Advancing Green Infrastructure and Low Impact Development in Raleigh: Overview of the Process and Work Plan for Next Steps

City of Raleigh
Public Works Department
Stormwater Management Division

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Introduction

Raleigh is expected to grow to a population of almost 600,000 by 2030, according to the City's 2030 Comprehensive Plan, and the City is assessing a variety of initiatives for ensuring growth that fosters economic development while ensuring that environmental impacts are managed effectively. Stormwater runoff and its effects on streams and lakes are among the most pronounced environmental impacts of growth and development. For several years City staff, the City's Stormwater Management Advisory Commission (SMAC), and Raleigh City Council have heard and discussed public comments and proposed actions for improving stormwater quality and stream health in Raleigh through use of low impact development practices.

In late 2013, in response to City Council direction and recommendations of SMAC, City staff began a process for developing a plan for advancing green infrastructure (GI) and low impact development (LID) in Raleigh. This document provides an overview of the process that has ensued and recommendations. Past and ongoing GI/LID efforts are summarized, and an appended work plan proposes actions to further build City capacity for advancing GI and LID.

What GI and LID are, and Why They are Important for Raleigh

GI and LID are relatively new concepts, and their definitions continue to evolve and frequently vary from source to source. At their core is the recognition that water is a valuable resource and that maintaining pre-development hydrology on developed land provides multiple important benefits (e.g., flood control, water quality, groundwater recharge, stream base flow, stream channel protection, and ecological integrity).

Where the natural hydrologic cycle maintains a balance of water circulation through evaporation, precipitation, infiltration/ groundwater recharge, and absorption and transpiration by plants, urbanization has altered local hydrologic cycles through construction of impervious surfaces such as buildings, roads and parking lots. Groundwater recharge has been reduced, and the volume and rate of runoff has increased. In general, as the area of impervious surface increases, runoff increases and groundwater recharge decreases.

For many decades stormwater runoff from developed land has been thought of largely as a nuisance, and development designs typically have shunted runoff from developed surfaces to storm drains and then to streams as quickly as possible. As a result, many streams in Raleigh have suffered severe bank and bed erosion, deposition of sediment, loss of biological diversity, extreme flows during rainfalls, and low flows or no flows between rainfalls. Some streams have become unattractive, which often leads to neglect and even abuse by local residents and businesses, the opposite of the assets and attractions they

Some Definitions of Low Impact Development

LID Center

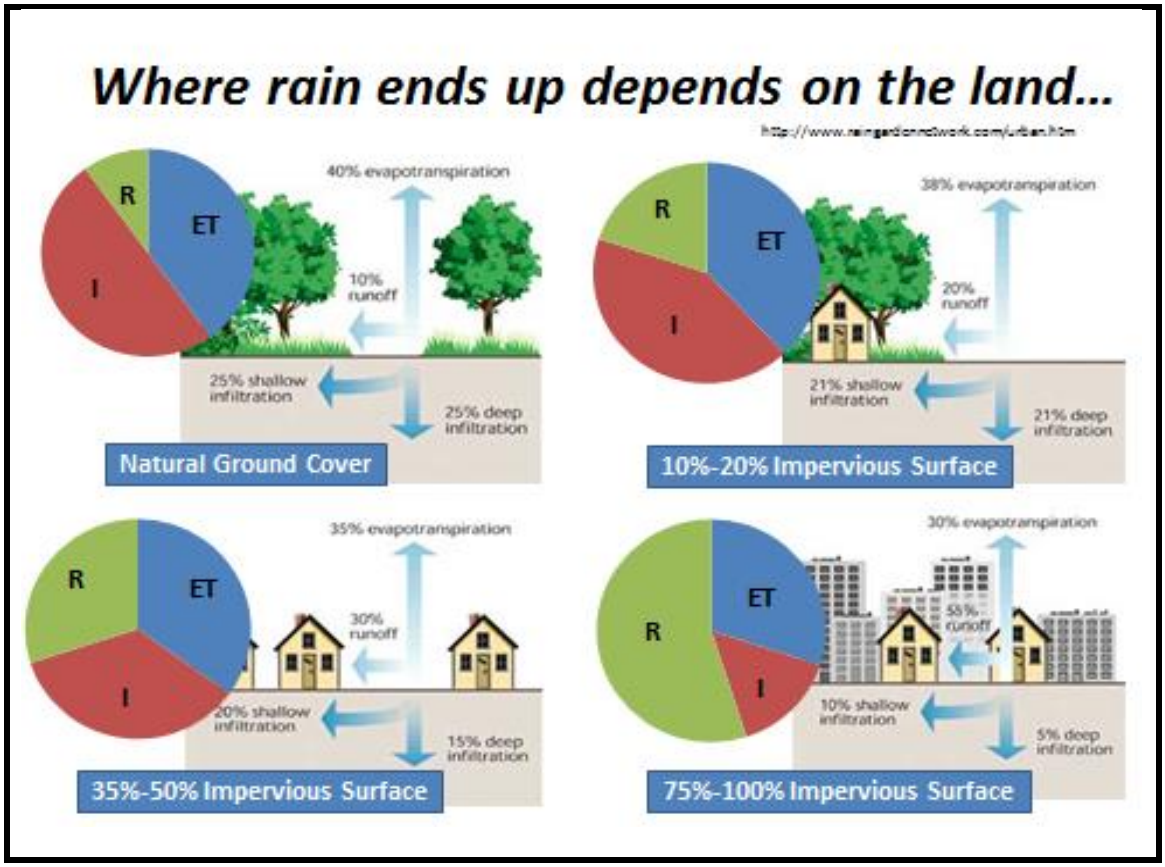
A comprehensive land planning and engineering design approach with a goal of maintaining and enhancing the pre-development hydrologic regime of urban and developing watersheds.

USEPA

An approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product.

could and should be.

LID is an approach to land development that essentially reverses the traditional approach, seeking to minimize impervious areas and retain and manage stormwater as close to its source as possible. LID uses engineered structural controls that mimic natural processes to infiltrate, filter, and slowly release stormwater, as well as practices associated with GI.



In this context, GI refers to an area's collective landscape features (vegetation, soils, and natural processes) that help manage stormwater while often providing other amenities (e.g., aesthetics, air quality improvement, reduced urban heat island effect, shading, carbon sequestration, and reduced energy consumption). Like LID, GI can be structurally engineered using practices such as green roofs, rain gardens, bioretention areas, bioswales, and pervious pavement. GI also can be nonstructural, including natural areas such as woods, wetlands, meadows, and grasslands. Land development using LID principles usually incorporates GI to achieve its stormwater management goals and other co-benefits. Both GI and LID treat stormwater runoff as a resource to be incorporated into the urban environment, rather than a waste to be disposed of.

