

Barriers Preventing Implementation of Green Infrastructure in Washtenaw County, Michigan

Huron River Watershed Council, February 2014

EXECUTIVE SUMMARY

Introduction

Green Infrastructure (GI) has emerged in the past decade as the next step toward more sustainable treatment of stormwater. It is an improvement on the concept of Low Impact Development (LID), which focused on site-specific Best Management Practices (BMPs) and proved to be economically viable and operationally effective. Green Infrastructure brings to LID the wider scope of strategic infrastructure planning and thereby increases both economic value and operational effectiveness.

On the whole, LID has been implemented opportunistically throughout Washtenaw County (WC). However, the broader concept of GI planning and development does not occur regularly throughout the county. Why? *If the benefits of GI over grey infrastructure are recognized, why is GI planning not happening on a larger scale or at a faster pace?* What barriers stand in the way? That is the question that the Huron River Watershed Council posed to begin planning and encouraging broader GI implementation. Through literature review and interviews with multiple local governments, a number of barriers to GI planning in WC were identified and a number of solutions for overcoming these barriers are outlined.

Note that throughout this summary, highlighting indicates sections or sub-sections in the full report.¹

The Barriers

Green Infrastructure is being implemented in a piecemeal way throughout WC largely because of a **(1) Lack of Planning or Limitations on Planning**. One of the major barriers to GI planning is the **LACK OF GI-REINFORCING POLICIES** at numerous local government levels. There is a lack of GI-reinforcing language in

¹ Some sections and sub-sections in the full report have been omitted from this summary.

local government ordinances or development standards. The County Water Resource Commissioner's (WRC) stormwater rules minimize GI benefits and can make GI projects more lengthy and difficult. Development policies or standards that require or encourage stormwater infiltration early in project development would be helpful at the project level. The development of capital improvement plans do not usually give priority for GI projects or consider GI attributes too late in the process. Standard maintenance practices also often undermine GI project success. Finally, state policies and legislation could encourage stormwater utilities providing a successful way to finance GI projects.

A second barrier is **LIMITATIONS ON FUNDING**. There is a lack of funding sources for GI projects. Sources are well-established, though under-funded, for conventional grey infrastructure, but this funding is often limited to or prohibited from being used to fund GI projects to capture, treat and convey the same stormwater. New funding sources for GI are necessary to meet a growing need. Technical assistance is also needed to guide project applicants through the process so that municipalities will take advantage of opportunities such as the State Revolving Fund low-interest loans.

A third major barrier to GI planning is a **LACK OF INTER-JURISDICTIONAL (I-J) COMMUNICATION AND PLANNING**. As one municipal staff member put it, "there is no one responsible for the watershed" as a whole. Because there is no single entity responsible for managing stormwater in the watershed, the various local governments that share this responsibility do not always work collaboratively. Managing stormwater is often a low priority for the local governments, or it falls to an individual without comprehensive training or access to an active network of stormwater managers. There is a lack of I-J mechanisms that are comprehensive enough or enduring enough to facilitate GI planning throughout the county. More importantly, there is no body or group to facilitate I-J activities, such as training, project-design, outreach, knowledge-sharing, and maintenance. This leads to piece-meal development of small GI projects. Better I-J coordination would lead to investment in projects that provide better stormwater infiltration and treatment benefits for the watershed overall.

Policy-makers, elected officials, engineers, maintenance staff, developers, and property owners **(2) Lack Information and Training** about GI. First, there is a lack of information and training **ABOUT SPECIFIC GI FEATURES**, especially in a way that advances implementation. Second, there is a lack of information and training **REGARDING THE ECONOMIC COSTS AND BENEFITS**. Though the EPA has clearly proved that "well-chosen GI projects save money," there is agreement across WC that more information is needed for both training of staff and proof of concept. Alternatively, information may need to be delivered in a way that works better with existing planning and implementation processes. Third, information may be insufficient **REGARDING LOCAL FEASIBILITY**. Case studies that mirror local topographic, geologic, and even political conditions are needed to produce a list of opportunities that are "real, not ideal." There is also a need for sharing information **ABOUT LOCAL GI POLICIES AND PRACTICES**. Local governments need successful examples to show how to encourage GI development. Fifth, information and training are lacking **REGARDING MAINTENANCE**. Because maintenance of GI is different and variable, questions remain regarding effective maintenance practices and sustaining maintenance over the long-term. Finally, there is a need for **INFORMATION AND TRAINING FOR A WIDE VARIETY OF ACTORS**, from public maintenance staff to

policymakers and a transfer of **INFORMATION AND TRAINING FROM THE GI INDUSTRY**, such as from pervious pavement contractors.

Proposed Solutions

1. Green Infrastructure Group (GIG)

“There is no one responsible for the watershed. That is why we do things in pieces.” The fact that no government body is charged with the responsibility of managing stormwater for the watershed does not mean that watershed-scale thinkers and actors do not exist in the various WC local governments. In addition, HRWC is uniquely positioned to lead watershed-scale GI planning. Establishing a Green Infrastructure Group will increase inter-jurisdictional communication and planning, increase the sharing of local information and identification of needs and opportunities, and institutionalize the development of GI, including collective efforts at removing some of the barriers.

2. Green Infrastructure drivers from the state

Many of the barriers identified would be less obstructive if there were adequate incentives from the state. The state could develop **STATEWIDE POLICIES TO ENCOURAGE STORMWATER UTILITIES**, such as by clarifying the legal process for developing a utility, fully enforcing stormwater permits, and expanding access to grant funds matched by local stormwater revenues. They could also offer more state **FUNDING FOR PLANNING AND FOR I-J PROJECTS**. GI requires planning, an inventory of assets, and a plan for the integration of GI projects going forward. Finally the MDEQ can emphasize the **CONNECTION BETWEEN GI IMPLEMENTATION AND IMPROVED WATER QUALITY THROUGH THE STORMWATER PERMITS**.

3. Development of master plans and township ordinances

The process of developing local government **MASTER PLANS** brings a community together to envision a future. The master plan is often essential in solidifying meaningful changes in **LOCAL ORDINANCES AND DIRECTING FUTURE CAPITOL INVESTMENTS**. Both of these steps need to include GI planning and more effectively identify projects.

4. Educational workshops

Educational needs on GI abound at all levels throughout local and government. Some of this learning will result from increased I-J communication and some from trial and error. Government officials and staff need workshops targeted at specific GI opportunities and skills that connect people to information, resources, and networks. Suggested workshops include GI construction and maintenance, the economics of GI, and details on specific GI practices.

5. Identification of GI opportunities throughout Washtenaw County

Part of the solution to increasing knowledge about and inter-jurisdictional planning for GI is on the ground GI projects. With greater experience to a diversity of GI projects including construction, costs, maintenance, and measured success, more planning and implementation of GI projects should occur.

Identifying opportunities and partnerships for GI projects can be a primary responsibility of the GIG partners along with the sharing of successes and failures.

6. Removal of barriers embedded in policies at all levels

At the local and county government level a few key policies and practices can make GI project implementation easier. A fruitful place to start is with the **WRC DESIGN STANDARDS**. The current standards allow for GI practices, but they do not encourage them or give guidance as to their effective use. The traditional or “grey” infrastructure practices are easily quantifiable and therefore easier to get approved. **STATE AND FEDERAL FUNDING MECHANISMS FOR ROADS** can be another great vehicle to encourage GI projects. Since road right-of-ways become stormwater conveyance features, funding for road maintenance and reconstruction should allow for and incentivize GI practices. **STATE AND LOCAL STORMWATER POLICIES** can include GI allowances and incentives. Stormwater permits should make it easier to gain approval for GI designs, and stricter permit limits might lead to greater local investment in GI. Finally, barriers in **TOWNSHIP ORDINANCE AND CODES** can be removed. While some specific examples were identified in the interviews, many of these barriers can be addressed through master planning and through long-term involvement as a GIG partner.

By making efforts to address these barriers to GI implementation, it is likely that Washtenaw County can move itself into a cycle of learning and implementation that will produce a GI foundation that yields lower costs, more attractive stormwater features, cleaner water resources and healthier aquatic ecosystems.

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Introduction

Green Infrastructure (GI) has emerged in the past decade as the next step toward more sustainable treatment of stormwater. It is an improvement on the concept of Low Impact Development (LID), which focuses on site-specific Best Management Practices (BMPs) and has proven to be economically viable and operationally effective. **Green Infrastructure brings to LID the wider scope of strategic infrastructure planning and thereby increases both economic value and operational effectiveness.**

On the whole, LID has been implemented opportunistically throughout Washtenaw County (WC). However, the broader concept of GI planning and development is only beginning to emerge in the county. This situation persists in spite of the fact that GI is often championed by WC entities. Why? **If the benefits of GI over grey infrastructure are recognized, why is GI planning not happening on a larger scale or at a faster pace? What barriers stand in the way?** That is the question that the Huron River Watershed Council (HRWC) posed to begin planning and encouraging broader GI implementation. Through literature review and interviews with multiple local governments, a number of barriers to GI planning in WC were identified and a number of solutions for overcoming these barriers were explored. Both the barriers and the solutions are outlined below.

(For a detailed description of GI, its representation in WC and a more detailed description of the complete HRWC project, see Appendix A).

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A. Barriers Preventing Green Infrastructure

Low Impact Development and GI are still relatively new concepts, having emerged only in the last few decades as the benefits (both direct and indirect) of natural systems have come to be appreciate and counted economically. Governmental management structures, however, were developed over previous generations prior to the emergence of LID and GI designs. These governmental structures were designed to accomplish municipal development and management given the standard practices of the time—practices that often did not appreciate the economic (or other) value of naturally-functioning systems. Unfortunately, some of these legacy governing structures present significant barriers to the implementation of GI in WC. **Broadly understood, the barriers result from the compartmentalized nature of state and local governing structures.** Stormwater is structurally dealt with separate from drinking water, land development, community aesthetics, energy supply, and water treatment. Policies are written for each independent area, authority is distributed accordingly and funds follow. Education and training are likewise compartmentalized, as are construction and maintenance efforts. Information and expertise remain in silos and private developers often need to address each silo separately. Most importantly, incentives for cross-jurisdictional planning and management are not inherent.

Green Infrastructure, however, is most successful when agencies and departments work together to comprehensively address community needs. **If GI is to be implemented in WC, the barriers presented by the compartmentalized nature of local governance need to be negotiated.**

In general, the barriers fall into three overlapping categories:

1. Lack of/Limitations in planning
2. Lack of information and training
3. Lack of community ownership and participation

These three barriers are examined in depth below. Following them is a set of possible solutions for overcoming the barriers.

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1. Lack of/Limitations in Planning

Green Infrastructure with regard to stormwater is the planned implementation of LID practices across a watershed to gain multiple benefits, including clean water, healthy ecosystems, recreational opportunities, beautiful landscapes, economic enhancement, flood reduction, and cost-savings. Broad, cross-jurisdictional planning of this type happens infrequently in WC. This is due, in part, to a lack of GI-reinforcing policies at all levels (1.1.), to limitations on the mandate and authority of each entity (1.2.), and to limitations on funding (1.3.). These are complicated and reinforced by the lack of cross-jurisdictional communication and planning (1.4.). Each of these obstacles is examined in depth.

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1.1. Lack of GI-reinforcing policies

Some policies throughout the county allow for and encourage LID practices. However, these policies are insufficient in their present form. The WRC design standards and municipal master plans allow for LID features but do not require them (1.1.1.), nor do the WRC standards provide leadership for municipalities which desire more stringent standards and ordinances (1.1.2.); Ann Arbor is still awaiting their green streets policy and stormwater model (1.1.3.); GI presents challenges for present maintenance policies (1.1.4.); there is a lack of stormwater utilities and a lack of incentives to create them (1.1.5.) as well as a lack of state leadership (1.1.6.); CIP development is often uncoordinated (1.1.7); master plans are often not implemented in ordinances and design standards (1.1.8.); and federal stormwater standards do not presently support GI (1.1.9.).

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1.1.1. Offering options of site-specific LID BMPs in master plans and WRC design standards is insufficient

Many attempts at implementation of GI fail because of an underestimation of the importance of scale. Suggesting, highlighting, or even prioritizing the use of LID designs in county standards or township master plans, while well-intentioned, is inadequate to produce the wide-scale planning necessary to bring about effective GI. Given a choice, developers tend to choose the path of least resistance, which tends to result in conventional development, a sentiment affirmed by two prominent, Ann Arbor-based developers.²

For example, a developer might face a decision of whether to build a vegetated swale with infiltration capacity or a curb-and-gutter design with a pipe to the nearest county drain. If the developer is not familiar with the practice, does not know the soil composition and infiltration rate, is uncertain of how to ensure maintenance over time, and is doubtful about the cost-effectiveness of the project, the developer is likely to choose the curb-and-gutter design, as long as it is allowed.

While simplistic, this scenario captures the rationale of a developer, especially during times of economic strain or uncertainty. Because the cost-effectiveness of GI expresses itself most clearly on a community-wide scale, and because it may *not* appear to be the most cost-effective on the site scale, individual developers at specific sites are likely to choose grey infrastructure when given a choice, which is, again, affirmed by Ann Arbor developers.³

This point is made clear by SEMCOG's 2005, 500-page *LID Manual*, in which numerous BMPs are highlighted. Despite this high-quality and practical source of information, some major WC entities have not implemented a single LID project. **LID BMPs are inadequate as "options" if they are not placed in the context of a broad-scale plan for GI.**

Ann Arbor developers have pointed out that property owners often drive choices about stormwater management on their properties.⁴ The two developers that were interviewed for this project frequently push the LID envelope, attempting to convince owners of the economic and environmental benefits. They affirm that most developers follow the easiest/cheapest path, but draw attention to the importance of market demands. Though these developers find no obstacles in the WRC standards for their LID projects (i.e., "options" truly work for them), they affirm that the standards do not encourage the development of GI (discussed in detail below in 1.1.1.1.). Educating property owners about the

² Personal interview with two developers and associated engineering staff, September 6, 2013.

³ September 6, 2013.

⁴ September 6, 2013.

economic and environmental value of GI could help build demand for LID features in the market, but the WRC standards remain limiting to GI implementation because of their “options” approach.⁵

A broad-scale plan for GI might prioritize the use of certain BMPs in specific geographic locations. A developer of a site would receive more specific guidance about which BMP to use, the cost-effectiveness of that BMP, how to implement the BMP correctly, and how to ensure long-term maintenance beyond initial installation.

Presently, many municipal master plans and the WRC rules provide flexibility and options for site-specific LID BMPs, but they do not provide the overarching planning and guidance necessary for GI implementation. They provide suggestions that can easily be ignored. Items that might be included in municipal master plans are not carried through into design standards or enforceable ordinances. Though the will to develop standards exists, their adoption is delayed by the presence of outdated county standards, which are addressed below (1.1.1.1.).

Examples of these problems can be found in Pittsfield and Augusta townships (see Appendix B for a more detailed analysis). In sum, both Pittsfield and Augusta township master plans and ordinances allow for LID practices, but they do not carry the necessary incentives to see them implemented, neither by specific requirements for LID use, nor by detailed guidance on options. This is due to a lack of integrated planning for GI at the county scale. A master plan that supported GI would lay out a detailed stormwater plan for the township and standards and ordinances would enforce that plan. This would require, among other things, a strategic integration and application of knowledge about soil types (knowledge which Augusta Township displays in its master plan), natural drainage patterns, percent slope, existing green space, and projected development pressures.

A complicating factor present in some of the municipalities in WC is the lack of strategic development of Capital Improvement Plans (CIPs). The 2004 Augusta Township master plan pointed out that a “routine process for the adoption of a [CIP] as part of the annual budgeting process” did not yet exist.⁶ This lack of procedural development of CIPs will be addressed further in this report.

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⁵ These developers also point out that the lack of LID inventory throughout the county may in part be due to the fact that development has been halted since 2006/2007. They indicate that, when the market picks up again, as it seems to be doing in the for-sale private sector, LID features may be in more demand than pre-2006. As of now, this remains conjecture.

⁶ Augusta Charter Township, *Master Plan*, December 14, 2004, p. 89, <http://augustatownship.org/PDFs/ATMP%202007.pdf>, accessed July 13, 2012. This situation may have changed since 2004.

1.1.1.1. *Water Resource Commissioner design standards*⁷

The WRC's "Rules and Guidelines – Procedures and Design Criteria for Stormwater Management Systems" (referred to throughout as "design standards") were designed to accomplish two goals: 1) protect against on or off-site flooding as a result of a new development, and 2) provide for some amount of capture and treatment of stormwater runoff from new developments to reduce polluted runoff and protect stream channels from erosion.

The WRC published county-wide standards in 2002 which redefined the context in which stormwater management in WC occurred. The focus of that new context was a "reevaluation [of] the way that stormwater and land development are managed."⁸ The emphasis was placed on preserving the long-term health of local streams. In order to protect local streams from being "re-shaped by the extreme shifts in hydrology, morphology and water quality that can accompany the development process," the entire process "from land use planning and zoning to site design and construction" must change. In order to achieve natural conditions of runoff, thereby preventing pollution to streams, "a coordinated network of structural and non-structural methods, designed to provide both source and site control" is necessary.

Despite this reevaluation, three major obstacles remain concerning the WRC rules. First, it was apparent from the beginning, even to the WRC, that this reevaluation would be quite limited in authority, for "the Rules of the [WRC] govern . . .

- "only the design of stormwater management systems . . .
- "within certain new development projects."⁹

Site controls are within the realm of the WRC's authority, but source controls are not. However, "source controls are the best option for controlling stormwater." They include the following practices.

- "Preservation of existing natural features that perform stormwater management functions . . .
- "Minimization of impervious surface area through site planning . . .

⁷ This section, as well as the overall report, was written prior to the release of the WRC's revised "Rules and Guidelines – Procedures and Design Criteria for Stormwater Management Systems." The draft revisions were released in January 2014.

⁸ Washtenaw County, MI, "Design Standards: Summary," Washtenaw County Water Resources Commissioner, http://www.ewashtenaw.org/government/drain_commissioner/dc_webPermits_DesignStandards/dc_summary.html, accessed July 13, 2012.

