Chapter 7

Watershed Flow Regime Restoration Evaluaton Process

Study Evaluation

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Study Evaluation

Introduction

This chapter reports the results from a questionnaire designed to evaluate the usefulness of the tools for project owners and project sponsors, facilitators, and other third parties engaged in ecosystem improvement. A questionnaire was administered in three parts to Rouge River watershed partners and in two parts to Menomonee watershed stakeholders. The questionnaires covered topics related to the utility of the knowledge gained from the project and how best to ensure that the study leads to improvements in the health of the Great Lakes ecosystem. Appendix 7A, Project Evaluation Results, contains the forms and the raw data for the Rouge participants and Appendix 7E, Milwaukee Area Study Evaluation Results, contains the forms and raw data for the Milwaukee area participants.

This and other chapters are a series of related documents[1] developed under a study to address Great Lakes flow regime-based ecosystem improvement projects. These chapters are presented individually because different applications are anticipated depending upon end users' goals. Chapters may be useful to users individually or collectively[2].

Questionnaire Administration and Results

The questionnaires were administered during the Forum of Rouge River Watershed Stakeholders and Forum of Milwaukee Area Watershed Stakeholders. Appendix 7B, Rouge River Implementation Forum Agenda, contains the forum objectives and agenda. In addition to the forum facilitators, eight stakeholders representing city and county stormwater authorities, community interests, and development interests in the Rouge River watershed participated. Appendix 7C, List of Forum Participants, identifies the participants and their affiliations. As a next step toward implementation, participants were asked to provide feedback on an example agreement, provided in Appendix 7D, Example Contract for an Offsite Improvement to Comply with Stormwater Ordinance. The survey results of the Example Contract are included in Appendix 7D.

The corresponding objectives for the Forum of the Milwaukee Area Watershed Stakeholders are in Appendix 7F, Milwaukee Area Implementation Forum Agenda. Milwaukee participants and their affiliations are identified in Appendix 7G, List of Milwaukee Area Forum Participants.

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[1] Executive Summary, Chapter 1: Watershed Flow Regime Restoration Evaluation Process, Chapter 2: Developing Stormwater BMP Quality Gallon Metric, Chapter 3: BMP Evaluation Process, Chapter 4: Quality Gallon Accounting System Protocol, Chapter 5: Facilitating and Funding Stormwater Management for Ecosystem Improvement, Chapter 6: Ecosystem Improvement Transaction Example Contracts, Chapter 7: Study Evaluation, Chapter 8: Study Communication Summary

[2] The project team members (CH2M HILL in association with The Conservation Fund, Cook and Franke, Public Sector Consultants, and Stormtech) acknowledge the generous support from the Great Lakes Protection Fund as part of their Growing Water suite of research projects.

Conceptual Approach

The Rouge forum questionnaire was administered in four parts. The first form and part of the second form addressed components of the conceptual approach. The first form had two sections: 1) managing stormwater for ecosystem improvement; and 2) quantifying improvement using quality gallons. The third conceptual topic, stormwater ordinances, was evaluated on a second form. The Milwaukee Area forum received the identical questions relating to the conceptual approach. The close-ended questions were rated on a five-point scale, with "1" for strongly disagree and "5 "for strongly agree. The results for the Rouge River are reported first, followed by the Milwaukee Area.

All eight Rouge River participants completed the first form. One participant could not stay for the entire workshop and missed completing the second form. The averages of the responses are reported in Tables 7-1A, 7-2A, and 7-3A. All eight Milwaukee Area participants completed all three forms and their corresponding responses are summarized in Tables 7-1B, 7-2B, and 7-3B.

Ecosystem Restoration

Rouge River Stakeholders

Among the Rouge River stakeholders, there was strong agreement (an average of 4.6 out of 5) that the health of rivers and streams is related to how stormwater flow is managed. Even more telling was the strong agreement (an average of 4.8 out of 5) that stormwater best management practices (BMPs) should be selected and designed to provide multiple benefits including flood protection, flow moderation, water quality improvement, and others. This support was amplified in discussions during the forum. Although it was widely recognized that the concept must be sold to developers, members of the general public, and even stormwater engineers, the participants were convinced that results (for example, fish returning to the streams) would be sufficiently compelling to build and sustain support for taking action. A recent unexpected discovery of trout in a reach of the Rouge River amplifies this point.

TABLE 7-1A
Rouge River Stakeholder Summary on Conceptual Approach: Ecosystem Restoration

Contractual Elements	Average Response [a]
Health of rivers and streams is related to how stormwater flow is managed.	4.6
Stormwater BMPs should be selected and designed to provide multiple benefits including flood protection, flow moderation, water quality improvement, and others.	4.8
Stormwater BMPs should focus only on flood protection.	1.3
The flow duration curves provide a reasonable basis for assessing current conditions and ecosystem restoration targets.	3.4
The state of science does not support a relationship between stormwater management and ecosystem improvement.	2.0
There are better ways to restore the aquatic ecosystem than by restoring flow regimes using stormwater BMPs.	2.5

[a] Responses were provided on a scale of 1 to 5, with 1 being "strongly disagree" and 5 being "strongly agree."

Respondents were neutral to slightly positive (an average of 3.4 out of 5) about the flow duration curve approach for assessing current conditions and ecosystem restoration targets. They were also somewhat neutral about whether there are better ways to restore the aquatic

ecosystem than by restoring flow regimes using stormwater BMPs. These results suggest that stakeholders are keeping an open mind about how best to evaluate and/or restore the health of aquatic ecosystems. For example, in the open ended responses, one stakeholder suggested that it would be better to restore the stream channel, especially oxbow restoration. During forum discussions, some stakeholders promoted low impact development and selective preservation of open space as alternatives for limiting increases in imperviousness. Such approaches were recognized as complementary to stormwater BMPs, and while not specifically discussed during the forum, they are consistent with flow regime restoration.

Milwaukee Area Stakeholders

To interpret the Milwaukee Area stakeholder responses relative to the Rouge River responses, it is helpful to know that a number of the Milwaukee stakeholders have a pressing need to manage stormwater to meet total suspended solids (TSS) regulations specific to Wisconsin. Thus, their interest was in evaluating the extent to which this research might present some opportunities to help meet this need. Clearly, the study purpose was not directed toward reducing pollutant loadings, however there is considerable overlap between managing stormwater for flow and for pollutant loading. Indeed, this topic generated a considerable amount of interesting discussion related to implementing the approach to help meet TSS reduction regulation targets and to help watersheds throughout the Great Lakes Basin improve water quality by managing flow. This topic is discussed further under the section on lessons learned.

An additional distinction for this group is that the work is fairly new to most of them. For the Rouge we had more continuity in stakeholder representation throughout the project, whereas for the Milwaukee Area, the stakeholder group changed as the project evolved to capitalize on drivers for implementing flow-based aquatic ecosystem improvements. In the case of both forums, the objective was to convene a group capable of implementing some of the concepts and tools of the research. Thus while the Milwaukee area stakeholders did not all have the full benefit of participating in each of the preceding workshops and conference calls, they did have the need and desire to improve upon current stormwater management practice to achieve ecosystem improvement goals.

TABLE 7-1B
Milwaukee Area Stakeholder Summary on Conceptual Approach: Ecosystem Restoration

Contractual Elements	Average Response [a]
Conceptual Approach (Ecosystem Restoration)	
Health of rivers and streams is related to how stormwater flow is managed.	4.6
Stormwater BMPs should be selected and designed to provide multiple benefits including flood protection, flow moderation, water quality improvement, and others.	4.4
Stormwater BMPs should focus only on flood protection.	1.8
The flow duration curves provide a reasonable basis for assessing current conditions and ecosystem restoration targets.	3.5
The state of science does not support a relationship between stormwater management and ecosystem improvement.	2.3
There are better ways to restore the aquatic ecosystem than by restoring flow regimes using stormwater BMPs.	3.1

[a] Responses were provided on a scale of 1 to 5, with 1 being “strongly disagree” and 5 being “strongly agree.”

Despite their differences, there were remarkable similarities in responses between the two groups on their views about the conceptual approach toward ecosystem restoration. As shown in Table 7-1B, the Milwaukee Area stakeholders strongly agreed (4.6 average score) that the health of rivers and streams is related to how stormwater flow is managed. They also agreed (4.4 average score) that stormwater BMPs should be selected and designed to provide multiple benefits including flood protection, flow moderation, and water quality improvement. They rejected the notion that stormwater BMPs should focus only on flood protection. The average score suggests that the group was neutral about the flow duration curve approach toward assessing current conditions and ecosystem restoration targets. In part, this reflects their limited familiarity with the approach. They remain cautious, but open-minded.

This group believes that the state of science does support a relationship between stormwater management and ecosystem improvement. However, based on group discussions, it is apparent that more work establishing these relationships is needed. We interpret this to mean that while the flow duration curves provide evidence in support of these relationships, this work alone is not definitive or all-encompassing. The group was neutral about the existence of better ways to restore the ecosystem than stormwater BMPs. They added that BMPs designed to tackle flow and water quality should be a big part of the solution, along with physical stream restoration and removal of barriers. We agree with this assessment.