Although GI and LID often are described in a context of new development (on land not previously developed), their principles and practices also are well-suited for use in redevelopment and for "retrofit" use on developed land.

Implemented broadly, GI and LID can contribute substantially to improving the health and attractiveness of Raleigh's streams and lakes and reducing stormwater runoff and frequency of local stream flooding. Recognizing the potential benefits of LID, the North Carolina Department of Environment and Natural Resources recently instituted a volume-based performance standard for its compliance definition of LID.

CORE CITY FUNCTIONS INVOLVED IN GI AND LID

Successful application of GI and LID principles requires both a technical framework for acceptable practices and a policy framework for clarity and consistency across City operations, including core functions of planning, design review, construction inspection, and maintenance.

Planning and Collaboration

GI and LID involve infrastructure design considerations. From a planning perspective, the City should be able to guide and administer infrastructure and land development incorporating GI/LID for City properties and facilities, City and State streets and rights-of-way, residential neighborhoods and properties, commercial centers, and more. Decisions can impact other City functions such as Solid Waste Services and the Fire Department whose operations, including pick up of waste containers and maneuvering of large vehicles, are affected by details of street cross-sections and geometry. Therefore, GI/LID should be considered in primary municipal planning documents such as comprehensive plans, strategic plans, watershed plans, capital improvement plans, transportation improvement plans, and neighborhood/district plans.

Also, City ordinances, manuals, support documents, and education should be in place so City staff and prospective developers and designers know in advance that GI/LID is not only acceptable, but encouraged, and that its use need not delay development review and approval (e.g., variances not necessarily required). This may mean bringing more flexibility and/or incentives for the use of GI/LID into development ordinances. City staff and developers also should begin working GI/LID into early conceptual designs and increase awareness about GI/LID costs and long-term maintenance.

Design, Review, and Permitting

Because any capital project or land development that incorporates GI/LID must be approved by the City, the City should ensure it has knowledgeable designers and reviewers, clear GI/LID design criteria and specifications, and zoning and development standards that allow GI/LID (including but not limited to its landscape areas, open space, parking areas, and street rights-of-way). The City also should have soil testing procedures to ensure that infiltration devices will work as intended. It is important that development applicants and City review staff are in sync regarding GI/LID site design and development criteria and the development review process. This can require training and administrative tools (e.g., manuals and checklists) that ensure effective and efficient development review and approval processes.

Construction and Inspection

Structural stormwater practices also must be properly constructed in order to function as intended. Clear construction inspection protocols are needed for GI/LID practices, for both developers and City staff. Because use of GI/LID tends to yield a large number of stormwater practices over a site than use of traditional stormwater practices, the City may need to keep track of more, dispersed stormwater treatment devices as more developments incorporate GI/LID, and have a tracking system that is versatile and can support a variety of tracking and reporting needs.

Maintenance and Inspection

GI/LID practices also must be properly maintained to ensure continued function. The City's role in maintaining proper function includes having proper legal agreements, on both public and private property and public-private ventures, to ensure long-term maintenance, and enforcing those requirements. The City will need policies, templates, staffing, training, tracking, and reporting systems for carrying out these functions.

Past and Ongoing GI/LID Activities in Raleigh

Although the terms green infrastructure and low impact development are fairly new for Raleigh, the City's Stormwater Management Division has been installing and maintaining, and encouraging others to install and maintain, stormwater best management practices (BMPs) that treat stormwater beyond requirements of regulatory programs. Among these "voluntary" stormwater BMPs are the following:

- Retrofits on City-owned properties, such as bioretention beds at a vehicle maintenance facility, and a constructed wetland in a City park;
- Retrofits on private property through the Stormwater Quality Cost Share Program, such as rainwater cisterns at City Farm and at numerous residences, and rain gardens at several residences;
- New BMPs installed as part of construction of new City facilities, such as a green roof at the Buffaloe Road Aquatic Center, and a bioretention bed, a green roof, and permeable pavers at the future Raleigh Union Station; and
- New BMPs integrated into designs of new streets and street improvements (including widenings, enhancements for pedestrians, and streetscapes), such as a bioretention bed along Pullen Road, future bioretention beds along Sandy Forks Road, future bioretention planter beds along Hillsborough Street Phase 2, and possible bioretention tree boxes along Currituck Road.

City staff and planning and design consultants have been routinely collaborating among departments to evaluate possible opportunities for using GI/LID on City capital improvement projects and for retrofitting BMPs and getting these concepts into planning documents early so the public and designers can see how they can be used in ways that allow multiples uses for a given land area (e.g., curb extensions, landscaping, and stormwater treatment working together).

Below are photos of several stormwater BMPs the City has installed or co-funded with private property owners to install.

Permeable pavers

Green roof

Rain garden

Cistern

Curb bumpout bioretention
07/05/2012

Grassed swale

Constructed wetland

Challenges for Implementing GI/LID in Raleigh

Expanding the Scale of GI/LID

Some in the Raleigh community have expressed impatience that the City has not implemented GI/LID more quickly and on a larger scale. As described above, GI/LID touches multiple City functions, and many administrative components are needed to implement and manage GI/LID effectively and efficiently on a large scale. Experience across the country has demonstrated that a municipality must build the capacity to administer and implement GI/LID in order to achieve lasting results on a meaningful scale.

Building Capacity

Based on experience of other municipalities, Table 1 displays four categories of operational elements for establishing a framework and capacity for effectively administering and implementing GI/LID. These policies, protocols, and tools collectively provide the capacity for a municipality to coordinate its planning, development review, construction inspections, and maintenance functions pertaining to GI/LID.

Table 1. Municipal Operational Elements for Implementing GI/LID

Policies and Ordinances	Coordinated and Trained Staff	Tools and Incentives	Outreach and Education
· City policy · Revised codes · Legal representation	· Administration · Standard operating protocols: – Development – City property (streets, parks, facilities) – Utilities – Emergency services – Solid waste services	· GI/LID templates · GI/LID checklists · Performance standards · Cost-effectiveness tool · O&M manual · Strategic plan · Expedited approval · Fees reduction · Cost rebate	· Demonstration projects · Multi-media program · Training and certification

Knowing the Challenges

Based on the City's implementation of GI/LID so far, on discussions with City staff from multiple departments, and on initiatives by other cities, more than 60 challenges for implementing GI/LID on a broad scale were identified for Raleigh. Many of these challenges reflect conflicts between or gaps within City departmental policies and operational protocols, as well as areas where administrative tools and training are needed. Additionally, because of the relative newness of GI/LID concepts and practices, there are areas of uncertainty for how some program elements would be handled cost-effectively. Collectively, these gaps and impediments must be addressed in order for Raleigh to move forward with effective management and support (i.e., coordinated and collaborative efforts across core City functions and departments) for GI/LID.