⁹ Washtenaw County, MI, "Design Standards: Summary," Washtenaw County Water Resources Commissioner, http://www.ewashtenaw.org/government/drain_commissioner/dc_webPermits_DesignStandards/dc_summary.html, accessed July 13, 2012.

- “Direction of stormwater discharge to open, grassed areas . . .
- “Careful design and installation of erosion control mechanisms and rigorous maintenance throughout the construction period”

Obviously, decisions about these practices determine the options available for site controls. If a developer wants to ensure ample room for parking in a lot and provide for future business growth, the lack of legal limitations on lot size and/or type (e.g., pervious pavement vs. asphalt) will encourage large impervious areas on a site. With such large impervious areas, runoff will be excessive and grey infrastructure will be necessary to detain runoff and transport it to county drains. A few small rain gardens will not handle runoff from a large parking area, so they will not be considered as an option. Because the WRC is restricted in its authority to site controls, its impact on site planning is limited.

Second, partly due to the above limitation, the WRC’s approach to stormwater management was somewhat unworkable and is likely ineffective as an over-arching GI policy. The new approach required “the consideration of [BMPs] that function together as a system to ensure that the volume, rate, timing and pollution load of runoff remains similar to that which occurred under natural conditions. . . Each BMP by itself may not provide major benefits, but when combined with others becomes very effective.”¹⁰ This is in absolute agreement with the most cutting edge concepts of GI, and it can be workable on a site scale where runoff volume is controlled. However, it is difficult to apply in practice across multiple sites: **assuming that site-specific BMPs will give birth to a “system” of GI is like assuming neighborhood streets will give birth to an expressway system. Effective governing systems emerge from planning, not practices.**

This raises the question of why there has been such a focus on BMPs or LID at the site-specific level without attention given to broad GI planning. For example, SEMCOG published an *LID* manual in 2005, not a *GI* manual. This is perhaps because the concept of LID emphasizes addressing stormwater at the site level instead of at the community or regional scale. Development projects happen on individual sites, so it follows that planning for LID should happen at the local, site-specific level. However, this assumption is likely to inhibit the implementation of GI: costs may outweigh benefits on the local scale, ongoing maintenance cannot be properly secured without local government oversight, knowledge gaps among developers exist, etc. **Just because implementation is site-based, this does not mean that planning can be left to developers. This realization, in fact, is what seems to have moved LID to GI.**

Effective implementation of GI through the WRC rules would entail contextualized and prioritized guidance on *which* BMPs to use *where*. Options of LID practices can still be offered, but the options

¹⁰ Washtenaw County, MI, “Design Standards: Summary,” Washtenaw County Water Resources Commissioner, http://www.ewashtenaw.org/government/drain_commissioner/dc_webPermits_DesignStandards/dc_summary.html, accessed July 13, 2012.

must be limited or expanded by proper planning. Otherwise, BMPs will be implemented haphazardly and sparsely by environmentally-minded or niche-market developers.

Third, even the WRC site controls, over which they have authority, are presented as options with self-defeating language present in the most GI-friendly options. They lay out a Preferred Hierarchy of Structural Site Controls:¹¹

1. Infiltration practices. These are “the most effective stormwater quality controls” because they “reduce both the runoff peak and volume.” Immediately, however, warnings follow: “but to date, structural infiltration devices such as basins and, to a lesser degree, trenches have suffered extremely high failure rates due to clogging.” Therefore, the rule recommends “an aggressive maintenance program and extensive upstream pretreatment measures.” In addition, “these practices are only feasible for smaller drainage areas with suitable soils and no potential for groundwater contamination.”

“Extremely high failure rates,” “aggressive maintenance program,” “extensive . . . pretreatment measures,” limitations on drainage area, “suitable soils,” “groundwater contamination”—these phrases likely cause most developers to continue on down the hierarchy to less-risky options. The WRC should focus on the end goals of the design standards and set the rules, then allow developers flexibility to meet them in a variety of ways. Even though all of the concerns raised by the WRC are legitimate, much progress has been made toward addressing these concerns and many resources are available¹² to assist developers. These resources should be included with the standards in some way. In addition, WRC, or a collaborative county planning body, could mitigate some of the risk involved in these practices by more proactive planning and guidance. As a result, these “most effective storm water quality controls” might not be passed over so quickly.

2. Storm water retention ponds. These are “wet” ponds which retain water permanently or “dry” detention ponds that retain water for an extended period of time. They are preferable to short-term “dry” detention ponds because they allow “more particulate matter to settle out” and because “the aquatic plants and algae within wet ponds take up soluble pollutants (nutrients) from the water column.”

¹¹ Washtenaw County, MI, “Introduction,” *Design Standards of the WC WRC*, May 15, 2000, http://www.ewashtenaw.org/government/drain_commissioner/dc_webPermits_DesignStandards/dc_Rules/dc_introduction.pdf, accessed July 16, 2012.

¹² See the [Green Infrastructure Resources](#) web page for a list of some helpful resources.

3. Storm water detention structures. Again, these should be designed to “provide extended detention.” They should be considered “where site conditions make the use of a wet pond infeasible.”¹³
4. Conveyance off site. These are to be considered “once all possible methods of reducing and treating storm water on-site have been implemented.” These conveyance systems must “not cause adverse downstream impacts to land or waterways.” For accomplishing this, “vegetated swales with check dams are generally preferred to curb and gutter systems and enclosed storm drains.”

In the end, the WRC rules seem to present just a few safe and workable options for developers: ponds (wet if possible) and vegetated conveyance systems (with check dams when possible). While other options remain, they are, so-to-speak, at the developer’s risk. Few guidelines are presented for developing distributed infiltration systems throughout a development project. **If GI is to be implemented in WC, the WRC design standards presented must invite and support decisions for LID implementation by developers. The present standards should be updated for this purpose.**

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1.1.2. Even if/when the WRC standards are published, there is a lack of specific language to draw on in writing township master plans and ordinances.

WRC rules “allow for,” and will even evaluate in accordance with, stricter local policies. In fact, the WRC states clearly their intent to allow more stringent local standards.¹⁴ However, **it is not necessarily flexibility that is needed from WRC.** Local policies with strong GI-reinforcing standards can only be developed in communities that have a qualified engineering staff, such as Ann Arbor. Townships like Pittsfield, who would like to have more environmentally protective design standards for stormwater, are constrained to the WRC rules because of a lack of site plan review expertise. If a township develops more stringent policies, it needs at least the endorsement of the WRC. A helpful first step would be a body of sample language that a municipality or township can use in developing local ordinances.

¹³ A point of tension arises “where thermal impacts are a concern.” Water standing in the sun warms and can impact stream health. The solution: find a balance between “the goals of pollutant removal and the reduction of thermal impacts.” But there are “preferable approaches:” source controls—over which the WRC’s rules have no authority—and infiltration practices—which are the risk-laden ideas in #1. It seems likely that developers will opt for the balancing approach.

¹⁴ Washtenaw County, MI, “Part 1: Procedures for Plan Submission and Review ,” *Design Standards of the WC WRC*, April 2000, p. 1, http://www.ewashtenaw.org/government/drain_commissioner/dc_webPermits_DesignStandards/dc_Rules/dc_parti.pdf, accessed July 20, 2012.

The WRC has provided brief guidance on two LID features, infiltration facilities and sand filters, even though these are “only two of many approaches acceptable to the [WRC], presuming site suitability and adequate maintenance provisions.”¹⁵ A more robust list would provide more guidance for smaller municipalities. The WRC has also provided a brief bibliography of seven other resources (Appendix N), though most of these are over ten years old. A continually updated and more expansive resource list would help fill in knowledge gaps.

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1.1.3. City of Ann Arbor green streets policy and stormwater model (unpublished)

Ann Arbor City Council voted on July 2, 2012, to develop a “green streets policy.”¹⁶ City staff developed a draft policy and is seeking approval by the City Council at the end of February 2014. The new policy requires that city designers and staff utilize GI infiltration practices on all future public street construction or reconstruction projects. This simple, bold policy requires infiltration of runoff from the first inch of rain, at minimum, and more as soil conditions allow. The city estimates that roads and right-of-ways constitute 30-40% of impervious surfaces in the city. Currently, streets are considered part of the stormwater conveyance system, with no requirement for stormwater treatment. Future street projects will have at least a portion of this runoff from impervious surfaces treated or eliminated entirely.

The city is also awaiting the publication of its stormwater model. Unfortunately, their stormwater model does not include direct guidance for GI development, nor does it take account of stormwater reduction through green roofs. However, it will provide a framework for evaluating the impact of broad GI implementation. It should be able to provide for evaluations of runoff and pollutant reduction across the entire city jurisdiction and not just individual sites in isolation.

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1.1.4. Policies must re-envision maintenance

Traditional maintenance strategies may not be adequate to support GI. A typical maintenance department is highly sensitive to citizen complaints and much of their activity can be described as

¹⁵ Washtenaw County, MI, “Part 2: Design Criteria for Storm Water Management Systems,” *Design Standards of the WC WRC*, May 15, 2000, http://www.ewashtenaw.org/government/drain_commissioner/dc_webPermits_DesignStandards/dc_Rules/dc_partii.pdf, accessed September 3, 2013.

¹⁶ City of Ann Arbor, “Legislation: 7/2/12 Creation of a Green Streets Policy,” July 2, 2012, <http://a2gov.legistar.com/LegislationDetail.aspx?ID=1143195&GUID=F76DA015-170B-4046-841A-316286F8965F&Options=&Search=>, accessed August 6, 2013.

“putting out fires.” For the Road Commission (RC), vegetation is encroaching upon the road and needs to be cleared. For the WRC, a drain is clogged and needs to be cleared. These urgent activities are often divorced from any strategic planning, or even from engineering staff. As a result, “fixing the problem” can be fraught with miscommunication: how is the “problem” defined, and what constitutes “fixing” it?

For example, interviewees told anecdotes of grounds crews mowing down unsightly vegetative features of LID projects in township parks. We heard accounts of “view obstruction” complaints stemming from vegetated LID features near or in RC rights-of-way. When “maintenance” becomes “LID destruction,” agencies hesitate to plan further LID projects. This is certainly the case with the RC, who often sees a legitimate tradeoff between traffic safety and longevity of roadway infrastructure on the one hand and LID on the other. For example, safety is first, and trees dripping water on roads degrades pavement. Therefore, vegetative structures in the right-of-way are typically trimmed back or eliminated.

These are a sampling of the problems inherent in GI maintenance. As a RC staff member put it, “[GI planning] always falls apart when you start talking about who is going to maintain it.”¹⁷ If GI is to be implemented, policies and planning will have to anticipate these problems and prioritize effective maintenance strategies that make GI possible over the long-term. **Policies will need to ensure the retraining of maintenance staff and may even need to re-craft the way maintenance activities are generated.** Because GI has a “living” component to it, it needs more direct and sustained attention. While the maintenance costs of GI will likely be lower over the long-term than with grey infrastructure, monitoring and maintenance activity will be more frequent. Merely fixing it when it breaks will be unproductive and expensive. In addition, incorporating local citizens into maintenance activities, such as through volunteer GI inspection programs or rain garden adoption programs, while presently outside typical maintenance procedures, may prove to leverage maintenance funding.

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1.1.5. Lack of stormwater utilities and requirements pushing the adoption of utilities

As will be outlined below, one of the primary roadblocks to GI (and stormwater infrastructure maintenance in general) throughout all US municipalities is funding. When GI gets listed on the general fund priority list, it seldom receives attention because it is a non-urgent, long-term, discretionary item. **This roadblock can be avoided with the implementation of policies creating stormwater utility service fees in municipalities. The EPA counts this among the “two most common funding options” across the US for GI.**¹⁸ Even if the revenue generated from such fees is relatively small, over time it can lead to

¹⁷ Personal conversation, June 14, 2012.

¹⁸ “Funding Options,” *EPA’s Municipal Handbook: Managing Wet Weather with Green Infrastructure*, September 2008, http://water.epa.gov/infrastructure/greeninfrastructure/upload/gi_munichandbook_funding.pdf, July 23, *Huron River Watershed Council, 2014*

significant capital improvements in GI, especially through U.S. EPA’s Clean Water SRF loan program. Loan programs are the other most common funding option according to the EPA. Moreover, utility fees provide a dedicated fund for stormwater investment and maintenance, which can include GI.

Stormwater fees are typically associated with other utilities, such as water and sewer. Having a separate utility for stormwater infrastructure allows revenue to be generated from those sites that produce the most runoff, thereby putting positive pressure toward LID, maintenance, and retrofit activities. Presently, only the Cities of Ann Arbor and Chelsea have stormwater utilities, though the Village of Dexter is considering one.

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1.1.5.1. *Chelsea*

Chelsea adopted stormwater fees in 1997 in order to fund improvements to stormwater infrastructure, including the severance of illicit septic connections. It does not presently use the revenues for GI investment.¹⁹ The fee generates around \$100,000 per year.²⁰

There are two separate fees that generate revenues for two separate purposes: the “service charge” revenues are used for the “operation, maintenance, and administration” of the system; the “connection charge” revenues are used for the “construction, improvement, and replacement of facilities” for the system.²¹ The fees are based on the Equivalent Hydraulic Area (EHA) method, which relies on the impervious surface area of each property. Generally speaking, single family, duplex, and three and four unit apartments on small parcels are assessed a flat annual fee set by the city council, either \$18 (less than 0.5 acres) or \$54 (between 0.5 and 2.0 acres). The fee is reduced if the parcel includes a retention pond (\$7.80 and \$39, respectively). Parcels larger than 2.0 acres are calculated as follows:

$$\$258 \times [(0.95 \times \text{impervious area}) \times (0.15 \times \text{pervious area})].$$

2012. EPA calls these “stormwater fees,” which include utilities, but also other fee-based options for generating regular revenue. These are addressed more fully below in “Limitations on funding: lack of funding sources.”

¹⁹ “Planning and Zoning: Stormwater,” City of Chelsea, 2013, <http://city-chelsea.org/PlanningZoning/Stormwater/tabid/219/Default.aspx>, August 14, 2013.

²⁰ Karon Barbour, Deputy Clerk and Accounting Assistant, personal conversation, August 15, 2013. Karon has been in Chelsea Planning and Zoning for last 12 years and is presently responsible for database management and billing. Christine Linfield, Planning and Zoning Administrator and City Engineer, was unavailable for comment in the month of August, 2013.

²¹ Article V. – Stormwater Utility, Chelsae Code of Ordinances, found at <http://library.municode.com/index.aspx?clientId=14162>, accessed August 14, 2013.

Vacant parcels and parcels adjacent to streams have all fees reduced by 50%.²²

There are no provisions for opting out of or reducing the fee other than installing a “private stormwater system,” i.e., “an approved stormwater detention basin [i.e., dry pond], an approved stormwater retention pond [i.e., wet pond] or an existing surface water body so that they can effectively manage collected stormwater on their real property during and following a 100-year storm event without affecting off-site property or using the city stormwater utility system.”

The fee system, as it stands now, addresses the flood reduction purpose of stormwater systems, but not water quality treatment or runoff reduction purposes. The utility does not encourage GI. The city makes the following assumption: “the fact that there may not be a storm drainage structure in front of the property does not exempt the property from the fee, as *all property drain water to a ditch or drain resulting in the water entering the City's drainage system.*”²³ The purpose of GI/LID, is, in part, to reduce runoff into stormwater systems, and should be recognized as such.

The utility could support GI by investing funds in GI projects (on government-owned property) or initiatives (such as for private rain gardens), or if fee-reductions could be accomplished through on-site treatment using LID practices (e.g., rain barrels or green roofs), using the logic that stormwater can be managed on-site (at least in part) without relying on the city system or on local streams.

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1.1.5.2. *Dexter*

Dexter held a work session on May 7, 2012, in which the idea of a stormwater utility was put forward. It was argued that the utility would allow Dexter to perform its own permitting and enforcement (instead of relying on the WRC), would increase village stormwater management staff, and would help the village meet regulatory requirements and infrastructure improvements. These objectives fall within the Dexter Master Plan priorities of protecting natural resources and providing services to residents. If adopted, the Dexter stormwater utility fee will provide a steady source of funding to ensure regulatory compliance and environmental protection, and to do so in the most cost-effective way, i.e., by proactively caring for stormwater infrastructure instead of fixing it through the village general fund only when repairs are needed.

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²² City of Chelsea, “City of Chelsea Stormwater Utility Legend,” acquired through personal contact with the city, August 15, 2013.

²³ “Planning and Zoning: Stormwater,” City of Chelsea, 2013, <http://city-chelsea.org/PlanningZoning/Stormwater/tabid/219/Default.aspx>, August 14, 2013.

1.1.5.3. *Bolt v. City of Lansing (1998), the Headlee Amendment, and Ann Arbor's Response*

Ann Arbor has leveraged a stormwater utility since the early 1980s. In its early stages, its rate structure was flat and generated approximately \$3.7 million annually.²⁴ For a number of reasons, including expanding service needs, improved technologies for defining imperviousness, and evolving legal requirements, Ann Arbor gathered a Stormwater Citizen Advisory Task Force to help redevelop their utility.

One of the driving factors in the redevelopment of the utility was the 1998 MI Supreme Court decision in *Bolt v. City of Lansing*. Alexander Bolt sued the City for charging a stormwater fee to all city residents and earmarking the revenues to alleviate a combined sewer overflow problem in a portion of the city in order to meet state regulatory obligations.²⁵ In essence, because the fee did not provide actual services to those upon whom it was imposed, the court considered it a tax. But, in Michigan, tax increases must be established through a voting process due to the 1978 Headlee Amendment to the State Constitution. The stormwater “tax” was illegally imposed by the city government in the guise of a “fee.”

In its opinion, “the Court established three criteria for distinguishing between a fee [which can be imposed by a government without a vote] and a tax [which requires a vote]: 1) a user fee must serve a *regulatory purpose* rather than a revenue-raising purpose; 2) a user fee must be *proportionate* to the necessary costs of the service; and 3) a user fee must be *voluntary*—property owners must be able to refuse or limit their use of the commodity or service.”²⁶

This decision serves as a roadblock to the implementation of stormwater utilities in municipalities throughout the state primarily because of the investment required to determine a legally-defensible fee that is “proportionate to the necessary costs of service” (#2 above), and the investment required to establish a process for measuring “use” so that users can “refuse or limit their use” (#3 above). Both of these require use of GIS data and engineering expertise.