Quality Gallons

Rouge River Stakeholders

Rouge Forum participants were generally supportive of the "quality gallon" concept. They all agreed or strongly agreed that the quality gallon approach of ranking BMPs by their contribution to watershed goals has merit; that this metric is a practical and useful tool for quantifying the contribution of stormwater BMPs toward restoring rivers and streams; and that quality gallons, combined with costs, provide a sound basis for ranking stormwater BMPs on the basis of ecosystem improvement per dollar spent. They did not have difficulty with following how the quality gallons were calculated and they did not agree that the units were too small to be manageable. Finally, they did not seem to think that other metrics were preferable, but this could be because they were not aware of any other metrics. One stakeholder indicated that a metric capturing pollutant loading was worth consideration for meeting water quality objectives.

In the discussions, one stakeholder observed that one could come up with better nomenclature to describe the concept of managing flow for ecosystem improvement. However, the stakeholder was referring to naming a program (for example, energy star program used to identify energy efficient appliances) that would convey the benefits of stormwater management to the public rather than a metric to quantify the benefits. Most participants felt that a systematic method of quantifying the gains from stormwater management, setting priorities, and ranking alternatives was essential for moving the concept of stormwater management for ecosystem improvement forward. It was needed for educating internally (for example, stormwater engineers) and for working effectively as a watershed team that could cross jurisdictional and regulatory boundaries.

Milwaukee Area Stakeholders

Comparing the results from Tables 7-2A and 7-2B shows that the Milwaukee Area stakeholders shared similar views on the quality gallon conceptual approach toward quantifying ecosystem improvement as their Rouge River counterparts. They thought the approach was straightforward to regulators and others familiar with stormwater management, but one respondent did not seem to think it would be a meaningful term to use with the general public. This response reinforced the comment made by one Rouge River participant who thought that one would want to devise a different name for the "program" in order to improve communication with the public.

TABLE 7-2A
Rouge River Stakeholder Summary on Conceptual Approach: Quality Gallons

Contractual Elements	Average Response [a]
The quality gallon approach of ranking BMPs by their contribution to watershed goals has merit.	4.4
The quality gallon metric is a practical and useful tool for quantifying the contribution of stormwater BMPs toward restoring rivers and streams.	4.0
It is hard to follow how quality gallons are calculated.	2.9
A quality gallon is too small of a unit if a watershed restoration requires on the order of 1 to 100 million of them to be effective. The unit should be consolidated to a more manageable number.	2.4
Quality gallons, combined with costs, provide a sound basis for ranking stormwater BMPs on the basis of ecosystem improvement per dollar spent.	4.3
Other metrics for quantifying ecosystem improvements because of stormwater BMPs are preferable to quality gallons.	2.5

[a] Responses were provided on a scale of 1 to 5, with 1 being "strongly disagree" and 5 being "strongly agree."

TABLE 7-2B
Milwaukee Area Stakeholder Summary on Conceptual Approach: Quality Gallons

Contractual Elements	Average Response [a]
The quality gallon approach of ranking BMPs by their contribution to watershed goals has merit.	3.9
The quality gallon metric is a practical and useful tool for quantifying the contribution of stormwater BMPs toward restoring rivers and streams.	3.8
It is hard to follow how the quality gallons are calculated.	2.9
A quality gallon is too small of a unit if a watershed restoration requires on the order of 1 to 100 million of them to be effective. The unit should be consolidated to a more manageable number.	2.9
Quality gallons, combined with costs, provide a sound basis for ranking stormwater BMPs on the basis of ecosystem improvement per dollar spent.	3.8
Other metrics for quantifying ecosystem improvements due to stormwater BMPs are preferable to quality gallons.	3.0

[a] Responses were provided on a scale of 1 to 5, with 1 being "strongly disagree" and 5 being "strongly agree."

Stormwater Ordinances

Rouge River Stakeholders

The third and last conceptual topic was to evaluate stormwater ordinances as a tool for implementing flow-based ecosystem improvements. One participant could stay only for the first hour of the forum and missed completing the last three forms. The average results of the

remaining seven participants (Table 7-3A) show that this group of Rouge River stakeholders is very supportive of this concept. They strongly agreed that stormwater ordinances are an appropriate mechanism for implementing stormwater BMPs that result in ecosystem improvement. Furthermore, they agreed that for the Rouge River watershed, stormwater ordinances covering new development and redevelopment are a promising near-term solution for making ecosystem improvement progress. Respondents indicated that flexible ordinances to achieve ecosystem improvement are feasible in today's political and economic climate. Responses were mixed, however, on the issue of how far ordinances must go to result in timely ecosystem improvement. That is, there was not a consensus on whether such ordinances would need to cover all landowners or just development and redevelopment.

TABLE 7-3A
Rouge River Stakeholders Conceptual Approach: Stormwater Ordinances

Contractual Elements	Average Response [a]
Stormwater ordinances are an appropriate mechanism for implementing stormwater BMPs that result in ecosystem improvement.	4.6
Stormwater ordinances would need to cover all landowners and not just new development and redevelopment in order to result in timely ecosystem improvement.	3.1
For the Rouge River watershed, stormwater ordinances covering new development and redevelopment are a promising near-term solution for making ecosystem improvement progress.	4.1
In today's political and economic climate, flexible stormwater ordinances to achieve ecosystem improvement are not feasible.	2.0

[a] Responses were provided on a scale of 1 to 5, with 1 being "strongly disagree" and 5 being "strongly agree."

An interesting twist on flexible stormwater ordinances came up during discussion. Namely, a question was posed (for situations where the flood management requirements of the ordinances would do little to mitigate downstream flooding) regarding whether developers could trade onsite flood control for quality gallons on- or offsite. The group seemed supportive of this idea, which originated with one of the stakeholders. It was seen as a way to make the concept attractive to developers who could then more intensively develop one highly profitable location in return for restoring offsite locations that may have greater ecological value than market value as developed property. Stakeholders also identified that flood control governs the overall size of stormwater BMPs—if progress can be made toward reducing the required volume through a lower standard, significant cost savings could be gained that could apply to flow regime restoration offsite. The broader issue of developing design standards for meeting both flood management and ecosystem improvement objectives, including water quality, was recognized as something that would need to be addressed, but was not viewed as an insurmountable obstacle. As one participant noted, they need to be able to apply the quantification method, whether with the quality gallon method or other method, to set the standard and measure the performance of rain gardens to provide credit towards flood control.

Milwaukee Area Stakeholders

As summarized in Table 7-3B, the Milwaukee Area stakeholders also supported the concept of stormwater ordinances as a tool for implementing ecosystem improvement. At first, they thought the approach might be more pertinent to addressing development and redevelopment, as opposed to the overall requirement of urbanized areas to meet 20 percent

and 40 percent TSS reduction requirements. Through discussion it became apparent that, to take most advantage of what the proposed approach has to offer, urbanized areas would need to find a way to count stormwater improvements by private property owners toward the 20 percent and 40 percent TSS reduction requirements. The Wisconsin Department of Natural Resources (WDNR) representative expressed the personal opinion that if property owners can be made accountable for such reductions, then perhaps the reductions could be counted towards regulatory requirements. City representatives indicated that they believed they had such authority through permit renewals and were interested in whether or not that would be sufficient for WDNR. The issue regarding the conditions for using the stormwater ordinances for implementing pollutant load reductions in conjunction with managing flow was identified for further exploration by both the city and WDNR.

TABLE 7-3B
Milwaukee Area Stakeholders Conceptual Approach: Why Stormwater Ordinances?

	Average Response [a]
Stormwater ordinances are an appropriate mechanism for implementing stormwater BMPs that result in ecosystem improvement.	3.9
Stormwater ordinances would need to cover all landowners and not just new development and redevelopment in order to result in timely ecosystem improvement.	3.6
For the Milwaukee area watersheds, stormwater ordinances covering new development and redevelopment are a promising near term solution for making ecosystem improvement progress.	3.7
In today's political and economic climate, flexible stormwater ordinances to achieve ecosystem improvement are not feasible.	2.3

[a] Responses were provided on a scale of 1 to 5, with 1 being “strongly disagree” and 5 being “strongly agree.”

The group believes that regulated entities are in favor of smarter management of stormwater, but they are not interested in new layers of regulations. Incentives, or “Carrots”—such as the flexibility to meet requirements offsite, decreases in stormwater utility fees if property owners demonstrate that they have achieved infiltration targets, and expedited permitting—could be applied. The WDNR representative noted that the Wisconsin Green Tier Program can help in this regard. In addition, the city observed that regional solutions were needed to ensure that the regulated entities would face the same regulations and opportunities throughout the region and that no one area would experience a competitive disadvantage for development dollars. One participant mentioned that the developer can receive a direct return on investments in aesthetic stormwater BMPs such as rain gardens and stormwater wetlands relative to structural controls. This return would come in the form of higher property values.