Strategy for Implementing GI/LID in Raleigh

SUPPORT AND STRUCTURE

In the fall of 2013, City staff recommended and the City Council authorized consulting assistance to help develop a GI/LID implementation plan. The City retained consulting firm Tetra Tech to facilitate staff work sessions, share their national experience assisting other communities with GI/LID implementation, and provide technical services to advance GI/LID in Raleigh.

City staff and the consultant identified three phases for advancing GI/LID:

- Scoping is needed to orient staff and stakeholders to the process, assess needs fully and prioritize actions, and develop an action plan for building the framework.
- Building framework involves conducting research, facilitating staff and stakeholder discussion of policies and protocols, and developing tools that will inform and facilitate effective implementation.
- Implementing is getting GI/LID integrated into codes and policies, planning and decisions by City staff, developers, and designers, and recognizing and seizing opportunities for using GI/LID on existing development, in new development and redevelopment, and in a wide range of City capital improvement projects. Successful implementation of GI/LID will mean considering use of GI/LID on par with use of conventional stormwater management practices.

RESULTS OF SCOPING FOR GI/LID

The City has completed the Scoping phase. The process and results of scoping activities are described below.

City Staff GI/LID Task Force

In November 2013 an internal City staff task force was formed to support scoping for advancing GI/LID in Raleigh. The GI/LID Task Force was composed of heads (or designees) from the following key City departments and administration offices:

- City Manager's Office (including Office of Sustainability)
- Public Works Department (including Stormwater Management, Transportation Field Services, and Design and Construction)
- Planning and Development Department
- Public Utilities Department
- Parks, Recreation, and Cultural Resources Department
- Solid Waste Services
- Fire Department

By having senior staff with decision authority participating, the objective was to ensure that each department's ideas and concerns were considered and that each department's commitments to the resulting GI/LID Work Plan would be acceptable and would benefit the City through departments' missions. Strong coordination among key City department programs moving forward was key to reducing existing gaps and impediments to advancing GI/LID in Raleigh.

The Task Force convened five times between November 2013 and May 2014 in work sessions facilitated by the City's consultant. From the onset, the Task Force understood that its primary objective for scoping was to provide input to a work plan that would present a clear vision and priority actions for building the City's capacity to advance GI/LID on a larger scale.

Developing a GI/LID Work Plan

Guiding Principles

At the beginning of the process, GI/LID Task Force members helped assemble and review the City's past GI/LID implementation efforts and identified the more than 60 challenges to be addressed for an effective, larger scale GI/LID implementation framework. As an initial group decision, the Task Force developed the following guiding principles for developing a work plan for implementing GI/LID:

Guiding Principles of the City Staff GI/LID Task Force
Incorporate GI/LID into new development, redevelopment, and existing development in ways that: ○ Demonstrate the City's leadership and set an example ○ Accommodate essential City operations ○ Are scalable and affordable ○ Consider long-term cost-effectiveness and can be sustained over a long period of time ○ Consider strategic timing/phasing of actions ○ Add amenities ○ Balance multiple City objectives ○ Help educate City staff and provide clear vision ○ Make sense to citizens and City staff responsible for implementation ○ Consider the social component/complexity of Raleigh (i.e., makes sense for Raleigh)

Priorities, Initial Ideas, and GI/LID Work Plan Drafts

The Task Force then identified which of the 60 challenges should move forward for evaluation, scoping, and cost estimating. Between January and May 2014, the Task Force worked with the City's consultant to flesh out the highest-priority work items for guiding initial GI/LID framework building. City staff and the consultant also obtained comments and suggestions from separate focus group meetings with representatives of SMAC, a homebuilders' association, a citizens advocacy group, and an environmental advocacy group. Based on this input, the following highest-priority work items were selected for guiding initial building of a framework for advancing GI/LID, the second phase:

1. Evaluate potential changes to design templates for streets
2. Develop and apply an LID cost-effectiveness tool
3. Prepare GI/LID site planning factsheets and checklists
4. Prepare guidance for GI/LID maintenance
5. Plan for implementing GI/LID on existing development
6. Evaluate potential incentives for using GI/LID

Each work item was framed to address multiple challenges among the original 60 challenges. Draft work descriptions, estimates of the consultant's costs, and estimates of duration were developed for each work item and, together, comprised the initial drafts for the City's GI/LID Work Plan. After receiving a draft GI/LID Work Plan and hearing a staff presentation on the scoping effort at a June 2014 work session, City Council directed staff to continue the scoping effort and return to Council with a process for obtaining additional stakeholder review and input. A process was developed by staff and approved by Council in October 2014 for implementation.

Stakeholder Input

The process for stakeholder review of the draft GI/LID Work Plan was intended to meet multiple objectives, including but not limited to:

- Raise awareness among a broad public spectrum regarding what LID and GI are and why the City is interested in advancing GI and LID
- Raise awareness about what Raleigh already has done to implement GI and LID
- Share information about what other communities are doing to implement GI and LID
- Communicate the long-term process for advancing GI and LID in Raleigh
- Describe the other Task Force-recommended high-priority draft Work Plan items
- Discuss how stakeholders might be involved in each draft Work Plan item
- Get input from stakeholders on the draft Work Plan including concerns, what is missing, who else should be involved, timing, etc.
- Gage level of community interest in and feasibility of implementing GI and LID
- Provide City Council with recommendations from a stakeholder community regarding support for and concerns about implementing GI and LID, revising the draft Work Plan, and potential Work Plan items to implement later

City staff reached out to multiple groups and individuals to participate in the draft Work Plan review, including some representing business and development advocacy, citizen advocacy, environmental advocacy, key City commissions and boards, professional organizations, and other public agencies. Invitees were encouraged to pass along notification of the process and meeting opportunities to any others they thought would be interested.