²⁴ Molly Wade and John Aldrich, “Re-tooling Ann Arbor’s Storm Water Utility to Address Change Legal Precedents,” Presentation at the Michigan Water Environment Association Conference, June 23, 2009, http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&sqi=2&ved=0CF0QFjAA&url=http%3A%2F%2Fwww.mi-wea.org%2Fdocs%2F7_SW%2520Utility%2520in%2520AnnArbor_Wade.ppt&ei=X-wOUPC5KsqirAG5p4C4DQ&usg=AFQjCNHVp17mm-Ec9tgZ9w8X20fwHaNJCg&sig2=Cc02DU7VwW5rhbF3-zvEvvw, accessed July 24, 2012.

²⁵ Frederick Baker, “Distinguished Brief: Alexander Bolt v. City of Lansing,” *LexisNexis*, 2000, <https://litigation-essentials.lexisnexis.com/webcd/app?action=DocumentDisplay&crawlid=1&doctype=cite&docid=17+T.M.+Cooley+L.+Rev.+599&srctype=smi&srcid=3B15&key=62fde82c6c907c613383e5b378740b1b>, accessed July 24, 2012.

²⁶ “Legal Defense Fund: Bolt v. City of Lansing,” *Michigan Municipal League*, http://www.mml.org/legal/ldf_top25/ldf_3.htm, accessed July 24, 2012. Italics added.

The city of Ann Arbor responded to this new legal environment through a lengthy process of redeveloping their stormwater utility fee (for a detailed description of the process, see Appendix D). The utility has the following advantages: costs are proportionate to runoff, four rate tiers make fees equitable, credits recognize management efforts, customers have control of stormwater services, and the partially-automated system can self-update. These meet the criteria set forth by the MI Supreme Court in the *Bolt* decision.

However, the disadvantages are obvious: it is a complex system and there are additional costs for future updates. These complexities and ongoing costs may be beyond the reach of some municipalities in WC. **While stormwater utility fees are the most promising avenue toward GI investment, and while they are certainly possible, they are a challenge.** Molly Robinson, Water Treatment Services Manager for the City of Ann Arbor, stated recently that, “I don’t know that the *Bolt* decision makes it more difficult to establish a stormwater utility, but it can make it more intimidating. As more communities with stormwater utilities demonstrate ongoing compliance with the three criteria (specified by the *Bolt* decision), the more communities will feel comfortable in establishing the utility.”²⁷ A smaller municipality than Ann Arbor may shy away from such a challenge, unless they are encouraged by the state.

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1.1.5.4. *Lack of a state-wide policy to reinforce stormwater utilities*

At present, establishing a stormwater utility is optional for communities. Municipalities that face the challenge of reducing pollution loads as a result of historic development patterns have employed them as part of the solution; municipalities with lesser pollution challenges have not. However, the regulatory environment is changing: TMDLs continue to be issued by the DEQ, and for watersheds outside of urban areas with storm systems (e.g., Honey Creek’s *E. coli* TMDL, 2009); TMDL requirements are being included in stormwater permits; non-point-source pollution is increasingly viewed as the most serious challenge for the Great Lakes ecosystem;²⁸ even smaller municipalities are struggling to pay for water quality out of the general fund; and “more stringent requirements are coming,” through the new iteration of federal stormwater rules.²⁹ Additionally, many grey infrastructure systems are exceeding

²⁷ Molly Robinson, personal correspondence, July 25, 2012.

²⁸ See, e.g., Marty Deskovich and Marites Woodbury, “WhadayaKnow? What is the greatest pollutant in the Great Lakes?,” *Great Lakes Echo*, July 23, 2012, <http://greatlakesecho.org/2012/07/23/whadayaknow-what-is-the-greatest-pollutant-in-the-great-lakes/>, accessed July 24, 2012.

²⁹ Amy Mangus, “Stormwater Utility Bill Status,” Presentation at the HRWC’s Stormwater Utility Seminar, March 26, 2010, http://www.hrwc.org/wp-content/uploads/2010/03/Utility_bill-mangus.pdf, accessed July 25, 2012. The EPA has announced their Proposed National Rulemaking to Strengthen the Stormwater Program, and “intends to propose a rule to strengthen the national stormwater program by June 10, 2013 and complete a final action by *Huron River Watershed Council, 2014*

their expected lives and beginning to fail. The increased frequency of larger storms due to climate change will only exacerbate this problem.

The adoption of a statewide stormwater utility law has come to be recognized as a tool that would help draw municipalities over the hurdle of the *Bolt* decision. SEMCOG has helped to introduce at least two such bills in recent years (SB 1249 and SB 256).³⁰ A successful law would give guidance and incentive (and thereby security) in developing a utility fee that is for a *regulatory* purpose (focusing on the “need for local governments to manage stormwater”), is *proportionate* to the cost of service (through the use of “established calculations”), and is *voluntary* (i.e., “users must be able to refuse or limit their use of the . . . service”)—in accordance with the *Bolt* decision. This would allow stormwater utilities to become much more prevalent throughout the county and state, opening up a dependable, long-term revenue source for implementing GI, as well as general stormwater infrastructure investment and maintenance.

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1.1.6. *Lack of state-wide stormwater policies that support GI*

Overcoming local hurdles to GI would be made easier by state-wide policies that support it. Although somewhat outside the geographic scope of this project, state-level policies can have dramatic local impacts. The Natural Resources Defense Council recently released their *Rooftops to Rivers II* report in which they identify four actions states can take to support GI at the local level:³¹

- a) *State-wide GI planning.* Transportation planning links roads and highways; state planning could also strategically link natural features as GI. SEMCOG is presently pursuing a similar regional strategy.³²
- b) *Develop and enforce permitting programs that incentivize the use of GI.* NPDES permits (especially those for municipal stormwater) could include performance standards and encourage GI incentives, through permit guidance and model tools, such as stormwater ordinances and development standards.

December 10, 2014.” (“Proposed National Rulemaking to Strengthen the Stormwater Program,” EPA: NPDES, July 10, 2012, <http://cfpub.epa.gov/npdes/stormwater/rulemaking.cfm>, accessed July 27, 2012).

³⁰ Amy Mangus, “Stormwater Utility Bill Status,” Presentation at the HRWC’s Stormwater Utility Seminar, March 26, 2010, http://www.hrwc.org/wp-content/uploads/2010/03/Utility_bill-mangus.pdf, accessed July 25, 2012.

³¹ Noah Garrison and Karen Hobbs, *Rooftops to Rivers II: Green strategies for controlling stormwater and combined sewer overflows*, NRDC, 2012, p. 37-38, <http://www.nrdc.org/water/pollution/rooftopsii/>, accessed 15 December 2012.

³² For more details, see SEMCOG, Sustainability – Green Infrastructure Vision, 2013, http://www.semco.org/Sustainability_GreenInfrastructureVision.aspx, accessed September 5, 2013.

- c) *Ensure that state building and other development-related codes and standards do not pose an unreasonable barrier to GI.* Standards for GI features must be clear. Green Infrastructure “stretch” codes (similar to the more-stringent LEED standards, which go beyond basic building standards for energy efficiency) could be developed.
- d) *Eliminate hurdles to ensure availability of appropriate funding sources.* Even though most municipalities have not taken the step of establishing a stormwater utility with which to leverage SRF loans, a mere 1% of all SRF loans in Michigan in 2012 went to non-point source projects (46% went to CSOs and 53% went to wastewater systems).³³ The DEQ could increase this percentage and eliminate unnecessary hurdles, such as restrictions on graywater and rainwater systems. Other revenue streams could be opened in addition to the SRF program, like the state’s recent efforts with the Stormwater, Asset Management and Wastewater (SAW) program.³⁴ However, even that program favors wastewater projects. The Michigan Department of Transportation could ensure that state regulations match or exceed federal guidelines, require that MDOT projects retain a certain percentage of stormwater, or require that some portion of transportation funds be used to protect waterbodies.

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1.1.7. Lack of coordinated development in Capital Improvement Plans (CIPs)

Because GI implementation is dependent upon planning, strategic development of Capital Improvement Plans (CIPs) for government owned property is critical. However, **given the “small-city” nature of Washtenaw County, CIPs often come about by informal processes, i.e., driven by citizen complaints and political desires of officials and not by the application of guiding, objective criteria and evaluation.**

The complications that prevent strategic CIP development are wide and varied. Some entities are directed by customer complaints or by personal interests (e.g., some municipalities), while others must develop their CIP in competition with other strong interests and tight deadlines (e.g., the RC). Some funds are not flexible enough to be used in a strategic way. Some CIPs are not coordinated between departments or are driven merely by grant funding. Municipalities may not even have the capacity to do capital improvements at all apart from grant funding due to challenging economic conditions, and some municipalities do not even have CIPs. (See Appendix C for a more detailed analysis).

There are two additional challenges for CIPs and GI. First, private property LID features do not make it into CIPs. Private parties are not rewarded for addressing community stormwater concerns at the site-

³³ “Fiscal Year 2012 Annual Report of Michigan’s State Revolving Fund and Strategic Water Quality Initiatives Fund,” MDEQ and Michigan Finance Authority, December 2012, http://www.michigan.gov/documents/deq/deq-ess-mfs-SRF-SRFar12_409292_7.pdf, accessed August 7, 2013.

³⁴ See http://www.michigan.gov/deq/0,4561,7-135-3307_3515_4143-294952--,00.html.

level. Second, GI features are often not considered part of a municipality's assets for stormwater management. For example, Ann Arbor has installed several rain garden projects with SRF loans. The gardens are city-owned, but they are not part of the stormwater system. This means that they do not get on the CIP list and they are left open to community criticism for being outside the scope of the stormwater program, rather than the cost-effective investment in the stormwater system that they are.

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1.1.8. Importance of drafting master plans, ordinances, and design standards that support GI

Master plans, stormwater ordinances, and design standards that do not clearly prioritize GI are likely not bringing about local ordinances to support its implementation. The Pittsfield master plan, for example, clearly prioritizes GI for stormwater management, but the township has yet to adopt ordinances that will bring about the vision laid out by the master plan.³⁵ Municipalities must take this additional step.

In addition, if ordinances or design standards are not written to support GI over the long-term, then efforts toward GI implementation will likely be counterproductive. An example may be Augusta Township's ordinance code for private property stormwater management.³⁶ The code clearly states that, for onsite stormwater treatment features, "a maintenance plan shall be provided, including notation and description of maintenance requirements and timelines." This plan will be a "perpetual restriction on the land" and will be recorded with the Register of Deeds. However, there are no provisions for inspection or accountability. Cities that have had success with GI implementation have clearly demarcated inspection programs, schedules, and regulatory authority.³⁷ It is unlikely that GI features on

³⁵ "Key Concepts: Protect our Water Resources," 2010 Pittsfield Master Plan, p. 119, June 2011, <http://www.pittsfieldtwp.org/2010-pittsfield-master-plan-final.pdf>, accessed August 7, 2013.

³⁶ Article 9.16, "Stormwater Management," Zoning Ordinance, Augusta Charter Township, effective August 1, 2007, http://augustatownship.org/PDFs/Ordinances/Augusta%20Zoning%20Ordinance_Adopted%20%208-1-07.pdf, accessed August 7, 2013.

³⁷ See, e.g., "Staying Green: Strategies to improve O&M of GI in the Chesapeake Bay watershed," by American Rivers and Green for all, spring 2013, <http://www.americanrivers.org/newsroom/resources/staying-green-operations-and-maintenance-of-green-infrastructure.html>. This report indicates that minimal or ineffective enforcement and inspection is a major challenge for GI O&M. Effective GI O&M programs modify procedures and schedules and incorporate training certifications, volunteer inspection programs, tracking and evaluation program, etc. See pages 33-36 for a detailed description. See also the 2013 EPA report, "The Importance of Operation and Maintenance for the Long-Term Success of GI," http://water.epa.gov/grants_funding/cwsrf/upload/Green-Infrastructure-OM-Report.pdf, which evaluates O&M strategies of 22 EPA funded GI projects from 2009. It calls attention to the need for accountability mechanisms such as an O&M plan and manual, documentation and tracking systems for O&M activity, and vehicles for compliance assurance, such as maintenance agreements or ordinances. These resources were reviewed in the third [Growing GI Forum](#) at HRWC, spring 2013.

private property throughout the township will remain at their highest-functioning capacity over time without regular inspections and accountability.

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1.1.9. Lack of federal stormwater policies that support GI

The U.S. EPA is presently engaged in a rulemaking process to strengthen their stormwater program, though they have missed their second target date of June 1, 2013.³⁸ The new rules could include performance standards for new development and redevelopment and expanded protections under the MS4 program. This kind of guidance at the federal level could help instill confidence in the process of reorganizing policies at all levels to favor GI as the default stormwater treatment solution.

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1.2. Limitations on mandate and authority

In addition to the lack of GI-reinforcing policies throughout WC and the state, broad-scale GI planning is obstructed by limitations on the mandate and authority of the entities involved. In fact, one of the most challenging barriers is, as one WRC staff member put it, “there is no one responsible for the watershed.” There is no WC entity whose primary mandate is to safeguard water quality and ecological health of water resources. Instead, several other (important and necessary) interests govern pieces of stormwater management throughout the county: drainage, road safety, development, maintenance, etc. The primary entities involved are the WRC (1.2.1.), RC (1.2.2.), townships (1.2.3.), and maintenance departments (1.2.4.).

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1.2.1. Water Resource Commissioner

Traditionally, the role of Drain Commissioner, especially in this low, flat land, was to get the water off the land as quickly and as economically as possible. The Washtenaw County WRC is one of only two Drain Commissioners in the State to adopt a more ecologically-responsible approach to water resources. However, the WRC still has the primary responsibility for the “design, construction, and operation and maintenance of over 500 storm water management and flood control systems (County Drains),” in addition to responding to emergencies, maintaining court-ordered lake levels, and managing the

³⁸ “Proposed National Rulemaking to Strengthen the Stormwater Program,” EPA: NPDES, July 19, 2013, <http://cfpub.epa.gov/npdes/stormwater/rulemaking.cfm>, accessed July 30, 2013.

county's finances regarding drainage.³⁹ That is to say, they are tasked primarily with stormwater removal and not with protecting water quality and ecosystem health, even though they strive to do so.

Though the WRC design standards outlined earlier in this report reveal a genuine concern for such matters, it is important to point out what the WRC does *not* have the authority to do. First, as clearly indicated in the WRC Rules, **they have no mandate to oversee land use development, even though this is the most important issue** for protecting water resources. This is the responsibility of local governments. For example, the WRC can control how water flows into a drain: fast or slow, in stages or all at once. But the decision of whether to build a sprawling shopping center, to create acres of additional impervious surface, or to fill in natural swales—these are the prerogative of the local government. While developers sometimes follow the WRC suggestions, “it depends on who the inspector is” and “on the township board and on elections.”⁴⁰ In addition to the maintenance issues, this is another sense in which they are “constrained by the customer,” even though they are “more involved in our communities than most [Drain Commissioners throughout] counties in Michigan.”

The WRC is also not responsible for environmental concerns primarily. “Most of the time GI opportunities are limited because of the scope of the plan . . . it can't be for just environmental purposes.” “We face criticism because these things are outside our focus/responsibility on stormwater removal. Some see GI projects as a waste of money.” They have overcome this deficiency in their mandate when doing projects involving the SRF, which reinforces water quality initiatives. Nevertheless, they are not employed to plan for environmental concerns. For this reason, demonstrating the cost-effectiveness of GI versus grey infrastructure is a priority for meeting environmental objectives. However, as is discussed elsewhere in this report, GI is most cost-effective when measured at the community-wide scale, i.e., in some circumstances, cost-effectiveness of an LID feature measured at the site may be less than it would be measured at the community-wide scale.

They are also not responsible for drains that are not County Drains. If a development wants to discharge stormwater directly into a RC drain (for which standards are far less stringent), which discharges immediately into a County Drain, WRC has no legal authority to regulate the stormwater discharge. However, in recent years, it has become customary for the RC to seek the WRC's approval for such projects, though they are not obligated.

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³⁹ “Water Resources Commissioner: What We Do,” *eWashtenaw*, 2012, http://www.ewashtenaw.org/government/drain_commissioner, accessed July 25, 2012.

⁴⁰ WRC personal interview, May 17, 2012.

1.2.2. Road Commission

When it comes to stormwater, the RC has a primary goal: “get water away from the roads.”⁴¹ “Our mission statement talks about reasonably safe roads.” Road Commission “duties” include snow removal and salting, road and bridge construction and maintenance, surface treatments, controlling roadside vegetation, and roadside ditch and drainage maintenance.⁴² Getting water away from the roads for safety entails fast drainage, especially on high-speed or high-traffic roads. This objective is often directly opposed to water quality management.

Again, it is helpful to recognize what the RC is *not* responsible for. **They are not tasked with protecting water quality or ecosystem health in streams.** While some of the WRC “drains” are also local ambient streams, the RC “drains” are more typically ditches or culverts used solely to transport stormwater. As such, neither their mandate nor the physical landscape with which they work directly incentivizes them to consider a GI approach to roadway stormwater. With limited funds and high public visibility, including the threat of litigation, environmental concerns are secondary priorities at best.

For example, in the winter the RC is tasked with removing snow and melting ice. Accidents can increase dramatically if these responsibilities are compromised. Even though recent research has shown pervious pavement to outperform standard pavement in freeze/thaw winter climates, the RC has not considered it because of the maintenance issues involved (i.e., questions about the use of salt and the piling of snow). **Altering standard practices for environmental concerns is not incentivized.**

Even though RC engineers are trained in LID procedures, and even though they look for LID opportunities, they haven’t been able to implement them yet. In their words: “We’re committed to the WRC design standards.”⁴³ One of the major factors is limitations on road funding, which is outlined below (1.3., especially 1.3.2.3.)