Interestingly, this group believes that the concept could be harder to sell to the public. One participant recommended communicating to the public in terms of water quality because that is now an understandable concept. Another participant was concerned that any change in ordinances should not be perceived as a new tax burden for the general public, which is not supportive of stormwater management other than for flood protection. This suggests that a public education process would need to precede any broad-based approach toward having all landowners share in the responsibility for managing stormwater. However, in the case of development and redevelopment, progress can be made more quickly.

Measure of Outcomes

Rouge River Stakeholders

One way to measure outcomes of the project is to obtain direct feedback from Great Lakes stakeholders on the potential applicability and usefulness of the products of the research. As summarized in Table 7-4A, the Rouge River forum participants showed strong support for the concept of managing stormwater for ecosystem improvement, for quality gallons as a tool for quantifying and ranking stormwater BMPs, and for using stormwater ordinances to affect changes leading to ecosystem improvement. Although they did not believe that impediments to implementing flexible stormwater ordinances were insurmountable, they named the following existing impediments:

TABLE 7-4A
Measure of Outcomes

Contractual Elements	Average Response [a]
The concept of managing stormwater for ecosystem improvement is worth exploring.	4.7
Quality gallons as a tool for quantifying and ranking stormwater BMPs shows promise.	4.4
Stormwater ordinances with ecosystem standards are a promising way to achieve progress towards ecosystem improvement.	4.6
There are too many impediments to using flexible stormwater ordinances for implementing ecosystem improvement any time soon.	2.4

[a] Responses were provided on a scale of 1 to 5, with 1 being “strongly disagree” and 5 being “strongly agree.”

- Lack of political will
- Influence of the development community on legislature and local government
- Public’s lack of understanding of water quality issues
- Lack of state leadership that is consistent and evident
- City councils
- Planning ordinance
- Master land use ordinance
- No wetland ordinance
- No stormwater ordinance
- Need for something simple enough for regulators who review projects and for regulated community to understand

Milwaukee Area Stakeholders

The Milwaukee Area stakeholders shared similar reactions on the applicability of the concepts to their area as the Rouge River stakeholders. Their average survey scores are reported in Table 7-4B. Participants also cited similar impediments as well as the belief that eventually they will move in this direction. The Milwaukee Area stakeholders were interested in modifying the quality gallon metric to explicitly track TSS reductions because of the State of Wisconsin

TABLE 7-4B
Measure of Outcomes

Contractual Elements	Avgerage Response [a]
The concept of managing stormwater for ecosystem improvement is worth exploring.	4.5
Quality gallons as a tool for quantifying and ranking stormwater BMPs shows promise.	4.0
Stormwater ordinances with ecosystem standards are a promising way to achieve progress towards ecosystem improvement.	3.6
There are too many impediments to using flexible stormwater ordinances for implementing ecosystem improvement any time soon.	2.4

[a] Responses were provided on a scale of 1 to 5, with 1 being “strongly disagree” and 5 being “strongly agree.”

regulatory requirement on TSS.

During discussion it was mentioned that this is something that could be done using data on pollutant loadings. The desired pollutant load reductions would then be reflected in both the quality gallon calculations and the BMP design criteria. The specifics on how this would be accomplished have not yet been investigated. Citing administrative ease, one participant raised the issue of going directly to prescribing design criteria and eliminating quality gallons altogether. This proposal was not endorsed by the group because it was recognized that much in terms of flexibility and incentives would be lost by this approach. It was clear, however, that administrative ease is an issue and that it would play a role in how this group of stakeholders would approach tweaking the quality gallon approach, if adopted. The group also debated the merits of the priority weighting factors that transform the gallons into quality gallons. They expressed some concern that the subjective nature of the weights could lead to criticisms of being arbitrary, but they appreciated the flexibility for targeting local concerns and priorities.

Some specific next steps to help expedite the process are summarized under "Lessons Learned," below.

Lessons Learned

Rouge River Stakeholders

A final area of obtaining feedback from the Rouge River stakeholders was on lessons learned. Table 7-5A summarizes the views of the six forum participants who provided feedback. The first question was intended to give the project team insight into what stakeholders believed to be the biggest barrier to the implementation of flow management for ecosystem improvement using quality gallons. The responses were varied, and by and large, the products of this research include tools to assist stakeholders with overcoming the barriers. For example, stakeholders listed the following points:

- Must be done regionally, so that development disincentives are not realized (that is, cannot impose stricter ordinances in one community only to have developers move to the neighboring community)
- Acceptability and administration of offsite maintenance agreement, especially long-term maintenance
- A set of commonly accepted standards needs to be applied (for example, agreement on quality gallon accounting system)
- Get all parties to agree to improvements (Michigan Department of Environmental Quality [MDEQ], County, City, Township, Mayor, Council, Developer, Owner)
- Potential legal/risk issues
- Manageable, easy to understand ordinance requirement or option

From working with the Rouge River forum participants and other Rouge River stakeholders, our take home message was that this group was ready to confront these challenges and move forward with overcoming barriers to implementation. Participants are looking to Wayne County to lead the effort.

TABLE 7-5A
Rouge River Stakeholders Lessons Learned

	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6
I. Lessons learned about ecosystem improvement						
a. What do you believe to be the biggest barrier to the implementation of flow management for ecosystem improvement using quality gallons?	Must be done regionally so that development disincentives are not realized. Accept/Admin of offsite maintenance agreement.	There needs to be a set of commonly accepted standards applied.	Getting all parties to agree to improvements (MDEQ, county, city, township, mayor, council, developer, owner)	Acceptance by local governments; potential legal/risk issues; long term maintenance.	Agreement on quality gallon manageable, easy to understand ordinance requirement or option. Off site facilities would be difficult to manage and ensure compliance.	Getting stakeholders to buy in (state and local regulators and development community) to concepts and to how it will be used locally; will take upfront work to customize tool to specific watershed.
b. How has the project changed your view of managing stormwater for ecosystem improvement?	I like the idea to encourage quality improvement. The main reason is that it encourages infiltration which is greatly needed. Also, includes incentive to imperv. agreement.	It's given me some ideas for additional thought.	Some new tools for improvements to system.	Reinforce the need to reconsider the most effective BMPs for each site. Cumulative effect = positive impact.	I like the concept of assigning a numeric value to different storm water BMPs to achieve better water quality and quantity results.	Yes
II. Lessons about the design of our project						
Under what circumstances can you envision using the tools and approaches from this project to change the way that stormwater is managed in your watershed and/or other watersheds in the Great Lakes Basin?	If embraced by region (watershed, city, etc.)	Catalog possible retrofit opportunities for detention ponds (that is, how many quality gallons can be obtained conv. dry pond/ wet pond to wetland pond) and apply and use for redevelopment situations.	All parties agree to No. 1 and setting. Having technical groups set up BMP numbers that all engineers and designers can see what is required.	Great "renewal" exercise; solving existing flow situations by proposing a demonstration project in a high profile location—preferably grant funded with percent match.	Selection of BMPs would be better founded in what the management goals are for the watershed. It could be used to better tailor regulatory requirements to individual watersheds.	Tie tools to Phase II NPDES stormwater "post construction" requirements (for example local stormwater ordinances) for permittees; tool used by watershedwide agency.

TABLE 7-5A
Rouge River Stakeholders Lessons Learned

	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6
III. Other						
Please use this space to provide any feedback or recommendations that you believe would be helpful to the Project Team to facilitate implementation of flow management for ecosystem improvement.	Agreed upon BMP ratios by all especially state	Need to refine practical application in this area (SEMI)		The language in the "forum" description is ponderous rather than user friendly. Plain English makes the concept and especially the quality gallon formula more approachable; thus understood the first time.	Try to demonstrate how a transition from current regulations to the proposed system would happen.	Good tool—hope to see further requirements.

NPDES = National Pollutant Discharge Elimination System

The purpose of the second question was to gain an understanding of how the project may have influenced the way participants think about managing stormwater, especially by linking stormwater management to ecosystem improvement. One respondent appreciated how this project showed the linkages between imperviousness and ecosystem quality. This finding confirmed the respondent's view that encouraging infiltration is critical to ecosystem restoration. Other stakeholders were swayed by the new tools for ecosystem improvement, including the systematic approach toward setting BMP priorities to achieve the greatest improvement for a given budget. Our interpretation is that the study affirms that managing stormwater for ecosystem improvement is more credible and feasible to this group of stakeholders as a result of this project.

Stakeholders reported on circumstances by which they could envision implementing the tools and approaches of the research to change the way that stormwater is managed in their watersheds and the Great Lakes Basin. Most participants seemed to respond to "how" they envisioned moving forward with implementation. Some suggested diving right in and applying the tools now to catalogue candidate projects, quantify quality gallons, and start holding developers and redevelopers accountable. One participant added that finding sources of matching funds to share in the cost of a pilot demonstration was the first step. Others thought that additional stakeholders needed to buy into the process first. Finally, some participants wanted to refine the approach to ensure that the quantification method incorporates the specific requirements of the watershed, including water quality requirements.