Two facilitated 2-hour evening meetings were held (November 12 and December 10, 2014). Twenty-nine stakeholders and eight City staff attended one or both meetings. Background information was shared, and the participants had multiple opportunities to share input orally and in writing. Stakeholder participants were engaged and provided excellent input. A detailed summary of each meeting is provided in the appendices to this document.

Stakeholders' input represented a broad spectrum of opinions, from an emphasis on moving as quickly as possible to a caution about taking on too much at once. Feedback addressed the six draft Work Plan items as well as broader policies and actions thought necessary to better support City staff leadership and engagement. Primary recommendations from the stakeholders' collective input are as follows:

Primary Recommendations of GI/LID Stakeholders

1. City Council and the City Manager should issue a clear mandate to City staff to reinforce expectations for advancing GI/LID through collaborative efforts across City departments, including:
    a. Adopt a formal mission statement regarding GI/LID.
    b. Designate an internal point person or champion on staff to encourage team work and to advance implementation.
    c. Create an ongoing interdepartmental team for discussing GI/LID as pertaining to issues and/or projects (e.g., ordinance, performance standards, selecting projects for CIP).
    d. Consider a directive that all departments must evaluate the application of GI/LID, where practical and reasonable, for all new City-initiated development and significant redevelopment. Consider setting goals and benchmarks for the City as a part of this initiative.
    e. Conduct informal internal cross-training and outreach to foster collaboration and facilitate incorporating perspectives of multiple departments from the beginning of projects; include a "GI/LID 101" course.
2. Revise the Work Plan to include a new item for reviewing of the entire City code (not just the stormwater section) to identify and eliminate barriers and create options for GI/LID. This is a critical part of implementing LID and should be done as soon as possible.
3. Don't rush to change the City's existing stormwater performance standards. Rather, focus on allowing voluntary (i.e., not mandatory) GI/LID best management practices to be used to meet existing performance standards. Establishing more stringent performance standards for GI/LID would likely create a disincentive for their implementation.
4. Accelerate identification of priority opportunities for GI/LID on existing developed City properties. Advancing GI/LID projects more quickly will set a tone for City leadership and enhance interdepartmental coordination.
5. Accept the consulting team's recommendation to reduce the early portion of the draft cost-effectiveness Work Plan item to a 3-4 month scoping process to reduce cost and allow for moving on to cost-effectiveness tool development more quickly.

Stakeholders also provided suggestions, opinions, and information for the City to consider when implementing the Work Plan items.

Revisions and Final GI/LID Work Plan

Incorporating stakeholders' input, a final GI/LID Work Plan (see Appendix A) was prepared for City Council's consideration. Primary changes from drafts include:

- Incorporated the previously separate GI/LID Process Overview document into the Work Plan.
- Incorporated description of the City's past and ongoing GI/LID activities.
- Modified the scope of the cost-effectiveness Work Plan item to reduce level of effort and cost for the initial analysis.
- Added a new Work Plan item (new item 1) for a strategic review of City code to identify barriers to using GI/LID and for recommending solutions.

Table 2 illustrates which of the elements of municipal capacity are addressed in the work items of this final Work Plan, based on priorities identified by the Task Force and later by community stakeholders. Elements associated with City policy and administration are considered to be only partially addressed in the Work Plan because they are quite broad and the work items are intended to start building capacity, but more work will be needed to address these elements comprehensively. For example, under this Work Plan, incentives such as expedited approval of development permits, reduction of permit fees, and cost rebates will be researched, discussed, and analyzed to set up opportunities to move forward with establishing those that make sense for Raleigh. Also, options for cost-effectiveness tools will be evaluated under this Work Plan, and a selected cost-effectiveness tool will be developed in a future effort.

Table 2. Municipal Operational Elements Addressed by the Seven Work Items in this Work Plan

Policies and Ordinances	Coordinated and Trained Staff	Tools and Incentives	Outreach and Education
Addressed comprehensively			
	·Standard operating protocols: – - Development – - City property (streets, parks, facilities) – - Utilities – - Emergency services – - Solid waste services	·GI/LID templates ·GI/LID checklists ·O&M manual	·Demonstration projects
Addressed partially			
·City policy ·Revised codes	·Administration	·Cost-effectiveness tool ·Expedited approval ·Fees reduction ·Cost rebate	
Not addressed			
·Legal representation		·Performance standards	·Multi-media program ·Training and certification

With the addition of the work item for reviewing the City code to identify barriers to GI/LID, the following work items are addressed in the final GI/LID Work Plan in Appendix A:

1. Review ordinances and policies as they pertain to using GI/LID
2. Develop GI/LID design templates for streets
3. Develop a tool for evaluating LID's cost-effectiveness
4. Prepare factsheets about GI/LID practices and construction checklists
5. Prepare guidance for maintenance of GI/LID devices
6. Identify opportunities for GI/LID retrofits on developed properties
7. Evaluate using incentives for encouraging LID

In addition to the items included in the Work Plan, City staff is continuing ongoing work related to implementing GI/LID, including:

- Implementing GI/LID retrofit projects on City properties through the stormwater Capital Improvement Program and on private properties through the Stormwater Quality Cost Share Program.
- Incorporating GI/LID into other City capital projects, such as new facilities and facilities expansion.
- Incorporating GI/LID into designs of new City streets and street improvements, where conditions are suitable.

Appendix A – Work Plan for Advancing Green Infrastructure and Low Impact Development in Raleigh

Appendix B – Summaries of Meetings with Stakeholders

City of Raleigh Green Infrastructure/Low Impact Development (GI/LID) Stakeholder Review of Draft Work Plan – November 12, 2014

Meeting 1 Summary

Stakeholder Attendees

Jacob Rogers, Triangle Community Coalition	Debra Ryals, Wake County
Travis Crissman, Hazen & Sawyer	Dave Toms, Environmental Advisory Board
Mike Mullis, Mullis Design Group	Nicholas Lannon, NCSU
Suzanne Harris, Homebuilders Association of Wake County	Kevin Brice, City of Oaks Foundation
Marc Horstman, WK Dickson	Eric Braun, Planning Commission
Hunter Freeman, Withers & Ravenel	Peter Raabe, American Rivers
Mary Brice, URS	Matthew Jones, Hazen & Sawyer
Jennifer Dean, Wake Up Wake County	Karen Rindge, Wake Up Wake County
Rob Gelblum, Wake Up Wake County	Leena McDonald, NCSU
Nathan Levin, NCSU	Jamie Powless, Mulkey Engineers
Melinda Clark, Wake County	Jim Broemer, Welcor Development
Debbie Hamrick	Kevin Yates, McAdams
Annette Lucas, NC DEMLR	