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1.2.3. Townships

Townships that are not required to have NPDES permits, by definition, do not own or operate stormwater infrastructure and they are therefore less concerned with how it is built and maintained. Water supplies and sewer services, on the other hand, receive greater attention because townships may be responsible for their maintenance, unless the township is on individual well and septic systems. This

⁴¹ Personal interview, June 14, 2012.

⁴² “About Us,” *Washtenaw County Road Commission*, 2011, <http://www.wcroads.org/About>, accessed July 25, 2012.

⁴³ Personal interview, August 19, 2013.

leads to a general lack of concern for stormwater infrastructure by less-developed townships. The complexities and regulations of stormwater management keep municipalities from adding this responsibility.

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1.2.4. Maintenance Departments

Previously, with regard to policies, we addressed the need for re-envisioning the function of maintenance departments for GI (1.1.6.). It is helpful, though, to consider the specific drivers of activity within and limitations on maintenance departments.

Maintenance in WC (whether within WRC, RC, or municipalities) is task-driven and is often divorced from other planned activities within agencies or departments. This is the case for several reasons.

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1.2.4.1. The term “maintenance”

First, “maintenance” can be a drain on valuable financial resources. It is hard to hold a public entity accountable for maintaining a resource: How much maintenance is necessary? How much is too much or not enough? These questions are hard to answer without long-term averages, i.e., annual evaluations may be misleading. (For example, it has become apparent in recent decades that U.S. cities have not invested adequately in maintenance of water systems, leaving enormous costs to be borne by the present and future generations).⁴⁴ In response, agencies or departments establish more specific scheduled task lists. While anchoring costs, this also undermines the flexibility necessary for adaptive maintenance of living GI features. For example, traditional maintenance might allow for measuring tasks such as, “mow x acres y times per summer”, “replace x valves every y years,” or “plow x road miles whenever we receive y inches of snow.” GI maintenance activities involve monitoring the health of all vegetative features and responding appropriately, monitoring sediment buildup in infiltration facilities and cleaning them when necessary or taking account of the effect of snow-piling on pervious pavement and responding accordingly. **Because GI maintenance pushes into the field of natural resource management, it requires more adaptability, responsibility, and therefore training than traditional gray infrastructure management.**

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⁴⁴ See, e.g., “U.S. Water Infrastructure Needs & the Funding Gap,” U.S. EPA, September 14, 2012, <http://water.epa.gov/infrastructure/sustain/infrastructureneeds.cfm>, accessed July 30, 2013.

1.2.4.2. *Understaffing and underfunding*

Second, maintenance departments are often understaffed and underfunded for the responsibilities they are given. This is partly due to the seasonal nature of maintenance work. For example, Ypsilanti Township has only four full-time maintenance staff members and hires low-wage seasonal staff in summer months. Part-time or seasonal workers are often less educated or concerned about the long-term quality of GI features. Funding does not flow easily into maintenance departments because nothing is “produced” that the public can see. According to a township manager, **“we face stiff resistance for ‘wasting money.’”** Yet maintenance needs, from the perspective of the maintenance department, are endless.

Lack of funding also reveals itself in **a lack of equipment necessary to care for GI features**. For example, Ann Arbor has vacuum trucks and a regular street sweeping program, therefore, they can use pervious pavement. The RC, on the other hand, does not have vacuum trucks, so that capital cost prohibits installation of pervious pavement.

Most importantly, funding does not flow to planning activities that are necessary for thoughtful approaches to care and repair of GI features. An example of a lack of spending on planning may be seen on Maple Rd., north of the Huron River. The project originated as a complaint and has been redone more than once. Yet the present condition is far from a solution as continued erosion undermines large trees on the edge of the road. With the capacity and mandate for more thorough planning, the project could have been a success regarding both responding to the complaint and preserving water quality and natural beauty.

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1.2.4.3. *Responders*

Third, maintenance departments primarily respond to problems. From the view of the WRC, they are “constrained by the customer.”⁴⁵ While they use “green approaches” to problems that arise within communities, it is “not a proactive approach, and is on a very case-by-case basis.” This is true of other entities as well. According to the RC, “we get calls about people not being able to see out of their driveway because of natural vegetation.” “If we plant something [in the right-of-way], they want it mowed down or cut down.” “We get sued for having trees in the right-of-way.” These issues not only bind maintenance activities to community complaints, but they cut right at the heart of a GI approach to road drainage. Yet the mandate of the RC maintenance department includes responding to community complaints. **Maintenance departments need to have the capacity to both respond and initiate.**

⁴⁵ Personal interview, May 17, 2012.

1.2.4.4. *Boundaries*

Fourth, maintenance departments are restricted to activities only within their agency's or department's boundaries. WRC staff can only respond to issues arising within WRC drains. If a problem arises within a WRC drain, but its cause is located upstream in a RC feature and is aggravated by a township feature, WRC may be so limited that it cannot respond to the problem at all. On the flip-side, maintenance departments often find themselves maintaining property that they are not responsible for. As one interviewee stated, "we spend thousands of dollars a year maintaining [___]'s] property." The RC drew attention to the issue of property owners blowing leaves into ditches, which the RC then has to clean out. Leaf removal is a township issue, "but it ends up being ours, and we have no ability to regulate it." **While some protection of turf is necessary for legal reasons, more cross-jurisdictional communication and activity needs to take place** (see below section on cross-jurisdictional planning, 1.4.).

In sum, for GI to be properly maintained over time, maintenance departments throughout WC require an elevation of mandate and authority, and therefore an increase in funding and training. They need to move from task-based entities (e.g., complete x, y, and z) to skills- and knowledge-based entities (e.g., care for and improve a, b, and c), and they need to cross jurisdictional boundaries more productively.

1.3. *Limitations on funding*

With cuts at all levels of government throughout the past four years, funding has come to be a primary challenge for GI implementation. As one staff member from the WRC put it, **funding is the "first seven reasons" why GI projects don't get done**. The funding barrier has two components to it: 1) a lack of funding sources, and, when funds are available, 2) restrictions on the use of funds.

1.3.1. *Lack of funding sources*

Sources for funding GI are lacking on several levels. There is a lack of revenue-generating sources for projects, a lack of access to funding banks, a lack of creative collaboration among entities, a lack of funds to generate GI-supporting WRC design standards, and a lack of funding for post-project monitoring.

1.3.1.1. *Attention-grabbing issue: CSOs*

A lack of funding partly exists because there is no Combined Sewer Overflow (CSO) problem in WC. Municipalities and counties that do face CWA violations due to CSOs, such as Milwaukee, Chicago,

Detroit or Syracuse are faced with enormous expenses for either separating stormwater and sanitary systems or constructing massive holding tanks underground to capture overflows. Compared to these expenses, large scale planning and budgeting for GI has emerged as a popular, EPA-endorsed, effective, and less expensive solution. Entities that do not face the CSO problem, such as Ann Arbor and WC, are not facing massive stormwater investments. So, GI implementation is entirely discretionary and of secondary concern, even if GI outcompetes grey infrastructure in cost over 20 years. As a result, **the momentum of the present grey infrastructure system is likely to receive the lion's share of funding**, from both state and local sources, as perceived needs for funding remain static. Because of the lack of urgency about the problem, sources for funding GI are limited.

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1.3.1.2. *Stormwater utilities*

The lack of stormwater utilities throughout WC leaves a massive vacuum for GI funding. As was indicated previously, the EPA has identified stormwater fees along with low-interest loans as the most promising and productive sources of GI funding.⁴⁶ Presently, only Ann Arbor and Chelsea have stormwater utilities, and Dexter is considering one. The challenges for implementing a utility are outlined above. **Without the steady, designated income from a stormwater fee, municipalities are hesitant to commit to GI over the long term through low-interest Clean Water SRF loans.** In fact, because Ann Arbor is the only entity investing in GI using their stormwater revenue and the SRF, they, in partnership with the WRC, have received the vast majority of SRF loans. More communities need to consider adopting a stormwater utility if they desire to see green approaches to stormwater, as they clearly do, according to township master plans.

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1.3.1.3. *Clean Water State Revolving Fund (SRF)*

The DEQ oversees distribution of the SRF, which “is a low 2.5% interest loan financing program that assists qualified local municipalities with the construction of needed water pollution control facilities.”⁴⁷ The SRF is especially friendly to GI projects: **“It is anticipated that both carry-over and new funding will be made available to subsidize Green Projects in fiscal year 2013.** If you have projects with components that address green infrastructure, water or energy efficiency improvements, or other environmentally

⁴⁶ “Funding Options,” *EPA’s Municipal Handbook: Managing Wet Weather with Green Infrastructure*, September 2008, http://water.epa.gov/infrastructure/greeninfrastructure/upload/gi_munichandbook_funding.pdf, July 23, 2012.

⁴⁷ “Clean Water Revolving Funds,” *Department of Environmental Quality*, 2012, http://www.michigan.gov/deg/0,1607,7-135-3307_3515_4143---,00.html, accessed July 26, 2012.

innovative activities, project plans” should be submitted. This support is greatly appreciated by the communities that have accessed the fund. However, a loan is not a grant, and for reasons outlined throughout this report, **municipalities that are struggling economically are unlikely to seek further credit.** (The EPA has provided helpful, specific advice on how GI projects can be funded through SRFs).⁴⁸

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1.3.1.4. *Other revenue-generating sources*

Stormwater utilities and SRF loans are not the only solutions to funding GI projects, even though they are the most effective. Other creative fee structures exist to generate funding.⁴⁹

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1.3.1.5. *Grants*

There are few grant programs to fund GI projects other than small, educational projects. Even the EPA points out that, while grants are available for individual LID projects, building a GI system through grants is infeasible. Throughout the county, many entities outside of Ann Arbor (which has a stormwater utility and utilizes the SRF loans) have funded LID projects through grants. With pressure from national non-profits, more substantial federal grants may be available in the future.⁵⁰

⁴⁸ *Managing Wet Weather with Green Infrastructure: Municipal Handbook: Funding Options*, 2008, http://water.epa.gov/infrastructure/greeninfrastructure/gi_policy.cfm, accessed 15 December 2012. See especially the “Helpful Hint” on p. 13.

⁴⁹ “Fortunately, a growing number of communities have overcome financial barriers with funding strategies that are sustainable and effective. Many communities pay for green infrastructure projects by drawing from general funds, while others set up new fees, taxes and other directed charges to help pay for public infrastructure repairs and improvements. Often, these fees are applied to new development and other land use alterations and may appear as plan review and permitting fees, or special assessment fees that discourage building in particular locations – like green fields – by exacting an additional charge for projects located in sensitive areas. Some communities are charging private properties a “fee-in-lieu” of on-site water quality treatment, wherein developers no longer implement on-site water quality treatment practices, but instead pay into a fund that the municipality can use to finance green infrastructure projects in priority areas. Capital cost recovery fees, impact fees, and real estate taxes are further examples of the many different ways that local governments are generating reliable funding for green infrastructure practices that will result not only in better stormwater management, but in a wide range of additional community benefits as well.” (*Managing Wet Weather with Green Infrastructure: Municipal Handbook: Funding Options*, 2008, http://water.epa.gov/infrastructure/greeninfrastructure/gi_policy.cfm, accessed 15 December 2012). Many more sources of funding for GI are outlined on EPA’s GI website.

⁵⁰ *Managing Wet Weather with Green Infrastructure: Municipal Handbook: Funding Options*, 2008, p. 1, http://water.epa.gov/infrastructure/greeninfrastructure/gi_policy.cfm, accessed 15 December 2012.

1.3.1.6. Collaborative planning and projects

There is a lack of collaborative planning between communities throughout the county. According to Ypsilanti Township staff, “any way [we] can put collaboration between communities into [a] GI project earns us points with the state,” i.e., state grant funds reward collaborative projects. An example is the new EMU women’s boathouse and redeveloped Lakeside Park in Ypsilanti Township on Ford Lake that is scheduled for completion by August 31, 2013. The project includes “an extension of the trail network that will connect it to regional trails; a new pavilion, fishing docks and lookouts over Ford Lake.”⁵¹ Though specific plans for the project are not readily available online, there are GI features included in the plan, in accordance with township priorities, according to Art Serafinski, Ypsilanti Township Recreation Department Director.⁵² Brian Barrick of Beckett and Raeder, the landscape architect for the project, explained that the plans will reduce the amount of impervious surface as much as possible. For example, the trail system will be built with compacted limestone and the parking lot will be gravel. In addition, runoff from buildings and the parking area will be directed toward bioswales with native plantings, and native seedings will populate any disturbed areas.⁵³

The project is the result of a partnership between Ypsilanti Township (the landowner), EMU (who will construct the boathouse), Saline High School (another crew team that will use the facility), and Washtenaw County Parks and Recreation (because the trails will connect to the regional trail network). These partners pooled their resources to generate the matching funds necessary for a \$500,000 DNR Natural Resources Trust Fund grant. The scoring system for the grant awarded the maximum 40 points for the size of the match (60%) and, in addition, the maximum 30 points for collaboration between government entities out of a possible 480 points. The 30 points for collaboration comprise 6% of the 480 points.⁵⁴ According to Serafinski, though the collaboration points may not have been a major factor, the matching funds generated by the partnership were: “we didn’t have the money to do it ourselves.”⁵⁵

⁵¹ Tom Perkins, “\$1.2 million upgrade to Ypsilanti Township's Lakeside Park aims to make Ford Lake a rowing hub,” Ann Arbor.com, May 25, 2013, <http://www.annarbor.com/news/ypsilanti/work-set-to-begin-on-12-million-upgrade-to-ypsilanti-townships-lake-side-park-ford-lake-area/>, accessed August 7, 2013.

⁵² Personal conversation, August 7, 2013.

⁵³ Personal conversation, August 7, 2013.

⁵⁴ “Michigan Natural Resources Trust Fund: 2013 Application Guidelines,” MDNR Grants Management, p. 26-29, January 7, 2013, http://www.michigan.gov/documents/dnr/IC1905-RECREATION_GRANT_SELECTION_BOOKLET-2011_2_346866_7.pdf?updated=01072013, accessed August 7, 2013.

⁵⁵ Personal conversation, August 7, 2013.

Many projects throughout the county, however, likely do not investigate the opportunities that collaborative partnerships such as this afford.

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1.3.1.7. WRC design standards

This report previously stated that the WRC Rules as they presently stand are an obstacle to GI planning because they lack guidance for LID structures and the planning necessary to bring about GI. However, **the WRC has never received the funding to redraft its design standards even though the Commissioner and staff would like to do so.** In their words, “[the redraft] is languishing, but it is still moving forward.” With funding for further research and planning, the rules could be updated, which would give county agencies and municipalities the green light to go ahead with GI planning.

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1.3.1.8. Funds for post-project monitoring

The entities we interviewed who had actually implemented some LID features voiced a concern over the lack of post-project monitoring funding. **Funding projects without funding monitoring, at least on pilot projects, prevents cumulative, local learning about costs/benefits, economic feasibility, and environmental impact.** It also leaves projects open to criticism from skeptical citizens and officials.

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1.3.2. Restrictions on use of funds

Not only do entities throughout WC face a limited amount of funds for GI implementation, the funds that do exist often have limitations that make GI implementation restricted or prohibited altogether.

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1.3.2.1. Millages

A millage typically has strict rules that may prohibit GI features and handcuff agencies into doing standard gray projects. According to Ann Arbor staff, “it can be difficult to influence these projects.” In addition, it is often difficult to pass a millage that generates enough funds for the full scope of needed improvements. For instance, the parks and recreation millage in Ypsilanti “is big enough only to cover maintenance, not capital improvement.”⁵⁶ This is aside from the fact that that particular millage is

⁵⁶ Personal interview, May 21, 2012.

restricted to bicycles, sidewalks, and recreation. **Millages are not a fruitful place to find the kinds of funds necessary for GI planning and implementation.**

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1.3.2.2. *Grants*

Grant funds are developed in order to bring about specific outcomes in communities across the state or country. While these outcomes may be desirable, their impact can serve to hinder or even prevent progress toward other important outcomes.

For example, the RC “aggressively [applies] for safety grants and air quality grants” from the EPA. They recently received an air quality grant to install a roundabout (which dramatically reduces air emissions at intersections) at the intersection of State and Ellsworth on the south side of Ann Arbor. When they presented their roundabout plans to the public, citizens wondered where the alternative plans were. The RC responded, “we have no other options.” The grant could only be applied toward a roundabout, and other development priorities were prohibited unless funded separately. What will happen to the runoff from the increased impervious area created by the roundabout? Will GI features fall within the limitations of the grant? These types of questions are common challenges for GI.⁵⁷

Non-GI grants are too restrictive to support GI implementation; grants specifically for GI are insufficient at this time, as EPA’s recent GI grant-funding makes clear.⁵⁸

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1.3.2.3. *Transportation funds*

Transportation funds for the Road Commission come from two sources. First, the Michigan Transportation Fund (MTF), which generates about 50% from the gas/diesel tax and the other 50% from

⁵⁷ Another example is Ypsilanti Township, which recently received a \$550k grant for bike paths. However, this money is restricted for Parks and Rec, not GI. Utilizing pervious pavement may or may not fall within the limits of the grant. The direct result may be increased impervious surfaces in the township. Township staff look for areas to incorporate LID features in existing projects because they simply do not have enough money in the general fund. But funding projects through grants restricts GI development.

⁵⁸ The EPA recently announced on its front page a grant to 17 communities nationwide to improve water quality through GI (“EPA Provides \$950,000 to Improve Water Quality Using Green Infrastructure in 17 Communities,” EPA: Newsroom, July 19, 2012, <http://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceeac8525735900400c27/7c5e0fa56cf7cd2e85257a40005874ff!OpenDocument>, accessed July 26, 2012.). The amount: \$950,000. By comparison, the new EMU boathouse cost 50% more than that. \$50k (roughly, per community) does not go far toward GI implementation.

vehicle registration,⁵⁹ provides enough funding for the RC to operate its facility, do maintenance on roads, and purchase equipment. What is left over is used basically as matching funds for federal grants. Federal sources, which are numerous (e.g., safety grants or clean air grants), get distributed to regional committees that include MDOT, Washtenaw Area Transportation Study (WATS), and regional Municipal Planning Organizations (MPOs), such as SEMCOG. Funding subcommittees are awarded a portion of the funds, which they divide among themselves. The RC is “just one voice” on this committee.⁶⁰

Some restrictions on RC funding were outlined previously (1.1.7.). A few other facets deserve to be mentioned. **First, federal funds can be used neither to purchase additional rights of way (ROW) in which to implement GI features, such as rain gardens, nor to purchase maintenance equipment, such as vacuum trucks.**⁶¹ The Michigan Transportation Funds (which originate from the gas/diesel tax and registrations) are only substantial enough to use for operating expenses and matching funds for federal grants; they are not substantial enough to purchase ROWs or additional GI maintenance equipment.⁶² There is only room in the ROW to install ditches or drainage pipes, which is the RC’s default stormwater treatment method.