In terms of making recommendations to the project team on what could be done to facilitate implementation of flow management for ecosystem improvement, there were two types of suggestions.

- Develop a simplified description of the conceptual approach, one intended for the general public.
- Develop a demonstration or implementation pilot to apply the tools and approaches.

Milwaukee Area Stakeholders

The Milwaukee Area stakeholders expressed the view that any new regulatory burden would be an impediment to implementation, but tweaking the approach to improve implementation of existing regulations would be welcome, especially if accompanied by appropriate efforts to educate the public on the benefits. In addition, this group stressed that a regional approach was needed to effect improvements and required buy-in by U.S. Environmental Protection Agency (USEPA) and the WDNR. The group wanted to discuss further amongst themselves other concepts that they may want to take to the next step of implementation, whether through a demonstration project or through other means, as well as methods of funding other activities. Ideas discussed included demonstrating:

- How offsite BMPs could provide greater flexibility to meet requirements
- How implementation of a gallon/quality gallon requirement in lieu of a 10 percent peak flow reduction requirement compares in terms of cost and ecosystem benefits
- How the approach could contribute toward funding the urbanized area TSS reduction targets, including what barriers would need to be overcome to allow communities to take credit for private property reductions
- Applicability of science-based decisions and incentive-based approaches to ordinances and programs that are already in existence (for example, guidelines for the Valley, Wisconsin Green Tier Program, stormwater ordinances)

TABLE 7-5B
Milwaukee Area Stakeholders Lessons Learned

	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6	Survey 7	Survey 8
I. Lessons learned about ecosystem improvement								
a. What do you believe to be the biggest barrier to the implementation of flow management for ecosystem improvement using Quality Gallons?	How to integrate with existing ordinances/state and federal regulations. Convincing people about the need to change our way of doing business to protect our waterways, drinking supply, etc.	Cost to developers	Political hurdles - getting ordinances in place	The development community	Buy in from regulated community Implementation and tracking of compliance	Education/language - importance of broader ecosystem goals to water quality	The concept of flow management is to vague for the average person, as are the benefits.	Lack of incentive for those profiting from an action, such as development, to protect environment and downstream users of water resource and flood protections provided by previous surfaces.
b. How has the project changed your view of managing stormwater for ecosystem improvement?	Interesting way of quantifying benefit of BMPs to the environment and relating that to existing "gallon" requirements	Has not changed my views	Adds another dimension	N/A	An important component of the overall management for ecosystem improvement	Provided a good overview of an alternative system for assessing stormwater BMPs.	Underscore the need to focus on quality.	The idea of using a required credit to offset downstream impacts.
II. Lessons about the design of our project								
Under what circumstances can you envision using the tools and approaches from this project to change the way that	I think it can be integrated into regulatory side of things as well in providing incentives for	If the standards (DNR Regulations) are	Working to incorporate responsible SW management into city	The Milwaukee draft ordinance provided requiring	Promoting specific types of BMPs that meet underlying requirements	As we move forward to meet new TSS requirements the broader water quality ecosystem	If it can be molded to help the city and private property owners meet	Requiring greater ratios to account for range of BMP effectiveness. Idea of one

TABLE 7-5B
Milwaukee Area Stakeholders Lessons Learned

	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6	Survey 7	Survey 8
stormwater is managed in your watershed and/or other watersheds in the Great Lakes Basin?	good BMPs by municipalities and the state.	modified.	redevelopment projects.	substantial additional work.	while providing additional benefits	issues shall be considered.	state and federal requirements, not just a new regulation.	gallon having more value than another.
III. Other								
Please use this space to provide any feedback or recommendations that you believe would be helpful to the Project Team to facilitate implementation of flow management for ecosystem improvement.	Good discussion!		Informative presentation.				Focus less on flow regime and more on pollutant loading. Also, reduce the amount of technical jargon in your presentation.	Look and load duration curves as tool for satisfying city needs to address TSS.

Summary

Contrary to encountering resistance to using the quality gallon terminology, we found that forum participants were generally supportive of the quality gallon concept. They all agreed or strongly agreed that the quality gallon approach of ranking BMPs by their contribution to watershed goals has merit; that this metric is a practical and useful tool for quantifying the contribution of stormwater BMPs toward restoring rivers and streams; and that quality gallons, combined with costs, provide a sound basis for ranking stormwater BMPs on the basis of ecosystem improvement per dollar spent. They did not have difficulty with following how the quality gallons were calculated and they did not believe that the units were too small to be manageable; nor did they want to rescale the quality gallons in order to work with single digits rather than quantities in the tens or hundreds of thousands, for example. In addition, project scales can be at multiple levels with individual property scale projects such as rain garden implementation easily scaled up to a neighborhoodwide project, a subwatershedwide-scale project, or watershedwide-scale project, with each implementation scale including multiple implementation sites.

Finally, they did not seem to think that other metrics were preferable to quality gallons. However, one participant suggested that the concept of managing stormwater for ecosystem improvements needs a moniker akin to the energy star program. In hindsight, given this opening, it would have been instructive to explore how receptive this group was to the concept of "Growing Water" for raising public awareness relating to managing water resources, including stormwater.

Perhaps the most substantial constructive criticism of the technical approach was to modify it to explicitly account for pollutant loadings, especially TSS in the case of Milwaukee. This would make the tool more useful and more meaningful to stakeholders familiar with and willing to take responsibility for improving and protecting water quality. A second clear message was that a simpler description of the approach and its benefits would be needed for communicating with the public.

The groups discussed behavior changes that need to take place to get the necessary decision makers to begin thinking in terms of improvement values to the ecosystem rather than meeting permit requirements. Most participants felt that a systematic method of quantifying the gains from stormwater management, setting priorities, and ranking alternatives was essential for moving the concept of stormwater management for ecosystem improvement forward. It was needed for educating internally (for example, stormwater engineers) and for working effectively as a watershed team that could cross jurisdictional and regulatory boundaries. Participants were of the view that the local authorities would not move in this direction unless the state showed their support. Ideally, all parties including the state, county, city, township, council, developers, and landowners/project owners would agree to improvements. Developers would need to see the benefit to them and the city council would need to be assured that economic development interests would be served.

All participants supported the idea of trading requirements with little benefit for greater flexibility that produces demonstrable gains. They expressed the view that pilot studies that produce visible benefits, such as fish returning to streams, were particularly effective at winning public support as well as support from the regulated community. In turn, these

changes in attitude help sway developers and the city council. To the extent that the increased flexibility for managing stormwater decreases costs while producing demonstrable environmental gains, all parties have an interest in coming to the table to discuss improvement.

Appendix 7A

Rouge River Watershed Study Evaluation Results

Rouge River Forum Stakeholder Feedback

Scale	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
	1	2	3	4	5		

	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6	Survey 7	Survey 8	Average Response
Conceptual Approach (Ecosystem Restoration)									
Health of rivers and streams is related to how stormwater flow is managed.	5	5	3	5	5	5	5	4	4.6
Stormwater BMPs should be selected and designed to provide multiple benefits including flood protection, flow moderation, water quality improvement, and others.	5	5	5	4	5	5	5	4	4.8
Stormwater BMPs should focus only on flood protection.	1	1	1	1	1	2	2	1	1.3
The flow duration curves provide a reasonable basis for assessing current conditions and ecosystem restoration targets.	3	4	3	4	4	4	1	4	3.4
The state of science does not support a relationship between stormwater management and ecosystem improvement.	1	4	3	2	1	1	2	2	2.0
There are better ways to restore the aquatic ecosystem than by restoring flow regimes using stormwater BMPs.	3	2	2	3	1	3	3	3	2.5
Better ways to restore the aquatic ecosystem include:				Restoration of stream channel exp. oxbow restoration		Limit imperveous-ness, etc. by legislation			
Conceptual Approach (Quality Gallons)									
The quality gallon approach of ranking BMPs by their contribution to watershed goals has merit.	4	4	4	5	5	4	4	5	4.4
The quality gallon metric is a practical and useful tool for quantifying the contribution of stormwater BMPs toward restoring rivers and streams.	4	4	3	4	4	4	4	5	4.0
It is hard to follow how the quality gallons are calculated.	3	3	3	4	1	2	4	3	2.9
A quality gallon is too small of a unit if a watershed restoration requires on the order of 1 to 100 million of them to be effective. The unit should be consolidated to a more manageable number.	3	3	3	2	2	2	3	1	2.4
Quality gallons, combined with costs, provide a sound basis for ranking stormwater BMPs on the basis of ecosystem improvement per dollar spent.	4	4	4	5	5	4	3	5	4.3
Other metrics for quantifying ecosystem improvements due to stormwater BMPs are prefereable to quality gallons.	3	3	3	3	1	3	2	2	2.5
Better metrics to quantify ecosystem improvements due to stormwater BMPs include:				Pollutant load evaluation		Not eough enfo.			