City Staff

Mark Senior, Public Works – Stormwater	Kevin Boyer, Public Works – Stormwater
Ben Brown, Public Works – Stormwater	Jen Baker, Office of Sustainability
Carmela Teichman, Public Works – Stormwater	

Consultant Team

Trevor Clements, Tetra Tech	Kimberly Brewer, Tetra Tech
Jonathan Smith, Tetra Tech	

Pre-Meeting Handouts: Overview of Process for Advancing GI/LID in Raleigh; Draft Work Plan for Advancing GI/LID in Raleigh

Presentation Overview

A Stakeholders Meeting regarding advancing green infrastructure and LID in Raleigh was convened on the evening of November 12, 2014, in room 305 of the Raleigh Municipal Building. The meeting was opened by Mark Senior representing the Raleigh Public Works Stormwater Division. He introduced the City staff and consulting team representatives, and then had the stakeholder attendees introduce themselves. Mark stated that the purpose of the meeting was three-fold: (1) to share information about what the City is doing to advance GI/LID, (2) to answer questions and to begin obtaining feedback on the City's Work Plan, and (3) to gage interest of stakeholders in GI/LID for the City.

Trevor Clements (Tetra Tech), Kevin Boyer (Raleigh Stormwater Division), and Kimberly Brewer (Tetra Tech) then co-delivered a presentation to set the stage for obtaining input from stakeholders on the proposed Work Plan for Advancing GI/LID in Raleigh. The presentation covered the following topics:

- What are GI and LID?
- Why are GI and LID important to Raleigh?
- Elements of a successful GI/LID Program
- What some other communities are doing
- What Raleigh is already doing to advance GI/LID
- Actions by a Raleigh City GI/LID Task Force
- A brief overview of the recommended Work Plan

Themes that were emphasized throughout the presentation included the following:

1. LID and GI represent a change of approach when it comes to stormwater management. Rather than trying to transport stormwater off of the built environment as quickly as possible (the primary objective for traditional stormwater management in the past), GI/LID seek to manage stormwater as close to its source as possible using natural landscape features to replicate undeveloped land hydrology as much as possible.
2. Advancing GI/LID in Raleigh is important because traditional stormwater management practices tend to increase destructive flooding and with widening and downcutting of stream channels, to decrease beneficial flooding. Traditional practices also tend to degrade stream habitat, deposit excess sediment, and carry pollution downstream. GI and LID are part of the solution for cleaner water, better aesthetics, and healthier streams and lakes, and are a priority of City Council.
3. While some stakeholders would like to see immediate widespread implementation of GI/LID, the reality is that this requires strong coordination among City departments because of the complex interaction among multiple City functions including planning, development (design review), construction (inspections), and operation and maintenance among others. Experience from successful implementation for other municipalities demonstrates that a City framework is required with elements including policies and ordinances, coordinated and trained staff, tools and incentives, and outreach and education. It takes some time to build this framework, but because of lessons learned

elsewhere Raleigh can develop its ability to advance GI/LID more quickly than if the City was the first to try to do so.

4. More than 60 challenges to implementing GI/LID routinely in Raleigh were identified through a scoping process with City staff from key departments. The draft Work Plan for Advancing GI/LID in Raleigh represents the initial strategy for building the necessary framework elements that will facilitate the City being able to address many of those challenges to achieve greater implementation of GI/LID.

(See pdf file of the slide presentation for more details)

Review of the Draft Work Plan

During the presentation Trevor provided a brief overview of the six items contained in the draft Work Plan and the background for their development (see handouts *Overview of Process for Advancing GI/LID in Raleigh* and *Draft Work Plan for Advancing GI/LID in Raleigh* for details):

1. Design Templates for Streets and Roadways
2. LID Cost-Effectiveness
3. Site Planning Factsheets & Checklist
4. Operation & Maintenance Evaluation & Guidance
5. Priority Opportunities for LID on Existing Development
6. Incentives Review

<u>Questions & Answers</u>

Before opening the floor to comments on the six items, stakeholders were given the opportunity to first ask questions about the process or to clarify specifics about the proposed items. A summary of questions and answers is provided below:

1. Is there a priority order and timeline for the items in the Work Plan? Will they run concurrently or consecutively?

   Answer: The intent is to work on them concurrently, with some potential for staggering start dates where it makes sense for synchronizing activities.

2. Since there are a lot of resources and examples already available, can more of the funds be spent on LID projects and less on replicating efforts?

   Answer: The plan is to draw on existing material where possible and where it makes sense. The resources for the Work Plan items are more directed to the effort of working with staff and stakeholders to tailor approaches or resolve issues to achieve buy-in for implementing the outcome successfully (i.e., to build local capacity).

3. The definitions for LID and GI in the Work Plan are broad and relatively vague (e.g., no performance standard is specified). Has any thought been given to establishing a clearer definition such as adopting the State's definition?

   Answer: The City has not yet agreed on what performance standards should be established. Part of what is learned through the initial framework development will help to define what performance standards might be established through ordinance revisions.

Potential changes to ordinances will be considered as appropriate after these initial Work Plan items.

4. Is it possible to break the Work Plan into elements addressing new versus existing development? There is a lot of pressure to develop certain areas (e.g., inside the I-540 corridor). Will the City's effort be able to address these more urgent needs?

   Answer: One of our questions to stakeholders regarding reviewing the Work Plan is to identify what you might think is missing. You are encouraged to provide input on specifics that you would like to be considered.

5. The proposed tasks take up a considerable amount of time; it has already been a year since the City started the process – what can be done to speed things up?

   Answer: We understand the desire to move forward as quickly as possible. However, communities have discovered that it takes time to build the framework to make it happen. The impediments in policies and operations and gaps in tools and training need to be addressed and that is what the Work Plan is aimed at accomplishing.

6. For the item on the Cost-Effectiveness tool, why is the second phase left as "to be determined?"

   Answer: The second phase involving development of the tool for the City will depend on the outcome of the first phase of review of existing tools. The City may decide to choose one or more existing tools, modify one or more of the existing tools, or develop a new one depending on its findings from the first phase. Given that content of the work, cost, and timing will depend on which direction is selected, it was decided to wait to define that next phase.

7. Why does the Work Plan focus more on LID and engineered GI rather than natural GI such as trees, meadows and wetlands? Was that a conscious decision by the Task Force?