Second, state and federal road funds can be narrowly directed. For example, some State Transportation Improvement Program (STIP)⁶³ funds can be used for resurfacing good and fair roads, but cannot be used to repair poor roads. As a result, the RC sometimes resurfaces the best stretches of roads and is forced to allow the most deplorable sections to fall further into ruin. This, of course, draws criticism from local residents who see the RC’s actions as irrational or irresponsible. Such restrictions can have an impact on whether GI is incorporated into road projects, but these restrictions are on a case-by-case basis, according to the individual grant.

Third, the planning process of the RC’s funds pose difficulties for GI implementation. The Transportation Improvement Program (TIP) is a 3-year plan that affords little flexibility once a project is listed. This means that the RC must establish all facets of a project well in advance. It does not allow time or funding for investigative work to determine soil types, drainage patterns, etc. Instead, gray infrastructure, which is much more uniform from project to project, is easier to add to the RC’s 5-year

⁵⁹ Michigan Department of Transportation, “Fast Facts 2013,” April 10, 2013, http://www.michigan.gov/documents/mdot/MDOT_fastfacts02-2011_345554_7.pdf, accessed August 19, 2013.

⁶⁰ Road Commission, personal interview, August 19, 2013.

⁶¹ Michigan Department of Transportation, “Project Eligibility,” 2013, http://www.michigan.gov/mdot/0,4616,7-151-9621_17216_54903-226827--,00.html, accessed 19 August, 2013.

⁶² Road Commission, personal conversation, 19 August, 2013.

⁶³ More information available at http://www.michigan.gov/mdot/0,1607,7-151-9621_14807_14808---,00.html.

plan and then onto the 3-year TIP. In addition, transportation funds usually have a short timeframe for implementation that precludes the planning that is critical to successful GI installation. For example, regarding the State and Ellsworth roundabout, a RC staff member said, “we have one year to design, get all the rights-of-way, and build it.” Planning, design, public engagement (which is critical for successful long-term care of GI), legal matters, and construction cannot happen in one year. Moreover, if vegetated structures are employed as part of a project, the vegetation requires ongoing attention for the first one to three until plants become established. These time restrictions prevent meaningful progress toward GI.

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1.3.2.4. *Public perception*

Standard projects are expected from agencies. When they do something different, it raises eyebrows and people criticize mission drift: “you’re doing environmental conservation when you should be doing drainage,” or “you’re gardening when you should be plumbing.” For example, the WRC faces criticism “because these things are outside our focus/responsibility on stormwater removal. Some see GI projects as a waste of money.”⁶⁴ **The cost-effectiveness of GI has not yet made it into common knowledge, so people assume that if stormwater features are attractive (e.g., rain gardens), they must be more expensive.** The public misconception of the cost of GI stands as a restriction on funds as agencies like the WRC, RC, and townships attempt to maintain public support.

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1.3.2.5. *Budgeted in-house funds*

Learning through trial and error must take place as climate- and geography-specific information accumulates about LID features and GI. There is still a large amount of risk (and perceived risk) involved in utilizing LID solutions compared to the certainty involved in grey infrastructure due to decades of learning from design and implementation. In addition, implementing single LID projects involves one level of risk, but implementing GI on a broad scale involves increased complexity and many unknowns. **Only a portion of an entity’s funding resources can be directed toward projects involving heightened risk; the majority of funding must remain risk-averse.** Ann Arbor is willing and able to take the risks of LID projects for several underlying reasons that have been explored throughout this report. Communities under economic strain are less able to do so. **If these risks are taken and a community is willing to learn through trial and error, monitoring is necessary in order to capture that learning—** what works and what does not. However, this usually entails additional and ongoing expenses. These expenses are usually not included in CIP allocations. As a result, the lack of sufficient knowledge

⁶⁴ Personal interview, May 17, 2012.

becomes a self-fulfilling prophesy: lack of knowledge is used to justify reduced funding for GI, which prevents obtaining the needed knowledge.

In conclusion, these limitations on funding, both on sources and on uses, are not insurmountable for implementation of LID projects. However, they currently are perceived to be insurmountable for the planning and long-term funding that is necessary for GI.

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1.4. Lack of inter-jurisdictional communication and planning

Given the lack of and limitations upon planning outlined thus far—lack of GI-reinforcing policies, limitations on mandate and authority, and limitations on funding—the need for inter-jurisdictional (I-J) communication and planning for GI should be clear. However, I-J communication and planning is not happening because no one organization is responsible for stormwater management in the watershed (1.4.1.), because mechanisms for such I-J activities do not exist (1.4.2.), no agency or association to plan I-J projects exists (1.4.3.), and because of the lack of incentives for such I-J activities (1.4.4.).

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1.4.1. No one responsible for stormwater management in the watershed

To date, GI features in WC have been accomplished opportunistically, mostly without planning. Why? Because, as one staff member from the WRC put it, “there is no one responsible for the watershed.”⁶⁵ Historically, townships and cities ensure that water is drained from developed lands to protect real estate, the RC ensures that water is drained off of roads to protect citizens, and the WRC ensures that water is transported off farm and developed lands. The DEQ pushes back by enforcing water quality standards to partially protect aquatic ecosystems and beneficial uses. However, “holding the line” by DEQ does not require active, integrated, and responsible planning, and therefore it does not yield cost-effective, long-term, and sustainable solutions to development. It is in this sense that no one is responsible for the watershed. There are boundaries, to be sure (e.g., federal and state policy, such as the Clean Water Act, Endangered Species Act, Safe Drinking Water Act, etc.), but competing organizational goals often work at cross-purposes to watershed management principals. **Accomplishing desirable objectives, such as an effective GI system for stormwater in WC, often escapes the well-intentioned entities involved.**

To be “responsible” for something in past decades usually meant establishing a government agency and arming them with incentive and regulatory powers. But recent developments in ecosystem management reveal that the most effective approaches to being “responsible” involve collaborative

⁶⁵ Personal interview, May 17, 2012.

relationships between stakeholders—agencies, municipalities, private businesses and developers, and citizens.⁶⁶ **Communication and planning between watershed stakeholders can link similar objectives, combine resources for cost-effectiveness, and facilitate broader education of activities and issues occurring throughout the watershed.** But most importantly it can organize the priorities and actions of agencies, governments, and businesses into a healthier, more cost-effective, and more responsible approach to stormwater management throughout the watershed.

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1.4.2. Lack of inter-jurisdictional mechanisms for communication and planning

Some mechanisms for I-J communication and planning exist in WC. Some Memorandums of Understanding (MOUs) have been established between agencies, such as that between the WRC and RC: questions arose in the past about whether and when the RC needs a permit from the WRC for particular projects; the MOU clarified the issue and established a review process. In addition to the MOU, a twice-monthly meeting takes place between the WRC and the Director of the RC, presumably to coordinate activities and share information about upcoming projects.

Ad hoc instances of I-J planning occur as well. For instance, collaboration between Ypsilanti Parks and Rec, Ypsilanti Township, EMU Women’s Crew, Saline Public Schools, and the DNR Natural Resources Trust Fund Program is allowing for the building of a new boathouse and redeveloped Lakeside Park. LID features are part of the \$1.3 million project (see 1.3.1.6., collaborative planning and projects, for a fuller description of the project).

However, these mechanisms are either not comprehensive enough or not enduring enough to facilitate GI planning throughout WC. As has been clear throughout, LID projects alone do not bring about GI. Presently, WC lacks the kind of communication and planning necessary for GI.

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1.4.3. No body or group to plan inter-jurisdictional projects

While more communication and collaboration would be an improvement and may lead to some collaborative projects, that alone may not be enough. Even if agencies, townships, and municipalities communicated better and planned joint projects, it is improbable that such a GI system could substantially reduce stormwater runoff and costs associated with stormwater management. To be effective, **I-J planning needs to examine GI broadly, from training and project-design to community-outreach and maintenance.** The other barriers, from knowledge to state-funding-mechanisms, would

⁶⁶ See, e.g., Julia Wondolleck and Steven Yaffee, *Making Collaboration Work: Lessons from Innovation in Natural Resource Management* (Washington, DC: Island Press, 2000)

have to be overcome effectively and on a consistent basis. **At the present time, Washtenaw County does not have an agency or association to facilitate this amount of collaboration.**

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1.4.4. Lack of incentives for inter-jurisdictional communication and planning

This barrier goes deeper than merely the lack of such an agency or organization. Incentives for the creation of such a body, or for I-J communication and planning in general, are lacking in WC. Present incentives align themselves toward each agency and township pursuing stormwater management, and by extension GI development, on their own. In this scenario, stormwater management is generally viewed as a burden to be alleviated as quickly and cheaply as possible. There is no reason for the RC to waste precious resources and time developing a joint plan with the WRC or with townships when they will be held accountable only for the resulting roadways. The RC may even be criticized if collaborative efforts result in an unconventional plan. This is especially true if, as outlined above, learning must take place through trial and error. With no incentive to risk trying new approaches, it is likely that agencies will follow conventional planning and design focused on their primary objectives.

At the present time, there are no major funding programs or regulatory benefits rewarding I-J planning that could overcome narrower jurisdictional interests. Major funding for the RC comes through the State Transportation Improvement Program; major funding for the WRC comes through county taxes and drainage district fees; major funding for the townships and municipalities comes through their general fund (unless there is a stormwater utility). Individual projects are sometimes funded through grants and loans, but these funds are limited, as has been outlined above. The DNR Natural Resource Trust Fund grant application, which was highlighted previously in 1.3.1.6., awards only 6% of points for collaboration involving a formal partnership and only 3% for informal partnerships.⁶⁷

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1.4.5. Need for coordination between regional, county-wide, and local planning

For LID features to be strategically placed throughout the county as GI, coordination in planning must take place between the regional, county-wide, and local levels. Regional planning and visioning for GI, such as is being accomplished through [SEMCOG's Green Infrastructure Vision](#), needs to support, be adopted by, and be incorporated into the county-wide (such as outcomes from this project) and

⁶⁷ "Michigan Natural Resources Trust Fund: 2013 Application Guidelines," MDNR Grants Management, p. 26-29, January 7, 2013, http://www.michigan.gov/documents/dnr/IC1905-RECREATION_GRANT_SELECTION_BOOKLET-2011_2_346866_7.pdf?updated=01072013, accessed August 7, 2013.

township-wide⁶⁸ planning. Regional GI plans can be too general or only focus on large projects (e.g., the establishment of greenways or parks); local programs can be short-sited and non-strategic (e.g., installing rain gardens anywhere, including areas where they are not needed or will not be successful). Presently there is no formal coordination in Washtenaw County between the various levels of planning.⁶⁹

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2. Lack of Information and Training

In addition to a lack of and limitations on planning for GI in WC, there is also a lack of information and training about GI getting out to those who need it. While there is plenty of information on GI available,⁷⁰ municipal staff have not been able to incorporate it to this point. Many unanswered questions remain about the economic costs and benefits, the local feasibility of specific LID features, and maintenance policies and procedures. These questions remain unanswered for policy-makers, agency managers, engineers, maintenance staff members, developers, and even property owners. **Filling this information and training void would build a foundation for GI in WC.**

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2.1. About specific LID features

LID, and its integrated planning through GI, is a relatively new approach. Though its roots reach back several decades, modern LID features and especially their integration within the stormwater system are not well integrated into the practices of engineers and planners. This reality is illustrated by two examples. First, green roofs are not included in the stormwater model being developed for Ann Arbor. Though green roofs exist in Ann Arbor, and though staff members are familiar with their benefits, their absence in the model reveals a knowledge gap concerning their integration with other stormwater management features. Uncertainty about this effective practice existed at the time development of the model was begun. Second, while the WRC design standards were once among the most progressive in the State, their lack of specificity about and trepidation toward distributed stormwater treatment

⁶⁸ Township wide GI planning is presently being accomplished through HRWC's Kris Olson, though this is the wider concept of GI that includes greenways, parks, and natural areas, but not specific BMPs along roadways or developed sites.

⁶⁹ There is, however, some amount of informal coordination. For example, Amy Mangus (SEMCOG) and Meghan Bonfiglio (Washtenaw County Parks) recently met with staff involved with this project at HRWC in preparation for SEMCOG's GI visioning workshop in the county planned for September, 2013.

⁷⁰ See the resource website associated with this project at <http://www.hrwc.org/>.

reveals uncertainty concerning how to make LID work. The effect of this knowledge gap is not small: a lack of incentive to install green roofs in Ann Arbor or bioinfiltration throughout WC.

This is not to say that LID training is absolutely lacking. Most of those interviewed for this project seemed confident in their understanding of LID, most having at least scanned the 2005 SEMCOG LID Manual. The RC was even more confident, stating that their engineers were routinely trained in LID practices. Nevertheless, the novelty of many LID practices—and especially the only-recent implementation of LID on a broad scale resembling GI throughout a handful of US cities—indicate that information about LID takes a long time to get incorporated into development systems.

The lack of information and training stems from two different sources. One is a genuine **lack of knowledge about features** and could be remedied through workshops, certifications, and seminars. High-level officials at the WRC expressed a need for training about GI features for all staff, extending from their position all the way to on-the-ground maintenance workers.

The other source is more complicated and requires more strategic incentives to change. Some engineers within WC entities look for new ideas to solve old problems; incorporating innovative stormwater features into their designs is motivating and rewarding. But for others, it merely adds complications; they prefer designing projects with well-tested, conventional features – even if those features are a bit more expensive. While this phenomenon is a common one, it reveals itself as a specific barrier for GI implementation in the context of a governmental system that does not encourage GI. That is to say, **given the present state of incentives for GI in WC and in MI in general, entrepreneurial designers and engineers are needed to champion GI in their projects.**

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2.2. *Regarding economic costs and benefits*

Green infrastructure has proven itself to be more cost-effective than gray infrastructure in most instances according to numerous recent studies.⁷¹ In 2007, the EPA conducted a study of 17 in-depth cases nationwide that examined economic issues revolving around LID. It concluded that,

Although the increase in application of these practices is growing rapidly, data regarding both the effectiveness of these practices and their costs remain limited. This document is focused on the latter issue, and the news is good. In the vast majority of cases, the U.S. Environmental Protection Agency

⁷¹ See, e.g., *Banking on Green: A look at How GI Can Save Municipalities Money and Provide Economic Benefits Community-Wide*, A Joint Report by American Rivers, the Water Environment Federation, the American Society of Landscape Architects and ECONorthwest, April 2012, <http://www.asla.org/ContentDetail.aspx?id=31301>, accessed July 27, 2012, which includes over 450 case studies nationwide; Noah Garrison and Karen Hobbs, *Rooftops to Rivers II: Green strategies for controlling stormwater and combined sewer overflows*, NRDC, 2011, <http://www.nrdc.org/water/pollution/rooftopsii/>, accessed July 27, 2012.

*(EPA) has found that implementing **well-chosen LID practices saves money for developers, property owners, and communities while protecting and restoring water quality.***

*While this study focuses on the cost reductions and cost savings that are achievable through the use of LID practices, it is also the case that **communities can experience many amenities and associated economic benefits that go beyond cost savings.** These include enhanced property values, improved habitat, aesthetic amenities, and improved quality of life. This study does not monetize and consider these values in performing the cost calculations, but **these economic benefits are real and significant.**⁷²*

This was five years ago and has been confirmed by numerous other studies and reports,⁷³ which has led to the EPA's massive push for GI and the likely inclusion of GI in the pending federal design standards.

All of the entities that we interviewed recognized the economic promise of GI. Some pointed out that "LID can't be used everywhere," and some showed a genuine knowledge gap due to the frenzied and pressured atmosphere caused by overburdened staff. **There was universal agreement that information about the costs and benefits of GI as compared to gray infrastructure was needed.** Several mentioned the importance of having information from cases that were similar to conditions in WC.

An interesting facet of the need for economic analysis was the intended use of that information. We didn't encounter skepticism from our interviewees; rather, they expressed a need to use this information to convince others of the cost-effectiveness of GI. This revealed that, **while detailed analysis for help in project development is needed, more general persuasive information is also needed in order to justify the use of GI.** Municipal staff are likely concerned that using "new" LID approaches will bring greater scrutiny and potential criticism. A solid portfolio of examples is needed to alleviate concerns about risks involved with GI.

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2.3. Regarding local feasibility

It has been mentioned more than once previously that there is a need for information about the local feasibility of GI. The comments received for this report mostly revolved around climate and environmental conditions: **case studies of GI success in counties and municipalities that had the same freeze-thaw cycles, faced the same kinds of temperature, and had the same topography and soil**

⁷² *Reducing Stormwater Costs through Low Impact Development Strategies and Practices*, EPA, December 2007, http://water.epa.gov/polwaste/green/upload/2008_01_02_NPS_lid_costs07uments_reducingstormwatercosts-2.pdf, accessed July 27, 2012. Emphasis is added.

⁷³ See the presentation from the second [Growing GI Forum](#) associated with this study, where the most prominent economic studies of GI over the past several years are laid out, revealing that 75% of GI projects cost equal to or less than they would if done with conventional gray infrastructure.

structures. In the words of one staff member, northern MI is different than central MI is different than southern MI is different than Wisconsin is different than Portland. What has worked for “others” is only helpful if “others” are like us.

There is also a need for specific information about WC soils and hydrology in a central, accessible location, coupled with political, jurisdictional, and economic considerations in order to produce a list of opportunities that is “real, not ideal.”⁷⁴ In agencies and governments that are not tasked with synthesizing this information, a list of real priorities could facilitate an initial wave of LID projects and open channels of communication and collaborative planning. The three [Growing GI Forums](#) associated with this project began the process of identifying “real” opportunities.