Rouge River Forum Stakeholder Feedback

	Scale	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
		1	2	3	4	5	
	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6	Survey 7	Average Response
Conceptual Approach (Why Stormwater Ordinances?)								
Stormwater ordinances are an appropriate mechaniism for implementing stormwater BMPs that result in ecosystem improvement.	3	5	5	5	5	4	5	4.6
Stormwater ordinances would need to cover all landowners and not just new development and redevelopment in order to result in timely ecosystem improvement.	3	2	2	5	3	4	3	3.1
For the Rouge River watershed, stormwater ordinances covering new development and redevelopment are a promising near term solution for making ecosystem improvement progress.	3	5	3	5	4	4	5	4.1
In today's political and economic climate, flexible stormwater ordinances to achieve ecosystem improvement are not feasible.	3	2	2	1	2	2	2	2.0
A better tool for implementing stormwater BMPs to achieve ecosystem improvement would be:			statewide legislation				stormwater utility with credits for implementing BMPs	
Measure of Outcomes								
The concept of managing stormwater for ecosystem improvement is worth exploring.	5	5	4	5	5	4	5	4.7
Quality gallons as a tool for quantifying and ranking stormwater BMPs shows promise.	4	5	4	5	5	4	4	4.4
Stormwater ordinances with ecosystem standards are a promising way to achieve progress towards ecosystem improvement.	4	5	5	5	4	4	5	4.6
There are too many impediments to using flexible stormwater ordinances for implementing ecosystem improvement any time soon.	4	2	2	3	2	2	2	2.4

Rouge River Forum Stakeholder Feedback

Scale	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
	1	2	3	4	5	

	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6	Survey 7	Average Response
Impediments to changing stormwater ordinances to include ecosystem standards include:	(1) practical application and consistency; (2) reviewer's knowledge of knowing when and how to be flexible		lack of political will; undue influence by development community on legislature and local government; lack of H2O quality issues understandi-ng; lack of MDEQ leadership that is consistent and evident			city councils; planning ordinance; master land use ordinance; no wetland ordinance; no stormwater ordinance	Simple enough for regulators to review projects and regulated community to understand	

	Scale	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Rouge River Forum Stakeholder Questions Regarding Sample Offiste Improvement Contract to Comply with Local Stormwater Ordinance		1	2	3	4	5

	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6	Average Response
Contractual Elements							
Potential projects and associated Gallons and Quality Gallons should be prescreened and recorded to faciliate off-site compliance.	5	3	4	4	4	5	4.2
The contract agreement should be between the Developer and the Landowner.	2	2	2	4	4	0	2.3
If for an off-site project, the Developer finds that the available Quality Gallons are significantly less than what the Landowner indicated were available, the developer should be able to void the contract.	4	3	2	3	4	4	3.3
The off-site project or projects must be reviewed for compliance with all relevant regulations.	5	4	4	5	4	5	4.5
If the final design falls short of the necessary Quality Gallons, the Developer should be accountable for the differrence.	2	4	4	5	3	5	3.8
For an off-site project, the Developer should be held accountable for providing financial assurances sufficient for covering the cost of project implementation and maintenance for the first five years.	5	4	2	4	4	0	3.2
For an off-site project, the developer should have responsibility for monitoring and maintaining the Project for the first five years.	4	3	2	3	4	0	2.7
A third party should have responsibility for certifying the Quality Gallons and for verifying the results of the monitoring reports provided by the Developer.	2	4	2	3	2	0	2.2
The Landowner should have responsibility for maintenance after the first five years of the project.	2	0	0	3	4	0	1.5
The City should have the authority to assume responsibility for maintenance and charge the Developer or Landowner to cover the costs in the event that the Developer or Landowner fails to adequately maintain the project.	5	0	0	4	4	0	2.2
Beyond normal maintenance, no party should be held accountable for damages due to calamities.	2	0	0	3	4	0	1.5

Lessons Learned Feedback Questionnaire

	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6
I. Lessons learned about ecosystem improvement						
a. What do you believe to be the biggest barrier to the implementation of flow management for ecosystem improvement using Quality Gallons?	Must be done regionally so that development disincentives are not realized. Accept/Admin of off-site maintenance agreement.	There needs to be a set of commonly accepted standards applied.	Getting all parties to agree to improvements (MDEQ, County City, Township, Mayor, Council, Developer, Owner)	Acceptance by local governments; potential legal/risk issues; long term maintenance.	Agreement on quality gallon manageable, easy to understand ordinance requirement or option. Off site facilities would be difficult to manage and ensure compliance.	Getting stakeholders to buy in (state and local regulators and development community) to concepts and to how it will be used locally; will take upfront work to customize tool to specific watershed.
b. How has the project changed your view of managing stormwater for ecosystem improvement?	I like the idea to encourage quality improvement. The main reason is that it encourages infiltration which is greatly needed. Also, inlcudes incentive to imperv. agreement.	It's given me some ideas for additional thought.	Some new tools for improvements to system.	Reinforce the need to reconsider the most effective BMPs for each site. Cumulative effect = positive impact.	I like the concept of assigning a numeric value to different storm water BMPs to achieve better water quality and quantity results.	Yes
II. Lessons about the design of our project						
Under what circumstances can you envision using the tools and approaches from this project to change the way that stormwater is managed in your watershed and/or other watersheds in the Great Lakes Basin?	If embraced by region (watershed, city, etc.)	Catalog possible retrofit opportunities for det ponds (i.e. how many qual. gallons can be obtained conv. dry pond/wet pond to wetland pond) and apply and use for redevelop. situations.	All parties agree to No. 1 and setting. Having technical groups set up BMP numbers that all engineers and designers can see what is required.	Great "renewal" exercise; solving existing flow situations by proposing a demonstration project in a high profile location - preferably grant funded with lowed % match.	Selection of BMPs would be better founded in what the management goals are for the watershed. It could be used to better tailor regulatory requirements to individiual watersheds.	Tie tools to Phase II NPDES stormwater "post construction" requirements (e.g. local stormwater ordinances) for permittees; tool used by watershedwide agency.
III. Other						
Please use this space to provide any feedback or recommendations that you believe would be helpful to the Project Team to facilitate implementation of flow management for ecosystem improvement.	Agreed upon BMP ratios by all especially state	Need to refine practical application in this area (SEMI)		The language in the "Forum" description is ponderous rather than user friendly. Plain English makes the concept and especially the Quality Gallon formula more approachable; thus understood the first time.	Try to demonstrate how a transition from current regulations to the proposed system would happen.	Good tool - hope to see further requirements.

Appendix 7B

Rouge River Implementation Forum Agenda

APPENDIX 7B

Rouge River Implementation Forum Agenda

Use of Storm Water Ordinances to Achieve Ecosystem Improvements

CH2MHILL, and Public Sector Consultants

Introduction

Under a grant funded by the Great Lakes Protection Fund, a team led by CH2MHILL has been developing a process to quantify and facilitate ecosystem improvements targeting flow regime restoration of impaired Great Lakes tributaries. Initially the project envisioned that requirements under the Great Lakes Charter 2001 proposed Annex Agreement/Compact would be the driving mechanism for a new ecosystem improvement standard related to Great Lakes water withdrawals. However, subsequent to the initiation of this study, the Annex Agreement finally adopted, and the proposed Compact endorsed by the Great Lakes Governors do not contain the ecosystem improvement standard.

A methodology to quantify ecosystem improvements related to achievable flow restoration targets has been developed using two pilot study areas (that is, the Rouge River in southeast Michigan and the Menomonee River in southeast Wisconsin). New mechanisms needed to be explored that would serve as drivers to implement flow regime restoration and other ecosystem improvements. Several alternative drivers to facilitate ecosystem improvements have been examined. One, the use of local stormwater management ordinances, appears to have the broadest application throughout the Great Lakes particularly in light of the relatively recent federal and state requirements for stormwater discharge permits in urbanized areas.

The Wayne County Storm Water Ordinance and related regulations have been used as a base for incorporating the concepts of ecosystem improvements using the quality gallons metric developed as part of this study to protect and, to the extent practicable, restore both surface and groundwater flow regimes essential to ecosystem health of Great Lakes tributaries. The purpose of this forum of interested stakeholders is to examine a number of questions related to the practical application of this approach to achieve ecosystem improvements as a part of the regulatory requirements recently developed or under consideration by local governments to meet state and federal stormwater discharge permit requirements.

Overview

Studies in the Rouge River watershed and elsewhere in the Great Lakes basin indicate that the impermeable surfaces created through development of the urbanized areas over the last 150 years in the region has had a significant impact on the flow regimes of both surface and groundwater resources. Despite improvements in water quality the alterations of physical

habitat (that is, the flow regimes and related impairments) in many urbanized areas prevent the restoration of aquatic communities and related beneficial uses.

Flow regime restoration has been identified as a major goal in several of the stormwater subwatershed management plans developed for the Rouge River watershed. Historically stormwater runoff regulations have focused on prevention of down stream flooding and require onsite facilities to detain water during specific major design storm events. While provisions to capture sediments, debris, and other pollutants have been recently added to the design requirements for new stormwater management facilities, very few stormwater management regulations address either groundwater infiltration or the volume of runoff from more frequent storm events that alter the flow regimes and aquatic habitat of the receiving natural watercourse.