   Answer: The Task Force prioritized which challenges that it felt were most important to address in the Work Plan. If you think an important element is missing from the Work Plan, we encourage you to provide specific items that you think the City should consider in revising the Work Plan.

8. How will the revisions to the Work Plan be documented? Will a tracked changes version be made available?

   Answer: That has not been decided at this point, but that request will be taken under consideration.

<u>Preliminary Feedback</u>

Next, stakeholders were asked to write down responses to the following three questions on 3 x 5 post-its and to post them on the appropriate flip chart pages affixed to the wall:

1. What do you support in the draft Work Plan?
2. What are your concerns about the draft Work Plan?

3. Are any items missing from the draft Work Plan?

The compiled responses are as follows:

[Note: Responses include input from one stakeholder who was not able to attend the meeting.]

<u>Initial Responses to "What do you support in the draft Work Plan?"</u>

- Support making sure that it's done right, but immediate steps can be made on existing development (e.g., downspout disconnection)
- Support the focus on departmental coordination
- I support the inclusion of green infrastructure and the benefits (social, economic, and environmental) our natural areas provide the community
- Including O&M guidance is very important to the process
- Support an incentive-based approach, not mandated
- Well thought out process and overall good Work Plan; buy-in from across City staff is critical to success; glad costs of Work Plan include consultant and City staff; Triple Bottom Line (TBL) is great to have in the plan
- Overall good plan/steps for work plan, except perhaps some unnecessary replication of existing research
- Well written

<u>Initial Responses to "What are your concerns about the draft Work Plan?"</u>

General

- These projects should be done simultaneously, especially since a lot of research has already been done
- Make sure that the need for policy and checklists does not encumber creative problem solving. All the examples in the presentation showed that successful approaches to GI/LID were born from a creative approach to solving the specific challenge, not from a manual detail.

Item 1 – Design Templates for Streets and Roadways

- What can be done to provide local demonstrations to improve stakeholder understanding?
- Should the templates be expanded to include the full public right-of-ways (e.g., sidewalks, alleys, etc.)?
- How does a roadside bioretention practice perform on a typical highway? They need to be installed on flat surface to infiltrate
- Didn't the Stormwater Management Advisory Commission (SMAC) produce a report/ recommendations on LID opportunities for road design? Thought Council liked it!
- How do we get City code to match LID?

Item 2 – LID Cost-Effectiveness

- Will the cost-effectiveness tool automatically include the triple bottom line analysis (rather than done separately from the White Paper)?
- Cost should focus on CIP financial impacts, not private development cost implications
- Look at all components: planning, construction and maintenance
- The right, functional plants put into the correct media and maintained properly work; how are plants accounted for in cost-effectiveness?
- Will plan prioritize BMPs based on cost-effectiveness?
- How are several BMPs dispersed throughout a site more beneficial than a central location?
- What solutions are simple, effective and much cheaper to implement pre- or during development? Which solutions can be easily retrofitted?

Item 3 – Site Planning Factsheets/Checklist

- What are the interdepartmental conflicts for design/implementation?
- How will site plan checklist be shared with developers?
- It appears that deep infiltration of water decreases much more quickly than shallow infiltration as hardscape increases. How does that affect/relate to water quality and stormwater management? What are environmental ramifications?

Item 4 – Operation & Maintenance Evaluation and Guidance

- Viability of private maintenance? Even if certified inspectors are used, City should conduct audits to ensure the system is effective. BMPs on private property = difficult maintenance issues (owner turnover, funding)
- The landscape industry has significant on-the-ground knowledge to bring to bear on making features work; They should be a stakeholder: Greenscapes, Daniel Currin or Kurt Bland, Bland Landscapes
- What would be the role of the city in this, and how would it be enforced? Or is the O&M only for city properties?

Item 5 – Priority Opportunities for LID on Existing Development

- Would it make sense to prioritize contiguous public parcels rather than individual lots? It may be most cost-effective to develop GI over a larger area to develop the systems as cost-effectively as possible (i.e. responding to grading changes and paving patterns across several lots rather than independently).
- Pursue immediate opportunities for small scale pilot projects

- Simplify process or narrow scope for more immediate goal achievement
- Is this just a lengthy analysis of where projects could be? What about actually doing some LID projects on public land?

Item 6 – Incentives Review

- Incentives review should be sure to distinguish between incentives for new versus existing development…both are important to the process
- You need to include infiltration through amendments as a practice and incorporate incentives to increase organic matter of soils because that will directly, positively affect infiltration
- If I have an existing development that is 100% impervious grandfathered from treating stormwater or providing open space, why do I want to retrofit LID? If I'm meeting all of my stormwater/open space tree save requirements for a new development, why do I care or want to implement LID?
- Most of the recommendations are for City/County public property - but is there a way to incentivize less surface parking at the big box store/mall developments? They cover acres and acres of space with typically so few GI systems. Maybe that is a tie-in to a planning issue.
- What have been some of the impacts on sprawl from LID Policy?
- What type of incentives have worked elsewhere? It seems like incentivizing may be challenging
- Appears this research has already been done. Why need to re-create it?
- Is there a plan to reach out to folks that have already taken advantage of incentives?
- What have other cities done for successful incentives?

<u>Initial Responses to "Are any items missing from the draft Work Plan?"</u>

- Greater tie-in to State BMP Manual credits and nutrient management; nutrient credits could be incentive (tracking excess)
- "Low hanging fruit." Can a short-term plan for implementing GI in new and existing development be integrated into the Plan? Especially with willing landowners or City projects?
- Where is urban forestry in the Plan, Urban Ag? Parks Dept? Where is the integration/overlay to Wake County? Parks/greenways, farms, forests also a part of GI for Raleigh
- How do we place value on extant natural areas in terms of GI? How can developers profit from protecting and/or enhancing such areas?

- Integrated water management – GI/LID is good for stormwater and is also good for water supply reliability; It might be good to highlight this a bit more
- Greater commitment to accounting for and including GI to enrich Raleigh
- Specific guidance for City coordination on all types of capital projects
- Just want to be sure the balance isn't out of wack – requiring more from new development instead of also focusing on what can be done with existing development
- How will the Walkable Watersheds project be incorporated into the LID/GI strategic plan?
- Changing ordinances/rules regarding lot for appearance – for example, taller grasses = clean water runoff. USDA NRCS has a compelling demonstration to show this to an outdoor audience.
- I'm concerned that the process is moving so slowly. I understand the need for these discussions, but there is a sense of urgency to these issues, as our City grows. Is there a way to start some implementation during the process?
- What is the overall goal? What is more important (retention, evapotranspiration, infiltration)?