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2.4. Regarding maintenance

Maintenance is often overlooked in the development of construction projects. The real difficulty, it is often thought, is in planning, engineering, and construction. After that, the tasks of keeping projects functional, such as fixing the pipes, patching holes, and mowing the grass, is left to others to add in to their routine. . This approach usually works fine with conventional projects, as the maintenance is relatively similar project to project.

This is not so with GI. As one staff member put it, if you rely upon GI in the stormwater system, you can’t neglect maintenance. Much of the literature on LID highlights how maintenance is needed more often, though less intensely, than for gray infrastructure. Two issues emerge: *how* to care for GI, and *how to ensure* care for GI over the long-term.

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2.4.1. How to care for GI

There is an obvious need in WC, expressed at the highest levels, for information and training on how to maintain LID features in the most effective and cost-effective way. Most GI projects utilize some mix of native plantings. Municipal staff or contractors that maintain landscaping usually have not been trained to properly maintain GI plantings. For example, there is a need to distinguish between native plants and weeds when caring for rain gardens or to know how often and how short to mow. With non-vegetated features, workers need to recognize, for example, flow blockages into infiltration devices and how to correct them, and to know proper snow removal techniques for pervious pavement. Inadequate maintenance training and lack of experience has caused the failure of some pervious pavement

⁷⁴ WRC personal interview, May 17, 2012.

projects⁷⁵ and the mowing of some vegetated features,⁷⁶ degrading these projects and transforming them into examples of “how GI projects do not work in this area.”

There is also a need for training and local knowledge about how to care for non-vegetated GI structures, such as pervious pavement. The RC does not use pervious pavement because it is not certain about how to care for it, nor does it have the equipment to do so (e.g., vacuum trucks).⁷⁷

However, though government employees (of municipalities, the WRC, and the RC) need this information, property owners, builders, and inspectors are often overlooked. **Property owners whose property supports GI structures** need to know both how to care for those structures and also how to avoid damaging those structures. Pittsfield has developed an innovative solution to this problem. It has hosted an annual homeowners’ association training meeting that keeps homeowners up to date on the latest maintenance practices and addresses issues.⁷⁸ This proactive involvement in education takes much of the guesswork out of LID care for property owners. Unfortunately, the township has a difficult time getting homeowners to attend these useful trainings.

Builders and building inspectors also need training in GI maintenance in order to ensure that particular GI structures are maintainable. For example, if an infiltration basin is installed in a manner that makes it impossible to clean out sediment and debris without a complete rebuild, then the device will be ineffective and more costly to maintain. This means that builders and inspectors need information not only about specific LID structures, but about which ones are easiest to maintain in various geologic settings. **When builders build effectively, and inspectors guide appropriately, then maintenance costs can be minimized.**

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2.4.2. Policies for ensuring GI maintenance over the long-term

Knowing about maintenance is the first step; ensuring maintenance over the long-term is an equally important second step. Again, GI is not like grey infrastructure. Steel valves last for 30 years and then need to be replaced. If they break prematurely, they need repair. **LID features require regular, ongoing attention. Neglect for just a few years can lead to project failure.** “There is trepidation to rely on GI for stormwater,” according to the WRC. They pointed out a situation where a LID feature was built, but then

⁷⁵ According to conversation at and following the third forum on GI Operations and Maintenance at HRWC, spring 2013.

⁷⁶ According to conversations with multiple managers across the county.

⁷⁷ Personal interview, August 19, 2013.

⁷⁸ Personal interview, May 23, 2012.

later development upstream silted it up.⁷⁹ Without effective maintenance over the long-term, important parts of the stormwater infrastructure can be quickly compromised, resulting in flooding and the loss of high value real estate. This is likely the reason for the warning about “high failure rates” of some LID structures in the WRC Rules.⁸⁰

There is special concern about how to ensure maintenance of LID structures that are on private property. For instance, if stormwater infrastructure is constructed as part of a home development that is sold ten years later, how can it be ensured that the structure remains in existence and functions properly? What keeps unknowing (or skeptical, indifferent, etc.) second-order homeowners from filling in GI structures?

Augusta Township has attempted to combat this barrier by writing a maintenance solution into its ordinances, which reads,

Whenever a landowner is required to provide on-site storm water retention . . . such measures or facilities shall be provided and maintained at the landowner’s expense. The landowner shall provide assurance to the Township that the land owner will bear the responsibility and cost of providing and maintain such method or facilities, by written agreement . . . that will act as a perpetual restriction on the land . . . A maintenance plan shall be provided, including notation and description of maintenance requirements and timelines.⁸¹

Requiring maintenance agreements for private property is the first step, but ensuring that those agreements are followed is also critically important. **GI features even on private property, because they are part of the stormwater system, require regular inspection and, if necessary, enforcement of the agreement.** Inspections, however, can occur as part of a volunteer program and need not require additional municipal staff. (For further discussion on the importance of inspections and accountability and current helpful resources, see the discussion under 1.1.8. and related notes).

Policy solutions of this sort need to be evaluated and findings need to make their way into the hands of policymakers from state to local levels. In addition, communities need to take greater responsibility for

⁷⁹ Personal interview, May 17, 2012.

⁸⁰ “Introduction,” *Design Standards of the WC WRC*, May 15, 2000, http://www.ewashtenaw.org/government/drain_commissioner/dc_webPermits_DesignStandards/dc_Rules/dc_introduction.pdf, accessed July 28, 2012.

⁸¹ *Zoning Ordinance: Augusta Charter Township*, August 1, 2007, http://augustatownship.org/PDFs/Ordinances/Augusta%20Zoning%20Ordinance_Adopted%20%208-1-07.pdf, accessed July 28, 2012, Section 9.14.F.

their local stormwater facilities, which is addressed below. Only then will fears of disappearing stormwater infrastructure be calmed.

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2.5. About present local GI policies

There is a need for education concerning present GI policies throughout WC.⁸² For example, Ann Arbor residents in general presently are unaware of the fee reduction policy for implementing private LID features. Educating residents about just this one issue would serve not only to increase minor LID practices throughout Ann Arbor, but would also begin to build public understanding of the cost-effectiveness and additional benefits of GI over gray infrastructure.

There is also a lack of understanding of LID policies between WC entities. This lack of understanding prevents learning about effective policy and probable community support. Such communication would also be beneficial at the broader regional- and state-levels. If Ann Arbor municipal staff know what Grand Rapids is learning, they can avoid the high costs of learning-through-experience.

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2.6. Information and training for whom . . . from whom?

The above information and training gaps exist on many different levels, from maintenance staff to policymakers

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2.6.1. For maintenance staff, engineers, managers, and policymakers

Maintenance staffs in WC are in need of information and training about LID structures and their place in a GI stormwater system, about the importance of maintenance for a GI system, about protocols for the monitoring and care of LID features, and about local policies that allow for inter-jurisdictional maintenance activities. This training needs to reach not only dedicated staff members, but also seasonal workers. In addition, there may be a need for some maintenance persons with specialized botanical or engineering training in order to serve as experts and trainers within each department or across departments. These specialists may also be needed to care for certain LID features, especially during the “establishment” phase (i.e., first three years) of vegetated structures or with regard to pervious pavement applications, in order to put such projects on a successful trajectory.

⁸² Though this topic was outside the focus of the interviews, it did reveal itself, and, as local policies change to become more GI-friendly, it will likely become a significant barrier.

Though **engineers** throughout WC appear to have training in LID practices, the pace of change in the field of GI, and especially the transition from LID to GI in the past decade, warrant continued education and training. Especially important is the role that cross-pollination can play through networks of engineers. As was pointed out previously, localized, specific information is needed rather than universal information about LID structures. **This implies that training seminars need to be hands-on, they need to invite and answer questions, and they need to nurture ongoing professional relationships.**

According to interviewees, a divide exists between engineers and maintenance staffs. Part of the need for information and training needs to be met by increased coordination between the design staff and on-the-ground workers who build and maintain the structures.

Managers are in need of information and training about, among other things, how GI functions as a system to reduce costs and improve water quality, how GI integrates with gray infrastructure, and how to effectively organize maintenance activities across jurisdictional boundaries. **They are also in need of a network of relationships for sharing localized learning and coordinating efforts.**

Policymakers are in need of information about the effectiveness of GI and its feasibility in WC. They are also in need of information about writing policies that will bring about GI, about how to incorporate ongoing maintenance into policies, and how to coordinate policies to support and not conflict with one another, either laterally (e.g., from township to township) or vertically (from local to state).

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2.6.2. For developers and inspectors

The need for information and training exists not only among public servants, but also among developers and inspectors. When developers “silt up” LID structures and inspectors allow it to happen, as the WRC indicated has occurred in the past, these setbacks can be costly.

Developers need information about the benefits of utilizing LID, the areas of the county where specific LID features would work best, and the broader plan for GI county-wide and regionally. They need training about how to construct LID features, how to adjust the design of features to accommodate the physical realities of the site, and how to properly incorporate LID principles into novel features. Again, this training needs to be hands-on, respond to specific questions from a developer’s perspective, and leave in place a network for future learning and planning.

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2.6.3. From GI industry

Some of this information and training can come from the GI industry. Ann Arbor indicated the value of lunchtime seminars by industries. “It is often from the vendors where you get information on what other municipalities are doing.”

Huron River Watershed Council, 2014

For example, there are many questions revolving around the use of pervious paving materials, whether asphalt, concrete, or pavers. How does it perform in WC's climate, on slopes greater than 6%, on truck and bus routes, or on high-traffic routes? How does road design differ from conventional paving? What other communities in the area are doing these things where local implementers could observe finished projects and project documents? **Many of these questions could be answered through industry-hosted events, especially if there were funding to support them.**

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3. Lack of community ownership and participation

As was indicated at the outset, residents of WC assume that stormwater is “taken care of” by the government. While this has been true to some extent in the past because of the use of gray infrastructure, **GI requires a higher level of participation and ownership by residents.**

This revealed itself as a barrier based on a number of comments from the WRC and RC. In fact, **some residents may even need to move from a posture of active interference with stormwater infrastructure** to active care and concern for it.⁸³ Occasionally, disruptive actions by citizens, such as interfering with stormwater management features, can cause agencies to backtrack on policies supporting good stormwater management.

Most county residents have mowed lawns. If the RC, for example, uses more natural, native vegetation in the right-of-way, homeowners often complain, especially if the natural vegetation is high enough to cause a visibility problem. Residents need to learn to tolerate the change in culture and aesthetics that GI brings.⁸⁴

But preventing destructive behavior is only part of what is needed to make GI fully effective. **Residents need to pay active attention to maintaining LID features and reporting violations.** For instance, if an LID feature that is vegetated with native plants is overtaken by an invasive species, such as *Phragmites australis*, residents cannot sit idly by and wait for county maintenance departments to “make the rounds.” Instead, they need to offer minor ongoing care for the GI system. Likewise, LID features on private lands need the ongoing, direct attention of landowners to ensure effective GI. Too many obstacles exist within and between the government entities to provide this level of oversight and

⁸³ For example, many property owners and lawn care services presently rake or blow grass clippings into county or roadway drains. The increased debris often causes clogs in the system downstream. Instead of downstream residents removing the debris and solving the problem themselves, they call the RC and WRC maintenance departments to do the work. This disregard for the stormwater removal system may make GI maintenance more difficult.

⁸⁴ Personal interview, June 14, 2012, and August 19, 2013.

maintenance to every LID feature throughout the county. A new citizen vigilance or shared ownership ethic may be required. To engender this will require public education and assistance.

If Washtenaw County wants a more natural-looking and natural-functioning stormwater system that costs less, improves water quality, provides habitat for birds and wildlife, and increases property-values and quality of life, then residents need to take ownership of and participate in stormwater management. **Yards cannot be viewed merely as blank slates on which to realize ideas; rather, they need to be viewed as parcels of a watershed which function to harness the benefits of rainfall.** This perspective comes by way of education and a shifting culture.

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4. Lack of understanding about why GI is not happening

The WRC in particular asked for insight into why GI is not happening in WC. From their perspective, this was just as important as questions about operation and maintenance of LID features. **Why does GI happen in some places and not in others?** If all it takes is a stormwater utility, why is Chelsea not implementing GI? If it takes merely a healthy economy, why does Ann Arbor not have a more developed GI system? How much do changes in local politics affect the process of GI implementation? And what policies would stop these disruptions so that long-term and county-wide GI can be implemented?

This report answers those questions to some extent. However, this report is only a static representation of a point in time. What would go much further toward answering the “why not” questions in years to come is communication and collaborative planning between entities, as outline previously. Only then will the barriers be eventually overcome.

For the time being, a plausible and broad-scope explanation might look something like this:

- There is a lack of ability to enforce stormwater requirements and a lack of an understanding of causal links from stormwater runoff to poor water quality, which leads to . . .
- A lack of incentives for municipalities to invest in stormwater infrastructure, which leads to . . .
- A lack of will to push for the creation of, or to raise fees associated with, a stormwater utility, which leads to . . .
- A lack of funding to invest in GI planning and implementation.

The causal links between the barriers could be expressed in multiple other ways due to the complex nature of the problem. The major facets of the problem, however, remain the same.

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5. Summary

In sum, an *infrastructure* for Green Infrastructure implementation needs to be put into place in WC: planning needs to take place; policies need to be enacted or altered; agency and municipal mandates need to be synchronized; funding needs to be more substantial and more flexible; inter-jurisdictional communication needs to happen regularly; information and training gaps need to be filled concerning LID features, effectiveness of GI, local feasibility, and maintenance; opportunities for a first wave of GI need to be identified; communities need to take responsibility for their stormwater; and communication about these very issues needs to be disseminated throughout WC. When this infrastructure is built, then WC can move beyond token LID structures and establish Green Infrastructure as the default approach to stormwater management.

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B. Solutions for Overcoming the Barriers

1. Green Infrastructure Group

“There is no one responsible for [stormwater in] the watershed. That is why we do things in pieces.”⁸⁵

But the fact that no government body is charged with responsibility for stormwater management across the watershed does not mean that watershed-scale thinkers and actors do not exist in the various WC entities. As is reflected throughout this report, there is broad support for GI as a concept. The general feeling was that county agencies and municipalities would like to see GI implemented (it is, after all, in municipal master plans and the WRC recommendations), but, 1.) there is little interjurisdictional communication, 2.) each entity is busy dealing with more urgent matters, 3.) each entity is locked into its own priorities, and 4.) there is a general lack of information and training.

HRWC is uniquely positioned to lead regarding GI planning as an organization the *does* prioritize watershed-scale thinking and action.

Therefore, a Green Infrastructure Group is necessary to foster three key priorities:

1. Increase inter-jurisdictional communication and planning
2. Increase the sharing of local learning and identification of needs and opportunities
3. Institutionalize progress toward GI

If a Green Infrastructure Group were formed within WC, many of the barriers could be overcome throughout the next decade. Some barriers could be avoided through increased communication and

⁸⁵ WRC personal interview, May 17, 2012.

some could be eliminated by clarifying their significance and pushing collectively for their removal. In this sense, the creation of a Green Infrastructure Group is one of the most important solutions to ensure long-term success with GI.

The formation of such a group may have been initiated through the [Growing GI Forums](#), hosted by HRWC in spring, 2013.

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2. Green Infrastructure drivers from the State

Many of these barriers would be less obstructive if there were adequate drivers to overcome them. Presently, however, neither state nor federal governments are currently driving forces for GI; citizens, nonprofits, and entrepreneurial public servants are. For example, according to Ann Arbor, the reason several LID projects have been done is because community members pushed for them and government officials went along. In a very real sense, Ann Arbor has gone out on a limb and risked failure on several LID projects in spite of the barriers present. Another example is Pittsfield Township, which has accomplished several small LID projects and has written GI into their 2010 Master Plan. They have done this all through aggressive grant-finding, which is more challenging (and less sustainable) than acquiring funds through the SRF or through the township general fund.

This leaves two options for moving forward with GI: either eliminate all the barriers, or create state incentives that overcome the barriers. It is unlikely that the barriers will be eliminated for the following reasons, among others. First, it is unlikely that the funding mechanism for the RC or the WRC is going to change in the near future: stormwater is an important issue, but it's not yet important enough to alter major transportation funding throughout the state given all the interests involved. Second, it is unlikely that the mandate of the RC or WRC or the authority that each wields will change in the near future: they are likely to continue to be responsible for making roads safe and draining water from towns and off farm fields—two crucial government functions. Third, it is unlikely that agencies, townships, and cities will begin thoughtful and thorough inter-jurisdictional planning given their limited resources and domination by local interest. Fourth, it is unlikely that Michigan townships and cities are going to suddenly encounter economically prosperous years: general funds are likely to remain tight and focused on only the most urgent needs. If the barriers are eventually eliminated, it may take decades.

This leaves the state the option of creating incentives to overcome the barriers—incentives to use traditional funds for meeting water quality objectives, incentives to plan projects that meet more than one objective (e.g., not just safety, but safety *and* contribution to the GI system for water quality), incentives to take part in inter-jurisdictional planning, and incentives to find more secure and long-term local sources to invest in GI, like stormwater utilities and SRF loans. These incentives may look like the following.

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2.1. *Statewide policies to encourage stormwater utilities and GI in general*

Because the EPA has pointed to stormwater utilities as one of the most likely sources of funding for GI, **the State needs to do more to encourage creation of stormwater utilities in municipalities.** This might look like a temporary matching fund to supplement income from stormwater fees. It could also write GI requirements into the new NPDES permits thereby putting pressure on communities to invest in long-term solutions for stormwater. There are many options available to the state to incentivize the creation of stormwater utilities.⁸⁶ One helpful action the state has taken already is helping municipalities lay the groundwork for stormwater utilities through their Stormwater, Asset Management, and Wastewater grant program, applications for which will be available in October 2013.⁸⁷

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2.2. *More state funding for planning and for inter-jurisdictional projects*

The difference between LID and GI is planning. With LID, a developer asks, “What’s the most cost-effective and aesthetically pleasing means of managing stormwater on this property?” Planning occurs at the site-scale. LID solutions at this scale may outweigh gray infrastructure, but they may not. With GI, a community asks, “What is the most cost-effective, aesthetically pleasing, and environmentally protecting means of managing stormwater in our community?” Planning takes place at the stormwater-system scale. GI usually outweighs gray infrastructure at this scale.