Bottom scouring, accelerated bank erosion related to increased runoff and fluctuating water temperatures as well as reductions in summer base flow due to decreases in groundwater infiltration are not adequately addressed under most current stormwater regulations. Best management practices (BMPs) that address these habitat concerns, as well as flood control are available, but are generally not required and developers have no incentive to incorporate them into the design of new or redeveloped sites that have significant impermeable surfaces.

The challenge is to create a regulatory approach that is acceptable to the development community and will at the same time result in both flow regime protection for portions of the watershed experiencing new development and sustainable ecosystem improvements in the developed portions of the watershed where impairments to flow regimes have already occurred. We will be asking for your views and opinions on whether or not the proposal we have outlined meets this challenge and whether, after reviewing the proposal, you have suggestions for alternatives that might be more acceptable or more effectively meet the objective of ecosystem protection and improvement.

Forum Agenda

1. Quality Gallons Concept and Development

a. *Presentation of concept and basis for establishing quality gallon metric*

b. Discussion:

- How acceptable is this conceptual approach (encouraging the use of selected BMPs to achieve ecosystem improvements) to regulators, the regulated entities, environmental interest groups, and residents of the Rouge River community?
- Are there areas that need better explanation or justification?

3. Implementation of Concept

a. Overview model based on Wayne County's stormwater regulations that incorporate ecosystem improvement concepts related to flow regime restoration:

- Legal authority

- Base conditions
- Developer options
- Flexibility for type and location of BMPs
- Method of calculating site requirements
- Differentiation between new developments and redevelopments
- Use of third party providers, etc.

b. Discussion:

- Is approach understandable?
- Is it practical/workable—what are the impediments?
- Suggested changes or modifications
- Are there alternative approaches that could accomplish the same objectives?
- Potential resistance to using quality gallon metric?
- Does approach help address existing problems in resolving storm water management requirements at redevelopment sites?
- What actions are needed to encourage adoption of approach by regulators, acceptance by business community, endorsement by environmental organizations—what behavior changes need to occur to allow concept to move forward?
- How could third parties like the Alliance of Rouge Communities or local communities participate in identifying offsite options?
- What would agreements between developers, offsite third party providers, and regulators look like?
- How could you communicate opportunities for offsite options to regulators and developers?
- Is there sufficient information in the Rouge River watershed to establish the design precipitation events to set standards—how difficult would it be to establish acceptable standards in other watersheds?

4. Measure of Outcomes

- Would implementation of this concept on a broad scale in the watershed result in ecosystem improvements—how long would it take?
- Is it worth pursuing and if not, under what circumstances would it be worthwhile?

Appendix 7C
List of Rouge Forum Participants

APPENDIX 7C

List of Rouge Forum Participants

Name	Agency
Mark Mittag	CH2M HILL
Mary Jo Kealy	CH2M HILL
Michelle J. Bononi	Washtenaw County Drain Commission Office
Jim Wineka	Oakland County Drain Commission
Gary Zorza	Farmington Hills
Kelly Karll	ECT
Jim Zoumbaris	Livonia
Dan Swallow	Van Buren TWP
Tom Biasell	Farmington Hills
Amy Spray	Public Sector Consultants
Kelly Caves	Wayne County
Jack Bails	Public Sector Consultants

Appendix 7D

Example Contract for an Offsite Improvement to Comply with Stormwater Ordinance

APPENDIX 7D

Example Contract for an Offsite Improvement to Comply with Stormwater Ordinance

Setting

To be in compliance with the local stormwater ordinance, a major Developer is seeking an offsite opportunity to meet the stormwater management requirements associated with multiple redevelopment projects in a watershed. The Developer has determined that the redevelopment projects require at least 50,000 offsite quality gallons. Potential flow regime enhancement stormwater best management practice (BMP) projects have been evaluated and found acceptable through a preliminary screening process put forth by organizations within the Alliance of Rouge Communities (ARC). The project screening quantified BMP benefits in terms of Gallons and quality gallons. The screening included prioritizing projects which maximize the ecosystem improvement (that is, quality gallons) for a given cost.

The Developer selects a prescreened detention pond retrofit project to be located on private property and contacts the sponsoring local agency, the City of Farmington Hills. This was one of the projects originally identified by the ARC, a public agency established by the Watershed Alliance Act (Public Act 517) in 2004. The City has conducted a preliminary screening analysis that identifies the location, quality gallons available (estimated at 69,000), cost range, and private owner of the BMP (the "Landowner").

An example contract is provided below outlining an agreement between the Developer and the Landowner to purchase quality gallons by funding a detention basin retrofit on the Landowner's property. The example covers the following elements:

- Planning and design
- Construction
- Post-construction monitoring and maintenance
- Long-term maintenance
- Project assurances
- Agreement

Each element is detailed below.

Planning and Design

Project funding will be provided by the Developer to fully fund the project that provides 69,000 quality gallons even though only 50,000 quality gallons are required. The full funding is needed because constructing a partial project is not practical. The Developer can sell the extra quality gallons to others or bank the quality gallons for future use. The Developer and the Landowner will jointly select the design alternative. Once developed, plans and specifications will be reviewed by both parties, submitted to the City of Farmington Hills, and reviewed by

required regulatory agencies (Oakland County for erosion and sediment control requirements, or others as regulations require). To minimize risk to both parties, a licensed professional engineer will inspect the Facility prior to retrofit design to not only obtain important design information, but also to identify the pond existing condition.

Construction

Contracting for the project will go through the Developer, who will prepare the contract documents, advertise the project, and select the contractor for the job. Construction management will be done through an agreed-upon third party. The construction manager will be contracted and funded through the Developer. Appropriate performance bonds will be associated with the construction contract.

Post-construction Monitoring and Maintenance

To make sure the retrofit functions as intended, the Developer will hire a third party to provide 5 years of annual monitoring once construction is complete. The monitoring will assess the functioning of the pond and identify any corrective measures that need to be taken in order to meet the quality gallon requirement and associated ecosystem improvement. Monitoring reports will be provided to the Developer and the Landowner. Third party monitoring data will also be reported to the ARC and used to certify the quality gallons provided by the improvement.

If corrective measures and maintenance are needed within the first 5 years to achieve the ecosystem improvement and quality gallons anticipated, a contractor will be hired and funded by the Developer to conduct the maintenance activities. If the maintenance requirement is caused by the operation of an extraordinary natural force that reasonable care could not avoid (for example, tornadoes and severe floods), the Developer is not responsible for reinstalling the retrofit.

Long-Term Maintenance

Assuming the detention basin retrofit meets the quality gallons goals at the end of the 5-year maintenance program; the Developer will no longer conduct monitoring or be responsible for maintenance. Maintenance responsibilities will then once again be assumed by the Landowner where the Landowner will maintain the proposed ecosystem function values in perpetuity. For example, the Landowner will continue monitoring every 3 years and maintain the Facility as needed. Failure of the Landowner to maintain the Facility will allow the local community (Farmington Hills) to maintain the Facility and charge the Landowner for all associated maintenance costs.

Project Assurances

All phases of the project, from planning to post-construction monitoring, include assurances so that the desired flow restoration improvement provides the necessary quality gallons. The initial Facility inspection verifies that the site can be retrofitted to meet the project goals.

To ensure that funds are available to complete the project, appropriate performance bonds will be issued. To assess the function of the retrofit and provide necessary corrections, a third party will be contracted to provide monitoring and maintenance.

Example Agreement

This example presents the issues that should be covered in an agreement between two entities cooperating on an ecosystem improvement project. The document outlines the major points that would be agreed upon as part of an ecosystem improvement measured in quality gallons between a Developer and a private land owner. **Legal counsel should be consulted when developing legally binding agreements.**

Flow Restoration Agreement Between
Good Neighbor Landowner
2000 Water Quality Lane
Farmington Hills, MI 48331

Contact Person:
Mr. Facility Manager
2000 Water Quality Lane
Farmington Hills, MI 48331
Phone: 555-555-5555

And

XYZ Developer
120 Stormwater Drive
Farmington Hills, MI 48331

Contact Person:
Ms. Project Liaison
120 Stormwater Drive
Farmington Hills, MI 48331
Phone: 444-444-4444

This Agreement, entered into this 15th day of September, 2006, by and between the Good Neighbor Landowner hereinafter called the "Landowner." and XYZ Developer hereinafter called the "Developer." WITNESSETH, that WHEREAS, the Landowner is the owner of certain real property located at 2000 Water Quality Lane, Farmington Hills, MI 48331, more particularly described in the attached Exhibit A hereinafter called the "Property." WHEREAS, the Landowner currently maintains a Stormwater Detention Facility hereinafter called the "Facility" at this location

WHEREAS, the Landowner and the Developer entered into a Flow Restoration Agreement to produce 69,000 quality gallons with regard to the Property in September of 2005.