Wrap Up

Trevor went over next planned steps. A copy of the slides will be distributed to all in the next day or two. Stakeholders were encouraged to email Kevin Boyer any additional thoughts on the three questions regarding the Work Plan as soon as possible so they can be considered thoughtfully at the next meeting. A meeting summary will also be prepared and distributed as soon as possible, targeting within the next 7 business days.

Emphasis on the second meeting will be on discussion to flesh out stakeholder input on revising the Work Plan. The second meeting is being targeted for some time during the first two weeks of December. The group was polled for any conflicts. One attendee indicated he could not participate in the first week of December. Kevin will send out an announcement on the date, time and location in the near future for all to mark their calendars.

Summaries of both meetings and a final Work Plan will be provided to City Council for consideration. It was clarified that the stakeholder group would not be expected to vote on items or reach consensus. Input will be documented in the meeting summaries so that Council members can see the breadth and depth of comments, and can see directly how the Work Plan reflects the input. The anticipated time frame for going to Council is late January or February 2015.

City of Raleigh Green Infrastructure/Low Impact Development (GI/LID) Stakeholder Review of Draft Work Plan – December 10, 2014

Meeting 2 Summary

Stakeholder Attendees

Kevin Yates, McAdams	Debra Ryals, Wake County
Suzanne Harris, Homebuilders Association of Wake County	Hunter Freeman, Withers & Ravenel
Eric Braun, Planning Commission	Rob Gelblum, Wake Up Wake County
Peter Raabe, American Rivers	Karen Rindge, Wake Up Wake County
Jamie Powless, Mulkey Engineers	Mary Brice, URS
Annette Lucas, NC DEMLR	Denny Murphy, Murphy Architect
Debbie Hamrick	Mark Senior

City Staff

Blair Hinkle, Public Works – Stormwater	Kevin Boyer, Public Works – Stormwater
Jen Baker, Office of Sustainability	Kenneth Waldroup, Public Utilities
Tansy Hayward, Asst. City Manager	

Consultant Team

Trevor Clements, Tetra Tech	Kimberly Brewer, Tetra Tech
Jonathan Smith, Tetra Tech	

The second of two planned stakeholders meetings regarding advancing green infrastructure and LID in Raleigh was convened on the evening of December 10, 2014, in room 305 of the Raleigh Municipal Building. The meeting was opened by Blair Hinkle, Manager of the Raleigh Public Works Stormwater Division to welcome attendees and thank all for being willing to share comments on the City's proposed Work Plan.

Blair first emphasized that the ultimate goal of the City's initiative is to end up with an operational framework in which LID/GI practices are part of business as usual. Rather than having stormwater management be an afterthought, the challenge is getting LID and stormwater management discussion to occur on the front end of development projects. The City sees its efforts as a way to get stormwater management into the development world's vocabulary in a way that isn't onerous or cost prohibitive, and as a way to expose LID/GI concepts to others who wouldn't normally think about stormwater or their relation to water quality.

Secondly, Blair addressed the fact that several of the stakeholder comments to date involved requests for the City to expedite efforts. He stated that the City operates in an environment that requires buy-in across the organization and community in order for an initiative to be accepted quickly and fully. This requires a thoughtful approach to implementation which is the staff's goal for the work plan. He believes that the more thoughtful we can be now in framework development the better, and he asks for patience as we work through the process.

Blair concluded his remarks with an observation. Since joining the City staff recently, he has noted that staff are already working collaboratively to support GI/LID. He cited efforts with the Unified Development Ordinance to provide for traffic calming streetscapes, City construction projects that incorporate innovative stormwater practices or LID, and water quality-based stormwater retrofit projects and stream restoration projects on public property as examples of what the City has been doing and will continue to support.

Next, Trevor Clements (Tetra Tech) reminded the group that the Work Plan currently consists of six proposed items:

1. Design Templates for Streets and Roadways
2. LID Cost-Effectiveness
3. Site Planning Factsheets & Checklist
4. Operation & Maintenance Evaluation & Guidance
5. Priority Opportunities for LID on Existing Development
6. Incentives Review

These items reflect the areas that the City Task Force determined were most important to supporting collaborative City department operations for the advancement of GI/LID in Raleigh. While individual efforts on specific projects such as those that Blair summarized will continue, the Work Plan currently focuses on building the City's capacity for a comprehensive GI/LID approach that links functions including planning, development design, construction inspection, operation and maintenance, and public outreach (see Meeting 1 Summary and presentation slides, and the supplemental document *Overview of Process for Advancing GI/LID in Raleigh*, August 2014, for more details).

Trevor confirmed that the primary purpose of the two stakeholder meetings was to obtain stakeholder input on the draft Work Plan including existing items or potentially missing items. Comments received from stakeholders during and after the first stakeholder meeting (held November 12, 2014) were incorporated with the Meeting 2 handout, sorted into two overarching categories:

(1) Comments pertaining to the Work Plan's Content

(2) Comments pertaining to Work Plan Implementation

Trevor stated that the focus of Meeting 2 would be on the first category. The City and its consulting team are concentrating on whether the draft Work Plan needs refinement before requesting consideration for approval by the City Council. The comments in category 2 can be considered later on by those performing the work for the Work Plan items approved by the Council.

The consulting team further divided the first category of comments into three general subcategories A, B, and C to organize the meeting discussion:

(A) Expediting Efforts

(B) New Development and Performance Standards

(C) Integrating with City GI-Related Initiatives

Subcategory A generally reflects the comments from several stakeholders recommending simplification of the scope for more immediate goal achievement and pursuing "low hanging fruit." Subcategory B contains comments requesting additional efforts to address GI/LID in new development particularly where there is heavy development pressure. This subcategory also included comments calling for development of performance standards to define what constitutes GI/LID in a development or project. Subcategory C includes comments that ask how the City plans to link the GI/LID Work Plan activities with opportunities that may be present with other ongoing City GI-related initiatives. Examples cited included the Walkable Watershed project and urban forestry programs.

The group was asked if they had any additional comments to add to the list. One suggestion was to include a more formal mission statement that reflects the City's commitment and objectives for the effort. A follow on comment was to include the impetus and basis for support for staff action to further demonstrate that commitment and provide a clear mandate for City staff to engage fully in the initiative.