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2.2.1. *Planning*

The best way for the government to support action on the ground is to fund “shovel-ready projects,” which has become a popular (and understandable) mantra since 2009. But shovel-ready projects do not always bring about sensible long-term solutions. **Long-term solutions require planning and monitoring, and the development of projects in concert with community objectives. Funds need to flow more easily to planning projects in general, such as GIS development and community engagement processes.** Counties and townships need to know the most cost-effective way to implement GI, which includes a reexamination of drainage patterns, soil types, jurisdictional boundaries, ordinances, etc.—

⁸⁶ See, e.g., Noah Garrison and Karen Hobbs, *Rooftops to Rivers II: Green strategies for controlling stormwater and combined sewer overflows*, NRDC, 2011, <http://www.nrdc.org/water/pollution/rooftopsii/>, accessed July 27, 2012.

⁸⁷ “Stormwater, Asset Management, and Wastewater (SAW) Program Highlights,” Michigan Department of Environmental Quality, http://www.michigan.gov/deg/0,4561,7-135-3307_3515_4143-294952--,00.html, accessed August 1, 2013

information that already exists but has never been digested for the purpose of planning GI. The state could support such activity by providing (or shifting) some grant funding for planning projects.

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2.2.2. Inter-jurisdictional planning

Planning at the stormwater-system scale incorporates the problem of multiple jurisdictions: county agencies and multiple townships, cities and villages. **Inter-jurisdictional planning does not usually take place unless incentivized because it is difficult, costly, open to criticism, and time consuming.** But this is exactly what needs to happen if WC is going to implement a GI system. **Communities and agencies need to be encouraged to plan with others instead of merely unto themselves and they need to be rewarded for such actions.** Such incentives could, again, take the shape of matching funds available for inter-jurisdictional projects.

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2.3. Clear public education on the connection between stormwater and water quality

One of the broadest possible recommendations that could ultimately do the most to encourage adoption of GI practices and planning, is to clearly and consistently educate the public about the role that stormwater plays in water quality and the responsibility all citizens have to reduce runoff. HRWC survey data shows that 73% of Washtenaw residents correctly understand that “water that goes into storm drains flows directly to the Huron River.” While this is good, the percentage can still be improved and the knowledge extended. The next steps of understanding, that stormwater runoff has a negative effect on water quality and that each resident bears responsibility, needs to be established. While HRWC leads educational efforts in Washtenaw County on these issues, DEQ also has a role to play by developing a consistent message that can be used across the state, and by providing funding for educational efforts.

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3. Development of master plans and township ordinances

Civic trends tend to replicate themselves until a creative variable interrupts them. That creative variable in a community is often the development of a master plan, including both the process and product. Citizens are asked to collectively envision their future and describe their most important values. This future and set of values then serve as a new anchor point from which to influence decisions about ordinances and development priorities. It pulls community actions in a direction that is beneficial for the community. An inspiring vision leads to good planning.

However, developing a master plan is only a first step. **An equally important second step is translating the master plan into ordinances that are enforceable.** This step not only prevents developers who seek compliance at the lowest-possible level from downgrading community aspirations, but it also provides guidance and legal protection for those developers who pride themselves on constructing attractive, effective, and modern stormwater solutions that are in sync with community values and vision. Translating master plans into zoning, stormwater or other ordinances turns a community's values into reality. Tools such as GI overlays could be effective for illustrating where to focus attention on GI solutions.

When writing GI into ordinances, municipalities should include **clear requirements for maintenance, as well as provisions for inspection and accountability over time,** so that GI features continue to treat stormwater over decades.

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4. Educational workshops / seminars for GI and LID

It is clear throughout this report that there are many basic educational needs. Increased inter-jurisdictional communication and planning, as well as trial-and-error learning, will nurture ongoing education throughout WC. But **seminars and workshops that connect people to information, resources, and networks are essential to establishing a foundation for GI.** These participatory events should be led by experienced industry or government professionals who have the latest data on LID construction, maintenance and policy. The focus would be on participation, practical information, facilitated discussion, networking, and some hands-on learning.

In the spring and summer of 2013, HRWC hosted three "[Growing GI Forums](#)" for Washtenaw County agencies and municipalities. The first focused on identifying and overcoming barriers and identifying GI opportunities throughout the county. The second focused on counting the economic value of GI, the cost effectiveness of GI, and on options for funding GI. The third focused on operations and maintenance of GI and featured speakers from the environmental services division of both Grand Rapids, MI, and Toledo, OH.

Potential future seminars and workshops include the following list. A more detailed educational strategy can be found in a companion product "Green Infrastructure Communications Strategy."⁸⁸

- *Introduction to GI (for all):* This seminar (the first forum, spring 2013) hosted a broad audience to bring all parties up-to-speed on what GI is (i.e., how it differs from LID), what barriers prevent GI in WC, and how some similar communities have moved forward with GI. It allowed for input

⁸⁸ This strategy can be obtained from HRWC's Green Infrastructure website at www.hrwc.org/green-infrastructure.

on future seminars. This broadly promoted initial seminar could be followed later by similar presentations to key local decision making bodies such as township boards or planning committees.

- *Economics of GI (for policymakers, planners, and developers)*: This seminar/workshop would present a tool for evaluating the economics of GI from the site-specific scale to the community-wide scale. It would focus on the tradeoffs between GI and gray infrastructure and would help determine the scale at which policies should be written. Case studies would serve as discussion starters. (Much of this content was the focus on the second forum, spring 2013).
- *Basics of GI maintenance (for maintenance managers)*: This workshop would answer questions about maintenance schedules and tasks for vegetated features and infiltration devices, would indicate resources for understanding GI vegetation, and would give guidance on how to respond to or preempt community complaints. (Some of this information, including a list of resources, was covered briefly in the second forum, spring 2013).
- *Funding GI (for policymakers and planners)*: This seminar will examine the options for funding GI over the long-term. Special attention will be given to stormwater utilities and the *Bolt v. Lansing* decision. (Much of this content was covered in the second forum, spring 2013).
- *GI maintenance policies (for policymakers and planners⁸⁹)*: This workshop would focus on strategies for writing long-term maintenance policies. It would include an open discussion about the main concerns of long-term maintenance and would feature examples of policies from other municipalities. A good amount of time would be reserved for analysis and discussion of example policies. (Much of this content was covered in the third forum, spring 2013).
- *Pro-GI policies (for policymakers)*: This short seminar would make clear the kind of policies that are available to support GI implementation over the long-term. Examples would be presented and evaluated. (Some of this content was explored in the three forums, spring 2013).
- *Pervious pavement uses and maintenance issues (for government managers, engineers, and maintenance managers)*: This workshop would focus on answered and unanswered questions about pervious pavement: weight and traffic limits, snow removal, vacuuming, etc. Local knowledge would be gathered and archived and lines of communication between industry, government, and private development would be established.
- *Basics of building LID (for contractors and developers)*: This hands-on workshop would answer questions about GI construction, adaptation of LID features to match local conditions, and basic cost-benefit analysis. It would also identify key resources for builders and provide a basic understanding of GI principles to facilitate inventive LID features. This workshop could be coordinated with SEMCOG, who developed the LID manual.

⁸⁹ “Policymakers” refers to elected officials, e.g., County Commissioners. “Planners” refers to planning directors of all levels, e.g., planning committees (or chairs) at townships, stormwater coordinators at cities, etc. They are non-policymakers who would be responsible for directing public funds toward GI solutions through the planning process. These are distinguished from maintenance managers.

- *GI marketing (for planners):* This seminar would focus on strategies for promoting GI. Special attention would be given to marketing GI to a broad audience, i.e., both those who are amenable to “green” solutions and those who want strictly economic rationale. Examples will be presented and brainstorming will draw out home-grown creative strategies. Attention will also be given to partnerships in the marketing process.
- *Inter-jurisdictional planning strategies and templates (for planners):* This participatory-intensive workshop will evaluate examples of I-J planning strategies and will create options for I-J planning in WC. Facilitation will lead this workshop to some established, long-term structures for I-J planning.
- *Establishing effective monitoring plans for pilot projects (for planners):* This seminar and workshop will present examples of monitoring programs from pilot GI projects and will highlight the most important facets of GI monitoring and interpretation of monitoring results. Attention will then be directed toward drafting monitoring plans for simulated GI features and adaptively responding to monitoring results.
- *Other workshops and seminars:* To be determined by the Green Infrastructure Group.

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5. Identification of GI opportunities in WC

In order to establish momentum in overcoming the barriers, it is necessary to identify present GI opportunities throughout the county. This will serve to generate local knowledge and establish inter-jurisdictional networks.

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5.1. *Develop a map of potential GI opportunities*

HRWC began an effort to utilize existing geographic information to develop a map of GI opportunities. The map focuses on densities of impervious surfaces connected to storm sewers. From that base, the map eliminates areas on poorly draining soils or steep slopes. The map is also being refined to highlight different types of GI projects such as tree planting, bioinfiltration, green roofs, and residential rain gardens. Information is also being added to identify drainages with higher stormwater related impairments, and impervious areas not captured in any storage compared to those with storage (i.e. detention ponds) that may need to be considered for evaluation for retrofits. Early versions of the “opportunities maps” were discussed with participants in the first GI Forum. These can be found on the [Growing GI Forum website](#). Final opportunity maps can be found through HRWC’s main [Green Infrastructure website](#).

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5.2. *Develop a list of priority GI projects*

The GI opportunities map was used in discussion with the Green Infrastructure Group to highlight areas (mostly road and parking) in the county that would have the greatest benefit. Group members were asked to compare target areas with future capital improvement projects to identify GI opportunities. HRWC is now cataloging identified projects. These projects should be shared with the full Green Infrastructure Group and actively added to. The group was later asked to identify priorities for GI designs. A complete prioritized list of potential GI projects should be developed and tracked to show progress in the county.

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5.3. *Identify funding sources*

Funding for GI projects need to be identified. This includes not only revisiting the option of establishing a stormwater utility, but also exploring how to use funds that exist presently, such as Ypsilanti Township's "bicycle, sidewalk, and recreation fund," U.S. EPA's clean air grants for transportation, or the myriad of funding sources with GI potential in the EPA's GI federal funding database.⁹⁰

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6. **Removal of barriers embedded in policies at all levels**

Multiple barriers exist within policies at various levels throughout the county and state. Removal of the following four barriers should be a priority.

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6.1. *State and federal funding mechanism for roads*

The largest barrier for GI implementation in transportation projects is the amount of funding provided and the restrictions placed upon that funding. Presently, federal funding cannot be used to purchase additional right-of-way (ROW), and state funding is not substantial enough to pay for it. In addition, funding mechanisms set up a trade-off where, road agencies choose to spend capital on GI stormwater treatment, less can be spent on additional road projects. The default design that follows, therefore, is curb-and-gutter and/or simple ditch drainage adjacent the road. Green Infrastructure features,

⁹⁰ "Funding Opportunities," U.S. EPA, Water: Green Infrastructure, January 11, 2013, http://water.epa.gov/infrastructure/greeninfrastructure/gi_funding.cfm, accessed August 6, 2013.

however, may require additional ROW to keep vegetated structures back from the road. This will require additional federal funding and the freedom to use that funding to purchase ROW for GI features.

The state is presently not utilizing the full potential of federal funding because state revenues for matching funds are low. This is mostly due to the fact that the gas tax, set at \$0.19/gallon, has not changed since 1997. In 1997 dollars, the tax is now only worth \$0.14/gallon, where one cent of tax equals around \$50 million in revenue. More fuel efficient cars, fewer registered cars, and decreased travel led to a decrease of \$100 million annually in the MTF from 2004-2009. This lost \$100 million annually could have been used to match \$600 million in federal funds annually.⁹¹ There is less money to cover increasing transportation infrastructure costs, which is why the Snyder Administration called this year for a “wholesale tax on gasoline and diesel fuel at the equivalent rate of 33-cents per gallon over the next two years, followed by a floating rate designed to keep pace with market conditions.”⁹² To remain economically sustainable, and to allow for innovative stormwater management through the RC, including the purchasing of additional ROW, the gas tax should be increased. Additionally, rules for the use of this funding could include requirements or incentives to infiltrate runoff from new or reconstructed roads.

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6.2. *WRC design standards*

The WRC design standards are outlined previously in this report with a description of how they function to prevent GI beyond detention ponds (see 1.1.1.). **Establishing up-to-date standards that encourage the use of, and give guidance for the construction of, LID features will empower townships and the RC to implement GI.** Presently the standards can cause paralysis for local officials because of the low-level of certainty they provide, i.e., most townships do not have the expertise to go beyond the WRC standards, and the RC has no incentive to go beyond them. Using the current standards leaves local policy makers without an effective way to encourage GI in development projects.

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⁹¹ Michigan Department of Transportation, “Transportation Funding Crisis,” TF2 Transportation Funding Task Force, February 6, 2009, http://www.michigan.gov/mdot/0,1607,7-151-9623_31969_49303---,00.html, accessed August 19, 2013. The gas/diesel tax makes up about 50% of the Michigan Transportation Fund (Michigan Department of Transportation, “Fast Facts 2013,” April 10, 2013, http://www.michigan.gov/documents/mdot/MDOT_fastfacts02-2011_345554_7.pdf, accessed August 19, 2013).

⁹² Jonathan Oosting, “Gas taxes in Michigan: Where does \$4 a gallon go? And why are our roads still so bad?” MLive, February 14, 2013, http://www.mlive.com/politics/index.ssf/2013/02/gas_taxes_in_michigan_where_do.html, accessed August 19, 2013.

6.3. *Stormwater policies*

As local stormwater policies undergo revision in coming years, they should reference the WRC design standards (if they get revised), but they should also specifically reference GI and emphasize that GI is preferred to detention or retention, and that redevelopment that includes GI will receive preferential consideration. In addition, it is vitally important that stormwater policies require maintenance agreements for GI features along with inspection schedules and enforcement authority for municipalities.

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6.4. *Township policies*

Township GI zoning layers should include a GI overlay in order to ensure that a municipality's pervious soils are utilized to the greatest extent possible. These layers will help focus attention on establishing GI in the most cost-effective areas.

Also, street reconstruction projects should require the development of "green streets," including the use of LID features. This will ensure that, over time, GI will be implemented as the default stormwater treatment measure.

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Appendix A: What is Green Infrastructure?

Green in comparison to grey infrastructure

Grey infrastructure is the stuff of human development: roads, bridges, buildings, channels, pipes, cables, parking lots. It is essential for modern life and provides for important human values such as communication, transportation, economic development, safety, and artistic and cultural expression. It has been the hallmark of human development since the beginning of the industrial revolution.

Green Infrastructure (GI) originated as a term in the 1990s as a means of calling attention to the value of natural systems within human communities. Rather than focusing merely on development, its end is more broadly defined as human security—not just *more* development, but *smart* development. The Conservation Fund’s GI initiative, one of the leading voices in GI implementation nation-wide, defines GI as “strategically planned and managed networks of natural lands, working landscapes and other open spaces that conserve ecosystem values and functions and provide associated benefits to human populations.”⁹³ It means limiting land use to only part of the land in any given area, planning parks and green space and linking them with natural corridors, and preserving functioning ecosystems in the midst of development. And it means treating these issues at the same level of importance and with the same scope of planning as transportation, housing development, or flood control.

GI as a solution for stormwater

Though GI is a broad term, encompassing all aspects of community planning, it has particular import for stormwater management. Urban runoff as a result of impervious surfaces is the cause of the vast majority of freshwater pollution and is a primary reason for the Environmental Protection Agency’s (EPA) National Pollutant Discharge Elimination System (NPDES), established under the Clean Water Act (CWA) of 1972. Impervious surfaces by definition must transport 100% of their precipitation to streams, lakes, or other pervious surfaces. Urban areas, which usually comprise high percentages of impervious surfaces, require massive transport systems for this runoff. In order to prevent flooding in urban areas, the objective becomes to get water to the river and out of town as fast as possible. Neighborhoods are “drained,” streams are straightened or turned into pipes, and levees are built to retain the increased volume of water.

As a result of this massive removal of precipitation, many urban areas in temperate regions could be classified as “deserts” because of the small amount of water that actually reaches roots and aquifers. Another result is that all neighborhood land pollution immediately becomes river pollution. Oil and other chemicals from millions of automobiles, pesticides and fertilizers from urban lawns, sediment

⁹³ “What is Green Infrastructure?,” *Green Infrastructure: The Conservation Fund*, <http://www.greeninfrastructure.net/content/definition-green-infrastructure>, accessed June 25, 2012.

from exposed topsoil at development sites and the attached nutrients such as phosphorus and nitrogen—most of this pollution gets channeled into the river within the first half-inch of rainfall (the “first flush”), disrupting or destroying aquatic ecosystems and preventing human beneficial uses of water resources.

Green Infrastructure seeks to prevent this scenario by limiting the amount of, or reducing the effects of impervious surfaces. More green space means more land available to absorb, filter, and gradually release water into streams. In addition, GI can actually be constructed to accept additional stormwater runoff from adjacent impervious areas. In the end, less grey infrastructure is needed to transport runoff to rivers and humans and other organisms benefit from less polluted rivers.

These two benefits are real benefits. The CWA requires that waters of the states be relatively clean, i.e., below certain pollution thresholds. Many waters in urban and suburban areas throughout the nation do not meet basic water quality standards (WQS) and are considered “impaired.” Gradually throughout the past 30 years, the EPA (through state departments of environmental quality or natural resources, e.g., MDEQ) has monitored the waters of the states and has issued Total Maximum Daily Loads (TMDLs) for impaired water bodies. TMDLs set specific standards for specific bodies of water and give recommendations on how to meet the standards. Many TMDLs have already been issued and municipalities are in the process of addressing them.