WHEREAS, the Landowner, its successors and assigns, and the Developer, its successors and assigns agree that the environmental quality of the Upper Rouge River Subwatershed hereinafter called the "Watershed" will be improved through a stormwater best management practice retrofit of the existing Facility, hereinafter called the "Retrofit."

WHEREAS, the City of Farmington Hills, Oakland County, hereinafter called the "City" has an easement over, on and in the Facility, which easement shall be for the purpose of access to the Retention and Discharge System for the maintenance, renovation, and repair thereof.

NOW, THEREFORE, in consideration of the foregoing promises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The Developer shall fund the planning, design, and construction of the Retrofit to produce 69,000 quality gallons of which 50,000 quality gallons shall meet the quality gallon obligation for projects outlined in Attachment 1 (not provided).

2. The Landowner and the Developer shall jointly select the design of the Retrofit. The final design will be submitted to the City for comment and the local stormwater authority for compliance review.

3. Should the final design determine that providing at least 50,000 quality gallons, is not feasible, the Company will have 30 days to submit a withdrawal of this agreement in writing and a proposed plan for fully realizing 50,000 quality gallons through this and/or other projects. The Company retains ownership of quality gallons in excess of 50,000 and may donate, bank, or sell them as legally allowed once all Company commitments provided herein are met.

4. The Developer will prepare the contract documents, advertise the project, select the contractor for the job and award a contract to construct the Retrofit. A construction manager will be contracted through the Developer with approval from the Landowner.

5. The Developer will submit financial assurances of a type and amount reasonably acceptable to the Landowner to assure the complete and proper installation of the Retrofit. These funds shall be in the form of a performance bond or other agreed upon financial mechanism.

6. The Developer shall annually monitor and maintain, at its sole expense, the above referenced Facility in accordance with the plans previously submitted to and approved by the City and in compliance with all applicable state and local laws for a period of 5 years from the certification by the construction manager of completion of construction. Monitoring reports will be provided to both parties and to the ARC. Monitoring reports shall include an assessment of whether quality gallon goals will be met or not. If monitoring indicates fewer than 50,000 quality gallons will be met at the end of the 5-year maintenance period, the Developer shall notify the local stormwater authority within 30 days and continue maintenance for the 5-year period as provided herein. The Developer shall make up a deficit of quality gallons as specified in Attachment 1 (not provided).

7. The Developer will submit financial assurances equivalent to the estimated 5 years of maintenance costs. This assurance will be maintained in the form of a bond or other agreed upon financial mechanism by the City. If the Developer fails to maintain the Facility in accordance with the approved design standards and with the law and applicable administrative regulation, the City may conduct necessary maintenance and

the Developer is responsible for the cost of the work, both direct and indirect, as well as applicable penalties.

8. In the event of an emergency within five years of certification of completion of construction requiring work on the Retrofit as determined by the City in its sole discretion, the Developer shall be responsible for the cost of the work, both direct and indirect, as well as applicable penalties. Subsequently, in the event of an emergency as determined by the City in its sole discretion, the Landowner is responsible for the cost of such work and applicable penalties.

9. The Developer shall be responsible for the operation and maintenance of the Facility (or Retrofit) for 5 years as outlined in this Agreement. After 5 years, the Landowner shall be fully responsible for the operation and maintenance of the Facility (or Retrofit). The Developer shall be excused from operation and maintenance, or reconstruction of the Facility (or Retrofit), to the extent hindered or obstructed, or damage is caused by virtue of acts of God, war, riot, labor unrest, terrorism, natural disaster, failure of basic infrastructure, or other calamity where the Developer has exercised reasonable, good faith, care and due diligence in attempting to prevent or avoid the impacts of such events or forces. This agreement does not change the local unit of government's authority to maintain and charge the Landowner of the facility if appropriate maintenance does not occur as specified in other agreements and covenants.

10. The Developer shall indemnify, save harmless and defend the Landowner from and against any and all claims, demands, suits, liabilities, losses, damages and payments including attorney fees claimed or made by persons not parties to this agreement against the Landowner that are alleged or proved to result or arise from the Developer's construction, operation, or maintenance of the Retrofit and/or Facility.

11. Invalidation of any of these covenants and restrictions by judgment or court order shall in no way affect the validity of any other of its provisions, which shall remain in full force and effect.

12. The parties, whose signatures appear below, hereby represent and warrant that they have the authority and capacity to sign this agreement and bind the respective parties hereto.

13. This Agreement constitutes the full and final agreement of the parties. All prior agreements, obligations or understandings are, to the extent inconsistent with this Agreement, superseded, replaced and merged herein.

14. This Agreement is to be interpreted in accordance with the laws of the State of Michigan.

WITNESS the following signatures and seals:

_____

_____

By:_____

_____
(Type Name)

_____
(Type Name)

STATE OF_____

COUNTY OF_____

The foregoing Agreement was acknowledged before me this ____day of_____, 20___, by

_____.

_____
NOTARY PUBLIC
My Commission Expires:_____

Rouge River Implementation Forum Participants' Feedback on the Example Contract

The draft "Example Contract for an Offsite Improvement to Comply with Stormwater Ordinance" was distributed to participants in advance of the forum, discussed as a group, and then privately evaluated by each of the stakeholders. The stakeholder discussion centered on long-term maintenance, especially for projects located on lands owned by third parties. Participants did not want to mandate who must take responsibility for which provisions of the contract, including the monitoring and maintenance provisions. Rather, they expressed the view that the contract needed to identify the conditions that must be met and allow the parties to the contract to negotiate the assignment of responsibilities.

Participants acknowledged that different types of projects could well require different specific provisions to evaluate performance and to assure that maintenance continued into perpetuity (or for the duration of the permit). For example, agreements covering the use of the land for the best management practice would need to convey with a sale of the property. Overall, participants agreed that the example contract included the necessary provisions, but they were not committed to how responsibilities were allocated in this example. The Rouge River Watershed stakeholders reacted negatively to use of the term "monitor," as they did not want to create the perception that they were treating offsite best management practices differently than onsite activities, which are not monitored. Instead, they recommended using a legally binding agreement that assigns responsibility for performance and maintenance and that includes the necessary financial assurances. Consequently, for stormwater BMP construction for ecosystem improvement, a monitoring program beyond what would be required for similar stormwater BMPs associated with development is likely unnecessary.

The results from the survey of participants' opinions on aspects of the example contract were consistent with these discussion points. Table 1 lists the average responses of six participants. The same five-point scale was used for these questions as for the previous questions. Again a score of "1" meant strongly disagree; "2" disagree; "3" neutral; "4" agree; and "5" strongly agree. Respondents were neutral to slightly in favor of the method of assigning responsibility to various parties as per the specifics of the example contract. However, they agreed or strongly agreed that candidate offsite projects and the associated quality gallons should be prescreened to facilitate compliance with the requirements of the ordinance. Once selected, projects should then be reviewed for compliance.

TABLE 7D-1
Rouge River Forum Stakeholder Feedback on Sample Offsite Improvement Contract to Comply with Local Stormwater Ordinance

Contractual Elements	Avg. Response
Potential projects and associated Gallons and quality gallons should be prescreened and recorded to facilitate offsite compliance.	4.2
The contract agreement should be between the Developer and the Landowner.	2.3
If for an offsite project, the Developer finds that the available quality gallons are significantly less than what the Landowner indicated were available, the developer should be able to void the contract.	3.3
The offsite project or projects must be reviewed for compliance with all relevant regulations.	4.5
If the final design falls short of the necessary quality gallons, the Developer should be accountable for the difference.	3.8
For an offsite project, the Developer should be held accountable for providing financial assurances sufficient for covering the cost of project implementation and maintenance for the first five years.	3.7
For an offsite project, the developer should have responsibility for monitoring and maintaining the Project for the first five years.	3.2
A third party should have responsibility for certifying the quality gallons and for verifying the results of the monitoring reports provided by the Developer.	2.7

Appendix 7E
Milwaukee Area Study Evaluation Results

Milwaukee Area Watershed Forum
Stakeholder Feedback

	Average Response
Conceptual Approach (Ecosystem Restoration)	
Health of rivers and streams is related to how stormwater flow is managed.	4.6
Stormwater BMPs should be selected and designed to provide multiple benefits including flood protection, flow moderation, water quality improvement, and others.	4.4
Stormwater BMPs should focus only on flood protection.	1.8
The flow duration curves provide a reasonable basis for assessing current conditions and ecosystem restoration targets.	3.5
The state of science does not support a relationship between stormwater management and ecosystem improvement.	2.0
There are better ways to restore the aquatic ecosystem than by restoring flow regimes using stormwater BMPs.	2.7

Better ways to restore the aquatic ecosystem include:

Conceptual Approach (Quality Gallons)	
The quality gallon approach of ranking BMPs by their contribution to watershed goals has merit.	3.9
The quality gallon metric is a practical and useful tool for quantifying the contribution of stormwater BMPs toward restoring rivers and streams.	3.8
It is hard to follow how the quality gallons are calculated.	2.4
A quality gallon is too small of a unit if a watershed restoration requires on the order of 1 to 100 million of them to be effective. The unit should be consolidated to a more manageable number.	2.9