Meeting participants were then asked to breakout into three discussion groups corresponding to the three subcategories listed above. Each group had a moderator to facilitate getting input on what refinements to the Work Plan should be considered. Feedback reported out by each group is summarized below:

Breakout Group A – Expedited Efforts

Participants in Group A represented the Planning Commission, a consultant, WakeUp Wake County, a land development firm, and a former City stormwater staff person. The group considered the two options proposed in the meeting handout for expediting Work Plan (WP) Items 2 and 5:

WP Item 2 – LID Cost Effectiveness. The breakout discussion group supported the proposal to reduce the scope of the first subtask which involves evaluating tool options. Simplifying the effort to a scoping level could allow the intent to be met sufficiently while reducing the time required for the effort from an estimated 9 months to 3 to 4 months (also reducing cost). The City should then be prepared to pick up with the second subtask to develop the City's method as soon as possible after the scoping is completed.

WP Item 5 – Priority Opportunities for LID on Existing Development. The group also supported the recommendation for City staff and the consulting team to initiate the first subtasks that involve identifying the best opportunities for additional GI/LID projects on City property, gathering information to support site evaluation and design, and discussion of the criteria to apply to site selection and GI/LID design. By starting immediately, this might reduce the completion date by 2 to 3 months from the original estimate that was based upon waiting until the City Council approved of any additional Work Plan items. Advancing GI/LID projects more quickly would set the tone for City leadership and continue advancement of enhanced interdepartmental coordination.

Members of the breakout discussion group thought, however, that the most important thing that the City could do overall to expedite advancement of GI/LID was to start working on ordinance revisions as soon as possible. The group acknowledged that the City did not have sufficient

information currently on all areas of the City codes that would need to be revised. However, because of the anticipated amount of time that ordinance revision will require, they advised the City to get working on items sooner and allowing for incremental progress. One example was evaluating changes in the Unified Development Ordinance as they occur to ensure that they do not create impediments to GI/LID that then have to be fixed at a later date.

The group discussed whether the City should consider reducing the effort to some "low hanging fruit" opportunities to avoid trying to take on too much too quickly. There was some concern that by trying to work through the complexities of interdepartmental operations, the process could bog down or collapse. Others thought that it was for this reason that a clearer mandate to City staff was needed to reinforce expectations. One idea discussed was having administration issue a mandate that all departments must evaluate the application of GI/LID, where practical and reasonable, for all new City development and significant City redevelopment.

Breakout Group B – New Development and Performance Standards

The breakout group had very diverse representation from the Homebuilders' Association, citizens, stormwater design engineers, formerly Environmental Advisory Board, Stormwater Advisory Commission, and NCDENR. The group discussed two items:

(1) New Development: should the work plan be revised to recommend consideration of changes to the City code to remove barriers to GI/LID, either in the first stage (i.e. 2015) or second stage (i.e. 2016) of GI/LID program development.

(2) Performance Standards: The overarching goal of LID is to try to replicate predevelopment hydrology. Communities have developed different design performance standards for LID BMPs linked to this goal (e.g. control and treat the 90th percentile storm event). As part of the Work Plan, should a LID design performance standard be developed for the City; if so, should this be a tailored performance standard to meet city-specific objectives or a more generic performance standard; and does the City have enough information to begin establishing a LID performance standard?

Based on the discussion, the breakout group reported out the following recommendations:

<u>New Development</u>

(1) Review the entire City code (not just the stormwater section) to identify and eliminate barriers and create options for GI/LID. This is a critical part of implementing LID and should be done as soon as possible. (ASAP may mean doing this task in 2016 or before.)

(2) The templates and factsheets that are part of the current Work Plan items #1 and #3 can inform the code review and needed code changes. Different departments discussing and reaching agreement on the GI/LID templates will facilitate their agreement on related code changes. Make sure that representatives from the development/design engineer community and other stakeholders also have a chance to review the draft templates and factsheets.

<u>Performance Standards</u>

(1) Don't change the City's existing stormwater performance standards; just allow LID BMPs to be used to meet those performance standards. Some additional discussion points included: keep GI/LID voluntary; don't make it mandatory. If you want developers to start using LID, don't increase the bar by creating more stringent performance standard

for GI/LID -- this would be a disincentive. Have uniform stormwater standards throughout the City unless there is a mandate, like a TMDL, for a particular area.

(2) Investigate what incentives can be given to developers who go beyond the City's existing stormwater standards.

(3) For the long term, investigate strengthening the City's stormwater performance standards across the board (not just for LID).

During the small group discussion and general discussion Annette Lucas of NCDENR noted that the state has a definition of LID and a LID tool (Storm E-Z) that the City of Raleigh could consider adopting and using.

Breakout Group C – Integrate with City Green Infrastructure Initiatives

Group C was comprised of representatives from American Rivers and WakeUp Wake County, along with City staff from the Office of Sustainability and the Stormwater Division. This breakout group discussed ways to integrate the Work Plan with the City's existing green infrastructure initiatives either to create more opportunities or remove barriers. Based on the discussion, the group made the following recommendations:

(1) Adopt a formal Mission Statement regarding GI/LID and appoint an internal point person or champion on staff to encourage team work and move it forward.

(2) Conduct cross training between departments to make sure other perspectives are incorporated into projects from the beginning. As a part of Work Plan item #1, conduct GI 101 internal training sessions.

(3) Create an ongoing interdepartmental team that meets to discuss issues and/or projects.

(4) Define and understand the value of GI and communicate that value. Get permission to spend more on GI, not eliminate as discretionary. Create something similar to "percent for art."

(5) Set a GI goal and benchmark. The GI portfolio standard in the Great Lakes region has a required percent and teeth.

Wrap Up

Trevor indicated that a Meeting 2 Summary would be generated and distributed to participants. The current plan is for a revised Work Plan to be generated and presented to the City Council along with a summary of stakeholder process for its consideration. City staff and the consulting team hope to have materials ready for the Council by early to mid-February.

Blair stated that from a technical standpoint, if the Council approves the Work Plan, City staff will begin to implement it. He added that from a philosophical standpoint, his commitment is that the Stormwater Management Division will continue to develop and encourage the internal and external relationships that foster progress in this area. Over the last 10 years, stormwater management has gone from an afterthought to getting attention on the front end of projects. He thinks that the next logical step in that trend is that stormwater management moves from peak matching to hydrology matching through increased use of LID/GI. That also means being open to innovation, and having LID as a tool in the toolbox is a great early step in being more

innovative in the way that we can collectively accomplish goals related to stormwater management.

The meeting was adjourned.