Older cities within the U.S., such as Detroit, Philadelphia, and Syracuse, were constructed with “combined sewers,” i.e., the “stormwater” and the “sanitary” sewers are one-in-the-same or are connected in significant ways. During dry weather this is not a problem: the combined system flows to a water treatment plant and the treated water is discharged to surface waters. However, during storm events the treatment plants cannot keep up with the increased volume. As a result, large untreated flows are released from the combined system directly into surface waters, violating CWA standards. These are called Combined Sewer Overflows (CSOs) and are no longer permitted in the US.

To address CSOs in the past, urban areas have constructed enormous holding tanks or tunnels to store large volumes of water during storm events. When the weather clears, the water is slowly released to the water treatment plants to avoid surface water pollution.

Low Impact Development (LID)

While holding tanks are the most popular mechanism by which to address CSOs, they are prohibitively expensive to construct. Because of the enormous construction costs, some cities have proposed to the EPA to use Low Impact Development (LID) as a more cost-effective solution. If more precipitation is absorbed locally into the groundwater, then less storage tank volume is needed to prevent CSOs. The LID approach utilizes site-specific BMPs to accomplish this: rain gardens, vegetated bioswales, green roofs, or porous pavement.

LID does more than reduce CSOs. Even in cities where the storm and sanitary systems are separate (“municipal separate storm sewer system,” or MS4), site-specific LID approaches are often more cost-effective than traditional grey infrastructure approaches. Developers can save money by remaining off the stormwater “grid.” Increased urban shade trees reduce heating and cooling costs. But economic benefits are not the only benefits to be had with LID. Increased vegetation increases quality of life, as well as property values, for homeowners. The green space required for LID can offer locations for recreation and aesthetic enjoyment. Environmental benefits abound, from increased habitat for small wildlife to restored water quality in local streams and lakes, which in turn increases recreational activity. These benefits are never realized with the implementation of grey infrastructure.

An often overlooked benefit of LID is community involvement. In modern urban and suburban neighborhoods that are often starved for local, physical civic involvement and relationships, LID offers the opportunity for neighbors and communities to care for their local environment together. LID requires maintenance, just like grey infrastructure, yet the type of maintenance differs. Plantings need to be monitored and cared for over time, debris needs to be removed from infiltration sites, and rain barrels need to be tended to regularly. These small, intricate tasks need regular attention and are dispersed throughout the watershed, which poses a challenge for maintenance crews at the Road Commission or Water Resource Commission. In some communities, maintenance has been provided for LID through the use of homeowner association contracts or other legal means. While maintenance still poses a challenge for communities that choose LID approaches, several modern cities have had success.

LID versus GI

What differentiates Green Infrastructure from LID? The methods for both involve the construction of wetlands, green roofs, and pervious paving. The goal of both is to treat stormwater locally through infiltration. Is GI just a second attempt to re-market a failed “green” solution to a persistent modern problem? No. There are important distinctions between them.

First, LID is site-specific. It has to do with the implementation of BMPs (such as bioswales) for specific stormwater projects. Runoff from a certain roof needs treatment; it can be planted with indigenous plants. Runoff from a parking lot needs treatment; infiltration strips can be constructed between rows of cars or pervious pavers can be used. LID answers specific questions about development or repair with specific solutions. LID BMPs are “tools” in the toolbox.

Green Infrastructure, on the other hand, is broader in scope and more ambitious in implementation. Just as “infrastructure” conjures up images of major arteries which sustain an urban community and culture (e.g., the Golden Gate Bridge, the 495 belt-loop around DC, or the fiber-optic network that supports international commerce), GI is the system that sustains the ecological health of a community. It is a system, and it is planned and implemented carefully and methodically to meet specific goals. LID is like building roads from one neighborhood to the next; GI is like planning the interstate highway system. GI implementation entails the broad gathering of information (e.g., soil types, grades, development pressure) and the use of that information to inform development priorities. LID BMPs can then be used,

along with some grey stormwater structures, to protect surface waters and their ecological inhabitants from unnecessary pollution, and to save money in the long-run by avoiding increasingly-costly grey infrastructure.

Second, LID sometimes struggles to compete economically with grey infrastructure because benefits and costs are measured on a local scale. A catch basin and drain pipe may cost less than constructing a vegetated infiltration facility with its ongoing maintenance costs. But when the broader costs for grey infrastructure are taken into account, such as the larger drain pipes down line and the expense of addressing impaired water bodies, green infrastructure usually becomes more cost-effective because of lower structure costs and because of secondary benefits.

EPA's push for GI

Because of these reasons, the US EPA has embraced GI as a preferable solution for managing stormwater. It has dedicated a large and detailed website to GI, including wide and varied case studies; tools for evaluating costs and benefits, funding opportunities, municipal policies, and more; research findings; a library; and a list of contacts for further information and support.⁹⁴ GI is touted specifically because of the abundant and broad benefits, leading to “sustainable communities.”

But not happening on a broad scale, even in Washtenaw County

However, even though the EPA has actively endorsed GI, and state departments and county and municipal agencies have followed suit, and even though the history of GI implementation has proven that it is cost-effective, it still struggles to gain a foothold in county and municipal governments. This is especially true in areas that are not facing the problem of CSOs, and it is true in Washtenaw County. While several LID structures have been implemented, GI as a solution for stormwater on a county- or municipality-wide scale has not been adopted. In essence, the benefits of GI have not yet come to Washtenaw County (WC), and the situation is not likely to change over the next decade unless additional action is taken on several fronts.

This situation persists in spite of the fact that GI is often championed by WC entities. For example, the design standards developed in 2000 by the WC Water Resource Commissioner urge developers to consider LID solutions as a first option.⁹⁵ They even go so far as to suggest stormwater solutions that fall outside of their jurisdiction (e.g., minimizing impervious surfaces). In 2010, Pittsfield Township

⁹⁴ “Green Infrastructure,” EPA, <http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm>, accessed June 28, 2012.

⁹⁵ “Design Standards,” *eWashtenaw: Water Resource Commissioner* (2012), http://www.ewashtenaw.org/government/drain_commissioner/dc_webPermits_DesignStandards/dc_Rules, accessed June 28, 2012.

completed its Master Plan, which includes a commitment to protect water resources and draws attention to specific LID techniques and to the Southeast Michigan Council of Governments (SEMCOG)/Michigan Department of Environmental Quality (MDEQ)-produced 2005 LID Manual.⁹⁶ Yet, in spite of the good intentions of WC public servants, GI is being implemented throughout the county in a piecemeal fashion.

Why not?

If the desire to protect water resources from stormwater runoff is strong in WC, what is preventing implementation of GI? That is the question that the Huron River Watershed Council (HRWC) posed to begin planning and encouraging broader GI implementation. Through literature review and interviews with multiple local governments, a number of barriers to GI planning in WC were identified and a number of solutions for overcoming these barriers were explored. Both the barriers and the solutions are outlined in this report. The initial round of interviews included the City of Ann Arbor, Ypsilanti Township, Pittsfield Township, the Water Resource Commissioner's (WRC) office, and the Road Commission (RC).

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⁹⁶ "2010 Pittsfield Master Plan," *Pittsfield Charter Township* (2009), <http://pittsfieldtwp.org/masterplan.html>, p. 115-116, accessed June 28, 2012.

Appendix B: Township Ordinances

Pittsfield Township

Pittsfield Township completed its Master Plan in 2010.⁹⁷ The Plan specifically targets protection of water resources with admirable intentions and forward-looking goals.⁹⁸ It highlights several LID BMPs, such as flow-through planters, rain gardens, and permeable pavement. A “key concept” is to “protect and preserve the quality of our water resources,” which includes the following priorities:

- “Encourage native landscaping and natural stormwater management systems [i.e., LID practices] . . . to be used in new development and the rehabilitation of developed sites.
- “Create/adopt guidelines for [LID] design and maintenance standards.
- “Proactively address potential code enforcement issues with a program where people can register their [LID] and maintenance plans with the township.”

Creating and adopting guidelines for LID design and maintenance, as well as enforcement mechanisms, is the necessary next step in order to see changes in development practices. At present, though the will to develop enforceable standards exists, their adoption is delayed by the presence of outdated WRC design standards.

“Soft” policies, such as training and education priorities and objectives, can also influence implementation of LID. Pittsfield is required by their NPDES permit to educate the public about stormwater pollution.⁹⁹ Part of their education plan involves the promotion of professional workshops in conjunction with other county or regional bodies, and LID practices may be targeted.¹⁰⁰ But when design standards do not require a change from the status quo, or when the rules actually make LID implementation more difficult, education is ineffective.

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Augusta Township

⁹⁷ See “2010 Pittsfield Master Plan,” *Pittsfield Charter Township*, <http://pittsfieldtwp.org/masterplan.html>, accessed July 3, 2012.

⁹⁸ “2010 Pittsfield Master Plan,” *Pittsfield Charter Township*, pages 115-120, <http://pittsfieldtwp.org/mp-a-green-pittsfield-107-120.pdf>, accessed July 13, 2012.

⁹⁹ EPA’s National Pollution Discharge Elimination System, administered by the MDEQ.

¹⁰⁰ *Pittsfield Charter Township: Storm Water Management Program Plan*, September 30, 2004, http://www.pittsfield-mi.gov/NRC_Storm_Water_Program_Plan.pdf, accessed July 13, 2012.

Augusta Township completed their master plan in 2004¹⁰¹ and revised their zoning ordinance in 2007.¹⁰² The first objective under Environmental Protection in the master plan is to “protect the township’s surface and groundwater resources.” Strategies one and two are to

1. “Minimize surface water pollution from lawn chemicals, road salt, and sediment contained in urban stormwater by implementing innovative stormwater [BMPs] in developments throughout the township.
2. “Investigate the development of supplementary stormwater regulations for the township, such as impervious surface regulations and natural feature buffer requirements.”¹⁰³

Later in the plan, under Land Use, stormwater management is again targeted to protect water resources. The township intends to partner with the WRC “to seek the most innovative, highest quality stormwater management improvements in new developments in the township.” This could “also involve the township adopting supplemental regulations to those of the [WRC], such as impervious surface regulations or alternative runoff discharge standards.”¹⁰⁴

The master plan was implemented in the 2007 Zoning Ordinance.¹⁰⁵ Regarding Stormwater Management, BMPs are encouraged, and “nonstructural control techniques,” such as vegetated buffers, infiltration devices, grass- or rock-lined swales, are encouraged “to the maximum extent feasible.”¹⁰⁶ But the line is drawn at the WRC standards: either “meet or exceed” the county standards. Again, examples of LID practices are suggested, but there is no specific guidance given for construction. The township may waive design standards that implicate unnecessary impervious surfacing in order to preserve open space, “whenever it finds that such deviations are more likely to meet the intent and standards of this

¹⁰¹ *Augusta Charter Township Master Plan*, December 14, 2004, <http://augustatownship.org/PDFs/ATMP%202007.pdf>, accessed July 3, 2012.

¹⁰² *Zoning Ordinance: Augusta Charter Township*, August 1, 2007, http://augustatownship.org/PDFs/Ordinances/Augusta%20Zoning%20Ordinance_Adopted%20%208-1-07.pdf, accessed July 3, 2012.

¹⁰³ *Augusta Charter Township Master Plan*, December 14, 2004, <http://augustatownship.org/PDFs/ATMP%202007.pdf>, accessed July 13, 2012, p. 50.

¹⁰⁴ *Augusta Charter Township Master Plan*, December 14, 2004, <http://augustatownship.org/PDFs/ATMP%202007.pdf>, accessed July 13, 2012, p. 67.

¹⁰⁵ *Zoning Ordinance: Augusta Charter Township*, August 1, 2007, http://augustatownship.org/PDFs/Ordinances/Augusta%20Zoning%20Ordinance_Adopted%20%208-1-07.pdf, accessed July 13, 2012.

¹⁰⁶ *Zoning Ordinance: Augusta Charter Township*, August 1, 2007, http://augustatownship.org/PDFs/Ordinances/Augusta%20Zoning%20Ordinance_Adopted%20%208-1-07.pdf, accessed July 13, 2012, Section 9.14.

Ordinance,” but this is optional. For example, a developer can avoid the use of fully-paved cul-de-sac, but they are not required to do so. The emphasis remains on detention and retention ponds, as the WRC rules require.

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Appendix C: CIP Development

Ann Arbor

The City of Ann Arbor develops the majority of its CIP as a result of their assets management program. For example, valves need to be replaced routinely. The second stream of input into the CIP comes from citizen complaints or staff projects. For example, if there is a complaint about flooding, a citizen can request that the city investigate. If 51% of residents affirm a project, the city must act. Regarding staff projects, a good example is the erosion problem behind the 10th green at Leslie Golf Course. A staff member noticed a problem and initiated the redevelopment process. While including these sources—citizen complaints and staff projects—in the CIP process is important, the fact that they overshadow strategic planning toward stormwater management makes implementation of GI challenging.

Water Resource Commissioner

The WRC faces similar obstacles to strategic development and improvement of capital. For instance, “major drain projects (generally defined as those with costs in excess of \$5,000 per mile) are initiated by citizens or municipality(s) through a petition process.”¹⁰⁷ They admit that they are “constrained by the customer” for both improvement and maintenance. In their words, “we use green approaches to [these projects], but it’s not a proactive approach, and is on a very case-by-case basis.”¹⁰⁸ Further, their funding for projects faces restrictions in scope. For example, it must primarily address the problem of flooding, not environmental concerns (though some funding sources, such as the SRF, prioritize water quality). This makes them responsive to the community they serve, but prevents the strategic planning necessary for GI implementation.

Road Commission

The Transportation Improvement Plan (TIP) that directs the RC’s projects is developed by a state-appointed regional committee that includes wide and varied interests among its members, e.g., AATA (busses) and Americans with Disabilities. In the RC’s perspective, “we are a very small voice.”¹⁰⁹ The committee decides upon a 3-year plan and divides the federal funding between the different groups. The process requires entities such as the WC RC to know their own plans and priorities well in advance “with little room for movement” following disbursement. The money is usually “very limited in scope.” Other funding, such safety and air quality grants that the RC “aggressively pursues,” are also heavily

¹⁰⁷ “Water Resources Commissioner: Services and Responsibilities,” *eWashtenaw*, 2012, http://www.ewashtenaw.org/government/drain_commissioner/dc_webServicesResponsibilities, July 23, 2012.

¹⁰⁸ Personal interview with WRC staff, May 17, 2012.

¹⁰⁹ Personal interview with RC staff, June 14, 2012.

restricted funds. Funding that comes through the MI Transportation Fund (MTF) is only substantial enough to provide for operational costs and for matching funds for federal funding (typically 20%). The RC develops its own 5-year plan for improvement projects, but it also splits the MTF funding it receives with maintenance, building upkeep, etc.

In addition, the RC planning process faces time restrictions. For example, funding often has to be spent within one year, which precludes any lengthy strategic planning. In the end, “coming up with a green stormwater management plan is challenging, especially in financially-hard times.” As a result, though the RC engineers are adequately trained in LID practices, there have been no LID projects implemented by the RC.

Townships

Townships hold some capital that could be utilized for both LID stormwater treatment and for educational purposes for their residents and developers. For instance, Ypsilanti Township owns 28 parks and Green Oaks golf course, and they frequently take properties that go into foreclosure. Ypsilanti is presently going through economically challenging times, and the reduction or elimination of state support intensifies each year. As a result, though they used to budget for capital investment and improvement in the township, they “can’t remember the last time [they] budgeted anything for [it].”¹¹⁰ There are a few informal/private lists of priorities, but even these haven’t been updated in a couple of years. In addition, much of their present funding comes through the Parks and Recreation department and is therefore limited in scope. While GI is on Ypsilanti’s radar, they don’t have the capacity to develop strategic plans. Though some LID projects have been completed or will be completed in the next few years, GI eludes the township as a solution for stormwater.

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¹¹⁰ Personal interview, May 21, 2012.

Appendix D: Ann Arbor's Stormwater Utility

The City of Ann Arbor responded to the new legal environment following the *Bolt v. City of Lansing* decision through its Task Force, which served to “relay information about stormwater needs, provide advice on stormwater utility implementation issues . . . participate in [the] public engagement program, [and] report to City Council.”¹¹¹ Regarding the first criterion from the Supreme Court decision, they developed “level of service [LOS] principles” (in order to determine what level of service the city would offer), elements of effective stormwater programs, and four LOS options for the city. They then estimated allocations of revenue under each LOS option and determined what LOS they would plan for.

In response to the second criterion, they asked how much money would be needed for each LOS, from whom the money should be collected, and how stormwater services should be priced. The Task Force decided that “impervious area [would be] used as the basis for an equitable rate model and cash flow analysis.” They used existing Ann Arbor GIS data and remote sensing to generate the amount of impervious area on each parcel of land, confirmed the results with field verification and geo-statistical analysis, and then assigned each parcel to one of four tiers. Each tier was then charged a specific stormwater usage fee. The city developed a website where a property owner could access the property’s analysis and make appeals. The city made a commitment to update the data every two to three years, and they established cost-sharing mechanisms with other City units and the University of Michigan.

In response to the third criterion, credits were offered to property owners for managing stormwater responsibly on-site. For example, a property owner could reduce his or her stormwater fee up to 50% by installing rain barrels, rain gardens, or standardized detention basins, or by establishing their home as a “RiverSafe Home” (a program administered by the WRC), etc. This gave property owners a choice regarding their level of participation in stormwater services. The city developed a website to facilitate the credits. Ann Arbor then advertised the new program through TV, radio, and web outlets, promoted RiverSafe Homes, and published articles about wastewater.

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¹¹¹ Molly Wade and John Aldrich, “Re-tooling Ann Arbor’s Storm Water Utility to Address Change Legal Precedents,” Presentation at the Michigan Water Environment Association Conference, June 23, 2009, http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&sqi=2&ved=0CF0QFjAA&url=http%3A%2F%2Fwww.mi-wea.org%2Fdocs%2F7_SW%2520Utility%2520in%2520AnnArbor_Wade.ppt&ei=X-wOUPC5KsqirAG5p4C4DQ&usg=AFQjCNHVp17mm-Ec9tgZ9w8X20fwHaNJCg&sig2=Cc02DU7VwW5rhbF3-zvEvv, accessed July 24, 2012.