Quality gallons, combined with costs, provide a sound basis for ranking stormwater BMPs on the basis of ecosystem improvement per dollar spent.	3.8
Other metrics for quantifying ecosystem improvements due to stormwater BMPs are prefereable to quality gallons.	2.1

Better metrics to quantify ecosystem improvements due to stormwater BMPs include:

Milwaukee Area Watershed Forum
Stakeholder Feedback

	Scale	rongly Disag	Disagree	Neutral	Agree	Strongly Agree		
		1	2	3	4	5		

	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6	Survey 7	Survey 8	Average Response
Conceptual Approach (Why Stormwater Ordinances?)									
Stormwater ordinances are an appropriate mechaniism for implementing stormwater BMPs that result in ecosystem improvement.	4	3	5	4	3	4, but one of many mechanism that may be used	4	4	3.4
Stormwater ordinances would need to cover all landowners and not just new development and redevelopment in order to result in timely ecosystem improvement.	3.5, but how to implement?	4	3	5 - yes, but that's not going to happen	2	3, haven't thought this through, but I'm inclinded to agree	4	4	2.1
For the Rouge River watershed, stormwater ordinances covering new development and redevelopment are a promising near term solution for making ecosystem improvement progress.	3.5	4	3	3	4	4	4	4, Redevelop-ment	3.2
In today's political and economic climate, flexible stormwater ordinances to achieve ecosystem improvement are <u>not</u> feasible.	2	3	2	2	3	2, but depending on how implemented	2	2	2.0
A better tool for implementing stormwater BMPs to achieve ecosystem improvement would be:	Need in state regs., local ordinances for flood mgt. regs.							Improvement in sustainable development, overall environment will probably not be improved by new develoment, maybe redevelopment	
Measure of Outcomes									
The concept of managing stormwater for ecosystem improvement is worth exploring.	5	4	5	4	5	4	5	4	4.5
Quality gallons as a tool for quantifying and ranking stormwater BMPs shows promise.	4	3	4	4	4	4	5	4	4.0
Stormwater ordinances with ecosystem standards are a promising way to achieve progress towards ecosystem improvement.	5	4	4	3	3	4	2	4	3.6
There are too many impediments to using flexible stormwater ordinances for implementing ecosystem improvement any time soon.	2	4	2	2	3	2, but still a lot of work to do to think about how to package this	2	2	2.1
Impediments to changing stormwater ordinances to include ecosystem standards include:	Policy & regulations, cost, and lack of understanding						Need to more simply present the benefits	Need to describe benefits in terms of economic benefits to property values (example: Prairie Crossing in Grayslake, IL)	

Milwaukee Area Watershed Forum Stakeholder Feedback

	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6	Survey 7	Survey 8
I. Lessons learned about ecosystem improvemen								
a. What do you believe to be the biggest barrier to the implementation of flow management for ecosystem improvement using Quality Gallons?	How to integrate with existing ordinances/state and federal regulations. Convincing people about the need to change our way of doing business to protect our waterways, drinking supply, etc.	Cost to developers	Political hurdles - getting ordinances in place	The development community	Buy in from regulated community Implementation and tracking of compliance	Education/language - importance of broader ecosystem goals to water quality	The concept of flow management is to vague for the average person, as are the benefits.	Lack of incentive for those profitting from an action, such as development, to protect environment and downstream users of water resource and flood protections provided by previous surfaces.
b. How has the project changed your view of managing stormwater fo ecosystem improvement?	Interesting way of quantifying benefit of BMPs to the environment and relating that to existing "gallon" requirements	Has not changed my views	Adds another dimension	N/A	An important component of the overall management for ecosystem improvement	Provided a good overview of an alternative system for assessing stormwater BMPs.	Underscore the need to focus on quality.	The idea of using a required credit to offset downstream impacts.
II. Lessons about the design of our project								
Under what circumstances can you envision using the tools and approaches from this project to change the way that stormwater is managed in your watershed and/or other watersheds in the Great Lakes Basin?	I think it can be integrated into regulatory side of things as well in providing incentives for good BMPs by minicipalities and the State.	If the standards (DNR Regulations) are modified.	Working to incorporate responsible SW management into city redevelopment projects.	The Milwaukee draft ordinance provided requiring substantial additional work.	Promoting specific types of BMPs that meet underlying requirements while providing additional benefits	As we move forward to meet new TSS requirements the broader water quality ecosystem issues shall be considered.	If it can be molded to help the city and private property owners meet state and federal requirements, not just a new regulation.	Requiring greater ratios to account for range of BMP effectiveness. Idea of one gallon having more value than another.
III. Other								
Please use this space to provide any feedback or recommendations that you believe would be helpful to the Project Team to facilitate implementation of flow management for ecosystem improvement.	Good discussion!		Informative presentation.				Focus less on flow regime and more on pollutant loading. Also, reduce the amount of technical jargon in your presentation.	Look and load duration curves as tool for satisfying city needs to address TSS.

Appendix 7F

Milwaukee Area Implementation Forum Agenda

APPENDIX 7F

Milwaukee Area Implementation Forum Agenda

Use of Storm Water Ordinances to Achieve Ecosystem Improvements

CH2M HILL

Introduction

Under a grant funded by the Great Lakes Protection Fund, a team led by CH2MHILL has been developing a process to quantify and facilitate ecosystem improvements targeting flow regime restoration of impaired Great Lakes tributaries.

A methodology to quantify ecosystem improvements related to achievable flow restoration targets has been developed using two pilot study areas (i.e., the Rouge River in southeast Michigan and the Menomonee River in southeast Wisconsin). However, new mechanisms needed to be explored that would serve as drivers to implement flow regime restoration and other ecosystem improvements. Several alternative drivers to facilitate ecosystem improvements have been examined. One, the use of local storm water management ordinances, appears to have the broadest application throughout the Great Lakes particularly in light of the relatively recent federal and state requirements for storm water discharge permits in urbanized areas.

The City of Milwaukee Storm Water Ordinance and related regulations have been used as a base for incorporating the concepts of ecosystem improvements using the Quality Gallons metric developed as part of this study to protect and, to the extent practicable, restore both surface and groundwater flow regimes essential to ecosystem health of Great Lakes tributaries. The purpose of this forum of interested stakeholders is to examine a number of questions related to the practical application of this approach to achieve ecosystem improvements as a part of the regulatory requirements recently developed or under consideration by local governments to meet state and federal storm water discharge permit requirements. The benefit for practical application through a demonstration project and idea for potential demonstration projects will also be discussed.

Overview

Studies in the Menomonee River watershed, Rouge River watershed and elsewhere in the Great Lakes basin indicate that the impermeable surfaces created through development of the urbanized areas over the last 150 years in the region has had a significant impact on the flow regimes of both surface and groundwater resources. Despite improvements in water quality the alterations of physical habitat (i.e. the flow regimes and related impairments) in many urbanized areas prevent the restoration of aquatic communities and related beneficial uses.

Historically storm water runoff regulations have focused on prevention of down stream flooding and require on-site facilities to detain water during specific major design storm events. While provisions to capture sediments, debris, and other pollutants have been recently added to the design requirements for new storm water management facilities, very few storm water management regulations address either groundwater infiltration or the volume of runoff from more frequent storm events that alter the flow regimes and aquatic habitat of the receiving natural watercourse.

Bottom scouring, accelerated bank erosion related to increased runoff and fluctuating water temperatures as well as reductions in summer base flow due to decreases in groundwater infiltration are not adequately addressed under most current storm water regulations. Best management practices (BMPs) that address these habitat concerns, as well as water quality improvements and flood control are available, but are generally not required and developers have no incentive to incorporate them into the design of new or redeveloped sites that have significant impermeable surfaces.

The challenge is to create a regulatory approach that is acceptable to the development community and will at the same time result in both flow regime and water quality protection for portions of the watershed experiencing new development and sustainable ecosystem improvements in the developed portions of the watershed where impairments to flow regimes and water quality have already occurred. We will be asking for your views and opinions on whether or not the proposal we have outlined meets this challenge and whether, after reviewing the proposal, you have suggestions for alternatives that might be more acceptable and/or more effectively meet the objective of ecosystem protection and improvement. A potential next step for discussion involves the feasibility and value of a pilot demonstration project, which incorporates these concepts on a demonstration basis.

Appendix 7G

List of Milwaukee Area Forum Participants

APPENDIX 7G

List of Milwaukee Area Forum Participants

Name	Affiliation
Brent Brown	CH2M HILL
Mark Mittag	CH2M HILL
Tim Thur	City of Milwaukee-Environmental Engineering
Benjamin Benninghoff	WDNR
Tory Kress	Milwaukee Redevelopment Authority
Ann Beier	City of Milwaukee
Erick Shambarger	City of Milwaukee
Shirley Krug	MMSD
Mary Jo Kealy	CH2M HILL
Cheryl Nenn	Friends of Milwaukee's Rivers
Christine Urban	U.S. EPA