasing rates. Changing the billing structure to allow for a line item for stormwater maintenance, with or without raising rates, could allow for spending transparency. To be able to make the funds as adaptable as possible, the structure would need to be done in a way that funds could carry over from year to year, to anticipate increased maintenance needs.

b. Create an Offset Banking System

As a form of enforcement, and to maximize to the extent practicable the best management practices of site performance standards for new and redevelopment projects, creating an offset banking system could be very useful. UNL has the benefit of having contiguous land within its campus and therefore can maximize its watershed management through careful planning and funding. UNL is in the process of creating a hydraulic model that can be used to build a watershed master plan to show where stormwater controls can maximize benefit and cost efficiencies. Offset banking could be used in the following example: consider a new set of tennis and basketball courts to be built on a small site with limited space which still exceeds the 0.5 acre rule and therefore had to include post-construction stormwater BMPs. UNL project managers could look at the site and decide that it was not cost effective to try to fit treatment BMPs into the site, nor would it maximize water quality value since runoff from a tennis court is not particularly polluted. Instead, with an offset banking system, projects that are determined to have site constraints could pay a percentage into a fund so that BMPs could be constructed elsewhere that could maximize water quantity and quality effectiveness. This could also help with maintenance costs. Instead of constructing numerous less effective BMPs on campus that landscape services would have to pay to maintain, UNL could fund highly effective BMPs through a watershed management plan with funding from construction that would have otherwise paid for less effective measures.

c. Create a Capital Project Maintenance Fund Requirement

As exemplified by Michigan State University, when projects are constructed, a designated amount of money could be agreed upon to set aside in an interest bearing account for maintenance costs on the lifespan of the asset. Through the maintenance work order system already in place at UNL, real time costs can be tracked. The fund would only have to pay for the actual cost of maintenance, but would guarantee that the asset would be fully functioning despite any budget shortfalls in the future. It would also protect the BMP from neglect that could potentially become a future regulatory compliance failure. With proper tracking, this could also be a research opportunity to provide accurate maintenance costs to the Nebraska stormwater community that could provide data for the advancement of stormwater BMPs in the future.

d. Create a Utility Fee

A utility fee is the most equitable way to fund a stormwater program. It would also take the most work to develop. There is potentially a long process involved to win over public opinion, develop an effective communication plan to inform UNL users, and institute a billing system that works within the financial system of UNL. If UNL were to decide to create a utility fee, it already has an excellent GIS system that could easily analyze impervious surface square footage to determine user fees. As the University of North Carolina-Chapel Hill has done, UNL could determine the impervious surface from the following sources:

1. Building roofs, including buildings under construction

2. Parking lots*
3. Roads, Driveways, and Service Roads*
4. Sidewalks and plazas*
5. Service Areas and other areas used by vehicles*
6. Recreation surfaces (synthetic turf fields, basketball and tennis courts, tracks, swimming pools)
7. Miscellaneous areas such as walls, steps, and concrete pads*

*Including gravel, compacted dirt, and permeable pavement. (UNC-CH, 2016)

UNL stakeholders could determine an appropriate fee based on the national average determined by the Western Kentucky Survey (Campbell, 2016), or it could assess a fee corresponding to assessed budget needs. A utility fee would be the most equitable and direct way to allow UNL to plan for and administer a stormwater program that could withstand major fluctuations in budget climates without jeopardizing regulatory noncompliance or drainage failures.

Conclusion

Ultimately, NPDES regulations and drainage control will continue to be an increasing need, requiring funding that must withstand budget issues. A blended form of direct funding mechanisms allows for a progressive and equitable way to plan for future costs associated with stormwater management. It is in the best interest of UNL to form a stormwater stakeholder committee to be tasked with planning for the future demands of stormwater development, regulatory compliance, maintenance, and funding. Stakeholders from a diverse network of university departments will be able to facilitate the greatest amount of insight to navigate the intricacies and needs required by the UNL funding network. University and municipal committee representatives could include:

1. Parking Services
2. Landscape Services
3. Facilities Maintenance and Operation
4. Utilities Services
5. Campus Planning & Space Management
6. Environmental Health & Safety
7. Housing
8. Facilities Management & Planning
9. City of Lincoln Watershed Management Department Representative

By facilitating an atmosphere that gives buy-in and acceptability from representative impacted stakeholders, UNL will build better trust and acceptance for all policy changes that are considered and implemented. The direct funding strategies recommended, such as a utility fee, banking offset, and a utility mark-up will require planning and considerable technical and policy contributions that can be best navigated with input from representative municipal and university members.

A blended funding system allows for diversification so no one funding mechanism supports the entire system. Money from these separate sources could be used in the following ways:

1. Utility Mark Up: Funding for existing pipe system and underground water quality asset construction and maintenance, such as hydrodynamic separators.

2. Offset Banking: Money could be used to fund assets constructed from a campus-wide stormwater management plan supported by a hydrology model that pinpoints where the best placement of Low Impact Development/Green Infrastructure could facilitate the most efficient and effective water quality and quantity measures.
3. Maintenance Fund on Capital Projects: Allows capital projects to commit to full ownership of asset and financially protects assets built by capital projects with guaranteed maintenance into perpetuity regardless of state funding shortfalls.
4. Utility Fee: Money could fund personnel and contribute matching funds to projects to maximize stormwater benefit. For example, if a road is going to be demolished to put in utility pipes, money from this fund could contribute to putting the road back as a green street. Where a green street would not have otherwise been affordable or funded within the scope of the utility project, the utility fee funds could allow UNL to maximize efficiency of cost by taking advantage of and piggybacking on a project that is already paying and performing work toward a green street project.

The sooner the University of Nebraska-Lincoln begins to understand the financial needs of the shifting and expanding scope of stormwater regulatory, maintenance, and management responsibilities, the better prepared it will be. The United States is now experiencing unfunded deferred maintenance on infrastructure across the country. If UNL waits until the moment management is required, they will be ill-equipped and considerably underfunded to deal with the crucial work that is necessary. UNL cannot begin restructuring funding strategies when a crisis is at hand. The University must look into the future and plan accordingly, otherwise it runs the risk of infrastructure failure and regulatory noncompliance that could be far more costly in the end.

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